



Variability and control of carbon consumption, export, and accumulation in marine communities

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ABSTRACT: Elucidating the extent and controls of the routes followed by primary production in marine communities (i.e., consumption by herbivores, decomposition, transportation of plant material beyond the community boundaries—referred to as export—or accumulation as biomass or detritus) is essential to understand how much and why they differ in their capacity to fuel secondary production, both within or out of the community, and in their role as sinks in the oceanic carbon budget. Here, using an extensive compilation of published reports, I compare the magnitude of these routes across and within a wide range of community types, including oceanic and coastal phytoplanktonic communities, benthic microalgal communities, coral reef algal beds, macroalgal beds, seagrass meadows, marshes, and mangroves. Furthermore, I examine whether the variability in the magnitude of these routes among and within types is associated with that in the magnitude of primary production. In general, different community types showed similar levels of consumption by herbivores and export, in spite of substantial within-type variability. On the contrary, substantial differences in detritus decomposition and accumulation were found among types: coral reef algal beds and benthic microalgal communities tended to show the highest and lowest levels of decomposition, respectively, whereas marshes and oceanic phytoplanktonic communities tended to show the largest and smallest levels of detritus accumulation. The results also identify primary production as a robust (i.e., applicable to a wide range of environmental conditions and communities) control of the variability in herbivory and decomposition among marine communities. The role of primary production as a control of export and detritus accumulation is generally minor and only restricted to coastal phytoplanktonic and benthic microalgal communities, for export, and marshes and mangroves for detritus accumulation.

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