

MESOPELAGIC MICROBIAL LOOP: ITS DIVERSITY AND FUNCTION

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It is considered that most of sinking POC is consumed by detritivorous zooplankton and particle-attached heterotrophic prokaryotes (*Bacteria* and *Archaea*, hereafter bacteria) in the mesopelagic layer and that DOC exported to the mesopelagic layer by lateral advection or winter mixing is likely consumed by free-living bacteria. While several studies report that not only bacteria and zooplankton but also viruses, flagellates, ciliates, dinoflagellates, foraminiferans, and radiolarians exist in the mesopelagic layer, the ecological role of the latter components has not yet been well understood.

In the NW Mediterranean, bacteria, heterotrophic nanoflagellates (HNF), and ciliates were always detected throughout the water column during an annual study, with one, two, and three orders of magnitude of depth-dependent decrease (5-2000 m), respectively (Fig. 1). Under the assumption that the food web was close to steady state, this suggests that rate processes (i.e. growth and loss rates) are less variable for bacteria than for protozoa over the depth, and that the density-dependent predator-prey relationship becomes less coupled between the three microbial heterotrophs with increasing depth down to 2000 m. Increase in number of trophic levels generally results in less efficient material transfer from lower to higher trophic levels or more efficient remineralization in the food web, which has been emphasized as a function of the “microbial loop” in the euphotic layer (cf. Azam et al. 1983). This concept may be applied in the mesopelagic layer (here, 110-1000 m), where all microbial heterotrophs and zooplankton exist and constitute the mesopelagic food web. Our simple steady-state food chain model analysis suggests that the mesopelagic bacterial production is similarly allocated to “DOC-bacteria-viruses” circuit and “DOC-microbial loop” circuit, or 1.5 times greater to the former than the latter, and that HNF are potentially important remineralizers of the mesopelagic bacterial production. But note that direct evidence of trophic interaction (predator-prey and virus-host relationships) is very few in the microbial part of the mesopelagic plankton food web. We wish to exchange the information of the structure and function of the mesopelagic plankton food web.

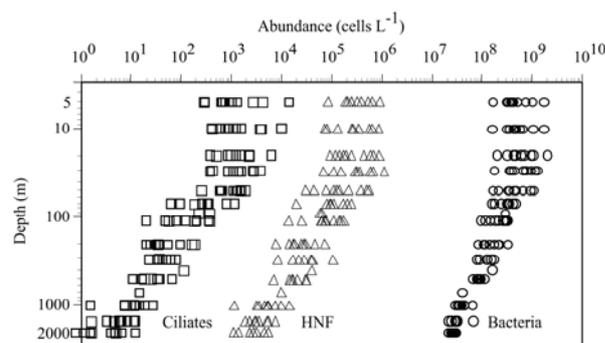


Figure 1. Distributions of bacteria, HNF and ciliates (cells L⁻¹). Measurements were monthly done at 13 depths between 5 and 2000 m from May 1999 to March 2000 at the DYFAMED time-series station (43°25.2'N, 07°51.8'E; 2350 m max depth) in the NW Mediterranean as a part of the French-JGOFS program. Circles, triangles and squares denote bacteria, HNF and ciliates, respectively.