

Production and decomposition of dissolved organic matter in Shiraho coral reef (Ishigaki Island, Japan)

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Coral reefs display a high gross primary productivity, though they are surrounded by oligotrophic seawater. This paradox has been explained by efficient nutrient recycling in the reef ecosystem: newly produced organic matter is decomposed into CO₂ in the system, and regenerated nutrients are again rapidly incorporated by primary producers. However, none of the studies has confirmed the degradability of organic matter produced in coral reef waters. In this study, bacterial decomposition of dissolved organic matter (DOM) has been investigated in a long-term to reveal what % of DOM is mineralized and contrarily, what % remains as organic matter. The obtained data would show net production of organic matter, which could be exported from the reef lagoon to the outer ocean.

In Aug 2008, sample seawater was collected at Shiraho coral reef in Ishigaki Island, Japan. The collected seawater was immediately filtered with Whatman GF/F filters (pore size: 0.7 micrometer) to remove particulate organic matter, and the filtrate was put under dark over 3 months to observe bacterial decomposition of DOM. Control seawater was collected out of Shiraho reef, which mainly consisted of oceanic seawater, and was treated in the same way.

DOM newly produced in the coral reef was gradually mineralized by bacteria during the first one month, but then the decrease rate in concentration declined, though the produced organic matter still remained more than control seawater. Consequently, 36% and 60% of the initial DOC and DON, respectively, were not decomposed by bacteria over 3 months. This suggests that N is not completely recycled in Shiraho reef but lost from the reef lagoon. C:N ratio of the mineralized DOM was 14 on average, which was significantly higher than that of remaining refractory organic matter (5.3). It should be determined in the future what the major source of the DOM is.