RESEARCH ABOUT MICROPLASTIC'S POLLUTING RESIDUES AND HEAVY METALS IN SEA WATER'S SAMPLES TAKEN BY SERGIO DAVI'

This research concerned the characterization of microplastics (counting and morphological analysis) by optics microscopical's techniques and electronical scanning (SEM) on 40 seawater's samples taken on the sites (from n. 0 to n. 39) highlighted on the map (image 1).
The microplastic's analysis was carried out by Preparation and Biomaterial's Analysis Laboratory (manager prof. Mariano Licciardi of Advanced Technologies Network Center , ATeN Center, of University of Palermo, with the support of Dr.s Luigi Tranchina and Francesco Paolo Bonomo.
In detail the microplastic's counting was carried out by optical microscopic's observations after filtration and treatment with nitric acid and hydrogen peroxide for the complete organic component destruction (images 2 and 3).
The morphological and surface analysis of the same was carried out by scanning electron microscopy (SEM) (images 3 and 4).
The analysis for the quantification of metals and semimetals's pollution was carried out by Residues Laboratory (manager Dr. Antonio Vella) of the Experimental Zooprophylactic Institute of Sicily, with collaboration of Dr. Gaetano Camilleri. The metal and semimetal's analysis was carried out through inductively coupled plasma mass spectometry (ICP-MS) following protocols already existing in the literature (Munksgaard & Parry 2001). This technique detected the Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Arsenic, Selenium, Silver, Cadmium and Lead's levels.

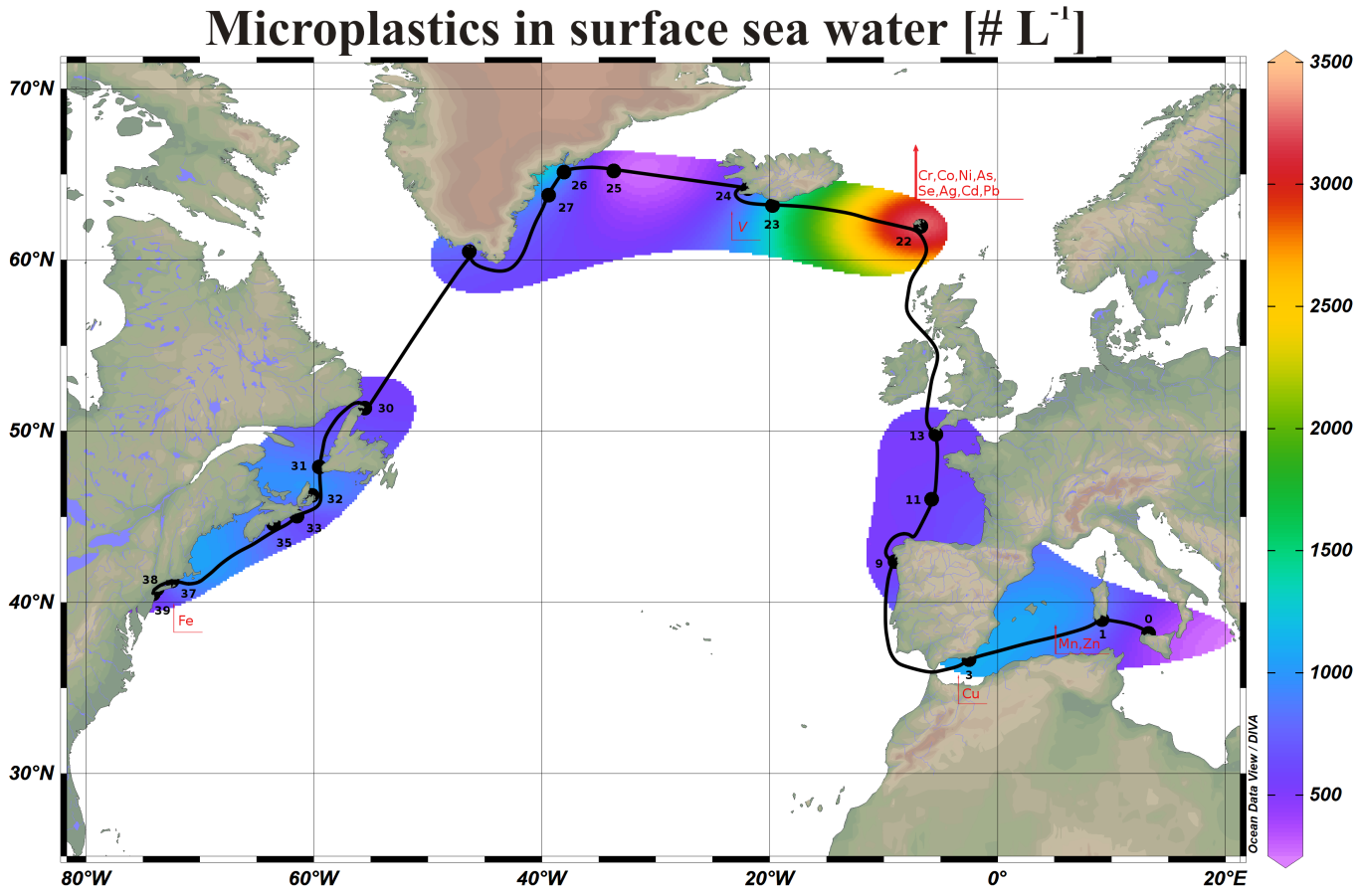

Image 1. Geo-localization and values of pollutants, microplastics and heavy metals.

The highest value of microplastics and heavy metals such as Chromium, Cobalt, Nickel, Arsenic, Selenium, Silver, Cadmium and Lead were found on site 22, Faroe's Islands, with maximum levels respectively of 2.54, 2.65, 2.1, 2.6, 0.68, 14.54, 1.45 and 1.45 micrograms per liter. The reasons for these results can be for the oceanographic peculiarity of the site, which presents numerous water

rising's phenomena (upwelling), as reported several times in the scientific literature (Logemann and collaborators, 2013).
The highest values of Manganese and Zinc were detected in the Mediterranean Sea, specifically in the Tyrrenian Sea (site 1), and Copper was found in Algerian coasts (site 3).
The highest values of iron, with a maximum value of 72.53 micrograms per liter, was detected in site 39 (North America), while the highest value of Vanadium, with a maximum of 2.6 micrograms per liter, was detected in site 24 (Iceland). At the same time, the microplastic's value in the sites mentioned above are always higher than site 22.

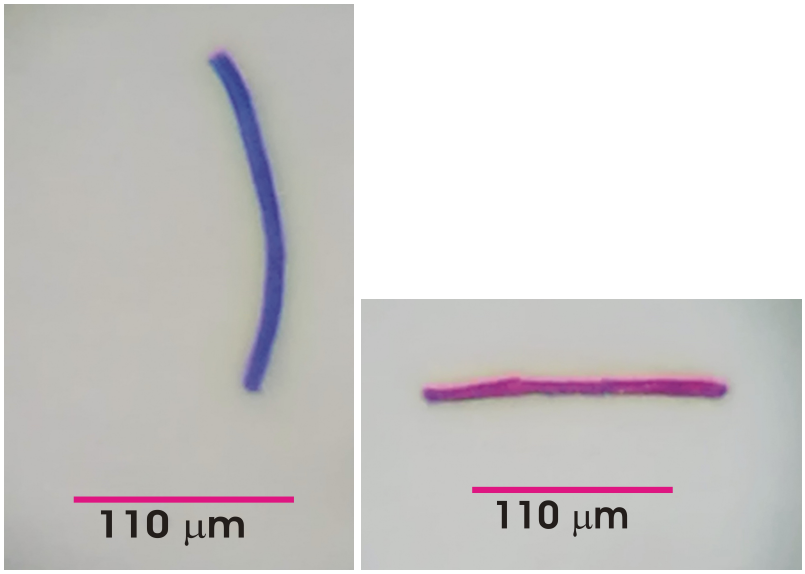

Image 2 and 3. Examples of plastic fiber observed with optical microscope (ATeN-Center)

Microscope's analysis shows that microplastic's filament/ and / or fibrous form are predominant with a diameter of a few microns and tens or hundred of microns long.

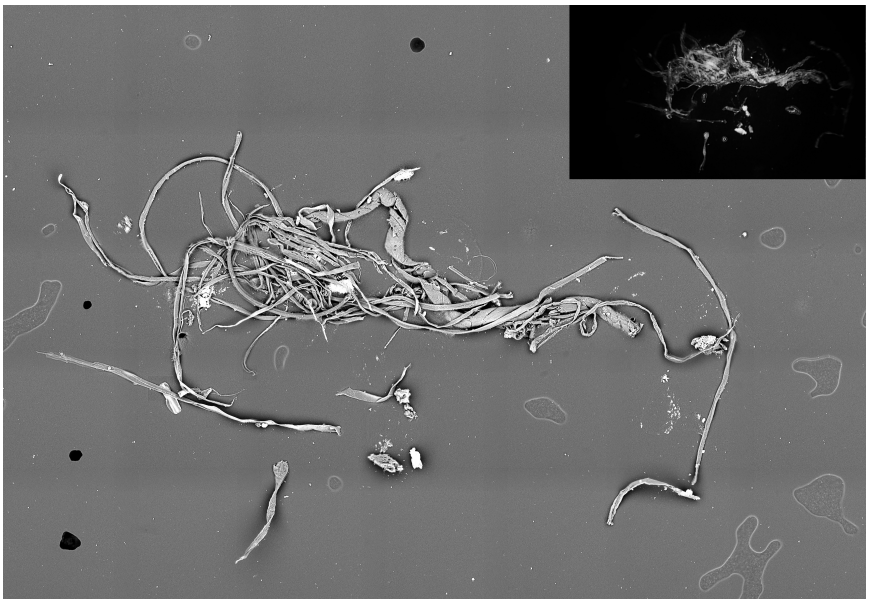

Image 4. SEM image (mapping) compared with the same in optical mode (top right) (ATeN-Center)

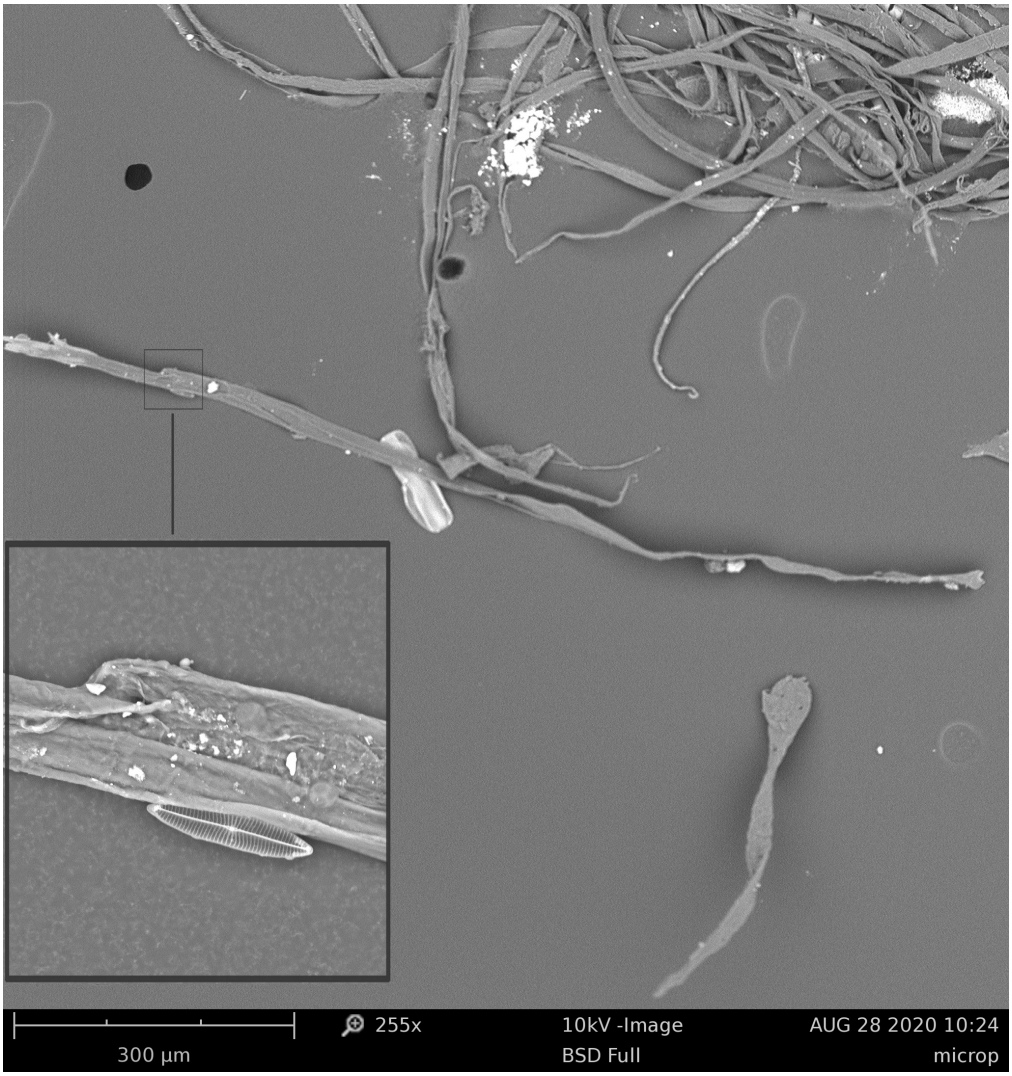

Image 5. SEM image fo microplastic, with detail of marine microorganism's adhesion (diatom) (ATeN-Center).