

Algae in the Rotorua Lakes



Algal bloom at Okawa Bay, Lake Rotoiti in February 2003

Introduction

Algae are a diverse group of plants that includes seaweeds, bottom-living cells, and phytoplankton that are suspended in the water. Algae are a vital part of lakes as they are the main producers of food and oxygen. Most other organisms therefore depend directly or indirectly on algae to sustain life. All algae contain chlorophyll, which is a green pigment that enables them to build up biomass and obtain energy by capturing light.

Other coloured pigments are sometimes present and may become clearly visible when there are red tide blooms in estuaries or the ocean, or blue/green coloured algal blooms in lakes.

Blue-green algae – cyanobacteria

Different species of algae thrive under different environmental conditions. In winter, phytoplankton known as diatoms are generally abundant. This group is well adapted to low light levels and thrives in winter when the water column is fully mixed from top to bottom, enabling the



Photo of *Anabaena planktonica*, one of the blue-green algae responsible for the bloom in Lake Rotoiti in summer 2002-3 (magnified = 400 times). The clear cell in the middle of the filament is a heterocyst, a specialised cell for nitrogen fixation. Photo: Eloise Ryan.

heavy cells to remain suspended in the water. Blue-green algae (cyanobacteria) are a group of bacteria, rather than true algae, that have acquired chlorophyll to capture light and behave like plants.

Cyanobacteria are present naturally in lakes but they may congregate into surface blooms under specific environmental conditions, though not all algal blooms are due to cyanobacteria. Many species of cyanobacteria thrive when there are high light and nutrient levels, as well as warm water temperatures. Several species have gas vesicles that enable them to float, and congregate at the water surface to form blooms under calm summer conditions.

In addition, some species of cyanobacteria can 'fix' atmospheric nitrogen. This process allows them to take advantage of the limitless supply of nitrogen gas that is dissolved in water, freeing themselves of dependence on nitrogen solutes such as nitrate and ammonia which might otherwise limit their rate of growth.

Nutrients

The key to reducing the frequency of algal blooms is to restrict the nutrient supply of nutrients. With increasing levels of nutrients, more algal growth occurs near the water surface and the proportion of nuisance cyanobacteria increases.

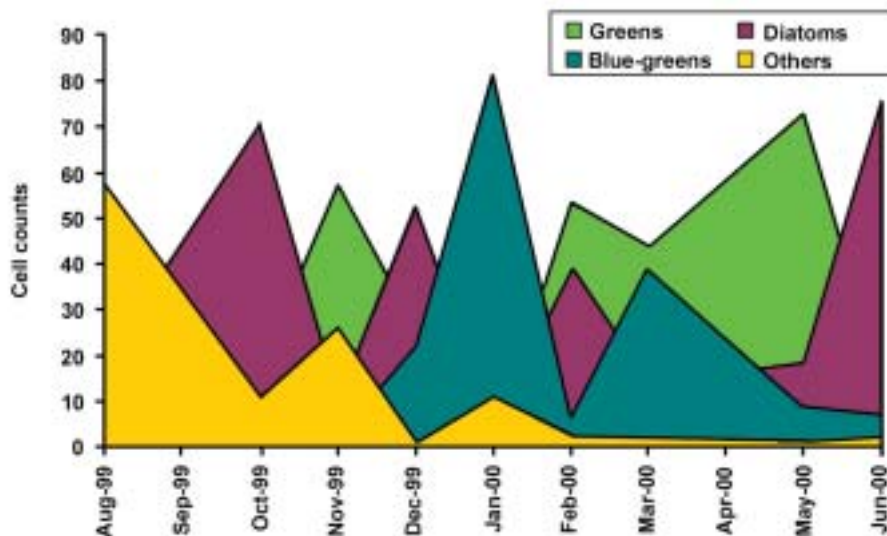


Phosphorus and nitrogen are nutrients that are especially important in the Rotorua lakes because they are present naturally at levels that are less than optimal for growth of algae, compared with other nutrients such as potassium or iron. If you live in one of the catchments of the Rotorua lakes, where the water eventually drains to a lake, then your activities will have a bearing on how much nitrogen and phosphorus reaches that lake and, therefore, on the algal growth and water quality of the lake.

Monitoring and management

Some cyanobacteria produce toxins that may cause skin irritations or problems with the nervous system or liver if swallowed in large quantities (acute toxicity) or with prolonged low-level exposure (chronic toxicity). Environment Bay of Plenty conducts regular monitoring of algae in the Rotorua lakes to ensure that the lakes are safe for swimming and other recreational activities.

Health warnings are occasionally issued for lakes or bays, to alert lake users of the potential health risks from entering water affected by high levels of cyanobacteria.



Cell counts in Lake Rotorua, 1999 to 2000 showing the variations between different groups of algae. Note how quickly variations occur between the different groups.

Environment Bay of Plenty conducts routine monitoring at twelve of the Rotorua lakes to assess levels of nutrients, algae and water clarity. These measurements are combined into a single measure known as the Trophic Level Index, to provide an overall assessment of water quality for each of the 12 lakes.

The Trophic Level index is also used in the Water and Land Plan to assist with decisions on sewage schemes, land retirement and lake management, in consultation with the community.

Environment Bay of Plenty has also funded the Chair in Lakes Management and Restoration at Waikato University to carry out research on the causes of algal blooms. This research is being used to provide a sound scientific basis for management actions that are being proposed for the lakes.

For further information and advice, contact Environment Bay of Plenty:

Telephone: 0800 ENV BOP (368 267)
 Facsimile: 0800 ENV FAX (368 329)
 Pollution Hotline: 0800 73 83 93
 Email: info@envbop.govt.nz
 Website: www.envbop.govt.nz
 Address: 5 Quay Street, P O Box 364, Whakatane, New Zealand

This fact sheet was prepared by Dr David Hamilton.

This fact sheet was last updated January 2005.