OIST Marine Genomics Seminar Ser 25th

New Approach for chemical -biological characteristics of micro -and sub- scales ecosystem in coral and coral reef.

Speaker: Dr. Yoshimi Suzuki

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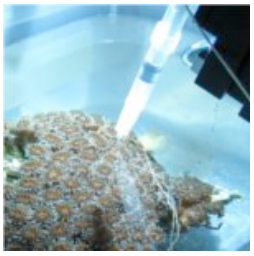

14th Mar. 2013, 16:00 – 17:00 pm
Bldg. 1. Level-C
Meeting Room 1 (C016)

Limitations of our understanding of the processes in the coral ecosystems due to the large scale approach generally used are shown through examples. Micro scale approaches were used to re-evaluate primary production and to understand how corals meet their nutriments requirements. The first one was done by integrating the production of micro ecosystems within the reefs. The second focused on the importance of the polyp gastric cavity for coral health. These different examples show the need to re consider the methodology used in the study of marine ecosystems. Micro scale approaches seems the most suitable for complex ecosystems and should therefore be considered.

Ecosystems are generally described at a large scale from meter to kilometer and processes in marine ecosystems are assessed through measurement of the variation in the chemistry of seawater. However this approach has strong limitations. Here we show through examples in coral and coral reefs studies, the importance to consider micro scale studies to better understand how the production in this ecosystem and how it is sustained.

Primary production and other processes of marine ecosystems are traditionally measured by following variations in chemistry: dissolved oxygen, CO_2, pH, Etc. in the water column. This approach shows its limitations in the case of coral reefs where different micro environments within the benthic components exist, each of them being more or less linked to the water column. A multi micro environment approach integrating the different ecosystems is therefore required for the evaluation of the reef primary production and element cycles. Furthermore this micro-environment approach lead to new insights on how coral reefs are able to thrive despite growing in waters depleted in essential nutrients including nitrogen and phosphorus.

Coral, sand, cyanobacteria mats, water and gravel primary production and nitrogen fixation were independently measured. The integrated primary productions of these micro ecosystems was found to be 527.8 µgC $cm^{-2}.day^{-1}$ which is 2.7 times the primary production as measured by traditional methods. This high productivity was largely sustained by high rates of nitrogen fixation and a fast a recycling of the large pool of organic nitrogen available. The study of the internal micro environment within the coral organism also contributed to understand how corals maintain a high production. Direct measurement of the chemistry within the coral polyp gastric cavity (Fig.) showed pH as low as 6.8 and oxygen levels close to anaerobic conditions. We concluded that the gastric cavity forms a semi closed micro environments within the coral itself. Further studies using micro manipulation techniques showed that concentrations of nutrients and vitamin B_{12} in the cavity were 26 to 500 times higher than in surrounding water. These results emphasis the importance of the processes occurring in micro-environments within the organism for the maintenance of the productivity and health of corals. These studies suggest that it is time to revisit the dogma of oligotrophic waters as settings for coral reefs notably through considering the different micro ecosystems

All Welcome

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