

Summary - Water Center Monthly Seminar and Discussion

Protecting Water Quality and Biodiversity in Asia: Research Perspectives from Indonesia and China

Time: 3:30 - 5:00, Monday, February 20, 2017

Location: Graham Institute, 214 S. State St., Ann Arbor, MI

Introduction

Hydropower development, land use changes and eutrophication stress aquatic ecosystems worldwide with a cascade of effects for wildlife and people. This seminar included two short presentations from researchers that have dedicated their careers to studying two unique and vulnerable aquatic ecosystems: China's Three Gorges Reservoir, which supports the largest power station in the world, and Indonesia's million-year-old lakes, the world's only hydrologically connected ancient lake system. They shared lessons learned and emerging research needs and opportunities.

Doug Haffner

Professor of Aquatic Ecology, Great Lakes Institute for Environmental Research, University of Windsor, Ontario

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Water issues in Indonesia: Lake Eutrophication

Indonesia is recognized as a global biodiversity hotspot in part because of its unique and dynamic geology, ancient lake systems and many endemic animals and plants. The Indonesian lakes that Doug Haffner has studied seem to have very low rates of primary production and animals such as snails and fish have evolved and diversified to take advantage of extremely limited food sources. As a result, the biodiversity of these naturally oligotrophic systems are very sensitive to nutrient enrichment; and hypoxic events and fish kills are becoming more frequent. Growing human populations, increasing reliance on water from large lakes for agricultural and domestic sanitary needs, land use changes in the watersheds, and a rapid increase in open cage aquaculture are contributing factors.

Haffner described recent efforts by Indonesian officials to better understand their lakes and shared an idea for developing a large lake institute to foster collaboration, technology transfer and improve research and protection of lakes across the globe. Setting water quality targets in lakes in Indonesia could be particularly challenging where biodiversity, in addition to human uses, must be protected and thresholds are less well understood.

Additional Resources

- Haffner personal website: <http://www1.uwindsor.ca/glier/douglas-haffner>
- Cristescu, ME, Adamowicz, SJ, Vaillant, JJ, Haffner, DG. 2010. Ancient lakes revisited: from the ecology to the genetics of speciation. *Molecular Ecology* 19: 4837 – 4851.
- Vaillant, JJ, Bock, DG, Haffner, DG and Cristescu, ME. 2013. Speciation patterns and processes in the zooplankton of the ancient lakes of Sulawesi Island, Indonesia. *Ecology and Evolution* 3(9): 3083-3094

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Lei Zhang

- Professor of Environmental Microbiology, Southwest University, China
- Deputy Director, Water Environmental Monitoring and Simulation in the Three Gorges Reservoir Region (WEMST)
- Adjunct professor, Great Lakes Institute for Environmental Research, University of Windsor, Canada

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Controlling Eutrophication in Three Gorges Reservoir, China

The Three Gorges Dam was completed in 2003 and became the world's largest dam and power station. The 185 meter high dam created a reservoir 660 km long in the Yangtze River that provides water for 400 million people in the region. Chronic nutrient pollution and seasonal algal blooms threaten water quality in the reservoir and have been a focus for intensive research. Lei Zhang outlined recent efforts to understand the sources and management options for nutrients from small scale farming that occurs throughout the mountainous watershed. Her studies include intensively instrumented experimental agricultural plots and novel incentive programs for farmers. Her recent work indicates that reductions in fertilizer rates can lead to an unacceptable decline in crop productivity, and other measures are needed to intercept nutrient run-off such as buffers.

Zhang's group is also studying the algal communities in nutrient enriched tributaries of the Three Gorges Reservoir. They have documented the rapid shift in algal biomass and microbial community composition that occurs in the spring. Dissolved nitrogen and phosphorous levels, mixing depth and euphotic depth influence the formation of algal blooms in early spring and eukaryotic grazers reduce algal biomass later in the spring.

Additional Resources

- WEMST: www.cctwcq.com
- Lei Zhang personal website:
<http://zihuan.swu.edu.cn/viscms/zihuanidex/fujiaoshou9364/20140818/134652.html>