

# Microplastics contribution to the marine environment through streams in Fildes Peninsula (King George Island, Antarctica)

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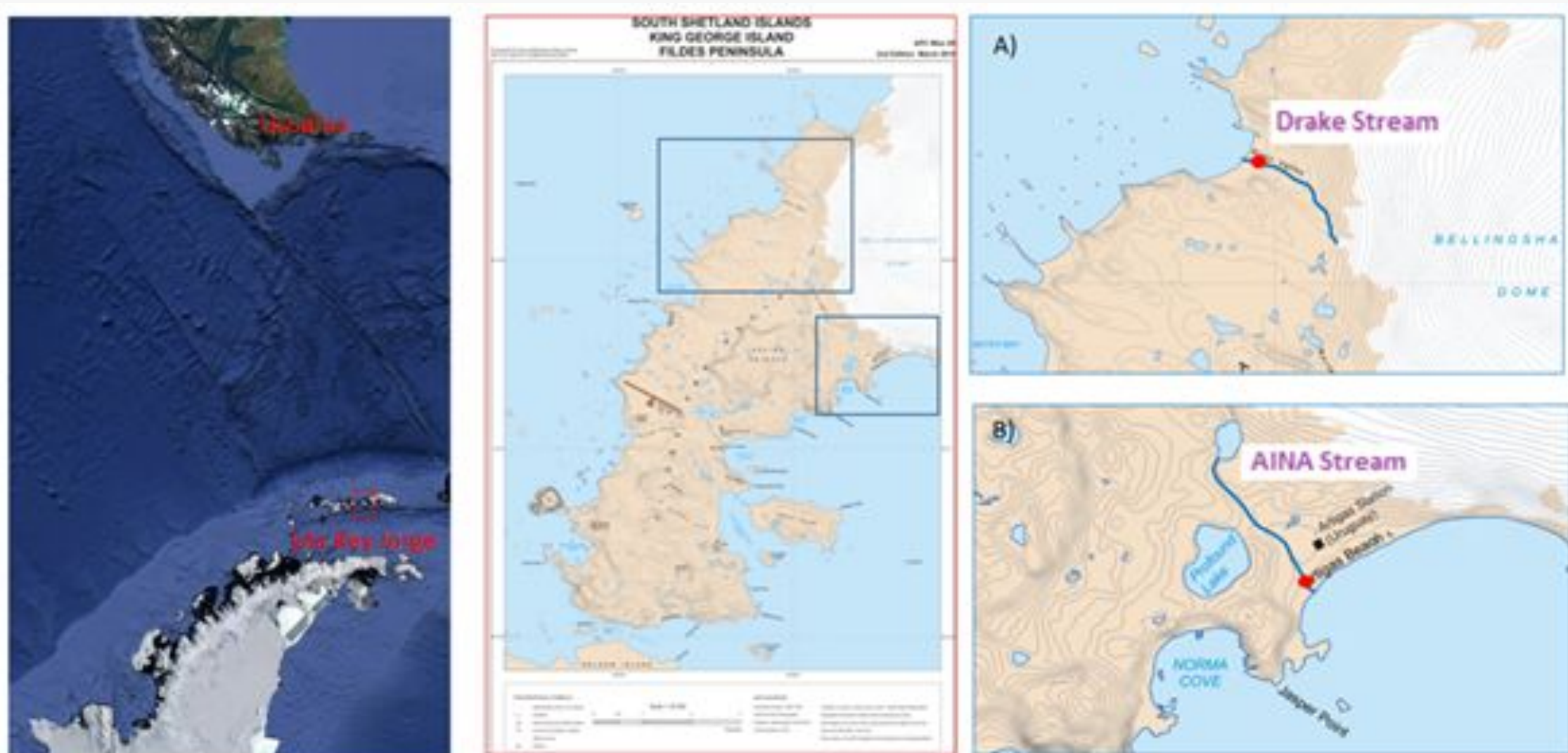
## 1. INTRODUCTION

Plastic is a low cost, durable and versatile material, and has become an indispensable part of our modern life. Its high production level and deficient waste management have led to the increase of plastic garbage in aquatic ecosystems around the world, and its accumulation in the ocean.

Microplastics (MP) are particles <5 mm. These could be either pellets intentionally manufactured in that size to make larger plastics objects, or the result of photochemical and mechanical degradation of larger plastic garbage in the environment (Cole et al., 2011).

Although not all plastic comes from land sources, lotic systems are considered one of the main discharge routes of plastics from terrestrial to marine ecosystems (Lebreton et al., 2017)

In Antarctica, human activities have increased due to the establishment of new scientific bases, fisheries and tourism, which have led to increasing waste production and pollution of aquatic systems with materials from different sources (Kelly et al., 2020).



**Figure 1.** Location of the study area (Fildes Peninsula, King George Island). A) Drake stream, that flows into the Drake Passage and B) AINA stream that flows into Maxwell Bay in front of the Artigas Scientific Station (Uruguay). Red dots indicate sampling points.

## 2. OBJECTIVES

### General

- Evaluate the discharge of MP from streams with different environmental characteristics and exposure to human activities to the coastal area in the Fildes Peninsula.

### Specific

- Classify MP according to type (fibers, fragments, foams), size and colour.
- Estimate MP density (items/m<sup>3</sup>) in water samples from the streams studied.

## 3. METHODS

- Water samples were taken in AINA and Drake streams in summer and autumn of 2018 and 2019.
- A Surber sampler ( net 300  $\mu$ m) was placed against the current near the mouth of each stream. Filtered volume was estimated with a flowmeter.
- Samples were analyzed via direct observation with a stereo microscope.
- The MP found were measured with a millimeter ruler and classified according to type, size and color. During the observation, a laboratory contamination control was placed near the stereo microscope.
- Fibers and fragments found in the samples were observed under a microscope with polarized light to verify their synthetic nature.



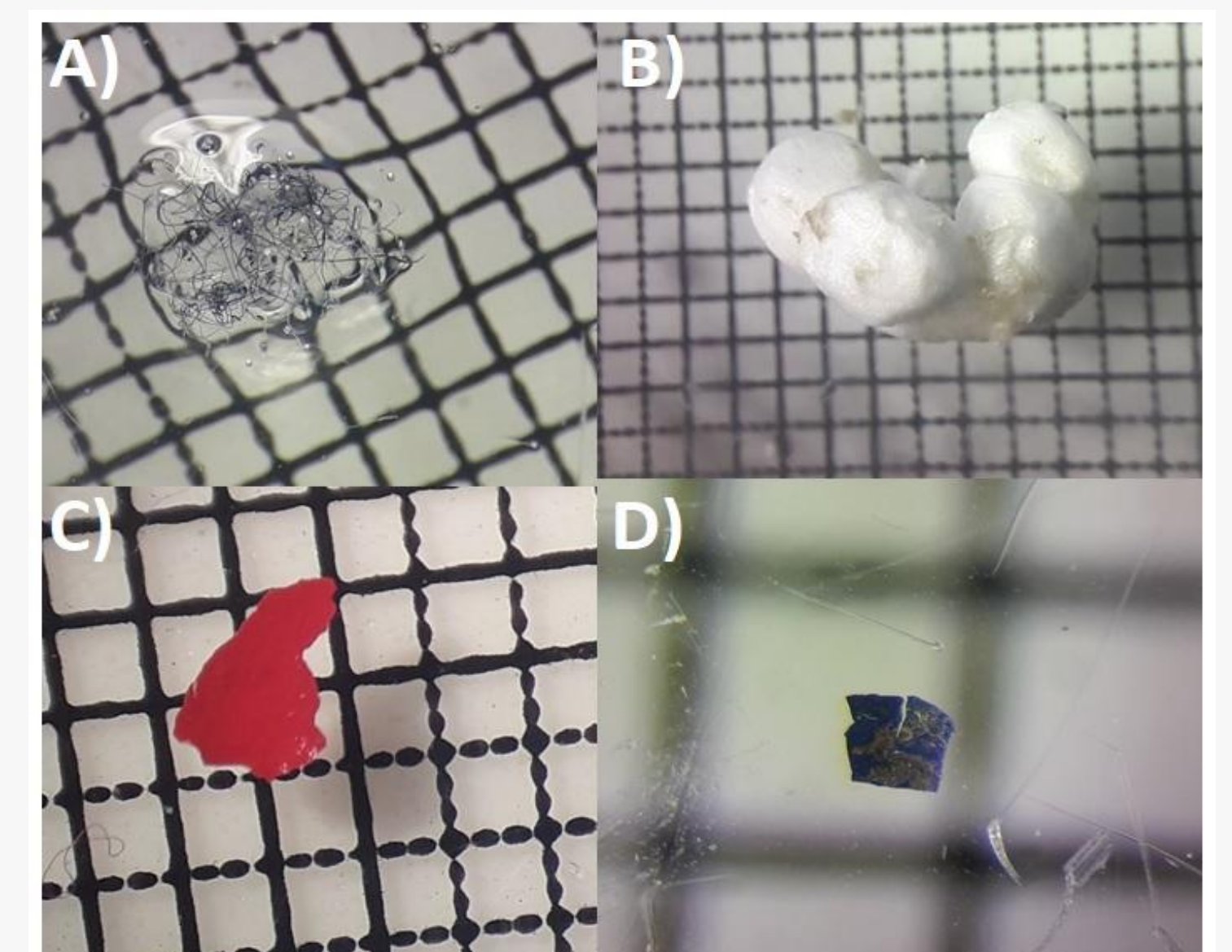
**Figure 2.** Sampling of the AINA Stream with a Surber net.

## 4. RESULTS

**Table 1.** Density of MP found in AINA stream and Drake stream in Summer (2018, 2019) and Autumn (2018).

YEAR	SEASON	STREAM	Total density (items/m <sup>3</sup> )	Fibers (items/m <sup>3</sup> )	Fragments (items/m <sup>3</sup> )	Fibers aggregates (items/m <sup>3</sup> )	Paint fragments (items/m <sup>3</sup> )	Foams (items/m <sup>3</sup> )
2018	Summer	AINA	1.28	0.73	0.15	0.03	0.24	0.13
	Autumn	AINA	3.24	2.90	0.34	-	-	-
2019	Summer	AINA	10.13	7.79	1.21	0.09	0.87	0.17
		Drake	9.14	7.16	1.21	-	-	0.77

- Fibers and fragments were found in all the analyzed samples, and were more abundant than other MP types in both streams.
- Densities of MP in the streams were higher in 2019, compared to 2018.
- AINA stream had higher MP densities in Autumn 2018, compared to the Summer of the same year.



**Figure 3.** MP found in the samples. A) Fibers, B) foams, C) paint fragment and D) fragment. Black square size is 1.0 x 1.0 mm.

## 5. CONCLUSIONS

- This study constitutes the first evidence of the presence of microplastics in freshwater ecosystems of King George Island, Antarctica (González-Pleiter et al., 2020)<sup>1</sup>
- Fibers, fragments and foams were found in both streams, while paint fragments were found only in the AINA stream.
- The proximity or distance of the streams to areas of human activities are not the only determining factor for the presence of MP, except perhaps in the case of paint fragments. Wind transport of MP could be a factor involved in explaining our results (González-Pleiter et al., 2020)<sup>2</sup>.

### Bibliography

Cole et al., 2011. Marine Pollution Bulletin 62, 2588-2597. González-Pleiter et al., 2020.<sup>1</sup> Marine Pollution Bulletin 161, 111811. González-Pleiter et al., 2020.<sup>2</sup> The Cryosphere. <https://doi.org/10.5194/tc-2020-261> Kelly et al., 2020. Marine Pollution Bulletin 154, 111130. Lebreton et al., 2017. Nature communications, 8, 15611.