SIL International Society of Limnology news

ISSUE 83

JANUARY 2024

LIMNOLOGY.ORG

High Arctic Thores Glacier and proglacial Thores Lake, Canada. Photo by WF Vincent

SILnews LAYOUT AND DESIGN BY SENSOV/ EVENT MARKETING

LETTER FROM

The President

Dear SIL members,

By this letter, I want to combine a look back on SIL activities in the previous year, with some perspectives on ongoing activities in 2024 – primarily our next SIL congress in Brazil in May 2024.

SIL Activities in 2023 – impossible without our many volunteers!

For SIL, the previous year was characterized by ongoing activities to transform the society towards an organization in which our members support and strongly interact with other members, but also inform non-members. The SIL board and committees, composed of a diverse group of our members, are excellent examples for voluntary engagement that generates opportunities and resources. The newly designed SIL website is a remarkable result of voluntary engagement – have you recognized the major changes in comparison to our previous content and design? Directly accessible via out website, the Wetzel videos are an example of recent activities generated by volunteers. These informative and fantastic videos are now available as a teaching aid for limnology courses all over the world. I would like to thank all authors and our communication and education teams who made these resources available! Another activity that I would like to mention is the mentor-mentee program of SIL where SIL members engage as voluntary mentors for early-career researcher mentees in developing countries. SIL is looking for more mentors – can you imagine supporting the scientific development of a mentee from the Global South? If you are interested, then please contact the SIL Vice President for Developing Countries. We have also launched the SIL ambassador network that shall replace the previous International Committee composed of National Representatives. We aim to create a bigger and more inclusive international network through our ambassadors, in particular via the link to the national limnological societies. In this regard, and to continue ongoing society development, it was very good to learn that we had several volunteers who wanted to replace SIL board members at the end of their terms, and were nominated for elections for the SIL board. I am happy that the long-term development of SIL is guaranteed by such a broad and diverse group among our members.

The upcoming SIL congress in Brazil

The SIL board has been closely working with the local organizing team for the 37th SIL congress in Brazil in May 2024. That SIL returns to Brazil after almost 30 years shows our dedication to the outstanding limnological research in South and Latin American countries and encourages their strong limnological associations. We were very excited about the joint proposal from 16 countries to organize the conference. Looking back to the productive meetings with the organizers I can confirm that we are well on the way towards a fabulous event. We would like to thank in particular Luciana Gomes Barbosa who is leading the local organizing committee, and the chairs of the Scientific Committee, José Attayde, Nestor Mazzeo and Susie Wood! I would like to highlight that there is an explicit emphasis on inclusion of local Indigenous communities in planning of the congress and the program. The strong interest of SIL members in the management of lakes and rivers, particularly in South and Latin America, is reflected by several contributed sessions on this topic, and by the line-up of excellent and fascinating keynote speakers who will address the mission of SIL to contribute to the sustainable use of aquatic resources. Please check out the website of the conference with much information about exciting events during the meeting. I hope that this will encourage you to register for the congress if you haven't done so yet.

The value of in-person conferences

In 2020, in one of my letters as the SIL president, I reflected upon the drastic changes to our lives and jobs due to the Covid-19 pandemic. As a by-product, we all have learned to master international video conferences during the last years. However, limnologists from all over the world are motivated again to attend conferences and workshops in presence, including the 37th SIL conference. These meetings generate enormous value linked to the opportunity to present your research, become inspired by numerous keynote lectures and presentations by colleagues, and have a full palette of social interactions. If this is true, and I believe we all share some similar opinions about the value of in-person conferences, then we may also think about how we can contribute to creating opportunities for exchange. I cannot repeat it often enough that societies such as SIL are entirely non-profit enterprises, where our members are volunteers who engage because they want to help form a society that is considered valuable by members and hopefully also by non-members. Organizing an international conference requires an enormous and often largely underestimated effort from numerous researcher colleagues. These colleagues understand the value of a conference as well, and put in their energy into creating this value. We should first and foremost be grateful to the organizers who take on the burden to the benefit of all of us. Thank you, I am looking forward to meeting you all in Foz do Iguaçu!

Partnerships in support of creating value

Another way of supporting SIL in creating value is by developing partnerships with industry and private companies. Local conference or workshop organizers may be interested in learning about the potential to establish business relationships with companies you are working with. Are these companies interested to contribute to the conference exhibition, or may sponsor the conference visit of colleagues in exchange for some business activities with you? I am convinced that there is a largely untapped potential in these mutual agreements – SIL has to develop a portfolio of assets, available during conferences, but also during other times, that may be attractive to companies and that would help establish long-term partnerships between our society and the industry. These partnerships may generate revenue that may later fund student, early-career or SIL members from low-income countries to participate in conferences. You can help by establishing these links with business partners, and by contributing to the values a scientific society has to offer to business partners. Suggestions are welcome!

> "These partnerships may generate revenue that may later fund student, early-career or SIL members from low-income countries to participate in conferences."

The value of being a SIL member

This letter is addressed to SIL members first, but I would like to encourage you, our members, to spread the word about SIL, and to motivate your colleagues to become part of our international society. SIL members have to pay lower fees for SIL conferences. They are also entitled to apply for financial support for travel costs to conferences, for example via the Wetzel fund. Our members in developing countries can apply for small-scale research projects via the Tonolli Fund. And SIL members don't have to pay page charges to publish in the SIL journal, *Inland Waters*. But in addition to these direct benefits, SIL members are part of the international society united in their activities to study freshwater systems all over the world, to promote their importance as nature-based solutions to mitigate the consequences of Global Change, and to achieve the UN Sustainable Development Goals.

I wish you all a safe, productive, inspiring and happy New Year 2024.

Thomas Mehner
SIL President

Winter - Lake Tovel, Italy. Photo by Giovanna Flaim

SIL 101 – the 37th Congress

Foz do Iguazu, Brazil: Welcome to SIL 101, Next Century and New Challenges for the Limnology!

The theme of SIL 101, *Building bridges between science and society to reduce the effects of fragmentation and degradation of inland waters,* highlights the importance of connections between people and water to mitigate impacts across continents. In the Indigenous language of the Kaingang (Indigenous people of southern Brazil), the theme can be read as *Ẽg tỹ goj kri fi ẽn rike han jé ciẽncia mré ẽg ta, goj ki rĩr jé, kar ti kókén tỹ sĩ ken jé gé ti kar mĩ*. Our aim in including the theme in an Indigenous language is to show the importance of these people to the integrity of water resources. For Indigenous people, water is a sacred resource, one of the most important foundations of life. Over the centuries, Indigenous people have not lost this perspective, notwithstanding fragmentation and increasing human pressure that greatly endangers this resource. Disorderly human growth is another current challenge, aggravated by the effects of climate change.

The International Society of Limnology (SIL) was founded in 1922 with the aim of establishing the science of inland waters and consolidating limnology as a relevant and multidisciplinary science. SIL conferences have a large international audience, with congresses on all continents over the last 100 years, thus building bridges between people and cultures.

The 37th Congress of the Society International of Limnology – SIL 101 – will be held under the auspices of the Brazilian Limnological Association (ABLIMNO) and the Latin American and Caribbean Network (LACAN), with the aim of promoting the building of bridges between stakeholders, Indigenous peoples and scientists from different continents and countries for a more inclusive and sustainable future. The great diversity of water bodies and biogeographical areas in Latin America and the Caribbean is matched by the diversity of Indigenous peoples and their cultures, which are inextricably linked to water. For these peoples and their descendants, freshwater is considered sacred ground, a gift that supports the dignity of their people and their ancestors. These characteristics make Brazil a relevant place to host this global limnological event. Foz do Iguazu, located in the south of Brazil, offers a great opportunity to discuss transboundary watersheds and the challenges they face.

The SIL 101 website provides information about Foz do Iguazu, abstract submission and registration, and other important information. As for the traditional, special and regular sessions, there are 35, covering a wide range of topics on conservation challenges, human pressures, climate change, ecosystems and communities. Other activities include language courses with indigenous peoples, meetings and workshops.

Registration is still open!

We very much look forward to welcoming you in Brazil in May 2024!

On behalf of the organizing committee,
Luciana Gomes Barbosa

https://sil2024.org/ @silcongress @SIL_limnology

Iguazu Waterfalls, Brazil. Photo by Visit Iguazu

IN THIS ISSUE

In this issue SIL's President tells us about ongoing SIL activities especially geared towards early career limnologists and students. We also have some important information about the upcoming 37th SIL congress to be held in Brazil, where the Naumann-Thienemann Medal Award recipients will be honored. You can read their brief biographies, and just saying - WOW! This issue's Opinion article deals with scientific publishing and specifically how open access contributes to global inequities. A new book on one of the world's most vulnerable areas, the Artic, will be of great interest to many readers. From the Limnology Around the World section, we can learn more about biodiversity hotspots in India, the serious problems afflicting South African reservoirs, and a PhD student's research journey in the United States. Please meet four of our members in the FACES of SIL section from Burkina Faso, Canada, Israel and Poland. Unfortunately, we have lost another long-time SIL member, limnologist Giuliano Bonomi.

Giovanna Flaim,
Editor SILnews

Contribution deadline for the July 2024 issue:
01 April, 2024
Send to: SILnews Editor at
SILnews@limnology.org

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 awarded internationally for outstanding scientific contributions to limnology. The medals will be bestowed at the upcoming 37th SIL congress to be held in Brazil (5-9 May 2024). Below are brief excerpts that the Naumann-Thienemann Medal recipients have provided.

VERA HUSZAR

It is an honour to be selected as the recipient of the Naumann-Thienemann Medal for from the International Society of Limnology (SIL) at the 37th Congress in Foz do Iguaçu, Brazil, in May 2024.

I am a professor at the Federal University of Rio de Janeiro, Brazil, where I started my professional career 44 years ago. My supervisors were central to my higher education: Maria Ofelia Garcia de Emiliani (Instituto Nacional de Limnología, Argentina) introduced me to phytoplankton ecology at the very beginning of my career; Carlos Bicudo (Instituto de Botânica, Brazil) gave me a solid phycological taxonomic basis during my Master's; Francisco Esteves (former at the Federal University of São Carlos, Brazil) provided the fantastic opportunity to develop my PhD in Amazonia; and Nina Caraco (Institute of Ecosystem Studies, NY, USA) opened my mind to face the challenges at the Biogeochemistry/Aquatic Ecology interface.

My research area has focused on planktonic aquatic ecology, mainly in phytoplankton ecology, plankton interactions, macroecology, functional diversity, carbon balance, recovery of aquatic systems, mitigation of cyanobacteria blooms, covering coastal lagoons, floodplain lakes, estuaries, reservoirs, fish farming systems, and rivers in tropical and subtropical areas, and, in to a lesser extent, temperate regions. One of my significant contributions to phytoplankton ecology science is consolidating the functional groups approach under Colin Reynold's leadership. Collaborating with colleagues in Brazil and many other countries (Argentina, Uruguay, Peru, Colombia, The Netherlands, Denmark, Spain, and the United States) brought new scientific insights to my research. One of the most relevant and worthy milestones in my career – unfortunately not fulfilled – was the dream of fostering the development of Limnology in Africa. Miquel Lürling from Wageningen University, and I, as SIL Executive Vice Presidents from Developing Countries, could not get enough money to invest in humanity's eternal debt to the African continent. We designed, articulated, and devoted much energy and time to organizing this Limnology course- a scientifically transversal course on the reality of African Limnology based on the training of multiplying agents – scientists and students from Africa. In contrast, I am proud of my contribution to undergraduate, MSc, PhD and post-doc students. They have been my significant legacy over my entire career.

JOHN MELACK

John Melack's contributions to limnology range from comparative studies of tropical African lakes and high-elevations lakes in the Sierra Nevada, linking ecological and hydrological processes on Amazon floodplains, long-term measurements and analyses of saline Mono Lake and in coastal California catchments, to applications of innovative remote sensing to inland waters. A recent book on lakes and watersheds in the Sierra Nevada integrates atmospheric deposition, catchment hydrology and biogeochemistry with variability of climate. Melack and his students have quantified the complex hydrology, nutrient dynamics and carbon fluxes within Amazon floodplains, an immense aquatic system with large methane emissions. He represented the science of inland waters in the formulation of NASA's Earth Observing System, and made seminal applications of synthetic aperture radar, passive microwave and hyperspectral imagery, to studies of inland waters. Over the years, these studies engaged numerous undergraduate and graduate students, postdocs and collaborators, resulting in many friendships.

John Melack's association with SIL began in 1979 at SIL's Workshop on African Limnology in Nairobi, Kenya, continued as Kilham lecturer in Melbourne, Australia, and plenary speaker in São Paulo, Brazil. He has long served as an associate editor for *Biogeochemistry, Hydrobiologia and Limnology and Oceanography.* Melack led the establishment and development of the Bren School of Environmental Science and Management, which trains students to be professional environmental scientists. He is a fellow of the American Geophysical Union.

Book Presentation

Smol, J.P. 2023. *Lakes in the Anthropocene: Reflections on tracking ecosystem change in the Arctic.* Excellence in Ecology Book Series, International Ecology Institute (ECI), Oldendorf/Luhe, Germany. 438 pp. ISBN 978-3-946729-30-3 ISSN 0932-2205. €50 - plus postage (print edition, hardcover)

In a book that is part memoir and part textbook, renowned limnologist John Smol reflects on his 35+ years of aquatic research in the Arctic. Working primarily on the limnology and environmental histories of lakes and ponds, he emphasizes the need for using appropriate spatial and temporal scales to understand the effects of natural and anthropogenic stressors. An overriding theme is the critical role that accelerated climate change plays as a "threat multiplier". The book pays homage to some of the pioneers of Arctic limnology using archival photographs before summarizing a diverse array of paleoenvironmental studies that he and his colleagues have led. Highlighted research includes collaborations with Indigenous knowledge holders and archeologists, tracking past ocean flooding events, the repercussions of permafrost thaw, the effects of pollutants from both local and distant sources, as well as tracking long-term changes in salmon and bird populations. Smol emphasizes the importance of using diverse sources of information, the role that personal relationships can play in successful collaborative programs, and issues linked to environmental justice for Northern peoples.

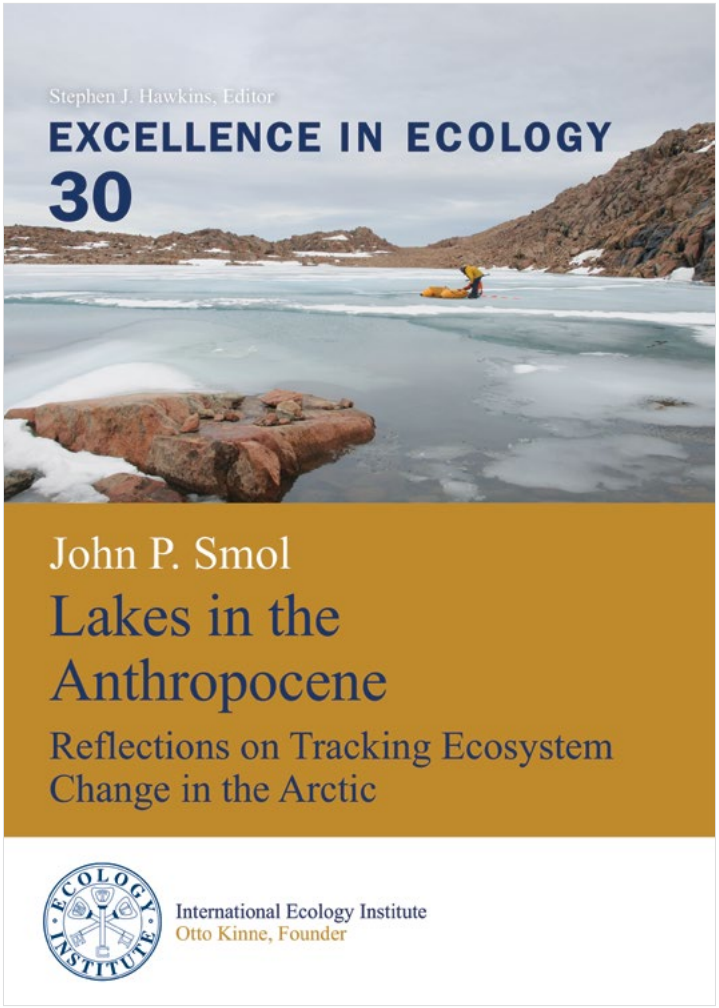


Table of Contents

As a laureate of the *International Ecology Institute Prize* John Smol's newest book is published in the *Excellence in Ecology Book Series*. The International Ecology Institute is a not-for-profit (i.e., no royalties, etc.), and hence the relatively low price of €50 (plus postage). A web page on the *PEARL* website has links to the 2-page flyer (library recommendations) as well as other information on the book.

Orders can be placed from the Distributor (Natural History Bookstore, NHBS) or directly from the International Ecology Institute.

Note the ECI web site states: Students are entitled to a 40% reduction, provided they are able to supply written proof of their status. If you have any further questions, please contact eebooks@int-res.com.

https://www.doi.org/10.5281/zenodo.10324557

Opinion

Lobos Shallow Lake, Buenos Aires, Argentina
Photo by Guillermina Nuozzi

Inequality In Academic Publishing: Latin American Researchers Against the Odds

M. Romina Schiaffino[1], M. Victoria Quiroga[2], Sebastián Metz[3], Clara Arboleda[4], M. Luz Padulles[5], Cecilia Alonso[6], Fernando Unrein[2], Irina Izaguirre[7], Hugo Sarmento[4].

[1] Departamento de Ciencias Básicas y Experimentales, Universidad Nacional del Noroeste de la Provincia de Buenos Aires (UNNOBA). Centro de Investigaciones y Transferencia del Noroeste de la Provincia de Buenos Aires (CITNOBA) – UNNOBA- UNSAdA-CONICET, 6000 Junín, Buenos Aires, Argentina.

[2] Instituto Tecnológico de Chascomús (CONICET-UNSAM); Escuela de Bio y Nanotecnologías (UNSAM), 7130 Chascomús, Buenos Aires, Argentina.

[3] Sorbonne Université, CNRS, UMR7144 Adaptation et Diversité en Milieu Marin, Ecology of Marine Plankton (ECOMAP), Station Biologique de Roscoff SBR, 29680, Roscoff, France.

[4] Laboratory of Microbial Processes & Biodiversity, Departamento de Hydrobiologia, Universidade Federal de São Carlos (UFSCar). São Carlos, São Paulo, 13565-905, Brazil.

[5] Instituto de Ecología y desarrollo sustentable – Universidad Nacional de Luján, Consejo Nacional de Investigaciones Científicas y Técnicas, Luján, Argentina.

[6] Centro Universitario Regional del Este. Universidad de la República, CP 2700, Rocha, Uruguay.

[7] Departamento de Ecología, Genética y Evolución, IEGEBA (UBA-CONICET), Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires (UBA). C1428EHA, Buenos Aires, Argentina.

Email: **rschiaffino@conicet.gov.ar**

(*) Researchers supporting this letter are detailed in the **Annex**

Researchers from Latin America have been facing many obstacles in science, ranging from limited research funding to language barriers, and in recent years the increase in pay-to-publish journals. Journals use a variety of models to meet their income needs and publishing service costs, and Article Processing Charges (APCs) is one of them. APCs are charged to authors of articles during the publication process and used by open-access journals in place of subscription fees that libraries and readers have traditionally paid to obtain access to research articles. Thus, APCs shift the burden of journal production costs (e.g., editing, peer review, archiving) directly to authors or their funders or institutions. APCs applied to academic research are usually quite high (ranging from around 350 to 3600 USD), effectively limiting the publishing opportunities for researchers from developing countries.

In particular, Latin American countries mostly lie in the lower bounds of the income-based categories of the World Bank, but even more importantly, they invest a low percentage of their gross domestic products (GDP) in research and development, even when compared to equivalent economies.

In the last years, the number of **APC journals** has grown rapidly (Chiodelli, 2021), including many top-ranking and highly cited journals (Walters *et al.,* 2011). APCs contribute to inequality between the global North and South. Authors from low- and middle-income countries (LMICs) often face greater financial constraints than those from high-income countries (HICs). Even in the case where research funds awarded by the National Academies of Sciences include publishing fees, in most cases the cost of journal fees represents a very significant amount of the grant, or in some cases the entire amount. This means that APCs represent a real barrier for authors from LMICs, as they usually do not have access to funding to cover these fees. As a result, they may be less likely to publish their research in high-impact journals that charge APCs, which can lead to a situation where important research is only accessible to those who can afford to pay for it, or is not published at all, perpetuating inequalities within the scientific community.

This situation is particularly concerning when it comes to decolonizing science (*e.g.,* Trisos *et al.,* 2021), as it can mean that research from marginalized communities is overlooked or excluded. Furthermore, the APC model is often biased towards research produced in HICs. For example, APCs are typically set in US dollars or euros, which can be prohibitively expensive for researchers in LMICs, where currencies may be weaker. In addition, journals that charge APCs may be more likely to receive research from HICs, which can perpetuate existing power imbalances in the scientific community and not favor the decolonization of science (Nakamura *et al.,* 2023).

APCs can also have a significant impact on young researchers who are in early stages of their careers and do not yet have access to funding or institutional support, particularly those working in LMICs. Young researchers may be particularly vulnerable to the financial burden of APCs, as they may have limited resources and face enormous pressure to publish in high-impact journals. In some cases, young researchers may be forced to choose between paying APCs and pursuing other professional development opportunities, such as attending conferences or undertaking additional training. This can limit their ability to establish themselves in their field and can exacerbate existing inequalities between early-career researchers and more experienced academics.

Publication in prestigious journals with global recognition has a very strong influence on the reputation and success of researchers' careers regardless of the field of specialty. Opportunities for researchers heavily depend on the articles they have been able to publish, which underlines the popular adage "publish or perish", but also on the perceived 'quality' of the journal in which they publish, as determined by impact factor (Solomon & Björk, 2012). Unfortunately, many authors from

developing countries, such as those in Latin America, struggle to publish their scientific articles, not due to poor research quality, but because of the financial limitations that place pay-to-publish journals beyond their reach. This idea is supported by a 2021 study that has concluded that APCs may be a barrier to publishing, especially for "less affluent institutions, scholars, and students" (Jain *et al.,* 2021).

Journals with publication fees push aside and fail to give equal opportunities to authors from developing Latin American countries and LMICs (Williams *et al.,* 2023). This model deepens the inequality between researchers from HICs and LMICs and puts at risk the ability to publish scientific research from LMICs in top-ranking and highly cited journals.

Here, we examined a dataset of papers related to aquatic science for the five-year period from January 2017 to January 2022 using the Web of Science. Two subsets of journals were selected: 1) journals with author publication fees (hereafter named fee or **APC journals**) and 2) journals with no author publication fee (hereafter named free or **non-APC journals**), to evaluate the percentage of articles published by Latin American authors (**LA**) in each subset (considering at least one Latin American author with Latin American affiliation in the list of authors) and no-Latin American authors (**No-LA**). We also compared the percentage of a monthly salary from a Latin American Researcher needed to pay an average APC (2784 USD).

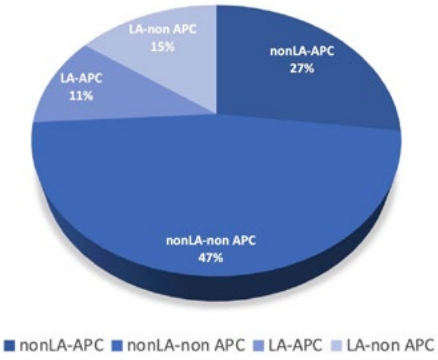


Fig. 1 Percentage of publications related to aquatic sciences from 2017 to 2022 found in the Web of Science: LA-APC - Latin American articles published in APC (Article Processing Charges) journals; LA-nonAPC - Latin American articles published in non-APC journals; nonLA-APC – articles from other high and upper middle-income countries published in APC journals; nonLA-nonAPC – articles from other high and upper middle-income countries published in nonAPC journals. The data is normalized/standardized by the number of countries in each subset: 20 LA countries, 99 non-LA high and upper middle-income countries (World Bank, 2022).

Overall, in aquatic science-related topics, we found more articles published in **non-APC journals** (62%) than in **APC journals** (38%) over the last five years (Fig. 1). Of the total publications analyzed, 11% were published in **APC journals** and included at least one Latin American author, while 15% were published in **non-APC journals** and included at least one Latin American author (Fig. 1). Furthermore, 27% of the articles were published in **APC journals** and 47% of articles were published in **non-APC journals**, both including non-Latin American authors (Fig. 1). But in particular, of the total publications analyzed, 26% were published by at least one Latin American author, while 74% of the articles were written exclusively by researchers from developed countries (Fig. 1). These results highlight that over a fourth (26%) of aquatic science articles are from Latin American authors, notwithstanding economic drawbacks.

Moreover, comparatively more than 100% of the monthly salary of Latin American researchers from upper middle-income countries (Word Bank, 2022) like Argentina, Brazil, Colombia, Mexico, and even the HIC Uruguay would be required to meet the mean cost of an APC (2784 USD), whereas 87 and 46% of a monthly salary of researchers from the HICs Chile and Puerto Rico, respectively, would be necessary to pay this fee (Fig. 2). Therefore, Latin American researchers are at a clear disadvantage.

All global researchers and scholars deserve worldwide recognition for quality research. In the twenty-first century, as the decolonizing science debate is in the spotlight as never before, it is unthinkable that so many scientists cannot publish their findings in high-quality, open-access, peer-reviewed journals due to individual financial barriers. We call for worldwide attention to these obstacles faced by researchers and scholars from Latin American and LMICs. We hope that curiosity, science, knowledge, and scientific communication will prevail over the publishing industry's interests and that academia promotes and defends fair and equitable dissemination spaces for all.

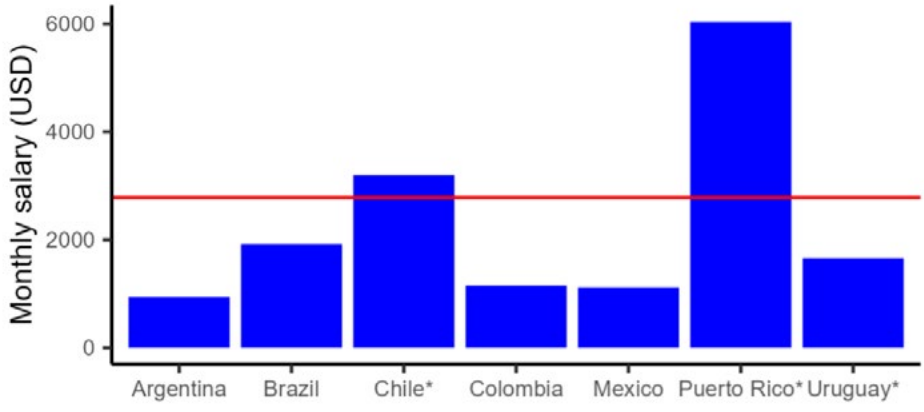


Fig. 2 Bars show average monthly salaries of researchers (in USD) from different Latin American countries. Database obtained from Glassdoor (research for University Professor, Assistant Professor, Professor and Researcher in May 2022). Uruguay data was retrieved here. Average monthly salaries were calculated using the following data: Argentina n=151, Brasil n=1578, Colombia n=23, Chile n=12, Puerto Rico n=67, México n=185, Uruguay= UdelaR. The red horizontal line represents an APC mean cost value (2784 USD).

*High Income countries; other countries: upper-middle income (World Bank, 2022).

References

Chiodelli F. 2021. Why we should stop publishing in open-access journals with article processing charges. Young Academic Network.

Jain VK, Iyengar KP, Vaishya R. 2021. Article processing charge may be a barrier to publishing. Journal of Clinical Orthopaedics and Trauma. 14: 14-16.

Nakamura G, Soares BE, Pillar VD, Diniz-Filho JAF, Duarte L. 2023. Three pathways to better recognize the expertise of Global South researchers. npj Biodiversity. 2: 17. https://doi.org/10.1038/s44185-023-00021-7

Solomon DJ, Björk Bo-C. 2012. A study of open access journals using processing charges. Journal of the American Society for Information and Technology. 63: 1485-1495.

Trisos CH, Auerbach J, Katti M. 2021. Decoloniality and anti-oppressive practices for a more ethical ecology. Nature Ecology & Evolution. 5: 1205-1212.

Walters W H, Linvill AC. 2011. Characteristics of open access journals in six subject areas. College & Research Libraries. 72: 372-392.

Williams JW, Taylor A, Tolley KA, Provete DB, Correia R, Guedes TB, Farooq H, Li Q, Pinheiro HT, Liz AV, Luna LW. 2023. Shifts to open access with high article processing charges hinder research equity and careers. Journal of Biogeography. https://doi.org/10.1111/jbi.14697

World Bank. 2022. World Bank Country and Lending Groups.

https://www.doi.org/10.5281/zenodo.10324505

LIMNOLOGY AROUND THE WORLD: INDIA

Biodiversity and Ecology of Freshwater Pools on the Rocky Outcrops of Peninsular India

Mihir R. Kulkarni
CSIR-Centre for Cellular and Molecular Biology, Hyderabad, Telangana, India
School of Environment and Sustainability, Indian Institute for Human Settlements, Bengaluru, Karnataka, India
Email: mihir.r.kulkarnii@gmail.com

Rocky outcrops are areas of exposed rock, distinct from the surrounding landscape. Typically, they are devoid of, or have a very thin layer of soil, often leading to a lack of permanent woody vegetation cover. These unique, harsh and often desolate landscapes have attracted the interest of ecologists for decades. However, rocky outcrops in India and south Asia are yet unexplored compared to those in Australia, parts of Africa and the Americas. Peninsular India has a long, complex tectonic history, varied climate and topography, and supports tremendous biodiversity, including the Western Ghats global biodiversity hotspot. The diverse landforms in this region have rocky outcrops of different geological formations, including extensive flat plateaus, monolithic inselbergs (a single rock emerging from the landscape) or patches of boulders (Fig. 1). The geological origins of these outcrops also vary, ranging from the ancient granites (~2 billion years old) to relatively younger basalts and laterites (~65 million years old). Although they seem barren and lifeless, especially in the dry phase, rocky outcrops support a rich and unique biota. These outcrops are climatically distinct from the surrounding landscape, making them ecologically unique. Moreover, these ancient rocks also have long cultural associations with humans, as observed through prehistoric art (*e.g.*, petroglyphs ~ >10 000 years old), religious significance and important roles in defense (*e.g.*, forts) (Fig. 2).

Rock pools are interesting habitats on these outcrops, formed when shallow depressions in the rock are inundated by precipitation. These pools have clear boundaries and are patchily distributed in the rock matrix, and hence are thought to resemble "islands". Hence, pools are isolated or occur in clusters on the outcrops, with a wide variation in the distance between adjacent pools. Due to their shallow depth and the physical properties of the rock (*e.g.*, heating), the pools typically hold water for short periods of time, ranging from a few days to a few months, after which the pools dry up, only to fill again in the next precipitation cycle (hydroperiod). Rock pools on the same outcrop can also vary greatly in features like depth, surface area etc., which can also affect their hydroperiod (Fig. 3).

Despite their short hydroperiod and usually small size, rock pools are rich in aquatic biodiversity, ranging from microscopic phytoplankton and zooplankton to larger algae, macrophytes, insects and vertebrates. The biodiversity of these fascinating habitats has not been well explored in south Asia, and especially in biodiverse regions like India. Hence, recent studies on these habitats have led to the discovery of hitherto undescribed species belonging to several taxa. Most of these species are endemic to these habitats, often occurring only in a few pools. Identifying and documenting this unknown biodiversity is thus very important to gain a deeper understanding about these habitats and promote their conservation, and this has been an important part of my research (Kulkarni & Pai, 2016). A big part of this work involves finding and sampling rocky outcrops, most of which are remote. They are also quite difficult to access, particularly during the monsoons as climbing wet rock is quite literally treading a very slippery slope! The samples collected from the pools are then examined microscopically in the lab, and a combination of morpho-taxonomic and molecular phylogenetic methods are used to identify species. This ongoing collaborative work has resulted in the discovery of new species of copepods and large branchiopods, some of which have been formally named (Kulkarni *et al.*, 2018; Padhye *et al.*, 2018, 2023; Kulkarni *et al.*, in prep.).

Studying the ecology of these pools is the next important step. The landscape is strongly influenced by the seasonal availability of water. For the pools too, the duration of inundation and the frequency of these wet-dry cycles (collectively termed the hydroregime) is a key driver. Arthropods, represented mainly by insects and crustaceans are a major component of the faunal diversity of rock pools. They often exhibit characteristic adaptations to survive the dynamic environment of the pools, particularly the dry phase. Some of these adaptations include short life cycles (as short as a few days), production of desiccation-resistant "eggs" (or cysts) and variable patterns of hatching of these cysts. The arthropod community comprises both active (insects) and passive (crustaceans) dispersers, where the former can move between pools on their own, while the latter require help from certain vectors (wind, water currents, animals) to disperse to other pools. The passive dispersers are also "resident" taxa, as they hatch from the resting eggs in the sediment after inundation (*i.e.*, populate the pool from within), while the active dispersers colonize pools from outside. These broad categories also relate to the ecological preferences of these organisms, with

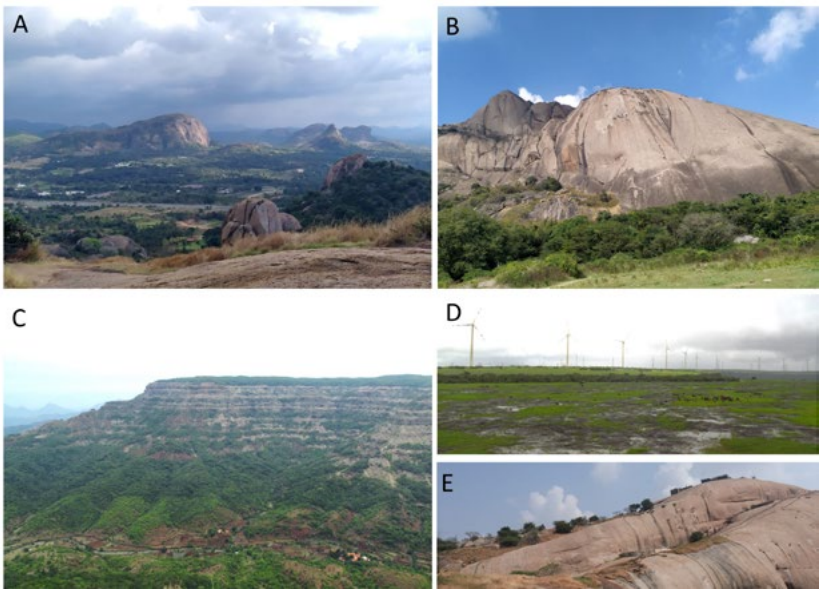


Fig. 1 Different rocky outcrops in peninsular India. Note the near absence of vegetation cover. A- Rocky outcrops in the peninsular Indian landscape, B - Granite monolith at Savandurga, a fort, C - Basaltic plateaus in the northern Western Ghats (note the characteristic horizontal bands of the Deccan Trap formation), D – A lateritic plateau at the crestline of the northern Western Ghats, E – The top of the granite monolith at Bhongir. (Photos by Mihir Kulkarni)

Fig. 2 Historical and cultural significance of rocky outcrops. A – Prehistoric (~10 000 year old) petroglyph on a laterite outcrop in Maharashtra, B – Sculptures at an historic Jain site near Madurai (~ 2 000 year old), C – The boulder strewn landscape at the historic city of Hampi (~ 12 AD), D - Fortified top of the basalt outcrop at Visapur. (Photo A by Sudhir Risbud, Wikimedia commons; Photos B-D by Mihir Kulkarni)

the colonizing active dispersers being more selective (specialists) than the resident passive dispersers (generalists). Variations in the rock pool environment and the arrangement of the pools in space (distance between pools) are thus important drivers of these communities, especially as they can affect active and passive dispersers differently.

To better understand the ecology of arthropod communities in these rock pools, I monitored communities in selected pools on one outcrop over their entire hydroperiod. In this study (Kulkarni *et al*., 2019), we observed that the number of arthropod species in these rock pools was positively associated with the hydroperiod of the pools. Hydroperiod was also the main environmental driver of the composition of these communities – pools with similar hydroperiod had similar communities. We also observed that spatial factors (distance between pools) influence the pair-wise differences in communities of pools. However, this varied among different groups of passive dispersers, possibly related to the differences in their dispersal capacities.

The role of the environment in shaping communities was observed, but environmental factors themselves can act at different spatial scales. For example, pool depth and annual precipitation both influence hydroperiod, but they act at small spatial scale (few meters) and larger spatial scale (few hundred kilometres) respectively, to shape communities in the pools. The species in these communities have different functional traits (*e.g.*, dispersal mode, body size), which shape their responses to environmental factors, *e.g.*, species with better dispersal abilities can disperse to farther habitats relative to poor dispersers. As functional traits are fundamental ecological attributes of species, they are strongly shaped by the species' evolutionary relationships. Thus, closely related species often have similar functional traits, which in turn drives the similarities in their responses to environmental factors. Such functional similarity can drive species interactions, where species with similar functional traits can compete for resources. This is especially important in habitats like rock pools, which have limited resources, but also support high species diversity.

To investigate the roles of these processes in rock pools, we used a larger dataset (32 pools on 3 outcrops), where the communities were sampled over the entire hydroperiod (2-7 months) of the pools (Kulkarni *et al*., 2023). We identified 68 species of arthropods in these pools, with up to 30 and 34 species in individual pools and outcrops, respectively. Although we did not identify several taxa like cyclopoid copepods, dipterans, turbellarians, rotifers etc., the observed diversity is comparable to that of extensively studied sites, *e.g.*, Australia. These diverse communities were largely shaped by environmental factors acting at small spatial scales, with substantial inter-species variation. Among these factors, hydroperiod was again the key driver for both active and passive dispersers. However, the influence of spatial factors was stronger for passive dispersers, indicating a potential role of dispersal limitation in shaping passive disperser communities, but this will need additional investigation. We also found a strong influence of phylogenetic relationships and functional traits in shaping species responses, where different functional traits were involved in species' response to environmental factors acting at different spatial scale. Thus, species' evolutionary history plays an important role in communities, reflecting the selection pressure of the environment. Interestingly, we did not detect many putative species associations in these communities, reinforcing the influence of the pool environment, rather than species interactions, in shaping communities in these habitats (Kulkarni *et al*., 2023).

The importance of the evolutionary history of species brings attention to the evolutionary significance of the outcrops themselves. The long, complex tectonic and bioclimatic history of peninsular India has driven the evolution of the extant biota, which is a mixture of ancient Gondwanan, Eurasian, Palearctic and endemic Indian lineages. The distribution of these lineages in the landscape provides clues about the biogeography of these organisms. In some ongoing work (Kulkarni *et al*., in

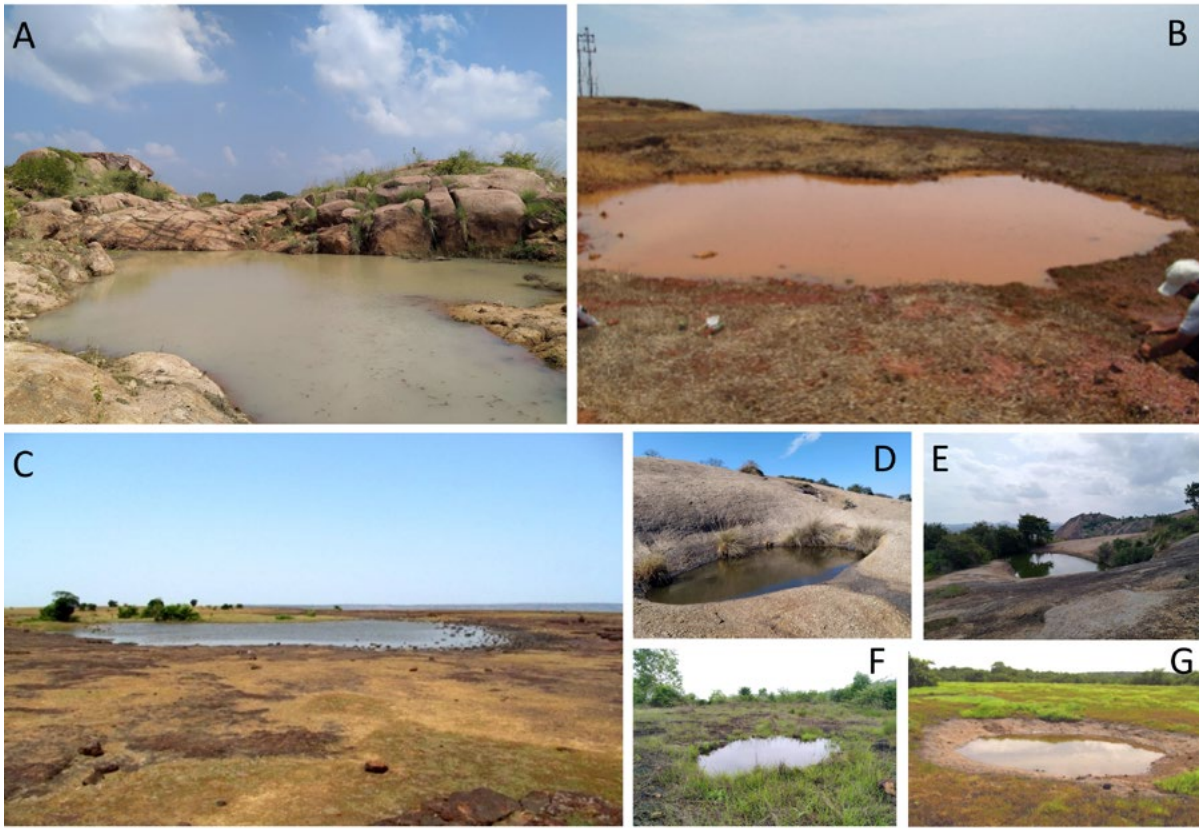


Fig. 3 Rock pools on granite (A, D, E), laterite (B, C, G) and basalt (F) outcrops. (Photos by Mihir Kulkarni)

prep), I analyzed the taxonomic and phylogenetic diversity of geologically different outcrops (granite, basalt, laterite) in India. While taxonomic diversity focuses on species identities, phylogenetic diversity considers their evolutionary history. Thus, a site with higher phylogenetic diversity indicates the presence of evolutionarily older/different lineages, highlighting their value for conservation prioritization. My preliminary observations indicate that rocky outcrops generally have a higher evolutionary diversity than "non-outcrop" habitats. Different outcrops also vary in species composition and phylogenetic diversity, where granite and laterite outcrops have high scores. Furthermore, the current distribution of ancient Gondwanan and Indian endemic lineages is mostly restricted to granite and laterite outcrops. This underscores their value for conservation, which is very much needed for these landscapes.

Rocky outcrops in India are often considered "barren wastelands", which greatly undermines their importance as reserves of rich biodiversity. These landscapes are also associated with ecosystem services (provisioning, cultural, recreational), which are important for sustaining small, traditional settlements in the vast rocky expanse. However, these outcrops are increasingly being threatened by activities like mining, changes in land use and pollution, and the looming challenge of climate change. Through these studies, I hope to contribute to scientific as well as public knowledge about these unique habitats and their contribution to the ecological, historical and cultural heritage of India.

References

Kulkarni MR, Pai K. 2016. The freshwater diaptomid copepod fauna (Crustacea: Copepoda: Diaptomidae) of the Western Ghats of Maharashtra with notes on distribution, species richness and ecology. Journal of Limnology 75: 135-143.

Kulkarni MR, Shaik S, Reddy YR, Pai K. 2018. A new species of *Megadiaptomus* Kiefer (Copepoda: Calanoida: Diaptomidae) from the Western ghats of Maharashtra, India, with notes on the biogeographic distribution and conservation status of the known species. Journal of Crustacean Biology. 38: 66-78.

Kulkarni MR, Padhye SM, Rathod RB, Shinde YS, Pai K. 2019. Hydroperiod and species-sorting influence meta-community composition of crustaceans in temporary rock-pools in India. Inland Waters. 9: 320-333.

Kulkarni MR, Paripatyadar, SV, Naniwadekar R, Joshi J. 2023. Local-scale abiotic factors influence the organisation of rock-pool arthropod communities in a biodiversity hotspot. Limnology & Oceanography DOI:10.1002/lno.12427

Padhye SM, Rabet N, Kulkarni MR, Pagni M. 2018. A new species of genus *Eulimnadia* Packard, 1874 (Branchiopoda: Spinicaudata: Limnadiidae) from India with an updated key for some Indian species. Zootaxa. 4399: 341-350.

Padhye SM, Kulkarni MR, Pagni M, Rabet N. 2023. New leptestherid clam shrimps (Pancrustacea: Branchiopoda: Spinicaudata: Leptestheriidae) from peninsular India. Zootaxa. 5264: 205-220.

https://www.doi.org/10.5281/zenodo.10593255

LIMNOLOGY AROUND THE WORLD: SOUTH AFRICA

Missing: South Africa's Ability to Manage its Reservoir Lakes

Bill Harding, PhD (Limnology), PhD (Public Law) Pr Sci Nat.
DH Environmental Consulting (Pty) Ltd
Somerset West, South Africa
Email: bill@dhec.co.za

One of the most common statements made about South Africa is that it is a country not blessed with an abundance of water. Our climate is arid, with an average annual rainfall of 450 mm that is both unevenly distributed and subject to high levels of evaporation. South Africa boasts a single natural fluvial lake and coastal lake systems are generally unsuitable for raw potable water supply. Hence, the social and economic well-being of South Africa's 62 million people is dependent on water stored in reservoirs, as well as a not-insubstantial reliance on groundwater. However, annual return flows of wastewater effluents are twice the volume provided by groundwater – and it is this substantial component of the annual water balance which continues to threaten the quality of both freshwater and coastal zone resources. Ominously, failed sewerage infrastructure has resulted in significant volumes of raw sewage never reaching treatment works, this apart from the fact that the majority of treatment works are dysfunctional. The environmental impact is thus substantial.

South Africa has 586 man-made lakes, storing thirty-two billion litres of water or 66% of the Mean Annual Runoff (MAR). As much as 76% of the total storage has impaired water quality as a result of elevated nutrient levels – largely originating from the aforementioned inadequately-treated sewage effluents. Outdated concentration-based standards have yet to be replaced by an assimilable loads approach. It is common understanding in South Africa that wastewater effluent treatment is in a very dire state, with eutrophication acknowledged as the primary threat to water quality and the health of the nation's reservoirs and, by extension its population. Cyanobacterial blooms and cyanotoxins are common (Fig. 1), as are vast swathes of floating invasives such as water hyacinth (Fig. 2).

From the above brief background, it might be reasonably assumed that South Africa possesses a cohesive, well-developed and academically-supported national programme for reservoir management. It may, then, come as a shock to learn that South Africa has no such programme, none of our academic institutions teach reservoir limnology as a career subject and the Department of Water and Sanitation ('Department'), the custodian of our water resources, has no Directorate of Reservoir Management that coordinates appropriate stewardship of our dams. The Department does not have a single reservoir limnologist in its employ. Curiously, the National Aquatic Ecosystem Health Monitoring Programme does not mention the terms "reservoir" or "dam"! Sadly, but not inexplicably, reservoir limnology remains the Cinderella of South African aquatic sciences.

So how did this egregious situation arise? Human and economic investment in South African limnology experienced a significant decline towards the end of the 1980s – especially with respect to attention to the science and management of reservoir lakes. This was, in part, underpinned by inaction on the part of the Department and its somewhat startling perception that eutrophication was not a priority issue! A review of the North American literature of the time might have suggested, however ill-advisedly, that eutrophication was considered to be "resolved," largely through legislative initiatives and engineering solutions applied to municipal wastewater

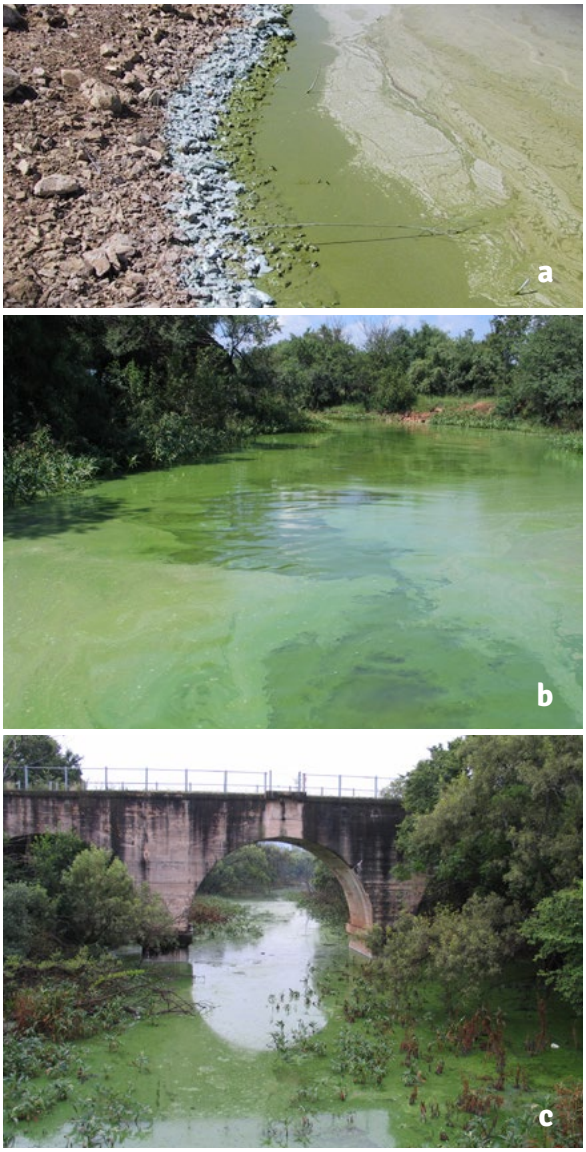


Fig. 1 Cyanobacterial blooms in Hartbeespoort Dam: a) shoreline, b) embayment and c) river inlet (photos by Bill Harding).

treatment. Emphasis was shifting to more exotic contaminants and nonpoint sources. Nevertheless, point-source eutrophication in the so-called 'developing countries' remained, and still remains, a concern, although the costs of applying the developed science are probably too high for these economies to bear.

In South Africa, reports which revealed major problems, and also solutions, were kept confidential – not only by the responsible agency but also by almost the entire cohort of aquatic scientists active at the time. If one was to seek an incentive for this then the conclusion drawn by the late Bill Williams speaks volumes "Denial [of the findings] will certainly result in short-term economic gain; just as certainly, denial will result in considerable long-term disbenefits". South Africa is now reaping the harvest of sustained denial.

The years following 1990 saw increased diversion of funding into river biology and ecology – almost to the exclusion of anything else in aquatic science (except perhaps ecotoxicology). Oddly, despite the interruption of all but one major South African river by dams, there were no calls from the growing fraternity of river ecologists for the authorities to hasten integrated attention to the reservoirs. There was also a myopic focus on water quantity – without due consideration of the ecosystems that are man-made. This led to a perception, especially in the hinterland, that the reservoirs were simply acting as a form of oxidation pond, a view first uttered in 1958!

Organizational changes which prevailed during the 1980s also

Fig. 2 Water hyacinth invasion in Hartbeespoort Dam and b) struggling to reach the shoreline (photos by John Wesson).

contributed to the termination of state-funded reservoir research – just at the time when the country had built a world-renowned team of reservoir limnologists at the National Institute for Water Research (NIWR). The subsequent years saw most of this group move to other careers or countries. Profit-driven government consulting required many highly-skilled specialists to "retrain" into other fields if they wanted to continue earning a living. Few chose to do so and, in one famous case, a world-renowned algologist dumped his life's work in the garbage rather than retool himself in 'waste management.'

A limited amount of applied lake management, research and monitoring was undertaken by the larger municipalities and Water Boards – generating a mass of unpublished reservoir-lake data. The bulk of this work was born of a need for the water utilities to understand and manage the nature of the water resources being treated and supplied to consumers. The need for effective early-warning protocols for cyanobacterial blooms is a case in point. One example of these efforts was the establishment of a dedicated cyanotoxin laboratory, the only one in Africa, by the City of Cape Town. However, the bulk of the smaller water providers were left completely unsupported.

Negligible funding was made available for reservoir studies after 1990. An examination of Water Research Commission projects shows that up until 2015 a mere ZAR10 Million (~USD 1 million) was been spent on six projects, this being both a fraction of the Commission's overall budget in general, or that applied to river and wetland science in particular.

South African reservoir limnology science reached its zenith during the 1980s, summarised in the Hartbeespoort Dam Ecosystem Programme Report. The 8-year project generated an international level of impact, 97 publications, 4 PhD's and a documentary film. Contrastingly, it reached an all-time nadir between 2006 and 2013 in an 8-year attempt to remediate conditions in the notoriously hypertrophic Hartbeespoort Dam, a project that lacked scientific rigour and technical guidance, ignored the fundamental casual issues and prior studies, deliberately ignored skills and advice, generated spurious claims and, instead, wasted ZAR158 Million on cosmetic pseudo-science 'solutions', applied by insufficiently qualified or experienced personnel. After eight years not a single publication in a recognised journal had been produced. The project was eventually quietly terminated but, at time of writing, a 'Hartbeespoort Season 2' attempt appears to be in the planning stages – absent any indications that lessons were learnt from the previous fiasco.

The inability to attract young South African biological scientists to the field of limnology, especially reservoir limnology, is an enduring constraint to progress. As long as the discipline does not form part of any nationally-acknowledged need, no curricula or career opportunities will open up. Limnology is not a "sexy" science. Unlike chemistry and microbiology, where funds and publication opportunities abound, lake biologists may not become financially-rich but certainly have a unique opportunity for a richly-rewarding outdoor life. Convincing newcomers is difficult, however, if there are no careers for them!

"South African limnology is in disarray. It is poorly-funded, failing to address certain important environmental problems, lacks a cohesive sense of direction and its potential contributions to effective water resource management are grossly underrated". This statement is, in several ways, almost as true now in 2023 as it was back in 1989 when it was made by one of the world's most eminent limnologists, the late Dr Bill Williams. He continued, "Additionally, many of its [South Africa's] practitioners are dispirited and disillusioned, there has been significant attrition from their ranks, and few young South Africans regard limnology as a secure and attractive career. All of this might be comprehensible in a country with plentiful water of good quality; for this to be the case in a country wherein water is a basic resource and is in short supply, faced with demographic problems of the magnitude prevailing, seems incomprehensible".

South Africa lacks human resources skilled in reservoir limnology. The few of us that are left can only despair at the mind-boggling recalcitrance to redress this paucity. The failure by the state to recognise and prioritise the environmental health of its man-made lakes has created a scenario in which no training or career opportunities exist for an urgently-needed cohort of reservoir limnologists. It will take decades to mitigate the harm resulting from the failure to have regard for reservoirs as semi-natural water resource ecosystems, this assuming that the economy can bear the now gargantuan cost.

Sources

Allanson BR, Hart RC, O'Keefe JH, Robarts RD. 1990. Inland waters of southern Africa: An ecological perspective. Monographs in Biology 64. Kluwer Academic Publishers, Dordrecht, 458 pp.

Harding WR. 2015. Living with eutrophication in South Africa: a review of realities and challenges. Transactions of the Royal Society of South Africa. 70: 155-171.

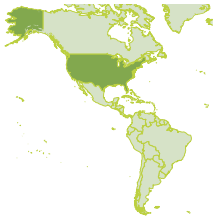
Mitchell SA, Crafford JG. 2016. Review of the Hartbeespoort Dam Integrated Biological Remediation Programme (Harties Metsi a Me). Water Research Commission Report No. KV 357/16, 256 pp. ISBN 978-1-4312-0803-6.

Williams WD. 1989. A Statement on the Inland Water Ecosystems Programme and the Current State of Limnology in South Africa. Foundation for Research Development, CSIR, Pretoria.

Zohary T, Jarvis AC, Chutter FM, Ashton PJ, Robarts R. 1988. The Hartbeespoort Dam ecosystem programme - 1980-1988. Division of Water Technology Report, CSIR, Pretoria. 8pp.

Bill Harding has PhDs in Limnology and Public Law. He has been involved with reservoir-lake science and management since 1988. His first reservoir limnology experience was as a student at Hartbeespoort Dam in 1975. He heads up an amicus group that will observe the current round of remediation efforts. Anyone wishing to be part of this oversight initiative is welcome to contact Bill at bill@dhec.co.za.

https://www.doi.org/10.5281/zenodo.10324419



LIMNOLOGY AROUND THE WORLD: UNITED STATES

Collaborative research as an early career scientist has changed the way I view science

Rosaura J. Chapina
University of Vermont
Burlington, Vermont United States
Email: Rosaura.Chapina@uvm.edu

Climate change has and will continue to affect our oceans, lakes, forests, deserts, the flora and fauna, and people who live in these environments, and has shaped the way we communicate our science. As a first-year Ph.D. student, I aspired to help save the planet. I was convinced that my science would achieve that. Pursuing a Ph.D. is difficult and can often be an isolating journey. However, my journey has been positively influenced by great colleagues and collaborations that have helped to mold my career. When I started my Ph.D., I had a small community. I am now part of various collaborations where I have gained mentors and a wide, diverse community of scientists—people I can reach out to and bounce off ideas.

Fig. 1 Participants at the GLEON meeting held in Ryn, Poland. (Photo by Jens Nejstgaard)

Being a member of the Global Lake Ecological Observatory Network (GLEON; Fig. 1) has allowed me to discover a new world where ideas emerge, projects develop, and collaborations are formed. Climate change does not have borders; it is a problem our lakes face not only in the U.S., Mexico, or China; it is a global issue. It is here and it is real. Global collaborative projects have challenged the way I think and changed the way I do science. In order to solve the large issues our planet is currently facing; we need interdisciplinary projects led by diverse teams. While as an early career scientist, it is intimidating

Fig. 2 Fecund female *Mysis* (Photo by Chris Liazos)

to be part of conversations and even disagree with renowned scientists, having diverse groups from all career stages allows for innovation and creativity.

There are a few aspects of collaborative science that I believe are crucial for professional development. One crucial skill I was able to gain through collaborative experiences was to actively participate in conversations where disagreement emerges and navigate through conflict resolution to come to a consensus. Communicating to different audiences with different backgrounds and views is another skill that is strengthened by being part of large diverse collaborations. Having to adapt and be flexible when working with people from different cultures and disciplines is vital. By being flexible, you also learn about new perspectives and different ways of brainstorming/designing a project.

My research focuses on understanding the diel vertical migration (DVM) patterns of a mysid shrimp, *Mysis diluviana* (Fig. 2), a large zooplankton that plays a vital role in lake systems by transferring nutrients from benthic to pelagic habitats. *Mysis* serves as a key food source for many pelagic and benthic fishes in north temperate lakes.

At the start of my Ph.D., my research was very local. I was focusing on understanding the migration of *Mysis* in Lake Champlain, Vermont, U.S and Lake Ontario, Canada/U.S. My advisor, Dr. Jason Stockwell (stockwelllaboratory.com), then motivated me to think globally and introduced me to GLEON. I attended a GLEON All Hands' meeting in Huntsville, Ontario, Canada. At that meeting, we were separated into working groups. In these working groups, graduate students, postdocs, and renowned scientists all participate in research discussions and brainstorm ideas for collaborative projects together and pitch ideas as a team. This was very surprising to me. It was eye-opening to see how scientists from different backgrounds and experiences came together to create and discuss potential research projects. I was pleased to be in a room where all viewpoints were valued despite career stages. At that GLEON meeting, I not only participated in research discussions, I ended up leading a global collaborative project. I went from evaluating the migration of one organism in two lakes to leading a global collaborative project that focused on assessing the migration patterns of *Mysis* in nine lakes.

Collaborative research and team science are important skill sets to master but are often purely experiential and unfortunately are not taught or typically encouraged during your Ph.D. In 2020, I was selected to be part of a graduate student fellowship program called Lake Expedition 2020 (fellowship.gleon.org). This fellowship trains nine graduate students from different disciplines and institutions across the globe (Fig. 3). All activities were supported, in part, by funding through the U.S National Science Foundation. This program was designed to specifically teach about and put into practice collaboration and team science skills. We had a social scientist who is an expert in the practice and science of team science that led training as part of the program. As a team, we explored a large diverse dataset, drafted, and submitted a manuscript. This fellowship, with its diverse and interdisciplinary lake expedition team, enabled me to develop skills such as authorship, communicating with different audiences, and learning the foundations of what makes a good team. Diversity is valuable, specifically when working on a project, due to the array of perspectives it brings. Different viewpoints allow honing the skill of finding common ground—a challenging yet

Fig. 3 Zoom meeting of a Lake Expedition 2020 meeting (Photo courtesy of Cary Institute of Ecosystem Studies)

crucial aspect, especially as an early career scientist. Through the mentorship of Dr. Paul Hanson (UW-Madison, Center for Limnology) and Dr. Kathleen Weathers (Cary Institute of Ecosystem Studies), we were able to do team science.

Not many graduate students have the opportunity to take a step back from their dissertation and immerse themselves in a completely different discipline. A Ph.D. trains you to become an expert in one particular field; however, there are many skills to be learned through collaborative projects. The research project that we worked on focused on using knowledge- guided machine learning to evaluate the surface area change of more than 100,000 lakes and reservoirs spanning 30 years of data. We engaged computer scientists to learn and use new skills in machine learning. When I was selected to be part of Lake Expedition, I was not expecting my whole perspective on science to change. Being part of a project that is different from your Ph.D. with a diverse team enriches you and your science by offering different perspectives, worldviews, and approaches that can influence or strengthen your own.

Through my Ph.D. journey, I learned how to communicate my science to diverse audiences, from the Board of Directors to first-year undergraduate labs to leaders in limnology. Working with teams where the work is distributed equally and where we help each other while identifying my own strengths and weaknesses has been very valuable and vital for my professional development. I believe that the exposure I have received has better prepared me for the future, and encourage early career scientists to engage in collaborative research.

Publications

Meyer MF, …Chapina RJ, … Weathers KC. 2021. Virtual growing pains: Initial lessons learned from organizing virtual workshops, summits, conferences, and networking events during a global pandemic. Limnology & Oceanography Bulletin. 30: 1-11.

Stockwell JD, O'Malley BP, Hansson S, Chapina RJ, Rudstam LG, Weidel BC. 2020. Benthic habitat is an integral part of freshwater *Mysis* ecology. Freshwater Biology. 65: 1997-2009.

Chapina, R.J, C. Rowe, R. Woodland. 2020. Metabolic rates of *Neomysis* americana (Smith, 1873) (Mysida: Mysidae) from a temperate estuary vary in response to summer temperature and salinity conditions. Journal of Crustacean Biology. 40: 450-454.

https://www.doi.org/10.5281/zenodo.10324445

FACES of SIL

VICTOR BANCE | BURKINA FASO

I am junior scientist and teacher at the Centre Universitaire de Manga/ University Norbert ZONGO of Burkina Faso, a sub-Saharan country located in West Africa. I have a Master's degree in Animal Biodiversity and Tropical Ecosystems and a PhD on the diversity and ecology of macroinvertebrates in lake ecosystems.

Developing countries such as Burkina Faso, face many water-related challenges. Agriculture, with its excessive use of fertilizers and pesticides, livestock farming, artisanal and industrial exploitation of mineral resources (which has increased over the last ten years), accelerated urbanization with inadequate sanitation, the discharge of often untreated industrial effluents, coupled with climatic variability, are the main pressures having a negative impact on aquatic ecosystems.

In order to contribute to the sustainable management of aquatic resources and the restoration of degraded aquatic ecosystems, my research is currently focused on freshwater biology and ecology. I work on macroinvertebrate diversity and ecology, and the development of multi-metric indices for assessing the health of lake environments.

SIL is the best international network bringing together limnologists from all over the world to tackle water-related challenges. We, the members of SIL, must work to firmly establish it in certain parts of the world, such as West Africa, where the network is little known. We must also work to ensure that the policies of our various nations truly integrate aquatic organisms into the protection of aquatic ecosystems, emphasizing their use as bioindicators.

Victor Bance

Centre Universitaire of Manga/
University Norbert ZONGO,
Burkina Faso

Filière Agro-Sylvo-Pastorale
Animal Biology and Ecology
Laboratory
University Joseph Ki-Zerbo,
Burkina Faso

(00226) 70644887 / 65589945

bance605@gmail.com

https://www.researchgate.net/profile/Victor-Bance

(00226) 70 64 48 87

MARIANE ANGERS | CANADA

Hello SIL members! My name is Mariane, I am 17 years old, and I am currently in grade 12. I have participated numerous times in science fairs in Canada, and I developed a passion for science, especially doing engineering projects to save lakes. I live in Québec where we can find multiple lakes. Since I was young, I have been able to notice the impact of climate change on the eutrophication phenomenon in lakes. This is why I have decided to refine my projects on this subject. In 2022, I built a buoy prototype that used only waves' mechanical movement to activate a mechanical air pump that injects oxygen into water using dynamic aeration method to save our beautiful lakes. This year, I decided to push this project further. So, I designed a novel buoy using three renewable sources of energy (wind, solar, wave) to generate electricity and to pump and diffuse oxygen at the hypolimnetic level. I would love to continue my research in designing prototypes that could help the water environment. I am very honored to be able to learn from SIL experts!

Mariane Angers

Cégep de Sherbrooke

Sherbrooke Canada

mariane.angers@gmail.com

FACES of SIL

ODED LIRAN | ISRAEL

I study aquatic photosynthesis with emphasis on photo-regulatory mechanisms in cyanobacteria and algae. Trained as part physicist and part biologist, during my studies, I was fascinated with the concept of photosynthetic energy conversion. How do aquatic photosynthetic microorganisms maintain optimum biomass production rates in a constantly changing environment – light intensity and quality, nutrient availability, temperature, etc.? A technique that combines the means to track light and dark photosynthetic reactions provides key information for this question. During my Ph.D. with Prof. Dan Tchernov (University of Haifa), I assembled a Membrane Inlet Mass Spectrometer (MIMS) in order to answer part of the question. By tracking in real-time carbon assimilation, oxygen evolution and respiration all at once, we found that at pH 5.7, marine and freshwater phytoplankton groups reduce the activity of their carbon concentrating mechanism, probably to save energy for other cellular processes. During my post-doc, with Prof. Iftach Yacoby (Tel Aviv University), while using the MIMS and a set of photosynthetic inhibitors, we showed that the hydrogenase enzyme in *Chlamydomonas reinhardtii* is active in aerobic conditions, despite being very sensitive to oxygen. In my newly established laboratory, at Lake Kinneret, I have assembled a combined MIMS-pump-and-probe spectrophotometer that answers my original question and simultaneously tracks light and dark photosynthetic reactions, *i.e.*, carbon assimilation, oxygen evolution and reduction-oxidation rates of the photosynthetic protein complexes. My hope is to contribute to a better understanding of how photosynthesis is related to, and regulates large scale ecological phenomena such as cyanobacterial blooms and allelopathy relations between photosynthetic microorganisms.

Oded Liran

Affiliations:

Yigal Alon Kinneret Limnology Laboratory
Israel Oceanography and Limnology Research Institute, Haifa, Israel

Leon Charney School for Marine Sciences
University of Haifa, Haifa, Israel

oded.liran@ocean.org.il

https://twitter.com/PhytoFreshLab?

https://www.linkedin.com/in/odedliran/

JOANNA ROSIŃSKA | POLAND

Hello SIL Members:-) I have loved water since I was a child and spent every holiday at a lake in the Masurian Lake District (Poland), sailing, but also kayaking and paddle boarding. I am very interested in attempts to “treat lakes” and during my PhD studies, I investigated the impact of several restoration methods on the functioning of a shallow urban lake. As part of my research, I analysed phytoplankton, macrophytes and the physical and chemical parameters of water. My research was conducted at the Department of Water Protection at the Adam Mickiewicz University (Poland), under the supervision of Prof. Ryszard Gołdyn. Nowadays, I am working in the Department of Environmental Medicine at the Poznan University of Medical Science.

In 2021, I joined the *Inland Waters* Associate Editor Mentoring Program as an Associate Editor-in-Training. Cooperation with authors and reviewers is very inspiring, and I can learn a lot, so I really appreciate the opportunity to participate in this program.

In 2022, as part of the NAWA scholarship (the Polish National Agency for Academic Exchange, program Bekker), I completed a 10-month internship at the Integrative Ecology Group at the University of Valencia (Spain). I conducted several experiments examining the reaction of submerged macrophytes to iron coagulants (used in lake restoration) under elevated temperature conditions. I carried out this project under the supervision of prof. Maria A. Rodrigo.

Since November 2023, I have been one of the SIL Ambassadors in Poland. I think that SIL gives us many opportunities for scientific interactions, especially nowadays when discussion and cooperation are crucial for discovering and understanding the world of science.

Joanna Rosińska

Department of Environmental Medicine

Poznan University of Medical Sciences

Poznań, Poland

rosinska.asia@gmail.com

https://www.researchgate.net/profile/Joanna-Rosinska

Obituary

Prof. Giuliano Bonomi
1933-2023

With deep emotion and deep sadness, I write about the passing of Professor Giuliano Bonomi, one of our most esteemed colleagues. He was a dear friend and a tutor during my younger years. Giuliano dedicated his life to scientific research, and particularly to the study of lake ecosystems. He was a pioneer of aquatic ecology research, and more specifically the study of freshwater and marine benthos (invertebrates associated with freshwater environments, commonly named "Macroinvertebrates") and their particular relationship to lake sediments. During his long scientific career, he worked in different fields of theoretical and applied ecology, addressing various problems of environmental research, including lake restoration.

Giuliano Bonomi studied at the University of Milan and graduated with a degree in Biological Sciences. He joined the staff at the Istituto Italiano di Idrobiologia in the late 1950s. He was professor of Ecology and Limnology at the University of Milan and then at the Faculty of Mathematical, Physical and Natural Sciences at the Universities of Bologna and Ravenna.

With the assistance of Giuliano, (together with Carlo Saraceni, Livia Tonolli and Michael S. Adams), I learned the first fundamentals of lake ecology and the functioning of aquatic ecosystems. Above all, I admire and am grateful for his lively conversations with me as he introduced me to the world of limnology. His curiosity and his way of "questioning" immediately struck me. When I was student, he always wanted to know about my courses, exams and the results of my studies on photosynthesis and eco-physiology of aquatic macrophytes. His talks encouraged learning - for example, as he described new techniques introduced to the Istituto at Pallanza by other scientists such as Dr. R. Vollenweider and others through the years. He was a true scientist, curious, competent and always eager to have contact with the outside world. He had many friends from the United States (I remember Charles Goldman, Tom and Yvette Edmondson) but also from other countries. With Giuliano, I spent much time on field trips to various lakes, and while driving he liked to listen to classical music, which he loved, especially Mozart. Every now and then, he would lower the volume of the " music tape, audio cassettes" (yes, those were "prehistorical" times) and would start talking about his students, his university courses, his volleyball games, the San Vittore (Verbania) and the Quadriclavio (Bologna) polyphonic choirs of which he was a member, but always with the desire to communicate and highlight what had value for him in his daily life.

In the early 1980's, he worked with me and other colleagues on the relationship between primary production (photosynthesis) and the concentration of algal pigments (chlorophylls and carotenoids) in sediment cores, with the aim of reconstructing lake history from its past trophic conditions.

I owe him a lot and working with him interested me, stimulated me, encouraged me... even if he was a bit loquacious, especially late in life... but I enjoyed it a lot.

I am happy to share these thoughts above all, once again, with young researchers and old colleagues that knew him.

At the risk of boring you, there is one last thing I must tell: he was one of the supporters, perhaps the first, of the "liming" operation on Lake Orta. In 1986, he went to Sweden, where this practice was widely used, to learn the method and adapt it to the new needs of our lake (I remind those who don't know that this intervention was the first in the world for a lake of that size and volume).

With his wife Carla Bonacina, also a researcher and often moderator in discussions with colleagues and friends, Giuliano had always shared everything in his life. Carla helped him frequently in recent years, when both physically and mentally he was slowly fading away. Giuliano, on the occasion of my last seminar at the Istituto (a summary of my scientific career), told me that he was happy to be there, and at the end, hugged me, saying: "you have made use of what you have learned in my courses at university and at the Istituto, and I have always tried to convey this to you as well as to other students and young researchers". With him goes an important piece of the Istituto Italiano di Idrobiologia, now CNR-IRSA. With him goes the personal history of freshwater ecology, of friends, of teachers, and of colleagues who played a part in the growth of the scientific community of which he was an eminent interpreter.

Giuliano was a member of SIL since 1958, and also of the North American Benthological Society, AIOL (Associazione Italiana di Oceanologia e Limnologia), S.it.E. (Società Italiana di Ecologia), and UZI (Unione Zoologica Italiana).

He was author or co-author of more than 150 scientific papers, mostly on the larger subalpine Italian lakes, but also on volcanic, reservoir lakes and coastal marine areas.

Giuliano leaves behind his wife Carla and his children Paolo, Anna and Isabella. RIP

Piero Guilizzoni
Senior Associate Researcher
National Research Council, Water Research Institute
(CNR-IRSA), Verbania-Pallanza, Italy

SIL Officers 2024-2025

PRESIDENT

Thomas Mehner

mehner@igb-berlin.de

Leibniz-Institute of Freshwater
Ecology and Inland Fisheries (IGB)
Dept. of Biology and Ecology of Fishes
Mueggelseedamm 310
Berlin
GERMANY

GENERAL SECRETARY-TREASURER

Björn Wissel

bjoern.wissel@univ-lyon1.fr

Laboratoire d'Ecologie des
Hydrosystèmes Naturels et Anthropisés
UMR 5023
Université Claude Bernard Lyon 1
Bâtiment Forel- 6 rue Raphaël Dubois
69622 Villeurbanne Cedex
FRANCE

EXECUTIVE VICE PRESIDENT DEVELOPING COUNTRIES

Inés O'Farrell

ines@ege.fcen.uba.ar

National Council of Scientific
and Technological Research
of Argentina (CONICET)
Institute of Ecology, Genetics
and Evolution of Buenos Aires
Buenos Aires
ARGENTINA

STUDENT/EARLY CAREER REPRESENTATIVE - DEVELOPING COUNTRIES

Dr. Mihir Kulkarni

mihircoolkarni@gmail.com

Student/Early Career Representative-
Developing Countries
Laboratory for Conservation of
Endangered Species
CSIR- Center for Cellular
and Molecular Biology
Hyderabad
INDIA

EXECUTIVE VICE PRESIDENT - COMMUNICATION

Cecilia Barouillet

cecilia.barouillet@gmail.com

INRAE, 75bis Avenue de Corzent
CS 50511
Thonon les bains, 74200
FRANCE

STUDENT/EARLY CAREER REPRESENTATIVE – COMMUNICATION

Juan David González Trujillo

jdgonzalezt@gmail.com

Rui Nabeiro Biodiversity Chair
MED Institute
Universidade de Évora
PORTUGAL

EXECUTIVE VICE PRESIDENT - EDUCATION

Maria de los Angeles Gonzalez Sagrario

gonsagra@mdp.edu.ar

IIMYC-CONICET
Derqui 147 PB A, Mar del Plata
Buenos Aires, 7600
ARGENTINA

STUDENT/EARLY CAREER REPRESENTATIVE – EDUCATION

Barbara Barta

barta.barbara@ecolres.hu

Centre for Ecological Research
Institute of Aquatic Ecology
Karolina út 29, Budapest, 1113
HUNGARY

SIL Officers 2024-2025

EXECUTIVE VICE PRESIDENT - GLOBAL OUTREACH

Dr. Zeynep Ersoy

zzeynepersoy@gmail.com

FEHM-Lab (Freshwater Ecology, Hydrology and Management)
Section of Ecology, Department of Evolutionary Biology
Ecology and Environmental Sciences
University of Barcelona
Barcelona
SPAIN

STUDENT/EARLY CAREER REPRESENTATIVE - GLOBAL OUTREACH

Dr. Lena Schallenberg

lenaschall@hotmail.com

University of Otago
Department of Zoology
Dunedin
NEW ZEALAND

EDITOR, INLAND WATERS

David Hamilton

david.p.hamilton@griffith.edu.au

Australian Rivers Institute
Sir Samuel Griffith Centre (N78)
170 Kessels Road
Nathan Campus, QLD 4111
AUSTRALIA

EDITOR, SILnews

Giovanna Flaim

SILnews@limnology.org

Fondazione Edmund Mach
38010 San Michele all'Adige
Trento
ITALY

SIL WEBMASTER

Veronica Nava

webmaster@limnology.org

University of Milano-Bicocca
Department of Earth
and Environmental Sciences
Piazza della Scienza 1
20126 Milano
ITALY

MEMBERSHIP and COMMUNICATIONS COORDINATOR

Michelle Gros

Business@limnology.org

International Society of Limnology
c/o UQAM
P.O. Box 8888, succ. Centre-Ville
Montreal, QC
CANADA H3C 3P8

SIL BUSINESS MANAGER

Genevieve Leclerc

business@limnology.org

International Society of Limnology
c/o UQAM
P.O. Box 8888, succ. Centre-Ville
Montreal, QC
CANADA H3C 3P8

SILnews (ISSN 2707-9422) is the official newsletter of SIL (International Society of Limnology @ limnology.org) and is published online twice yearly in January and July (https://limnology.org/news/silnews/). International Society of Limnology c/o UQAM - P.O. Box 8888, succ. CentreVille Montreal, QC, CANADA H3C 3P8. Business Manager Genevieve Leclerc; Editor Giovanna Flaim. Disclaimer - The opinions expressed in this publication are those of the authors and do not necessarily reflect the opinions or views of SIL or its members.