LakeScience Rotorua

A newsletter about research on the Rotorua Lakes

Produced as an occasional publication by the LakesWater Quality Society, in association with the Royal Society of NZ (Rotorua Branch)

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Welcome to the ninth issue of our email newsletter for those involved in or interested in scientific or management work on the Rotorua Lakes. It is up to **you** to make this informal newsletter a success by providing it with copy – our Society is merely providing the vehicle. We email it free of charge to all those who attended the Rotorua Lakes 2001 Symposium or the 2002 workshop, and are on email, and also to anyone else who requests it. If you don't wish to receive future copies, please email us. We will snail mail it on request. The newsletters will also be posted on the Royal Society (Rotorua Branch) website at www.rotorua.rsnz.org . If you are interested in, or working on lakes, but not the Rotorua Lakes, we are still very happy to receive material from you and to send you newsletters.

The more copy we receive, the more frequently we will be able to send this newsletter out. Electronic copy is preferred but not essential. Only minimal editing is carried out. We hope to send another issue out in December 2003 – given copy.
Technical content of all contributions is essentially the responsibility of the authors

All material and correspondence relating to *LakeScience Rotorua* to Nick Miller, millern@wave.co.nz, 91 Te Akau Road, R D 4, ROTORUA.

This is a shorter issue than usual – no-one with anything to say? Despite our best intentions it is late to appear – blame the symposium!

CONTENTS

NEWS

Preparations for the Rotorua Lakes 2003 Symposium are well advanced. The official title is *Rotorua Lakes 2003: Practical Management for Good Lake Water Quality*. The symposium is now less than a week away.

Twenty four oral papers and 30 poster papers will be presented. We have three keynote speakers, two of them from the US, Dr Dell Bottcher and Dr Jake Peters. The third is Professor David Hamilton (University of Waikato). A field trip has been planned. The number of registrations is now hovering around 200, with more still coming in, so there is obviously much interest. We hope to see many of our readers at the symposium.

GLEANINGS – some interesting papers seen recently (other contributions to this section are welcome.)

Growth Inhibition of Cyanobacteria by Ultrasonic Radiation: Laboratory and Enclosure Studies

Chi-Yong Ahn, Myung-Hwan Park, Seung-Hyun Joung, Hee-Sik Kim, Kam-Yong Jang, And Hee-Mock Oh. 2003. *Environ. Sci. Technol.* 2003**, 37** (13)*,* 3031—3037

The growth of *Microcystis aeruginosa* was repressed by ultrasonic radiation and resulted in an increased chlorophyll *a* content and cell size, suggesting the inhibition of cell division. However, growth was recovered immediately after the interruption of ultrasonication. In addition to the disruption of gas vesicles, other mechanisms of growth inhibition were also investigated. Although free radicals were produced by ultrasonication and hydrogen peroxide, the resulting lipid peroxidation in the cells was not comparable, indicating minimal damage by the free radicals. Ultrasonic radiation late in the day was found to be most effective in reducing the growth rate of *M. aeruginosa,* and this timing also corresponded to the phase of daily cell division. In an enclosure experiment, ultrasonic radiation reduced the pH, DO, total nitrogen, and total phosphorus, whereas it increased the water temperature, conductivity, and orthophosphate concentration. The algal cell density and chlorophyll *a* concentration drastically decreased after 3 d of ultrasonication, plus the cyanobacterial proportion was selectively reduced as compared to other algal species. Accordingly, ultrasonic radiation would appear to have considerable potential as an effective control method for cyanobacterial blooms.

Long term effects of phosphorus precipitations with alum in hypereutrophic Lake Stisser See (Germany)

J★rg Lewandowski, Inke Schauser, Michael Hupfer. 2003. *Water Research* **37** (2003) 3194—3204

Precipitation and inactivation of phosphorus (P) by the addition of aluminum (Al) is a widely applied lake restoration measure. Many studies about short-term effects are reported, but little is known about long-term effects. To reduce this lack of knowledge the authors investigated the German hardwater lake, S✧sser See, which was treated almost annually from 1977 to 1992 with aluminum sulfate (alum). They conducted sediment core experiments in laboratory, as well as in situ investigations of sediment and pore water. The treatment is clearly recognizable in sediment depth profiles as increases of total phosphorus, NaOH-extractable phosphorus, and NaOH-extractable aluminum. The molar ratio of added Al to additionally bound P is approximately 2.1:1. Pore water profiles of soluble reactive phosphorus taken in situ and in sediment core experiments, as well as sorption batch experiments, illustrate that the AI(OH)3 layer's sorptive capacity is still not exhausted with further P sorption occurring in different P fractions. The P release of the sediment is affected by the magnitude of the downward flux into the P sorbing layer. However, sediment core experiments and a modeling exercise indicate that a buried P sorbing layer has little or no effect on the P release of the uppermost fresh sediment layers.

The Bioturbation-driven Chemical Release Process

Lois J. Thibodeaux and Victor j. Bierman. 2003. *Environ. Sci. Technol.* **37** (13) 252A – 258A

Conventional wisdom has it that the primary process responsible for natural recovery of polluted streambeds and their adjoining water columns is fresh-particle deposition onto the sediment bed surface. In addition, until recently the only significant chemical transport process was believed to be water velocity-generated particle resuspension from the polluted bed. But the latest computer modeling results show other forces may be at work in the sediment bed.
Bioturbation – an in-bed translocation phenomenon driven by the activity of bottom-living animals that moves sediment-bound pollutants and homogenizes surface layers – has been proposed as an

additional and very significant pollutant transport process. Bioturbation may be responsible for a major, if not dominant, fraction of the chemical quantities released from sediments to the water column. Including bioturbation may change our ideas about how natural attenuation processes work and enable engineers and scientists to make credible long-term predictions of remediation's impact and consequences.
This discussion paper is largely devoted to streams and rivers, but it would seem to have some relevance to the situation in lakes. – Ed.

NEWS FROM ENVIRONMENT BOP

John McIntosh

Lake action plans are progressing. The Lake Okareka working party has found that the process is important. This is because local authority spending requires that community consultation has taken place and all alternatives have been assessed. Nevertheless, the working party is on target to go the public in November this year with proposals to implement works to reduce the nitrogen and phosphorus load by the target amounts. There is information on Environment Bay of Plenty's web site regarding the action plan process at the link below.
http://www.envbop.govt.nz/Publications/Lake-Newsletters.asp

Matthew Bloxham, Environmental Scientist, Environment Bay of Plenty, is preparing for the blue-green algal monitoring programme to be intensified for the summer. Warnings will be advertised as usual and will be available on Environment Bay of Plenty's web site at
http://www.envbop.govt.nz/Water/Lakes/Lake-Health-Warnings.asp

Research works and draft proposals being undertaken by Environment Bay of Plenty's consultants includes; constructed wetland design (NIWA), treatment wall (Landcare/Lincoln Ventures), nutrient load on Lake Rotorua (NIWA), continued NPLAS (Nitrogen Phosphorus Land Assessment System) model development (NIWA), effects of Ohau Channel diversion on Lake Rotoiti (NIWA and Uni of Waikato), oxygenation proposal (BOC gases). In addition, the research undertaken by the doctorate students of Professor David Hamilton, continues to throw light on the details of the dynamic processes that affect the Rotorua lakes.