Evaluating the influence of macrophytes on algal and bacterial production in multiple habitats of a freshwater wetland

Stanley, Emily H., Mark D. Johnson, Amelia K. Ward

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ABSTRACT: Algal ^{14}C uptake and bacterial ^{3}H leucine incorporation were measured over 20 months to assess the influence of macrophytes on the spatial distribution and magnitude of microbial production and the relative importance of algae versus macrophytes to whole-system energy flow in a southeastern U.S. wetland. Algal and bacterial production were determined for water column and plant-, sediment-, and wood-surface microhabitats in four zones defined by aquatic vascular plant composition: no macrophyte, floating leaved (<*Nymphaea odorata*), heterophyllous (*Proserpinaca palustris*), or emergent macrophyte (*Juncus effusus*) zones. We combined production data with detailed habitat measurements to estimate production at meter-squared and whole-wetland scales and compared microbial C fixation to concurrently determined rates of macrophyte production. Production on plant surfaces was significantly lower than on wood and benthic sediments in all zones. At a meter-squared scale, 79% of algal production and 74% of bacterial production occurred on sediments, with epiphytes contributing ,6% to both algal and bacterial rates. With the exception of phytoplankton in the *Nymphaea* zone and bacteria on *Juncus* zone sediments, production in the water column or on plant or sediment surfaces did not significantly differ among macrophyte zones. Thus, plant type did not affect the spatial distribution of microbial activity except in the *Juncus* marsh, where the limited area and volume of water per square meter reduced production at larger spatial scales. However, the magnitude of bacterial production was influenced by macrophytes, as bacterial carbon demand greatly exceeded the amount supplied by algal production. At the whole-ecosystem scale, macrophytes overwhelmed algal production, which accounted for only 4-10% of total wetland C fixation.