



SIL news

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The International Association of Theoretical and Applied Limnology (Societas Internationalis Limnologiae Theoreticae et Applicatae, SIL) promotes and communicates new and emerging knowledge among limnologists to advance the understanding of inland aquatic ecosystems and their management.



En Shalem thermal spring flowing through the recently exposed muddy sediments towards the Dead Sea. The salinity of these thermal-mineral water is about half that of the Dead Sea with a generally similar ionic ratios. The H₂S in the water is due to bacterial sulfate reduction occurring at depth. The spring water is used for a health spa. (Photo taken by Ittai Gavrieli, October, 2001)

The Dead Sea - recent changes in the limnology of a hypersaline terminal desert lake

by
Aharon Oren and Ittai Gavrieli

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Material for the May 2002 issue should be sent to the Editor for **February 1, 2002:**

Richard D. Robarts, or
Clara A. Fabbro, Assistant Editor
UNEP GEMS/Water Collaborating Centre
Environment Canada
11 Innovation Blvd., Saskatoon, SK
S7N 3H5 CANADA
clara.fabbro@ec.gc.ca
fax: (306) 975-5143

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



Figure 1 - Location map of the Dead Sea.

General background

The Dead Sea is a hypersaline terminal desert lake. With its present shore line at an elevation of 415 m below mean sea level it is the lowest exposed surface on Earth. Its deepest point (730 m below mean seawater level; maximum depth 315 m) forms the lowest continental surface. The present-day Dead Sea is the last in a series of lakes which occupied the Dead Sea Rift since its formation. Its precursor, the Lisan Lake, existed between 70,000 and 17,000 years ago and occupied a much larger area, from the Sea of Galilee (Lake Kinneret) in the north to about 25 km south of the southern basin of the Dead Sea (Gavrieli *et al.* 1998).

Presently the total salt content of the Dead Sea water is about 340 g L⁻¹. The ionic composition of this athaloassohaline brine is dominated by divalent cations. The mean values for the ionic concentrations in 1996 were (in mol L⁻¹): Mg²⁺, 1.89; Na⁺, 1.59; Ca²⁺, 0.44; K⁺, 0.20; Cl⁻, 6.34; Br⁻, 0.07, and SO₄²⁻, 0.005. The density of the water is about 1.237 kg L⁻¹.

As in all terminal lakes, the water level of the Dead Sea is determined by the balance between evaporation and inflow of water from its drainage basin - an area of about 40,000 km² (Figure 1). The lake level has, therefore, been subject to fluctuations over the years (Figure 2). Before the 1950s there was little human intervention in the water balance of the lake, and level changes thus reflected the climatic changes in the area.

An in-depth limnological study of the lake in the late 1950s - early 1960s showed the Dead Sea as a meromictic lake with a pycnocline at about 40 m depth (Neev and Emery 1967). This pycnocline separated an upper water layer with approximately 275 g L⁻¹ total dissolved salts (density 1.173 kg L⁻¹) from the more saline (332 g L⁻¹; 1.23 kg L⁻¹) anoxic lower water mass.

Physical and chemical limnological changes in the past 30 years

During the last decades there has been a continuous decline in the inflow of floodwater to the lake, mainly due to diversion of water from the main water sources of the Jordan River, namely, the Sea of Galilee and the Yarmuk River. Whereas in the beginning of the 20th century, the yearly Jordan River input to the Dead Sea is estimated to have been 1,100 million m³, its present inflow is less than

200 million m³. A drastic decline in the Dead Sea water level has been the result; in recent years the lake level has dropped on average by 1 m annually. The surface area has decreased accordingly: while in 1940 the surface of the lake measured 980 km² (including the southern basin, which became detached from the lake in 1976, and is now occupied by industrial evaporation ponds), only about 635 km² remained in 2001. Due to the lowering of the regional water table, many sink holes have formed on the newly exposed shore (Arkin and Gilat 2000).

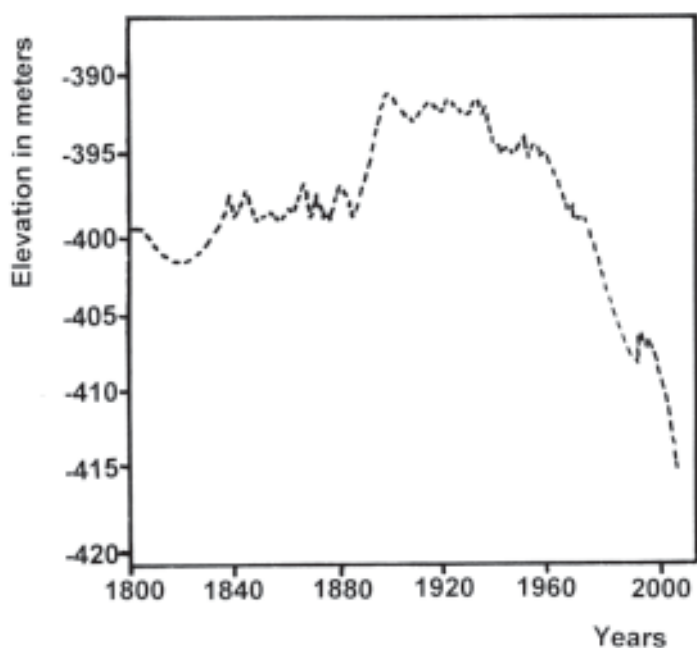


Figure 2 -
The Dead Sea surface water levels from 1800 - 2000.

The drying up of the lake led to an increase in the salinity of the upper water layers until the density of the upper water mass equalled that of the deep waters. An overturn of the water column resulted at the beginning of 1979, thereby ending the long-existing meromictic state. Holomictic conditions now prevail (1982-1991 and 1995-present). A stratification is built up during the summer months by the formation of a thermocline (generally located between 15 and 30 m depth), large enough to balance the destabilizing halocline formed as a result of increased evaporation. The surface layer cools in autumn, and an overturn takes place around November. A temporary dilution of the upper water layers may occur due to winter rain floods, the effect of which is abolished as a result of summer evaporation (Anati and Stiller 1991).

The chemical properties of the lake have changed also. The lake is saturated with respect to sodium chloride, and the negative water balance thus caused a mass precipitation of halite (NaCl). The weight of halite that precipitated between 1976 and 1992 was estimated to be about $2,550 \times 10^6$ tonnes (Gavrieli 1997), and halite precipitation has continued since. As a result, the Na⁺ concentration and Na/Cl ratio are decreasing, while the continuous negative water balance results in increased concentrations of the divalent cations (Mg²⁺ and Ca²⁺). Additional changes in salt concentrations and ionic composition are caused by the activities of the Dead Sea Works Ltd. (Israel) and the Arab Potash Co. (Jordan). These companies evaporate Dead Sea water in shallow ponds near the southern end of the lake to produce potash (KCl), bromine, and other chemicals. Most of the sodium precipitates out in the first set of evaporation ponds (estimated at about 35×10^6 tonnes annually). The brine remaining after extraction of potassium and bromide salts contains mainly MgCl₂ and CaCl₂, and is returned to the Dead Sea, further increasing the divalent/monovalent cation ratio of its waters.

The new holomictic regime has been interrupted twice: short meromictic episodes have occurred from 1979-1982 (Stiller *et al.* 1984) and from 1992-1995 (Beyth *et al.* 1993) as a result of massive inflow of fresh water during unusually rainy winters. The winter of 1980 saw a rise in the surface level of 1.5 m, and an even more dramatic rise in surface level of nearly 2 m occurred in the winter of 1991-1992, when approximately 1,500 million m³ of fresh water entered the lake.

Dynamics of microorganisms in the Dead Sea

Since the pioneering studies of Benjamin Elazari Volcani in the late 1930s, the Dead Sea is known to be inhabited by an indigenous microbial community. The main components of the biota in the water are the unicellular green alga *Dunaliella*, being the sole primary producer in the lake, and several types of halophilic archaea of the family Halobacteriaceae, colored red due to a high content of carotenoid pigments. These archaea live at the expense of organic compounds produced by the algae.

Systematic monitoring of algal and archaeal communities in the Dead Sea has been performed from 1980 onward. It has become clear that even for these halophilic

continued on next page

microorganisms the Dead Sea is far from being the ideal environment: all prefer to thrive at far lower salinities and in particular at much lower divalent cation concentrations. Only when the upper water layers of the lake become diluted with more than 10% fresh water does *Dunaliella* show mass development, provided that all essential nutrients (especially phosphate, which is limiting in the Dead Sea) are available. Dense microbial blooms thus occurred in 1980 (up to 8.8×10^3 *Dunaliella* cells ml⁻¹ and 1.9×10^7 archaea ml⁻¹) (Oren 1988) and again in 1992 (1.5×10^4 and more *Dunaliella* cells ml⁻¹ and 3.5×10^7 archaea ml⁻¹) (Oren 1993, 1999; Oren and Gurevich 1995; Oren *et al.* 1995). In both cases the archaeal communities were sufficiently dense to impart a reddish color to the lake. Today, after a prolonged holomictic period with ever-increasing salt concentrations of the water, the lake is virtually devoid of microbial life.

Will the Dead Sea ever dry up?

It may be expected that in the absence of drastic human intervention, the level of the Dead Sea will keep declining in the coming years. The lake will not dry up completely, however, as the rate of evaporation will decrease as the salinity of the brine increases. If water inflow remains at the present-day level, a new equilibrium between evaporation and water input will be reached in about 400 years (Yechieli *et al.* 1998). The surface level will then be at -500 m, i.e., more than 80 m below the present value. The surface area of the lake will only be 526 km², and the water volume will have decreased by about one third. The remaining brine, in equilibrium with the air of 50% humidity, will contain about 380 g L⁻¹ dissolved salts, and have a density of 1.27 kg L⁻¹ (Krumgalz *et al.* 2000).

There are, however, plans in an advanced stage to counteract the decline in the water level of the Dead Sea by establishing a canal connecting the Gulf of Aqaba with the Dead Sea, enabling the exploitation of the 400 m difference in elevation between the two water bodies. Schemes to use this hydrostatic potential to produce hydroelectric energy have been proposed in the 1970s, based on a planned connection between the Mediterranean Sea and the Dead Sea (Neeman and Shul 1983; Weiner 1985). These plans have now been revived in a significantly modified way. In the framework of the 1994 peace treaty between Israel and Jordan, plans for a Red Sea - Dead Sea canal are advanced in a joint venture by both countries. The purpose of the canal, if it materialized, would be to utilize the potential energy to desalinate water by reverse osmosis (up 800 million m³ annually) and to stabilize

the Dead Sea level. Pre-feasibility studies toward the construction of the water carrier are already being carried out.

The inflow of massive amounts of seawater (about 40 g L⁻¹ salts) into the hypersaline Dead Sea will undoubtedly cause drastic changes in the lake's physical, chemical and biological properties. It is possible that a new diluted epilimnion will be formed, and that blooms of halophilic microorganisms will return. Whether the degree of dilution will be sufficient to allow the development of higher organisms as well, remains to be seen. If so, the fulfillment of the prophecy by Ezekhiel (47: 8-10) that the Dead Sea will once be teeming with fish, may be close!

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Aharon Oren

*The Institute of Life Sciences and the Moshe Shilo Minerva
Center for Marine Biogeochemistry
The Hebrew University of Jerusalem
91904 Jerusalem
Israel*

Ittai Gavrieli

*Geological Survey of Israel
30 Malkhe Israel St.
95501 Jerusalem
Israel*



A view due north over the Dead Sea and its receding shorelines. The western escarpment of the Dead Sea Rift is seen on the left. Sediments deposited by Lake Lisan, the precursor of the Dead Sea, are exposed between the escarpment and the Dead Sea. (Photo taken by Yehuda Peled, October, 2001)



A view across the Dead Sea towards the eastern escarpment of the Dead Sea Rift Valley. Newly exposed shorelines left by the receding Dead Sea are seen in the foreground. (Photo taken by Yehuda Peled, October, 2001)

Message from the President

Dear Members of SIL:

The National Representatives urged the development of a new Mission Statement during meetings of the International Committee at the Melbourne Congress. In response, Professor Robert Wetzel and I have drafted the following statement for your consideration. We acknowledge helpful comments and suggestions from Professors Carolyn Burns, Winfried Lampert and Brian Moss on this draft.

Our attempt has been to make this statement short (maximum two pages) and clear. We plan to discuss and then propose the adoption of this statement during the Congress in Finland in 2004.

Gene E. Likens
President

Mission Statement of SIL

The International Association for Theoretical and Applied Limnology works worldwide, to understand lakes, rivers and wetlands and to use knowledge, gained from research, to manage, protect and conserve these diverse, inland aquatic ecosystems.

Objectives and Goals of SIL:

1. to study all inland aquatic ecosystems;
2. to understand how these ecosystems arose, function and are maintained;
3. to educate everyone about the value of these aquatic systems for the well-being and survival of all organisms, including humans on Earth; and,
4. to protect and conserve these ecosystems by promoting and fostering only sustainable use.

Functions and Activities of SIL:

- *SIL is an international scientific society.* Its membership comes from approximately 80 countries and increasingly from tropical regions. Scientific excellence and credibility are essential underpinnings for SIL.
- *SIL is limnological* and is concerned with all aspects of lakes, rivers and wetlands, both fresh and saline.

- *SIL is really SILTA, theoretical and applied.* The application of understanding to practical problems is an important role for the Society. Fundamental knowledge about the structure, function and temporal change of inland, aquatic ecosystems is essential for the diagnosis and solution of problems. Such knowledge is key for the protection and sustainable use of these ecosystems worldwide.
- *SIL publishes a scientific journal and other scholarly publications.* Every member of SIL has a constitutional right to publish work meeting accepted standards of quality in the **Proceedings**, a valued scientific publication. The **Proceedings** provide a worldwide overview of limnological research results and thinking.
- *SIL provides an international forum* for discussion and presentation of scientific findings during triennial congresses.
- *SIL has Working Groups* dedicated to exploring new ideas and methods, fostering communication, promoting limnology and protecting the inherent qualities of all inland aquatic ecosystems.

Gene E. Likens
President

Robert G. Wetzel
General Secretary-Treasurer

Special offer to SIL members

The international journal, *River Research and Applications*, previously published as *Regulated Rivers: Research and Management* (1987 - 2000) published by Wiley Interscience is being offered at a SIL price of \$130 US.

Contact: Journals Subscription Dept.
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West Sussex, PO 22 9SA. UK
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Fax: +44 (0) 1243 770432
E-mail: cs-journals@wiley.co.uk

Announcements

Launch of the South American Wetland Assessment website

In March 1994, Wetlands International began an ambitious project: to catalogue the biological, social and economic importance of wetlands in South America. In partnership with US AID and several public and private foundations, this initiative aimed to secure enough information to guide the development of an agenda for wetland conservation in the region. Over the ensuing five year period, a massive amount of information was gathered and analysed by a diverse team of more than 20 wetland experts from across South America. While vast areas remain relatively intact, the Assessment confirmed that South America's wetlands were under increasing threat. The Assessment presented a broad series of recommendations for promoting the conservation and wise use of these increasingly threatened areas. The full 1000+ pages, limited edition Assessment report was presented at the Seventh Meeting of the Contracting Parties to the Ramsar Convention in Costa Rica, in 1999.

Now, to make the Assessment widely accessible, the entire report has been redesigned for presentation over the World Wide Web. This digital version also includes a new Executive Summary, and incorporates updated information from the aforementioned wetland inventory work by Wetlands International. The new website is: <http://www.wetlands.org/SAA/>.

We trust that increased awareness availed by web publishing of the Assessment will provide further incentive to policy and decision makers towards the sustainable management of South America's amazing wetland wealth.

Simon Nash
International Director
Wetlands International
nash@wetlands.agro.nl
Phone: + 31 317 478851
www.wetlands.org

Millennium Ecosystem Assessment

On June 5, 2001, U.N. Secretary-General Kofi Annan launched a four year checkup by 1,500 scientists aimed at diagnosing the Earth's environmental ills and identifying treatments to nurse the planet back to health.

"The study will examine all the world's grasslands, forests, rivers and lakes, farmlands, and oceans in a comprehensive fashion for the first time to bring the world's best science to bear on the pressing choices we face in managing the global environment", Annan said.

Dubbed the Millennium Ecosystem Assessment and budgeted at \$21 million US, the study was launched on World Environment Day. The assessment will involve the largest number of natural and social scientists ever involved in a study of the global environment, organizers said.

All findings will be reviewed by peers before publication in a final report due in four years, they said.

For more information, please see:

<http://www.ma-secretariat.org/en/index.htm>

Watch for this story in a future issue:

"Towards Upstream/Downstream Hydrosolidarity", the importance of communication between countries sharing the same river basin. This pertains to, for example, the Okavango River Basin, which is shared by Angola (upstream), Namibia and Botswana (downstream).

New Journal

A new international scientific journal 'Ecohydrology and Hydrobiology' has been established. It is a continuation of two Polish periodicals 'Polskie Archiwum Hydrobiologii' and 'Acta Hydrobiologica'.

Ecohydrology is the study of the functional inter-relations between hydrology and biota at the catchment scale and is a new approach to achieving sustainable management of water.

Therefore, with the need for new solutions in sustainable water management, the new quarterly journal especially invites contributions:

- providing an integrative (also interdisciplinary) approach to aquatic sciences;
- giving an explanation of ecological and hydrological processes at the basin scale; and,
- proposing practical applications of this knowledge.

For further information and Instructions for Authors, or to submit a manuscript, please contact the editors:

Maciej Zalewski

International Centre for Ecology
Polish Academy of Sciences, Warsaw
1, Marii Konopnickiej Str.
Dziekanów Leśny
05-092 Lomianki
Poland
mce-pan@mail.unicom.pl

and

David M. Harper

Department of Biology
University of Leicester
Leicester University Road
LE 1 7RH
United Kingdom
dmh@le.ac.uk

Limnology job and studentship notices

Notices on the availability of limnologically-oriented jobs and graduate student opportunities are now accepted for publication in SILnews and displayed on the SIL web site at www.limnology.org. There is no charge for the service at this time, which is available to 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: +1 (204) 474-7650, attention: *Gordon Goldsborough*.

World Lakes Dialogue

LakeNet and the International Lake Environment Committee (ILEC), Japan have teamed up to establish a special electronic forum on the future of the world's lakes called "World Lakes Dialogue". This forum will make use of the existing LakeNet egroup, hosted by Yahoo!groups, to announce opportunities for participating in a global dialogue and for providing feedback on important documents, meetings and other information related to the future of the world's lakes. Several of these initiatives that are planned or underway are: development of a World Lake Vision and Action Plan to be presented at the 3rd World Water Forum in 2003; and, documenting case studies and lessons learned in lake watershed management.

SIL members are invited to participate in this dialogue. For more information, visit the LakeNet website at: <http://www.worldlakes.org> or send a message to: info@worldlakes.org. To join the LakeNet egroup, send a message to: lakenet-subscribe@yahoogroups.com or visit the web site: <http://www.worldlakes.org/online.htm>.

Lisa Borre

LakeNet/Monitor International

300 State Street

Annapolis, Maryland 21403 USA

lborre@monitorinternational.org

Phone: (410) 268-5155

Fax: (410) 268-8788

<http://www.monitorinternational.org>

<http://www.worldlakes.org>

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.

Biodiversity Conservation Report Available

The second report in a series published by the LAKENET Secretariat is now available, entitled "Biodiversity conservation of the world's lakes: A preliminary framework for identifying priorities". Out of the five million lakes existing worldwide, the report identifies 250 lakes in 73 countries as initial priorities for biodiversity conservation. Although available data are very limited, these lakes support globally significant fish, mollusc, crab, shrimp and bird biodiversity or they are representative examples of particularly rare types of lakes. The study includes biological diversity and limnological information on each priority lake, and water scarcity and institutional measures (government effectiveness and accountability) by country.

Despite their importance, lakes continue to be fairly invisible on the global conservation screen. Lakes and their watersheds are dramatically under represented both in protected areas and in conservation funding. Priority lakes are identified with the hope of stimulating dialogue with stakeholders and organizations working in lake watersheds and with conservation organizations. The next steps include obtaining feedback from other organizations and from stakeholders in targeted watersheds. For instance, many of the identified lakes may not have watershed maps; most do not have comprehensive lake watershed management plans.

The biodiversity conservation report is available in PDF format at the LakeNet website at: <http://www.worldlakes.org/biodiversity.htm> or it can be ordered in hard copy format for US \$20.00 (price includes postage). You may also want to search LakeNet's database to identify useful links for lakes included in the study.

Feedback on the issue of biodiversity and world lakes will be incorporated into the ongoing "World Lakes Dialogue", so feel free to share your thoughts or feedback at: <http://www.worldlakes.org/feedback.htm>.

Laurie Duker

Conservation Director

LakeNet

300 State Street

Annapolis, MD 21403

USA

laurieduker@monitorinternational.org

Website: www.worldlakes.org

SIL Co-Sponsors DIALOG Program for Recent Ph.D.s

“I am positive that my perspective of science was changed by DIALOG. It has already proven to be a milestone in my career and others should have the opportunity to benefit from this unique and innovative program”.

Many past DIALOG (Dissertations Initiative for the Advancement of Limnology and Oceanography) symposium participants share this view. To enable more graduates to take advantage of this opportunity, SIL is now co-sponsoring this initiative.

DIALOG’s goal is to reduce the barriers that limit the exchange of information across the aquatic sciences. The initiative has several components, which are described below. Program information, including the Ph.D. Dissertation Registry, is available at: <http://aslo.org/phd.html>. The site is also linked to the SIL website.

An international registry of Ph.D. dissertation abstracts has been created in order to provide a concise overview of the field, and to introduce new graduates to the community. The Registry is available on line, in a fully searchable format.

Graduates may submit a one page abstract using an interactive form on the website. Once registered, graduates are placed on an e-mail distribution list to receive job announcements, DIALOG program updates, and other items of interest to recent Ph.D.s. Individuals wanting to post announcements should send messages to: phd@whitman.edu.

Information collected with the dissertation abstracts is enabling us to better characterize the graduate population. Demographic reports are posted on the ASLO web page at: <http://aslo.org>. A biennial symposium brings together 40 recent graduates from a variety of countries and specialties to catalyze interdisciplinary understanding and networking. The symposium format includes brief presentations of dissertation research, working-group discussions of emerging research, education, policy and management issues, and interactions with funding agency representatives.

Past DIALOG participants have noted many advantages of symposium participation, including being able to count as friends as well as colleagues the ‘emerging experts’ in a variety of fields. The first years after receiving a degree can be daunting. Having a diversity of colleagues at roughly the same career stage can ease the transition from student to professional. Their experience, advice and support can help with everything from negotiating a first job to career/family issues. And, the interdisciplinary context of the symposia gives participants the background and collegial ties necessary to develop a more interdisciplinary context for their work and move in new directions. Discussions with funding agency representatives help participants turn research ideas into concrete plans. Working-group reports from the symposium represent an international assessment by some of the best new minds in the field.

The DIALOG V symposium will be held from October 19-24, 2003 at the Bermuda Biological Station for Research. The symposium is open to Ph.D.s completed between January 1, 2001 – March 31, 2003 and whose work relates to any branch of aquatic science.

To take full advantage of the program, graduates should register their dissertation as soon as they graduate. The website at: <http://aslo.org/phd.html> contains program information, an on-line dissertation registration form and symposium application instructions.

Graduates receiving Ph.D.s after January 1, 2000 are encouraged to register with DIALOG, even if they are not interested in the symposium. The Dissertation Registry is a terrific way to introduce your work to the community, and it is a tremendous resource for researchers throughout the world.

C. Susan Weiler
DIALOG Program Director
Whitman College
Walla Walla, WA 9936
USA
weiler@whitman.edu
Phone: (509) 527-5948
<http://aslo.org/dialog.html>

European Ichthyological Society

European Ichthyology is alive and well! The 10th European Ichthyological Congress (EIC 10) which was organised by Petr Ráb and held from 3 to 7 September 2001 in Prague (Czech Republic) was attended by 284 ichthyologists from 41 countries. EICs are the tri-annual meetings of the European Ichthyological Society (EIS) which also had its business meeting during the congress. There have been numerous formal and informal discussions regarding the future of the congresses and of the society. The members unanimously supported their continuation. The structure of the EIS has been renovated a few years ago and during EIC 10, several members volunteered to work in various committees. An electronic newsletter should be established shortly. A committee is investigating the feasibility of electronic publication. EIS now counts around 150 members.

The General Assembly of the EIS met on 6 September 2001. It elected a new Board with Maurice Kottelat (President), Menachem Goren (Vice-president), Maria João Collares-Pereira (Secretary), Maria Th. Stoumboudi (Treasurer), Sven O. Kullander (Information Technologies) and Petr Ráb (Congress issues), and adopted a budget. The next congress will be held in 2004 at a site to be decided in December, 2001. The Board is presently evaluating three proposals. Between congresses, EIS also will be involved in co-sponsoring other activities (meetings, workshops, courses) of interest to European ichthyologists. The EIS will work on a list of common names of European fishes. The Board welcomes other proposals by members. Membership fees for the period 2001-2004 for ordinary members are 20 Euro per year; students under 35 years pay a single 10 Euro entrance fee (no annual fee); ordinary members from eastern Europe pay 10 Euro per year (case by case, lower fees can be decided by the Board for members under unfavourable social or economic conditions).

EIS is an international, non-governmental organisation of scientists and individuals interested in ichthyology. Historically, the EIS was established to promote international co-operation between scientists of the western and eastern blocks and to co-ordinate scientific collaboration. With the change in the European political landscape, its emphasis has now shifted to become a forum for the exchange and dissemination of information and experience; and, the promotion of original research and intra- and extra-European collaboration. It will also have to connect ichthyological research to

European Union policies. These aims are presently achieved by organising or supporting international scientific meetings and promoting publications. Students are most welcome and the EIS is working at making EICs more attractive for them. Students are expected to have an important role to play in the society and, obviously, in the future of ichthyology.

There has been a continuing misperception that the EIS is a federation of national ichthyological societies and that being a member of a national society member of EIS resulted in automatic membership into EIS. This may have been true in some countries in the early history of the Society, but it is no longer the case as EIS membership is now made up only of individual members.

For membership applications, visit the EIS website at: <http://www.nrm.se/ve/pisces/eis/> or contact the Treasurer, Maria Stoumboudi at: mstoum@ncmr.gr. For other information, please contact the Secretary, Maria João Collares-Pereira at: mcolares@fc.ul.pt.

Board of European Ichthyological Society

Thank you, Debbie

I was once told that 'Behind every good man is a great woman'. Such a statement is indeed a truism in the case of Ms. Deborah Cook who has worked for SIL as my secretarial assistant for over a decade. Debbie is one of those extraordinary people that have exceptionally savvy and conscientious perceptions, as well as superb organizational abilities. Her competence, poise, and devotion to SIL have contributed to the efficient operations of our association. It is with great regret, as I changed university affiliations, that I lost the service that Debbie has so ably provided. SIL and especially I thank her and wish her well in her new position.

Robert G. Wetzel
General Secretary Treasurer

World Lake Vision (WLV)

The story is an old one: lakes are important, yet face many stresses that impair their use. Ironically, it is the very value of lakes that draws people to live, work and play in their watersheds. These changes in population and land-use inevitably lead to stresses that impact the lakes themselves, thereby decreasing the values that drew people in the first place. As Aitken Clark of Living Lakes says about lakes, “We are loving them to death”. Something must be done.

That “something” was the focus of a recent workshop hosted by the International Lake Environment Committee (ILEC), Japan entitled, “The Future of World Lakes: Principles for Action”. The workshop, which ran for three days (4-6 September) at ILEC headquarters, drew 22 people from around the world to discuss the project tentatively known as the “World Lake Vision”.

The past few years have been a time of intense introspection at ILEC. We were founded in 1986 with the mandate to promote the sustainable management of the world’s lakes and reservoirs. To carry out that mandate, ILEC has organized many World Lake Conferences (9th Conference in November 2001), compiled a databook of the world’s lakes, designed guideline books on lake management, published a scientific journal, and conducted training courses for young lake managers.

In spite of these efforts, most lakes around the world remain unsustainably managed. ILEC’s approach to date has lacked a way of communicating the principles of sustainable lake management to top-level decision makers. A “vision” is one effective way to do this. Promoting the development of a World Lake Vision will be an additional step on the road to reaching our goal of the sustainable management of the world’s lakes and reservoirs.

The process leading to the World Lake Vision is expected to culminate at the 3rd World Water Forum to be held in Kyoto, Japan in March 2003. Along the way, inputs will be gathered at various international events such as the World Lake Conference (November 2001, Japan), Dublin+10 (December 2001, Bonn), Rio+10 (August 2002, South Africa), and the Stockholm Water Symposium (August 2002, Stockholm). An electronic forum is being developed to gather input from now until 2003.

If you’ve read this far, then surely you will want to have some input in the World Lake Vision process. You can start by pointing your browser to ILEC’s home page at: www.ilec.or.jp. There, you will find a draft of the WLV, a position paper, and the minutes of the September workshop. Also, there are links to various electronic fora dealing with the WLV. Feel free to send comments to ILEC directly by e-mail at: tom@ilec.or.jp.

Tom Ballatore
International Lake Environment Committee
Japan

Watch for this story in a future issue:

Lake Hovsgol is the largest freshwater lake in Mongolia and is one of the ancient lakes of the world. It was formed by tectonic events during the early Cenozoic period. As the area around the lake is sparsely populated, the lake remains generally pristine. However, due to recent global warming and the introduction of a market-oriented economy into Mongolia, concerns are growing about the potential impacts on the ecology of the lake and its environs.

Reports on Working Groups

Aquatic Microbial Ecology

This SIL Working Group was approved at the 19th Congress of SIL in Winnipeg, Manitoba, Canada in 1974, as the Working Group on Microbial Activities and the Carbon Cycle in Fresh Waters. Its name was changed to Aquatic Microbial Ecology in 2000. Six workshops were held (Plön 1977, Malente 1983, Utrecht 1986, C. Budejovice 1988, Helsingör 1991, Konstanz 1995). The 7th Workshop was organized from September 17-22, 2000 jointly with the 7th European Marine Microbiology Symposium (EMMS). The international workshops of this SIL Working Group have a steady increase of participants which reflects the development of aquatic microbiology as an important part of microbial ecology. Another remarkable feature was the continuous integration of freshwater and marine research based on the existence of similar structures in all aquatic ecosystems. The EMMS and the SIL Workshops showed some overlap and many scientists attended both meetings.

Therefore, it was decided to organize the next meeting jointly for the first time and to have a forum for the broad field of aquatic microbiology. The meeting took place in the Leeuwenhorst Congress Center at Nordwijkerhout, The Netherlands. I was invited to give a keynote lecture with the title, "Development of Aquatic Microbial Ecology: Observations and Remarks of a Witness". For me aquatic microbiology begins with the lecture of S.I. Kusnezow at the 13th SIL Congress in Helsinki in 1956. He demonstrated for the first time adequate methods for studying structure and function of aquatic microflora. Most of the people in the auditorium at Noordwijkerhout were of course younger, born after 1956, and I was impressed with the attention which the history of our science attracted.

The progress of the recent years is tremendous - there were hardly any oral presentations or posters without highly developed molecular techniques. However, there remains a big gap between the genetic structure and the function of the microbial biomass. The classical methods for measurement of biochemical activities in the aquatic environment will therefore be inevitable in the future. It will be of much interest to follow the development of aquatic microbial molecular ecology.

In summary, the meeting was a success and it was decided to proceed with joint meetings of freshwater and marine microbiologists. The future name of these Symposia will be SAME (Symposium on Aquatic Microbiology Ecology). The next SAME Symposia will be in Italy (2002) and Finland (2004).

Following my retirement as the chairperson of this SIL Working Group, the new chairperson will be:

Professor Meinhard Simon
Inst. for Chem. and Biol. of the Marine Environment (ICBM)
Univ. of Oldenburg
D-26111 Oldenburg, Germany
m.simon@icbm.de
Phone: 0441 798 5361
Fax: 0441 798 3404

Chairpersons of EMMS are:

Professor Gerhard J. Herndl
Netherlands Institute of Sea Research (NIOZ)
P.O. Box 59
1790 AB Den Burg, The Netherlands
herrndl@nioz.nl
Phone: 31 222 369 507
Fax: 31 222 319 674

and

Professor Lucas J. Stal
Netherlands Institute of Ecology
- Centre of Estuarine and Coastal Ecology (NIOO-CEMO)
P.O. Box 140
4400 AC Yserke, The Netherlands
stal@cemo.nioo.knaw.nl
Phone: 31 113 577 497
Fax: 31 113 573 616

Jürgen Overbeck
Chairperson

Book Reviews

Limnology of Humic Waters

Edited by Jorma Keskitalo and Pertti Eloranta
284 pp., 1999
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-029-3
Dutch Guilders 168.00/US\$ 93.00

The book 'Limnology of Humic Waters' summarizes the structure and function of humic substances in waters and their effects on the biota and biological processes. The first section of the book deals with the occurrence, character and biogeochemistry of humic substances and their impact on water chemistry and light attenuation. Subsequent chapters tackle food webs of humic water, including a close look at pelagic bacteria, algae and zooplankton, benthic communities, fish, decomposition processes and trophic interactions. Most of the data presented stems from comprehensive studies of Finnish humic lakes that have taken place over the past several years.

The greatest strength of the book is the wealth of information provided. This alone will prove invaluable to researchers working on humic systems (for example, on the North American prairies where humic systems tend to be alkaline as opposed to acidic) who wish to contrast and compare their data.

The quality of information provided varies greatly from chapter to chapter. For example, the discussion of light attenuation and penetration in humic systems in Chapter 4 is thin. Classic papers by Kirk (1994) and Jerlov (1968) are not even acknowledged. There is no mention of measurement of absorptivity coefficients as a metric for coloured dissolved organic matter (CDOM), current models which predict light attenuation from DOC concentration (Scully and Lean 1994) or measurement of spectral slopes. On numerous occasions, various authors state that light does not penetrate deeply into humic aquatic ecosystems. Curiously, no actual light penetration depths are provided. Such information for Swedish lakes of differing humic content is given in Graneli *et al.* (1996). In Chapter 5, the 'Resource Ratio Hypothesis' of Tilman is inaccurately referred to as the 'limited nutrition resource hypothesis' (Tilman's name is misspelled in the reference as well).

Numerous small, but annoying, gaffs such as the one noted above detract from the overall message of the book. There are, however, more serious problems. This book is riddled with spelling mistakes (including a number of authors' names) and grammatical errors. Moreover, awkward sentence and paragraph construction, at times bordering on the unintelligible, abound. While some chapters are well written (e.g. Chapter 6.3, Benthic Communities in Humic Streams), others require a ruthless edit (Chapter 5, Bioavailability of Nutrients - at one point the author states that 'Seriously profound critics have been raised in the concept of nutrient limitation.'). This is a major problem and could have been avoided had Backhuys Publishers availed themselves of a competent English editor. Considering the hard work that went into the book, it is a travesty that such tight editing was overlooked.

References Cited:

- Graneli, W., Lindell, M. and Tranvik, L. 1996. Photo-oxidative production of dissolved inorganic carbon in lakes of different humic content. *Limnol. Oceanogr.* **41**:698-706.
- Kirk, J.T.O. 1994. Optics of UV-B radiation in natural waters. *Arch. Hydrobiol. Beih. Ergebn. Limnol.* **43**:1-16.
- Jerlov, N.G. 1968. *Optical Oceanography*. Elsevier.
- Scully, N.M. and Lean, D.R.S. 1994. The attenuation of ultraviolet radiation in temperate lakes. *Arch. Hydrobiol. Beih. Ergebn. Limnol.* **43**:135-144.

Marley Waiser
National Water Research Institute
Canada

**Introduction to the Copepoda:
(2nd, revised and
enlarged edition)
(Guides to the Identification of
the Macroinvertebrates of the
Continental Waters of the World.)
(Coordinating Editor - H.J. Dumont)**

By B.H. Dussart and D. Defaye

344 pp., 2001

Backhuys Publishers, Leiden, The Netherlands

ISBN 90-5782-069-2

Dutch Guilders 160.00/US\$ 80.00 (softbound)

Unlike the water fleas or Cladocera, that looked tantalizingly easy to identify to workers a century ago, the Copepoda were considered more complex and difficult to study. However the laugh has been at the expense of the Cladocerologists. As Korovchinsky (2000) states, the Copepoda can be identified with greater certainty being bisexual while the parthenogenetic Cladocera with their microvariations are much more difficult to identify to species. Only slightly more than 17% of Cladocera have been well described according to Korovchinsky (1996). The proportion for Copepoda must be higher, though I may be wrong here, thanks to intensive studies on Cladocera recently as compared to Copepoda perhaps.

Copepod taxonomy has also benefited from some excellently endowed taxonomists and both Bernard Dussart and Danielle Defaye belong to this category. Their combined work has spanned over half a century and has brought to freshwater copepod taxonomy great morphological insights and a superb appreciation of Copepod morphology. Both Danielle and Bernard have been in my laboratory three or four times working on Copepoda taxonomy and I was astounded and absolutely amazed at their intimate and effortless knowledge of copepod morphology. Danielle has not played second fiddle and has contributed much to their partnership since she teamed up with Bernard many years ago.

Earlier workers considered especially the free living Cyclopoida as cosmopolitan. *Mesocyclops leuckarti* described from Germany 150 years ago was reported from all continents (except Antarctica). These records now would apply to about 50 species. Better microscopes and long

experience studying the group helped. Kiefer (1981) had seen *Mesocyclops* for over 50 years before he recognised the crucial importance of the male genitalia in his seminal revision of this genus. The Dussart - Defaye team did a fair share to bring more *Mesocyclops* to light, though others too have contributed greatly in the study of this genus.

This volume on Copepoda is invaluable to anybody studying this group now. The coverage is very wide and the literature citations are very useful. The revised and enlarged edition is an improvement on the first edition.

The illustrations are very good. This is very important for all Copepoda, even for routine diagnosis, but is especially important for the Calanoida where proper orientation and the ability to picture three dimensional animals is crucial. This volume has done an excellent job with these figures.

The authors modestly and accurately state that this copepod guide is a short lived tool. However, the morphology of these fascinating animals, supposed to be the most numerous metazoans of any size in the world today, has been superbly displayed and described. The authors should be congratulated on their effort which will be a boon to copepodologists working on freshwater copepods anywhere in the world.

References Cited:

Kiefer, F. 1981. Beitrag zur kenntnis von Morfologie, taxonomie und geographischer Verbreitung von *Mesocyclops leuckarti* auctorum. Archiv fur Hydrobiol. Supplement **62**:148-190.

Korovchinsky, N.M. 1996. How many species of Cladocera are there? Hydrobiol. **321**:191-204.

Korovchinsky, N.M. 2000. Trends in Cladocera and Copepoda taxonomy. Arthropoda Selecta **9**:153-158.

C.H. Fernando

Distinguished Emeritus Professor

University of Waterloo

Canada

Aquatic Restoration in Canada

Edited by Tom Murphy and Mohiuddin Munawar
212 pp., 1999, Hardbound
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-049-8
Dutch Guilders 125.00/US \$62.50

Canada is generally regarded as a nation with a plentiful supply of clean water. However, some Canadian waters have been damaged by industrial, municipal and agricultural discharges. This book examines remediation and restoration techniques used to rehabilitate lakes, wetlands, beaches and sediments through a series of ten papers, each presenting a different action or approach and its application in Canada.

Planning and management actions are the theme of the first four chapters and involve determining the nature and extent of the problem and identifying restoration/remediation options suitable to the degree of contamination and environmental consequences. One example of these type of actions is the Remedial Action Plan program that was initiated in 1987 to restore "beneficial uses" within 42 degraded Areas of Concern (AOCs) around the Great Lakes. The program, described in Chapter 1, is a three-step process that involves identifying impacts and sources of environmental degradation (i.e., problem definition); setting of restoration goals by local communities in association with experts and determining required actions and time lines (i.e., implementation); and achieving restoration goals (i.e., restoration). As of July 1997, the implementation phase was, on average, a little over half completed and about half of the restoration targets had been achieved for the 18 Canadian or joint Canada-USA AOCs. Other examples of planning and management activities in support of aquatic ecosystem restoration are given in Chapters 2-4 and include methods for assessing impacts of development on fish habitat; identifying appropriate on-site wastewater treatment for small communities; and evaluating sediment contamination in relation to the concentration and loads of contaminants from point and non-point sources.

The remaining six chapters examine a variety of technologies that have been used to remediate aquatic habitats in Canada. Three chapters examine techniques to restore eutrophic lakes, namely aeration, liquid oxygen injection and sediment dredging combined with withdrawal of hypolimnetic waters. In southern British Columbia, lake aeration has been used to improve recreational fisheries and water quality in 21 lakes (by inducing artificial circulation during fall and winter in 19 lakes or

increasing oxygen concentrations in the hypolimnion in two lakes). The results were variable due largely to variation among lakes in the effectiveness of the aeration system in matching or exceeding oxygen consumption in the water. However, when air supply was sufficient to maintain oxygen in the water column, responses such as change in phytoplankton dominance from cyanobacteria to diatoms, a return of cold-water fish species and a decrease in spring overturn phosphorus concentrations were observed. A similar assessment of the effects of liquid oxygen injection into three lakes showed that in the case of Amisk Lake in Alberta, year-round injection of about 1.3 t oxygen/day maintained hypolimnetic oxygen concentrations at $> 2 \text{ mg L}^{-1}$ in summer and $> 5 \text{ mg L}^{-1}$ during ice-covered periods, decreased total phosphorus concentrations in the hypolimnion by $> 50\%$, and reduced chlorophyll *a* concentrations in surface waters by 55%. A third study assessed the effectiveness of sediment dredging and reported that for a long narrow lake with high sedimentation, dredging and withdrawal of hypolimnetic water improved water clarity although total phosphorus and chlorophyll *a* concentrations were reduced by only 10-20%. In contrast with the three chapters addressing lake eutrophy, fertilization with phosphorus and nitrate was undertaken in a British Columbia lake with the intention of replacing nutrients trapped behind upstream dams, thereby enhancing productivity of the food web and restoring declining stocks of kokanee salmon. Although this approach is not widely applicable, kokanee numbers in the lake appear to have increased. The remaining two chapters in this section consider entirely different problems: (1) bioremediation of oil spills on shorelines, a technique that involves the addition of oil-degrading bacteria or the addition of material (e.g, nutrients, oxygen), or improvements to habitat to simulate their growth, and (2) restoration of prairie wetlands and associated waterfowl habitat by installing water control structures or earth plugs to reverse the effects of drainage caused by agricultural and urban expansion.

This book is a valuable reference for ecologists and engineers involved in restoration of aquatic ecosystems and for students of environmental design and management. A particularly useful feature of the book is that, successes as well as setbacks and failures of the four planning/management actions and six methods/techniques are discussed, thus allowing others to benefit from the experiences gained in these studies. Because of the diverse climate, soils and topography in Canada, it is likely at least one of the approaches presented in this book is applicable to other countries in the world.

Patricia Chambers
National Water Research Institute
Canada

Biodiversity in Wetlands: Assessment, Function and Conservation Volume 1

Edited by B. Gopal, W.J. Junk and J.A. Davis
354 pp., 2000
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-059-5
Dutch Guilders 196.00/US \$98.00, softbound

This book is the first of two volumes from a symposium on wetlands biodiversity held at INTECOL's V International Wetlands Conference in Perth, Australia in September 1996. The fourteen contributions in this volume deal with biodiversity in a variety of wetland types including riverine floodplains, mangroves, karst wetlands, bogs and fens, and wetlands in arid regions. A variety of plant and animal groups including microbes are addressed. The second volume will include additional wetland types and organisms not covered in this first book and an overall synthesis and summary for the two volumes. The second volume was supposed to follow the first book by four months, however a recent check of the publisher's website (October 2001) did not show it listed.

The volume opens with an introductory paper on biodiversity and wetlands and defines the issues to be discussed in each of the subsequent review papers. The primary focus is the wide array of factors determining the biodiversity in various wetland types and how biodiversity is generally becoming depleted due to human impacts on these systems. The next two papers provide reviews of biodiversity in tropical stream/riverine wetlands. The first of these focuses on invertebrates while the second discusses the factors affecting fish and mammal diversity in these unique ecosystems. The next four papers provide reviews on biodiversity in a variety of river floodplains. The first two focus primarily on fish and the biotic and abiotic factors affecting fish use and diversity, while the last two provide detailed reviews of functional and structural diversity on plant and animal communities. The next five papers look at determinants of biodiversity in a variety of wetland types from mangroves to seasonal wetlands in arid regions. Factors discussed include natural water level changes throughout the year to long-term changes influenced by climate change. These chapters on specific wetland types are followed by an excellent review of bacterial biodiversity,

an often-neglected group in these types of discussions. Finally the volume concludes with two papers addressing methods and issues related to the restoration and conservation of biodiversity in wetlands. The first of these papers provides a realistic look at restoring biodiversity in wetlands and the final paper reviews international mechanisms (conventions, codes, and treaties) for conserving wetlands.

The quality of the reviews in this volume is generally very good and although there is a geographic focus to the majority of the contributions as a package they all contribute to a sound overview of the factors determining biodiversity in wetland systems. It is unfortunate that an overall synthesis and summary was not provided at the end of this first volume. It would have allowed this volume to stand alone more effectively and could have served as a helpful transition to the second volume.

Henry R. Murkin
Ducks Unlimited Canada



Sunset in the Dead Sea area. (Photo taken by Ittai Gavrieli, October, 2001) (See story on page one)

Calendar of Events

2002

The Fourth International Ecohydraulics Symposium: Environmental Flows for River Systems. An international working conference on assessment and implementation.

3 - 8 March 2002

Cape Town, South Africa

conference2002@southernwaters.co.za

Phone: +(27) 21 685 4166

Fax: +(27) 21 685 4630

www.southernwaters.co.za

Phytoplankton Productivity Conference: An Appreciation of 50 years of the Study of Oceans and Lakes.

18 - 22 March 2002

University of Wales

Bangor, UK

Contact: Peter J. le B. Williams

School of Ocean Sciences

University of Wales BANGOR

Menai Bridge

Anglesey

LL59 5EY

UK

pjlw@bangor.ac.uk

Phone: (+44) (0)1248 382840

Fax: (+44) (0)1248 382620

<http://www.plankton-productivity.org>

The International Conference on Water Resources Management in Arid Regions.

23 - 27 March 2002

Kuwait

Contact: Muhammad F. Al-Rashed

Conference Chair

Water Resources Division

Kuwait Institute for Scientific Research

P.O. Box 24885

Safat 13109, Kuwait

mrashed@safat.kisr.edu.kw

msherif@safat.kisr.edu.kw

eawadi@safat.kisr.edu.kw

Phone: (965) 4836100 ext. 4600 & 5197

Fax: (965) 4818482

The Fifth Symposium on Enchytraeidae.

12 - 14 April 2002

Wageningen, The Netherlands

Contacts: Wim Didden

wim.didden@bb.benp.wa.nl

or Petra van Vliet

petra.vanvliet@bb.benp.wa.nl

Phone: +31 317 482 134/344

Fax: +31 317 483 766

9th International Symposium on the Interactions between Sediments and Water (IASWS).

5 - 10 May 2002

Banff Springs Hotel, Canada

Contact: Ellen Petticrew

University of Northern British Columbia

3333 University Way

Prince George, BC

V2N 4Z9 Canada

iasws@unbc.ca

Phone: 1 (250) 960-6645

Fax: 1 (250) 960-5538

www.wsc.monash.edu.au/iasws/ninthconference.html

First International Conference on Water and Health -ICWH 2002.

12 - 15 May 2002

University of Ottawa Campus

Ottawa, Ontario, Canada

Contact: ICWH 2002 Conference Secretariat

Centre for Water and the Environment

Queen's University

Kingston, Ontario, Canada

K7L 3N6

cwe@civil.queensu.ca

Phone: (613) 533-6438

Fax: (613) 533-2128

Shallow Lakes 2002 - International Conference on Limnology of Shallow (Non-Stratifying) Lakes.

25 - 30 May 2002

Balatonfüred, Hungary

Contact: Judit Padisák

Shallow Lakes

Balaton Limnological Research Institute

H-8237 Tihany, P.O. Box 35

Hungary

padisak@tres.blki.hu

Fax: +36 87 448 006

<http://www.shallowlakes.hu>

50th Annual Meeting

North American Benthological Society.

28 May - 01 June 2002

Pittsburgh, Pennsylvania, USA

<http://www.benthos.org/>

XI Congreso de la Asociación - Española de Limnología y - III Congreso Ibérico de Limnología.

17 - 21 Junio de 2002

Madrid, Spain

Contact: Secretaría Científica del Congreso

Centro de Estudios Hidrográficos del CEDEX

Congreso AEL 02

Paseo Bajo de la Virgen del Puerto

3 - 28005 Madrid (España), Spain

Manuel.Toro@cedex.es

Phone: +33 91 3358001

Fax: +34 91 3357994/ +34 91 3357922

www.cedex.es/enlaces/congreso/AEL2002

International Workshop: Ecological Advances on Animal Populations and Communities in North Africa.

24 - 26 June 2002

Toulouse, France

Contact: Sebastien Brosse

CESAC

Universite Paul Sabatier Toulouse-III

118 route de Narbonne

F-31062 TOULOUSE cedex 04

France

brosse@cict.fr

Phone: +33 5 61 55 86 87

Fax: +33 5 61 55 60 96

www.mairie-toulouse.fr/enbref/enbro001F.htm

(in French)

Third International Conference on Water Resources and Environment Research (ICWRER)

Subtitle: Water Quantity & Quality Aspects in Modelling and Management of Ecosystems.

22 - 26 July 2002

Dresden, Germany

Contact: Conference Secretariat

Cathleen Schimmek, Gisela Schöler

Conference Secretariat ICWRER 2002

Institute of Hydrology and Meteorology

Dresden University of Technology

Wuerzburger Str. 46

D - 01187 Dresden, Germany

icwrer2002@mailbox.tu-dresden.de

Tel: +49 - 351 - 463 3931

Fax: +49 - 351 - 463 7162

www.tu-dresden.de/fghhihm/hydrologie.html

4th International Conference
on Reservoir Limnology and Water Quality.
12 - 18 August 2002
„ eské Bud • jovice, Czech Republic
Contact: Jakub Borovec, Conference Secretary
Hydrobiological Institute
Academy of Sciences of the Czech Republic
Na sádkách 7
CZ-370 05 „ eské Bud • jovice
Czech Republic
reslim@bu.cas.cz
Phone: +420-38-777 5879
Fax: +420-38-530 0248

11th International Symposium on Aquatic Weeds
European Weed Research Society.
2 - 6 September 2002
Moliets et Maâ, France
Contact : Cemagref
Symposium EWRS
Unité de Recherche Qualité des Eaux
50, Avenue de Verdun
33612 CESTAS CEDEX, France
ewrs.2002@bordeaux.cemagref.fr
Fax: (33) 5 57 89 08 01

The Third International Symposium
Speciation in Ancient Lakes (SIAL-2002).
2 - 7 September 2002
Irkutsk, Russia
Contact: Oleg A. Timoshkin
Vice-Chair of the Organizing Committee
Limnological Institute SD RAS
Baikal International Centre for Ecological Research
Ulan-Batorskaya, 3
P.O. Box 4199
664 033, Irkutsk, Russia
tim@lin.irk.ru
Phone: +3952-46-02-18
Fax: +3952-46-04-05

NALMS 2002: 22nd International Symposium
of the North American Lake Management Society.
30 October - 1 November 2002
Anchorage, Alaska
Contact: Terry Thiessen
NALMS Conference Coordinator
P.O. Box 5443
Madison, WI 53705-0443
USA
thiessen@nalms.org
Phone: (608) 233-2836
Fax: (608) 233-3186
www.nalms.org

2003

The 3rd International Limnology Congress
(ILIC).
29 March - 2 April 2003
Tucson, Arizona, USA
Contacts: Theme session proposals:
Andrew Cohen, General Chair of the Congress,
Dept. of Geosciences, University of Arizona,
Tucson, AZ 85721
acohen@geo.arizona.edu
Phone: 1-520-621-4691
Fax: 1-520-621-2672
Field trip proposals: David Dettman, Field Trip
Coordinator for the Congress
dettman@geo.arizona.edu
Housing and Registration: Noah Lopez
noahl@u.arizona.edu

2nd International Symposium on Contaminated
Sediments: Characterisation, Evaluation,
Mitigation/Restoration, Management Strategy
Performance.
26 - 28 May 2003
Quebec City, Quebec
Canada
Contact: Hélène Tremblay
Secretariat of the Symposium on Contaminated
Sediments
Département de géologie et de génie géologique
Université Laval
Québec, QC,
G1K 7P4
Canada
htrembla@ggl.ulaval.ca
Phone: 1 (418) 656-2193
Fax: 1 (418) 656-7339
<http://www.SCS2003.ggl.ulaval.ca>

51st Annual Meeting
North American Benthological Society.
May/June 2003
Athens, Georgia, USA
<http://www.benthos.org/>

The 4th Conference of SIL Working Group on
Aquatic Birds - Limnology and Waterbirds 2003.
4 - 9 August 2003
Sackville, New Brunswick, Canada
Contact: Joseph Kerekes
Environment Canada
45 Alderney Drive
Dartmouth, Nova Scotia
B2Y 2N6, Canada
joe.kerekes@ec.gc.ca
Phone: (902) 426-6356
Fax: (902) 426-4457
<http://qlinks.ucs.mun.ca/lw/>

The Ninth International Symposium on Aquatic
Oligochaete Biology.
September 2003
The Netherlands
Contact: Piet F.M. Verdonschot
Alterra Green World Research
Team Freshwater Ecology
P.O. Box 47
6700 AA Wageningen
Utrecht, The Netherlands
P.F.M.VERDONSCHOT@ibn.dlo.nl
Phone: [31] (0) 343 45 52 78
Fax: [31] (0) 343 45 52 88

2004

52nd Annual Meeting
North American Benthological Society.
May/June 2004
Vancouver, British Columbia, Canada
<http://www.benthos.org/>

SIL XXIX Congress.
8 - 14 August 2004
Lahti, Finland
Contact: Congress Management Office
University of Helsinki
Palmenia Centre for Research and Continuing
Education
Kirkkokatu 16
15140 Lahti
Finland
sil2004@latkk.helsinki.fi
Phone: + 358 3 892 11
Fax: + 358 3 892 20219
www.palmenia.helsinki.fi/congress/SIL2004

2005

53rd Annual Meeting
North American Benthological Society (this is
being planned as a joint meeting with the Council
of Aquatic Sciences).
10 - 15 July 2005
Portland, Oregon, USA
<http://www.benthos.org/> and
www.nalms.org/aqscoun/aqscoun.htm

2006

The Tenth International Symposium on Aquatic
Oligochaete Biology.
2006
Tentatively scheduled to convene at:
The Institute of Hydrobiology
Chinese Academy of Sciences
Wuhan Hubei, People's Republic of China
Contact: Hongzhu Wang
Chair of the symposium organizing committee
State Key Laboratory of Freshwater Ecology and
Biotechnology Institute of Hydrobiology
Chinese Academy of Sciences
Wuhan Hubei 430072 People's Republic of China
wanghz@ihb.ac.cn or hongzhu.wang@nrm.se
Phone: [86] 27 8764-7719
Fax: [86] 27 8764-7664

SIL Officers

President

Gene Likens
Institute of Ecosystem Studies
Box AB
Millbrook, New York 12545
USA
likensg@ecostudies.org

Vice Presidents

Winfried Lampert
Max-Planck-Institut für Limnologie
Postfach 165
D-24302 Plön
Germany
lampert@mpil-ploen.mpg.de

Brian Moss
School of Biological Sciences
Derby Building
The University of Liverpool
P.O. Box 147
Liverpool L69 3BX
Great Britain
bmoss@liv.ac.uk

General Secretary-Treasurer and Editor

Robert G. Wetzel
Dept. of Environmental Sciences and Engineering
School of Public Health
The University of North Carolina
Chapel Hill, North Carolina 27599-7431
USA
rwetzel@unc.edu

Associate Editors

Colbert E. Cushing
105 Cherokee Drive
Estes Park, Colorado 80517
USA
cecushing@aol.com

John R. Jones
Fisheries and Wildlife Sciences
School of Natural Resources
302 Anheuser-Busch Nat. Res. Bldg.
University of Missouri-Columbia
Columbia, Missouri 65211-7240
USA
jonesj@missouri.edu

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Courtney Parker
Dept. of Environmental Sciences & Engineering
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The University of North Carolina
Chapel Hill, North Carolina 27599-7431
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Fax: (919) 966-7911
courtney_parker@unc.edu