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TITLE: Potential contribution of surface-dwelling Sargassum algae to deep-sea ecosystems in the southern North Atlantic

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ABSTRACT:

Deep-sea ecosystems, limited by their inability to use primary production as a source of carbon, rely on other sources to maintain life. Sedimentation of organic carbon into the deep sea has been previously studied, however, the high biomass of sedimented Sargassum algae discovered during the VEMA Transit expedition in 2014/2015 to the southern North Atlantic, and its potential as a regular carbon input, has been an underestimated phenomenon. To determine the potential for this carbon flux, a literature survey of previous studies that estimated the abundance of surface water Sargassum was conducted. We compared these estimates with quantitative analyses of sedimented Sargassum appearing on photos taken with an autonomous underwater vehicle (AUV) directly above the abyssal sediment during the expedition. Organismal communities associated to Sargassum fluitans from surface waters were investigated and Sargassum samples collected from surface waters and the deep sea were biochemically analyzed (fatty acids, stable isotopes, C:N ratios) to determine degradation potential and the trophic significance within deep-sea communities. The estimated Sargassum biomass (fresh weight) in the deep sea (0.07?3.75 g/m2) was several times higher than that estimated from surface waters in the North Atlantic (0.024?0.84 g/m2). Biochemical analysis showed degradation of Sargassum occurring during sedimentation or in the deep sea, however, fatty acid and stable isotope analysis did not indicate direct trophic interactions between the algae and benthic organisms. Thus, it is assumed that components of the deep-sea microbial food web form an important link between the macroalgae and larger benthic organisms. Evaluation of the epifauna showed a diverse nano- micro-, meio, and macrofauna on surface Sargassum and maybe transported across the Atlantic, but we had no evidence for a vertical exchange of fauna components. The large-scale sedimentation of Sargassum forms an important trophic link between surface and benthic production and has to be further considered in the future as a regular carbon input to the deep-sea floor in the North Atlantic.

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