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Mesozooplankton distribution, especially copepods, according to water masses dynamics in the upper layer of the Southwestern Atlantic shelf (26°S to 29°S)

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Abstract
Zooplankton in shelf waters is dominated by a highly diverse assemblage of copepods, followed by a variety of organisms sorted according to the environmental conditions. Epipelagic copepod, chaetognath and cladoceran species assemblages in the upper 100 m layer, together with mesozooplankton major groups were characterized in relation to dynamics of the water masses in the subtropical domain of the Brazilian shelf. Water samples for nutrients and chlorophyll, measurements of temperature, salinity and fluorescence (Rosette/CTD) and zooplankton samples were collected in four transects (26°S to 29°S), ~250 km long, across the shelf, during early summer. Intrusions of the cold South Atlantic Central Water (~15 m) was evidenced by the large abundance (> 3000 ind.m^{-3}) of the small copepod *Oncaea venusta*, highlighting the role of small omnivorous copepods in the coastal upwelling at ~26°S. Low-salinity waters (< 34.5 S) were observed up to 120 km off the bay area at ~29°S, together with a high abundance of *Temora turbinata*. At the slope, the dominance of the Tropical Water increased the prevalence of *Clausocalanus furcatus*. The chaetognath *Flaccisagitta enflata* and the cladoceran *Penilia avirostris* in the inner shelf and the cladoceran *Evadne spinifera* in the outer shelf were also dominant species in the area. Zooplankton assemblages were related to different oceanographic scenarios, associated with coastal upwelling, coastal and estuarine plumes, shelf and slope areas. These assemblages were mainly comprised of epipelagic and tropical species; however, the recurrent presence of copepod, cladoceran and chaetognath cold-water species reinforced the transitional character of the area. In addition, there was a clear cross-shelf gradient, with an increasing contribution of large copepods, siphonophores, salps and euphausiids toward the ocean. The characteristic tropical species assemblages emphasise the dominant role of small metazoans in the pelagic food webs driven by the dynamics of the water masses. The species assemblages also established the species distribution baseline in the subtropical Brazilian shelf.
Keywords: *mesozooplankton; small copepods; chaetognaths; cladocerans; coastal processes; water masses; transitional zone*

1. Introduction

Coastal environments and water mass interactions may create important subregions of intense biological responses at several trophic levels, from plankton to nekton (Schettini et al., 1998; Acha et al., 2004). The properties of water masses are widely used around the world to evaluate ecological processes that control primary and secondary production and define distinct zones of the epipelagic ecosystem (Boltovskoy, 1999; Longhurst, 2007; Acha et al., 2015). For instance, zooplankton species richness increased according to water mass interactions in the Mediterranean Sea (Brugnano et al., 2010), the intensity of El Niño effects was defined by different water mass indicator species (Cruz et al., 2011) and water masses structured biogeographic patterns of zooplankton communities and copepod biodiversity in the China Sea (Chen and Liu, 2015).

At the extreme south of the Brazilian 8000-km-long shelf, different water masses coexist in the water column associated with different oceanographic processes that act on plankton communities, such as the proximity of Subtropical Convergence, the brackish water