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Estimating Active Carbon Flux Using the Biomass Size Spectra

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Macrozooplankton and micronekton (MM, size range 20-200 mm) play a critical role in global carbon cycling, through active transport of carbon between surface and deep waters during their diel vertical migrations. Carbon transport is mediated via respiration, feeding, excretion and mortality of migrating organisms. Because marine ecological processes are strongly size dependent, it was proposed that patterns of active carbon transport via vertical migrations are correlated to body size and hence can be measured from a normalized biomass spectra. Sampling was carried out onboard the *RV Oscar Elton Sette* during October 2004 along the southwest coast of Oahu Island using three micronekton gears (Cobb trawl, Isaacs-Kidd Midwater trawl, Hokkaido University Frame Trawl) and an acoustic echosounder (hull-mounted, dual-frequency, split-beam Simrad EK60), during both day and night in the epipelagic (0 – 120 m) and mesopelagic (550 – 650 m) layers. For inter-comparison purposes, biomass size spectra were obtained both by measuring all individuals, and by running samples through a laser optical plankton counter lab bench unit. According to the Cobb trawl, on average ~74% of the total MM catch in carbon equivalent were undergoing diel vertical migrations. The main contributors in terms of biomass to active carbon transport were myctophids (45%) and decapods (30%). This study confirmed that vertically migrating MM play a significant role in active carbon flux contributing substantially to downward carbon export. The biomass spectrum inferred that this contribution is largely size dependent, and will provide a promising new tool for assessing active carbon transport.

Keywords: macroplankton, micronekton, diel vertical migration, active carbon transport, biomass spectra

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