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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

Photo of Alqueva Reservoir being filled. Effects of deforestation are clearly visible – only a few trees are left on the top of the higher hills (Photo courtesy of Meryem Beklioglu – September 2002).

Is Big Beautiful? Alqueva Reservoir (Portugal): the Largest Artificial Lake in Europe

by
Luís M. Zambujal Chícharo

continued on next page

Material for the September 2003 issue should be sent to the Editor for:

June 14, 2003

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Figure 1 – Location of the Alqueva Dam (approximately) on the Guadiana River (Portuguese section).

The Alentejo region, with an area of 27,000 km^2 and a population of around 540,000, is located in the southern part of Portugal and is considered one of the most depressed regions of the European Community (EC). The Alqueva project was conceived in 1957 as part of the *Alentejo Irrigation Plan.* At the time, the main objective of the Alqueva project was the economic development of the region, based on promotion of the agricultural sector and the development of a new industrial city. The dam project was approved in 1975, following the 1968 Portuguese–Spanish Agreement on international rivers.

In 1997, the European Commission agreed to support in part the Specific Programme for the Integrated Development of the Alqueva Area (PEDIZA), which included the Alqueva Dam. The aim of the programme is to mobilize around the construction of the dam a suite of projects that can contribute to regional economic development. In the long term, the PEDIZA Programme is expected to create 20,000 jobs. The estimated total cost to the completion of the project in 2025 will reach, at current (2002) levels, 1,800 million euros (Lobo *et al.* 2002).

Alqueva is, therefore, a multipurpose project aimed at the social and economic development of the Alentejo region by establishing a strategic water reserve and providing a guarantee of water supply for irrigation, industrial use and domestic supply (EDIA 2002).

The Alqueva Dam, the main infrastructure item of the project, is located on the Guadiana River (Figure 1). This river flows 810 km from its headwaters in Spain to its mouth in Portugal, with 150 km of the main channel and many longer tributaries in Portugal. A 110 km stretch of the river forms part of the border between the two countries (Pires *et al.* 1999) (Figure 2).

Figure 2 – The Guadiana River upstream of the Alqueva Dam, September 2002. Photo is courtesy of Meryem Beklioglu.

The construction of the dam started in 1998, and the entire complex of the Alqueva will not be completed until 2025. When the water level is at the maximum of 152 m, the Alqueva Dam will create the largest artificial lake in Europe, an area of 250 km^2 with a perimeter of more than 1,000 km and a total capacity of 4,150 hm^3. It will provide water for 110,000 ha of intensive irrigation in a semi-arid region (EDIA 2002). The dam will directly affect 19 districts in the Alentejo region.

On 8 February 2002, the first Alqueva Dam gates were closed and the reservoir started to fill. Despite that, some studies of the impacts are still not available. At present (February 2003), while the Alqueva reservoir is still filling and areas of land are still being submerged, it is impossible to completely evaluate the effective characteristics of this huge lake and the consequences to wildlife.

The Impacts

The Alqueva Dam has inundated a large area of prime wildlife and plant habitat in the river banks and adjoining areas, with serious consequences for the populations of several threatened species protected under European Union law, as well as under several conventions signed by Portugal.

At its maximum capacity, the dam will affect highly important areas for birds in Portugal and Spain. In the area of the Guadiana River, several species, are or will be, affected (*Lxobrychus minutus, Nycticorax nycticorax, Bubulcus ibis, Ardea purpurea, Ciconia ciconia, Ciconia nigra, Milvus migrans, Neophron percnopterus, Circaetus gallicus, Hieraaetus pennatus,*

Hieraaetus fasciatus, *Bubo bubo*, *Aegypius monachus*, and *Caprimulgus ruficollis*). In addition, effects are expected on the nesting habitats, migration patterns and wintering sites of 38 bird species considered by the European Community (Annex I, Directive 79/409) to be in danger of extinction. These include *Aquila adalberti*, *Aegypius monachus* and *Ciconia nigra.* Environmental NGOs (ADENEX 2002; GEOTA 2002) estimated that, of the original 140 bird species in the Alentejo areas affected by the dam, only 35 to 40 will continue to exist, mainly the aquatic species. Moreover, only 12 of the previous 113 species will continue to nest in the area.

Impacts on the flora and vegetation are also present. At least nine species considered rare, endemic or threatened with extinction will be severely affected by the flooding of the dam (*Loyus palustris*, *Marsilea batardae*, *Narcissus cavanillesii*, *Narcissus jonquilla* var. *henriquesii*, *Narcissus serotinus*, *Ranunculus gramineus*, *Damasonium alisma*, *Tordilium apulum* and *Elatine macropoda*). Environmentalists predict that at least two of these species will be eradicated from Portugal because of their localized occurrence (ADENEX 2002).

To reduce the risk of eutrophication caused by decomposition of submerged vegetation, a vast deforestation process was implemented that led to the felling of thousands of trees (including several ancient specimens). Environmental NGOs are now focusing their attention on the level to which the dam will be filled. Operating the dam at a level of 139 m (instead of 152 m) will reduce the surface area by almost half and thereby save more than 400,000 trees as well as other habitats, crucial for many rare animal and plant species.

The destruction of the habitats of several endangered species, including the golden eagle (*Aquila chrysaetos*), the otter (*Lutra lutra*), the Iberian lynx (*Lynx pardina*) (which has an estimated population of 50 individuals), and other vertebrate species under protection (e.g., *Canis lupus*, *Emys orbicularis*, *Mauremys caspica* and *Hyla meridionalis*) is a fact (ADENEX 2002).

The fish fauna in the Guadiana basin includes 13 non-migratory native species, eight of which have a high conservation status (SNPRCN 1991; Collares-Pereira *et al*. 1998). The fish community of the middle Guadiana River is dominated by the endemic species *Rutilus alburnoides* and *Barbus steindachneri.* Other species occurring in this area include the indigenous species *Anaecypris hispanica*, *Barbus microcephalus*, *B. comiza*, *Chondrostoma willkommii*, *C. lemmingii*, *Leuciscus pyrenaicus* and *Cobitis paludica*; and the exotic species *Esox lucius*, *Micropterus salmoides*, *Lepomis gibbosus*, *Gambusia holbrooki*, *Cichlasoma facetum*, *Cyprinus carpio* and *Carassius auratus* (Pires *et al.* 1999). In Spain, some of these species are also highly threatened (Elvira 1998).

Changes in fish populations are expected. The reduction of inflow (to a minimum of 4 $m^3.s^{-1}$, the "ecological inflow") will affect downstream fish populations by causing aggregation and promoting competition for food and space, in a way that may be similar to that observed during droughts (Figure 3). Moreover, the dam also constitutes a physical barrier hampering the free circulation of both anadromous and catadromous fish species.

The impacts of the Alqueva project will be felt even in regions away from the reservoir. In fact, the project considers transferring water between basins, from the Guadiana Basin to the Sado Basin, which may affect the characteristics of the Sado estuary and the resident population of bottlenose dolphins (*Tursiops truncatus*).

Figure 3 – The Alqueva Dam and downstream river flow (section with arrow), September 2002. Photos are courtesy of Meryem Beklioglu.

There will be effects on the Guadiana estuary and coastal areas near the mouth of the Guadiana River. The predictable reduction of riverine flow will affect estuarine and coastal ecosystems. The salinity of the estuary will increase with consequences for the distribution and abundance of estuarine species and the use of the area as a nursery for bivalves, crustaceans and fish species (Chícharo and Teodósio 1991; Chícharo *et al*. 2001). Moreover, changes in nutrients ratios will affect primary production and phytoplanktonic composition in coastal waters (Rocha *et. al*. 2002) with consequences to coastal fisheries (Chícharo *et al.* 2002). Coastal areas will also suffer negative impact from the reduction of the sediment load input that will enhance coastal erosion processes (Dias *et al.* 2000).

Mitigation and Conservation Measures

EDIA, the company responsible for the development of the Alqueva project, contracted 14 teams of biologists to

develop a total of 28 projects: 13 that focused on minimization of the impacts, and 15 on monitoring the effects of the project for five years. Based on these studies, several environmental conservation measures were proposed and implemented: (1) removal to a new location of the 1,200 individuals that constituted the population of *Narcissus cavanillesii*; (2) construction of a 50 m artificial cave for the 52 bats that lived in the area to be submerged; (3) removal of bird prey species nests; (4) implementation of ecological corridors; (5) reforestation of riparian vegetation; (6) plantation and transplanting of Holm-oak, olive and cork trees; (7) valorization of the swamp areas; and (8) development of seed "banks" for RELAPE (rare, endemic, localized, threatened with extinction) plants.

Despite these measures, environmental impacts associated with the Alqueva Dam are conspicuous and hardly compensated by these imaginative mitigation and compensation measures. In fact, mitigation of the impact of flooding 25,000 ha, felling more than one million oak and olive trees, and destroying the habitats of several endangered species, to name only a few impacts, is an overwhelming task that is highly unlikely to be successful.

The Future

Minimization or compensation measures in such a large project can only be considered, despite their importance, as a limited contribution to maintenance of pristine characteristics or preservation of biodiversity. From the environmental point of view, it is necessary to accept that the dam and the resultant lake exist and that the environmental characteristics of the region are changing abruptly. For example, there is an increase in humidity, and changes in air temperature variability, with consequences for vegetation, types of habitats and species abundance and distribution.

The only sensible option, given the existence of the project, is to implement solutions that will make the reservoir and its surroundings a rich and important ecosystem with its own biodiversity, albeit different from the one that previously existed. Monitoring, planning and management projects are fundamental to ensure good water quality, to promote species richness, and to support a sustainable new ecosystem in which there is an assurance of adequate environmental protection for terrestrial, riparian and aquatic species.

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Announcements

Pacific Institute Launches Water and Climate Bibliography

How will climate changes affect freshwater resources? In an effort to aid those studying this question and related issues, the Pacific Institute has created the Water and Climate Bibliography - a searchable, online database containing over 3,000 references to books, articles, and other scholarly works.

Climate change and water resources are closely connected. A large and growing scientific literature on these issues exists, but a comprehensive electronic compilation has not been available, until now. We hope this new tool will help those studying these critical problems improve our knowledge and forge effective, real-world solutions.

The project, funded by grants from the Dialogue on Water and Climate, the California Energy Commission, and the California Department of Water Resources, will also be available in a CD-ROM version in March. Researchers are encouraged to submit new citations for consideration using the online form, accessible from the main bibliography page. The bibliography is available online at: *http://www.pacinst.org/resources/* and for more information, please contact:

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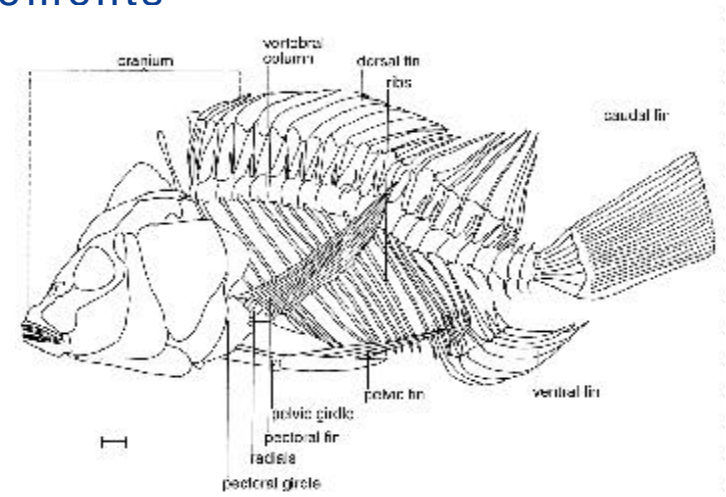

The Anatomy of Tilapine Fishes

By James J. Gwahaba

This 45 page, A4 booklet is primarily a dissection guide for students, written and amended over many years by James Gwahaba when he was teaching at Makerere University in Kampala, Uganda. It contains more than 40 line drawings of every aspect of the anatomy and skeleton of the most widely known species of tilapia, *Oreochromis niloticus* plus instructions on how to expose and identify all the organs, nerves, blood vessels and bones. It includes an index and reference list.

James was confined to a wheelchair from the early '80s and died in 1998. In about 1995 he asked me to see if I could get this booklet published but no one that I approached was interested. I have, therefore, belatedly, turned the whole thing into an MS Word file (5.3Mb) which I am willing to send by e-mail or on zip disk, or as a printed master copy, to anyone who would find it useful – for their own teaching or information. There will be no formal charge but any donation considered appropriate (and possible) by the recipient will be added to The James Fund which pays for the schooling of James' two teenage daughters in Kampala. This modest fund, which I and Dr. Ian Dunn administer in the UK and dispense with the aid of Prof. Derek Pomeroy in Kampala, was originally started by his former colleagues of the IBP-Lake George team and associated friends who valued James and paid for his treatment after his stroke and bought him a wheelchair. When he died it was agreed that the balance in hand should be used for the girls' school fees and books, etc. The contributors to the fund are now declining in number but there are a good many years of fees still needed.

All contributions in return for a copy of *The Anatomy of Tilapine Fishes* will be gratefully received. Please pass this message to anyone not likely to see this notice, who might be interested in this publication.

Copies can be requested from me at: *p.morris@rhul.ac.uk* or via snail mail at West Mains, London Road, Ascot, Berks. SL5 7DG, UK.

Mary J. Burgis
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Update on Sanitation Connection: an Environmental Sanitation Web Portal

Sanicon (Sanitation Connection) is an environmental sanitation web portal sponsored by the Water Supply and Sanitation Collaborative Council (WSSCC), The World Health Organisation (WHO), the United Nations Environmental Programme (UNEP) the Water and Sanitation Program (WSP) and the International Water Association (IWA). The aim of Sanicon is to improve access to relevant information concerning environmental sanitation for policy-makers and practitioners. This article is an update on developments at Sanicon and a follow-up to the article which was published in SILnews, Volume 33, May 2001.

The Sanicon partners will re-launch Sanicon at the 3rd World Water Forum in Kyoto in March. In preparation for this, work has already begun on updating and modifying the site. The following changes will be seen in Sanicon in the coming months:

- Several new topic nodes will soon be added to the site. This will widen the topic coverage of Sanicon for the benefit of users.
- It will also be possible to view the site in different languages. At present, the site only supports Arabic but this will be extended to include Spanish and French initially.
- A 'What's new' page will be set up and will include downloadable Sanicon promotional material which only exists in print at the present time. Alongside this will be a 'Coming soon page' where planned but not yet launched activities will be announced.
- A site search facility will be developed, as it has become evident with the expansion of the site that there is need for such a facility. At present, it is only possible to perform a *document* search and not a site search.
- Alongside the site search, a site map will be developed as well.
- A Sanicon newsletter will be launched to provide updates on new developments and will be sent initially to Sanicon partners and frequent users.

It is hoped that these changes will improve the usability of the site and enhance the visitors' experience of Sanicon. Please visit the Sanicon site at *www/sanicon.net* and see for yourself the wide range of information sources that are available.

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Look for these interesting stories to appear in an upcoming issue of SILnews:

Redberry Lake - a Prairie saline lake located in Saskatchewan, Canada.

Ecohydrology - a new paradigm for integrated water resources management.

SIL XXIX Congress in Lahti, Finland.

Do you have an idea for a cover story for SILnews?

We are interested in your input, please contact us at clara.fabbro@ec.gc.ca.

Book Reviews

Limnology in Developing Countries, Volume 3

Edited by R.G.Wetzel and B. Gopal
189 pp., 2001, softbound
International, Sci. Publ., New Delhi, India
ISBN 81-86047-21-2
Volume 3 is free to SIL members in good standing, $10.00 US to individual non-members, $20.00 US to institutions/ libraries non-members

This Volume 3 of 'Limnology in Developing Countries' contains contributions from four countries from geographically distant regions. Algeria on the Mediterranean coast and Malawi, south of the equator, are both located on the African continent. Belize is a small independent country on the Caribbean coast of Central America and Colombia lies in the north-west part of South America. Correspondingly diverse are the climatic conditions between and even within these four countries.

Algeria is the second largest country in Africa with two very different climatic zones, the Mediterranean in the north and a large arid region south of the Atlas. Following a brief outline of geology, climate, vegetation and agriculture, the authors, Gagneur and Kara describe the demographic situation in their country. The population growth rate close to 3.2%, one of the highest in the world, and the high density in the northern part of the country, severely impacts on water resources. The hydrographic network mainly consists of so-called 'Wadis', rivers which are seldom perennial, characterized by high discharge variability and great turbidity due to enormous erosion. Except for some small regions near the sea, most basins are endorheic and contain Algeria's natural lakes. Many reservoirs serve for drinking and irrigation water purposes. The most interesting water bodies in Algeria are the 'Chotts' and 'Sebkhas', shallow depressions filled with saline water. The limnological literature, especially those on taxonomy and distribution of aquatic groups, is summarised in the chapter. Problems such as the lack of reservoir studies or the increased demand for ecological studies are outlined. Finally the authors conclude that Algeria must get better access to the international scientific society as well as solving internal communication problems.

A quite detailed insight into the environmental conditions, water bodies and limnological work done in Belize is given in the second part of the book by Esselman and Boles. The river network is the most important water resource of Belize. Studies on the physicochemical conditions as well as ecological investigations have been undertaken in rivers comprising macroinvertebrates, plankton and microorganisms. Water pollution in Belize arising from agriculture and domestic and industrial wastes is described in great detail on several pages. Conservation problems and a description of institutions and community groups round out the chapter. The authors conclude with a description of knowledge gaps and a list of future needs.

The development of limnology in Colombia, written by Roldan and Ruiz, starts with a description of the large variety in climatic conditions in this country followed by a brief description of the water resources which are mainly rivers. A brief overview of the historical development leads into the main part explaining the limnological findings depicting data on lakes, rivers and reservoirs in several tables. Work on aquatic biota, ranging from phytoplankton to fish, are then described with strong emphasis on periphyton with details on results obtained from a reservoir. Water pollution and applied ecology, covering such aspects as aquaculture and sewage treatment are covered as well as conservation. A detailed description of Columbian institutions and a detailed reference list finishes the chapter. In the conclusion more co-operation both with the international aquatic science community and internally between universities and other institutions is sought.

The review on the limnology in Malawi by Msiska is the longest contribution within this volume. The introductory part describes the country and its biophysical environment in some detail giving demographic data, climatic conditions, details on fisheries, hydrography and drainage pattern. Next the role and history of limnology in Malawi is outlined. A longer part is then devoted to the detailed limnological description of Lake Malawi, formerly Lake Nyasa, one of the Great African Rift Valley lakes. Many early studies of tropical limnology have been conducted on this lake and a lot on information on almost all trophic levels has been gathered, which is clearly shown in this chapter. Mineralization, however has attracted very little attention resulting in poor knowledge of nutrient cycles and the microbial loop. The rest of the chapter is devoted to Lake Chilwa, and other lakes and water bodies in Malawi. The use of reservoirs for fish farming is briefly discussed. A comparatively small paragraph towards the end describes institutions involved in limnological research. Existing knowledge is summarised by the list of references at the end.

Collectively the articles in this volume provide a good overview on the present state of limnology in four not so well known developing countries. Together with the articles in the two previous volumes, the reader will get a comprehensive insight into the diversity of water resources, their biota, and the problems for management and conservation, as well as approaches to these in developing countries. This is of utmost importance because greater understanding of natural processes will become necessary as water becomes a critical resource for human well-being. It also underlines the necessity for scientific and applied collaboration between limnologists from developed and developing countries to meet these problems and find solutions. In this respect, the initiative of SIL to produce these volumes is a valuable contribution to limnology worldwide.

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Phytoplankton Productivity: Carbon Assimilation in Marine and Freshwater Ecosystems

Edited by P.J. le B. Williams, D.N. Thomas and C.S. Reynolds
400 pp., 2002, Illustrated Hardback
Blackwell Science Ltd., Oxford, UK
ISBN 0632057114
£79.50

This is a collection of review articles written to celebrate the 50 years of advances in the field that followed E. Steeman Nielsen's development of the ^{14}C method to measure aquatic productivity, an event that was further celebrated in a conference in March of 2002, "An Appreciation of 50 Years of the Study of Primary Production in Oceans and Lakes", in Bangor, Wales.

This book is in one sense a proceedings volume for the meeting, but is actually much more than that. It is a formidable testament to Nielsen and the many scientists who adopted his technique and brought about the modern age of phytoplankton studies. Obviously, discussion of how much, where and when production occurs is a central theme of the book particularly in articles by Marra, Behrenfeld, Karl, and others, but editors Williams, Thomas and Reynolds did not use the 13 chapters to encompass productivity in all types of systems. Instead, the chapters emphasize the many paths of inquiry that were taken once application of the ^{14}C technique established that phytoplankton were key players in aquatic ecosystems and, indeed, earth's biogeochemical cycles. Thus, we have everything from consideration of physiology (Geider and Macintyre) and small-scale processes (Riebsell and Wolf-Gladrow) to phytoplankton as mediators of geochemistry over some 4 billion years of earth's history (Falkowski). These reviews are grounded in fascinating historical accounts of Nielsen's life (Søndergaard), including his ongoing disputes with Ryther, a more general history of productivity studies by Barber and Hilting, and 19th century oceanography by Smetacek *et al*. These sections are recommended reading for graduate students seeking a sense of the intellectual core of the field in these days of mega-projects and voluminous computer data sets. The portrait of Nielsen is appreciative but makes no attempt to hide his rough edges. He was a stern and demanding figure, who would hardly fit in today's large-scale, multi-investigator, "leave your ego at the door", ecological projects – ironic considering, as Barber and Hilting note, that it was his work that made such projects possible.

Though solidly grounded in past work, the book also looks to the future, with the majority of chapters having a section on future perspectives, frequently with some very specific recommendations of what should be done, such as Lewis' suggestion for a 250 km^2 5 x 5 mooring array to study mesoscale processes. The book closes with an appeal by Smetacek *et al*. to integrate organismal and process centered studies which have historically been pursued independently. My personal view is that such integration is well underway, in part because of the development of many techniques besides microscopic examination that enable taxon-specific information to be obtained.

Overall, the editors and chapter authors have done a splendid job at putting together a book that should be useful to all researchers interested in aquatic productivity, and as an advanced text for graduate students. Despite the publisher's description of the chapters as "reader-friendly" some of the material might be hard going for a more general science reader, particularly the biochemical pathways in Chapter 2 and math in Chapters 5 and 6. Also, I (and probably many readers of *SILnews*) would have liked somewhat more coverage of freshwater systems (only two chapters of the thirteen). Chapter 11 on "Ecosystem function and degradation" was interesting but not closely relevant to the theme of the book. These are minor quibbles on what is overall an excellent contribution to the field, one of the better multi-authored conference volumes that I have seen.

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A Guide to Tropical Freshwater Zooplankton. Identification, Ecology and Impact on Fisheries

Edited by C.H. Fernando
292 pp., 2002
Backhuys Publishers, Leiden
ISBN 90-5782-117-6
EURO 80.00/US$ 80.00

If, at the height of the temperate zone summer, you tow your zooplankton net from the open water of a lake to the swampy, weedy littoral, you will easily recover 20 - 25 cladoceran species from your sample. Repeat the same exercise any time of year (it does not matter much when) in a tropical lake, and you will end up disappointed: almost no species in the pelagic, and quite a few, but in sparse numbers, in the littoral. This constitutes the core of the tropical zooplankton paradox. Unlike most terrestrial groups of plants, animals and fish, there is no enrichment of zooplankton species diversity in the tropics. Or is there? First impressions may be misleading, and a moment's reflection will tell us why, and why this book is welcome.

In the tropics, unlike the temperate zone, there is little seasonal fluctuation of temperature and photoperiod, meaning that the physical environment is always equally conducive to the presence of plankton. But if this is the case, all species are likely to be present all the time, and competition for scarce resources among them should be much more acute than elsewhere!

Predation, interrupted by a winter pause in the temperate zone, is also relentless here, while the number of predators is probably higher in the tropics. As a result of both effects, the zooplankton suffers heavily. One might argue that impoverishment will result, with many species likely driven to extinction. It turns out that this is not the case. Species appear to be capable of adjusting to such pressures, and above all, many occur at such a low abundance that they are hard to find (for us and their predators alike). We should thus sample much harder in the tropics than elsewhere, and this book describes some of the methods we can use for this.

Most work, including taxonomy, on zooplankton was done in the temperate zone, and so, we still do not know much of the assemblages in the tropics, a point correctly stressed by

Fernando. Progress is being made, but the situation of many genera of cyclopoids copepods, and of many ostracods and anomopod cladocerans still varies from hopeless to badly obsolete. Having gone through the various chapters of this book, I offer the following comments. Kutikova (rotifers) has written an introduction to rotifers that includes keys to families, most genera, and a few common species; Alexeev (copepods) addresses the three main orders, but includes only a selection of genera and only some of the most important species. Korinek (Cladocera) cleverly avoids the pitfall of venturing into the "difficult" and speciose radopods, but should be commended for his excellent illustrations of all sidids, bosminids and daphniids included. Victor (Ostracods) had the difficult task to deal with a group in which at least half of the tropical taxa remain to be described. His illustrations are of variable quality: SEM images are excellent, the line drawings blurred. Fernando himself, finally, deals with "miscellaneous small groups" and with the linkage fish-fisheries and plankton in the tropics.

On balance, I find this book a positive contribution to the much needed study of tropical zooplankton, but on condition that it is used for what it is intended: as an introduction to the subject. For those of you wishing to dig deeper into the subject, especially taxonomy and diversity, I recommend using the identification guides that Backhuys Publishers started to produce ten years ago. Twenty volumes are now available, and more are in the works.

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Animal Ecology, Ghent University
Belgium

The Lake Foodweb – Modelling Predation and Abiotic/biotic Interactions

By L. Håkanson and V.V. Boulion
344 pp., hardbound, 2002
Backhuys Publishers, Leiden, The Netherlands
ISBN 90-5782-110-9
EURO 106.00/US$ 101.00

Håkanson and Boulion have written an intriguing book that simultaneously instructs the reader on principles of limnology and ecological modelling. The principal goal is to develop a generalized dynamic model (called LakeWeb) designed to simulate physical, chemical and biotic processes in northern lakes that vary over broad ranges of size, depth, trophy, pH and humic status. There are nine functional groups in the model – phytoplankton, benthic algae, macrophytes, planktonic bacteria, herbivorous and predatory zooplankton, benthic invertebrates, and planktivorous and piscivorous fish. Lake area, mean and maximum depths, epilimnetic temperature, phosphorus concentration, humic state and pH drive simulations of biomass, production and predation on a weekly time step. Many of these drivers and state variables are further detailed in various sub-models.

The book comprises six chapters – an introduction, basic limnological and modelling approaches, model set-up and testing, a new mass balance sub-model for phosphorus, development of the main model, and use of the model to explore effects of biomanipulation, forestry, agriculture, climate, fish farming and acidification on lakes. The LakeWeb model is built upon a huge variety of empirical relationships derived from analyses of lake data coming principally from Western Europe and the former Soviet Union, although there is a good mix of literature citations from around the world. The development of the zooplankton sub-model illustrates the typical sequence of steps. The fundamental difference equation (used for all functional groups) makes herbivorous zooplankton biomass flux equal to productivity (from consumption of phytoplankton and bacterioplankton) minus the rate of consumption (by predatory zooplankton and prey fish) minus the rate of elimination (not clearly explained but a reference is given). Each of these processes is further defined and parameterized from empirical relationships that are illustrated in detail. The same approach is used for predatory zooplankton. Then a series of sensitivity analyses is used to illustrate how selected functional groups in the "default" lake (standard values of morphometry, colour, pH and phosphorus concentration) respond to changes in parameters such as the fraction of zooplankton that is herbivorous, and the proportion of various prey types in the diet. Finally, simulations of the default lake across gradients of pH, colour, latitude, phosphorus concentration, mean depth, and lake area are used to compare model predictions of the biomass of selected functional groups to their empirical norms (i.e., values derived from the empirical relationships used to build the model).

A huge variety of useful data and relationships is presented throughout the book including a new trophic classification scheme for lakes, a new model for Secchi depth, a model of growing season duration, hundreds of empirical relations among physical, chemical and trophic variables and a substantial collection of raw data in a series of appendices. Chapter 3 on model calibration and testing through Monte Carlo techniques is particularly useful.

I found the book difficult to read, as it is a highly concentrated presentation of hundreds of formulations and associated graphs. Its usefulness is as a reference book rather than a text for students. On the plus side Håkanson and Boulion provide some highly interesting modelling approaches along with a huge compilation of useful limnological concepts, literature and data. On the minus side the only apparent access to the source code is through an extensive appendix of equations and parameter values. It would have been much more helpful had a disk or web listing of the code been included in the book. The software used to develop the model was not specified but from the form of the equations and details of modelling diagrams it looks to me as if STELLA® by High Performance Systems Inc. was used. I found quite a few typographical errors early in the book and many of the diagrams appear to have been copied directly from dot-matrix printer output and are not as easy to view as one might like.

Would I recommend the book? Yes – readers will find it to contain a rewarding collection of limnological data, new empirical relationships, references, and novel modelling approaches. Do not, however, plan to take the book as light reading on your next vacation!

W. Gary Sprules
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Canada

Management and Ecology of Lake and Reservoir Fisheries

Edited by I.G. Cowx
401 pp., 2002, hardcover
Blackwell Science, Oxford, UK
ISBN 0-85238-283-9, £79.50

The book is assembled from presentations made from a symposium and workshop prompted by the European Inland Fisheries Advisory Commission and held with its co-operation at the International Fisheries Institute, University of Hull, UK, in April 2000. The 31 contributions are given under three sections: 1) - stock assessment for management purposes (12 chapters); 2) - anthropogenic activities / rehabilitation and mitigation (9 chapters); 3) - management (10 chapters), with subject and species indices. Understandably from this origin, European countries dominate (17 chapters), with another nine from Africa, one each from Bangladesh, Brazil, Canada, and Sri Lanka, and a concluding summation by the editor.

Symposia presentations, even when selected to form into a book on the subject areas, do not easily meld into a logical and interesting sequence, as I well know for that of the 1968 Salmon and Trout in Streams Symposium.

The editor clearly has tried to bring this about in each of the three sections of the book, with the six chapters on stock assessment in European lakes and reservoirs, followed by the three on African Lake Victoria and another on Côte d' Ivoire reservoirs. Again in the section on anthropogenic activities there is broad coverage of the subject by seven chapters for Europe and two for Africa - one exploring effects of five different introduced fishes (the only ones present) as well as an introduced crayfish, and the other on the invasion of water hyacinth into Lake Victoria. The third section (management) starts out with a chapter on brook trout management in Newfoundland (Canada) lakes, followed by four on European lakes and pools, one on a Sri Lankan reservoir, and three on African lakes.

In the final chapter the editor tries to synthesize the foregoing ones around the shift in inland fisheries management from a previous orientation on a mainly regulatory administrative function towards a more sustainable approach into an integrated community management one. This includes consideration of needs for whole watershed issues, of human social and economic demands, of inter-sectoral conflicts (commercial and recreational fisheries, both within and between), and of other aquatic resource users. A final concluding paragraph covers techniques for management of fish assemblages, fisheries, and a series of possible approaches for management of aquatic ecosystems, ending with a further plug for integration of all these.

Only time will tell if some three and a half decades later this book will still enjoy frequent referencing and quoting as has been the case for that of the Salmon and Trout in Streams book, but in my view the prospects auger well.

Reference cited:

Northcote, T.G. 1969. Symposium on Salmon and Trout in Streams. H.R. MacMillan Lectures in Fisheries, University of British Columbia, Vancouver, B.C., Canada. 388 pp.

Thomas G. Northcote (tnorthco@vip.net)
The University of British Columbia
Canada

Lake Kizaki Limnology and Ecology of a Japanese Lake

Edited by Y. Saijo and H. Hayashi
428 pp., 2001, hardbound
Backhuys Publishers, Leiden
ISBN 90-5782-092-7, EURO 128.00/US$ 124.00

When reading this book, readers will be able to imagine a pristine highland lake surrounded by beautiful mountains, the Japanese Northern Alps, as Dr. Saijo mentions in the Foreword. Lake Kizaki is located very close to several major sightseeing spots on the main island of Japan, between Tokyo and Kyoto. But Lake Kizaki is not the allure for tourists that it once was. It was first studied 100 years ago by a famous limnologist, Autamaro Tanaka. It now shows the signs of serious water quality deterioration due to its use for such things as irrigation, fish culturing and hydroelectric power generation. Now the beautiful lake with clear, clean water that Dr. Tanaka studied can no longer be seen. It was this that persuaded the editors to write a detailed account of the lake's present situation and to give a strong word of caution to readers about how easy it is to lose such important parts of nature.

Lake Kizaki is linked with Lake Aoki and Lake Nakatsuna, and the three are known locally as the Nishina Three Lakes. They are tectonic lakes that are estimated to be about 30,000 years old. All of them are small and dimictic and range in trophic status from oligotrophic to eutrophic, with Lake Kizaki previously being mesotrophic. The minimum water temperature in winter is often below 4° C, while in summer it is between 22 and 28° C. The surface area of Lake Kizaki is only 1.41 km², but it has a number of interesting limnological features. The maximum depth is about 29 m and the benthic layer in the hypolimnion becomes completely anoxic during the stratified period. In winter the lake level is lowered by about 3 m due to hydropower generation but is replenished in spring with water from Lake Aoki. Until 1950 water transparency was about 5 m but has decreased to about 3 m since 1970 due to increased algal populations. After the 1970s, although the oxygen concentration in the surface layer was above saturation level, it was depressed at lower levels, and the lake was completely anaerobic at the bottom. The lake is now considered to be atrophic.

This book summarizes many features and issues about Lake Kizaki quite well. It widely covers different aspects of geography, geology, geomorphology, meteorology, hydrology, paleolimnology, physics, biogeochemistry, ecology and anthropogenic impact studies of Lake Kizaki. It, therefore, will provide young researchers in Japan and elsewhere with an in-depth understanding of the overall processes occurring in a small Japanese lake and the recent environmental issues, such as the invasion of exotic aquatic plants, cyanobacterial blooms (*Anabaena*), that are affecting it. The possible future of the lake is also discussed from the viewpoint of interrelationship between human activity and the lake environment, science based studies, and the effect of global warming.

The authors of the book are the leading and best known limnologists in Japan. Over the years they have published a series of manuscripts that cover in detail almost all aspects of Lake Kizaki. Also the editors, Dr. Saijo and Dr. Hayashi, have devoted themselves to the study of this lake for several decades. This book is one of the treasures from their limnological work in Japan. While reading this book readers will have a sense of having visited Lake Kizaki and watched its history unfold.

Michio Kumagai
Lake Biwa Research Institute
Japan

Calendar of Events

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/

4th International Symposium of Phosphate in Sediments.
9 - 12 September 2003
Sevilla, Spain
Contact: Laura Serrano
Dep. Plant Biology and Ecology
University of Sevilla
P.O. Box 1095
Sevilla 41080, Spain
serrano@us.es ***or*** *golterman@wanadoo.fr*
Phone: (34) 954 55 70 63
Fax: (34) 954 62 63 08
www.uv.es/ael

Monitoring Tailor - Made IV (Information to support sustainable water management: From local to global levels).
15 - 18 September 2003
St. Michielsgestel, The Netherlands
Contact:
Conference Secretariat Monitoring Tailor-Made IV
IWAC
P.O. Box 17
8200 AA Lelystad
The Netherlands
mtm@riza.rws.minvenw.nl
Phone: +31 320 298 894
Fax: +31 320 297 642
www.mtm-conference.nl

International Conference on Remediation of Contaminated Sediments.
30 September - 3 October 2003
Venice, Italy
Contact: Marco Pellei
Battelle-Geneva Research Centre
Geneva, Switzerland
sedimentscon@battelle.org
Fax: 41 22 827-2094
Abstracts can be submitted to:
www.battelle.org/sedimentscon

XI World Water Congress
Water Resources Management in the 21st Century.
5 - 9 October 2003
Madrid Congress Hall
Madrid, Spain
Contact: Centro de Estudios Hidrográficos
Paseo Bajo Virgen del Puerto, 3
28005 Madrid
SPAIN
wwater2003@cedex.es
Fax: +34 913 35 79 22
www.cedex.es/iwracongress2003

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:
Piet Verdonschot ***or*** Rebi Nijboer
Alterra, Green Word Research
Team of Freshwater Ecology
P.O. Box 47
7700 AA Wageningen
The Netherlands
oligochaeta@alterra.wag-ur.nl
Phone: +31 317 477933/ +31 317 47837
Fax: +31 317 424988

Symposium on Urbanization and Stream Ecology.
8 - 10 December 2003
University of Melbourne
Melbourne, Victoria, Australia
Contact: Chris Walsh
CRC for Freshwater Ecology
Water Studies Centre
Monash University
Clayton 3800 Australia
Chris.Walsh@sci.monash.edu.au
Phone: +61 3 9905 4091
Fax: +61 3 9905 4196
http://www.conferences.unimelb.edu.au/urbanization_and_stream_ecology/

2004

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

Sixth International Chrysophyte Symposium.
2 - 7 August 2004
Lammi Biological Station, Central Finland
Organizers:
Johanna Ikävalko, Finland
johanna.ikavalko@alih.masa-yards.fi **OR**
ikavalko@mappi.helsinki.fi
Gertrud Cronberg, Sweden
gertrud.cronberg@limnol.lu.se
Joergen Kristiansen, Denmark
joergenk@bot.ku.dk
Further information will follow

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
sil-2004@helsinki.fi
Phone: + 358 3 892 11
Fax: + 358 3 892 20219
www.palmenia.helsinki.fi/congress/SIL2004

5th International Symposium on Ecohydraulics.
12 - 17 September 2004
Madrid, Spain
Contact: TILESA, OPC, S.L.
Londres, 17
28028 Madrid, Spain
Phone: +34 91 361 2600
Fax: +34 91 355 9208
ecohydraulics@tilesa.es
http://www.tilesa.es/ecohydraulics

2005

53rd Annual Meeting
North American Benthological Society.
Although previously planned as a joint meeting with the Council of Aquatic Sciences, for June/July 2005 (Portland, Oregon, USA), this joint meeting concept has been postponed. NABS will meet as usual, in May/June 2005; venue not yet chosen.
http://www.benthos.org/

2006

The Tenth International Symposium on Aquatic Oligochaete Biology.
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

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Manufacturers of limnological equipment and Publishers

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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.

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

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

Submissions for the SIL web site should be sent by e-mail to *webmaster@limnology.org* or by fax to the attention of *Gordon Goldsborough* at: +1 (204) 474-7650.