Microplastic Ingestion by Perch *Perca fluviatilis*, Linnaeus 1758) from four Italian Lakes

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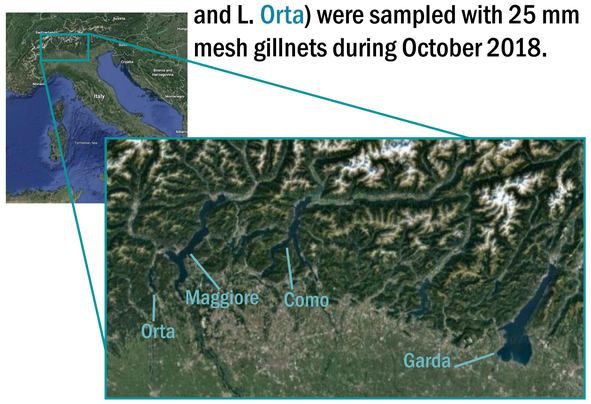
Background

Microplastic particles (MPs) carry several potential threats to the biota. Together with the physical damage that can occur during ingestion, MPs can release chemicals, both residues from the manufacturing process and pollutants adsorbed during atmospheric agents in the environments. Also, the biofilm on them can host pathogenic or antibiotic-resistant bacteria, potentially dangerous for the organism.
Although publications on freshwater MP pollution are rapidly increasing, those in which the same species is sampled in a large number of different environments and those that measure the effects on health are still few. For these reasons the assessment of the different effects induced by natural MPs exposition still needs research efforts.

Study sites

Four subalpine lakes (L. Garda, L. Como, L. Maggiore, and L. Orta) were sampled with 25 mm mesh gillnets during October 2018.



Objectives

Evaluation of MPs ingestion in perch in different freshwater environments and their potential effects on fish health and body condition.

Methods

STEP 01 — Dissection
Gastrointestinal tract (GIT, from oesophagus to anal sphincter) excision

STEP 02 — MPs isolation
GIT dissolution with KOH 10%, saturated NaCl separation

STEP 03 — Filtration
On 25 µm filters

STEP 04 — Counting and classification
Visual observation

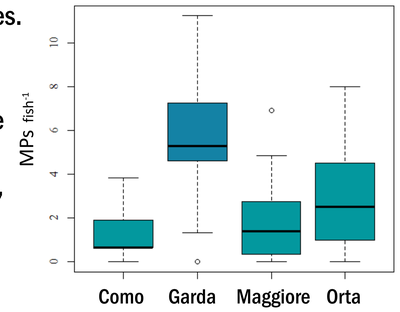
STEP 05 — FT-IR spectroscopy
Polymer identification

Results

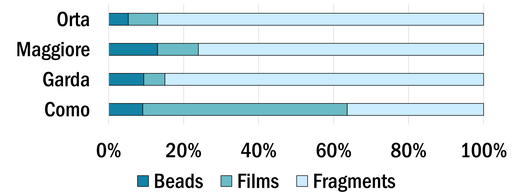
	Como	Garda	Maggiore	Orta
Fish (n)	15	19	20	26
Fish with no MPs (n)	2	1	5	3
Fish with MPs (%)	87	95	75	88
MPs (MPs fish^{-1})	1.24	5.59	1.73	2.75
TL (cm)	14.80	16.01	14.73	12.79
TW (g)	36.74	43.38	30.99	17.96
HIS (Hepatosomatic index)	1.07	0.81	0.94	0.86
K (Fulton's body condition factor)	1.13	1.02	0.96	0.82
FI (Fullness index)	6.09	3.55	5.03	4.88

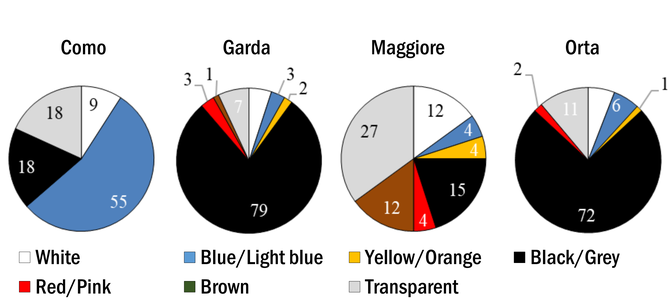
Fishes from Garda Lake ingested more MPs that those from the other lakes.

Polyethylene and polyethylene terephthalate were the two most frequently present, followed by polystyrene, polyamide, and polycarbonate.

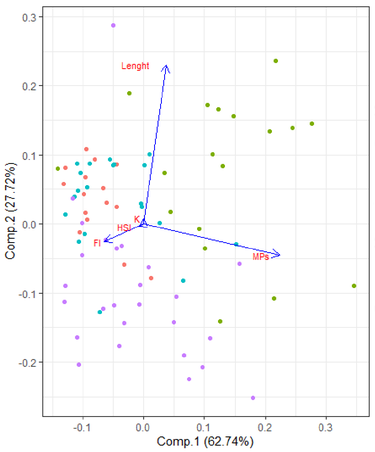


Fragments were the most abundant MPs shape, followed by films and beads (fibers were not considered). A high degree of degradation was present, that did not allow a precise polymer identification for 43% of the synthetic particles isolated.





No relation was found between MPs presence and length or sex of the fishes. Also, health status indexes as Fulton's body condition factor (K) and hepatosomatic index (HSI) did not show any significant correlation.



Fullness index (FI), used as a proxy of the feeding activity, showed a negative correlation with MPs presence meaning that an empty stomach had a higher probability to contain MPs.

Conclusion

MPs pollution revealed to be highly present in the Italian subalpine lakes, especially in L. Garda. Particles present in perch GITs were highly degraded, probably due to the permanence in the GIT harsh conditions. Negative correlation with the fullness index points out that also in perch, MPs ingestion can induce false satiety and interfere with feeding, as already reported for other organisms.