THE UTILIZATION OF UREA, AMMONIUM AND NITRATE BY NATURAL POPULATIONS OF MARINE PHYTOPLANKTON IN A EUTROPHIC ENVIRONMENT

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ABSTRACT

The utilization rates of urea, ammonium and nitrate have been determined for natural populations of marine phytoplankton in the South sector of Kaneohe Bay on the Island of Oahu, Hawaii. Radioactive tracer techniques, using ^{14}C-urea, were employed to determine the urea uptake rate. The uptake rates of ammonium and nitrate, in addition to urea, were monitored by time series nutrient analysis. The results have been evaluated in terms of various physico-chemical variables measured during the experimental period. The distribution of the phytoplankton biomass within the South sector appears to result from the mixing processes associated with wind stress and the tidal prism. Within the phytoplankton community, the principle spatial and temporal variation was found to occur in the 102-35μ and 35-20μ size ranges and the <20μ fraction remains relatively constant in terms of total pigment concentration and percent of total chlorophyll-a present. The C/N ratio indicates that the phytoplankton community is less nitrogen deficient than previous studies reported and, therefore, may not be nitrogen limited at the present time. Based on the relative nutrient uptake rates, the order of preference was found to be ammonium > urea > nitrate. Although all three nutrients were utilized simultaneously, there was an apparent relationship between the concentration of ammonium and the urea uptake rate. Mass balance calculations indicate that the sewage effluent and

stream run-off into the South sector contribute only 2.6% of the total mean nutrient uptake rate, but provide the primary nutrient source for maintaining the phytoplankton concentration.