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SIL news

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In This Issue

Material for the December 2011 issue should be sent to the Editor by:

1 NOVEMBER 2011

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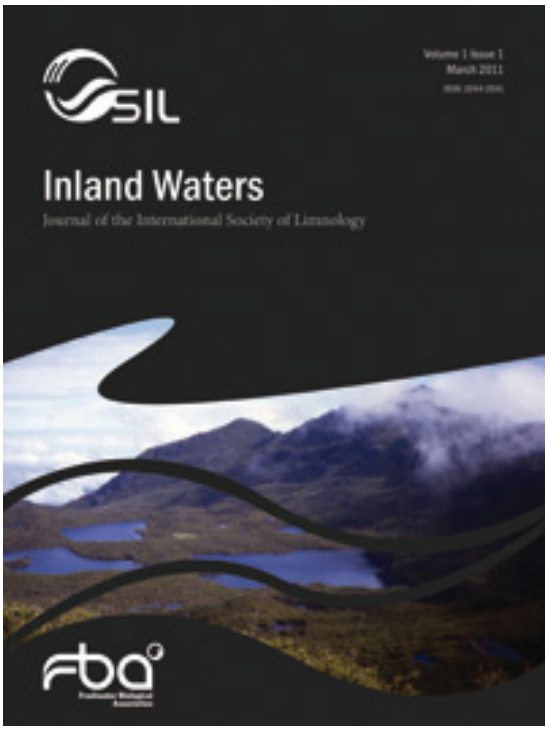
Contributions on a PC formatted disk, in any standard word processor or DOS (ASCII) text, or as e-mail attachments, will assist the Editor.

Editor's Foreword

Let me at the outset ask for forgiveness for the delay that happened in the appearance of this SILnews letter. This is primarily due to my short illness on my return home in early May from an eventful trip to China. I had to halt the editing work on the *newsletter* for some time: a short illness put me off and therefore it took me a while to pick up where I had left off.

In this newsletter there is a lot of good news for the readers but also some sad news. In the death of Dr. Saunders (USA), the Limnology lost one of its outstanding limnologists (see Obituary). Since I had the opportunity to meet Dr. Saunders on two occasions in the early 1970s, it hurts all the more. On behalf of the SIL Secretariat, and on my own behalf, I wish to express that our thoughts are with the grieving family. Further, there is a short report from the SIL President (Prof. Brian Moss) who visited Borneo (Indonesia) in October 2010 to teach for Tropical Biology Association course; and there are announcements from the organizers of the next two triennial SIL meetings: in Budapest (Hungary) in 2013 and in Turin (Italy) in 2016. I provide an extended review of Winfried Lampert's book *Daphnia: Development of a Model Organism in Ecology and Evolution*. The book sums up in nutshell some of Winfried's life term works on the water fleas. Another book review deals with Zebra mussel and should interest many of us interested in the role of bio-invaders in lake ecosystems. There are also various reports of studies/courses completed and of the scientific meetings held as well as announcements of the conferences to be held in near future.



International Society of Limnology (SIL) launches its new jounral, Inland Waters. The journal is the scholarly outlet for the society and advances science by promoting understanding of inland aquatic ecosystems. See page 14 for more information.

Last but not least, good news, as many of you already know, is the appearance in March 2011 of the maiden issue of "Inland Waters" – SIL's peer-reviewed quarterly journal. Both SIL- members and non-members can submit manuscripts of their presentations at the triennial SIL conferences but also regular primary research papers (see editors' announcement elsewhere in this newsletter).

Ramesh D. Gulati
Editor, SILnews letter

Reports

Rainforest Streams and Income Streams

Last October I had the privilege to teach for the Tropical Biology Association on a course at the Danum Valley Research Centre in the forests of Sabah, in Borneo. Tropical biologists are somewhat preoccupied with tree and insect biodiversity, and sometimes this means that processes are ignored. It was my job to make the connection between the forest processes and what was going on in the streams. That was nothing if not highly interesting because the afternoon thunderstorms could turn a trickling base-flow stream into a raging flood a metre deeper in a couple of hours, with a return to base flow by the next morning. And the forest elephants tended to reclaim the territory sometimes, when the flow rate otherwise allowed us to work.

The results were very interesting. The established idea that the forest retained nutrients was well born out. Much of the tree-leaf-litter never even reaches the forest floor, being intercepted by bird's nest ferns and ginger plants growing as epiphytes on every trunk and major branch, and collecting the litter for processing by a rich invertebrate community from which ion-rich water trickles down the trunk and back into the roots. We showed that earthworms, with thick tube-like casts, 10-15cm tall above ground level, were mineralising nutrients and returning nitrate preferentially to the soil surface, and on one memorable occasion a very large python that had settled by one of our streams was trampled in the night by elephants. Its entire body, including most of the bones, disappeared into the forest insects and rodents within four days.

Setting out a grid on a stream for a comparative study. However, the afternoon storms washed out the grids however firmly anchored.

For the stream chemistry, consequences of efficient nutrient retention by the forest were that conductivities were very low, nitrate was indetectable and the biofilm and invertebrate populations were sparse. The invertebrate community was dominated by filter-collectors. Despite a supply of leaves and twigs, there were every few shredders, not even crabs and prawns, nor deposit feeders. The almost daily torrent of floodwater took litter and sediment rapidly down to the sea and the fish, diverse though their communities were, were dependent as much on terrestrial insects falling in as on aquatic animals, and indeed were taking exuviae of both land and stream animals as major parts of their diet.

The whole system of forest and stream was a very good parallel to scientific societies whose members hoard their funds and don't renew their memberships nor lure others to join! They wither for lack of nutrients. Now is the time for membership renewals; now is the time to persuade your colleagues and graduate students to join SIL. You can immediately offer them 'Inland Waters'; the first part is just out and it is as rich in diversity as the forest streams. It has the bright appearance of the streams too, with their waters sparkling in the sunshine and the damselflies hovering. But it too might wither if you do not bombard it with your papers. I do not think that we apply the lessons we learn from natural systems to our own societies nearly enough, so here is somewhere to start.

Brian Moss
President of SIL

The Brackish-Water Baltic Sea Is Not Poor But Rich In Species: New Biodiversity Pattern Discovered

The long-term investigations of the biodiversity of the brackish-water Baltic Sea were performed by the Russian-German research team. The team carried out an intensive international cooperation during the last two decades, which has resulted recently in the break-through findings that help dismiss several misconceptions about the biodiversity/salinity relationships (Telesh, Schubert & Skarlato, 2011, MEPS Feature Article, 421:1–11). These recent discoveries are transforming our views about the biodiversity in transition zones and underpin the novel concept that argues for a protistan species maximum in the horohalinicum, i.e. in the critical salinity zone of 5–8 psu, which separates the freshwater and marine environments (Fig. 1).

The new brackish-water biodiversity pattern was discovered due to re-assessment of the plankton diversity in the Baltic Sea, which had previously been considered as a species-poor basin. The Baltic Sea that is characterized by the unique large-scale smooth salinity gradient is now proved to be rich, not poor, in the plankton species. We revealed the unexpectedly high species richness of phytoplankton and zooplankton (in total 4056 taxa) in the brackish Baltic waters, with dominance by protists (50 to 85 % of all plankton species). The find-

ings are based on a broad meta-analysis of large phytoplankton data sets, comprehensive species lists, long-term studies of zooplankton diversity in estuaries, and a revision of zooplankton species richness in the open Baltic Sea.

Results show that species numbers of unicellular organisms in the Baltic salinity gradient follow the binomial distribution mode, while the metazooplankton diversity decreases exponentially with salinity increasing. The species richness of both groups, however, peaks within the horohalinicum. Our results agree with the hypothesis that the horohalinicum zone presumably supports protistan species that are tolerant to a broad range of environmental conditions. The findings are consistent with the Intermediate Disturbance Hypothesis and the Insurance Hypothesis; they also contribute to the debate on ecosystem stability. Moreover, as the horohalinicum expands to major area of the Baltic Sea, such exciting protistan diversity is fairly concordant with the taxa-area relationships for protists.

This study thus challenges the established *Artenminimum* (species minimum) concept, originally developed by Adolf Remane (1934) for macrozoobenthos of the Baltic Sea and later accepted as a textbook model for all brackish waters. The alternative view, i.e. a *protistan species maximum concept* (Telesh et al., 2011) substantiates a new ecological perspective of the previously overlooked exciting protistan diversity in brackish waters. We assume that pronounced adaptability and advanced osmoregulation strategies of protists allow these small-sized fast evolvers to develop considerable species richness and fill in biodiversity gap in a large brackish-water basin. Moreover, drifting within large water masses, the planktonic protists are affected by only moderate salinity fluctuations (compared with the benthos), and therefore they can prosper in a brackish environment.

The Baltic Sea thus represents a clear example of how pelagic biodiversity in a large, osmotically stressed though relatively stable ecosystem is promoted when the fast-growing eukaryotic unicellular organisms are abundant. The new concept critically reconsiders Remane's model and refines the range of its application by discriminating between the salinity effects on diversity of large sessile versus small motile aquatic species in the fluctuating environment. This study is critical to shake loose from the outdated viewpoint that the Baltic Sea is "poor in species".

For further research into the mechanisms underlying the newly discovered brackish-water biodiversity pattern and the proposed protistan species maximum concept, the "Ulrich Schiewer Experimental Laboratory for Aquatic Cytoecology" (USE Laboratory, Fig. 2) was created in the framework of the German-Russian research cooperation supported by the German Federal Ministry of Education and Research (IB/BMBF project RUS 09/038). The work is also supported by grants from the Russian Foundation for Basic Research (RFBR 10-04-00943, 11-04-00053), the Leading Scientific School project 3276.2010.4, and Program "Biodiversity" of the Presidium of the Russian Academy of Sciences.

Figure 2. Logo of the German-Russian "Ulrich Schiewer Experimental Laboratory for Aquatic Cytoecology" (USE Laboratory) created for researching into the processes that underpin the new protistan species maximum concept; image: modified from Telesh et al., 2011.

References

Remane A., 1934. Die Brackwasserfauna. Zool. Anz. (Suppl.) 7: 34–74.

Telesh I.V., Schubert H., Skarlato S.O, 2011. Revisiting Remane's concept: evidence for high plankton diversity and a protistan species maximum in the horohalinicum of the Baltic Sea. Mar. Ecol. Prog. Ser. 421: 1–11.

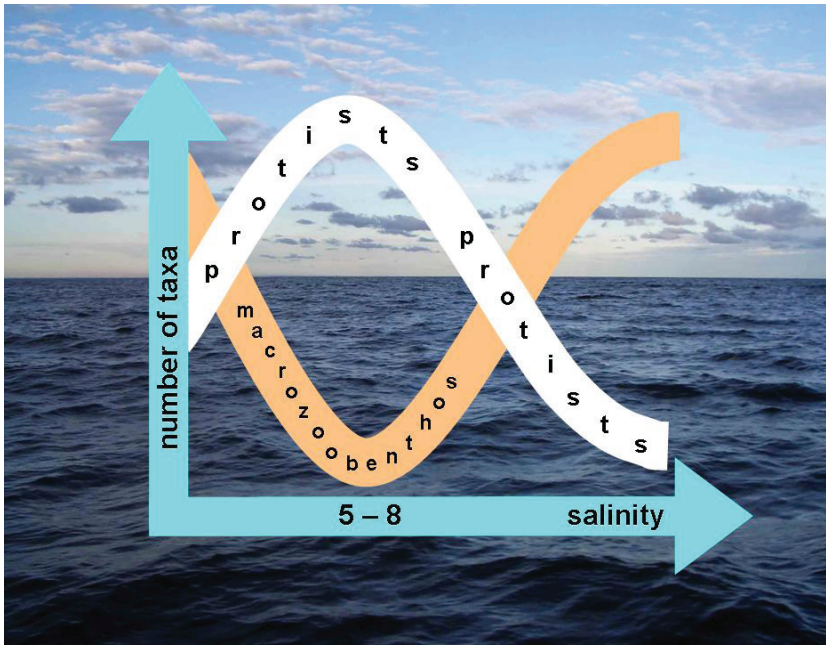


Figure 1. Protistan species maximum in the horohalinicum of the Baltic Sea challenges the Remane's Artenminimum model for macrozoobenthos; image: modified from Telesh et al., 2011.

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Application of the EU Water Framework Directive Methods in Turkey

Aquatic ecosystems are undergoing various changes due to increasing anthropogenic effects. Aim of the EU Water Framework Directive (WFD) is to upgrade ecological quality (good water status) of all waters (inland surface waters, transitional waters, coastal waters and groundwaters) by 2015. For this purpose, ecological quality of aquatic ecosystems should be determined by using biological, hydromorphologi-

cal and physicochemical quality variables. The benthic macroinvertebrates are the most widely preferred group for biological monitoring. The application of benthic macroinvertebrate based indices is a necessary prerequisite for determination of ecological quality of the running water ecosystems.

In Turkey, the saprobic index, the diversity, the biotic and the multivariate approaches have been applied to water quality assessment based on the benthic macroinvertebrates during last 20 years. However, the WFD methods have been recently applied to various running waters by our team in Biomonitoring Laboratory (Biology Department of Science Faculty of Hacettepe University). The aim of these researches is to determine reference conditions of different running water types

Some members of the Biomonitoring Laboratory during a field trip to the Black Sea (Eastern Region). Nilgün Kazancı, in the middle.

An alpine stream at Ovit Pass in Eastern Black Sea Region.

using the biological, physico-chemical and hydromorphological characteristics, specific benthic macroinvertebrate communities of reference sites of the each running water types and the "Ecological Quality Ratio" of sites by using multimetric index and multivariate methods included in WFD. These researches have indicated that the WFD methods are applicable to waters in Turkey. However, adaptation of some indices, to the WFD methods, is necessary. For example, there is no commonly accepted biotic index for the territory. The preparation of applicable biotic indices using faunal elements of Turkey is an ongoing process. However, the following difficulties slow down biomonitoring activities: inadequate information on aquatic fauna, the need to prepare several regional biotic indices is inevitable due to the complex geographic structure and lack of an agreement among the scientific communities and political institutions on necessity of biological monitoring. The results of these researches are being published regularly in a new Turkish journal "Review of Hydrobiology" (www.reviewofhydrobiology.com), which is edited by the undersigned.

Such a work needs a lot of effort by many research teams both on the different running water types and on faunal researches. But unfortunately, there are not many teams working on these topics.

The biological monitoring should also be a part of river basin management plan for the determination of running water ecological status in Turkey. According to the Water Framework Directive, the "ecological status" of running waters should be evaluated by the using biological indicators. Therefore, freshwater biologists play a key role in leading the politicians to implement the basic concepts of the Water Framework Directive.

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The 7th International Shallow Lake Conference Wuxi, China, April 24-28, 2011

The Shallow Lake Conference was jointly organized by the Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (NIGLAS), Nanjing and Government of Wuxi City, China. Prof. Brian Moss (the president of the International Society of Limnology, University of Liverpool, UK.) was the chairman of the scientific committee, and Prof. Zhengwen Liu from the NIGLAS chaired the conference organizing committee. About 300 limnologists and limnology students from 22 countries participated in the conference.

The conference focused on the theme "Conservation, Management and Restoration of Shallow Lake Ecosystems Facing Multiple Stressors".

The five main topics were:

- Fish, zooplankton, and food webs in shallow lakes
- The functional role of sediments and benthic organisms in shallow lakes
- Plankton and macrophytes in shallow lakes
- Multiple stresses and ecosystem changes in shallow lakes
- Water quality, restoration and management of shallow lakes

On April 24, 2011, at 9:00 AM, Prof. Brian Moss formally inaugurated the Conference. Mr. Xu Jie, the executive vice mayor of Wuxi

Participants of the 7th International Shallow Lake Conference

City, warmly welcomed the conference participants, and introduced the social and economic developments of Wuxi, and drew attention to the water quality problems of Taihu Lake. Mr. Huasheng Qiu (vice director, Bureau of International Co-operation, Chinese Academy of Sciences), Prof. Guihua Lu (vice director, Department of water resources of Jiangsu province), Mr. Wei Zhu (vice director, Lake Taihu Basin Authority), and Prof. Ji Shen (vice director, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences) also delivered the opening addresses and welcomed the participants.

After the opening ceremony, Prof. Brain Moss delivered the first plenary lecture titled "All things are connected: the culture and cultures of shallow lake and wetlands". Other leading limnologists from around the world who gave plenary talks were: Erik Jeppesen, Martin Søndergarrd, Liesbeth Bakker, Wolf Mooij, Zhengwen Liu, Thomas A. Davidson, Lars-Anders Hasson, Mariana Meerhoff, Lirong Song, Sandra Brucer, Linzhang Yang, Sarian Kosten and Qinglong Wu. In addition to the fourteen plenary talks (covering a range of the conference themes listed above), eighty one oral papers and eighty five poster papers were presented. Theses talks encompassed a variety of regional problems relating to water quality, including lake eutrophication and pollution, lake restoration and effects of current global climate change in the shallow lake ecosystems.

The conference participants took part in the mid conference excursion on 26 April: this included visits to the Taihu Lake Ecosystem Research Station and Wuli Lake Ecological Restoration Demonstration Region. Wuli Lake is a bay at the northern part of Taihu Lake, which faces serious water pollution and eutrophication problems now. The Wuxi government is paying great attentions to the comprehensive management and restoration of Taihu Lake. There are many on-going restoration projects on Taihu Lake being carried out by the Chinese Academy of Sciences, several universities and other research institutions.

At the closing ceremony on 28 April, Prof. Brain Moss expressed his appreciation, and thanked the Nanjing Institute of Geography and Limnology and the Wuxi Government for organizing the conference, and announced the venue for 8th shallow lake conference, to be held in Turkey in 2014.

The Proceedings of the Conference will be published in a Special Issue of *Hydrobiologia* in 2012 which will be edited by Zhengwen Liu, Boping Han and Ramesh D. Gulati (for more information please visit website (www.shallowlake2011.com).

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Flathead Lake Research Gains National Recognition


RESEARCH HIGHLIGHTS Selections from the scientific literature

MICROBIOLOGY

'Jet lag' weakens malaria parasite

The periodicity of the life cycle of malaria parasites during host infection suggests that these organisms are regulated by circadian rhythms. Aidan O'Donnell at the University of Edinburgh, UK, and his team found that parasites whose rhythms were not synchronized with those of their hosts were less able to replicate in, and transmit out of, the hosts.

The researchers 'set' the circadian rhythms of mice and the rodent parasite *Plasmodium chabaudi* by keeping them in one of two rooms with opposing 12-hour light–dark cycles. They then infected the mice with parasites that were either in or out of sync with the animals' own cycles.

When mouse and malaria rhythms were the same, parasite densities during the replication and transmission stages of infection were double those seen for parasites that were out of sync with the mice. ***Proc. R. Soc. B* doi:10.1098/rspb.2010.2457 (2011)**

ECOLOGY

The effects of opossum shrimp

An analysis of more than a century's worth of ecosystem data has revealed how the introduction of a single species of shrimp to a US lake led to a cascade of changes in the food web.

Bonnie Ellis at the University of Montana's Flathead Lake Biological Station in Polson and her colleagues examined published data from Flathead Lake (**pictured**) dating back to the end of the nineteenth century. They found that the opossum shrimp (*Mysis diluviana*), which was introduced into the lake in the mid-1980s, became a food source for the previously introduced but theretofore unobtrusive lake trout, which now dominates the lake.

The lake trout went on to eat all of the kokanee salmon, depriving eagles of their annual spawning kokanee feast. In addition, the shrimp consume large zooplankton, so small zooplankton now dominate. Because the latter do not consume as much algae, algal levels have increased, leading to a 21% rise in photosynthesis. ***Proc. Natl Acad. Sci. USA* doi:10.1073/pnas.1013006108 (2011)**

CLIMATE CHANGE ECOLOGY

Butterflies break out earlier

As Earth's climate changes, many butterfly species are emerging — from cocoons or from hiding — earlier in spring. Researchers have identified traits in UK butterflies that predict the largest shifts seen in emergence times over the past 30 years.

Sarah Diamond, then at the University of North Carolina, Chapel Hill, and her colleagues analysed a data set on UK butterflies such as the speckled wood (*Pararge aegeria*, **pictured**) during a period in which the country's spring temperatures rose by 1.5 °C. Butterflies that eat a lower diversity of plant species as caterpillars showed larger shifts in emergence time. The authors suggest that the butterflies may be tracking changes in their host plants' annual schedules.

Bigger shifts were also apparent in butterflies that overwinter as adults rather than as pupae or larvae. These species may respond more quickly to warm temperatures, the authors say. **Ecology doi:10.1890/10-1594.1 (2011)**

CELL BIOLOGY

Best of two microscopes

Electron microscopes allow cell biologists to visualize the tiniest of cellular features, but struggle to locate rare features or events. Fluorescence light microscopy (FM) is well suited to this task, but its resolution is low. So Marko Kaksonen, John Briggs and their colleagues at the European Molecular Biology Laboratory in Heidelberg, Germany, combined the two modalities to image rare

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Recent research conducted at The University of Montana's Flathead Lake Biological Station has provided important data about how introductions or invasions of nonnative organisms can lead to major changes in the structure of aquatic ecosystems.

UM Assistant Research Professor Bonnie Ellis and FLBS Director Jack Stanford were among a team of scientists from around the Pacific Northwest who studied how the invasion or introduction of organisms into the lake has affected its biological diversity.

The research was published in the Proceedings of the National Academy of Sciences, and the scientists' study, "Long-term Effects of a Trophic Cascade in a Large Lake Ecosystem," will be highlighted in an upcoming issue of Nature.

The researchers looked at a 120-year record of the food web structure and dynamics of the lake, the largest freshwater lake in the western United States. They examined the mechanisms of what is known as a trophic cascade, which occurs when reciprocal effects of predators on prey alter the abundance, biomass or productivity of a population, community or trophic level across more than one link in the food web.

The data reveal four distinguishable periods: the pre-1920 native period, when native species dominated the fish community (although numerous nonnative fishes had been introduced); the kokanee period from 1920 to 1984, when many nonnative fish species first appeared and nonnative kokanee expanded to a large population size, replacing

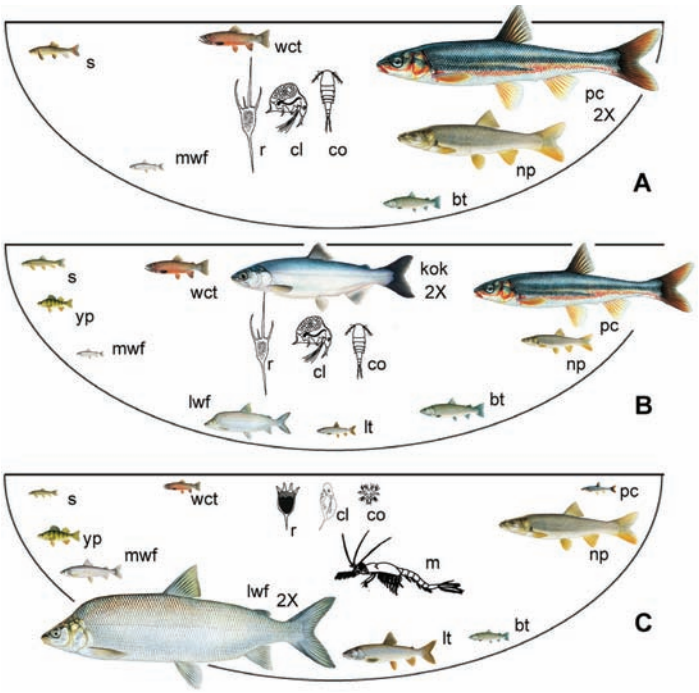
cutthroat trout as the predominant angler catch; the period from 1985 to 1988, when the population of introduced opossum shrimp, *Mysis diluviana,* grew rapidly and then declined to less than half the peak density while the kokanee population crashed; and the lake trout period from 1988 to today, when a new community dominated by the roles of the opossum shrimp and lake trout seem to have stabilized.

In particular, the team looked at the invasion of the opossum shrimp during the 1980s.

"The population of opossum shrimp in the lake exploded from 1985 to 1988," Ellis said. "During that time, the population of kokanee in the lake fell and never recovered, bull trout declined and lake trout came to be the dominant top predator. At the same time as the kokanee decline, bald eagle numbers dropped with the collapse of their primary prey.

"But the most important and unexpected finding is that the rate of primary productivity (growth of algae) increased suddenly by 21 percent, exactly coherent with the peak mysid numbers in 1986, and has not decreased since then. Basically, the mysid invasion changed the entire food web and in that way altered the water quality in Flathead Lake by increasing algae growth."

The study also noted the loss of the kokanee salmon. Anglers reported kokanee, landlocked sockeye salmon, in Flathead Lake as early as the 1920s. The Flathead Lake stock came from the hatchery at Bonneville, Ore. The kokanee began spawning very successfully in two groundwater upwelling zones on the lake shoreline. By 1940



The food web of Flathead Lake emphasizing three of the trophic levels altered by the introduction of nonnative fishes and an opossum shrimp, Mysis diluviana. Dominant fish and zooplankton species are shown in the native community (A; 1915-1916), following more than a half century of nonnative fish introductions (B; 1981, 1983) and the present day community following the introduction of Mysis (C; 1996-2005). Size of fish roughly represents abundance during each period with '2X' denoting species about twice as abundant as shown. wct = westslope cutthroat trout, bt = bull trout, mwf = mountain whitefish, np = northern pikeminnow, pc = peamouth chub, s = longnose and largescale suckers, lt = lake trout, lwf = lake whitefish, kok = kokanee, yp = yellow perch., m = Mysis, r = rotifers, cl = cladocerans, co = copepods. (Ellis et al. 2011).

kokanee replaced cutthroat trout as the dominant catch of anglers.

During 1979-83 the kokanee population was estimated at 1.6 million to 2.3 million. From 1980 to 1985, high congregations of bald eagles gathered to feed on the kokanee spawning run at the McDonald Creek spawning site.

"With the invasion of the opossum shrimp, lake trout that had been introduced 80 years earlier but remained at low densities flourished," Stanford said. "The shrimp provided a deep water source of food where little had been available previously. Lake trout, who fed on the shrimp, now dominate the lake fishery, at the expense of the native fishes."

In addition to the loss of the kokanee population in the lake, native bull and westslope cutthroat trout also are imperiled, he said. The research shows that recovery of bull and cutthroat trout will be difficult given strong food web control by the expansive lake trout population.

"An important challenge now is to determine the tipping point for what might be the next ecosystem state as the community continues its internally driven dynamics – and how external drivers such as climate change and direct human intervention, such as introduction of yet another exotic species or manipulation of the lake trout population by netting in an attempt to protect the remaining bull trout, affect those dynamics," Ellis said.

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Publication and Copyright notice:

Bonnie K. Ellis, Jack A. Stanford, Daniel Goodman, Craig P. Stafford, Daniel L. Gustafson, David A. Beauchamp, Dale W. Chess, James A. Craft, Mark A. Deleray, and Barry S. Hansen. 2011. Long-term effects of a trophic cascade in a large lake ecosystem. Proceedings of the National Academy of Sciences 108 (3):1070-1075.

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BioFresh - Biodiversity of Freshwater Ecosystems: Status, Trends, Pressures, and Conservation Priorities

BioFresh is an EU-funded international project that aims to build a global information platform for scientists and ecosystem managers with access to all available databases describing the distribution, status and trends of global freshwater biodiversity. BioFresh integrates the freshwater biodiversity competencies and expertise of 19 (largely European) research institutions.

Scientists and water managers have collected vast amounts of data on freshwater biodiversity. Nonetheless, it is often impossible to be certain of the geographic range of a species. This is because the existing data from these studies are widely dispersed and often gathered in locally-managed databases, many of which are not publicly available. If these data were integrated and made easily accessible to scientists, policy makers and planners, they could be used to improve and estab-

lish effective plans for conservation and improve our understanding of the services provided by aquatic ecosystems.

BioFresh aims:

- BioFresh will improve the capacity to protect and manage freshwater biodiversity by building an information platform as a gateway for scientific research on freshwater biodiversity.
- Raising awareness of the importance of freshwater biodiversity and its role in providing ecosystem services.
- Predicting the future responses of freshwater biodiversity to multiple stressors in the face of global change.

BioFresh freshwater biodiversity meta-database

A major challenge is to integrate new data within existing databases on freshwater biodiversity and distribution patterns whilst imposing strict quality controls. Within BioFresh, these data will be linked with geographical and socio-economic information. By developing a universally accessible information platform, BioFresh will foster our understanding of present freshwater biodiversity and changes expected for the future.

BioFresh will use existing data to build predictive models of biodiversity change in order to inform freshwater biodiversity management and conservation. Ultimately, the interoperable meta-database - analysed using geo-spatial visualisation tools and predictive models - will be made freely accessible through an online data portal. The portal will form an unprecedented global information tool for decision makers, stakeholders and users of freshwater biodiversity.

Online data portal

We encourage the publication of basic freshwater biodiversity related data through our online data portal. The portal aims to integrate freshwater biodiversity data from all possible sources, providing open and free access to users. The portal will serve as a data discovery tool, allowing scientists and managers to integrate and analyse distribution data to elucidate freshwater biodiversity patterns and trends.

Submit data to BioFresh

BioFresh is constantly searching for freshwater biodiversity databases for both completing its meta-database and for publishing the data on the data portal. We invite scientists, NGOs and other persons/institutions to contribute freshwater biodiversity datasets to BioFresh, to be made available through the data portal.

We believe that by contributing to the BioFresh meta-database, your dataset will gain visibility, help further our understanding of the freshwater systems, and potentially catalyse new collaborations with other researchers. We will offer full acknowledgements on the portal and provide clear citation guidelines for users consulting your data.

Links and contact details

Data submission: data@freshwaterbiodiversity.eu

BioFresh enquiries: freshwaterbiodiversity@igb-berlin.de

http://www.freshwaterbiodiversity.eu

http://www.freshwaterbiodiversity.eu/index.php/metadatabase.html

http://www.freshwaterbiodiversity.eu/index.php/dataportal.html

Migratory terns need a holiday too

The Australian continent is part of the East Asian-Australasian Flyway which links with east and south-east Asia through to Siberia and Alaska. Australia's vast golden-sand coastline entices millions of shorebirds and seabirds to frequent its shores. Many of these birds are migrants escaping from the northern cold, spending several months each year feeding and enjoying the Austral weather before returning to their northern breeding grounds.

Shorebirds, commonly known as waders (*Charadriidae)*, are generally familiar to people as they can be easily observed feeding actively close to the shoreline. They are widely appreciated as great travelers, some clocking up distances of more than 20,000 km each year. Another bird group, but perhaps less noticed, are the terns (*Laridae*) that also travel vast distances to reach Australian shores. Unlike waders that forage on substrates in shallow water, migrant terns typically forage in the open sea, only to come to coastal sandbanks to roost.

Most people in Australia live along the eastern coastline. One such urban sprawl, Brisbane, lies in a large estuary called Moreton Bay. The Bay's importance to migratory shorebirds is recognised by the United

Tens of thousands of terns from East and Southeast Asia stopover and roost on estuary-type sandbanks during the Austral summer in popular recreational waterways at the cities of Caloundra and Noosa, in a major tourist region known as the "Sunshine Coast" (photo by Brett Wortman).

Nations Convention on Wetlands of International Importance as Ramsar Site No. 41. Each year large numbers of migratory waders, such as grey-tailed tattlers *Tringa brevipes*, bar-tailed godwits *Limosa lapponica*, sanderlings *Calidris alba*, eastern curlews *Numenius madagascariensis*, and Pacific golden plovers *Pluvialis fulva*, come to forage on its shores. As a consequence, the area has been made into a Marine Park for the protection of waders and of their habitats.

The coastline of Moreton Bay also represents one of the fastest growing residential regions in Australia, not to mention the millions of tourists attracted to the area each year by the warm climate and favourable lifestyle. At the northernmost tip of Moreton Bay is a narrow and shallow body of water squeezed between a sand island and the mainland city of Caloundra. Mobile sandbanks sit between the island and the city, and the two land masses are almost joined during low tide which exposes intertidal mudflats ideal for feeding waders and sandbanks ideal for roosting terns. The waterway is especially popular for a variety of recreational activities, which range from walking and four-wheel driving on the sandbanks to jet-skiing and yachting in the surrounding waters.

A study (Chan and Dening 2006) showed that more than 40 000 terns use these sandbanks each year, in an area that measures less than 100 ha. A vast majority of these are migrant terns from the north. One count alone revealed more than 38 000 common terns *Sterna hirundo* of the subspecies *longipennis*, making it the largest single congregation in the world. Large numbers of migratory white-winged black terns *Chlidonias leucoptera* and little terns *Sterna albifrons* were also found from September to April, while smaller numbers of three resident tern species can be seen throughout the year. These six species of terns overwhelmingly predominate over the waders, which numbered less than 1 000.

At Noosa, 55 km north of Caloundra, lies a smaller estuary-type sandbank habitat at the mouth of Noosa River. Similar numbers of terns have been counted on its mobile sandbanks (Chan et al. 2008). Noosa is even more popular than Caloundra as a tourist holiday destination, but its waters is not part of the Moreton Bay Marine Park. A large number of human activities have been observed using the sandbanks and surrounding waters, but no measures are in place to protect the birds or the sandbanks.

Based on criteria contained in the Ramsar Convention, areas that support ≥ 20,000 or ≥ 1% of the individuals in the East Asian-Australasian Flyway population of one shorebird species or subspecies are adjudged "Areas of International Importance". Caloundra sandbanks form part of the larger Moreton Bay, which as a single entity is declared an Area of International Importance (Watkins 1993) owing to the large number of waders using the Bay. Its Marine Park status offers some incidental protection to terns at Caloundra sandbanks. The same cannot be said about Noosa, whose sandbanks similarly support terns rather than waders, and so has been overlooked as an Area of International Importance. But the number of common terns alone at Noosa would meet the criteria for identifying the area as an Area of International Importance; that is if the tern is a wader. Clearly criteria contained in the Ramsar Convention need to be reassessed and their wader focus shifted to accommodate other marine birds. Recognition is required for immediate protection to ensure terns could continue their long-term visitation to estuary-type sandbank habitats located close to human activities.

A reduced emphasis on waders will also see studies expanding to other marine birds and associated habitats that have previously been overlooked. Caloundra and Noosa sandbanks represent just two vital stopover and non-breeding roosting sites for migratory terns, which must share their habitats with recreational activities. No doubt other favourable and equally important estuary-type sandflats exist, but yet to be surveyed.

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Chan, K. and Dening, J. (2006) Use of sandbanks by terns in Queensland, Australia: a priority for conservation in a popular recreational waterway. Biodiversity and Conservation 16:447–464.

Chan, K., Dening, J. and Malinen M.-J. (2008) Can tern migrants coexist with urban development and estuarine recreational activities? In: Wetlands: Ecology, Conservation and Restoration. Editor: R. E. Russo. Pp. 373–389. Nova Science Publishers, New York.

Watkins D. 1993. A National Plan for Shorebird Conservation in Australia. RAOU Report No. 90, Royal Australasian Ornithologists Union, Melbourne.

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Large numbers of terns mix with waders and gulls in sandflats off the coast of Caloundra (photo by Brett Wortman).

Obituary

George W. Saunders, Jr. 1926 – 2010

George Saunders died on December 7, 2010 in Olney, MD USA.

Dr. Saunders held academic appointments at Wayne State University (1961–1962) and the University of Michigan (1963–1972). His research and writing during this period centered on phytoplankton photosynthesis and other issues emerging from the public awakening to problems of eutrophication in lakes, e.g.,

G W Saunders. 1957. *Interrelations of dissolved organic matter and phytoplankton*. Botanical Review, 23:389-410.

G W Saunders, F B Trama, and R W Bachmann. 1962. *Evaluation of a modified C^{14} technique for shipboard estimation of photosynthesis in large lakes*. Univ of Michigan, Great Lakes Research Division. No. 8. pp. 1-62.

G W Saunders. 1969. *Some aspects of feeding in zooplankton* . In: *Eutrophication: Causes, Consequences, Correctives. Proceedings of a symposium.* National Academy of Sciences. Washington, DC. pp. 556-583.

G W Saunders. 1972. *Potential heterotrophy in a population of Oscillatoria agardhii var. isothrix Skuja.* Limnol. and Oceanogr. 17:704-711.

He joined the Division of Biomedical and Environmental Research of the Atomic Energy Commission (AEC) in 1972 as an aquatic ecologist. He had a talent for asking penetrating central questions.

He conducted an active research program during most of this period. He investigated algal metabolism in an assortment of productive temple ponds near the campus of Madurai Kamaraj University in South India working with colleagues and students, both Indian and American. Field work in USA was done on weekend trips to Sanctuary Lake near the University of Pittsburgh's Pymatuning Field Laboratory in western Pennsylvania, e.g.,

G W Saunders, W P Coffman, R G Michael, and S Krishnaswamy. 1975. *Photosynthesis and extracellular release in ponds of South India*. Verh. Int. Verein. Limnol. 19:140-146.

Lake Melakkal near Madurai, Tamil-Nadu, India; colleagues K. Navaneethakrishnan (left) and R. Marzolf (second from left) are seen on shore (ca. April 1981; photo by G. Saunders)

G W Saunders with T A Storch. 1971. *A coupled oscillatory control mechanism in a planktonic system.* Nature 230:59-60.

G W Saunders with T A Storch. 1978. *Phytoplankton extracellular release and its relation to the seasonal cycle of dissolved organic carbon in a eutrophic lake.* Limnol. and Oceanogr. 23:112-119.

Marzolf, G R and G W Saunders. 1983. *Patterns of diel oxygen changes in ponds of tropical India.* Verh. Internat. Verein. Limnol. 22:1722-1726.

Dr Saunders was Secretary 1970-1976 and President 1977–1978, American Society of Limnology and Oceanography.

He and his wife, Marilyn (deceased 2001), are survived by three daughters: Patricia Saunders (PhD in ecology, Univ. of Georgia) of Mansfield, OH; Christina Saunders Sturm (PhD in medical anthropology from Case-Western Reserve Univ.) of Davis, CA and Linnaea Saunders (Post-grad diploma from Courtauld Institute of Art, London) Conservator of Paintings in Los Angeles, CA and three grandchildren Julia Brauner, Katrina and Tristan Sturm.

Richard Marzolf
Scientist emeritus, US Geological Survey

Claire Schelske
Eminent Scholar Emeritus,University of Florida

Configuration set up for 24-hour time-series incubations at Sanctuary Lake, Pennsylvania, U.S.A. (16 July 1984; photo by G. Saunders)

George Saunders working at a site on the Beartooth Highway at Long Lake in the Rocky Mountains, near Cooke City, Montana, U.S.A. (August 1984; photo by M. Saunders)

Courses

Web Access to Numerical Tools of Limnology

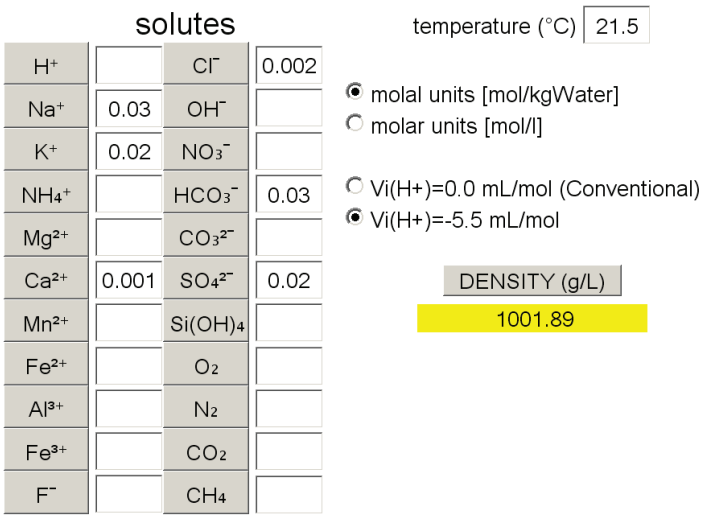
Density stratification in lakes controls the vertical circulation and hence is a central physical quantity in physical limnology. Compared with ocean waters, the chemical composition of lake waters is much more variable. Especially in meromictic lakes, such gradients of chemical composition are sometimes encountered even within the same lake between mixolimnion and monimolimnion. Hence a method for calculating density based on the chemical composition is required. An inclusion of density contributions of solutes requires the use of specific coefficients. These coefficients are, however, not readily available, at least not for all limnologically relevant solutes. In addition, the implementation of these coefficients is a tedious piece of work.

The form is provided on the web site http://www.ufz.de/webax . The open spaces can be used for inserting the concentrations of density relevant substances. Also temperature can be added. The web calculator provides the density within about a second in the yellow field.

For an easy access, we have placed a calculator on the Web, which derives (potential) density of lake water based on the chemical composition and temperature. The composition of limnic waters can be inserted in a form on the internet site www.ufz.de/webax -> RHOMV. We have implemented the density calculation RHOMV which uses the inserted numbers from molar masses and molal volumes following the paper of Boehrer et al. (2010, Limnol. Oceanogr.: Methods 8, 567–574). The calculator also offers the convenient choice between molal and molar units for the input. Web calculators using alternative approaches (e.g. UNESCO) can also be accessed from this page. Interested colleagues are encouraged to suggest links to similar pages. We expect a further development of this site for numerical approaches to other relevant lake properties.

References

Boehrer B., P. Herzsprung, M. Schultze, and F.J. Millero (2010) Calculating density of water in geochemical lake stratification models, Limnol. Oceanogr. Methods 8, 567–574.



The form on the web site http://www.ufz.de/webax

Santiago Moreira
The Technical University of Dresden, Germany

Bertram Boehrer
Helmholtz Centre for Environmental Research – UFZ

Block Course on Physical Limnology

A block course on Physical Limnology was held from 28 March to 1 April 2011 at the University of Heidelberg, Germany. The course was intended for the Masters degree students of physics and postgraduates working in Physical Limnology. The aim of the course was to provide specialized training to physical limnologists, who work in small, limnological institutions and do not have access to specialized training.

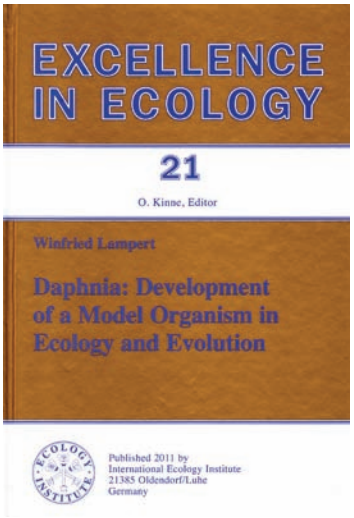
Basics of physical limnology were taught at an advanced level, while the special focus of this course was on transport and turbulence. Fourteen lectures were held on the following topics: stratification of lakes; stability and circulation; variability and climate sensitivity; Navier-Stokes equation and scaling; surface gravity waves; internal waves; properties of internal waves and ray waves; introduction to turbulent flows; spectral characteristics and measurements; momentum and mass transport in turbulent boundary layers; emission-pathways of methane in lakes; tracers in limnology, and living in a turbulent world - physical-biological interactions. The course was given by Prof. Andreas Lorke of the University of Koblenz-Landau, Dr. Hilmar Hofmann of the Limnological Institute at Konstanz, Dr. Johann Ilmberger of the University of Heidelberg and Dr. Bertram Boehrer of the Helmholtz-Centre for Environmental Research – UFZ. More information on the teaching programme can be found on the webpage www.intern.ufz.de/index.php?de=18470. We intend to continue the format of the block courses with varying focus. Announcements will be placed under the above listed URL. Interested candidates and colleagues may also contact Bertram.Boehrer@ufz.de directly.

Bertram Boehrer
Helmholtz Centre for Environmental Research – UFZ
www.ufz.de/limnophysik

Participants and teaching staff of the Physical Limnology course: B. Boehrer, the author, the sixth from the left (light coloured shirt). Some members of the staff are missing on the photo.

Book Reviews

Lampert, W. (2011). *Daphnia:* Development of a model organism in ecology and evolution. Excellence in Ecology, Book 21 (Ed. O. Kinne), International Ecology Institute, Oldendorf/Luhe, 250 pp



The International Ecology Institute (ECI), which was founded by Dr. Otto Kinne in 1984 annually awards the ECI Prize to outstanding research ecologists, in the fields of marine ecology, terrestrial ecology and limnology on a rotating basis. In 2006 the prize was awarded to Prof. Dr. Winfried Lampert who was-Director the Max-Planck Institut für Limnologie at Plön, Germany, from 1984 to 2006. The institut was closed in 2006, making place for the Max-Planck Institut für the Evolutionsbiologie. Dr. Kinne provides an introduction to the both Winfred Lampert, the author of the present book, the previous award winners and their book titles and to the ECI staff. Dr. Nelson G. Hairston, Jr., provides a Laudation " Winfried Lampert: Recipient of the Ecology Institute Prize 2006 in Limnetic Ecology". He gives a resume of Winfried Lampert's scientific career that began at the Limnological Institute at Konstanz, Germany in the early 1970's. It is here, that Winfried recognized that *Daphnia* could significantly impact and control algae; this included Winfried's field studies on the role of *Daphnia* grazing in causing in spring period a clear water

In the Preface Dr. Lampert recounts some interviews in Plön with the press, telling reporters why *Daphnia* is so well suited to study biological interactions in lakes, and the mechanisms of evolutionary adaptations that determine the composition of communities. Before he joined Plön, Winfried spent about 10 years at Constance and Frankfurt. During this period he attended the Symposium "The Structure of Zooplankton Communities at Dartmouth, USA. He tells us how *Daphnia* was recognized and turned out to be a model organism and how he at Plön was given the opportunity and scientific freedom to build a scientific laboratory with a focus on *Daphnia*, its ecology, its genetics, evolution and its impact on food web. Winfried dedicates the book to his wife, Renate, who as Winfried very aptly verbalizes himself, "put up with my obsessions with *Daphnia* for 40 years…"

This ten-chapter book by Winfried Lampert starts with *Daphnia* as a Model Organism, recalling the Mendelian Inheritance vis-à-vis "model organisms" that helps us to apply the knowledge gained to other organisms. He considers two necessary prerequisites for a model organism: 1). the full genomic information as is now available for *Daphnia pulex* genome (see further) and an almost complete sequencing of *Daphnia magna* genome; and 2) also because for *Daphnia*, contrary to other organisms, information is available on its biology, and its ecological and evolutionary responses to the intrinsic factors of community and ecosystem dynamics. Thus, although *Daphnia* fulfills the two requirements of a new model organism for establishing a new field "environmental genomics". Winfried considers that "It may still need some time before *Daphnia* gains recognition that it is not just another model organism of the classical type with a sequenced genome…". This seems to be also true based on the scientific literature published in Web of Science (WoS) during the last 40 years where *Daphnia* with 8800 publications takes the last place compared with other model organisms --compare with *Drosophila* on the top of the list with some 100000 publications. Without further revealing the contents of this chapter I want to spare the reader from the interesting details of this chapter so that he/she can read this chapter and find out what Winfried has to tell us for his hobby horse, the *Daphnia*. Before I move on to next chapter, I must mention that some readers may be interested to read a paper by Weisse (2006) who had the premonition already five years ago and paid a tribute to Winfried, mentioning "Thanks to the work by Winfried Lampert and his numerous colleagues worldwide, *Daphnia* has become a model organism of international freshwater ecology…"

Chapter 2 deals with "Testing Concepts and Hypotheses with *Daphnia"* as a useful organism for such appraisals. It covers a variety of study aspects: 1). Physiological Ecology, including the response of *Daphnia* feeding and growth rates to the changes in water temperature, to filter-feeding and food uptake rates in relation to the food concentration and body length, and more. 2). Selective predation, gape-limited predators and size-dependent predators have a bell-shaped electivity curve. Further, there is an excellent account of how the larger preys are strongly preferred by planktivorous fish and, the role played by size, and other environmental factors. Interestingly, for the invertebrate predators such as *Chaoborus,* the product of prey (*Daphnia*) size and its capture efficiency has a maximum at prey of intermediate size (~1.5 mm). The invertebrate predators feed on small prey so that predators affect the communities differently. Following this, a lucid account of the now well known The Size Efficiency Hypothesis (SEH: Brooks and Dodson, 1965) and its early development follows. But before describing the SEH in some detail, Winfried very rightly takes the reader back to the earlier, monumental work of Hrbáček (1962) who had (perhaps unknowingly!) laid the foundations of the SEH. Other important parts discussed in this chapter relate to competition and testing of the SEH and ecosystem effects of competition. Chapter 3 (Phenotypic Plasticity) discusses cyclomorphosis in daphnids giving the history of development of the ideas and referring to the importance (some 145 pages) given to cyclomorphosis by Hutchinson in his treatise book on limnology. It is fascinating to notice that temperature alone cannot control cyclomorphosis in daphnids: the process seems to be complex if we look at the causal inducing factors. The subsection give excellent accounts of inducible defenses, and morphological and behavioral response. Further, we are told how difficult it is to chemically identify kairomones and that identification of the kairomones will be a major task for the future.

The Chapter 4 on Diel Vertical Migration (DVM) is the second biggest in bulk (38 pages) in this book. The DVM phenomenon and

its history are described at some length before the proximate factors for the DVM are described. It is fascinating to note how *Daphnia* compensates for changes in light intensity with time by moving down if the light intensity increases, as at dawn, and moving up if the light intensity decreases, as at dusk. Equally interesting is the effect of several environmental factors, e.g. high food level and high info-chemical (kairomones) concentration in contributing to trigger the DVM. Next, there is an excellent account of the likely metabolic and demographic advantages of the DVM and how the hypotheses of the 1960s and 1970 regarding DVM were rebutted because the increased *Daphnia* fecundity at lower temperatures on migrating to deeper cold areas, cannot make up for the protracted development and reduced population growth (r) rate at lower temperatures. Thus, it is now well established that *Daphnia* migration brings about net costs in energy accretion and demography rather than gains. Predator Avoidance (Chapter 4.6) has been proposed as the ultimate cause of DVM. It is worthy of note that DVM is now considered as an optimization strategy with varying solutions in different taxa. That the DVM in daphnids is light triggered response to a chemical cue released by the predators (fish), was demonstrated unequivocally in the 12- m high plankton towers at Plön that allowed vertical simulation of light, temperature and food conditions (Fig. 35: page 79; Lampert and Co-workers). The chemical nature of this cue or kairomone (Chapter 4.8) is not clearly known but the pertinent literature collated by Lampert reveals that the kairomones are active molecules with size <500 Dalton, are water soluble, non volatile and highly stable under extreme temperature and pH conditions. There is also evidence that the kairomone is produced by bacteria living on the fish rather than by the fish itself. Unfortunately, however, our knowledge about such kairomones stagnates and is quite incomplete. There is an interesting section on reverse migrations in smaller-bodied zooplankton in response to invertebrate predation in deeper dark layers. The last short sub-chapter on DVM deals with effects of DVM on phytoplankton: DVM seems to have positive effects on phytoplankton growth but these effects are species specific as well as cause species diversity to increase.

The 15-page Chapter 5 Distribution starts with Aggregation (5.1) and various reasons for doing so, include finding mates, exploiting habitats and avoiding predation. The information seems to be limited and Lampert ends this subsection with a subtle note "Rather than swarms being the consequence of sexual attraction, it seems that the induction of sex is related to high population densities (competition for food)". Predator Avoidance (Chapter 5.2) relates to aggregations in relation to detection by the predator. The evidence of *Daphnia* swarming in response to predators is only indirect. Interestingly, however, a great majority of swarming individuals has the same allozyme genotype, and that clones of *D. longispina* do not aggregate. Chapter 5.3 (Search for Food) deals with aggregation in response to food availability: this response of daphnids is true only if food levels is >0.05 mg Cl-1. A more interesting literature observation is that if food quantity is similar but food quality (C:P ratio) shows a gradient, daphnids tend to orient around high quality food (low C:P ratios). It is remarkable (subhead: Ideal Free Distribution) how daphnids spatially distribute themselves in response to the temperature and food heterogeneity with depth. Some of this was work was done in the plankton towers in Plön and it facilitated maneuvering not only the temperature and food concentration but also the food quality.

Chapter 6 (Parasitism) is conspicuous, with its 76 pages being the thickest book chapter, comprising almost one-third of this book, it is at odds with other essential *Daphnia* study aspects, as reported in the foregoing review. Nonetheless, the information, including literature that Winfried has put together will be very handy for those wanting to work on *Daphnia* parasites. *Daphnia* epibionts, including algae, ciliates and even rotifers, are mentioned. Fungi parasitizing *Daphnia* are reported as aggressive because they are normally fatal. Microsporidia comprise the biggest group of parasites on the various body tissues. Being filter feeders, *Daphnia* are prone to easily transmit infection to other daphnids through ingesting the infected food particles. In addition, some 10 microparasites listed are reported to infect various specific body parts, including the gut wall, ovaries, haemolymph, body cavity, etc. The infections seem to be relatively more common in summer, i.e. after the spring peak. Especially *D. magna,* which switch to browsing at the sediment when algal resources in the water column are exhausted, get infected with the spores of parasites. It seems whereas stratification forms a barrier for infection, the vertical mixing ensures redistribution of spores in the water column. The parasite virulence is manifested in fitness reduction in the affected daphnids, i.e. reduction in fecundity or increased mortality. Better food availability apparently relaxes the resource competition between the host and parasite. Several other aspects of parasitism in daphnids dealt with in this chapter relate to the host size, foraging ecology, food conditions, conspecifics and defenses, temperature, food, predation and the ecosystem effects. I cut short the review of this chapter here due partly to the enormous amount of information that this chapter encompasses.

"Dormancy-Insights from Sexual Reproduction" (Chapter 7) starts with production of epihippia, their spatial and temporal dispersal. Indeed, the applicability of data on dormant *Daphnia* eggs is another example of *Daphnia* becoming a model organism. Strategies of the production and dispersal of the epihippia are described at some length. The sub-chapter 7.4 deals with paleolimnology and paleogenetics using head shields, abdominal claws and epihippia, which have proved very valuable tools in analyzing the dated cores for studying the past changes. This last includes also tracing the environmental and anthropogenic impacts, comprising the climate change, pollution history and the eutrophication. Winfried provides an excellent example of Lake Constance, Germany, nearer home: Fig. 9.3 shows that *D. hyalina* exclusively inhabited the lake until the 1940s when the proportion of both *D. galeata* and their hybrid became more dominant until to date. This nearly 100-year period extends from the era before and during the eutrophication to the return of oligotrophic conditions in the lake more recently. I would like the readers to peruse the closing part of this chapter Witnesses of the Past, and the last chapter The Genomic Future. Keeping the suspense, I must say that I found the reading quite spellbinding.

References to all the book chapters presented at the end cover 29 pages. I missed a précis or a resume at the end of some chapters but this is personal liking. The book with its hard cover and attractive format is written splendidly, and is easy to follow. I enjoyed the extra bit of reading needed for the reviewing. I congratulate Winfried Lampert for creating, composing and compiling an excellent book on *Daphnia*: It is meant for all those, who work with and love *Daphnia*. To me a book as this seems more indispensable now than ever before. A personal note for Winfried: while I read and reviewed, and enjoyed doing so, I also certainly looked for typos but I found the text flawless, unless one mulls over 'und' in place of 'and' as an error at one page! I believe it is a processing glitch that intercedes between a thought and its expression. I got great pleasure reading the book that you (Winfred)

were obliged to write. I will recommend the book to one and all, but especially to the *Daphnia* devotees, or aficionados, if you like.

Reference

Weisse, Thomas (2006) Freshwater ciliates as ecophysiological model organisms – lessons from *Daphnia*, major achievements, and perspectives. Arch. Hydrobiol. 167 1–4 371–402

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Van der Velde G, Rajogopal S, bij de Vaate A (eds) (2010) The Zebra Mussel in Europe, Backhuys Publishers,Leiden (2010), 490 pp

When the zebra mussel *Dreissena polymorpha* staged a trans-Atlantic invasion of North America in the late 1980s, jumping from its native Europe, it set off a major new international research initiative to study not only the biology of invasion by this species, but of invasive aquatic organisms in general. Over the last 20 years, more has been published on the zebra mussel than in all the previous years, mostly relating to its impact on North American systems. However, in the last decade, much of the interest in the zebra mussel has shifted back to its native continent, due in part to the invasion of new European regions such as Ireland and Spain. At the same time, its success in newly invaded areas has caused a resurgence of interest in its original biogeographical range. With the release of a new major book, The Zebra Mussel in Europe, editors Gerard van der Velde, Sanjeevi Rajagopal, and Abraham bij de Vaate have brought a compilation and synthesis of knowledge on this species and related freshwater and brackish water bivalves. This work is a grand achievement, and will serve not only to consolidate the disparate literature on the subject, but will undoubtedly stimulate even more work on this species and, perhaps more importantly, the globally emerging field of aquatic invasion biology.

The book certainly lives up to its title in being an international work. Geographically, chapters and authors span countries across Europe, from Ireland and Great Britain to Poland and Russia, from southern Spain to Norway, from Macedonia to Belgium, and most of the areas and watersheds between. In all, the impressive 95 contributing authors represent home institutions in 18 countries, and most of the authors reflect on their extensive experiences in countries other than those in which they are based. Most of the coverage is of Europe, as the designated topic, but the global impact of zebra mussel invasions gains coverage from treatment of other areas that have been invaded or are considered potential sites of future invasions. Thus, chapter authors from the United States, Canada, and New Zealand add to the geographic breadth of the book. Clearly, from a geographical standpoint, biologists from around the world will find much of value in this book.

Physically, the book is handsomely designed to be a major reference work, crafted from archival quality materials including acid-free hard-stock paper, bound into signatures in a single hard-cover volume. The book is of large format, approximating a standard A4 page size, thus making the book very effective for highly functional layouts that include text, halftone photographs, and numerous graphs and line art. The many illustrations are generally very good in quality throughout. The line art is very good to excellent, varying somewhat in quality from chapter to chapter. The authors have been very generous in their use of line art and graphics, which give the book much of its utility and will result in its frequent use for teaching and research. Halftones are good but not excellent, with contrast and resolution slightly below optimum due to medium-resolution screening, and thus low number of dots per inch, combined with the low-gloss paper stock. The few color photographs are nicely reproduced, as the four-color screening renders better results in these media than with halftones. Nevertheless, there are many photographs, ranging from histological sections to riverine landscapes, and the quality is more than adequate.

The book is arranged into six sections, which incorporate 41 chapters. The topics are comprehensive, ranging from basic biology of zebra mussels provided by several authors, to historical biology and paleontology coverage. There is excellent coverage of monitoring and surveillance, including in-depth treatment by Verween et al. of the related brackish-water species, *Mytilopsis leucophaeata,* which was introduced into Europe from North America, thus reversing the invasion direction of *Dreissena* spp., and providing a good comparative model. Distribution, dispersal and genetics are covered in 11 far-ranging chapters, spanning the areas of classical ecology through modern molecular genomics. Five chapters are devoted to food, growth and life history, including larval development, nutrition, reproductive behavior, and other topics. Ecology and ecological impacts of the mussels in both native and invaded waters receive in-depth coverage in seven chapters, including treatment of interactions with aquatic plants, predation by waterfowl, and associations with endosymbionts. The fifth section deals with indicators of water quality, exploring aspects of ecotoxicology, histopathology, and genotoxic effects, along with applications such as biofiltration, biomonitoring of pollution, and potential mitigation of eutrophication, in seven chapters. The last section devotes seven chapters to covering the consequences of biofouling, and control measures ranging from chemical to physical and thermal to biological control. Finally, the editors provide a brief summary and synthesis, which provides a coherent contextual conclusion to the work. The combination of this final chapter and the opening preface and introductory chapter do a commendable job of creating a unified work from what might otherwise break down into a somewhat fragmented compilation. The organization of the chapters and sections contributes to this unifying character, as does the single and extensive index. Finally, the work is unified by consolidation of all references for the book into a single alphabetical reference list, which includes highly valuable and comprehensive full citations of nearly 2000 references.

There are some expected problems with a book of this scope. The authors have done a good job of integrating disparate chapters into a cohesive volume, but as expected in a multi-author edited work, there is variation in style across chapters, and there are some gaps that undoubtedly resulted from authors not crossing beyond the specific topics of their individual treatments. Another deficiency is that there is little or no coverage of some important areas that are of interest to many biologists. An example is the lack of coverage of using zebra mussels as sentinel organisms for human and animal pathogens, despite the significant studies on this topic published in recent years, and despite the fact that the book devotes part of a section to the

mussels as indicators for other aspects of water quality.

For those who wish to extract or cite individual chapters, there will be some frustration from the fact that the references from literature cited are published in a single section at the end of the book. As pointed out above, this makes the entire book hold together better as a composite work, but the pagination for citing an individual chapter of the book thus becomes a bit awkward.

But the shortcomings are very few in this magnificent opus. Overall, this book is a superb contribution to the literature of both science and management policy for zebra mussels and other aquatic invasive species. It is a must-have for the library of anyone involved with freshwater biology in Europe, and anyone involved with aquatic resources or biotic invasions in any part of the world. Invertebrate biologists will also find this to be a valuable treatise on the impact of one highly successful and adaptable species. As one of the best and most comprehensive works produced on aquatic invasions, this will set the new standard for similar works in the future.

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E-mail: bconn@berry.edu

Designed Lakes and Ponds: Some Limnological, Aesthetic and Safety Considerations. A guide to designing, constructing and managing the limnology of small, man-made lakes and ponds By Arlo W. Fast

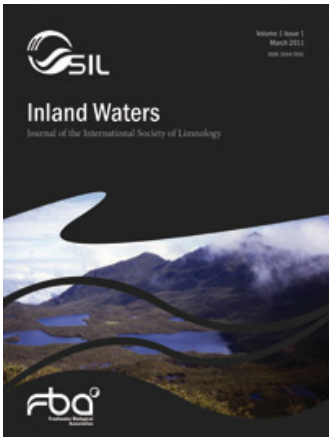
Designed lakes and ponds are often prominent features of golf courses, municipal parks, housing developments, industrial parks, and malls. Well-designed lakes add natural ambiance not easily captured by land-based landscaping. Lakes reflect the sky and attract an entirely different set of plants, birds, fish and other biota. Too often, designed lakes are not properly designed, constructed or maintained. Poorly designed and maintained lakes can create serious safety and maintenance problems, and create negative ambiance. This book describes some limnological, maintenance and safety issues that can make the difference between desirable, designed lakes and ones that are not pleasant or safe.

Softcover, ISBN 978-0-9820499-1-4, first edition printed 2010, 278 pp. List Price: US$26.95 plus shipping and tax; Available from Amazon.com, Barnesandnoble.com

Special Price for SIL members: US$13.00 including shipping and tax for shipments in the U.S. Send check or money order to: Limnological Associates LLC, PO Box 303, Grand Marais, MI 49839 For other than U.S. US$23.00 including shipping with payment in US$. Contact: arlofast@jamadots.com

Announcements

SIL Launches Inland Waters



The International Society of Limnology (SIL) has launched its new journal, Inland Waters. The journal is the scholarly outlet for the society and advances science by promoting understanding of inland aquatic ecosystems. The subject matter parallels the content of SIL Congresses and includes all aspects of physical, chemical, and biological limnology, as well as applied and regional limnology. The journal will include articles based on plenary lectures presented at Congresses, standard manuscripts, and focal articles entitled 'Research Briefs' intended to promote communication of emerging issues. To serve the interests of the society and its working groups, future special issues may be dedicated to particular themes, specific water bodies, or aquatic systems in a geographic area. Inland Waters benefits from an international Editorial Board and publication by the Freshwater Biological Association. Papers are available online to SIL members and subscribers as they are finalized. Print issues are available quarterly.

This first issue matches the goals of our new publication. The Baldi Memorial Lecture by William Lewis Jr. entitled "Global primary production of lakes" provides a synthesis of the deterministic and stochastic factors that control primary production with estimates based on background nutrient conditions and perturbed conditions arising from eutrophication. The Kilham Lecture by Robert Sterner entitled "C:N:P stoichiometry in Lake Superior: freshwater sea as end member" characterizes this deep, low-phosphorus lake that has efficient carbon cycling, excess nitrate, and limited organic carbon to promote denitrification. The plenary paper by Tamar Zohary and Ilia Ostrovsky entitled "Ecological impacts of excessive water level fluctuations in stratified freshwater lakes" provides a comparative analysis of water level fluctuations in response to climate, hydrology, and human exploitation that may exceed natural amplitudes. Evidence shows that deep lakes respond adversely to excessive water level fluctuations, demonstrated by biotic changes and increased internal loading, manifesting symptoms of eutrophication. Lastly, the paper by Jack Talling entitled "Some distinctive subject-contributions from tropical Africa to fundamental science of inland waters" highlights the unique features of water bodies on the continent that hosted our most recent Congress (Capetown, South Africa, August 2010).

Inland Waters supplants the familiar and historic scientific proceedings from SIL Congresses – the Verhandlungen. The Verhandlungen was first published in 1923 and the 30-volume series contains some 7785 manuscripts representing the progress and

contributions of the society (Jones 2010). Given the drastic changes in scientific communication, and with the support of Freshwater Biological Association, SIL has now made a switch to a rapidly accessible, peer-reviewed publication. We are looking forward to continued support from SIL members and receiving diverse and timely contributions.

John R. Jones
Editor-in-Chief

David P. Hamilton
Senior Associate Editor

Reference

Jones J. 2010. Verhandlungen epilogue. Verh. Internat. Verein. Limnol. 30:1671

32nd SIL Triennial Congress (4-9 August 2013 Budapest, Hungary)

The 32nd Congress of SIL will be held from 4 to 9 August 2013 in Budapest, Hungary in the heart of Europe, with the motto, "Diverse water- rich life".

Budapest is a magical city. The river Danube divides the city into two parts: a part with hills, castles on the right bank of the Danube (Buda), and the city with the line of hotels on the left side (Pest)(Picture 1.). The air of history, the pleasant climate, festivals and cultural events prove that the city is indeed the pearl of the Danube. Uniquely, the town also is endowed with two-thousand-year-old Roman remains, four-hundred-year-old monuments from the Turkish period, beautiful Romanesque churches, examples of the pinnacle of neo-Gothic and art nouveau architecture. The springs where Roman legionaries once bathed still flow at Római Fürdő (Roman Bath). It is the only capital city in the world where there are more than one hundred hot thermal springs. There are no other cities of comparable size anywhere where visitors can explore dripstone (stalactite) caves in the middle of the residential districts.

The natural conditions of Hungary are dominated by its location in the middle of the Carpathian Basin, Mediterranean, Atlantic, Continental and Alpine influences; and the mosaic pattern of the landscape. Due to its position, Hungary is a water transiting country, where 96% of surface water resources come from abroad. All these effects influence the unique and extraordinary surface and interstitial water resources of the country dominated by large and shallow lakes (Lake Balaton, Fertő, Velence) and big rivers (River Danube (Picture 2.), Tisza, Dráva). We must also

Picture 1. The view on Budapest and bridges across Danube River form Gellért hill

Picture 2. The view on Danube bend from hills of Northern Hungary

Picture 3. The Balaton Limnological Research Institute of the Hungarian Academy in Tihany

mention such unique waters that can rarely be found even in Europe: wetlands (Gemenc, Szigetköz and Hortobágy), natural oxbow lakes (Upper-Tisza region), soda lakes (Southern Great Plain), underground waters in caves (Aggtelek, Budapest), and medical, mineral and hot thermal springs (Héviz, Budapest, Hajdúszoboszló, Tata, Harkány, etc).

Hungary's water management, which is rooted in a tradition of number of decades, has given special attention to the realisation of ecological principles in water quality protection, flood control (sustainable river regulation), fisheries biology and fish farming. Some of the ongoing important projects are: European Lakes Under Environmental Stressors, Conserving Threatened Biodiversity in the Pannon Ecoregion: Evaluation Of Ecological, Morphologicaland Genetic Diversity Hotspots and Human Influenced Landscape, Habitat Selection, Stock Size, Reproduction and Genetic Variability of Asian Carps in Lake Balaton. Water management oriented applied research is carried out at research institutes of the Hungarian Academy (Balaton Limnological Research Institute (Picture 3.), Hungarian Danube Research Station) and university departments (Debrecen University, Pannon University Veszprém), which were originally founded for basic research to help the decision-making process of water management, environmental agencies and national park directorates.

Tentative themes for the SIL Congress in 2013 will be as follow: Limnology and global climate change, Biodiversity in aquatic ecosystems, Limnology of humic, soda and brackish waters, Human impacts, management, restoration and modelling of lake and stream ecosystems, Catchment impacts, nutrient dynamics and biogeochemical cycles, Food-web interactions in aquatic ecosystems, Molecular biology, taxonomy and evolutionary ecology of aquatic species, Sediment-water interactions, Wetlands and littoral ecology, Paleolimnology, Microbial ecology, and Ecology and impacts of invasive species.

Scientific excursions will introduce natural, historical, cultural, musical, architectural, gastronomic and recreational highlights, including several World Heritage sites. However, we wish is to guide the participants to our unique surface and ground waters, to present the country's natural values, its basic limnological studies and education as well as our water management projects. The following regions are included for introduction: Budapest and its surroundings, Central Danube Region, Northern Hungary, Lake Tisza, Lake Balaton, Northern and Southern Great Plain, Southern, Western and Central Transdanubia. More information will be soon at our home page (http://sil2013.hu)

The First Announcement containing major themes, site of the Congress and information on preliminary registration is expected in summer 2011.

Dr. Péter Bíró
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Chair of the Local Organizing Committee,
biro@tres.blki.hu

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Balaton Limnological Research Institute,
Secretary of the Local Organizing Committee,
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33rd SIL Congress, Turin, Italy.

At the general assembly held during the 31st SIL Congress in Cape Town in August 2010, I as Italian national representative presented the proposal to hold the 33rd SIL Congress in Turin, Italy, in summer 2016. In my presentation, I pointed out the logistics and convenience of holding such a congress in Turin, the host city. Turin is well connected to the European motorways and railway network. Turin also has an international airport as well as it is close to an intercontinental airport (Milan). I also illustrated the characteristics of the Lingotto complex, once home to the Fiat car factory, and now a large convention center. The accommodation facilities provided by the town, greatly improved since the XX Winter Olympic Games were held during 2006 in Turin, and are quite adequate for the proposed event.

The proposal was enthusiastically received by the General Assembly: from the warm welcome my proposal received, I quite believe that I was successful in my vigorous attempt to outline the artistic merits of the city known for its winemaking and gastronomic excellence. For those who could not attend the General Assembly, an extensive presentation of Turin as the venue of the 33rd SIL Congress is available at the website for Italian SIL members: www.silitaly.it.

Obviously, it is too early to sketch out a scientific programme. Nevertheless, I have no doubts that it will be an interesting congress because the Italian limnology has a long history and does not live only on traditions and past glories. The Italian limnology is still very active and productive, despite suffering, like other environmental sciences due to the persistent lack of interest and inadequate funding from the political managers. I am confident that in the 33rd SIL

View of Turin with the Mole Antonelliana, the symbol of the city, in the foreground.

Congress in Turin we will have days of exciting discussions during the lectures including seminal plenary lectures and poster sessions. There will be chances for all for scientific exchange of ideas, also at the artistic and gastronomical gatherings.

Arrivederci a Torino.

Roberto Bertoni
SIL Italian national representative
r.bertoni@ise.cnr.it

Conference on Ecological Problems of Tourist Lakes, 20-23 June 2011, Tihany, Hungary

The Balaton Limnological Research Institute of Hungarian Academy of Sciences cordially invites you to the conference on "Ecological Problems of Tourist Lakes," which will be held in Tihany, Hungary, from 20 to 23 June 2011.

Please register if you are interested to attend the conference by using the Registration Form available in our website (www.blki.hu/touristlakes2011), and also visit the website for regular updates on the scientific and social programs.

The main conference topics of the of tourist lakes are: eutrophication, external and internal nutrient load, algal blooms, control of aquatic macrophytes, water pollution, water level fluctuations, mosquito and midge swarming, fish diseases and kills, invasive species, and shoreline management.

Hope to see you at Lake Balaton!

Móra Arnold
marnold@tres.blki.hu

I apologize that this newsletter was delayed. For those interested, I include this for information only. —Ramesh Gulati, Editor, SILnews.

First International Conference on Integrative Sciences and Sustainable Development of Rivers in Lyon, France, June 2012

This first edition represents one of the rare opportunities for meetings and exchanges between researchers and rivers professionals from Europe and from all over the world and allows them to:

- Take cognizance of Rivers complexity and diversity;
- Share their experiences in terms of research and actions, implementation of local politics led in the framework of watershed districts in particular for European examples

Two main conference themes will be presented:

a. **The production of scientific knowledge feed the management politic** (the understanding and the evaluation of river functioning, functions of rivers and the services they provide, Management strategies for rivers: interactions with scientist

b. **From knowledge to actions: feedbacks on management practices at different scales?** (Rivers and their longitudinal corridors, Rivers and large cities, Rivers and their interface areas, Rivers and the River mouths…)

The call for papers will focus on three different types of contributions: scientific communications, feedback on management practices and prospective papers. To submit a paper, a declaration of intent must be sent to the secretariat before October 30, 2011 and then the final paper of one or two pages in English or in French, must be sent by December 1st, 2011.

Organization:

- A 1st day with scientific and specialized workshops organized by the partner international associations.
- Two, 5 days of conferences, with alternating plenary and parallel sessions
- Scientific and technical posters
- A post-conference technical tour, on the 5th day's afternoon
- Social events and a special programme for the accompanying persons
- Simultaneous translation in English and French, will be provided during all the sessions and the technical tour.

Calendar:

- Call for papers: **September, 2011**
- Deadline for declaration of intent: **October, 2011**
- Deadline for abstracts submission: **December, 2011**
- Notification of acceptance for oral or poster presentation: **February, 2012**
- Registration: **March, 2012**

Organizers:

- ZABR (Rhone Long Term Environmental Research Observatory)
- GRAIE (the Rhone-Alps Group of Research on the Infrastructures and Water)

Information:

GRAIE
Conference Secrétariat
BP 52132 – F-69603 VILLEURBANNE CEDEX
France
Tel: +33 (0)4 72 43 83 68
asso@graie.org – http://www.zabr.org

Rhone river, France – P. Gaydou - ZABR

The IXth International Symposium on Cladocera (ISYMCLA), Verbania 2-8 October 2011

The International Symposium on Cladocera will take place in Italy, on 2-8 October 2011, twenty-five years after the first Cladocera Meeting, in Budapest, which was organized by Lazlo Forrò, the late David Grosvenor Frey and Henri Dumont. A Symposium in Italy could not be in a place better than where one of the oldest, and well-known limnological research Institutes in Italy is located, the former Istituto Italiano di Idrobiologia, now CNR-Institute for Ecosystem Study.

The visitors and friends know that Cladocera are the *"Institute's guardians*" because of the wall paintings of *Daphnia*, *Bosmina* and *Leptodora* on the Villa's entrance.

During this triennial meeting we will exchange ideas and discuss results on research fields, spanning from evolutionary genetics and taxonomy to functional ecology. Cladocera 2011 is of interest to those involved in Cladocera research or those using Cladocera as model organisms. We will address especially ecology and paleoecology, food chain studies, genetics, genomics, systematics and evolution, but researchers working in other relevant fields are welcome.

Registrations is already open, and a detailed program is also available on line. Please, visit the web site (http://www.cladocera2011.org) and contact the secretary at the address info@cladocera2011.org

Organizing Committee

- Marina Manca, Institute for Ecosystem Studies, National Research Council (CNR-ISE), Italy (email: m.manca@ise.cnr.it)
- Piet Spaak, (and his secretary, Arianne Maniglia), Swiss Federal Institute for Environmental Science and Technology (EAWAG), Switzerland

International Sympoisum on Aquatic Plants, "Plants in Hydrosystems: from Functional Ecology to Weed Research," 27-31, August 2012, Poznan, Poland

Symposium organized by:

- European Weed Research Society (EWRS)
- International Society on Limnology (SIL) - Working Group on Macrophytes
- Polish Hydrobiological Society
- Poznań University of Life Sciences

Scientific context:

The main theme of the symposium is 'Plants in hydrosystems: from functional ecology to weed research'. The symposium holds:

- 13th EWRS International Symposium on Aquatic Plants
- 2nd SIL International Workshop of Working Group on Macrophytes
-

The following sessions are planned:

- Biology, ecology and distribution of aquatic plants
- Aquatic plants in biomonitoring
- Nature conservation of aquatic and riparian vegetation
- Management of aquatic vegetation and side effects
- Invasive plants and their ecological effects
- Environmental management in relation to aquatic plant cover
- Aquatic vegetation and environmental relationships
- Hydrobotanical systems in waste water treatment.

We encourage any proposal of new topics and sessions. Please contact the symposium organizers.

Preliminary programme:

- 25-26 August (Saturday-Sunday): Pre-Symposium programme – macrophyte identification course and macrophyte methods in biomonitoring. Additional registration required.
- 27 August (Monday): registration, opening ceremony, plenary lecture, reception
- 28 August (Tuesday): oral and poster sessions
- 29 August (Wednesday): oral and poster sessions, symposium dinner
- 30 August (Thursday): field excursion
- 31 August (Friday): oral and poster sessions, closing ceremony
- 1-3 September (Saturday-Monday): Post-symposium programme–tour

Registration fees for the Conference

Mid-conference excursion included

- EWRS/SIL Members: early 270€/late 370€
- Others: early 300€/late 400€
- Students: early 200€/late 250€

The fees cover participation in all symposium sessions, symposium material, abstract book, lunches and coffee or tea during the breaks as given in the program, the reception and a field excursion including dinner on Thursday evening.

Important dates:

- 15 January 2012 – deadline for proposing topics and sessions
- 28 February 2012 – deadline for preregistration
- 1 April 2012 – deadline for early payment
- 31 May 2012 – deadline for final registration, abstract submission
- 5 June 2012 – final abstract decision, deadline for payment

Symposium venue:

The symposium will be held in the city of Poznań, Poland. The symposium will be hosted by the Poznań University of Life Sciences.

Travel information:

- By plane: Poznań has regular plane connections with e.g. Barcelona-Girona, Copenhagen, Dortmund, Edinburgh, Frankfurt, Liverpool, London, Munich, Oslo, Rome, Warsaw, Zurich and Cracow.
- By train: EuroCity trains, regularly connect Berlin and Warsaw, go via Poznań. It takes three hours to get from Berlin to Poznań as does the train journey from Warsaw. There are also convenient rail connections with all major towns and cities in Poland.

Accommodation

Accommodation is plentiful in Poznań with a good choice of hotels and hostels.

Contact information:

Krzysztof Szoszkiewicz
kszoszk@up.poznan.pl

http://www.aquaticplants2012.pl
aquaticplants@up.poznan.pl
phone: +48 61 8466510
fax: +48 61 8466510

Meeting of the SIL Plankton Ecology Group (PEG 2012), February 12-18, 2012, Mexico City, Mexico

The Plankton Ecology Group (well known in scientific literature as PEG) was formed during 1974 as a working group of the SIL. The PEG has had more than 20 scientific meetings so far in different parts of Europe. The first PEG meeting was held in Norway (1975), and the most recent one in the Netherlands (2010). An important aim of the PEG is to provide a common platform for scientific research to focus on specific themes in plankton ecology (mostly freshwater) and to offer the possibility to compare different methods and results. Thus, the main objective of the PEG meetings is to get deeper insight into life history strategies and inter-relationships among the planktonic species and to the abiotic factors. The meetings have helped to construct ecological models of predictive importance for plankton in the natural waterbodies and contributed to the ecological theory building.

The next international PEG meeting will be held in the Mexico City (Mexico) from 12 to 18 February, 2012. The focal theme of the meeting will be Global Warming and Plankton. However, other aspects of plankton ecology will also be considered for presentation during the meeting.

Details of the International Scientific Committee, National Organizing Committee, keynote speakers and other aspects are included in the official website of the meeting: http://www.iztacala.unam.mx/peg2012/.

The plankton ecologists interested in participating in the meeting may contact the address given below.

Deadlines

- Replies to preliminary enquiries starting from 30 June 2011
- Registration of participants and submission of abstracts: from August 2011 to 15 January, 2012

Prof. S.S.S. Sarma
Organizing Secretary, PEG Meeting 2012 Mexico City
Laboratory of Aquatic Zoology, Building UMF
National Autonomous University of Mexico, Campus Iztacala
sarma@servidor.unam.mx, or sarma@campus.iztacala.unam.mx

Call for Proposals to The Edward B. and Phyllis E. Reed Endowment

The Department of Invertebrate Zoology at the National Museum of Natural History is pleased to request proposals for grants to pursue research on freshwater copepods of North America. Funding for the grants is made available from The Edward B. and Phyllis E. Reed Endowment at the Smithsonian Institution.

Grants are for one year duration and are limited to no more than $6,000. Funds are disbursed in US dollars. US citizens and foreign nationals are eligible. Proposals should include: (1) a statement of intended research of no more than 3 double-spaced pages; (2) a budget page; (3) CV's of all participants. Proposals from undergraduate and graduate students also must include a letter of support from the primary faculty advisor explaining the student's funding needs, and describing the student's academic and research accomplishments.

Proposals may address any aspect of the biology of freshwater copepods of North America, although specimen-based research on taxonomy, poorly surveyed habitats, zoogeography, invasive species, or phylogeny are topics of particular interest. Proposals should include, as applicable, an indication of the taxa expected to be studied, and the number of specimens to be examined. Awards for work at the Smithsonian Institution will be made as a travel grant plus stipend; awards for all other research will be made as a reimbursable contract. Funds cannot be used to attend meetings. Principal investigators will deliver a final report on the results of the research within eighteen months after funds are disbursed. Reprints (paper or electronic) of publications resulting from the research should be made available to the Charles Branch Wilson Copepod Library, Dept. of Invertebrate Zoology [MRC – 534], Smithsonian Institution, 4210 Silver Hill Rd., Suitland, MD, 20746, USA, and to the Monoculus Library, Deutsches Zentrum fuer Marine Biodiversitaetsforschung, Forschungsinstitut Senckenberg, Suedstrand 44, D-26382 Wilhelmshaven, GERMANY.

Proposals are due by June 1, 2011. Send electronic proposals or your querstions to ferrarif@si.edu (MS Word, WordPerfect, or PDF) or paper proposals to Dr. Frank D. Ferrari, Dept. of Invertebrate Zoology [MRC – 534], Smithsonian Institution, 4210 Silver Hill Rd., Suitland, MD, 20746, USA. Proposals will be evaluated by a standing committee. All applicants will be notified by the end of August, 2011.

Attention: Manufacturers of Limnological Equipment and Publishers

SILnews accepts advertisements for equipment and publications that will be of interest to SIL members.

SILnews is distributed twice a year to more than 3,000 SIL members and libraries world-wide. If your company is interested in acquiring advertising space in *SILnews,* please contact Ramesh D. Gulati (r.gulati@nioo.knaw.nl) or Ms. Denise Johnson (denisej@unc.edu) the Editorial Office for rates, or use the mailing address indicated on the front page.

A complimentary copy of *SILnews,* in which your advertisement appears, will be sent to you once it has been published. *SILnews* is posted on the SIL web site at http://www.limnology.org after it has been published .

Limnology Jobs and Studentship Notices

Notices on the availability of limnologically-oriented jobs and graduate student opportunities are now accepted for publication in the *SILnews* and displayed on the SIL web site at http://www.limnology.org. There is no charge for the service at this time, which is available to both SIL members and non-members.

Persons submitting notices should note the four month lead-time for the print edition of *SILnews;* those advertisements with short deadlines should be directed to the web site only.

Submissions should include:

- a short title describing the position (job or studentship);
- location and duration of the position;
- closing date for applications;
- a short paragraph describing the position, including any citizenship, educational or employment prerequisites; and,
- information on where potential applicants may obtain further information, including names of contact persons, telephone numbers, fax numbers, e-mail addresses, and web site addresses, where appropriate.

Submissions may be edited for length and clarity. Those deemed inappropriate to the SIL mandate will be rejected at the discretion of the *SILnews* Editor or the Webmaster. Submissions for the print edition of *SILnews* should be sent to the editor at the address on the cover of this issue.

Submissions for the SIL web site should be sent by e-mail to webmaster@limnology.org or by fax to the attention of Gordon Goldsborough at: +1 (204) 474-7618.

Are you moving?

Please send your change of address to:

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c/o Ms. Denise Johnson
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GSGPH, 135 Dauer Dr., ESE, 148 Rosenau Hall
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E-mail: denisej@email.unc.edu

The International Society of Limnology (formerly International Association of Theoretical and Applied Limnology; Societas Internationalis Limnologiae, SIL) works worldwide to understand lakes, rivers, and wetlands and to use knowledge gained from research to manage and protect these diverse, inland aquatic ecosystems.

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For Your Information

SILnews is now on the SIL web site in PDF format. The newsletter is created in Adobe Acrobat, Version 5. To open, use Adobe Acrobat Reader.