Abstract

High-altitude mountain lakes remain understudied, mostly because of their relative inaccessibility. Laguna de Guatavita, a small, equatorial, high-altitude crater lake in the Eastern Range of the Colombian Andes, was once of high cultural importance to pre-Columbian inhabitants, the original location of the legendary El Dorado. We investigated the factors regulating the primary production in Laguna de Guatavita (4°58'50" N - 73°46'43" W, alt. 2 935m.a.s.l., area: 0.11km², maximum depth: 30m), during a series of three intensive field campaigns, which were conducted over a year-long period in 2003-2004. In each, standard profiles of temperature, oxygen concentration and light intensity were determined on each of 16-18 consecutive days. Samples were collected and analysed for chlorophyll and for biologically-significant solutes in GF/F-filtered water (NH₄ +, NO₃ -, NO₂ -; soluble reactive phosphorus). Primary production was also determined, by oxygen generation, on each day of the campaign. Our results showed that the productive potential of the lake was typically modest (campaign averages of 45-90mg C/m².h) but that many of the regulating factors were not those anticipated intuitively. The lake is demonstrably meromictic, reminiscent of karstic dolines in higher latitudes, its stratification being maintained by solute-concentration gradients. Light penetration is poor, attributable to the turbidity owing to fine calcite and other particulates in suspension. Net primary production in the mixolimnion of Laguna de Guavita is sensitive to day-to-day variations in solar irradiance at the surface. However, deficiencies in nutrient availability, especially nitrogen, also constrain the capacity of the lake to support a phytoplankton. We deduced that Laguna de Guatavita is something of a limnological enigma, atypical of the common anticipation of a "mountain lake". While doubtlessly not unique, comparable descriptions of similar sites elsewhere are sufficiently rare to justify the presentation of the data from Laguna de Guatavita that our studies have revealed so far.

Keywords

Chlorophyll a, photosynthetic rate, stratification, meromictic structure, sacred lakes.