BENTHIC-PELAGIC COUPLING ON THE ANTARCTIC CONTINENTAL SHELF: IMPACTS OF SEASONAL PHYTODETRITUS DEPOSITION ON THE BENTHIC COMMUNITY

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ABSTRACT

The West Antarctic Peninsula (WAP) shelf experiences highly seasonal fluxes of particulate organic carbon following the retreat of winter sea-ice, resulting in deposition of labile food for benthic detritivores (i.e., "benthic-pelagic coupling"). A time-series study (Nov 99 - Mar 01) was conducted to determine timing and magnitude of bloom deposition to the WAP shelf, and consequences for benthic ecology. Impacts on microbial biomass, persistence of labile organic material in sediments, and effects of pulsed food inputs on benthos are discussed. Despite substantial temporal changes in particle flux, labile compounds (chloropigments, bioavailable amino acids) in near-surface sediments varied modestly, with evidence of elevated flux limited to the top 3 cm. Despite high sediment inventories of labile organic matter and microbial biomass, organic matter remineralization balanced sinking particle flux, and rates were comparable to temperate shelves. High substrate concentrations required for microbial mineralization of organic matter at low temperatures may promote the existence of a "food bank" of labile material for benthic detritivores in WAP shelf sediments. Stable isotopes in benthos and potential food sources were used to examine sources and sinks of particulate organic material reaching the sediments, and to establish trophic linkages among the most abundant benthic megafauna. The broad (>14‰) range in $\delta^{13}C$ values of surface plankton was narrowed considerably in sediments, where little seasonal or interannual variability in isotopic signature was observed. Bloom-derived detritus appears to be the primary source of organic material supplied to benthic detritivores; however, seasonal variability in the supply of this material is not mirrored in the sediments, and only to a

minor degree in the benthic fauna. This pattern suggests substantial inertia in benthic-pelagic coupling, whereby the sediment ecosystem integrates long-term variability in water column productivity. The dominant pattern of recruitment observed was one of essentially continuous recruitment, with localized peaks (in space and time) observed in some taxa. This pattern is consistent with the presence of a "food bank" for detritivores, such that recruitment is not limited by the presence of a seasonally available food source. Post-settlement controls may also be important influences determining localized recruitment peaks in particular seasons or locations.