Biodegradability of organic matter released from a zooxanthellate coral

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Fates of photosynthetic products in coral reefs are important processes to evaluate carbon (C) cycling and CO_2 fixation in the reef. From in situ observations of seawater parameters such as dissolved inorganic C (DIC) and dissolved oxygen, it has been suggested that some of the organic products are exported to the outer reef. However, there have been few reports which directly followed a decomposition process of the photosynthetic products. In this study, biological availability of organic matter released from a zooxanthellate coral, which is one of the major primary producers in coral reefs, was investigated by a long term incubation experiment under a laboratory condition.

In Aug. 2003 and 2004, coral branches of *Porites cylindrica* were collected at Shiraho Reef in Ishigaki Island, and incubated in seawater containing ^{13}C-labelled DIC ($NaH^{13}CO_3$ addition) for 4 days. During this incubation, ^{13}C-labelled organic matter was synthesized by the zooxanthellae and subsequently released from the coral colony, and gradually accumulated in the seawater. After removal of the coral, the seawater was put under a dark condition to decompose the newly synthesized dissolved and particulate organic matter (DOM_{new} and POM_{new}). In 2004, the seawater was filtered with a GF/F filter before the decomposition experiment in order to focus on DOM.

Concentration of both DOC_{new} and POC_{new} dramatically decreased within the first 1 month. In particular, more than 95% of POC_{new} disappeared due to mineralization and/or fractionalization to DOM. DOC_{new} concentration decreased to ca. 50% of the initial during this period, but did not change significantly any more. On average, 35% of DOC_{new} still remained after 6 months. These results suggest that significant parts of DOC released from the coral colony are recalcitrant to biological availability and not mineralized to CO_2. In terms of net CO_2 fixation in coral reefs, it could be necessary to take into account of these DOM.