Eliminating microplastics from bodies of water by using an innovative system

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WHAT ARE MICROPLASTICS?

Microplastics are small plastic particles with a size between 5 mm and 50 µm (0,05 mm). Microplastics can be divided into primary and secondary microplastics. Primary microplastics are deliberately made this small and are used for example in cosmetics, personal care or for the production of plastic items (as shown in figure 1). Secondary microplastics originate from bigger plastic items, due to for example wear and tear and degradation.

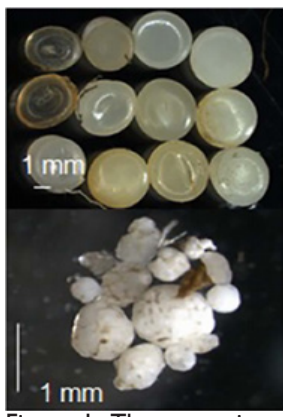


Figure 1- The upper image shows translucent pellets and the lower image shows fluff and fragments.

TEST RESULTS PROTOTYPE

The prototype (see figure 3) has been tested in the harbour of Tiel. Some results of the test can be seen in the images below. Based on the test results we were able to design our final solution.

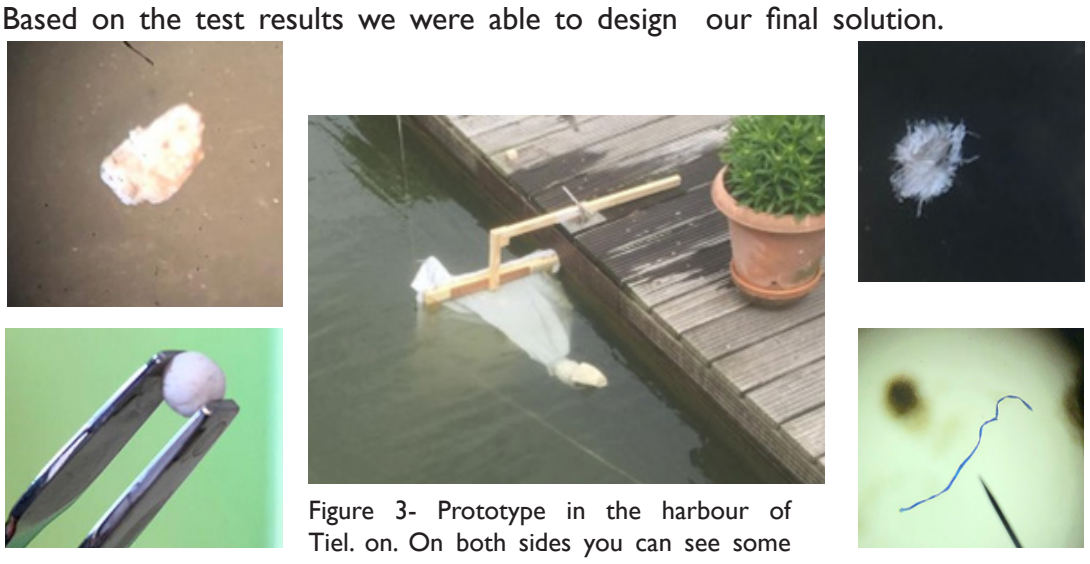


Figure 3- Prototype in the harbour of Tiel. on. On both sides you can see some microplastics captured by our prototype.

THE PROBLEM

Microplastics have been found in a wide variety of aquatic species. There is also evidence of trophic transfers of plastics and transfers of sorbed contaminant from plastic due to ingestion of other organisms have been suggested. Microplastics absorb dangerous chemicals from water or already contain them. The absorption of these pollutions when microplastics are ingested could be harmful to aquatic organisms, the amount of ecologically adverse effects are however unknown. Not only are microplastics harmful due to the added and adsorbed chemical but also due to the shape. The shape of microplastics can perforate the intestines of organisms. Microplastics can pass through the created holes and cause even more damage to other cells and could possibly stay in the organism for a long time. There has even been documented that microplastics can be taken up into cells of the blue mussel where they cause significant effects on the tissue.

The potential damage of microplastics doesn't only limit itself to aquatic organisms. The average European that consumes shellfish on a regular basis ingests 6400 pieces of microplastics a year. There has been research on accumulation of microplastics in different kinds of tissue of mice. The results suggest an induced disturbance of energy and lipid metabolism. The results also indicated potential toxicity from exposure to microplastics. There's little published research about the effects of microplastics on the human body. But research with the smallest indications that indicate health risks should be taken seriously until the contrary is proven.

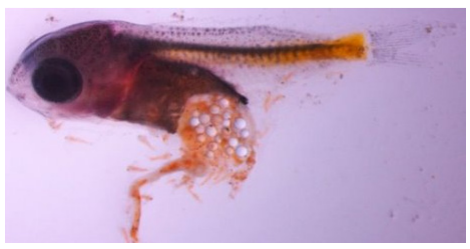
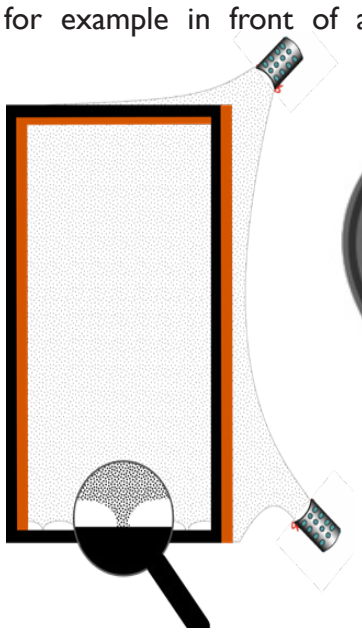
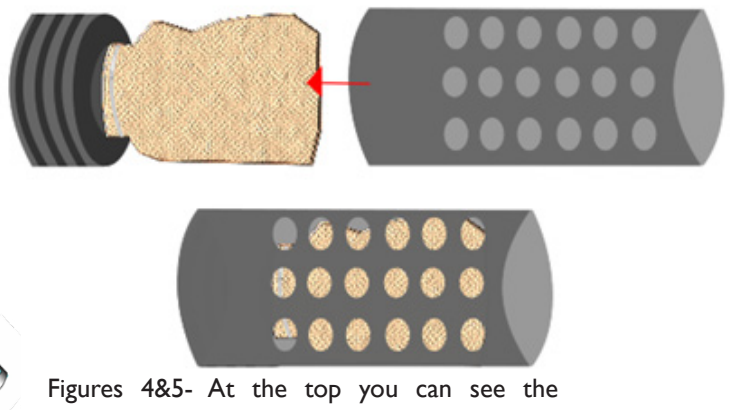


Figure 2- On the left you can see a small fish which has ingested multiple microplastics (the small white particals).

THE SOLUTION

The solution which we came up is named 'The Banana', it takes its name from its distinctive shape. The front of the Banana is equipped with a wall which redirects larger litter, stopping it from entering the Banana itself and preventing it from clogging. The remaining litter, carried by the flow of water, will follow the net of the Banana and flow through the storage containers. Valves in the storage containers prevent the water from flowing back. Attached to the storage container is a storage bag which collects the microplastics. These bags can easily be exchanged for new bags while emptying the Banana. This system has been tested and operated as desired. The system can be used in all kinds of circumstances for example in front of a weir or in the plastic litter trap from Recycled Island Foundation. For more information scan the QR-code above.





Figures 4&5- At the top you can see the storage system and on the left the banana with the holes at the bottom where fish are able to leave the sysyem.

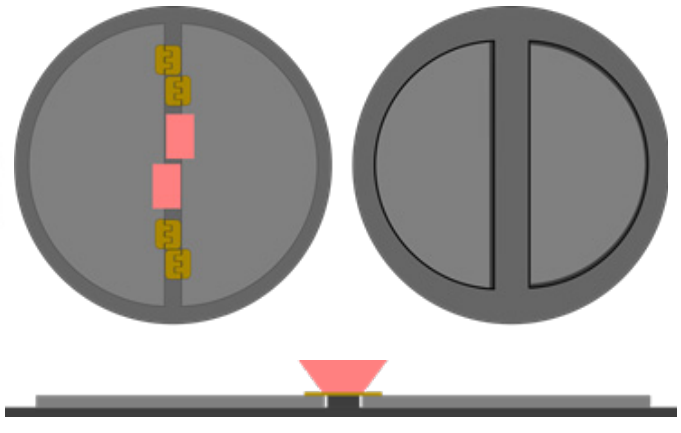


Figure 6-The heartvavlves

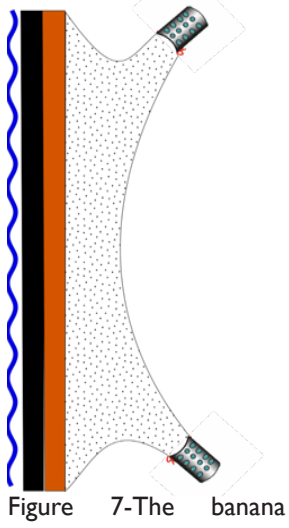


Figure 7-The banana