Novel Approach to Monitor Red Tide Status and Its Application for Red Tide Prediction

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Mass mortalities of fish cage caused by red tide remain a serious problem in Japanese waters. In 2009 and 2010, red tide led severe yellows tail kill, equivalent to a so far loss of 8.7 billion JPY in the Arieke and Yatsushiro Seas. Avoiding mass killer of fish, it is need the new method of red tide happen. One of novelty approach use the pulse amplitude modulation (PAM). This study objective is PAM fluorometry development for phytoplankton survey and its testing usefulness for red tide prediction. This research was conducted in Kure Port-Hiroshima Bay in the period 11 April to 19 August 2010; Tachibana Bay and Ariake Sea on July 2012. PAM method was used to analyze maximum photo-energy yield (Fv/Fm) in dark adapted photosystem II, and the same time actual quantum yield (ᶲ II) under illumination of various light regimes to produce electron transportation rate (ETR).

As result, using the indicato Fv/Fm and ETR, Chatonella blooms were found in the sampling occasion at Tachibana Bay and Ariake Sea. Fv/Fm resulte has negative correlation with water quality and significant correlation with PO4-P and dissolved in-organic nitrogen. On other hand, ETRmax, assumed from relationship between the light regimes and each corresponding ETR, increased almost one week prior to the blooming of dinoflagellate and Heterosigma. Therefore, ETRmax would be usable for primary prediction for such phytoplankton blooms because it has advantage for the value of surface water when diatoms dominant or high at the middle or deeper water for flagellate. As recommendation, this research suggested that the vertical measurement can be used for giving a warning whether blooms of diatoms or flagellate would be forthcoming.