



## Coupling of epipelagic and mesopelagic heterotrophic picoplankton production to phytoplankton biomass in the Antarctic polar frontal region

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**ABSTRACT:** We assessed relationships between phytoplankton standing stock, measured as chlorophyll *a* (Chl *a*), primary production (PP), and heterotrophic picoplankton production (HPP), in the epipelagic zone (0-100 m) as well as in the mesopelagic zone (100-1,000 m) in the polar frontal zone of the Atlantic sector of the Southern Ocean in austral summer (late December to January) and fall (March to early May). Integrated epipelagic HPP was positively correlated to integrated PP in summer (data for fall are not available) but not to integrated Chl *a*. However, integrated mesopelagic HPP was positively correlated to Chl *a* in summer as well as fall. The mesopelagic fraction of HPP as a percentage of total HPP was also positively correlated to Chl *a*, whereas the epipelagic fraction of HPP was negatively correlated to it. These results indicate that with increasing phytoplankton standing stock, constituted mainly of highly silicified diatoms, the focus of its consumption by heterotrophic picoplankton shifts from epipelagic to mesopelagic waters. With a growth efficiency of 30%, our HPP data indicate that in both the epipelagic and mesopelagic zone heterotrophic picoplankton consume 20% of PP. Mesopelagic heterotrophic picoplankton consumed around 80% of the sinking flux, measured from depletion of <sup>234</sup>Th, which is a lower fraction than that reported from the central and subarctic Pacific. Our analysis indicates that it is important to include mesopelagic HPP in comprehensive assessments of the microbial consumption of PP, phytoplankton biomass, and particulate organic matter in cold oceanic systems with high rates of export production.

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