Federal Ministry
of Education
and Research

FONA
Research for Sustainable
Development
BMBF

MikroPlaTaS – What Happens to Microplastics in Dams and Reservoirs

Plastics in the Environment – Sources · Sinks · Solutions

Extremely small plastic particles can be detected in varying concentrations in many inland waters. Previous studies show that fewer particles are found in rivers downstream of the reservoirs than upstream. Researchers assume that microplastics accumulate on the bottom of these water bodies. Dams and reservoirs therefore represent possible sinks for microplastics. The aim of the joint research project MikroPlaTaS is to gain a better understanding of the environmental factors that lead to the sedimentation of plastic particles in these water systems and to assess their effects on aquatic organisms.

Potential Factors for Accumulation of Microplastics

Plastic particles are typically lighter than water; thus, most particles should swim on the surface while only a few float in water or sink to the bottom. However, this is exactly what happens over time. A prediction of sedimentation behavior is therefore important as it can be used to estimate the pollution of downstream waters as well as the effects on various aquatic populations. There are several reasons why the plastic particles may behave contrary to expectations. For example, it is possible that the density of the particles increases due to fouling. It is also conceivable that they absorb more water through weathering. Furthermore, microplastics could stick to surfaces or be consumed by animals.

Tracking Down Causes in Environment and Laboratory

The researchers want to experimentally determine the plastic concentration in sediment and which mechanisms cause particles to sink as well as to compare these to the results of field tests. Three industrial water reservoirs in Saxony (Bautzen, Quitzdorf and Malter) and three dammed areas in North Rhine-Westphalia (sections of the Ems, the Lippe and the former sewage fields of the city of Münster) serve as field investigation sites.

Dams and reservoirs offer ideal conditions to act as sinks for particles due to their decreasing flow velocity. In Germany alone, there are over 300 reservoirs, and almost all major rivers are dammed several times. In these water systems, which are important for water supply and leisure use, significant microplastic loads are expected, but have not yet been investigated. Because dams are regularly monitored by their operators, there are existing databases for the environmental conditions. The project partners are conducting chemical and biological analysis of water and media samples to examine them for microplastics. So-called sediment traps are being used at selected sites to quantitatively determine the amount of suspended particles sinking at different times of the year and to establish whether microplastic particles are present.

Moreover, MikroPlaTaS also examines the microbial colonization of plastic particles and the role of these biofilms on sedimentation. Researchers are investigating the deposition of overgrown microplastics in laboratory experiments under various environmental conditions: in light, in the dark, with oxygen and without oxygen. This work provides major impulses for the third focus of the joint research project. The aim here is to determine the ecological effects of plastic particles with different

At the water reservoir in Bautzen, employees of the state dam administration show the researchers where to use boats for sediment sampling.

biofilms on cohabitation in plankton as well as in the sediments of water bodies. The planned experiments range from small laboratory vessels with individual key species such as water fleas, rotifers, nematodes and snails to artificial ponds with complex biological communities, so called mesocosms.

Risk Assessment and Recommendations for Action

The project partners will present a risk assessment for the contamination of dams and reservoirs with microplastics as well as concrete recommendations for practical action. A better understanding of the distribution, deposition processes and effects of microplastics in dams and reservoirs will enable researchers to assess the natural self-cleaning potential in these water areas. These findings can be used for water management and future construction measures. If, for example, the deposition of small plastic particles proves to be environmentally compatible, concepts could be developed to promote this process. The practical recommendations for the handling of microplastics are being developed with the practical partners of MikroPlaTas – the State Dam Administration for the Free State of Saxony, the City of Hamm, and the North Rhine-Westphalia Nature Conservation Academy (NUA).

Roundworm with recorded microplastic (1 µm, blue fluorescent)

Research Focus
Plastics in the Environment – Sources • Sinks • Solutions

Project Title
Microplastics in Dams and Reservoirs: Sedimentation, Spread, Effects (MikroPlaTas)

Grant Number
02WPL1448 A-F

Duration
January 1, 2018 – December 31, 2020

Funding Volume
EUR 1,492,800

Contact
Helmholtz-Zentrum für Umweltforschung (UFZ)
Department Seenforschung
PD Dr. Katrin Wendt-Potthoff
Brückstraße 3a
39114 Magdeburg
Phone: +49 (0) 391 8109810
E-mail: katrin.wendt-potthoff@ufz.de

Project Partners
Ecossa, Starnberg
Institut für Gewässerschutz Mesoscosm GmbH, Homberg/Ohm
Universität Bielefeld, Bielefeld
Universität Potsdam, Potsdam
Westfälische Wilhelms-Universität Münster, Münster

Website
www.uni-muenster.de/Mikroplatas/

Publisher
Federal Ministry of Education and Research (BMBF)
Department of Resources, Circular Economy; Geosciences, 53170 Bonn

Editorial Work and Design
Project Management Agency Karlsruhe (PTKA)

Print
BMBF

Photo Credits
Front page: UFZ, Matthias Koschorreck
Back page: Universität Bielefeld, Arne Hägerbäumer

Version of
November 2018

www.bmbf.de