



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.

In this Issue

Limnologists in Schools -
- SIL possibilities 1-3
Announcements 4-7
Gernot Bretschko 1938 - 2002 . . . 4-5
USA National Medal of Science 5
Vale Bill Williams, AO 1936 - 2002 . 6-7
Book Reviews 8-13
Calendar of Events 14-15
SIL Officers 16
Change of address 16



Thomas G. Northcote with some of the Grade 2 students from the Giant's Head Elementary School at Prairie Creek near the foot of Giant's Head Mountain, Summerland, British Columbia, Canada. (Photo taken April 23, 2001 and is courtesy of Mrs. Chris McIntosh)

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Limnologists in Schools - SIL possibilities

by

Thomas G. Northcote

continued on next page

In Volume 34 of SILnews, September 2001, I noted that limnologists and the science of limnology were not widely recognized by the general public, especially in comparison with oceanography. I put forward the suggestion that SIL members might help rectify this by giving two or more days each year to provide primary and/or secondary school children, as well as their teachers, with some understanding of our science. I have been involved in such an approach with the “Scientists in Schools” programme in the province of British Columbia, Canada, for well over 30 years. I thought that it might be useful to outline briefly as an example for other SIL members, an evolved session sequence that seemed to be interesting and effective for both students and teachers.

A day session begins in the morning in an auditorium or gymnasium where several classes can assemble. As the classes file in, I project on a large screen from an overhead projector live local freshwater animals in Petri dishes. They were collected the previous afternoon with some of the teachers and students. Invariably this catches the students’ attention as they come in, with repeated exclamations of “cool”! I tell them that each class will be working with these animals, and others, later in the morning and afternoon to see how many different “kinds” we can find from their local ponds, lakes, streams and rivers.

Then I explain briefly that in any science it is important to ask questions, especially new ones, and then to try to answer them in special ways which often involves experiments. I say, I am going to try to answer four questions: (1) What is limnology? (2) How is it done? (3) Why is it an important branch of science? (4) What are some of the very interesting inland waters of the world that limnologists study?

1. What is LIMNOLOGY?

I ask the classes that if I told them that I was an oceanographer, would they know where I often worked and what would be some of the things I would do there. Many of the students do, and give good suggestions about what I might do on or in seawaters. I then say that limnologists do nearly all those things but on our inland waters, some of which are even saltier than the sea, and just as interesting! I have the classes repeat “limnology” several times so they (and the teachers) learn how to pronounce it properly. Depending on the class level, I may extend the definition of limnology somewhat, noting that limnologists, like oceanographers, study the physics, chemistry, biology and ecology of their inland waters. Also I may give a few comments on where

and when this science began. If I am working with the primary classes, I keep forgetting what kind of a scientist I am, and ask them to tell me. By the end of this first session they surely all know how to say “limnology” and “limnologist”!

2. How is LIMNOLOGY done?

On a table at the front I set up some of the more simple instruments that limnologists use in their science, and illustrate how these are used, as well as how many of them can be cheaply made with a little help from their father or mother. Again, I say, these instruments are used to answer questions:

- How deep are certain ponds, lakes, rivers? (marked sounding line and weight, now largely replaced by echo sounders);
- What is their temperature at the surface, mid-way down the water column, near the bottom? (simple thermometer, a maximum-minimum thermometer, a thermistor);
- How can we get water samples from these depths to measure temperature, dissolved chemicals? (weighted plastic bottle corked with a short string and attached to a sounding line);
- How can we measure how clear lakes and rivers are, i.e., their water transparency? (sounding line and Secchi disc);
- How can we catch some of the small plants and animals living in pond, lake, and river waters? (small Wisconsin-type plankton net, detachable bucket, and sounding line);
- How can we catch the larger animals living on or near the shoreline bottom of ponds, lakes and rivers? (various sized dipnets with handles, non-toxic holding buckets);
- How can we catch small fish living in such areas? (similar nets and small seines).

The above of course are mainly for the primary grades but can be amplified and expanded on with more sophisticated examples for senior grades. For each of the above, I try to give briefly how the information obtained is used - Secchi depths give an indication of how deep one might expect to find many plants, and how clear the water should be for safe swimming (for example, 2 m in Canada), and so on.

3. Why is LIMNOLOGY a very important science?

I introduce this topic by asking the class who among them has had a nice cool glass of seawater with their breakfast. Invariably several put up their hands and I tell them if that were true they had better leave quickly for the bathroom! I then explain that limnologists have long been very interested in not only the supply of freshwater used for drinking and cooking by humans, but also with its quality. Indeed, I point

out that a good supply of high quality, non-contaminated freshwater is essential to human life everywhere, and that unfortunately even here in Canada with its abundance of freshwater we sometimes have severe problems as was demonstrated recently in Ontario. So limnologists are very much involved with the most important liquid on earth - fresh water!

I then illustrate the many other important uses of inland waters and how limnologists are contributing to their proper use and preservation. These include food production, especially agricultural crops, and how in some parts of the world, inland waters are becoming so laden with salts that agricultural production of food is now difficult. Inland waters are also used for aquatic farming of some invertebrates and fishes. In addition, and, especially in Canada, much of our electrical production comes from hydroelectric storage dams and study of the conditions in these require major inputs from limnologists. Furthermore, many of our inland waters are important for transportation, as well as recreation, and all these uses along with the others require information from limnologists.

4. What are some very interesting inland waters of the world?

Here with the use of overheads and slides (many from pre- and postcongress SIL excursions), I give illustrated information on:

- The largest (by volume), deepest, and oldest lake in the world - Lake Baikal;
- The largest and most species-rich river for fishes in the world - the Amazon;
- If time permits, some coverage of a nearby lake or river.

This concludes the morning group session. Then we move class by class to a suitable room where I have set up, beforehand, about six tables on which I have for each:

- (1) A large 'limnpond' (a good-sized white-bottomed dishpan or plastic pan);
- (2) Six plastic 'limnosuckers' (pipette tips angle-cut to allow capture of moderate sized zooplankters);
- (3) Six 'limnonets' (5 cm handles with 1 cm oval-shaped ends, made from white coat hanger wire and covered with fine nylon mesh);
- (4) One plastic 'limnodish' (10 cm Petri dish partially filled with the local pond/lake/river water); and,
- (5) Lots of paper towelling!

Each 'limnpond' is partially filled with local pond/lake/river

water collected the previous evening and contains a rich array of aquatic plants and live invertebrates. Up to six students work at each table and try to find as many different kinds of live animals as they can from their 'limnpond', carefully placing them into their 'limnodish' with the 'limnosuckers' and 'limnonets'. They have up to 15 minutes to do this. Then with the help of the teacher, I take sequentially each 'limnodish' up to an overhead and identify the number of different kinds of plants and animals found by each table, saying a bit about them, and having the teacher score the number, table by table, on the blackboard. There is always great interest, fun and excitement at this stage.

Finally there is a 10 to 15 minute question, answer and discussion session (don't ever underestimate the depth of questions that even the young ones can ask!), before moving on to the next class- usually one or two in the remainder of the morning, and the same in the afternoon.

For the more senior class levels, I have found it easier to provide more in depth coverage of the initial four basic questions posed, and to use a more experimental approach to the hands-on biodiversity session. For example, biodiversity indices can be compared among pond, lakeshore and streamside habitats; among low, intermediate and high productivity waters by in classroom measures of their total dissolved solid content, or even dissolved phosphate and nitrate levels. Feeding and/or vertical migratory behaviour of larger zooplankters such as *Chaoborus* larvae can be observed, compared with different prey types or illumination levels, and so on.

In conclusion, I have found every session with the young and older students a most rewarding and challenging experience - and consider the sessions (usually six to eight each year) a positive means to put forward limnology as an exciting and important branch of science for young searching minds in all parts of the world.

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Announcements



Photo taken of Gernot Bretschko in Kenya in 1994.

Gernot Bretschko 1938 - 2002

Gernot Bretschko died from cancer on March 28, 2002. He was not alone when he died. With him was one of his Ph.D. students and the owner of the “Wirtshaus” (a place where you either drink and eat or simply drink) where many of us shared hours of fun with him. His last company symbolizes what mattered a lot in his life: science and a zest for living.

As many of us know, Gernot would not have wanted extravagant praise of his scientific career and many merits in this obituary because he was a very modest man. Thus, I will give just a few details. He studied zoology and physical chemistry in Graz (Austria) and received his first academic position there. At the time of his death, he was head of the Biological Station Lunz (a department of the Institute of Limnology of the Austrian Academy of Sciences). He worked in many places in Europe, America, Africa and Asia

on various ecological subjects in systems as diverse as open oceans, mangroves, reservoirs, high mountain lakes, small streams and large rivers. When he became head of the Station at Lunz in 1976, he began a long-term, ecological study of a small stream near the laboratory (RITRODAT-LUNZ project). Throughout this project, he faced a problem common to all those involved in long-term, ecological research: the dilemma of whether to write a synthesis of all the many data now or to add more years to the study. He opted for “more years” and left a treasure of long-term, ecological data on an alpine stream that awaits exploitation. It would be his greatest wish that younger colleagues could gain the support to fulfil this task.

Being director of the Biological Station Lunz, Gernot cared a lot for his staff but also for visitors. According to the tradition of the Station, he maintained Lunz as a place where limnologists go to get a break, to read and think, to discuss, to write a paper without being disturbed by every-day business. For those who met him in Lunz, as well as for those who had the chance to meet him elsewhere, he was a master of combining experience, humanity and common sense with his great sense of humour to guide, encourage, criticize (often by criticizing his own ideas), comfort and entertain. As one of his friends coined it: *he was a real gentleman!*

With his broad knowledge in many fields of science, he was appreciated for the valuable advice that improved so many research projects. In addition, he knew so much of many other fields. Marked by his job as an extra at the opera and the theatre in Graz during his college days, and by his many trips through all continents, he loved to talk about the diversity of cultures existing in our world, which was another element which contributed to enriching and enlivening discussions with him. These traits made him a perfect catalyst for encouraging relationships between people, and countless are the friendships he created with and among others.

When Gernot started to talk about his retirement plans a couple of years ago, some people began to plan a suitable event for the occasion. They agreed that he would appreciate a symposium at Lunz, during which he and his friends would repeat the first scientific conference of their lives, including some retrospective comments. With great sorrow we have to accept that this is now impossible, but perhaps we should do it anyway in his honour and as a memorial to the extraordinary person that we have lost.



In 1988, Wolf E. Klemens drew this cartoon drawing to commemorate Gernot's 50th birthday.

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Erratum

Unfortunately the names of the survivors mentioned in the obituary for David C. Chandler in *SILnews*, Volume 36, May 2002 issue on page 5 were misspelled. A computer software glitch is responsible for the misspelling. Conduce Lacolle should read Candace Loechl and Jessica Lacolle should read Jessica Loechl. Our apologies to Candace and Jessica Loechl.

SIL President - Gene Likens Awarded USA National Medal of Science

President Gene E. Likens was among the 15 recipients of the National Medal of Science in a ceremony at the White House on 12 June 2002. The National Medal of Science honors individuals for pioneering scientific research that has enhanced our basic understanding of life and the world around us. Professor Likens was specifically recognized for his contributions to establishing the link between increasing acidity of precipitation and fossil fuel combustion in North America and to understanding of the consequences of acid rain. His studies with colleagues commanded public awareness and led to national legislation directed toward remedying the effects of acid rain. Furthermore, Dr. Likens' long-term ecological studies led to important understanding of ecosystem couplings among airsheds, watersheds, nutrient cycling, land-use practices, and biogeochemical cycles. The members of SIL congratulate Dr. Likens for his many contributions to global environmental problems.



Thomas G. Northcote with students in a classroom of Good Shepherd Christian School, Osoyoos, British Columbia, Canada. (Photo courtesy of Mrs. Ruth Knippleberg taken April 30, 2002) (See cover story)



Bill Williams as Chairman of the Department of Zoology, University of Adelaide, circa 1990 (Photo: Phil Kempster)

Vale Bill Williams, AO 1936 - 2002

Emeritus Professor W.D. (Bill) Williams died on Australia Day 2002, after a long battle with acute myeloid leukaemia.

Bill was a long time member of SIL, and began partial editorial duties for the *Verhandlungen* in 1995 (congress in Brazil) and continued through 2000 (end of Proceedings from the Congress in Dublin). He also presented the Kilham Memorial Lecture at the Congress in Brazil in 1995. Although he influenced many facets of limnological science, his passion was the saline lakes that dominate the Australian landscape. "Salt lakes", he would say, "are a marvellous resource for scientists, but very few of us recognise their intrinsic values".

Bill grew up in Liverpool, during the harsh years of the Second World War and its aftermath. With a deep affection for the English Lakes District, encouraged by Macan and Worthington's *Life in Lakes and Rivers* (Collins, 1951), and driven by a fierce inner determination, Bill graduated as a

limnologist from the University of Liverpool in 1961. There he was a protégé of Professor H.B.N. (Noel) Hynes, a pioneer in river ecology who later went to Canada. Bill's Ph.D. was devoted to the ecology, taxonomy and biogeography of an aquatic isopod, *Asellus*. He completed his thesis in record time, by sleeping during the day and working at night.

In 1961, with his bride Anne, and still with a very English demeanour, Bill arrived in Australia to join the new Department of Zoology & Comparative Physiology at Monash University, chaired by Professor A.J. (Jock) Marshall. Encouraged by the good-natured chivvying of colleagues at Monash, Bill soon adapted to his new environment and was evermore an Australian.

He remained at Monash for 14 years. From the outset he developed a close working relationship with Ian Bayly, a recent arrival from New Zealand, and together they became pioneers in Australian limnology. The pair explored the farthest corners of the continent and forged links with other pioneers like Peter Tyler in Hobart, Hilary Jolly in Sydney, John Lake in Narrandera and Alan Weatherley in Canberra. One of their initiatives, in 1961, was to help found the *Australian Society for Limnology*. Today, the ASL has a membership of more than 600.

The many saline lakes of western Victoria held a particular fascination for Bill and Ian, and their beloved lakes soon became a magnet for students. Part of the reason was that, in a time when ecology had an 'ecosystem' focus, saline lakes were attractive because they contained relatively few species, notwithstanding their high productivity, and so appeared to be less complex and more easily investigated than other ecosystems. Sadly, many of those lakes eventually fell to unsympathetic development, particularly irrigated agriculture, and they are now a shadow of what they were.

During his years at Monash, Bill and his colleagues all exercised a strong sense of social responsibility, seen in their contributions to public debates. For Bill especially, the flooding of Lake Pedder in Tasmania was a grievous loss that he strongly contested and never forgot.

At the time he left Monash in 1974, Bill had been promoted to Reader. With an already prodigious record of publications, including the seminal first edition of *Australian Freshwater Life* (1968) and *Inland Waters and their Ecology* (with I.A.E. Bayly, 1973), and as a father-figure to a generation of new limnologists, Bill left Monash to join the University of Adelaide, where the Chair in Zoology lay vacant following the retirement of Professor H.G. Andrewartha. He took up that post in January 1975.

At the helm of the new department, Bill's good humoured, avuncular nature extended well-beyond colleagues in limnology. Students in all areas of zoology will remember his encouragement, perhaps as kindly words over a sherry in the Chairman's office, a letter of support or names dropped at those critical times when people's career paths are set. Within the limnological realm, Bill's prowess as an editor assumed legendary status. We may never know how many of today's present generation of water resource professionals have benefited from his reworking of a once-shabby manuscript! And many more received the same benefit through papers submitted to journals, conference proceedings and books that issued from his influence.

Throughout his tenure at Adelaide, Bill continued his extraordinary output of literature, eventually accruing more than 250 articles, book chapters and books. Amidst the pressures of chairmanship, he could always find time to write, as he loved to do, but it usually was after dinner at home, when he could retreat to his den and work on into the early morning.

At Adelaide, Bill became more involved in matters related to the management of water resources, seen in edited books like *An Ecological Basis for Water Resource Management* (1980) and *Limnology in Australia* (with P. De Deckker, 1986), and his contributions to government committees. He was proud to receive a Doctor of Science degree from his *alma mater*. At that time too, he extended his global influence, spending time in the UK, USA, Canada, Germany, South Africa, Japan, Indonesia, India and Hong Kong. In journeys to Kazakhstan and Uzbekistan, discussions over the fate of the Aral Sea left no less an impression on him than did the saga of Lake Pedder. Bill's global outreach was such that, if limnologists in other countries were asked to name a colleague in Australia, he surely would be the popular choice. As an advocate for the Australian environment, he insisted that we should look at our lakes and rivers afresh, and not through the eyes of scientists from the Northern Hemisphere, as some textbooks encourage us to do (Williams, 1988).

Bill never much enjoyed university administration because it diverted him from science. He did appreciate the value of his role as Chairman, however, as a means to expedite action and overcome inertia. Eventually, the increasing demands of administration and the changing nature of universities, under external political pressures, were among reasons that led him to retire in 1994. The change was a release for pent-up energy that led him into important new roles with the South Australian Fisheries Research Advisory Board and the National Wetlands R&D Program. He donated his priceless library of reprints, spanning many shelves, to the South Australian R&D Institute

(SARDI). He retained an academic role as Emeritus Professor, but preferred to keep a low profile in a department that had new paths to explore.

Fourteen months ago, Bill learned that he had leukaemia. In the months that followed he continued to read and write, and many associates received from him drafts, manuscripts or proofs needing their attention. "I've had a good life", he said in November 2001, "and if I have one professional regret it is that I did not speak out more strongly about the destruction of 'Spaceship Earth'". Although Bill enjoyed a brief period in apparent remission, it was not to last. He died in Brisbane on 26 January 2002.

Bill Williams made a major contribution to science, and no less a contribution to the welfare of other scientists. Academics sometimes represent the lifetime achievements of a colleague as a tree, and in that regard Bill's lineage is well-grown. The spreading branches and branchlets represent connections to many hundreds of water resource professionals in Australia and around the world. With roots in the past, branches in the present and seeds for the future, long may that tree flourish.

Bill is survived by a brother and sister, wife Anne, sons Simon and Richard and two grandchildren.

In the Queen's Birthday Honours List for June 2002, Bill was made a Member of the Order of Australia. Anne was able to tell him of his nomination before he died.

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Book Reviews

Fish Behavior in the Aquarium and in the Wild

by Stéphan Reebbs

272 pp., 2001

Cornell University Press, Ithaca, New York

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Living fishes, wherever they are, tend to captivate the interest and curiosity of the human mind. More people today than ever before have increasing opportunity to observe fishes alive and behaving as fishes do. Fishes are extremely popular pets and the number and popularity of large public aquariums around the world are growing at pace. Through sport diving and various other outdoor activities the number of people coming across fishes in the wild, both in freshwater and marine situations, is increasing all the time. More than this, the ever popularity of angling, the importance and growth of the fishing industries and of fish farming, ensures that more and more people want or need to know something about fish behaviour if they are to progress and succeed in these pursuits. Thus, aside from mere curiosity the need to understand fish behavior becomes more than just of passing interest. However a stumbling block for the public to understanding fish behavior is the paucity of good literature available to the interested non-specialist. It is in this light that Stéphan Reebbs' book is both timely and welcome.

The book differs from what might be expected of one intended primarily for the 'popular' market. It has a compact format without elaborate colour pictures or photographs, and it is essentially a written work where the illustrations are simple line diagrams that provide clarifying support to the text. Such 'public' modesty possibly stems from the fact that the author is a professional scientist specializing in animal behavior – an ethologist. Perhaps this also explains that the text is extremely well written, giving sufficient detail and explanation of the necessary jargon to satisfy the most enquiring mind. It forms a great 'bridge' between the professional and the curious public, precisely the intention of the author in writing it in the first place.

The approach taken in covering the field of fish behavior is constructive and sensible. The first set of chapters explores fish behavior through their sensory structures and abilities under different circumstances. The second set focuses on the fishes' cognitive abilities and the third set on the ability of fishes to make behavioral choices. A successfully conscious effort is made to ensure that the science does not overwhelm the message – unavoidable scientific terms are not ignored or shied away from but they are explained in everyday terms, scientific species names are generally avoided and specific references are indicated by numerical superscripts. A subject and species index as well as a thorough reference section ensures that the serious student can follow up on accounts given in the text. The book is informative and educationally advanced enough to provide an excellent introduction and background text to the subject at the

undergraduate level. Some experiments are described that, of themselves, indicate how innovative scientists have to be to answer questions of behavior in animals.

In discussing the sensory structures and abilities of fishes, the focus is on the senses in which fishes as aquatic organisms essentially differ from terrestrial vertebrates: viz., olfaction, hearing, lateral line and electricity. Eyes and sight are not featured even though they play a major role in much of fish behavior. The author's reason for this omission is that he believes that the 'visual abilities of fishes are not counterintuitive enough or noticeably better than our own'. The accounts on the other senses are filled with interesting facts not otherwise easily come by, for example, that the fastest contracting muscles of the vertebrate world are those of the toadfish swimbladder! Undoubtedly the strengths of this book stem from the author's scientific background. Thus, he not only indicates the limits of current knowledge but also intersperses the text with asides that candidly answer likely questions readers might have with issues around the ethics and processes of experimental ethology.

The second section deals with chapters on learning, telling time, individual recognition and gauging predators. It becomes clear that fishes as 'lower' vertebrates are certainly no less intelligent than so-called 'higher' vertebrates. This is an important message in a book that seeks to convey truth to the general public if ever there is to be an improvement in the way humans treat fishes generally. I found these chapters particularly interesting and informative in terms of understanding the challenges that fishes face in the wild and especially in having to come to terms with situations that change suddenly and inexplicably through the hand of man. Unfortunately, we learn from so many studies and bitter experience that fishes often cannot learn or adjust to new circumstances, such as new predators introduced into their environments, fast enough to survive the experience.

The final section where the choosing abilities of fishes are dealt with inevitably raises the problem of interpreting fish behavior in human terms. Although it was encouraging to find the author warning of the temptation to do this, the temptation is definitely enhanced by his style of writing. Again the depth of research that has been done on various details of choice by fishes is really quite amazing and reveals as much about the depths of human curiosity as it does about fish behavior. Relating the relevance of such questions to the situations facing fishes in the wild is probably the real success of this work – for it is difficult for anyone at the best of times to try to imagine life as it really is in an aquatic environment.

This is a fascinating book, one that increased my understanding of, and introduced me to, many new aspects of fish biology. It is a great starting point for anyone interested in the life of fishes.

Paul Skelton

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Migration of Freshwater Fishes

Martyn C. Lucas and Etienne Baras
420 pp., 2001, £79.50
Blackwell Science, Oxford, UK
ISBN 0-632-05754-8

There has been a long human interest in freshwater fish migrations. Probably this arose first because of the reasonably precise and predictable timing of sizable returns of a fish-food source to inland locations where means of catching and preserving large numbers for later use were possible. Certainly in western North America this led to important gatherings and even fish migration festivals among early tribal peoples. But the phenomenon also has spawned a long scientific interest, starting shortly after the turn of the last century with, for example, the classic book by Meek in 1916 and the development of fishways in Belgium by G. Dènil in 1908. Both Meek and Dènil worked from the same universities as the two lead authors of this book. Included among the subsequent sequence of books on fish migration with freshwater coverage are those by Hasler (1966), Harden Jones (1968), McCleave *et al.* (1984), Smith (1985), and Jungwirth *et al.* (1998).

The Lucas and Baras book is divided into eight major sections: (1) migration and spatial behaviour, largely devoted to definition and clarification of migration types; (2) the stimuli (internal, external) and physiological capacity for migration; (3) a detailed consideration of the various types of migratory behaviour in arctic, temperate and tropical systems; (4) the effects of climate on patterns of migratory behaviour; (5) a long review (over 90 pages) of migration in some 44 taxonomic groups of both fresh and brackish water fishes; (6) 40 pages on methods for studying or inferring freshwater fish migration; (7) the many anthropogenic effects on fish migration in freshwater and means for their mitigation; and, (8) a brief concluding section.

The book is thorough, well illustrated, and up-to-date in its coverage. Among many strengths are its welcome and effective attempts to include migrations of short distance but large ecological significance in fresh waters; to cover inland water migratory behaviour in a breadth of different taxa of fishes; to review the interesting differences in migratory behaviour of freshwater fishes in arctic, temperate, subtropical and tropical regions; to compare and contrast that in both northern and southern hemisphere countries; and, to point out the serious effects which various human activities may

have on inland water fish migration along with means for minimizing or correcting these. The possibility that freshwater fishes that presently have restricted home ranges may turn increasingly to a migratory behaviour pattern with the advent of global warming, is even considered.

The book includes geographical, taxonomic and subject indices. It provides an excellent and important addition to the above noted sequence of recent fish migration books.

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SIL CONGRESS 2004

The next Congress of SIL will be held in Lahti, Finland, 8-14 August 2004. The City of Lahti, a gateway to the Finnish Lake District, is located 100 km northeast of Helsinki (the capital city of Finland). Lahti is known for its winter sports, skiing and ski jumping, as well as for a rich variety of cultural and artistic activities. Lahti with its 100,000 inhabitants is a friendly and hospitable city which is located by Lake Vesijärvi and the lofty green Salpausselkä ridges of glacial origin.

For further information on the 29th Congress of SIL in Lahti, please visit our website at:
www.palmenia.helsinki.fi/congress/SIL2004.

Timo Kairesalo
On behalf of the Organizing Committee

Toxic Cyanobacteria in Water (A Guide to their Public Health Consequences, Monitoring and Management)

Edited by Ingrid Chorus and Jamie Bartram

432 pp., 1999, paperback

E&FN Spon, London and New York

ISBN 0-419-23930-8

UK £24.99/US \$41.95

The recent contribution by the World Health Organization on Toxic Cyanobacteria in Water is a precisely compiled and edited, practical synthesis of an emerging topic worldwide. The book begins with a review of the environmental conditions necessary for the proliferation of the organisms variously labelled blue-green algae, or more recently cyanobacteria. All of the factors necessary to elicit 'green scum' formation in surface waters are presented and referenced: light, nutrients, and warm water. Then the celebrities are introduced: the cyanotoxins themselves. Although they play no clear ecological role, cyanotoxins are produced by an amazing variety of cyanobacteria, with clear implications for human health. The subtle implications of toxic substances that are not routinely monitored are aptly summarized in their introduction (page 10): "Human deaths have only been observed as a consequence of intravenous exposure through renal dialysis. Cyanotoxins are rarely likely to be ingested by humans in sufficient amount for an acute lethal dose. Thus, cyanobacteria are less of a health hazard than pathogens such as *Vibrio cholerae* or *Salmonella typhi* . . . The combination of available knowledge on chronic toxicity mechanisms (such as cumulative liver damage and tumour promotion by microcystins) with that on ambient concentrations occurring under some environmental conditions, shows that chronic human injury from some cyanotoxins is likely, particularly if exposure is frequent or prolonged at high concentrations".

The most comprehensive of the 13 chapters in this review is Chapter 3, which describes toxins and what is known about their occurrence in relationship to the environment where they are found. Although the review is comprehensive, it clearly focuses on the toxins that are most ubiquitous and best characterized, the hepatotoxic microcystins. The appalling lack of information on cyanobacterial toxins, of which at least 100 types have been identified, can only be understood based on the tortuous path required to study an odourless, colourless class of substances found in trace amounts in a substance

vital to life on earth. Although the first documented reports of cyanotoxins stem back over a century, appropriate analytical techniques have only emerged in the past decade. Laboratory studies have identified optimum conditions for production of cyanobacterial toxins, but the integration is still wanting regarding their occurrence in natural environments. The only technical flaw noted in this comprehensive review likely reflects the absence of integration between limited field observations and laboratory experiments (page 56): "It is important to note that mass occurrences of toxic cyanobacteria are not always associated with human activities causing pollution . . . For example, massive blooms of toxic cyanobacteria have been reported in Australian reservoirs with pristine or near-pristine catchments (watersheds), and toxic benthic cyanobacteria have killed cattle drinking from oligotrophic, high-alpine waters in Switzerland". The words "reservoir" and "cattle" are cause for concern in terms of potential pollution. It has yet to be demonstrated that human activities are not linked to this class of compounds.

The environmental and analytical setting for our limited knowledge base on cyanotoxins is followed by the crux of the story—human health aspects in Chapter 4 (page 126): "The expert review of the pertinent literature in April 1997, which led to the production of this book, revealed that information currently available is insufficient for calculation of a TDI" (i.e., tolerable daily intake) 'for most of the cyanotoxins'.

The remainder of this important chapter is devoted to the one cyanotoxin where a "provisional" TDI or, highest dose associated with the absence of adverse health effects, can be estimated—microcystin-LR (TDI 0.04 F g · kg⁻¹ bw per day). Insufficient information exists on all the other cyanotoxins to estimate a provisional TDI.

The remainder of the book (Chapters 5-13) is a very practical guide to management of the cyanotoxins (which by the nature of the database boils down to microcystin-LR) in drinking and recreational water supplies. Toxic Cyanobacteria in Water uses tables and flowcharts in positively ingenious ways—beginning with the organization of the book (Figure 1.2) through the description of the toxin (Chapter 3) to Chapter 6, where practical advice is given (summarized in Figure 6.5). With the most rudimentary equipment (a method of estimating chl *a*), appropriate measures can be instituted to protect users. The book thus makes a much too rare leap between an emerging database and a practical problem that cries for more attention worldwide. Their common sense

approach begins with the following (page 191): “If you walk into the water up to your knees, carefully, without stirring up sediment, and cannot see your feet because of a greenish discoloration, don’t swim and inform the local authority using the following telephone number”. How many water regulatory authorities worldwide are this wise?

Toxic Cyanobacteria in Water contains information essential for everyone from the freshwater scientist to the manager of a small rural water supply. The editors and contributors are to be congratulated for setting an industry standard. Only time will tell whether the void of information about cyanotoxins receives appropriate focus.

E.E. Prepas
Lakehead University
Canada

Cyanotoxins – Occurrence, Causes, Consequences

Edited by Ingrid Chorus
357 pp., 2001, Hardcover
Springer, Berlin
ISBN 3-540-64999-9
EUR 119.00

In her review of the field database on cyanobacterial toxins, Dr. Chorus and coauthors comprehensively document the occurrence of cyanotoxins in six countries (Germany, Norway, Denmark, Czech Republic, Portugal, and South Korea). They then review factors (light, nutrients and energy charge) associated with cellular microcystin concentrations and characterize microcystin synthetase genes in *Microcystis* sp. Concentrations of cyanotoxins in natural cyanobacterial populations are presented, as are cases of human exposure via drinking water and recreational contact. Food chain effects on select aquatic organisms and toxicity testing complete the review. The focus is on microcystins, although other hepatotoxins and neurotoxins are discussed where appropriate. The book is an excellent up-to-date summary of the existing literature and along with its partner in the World Health Organization review, is a must for those looking to manage natural populations of toxic cyanobacteria.

E.E. Prepas
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Canada

Transformations of Nutrients in Natural and Constructed Wetlands

Edited by Jan Vymazal
510 pp., 2001
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-076-5
Dutch Guilders 296.00/US\$ 148.00

This book is a collection of twenty-five refereed papers resulting from presentations at a 1999 workshop in the Czech Republic, entitled “Nutrient Cycling and Retention in Natural and Constructed Wetlands III”. The editor, Jan Vymazal (Ecology and the Use of Wetlands, Prague, Czech Republic) contributes two chapters: a review of types and nutrient removal potential of wastewater treatment wetlands; and, a paper on removal of organics in horizontal sub-surface flow wetlands.

The first article by Vymazal is an excellent review of nutrient transformations and removal mechanisms in different types of constructed and natural wetlands, focusing on phosphorus and nitrogen cycles. Characteristics for different types of wetlands for wastewater treatment are discussed, including those with free-floating, floating-leaved, emergent, and submerged plants. Constructed wetlands with emergent plants are broken down into categories of surface flow and sub-surface flow, with the latter including information on horizontal flow, vertical flow (both down- and up-flow), and hybrid systems. This review encompasses information on treatment of wetlands worldwide, and there is considerable information on the Czechoslovakian and east European perspective. While the data are well organized and easily understood, the text could benefit from more thorough editing.

Most of the remaining chapters report short reviews or case studies on a wide range of topics including: treatment wetlands, functional assessment, restoration, and other related topics. However, most of the papers are on constructed wetlands. Some papers address nutrient fate, most report nitrogen and/or phosphorus input versus output for specific wetlands or vegetation types. Several articles address nutrient cycling little, if at all, but rather focus on issues such as plant growth characteristics in wastewater, dissipation of solar radiation, or functional assessment of wetlands. Although these are important considerations, they do not fit neatly under the heading of nutrient transformations in treatment wetlands and, most importantly, very few papers address the biogeochemical processes regulating nutrient fate in wetlands. Overall, papers presented in this book provide current understanding of constructed wetlands in treating a wide range of wastewaters.

Joseph Prenger and K.R. Reddy
University of Florida
USA

Phytoplankton dynamics in the North American Great Lakes. Volume 2. Lakes Superior and Michigan, North Channel, Georgian Bay, and Lake Huron

By M. Munawar and I.F. Munawar

253 pp., 2000, Backhuys Publishers, Leiden

ISBN 90-5782-032-3

Dutch Guilders 170.00/US \$74.00 (Hardbound)

For more than 100 years, researchers have been investigating the Great Lakes' phytoplankton populations. Early studies in the mid- to late 1800s focussed on taxonomic descriptions. Research continued through the late 1800s and early to mid-1900s, as the Great Lakes began to experience increased nutrient inputs, the commercial fisheries began to collapse and exotics such as smelt and alewife displaced indigenous species. In the late 1960s and through the 1970s, researchers investigated spatial and temporal patterns in phytoplankton populations clarifying the relationship between nutrients and phytoplankton production and standing stocks. Continuing research investigated the responses of phytoplankton communities to decreasing nutrient inputs, major alterations in the predator-prey relationships in fish and zooplankton communities, and then the invasion of exotics including the zebra mussel. An excellent series of paleolimnological studies reconstructed the history of phytoplankton communities from the early days of European settlement to modern times, including responses to increased and then decreased nutrient loading. A book summarizing the highlights of this rich history of studies of the Great Lakes' phytoplankton communities would be a welcome addition to the limnological community. This book, by M. Munawar and I.F. Munawar, was designed to bring the phycology of the North American Great Lakes into the "new millennium" and had this potential. Unfortunately, this potential is not met.

The first chapter, on Lake Superior, provides detailed information on lake-wide phytoplankton composition during six cruises conducted in 1973 and three cruises in 1983. Primary production and nutrient studies are also reported. Chapter 2, on Lake Michigan, focuses on the results from cruises conducted by M. Munawar and his associates in 1982 and 1987, while the North Channel (Chapter 3) and Georgian Bay (Chapter 4) chapters are based largely on his 1974 cruise results. Chapter 5, on Lake Huron, focuses on the results of M. Munawar's 1971 cruises on the main body of Lake Huron including Saginaw Bay. Chapter 6, which provides a synthesis and summary for all five Great Lakes, is

based largely on dated studies from the 1970s and 1980s. These chapters are illustrated with a wealth of figures from M. Munawar's earlier publications, providing information on taxonomic categories, size fractions, biomass, and composition, all in one convenient volume.

This volume is weak in a number of ways. Most importantly, as a synthesis of phytoplankton research conducted on the Laurentian Great Lakes, it focuses almost exclusively on the research conducted by M. Munawar and his associates. Research conducted by other limnologists working on Great Lakes phytoplankton communities are scarcely mentioned. For example, although E. Stoermer has been conducting outstanding research on Great Lakes phytoplankton communities since the late 1960s, there is virtually no mention of any of his work as a first author and only two papers are cited in which he is a co-author. C. Schelske, who also has contributed much to our understanding of Great Lakes phytoplankton communities, merited only three citations. The lively debate on top-down versus bottom up control of Lake Michigan phytoplankton standing stocks and composition (D. Edgington, A. Brooks, J. Scavia, J. Lehman, and others) is not mentioned. Nor is there mention of the research conducted by the Great Lakes Environmental Research Laboratory in the early 1990s in Saginaw Bay investigating changes in phytoplankton communities with decreased nutrient inputs and the zebra mussel invasion. The results of researchers from other Great Lakes' universities and agencies, too numerous to mention here, also are given short attention in this volume.

In summary, this book is an excellent compendium of the research contributions of M. Munawar and his associates on phytoplankton standing stocks and production in the Great Lakes over the early 1970s to late 1980s. The volume would have made a better contribution to our understanding of Great Lakes phytoplankton communities had the authors recognized and incorporated the contributions of other researchers into the book. Because this was not done, the volume provides a weak synthesis of the responses in phytoplankton communities to the changing character of the Great Lakes ecosystem, particularly over the past 10-15 years.

Marlene S. Evans

National Water Research Institute
Canada

Cladocera: Anomopoda
Daphniidae: Genus *Simocephalus*
(Guides to the identification of the
Macroinvertebrates of the
Continental Waters of the World,
Volume 17; Coordinating Editor-
H.J. Dumont)

By Marina Y. Orlova-Bienkowskaja
130 pp., 2001, paperbound
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-090-0
EURO 38.00/US \$37.00

In the second half of the 19th century, travelers from Europe collected Cladocera from tropical regions. In Europe and North America collections were done mainly by field naturalists. Also, indigenous workers in Australia (together with students of all this material collected mainly by naturalists working in Europe), had already described 10 of the 20 valid species dealt with in the present monograph on the taxonomy of *Simocephalus*. Added descriptions were made in the 20th century. All species described in Asia and South America by indigenous workers ended up as synonyms. This was probably due to inadequate literature and the lack of comparative material available to these students. It was only in the past three decades or so that collections were available on a global scale and adequate descriptions based on comparative and detailed studies were made. This pattern of study over the past 150 years was the same for most Cladocera.

Simocephalus is found on all continents but it is not a commonly seen species because of its predominantly littoral habitat and its relative rarity compared to the ubiquitous *Daphnia* so common in the non-tropical zone or *Diaphanosoma* in the tropical zone. One does not encounter members of this genus in large numbers anywhere except in rare instances when it invades the pelagic as recorded in one instance in this book. *Simocephalus vetulus* (probably *S. mixtus* or *S. vetuloides*) has also been recorded in the pelagial of Sumatran lakes (Ruttner 1952). Fernando *et al.* (1990) has discussed the occurrence of littoral Cladocera in the pelagial region on a global basis. The absence of planktonic *Daphnia* and also the predator *Chaoborus* may account for this unusual situation in some cases. The genus *Simocephalus* occurs on all continents. A few species are transcontinental and one of them, *S. vetulus*, can be considered cosmopolitan. The author has examined material from the whole geographic range of this species and has given very detailed and adequate descriptions of all the species.

The illustrations are very good and should enable easy and

reliable diagnosis of species. For the first time limnologists in all parts of the world have the wherewithal to identify the 20 members of the genus *Simocephalus* and not just put probable names to the material they see under the microscope. The keys and excellent illustrations make species diagnosis relatively easy when one has a good quality microscope. Incidentally, M.Y. Orlova-Bienkowskaja is one of a long line of distinguished taxonomists who have contributed greatly to our knowledge of Cladocera systematics for almost a century.

This study of Cladocera taxonomy marks the availability of comprehensive coverage of a group of species that is taxonomically adequate by modern standards. This level of taxonomic achievement is now being seen for some other members of the Cladocera that number about 600 species. Presently, less than 20% of these species are adequately described according to Korovchinsky (1996). Extensive collections of material are now available at a number of well known museums world wide (e.g., United States National Museum, USNM). More recently, much tropical and some temperate material has become available in Singapore at the National University, Zoological Collection (Fernando and Alekseev 1999). Experts now located mainly in developed countries should take the opportunity to do what the author of this book has done and make detailed studies of groups of species of Cladocera and help in clarifying the taxonomy of the remaining 80% of species of this interesting group of animals. Tonolli fellowships of SIL could help experts and aspiring experts from developing countries to study the taxonomy of this group to levels of modern standards. Experts, library resources and comparative material have to be brought together in the same location. The question is will this happen in an age of molecular biology domination and environmental demands in biological research. However without a good basic taxonomy of plants and animals there can be very little relevant studies on biodiversity and other environmental issues.

References cited:

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

Ruttner, F. 1952. Fundamentals of limnology. University of Toronto Press, 242 pp. (English Transl. Frey, D.G. and Fry, F.E.J. 1953).

C.H. Fernando
Distinguished Emeritus Professor
University of Waterloo, Canada

Calendar of Events

2003

Joint European - Southern African International Conference: Pesticides in non-target agricultural environments: Environmental and Economic Implications.

20 - 23 January 2003

University of Cape Town, South Africa

Contact: Ralf Schulz, Jenny A. Day

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7701 Rhodes Gift, South Africa

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Phone: +27 21 650 3635

Fax: +27 21 650 3301

www.tu-bs.de/conference-CPT

The 3rd World Water Forum

16 - 23 March 2003

Kyoto, Shiga and Osaka, Japan

Contact: Secretariat of the 3rd World Water Forum

5th Floor

2 - 2 - 4 Kojimachi

Chiyoda-ku, Tokyo 102-0083, Japan

office@water-forum3.com

Tel: 03-5212-1645

Fax: 03-5212-1649

<http://www.worldwaterforum.org>

Environmental Future of Aquatic Ecosystems Conference. 2003 will be the International Year of Freshwater. This conference will be a landmark in predicting the future of both marine and freshwater ecosystems and is being organised by the Foundation for Environmental Conservation and Swiss Federal Office of Environmental Science & Technology (EAWAG).

23 - 27 March

Zurich, Switzerland

Contact: icef@eawag.ch

<http://www.icef.eawag.ch/>

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 USA

acohen@geo.arizona.edu

Phone: 1 (520) 621-4691

Fax: 1 (520) 621-2672

Field trip proposals:

David Dettman, Field Trip Coordinator

dettman@geo.arizona.edu

Housing and Registration: Noah Lopez

noahl@u.arizona.edu

River Basin Management 2003 - Second International Conference on River Basin Management - all aspects of Hydrology, Ecology, Environmental Management of Rivers, Flood Plains and Wetlands.

28 - 30 April 2003

Las Palmas, Gran Canaria

Contact: Conference Secretariat - River Basin03,

Wessex Institute of Technology

Ashurst Lodge, Ashurst

Southampton, SO40 7AA, UK

shobbs@wessex.ac.uk

Telephone: 44 (0) 238 029 3223

Fax: 44 (0) 238 029 2853

<http://www.wessex.ac.uk/conferences/2003/riverbasin03/>

2nd International Symposium on Contaminated Sediments: Characterisation, Evaluation, Mitigation/Restoration, Management Strategy Performance.

26 - 28 May 2003

Quebec City, Quebec, Canada

Contact: H  l  ne Tremblay

Secretariat of the Symposium on Contaminated Sediments

D  partement de g  ologie et de g  nie g  ologique

Universit   Laval

Qu  bec, 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/>

ECOSUD 2003 - Fourth International Conference on Ecosystems and Sustainable Development.

4 - 6 June 2003

Siena, Italy

Contact: Conference Secretariat, Ecosud03

Wessex Institute of Technology

Ashurst Lodge, Ashurst

Southampton SO40 7AA, UK

gcossutta@wessex.ac.uk

Phone: 44 (0) 238 029 3223

Fax: 44 (0) 238 029 2853

www.wessex.ac.uk/conferences/2003/ecosud03/index.html

Water Pollution 2003 - Seventh International Conference on Modelling, Measuring and Prediction of Water Pollution.

18 - 20 June 2003

Cadiz, Spain

Contact: Conference Secretariat - Water Pollution03

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Ashurst Lodge, Ashurst

Southampton, SO40 7AA, UK

rgreen@wessex.ac.uk

Telephone: 44 (0) 238 029 3223

Fax: 44 (0) 238 029 2853

<http://www.wessex.ac.uk/conferences/2003/water03/>

Symposium for European Freshwater Sciences (SEFS3) (co-ordinated by the FBA, in collaboration with other European freshwater and limnological Associations).

13 - 18 July 2003

University of Edinburgh

Scotland, UK

Contact: Freshwater Biological Association

(FBA), SEFS Office, The Ferry House,

Far Sawrey, Ambleside, Cumbria, LA22 0LP,

U.K.

sefs3@fba.org.uk

Tel: +44 (0) 15394 42468

Fax: +44 (0) 15394 88541

www.fba.org.uk

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://www.links.umoncton.ca/lw/>

Ninth International Symposium on Aquatic Oligochaete Biology. This symposium is being sponsored and organized by Alterra, Green Word Research (Department of Ecology & Environment), and Wageningen University (Department of Environmental Technology).

6 - 10 October 2003

Wageningen, The Netherlands

For additional information, please contact:

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Fax: +31 317 424988

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
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Fax: (86) 27 8764-7664

The Fourth World Water Forum

19 - 25 March 2006
Montreal, Quebec
Canada

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- location and duration of the position;
- closing date for applications;
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