Activity report on the project "*Microplastic concentration in sediments and waters of Matagorda and San Antonio Bays: Initial assessment and mitigation plans*"

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Period: January 1st 2022 to March 31st 2022 – Laboratory separation of microplastics from sediments.

During the last quarter, January to March 2022, we worked mainly on separation of microplastics from sediments while also trying to streamline the method. The separation focused on the grab samples (10-20 cm surface sediments) collected from San Antonio and Matagorda bays (Figure 1). The grab samples will allow an overview distribution of microplastics on top sedimentary layer.

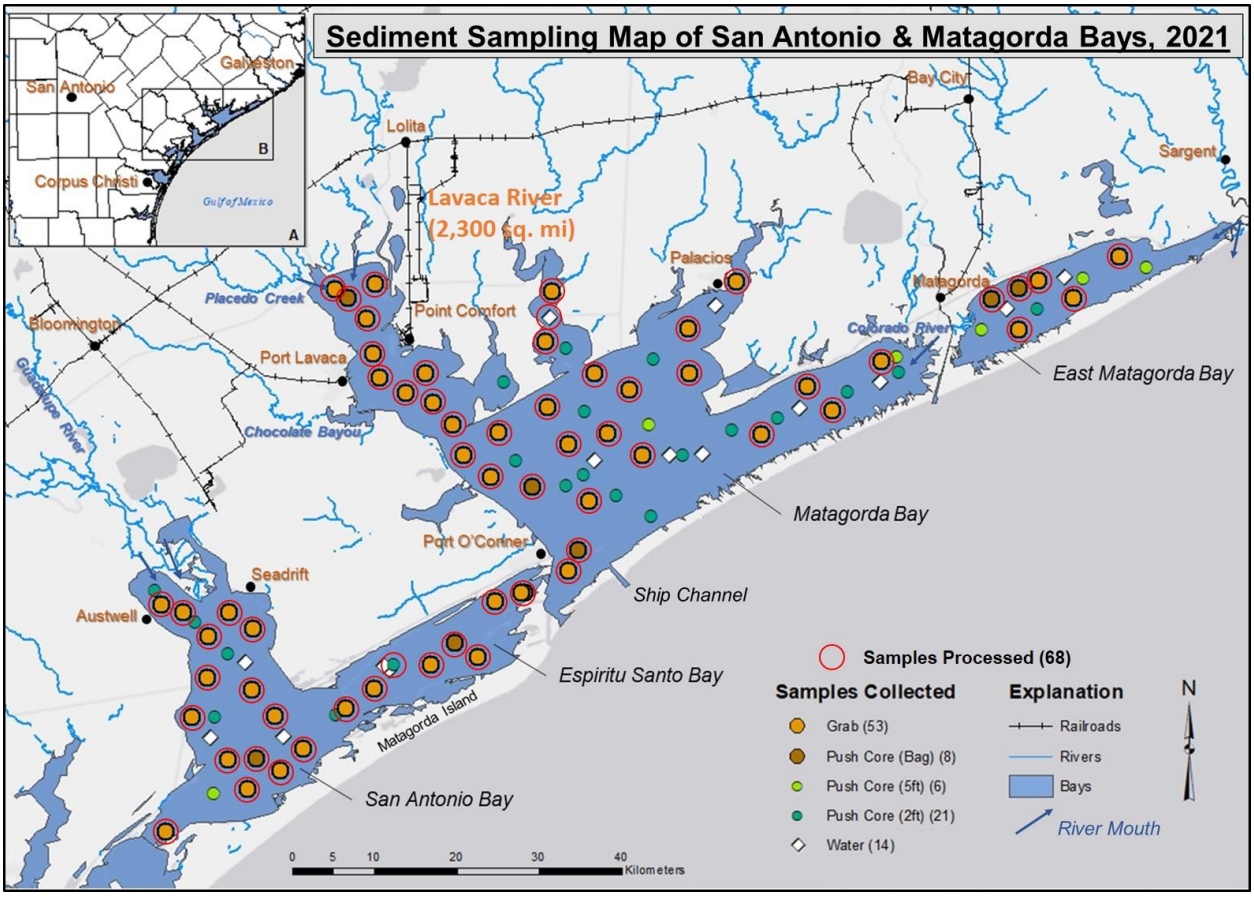

Figure 1. Location map of 2021 sampling campaign on San Antonio and Matagorda bays emphasizing the samples already analyzed in the lab. PC long and short correspond to 5 ft and 2 ft push core locations, PC bag indicates proposed core location where only a grab sample was recovered. Water sites indicate locations where phytoplankton net samples were collected. Salinity, temperature, pH and Dissolved Oxygen data were recorded at most sites.

Following the different method experiments of using vary heavy liquids (NaCl, $ZnCl_2$ and LMT (lithium metatungstate)) and separation devices such as simple funnels, separator funnels and JAMSS (Japan Agency for Marine…Sediment Separator), we decided to use JAMSS with LMT heavy liquid.

The analysis procedure which was used for separation (was also mentioned in a previous report) has 3 main steps:

- **Wet sieving: c.a. 100g sediment using 45um sieve;**
- **Separation with JAMSS (2) using LMT solution (diluted at c.a. 1.5 g/cm^3);**
- **Microscope examination and photography of the filtered material;**

Until present, a number of 68 samples have been analyzed (Figure 1) and particles lighter than 1.5 g/cm^3 separated on filters. The material content of about 33 filters have been described using the optical microscope and content of individual microplastics particles counted. Main observations are:

(1) there are significant variations between microplastics content, some of the samples seems to have >100 (over 100 microplastics particles) per 100g sediments while some samples have only a few microplastics particles per 100 g (Figure 2);

(2) microplastics particles observed at the microscope have varied morphologies (fibers, fragments, pellets, and nurdles) (Figure 3);

(3) the samples that have large number of microplastics seems to be dominated by one single type that dominate such as white/semi-transparent disks (Figure 3).

Preliminary observations on the spatial (map) variability in the bays sediment indicate that larger amount of microplastics is not concentrating in front of the river mouth (for example in San Antonio Bay) but rather close to the seaside/ barrier bar or closer to the landward bayshore (Figure 2). Such observation despite preliminary, and need to be confirmed by FTIR analyses, indicate that microplastics particles once released in the bay can be transported over large areas, or alternatively there have been some microplastics release in the bays that allow concentration in areas that we didn't expect initially.

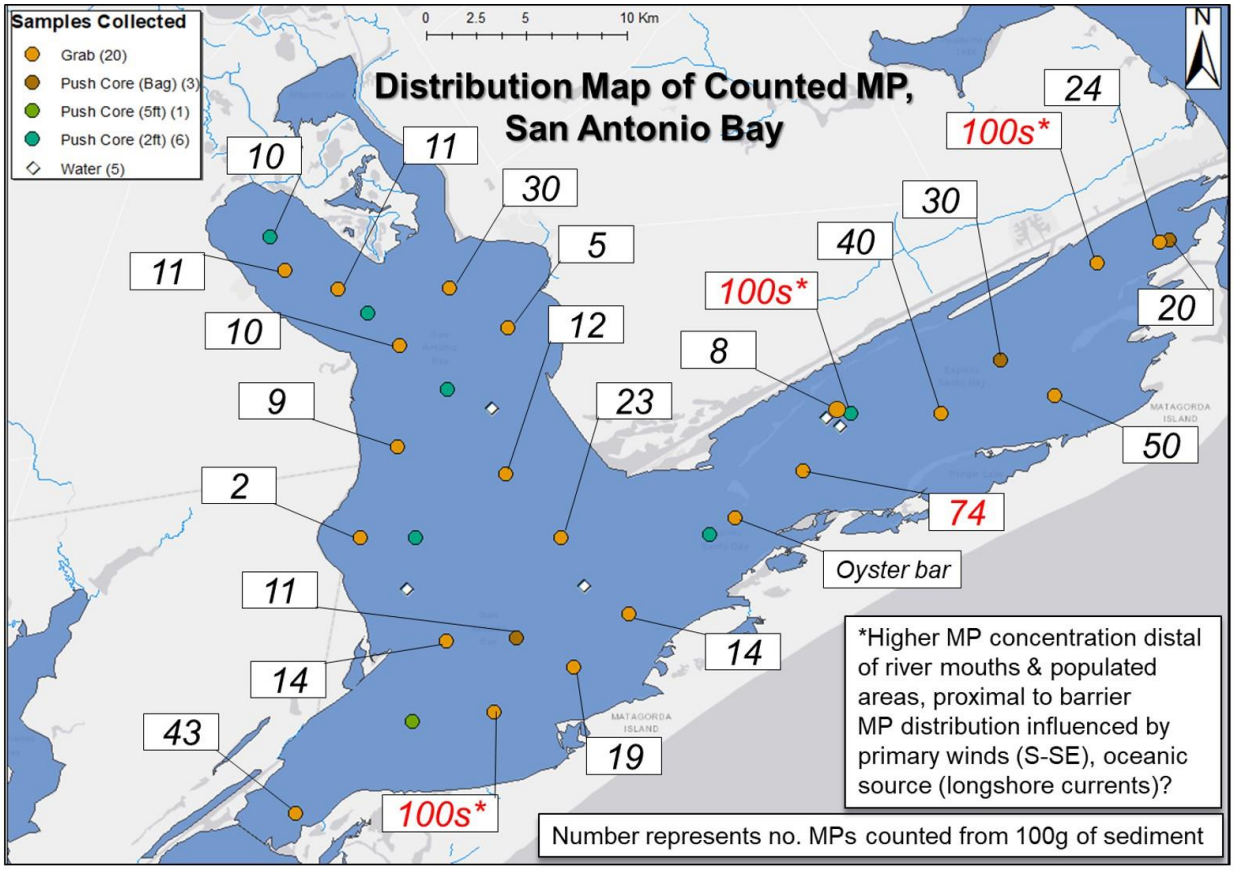

Figure 2. Sample location with the number of microplastics grains in San Antonio Bay as observed at optical microscope. Asterisks indicate samples with c.a. 100s- potentially 1,000s of microplastics observed.

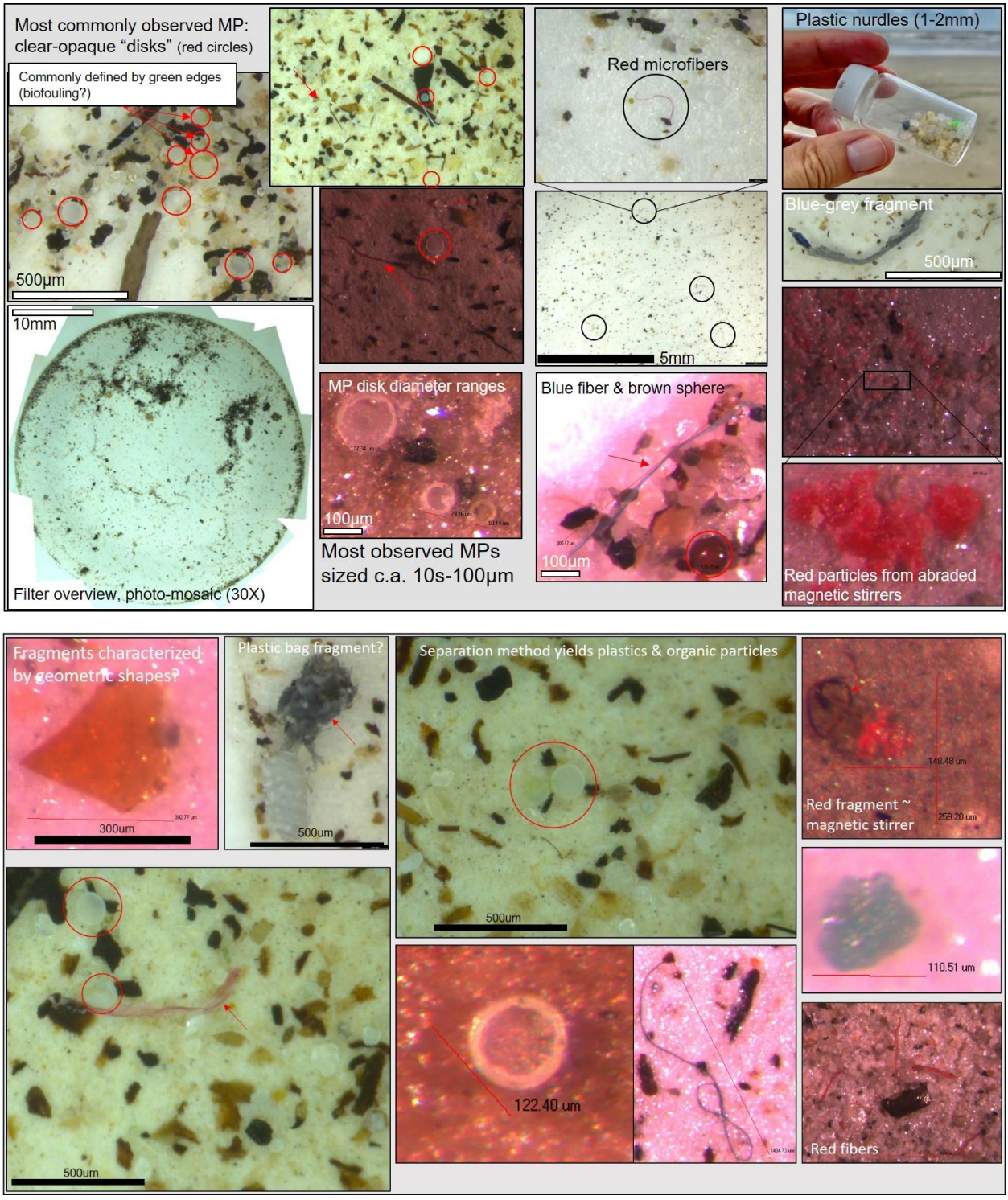

Figure 3. Optical microscope photos. Photos shows variable morphology of the plastic particles and dimensions that are commonly around 100 µm.

Filters with microplastics separated in the sedimentology lab in Austin were submitted to Marine Science Institute in Port Aransas for plastic type identification using FTIR method.

Some of the short cores have been opened (Figure 4), and every inch the sediment was sub-sampled and stored in aluminum-tapped bags for later sampling.

Figure 4. Sediment core (San Antonio Bay site 26) subsampling (2cm interval).

Shimadzu Scientific Inc. is developing a device that can automatically pretreat solid samples and isolate the plastics. PI Liu is permitted to evaluate the beta model of this devise, and is expected to receive during April 2022 (shipped from Japan). We plan to use this device to further polish our pretreatment protocol, and if possible, this device will help streamline the process and enhance the data quality.