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Effect of climate and environmental changes on plankton biodiversity and bigeochemical cycles of the Dongsha (Pratas) Atoll, South China Sea

Wen-tseng Lo (1), Pei-Kai Hsu (2), Jia-Jang Hunag (3), and Yu-Huai Wang (4)

(1) Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung, Taiwan (lowen@faculty.nsysu.edu.tw), (2) Department of Marine Biotechnology and Resources, National Sun Yat-sen University, Kaohsiung, Taiwan, (3) Institute of Marine Geology and Chemistry, National Sun Yat-sen University, Kaohsiung, Taiwan, (4) Institute of Applied Marine Physics and Undersea Technology, National Sun Yat-sen University, Kaohsiung, Taiwan

Dongsha (Pratas) Atoll, the so called “Pearl Crown of South China Sea”, is a well-developed atoll with a total area of 80000 hectares. It possesses various ecosystems and has very high biodiversity, but it is very sensitive to climate change and physical processes. According to our investigation within the shallow semi-enclosed atoll in April, July, and October, 2011 (i.e. spring, summer, and autumn, respectively), we found that plankton assemblages and hydrographical conditions exhibited clear seasonal and spatial variations. Colder and higher salinity water was observed in April, while warmer water in July and lower salinity water in October, respectively. Nutrient concentration within the atoll was similar to that of the oligotrophic South China Sea waters and seemed to be in nitrogen-limit situation, while the distribution pattern of DOC and POC was mainly attributed to Chla and imported detritus matters. Carbon deposition flux also showed significant seasonal changes, but POC/PN value was near Redfield ratio, implying mostly due to biogenic factors; however it could still be classified as a typical coral ecosystem, since $CaCO_3$ sinking flux generally was 30 times higher than that of organic matter. Plankton biodiversity was quite high in the atoll, and preformed apparent seasonal succession; in total, 82 phytoplankton species and 67 copepod species were recorded; furthermore, crab zoea (17.3% of the total zooplankton by number), fish eggs (12.5%), and shrimp larvae (4.2%), were relatively abundant in zooplankton community, revealed that atoll might be a good hatching ground. We deduced that the seasonal patterns of chemical and biological variables were mainly influenced by monsoons and precipitation, while small scales of temporal and spatial variations could be ascribed to internal wave and tide in this study area.