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Valentina Fagiano, Matthew Cole, Rachel L. Coppock, Penelope K. Lindeque, 2025.

[Real-time visualization reveals copepod mediated microplastic flux](#)

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Abstract: Zooplankton are emerging as key actors in shaping the distribution and fate of microplastics in marine environments. Copepods are the predominant taxa in marine zooplankton communities, underpinning food webs and playing vital roles in biogeochemical cycling. Marine copepods have been identified as microplastic reservoirs that likely contribute to the biological transport of microplastics. Evaluating the extent to which copepods contribute to marine plastic cycles requires accurate measures of copepod-mediated microplastic fluxes. To address this critical research gap, real-time visualization is implemented to precisely measure microplastic gut passage time and ingestion intervals. The North Atlantic temperate copepod *Calanus helgolandicus*

was exposed to fluorescent polystyrene beads, polyamide fibers and polyamide fragments under varying food concentrations. Copepods demonstrated consistent microplastic gut passage times (median: 40 min) with food concentration and microplastic shape having no significant effect. This study provides robust estimates of gut passage time and ingestion intervals, establishing a quantitative framework for assessing copepod-mediated microplastic fluxes. Estimated fluxes (~ 271 microplastics $m^{-3} day^{-1}$), based on the mean abundance of *C. helgolandicus* in the western English Channel (Northeast Atlantic), suggest that copepods may represent key drivers of vertical microplastic transport. These findings advance integration of copepod-driven processes into oceanographic models, reducing uncertainties in microplastic transport predictions and enhancing understanding of microplastics' ecological impacts on marine ecosystems and global biogeochemical cycles.

Keywords: Zooplankton, Calanus, Plastic, Pollution, Biological pump