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Plastics contamination in different streams of Lake Orta (Northern Italy)

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INTRODUCTION & AIM

Research on plastic pollution has primarily focused on oceans, large rivers, and lakes, leaving mountain streams and small basins largely overlooked. Despite their ecological relevance and widespread distribution, these systems remain poorly investigated. Within this context, the tributaries of Lake Orta (Figure 1), exposed to significant industrial pressures, represent a valuable model for assessing plastic contamination in small freshwater ecosystems and for evaluating their contribution to plastic inputs reaching the lake.

METHODS

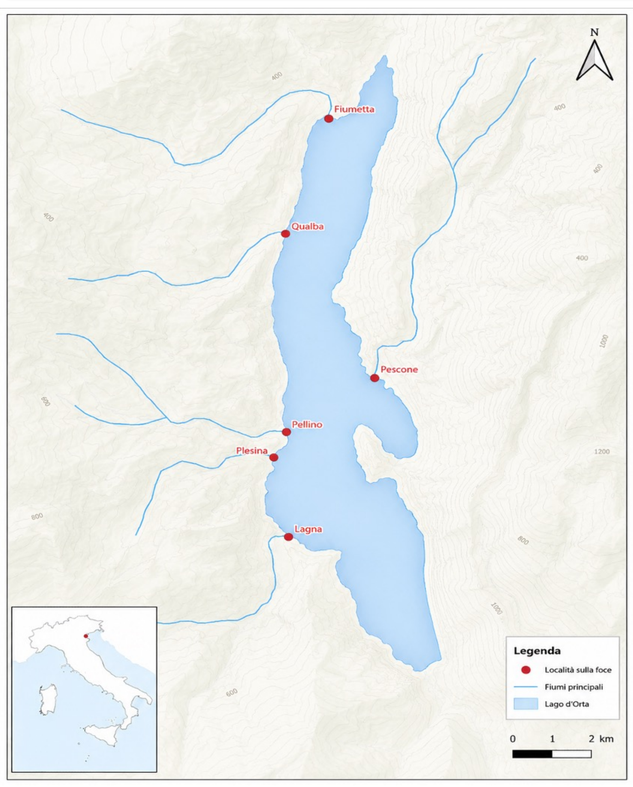

Figure 1. Map of Lake Orta (Northern Italy).

Surface water samples were collected using a 100 µm plankton net equipped with a flowmeter to quantify filtered water volumes. Samples were processed (Figure 2) using a hypersaline solution to separate potential microplastic particles by density flotation (1), filtered onto nitrocellulose membranes (2), and treated with hydrogen peroxide to remove organic matter (3). Suspected microplastics (4) were then identified by µFT-IR (5) spectroscopy and classified according to shape, size, and colour.

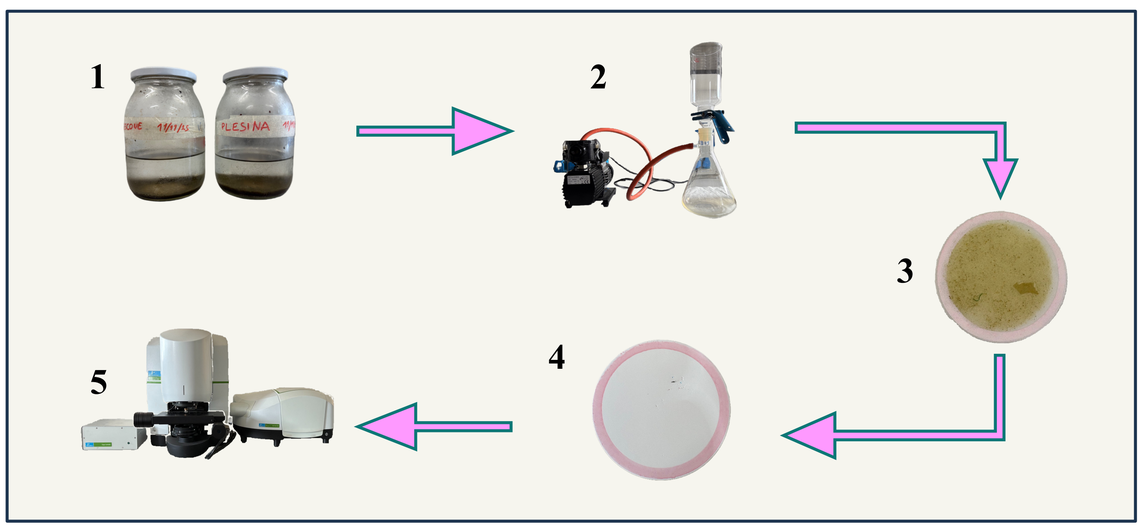

Figure 2. Laboratory procedures.

RESULTS & DISCUSSION

- Plastic particles were detected in all streams (Figure 3).
- Microplastics represented the dominant fraction of the particles collected, with fragments and fibers being the most abundant morphologies (Figure 5), suggesting that most particles originated from the fragmentation of larger plastic debris and therefore had a predominantly secondary origin.
- Polymer characterization revealed polyethylene (PE) and polypropylene (PP) as the most frequently detected polymers across the study area (Figure. 5).
- Polypropylene fragments generally predominating in all streams (Figure. 4).

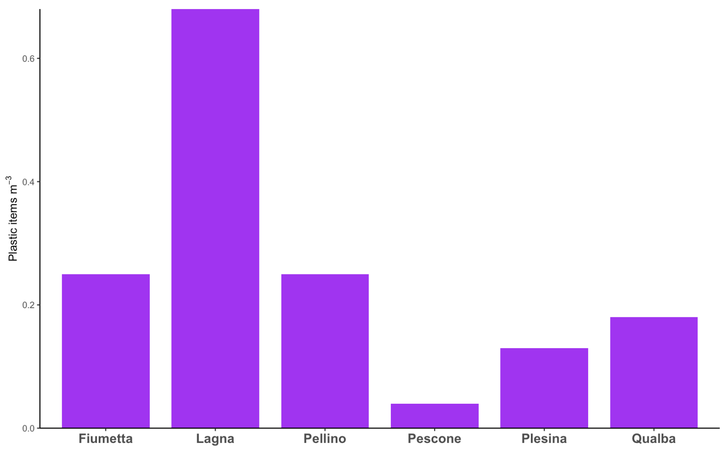

Figure 3. Concentration of plastics in streams (Plastics m^3).

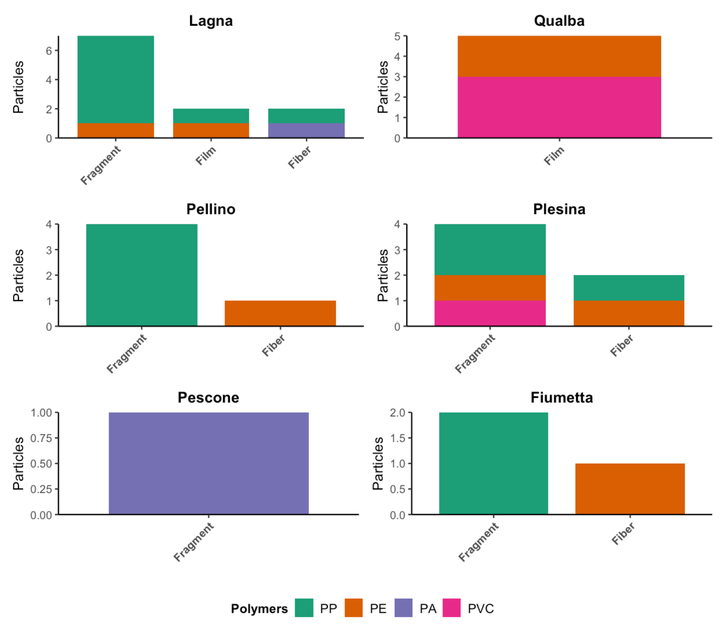

Figure 4. Distribution of plastics shapes across the identified polymers.

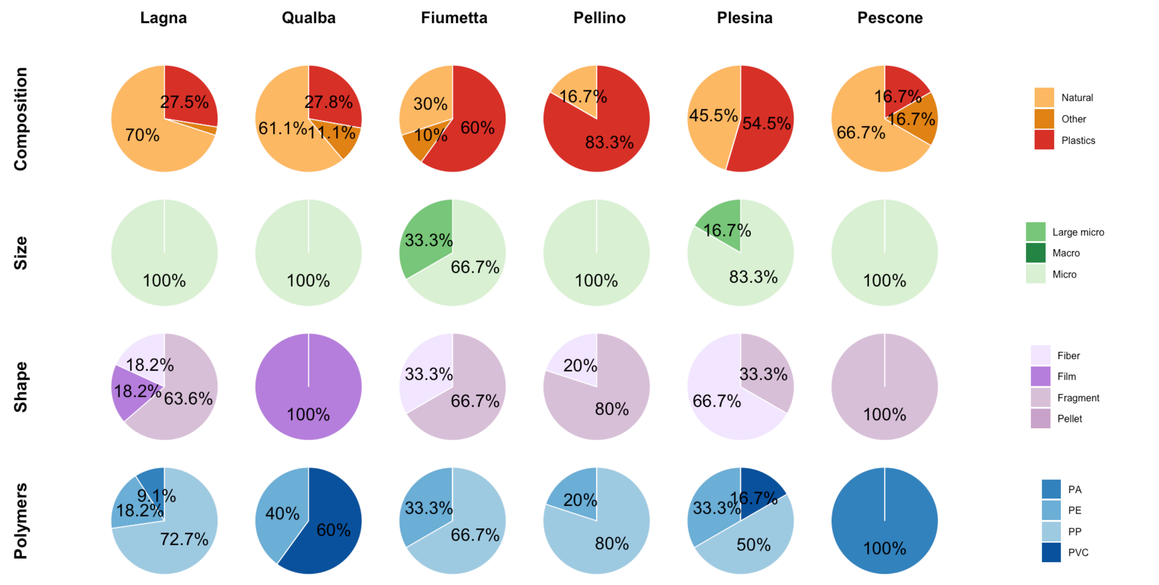

Figure 5. Percentage distribution of size classes, shapes, and polymer types across tributaries.

CONCLUSIONS

- Tributary streams represent a non-negligible source of plastic inputs into Lake Orta.
- Microplastics dominated all sampled tributaries and were exclusively of secondary origin.
- Dominant fragments, fibers, PP and PE indicate inputs mainly from degradation of single-use plastics.

FUTURE WORK / REFERENCES

Current research is focusing on seasonal variability in microplastic occurrence to better understand temporal changes in transport dynamics.

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