LERNZ TEBMS

Lake Ecosystem Restoration New Zealand

University of Waikato

Issue 14 Jan-Mar 2010

New nutrient analyser

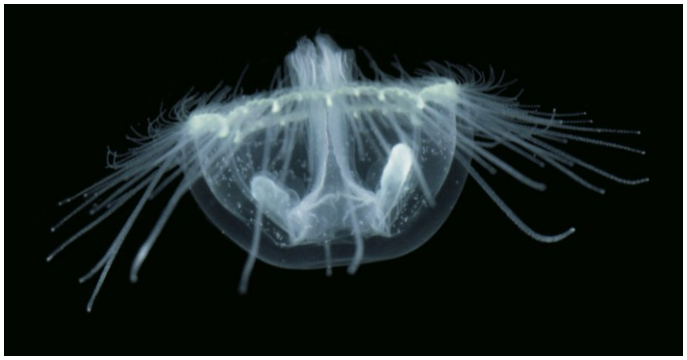
Professor Craig Cary, Wendy Paul and Bruce Patty spearheaded the search for a new nutrient analyser to replace the FIA. The aim was to get an analyser that is efficient, reliable and easy for students to learn to use. This new discrete analyser uses robotics to mix the various reagents with the lake and sea water samples. Louise Stewart reports that it is much easier to use than the previous FIA.

Daniel Hoger and Bruce Patty testing the Aquakem discrete analyser.

Jellyfish in our lakes

Kevin Eastwood undertook a summer research scholarship under the supervision of Ian Duggan. His aim was to examine the distribution of the non-indigenous freshwater jellyfish *Craspedacusta sowerbii*. To date, reports on this species have been of the medusa, or jellyfish stage. Ian and Kevin felt that actual distribution of the species was far greater than past reports of the jellyfish suggested. They investigated the rocky substrates of 23 North Island lakes for the benthic, anemone-like, polyp stages. To date they have found polyps in 17 of the lakes, including many lakes where jellyfish stages have never been found. Their findings suggest that studies of the distribution of this species based on the jellyfish stage are not a true reflection of its spread.

Polyp of *Craspedacusta sowerbii.*



Medusa of *Craspedacusta sowerbii.*

Pest fish removal from Lake Mangahia

Lake Mangahia

Lake Mangahia is a 10-ha peat lake south of Temple View that has deteriorating water quality, with increasing phosphorus levels. Boat electrofishing and fyke netting revealed a high biomass of catfish and goldfish (>180 kg/ha), both bottom feeders that can greatly increase nutrient recycling to the overlying waters. The riparian vegetation of the lake has some native trees but was overrun with willows. As part of a restoration effort, Environment Waikato has sprayed the willows with herbicide. The lake is one of five scheduled for pest fish removal in the Waikato region, and to prepare for fish removal and robust population estimates we have captured, marked, and released about 2,700 fish, primarily catfish (1,200), goldfish (1,200), and eels (300). We aim is to reduce the catfish and goldfish biomass to <50 kg/ha to test the hypothesis that pest fish cause significant nutrient recycling and are an important influence on water quality of the shallow lakes in the region.

Pest fish baits

Reducing populations of pest fish, especially koi carp, is logistically difficult and few viable tools are available. Rotenone has been developed into a piscicide for managing fish populations and is directly applied to waterways to control fish. However, this method has associated problems including high potential for non-target by-catch, uneven distribution of the toxin, difficulty in poisoning large or lotic water bodies and high financial cost. Tank trials are underway to revisit the viability of developing a pest fish bait. The aim is to identify ingredients and flavours that increase structural integrity of the bait pellet and are highly palatable. Subsequent trials will be conducted where rotenone will be added to the baits and performance measured. We are also investigating technology that will mask the flavour of rotenone, and protect the toxin from environmental degradation. Ultimately, we aim to develop a toxic bait that floats, so that uneaten baits can be recovered to minimise bykill.

For more information go to www.lernz.co.nz Centre for Biodiversity and Ecology Research, Department of Biological Sciences, Science and Engineering, The University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand.

New people

Konrad Gorski (Postdoc) will be involved with water quality and ecosystem modelling of the lower Waikato River in support of our Strategic Initiative Fund project entitled "Forecasting New Zealand's water quality management: developing the modelling tools and people for the challenges ahead". Konrad's work will capitalise on databases completed by Alex Guindon.

Mark Jones, an electrical engineering ME graduate, is looking at conductivity of fish related to injury rates from electrofishing. He will also map the electric field around the electrofishing boat.

Paloma Lucena Moya (Ph.D.) is here for 3 months from Spain (University of Vigo) where she is doing a Ph.D. on coastal lagoon ecology, focused on implementation of the European Water Framework Directive for water quality. Paloma is working on an experiment with Dr. Ian Duggan focusing on the relationship between zooplankters and macrophyte assemblages.

Rebecca Eivers (Ph.D.) has recently become enrolled and is investigating the effect of nutrient control measures for runoff in intensive agricultural catchments in the Waikato peat lake region.

Abhilasha Sharma (M.Sc.) has recently begun her thesis investigating management options for Lake Rotokauri.

Brennan Mahoney (M.Sc.) will conduct research into bait attraction of pest fish to improve capture rates.

Duncan Law (M.Sc.) will focus his study on restoration of urban stream fish habitat, including in-stream flow incremental modelling and habitat structure installation.

Visitors

Donald Mavinic and David Hamilton

Professor Donald Mavinic from University of British Columbia talked to us about a globally emerging paradigm-phosphorus removal and recovery. Phosphorus is a key element and each person contains about 1.5 kg - mainly in our teeth and bones. Peak extraction of accessible reserves of phosphorus is expected in 2025-2035. Thus, we need to start recovering phosphorus from treated effluent. Struvite, which is phosphorus-rich, can be recovered from the waste stream and developed into slow release phosphorus fertiliser using proprietary techniques with which Prof. Mavinic is involved, involving production of Crystal Green. Learn more at http://www.ostara.com/

Professor Xin Qian

Professor Xin Qian from Nanjing University spoke to the LERNZ group on water quality measurements in Liuxihe Reservoir in south-western China. Here, water supply reservoirs have relatively good water quality compared with other places in China. Through water quality monitoring time, it has been shown that Liuxihe Reservoir is becoming progressively degraded in association with an increase in agricultural activities.

Rotorua LakesWater Quality Society visited LERNZ for lunch on 16th March as part of a fact-finding tour to examine methods used for lake restoration in other areas. They were duly impressed in a visit to Andrew Hayes' farm where a tremendous effort is being made to restore Lake Kaituna.

Scholarship

Congratulations to **Toni Johnston** who has been awarded the Whanganui River Enhancement Trust Scholarship. She holds it jointly with a student from Massey University whose research is related to hers. Toni's research is on the effects of willows and riprap on invertebrates, fish and habitat in the Waikato River. http://www.lernz.co.nz/people/largerivers/tonijohnston.html

Toni holding a grey mullet

Recent Publications

Ashraf, S., Brabyn, L., Hicks, B.J. and Collier. K. 2010. Satellite remote sensing for mapping vegetation in New Zealand freshwater environments: a review. New Zealand Geographer 66: 33-43. http://hdl.handle.net/10289/3752

Brijs, J., Hicks, B.J. and Powrie, W.S. 2009. Spatial and temporal abundance of mysid shrimp (*Tenagomysis chiltoni*) in shallow lakes in the Waikato region CBER Contract Report No. 107. Client Report prepared for Environment Waikato. http://cber.bio.waikato.ac.nz/publications.shtml

Brijs, J., Hicks, B.J. and Bell, D.G. 2010. Boat electrofishing survey of common smelt and common bully in the Ohau Channel in December 2009. CBER Contract Report No. 112. Prepared for Environment Bay of Plenty. http://cber.bio.waikato.ac.nz/publications.shtml

Collier, K.J., Aldridge, B.M.T.A., Hicks, B.J., Kelly, J., Macdonald, A., Smith, B.J., and Tonkin, J. 2009. Ecological values of Hamilton urban streams (North Island, New Zealand): constraints and opportunities for restoration. NZ Journal of Ecology 33(2): 177-189. http://www.nzes.org.nz/nzje/abstract.php?volume_issue=j33_2&pdf_filename=NZJEcol33_2_177.pdf

Entry, J.A., Sojka, R.E. and Hicks, B.J. 2010. Matrix-based fertilizers reduce nutrient and bacterial leaching after manure application in a greenhouse column study. Journal of Environmental Quality 39(1): 384-392. http://hdl.handle.net/10289/3627

Luo, L., Hamilton, D. and Han, B. 2010. Estimation of total cloud cover from solar radiation observations at Lake Rotorua, New Zealand. Solar Energy. http://hdl.handle.net/10289/3558

Matsuzaki, S.S., Mabuchi, K., Takamura, N., Hicks, B.J., Nishida, M. and Washitani, I. 2010. Stable isotope and molecular analyses indicate that hybridization with non-native domesticated common carp influence habitat use of native carp. Oikos. DOI: 10.1111/j.1600-0706.2009.18076.x http://www3.interscience.wiley.com/journal/123287123/abstract

Gibbs, M. and Özkundakci, D. 2010. Effects of a modified zeolite on P and N processes and fluxes across the lake sediment-water interface using core incubations, Hydrobiologia, DOI 10.1007/s10750-009-0071-8

Özkundakci, D., Hamilton, D.P. and Scholes, P. 2010. Effect of intensive catchment and in-lake restoration procedures on phosphorus concentrations in a eutrophic lake. Ecological Engineering 36: 396–405. doi:10.1016/j.ecoleng.2009.11.006

Trolle, D., Hamilton, D.P. and Pilditch, C.A. In press. Evaluating the influence of lake morphology, trophic status and diagenesis on geochemical profiles in lake sediments. Appl. Geochem. doi:10.1016/j.apgeochem.2010.01.003 http://hdl.handle.net/10289/3721