

Assessment of physiological and chronic effects of ZnPT and CuPT on the non-target marine rotifer *Brachionus manjavacas*

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Introduction

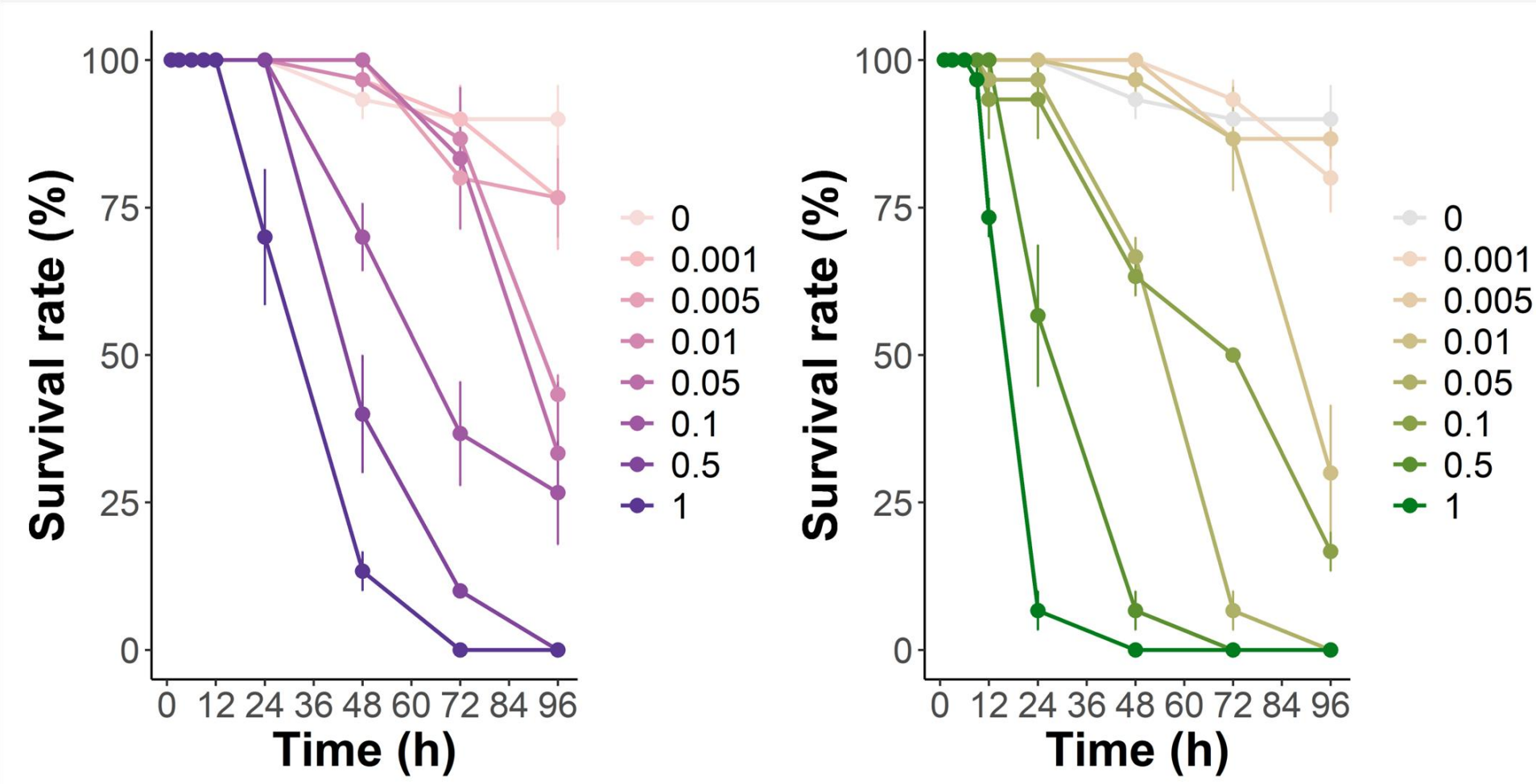
Zinc pyriothione (ZnPT) and copper pyriothione (CuPT) are new antifouling paint materials widely used as substitutes for tributyltin (TBT). Residual concentrations of ZnPT and CuPT have been detected in marine environments, and harmful effects on non-target organisms have been reported. However, data on the effects and mechanisms of ZnPT and CuPT on aquatic invertebrates is limited.

Objective

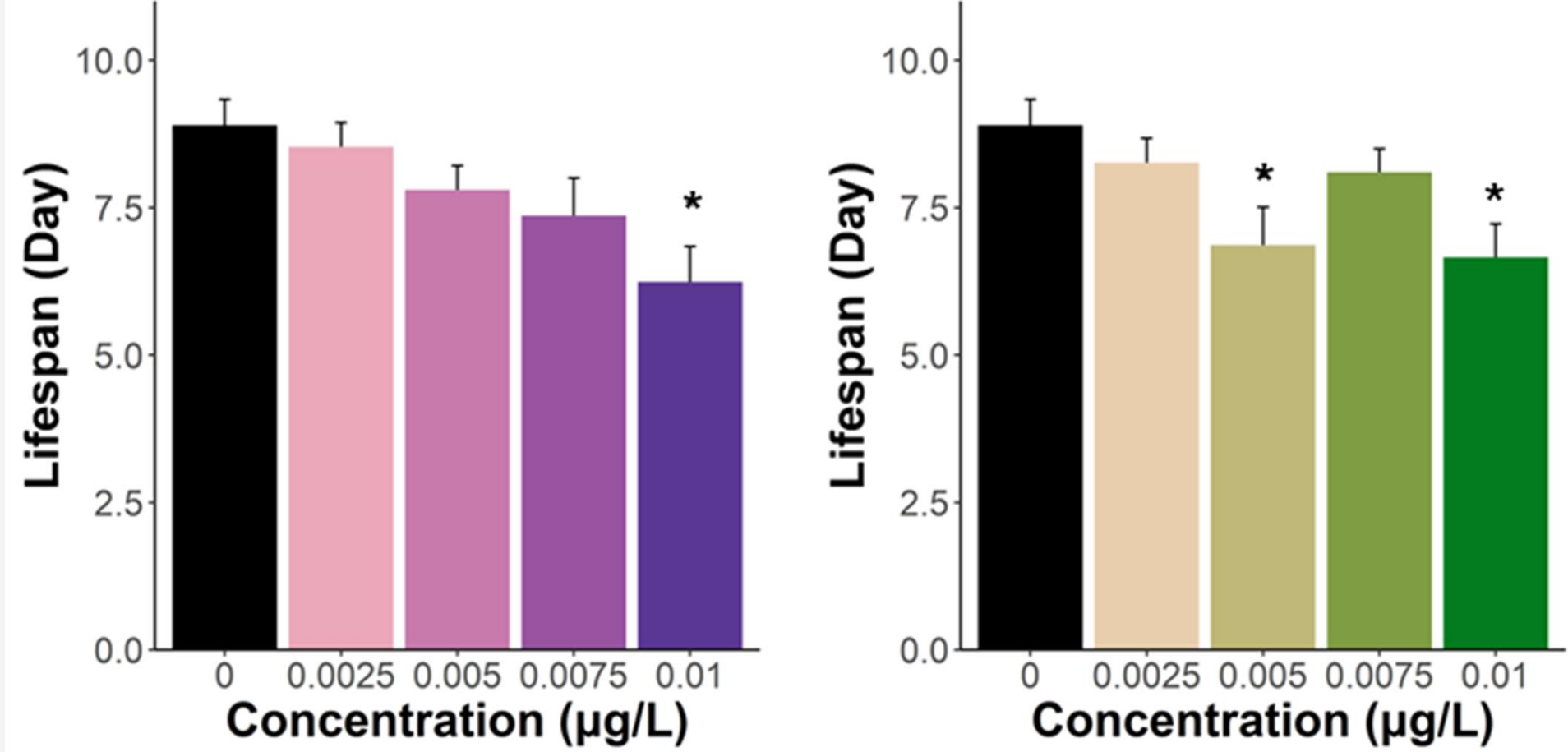
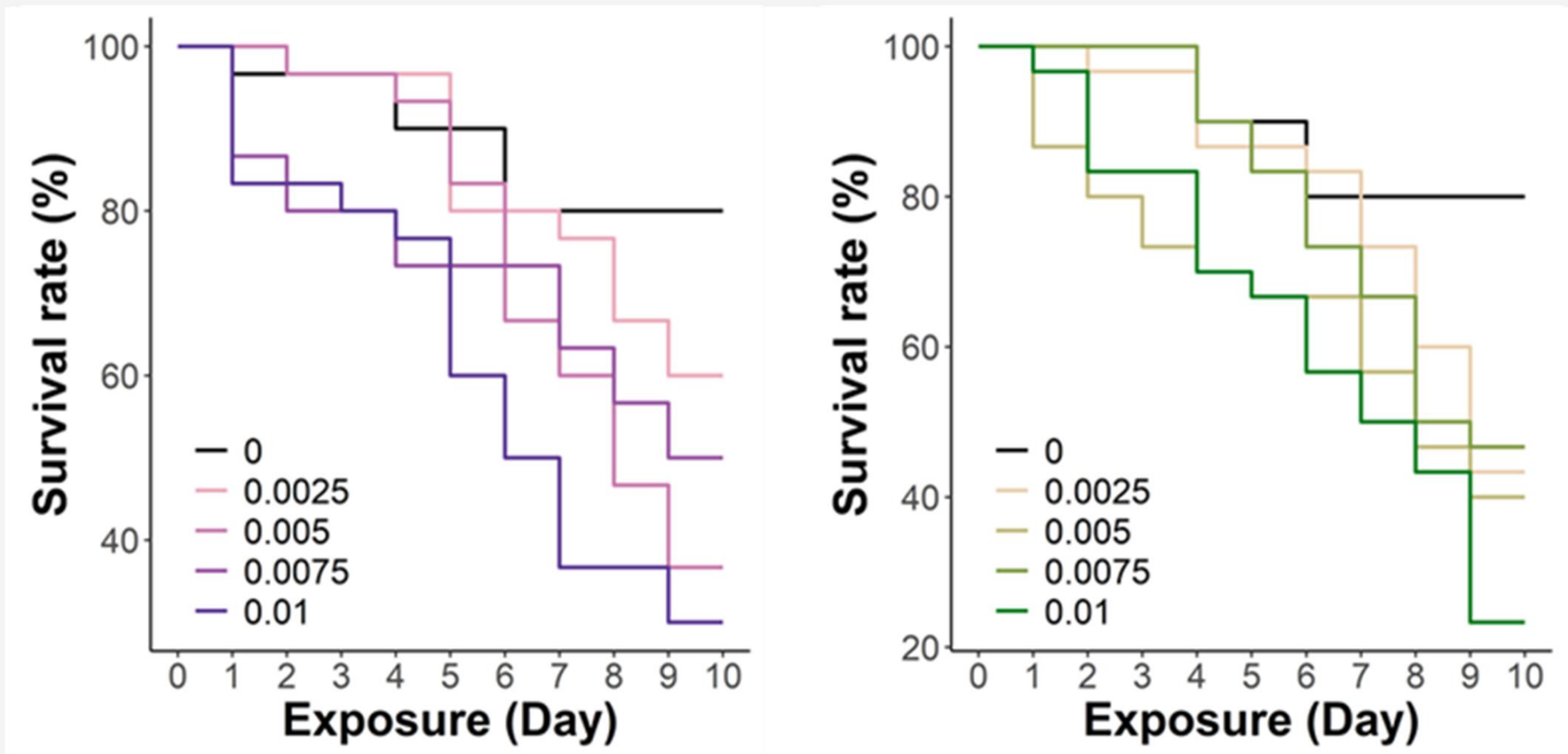
This study aimed to investigate the effects of ZnPT and CuPT on one of the model invertebrates, a marine rotifer *Brachionus manjavacas*, and the survival strategies of exposed the rotifer.

Results

The survival rate decreased as the concentration increased for each of ZnPT and CuPT. The 96 h LC₅₀ of *B. manjavacas* was approximately 0.0093 µg/L and 0.0084 µg/L when exposed to ZnPT and CuPT, respectively.



The chronic toxicity test concentration was calculated based on the 96 h LC₅₀. ZnPT and CuPT chronic toxicity tests were conducted at concentrations of 0, 0.0025, 0.005, 0.0075, and 0.01 µg/L.

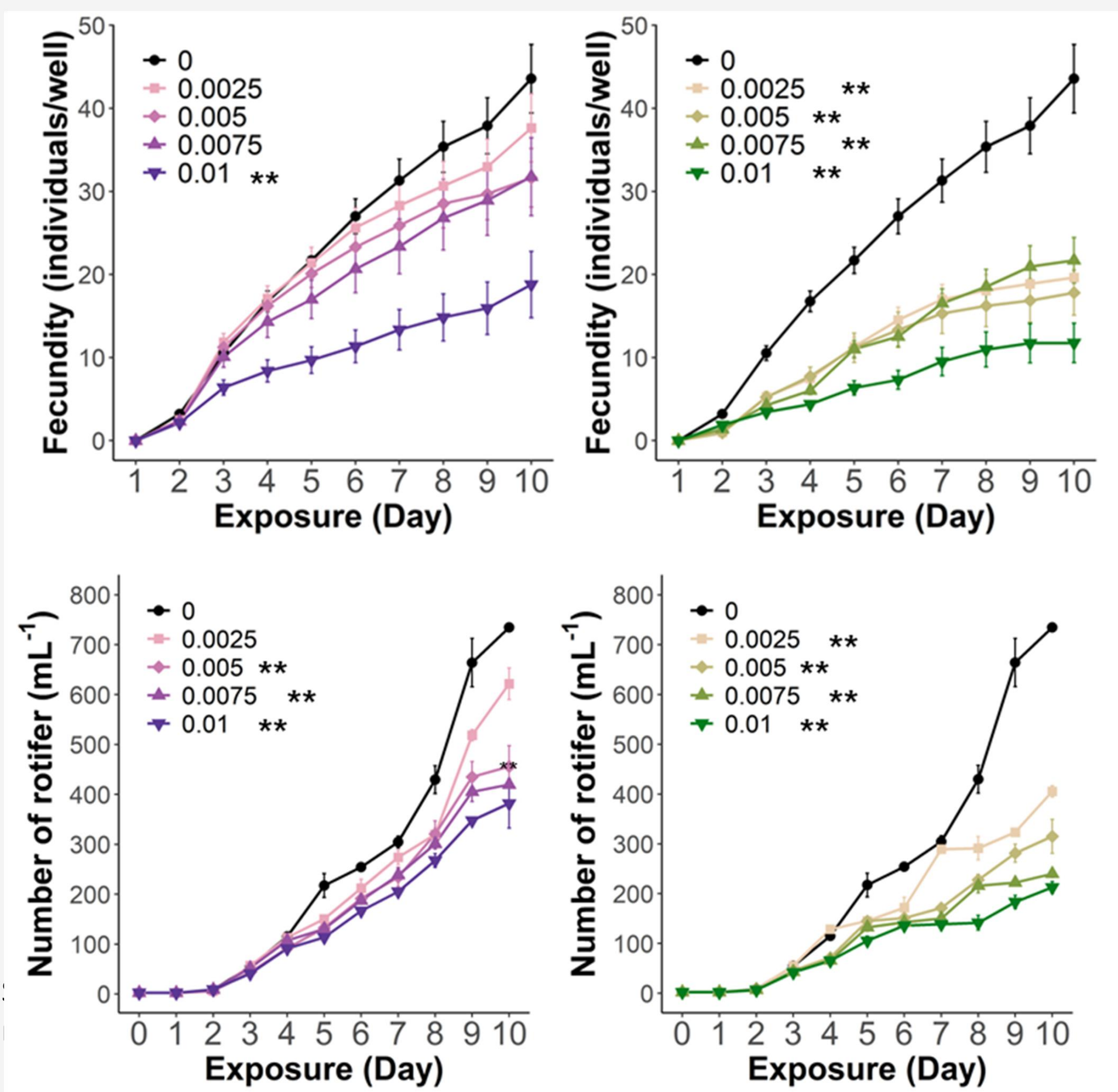
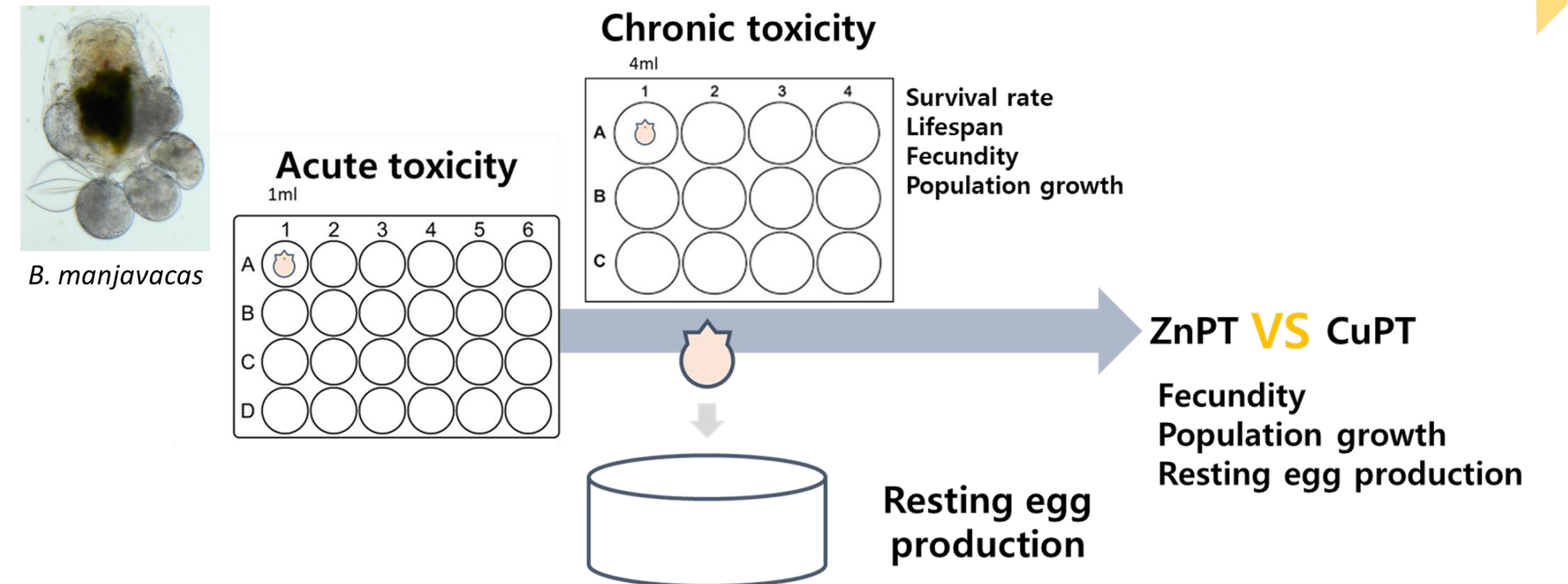


A decrease in survival, lifespan, fecundity, and population growth rate was observed when marine rotifers were exposed to ZnPT and CuPT. After 10 days of exposure, CuPT resulted in lower values for every parameters compared to ZnPT, suggesting that CuPT is more detrimental to rotifers.

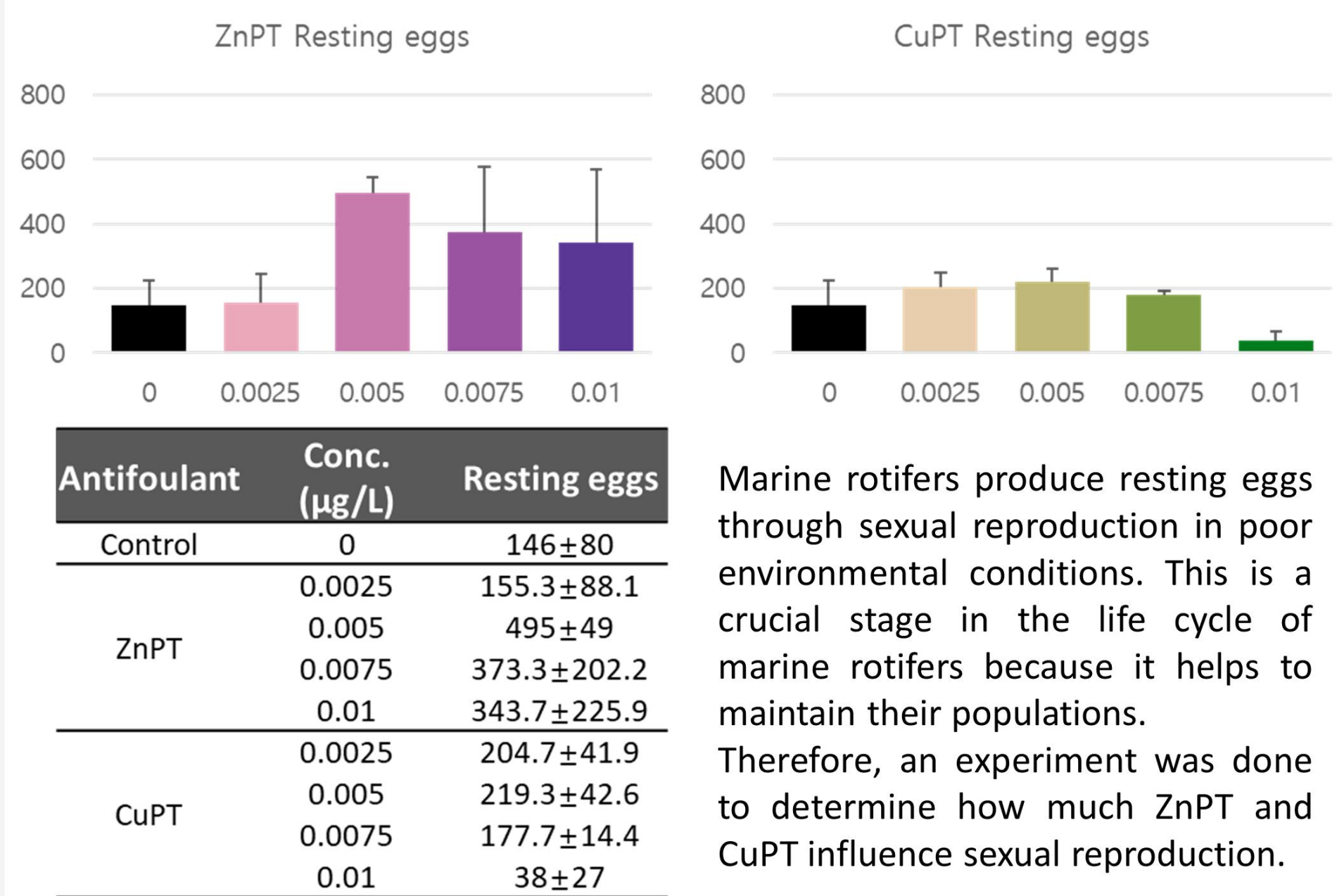
Conclusion

This study is the first to examine the effect of these substances on reproduction of rotifers and is expected to be helpful in investigating the impact of ZnPT and CuPT on the marine environment. The experiment demonstrates that rotifers could be affected by residual biocides in the actual aquatic environment. As a result, we believe that tougher rules for the use of ZnPT and CuPT are required.

Methods



The findings of a 10-day long-term toxicity test of ZnPT and CuPT revealed a decrease in survival and reproduction rates compared to the control group, even at the lowest concentration (0.0025 µg/L).



Marine rotifers produce resting eggs through sexual reproduction in poor environmental conditions. This is a crucial stage in the life cycle of marine rotifers because it helps to maintain their populations. Therefore, an experiment was done to determine how much ZnPT and CuPT influence sexual reproduction.

In *B. manjavacas* exposed to CuPT, the production of dormant eggs was reduced by more than two-fold compared to the ZnPT treatment groups. These findings suggest that, at environmental concentrations, ZnPT and CuPT may have considerable detrimental impacts on the reproduction and population maintenance of marine rotifers, despite their rapid degradation properties.

Reference

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