



Changes of nutrients and phytoplankton chlorophyll-*a* in a large shallow lake, Taihu, China: an 8-year investigation

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Abstract

Inter-annual changes of total nitrogen (TN) and total phosphorus (TP) and phytoplankton chlorophyll-*a* (Chl*a*) in a large shallow lake, Taihu China, were analysed using the monthly monitoring data covering the period of 1991–1999. The concentrations of TN, TP and Chl*a* showed marked gradients in the lake from high values near the northern river input in the inner Meiliang Bay towards lower concentrations the lake centre. TN was always much greater than TP ($\gg 7:1$ by weight) indicating that nitrogen was not a limiting factor in the lake. Annual averages of TN, TP and Chl*a* increased until 1996 declining thereafter possibly because of the controlling of wastewater discharged from the catchment area by the local government. The internal nutrient loading in the lake was low because of the well-mixed condition and the low organic content of superficial sediment. Our results suggest that the recovery process in the lake might have started in 1996.

Introduction

Freshwater shallow lakes with a surface area of more than 500 km² are not abundant in the world. Such large shallow systems usually have specific characteristics influencing ecosystem structure and management (Dokulil, 2000; Kangur et al., 2003). Seven of these large shallow freshwater lakes are located in central-east China, which is one of the most densely populated regions in the world (Chang, 1987). Historically, human populations have lived close to freshwater resources in China. Population increase, rising living standards, local agriculture, and industrial development have all contributed to increased water consumption. As a consequence, water pollution and water shortage have now become major environmental problems in China (Chen et al., 1997).

Similar to many developing countries, surface waters in China are generally utilised simultaneously for several purposes, among which drinking water abstraction, sewage disposal, fisheries and tourism are the most important ones (Dokulil, 2000). Taihu is a large shallow lake that is located in the vicinity of two large cities, and serves as a good example for studying

the anthropogenic impacts on aquatic ecosystems in China.

This paper concentrates on the changes of the nutrients nitrogen and phosphorus, and phytoplankton chlorophyll-*a* in Taihu over an 8-year period. The main questions that are addressed are: (1) Are there spatial differences within the lake? (2) What is the long-term development of eutrophication by nutrient loading from the catchment area?

Methods

Site description

Taihu is located downstream of the Changjiang River, east of Shanghai between 30° 05'–32° 08' N and 119° 08'–121° 55' E (Fig. 1). It is the third largest freshwater lake in China with a surface area of 2338 km² and an average depth of about 2.0 m (Chen et al., 1997).

Meiliang Bay is one of the most eutrophied bays in the northern part of the lake. The surface area of the bay is about 100 km² and the average depth is about 1.8 m. There are two main rivers, the Liangxi