Can Anthropogenic Pollutants (Microplastics and Fertilizers) Really Be Dangerous to Freshwater Zooplankton?

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The increasing level of anthropogenic pollutants, particularly microplastics and artificial fertilizers, in the freshwater environment is currently intensely studied in the fields of ecology and environmental protection. It is supposed that these pollutants can affect many groups of freshwater organisms, including zooplankton, but the impact is still not fully understood. Our studies focused on Daphnia, which are commonly used as model organisms in ecotoxicological research. First, we analyzed the difference in the microplastics consumption by Daphnia during their development in relation to body size in the 8-day experiment with larger-bodied D. pulex and smaller-bodied D.galeata. The number of microplastics in the digestive tracks of Daphnia was counted daily by using fluorescent polystyrene microparticles and an epi-fluorescent microscope. Secondly, we investigated the combined effect of a fertilizer type (ammonium nitrate, ammonia, and urea; applied in two concentrations of 0.25 mg and 2.5 mg x ml-1) and the effect of the elevated temperature (20, 25, and 30? C) on the life history traits (LHT) of D. pulex. Our studies showed that the accumulation of microplastics increased during Daphnia's development. Moreover, the larger D. pulex not only accumulated more microplastics compared to the smaller D. galeata but started to do so at an earlier stage. We also found that the ammonium nitrate and ammonia fertilizers had the strongest impact on the LHT of D. pulex, and the negative impact of the fertilizers increased with temperature elevation. These results indicate that anthropogenic pollutants (microplastics and fertilizers) can affect the biology of Daphnia and thus the proper functioning of zooplankton communities.

Awards Won:
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