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Mesopelagic fishes and heterotrophic prokaryotes: food for thought

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The biomass of mesopelagic fishes has been recently quantified to be one order of magnitude higher than previous estimates. This finding is boosting studies about their role in ocean biogeochemical cycles. Diel vertical migrations of these small fishes represent a rapid, massive transfer of organic matter to impoverished mesopelagic layers during daytime. However, its effect on heterotrophic prokaryotes (bacteria and archaea) remains unknown. A series of experiments conducted at one 700 m deep station in the central Red Sea suggest that mesopelagic fishes represent an important food source for heterotrophic prokaryotes inhabiting the 500-600 m depth layer. We have documented dissolved organic carbon (DOC) consumption rates of up to 5 μmol L^{-1} d^{-1} in parallel to sustained increases in heterotrophic prokaryotes biomass during short-term incubations. Mesopelagic microbes were significantly larger than their counterparts from shallower depths and they also showed higher growth efficiencies, indicating the existence of labile organic compounds. Dissolved organic matter C:N ratios and fluorescent properties do not support the contention that deep stocks are uniformly refractory. Incubations conducted in different seasons and at different times of the diel cycle (i.e. noon vs. midnight, detailed monitoring of the fish arrival at sunrise) consistently support the existence of previously overlooked DOC hotspots that may change our view of the functioning of microbial food webs in the twilight ocean.