P-30

Vertical distribution and seasonal changes of phytoplankton communities in the Hoe-Dong Reservoir

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1. Introduction

Phytoplankton communities in freshwater ecosystems are important as a primary producer. Study of their dynamics can be basic properties for the understanding of ecosystems. Recently, the community dynamics of phytoplankton were frequently evaluated at many large reservoirs and rivers in S. Korea (Oh et al., 1995; Kim et al., 1998; Ha et al., 1999; Kim et al., 1999; Kim et al., in press). About 18,000 reservoirs are in S. Korea, and most of them are small. These are important sources for the agricalcutural, industrial, and drinking water supply. The Hoe-Dong Reservoir, constructed in 1967, is relatively small (surface area, 2.7 km^2; water storage capacity, 18,607,000 m^3). However it supplies about 15% of total daily intake of drinking water of Pusan City. During the dry season, water from the Nakdong River was pumped to the resoirvoir. Even though several studies (Moon et al., 1995) on phytoplankton and water quality has been conducted in this reservoir, detailed limnological studies on the vertical distribution of phytoplankton and relevant physico-chemical parameters has not been documented. In this study, seasonal changes and vertical distribution of phytoplankton were investigated to provide baseline information for the comprehensive management of the reservoir.

2. Materials and Methods

Two sampling sites were selected (site 1, in front of dam; site 2, inlet) in the Hoe-Dong Reservoir from March 1999 to February 2000. Water samples were collected on monthly basis at both sites. To determine vertical distribution of phytoplankton, 3 depth were selected (1, 3, and 6 m). The phytoplankton samples were immediately preserved with Lugol's solution. Phytoplankton was enumerated using an inverted microscope (ZEISS) by the Utermöhl sedimentation method (1958). Identification of phytoplankton was achieved with classification keys of Cassie (1989), Foged (1978), and Round et al. (1990).

3. Results and Discussion

During the study period, 5 phytoplankton classess were observed (Bacillariophyceae, Cyanophyceae, Chlorophyceae, Chrysophyceae, and Dinophyceae). The phytoplankton communities exhibited seasonal changes. Bacillariophyceae dominated at both sites (site 1, 63%; site 2, 72%), and Cyanophyceae (25%; 15%) and Chlorophyceae (10%; 12%) followed. During the late summer (August-September), dominace of Cyanophyceae was observed while Bacillariophyceae occupied the phytoplnakton communities in other seasons. Cell abundance of Chrysophyceae and Dinophyceae were low during the study period. The pattern of phytoplankton succession of the Heo-Dong Reservoir was similar to that of eutrophicated systems such as the Nakdong River and Lake Soyang (Ha, 1999; Kim et al., 1999; Ha et al., in press).

Vertical distribution of phytoplankton biomass (chlorophyll *a*) ranged from 10 to 45 $\mu g\ l^{-1}$ at dam site (Fig. 1). Two peaks of biomass occurred during the middle of July and late September with 35 and 45 $\mu g\ l^{-1}$. *Microcystis* spp. blooms were mainly responsible for these peaks.

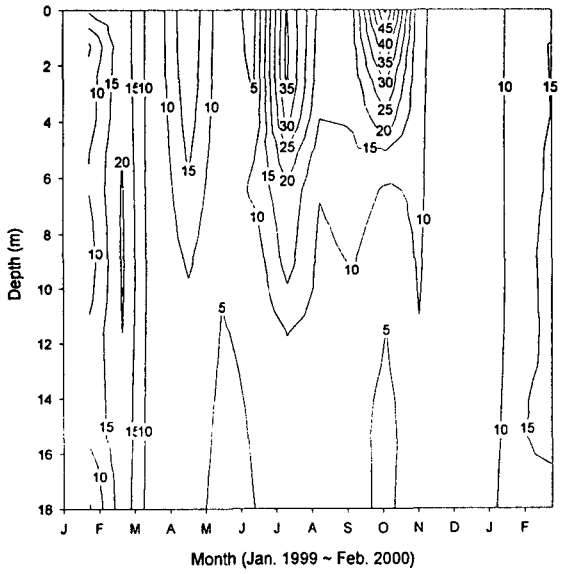

Fig. 1. Changes of chl. *a* ($\mu g\ l^{-1}$) at the dam site of the Hoe-Dong Reservoir.

All classess of phytoplankton did not show distinctive vertical distribution at both sites. The seasonal changes of diatom biomass were distinctive while differences in vertical distribution of biomass was not observed. The cell density of other groups exhibited low level along the water depth. Under the stable condition of water body, phytoplankton can be distributed in specific water depth (Oliver et al., 1985). In case of this study, frequent rainfall and corresponding short retention time during summer

caused relatively even vertical distribution of phytoplankton. Through this study it was concluded that vertical distribution was not strongly occurred except during the blue-green algal dominance

4. Abstract

In this study, we investigated vertical distribution and seasonal changes of phytophlankton community in the Hae-Dong Reservoir from March 1999 to Feburary 2000. This reservoir is relativly small (surface area, 2.7 km^2) and is the source of drinking water supply to the eastern part of Pusan City. Samples were collected at 2 sites (1, 3, and 6 m; site 1, in front of the dam; site 2, inlet). The dominant group was Bacillriophyceae at both sites (over 63%), and other groups exhibited seasonal changes (high cyanobacterial density in summer; green algal communities in winter). Chrysophyceae and Dinophyceae were maintained lower level during the study period. Along the water depth, all classess of phytoplankton did not show distintive vertical distribution at both sites except during the blue-green algal bloom in the middle of July and late September. The phytoplankton community dynamics in the Hoe-Dong Reservoir was strongly affected by the hydrological factors such as concentrated precipitation and short retention time.

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