Marine macrophytes retain microplastics

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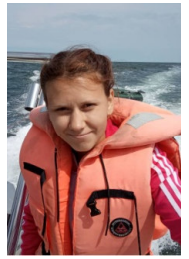
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Laboratory for Marine Physics

Study area: off the Sambian peninsula

Sampling locations (8 stations) are within the red circle.
Depth range – from 3.0 to 8.6 m.
Distance from the shore - from 60 to 850 m.

Sampling of macrophytes was performed:
a) directly from growing thickets on underwater slope by the diver working from the boat,
a) in shallow coastal waters (floating torn off filaments);
b) from the beach.

(*photos by Esiukova E.*)

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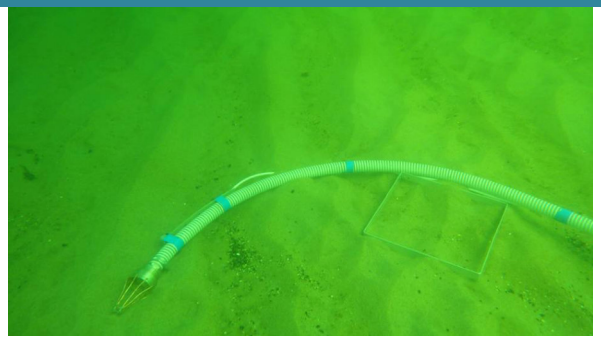
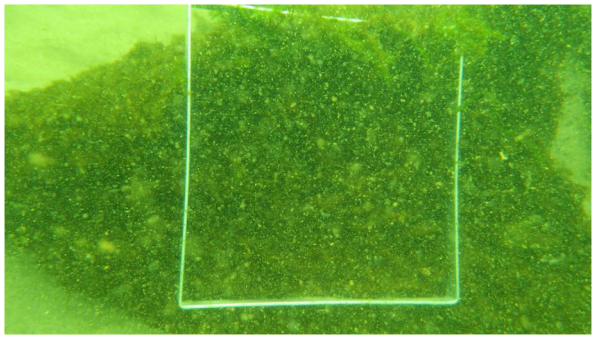
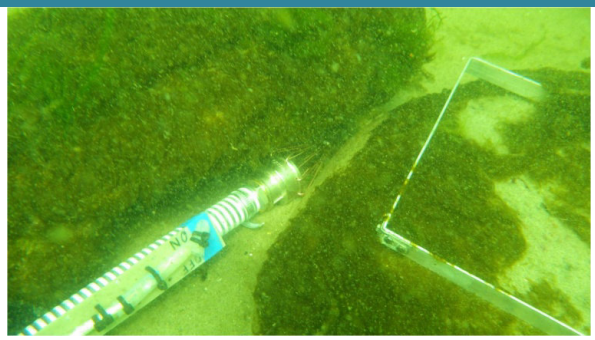
Sampling: plants and water



The goal of our field campaign in the southeastern part of the Baltic Sea was to check whether growing macrophytes concentrate and retain plastics, particularly microplastic (MP, 0.2-5 mm here).

Three summer expeditions were conducted (July 30, August 5 and 7, 2019) in sea coastal zone, where communities of attached macroalgae (*Furcellaria lumbricalis, Coccotylus truncatus, Polysiphonia fucoides, Cladophora rupestris*) are developed on underwater boulders off the Cape Taran.

Samples were collected at **8 stations**, covering areas with filamentous algae (at depths of 3.2 and 4 m) and with perennial algae *Furcellaria* (depths of 5.6 and 8.2 m).

Along with sampling of growing **algae** (from area 25x25 cm^2 in triplicate), a hand pump was used to sample 20-100 liters of **sea water** from both algae thicket and algae-free water in surroundings.

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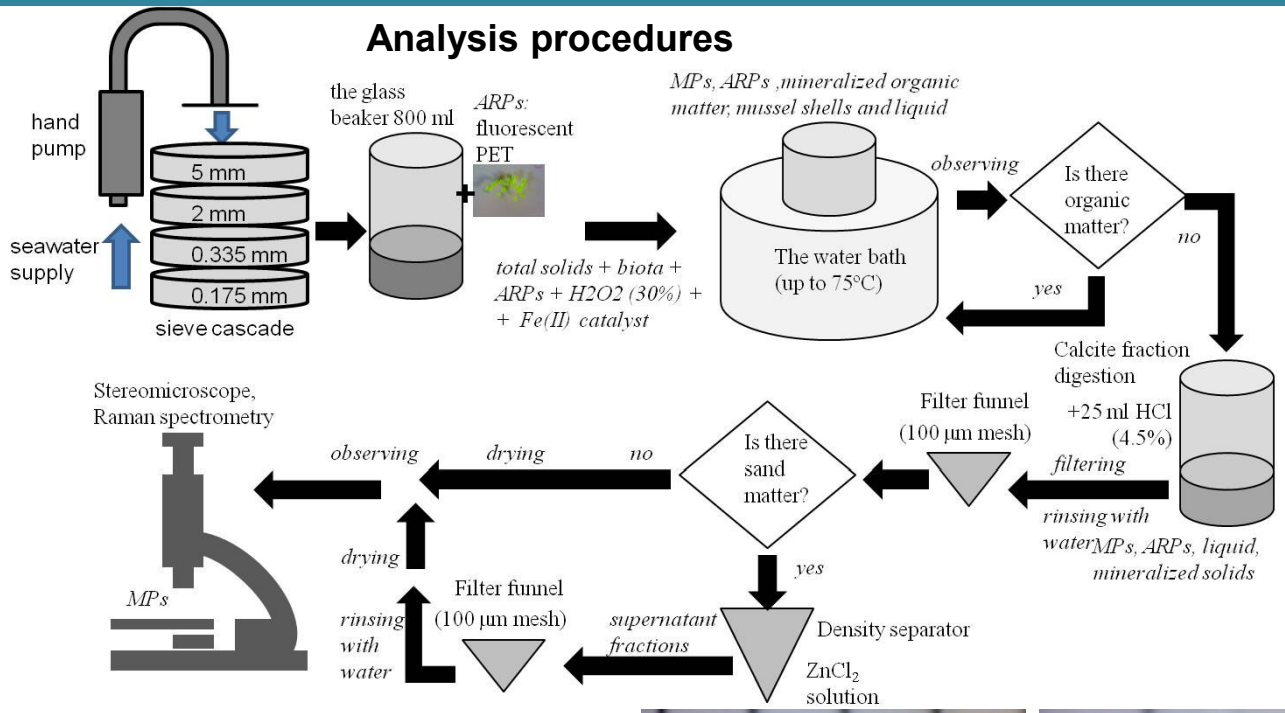
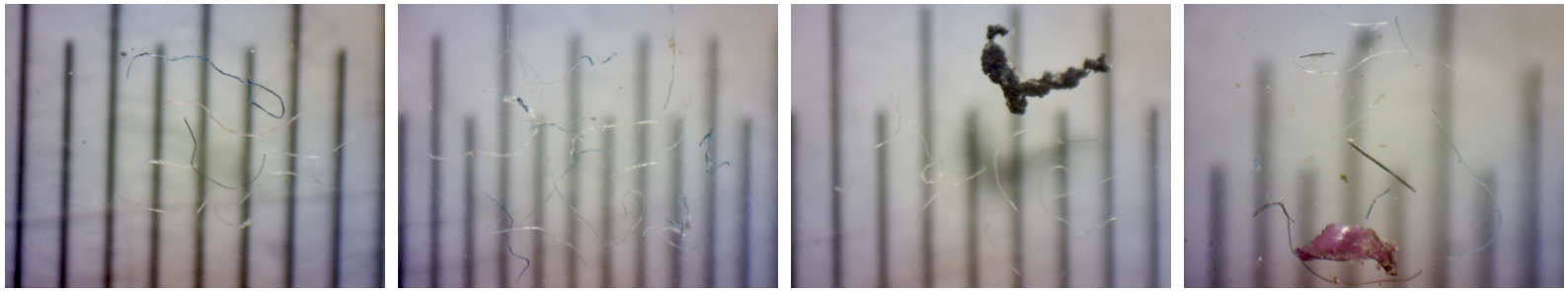
Microplastics extraction

Analysis procedures



Micro particles found in water outside of algae:

Micro particles found in water within algae thickets:



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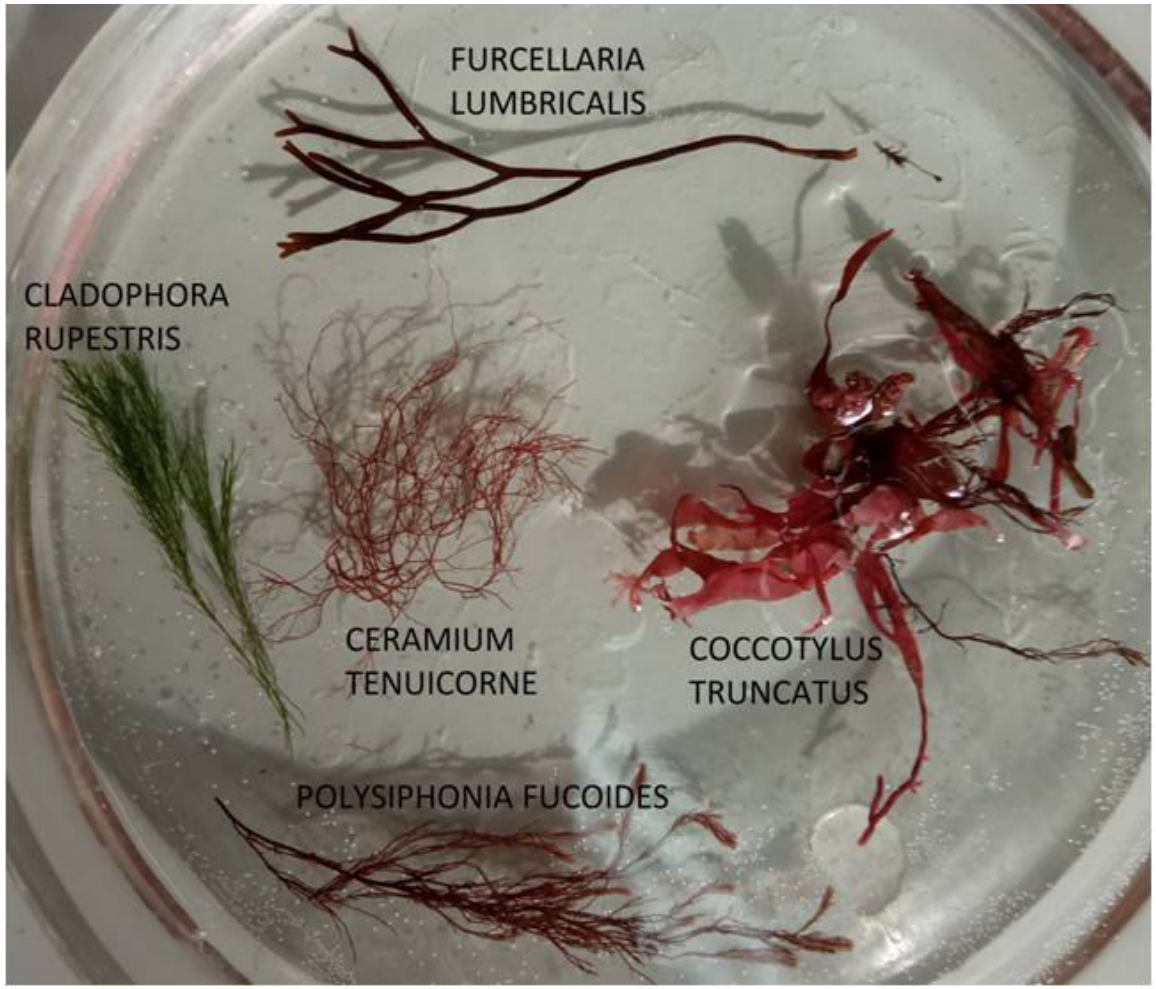
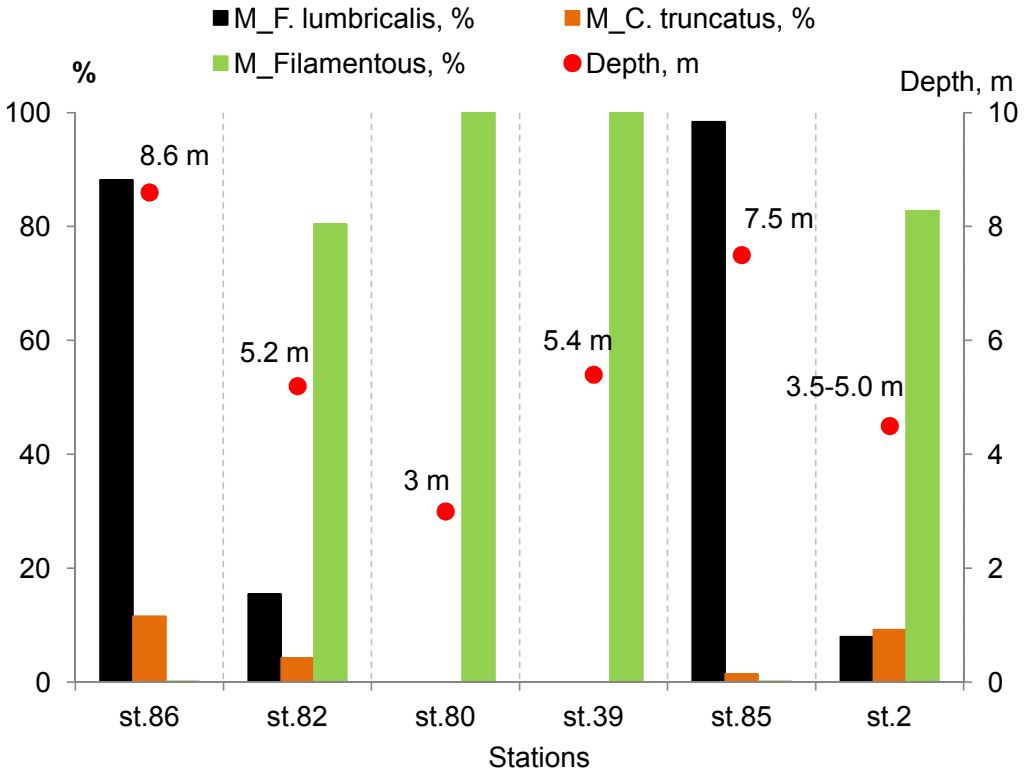
First results



Mass fraction of algae of each species (in percent of the total sample mass of algae at the station): *Furcellaria lumbricalis* (**M_*F. lumbricalis***), *Coccotylus truncatus* (**M_*C. truncatus***), and Filamentous (*Polysiphonia fucoides, Cladophora rupestris, Cladophora glomerata, and etc.*) (**M_Filamentous**)



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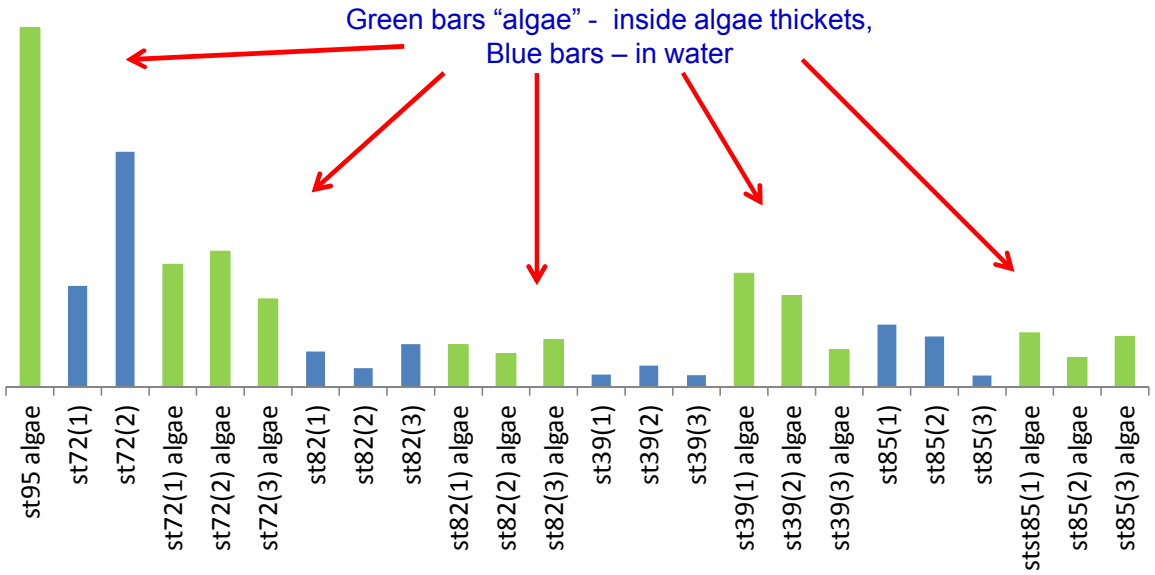
First results: MPs in water from the algae thickets and out of them

Microplastic particles were found in all the collected samples/replicates of both water and plats.

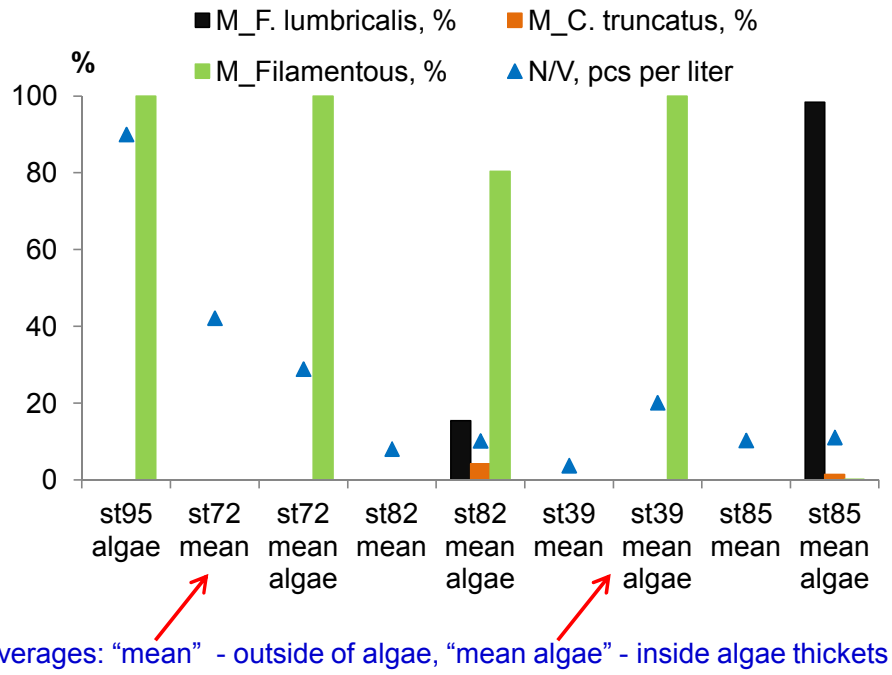
Preliminary analysis shows 1.3--5.3 times higher microplastic contamination in water samples taken from the algae thickets than in those taken from the plant-free areas nearby.

Comparison between **the number of microparticles** (items per liter) in water outside of the algae and inside the algae thickets (with replicates)



At each station, several samplings were performed: outside the algae and inside the algae thicket.

Correlation between the number of microparticles (item per liter) and mass fraction of algae of each species (percent of the total mass of algae at the station)



Averages: “mean” - outside of algae, “mean algae” - inside algae thickets

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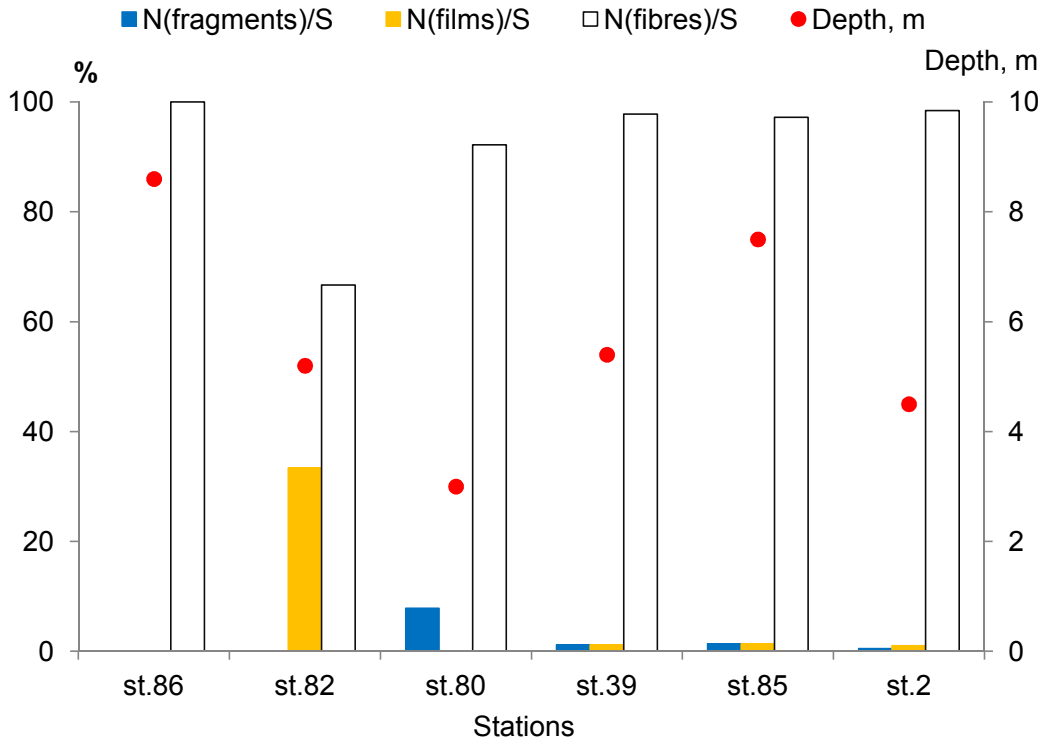
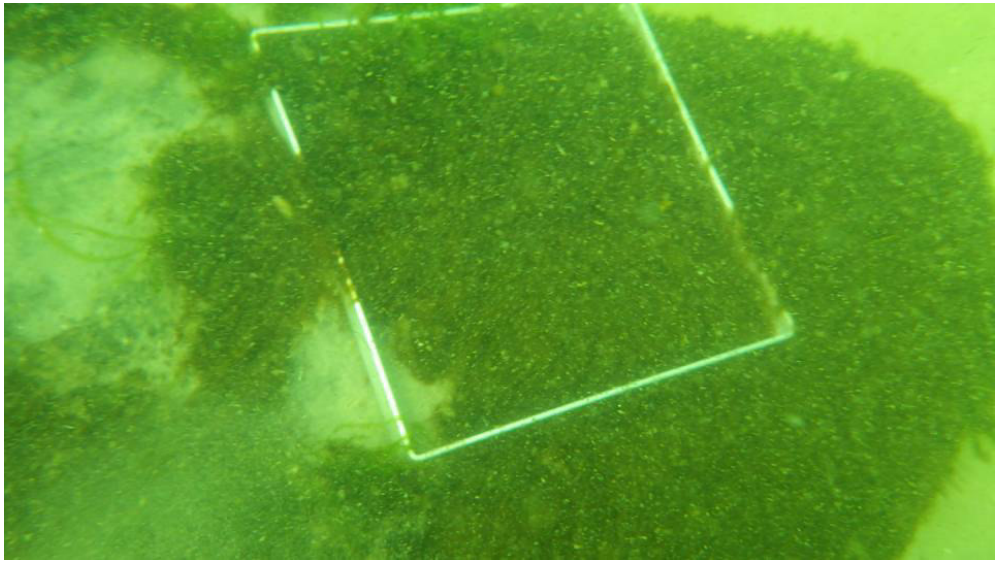
First results

Distribution of types of shapes (fragments, films, and fibres) (percent from the total number of microparticles per m^2) at the stations.

The majority of microparticles are fibers, mainly colorless and blue, but also red, black, golden, and yellow.



Microparticles per m^2



For a rough estimate of micro particles contamination (items per m^2), the sampling of algae on a frame area of 25 cm x 25 cm was carried out.

The collected algae samples were thoroughly washed with water in laboratory. Water washout was processed in accordance with the procedure (see Analysis procedures).

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Conclusions

- ✓ Marine macrophytes do retain microplastics: both the very plants and water in-between them show high concentration of plastic particles.
- ✓ Water within thickets is 1.3—5.3 times more contaminated than water in neighboring areas, which are free of vegetation.
- ✓ Fibers are the prevalent type of microplastics in water and seweed.
- ✓ Plant thalli are entangled by fibers.
- ✓ Filamentous seweed (*Polysiphonia fucoides, Cladophora rupestris, Cladophora glomerata, and etc.*) collect more fibers than *Furcellaria lumbricalis* and *Coccotylus truncatus.*

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Thank you
for your attention!