

BOTANY

Outbreak, Harm and Control of Algal Blooms in Lakes of China

By Yang Y. Liuyan and Xiao Lin. 2011. Science Press, Beijing. 281 pages. 69.00 CNY.

Fresh-water algae are found in a large range of habitats, such as ponds, lakes, reservoirs, streams and so on. They are usually a natural and essential part of the aquatic ecosystem, acting as the base of the food chain. However, algae are usually sensitive to the environmental changes and its life cycle is short. When nitrogen, phosphorus and other nutrients in a lake or a river reach a certain level, growth and reproduction of algae tend to be accelerated, and the numbers of algae might increase explosively, resulting in an algal bloom. Lakes, ponds, and slow-moving rivers are most susceptible to blooms. Algal blooms generally occur where there are high levels of nutrients, coupled with the occurrence of warm, sunny and calm conditions. Human activity often can also trigger or accelerate algal blooms. Natural sources of nutrients such as phosphorus or nitrogen compounds can be supplemented by a variety of human activities, for example, in rural areas, agricultural runoff from fields can wash fertilizers into the water; in urban areas, nutrient sources can include treated wastewaters from septic systems and sewage treatment plants, and urban stormwater runoff that carry nonpoint-source pollutants. The outbreak of algal blooms is an important indicator of pollution in fresh water body, or a visual representation of lake eutrophication, or ecological unbalance in other aspects.

Typically, only one or a small number of phytoplankton species are involved in an algal bloom. Some blooms may be recognized by discolouration of the water resulting from the high density of pigmented cells. So far there is no unanimously recognized threshold level, but algae can be considered to be blooming at concentrations of hundreds to thousands of cells per millilitre, depending on the severity. The recurrent or severe blooms can cause dissolved oxygen depletion as the large numbers of dead algae decay. In highly eutrophic lakes, algal blooms may lead to anoxia and death of fish. The odours and unattractive appearance of algal blooms can also detract from the recreational value of water bodies. Some algae produce toxic chemicals and released into water when dying and decaying, which pose a threat to fish, other aquatic organisms, wild and domestic animals, and humans.

In recent years, along with the rapid economic development in China, large amounts of industrial wastewater, urban sewage, and agricultural non-point source of nitrogen and phosphorus were discharged, and flowed with runoff into lakes, causing a rapid increase in the levels of pollutants in lakes. In the five largest freshwater lakes of China, the outbreak of algae blooms frequently happened in recent years, especially in Lake Taihu, Lake Chaohu. The newly published book *Outbreak, Harm and Control of Algal Blooms in Lakes of*

China, described the present situations of eutrophication and algal bloom of the lakes in China, and systematically elucidated the latest research results on algae growth, ecology and biogeochemical cycling of main elements in lakes of China.

The main contents included Chapter I describes Lake ecosystems and algal blooms, including lake eutrophication and algal blooms in China and the world, the biology, species and distribution of algae in lakes and the biogeochemical cycling of nutrient elements (nitrogen, phosphorus and carbon) in lake. Chapter II explains environmental factors and microcystis bloom, including nutrients, growth and metabolism of microcystis aeruginosa, the exogenous phosphorus concentrations and the growth of microcystis aeruginosa, different forms of phosphorus and the metabolism of microcystis aeruginosa, different N/P ratios and the growth of microcystis aeruginosa; hydrological, meteorological factors and the outbreak of microcystis blooms, temperature, duration of illumination, disturbance, and the other environmental factors, such as redox potential and the growth of microcystis aeruginosa, and the phosphorus metabolism of microcystis bloom. Chapter III covers microcystis blooms and the interaction with epiphytic bacteria, including the epiphytic bacteria in microcystis bloom, phosphorus metabolism of microcystis aeruginosa and the epiphytic bacteria, impacts of environmental factors on the phosphorus metabolism of microcystis and epiphytic bacteria, microbial community succession in the water body with algal blooms. Chapter IV describes the impacts of outbreaks of cyanobacteria blooms on water ecosystems, including the effects of nitrogen removal of microcystis blooms, nitrogen and phosphorus migration and cycling in water body with cyanobacteria outbreaks, impacts of algae outbreak on the macrophytes, fish and other aquatic animals in aquatic ecosystems, the responses of aquatic community structure to algal blooms. Chapter V explains the disaster of cyanobacteria outbreak and algal toxin, including the harm of algae outbreak on drinking water, fishery and tourism; the types, mechanism and the spatio-temporal distribution of algal toxin, as well as its bioaccumulation, migration and transformation (physical and chemical degradation, and biodegradation) in the environment. Chapter VI elucidates the control of lake algae and the transformation into resources, including the control of lysine on the growth of microcystis aeruginosa and the toxicological effects, the control of cyanobacteria virus on algae, the transformation of aquatic plants into resources, hydrogen production from cyanobacteria. Chapter VII reveals the progress and prospects of the research on lake algal blooms, including

the physiological and biochemical characteristics of cyanobacteria, the external conditions for the formation of algal blooms, and the development process of the disaster, the control of lake eutrophication and the ecological restoration of lakes, prospects on the research on the lake ecology and algal bloom.

This book will become a good reference for the persons who are engaged in algology, botany, population or ecosystem or conservation ecology, hydrology, environmental science and management so on.

After all, prevention of a problem is always better than trying to fix it after its happening. In order to prevent human-induced fresh-water algal blooms, control-

ling agricultural, urban, and stormwater runoff, properly maintaining septic systems, and properly managing residential applications of fertilizers might be the most effective measures, which apply to not only China but also other countries with similar situations.

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Erratum The Canadian Field-Naturalist 126(4)

In response to the review of *Contributions to the History of Herpetology*. CFN 126(3): 344-345, the book's editor Kraig Adler pointed out (personal communication to FRC 12 May 2013): "Only one small correction. Mrs. Martof used a kitchen knife, not a gun. She told the police she slipped while cutting some pizza. But Bernie was stabbed up under his rib cage several times!"

Erratum The Canadian Field-Naturalist

It has come to our attention that sections of many of the book reviews by Li Dezhi and Qin Aili were copied from sources without attribution. The journal and the authors apologize for this oversight.