In situ observations of a doliolid bloom in a warm water filament using a video plankton recorder: bloom development, fate, and effect on biogeochemical cycles and planktonic food webs

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We investigated distribution patterns of a doliolid (*Dolioletta gegenbauri*) bloom in relation to the physical environment by using a video plankton recorder in the Oyashio-Kuroshio mixed water region. Using 12 km transects, doliolid blooms were encountered at a horizontal scale of ca. 2-3 km, which corresponds to sub-mesoscale physical events. Doliolids were also consistently encountered in the subsurface layer above the pycnocline in warmer (>14ºC) and higher-salinity (>34) water masses, and seawater density was the most critical factor affecting distribution depth. Compared to previous studies, the density and biomass of the blooms observed in this study (77 mgC m-3 and 4600 inds m-3) were highest in the open ocean. Bloom formation consisted of two phases; first, the seeding population of a nurse stage increased rapidly to 2000 inds m-3 by asexual reproduction, followed by asexual production of phorozooids. Estimated population clearance rates revealed that these dense patches could potentially sweep the surrounding water within 2-3 days. The incidence of exhausted and shrunken zooids was significantly correlated with patch density, suggesting that mortality was due to overgrazing. Shrunken doliolids appeared to sink below the pycnocline, corresponding to 8-17% of the particulate organic carbon flux at 150 m. Hydromedusae, pelagic polycheates, and sapphirinid copepods preyed on the doliolids. These results indicate that doliolids, which were seeded by populations originating from the Kuroshio, formed dense blooms in response to sub-mesoscale physical events and would alter the sinking particle properties (i.e. biological pump) and the epipelagic food web structure through their grazing and mortality.

Keywords: Doliolids, Gelatinous zooplankton, Patchiness, Biogeochemistry, Food web

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