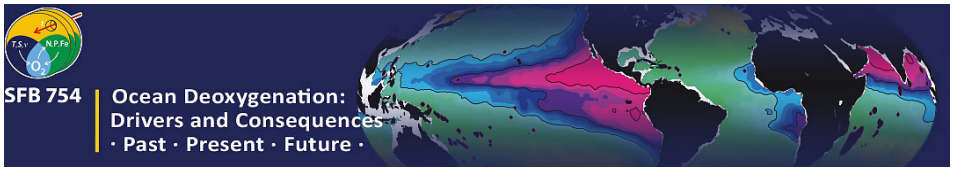

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Elemental fluxes mediated by vertically migrating zooplankton and nekton into the mesopelagic oxygen minimum zone off Peru

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In the Peruvian Upwelling system, the mesopelagic oxygen minimum zone (OMZ) is the main vertically structuring feature of the pelagic habitat. Several zooplankton and nekton organisms undertake diurnal vertical migrations (DVMs) into anoxic depths. It has been argued that these migrations contribute substantially to the oxygen consumption as well as excretion of dissolved compounds (in particular ammonium) in subsurface waters. However, metabolic suppression as a response to low ambient pO2 was not considered in these estimates. Here, we present estimates of zooplankton- and nekton-mediated ammonium release, oxygen consumption, and carbon export flux based on vertically stratified net hauls (day/night, upper 1000m). Samples were scanned, followed by image analysis and size-/taxon-specific estimation of metabolic rates of all identified organisms as a function of their biomass as well as ambient temperature and pO2. The main crustacean migrants were euphausiids (mainly E. mucronata) on offshore stations and the commercially exploited squat lobster Pleuroncodes monodon on the upper shelf, where it undertakes migration to the seafloor during the day (which leads to biomass underestimation during pelagic surveys). Correction for metabolic suppression results in a substantial reduction of e.g. ammonium release within the OMZ core. We argue that nighttime aggregations of euphausiids near the upper oxycline likely play a more important role (both in terms of oxygen consumption and providing NH4 for anammox) and explore the ecological niche boundary conditions of euphausiids using high-resolution profiles obtained with an Underwater Vision Profiler (UVP5).

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