MERIAN MSM41

Weekly report 2 (06.04. to 12.04.2015)

In addition to the plankton sampling programme major additional objectives of the survey are the exploration of the marine litter colonising community in the Atlantic garbage patch as well as investigations on the ecology of the *Sargassum* seaweed community.

Since our departure from Bermuda harbour flotsam was quantified visually during daytime on transects parallel to the ship. In addition to floating seaweeds of the genus *Sargassum*, flotsam in the Sargasso Sea region mainly consists of plastic litter. Until Saturday 11.04.2015 the abundance of seaweeds and flotsam was counted on a total of 28 transects. The amount of floating litter, which was encountered on each transect, was considerable in this offshore oceanic region. An average of 37 litter items per km^2 was counted, with a maximum of 98 items per km^2, which corresponds to densities in European coastal regions. Densities on the eastern transect were consistently higher than on the western transect indicating that litter densities may increase towards the centre of the subtropical gyre (Figure 1). Small fragments, which constitute the degradation products of larger items, constitute the major type of floating plastics.

The contamination of the region by plastic debris was confirmed by collections of microplastics from the sea surface using the Manta trawl (Figure 2). Considerable numbers of microplastics were collected during each operation of the Manta trawl.

Specific flotsam items were collected from the sea surface during operations of the Zodiac in order to study the associated species communities (Figure 3). The collection of floating objects is substantially supported by the very careful observation of the crew. A diverse community of organisms was found on floating *Sargassum*. Until now, a total of 35 rafting species could be identified. Species on floating litter are preserved for later analysis.

The Zodiac was also used to collect individuals of *Sargassum natans* at specific stations for a latitudinal comparison of the physiological algal status. Until today, algae were sampled at five stations (24°N to 30°N). This was always carried out with great support of the crew. On board of *Maria S. Merian*, pulse amplitude in vivo variable chlorophyll *a* fluorescence of photosystem II was measured with a pulse amplitude-modulated fluorometer (Diving-PAM). Moreover, samples were shock-frozen for later analysis of photosynthetic pigments, antioxidants and phlorotannins, which will be carried out in the laboratories of the University of Bremen.

Whenever possible larger amounts of *Sargassum natans* were collected at specific stations to monitor the physiological status of the algae in comparative temperature-stress experiments (+5°C, ambient and -5°C). Since it was not possible to run more than a single temperature treatment per day, algae were stored on deck in flow-through tanks. Despite the great effort of the crew (different positioning of the tanks: shade and sun; different flow-through systems etc.), it was not possible to maintain the physiological status of the algae from the field. After only one day the algae became darker in color, possibly due to accumulation of light-harvesting pigments (Figure 4), and displayed a drop in the fluorescence signal. Therefore, it was not possible to compare the algal reactions in the experiments, so that we decided to focus rather on the above described latitudinal comparison of the physiological status.

Due to ideal weather conditions the sampling proceeds as originally scheduled. The crew of the Maria S. Merian wishes a nice weekend!

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