First observations and monitoring of microplastics on oceanic and coastal waters off the Canary Islands (Subtropical NE Atlantic)

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INTRODUCTION

Broad scale sampling methods for microplastic monitoring in open ocean waters remain a challenge in oceanography.

The use of pumps as a low-cost system for circulating surface seawater together with an in-line filtration system to prevent contamination has been employed for this purpose in a few studies up to date [1,2].

We used a methodology based on a pump-underway system to filtrate seawater and provide microplastic abundance and distribution in subsurface coastal and oceanic waters off the Canary Islands.

EXPERIMENTAL: MATERIAL & METHODS

Samples were collected during three oceanographical campaigns to the European Station for Time Series in the Ocean (ESTOC; 29°10'N, 15°30'W) on 24-26 March 2018, 6-8 December 2018 and 21-25 February 2019 [Fig. 1].

Different sampling modes were performed:
- samples taken on *stationary mode*
  - coastal, at the PLOCAN Test Site, and
  - *oceanic*, at ESTOC Station.
- samples taken on *navigation*.

The microplastic device employed consisted on four stacked sieves (ø = 100 mm) with mesh sizes of 300, 200, 100 and 50 µm [Fig. 2].

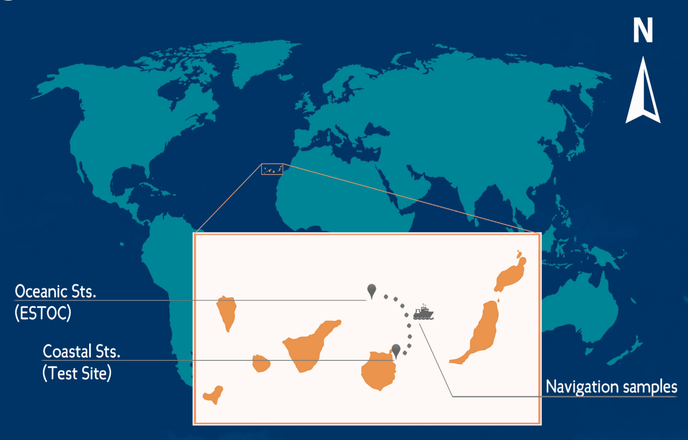

Fig. 1 Map of the sampling locations and modes repeated on the three research cruises.

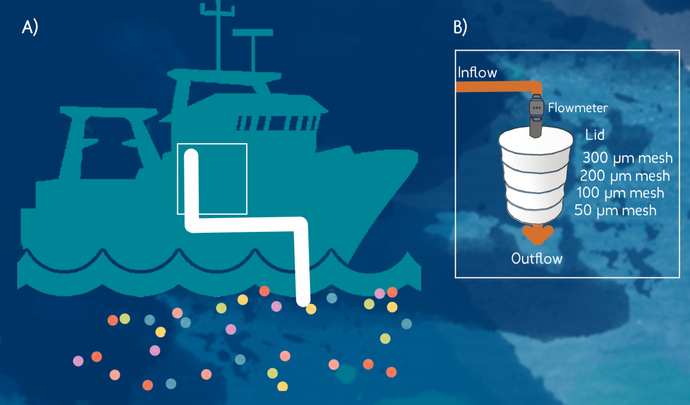

Fig. 2 Sampling set up diagram, showing (A) the pump-underway system of the R/V; and (B) the filtering device diagram.

RESULTS & DISCUSSION

The filtering device allowed the study of the microplastic concentration on volumes up to 4000 L without clogging in transects of up to 60 miles. In this way, the present design was suitable for continuous sampling on stations and also while on navigation, in both cases without interfering the ships' regular activity.

Table 1 Total survey effort, per mode and sample type.

Mode	Total survey effort	Mean per sample	Average flow rate
Stationary	3525 L	251 ± 20 L/station	7 L/min
Navigation	10472 L	2377 ± 895 L/transect	5 L/min

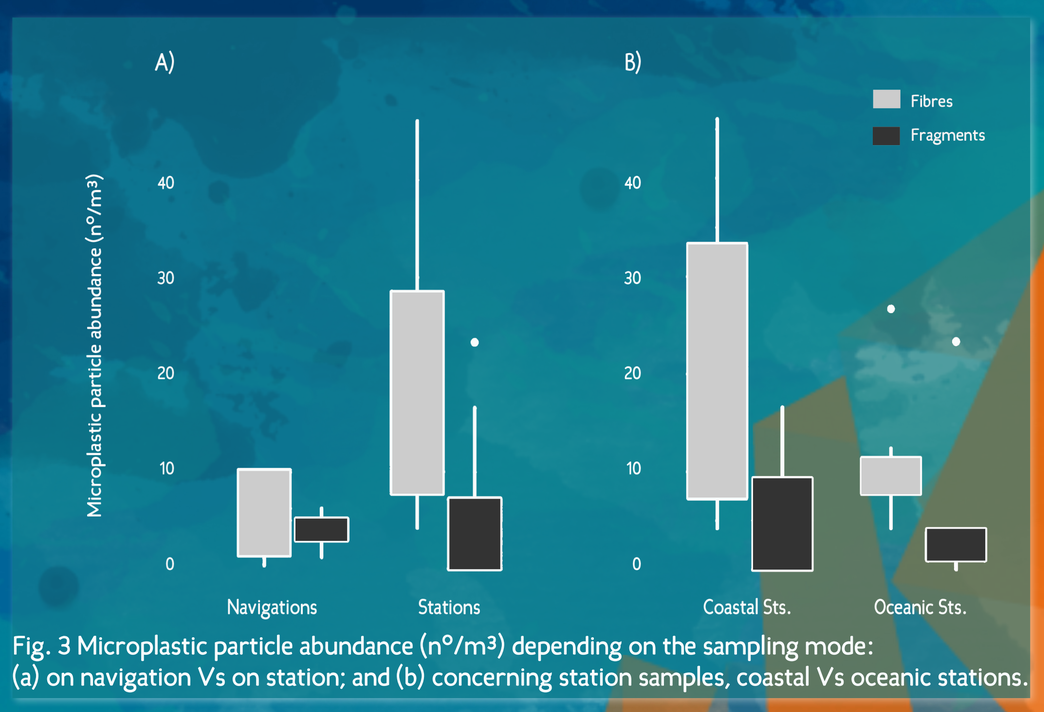

Fig. 3 Microplastic particle abundance (n°/m³) depending on the sampling mode: (a) on navigation Vs on station; and (b) concerning station samples, coastal Vs oceanic stations.

Microplastics were found in all samples and at all stations and transects, identifying a total of 163 particles (5mm - 50 µm), with a mean value of 19.88±15.92 particles/m^3 corresponding to a mean of 14.49±13.22 fibres/m^3 and 5.39±6.35 fragments/m^3.

Microplastic densities on the stationary and on navigation samples were signifficantly different, representing an underestimate of approximately 30% in the case of fibres retrieved on navigation [Fig. 3 (A)]. The concentration of microplastic fibres samples in the Test Site (4km off the coast) was signifficantly higher than the concentration obtained in oceanic samples: 21.39±14.25 fibres/m^3, versus 11.20±8.03 fibres/m^3 [Fig. 3 (B)]; reinforcing the fact that concentration values are higher for coastal samples than for oceanic ones, also noted by Cincinelli et al. [3].

CONCLUSIONS

First baseline data is reported with this study concerning microplastic abundance and distribution on **oceanic and coastal waters** off the Canary Islands.

The methodology employed comes up as **an opportunity to sample microplastic particles down to 50 µm** and report data in **marine open water environments without interfering the regular vessel activities.**

Microplastic **particles were found in the total stations and transects** sampled. Fibres (64.42%) were predominant over fragments (35.58%).

More research is needed in order to assess the monitoring method efficiency and to understand the **variability dependant on the sampling mode** (i.e. *navigations* vs *stationary*).

References

[1] Enders, K., Lenz, R., Stedmon, C. A. & Nielsen, T. G.: Abundance, size and polymer composition of marine microplastics ≥10µm in the Atlantic Ocean and their modelled vertical distribution. Marine Pollution Bulletin 100, 70–81 (2015). [2] Kanhai, L. D. K., Officer, R., Lyashevska, O., Thompson, R. C. & O'Connor, I.: Microplastic abundance, distribution and composition along a latitudinal gradient in the Atlantic Ocean. Marine Pollution Bulletin 115, 307–314 (2017). [3] Cincinelli, A. et al.: Microplastic in the surface waters of the Ross Sea (Antarctica): Occurrence, distribution and characterization by FTIR. Chemosphere 175, 391–400 (2017).

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