Micro- and nanoplastics in the sediments of the Santos Estuarine System, Brazil

G.T. Gimiliani[1], M.M. Redígolo[1], M. Fornari[2], M.D.F. Parra[1], A.B. Lugão[1], D.M.S. Abessa[2], M.E.B. Cotrim[1], M.A.F. Pires[1].

[1] Center for Chemical and Environmental Technology, IPEN/CNEN-SP, Brazil
[2] Marine Biology and Coastal Management, UNESP-SP, Brazil

Small-scale plastic debris, such as microplastics and nanoplastics has become leading contributors to the pollution of marine and freshwater ecosystems [1]. These particles are derived from plastic degradation and produced intentionally for manufacturing products [2]. Microplastics are fragments and fibers smaller than 5 mm [3], while the definition of nanoplastics is still under debate; different studies have set the upper size limit at either 1000 nm or 100 nm [2]. The changes in the density of floating plastic debris caused by weathering process, biofilm formation and biofouling may result in sedimentation of these particles [3]. The present study investigates the presence of the micro- and nanoplastics in marine and estuarine sediments because these environments are suggested to be long-term sinks for microplastics. This study is the first investigative analysis about the presence of the micro- and nanoplastics on sediments of the Santos Estuarine System (SES), central coast of the São Paulo State, southeastern Brazil. Sediment samples from four sites distributed along in the Bugres River (23º56'49''S – 46º22'57''W), a small estuarine inlet located within the SES, were collected using a Van Veen grab sampler. In laboratory, the samples were then sieved with different mesh sizes (including < 63 µm), dried and evaluated for type of polymer by infrared spectroscopy (IR) and quantification of microplastics by visual sorting. IR analyses indicated that polyethylene and polypropylene were the main types of polymers found in fragments. Abundance of microplastics were likely inversely related to the mesh size of the sieve. Thus, the amount of microplastics increases as the size fractions decreases. Values ranged from 19 to 4,700 particles g^{-1} of sediment for 2 mm, 450 to 1,900.00 particles g^{-1} for 1 mm, 634 to 7,440 particles g^{-1} for 500 µm, 447 to 26,520 particles g^{-1} for 250 µm. The concentration of fibers ranged from 1.24 to 14.75 times higher compared to the concentration of fragments. In addition, the abundance of microplastics for 125, 63 and < 63 µm will be analyzed by thermogravimetric technique. Considering that the largest abundances of microplastics were found in the smallest meshes, it is expected the presence of nanoplastics in the sediment samples. The results of this study revealed relatively high concentrations of microplastics in sediments of the SES, confirming the widespread occurrence of microplastics in the Bugres River.

Acknowledgements: This study was supported by fellowship CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior). We deeply appreciate the assistance of William Rodriguez Schepis and Ecofaxina Institute who helped with sediment sampling.

References:

[1] CHAE, Y.; AN, Y. **Mar. Pollut. Bull.**, v.124(2), p.624-632, 2017.

[2] GIGAULT, J.; HALLE, A.; BAUDRIMONT, M.; PASCAL, P.; GAUFFRE, F.; PHI, T.; HADRI, H.E.; GRASSL, B.; REYNAUD, S. **Environ. Pollut.**, v.235, p.1030-1034, 2018.

[3] CAWENBERGHE, L.V.; DEVRIESE, L.; GALGANI, F.; ROBBENS, J.; JANSSEN, C.R. Microplastics in sediments: A review of techniques, occurrence, and effects. **Mar. Environ. Res.**, p.1-13, 2015.