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Evidence of Microplastic Pollution in the Río Bravo/Rio Grande (Mexico/US Border)

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Abstract : Microplastics (MPs) are plastic particles smaller than 5 mm that has been detected in soil, air, organisms, and mostly water around the world. Most studies have focused on MPs detection in marine waters, and less so in freshwater, such is the case of Mexico, where studies about MPs in freshwaters are limited. One of the most important rivers in the country is The Rio Grande/Río Bravo, a natural border between Mexico and the United States. Its waters serve different purposes, such as fishing, habitat to endemic species, electricity generation, agriculture, and drinking water sources, among others. Despite its importance, the river's waters have not been analyzed to determine the presence of MPs; therefore, the purpose of this research is to determine if the Rio Bravo/Rio Grande is polluted with microplastics. For doing so, three sites (Borderland, Casa de Adobe, and Guadalupe) along the El Paso-Juárez metroplex have been sampled: 30 L of water were filtered through a plankton net (64 µm) in each site and sediments-composed samples were collected. Water samples and sediments were 1) digested with a hydrogen peroxide solution (30%), 2) resuspended in a calcium chloride solution (1.5 g/cm3) to separate MPs, and 3) filtered through a 0.45 µm nitrocellulose membrane. Processed water samples were dyed with Nile Red (1 mg/ml ethanol) and analyzed by fluorescence microscopy. Two water samples have been analyzed until January 2023: Casa de Adobe and Borderland finding a concentration of 5.67 particles/L and 5.93 particles/L, respectively. Three types of particles were observed: fibers, fragments, and films, fibers being the most abundant. These data, as well as the data obtained from the rest of the samples, will be analyzed by an ANOVA (α=0.05). The concentrations and types of particles found in the Río Bravo correspond with other studies on rivers associated with urban environments and agricultural activities in China, where a range of 3.67—10.7 particles/L was reported in the Wei River. Even though we are in the early stages of the study, and three new sites will be sampled and analyzed in 2023 to provide more data about this issue in the river, this presents the first evidence of microplastic pollution in the Rio Grande.

Keywords : microplastics, fresh water, Rio Bravo, fluorescence microscopy
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