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*Rio Negro, Uruguay  
Photo by Franco Teixeira de Melo*

# The President

Dear SIL members,

While writing this letter to you, sad news about the development of the war in Ukraine are popping up repeatedly. I am sure you all agree that a military attack on an independent country can by no means be justified. On behalf of SIL, I would like to express our solidarity and deepest sympathy with the people in Ukraine. As an international organization hosting members from all around the globe, SIL expresses condolence and grief to families, friends and colleagues who are affected. As far as I know, several European countries have provided working space, material and even salaries to Ukrainian freshwater and marine researchers. This support demonstrates that there is a truly international research community that follows the ideals of collegiality and mutual help when needed. I am grateful that the members of SIL are part of this international community.

Although the focus is on Ukraine at the moment, I would like to mention that SIL condemns wars and military attacks all over the world. Research and education are always among the first victims, and hence we should be aware of any call from affected colleagues who need our support. Research to support the sustainable development of life on our planet is effective only by peaceful and respectful interaction among researchers, the general public and politicians. SIL will continue to propagate diversity and fairness among researchers independent of nationality, gender and geographical origin. As SIL president, I welcome any suggestion on how SIL can become more active in supporting freshwater research worldwide, also in areas where military actions massively affect civil life.

Please take the time and send a Welcome to our [new Board members](#) (Vice Presidents and Early Career Researchers), elected in 2021. I am very thankful that the Executive Board of SIL is now composed of a strong diversity of researchers, with many of the Board members coming from developing economies. This voluntary engagement makes the society stronger and supports its internationalization. And please note in particular that SIL soon will have board members to develop the group of SIL ambassadors – members from all countries who can actively link SIL with the national limnological communities. We are looking forward to the new initiatives that will emerge from the engagement of the SIL board members and committees, and we hope for interest and support by our members to make SIL a hub for connecting national and international freshwater societies. You may be volunteering to become one of the ambassadors of your country – please contact us and express your interest!

Thanks to the now much larger and more diverse SIL Executive Board, we have generated the capacities to evaluate some key actions of SIL, for example the SIL awards, the student 'Best paper' competition and the selection of keynote speakers for SIL conferences. These are successful traditional SIL actions, which have substantially contributed to visibility and appreciation of SIL as a scientific society. However, the selection procedures primarily evaluate

researchers by publications in scientific journals with high impact factors. I have become more skeptical during the last years that these relatively narrow evaluation criteria correspond fully to the SIL mission. Excellence in studying and managing inland waters and addressing global issues covers more than excellent scientific papers. Furthermore, these criteria tend to be a disadvantage for researchers from the Global South, for whom the national science environments provide fewer resources and less support than what is offered to researchers in the Global North. There is no simple solution that removes all inequality in the evaluation and selection procedures. However, I am convinced that our criteria can be re-designed toward awarding those international researchers who decisively contribute to the worldwide development of freshwater research and management in all its facets. In this vein, I also would like to mention that we intend to have the SIL meeting in 2024 in South or Central America. We have asked for a bid and are currently reviewing conditions and opportunities of the offers we have received. The decision to go to South or Central America reflects our motivation to link with the large limnological communities in these countries. I hope you all like the idea that SIL will have an international meeting in this region of the world.

But as you know, SIL will celebrate its 100<sup>th</sup> anniversary with an international congress in Berlin in early August this year. The local organizing committee has been actively promoting the event, and we are happy to see that more than 700 researchers from all over the world have announced their participation. The meeting will be among the first occasions where limnologists meet face-to-face after more than two years of harsh Covid-19 restrictions. However, the organizers will also provide substantial online resources and access to all major scientific presentations of the congress – hence participating online is still an option for all who cannot come to Berlin. I hope that the congress sends the strong signal that science is an international endeavor, and is needed to contribute to resolving worldwide problems. I think we, members of SIL, can be proud to belong to a society that has such a long history. SIL was founded with the intention to promote fundamental and applied aspects of freshwater research. I am convinced that this intention has been continued and will continue to define what SIL stands for. I hope to meet many of you in person or online in Berlin this summer, to celebrate the centennial and to discuss our activities in the sense of the congress motto: The next 100 years – Sensing and Safeguarding Inland Waters.

See you in Berlin.



**Thomas Mehner**  
SIL President

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### BREAKING NEWS!

*The 2021 Impact Factor for Inland Waters is 3.000 - 2021 Journal Citation Reports®*

In this issue we have some last minute news about SIL100 – Berlin and brief insights into our award winners. As always SIL President T. Mehner has a thought-provoking letter for us. There are exciting developments in Latin America and Caribbean limnology. This issue's Opinion article outlines an alternative way of understanding water rights and from the Limnology Around the World section we can learn more about an important algal culture collection in Brazil and the challenges facing Moscow's water supply. Please meet four of our members in the FACES of SIL section. Unfortunately, we have lost three outstanding limnologists, but as we read their obituaries, we can see that their spirit lives on through their colleagues.

Hope you enjoy this issue of SILnews.

Giovanna Flaim,  
Editor SILnews

Contribution deadline for the January 2023 issue: **01 October, 2022**

Send to: SILnews Editor, Giovanna Flaim, at [SILnews@limnology.org](mailto:SILnews@limnology.org)



# SIL 100 - Award Recipients



**David Hamilton**

## The Baldi Lecture

The Baldi Lecture Award, instituted in 1952, is given for stimulating research and inquiry within the field of theoretical limnology to which Edgardo Baldi devoted his life's work. The Baldi Lecture is delivered as the foremost lecture at SIL congresses. For the SIL100 congress in Berlin, the Baldi Lecture will be given by:

**David Hamilton, Deputy Director, Australian Rivers Institute and Professor at Griffith University, Brisbane, Australia.**

This lecture will examine how new geospatial tools, remote sensing capability, and high performance computing environments are transforming our spatially confined studies from individual catchments, streams and lakes, to regional, national and global assessments. These advances provide the landscape connectivity required to effect spatially relevant policy change, conservation planning and restoration. Fully utilising these tools can raise the profile of limnological studies and focus investment towards addressing the freshwater biodiversity crisis.



**Susie Wood**

## The Kilham Lecture

The Kilham Lecture Award, instituted in 1992, honors the memory of Peter Kilham by promoting and stimulating research in the subjects that most interested him and to which he devoted his life: African limnology, biogeochemistry, ecology and physiology of planktonic diatoms, comparative ecology of lakes and oceans, paleolimnology, and saline lakes. For the SIL100 congress in Berlin, the Kilham Lecture will be given by:

**Susie Wood, freshwater scientist and molecular ecologist, Cawthron Institute, Nelson, New Zealand.**

Multidisciplinary and integrative research spanning three broad areas: (i) toxic cyanobacteria dynamics in freshwater systems (both planktonic in lakes and benthic in rivers), (ii) the development and application of molecular techniques to monitor and understand aquatic systems, and (iii) integrating cutting edge techniques with more traditional paleolimnological approaches to guide future lake management and restoration. The Our Lakes team is using sediment coring, novel proxy analyses (environmental DNA, high-resolution core scanning), geochronology and mātauranga Māori (indigenous knowledge) to reconstruct water quality and lake health over the past 1000 years and provide a richer understanding of the value of New Zealand's lakes.

## The Naumann-Thienemann Medal

**The Naumann-Thienemann Medal, instituted in 1930, is awarded at The First General Assembly of each SIL congress. This award is the highest honor that can be bestowed internationally for outstanding scientific contributions to limnology. At the SIL100 congress in Berlin, the Naumann-Thienemann Medal will be awarded to:**

**Sally MacIntyre, University of California, Santa Barbara, USA** for a lifetime of limnological research. Sally continues to make important contributions by studying turbulence and other physical processes and their links to biology and biogeochemistry of lakes. Sally has studied large tropical lakes in eastern Africa, lakes along the Amazon floodplains, soda lakes in Kenya and hypersaline Mono Lake in California, the large deep lakes Biwa and Tahoe, and boreal and arctic lakes in Alaska and Sweden. Dr MacIntyre has worked on the hydrodynamics of Lake Victoria and linked fluxes across the metalimnion to internal waves and boundary mixing in Mono Lake, made possible by a newly developed temperature-gradient microstructure profiler.

**Jose Tundisi, International Institute of Ecology, São Carlos, Brazil.** Jose Tundisi's main research activity is the study of ecology and limnology of inland aquatic ecosystems (lakes, rivers, reservoirs) in tropical and subtropical latitudes mainly in South and Central America. The research work of Jose Tundisi has promoted new approaches in the scientific studies and in the integrated management of watersheds, reservoirs, and lakes. Dr. Tundisi has worked in 40 countries as Professor of Limnology and Ecology, and as consultant and adviser in management of aquatic ecosystems. His current research includes studies of the impacts of cold fronts on reservoirs in the Southeast region of Brazil and the physical, chemical, and biological responses to these weather patterns, including the effects of global changes.



**Sally MacIntyre**



**Jose Tundisi**



36<sup>th</sup> Congress of the  
International Society of Limnology  
7 – 10 August 2022 | [www.sil2022.org](http://www.sil2022.org)



## We look forward to meeting you this summer in Berlin, from 7-10 August 2022, at the 36<sup>th</sup> Congress of SIL, which will mark our society’s 100<sup>th</sup> anniversary.

### PARTICIPATION

Almost 800 abstracts have been submitted and will form the backbone of the scientific program. On-site registrations account for about 70% of the total, which reflects the desire to meet and interact in person again. We take this large response as a promising assurance for an exciting meeting – and are happy to provide the floor for the event at the conference venue “Hotel Berlin, Berlin”, located in the downtown area of Berlin, Germany.

We are particularly pleased to note that participants will gather from all around the world. Despite the difficult times for travel, 60 countries will be represented from Africa, Asia, Australia and Europe as well as South and North America. Registration for the congress, excursions and social events is still possible (<https://www.sil2022.org/registration/registration-fees-onsite-and-online>).

### PROGRAM

The program was largely generated bottom up. It will include oral onsite presentations, e-posters, pre-recorded oral presentations, workshops, and social events. There will be about 40 scientific sessions spanning a wide variety of topics that range from biodiversity dynamics to carbon cycling, and including sessions on consequences of ecosystem coupling, data analysis and monitoring, ecosystem functioning, extreme events, human-freshwater relationships, microbial diversity and activities, stressor impacts on freshwaters, and more. One session will be devoted to limnology in society and the history and future of SIL. The complete program will be shortly posted on the SIL 100 website at [sil2022.org](http://sil2022.org).

### PLENARY SPEAKERS AND AWARD WINNERS

As highlighted on the previous page, we are very pleased to host the Baldi and Kilham Memorial lectures by David Hamilton and Susie Wood, along with five plenary presentations by Nancy Grimm, Christiane Zarfl, Spencer Hall, Tamlin Pavelesky and Amy Rosemond. The Baldi and Kilham Memorial and plenary lectures are scheduled every day in the early afternoon local time to facilitate online participation from different time zones around the world.

The plenary lectures will address the resilience of inland waters to environmental pressures, the importance and consequences of river fragmentation, the role of parasites in freshwater ecosystems, and human impact on inland water ecosystems. Perspectives on new strategies and technologies for limnological research will also be addressed, including remote sensing, large-scale and long-term experiments, and high-performance computing. See [sil2022.org](http://sil2022.org) for further details.

We are equally delighted to give the floor to the winners of the 2022 SIL Student competition. Samuel Dijoux from the Czech Republic (1<sup>st</sup> prize) will speak at the closing ceremony, and presentations by runners-up Joachim Jansen from Sweden (2<sup>nd</sup>) as well as Marcin Dziuba from Poland and Lena Schallenberg from New Zealand (shared 3<sup>rd</sup>) will speak in different sessions of the program. See the announcement by SIL for further details.

### Plenary lectures by -



Nancy Grimm



Christiane Zarfl



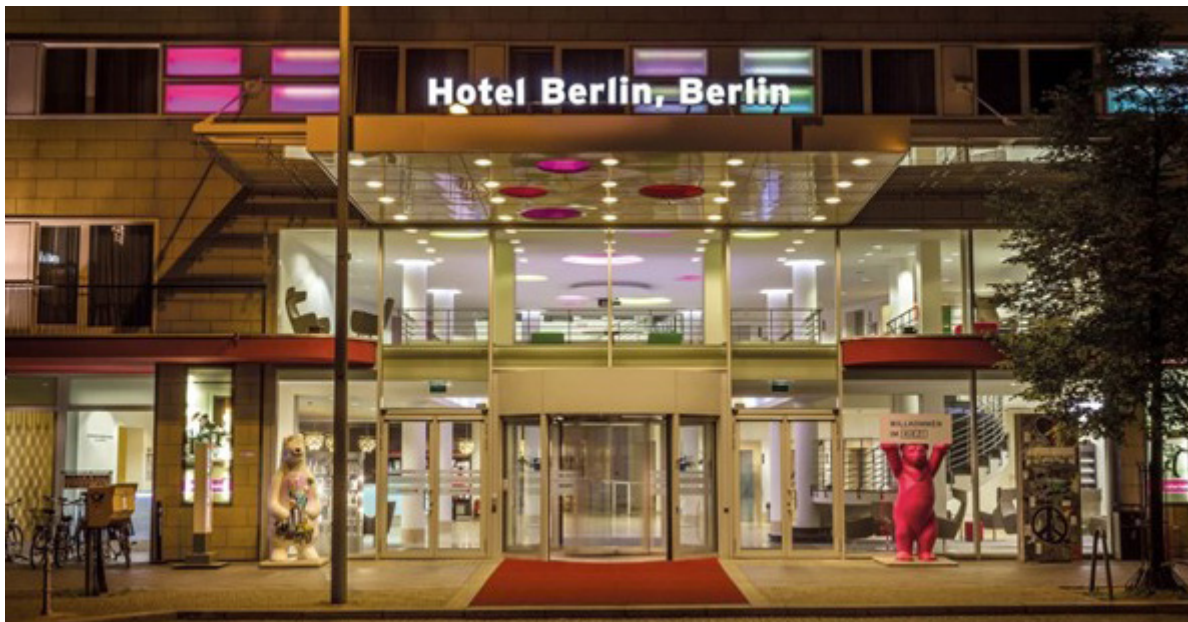
Spencer Hall



Tamlin Pavelesky



Amy Rosemond



## SOCIAL EVENTS

A selection of excursions to join after the congress will be offered, mostly on Thursday. These are opportunities to visit highlights of inland water landscapes as well as limnological research and water management projects in and around Berlin (one-day trips) and elsewhere in Germany. More detailed information is provided under <https://www.sil2022.org/program/excursions/>

Join the Limnology Night on Tuesday, 9 August, in a German beer garden under large horse-chestnut trees. This will be an informal get together and barbecue dinner including seasonal cuisine with fresh regional products. The Keller Blues Band featuring our SIL president on double bass will rock the show (<https://www.sil2022.org/limnology-night>).

The opening ceremony and presentations on Sunday afternoon will be followed by a reception with drinks and finger food at the venue. On Monday night, 8 August, we will organize a film evening on fresh waters that was shown at the Berlin Film Festival this year. Both the director and producer will be present and will be happy to discuss their highly experimental film. Further details will be available on the website soon.

## 100 LIMNOLOGICAL QUESTIONS

There is still a chance to submit questions on inland waters that you find inspiring or pressing or that are highlighting priority areas of future limnological research to advance both theoretical and practical knowledge on inland waters. Do not hesitate to participate, this is a brainstorming exercise that relies on your unfiltered ideas. We will compile your views and provide a floor for discussion during the congress as a basis to crystallize a suite of key questions expected to shape research on inland waters in the future. Let us make the 100 Limnological Questions initiative a milestone reflecting where limnology is heading in the years to come. Visit the [SIL 100 conference website](#) to get involved in the initiative by turning in your questions.

## THE CONGRESS VENUE: HOTEL BERLIN, BERLIN

Hotel Berlin, Berlin has been voted “Top 1 Independent Meeting Hotel in Europe” and owns the “Sustainable Meetings Berlin” certificate. Committed to sustainable development and an eye for the environment, Hotel Berlin, Berlin offers a welcoming setting for our anniversary congress. For more information visit: <https://www.sil2022.org/venue-accommodation/venue/>

## ACCOMMODATION

Arrangements with three hotels have been made for the congress. Please see <https://www.sil2022.org/venue-accommodation/accommodation> for your preferred hotel. The venue itself, Hotel Berlin, Berlin, has large capacities for accommodation. However, tourists are beginning to return to Berlin, so that booking a room as soon as possible may be wise. A wide variety of additional hotels in different prize categories are available in Berlin. You will find a link at the above address to “Visit Berlin,” which lists many of them. If you are interested in staying near the venue, select “Tiergarten” district on that website to narrow your search.

We hope this short update gives you a flavor of what to expect at SIL 100 this August in Berlin.

On behalf of the Planning and Scientific Committee, our sponsors and the entire community of limnologists in Germany and Sweden, we look forward to welcoming you there.

Emma Kritzberg, Rita Adrian, Mark Gessner, Sami Domisch, Florian Leese, Ryan Sponseller, Lars Tranvik, Markus Weitere

THE NEXT 100 YEARS:  
SENSING AND SAFEGUARDING INLAND WATERS



# SIL Student Competition Congratulations to the winners of the 4<sup>th</sup> SIL Student competition!



**First place:**  
**SAMUEL  
DIJOUX**  
**CZECHIA**

Dijoux S, Boukal DS. 2021. Community structure and collapses in multichannel food webs: role of consumer body sizes and mesohabitat productivities. *Ecology Letters* 24: 1607-1618.



**Second Place:**  
**JOACHIM  
JANSEN**  
**SWEDEN**

Jansen J, Thornton BF, Jammet MM, Wik M, Cortés A, Friborg T, MacIntyre S, Crill PM. 2019. Climate-sensitive controls on large spring emissions of CH<sub>4</sub> and CO<sub>2</sub> from northern lakes. *Journal of Geophysical Research: Biogeosciences* 124:2379-2399.



**Third place:**  
**MARCIN  
KRZYSZTOF DZIUBA**  
**POLAND**

Dziuba MK, Kuczyński L, Wejnerowski L, Cerbin S, Wolinska J. 2021. Countergradient variation concealed adaptive responses to temperature increase in *Daphnia* from heated lakes. *Limnology & Oceanography* 66:1268-1280.



**Third place:**  
**LENA  
SCHALLENBERG**  
**NEW ZEALAND**

Scallenberg L, Pearman JK, Burns CW, Wood SA. 2021. Metabarcoding reveals lacustrine picocyanobacteria respond to environmental change through adaptive community structuring. *Frontiers in Microbiology* 12: 3258.

The winners will be awarded their certificates at the SIL Congress in Berlin, Germany (7-10 August 2022), where the first place winner, Samuel Dijoux, will give a plenary and second and third place winners will give a short congress summary talk at the closing ceremony.

We thank all those who contributed to the competition, including the 41 applicants from 20 countries, mentors who wrote recommendation letters, SIL National Representatives who coordinated internal elections at the first stage of the competition, and national committee members who ranked the papers at the National level competition.

Most importantly, we all owe great thanks to Cristiana Callieri (Italy), Régis Céréghino (France), Paul DelGiorgio (Canada), David Hamilton (Australia), Stéphan Jacquet (France), Nico Salmaso (Italy), Piet Spaak (Switzerland), Sidinei Magela Thomaz (Brazil) who examined and ranked the 21 articles participating in the international stage of the competition. All of them are leading editors of limnological journals, thus experts in assessing the merits of scientific papers. Without their professional experience and their precious time, this competition would not have been possible. Thanks to their contribution, this competition has tremendous impact and is considered a very prestigious award. Again kudos to all the winners!

# The Brian Moss Student Competition

Lake Pueyrredon, Argentina.  
Photo by Irina Izaguirre

It is a great honor and pleasure to announce that from now on the SIL Student Competition will be re-named 'The Brian Moss Student Competition', after Brian Moss, SIL's president during 2007-2013. Brian's wife, Joyce Moss, will be donating a big sum to create a SIL Memorial Fund named after her late husband. This fund will cover the costs of these competitions, mostly congress participation expenses and monetary awards to the competition winners. Joyce will be joining us in August at the 2022 SIL Congress in Berlin to participate in the student award ceremony on the last day of the congress.

Prof. Brian Moss was a pioneer in the ecological restoration of lakes worldwide, notable for his work restoring the Norfolk Broads in the UK. In 1996 much of this work was summarised in *A Guide to the Restoration of Nutrient-Enriched Shallow Lakes*, co-authored with collaborators in the Environment Agency and the Broads Authority. This guide continues to be used as a lake restoration bible across the world. The 5<sup>th</sup> edition of his popular textbook *Ecology of Freshwaters* was published shortly after his death. Brian was a keen educator, and an inspiration to environmental science students around the world. He was the President of SIL from 2007 to 2013. He won the SIL Naumann-Tienemann Medal - the highest international honour for outstanding contributions to scientific limnology in 2007, the Excellence in Ecology Prize in 2009, and the Institute of Ecology and Environmental Management's Medal in 2010.

In Brian's own words, taken from a letter to SIL members he wrote a few weeks before he passed away: "I now realise more than ever what it has been to work and communicate, argue and sometimes laugh with you all. Trends in science are getting more cut-throat and competitive as funds become shorter, as administrations create league tables of citations and h factors, esteem indices and other nonsense. But deep below all that, and transcending it, there is a profound humanity in the scientific community and my recent experiences have brought that home to me. Thank you for everything."

The Brian Moss Student Competition is for the best limnological paper recently published coming out of a PhD or MSc research work done by a student who is a SIL member. Four competitions have been held so far, with world-wide participation (see Table 1).

The student competition has two stages. The first stage is a national competition for the best paper coming out of each country. A team created by the National Representative of each country ranks the papers and chooses the one to represent their country. The second stage is an international competition for the best papers among each country's winners. An international jury of at least five members who are editors of leading limnological journals review the papers and choose the winning papers for the first 3 places, based on the following scoring criteria:

- Scientific/technical quality (score 0-20),
- Methodological approach (0-20)
- Relevance and potential scientific impact (0-20).



Brian Moss. Photo by Tom Barker

Over one hundred students from 31 countries have participated in the four editions (Table 1). The countries with the highest participation were Argentina (16), Brazil (16), The Netherlands (10) and Spain (10). Other countries had a total of 1-7 competitors in the four editions. Greater participation from a particular country mostly reflects the success of its National Representative(s) in recruiting applicants. Students from less economically advantaged countries are encouraged to participate, and so far, we have had competitors from Algeria, Bukino-Faso, Ethiopia, Kenya, and Tanzania from Africa, The Philippines from East Asia, Argentina, Brazil and Mexico from Latin-America, Czechia, Hungary and Poland from Eastern Europe. We note that so far only two winners have come from these countries (Argentina, Czechia), and we appreciate the unjust competition they are facing, and looking for ways to increase their success rate. We also note that most of our winners are men, only three of the 15 competition winners so far were women. SIL will look further into encouraging their participation.

At the same time, we are proud to highlight the great success of these student competitions. They attract huge attention, as obvious on social media on the day the competition results are being announced, and their winners receive a big boost to their career. Some of them have joined the SIL board, SIL committees, and SIL activities.

The fifth competition will be announced around mid-2023.

Tamar Zohary  
SIL General Secretary-Treasurer

**Table 1.** SIL Student Competition: the number of participants from each country at stage 1 for each of the four editions. For stage 2 results, the country winning 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> place in each edition is color-coded (1<sup>st</sup> place- blue, 2<sup>nd</sup> place – green, 3<sup>rd</sup> place – yellow). The third place was shared by two students in 2016 and 2022.

| Country                          | Student Competition Editions |                 |                 |                | Total no. of participants from country |
|----------------------------------|------------------------------|-----------------|-----------------|----------------|--|
|                                  | 1- Torino 2016               | 2- Nanjing 2018 | 3- Gwangju 2021 | 4- Berlin 2022 |  |
| Algeria                          |                              | 1               |                 |                |  |
| Argentina                        | 7                            | 2               | 2               | 5              | 16                                     |
| Australia                        | 1                            | 2               |                 | 3              | 6                                      |
| Austria                          | 2                            | 1               |                 |                | 3                                      |
| Belgium                          | 2                            | 1               |                 |                | 3                                      |
| Brazil                           | 5                            | 4               | 1               | 6              | 16                                     |
| Burkina-Faso                     |                              |                 |                 | 1              | 1                                      |
| Canada                           |                              | 3               |                 |                | 3                                      |
| China                            |                              | 1               |                 |                | 1                                      |
| Czechia                          |                              |                 |                 | 2              | 2                                      |
| Ethiopia                         |                              |                 |                 | 1              | 1                                      |
| Finland                          | 1                            | 2               |                 |                | 3                                      |
| Germany                          |                              | 2               | 2               | 2              | 6                                      |
| Hungary                          | 1                            | 1               | 1               | 1              | 4                                      |
| Ireland                          | 1                            |                 |                 |                | 1                                      |
| Israel                           |                              | 2               |                 | 1              | 3                                      |
| Italy                            |                              | 1               |                 | 1              | 2                                      |
| Japan                            |                              | 1               |                 | 1              | 2                                      |
| Kenya                            |                              |                 |                 | 1              | 1                                      |
| Mexico                           |                              |                 |                 | 3              | 3                                      |
| New Zealand                      | 1                            | 1               |                 | 1              | 3                                      |
| Philippines                      |                              | 2               |                 |                | 2                                      |
| Poland                           | 2                            |                 | 1               | 1              | 4                                      |
| South Korea                      | 5                            | 1               |                 | 1              | 7                                      |
| Spain                            | 1                            | 4               |                 | 5              | 10                                     |
| Sweden                           |                              | 1               |                 | 1              | 2                                      |
| Switzerland                      |                              |                 |                 | 2              | 2                                      |
| The Netherlands                  | 2                            | 4               | 3               | 2              | 11                                     |
| Tanzania                         |                              |                 | 1               |                | 1                                      |
| UK                               | 2                            | 1               |                 |                | 3                                      |
| USA                              | 2                            |                 | 1               |                | 3                                      |
| <b>Total no. of participants</b> | <b>35</b>                    | <b>35</b>       | <b>12</b>       | <b>41</b>      | <b>123</b>                             |



Brian in Quebec. Photo by Joyce Moss



Doing what he loved best. Brian and students - Norfolk Broads, East Anglia. Photo by Mike O'Conner





# SIL Educational Videos – Arriving Soon!

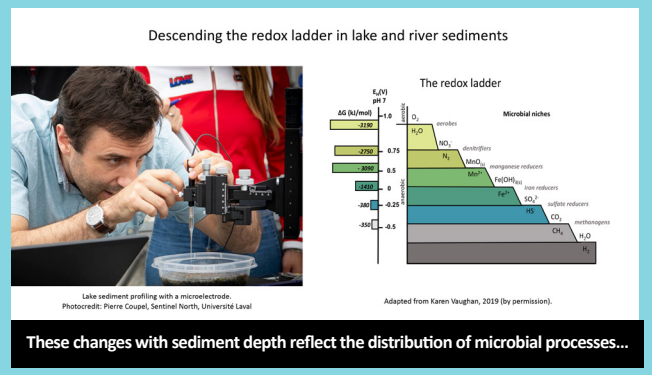
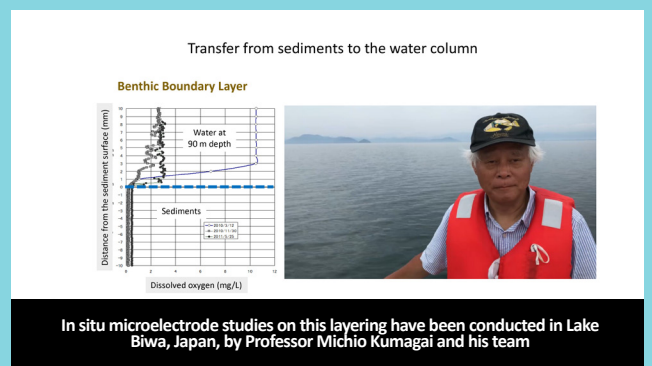
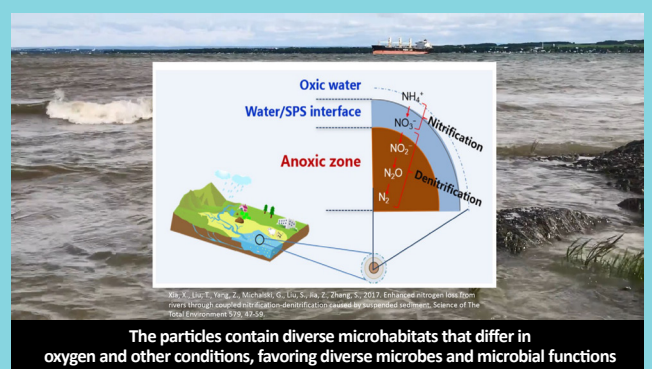
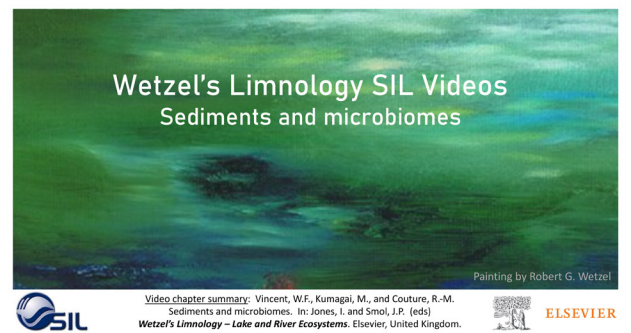
A new video production is underway by the SIL Education Committee, with initial examples planned to be online in time for SIL100 in Berlin (some early screen shots of one example are shown on the right). Entitled *Wetzel's Limnology SIL Videos*, this project is the exciting result of a partnership between SIL and the academic publisher Elsevier. The aim is to produce a series of educational videos on all facets of limnology, to be released one-by-one as each becomes available, from summer 2022 onwards.

For many decades now, Robert Wetzel's *Limnology* has been a standard reference source for all limnologists, and a popular textbook for limnology classes. The last edition was published in 2001, and Professor Wetzel sadly passed away in 2005. The publisher of this work, Elsevier, with cooperation from the Wetzel family, was keen to continue this legacy and to produce a new edition. Ian Jones at the University of Stirling (UK) and John P. Smol at Queen's University (Canada) agreed to take on the coordination and editing of this new edition, and they recruited more than 50 authors throughout the world, so that each chapter could be extensively revised and brought up to date by specialists in each topic. The 31 chapters will soon be submitted to the publisher, and the resultant volume is planned for publication in print and e-book formats in 2023.

Robert Wetzel is especially well known to SIL members because he was our General Secretary and Treasurer for 37 years, and he contributed enormously to the success and growth of the society. The SIL Education Committee thought that video summaries of the chapters in this new *Wetzel's Limnology – Lake and River Ecosystems* would be a fitting tribute to the memory of Wetzel, as well as an outstanding educational resource. This idea was received very favorably by the editors Ian and John, as well as by Elsevier and all members of the SIL Board. We have therefore been following up with the authors of each chapter to see if they would like to produce a video summary on their topic with support of our committee, and there has been great enthusiasm for the project.

This video production is a voluntary activity by SIL members and authors, and from the beginning we have planned it to be a freely available educational resource. The videos will be delivered in an open access channel via the SIL website. SIL members will be notified by Twitter when new videos are put online, and Elsevier has generously agreed to offer SIL members a substantial discount on the book. We are working closely with the SIL Communications Committee on this, and on other video projects that are in the planning stage right now.

**SIL Video Team:** **Warwick F. Vincent** (Université Laval, Canada), **Ali Ger** (Universidade Federal do Rio Grande do Norte, Brazil), **María de los Ángeles González Sagrario** (Instituto de Investigaciones Marinas y Costeras, Argentina), **Barbara Barta** (Center for Ecological Research, Hungary) and **Veronica Nava** (University of Milano-Bicocca, Italy).



# Regional News

Lake Alchichica, Mexico. Photo by Javier Alcocer Durandyou

## LATIN AMERICAN AND THE CARIBBEAN LIMNOLOGY NETWORK: AN INTEGRATED INITIATIVE TO CONNECT COUNTRIES AND RESEARCHERS

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### Introduction and background

Latin America is the cultural cradle of relevant civilizations that were precursors of important fields of modern science. For example, advanced agricultural production techniques, already favored food availability for settlements between 5 and 7 thousand years ago (Turci, 2014). Stretching from Mexico to the *Tierra de Fuego* in Patagonia, Latin American and Caribbean identity is a process under continuous construction (Souza, 2011) permeated by historical elements and political events spanning early colonization between the late Pleistocene and early Holocene periods (Bueno *et al.*, 2013). Such historical complexity gave rise to cultures of high richness and miscegenation in different countries, by maintaining characteristics and historical aspects of native cultures, while generating unique scenarios in constant redefinition.



Poza Azul, Mexico. Photo by Robert Wallace

In this sense, these cultural memories and identities are marked by constant redefinition or temporal layers of meanings (Kosseleck, 2006), extrapolating present experiences. In this scenario of great effervescence, Limnology has developed a perfect connection between historical tradition and current innovation in the many research groups present in the region. Some highlights include theoretical bases for relevant theories such as the functioning and ecology of shallow lakes (Teixeira de Mello *et al.*, 2009, O'Farrell *et al.*, 2011, Izaguirre *et al.*, 2015, Carnevali *et al.*, 2016, Barbosa *et al.*, 2020, Meerhoff *et al.*, 2021), and community ecology, including relevant proposals on phytoplankton functional groups (Kruk *et al.*, 2017), among others. However, the currently high

scientific production and high citation rates can be further stimulated by investing and establishing cooperation between already consolidated groups with those in the initial stages of formation. In this sense, nucleation and training can be great allies, redefining relations between Latin American and Caribbean countries and favoring a more equitable development.

One of the most challenging aspects is to establish connections and bridges between the different countries of Latin America and the Caribbean in a scenario of reduced resources for science and technology, as is currently occurring in Brazil and other nations. Since 2020, this scenario of scarce resources has been aggravated by the global pandemic of COVID-19, driving thousands of people into extreme poverty. On the other hand, science has never been so necessary. In this regard, the digital connection and online scientific actions have broadened horizons and indicated the relevance of network projects in increasing the impact of actions and publications, enabling obtaining resources for research development on common issues such as impacts by anthropogenic actions (*e.g.*, salinization, biotic homogenization, and eutrophication, among others) (Torremorell *et al.*, 2021) and climate change consequences (Attayde *et al.*, 2021).

### Mission

The creation of a Latin American and the Caribbean Limnology Network arises from the need to strengthen and favor the development of Limnology in these regions, generating spaces for sharing ideas and projects, as well as functioning as an “umbrella” for researchers, societies, and their members, by promoting the integration and development of regional Limnology as a whole (Fig. 1).

### General objectives

- To encourage the development of limnological research in Latin America and the Caribbean, with a special focus on spatial and temporal gradients.
- To promote scientific cooperation in limnology among countries from Latin America and the Caribbean.
- To generate shared databases to stimulate the construction of hypotheses and the generation of analyses at large spatial scales.

### Specific objectives

- To promote a unique agenda of events, congresses, and joint actions, and enable the participation of network members in these events.
- To support countries where organized scientific societies do not yet exist, aiming at the preservation of the history of limnology, and the development of the limnologist's career.

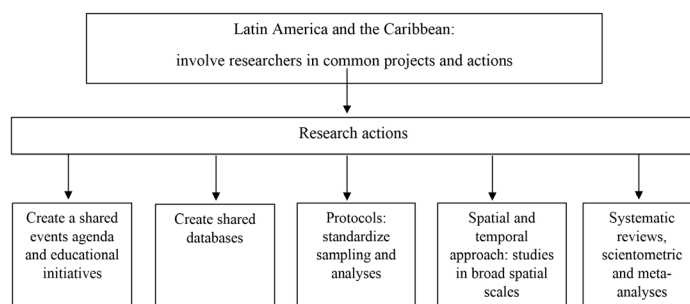
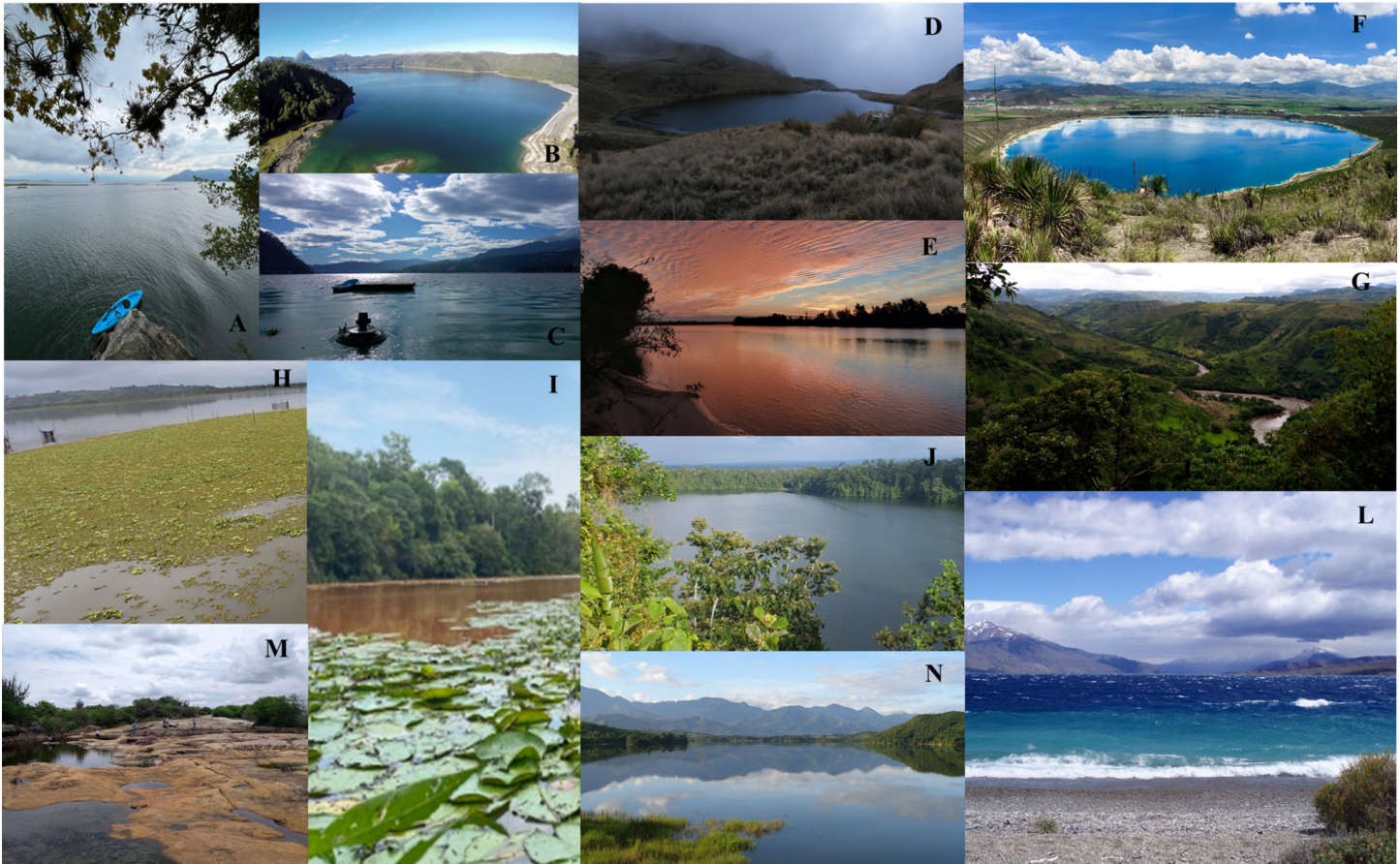


Fig. 1. Educational design of Latin American and Caribbean Limnology.

- To promote courses and virtual laboratories in partnership between societies and researchers from different member countries.
- To generate the interchange of postgraduate students between different member countries.
- To encourage and promote young limnologists.
- To promote discussions and foster actions such as publications, concerning common problems associated with environmental conservation, especially in the context of climate change and multiple stressors that currently threaten our inland waters.
- To search, through international articulation, for international funding aimed at fomenting research and actions in Latin America and the Caribbean.

- To promote broad scale projects by involving the many countries of Latin America and the Caribbean.
- To develop protocols aiming to standardize limnological sampling and analyses.

Currently, researchers from 18 countries are part of the Latin America and Caribbean Limnology Network. These include Argentina, Brazil, Bolivia, Colombia, Costa Rica, Cuba, Chile, Ecuador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Mexico, Republica Dominicana, Uruguay, and Venezuela. Our objective is to expand the participation of researchers and countries, generate opportunities for young students and contribute to the valorization and growth of Limnology in this region. Fig. 2 illustrates some of the great diversity of freshwater systems in Latin America and the Caribbean.



**Fig. 2.** A. Yojoa Lake (Honduras); B. Huishue Lake (Chile); C. Amatitlán Lake (Guatemala); D. Laguna Viscacha, Tunari National Park (Bolivia); E. Rio Negro at Villa Darwin (Uruguay); F. Alchichica Lake (Mexico); G. La Magdalena River (Colombia); H. RAMSAR La Segua wetland (Ecuador); I. Arroyo Minga Porã (Paraguay); J. Río Cuarto Lake (Costa Rica); K. Laguna Grande Ciervo de los Pantanos (Argentina); M. Rock Pools (Brazil) and N. Clavellinos reservoir (Venezuela).

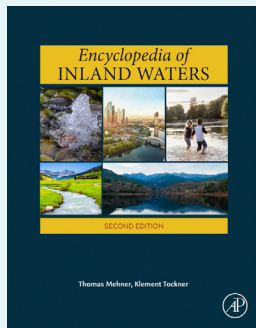
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## NEWS FROM MEMBERS



The second edition of the Encyclopedia of Inland Waters | ScienceDirect, edited by Thomas Mehner and Klement Tockner is out!

Nikolai Aladin, from the Laboratory of Brackish Water Hydrobiology - St. Petersburg Russia, sends us this link to “KURT” - Brine Shrimp & the Aral Sea <https://youtu.be/9cFLzCkYHTs>



Lake Kinneret, Israel. Photo by Tamar Zohary



# Opinion

*Ko Waikato te awa, Ko Ngāti Tahu Ngāti Whāoa te iwi.  
Photo by Lara Taylor (a mokopuna of the Waikato).*

## Learning How to Operate in Aroha

**Lara Taylor**

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In the last edition of SIL (January 2022), Dr Anne Poelina shared her Opinion on Indigenous water rights as the Chair of the Martuwarra Fitzroy River Council, and a Nyikina Warrwa Traditional Owner. Across the ditch from Te Whenua Moemoeā (the land of the dreamtime also known as Australia), in Aotearoa New Zealand, I think it is safe to say that tangata whenua (people of the land) stand with the Martuwarra Fitzroy River in the fight for Indigenous water rights. Here I contribute my Opinion as a Māori-Pākehā-Dutch woman, passionate about Indigenous and environmental justice and well-being. In 2012, an urgent inquiry began into Māori proprietary rights

in freshwater bodies and geothermal resources. It just so happens that my tūrangawaewae (place of standing) is adjacent to the Waikato River, and on top of geothermal resource. The application granted by the Waitangi Tribunal<sup>1</sup>, was in response to Māori opposition to the Crown’s proposed sale of shares in state-owned power companies (including on the Waikato River). Thus began a national investigation into significant legal and political issues, including how Māori water rights and interests could be resolved and enabled alongside those of other users. The Crown has since acknowledged its obligation and ability to deliver ‘use and control’ to Māori through more appropriate decision-making roles and economic benefits (Waitangi Tribunal 2019:532). Regulation of water use that upheld Māori rights would also require a specific allocation for the exclusive use by iwi (tribes) and hapū (sub-tribes, family groups). The Tribunal contends that ‘this allocation would be inalienable other than by lease, and it should be perpetually renewable (as all consents are in theory, provided there is still allocable water available)’. However, despite the Tribunal’s confirmation of Māori proprietary rights in water, the Crown’s position with regard to redress remains opposed to any national settlement or generic share for Māori (Waitangi Tribunal 2019:521). All ethical breaches aside though, Māori could still achieve proprietary through resource management reforms and the current allocation system instead.

Rather than address the complexities of Māori water rights and allocations, the Crown has concentrated on constructing legislation and policy that only recognises and empowers the rights and mana (prestige and authority) of water itself rather than that of tangata whenua. As with elsewhere in the world, one of the rivers in Aotearoa, the Whanganui River, has been awarded legal personhood. This Treaty settlement outcome for the Whanganui River iwi recognised their genealogical connection to the river which is their ancestor, with its rights provided for by the resultant legislation [the Whanganui River Act] Te Awa Tupua (Whanganui River Claims Settlement) Act 2017. Alongside an isolated application of legal personhood to one particular water body, aspects of Te Ao Māori (the Māori worldview) are also being progressed at the national scale through policy and planning. The National Policy Statement for Freshwater Management (NPSFM) now includes an overarching principle, Te Mana o te Wai. A policy that recognises and empowers the mana of wai (water) itself. This principle is set to be embedded across wider policies and plans throughout Aotearoa, for implementation by regional and local authorities in collaboration with iwi and hapū and communities. This policy work has been carefully centred around water quality, whilst managing to avoid aspects of water quantity such as access, use and allocation rights. These philosophical shifts in policy and legislation accommodate aspects

aroaha ~ love, care, compassion • hapū ~ sub-tribes, family groups  
iwi ~ tribes • koha ~ gift • mana ~ prestige and authority  
mātauranga ~ knowledge • tāngata whenua ~ people of the land  
taonga ~ treasures • Te Ao Māori ~ the Māori worldview  
tikanga ~ a customary system of values and practices  
tipuna ~ ancestors • wai ~ water  
waimāori ~ freshwater • whakapapa ~ genealogy

<sup>1</sup>The Waitangi Tribunal was established by the Treaty of Waitangi Act 1975. It is a permanent commission of inquiry that investigates and makes recommendations on claims made by Māori relating to Crown breaches of the Treaty of Waitangi (signed in 1840 by Māori chiefs and the British Crown).

of Te Ao Māori (the Māori worldview) through the recognition and empowerment of the mana of water itself. Arguably this leads water politics in Aotearoa in a better direction. However, these constructs that only recognise and provide for one or some Māori relational values (i.e. 'mana' or genealogical connections between a river and an iwi) also detract and distract us from explicitly recognising the mana of the people themselves who are indigenous to and interconnected with these lands and waters.

Perhaps it's coincidence, or just the best that the Crown can do. However, many of us – academics,

(freshwater) and the love and respect required for appropriate management of our ancestral waterways, taonga (treasures) passed down from Papatūānuku (our earth mother). This could, at a minimum, be created within the current policy settings, albeit with changes that elevate protection of and provision for cultural values alongside environmental values. More fundamentally, the proposition is that a reframing of environmental governance to one based on tikanga (a customary system of values and practices) and mātauranga-a-iwi/hapū (knowledge specific to iwi/hapū) will stimulate more caring attitudes to water across Aotearoa (refer Sec. 7)<sup>2</sup> – to enhance and

place) and papakāinga (communal Māori dwellings). Allocation Three, 'Ngā Koha Puna' (gifted waters), provides for commercial takes of water and includes Māori rights and interests related to the development and commercial enterprises (Fig. 2). The principles within the tikanga-based framework implement a true partnership approach to water governance and management (refer to Taylor *et al.* 2021 for further detail). This framework defines a stronger hierarchy of water values in which cultural values have an appropriate place, and explicitly provides for consideration of cultural flows and allocations in water allocation planning. It aligns with, and builds on, the most recent NPSFM which has adopted a hierarchy that values (in principle) the wellbeing of the water first. Unfortunately, the policy lacks an implementation framework or guidance to help realise this transition. The type of approach we advocate for – pragmatic, implementable and informed by inherited wisdom – would help re-conceptualise water governance and management for the twenty-first century, through much-needed change in our societal awareness, attitudes, and behaviours.

Three factors are critical to this allocation framework. One is that freshwater is appreciated as a taonga (treasure), and we argue that in order to achieve this outcome, the system also needs to be reformed for which we suggest an overarching bicultural policy Ngā Taonga Tuku Iho (treasures handed down from our ancestors) (Sec. 5). Two is Te Mana o te Wai, which is consistent with and supports the current overarching principle in the NPSFM. If the mana of the wai (which is our tīpuna and taonga) is truly upheld, then so is the mana of the people, the place, and the culture; emphasising the reciprocal nature of a tikanga-based management approach. Three, that Māori rights and interests are provided for, alongside others, in each of the categories. The allocation hierarchy in Fig. 2 means that the flow or volume of water in a waterbody that is left once the tīpuna are sustained can be shared among humans for our own use and well-being, including for commercial purposes if there is sufficient volume. This wai is a koha (gift) based on aroha (love, care, compassion) to be used respectfully, responsibly, and sustainably. The column on the left side of the framework (refer to Fig. 1) stresses the importance of equitable distribution across people, place, and time including generations. Decision-making for water allocation must be respectful and wise, ensuring sustainability of this taonga for future generations, a concept sometimes referred to by Māori as 'being a good tīpuna' for our future mokopuna. The column on the right side provides a set of guiding principles

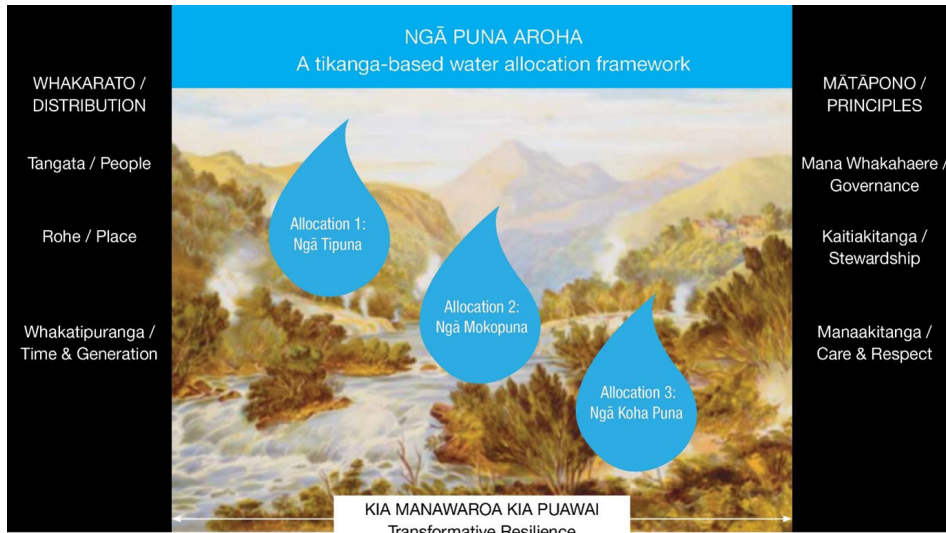


Fig. 1. Ngā Puna Aroha – a tikanga-based water allocation framework.

activists, and everyday people – argue that these constructions are illustrative of the strategic and manipulation of a deeply ambivalent Crown. A fragile structure that is mindful of needing to show that it is 'doing the right thing' (demonstrated by the policy work around the mana and personification of water), but simultaneously refraining from going to the full extent to recognise and provide for the mana of the people themselves. That further step would require the Crown to share its assumed authority, and uphold the guarantee made by the Crown in the Treaty of Waitangi/Tiriti o Waitangi (1840) that Māori would be able to continue under the system or lore of tino rangatiratanga (sovereignty and self-determination) over their taonga katoa (all that they treasure). The relationship between the environment and our taonga (including but not limited to freshwater) is one of reciprocity, such that the mana and wellbeing of those taonga will require the equivocal mana and wellbeing of the respective iwi and hapū. Kaitiakitanga (the Māori ethic of care or guardianship which applies but is not limited to the environment) requires those communities to be able to exercise rangatiratanga; rangatiratanga, tikanga, and mātauranga-a-iwi/hapū. These are all Te Ao Māori concepts that are nested within a deep, holistic, values-based culture which cannot be disconnected and applied authentically if it is in bits and pieces (the way the Crown is currently trying to apply it, or more appropriately, trying to support application by Māori).

I want to share with you a framework that a few of us developed to assist the (seemingly perplexed) Crown to re-indigenise water allocation for Aotearoa. We called this framework Ngā Puna Aroha. This name reflects the springs or genesis of waimāori

protect the mauri (health and well-being) and mana (spiritual power, authority, prestige) of waimāori and, reciprocally, human communities.

The framework proposes a restructured system of water allocation, grounded in indigenous principles, which would provide the fundamental shift needed in our conception and use of freshwater. In Fig. 1, the first priority for allocation 'Ngā Tīpuna' (ancestors) ensures that the mauri (life force) and health of ngā tīpuna' must be provided for through an environmental baseflow and mauri allocation (and thus ecological well-being). Allocation Two, 'Ngā Mokopuna', (grandchildren) provides for 'priority' human and domestic consumptive purposes but includes water allocated for marae (tribal meeting

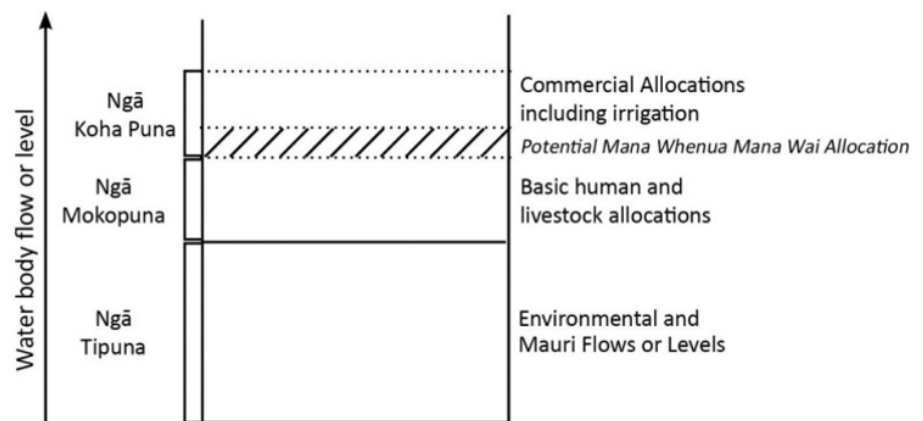
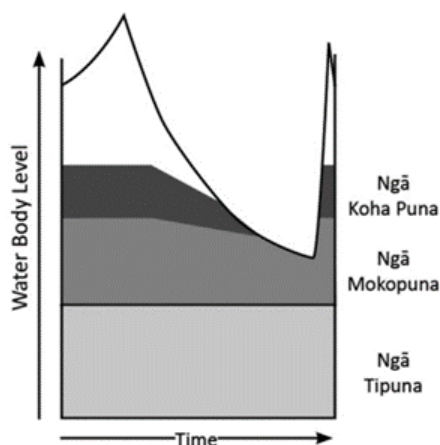


Fig. 2. Allocation hierarchy for Ngā Puna Aroha

<sup>2</sup> I will refer to "sections" throughout this article, by which I am referring to sections within the full article by Taylor *et al.* 2021.

to support such decision-making and implementation (refer to Box 2 Sec. 6).

If implemented, transitional limits would be required until values and allocations were established on a catchment basis through the NPSFM and Te Mana o te Wai. Catchments that are fully or over allocated would need proactive management with precautionary approaches informed by scientific knowledge as well as mātauranga, and by structured value assessments. While more clearly defined rights and interests would provide greater certainty and equity overall, a transitional phase would also be necessary to ensure existing users and consent holders are not unfairly prejudiced (MacPherson, 2017). With respect to a specific cultural allocation, in catchments where water has not been fully allocated, there is potential to put in place 'Mana Whenua Mana Wai' allocations (Fig. 2), the precedence for which has already been set by the reservations of water for Māori reserved lands undertaken by Tasman District Council (refer to Sec. 4 of Taylor *et al.*, 2021).



**Fig. 3.** Potential water-trading allocation framework based on the principles and proposed water allocation hierarchy of Ngā Puna Aroha

Water-trading markets may develop formally over time in Aotearoa (Fenemor, 2013), as has been the case in many other countries. Both Australia and Chile have included special provisions for their indigenous peoples (*e.g.* refer Jackson & Langton, 2011; Jackson & Barber, 2013; MacPherson, 2017). If markets are considered for Aotearoa, Ngā Puna Aroha could be used to assist with this consideration and potential market development. Fig. 3 is a simple illustration of where one might start, with the white area being unallocated water to be precautionary and to allow variability of residual flows.

If this approach were implemented then a water-trading allocation framework that was socio-culturally and ecologically just could potentially be considered in Aotearoa. While I don't necessarily advocate for water-trading, if Aotearoa shifted to a system that operates in aroha (Marsden, in Royal, 2003) it may offer efficient management that provides for the wellbeing of people, taonga, and place.

I have outlined Ngā Puna Aroha above to provide ideas for good practice for a regulatory system that reclaims and redefines the way that water is managed and protected (and potentially other taonga) for our shared future. Its legislative delivery could be achieved in multiple ways, which are considered in Taylor *et al.* (2021). The development of Ngā Taonga Tuku Iho would encompass all natural 'resource' management and provide a korowai (cloak) for the management of each particular 'resource' or taonga – and learning how to operate in aroha for our taonga that is freshwater, our lifeblood, is the best place to start.

## Ko te wai te ora ng mea katoa

### Water is the life giver of all things

In Aotearoa a whole-of-system transition to a Tiriti-based relational system, grounded in a new and formalised constitution is required (Taylor, 2022). Policies and legislation are important but must be supplemented with a commitment to a mutual learning process and re-institutionalisation by both Indigenous Māori and the Crown around genuine power-sharing and ways of operating ethically (Royal, 2000), ResponsAbility (Martin *et al.*, 2018) and in aroha (Marsden, in Royal, 2003) for our collective health and wellbeing. Further afield, I hope that this proposal to develop a dual water governance and management paradigm will inform and inspire freshwater and wider natural 'resource' management policymaking, regulatory frameworks, and implementation in other postcolonial nations. I welcome potential collaborators and thought-provokers to get in touch should this opinion-piece spark an interest.

**Acknowledgements:** I would like to acknowledge the co-authors and developers of Ngā Puna Aroha – Andrew Fenemor, Roku Mihiniui, Te Atarangi Sayers, Tina Porou, Dan Hikuroa, Nichola Harcourt, Paul White & Martin O'Connor – Ngā mihiniui ki a koutou!

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## LIMNOLOGY AROUND THE WORLD: BRAZIL

# The Culture Collection of Freshwater Microalgae from the Federal University of São Carlos (CCMA-UFSCar), Brazil

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Microalgae and cyanobacteria have great ecological and economical importance. They are the main primary producers in aquatic systems, and some may produce harmful blooms (*e.g.* Field *et al.*, 1998; Paerl *et al.*, 2001). Moreover, in the last decades, there has been a growing use of these microorganisms in various industrial sectors, *e.g.* food, pigments, pharmaceuticals, cosmetics (Borowitzka, 2013; Borowitzka *et al.*, 2016). In spite of this, so far just a small portion of microalgae and cyanobacterial diversity has been explored for biotechnological and commercial purposes (Harvey, 2000; Senhorinho *et al.*, 2015), and much of their diversity is still unknown (Guiry, 2012; De Vargas *et al.*, 2015).

Some studies on algal ecology and research for biotechnological and commercial uses demand isolated strains that are usually requested from (and/or deposited in) culture collections. Therefore, these collections are important centers of *ex situ* conservation of genetic resources, providing strains and services for both academic and non-academic purposes.

The culture Collection of Freshwater Microalgae from the Federal University of São Carlos (CCMA-UFSCar, Portuguese acronym for Coleção de Culturas de Microalgas de Água Doce da Universidade Federal de São Carlos) is located in the Phycology Laboratory,

Botany Department. The CCMA-UFSCar (World Data Centre for Microorganisms 835), formerly named UFSCarCC ([http://ccinfo.wdcm.org/collection/by\\_id/835](http://ccinfo.wdcm.org/collection/by_id/835)), was the first culture collection of freshwater microalgae founded in Brazil, in 1977, by Prof. Armando Augusto Henriques Vieira (Lourenço & Vieira, 2004). Currently, it is probably the largest and most diverse collection of the kind in Brazil, besides being among the largest microalgae collections in Latin America.

Throughout these 45 years, the collection has been expanded and maintained mainly by grants from research projects. Its curation and maintenance have been taken care of by non-exclusive staff from UFSCar, and voluntarily by post-docs and students from the Phycology Lab.

Since its foundation, the CCMA-UFSCar has been providing training in algal culture curation, as well as offering strains of microalgae and cyanobacteria for educational and research purposes to schools, institutions and companies across the country. Since 2017 this has been done through an institutional outreach project at UFSCar, and it has been possible to request restitution for maintenance costs. Unfortunately, due to the lack of dedicated staff for the culture collection and some constraints that derive from Brazilian laws, shipping strains abroad is difficult. In the last four years, only within Federal University of São Carlos, our collection provided strains for at least 29 projects (from post-doc to undergraduate research) funded by FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo), CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) and CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior).

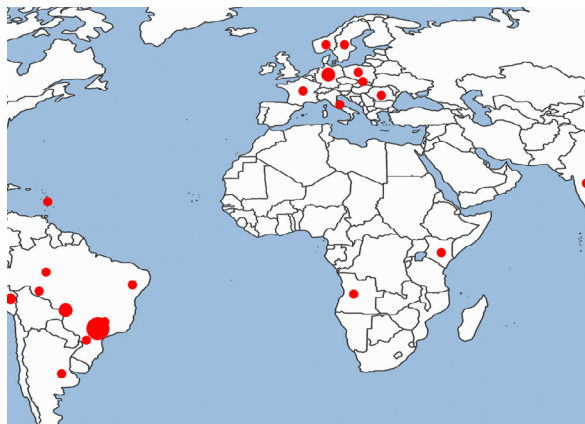
All strains at CCMA-UFSCar are maintained as metabolically active cultures (Fig. 1), which demands time and effort; also, some replicates are cryopreserved (Tessarolli *et al.*, 2017). We have approximately 670 strains from Brazil and we also keep around 120 strains from other countries (Fig. 2). From these, about 170 are also kept in axenic cultures, which may be important for some biotechnological application, since interactions with bacteria and fungi can alter the production and degradation of compounds (*e.g.* Bruckner *et al.*, 2011; Stengel *et al.*, 2011). Most of the strains were isolated from reservoirs, small ponds, streams, springs, and bogs at São Paulo State, half of it during a research project BIOTA-FAPESP coordinated by Prof. Armando Vieira, but we have also isolated strains from other regions (Fig. 2). Since the focus of the Phycology lab projects has been green microalgae, most of the isolated algae are chlorophytes and some streptophytes, but we also cultivate cyanobacteria, cryptophytes, xanthophytes, chrysophytes, and diatoms.



**Fig. 1** The Culture Collection of Freshwater Microalgae at the Federal University of São Carlos (CCMA-UFSCar).



Most of the strains have been identified based on morphological features, which are usually insufficient for morphologically simple microalgae (Krienitz & Bock, 2012; Fawley & Fawley, 2020). This means that we have possibly underestimated the diversity of the collection. Recently, 150 strains of green microalgae were analyzed by morphological and molecular techniques, leading us to identify three new species and reposition one family within the Chlorophyceae (Garcia *et al.*, 2017; Garcia *et al.*, 2021). We also estimate that around 20% of the remaining strains within this dataset belong to at least six more new species/genera (including picoeukaryotes). Thus, we have much more to discover in the Culture Collection. This is also true for biotechnological applications. For example, in a screening for promising biodiesel producers, one strain from our culture collection produced 115% more fatty acids than soybean (Menezes *et al.*, 2013).



**Fig. 2** Countries from where the strains maintained at the CCMA-UFSCar were isolated. Most of the strains were isolated from Brazil, mainly from São Paulo State.

Although the correct identification of strains is important for applications and commercial use (please, see references in Borowitzka, 2016), most of the identification has been done by PhD students and postdocs, which limits the number of strains used. In 2018 we received a grant from FINEP (Financiadora de Estudos e Projetos, Brazilian Federal Government) that specifically aimed to improve quality of the collection. This project allowed us to obtain molecular markers for 100 strains and to get infrastructure for cryopreservation and data curation. Increasing the number of cryopreserved strains is important for the quality of the Culture Collection, since it is more suitable for maintaining their long-term genetic stability, fundamental for basic and applied science. By 2023 we expect to make available at the [Phycology Lab page](#) data about the strains, such as identification, isolation site, culture medium used, and published papers. Despite funding for materials and equipment, we still lack personnel. Since most of our staff is composed of volunteer students, and the number of scholarships to postgraduate programs is getting scarce, this has been a growing constraint to keep the collection in good shape and to continue to offer services to the community.

Currently, besides the project funded by FINEP, another two wider research projects are helping to maintain the CCMA-UFSCar: 1) Bioprospection, characterization and optimization of Brazilian microalgae for CO<sub>2</sub> biofixation and production of commercially important biomolecules, funded by FAPESP and Coordinated by Prof. Ana Teresa Lombardi, and 2) Ecological species concept applied to the specific delimitation of asexual green microalgae, funded by CNPq and coordinated by Prof. Inessa Lacativa Bagatini.

In the future, we hope that Brazilian funding agencies and government realize the importance of keeping these important and unexplored genetic resources that are culture collections. Furthermore, understanding that culture collections (which includes the ability to provide strains) require a lot of work and dedicated personnel must be attained. The reality of collections being undervalued and not funded must come to an end.

**Acknowledgments:** We thank Luiz Sartori, Dr. Thaís Garcia da Silva and Dr. Leticia Tessarolli for helping in the curation of the CCMA-UFSCar, and all the students from Phycology Lab for helping in the collection maintenance.

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## LIMNOLOGY AROUND THE WORLD: RUSSIA

# Guarding Freshwater Ecosystems in the Moscow Region

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Moscow - the largest megacity in Europe - is located in a place without sufficient water resources to supply all of its 17 million inhabitants with drinking water. To meet the water needs of the growing city, two hydrotechnical systems were created during the 20<sup>th</sup> century in the upper reaches of the Moskva and Volga rivers (Fig. 1). The first large reservoir on the Volga – Ivankovo - was constructed precisely to supply water to Moscow. In total, more than 10 reservoirs have been built to supply drinking water to the greater Moscow metropolitan area.

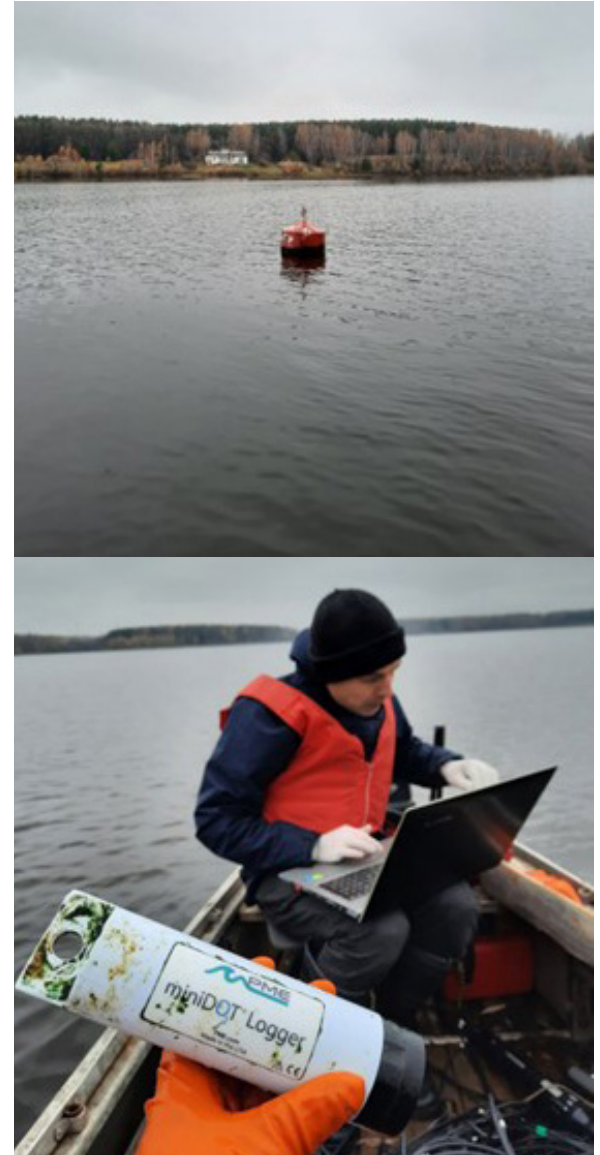


**Fig. 1** Location of the Moscow Drinking Water Supply System.

The Moskva River water supply system includes 4 main reservoirs: Mozhaysk, Ruza, Istra and Ozerna. Currently, this system provides about 80% of the total annual drinking water consumption in the Moscow metropolitan area. In 1965, a laboratory for reservoir studies was established at the largest of these reservoirs - Mozhaysk – by the Faculty of Geography of Lomonosov Moscow State University. This laboratory has been conducting complex research on these reservoirs almost from the moment of their construction. In the 1970s, the laboratory actively monitored the ecosystem of the newly created Mozhaysk Reservoir, publishing the results in several monographs. In the 1980s, when more attention in the Soviet Union had turned to pollution of natural waters, the focus of limnological research of the laboratory shifted to studying the phosphorus cycle in the reservoir and the key hydrological and physical processes behind it. In the 1990s, the extent of monitoring carried out by the laboratory dropped due to the economic crisis, and during the next 20 years was limited to only studying lake physics. However, the situation has improved considerably in the last 12 years: comprehensive monthly monitoring was resumed, with

regular measurements of concentrations of nutrients and organic substances, adding chlorophyll measurement for the first time. With guidance from [GLEON](#), an optimized monitoring program was developed, and high-frequency monitoring of temperature, oxygen and chlorophyll at the deepest point of the reservoir was started (Fig. 2). Additionally, in the last 10 years the laboratory began to publish the results of its research, making it available to researchers from other countries.

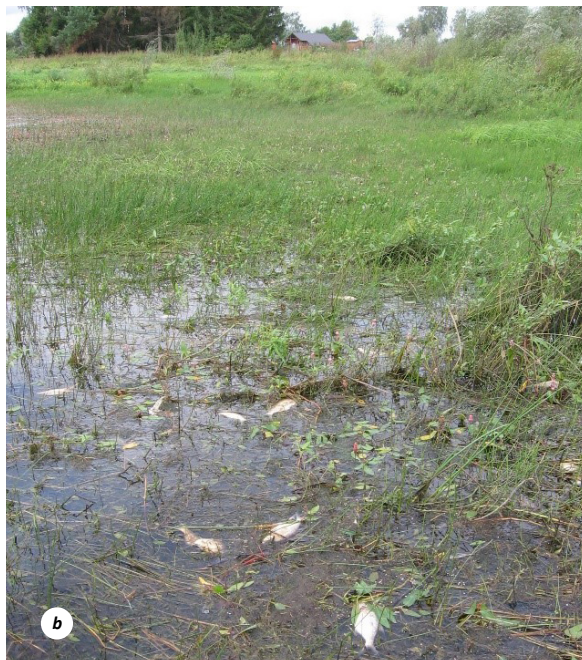
Limnological studies on reservoirs in the Moscow region are becoming more and more relevant because all reservoirs in the Moscow River basin are eutrophic with harmful algal blooms (HABs), usually cyanobacteria, occurring every few years (Fig. 3). At the same time, Russian water supply services do not monitor concentrations of either chlorophyll content or cyanotoxins in drinking water and its



**Fig. 2** Buoy installed in the Mozhaysk Reservoir and saving data from loggers

sources, and the only data relevant to algal blooms received at water supply stations are information on the number of different algae divisions. That is why limnological research conducted by LMSU scientists is devoted first of all to understanding which processes control blooms in these reservoirs and to finding mechanisms of reducing the intensity of these blooms.

Reservoirs on the Moskva River have catchments with relatively low anthropogenic impact: even 50 years ago agriculture was not intensive, and in the last 30 years it has almost disappeared. At the same time, in recent decades urban development along the shores of the reservoir is continuously increasing with almost no control



**Fig. 3** A harmful algal bloom (a) and fish kill (b) in the Mozhaysk Reservoir in summer with low water level.

of sewage discharge from newly built houses. Reservoirs are also popular recreational areas and attract more and more people, including non-organized tourists, who leave behind significant quantities of garbage. All this together with global warming as an additional driver, increases algal blooms in reservoirs even under low nutrient loading with river flow.

The key nutrient source here is the internal nutrient load, which results in high concentrations of inorganic nitrogen and phosphorus released from bottom sediments under anoxic conditions in summer.

Climate warming in recent decades has resulted in about a doubling of maximum concentrations of phosphorus and nitrogen in the hypolimnion during periods of summer hypoxia, which is primarily controlled by an increase in the duration of stratification. At the same time, the number of storms in summer has significantly increased in the Moscow region over the last 10-15 years, which temporarily disrupt stratification and cause a release of nutrients accumulated in hypolimnion into the surface layers.

The analysis of long-term data from the Mozhaysk Reservoir revealed that the key controlling factor behind the intensity of cyanobacterial blooms is the water level. Direct correlation between cyanobacterial biomass and chlorophyll *a* content with water level was confirmed by both observational data and model simulations. For instance, when in

2008-2009 the level of the reservoir dropped down to the minimum permissible levels due to construction work at the dam, resuspension of nutrients caused a harmful algal bloom, which lasted for one and a half months. Draining of spawning areas and dangerous algal blooms in the Mozhaysk Reservoir resulted in many fish kills over the years, and unfortunately there were no assessments of the damage to the reservoir ecosystem caused by dam repairs. The last harmful algal bloom event observed in the Mozhaysk Reservoir was in 2019, when the reservoir was not completely filled in spring due to low water inflow, and summer storm events again caused resuspension of nutrients, making them bioavailable to phytoplankton. Unfavorable hydrological conditions led to phytoplankton biomass in the reservoir exceeding 100 mg/l in August, and more than 80% of this biomass was composed of toxic cyanobacteria. Phytoplankton abundance was so high that it raised serious concerns from professionals at the Moscow water supply facility and brought them in contact with laboratory experts regarding the cause of the HABs. Meanwhile, water from Mozhaysk and other reservoirs along the Moskva River water supply system continued to be used for drinking water for lack of direct measurements of cyanotoxin levels during water treatment and the complete absence of any national Russian guidelines for cyanotoxin levels in drinking water.

Research on which nutrient elements limit cyanobacteria growth have shown that nitrogen limits algal growth to a greater extent than phosphorus. However, in modern Russian limnological studies nitrogen is often not considered as an important component of the aquatic environment in the context of eutrophication control. Presently, most Russian-language studies consider only phosphorus compounds as limiting ones, and much less importance is given to monitoring the intake of nitrogen compounds.

Regrettably, in today's Russia, there is still very little integration of limnological research with decision makers and organizations involved in the treatment of drinking water. The importance of such a synergistic approach only increases in view of more frequent occurrences of HABs, which were not observed in the Moscow region some decades ago and made worse in a warming climate. Therefore, collecting long-term data, understanding the mechanisms of outbreaks and developing strategies for controlling and reducing HAB intensity and regularity is crucial for ensuring the safety of the 17 million people in the Moscow metropolitan area even in the absence of action from policy makers. The experience of many other countries shows that sooner or later the lack of action in this direction leads to water crises in cities, and the task of Moscow limnologists today is to conduct scientific research that will help explain causes of harmful algal blooms and outline ways to avoid them.

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# FACES of SIL



**Sabine Wanzenböck**

## SABINE WANZENBÖCK | AUSTRIA

My job may be a bit unusual for Faces of SIL. Since 1998, I have been working in the Upper Austrian Lake District in Mondsee. My current position at the [Research Department for Limnology, Mondsee](#), of the University of Innsbruck, includes public relations and library agendas. Through my biology studies at the University of Vienna and my professional career, I was able to gain experience that goes beyond the pure field of science. I see myself as a person who transfers knowledge to the general public. For example, I am PI of citizen science projects in co-operation with schools. I love working on water related projects with kids. Currently, I lead the project [geniALGE](#) with six regional schools, company partners, and scientific staff. We work on microalgae and their application for agriculture. I also organize events for the public; e.g. [Long Night of Research](#) and [Young University](#).

At the Research Department for Limnology, Mondsee, we investigate the ecological and evolutionary adaptations of aquatic organisms and the resulting consequences at the ecosystem level under the influence of climate change and increasing human impact. The eight research groups investigate aquatic model organisms, ranging from bacteria, plankton organisms, algae, snails, to fish. Lake Mondsee is a regular site of the Austrian [Long-Term Ecosystem Research Network \(LTER\)](#).

Since 2017, I have been responsible for financial agendas on the Executive Board of the Austrian limnological society "[SIL-Austria](#)". SIL-Austria is committed to its regional members as a national organisation. We organize webinars, workshops, and projects for young scientists, and regular conferences in Austria.

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**Alidor Kankonda Busanga**  
Department of Hydrobiology  
Faculty of Sciences  
University of Kisangani (UNIKIS)  
Democratic Republic of the Congo  
(DRC)

## ALIDOR KANKONDA BUSANGA | CONGO

I am Professor and Head of the Department of Hydrobiology (Faculty of Sciences). My research interests are focused on water quality, ecology of benthic macroinvertebrates and fisheries.

According to its aquatic resources, the Democratic Republic of the Congo (DRC) should be a great country for limnology. However, there are not enough qualified Congolese researchers in this domain. It is why I dedicate most of my time to the formation of students in aquatic sciences to prepare the researchers of tomorrow. But this impulse is unfortunately curbed by limited financial and material resources. I would like to see a large mobilisation of the international community for tropical African freshwater ecosystems as is done for tropical forests!

Presently, our freshwater ecosystems face large negative impacts especially as related to climate changes, non-sustainable exploitation and environment degradation, although many of these aspects remain poorly or not yet studied. As the Congolese people struggle to put years of civil conflict behind them, I urgently invite the limnological scientific community to reengage with relatively isolated scientific communities in places like the University of Kisangani (UNIKIS), the center of aquatic biology studies in the country. Foremost among the many things needed by the faculty and students at UNIKIS is contact and collaboration with colleagues from the outside world.

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# FACES of SIL



**Milette U. Mendoza**

## MILETTE U. MENDOZA | PHILIPPINES

I am currently affiliated in the Department of Environmental Science, Ateneo de Manila University, Philippines, teaching Introduction to Environmental Science, Tropical Ecology, Environmental Monitoring, Ecology, and some research courses. As an early career scientist, I am still in the process of establishing a research group in our university, consisting of fellow faculty members and students, who will focus on methane dynamics in aquatic ecosystems. Right now, I am mostly interested in explaining the mechanisms of methane produced from natural sources, such as tropical freshwaters, and describe its rate and impacts especially in the case of a climate change vulnerable country like the Philippines. Looking at the contribution of tropical freshwaters to global methane emissions will not only enhance the sustainable management of our limited freshwater resources, but might also help in maintaining the Earth's future climate.

Since I joined SIL, I have been more inspired to contribute to the scientific community. I am very grateful to meet experts and mentors who generously and eagerly shared their knowledge and expertise to young scientists like me.

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**Richard K. Johnson**

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## RICHARD JOHNSON | SWEDEN

My interest in limnology was kindled while studying mine effluent impacts on benthic macroinvertebrates in northern California. Wanting to broaden my studies I was awarded a one-year stipend to study limnology at Uppsala University - an opportunity that morphed into a PhD and subsequently an academic career in Sweden.

Research interests have followed two parallel paths. Food web research has been an interest from the start - during my early work on mine effluents, I was curious what the bugs were feeding on in the Fe-rich mud. This query led to my PhD work on aquatic food webs, specifically pelagic-benthic coupling in lakes. Feeding studies have continued with recent focus on understanding the importance of resource flows from streams to riparian consumers using fatty acid biomarkers and eDNA to track consumer diets. My interest in bioassessment, the other red thread, increased after spending six years at the Swedish EPA. This interest also led to many enjoyable years as the Applied Issues Editor of *Freshwater Biology*. Relatively recently my group has begun studying how anthropogenic pressures, such as land use and hydropower, affect the ecological linkages of stream-riparian meta-ecosystems.

My first international meeting was at the 22nd SIL Congress in Lyon (France). An experience I'll never forget and one that was greatly enhanced by having the late Thomas Macan as the session chair. Being a member of SIL and the Swedish national representative since 2010 has been very rewarding. In contrast to many other professional societies and meetings, SIL offers a unique forum with its diversity of research and focus on global and regional environmental issues.

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# Obituaries



**Takayuki Hanazato**  
1957-2021

Takayuki Hanazato, 64, a professor at Shinshu University in Japan, passed away on November 17, 2021. He was a distinguished scholar in the fields of limnology and ecotoxicology, focusing on zooplankton ecology.

He began his research career at the National Institute for Environmental Studies, Japan, after graduating from the Faculty of Science, Chiba University, in 1980. Since joining the institute as a researcher, he was engaged in research on material cycling, eutrophication, and the effects of toxic pollutants, focusing primarily on the ecosystem of Lake Kasumigaura. On the basis of extensive experience in the field at Lake Kasumigaura, he and his colleagues conducted several experiments to confirm the environmental factors affecting zooplankton community dynamics using experimental systems that artificially developed plankton communities. The effect of chemicals, particularly pesticides, on lake ecosystems was one of Dr. Hanazato's major research themes. The results of the community-level experiments presented by Dr. Hanazato are still providing meaningful suggestions for the development and application of community-based ecotoxicological research and assessment.

In the late 1980s, Dr. Hanazato started studies on the interactions between organisms via infochemicals (chemical communication) in parallel with community-level assessments of the impact of pesticides on aquatic ecosystems. His significant achievement at that time was the discovery of the phenomenon that morphological changes in *Daphnia*, originally a defense mechanism against predators, are induced by exposure to insecticides (carbamates and organophosphates). The morphological changes in *Daphnia* are induced by infochemicals (kairomones) released particularly by their invertebrate predator, *Chaoborus* larvae. After his finding, similar phenomena were reported for various chemical and biological taxa, and today it is known as infodisruption.

In 1991, he moved to the U.S. as an overseas researcher and conducted further research there for two years. During that time, he collaborated with Dr. Stanley I. Dodson and Dr. Karl E. Havens, both prominent limnologists, who, unfortunately, are now deceased. His research in the U.S. focused on chemical communication between *Daphnia* and its predators and the evaluation of the effects of anthropogenic and nonanthropogenic environmental stresses on it. In particular, he and Dr. Dodson found

that even insecticides at concentrations low enough to exert no effect on survival or reproduction induced stronger defense forms in *Daphnia* when exposed simultaneously to naturally occurring predator chemicals (kairomones). This was the first study to suggest that insecticides used in agricultural fields, even at low concentrations that are not generally a problem when they enter water bodies, can affect ecosystems through disturbance of biological interactions.

Dr. Hanazato was invited as a professor to the Faculty of Science, Shinshu University, in 1996. He worked as a director of the Suwa Hydrobiological Station, a research institute of the university. The major research field of the institute was Lake Suwa, which has been selected and investigated as a representative of shallow eutrophic lakes in the Plankton Ecology Group (PEG) model. From this time on, he began focusing not only on research activities but also on contributing to the local community through the application of limnology to lake water quality improvement. He actively participated in public-private-academic consortia to improve the water quality of Lake Suwa and continued his efforts to share his knowledge and ideas about the water environment through local government committees and councils, as well as through regular lectures and a variety of local events. He also served as a member of several councils of the Ministry of the Environment.



Dr. Hanazato was the first to introduce biomanipulation in Japan to improve the water quality of a lake experiencing the blue-green algae phenomenon due to eutrophication. The biomanipulation was implemented as a result of in-depth discussions and consensus building with local organizations and administrative agencies in response to requests for water quality purification at Lake Shirakaba. In 2000, he conducted the first biomanipulation in Japan, which reduced the abundance of planktivorous fish and restored the *Daphnia* community in the lake. The water clarity of Lake Shirakaba was improved significantly due to biomanipulation. There are numerous examples of biomanipulation in Europe and North America, but Dr. Hanazato's application of biomanipulation at Lake Shirakaba is the only example in Japan.

As a professor, his teaching policy was to "create an atmosphere in which students could engage in investigations and experiments at their own pace" and to provide constructive opinions and advice to students. Dr. Hanazato always encouraged students through constructive comments and discussion. Under his kind guidance, students freely set up their own interesting hypotheses and developed their own studies. Currently, they are continuing Dr. Hanazato's research philosophy at universities, national research institutes, and company laboratories.

Dr. Hanazato was a forward-looking person who was passionate about research. Additionally, he was an all-around sportsman and an outstanding singer. He enjoyed chorus singing and was a tenor in the Suwa area choir and enjoyed singing in the choir's concerts at city festival events. Dr. Hanazato will remain in everyone's memory as "a great researcher with eyes as bright as a boy's, passionately talking about the fun of research on zooplankton and lake ecosystems."

#### The 5 most cited publications by Takayuki Hanazato

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**Susan Soltau Kilham**  
1943-2022

Photo by James Spotila

Susan was born in Duluth MN and grew up in Florida where she became fascinated with oceans and the organisms that live in them. She earned a BS in biology at Eckerd College and a PhD in marine science at Duke University. She made many important discoveries about marine and freshwater biology including the calcification of deep sea clams (1 inch long and 300 years old!), biological processes in African lakes, the importance of resource ratios in the growth and competition of algae in freshwater lakes, the effects of climate change on diatoms in Yellowstone Lake, and systems to grow algae in the laboratory. She was a professor at University of Michigan and Drexel University where she and her students contributed to our understanding of ecological changes related to invasive species, climate change, and the biology of tropical streams. The EPA policy on control of endocrine disruptors in the environment is a direct result of her research in that area. Her students continue her tradition of excellence in science and mentorship.

Susan overcame many challenges including sexism to become one of the leading scientists in aquatic biology and ecology. She has received numerous awards for her scientific, service, and equity contributions. In 2019 the Phycological Society of America gave her the Award of Excellence, its highest honor. And her transformational work within the Delaware River Basin, from Lake Lacawac to Delaware Bay, was acknowledged in 2015 when the Partnership for the Delaware Estuary awarded Sue with the Jonathan Sharp Lifetime Achievement Award, its highest honor.

Susan was a SIL member during her entire career and participated in most SIL congresses. After her husband Peter Kilham, also a renowned limnologist, passed away in 1989 while conducting field work in Kenya, she created the Kilham Memorial Fund to commemorate him. This fund supports a keynote speaker at each SIL Congress, given to distinguished lecturers whose research focus on topics that interested Peter Kilham.

Susan Kilham, 79, died on 12 April 2022 in Haddonfield, NJ. Donations in memory of Susan may be made to The Kilham Bear Center, a non-profit organization dedicated to preserving the American black bear ([www.kilhambearcenter.org](http://www.kilhambearcenter.org)).

#### A selection of Susan Kilham's publications

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Sue at lake Clayton, USA. Photo by Fanqi Wu

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**Roland Pechlaner**  
1934-2022

It is with great sadness that we announce that our friend, emeritus colleague and former Head of Department of Limnology (now Department of Ecology) of the University of Innsbruck, Prof. Roland Pechlaner died on 1<sup>st</sup> May 2022. Born on 18 January 1934, he became one of the leading figures of Limnology in Austria and in the international arena. He studied Zoology and Botany at the Leopold Franzens University in Innsbruck and since 1967 (when he finished his habilitation), he worked at the Department of Limnology of the same University and in 1974 became director. He spent half a year at Lake Erken, Sweden in 1960, studying the spring development of plankton. In the winter semester 1967/1968, he was visiting professor at the Limnology Division of the University of Wisconsin - Madison (USA) and worked with Prof. Arthur Hasler. Later in 1974, he was back to Sweden, this time to work with Prof. Sven Björk at Lunds University.

Roland Pechlaner took over as director of one of the oldest limnological mountain research stations in the world founded in 1959 on the shore of one of the two former Finstertaler lakes in Tyrol. His publication in 1973 about these lakes was a reference within the International Biological Program (IBP, 1967-1974) for modern research on the limnology of alpine lakes. Lamentably in 1974 and after many successful research projects such as the UNESCO IBP that he coordinated, the station had to make way for an electric power plant project and was relocated to the nearby Lake Gossenkölle located at 2,417 meters above sea level. For decades this research station has been a base for international research on alpine limnology and since 2016 carries Roland's name (see Photo) in recognition of his many scientific contributions to this area.

During his research and teaching activities Roland Pechlaner supervised 52 Ph.D. students and many more Master students. He showed young students that limnology is more than science and convinced them that it is about understanding and protecting aquatic habitats. He was in fact a forerunner of the environmental movement, foreseeing developments, problems and threats to our waters and advocating at all levels for the preservation of natural rivers and lakes (e.g., restoration of Piburger See in the 70s) long before the sustainability and natural resource conservation movement became mainstream. He actually was a pioneer in establishing a bridge between Limnology and Engineering.

Roland Pechlaner was a driving force during the 70s for the development of limnology in Austria and will be remembered not only as a pioneer of limnological mountain research and as an early and tireless fighter for the environment, but also for his passion, his perceptive and pointed questions, his ability to communicate complex concepts to politicians, his ability to inspire others, and his kindness to his students and many others who knew him.

Everyone who knew him will feel the passing of Roland Pechlaner, but our thoughts at this time are with his wife, Christine, and the rest of his family.

*His colleagues and former students from the University of Innsbruck*

#### Some representative publications

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Gossenköllesee, Austria. Photo by Ruben Sommaruga



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