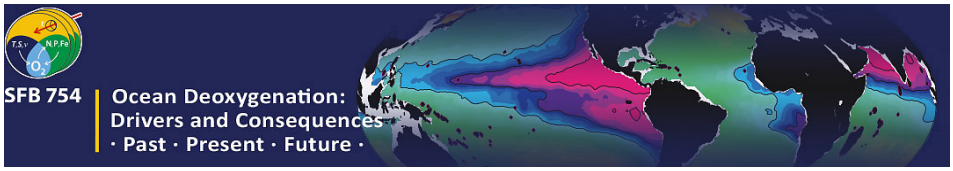

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Factors controlling the productivity of plankton communities in the coastal upwelling system of Peru

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Eastern boundary upwelling systems (EBUS) are among the most productive ecosystems on Earth. Chemical and biological processes in EBUS are strongly influenced by the sub- to anoxic conditions that are typically found in water masses below the productive surface layer. During February to April 2017 we conducted an *in situ* mesocosm experiment near Callao (Peru) to study the factors that control primary, secondary, and export production in a region which harbours one of the most extreme oxygen minimum zones (OMZ) worldwide. First results suggest that upwelling of OMZ-influenced seawater from different locations have a small effect on productivity as long as macronutrient concentrations in the upwelled OMZ water masses are similar. Conversely, the structure of the plankton community had a strikingly large influence on the productivity and the transfer of biomass between the different particulate matter pools. For instance, communities dominated by smaller phytoplankton functional groups generated considerably less biomass suspended in the water column but similarly high export production than communities dominated by larger species. The temporal development of productivity as observed over the course of the experiment suggests that the coastal upwelling system functions similar to a „batch culture“. Primary production is fueled by upwelled nutrients that are frequently injected into the euphotic zone but phytoplankton growth rates are limited by very low light penetration (due to the high turbidity of seawater). The build-up of phytoplankton biomass is kept in check by grazers which rapidly transfer primary production to higher trophic levels and/or detrital matter. The relatively constant levels of phytoplankton biomass is reflected in the downward flux of sinking detritus which is also remarkably constant at least over the 7 week timescale of the mesocosm study. Our dataset revealed key factors that control the productivity in the coastal upwelling system of Peru and provides mechanistic understanding to implement these processes in models.

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