

Title: Estimating microzooplankton grazing functions from dilution experiments in the ocean

Abstract:

Grazing functions play an important role in determining dynamics and stability of ecological models. Particularly, Holling Type II functional response destabilizes the ecosystem, while Holling Type III functional response stabilizes the system at low food concentrations. In addition, although numerous experiments have been conducted in the laboratory to quantify the grazing saturation constant ( $K$ ), there are few field data available for parameterizing ocean models. We used two approaches to estimate the type of microzooplankton grazing functional response and  $K$  from dilution experiments. The first approach was to fit a grazing model that takes into account microzooplankton biomass, temperature, and grazing functional response to a pooled dataset of dilution experiments. The Holling Type III functional response was found as the best fit to the data, with the  $K$  estimated as  $0.2 \mu\text{g Chl } a \text{ L}^{-1}$ . The second approach was to fit grazing functions to nonlinear dilution experiments. The proportion of significant nonlinear experiments was  $\sim 20\%$  of total dilution experiments collected. Based on these nonlinear experiments, we found that there is a significant positive relationship between  $K$  and ambient Chl  $a$  concentration, which complicates the parameterization of grazing functions in ocean models. Further studies are needed to reconcile the discrepancies of different methods to reach a more realistic grazing function.