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Carbon sources driving benthic mineralization in coastal ecosystems: insights from stable isotope analysis of bacterial markers

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Coastal ecosystems are typically highly productive, and receive organic matter from a variety of sources – both local and imported from outside the ecosystem boundaries. Mineralization represents a major fate of the total carbon inputs in such systems, but it is not always clear which sources of carbon fuel bacterial communities, and the latter is an important question in our understanding of the transformations which different carbon inputs undergo in the coastal zone. Here, we have compiled $\sim$350 data on δ^{13}C of bacterial PLFA (the phospholipid fatty acids i+a15:0) along with δ^{13}C data on sediment organic matter ($\delta^{13}C_{TOC}$) and macrophyte biomass from a variety of coastal systems, including mangroves, salt marshes (both C3 and C4-dominated sites), seagrass beds, and macroalgae-based systems, in an attempt to look for general patterns in the origin of carbon sources for sedimentary bacteria, and their relation to the origin of C in the sediment organic C pool. $\delta^{13}C_{i+a15:0}$ show a large variability over the entire range of $\delta^{13}C_{TOC}$ data, but generally follow the trend of $\delta^{13}C_{TOC}$, indicating that in most settings, bacteria largely assimilate the available TOC pool rather unselectively, and hence depend on C from various sources. Secondly, systems for which isotope signatures indicate that local macrophyte production is the major supplier of C for in situ decomposition are generally organic carbon-rich sites (TOC $>$ 10 %), but these are likely to make up only a small part of the global areas of salt marsh and mangrove systems. Thirdly, a large number of the data are from sediments with a low organic carbon content ($<$1% TOC), and here we found that bacterial communities show a clear selectivity for ^{13}C-enriched carbon sources (most likely microphytobenthos).