In the middle of the web: microzooplankton-mediated carbon flux in a marine coastal system

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A plankton food-web was studied in detail in the coastal Gulf of Naples during summer. In order to investigate material flows, a biomass-balanced ecological-network model including sixty-three functional nodes (from detritus to carnivorous mesozooplankton) was developed based on the carbon-budget in the system and species-specific physiological-trophic rates (e.g. ingestion and assimilation) derived from the literature and laborarory experiments. Microzooplankton nodes were key structural elements of the food-web. For instance, the modeled microzooplankton consumed about 50% of the diatom production and 55% of total primary production during eutrophic states of the system (ranging 50-250 µg C L^{-1}), in line with experimental evidence gained for the global ocean. Moreover, the main microzooplankton players (e.g. oligotrichous ciliates, heterotrophic dinoflagellates and prostomatids) almost doubled their predation rates on picoplankton during oligotrophic states of the system. Conversely, microzooplankton contributed 33% of the diet of calanoid copepods' with food concentrations in the surface layer. With food concentration <50 µg C L^{-1} over the whole water column, that contribution rose to 41%. Such consumption shifts are in line with meta-analyses of experimental data. Overall, our model demonstrates that, by consuming small food particles (e.g., bacteria and small-sized protists) not directly edible by copepods for their limited size, microzooplankton established an important pathway of delivery of organic material to metazoan consumers during oligotrophic states in the studied coastal system.

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