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Author(s)	Tsuchiya, Makoto
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Session 1: Biodiversity in ecophysiological scales

Diversity of landscapes and biogeochemical cycles in coral reefs

Makoto Tsuchiya

Faculty of Science, University of the Ryukyus

Within a coral reef ecosystem, various microenvironments or biological communities construct a variety of landscapes -- each showing distinct functions in the biogeochemical cycle and food web. The function might be affected by the differences in feeding behavior of the dominant species or by geographic characters.

Sandy beaches developing in the landward area of coral reefs play an important role as purification systems and in improving the water quality. At high tide, water containing particulate organic material or nutrients percolates through the sand. There, filtration of sand particles and bacterial activity occurs, so that clear filtered water seeps into the coral reef at low tide, together with inorganic materials.

Animal feeding behavior provides important information on the cycling of organic materials in ecosystems. In a coral reef of ca. 15 ha, 11,500 individuals (0.08 inds./m²) of the deposit feeding sea cucumber *Holothrulia leucospilota* were counted and the amount of sediment consumed by this population was estimated to be 92 kg/day or 33.6 tons/yr. During this feeding process, an estimated 272.4 kg of carbon and 31.3 kg of nitrogen were removed from the sediment surface over the year, thus helping to maintain a beautiful and a healthy coral reef environment. This is true for all animals, i.e. both deposit and filter feeders respectively work to purify the bottom environment and water column.

Fatty acids as biochemical markers of trophic relationships among species and as indicators of sources and sinks of organic matter are useful tools in analyzing the food web interactions within an ecosystem. For example, significant differences in fatty acid composition were recognized between healthy and bleached corals *Pavona frondifera* due to the loss of zooxanthellae. Similar phenomena were also found even in closely related species or two filter feeding bivalves living in the same habitat.

Characteristics of the function of each micro landscape in coral reef from the viewpoints of biogeochemical cycle will be discussed.