

Primary productivity – an important structuring variable in marine plankton food webs

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Abstract

Data obtained from a spring blooming marine ecosystem suggest that grazed phytoplankton dominate under high grazing pressure and when the main source of nutrients stems from recycling. Under the assumption of negative impact of herbivory on phytoplankton (antagonism), this appears paradoxical, as nongrazed phytoplankton would be expected to dominate. To account for this phenomenon, a mechanism for the positive coexistence of herbivores and their preferred algal prey has been proposed, which also involves bacteria, heterotrophic nanoflagellates (HNF), and viruses taking part in the cycling of nutrients. This phenomenon is referred to as predator-prey synergism—an interaction resulting in both predator and prey enhancing their abundance. Herbivores exert a strong influence on the algal community. However, in contrast to the traditional perspective of top-down control in ecosystems, the relationship between predator and prey is positive. Based on this predator-model, primary productivity (PP) stands out as an important structuring variable in marine planktonic food webs, by larger plankton being favoured at lower levels of PP and smaller plankton at higher levels of PP. Eutrophication results in increased PP and thus reduced size in plankton. This relates to plankton contributing to cycling of nutrients, i.e. species that are being eaten. In nongrazed phytoplankton, on the other hand, eutrophication may result in increased abundance of larger species (e.g. dinoflagellates).

Keywords: Primary productivity, predator-prey synergism; zooplankton, phytoplankton; nanoflagellates; bacteria; phages; nutrient cycling, eutrophication

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