

Effect of light availability on dissolved organic carbon release by Caribbean reef algae and corals

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Abstract

Dissolved organic carbon (DOC) release of three algal and two coral species was determined at three light intensities (0, 30–80, and 200–400 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$) in ex situ incubations to quantify the effect of light availability on DOC release by reef primary producers. DOC release of three additional algal species was quantified at the highest light intensity only to infer inter-specific differences in DOC release. For species tested at different light intensities, highest net release of DOC occurred under full light (200–400 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$). DOC released by benthic algae under full light differed (up to 16-fold) among species, whereas DOC release by scleractinian corals was minimal (*Orbicella annularis* Ellis and Solander, 1786) or net uptake occurred (*Madracis mirabilis* Duchassaing and Michelotti, 1860) independent of light availability. DOC concentrations and light intensities were also measured in situ near seven benthic primary producers, sediment, and in the water column at nine sites evenly distributed along the leeward coast of Curaçao. In situ DOC concentrations increased with light availability, although the magnitude of this positive effect differed among species and bottom types tested. In situ DOC concentrations were on average lower in November–December [87 (SD 45) $\mu\text{mol L}^{-1}$] compared to May–June [186 (SD 136) $\mu\text{mol L}^{-1}$], which can, at least partly, be explained by the lower light availability in the latter period. Our results suggest that DOC release by Caribbean benthic primary producers varies considerably among species and depends on light availability in reef algae.