ABSTRACT

CHARACTERIZATION OF THE SPATIAL VARIABILITY OF PHYTOPLANKTON COMMUNITY STRUCTURE IN TWO KEY SARDINE FISHERY AREAS IN THE PHILIPPINES USING FLOWCAM

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Knowledge of the phytoplankton composition and distribution are important as they form the base of the aquatic food web; hence, influencing the abundance of organisms at higher trophic levels such as fishes. In the Philippines, however, there is limited or even no information on phytoplankton community structure in productive fishing grounds. Examples of these are the watershed-driven Butuan Bay and the upwelling-influenced Dipolog- Sindangan Bay off the Bohol Sea - Zamboanga Peninsula region in northern Mindanao, which are major contributors to the nation's sardine fishery industry. In this thesis, FlowCAM (Flow Cytometer and Microscope) was utilized to characterize the phytoplankton community structure in these two key sardine fishery areas. The use of auto-imaging devices such as FlowCAM for rapid phytoplankton assessment is a relatively new method that has not been used in the Philippines and requires further optimization primarily to increase the resolution of its taxonomic classification output which is essentially dependent on the quality of images being generated by the instrument. Hence, the first study of this thesis aimed to develop a modified FlowCAM protocol optimized for acquiring good quality images of preserved micro-phytoplankton samples from natural environments. Another objective of the first study was to optimize FlowCAM's automatic image classification functionality by conducting accuracy tests to determine the most effective *Statistical Filter* (based on different particle property combinations) for each phytoplankton group. The optimized FlowCAM protocol was used in the second study of this thesis to characterize the phytoplankton composition and abundances in Dipolog, Sindangan Bay and Butuan Bay during the northeast monsoon (NEM) season in February 2013. Results of the principal component analysis (PCA) suggested that the three sites harbor different phytoplankton community structure, even between the two adjacent sites – Dipolog and Sindangan Bay. The large, chain-forming diatoms *Chaetoceros* and *Bacteriastrum* which are tolerant of highly turbulent environments, were the major phytoplankton groups that dominated in Butuan Bay. On the other hand, an assemblage of the diatoms *Thalassionema, Pseudo-nitzschia, Asterionellopsis,* together with *Chaetoceros,* was dominant in Dipolog similar to the assemblages observed in other major upwelling systems. Sindangan Bay seemed to provide a more suitable condition for the growth of more diverse phytoplankton groups compared to Dipolog and Butuan. Among the phytoplankton taxa that were found common only in this bay are *Meuniera membranacea*, *Planktoniella sol, Climacodium and Rhizosolenia.* The variability observed in the distribution patterns of phytoplankton between the adjacent sites Dipolog and Sindangan Bay may be attributed to the difference in the intensity of upwelling in these areas wherein Dipolog manifested stronger upwelling (as indicated by relatively lower temperatures and higher chl a concentrations) compared to Sindangan Bay (weaker upwelling as indicated by relatively higher temperatures and lower chl a values). Overall, the results of this thesis provide insights into variations in the phytoplankton assemblages and conditions leading to productive fisheries in these sites, as well as a working phytoplankton image libraries that can be utilized in future studies using FlowCAM for rapid and semi-automated phytoplankton analyses in Philippine waters.