

Natural Diet of Coral-Excavating Sponges Consists Mainly of Dissolved Organic Carbon (DOC)

Benjamin Mueller^{1,2,3*}, Jasper M. de Goeij^{2,4}, Mark J. A. Vermeij^{2,5}, Yannick Mulders³, Esther van der Ent³, Marta Ribes⁶, Fleur C. van Duyl^{1,2}

1 Department of Biological Oceanography, Royal Netherlands Institute for Sea Research, Den Hoorn, The Netherlands, 2 CARMABI, Willemstad, Curacao, 3 Department of Earth Sciences, Utrecht University, Utrecht, The Netherlands, 4 Department of Aquatic Ecology and Ecotoxicology, University of Amsterdam, Amsterdam, The Netherlands, 5 Department of Aquatic Microbiology, University of Amsterdam, Amsterdam, The Netherlands, 6 Departament de Biologia Marina i Oceanografia, Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain

Abstract

Coral-excavating sponges are the most important bioeroders on Caribbean reefs and increase in abundance throughout the region. This increase is commonly attributed to a concomitant increase in food availability due to eutrophication and pollution. We therefore investigated the uptake of organic matter by the two coral-excavating sponges *Siphonodictyon sp.* and *Cliona delitrix* and tested whether they are capable of consuming dissolved organic carbon (DOC) as part of their diet. A device for simultaneous sampling of water inhaled and exhaled by the sponges was used to directly measure the removal of DOC and bacteria in situ. During a single passage through their filtration system 14% and 13% respectively of the total organic carbon (TOC) in the inhaled water was removed by the sponges. 82% (*Siphonodictyon sp.*; mean±SD; 13617 mmol L⁻¹) and 76% (*C. delitrix*; 10612 mmol L⁻¹) of the carbon removed was taken up in form of DOC, whereas the remainder was taken up in the form of particulate organic carbon (POC; bacteria and phytoplankton) despite high bacteria retention efficiency (72615% and 87610%). *Siphonodictyon sp.* and *C. delitrix* removed DOC at a rate of 4616773 and 3546562 mmol C h⁻¹ respectively. Bacteria removal was 1.860.961010 and 1.760.661010 cells h⁻¹, which equals a carbon uptake of 46.0621.2 and 42.5614.0 mmol C h⁻¹ respectively. Therefore, DOC represents 83 and 81% of the TOC taken up by *Siphonodictyon sp.* and *C. delitrix* per hour. These findings suggest that similar to various reef sponges coral-excavating sponges also mainly rely on DOC to meet their carbon demand. We hypothesize that excavating sponges may also benefit from an increasing production of more labile algal-derived DOC (as compared to coral-derived DOC) on reefs as a result of the ongoing coral-algal phase shift.

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