

Occurrence and distribution of microplastics along the Colorado River, Patagonia, Argentina.

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Introduction

Contamination of microplastics (MPs) in freshwater ecosystems has been scarcely studied in comparison to marine ecosystems around the world while the riverine contribution to the global plastic budget remain as a gap (Zhao et al., 2020). The Colorado River is one of the most important rivers in Patagonia, Argentina, including various land uses in its basin which might contribute to plastic inputs, namely, livestock and irrigated agriculture, the extraction of hydrocarbons and minerals, and sound urbanization. Then, the aim of this study was to identify and quantify for the first time the load of MPs in the Colorado River.

Material and methods

Then, the aim of this study was to identify and quantify for the first time the load of MPs in the Colorado River. 12 sites along the river (approximately 1000 km) were selected and samples were collected by filtering 100 L of water (Fig. 1)

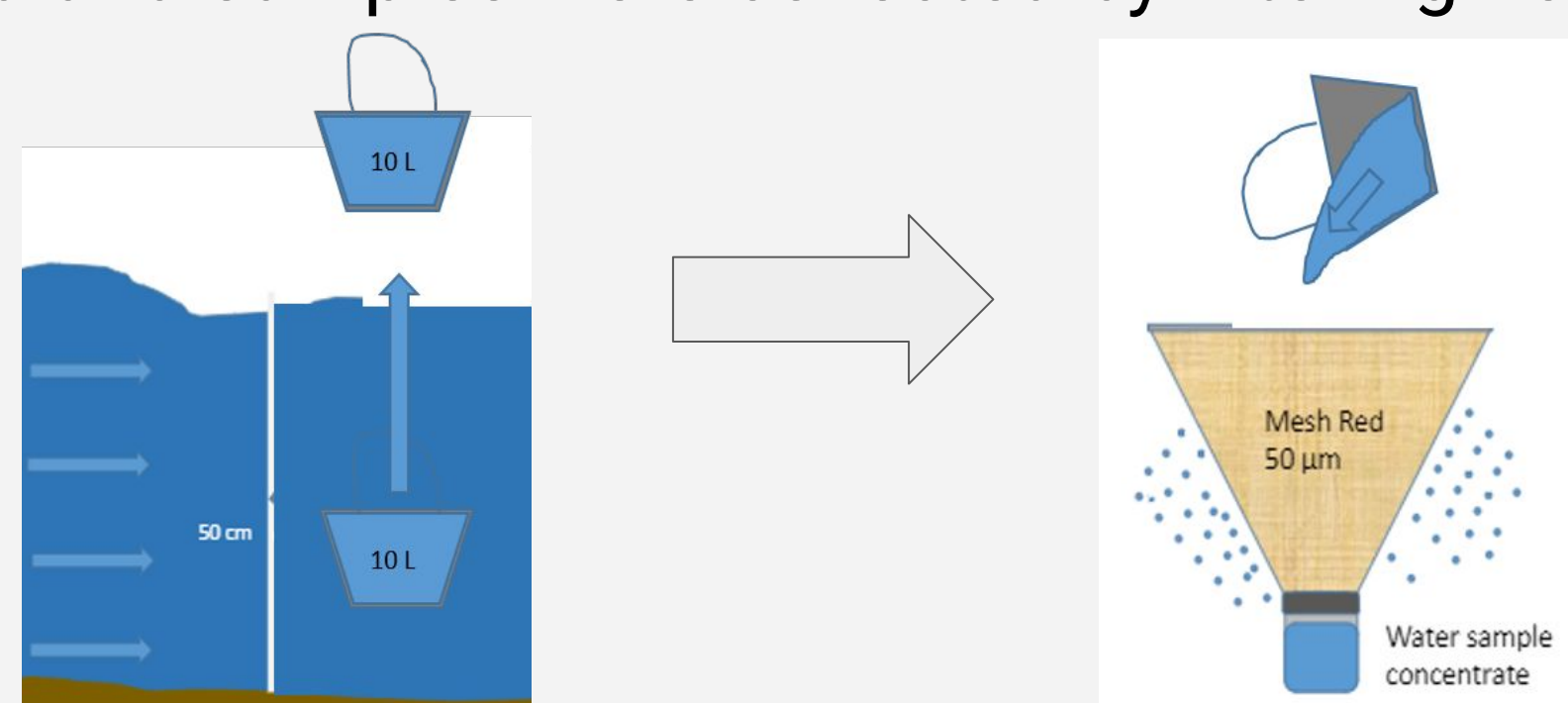


Figure 1. Microplastic sampling.

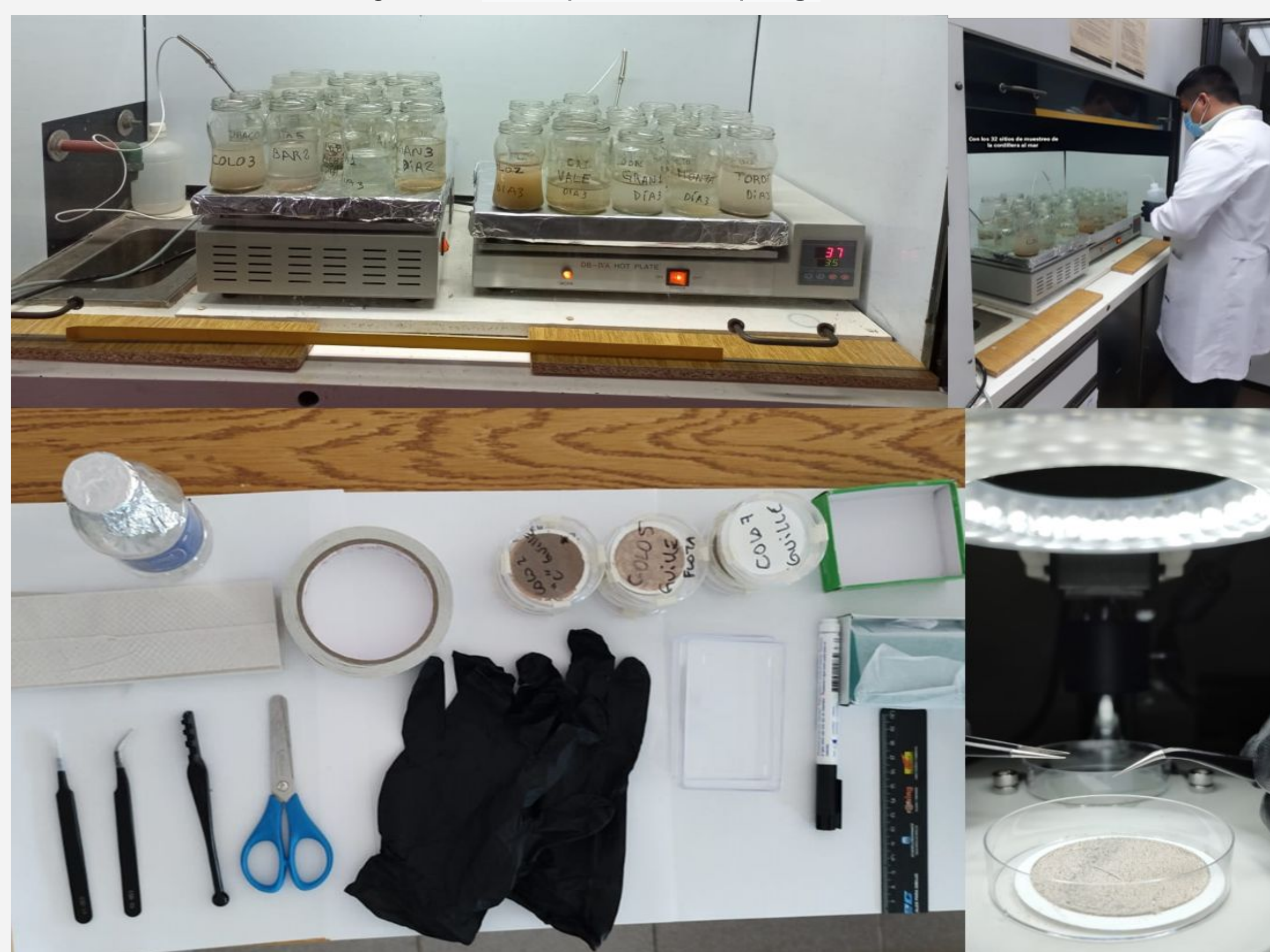


Figure 2. Processing and extraction of microplastics in the laboratory.

Results

The average MPs concentration was 245 ± 204.38 MPs.m⁻³, indicating a high level incidence of plastic pollution of the freshwater ecosystem when compared to other studies in worldwide rivers. The maximum concentration found (760 MPs.m⁻³) was in the middle section of the basin, which exhibit the greater urban and industrial development. The most frequent MPS shapes were fibers (95.2%), prevailing the colours blue (50.3%) and black (34.2%) (Fig.3). The fibers length range was between 0.0146-4.7 mm.

Table 1. Mean length-width of the particles and standard deviation were obtained according to sections of the basin.

| Basin Sector | Length Mean (SD) | Width Mean (SD) |
|--------------|-----------------------|-------------------|
| Upper | 1657,79µm (1300,26µm) | 14,10µm (4,41µm) |
| Middle | 1019,47µm (1172,69µm) | 25,19µm (61,49µm) |
| Lower | 1598,44µm (1739,13µm) | 20,99µm (32,08µm) |

Table 2. Studies of MPs in surface water of rivers in other parts of the world.

| River (Located) | Average concentration (SD) MPs.m ⁻³ | Authors |
|------------------------------------|--|----------------------------------|
| Cuiabá (Brazil) | 96 ± 83 MPs.m ⁻³ | de Faria, E. et al. (2021). |
| Braamfontein Spruit (South Africa) | 705 MPs.m ⁻³ | Dahms, H.t. et al. (2020). |
| Cisadane (Indonesia) | 44.67 ± 24.25 MPs.m ⁻³ . | Sulistyowati, L., et al. (2022). |
| Colorado (Argentina) | 245 ± 204.38 MPs.m ⁻³ | Mora G. et.at. (2022). |

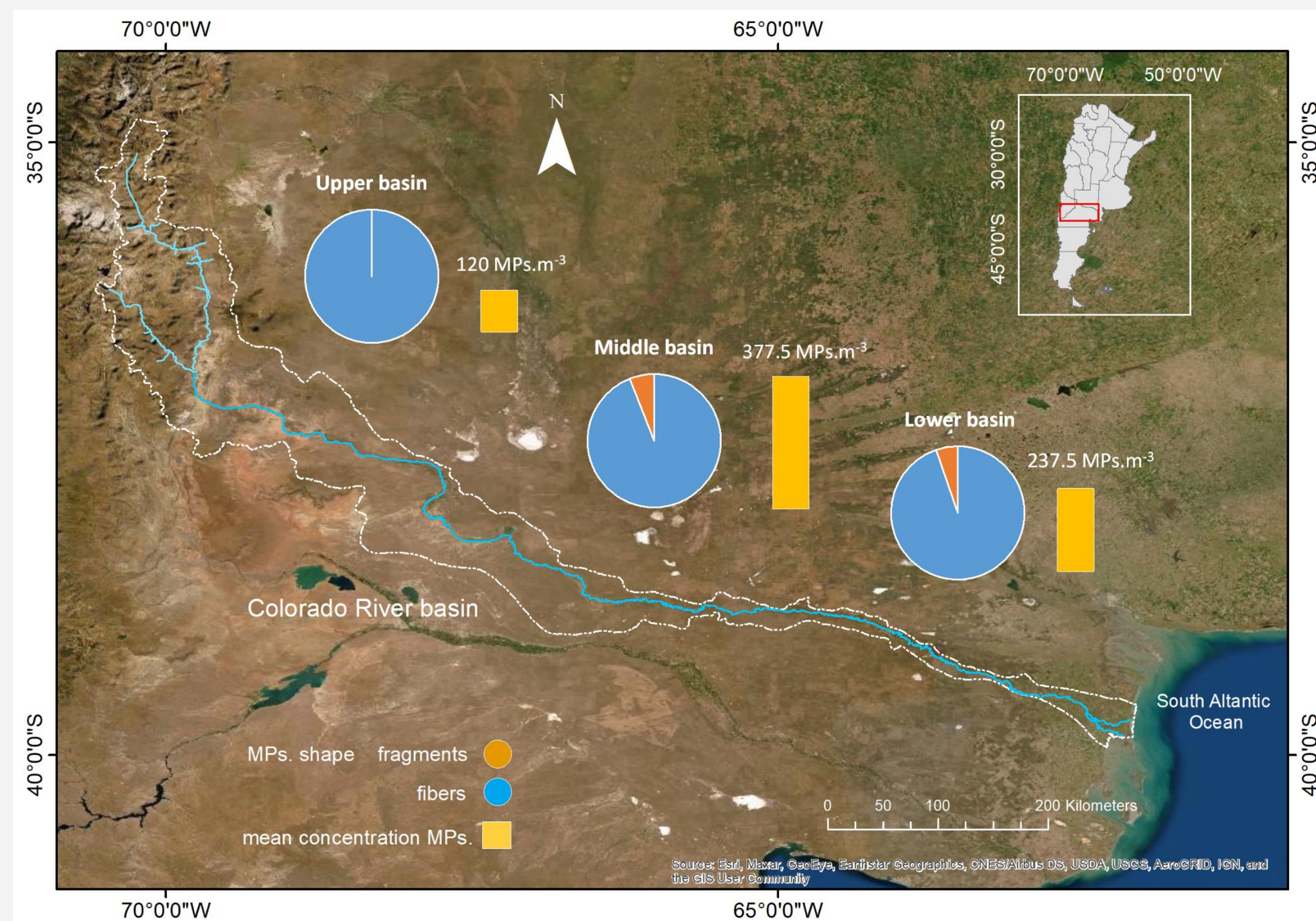


Figure 3. Mean concentration and shapes of MPs. according to sections of the basin

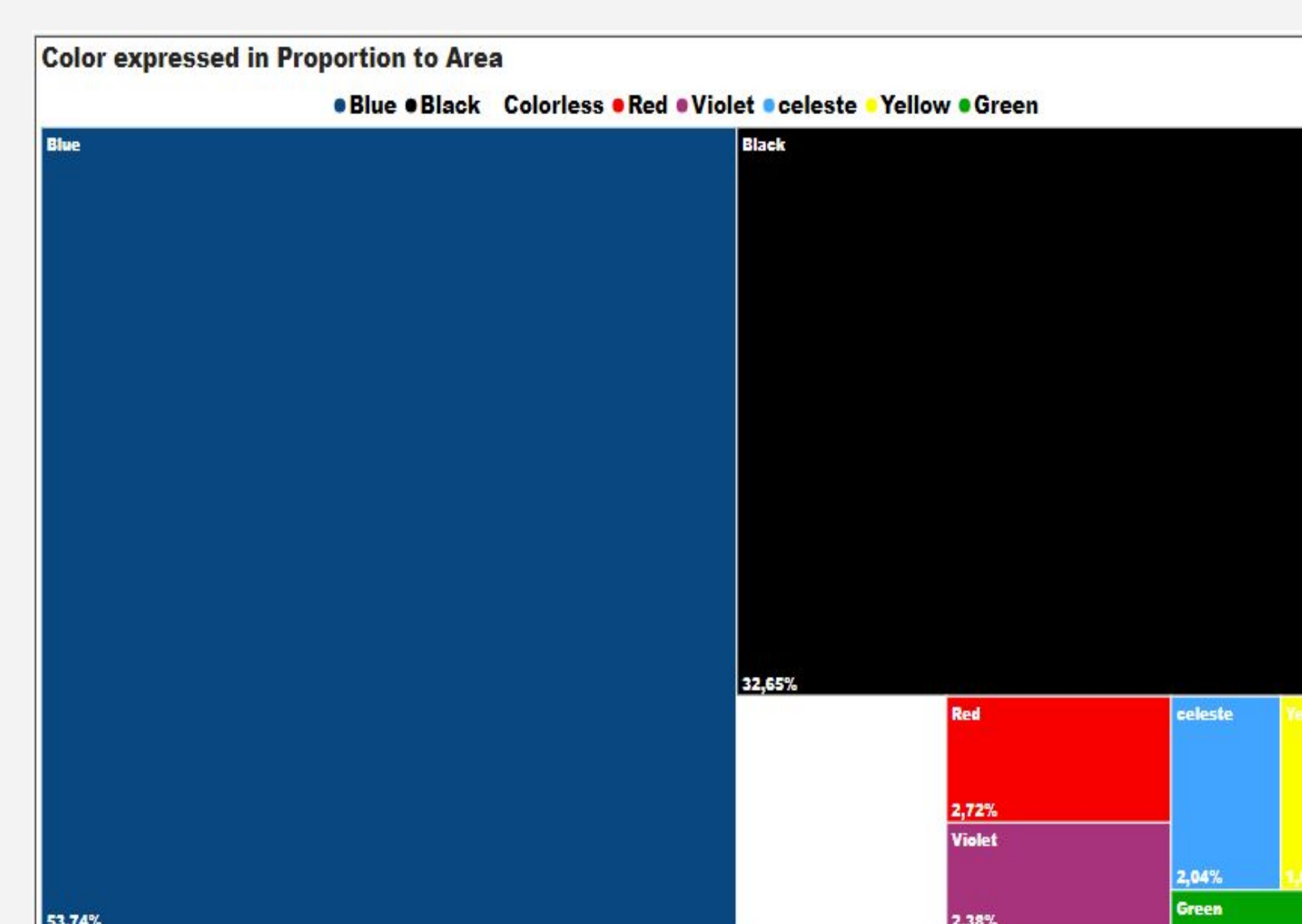


Figure 4. MPs. colors expressed in proportional areas.

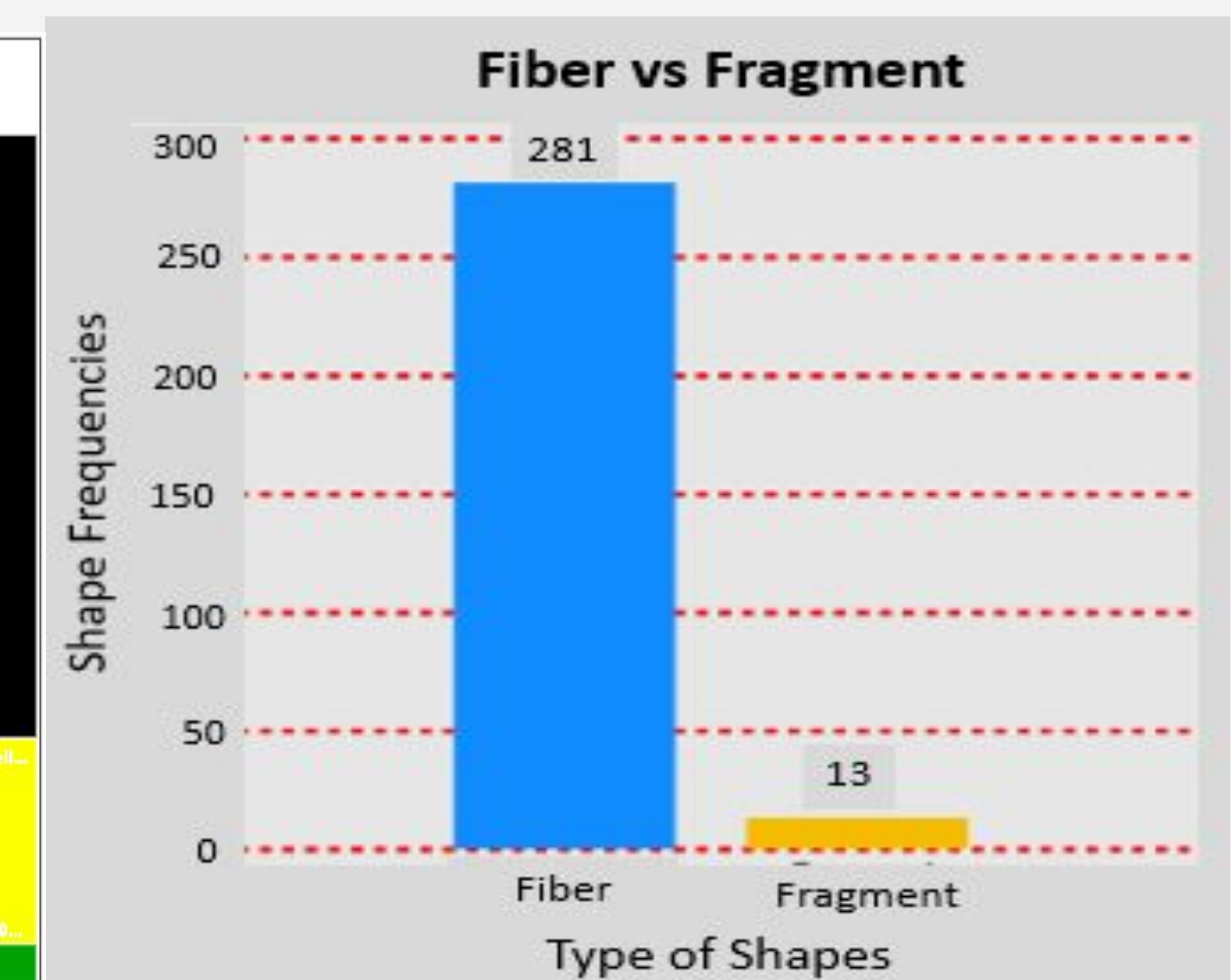


Figure 5. Frequencies of shapes by type of shapes.

Discussion

This preliminary study highlights for the first time the high level of MPs at the Colorado River, describing its distribution and the contribution of the basin to the Atlantic Ocean, as well as its possible impacts on the environment. This knowledge is essential for the preservation and sustainable management of water resources at the Patagonia.

Conclusión

- The surface water of the Colorado River presents high concentrations of MPs comparable to the world order.
- The average concentration of MPs was 245 ± 204.38 MPs.m⁻³ in the Colorado River.
- The maximum concentration found (760 MPs.m⁻³) was in the middle section of the basin.
- The blue colored fibers were the type of most recurrent forms.

Funding. This work was financed with the project PI-UNRN 40-A-915 (2021–2023) of Universidad Nacional de Río Negro "Comprehensive water quality assessment of the Colorado River Basin"; Project PGI 24-Q111 granted to Andres H. Arias, SECyT-UNS.

CONICET financed the doctoral scholarship awarded to GAM

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