

## Role of Zooplankton in the Transformation, Remineralization, and Export of Particulate Organic Matter in the Sea

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Developing predictive models of the relationship between primary production and carbon flux requires an understanding of food web processes. Zooplankton, through the processes of ingestion, metabolism, and egestion, play an integral role in the biological pump by feeding in surface waters and producing sinking fecal pellets. Vertically migrating zooplankton and nekton also play an important role in transport by consuming organic particles in the surface waters at night and metabolizing the ingested food below the mixed layer during the day. Changes in zooplankton biomass and species composition in surface waters can dramatically affect the sedimentation rate of fecal pellets and thus the export of organic material to the deep ocean. Results from JGOFS studies show differences in the importance of fecal pellet flux, relative to primary production or total carbon flux, from one ocean basin or season to another.

Below the euphotic zone, zooplankton affect particle flux by grazing (and remineralizing or repackaging) particles, disaggregating particles by their feeding or swimming actions, vertical migration, and by producing dissolved organic matter through their metabolism and feeding the microbial loop (ultimately increasing flux). Studies to date indicate zooplankton metabolic activity can account for a significant proportion of the loss of particulate organic matter (POC) with depth (9-100% of sinking POC respired, 6 - 38% of sinking POC consumed). Zooplankton vertical migration increases flux via production of feces at depth (but equals on average only 2-7 % of passive POC flux) and by actively transporting dissolved material (on average 4-40% of passive POC flux), fueling the microbial loop. Combining information on zooplankton biomass and species composition across the ocean basins with empirical models for determining zooplankton feeding, metabolic, and production rates will allow us to determine the global role of zooplankton in particle cycling. While we have dramatically increased our ability to make this determination during the JGOFS era, still much is unknown about zooplankton processing of organic matter, especially below the euphotic zone.