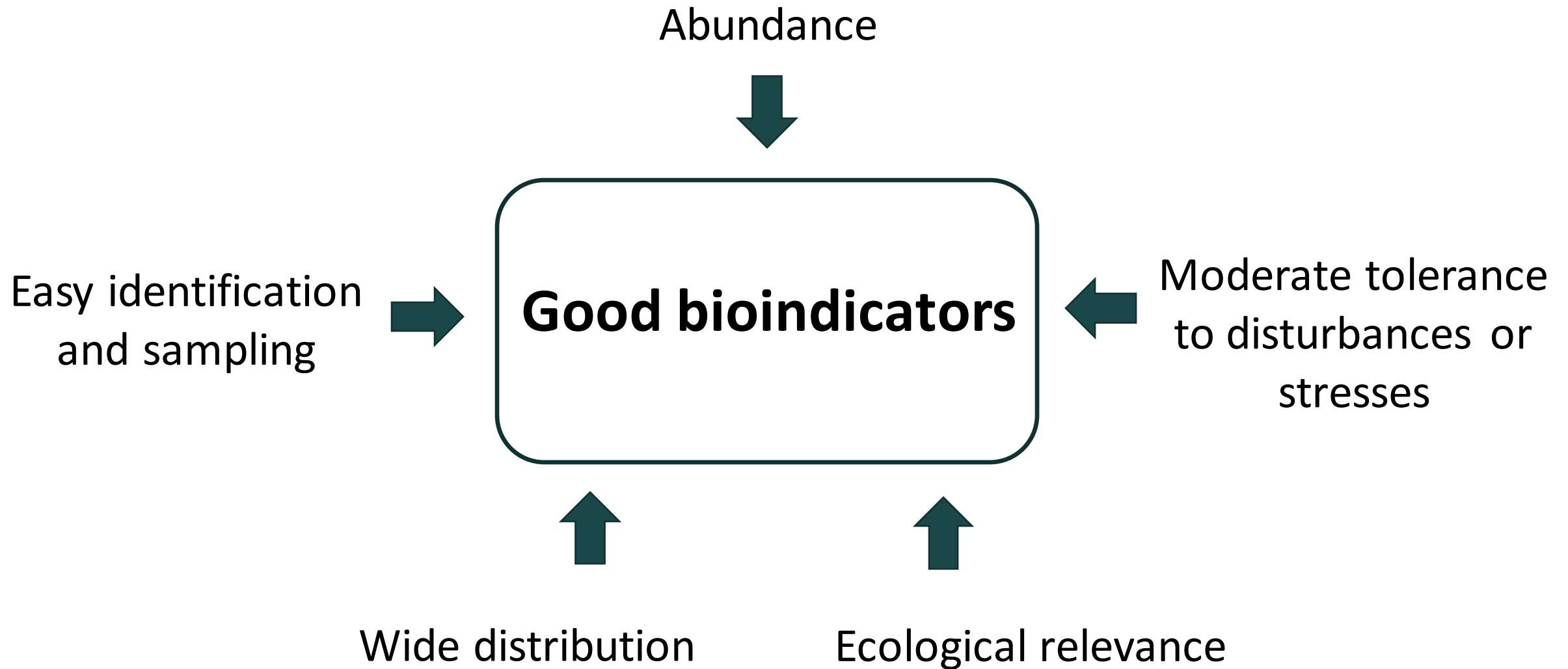


Jellyfish as bioindicators: exploring microplastic contamination in *Blackfordia virginica* and its surrounding environment

Joana Cruz, José P. da Silva, Isabel Marín-Beltrán, Vânia Baptista, M. Alexandra Teodósio

Bioindicators



Potential bioindicators of microplastic pollution

Sessile macroinvertebrates



Crustaceans



Birds

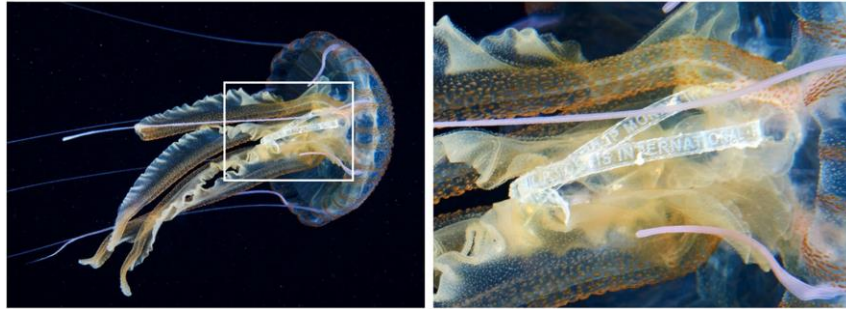


Fish



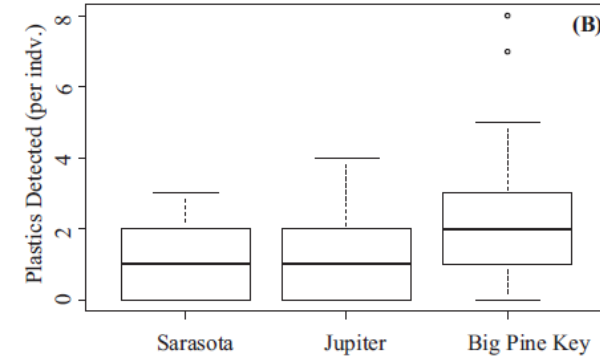
Ingestion of microplastics by jellyfish

Pelagia noctiluca



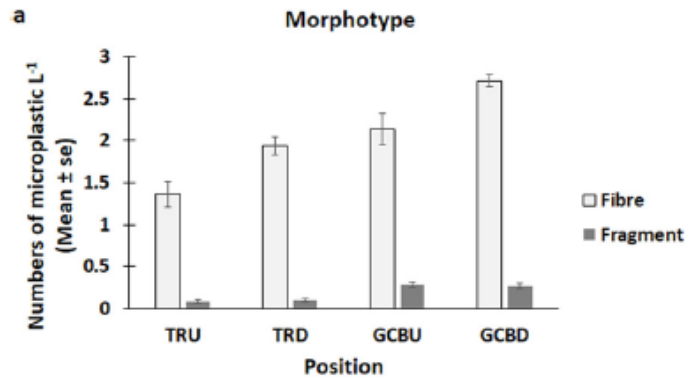
Macali *et al.* 2018; Rapp *et al.* 2021

Cassiopea xamachana



Iliff *et al.* 2020

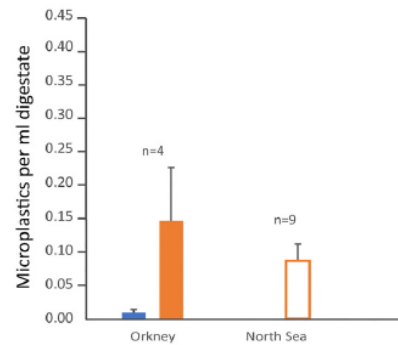
Chrysaora pentastoma



Sucharitakul *et al.* 2021

Aurelia aurita, *Cyanea* spp.

(E) *Aurelia aurita* beach- and pelagic-sourced



Devereux *et al.* 2021

Cosmetira pilosella (Hydrozoa)



Source: <https://www.verspreidingsatlas.nl/S117747>

Devereux *et al.* 2021

Blackfordia virginica as a potential bioindicator of microplastic pollution

- Already monitored
- Easy to identify and sample
- Found in several estuaries of the world
- Abundant during bloom season
- Well-defined spatial and temporal gradients
- Previous study detected fibers inside guts
(Morais *et al.* 2015)



Aims of the study

Investigate the presence of microplastics inside the guts of the hydrozoan *Blackfordia virginica*.

Determine if the microplastics ingested by *B. virginica* are representative of those found in the surrounding water.

Is *B. virginica* a good bioindicator of microplastic pollution?

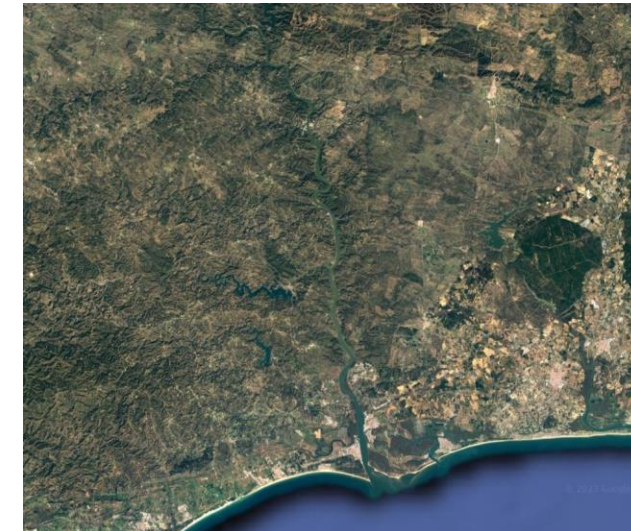
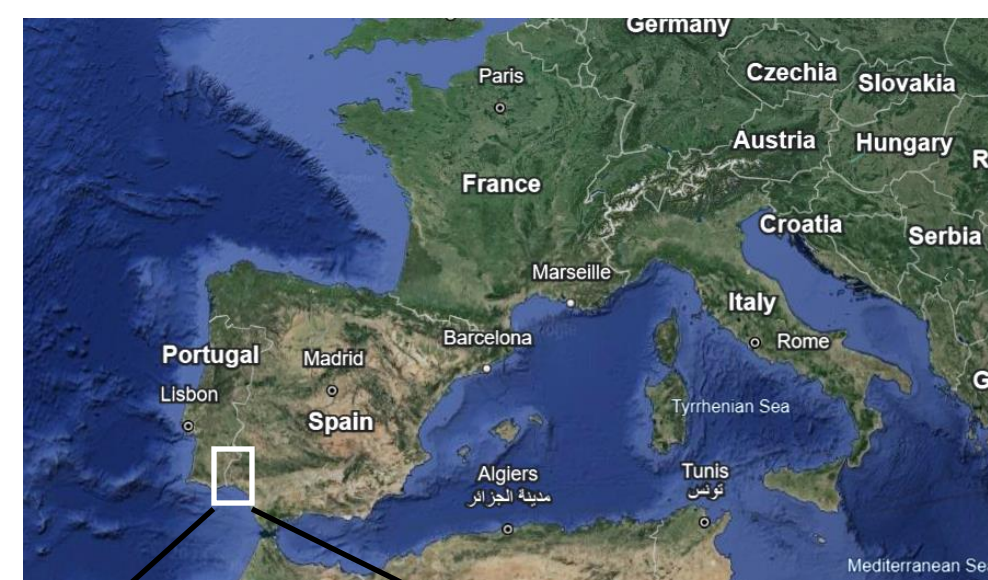
Methods

Sampling

Middle estuary Guadiana River 2021 (Monthly)

Horizontal zooplankton tows (200 μm mesh size) for *B. virginica* individuals

Oblique hauls (100 μm mesh size) for water sampling



Methods

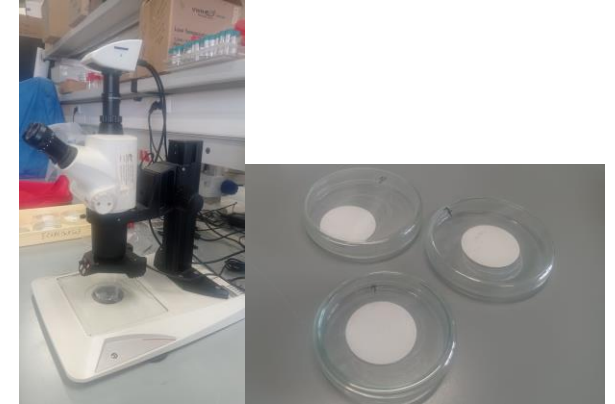
Microplastics analysis



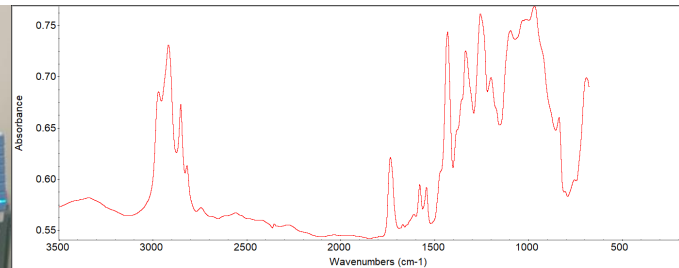
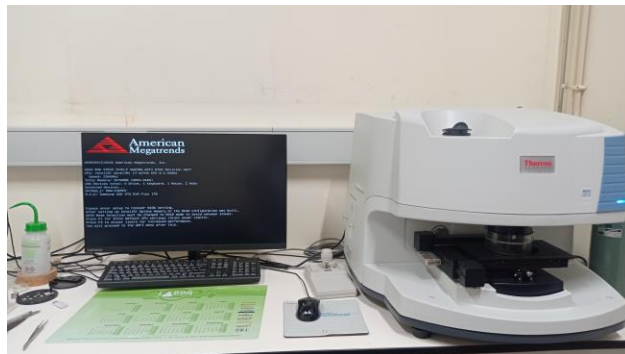
- 10 *B. virginica* and 1 water sample each month
- Digested H₂O₂ 30 % (in the presence of a Fe(II) for water samples)



- Filtration using GF/C filters



- MPs counted, measured, and classified according to colour and type

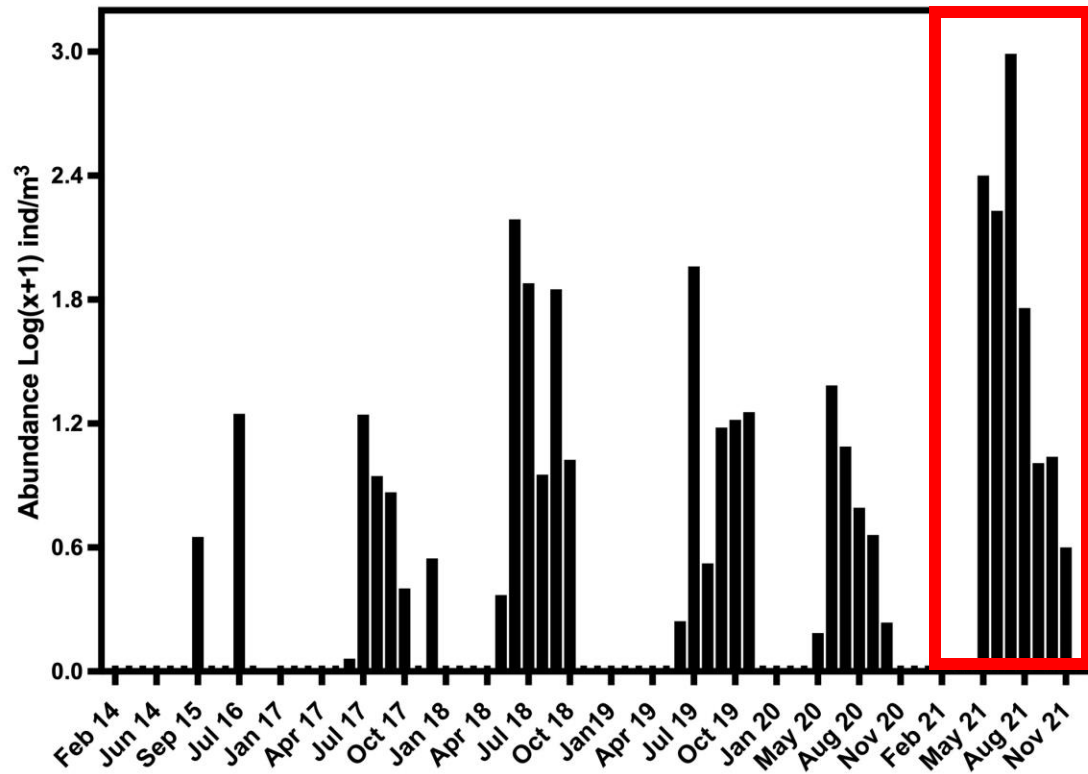


- Polymer identification using micro-FTIR

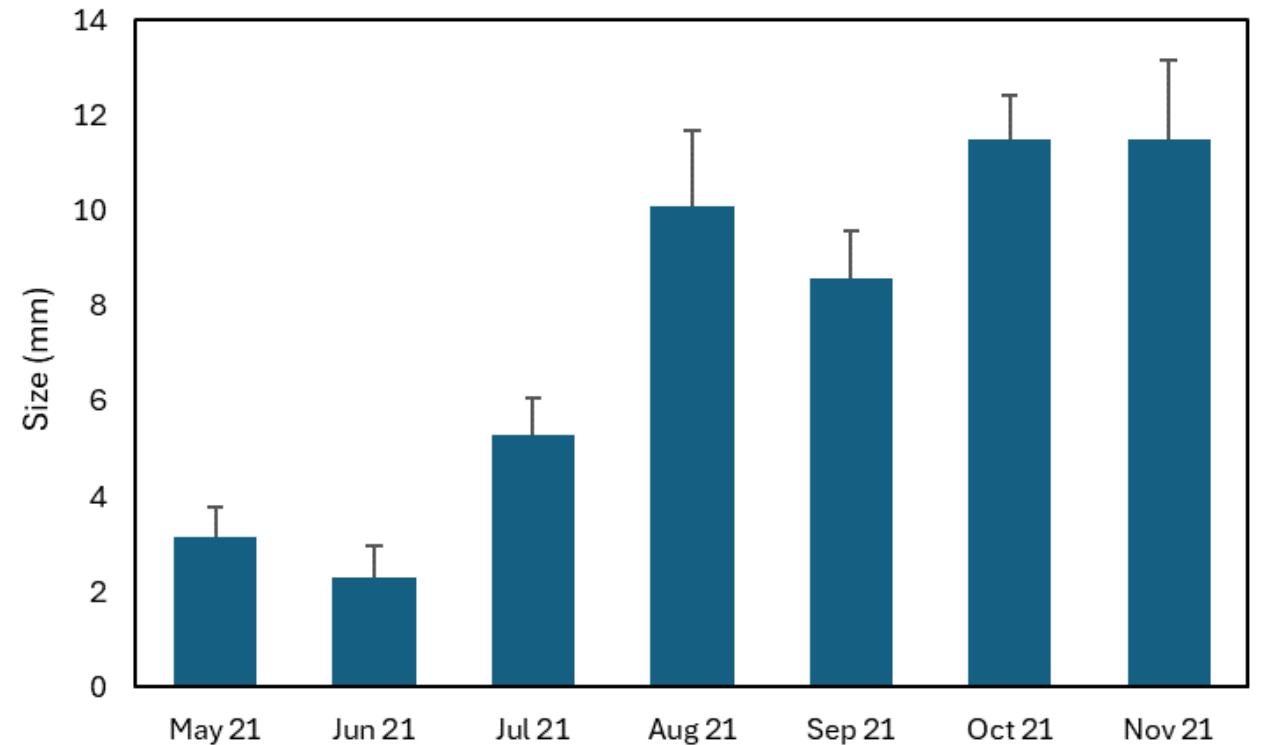


Results

Blackfordia virginica abundance



Blackfordia virginica size



2021 highest abundance of *B. virginica*, reaching 976.1 ind. m^{-3} in July.

B. virginica sizes used in the analysis ranged between 2.3 ± 0.7 and 11.5 ± 1.6 mm (June and November).

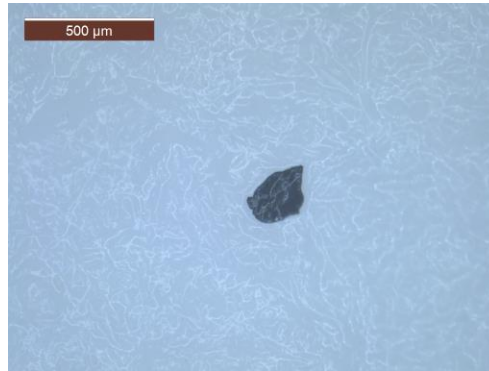
Results

B. virginica

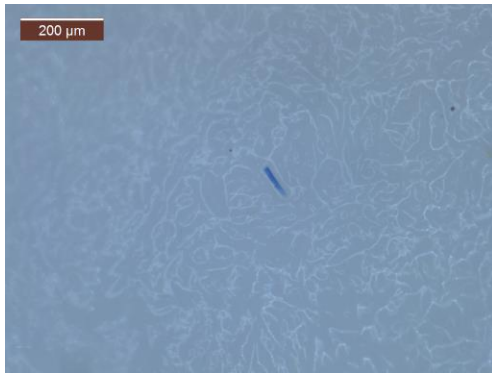
Fiber



Fragment



Line



Film

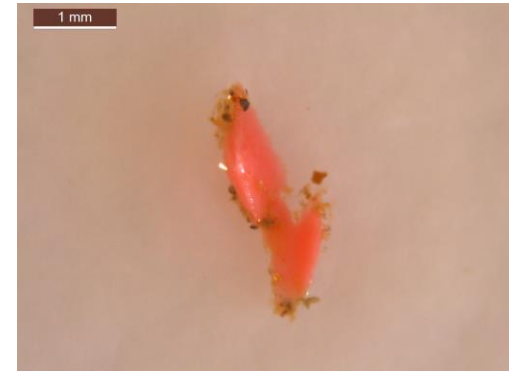


Water

Fiber



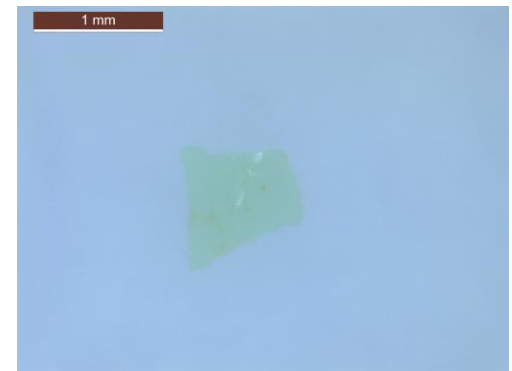
Fragment



Line

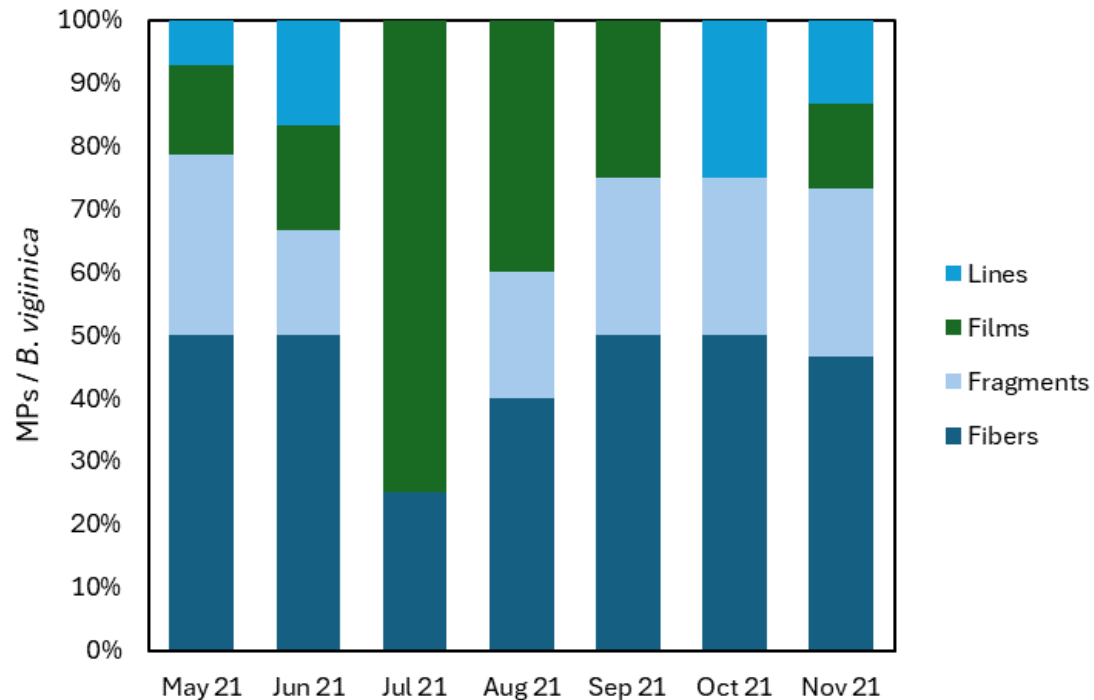


Film

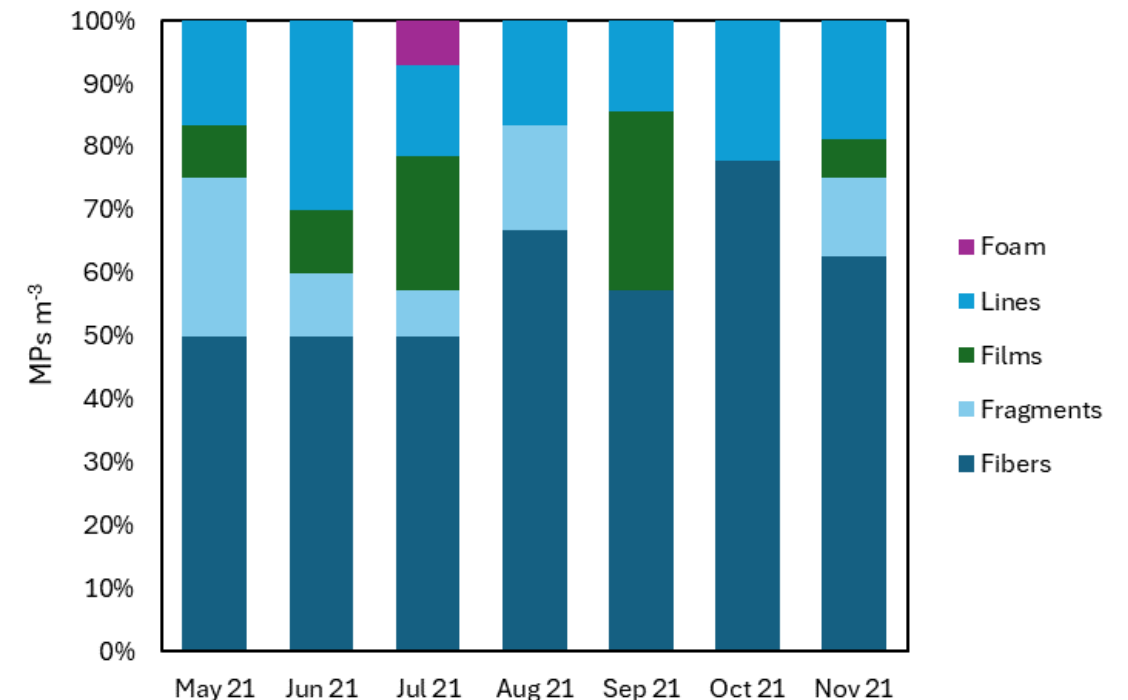


Results

B. virginica



Water



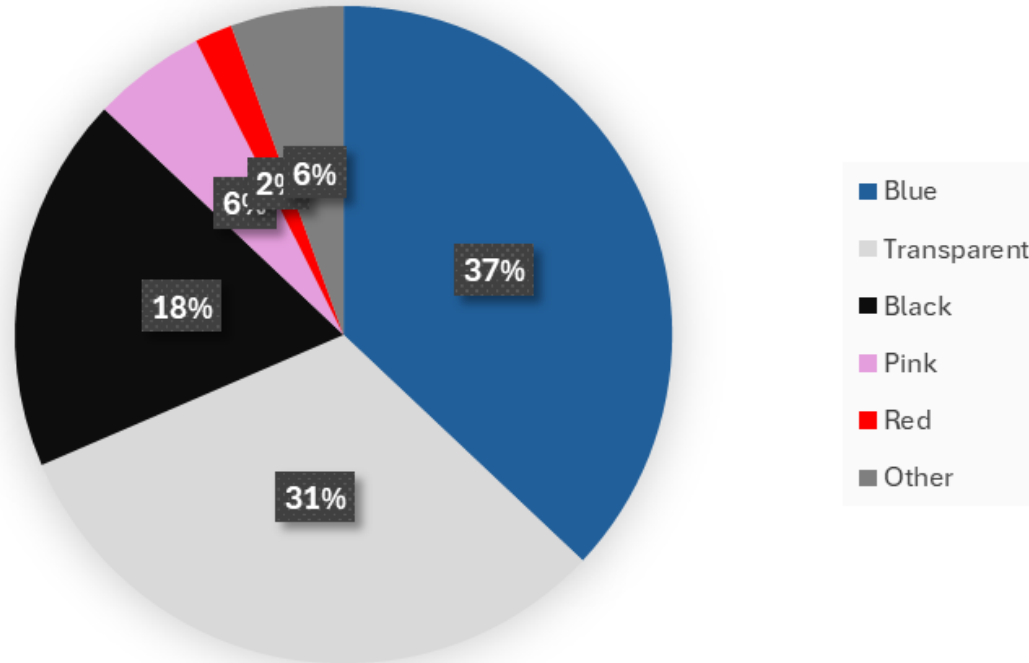
53% *B. virginica* ingested microplastics

Abundance of microplastics ingested between 0.8 and 3 MP/medusae (July/October and November) and in water between 7.5 to 20 MPs m⁻³ (August and November).

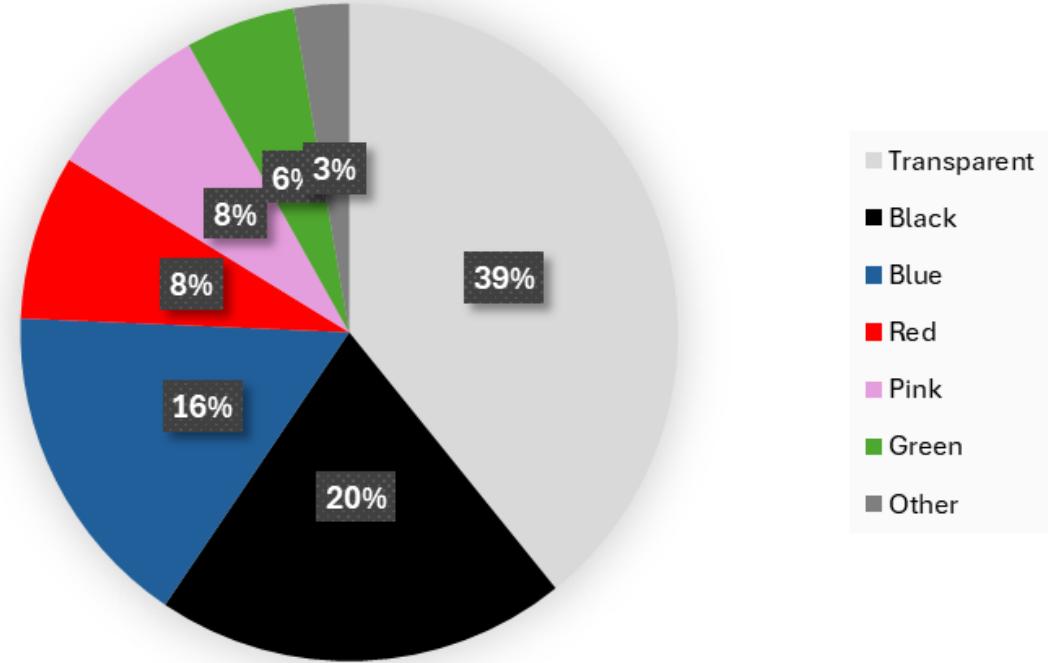
The percentage of fibers is higher in the water than inside medusae guts, while the opposite occurs for films.

Results

B. virginica



Water

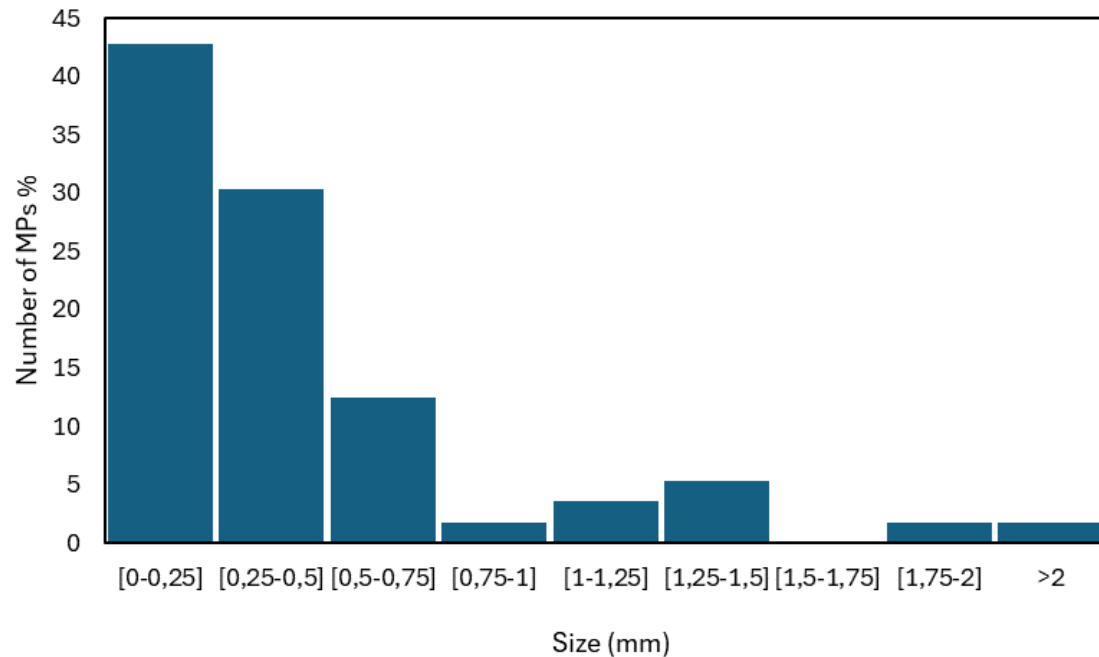


Higher percentage of blue microplastics, followed by transparent and black found inside *B. virginica*.

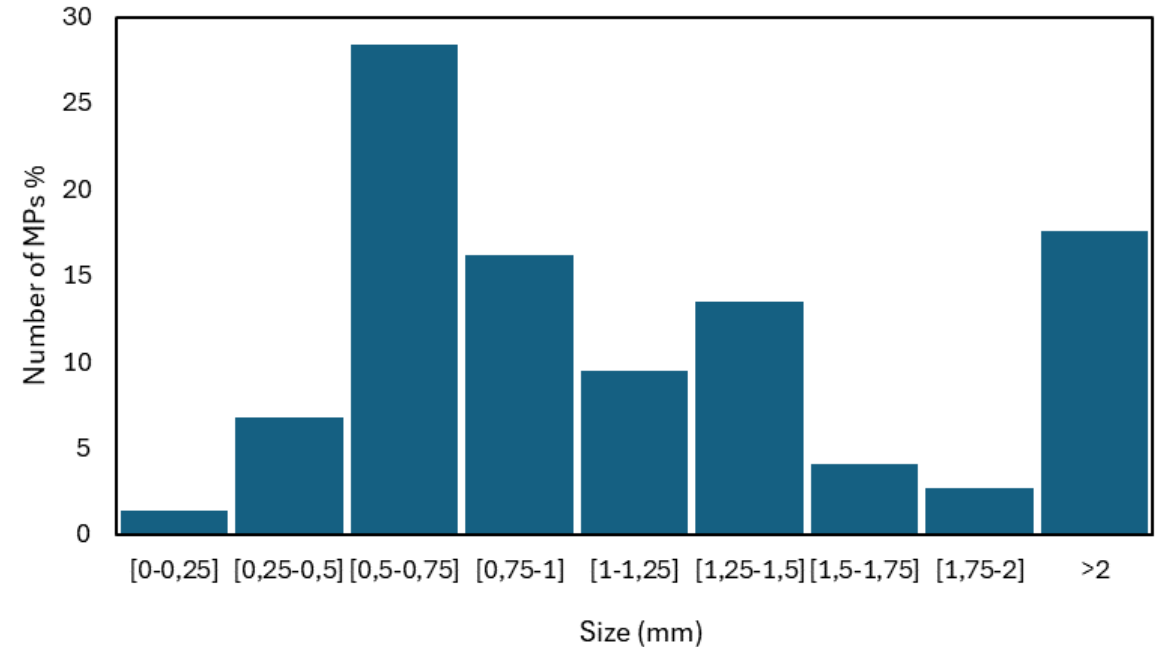
In the water, higher percentage of transparent microplastics, followed by black and blue.

Results

B. virginica



Water

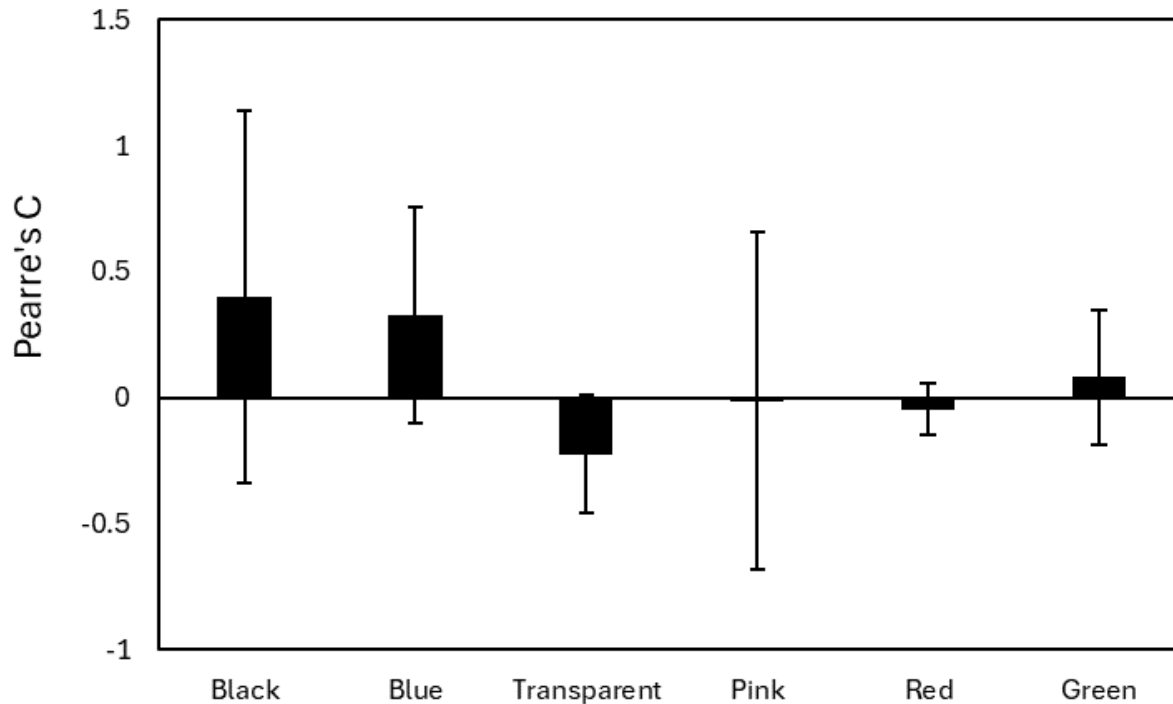


The microplastics with smaller sizes (0-0.25 mm) were the most ingested by *B. virginica*.

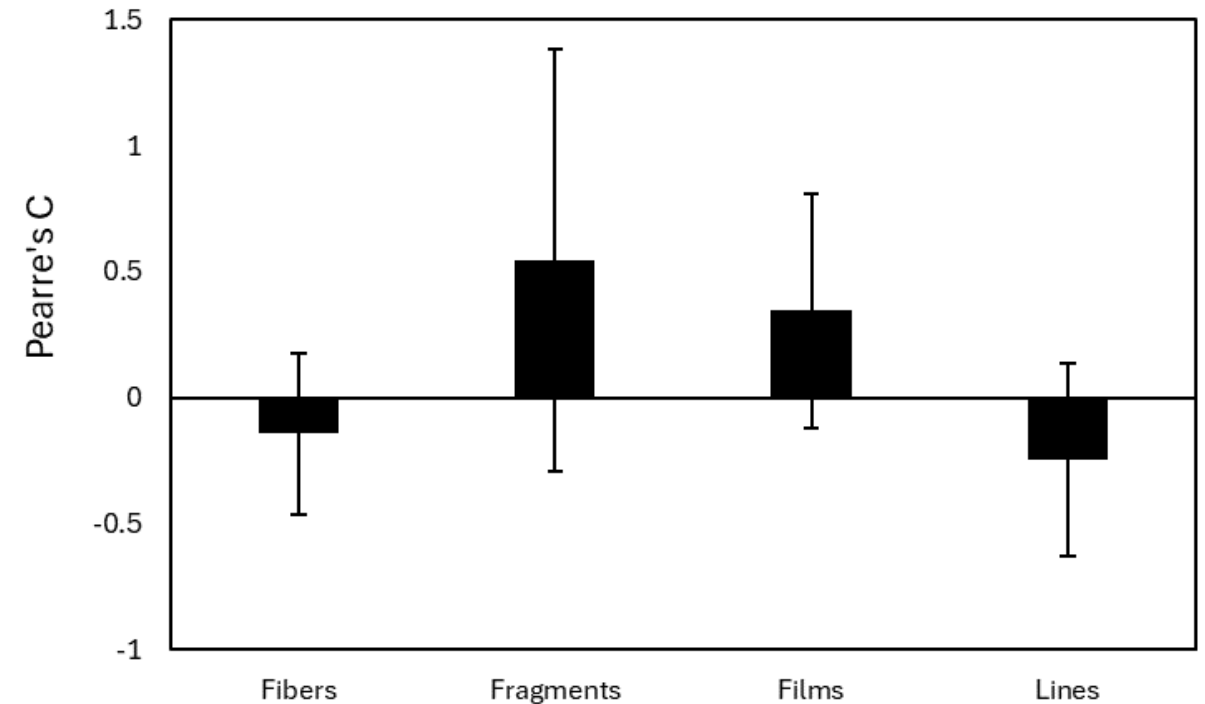
Microplastics between 0.5-0.75 were the most abundant in the surrounding water.

Results

Selectivity microplastics colours



Selectivity microplastics types



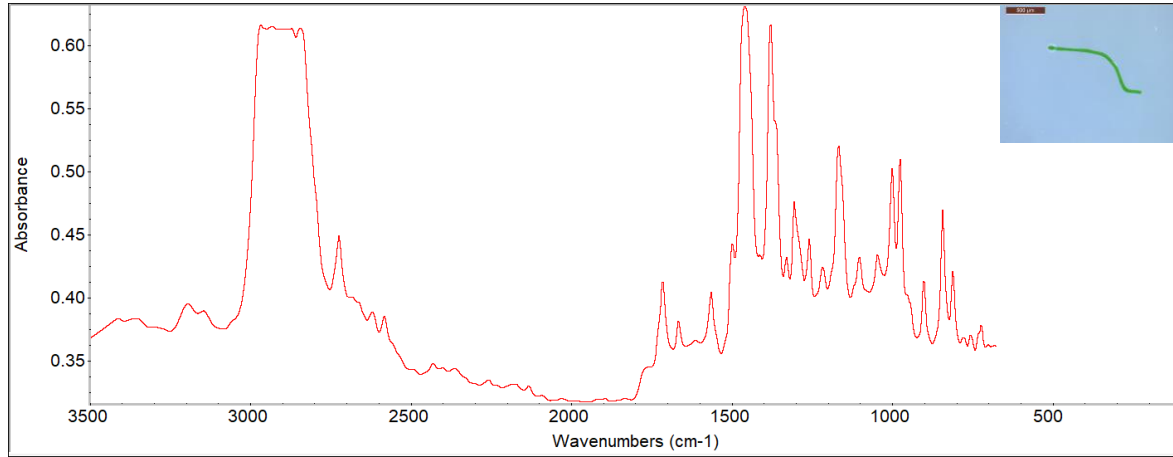
Colours: *B. virginica* positively selected mainly black and blue microplastics, and negatively selected transparent.

Types: *B. virginica* positively selected fragments and films and negatively selected fibers and lines.

Results

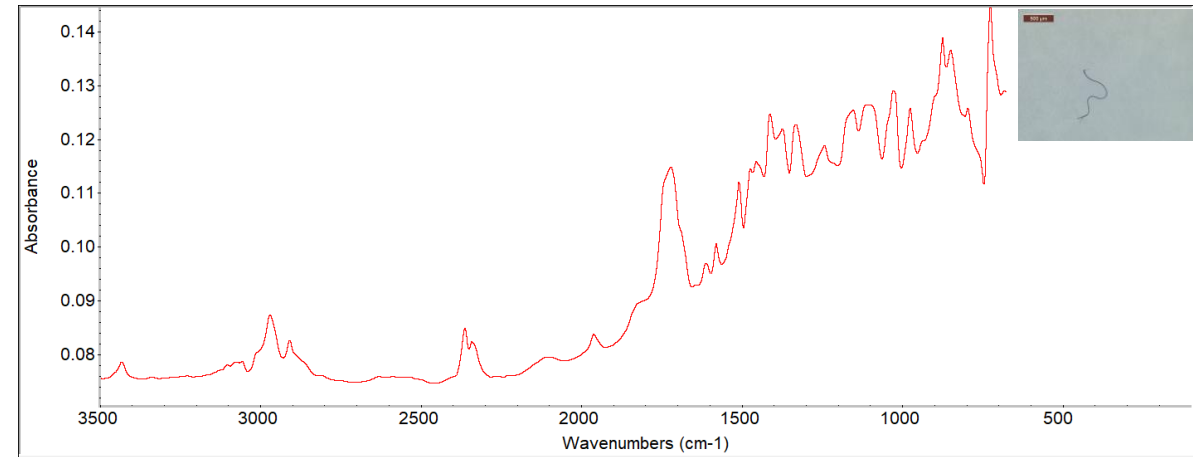
Water

Polypropylene (PP)

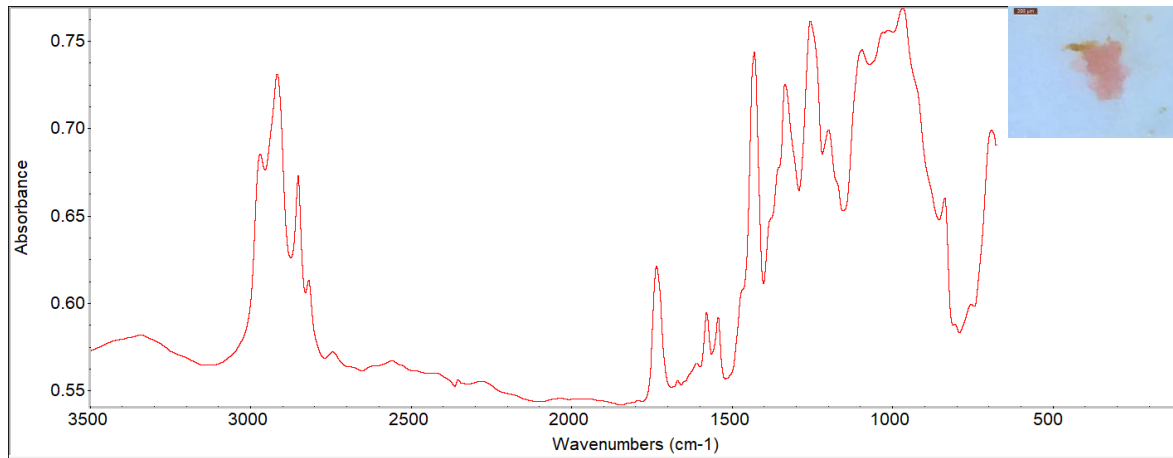


B. virginica

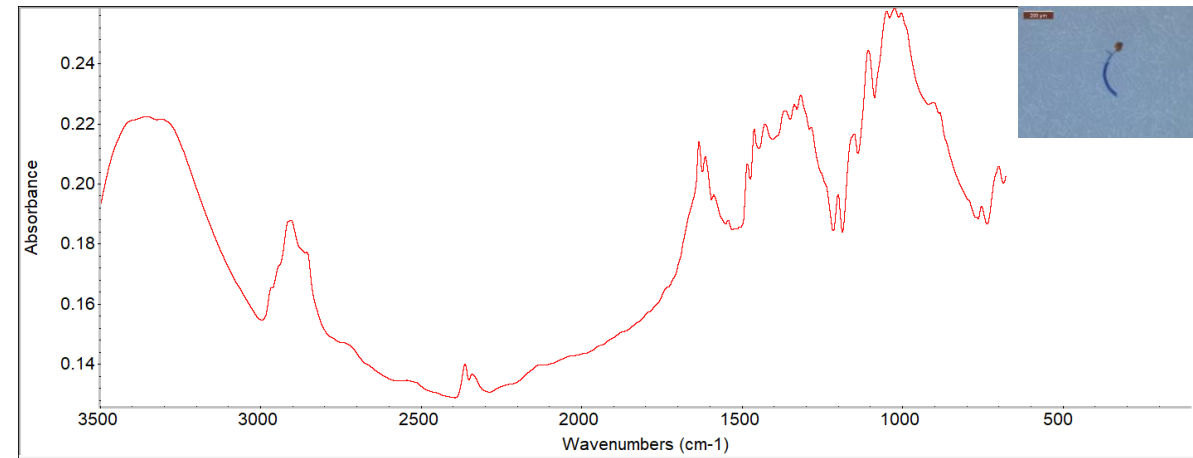
Polyethylene terephthalate (PET)



Polyvinyl chloride (PVC)



Nylon



Final remarks

B. virginica seems to be a poor bioindicator of microplastic pollution:

- only 53% of *B. virginica* individuals contained microplastics in their guts;
- selected against the most common colour and type occurring in the water (transparent and fibers), and the most abundant microplastics size range was different inside *B. virginica* and in the water.

But... the polymer analysis is still not completed, and the number of individuals could be increased to have a more robust analysis.

Future works: analyze the ingested microplastics by *B. virginica* and other jellyfish (including scyphozoan) together with the natural prey also ingested.

Thank you!

Funding

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