Transformation and fate of microphytobenthos carbon in subtropical shallow subtidal sands: A ^{13}C-labeling study

Joanne M. Oakes, Bradley D. Eyre and Jack J. Middelburg

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ABSTRACT: Microphytobenthos (MPB) in photic sediments are highly productive but the fate of this production remains uncertain. Over 33 d, tracing of ^{13}C from added bicarbonate in subtropical shallow subtidal sand showed rapid transfer of MPB-derived carbon to deeper sediment; below 2 cm (31% within 60 h) and 5 cm (18%). Despite their high turnover (5.5 d) and only representing ~ 8% of sediment organic carbon, MPB represented up to 35% of the ^{13}C retained in sediments, demonstrating substantial carbon recycling. Carbon was rapidly transferred to heterotrophs, but their contribution to sediment ^{13}C was similar to their biomass contribution (< 0.1% to 3.8%), with the exception of the foraminifera *Cellanthus craticulatus*, which accounted for up to 33% of the ^{13}C within sediment. There was little loss of MPB-derived carbon via dissolved organic carbon (DOC) effluxes (3%) or resuspension (minimal). Respiration was the major loss pathway (63%), reflecting the high microbial biomass typical of lower latitudes. Given that MPB take up dissolved inorganic carbon (DIC) from overlying water, and the carbon they fix is released as DIC, MPB in subtropical sands are unlikely to substantially alter the form of carbon transported offshore (i.e., there is no conversion to DOC), but processing within the sediment may alter its δ^{13}C value. Given that 31% of fixed carbon remained in sediments after 33 d, subtropical sands may act as a carbon sink, thereby affecting the quantity of carbon transported offshore.