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Mapping zooplankton size spectra over large ocean regions

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Zooplankton are the link in the oceans between the primary producers (phytoplankton) and fish, but there is relatively little knowledge of how zooplankton biomass and size is driven by oceanographic processes. Oceanographic features such as currents, eddies and fronts influence a range of biological processes in the ocean, including abundance, size and biomass of organisms, at different spatial and temporal scales. Over the past 10 years we have collected 2,500 km (20,000,000 m^3 sampled) of in-situ towed measurements of zooplankton size-spectra from a range of water-masses off SE Australia – the East Australian Current (EAC), continental shelf, cyclonic and anti-cyclonic eddies, upwelling regions and fronts. Using generalised linear models (GLM) we investigate oceanographic drivers of size-spectra using coincident measurements of physical (depth, temperature, salinity, oxygen) and biological (phytoplankton, larval fish) parameters. For example, a higher zooplankton biomass and a flatter slope of the normalised biomass size-spectra (NBSS) are negatively correlated with temperature and positively correlated with fluorescence across all locations. Here we use these relationships to map zooplankton size spectra along the east coast of Australia using satellite and oceanographic model outputs. By understanding the link between zooplankton size-structure and readily measured environmental variables such as temperature and depth, we improve our ability to manage marine ecosystems from phytoplankton right through to fisheries.

Keywords: Zooplankton; Upwelling; Eddies; Temperature; Normalised Biomass Size Spectra

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