The 7th International Shallow Lake Conference

Theme: Conservation, Management and Restoration of
Shallow Lake Ecosystems Facing Multiple Stressors

April 24 – 28, 2011; Wuxi, China

Programs and Abstracts

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Shallow Lake Conference

Organized by

Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences

Government of Wuxi, Jiangsu Province

In collaboration with

Jinan University

Nanjing University

Institute of Hydrobiology (Wuhan), Chinese Academy of Sciences

Jiangsu Society of Oceanography and Limnology

Sponsored by

Chinese Academy of Sciences

National Natural Science Foundation of China

State Key Laboratory of Lake Science and Environment

April 27 (Wednesday)

Session D: Multiple stresses and ecosystem changes in shallow lakes
10:20-12:00

Place: Jiale Hall

Chair: Néstor Mazzeo

10:20-10:40 **Using diatoms to understand climate-nutrient interactions in Esthwaite Water, England: evidence from observational and palaeolimnological records**

Xuhui Dong[1,2], Helen Bennion[1], Stephen C. Maberly[3], Carl D. Sayer[1], Richard W. Battarbee[1]

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10:40-11:00 **Chytrid infections and diatom spring blooms: paradoxical effects of climate warming on fungal epidemics in lakes**

BW Ibelings[1,2], AS Gsell[1], WM Mooij[1], E. van Donk[1], S. van den Wyngaert[2], L. de Senerpont Domis[1]

[1] Netherlands Institute of Ecology, Department of Aquatic Ecology, Droevendaalsesteeg 10, 6708 PB Wageningen, The Netherlands; [2] Eawag, Department of Aquatic Ecology, Ueberlandstrasse 133, CH-8600, Duebendorf, Switzerland

11:00-11:20 **Delineating shallow lake drainage basins: New techniques with application to Lake Taihu, China**

Thomas J Ballatore, Shane R Bradt

International Lake Environment Committee (ILEC) Foundation

11:20-11:40 **Are these signs of shallow lake dying? Searching for the methods to heal Lake Zdworskie**

Ryszard Wisniewski [1,2]

[1]Laboratory of Applied Hydrobiology, Institute of Ecology and Environment Protection, N. Copernicus University, Gagarina 9, 87-100 Torun, Poland; [2]PROTE Technologies for our Environment Ltd, Nieszawska 1, 61-021 Poznan, Poland

11:40-12:00 **Functional link between diatom and cladoceran communities along the eutrophication gradient: an example from Irish lakes**

Guangjie Chen, Hucai Zhang, Qingzhong Ming, Fengqing Chang, Wenxiang Zhang, Manping Xie

Key Laboratory of Plateau Lake Ecology & Global Change, School of Tourism & Geography, Yunnan Normal University, Kunming, Yunnan 650092, P.R.Chnia

12:00-13:30 **Lunch**

April 28 (Thursday)

Session D: Multiple stresses and ecosystem changes in shallow lakes
13:30-15:30

Place: Jiale Hall

Chair: Ryszard Wisniewski

13:30-13:50 **Large scale ecosystem shifts in Lake IJsselmeer area, The Netherlands**

Ruurd Noordhuis

Deltares, *Princetonlaan 6, Utrecht, The Netherlands P.O. Box 85467 3508 AL Utrecht, The Netherlands*

13:50-14:10 **An adaptive shallow lake ecology: Kunchenghu Lake at Yangtze River Delta in China resists cyanobacterial bloom**

Neng Wan [1], Soumyajit Roy[2]

[1] School of Biology and Food Engineering, Changshu Institute of Technology, Changshu 215500, P.R.Chnia; [2]Jiangsu Laboratory of Advanced Functional Material, School of Chemistry and Materials Engineering, Changshu Institute of Technology, Changshu 215500, P.R.Chnia

14:10-14:30 **Simulating impacts of external loading and sediment resuspension on water quality of Lake Taihu**

Liancong Luo[1], Shujun Dai[1], Wang Yao[2], Shang Yang[3]

[1] Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences; [2]College of Water Resource & Hydrology, Hohai University; [3]Research Centre of Hydrobiology, College of Life Science & Technology, Jinan University

14:30-14:50 **The role of planktonic and benthic communities in the functioning of hyperSaline Lake ecosystems**

Sergey Golubkov

Zoological Institute RAS, Russia

14:50-15:10 **Nutritional value of algal communities and its implication to the occurrence of Lesser Flamingos (*Phoeniconaias minor*) in African saline lakes**

Mary N. Kaggwa[1], Michael Schagerl[2], Steve Omondi Oduor[3], Martin Gruber[2]

[1]Department of Chemistry, Kyambogo University, Kyambogo, Uganda; [2]Department of Limnology, University of Vienna, Vienna, Austria; [3]Department of Biological Sciences, Egerton University, Njoro, Kenya.

15:10-15:30 **The seasonality of nutrient dynamics in two limnologically different parts of large shallow Lake Peipsi: the effect of water temperature and level fluctuations**

Buhvestova, O., Möls, T., Kangur, K., Haldna, M.

Centre for Limnology, Estonian University of Life Sciences, Rannu, Estonia.

15:30-15:50 **Coffee Break**

15:50-17:40 **Closing Ceremony**

18:00-20:00 **Farewell Party**

Asterionella bloom is followed by epidemic development of disease as high Asterionella densities greatly facilitate transmission of chytrid zoospores. This sequence of events is absent in milder winters. Earlier experimental studies have shown that the parasite is almost non-infective at water temperatures below 3 oC, offering a disease-free window of opportunity for growth of Asterionella. Climate warming has reduced periods in which water temperature remains <3 oC, narrowing the window of opportunity for uninfected growth. Consequently. Asterionella continuously suffers from infection, albeit at low levels. Population reduction as a result of low level infection allows other diatoms to take over as dominant species, possibly through priority effects. In mild winters, chytrid infections no longer reach epidemic levels, but remain at low prevalence since transmission is impaired at low host densities. Climate warming thus affects both host and parasite in intricate ways, with the host denied a bloom and consequently the parasite denied an epidemic. A shift from Asterionella to a mixed diatom community in years with mild winters may benefit the food web. because of the poor edibility of Asterionella. unless the numerous chytrid zoospores produced during epidemics significantly contribute to zooplankton nutrition. Our study demonstrates the potential complexity of climate change impacts on disease. A reduction in the likelihood of epidemic development of a virulent parasite would seem to be of great benefit to the host, but this was not the case. Unexpected, sometimes paradoxical consequences of climate change can be expected and suggest that the view of a "warmer hence sicker world' may not always apply.

OR D-03 Delineating shallow lake drainage basins: New techniques with application to Lake Taihu, China

Thomas J Ballatore. Shane R Bradt

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Accurate knowledge of the spatial extent of a lake's drainage basin is the basis for integrated management and a starting point for runoff modeling studies. National-level digital or printed topographic maps are often used to delineate drainage basins: however, in many countries, even if these maps exist, their usage is either restricted to certain parties or the price of access is prohibitive. In some countries, restrictions even extend to government bodies studying environmental issues. Therefore. NASA's free, near-global coverage Shuttle Radar Topography Mission (SRTM) digital elevation model has been of significant value since release of the "finished" version in 2005. Unfortunately, shallow lakes tend to have shallow basins and the SRTM data is often insufficient in areas of low relief. Additionally, many of the shallow lakes of greatest concern are in highly urbanized areas in which humans have made significant alterations to the hydrology through canals and other water diversions. Here we present a hybrid technique using freely available high-resolution remotely-sensed images coupled with SRTM elevation data to delineate shallow lake drainage basins. The remotely-sensed images are used to edit the elevation data as well as to groundtruth the resulting basin delineation and predicted river networks. We use the case of Lake Taihu. China to demonstrate the technique and to show that the lake is more affected by distant urban areas and upstream land use change than is commonly-perceived.

OR D-04 Are these signs of shallow lake dying? Searching for the methods to heal Lake Zdworskie

Ryszard Wisniewski[1 2]
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Lake Zdworskie is a large (340 ha), shallow (2.0 m of mean depth), and hypereutrophic lake. Investigations conducted since 200o have confirmed its very high trophic state. The water is turbid

(Secchi disk about 0.5 m). Chlorophyll concentration is over 40|µg l^{-1} . *Cyanobacteria* are a dominant group in phytoplankton, forming frequent, intense blooms. In spring *Rotatoria* were dominant in zooplankton, but in summer, and autumn the most numerous group were protozoans (Ciliata) - 1430 individuals l^{-1}, 88,6% of total zooplankton. The analysis of lake sediments confirm its bad trophic state. Total phosphorus contents in sediments varied from 0.491 to 2.247 mg P g^{-1} dm. Organic matter content was very high on all soft sediment stations - 45,5% -56.7%.

Sediments of shallower regions with a depth of 1.0-1.5m indicated unexpected features:

- high water content (97%); lack of consolidation (fluidization); very high oxygenation of interstitial water -92.2% -133.3% (comparable to saturation of the water body); high pH -8.09 - 8.72.
- scarce benthos, only one taxon (*Chironomus* sp.) at a density of 22 individuals m^{-2}
- unusually low numbers of basic functional groups of bacteria - nitrifying - 0.0 cells, denitrifying - 3.0 cells, protein decomposing 140.0 cells, and urea decomposing - 25.0 cells cm"^{3} of fresh sediment. In a lake of comparable trophy, but mean depth of 6.0 m that numbers were respectively - 0.0, 300000.0, 100000.0, and 200000.0 cells cm^{-1} of fresh sediment.

Additional laboratory and in situ experiments show that most probable cause of such features, among three possible - (Cd and Ag toxicity, *Ciliata* predation, and waving) - are waves. The waves in shallow water, described by separate equations set, can cause oscillations, and resonance phenomena leading to loosening of sediment particle aggregation, and sediment fluidization.. During 2007-2010 several known lake restoration methods were tested on isolated parts of the lake. The main were - external water pumping to increase, and keep stable water level; phosphorus inactivation with Phoslock and $FeCl_3$ directly in sediments during its controlled resuspension; partial sediment dredging; installation of artificial reef with *Dreissena polymorpha* as a very efficient filtrator of fine grained suspension, long lasting in water column after sediment resuspension.

OR D-05 Functional link between diatom and cladoceran communities along the eutrophication gradient: an example from Irish lakes

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Lake eutrophication leads to the enrichment of nutrients (e.g. P and N), which are essential resources for algae and zooplankton growth. Nutrient enrichment has long been found to drive the community structure and diversity patterns of lake plankton. In particular, species richness (i.e. alpha-diversity) and beta-diversity (i.e. degree of community dissimilarity between samples) are sensitive indices in response to the changes in lake productivity. Taxonomic differences mainly reflect the evolutional history of different taxa, however, they provide limited insight into the functional difference or link between different communities. This talk will present an application of trait-based approaches to explore the functional relationship between diatom and cladoceran communities recovered from surface sediments of 31 Irish lakes along the eutrophication gradient. Cell size and volume, cell shape, coloniality and motility are the main traits for diatoms; cladoceran functional traits include body size, habitat preference, trophic level and feeding type. Taxonomy-based patterns will be compared with trait-based indices to test whether trait-based methods could provide additional information on community responses for diatoms and cladocerans, which are at different trophic levels. Trait-based community structure patterns for both organisms will then be compared to examine the impact of nutrient and energy link along food webs (i.e. bottom-up effect), as well as the predation control exerted by planktivores (i.e. top-down effect). Trait-based community and diversity patterns can help understand the mechanisms that structure the community and help predict how communities reorganize with lake eutrophication. Therefore, trait-based approaches have the potential to detect specific impacts under multiple stressor scenarios.