Microbial Control of Oceanic Carbon Cycle and Implications for Ecosystem Response to Human-Induced Stresses

Prof. Farooq Azam
Professor, Scripps Institution of Oceanography, UCSD
fazam@ucsd.edu 858-534-6850

Dr. Alexandra Worden
Postgraduate Researcher, Scripps Institution of Oceanography, UCSD
aworden@ucsd.edu 858-534-6850

Abstract: Our understanding of marine ecosystems is still largely descriptive and with little power to predict ecosystem response to future stresses. Past anthropogenic stresses, e.g. over-fishing and pollution, have had devastating effects, and future stresses (e.g. global warming, emerging pathogens, ocean fertilization and coastal eutrophication) may even more profoundly impact marine ecosystems. Do we have the necessary depth of understanding of marine ecosystems to formulate effective policy? The discoveries of major roles of highly diverse microbes in the ocean, which I will recount to set the stage, have further compounded the challenge. How should we integrate microbial processes into functional and predictive ecosystem models? The current emphasis on large-space-scale description and exploration needs to be enriched with mechanistic and functional studies of interactions at the biochemical and molecular level. While recognizing that microbes significantly structure the marine ecosystem at the microscale, the new challenge is to discover a way to integrate microbial influences across spatial scales, from micrometer to the ocean-basin scale. Toward this goal, I will discuss the ecosystem roles of heterotrophic bacteria to illustrate the utility of conceptualizing marine ecosystems as biochemical networks. This integrative approach may serve as a basis for predicting how marine ecosystem may respond to future stresses.

0-933957-31-9