

Scientific Paper:

Limnology and Oceanography (2022)

“Sinking dead” – How zooplankton carcasses contribute to particulate organic carbon flux in the subantarctic Southern Ocean

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Abstract:

Zooplankton carcasses are an important, yet understudied, pathway of the biological gravitational pump. To understand their contribution to the downward carbon flux in the subantarctic, carcasses of the copepod *Neocalanus tonsus* were analyzed for carbon content, microbial remineralization rates, and sinking velocities. In addition, the sensitivity of carcass flux to varying mortality, microbial turnover, and sinking velocity rates was analyzed and compared to carbon flux measurements from sediment traps. Microbial decomposition rates (between 0.02 and 0.16 d⁻¹) were comparable to those of marine snow, highlighting the importance of carcasses as microbial hotspots. High sinking velocities (730 ± 182 m d⁻¹) suggest that particulate organic carbon flux to the deep ocean is substantial. Carcass flux is sensitive to a change in sinking velocity but appears less sensitive to fluctuations in microbial decomposition rate. More research on zooplankton mortality and the factors that influence carcass sinking through the water column is needed to quantify the carcass-mediated carbon export and enable their inclusion in marine ecosystem and biogeochemical models.

Keywords: zooplankton, carbon flux, subantarctic, *Neocalanus tonsus*, sinking velocity, microbial decomposition rate