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Pelagic *Sargassum* community metabolism: Carbon and nitrogen ☆

Roger B. Hanson[2]

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Abstract

The production, nitrogen fixation, and release rates and fate of dissolved organic matter of a pelagic *Sargassum* community have been investigated at eight stations in the Gulf Stream and the Sargasso Sea. Net production and gross nitrogen fixation rates of *Sargassum* and epiphytes varied significantly between stations, 328 ± 114μg C (g dry wt)$^{-1}h^{-1}$ and 18 ± 7.4μg N g$^{-1}h^{-1}$, respectively. The net release rates of dissolved organic carbon (287 ± 150μg DOC g$^{-1}h^{-1}$) also showed the same variability between stations. On the other hand, the community carbon and nitrogen content, 268 ± 4.8 and 16.9 ± 2.4 mg g dry wt^{-1}, respectively, remained constant at all stations. The results of chemical measurements indicate that ≈ 0–50 % of the gross production was lost as a result of photosynthate release. From ^{14}C-tracer experiments it was found that the planktonic and epiphytic heterotrophs mineralized 50–70 % of the photosynthate released by *Sargassum* and epiphytic algae. Based on the community gross production and fixation rates, carbon and nitrogen content, the amount of nitrogen required for the observed production rates, the *Sargassum* community appears to obtain a substantial part (40%) of its nitrogen from nitrogen fixation.

☆ Contribution No. 341 from the University of Georgia Marine Institute, Sapelo Island, Georgia, U.S.A.

2 Present address: Skidaway Institute of Oceanography, Savannah, Georgia, U.S.A.

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Aspects of nitrogen fixation in Sargassum communities off the coast of Florida
Journal of Experimental Marine Biology and Ecology, Volume 102, Issues 2–3, 28 November 1986, Pages 99–119
Original Research Article

Abstract

The magnitude and character of nitrogen fixation in Sargassum communities was studied for three different species, S. fluitans Borgesen, S. natans J. Meyen and S. filipendula C. Agardh. Nitrogen fixation activity was measured using the acetylene reduction technique. The character of epiphytic populations on the surface of Sargassum was investigated by scanning electron microscopy. All three species of Sargassum exhibited the potential for high levels of acetylene reduction. Mean rates of up to 7.1 μmol C2H4 produced·g−1 (Sargassum dry wt.)·h−1 were observed at one location. Nitrogen fixation activity was strongly light dependent. Saturation light intensity for nitrogen fixation was low, i.e. < 100 μE·m−2·s−1, and no photoinhibition was observed under full sunlight intensity (i.e. photon flux of ≈ 2000 μE·m−2·s−1). Results indicated that cyanobacteria were responsible for nitrogen fixation. Both Calothrix and LPP type cyanobacteria were commonly represented on the surface of the Sargassum. Activity associated with the benthic species S. filipendula exhibited significant seasonal variability. Nitrogen fixation activity in pelagic samples was variable but high throughout the year. The contribution of nitrogen fixation to the nitrogen budget of Sargassum communities appears to be particularly pronounced in the pelagic environment.

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