



SCAS  SCSA

Society of Canadian Aquatic Sciences
Société canadienne des sciences aquatiques

Issue 3 - December 2023

REFLECTIONS

In this issue:

- News from our members
- 2024 conference update and award winners
- New experiments from ELA
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& Much More!

Lake 303 in the Experimental Lakes Area (ELA) in July 2022
experiencing phosphorus-induced cyanobacterial blooms
Photo credit: IISD-ELA

Exciting Times for Aquatic Science and Management in Canada

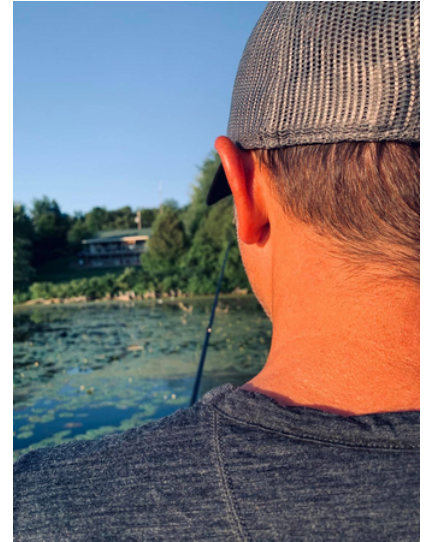
Steven Cooke, President of SCAS

Anyone who knows me will attest to the fact that it does not take much to get me excited... However, when it comes to SCAS, I am beyond excited. We are months away from our annual meeting in Fredericton where participants will be able to take in sessions on topics that span the entirety of the aquatic science and management space. Some sessions celebrate the contributions of colleagues who we have lost while others bring us new methods for collecting and analyzing data. Some sessions focus on bridging knowledge systems while others focus on understanding fundamental ecological processes. There is something for everyone! The best part is that many of the participants are trainees and early career professionals. Supporting the development of trainees and creating opportunities for them to share, learn, and connect is core to what SCAS is about. If you can't make it to Fredericton this year, we hope to see you in Hamilton in February of 2025.

There are other things that I am excited about too! I am excited to see what steps will be taken by the Canadian government and other relevant partners to operationalize the outcomes of the Kunming-Montreal Biodiversity Forum. For the first time freshwater ecosystems and biodiversity are explicitly acknowledged as being in need of dedicated conservation efforts. I am also excited about the data our lab collected this summer and what we will learn when it is visualized and analyzed. In particular, I am on the edge of my seat waiting to learn the outcome of an experiment where we are evaluating the effects of stress on thermal habitat selection in the wild. I am also curious about what women anglers who we interviewed have to say about the extent to which the recreational fishing sector is a welcoming and safe space. Finally, I am awaiting the outcome of a meta-analysis on the effectiveness of different invasive aquatic macrophyte controls to provide evidence to guide management efforts. I am also excited about spending time with my kiddos this winter on the ski trails and tending tip-ups. I definitely love open water and hot summer days but being a good Canadian means embracing winter for all it has to offer.

SCAS President

Steven Cooke



As we approach our second SCAS annual meeting, I remain in awe at what a dedicated group of volunteers have been able to accomplish. There are **MANY** moving parts to this organization and at the core are trainees and professionals from coast to coast working in every sector, discipline, and domain relevant to aquatic science and management. When I reflect on what I have personally gained from the professional service I have done over the years, meeting new people and working together on a common mission has been what keeps me coming back for more. If for one moment you have hesitated about asking how **YOU** can get involved, please just reach out. There is something for everyone no matter whether you have one hour per month or one hour per week, whether you are a gifted communicator or amateur bean counter, whether you are an EDI champion or a fundraising guru, or a blend of any of those and more. I hope that you too will get excited at what SCAS is and what it could become.

As always, I want to remind you that this is **YOUR** society. Please help us shape SCAS to be what you want it to be. Drop me a line if you have any idea, critiques, or questions!

Steven Cooke, SCAS President
Steven_Cooke@carleton.ca

News from our Members

Congratulations to **Elizabeth (Liz) Favot** and co-authors for winning the 2023 Jim LaBounty Best Paper Award in *Lake and Reservoir Management*. The award is a peer award given to the best paper published in the journal over the previous year.

Congratulations to **Matthew Duda** (J. Smol supervisor, PEARL; Queen's University) whose PhD thesis entitled "Long-Term Trends in a Vulnerable Seabird Species: Explorations of Population Dynamics Using Paleolimnology" was chosen by Queen's University as the best PhD thesis from a science department completed in 2021.

Congratulations to **John P. Smol** (Paleoecological Environmental Assessment and Research Lab (PEARL), Queen's University) for his recent two additional recognitions. On November 17, John was presented with his 4th medal from the Royal Society of Canada (RSC), namely the Sir John William Dawson Medal, presented every two years by the RSC for important and sustained contributions in two domains (in John's case, geology and biology) of interdisciplinary research.

<https://www.queensu.ca/gazette/stories/royal-society-awards#:~:text=Queen's%20researchers%20John%20Smol%20and,Canada%20for%20their%20research%20excellence>.

And then on November 27, the Lt. Governor of Ontario presented John Smol with the Order of Ontario, the province's highest honour.

<https://www.queensu.ca/gazette/stories/receiving-ontario-s-highest-honour#:~:text=Queen's%20researcher%20John%20Smol's%20groundbreaking,with%20the%20Order%20of%20Ontario.&text=Dr.%20John%20Smol%2C%20former%20Canada%20Research%20Chair%20in%20Environmental%20Change>.

Finally, **Jamie Would** (PEARL; Queen's University) received the 2023 Jody Connor student award for best poster at the recent North American and Reservoir Management Conference.



Photo from a field sampling trip at Lake Champlain (USA) investigating cyanobacterial toxins in both air and water. Filters of near shore surface water were collected every 6 hours and show the dynamic nature of the *Microcystis* bloom over three days. The bloom was the thickest during the first sampling event where 10 mL of material created a cyanobacterial "soufflé" on the filter paper (bottom left). Bloom material dried on the shore and appeared bright blue from the cyanobacterial phycocyanins.

Photo taken by Keri Malanchuk, MSc. student (Carleton University/University of Ottawa).

Announcing *Wetzel's Limnology: Lake and River Ecosystems* 4th Edition

Jones, I. and Smol, J.P. [Editors]. 2024. *Wetzel's Limnology: Lake and River Ecosystems*. 4th Edition.

Elsevier, Oxford. 1088 pp. Paperback ISBN: 9780128227015 eBook ISBN: 9780128227107 (approximately \$100.00 US)

With 59 co-authors, Ian Jones and John Smol edited a very much revised version of Wetzel's 3rd edition, published over 20 years ago. Bob Wetzel died not long after publication of the 3rd edition.

Similar to the 3rd edition, the 2024 book is big – 31 chapters and over 1,000 large format pages. Colour is used throughout – so it looks and is quite different from the 3rd edition. Below is the book's summary:

A much-anticipated and completely updated edition of the late Robert Wetzel's quintessential textbook on limnology.

*Wetzel's Limnology, 4th edition, presents a fully updated revision of the classic textbook *Limnology: Lake and River Ecosystems*—last published in 2001. The coverage has been thoroughly updated with recent research and theoretical developments. Each chapter of this edited volume has been written by an expert, or team of experts, providing a comprehensive and global perspective, with the editors working closely with the authors to maintain continuity within and between the chapters. This is not only an essential textbook for undergraduate and graduate students in limnology but also a standard reference book for seasoned limnologists and other scientists.*

Highlights of this new edition:

- Chapters from the third edition have been updated by an international team of experts, incorporating developments from the past two decades
- Several new chapters have been added, reflecting exciting developments in the field of limnology

- New color illustrations and images throughout
- Detailed summaries at the end of each chapter

Currently the book is selling on the Elsevier web page for about \$100 US dollars... with bundles available for the e-version, etc.

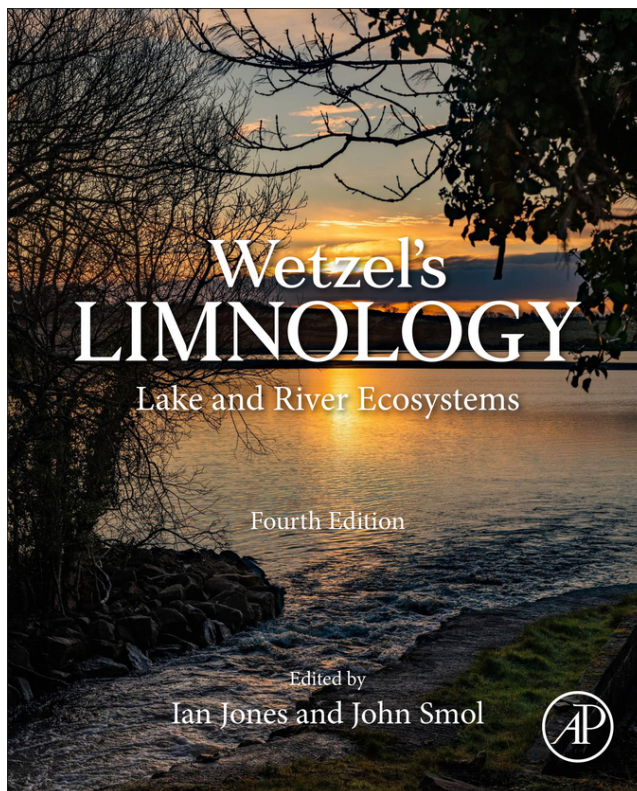
Information on the textbook as well as ordering information is at:

<https://shop.elsevier.com/books/wetzels-limnology/jones/978-0-12-822701-5>

If you are a member of the International Limnology Society (SIL) you can get an additional discount by logging into your SIL web page.

In addition, SIL members have been developing short videos (~10 mins or so) of each chapter for teaching purposes. These videos are freely available to anyone at:

<https://limnology.org/resources/wetzel-videos/>



Wetzel's Limnology (cont.)

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The Next Generation of Fisheries Management and Conservation

FishCAST is collaborating with the scientific journal *Environmental Biology of Fishes* on a Special Issue to highlight early career researchers and the spirit of collaboration. FishCAST is an NSERC-CREATE program that focuses on training the next generation of aquatic scientists in freshwater fish(eries) management and conservation. Submissions demonstrating strong collaborative efforts between early-career practitioners and government, NGO, industry, and community partnerships are particularly welcome, especially articles concentrating on the four FishCAST Research Themes: 1) Ecosystem and Habitat Assessment, 2) Fisheries Ecology and Exploitation, 3) Fish Health and Fitness, and 4) Fish Culture. The deadline for manuscript submission is **November 30, 2024**, but early submissions are highly encouraged. Papers will be published online as they are accepted, and then printed in a single print issue when all articles are complete. There are no page charges for publication.

The Call for Papers can be found at the following link:

<https://www.springer.com/journal/10641/updates/26289296>



FishCAST

Open Waters Meet Open Access

News from our publishing partner:
Canadian Science Publishing

Endless blue for migratory marine species. Unobstructed passage for riverine fish. The calm centers of reed-encircled wetlands. What do you think of when you hear the phrase “open water”?

We’re continuously thinking about openness at Canadian Science Publishing (CSP) as we transition to becoming a fully open access publisher. There are different layers of open access, which is one of the many practices of open science. During Open Access Week 2023, CSP hosted a webinar to unearth some of these layers, including: defining open access terminology, navigating funder requirements, discovering what publishers provide in exchange for Article Processing Charges (APCs), and more.

Did you miss the webinar? Catch the recording here: <https://www.youtube.com/watch?v=4J5sytCKs34>

What’s new and Open Access in SCAS partner journals?

- *Environmental Reviews* | Protecting and restoring habitats to benefit freshwater biodiversity | Morgan Piczak et al. <https://doi.org/10.1139/er-2023-0034>
- *Canadian Journal of Fisheries and Aquatic Sciences* | Lake trout reflex impairment and physiological status following ice-angling | Bradley Howell et al. <https://doi.org/10.1139/cjfas-2023-0037>
- *FACETS* | Community science to the rescue: capturing water quality data during the COVID-19 pandemic | Erin Smith & Andrea Kirkwood <https://doi.org/10.1139/facets-2023-0004>
- *Canadian Journal of Zoology* | Spatiotemporal variation in pup abundance and preweaning survival of harbour seals (*Phoca vitulina*) in the St. Lawrence Estuary, Canada | Limoilou-Amélie Renaud et al. <https://doi.org/10.1139/cjz-2023-0005>



Canadian
Science
Publishing

From the Archives

Fisheries comprise fish populations and the fishers who harvest from those populations. In 2003, Dr. Darren Gillis wrote about the intersection of Behavioural Ecology and Fisheries Science to better understand dynamics between both fish and fishing vessels (<https://doi.org/10.1139/z02-240>).

Twenty years later, how does Behavioural Ecology inform fisheries management? We asked Dr. Gillis, Professor at the University of Manitoba, to find out. “The application of Behavioural Ecology to fisheries has evolved since then, but many of the issues remain to be developed further - even after all of this time. In the 2003 review, I discussed the use of Ideal Free Distribution (IFD), from Foraging Theory, to link vessel movements to success among fishing locations. Briefly, under competition an IFD results when all foragers relocate until they receive the same benefit at all sites (a Game Theory perspective). Among fishers, IFD implies that catch rates in weaker areas may not reflect local abundance. Currently, stock assessments, from simple Biomass Dynamics Models to more complex integrated analyses like Stock Synthesis, do not account for IFD predictions when using fisheries dependent data.

There have been great developments in the statistical side of the analysis of catch and effort data. We have gone from linear models to generalized, Bayesian, and correlative models that account for both temporal and spatial autocorrelation. However, statistical models only address the precision of our estimates - not patterns of bias. For this, explicit models of behavioural processes, like the IFD, still have a lot to offer to the development and practice of fisheries science.”



2024 Conference “From the Source to the Sea”

Anne Crémazy and André St-Hilaire, SCAS/SCSA Program Committee Co-Chairs

Mariëka Chaplin, Local Arrangements

We look forward to welcoming you to Fredericton for the second-ever SCAS/SCSA Conference from February 21-24, 2024. It will be an exciting week of talks, panel discussions, social events, community building, and great science! Located in the heart of downtown, the Fredericton Convention Centre is New Brunswick’s premier meeting destination. The Centre is surrounded by a number of hotels in the area, including the historic Crowne Plaza Fredericton (Lord Beaverbrook Hotel) and is connected by pedway to downtown’s newest hotel: the Hilton Garden Inn Fredericton Downtown.

The Fredericton Convention Centre is located close to the Wolastoq |Saint Jean |St. John River and is connected to the downtown trail system, which provides delegates a wonderful way to explore the centre of the city. Meeting registration will include a banquet, as well as lunches on the full meeting days.

This conference brings together scientists, researchers, practitioners, policy makers, and community members from across Canada to exchange knowledge across disciplines in the aquatic sciences. **Please visit the website for more details** (<https://www.scas-scsa.ca/CONFERENCE>). The theme for this year’s meeting is “From the Source to the Sea” and will include a number of exciting symposia and special sessions on related topics.

We have received submissions covering a wide range of themes and topics related to aquatic sciences. In line with our commitment to fostering an inclusive forum to share knowledge, we encourage Indigenous voices, knowledge, and perspectives to submit to any session, not just ones focusing on Indigenous perspectives. Talks will be slotted into the following sessions: (next page)

2024 Conference “From the Source to the Sea” (cont.)

Biogeochemistry of lakes, rivers, and coastal waters

Aquatic food webs

Climate change

Cumulative effects and stressors

Fish, fisheries management and stock assessment

Anthropogenic impacts on water quality

From science to policy

Estuaries, coasts, and oceans

Human dimensions

Long-term records

Advancing Indigenous knowledge systems in Canadian aquatic research and governance

In addition, plenary lectures by the Stevenson, Rigler, and Peters awardees will feature on Thursday, February 22nd. Another item to mark in your calendar is the SCAS Annual Society Meeting, on Friday February 23rd from 5:00 pm – 6:00 pm.

We have reserved blocks of rooms at a couple hotels and encourage you to book your room by the end of December to take advantage of special conference rates. Please visit the SCAS website for full details.

We look forward to seeing you in Fredericton!



A major goal of One Ocean Health is to promote the sustainable use of ocean resources in the future. A new collection of papers in the open access journal *FACETS* aims to develop a better understanding of climate change risks to ocean and animal health, develop new ways to monitor waste and pathogens, and to ensure prudent antimicrobial use.

Guest Editors: Drs. Stefanie Colombo (Dalhousie University) and Mark Fast (University of Prince Edward Island)

Submission deadline is **March 1, 2024**. Learn more at <https://www.facetsjournal.com/topic/one-ocean-health>

THANK YOU TO OUR SUPPORTERS MERCI À NOS PARTENAIRES



Fisheries and Oceans Canada / Pêches et Océans Canada



Our 2024 Award Winners

Rigler Award

Dr. Roxane Maranger

The Frank H. Rigler Award recognizes and honours major achievements in the field of limnology by Canadians or those working in Canada. The 2024 Rigler awardee is Dr.

Roxane Maranger, Professor in the Department of Biological Sciences at University of Montréal (UdM) and Tier I Canada Research Chair



(CRC) in Aquatic Ecosystem Science and Sustainability. Her research investigates how anthropogenic activities on land and climate change interact to control water quality, greenhouse gas emissions, and major biogeochemical cycles in both freshwater and marine ecosystems. Some of Dr. Maranger's most significant scientific contributions, achieved with her 40+ graduate students and postdoctoral fellows, explore how land-water interactions and organismal traits regulate the biogeochemical cycling of nitrogen in freshwaters. Dr. Maranger's career is also marked by life-long dedication to scientific service. She has served as Scientific Director of UdM's Station de Biologie des Laurentides, played a pivotal leadership role in establishing the Future Earth Global Secretariat, and more recently, has been President of the Association of the Sciences of Limnology and Oceanography (ASLO 2020-2022) where she spearheaded critical Equity, Diversity, and Inclusion initiatives.

Peters Award

Dr. Morgan Botrel

The winner of the 2024 Peters Award is Dr. Morgan Botrel, a postdoctoral researcher from McGill University. Morgan's paper titled "Global historical trends and drivers of submerged aquatic vegetation quantities in lakes" was published in *Global Change Biology* (Botrel and Maranger 2023). In the paper Morgan synthesized all of the existing information on the historical changes of submerged aquatic vegetation (SAV) quantities in lakes around the world. Wetland surrounding lakes had been ignored in wetland assessments and are typically understudied by limnologists that tend to focus on open-water habitats. In Morgan's words "I believe the major contribution of this paper is that it 'puts SAV on the map', providing clear evidence of the need for the restoration of these crucial habitats while providing insight for future SAV management and research priority".



Congratulations to Morgan!

2024 Award Winners (cont.)

Stevenson Lectureship Award Dr. Sandra Binning



The Stevenson Lectureship Award is a prestigious lectureship instituted in memory of Cam Stevenson, the long-time Editor of the *Canadian Journal of Fisheries and Aquatic Sciences* (CJFAS). The lectureship is conferred upon an energetic and creative early-career researcher at the cutting edge of an aquatic discipline.

The 2024 winner is Dr. Sandra Binning, Canada Research Chair in the Eco-Evolution of Host-Parasite Interactions, and Associate Professor, Department of Biological Sciences, University of Montreal. Dr. Binning is the PI of an interdisciplinary lab of undergraduate and graduate researchers who investigate the complex relationships among fishes, parasites, and changing aquatic environments.

With more than 50 publications in scientific journals, Dr. Binning's influential research has advanced our understanding of the interplay between parasitism and abiotic stressors on fish locomotion/migration, cognition, physiology, and behaviour. Her highly collaborative research, including mentorship of more than 30 students to date, spans marine and freshwater ecosystems globally—from coral reefs in Australia, the Caribbean, and the Red Sea to inland lakes in Canada.

Dr. Binning is a member of the Groupe de recherche interuniversitaire en limnologie (GRIL) and Ressources Aquatiques Québec (RAQ). In conjunction with her empirical research, Dr. Binning is an advocate for open science practices, especially the public archiving of data.

We look forward to the meeting in Fredericton, where Dr. Binning will present a plenary lecture on her multifaceted research program.

What does your research look like this winter?

Ice-fishing huts?
Thermoses of coffee?
Stacked reading lists?
Filled lab books?

Tag @CJFAS on X (formerly Twitter) in photos showing the winter version of your research!

Sediment's Hidden Influence on Cyanobacteria Blooms

Lewis Molot, Scott Higgins, Jason Venkiteswaran, Megan Blackwell, Julia Kozak, Sonya Havens, Helen Baulch, and Sherry Schiff

A team of researchers from the University of Saskatchewan, Wilfrid Laurier University, York University, University of Waterloo and the IISD Experimental Lakes Area (IISD-ELA) are poised to enter a second phase of a large-scale (whole-lake) eutrophication experiment designed to test the role of sediment reduction in driving cyanobacterial blooms. The experiment will test a novel hypothesis presented in detail in Molot et al. (2021a) that built on previous studies (Molot et al. 2010; 2014). The hypothesis posits that cyanobacteria obtain a significant fraction of their metabolically essential iron (Fe) via vertical migration, or vertical positioning, to anaerobic waters near the sediment-water interface or within subsurface layers (e.g., hypolimnion) which are replete with ferrous Fe released from reduced sediments. Thus, development of a layer of anaerobic water at depths accessible to migrating cyanobacteria is posited to play a key role in onset of cyanobacteria blooms. If correct, the idea that reduced sediments regulate the onset of blooms should prove highly useful to cyanobacteria bloom management.

In the first phase of the experiment, phosphorus (P) was added to polymictic Lake 303 and shallow but thermally stratified Lake 304 in 2019, 2022 and 2023 to ascertain whether adding P without adding nitrogen (N) can promote large blooms of N₂-fixing cyanobacteria – the result was a resounding yes (Figure 1, Molot et al., 2021b). The phenomenon was repeated in 2022 and 2023 consistent with repeated bloom formation in Lake 227 almost every year since 1990, a 34-year period in which the lake received only P (Schindler et al., 2008; Higgins et al., 2018).

Earlier experiments by others have shown that high levels of nitrate, a plant nutrient and strong oxidizing agent, can suppress blooms. Conventional wisdom argues that the shutting off internal P loading inhibited bloom formation under such conditions would have been responsible although internal P loading is not a prerequisite for bloom formation

when reducing conditions are present (Verschoor et al., 2017). However, the role of sediment redox and internal loading of Fe cannot be tested in these studies because they were not monitored. In the upcoming phase of our experiment in 2024 and 2025, P will continue to be experimentally added to Lakes 303 and 304 simulating internal P loading but nitrate will also be added at a level high enough to maintain oxidized sediments throughout the summer preventing access to ferrous Fe. Phytoplankton community composition, P and N forms, Fe, trace elements, dissolved oxygen along the bottom and sediment redox will be monitored. This design will test whether blooms can form when P is available even though sediments will be oxidized: we predict that cyanobacteria-dominated blooms will not form despite adequate P and that internal loading of ferrous Fe will be low.

In the third phase to occur in 2026 and 2027, an equivalent amount of N in the form of urea will be added along with P. Since urea is not an oxidizing agent, we hypothesize that sediments will be reduced, ferrous Fe flux from sediments will be high, and large cyanobacteria blooms will form (although probably not N₂-fixing species). Indeed, we predict that high levels of nitrate and urea will have opposite effects on bloom formation, sediment redox and internal loading of Fe, lending support to the oxidized sediments-cyanobacteria suppression hypothesis.

While adding large amounts of nitrate to oxidize sediments may not be a practical management tool for most eutrophic systems, the results should be useful if the experiment supports the hypothesis (but of course, scientific predictions don't always bear out). Predicting onset of blooms in lakes across a trophic range several weeks before they are detectable would be made possible by monitoring thermal and dissolved oxygen gradients at depths accessible to vertically migrating cyanobacteria. Second, nutrient loading targets can be tweaked to ensure that extensive sediment reduction does not occur, political difficulties in setting and reaching such targets and other considerations (e.g., levels of

nitrate for drinking water supplies) notwithstanding. Third, it gives us a reasonably good idea of how climate change might be driving increasing incidence of blooms (albeit small ones) in oligotrophic lakes in recent decades (Winter et al. 2011; Taranu et al.; 2015; Favot et al., 2023) – by generating thermal gradients that last long enough for anaerobic conditions to develop at the sediment-water interface above the hypolimnion. Fourth, it tells us that for oligotrophic lakes, focusing on nutrient reduction with low external P loads will have little impact and that our attention would be better focused on ways of introducing dissolved oxygen to sediments in critical areas and at critical times. Fifth, removing large amounts of nitrate to meet water quality targets may exacerbate cyanobacteria blooms.

Molot and colleagues (2021a) argued that release of ferrous Fe from anaerobic sediments is probably the proximate driver of cyanobacteria blooms (although it is possible that other redox-sensitive metals with elevated fluxes from reduced sediments, such as manganese and cobalt, are the intermediary agent). Regardless of the identity and nature of the intermediary between blooms and reduced sediments, which is of scientific interest, confirmation that sediment redox plays a critical role in driving bloom formation should be very helpful to environmental managers.

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Figure 1. Photos of Lakes 303 (left) and 304 (right) in July 2022 with cyanobacteria blooms. The lakes were fertilized only with P. Photos courtesy of IISD-ELA.



Appel à propositions

<http://glfc.org/call-for-proposals.php>

La Commission des pêches des Grands Lacs sollicite actuellement des pré-propositions et des propositions de projets pilotes pour les programmes de [recherche sur la pêche](#) et de [recherche sur la lamproie marine](#).

Projets Spéciaux de Recherche sur la Pêche

- Projets Utilisant des Méthodes Mixtes
- La Conservation et la Restauration des Coregoninés
- Productivité en Déclin dans les Régions au Large et Processus Côtiers

Sujets Spéciaux de Recherche sur la Lamproie Marine

- Recherche sur la Lamproie Marine Dirigée par les Premières Nations
- Potentiel de Production des Habitats Nouvellement Ouverts

Regardez nos webinaires d'information pour en savoir plus sur les besoins de recherche et le processus de financement

Programmes de Recherche sur la Pêche: https://youtu.be/amh9ryh_2U0?si=zNfqPIH-UgqQQyWv

Recherche sur la Lamproie Marine: <https://youtu.be/2FS1H6u31kU?si=kwsISJqgp04vlfir>

Les propositions doivent être soumises d'ici la fin de la journée du 15 janvier 2024



CALL FOR PROPOSALS

<http://glfc.org/call-for-proposals.php>

The Great Lakes Fishery Commission is soliciting pre-proposals and pilot project proposals for the [Fishery Research](#) and [Sea Lamprey Research](#) programs.

Fishery Research Special Topics

- Projects Using Mixed Methods
- Coregonine Conservation and Restoration
- Declining Offshore Productivity and Nearshore Processes

Sea Lamprey Research Special Topics

- Indigenous-Led Sea Lamprey Research
- Production Potential of Newly Opened Habitat

Watch our informational webinars to learn more about research needs and funding process

Fishery Research: https://youtu.be/amh9ryh_2U0?si=zNfqPIH-UgqQQyWv

Sea Lamprey Research: <https://youtu.be/2FS1H6u31kU?si=kwsISJqgp04vlfir>

Proposals due by January 15, 2024



The Canadian Centre for Evidenced-Based Conservation (CEBC) at Carleton University, in collaboration with Parks Canada, needs your help with an ongoing systematic review:

“What is the effectiveness of methods for eradicating or controlling abundance and biomass of invasive aquatic plants in Canada?”

Aim:

The primary aim of this systematic review is to clarify, from the existing literature, the effectiveness of invasive freshwater aquatic plant control methods at eradicating or controlling freshwater plant population abundance and biomass to better inform decisions in invasive aquatic plant management.

While the focus of this review is on invasive freshwater aquatic plants in North America, especially in Canadian freshwaters, studies from other locations around the world may be considered depending on the species.

What are we looking for:

The review team is sourcing studies on this topic in the form of:

- Academic research and theses
- Reports (e.g., government, NGO, consultant, community)
- Conference papers
- Workshop summaries
- White papers
- All other literature “that is produced on all levels of government, academics, business, and industry in print and electronic formats, but which is not controlled by commercial publishers” (4th International Conference on Grey Literature, 1999).

*Please note - to be eligible for inclusion in our review, literature should include written methodology and results at a minimum (i.e., not only a dataset)

Learn more:

To learn more about this project and find a list of species we are interested in go to:
<https://canadiancebc.com/projects/what-is-the-effectiveness-of-methods-for-eradicating-or-controlling-abundance-and-biomass-of-invasive-aquatic-plants-in-canada/>

Get in touch:

If you can provide any grey literature (or relevant published material) on this subject, please send any information to MeaganHarper@cmail.carleton.ca by **March 31st 2024**.

Thank you!

News and Events from the Ocean Tracking Network (OTN)

The Ocean Tracking Network (OTN) is a global aquatic research, data management and partnership platform headquartered at Dalhousie University in Halifax, Nova Scotia, Canada. OTN's mission is to inform the conservation and management of aquatic species by tracking their movements, habitats and survival in the context of changing global environments.



2024 OTN Symposium:

Please save the date for the 2024 OTN Symposium taking place from Sept. 23-26 in Halifax, N.S.

The OTN Symposium will begin on the evening of Sept. 23, with two full days of presentations and panel discussions from Sept. 24-25, followed by an early career researcher workshop on Sept. 26.

The Symposium brings together researchers from across the globe to collaborate, share strategies and seek new opportunities for the sustainable management of aquatic animals in changing ocean environments.

Topics and activities to include:

- Advances and innovations in telemetry technology
- International and national telemetry collaborations
- Pairing different ways of knowing and building Indigenous research partnerships
- Cross-project synthesis and publication
- Best practices and lessons learned: data and field
- Student presentations
- Poster sessions

More details to follow—we look forward to seeing you there!

OTN study hall:

Every Thursday, the OTN data team hosts a virtual study hall, where peers from around the world can discuss data analysis tools/methods and explore solutions to common problems and errors. This weekly gathering has led to tech support and coding advice, new friendships, international collaborations, and even co-authorships! Email otn@dal.ca for a Zoom participation link—all are welcome!



Follow OTN on social media and join the e-list:

Facebook:

<https://www.facebook.com/oceantrackingnetwork>

Twitter/X: <https://twitter.com/oceantracking>

Instagram: @oceantrackingnetwork

LinkedIn: OceanTrackingNetwork

Sign up to our e-list:

<https://mailchi.mp/878c3b54d129/9k6r7u7l6l>

Student/ECP Committee Updates

Name change: ECR to ECP

After thoughtful consideration, the SCAS Executive Committee passed a motion for a name change from the "Student/Early Career Researcher Committee" to the "Student/Early Career Professional Committee". This transformation reflects our commitment to inclusivity and acknowledges the diverse paths our early-career stage members take in their professional journeys. We recognize the richness of experiences within our community and want our committee to be a home for all early career professionals, whether in research, academia, industry or beyond!

Committee Progress in 2023

This year, our main objective was to build this committee into something that was long-lasting and that would be set up for success in future years. We ensured our student/ECP perspectives are heard throughout The Society by appointing a student or ECP liaison to each SCAS committee. We've also contributed newsletter content, created a communications channel, and provided feedback on some key items, including the changes to the Clemens-Rigler Travel Fund. Finally, we have worked with Canadian Science Publishing, in their partnership with SCAS, to host a Student/ECP-specific event at the upcoming conference that is centered on casual networking with peers and some essential skill-building. We are proud of the progress we've made as a committee and are so grateful to the individuals who have been a part of it thus far!

Anas & Erin

Student & Early Career Professional Committee Co-Chairs 2023-24

Student/ECP Lunch & Learn: Creating your go-to research overview

When: February 22, 12:30-1:30pm at SCAS Fredericton 2024

"What do you research?" A seemingly simple question, or not. Whether you're describing what you plan to do, what you did, or what happened, communicating your research takes thought and reflection. Students and early-career professionals are invited to a lunch-hour event where breakout groups will discuss and craft content to use or build upon to communicate their research.

Breakout groups will commence by 1 pm, following time dedicated for socializing over lunch.

Co-organized by the SCAS Student and Early-Career Professional Committee, Canadian River Institute Student Leadership Committee, and Canadian Science Publishing.



PhD student Jessica Robichaud radio tracks Northern Map Turtles under the ice at Lake Opinicon in Ontario.

Read the paper in CJZ: <https://doi.org/10.1139/cjz-2022-0100>.

Credit: Grégory Bulté

Protecting Freshwaters from Pollution

The Standing Committee on the Environment and Sustainable Development of the House of Commons is currently conducting a study on freshwater. On November 23th, a session on pollution management was held, allowing for Jérôme Marty (Board member of SCAS and ED of IAGLR) to share about priorities for the Great Lakes. These priorities, specific to pollution issues, are:

Consider adding Contaminants of Emerging Concerns (CECs) and Microplastics to the list of contaminants of concerns in Annex 3 of the Great Lakes Water Quality Agreement.

Invest in research to better understand the fate, behavior, and toxicity of emerging contaminants to support informed regulations. Such studies may be needed for specific chemicals which are poorly studied and should consider cumulative effects. Consumers are exposed to several contaminants at once, and understanding the cumulative effects of multiple exposures deserves further research.

Consider climate change as an accelerator for pollutant production and toxicity.

Higher temperatures increase metabolic rates of resident organisms, causing oxygen depletion and, subsequently, creating toxic conditions for the biota. Higher water temperatures also favor the growth of Harmful Algal Blooms (HABs), able to release cyanotoxins such as microcystin.

Significant efforts are being invested to reduce nutrient runoff from agriculture and urban sources in Lake Erie. Even under the proposed nutrient reduction, the lake water will continue to see nutrients being released from its sediments because of climate change. As stated by the Editor of JGLR, Dr. Robert Hecky, “Lake Erie is the canary in the Great Lakes climate mine.” In this context, the urgency of reducing nutrient inputs from the land becomes even more critical.

Engage with Indigenous Peoples on water monitoring and management. This recommendation



J. Marty (right) shared about priorities for the Great Lakes as a witness for the study on Freshwater (pollution management) by the Standing Committee on the Environment and Sustainable Development of the House of Commons.

is reflected in the 2023 Third Triennial Assessment of Progress on Great Lakes Water Quality released by the International Joint Commission (IJC) to the parties earlier this month. Pollutants are affecting Indigenous communities to a much higher degree than the non-indigenous population because sources of pollution were placed close to reserves and settlements and because diets of indigenous peoples often result in higher consumption of bioaccumulative toxins.

Overall, growing evidence illustrates the value of bridging knowledge systems to support better, lasting, and adopted management practices and policies at both local and regional levels.

Adopt a comprehensive approach for Great Lakes Science. The Great Lakes are inland seas and as such, they call for management approaches that are similar to those developed for marine ecosystems. Faced with an aging research infrastructure, Great Lakes science has fallen behind in its ability to understand the physical, chemical, and biological features of these ecosystems and to report on how quickly they are changing. Several organizations are working together to develop a decadal science plan for the Great Lakes. This initiative, led by the IJC, has identified six priorities for the Great Lakes and will next focus on a blueprint for its implementation.

Growing up close to the edge

A poem by Katryna Seabrook

I used to be afraid of swimming in the lake.
I didn't like the uncertainty
of not knowing what other creatures I was sharing the water with, when my toes might get tangled up in weeds, or how far down I'd have to sink before I'd touch the bottom.
Yet despite all of the paralyzing thoughts of catastrophic outcomes that filled my mind while standing at the water's edge, I still always
jumped in.

I think we are called to the water, like to like,
spending our lives trying to learn how to flow freely,
our eyes reflected back up to us when we try to look down deep, somehow separated
from what is in us and all around us - we spend our lives growing up close to the edge,
just dangling our feet.

Some of us are drowning
(3 days without water is as long as one can go)
while others are comfortably floating
(with clean water running right into our homes)
chronically late to our swimming lessons, always missing the ones about how we are all connected.
Always forgetting that one day we will all be living downstream of something.
And so maybe we shouldn't be surprised at the island of garbage floating off the west coast, or
at the dying fish washing up onto Lake Huron's shores, or
if the Cuyahoga River were to catch fire once more.
But maybe we could try to be a bit more like that molecule with two hydrogen atoms covalently bonded to one
oxygen atom, that molecule making up 60% of our essence.
Maybe we too could try to support life with our presence, refreshing each other in our efforts to grow just a little
bit more,
reaching our toes
toward the shores of a better tomorrow.

Because today, while I am no longer afraid of swimming in the lake, I am afraid that one day there won't be a
lake in which I am able to swim.
I don't like the uncertainty
of not knowing what creatures will disappear next, when my toes might get tangled up in plastic waste instead of
weeds, or how far we are willing to sink before we change direction.
So despite all of the paralyzing thoughts of catastrophic outcomes that fill our minds while standing at the water's
edge, it is crucial, now more than ever,
that we all
jump in.

The TAPER project as a novel approach in research co-production and actionable science

Flavia Breje, MSc Student and Erin Smith, PhD; Ontario Tech University

The Kawartha Lakes are a set of interconnected lakes in southern Ontario, about an hour from the Greater Toronto Area (GTA). Due to their proximity to this densely populated region, the lakes have long been a popular tourist destination, and recently, the permanent resident population living along the shorelines of these lakes has been growing. As part of the Trent-Severn Waterway National Historic Site of Canada, the water levels of these lakes were artificially raised over 100 years ago during the construction of a series of locks and dams that connect the waterway, and many wetlands were flooded to form a larger connected lake system. The resultant lakes tend to be shallow, with high plant and algal growth. Two of these lakes, Scugog and Canal, have especially high plant growth, such that it is a major concern for many lake residents.

Over many decades, shoreline residents have attempted to eliminate the 'weeds' in the shallow water along the shore of their properties using different plant removal methods. In recent years, new plant removal technologies have been applied, which has raised concerns about aquatic ecosystem health by local lake stewards, Conservation Authorities, and Parks Canada (Trent-Severn Waterway). To address these concerns, the Trent-Severn Aquatic Plant Experimental Removal (TAPER) project was conceived to test the effects of various macrophyte (aquatic plant) removal methods on the abiotic and biotic components of the nearshore aquatic ecosystem. TAPER is a collaborative project with researchers from Ontario Tech University (OTU), Toronto Metropolitan University (TMU), Carleton University, and the University of Ottawa. Additionally, Parks Canada and Kawartha Conservation collaborated on the project providing local connections to homeowners and permit details for the planned plant removal whilst co-developing the science and research.

To understand the impacts of plant removal techniques, the study was designed to replicate actual plant removal efforts by shoreline residents. We aimed to recruit 12 volunteers on each lake (Scugog and Canal) to access their properties for the duration of the experiment. With help from Kawartha Conservation and the Scugog Lake Stewards, we recruited 12 volunteers on each lake, with only one volunteer on each lake dropping out before study completion. In addition to reference sites, there were three treatment categories, initially: oscillating thruster, lake rake, and mechanical harvester. The mechanical harvester was replaced with a motorized weed-cutter due to logistical challenges, including safety, permitting, and expense. A Before and After Control-Impact (BACI) study design was implemented with plant removal at all treatment sites in early August. A BACI design enables us to directly compare each site before and after treatment to reduce the impact of uncontrolled factors across sites.

This experimental design should allow the TAPER team to better understand the environmental impacts of macrophyte removal in these lakes, and this will ideally provide broader insights on macrophyte control by considering ecosystem dynamics. Specifically, the various treatments will allow the team to investigate the effects of each plant removal method on the food web, water chemistry, and indices of aquatic diversity. Macrophytes provide shelter and food for zooplankton, macroinvertebrates, and fish, and they play an integral role in aquatic nutrient dynamics. However, excessive growth of macrophytes can deplete oxygen during die-off, potentially leading to fish kill. Additionally, many shoreline residents are concerned that macrophytes interfere with recreational activities and decrease the aesthetic value of waterfront properties. The removal of macrophytes may also have consequences for the aquatic ecosystem. Removal may increase light availability thereby benefiting algae, disturb benthic organisms via sediment agitation, and alter fish and macroinvertebrate communities through the loss of shelter and a shift in food sources. Undoubtedly, macrophyte management is complex and requires comprehensive research so that well-informed suggestions are made to the public, and land and water custodians about maintaining healthy waterfront properties. The TAPER team therefore monitored a wide array of biotic and abiotic parameters at shoreline properties.



From top to bottom, left to right: Flavia surveying macrophytes; Alana retrieving a Hester-Dendy; Sarah removing macrophytes on treatment day; field assistants Andraya and Amelia Rinaldo helping survey macrophytes; field assistant Sam Woods and Dr. Smith electrofishing; Mike collection fish data; Dr. Bailey, Dr. Melles, and members of Parks Canada removing macrophytes with a weedsickle; Husnah recording acoustic data with a hydrophone; Dr. Melles, Husnah, and members of Parks Canada on treatment day.

As a collaborative project, the different components of the aquatic ecosystem were studied by various researchers. Flavia Breje, a MSc student in Dr. Andrea Kirkwood's lab at OTU, collected data on the percent cover, species composition, and relative abundance of macrophytes. Alana Tyner, a PhD candidate at OTU used Hester-Dendy artificial

samplers to capture the macroinvertebrate community and determined the presence of coliforms and *Escherichia coli*. Sarah Rijkenberg, a PhD candidate at OTU collected zooplankton and phytoplankton samples. Fish were surveyed by an electrofishing crew led by Mike Dusevic, a MSc student, in Dr. Steve Cooke's lab at Carleton University. Husnah

The TAPER project (cont.)

Azmi, a PhD student in Dr. Stephanie Melles' lab at TMU, collected underwater acoustic samples to describe impacts on the underwater soundscape. In addition, Dr. Robert Bailey, a professor at OTU, captured drone satellite imagery. Dr. Erin Smith, a postgraduate fellow at OTU, oversaw the administrative and logistic coordination for the project. Kawartha Conservation and Parks Canada also provided field support.

The TAPER study is comprehensive and inclusive of a large and dedicated team with a diversity of expertise, that allows us to examine many aspects of nearshore aquatic communities of these lakes. Currently, the TAPER team at OTU is continuing their research by identifying macrophyte, zooplankton, and phytoplankton communities from field samples and performing chemical analysis to determine concentrations of water quality parameters, including total phosphorus, chlorophyll-a, and total nitrogen. The TAPER team is excited to combine and analyze the multitude of data to determine the impact of various macrophyte removal methods on nearshore ecosystem health and help inform management.

Did you know?

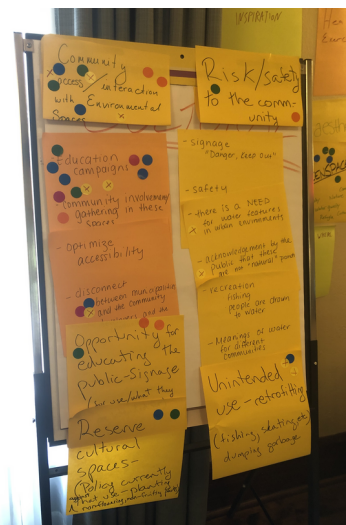
Corresponding authors from the Canadian Research Knowledge Network (CRKN)-affiliated universities or Canadian Federal Science Libraries Network (FSLN)—including Fisheries and Oceans Canada, Environment and Climate Change Canada, and Natural Resources Canada—receive a 25% discount off the Open Access fee when publishing with Environmental Reviews, Canadian Journal of Fisheries and Aquatic Sciences, or Canadian Journal of Zoology.

Learn more at: <https://cdnsiencepub.com/open-science/oa-partnerships>

Help Sponsor the Future of SCAS-SCSA

We are looking for you and your organization to join in supporting and build a successful SCAS-SCSA. Thanks to the generosity of past sponsors to SCAS-SCSA, we have had remarkable success training the next generation of aquatic science professionals and building a diverse and inclusive community to meet future challenges. We are seeking new sponsors to build on this success by amplifying our aid for trainees in financial need through travel support with the Clemens-Rigler Travel Award. We are aiming new resources at focused initiatives related to justice, equity, diversity, inclusivity, and Indigeneity. From new awards to recognizing inclusive excellence through to better efforts to engage aquatic science practitioners, your sponsorship will add to the excitement of the whole community with the launch of SCAS-SCSA.

Contact Gavin Christie, SCAS-SCSA Fundraising Chair (gavin.in.the.county@gmail.com) for more information about how you can help.



Some cultural ecosystem services in SWMPs identified by participants (story on next page).

Credit: Edina Illyes)

Working with the community to better understand the ecosystem services of urban stormwater management ponds (SWMPs) in Canada

Edina Illyes, Nicholas Mandrak, Andrea Kirkwood, and Piata Marques

University of Toronto Scarborough & Ontario Tech University

Scattered across the landscape of growing Canadian cities, urban stormwater management ponds (SWMPs) are familiar features to many people. Such structures are built to control flooding, to improve stormwater quality by retaining large amounts of runoff and slowly releasing it back to the environment, and to prevent sewage treatment plants from being overwhelmed from flood waters in cities with combined sewers. It is very common to find animals and plants, both native and alien, that have naturally colonized or been introduced into these systems. And, in many neighborhoods, SWMPs represent the only green spaces available for use by urban residents.

Despite their biological and social importance, SWMPs are still not managed as valuable ecological or community spaces. This is especially true in Ontario, where provincial guidelines state that, “It must be recognized that stormwater ponds and wetlands are first and foremost stormwater management facilities that must be maintained. They should not be considered as significant natural areas which require environmental protection.” (Ontario Ministry of the Environment, 2003). This leads to SWMPs being constructed and managed mainly for the purpose of flood and water-quality control, overlooking their multipurpose potential.

To pave the way towards a better understanding of SWMPs in Ontario, in October 2023, we facilitated a workshop at the University of Toronto Scarborough (UTSC), with support from the UTSC Water Pathways research cluster. This workshop had the goal of sharing community experiences related to SWMPs.

We gathered 40 participants including graduate students, researchers from multiple institutions, federal and municipal conservation agencies, managers,

developers, and community members. The workshop provided opportunities for the sharing of ideas and discussions through a plenary and breakout groups that will be detailed in an upcoming paper.

In general, we report that the community (urban residents, often organized in non-governmental groups, that interact with SWMPs) holds a sense of abandonment from local authorities regarding SWMP maintenance and takes it upon themselves to partake in voluntary stewardship such as cleaning trash and maintaining the aesthetic value of SWMPs. Also, the poor water quality, pests, and the impact of SWMPs on receiving waters are raising concerns of the local communities. In group discussions, we identified a diverse range of benefits people can potentially obtain from SWMPs (i.e., ecosystem services). We collectively ranked them from most urgent to least urgent as: 1) habitat provisioning; 2) control and retention of stormwater, temperature, and sediment; 3) use of plants for medicinal purposes and spaces for mental and physical activities; 4) spaces for environmental and user safety education; and, 5) green space for contact with nature, leisure, and community engagement.

We note that the provisioning of such services can be facilitated by actions that prioritize habitat goals, facilitate discussions among and engage groups of multiple stakeholders, monetize ecosystem services, promote guidelines for building with purpose, and provide tax credit and funding for municipalities.

Our experiences at the workshop made clear the importance of co-creating knowledge with a diverse group that includes the community. We are convinced that advancing the understanding and management of SWMPs towards a more integrated approach, which recognizes the multiple ecological and social roles of these systems, requires a multidisciplinary approach that places community experiences at the center of the discussion. This can help direct researchers to provide information on key aspects that can be used by managers to make science-based decisions that are in

SWMPs (cont.)

tune with community values. Such transdisciplinary integration of ecological, management, and social aspects can only be fully appreciated if SWMPs are understood as important urban ecological infrastructures (sensu Childers, DL, et al. 2019. Urban ecological infrastructure: an inclusive concept for the non-built urban environment. *Elem. Sci. Anth.*, 7:46.) from construction to management.

We aim to keep advancing the understanding of SWMPs by providing more opportunities for knowledge sharing and collaboration through a research consortium list managed by Andrea Kirkwood at Ontario Tech University.

If you would like to learn more about the Ontario Urban Stormwater Pond initiative, reach out to Andrea at andrea.kirkwood@ontariotechu.ca



Welcoming workshop participants.
Credit: Edina Illyes



Breakout group discussion of SWMP services.
Credit: Andrea Kirkwood

Announcing *Lakes in the Anthropocene*

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. 13 chapters. 438 pp. ISBN 978-3-946729-30-3 ISSN 0932-2205

€50 - plus postage (print edition, hardcover); over 200 mainly colour figures

In a book that is part memoir and part textbook, 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.

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 at:

https://www.queensu.ca/pearl/textbooks/Anthropocene_text.php

Lakes in the Anthropocene (cont.)

Orders can be placed directly from the International Ecology Institute

<https://www.int-res.com/book-series/excellence-in-ecology-books/ee30/>

<https://www.int-res.com/book-series/%20excellence-in-ecology-books/order/>

or from the Distributor (Natural History Bookstore, NHBS) www.nhbs.com/lakes-in-the-anthropocene-book

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

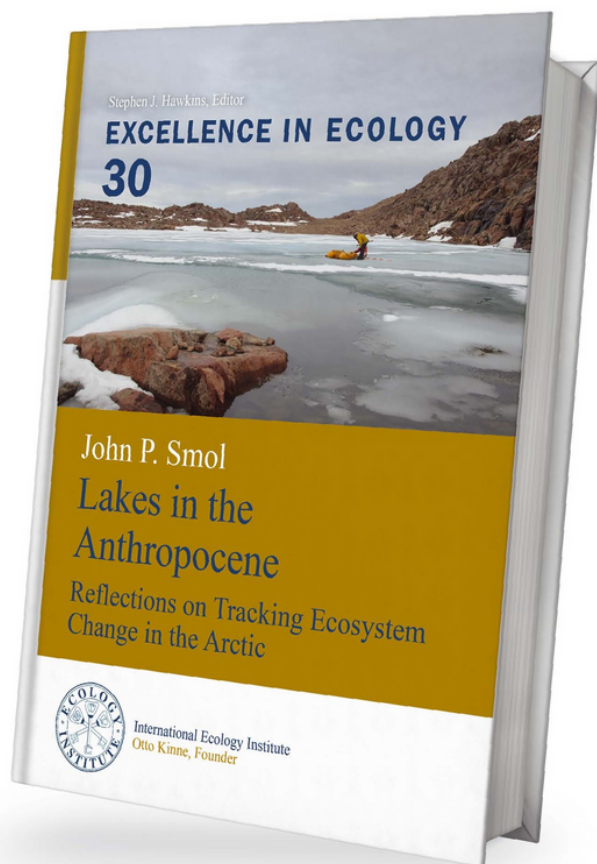


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Thinking about where to publish what you present at SCAS-SCAS?

Canadian Science Publishing is counting down the days until the 2024 meeting—we can’t wait to reconnect with familiar faces and meet more SCAS members!

If you have ideas for new special collections or papers in SCAS partner journals, start the conversation early and contact Natalie Sopinka (Journal Development Specialist) at natalie.sopinka@cdnsiencepub.com

Method spotlight: Underwater camera traps

Jessica Reemeyer, PhD candidate, McGill University

My research is focused on the effects of environmental stressors on freshwater fish species at risk in Canada. We're seeing an increase in extreme heat events as a result of climate change which is a major threat to global biodiversity. I'm interested in better understanding how climate change related warming interacts with other environmental stressors such as low dissolved oxygen (hypoxia).

Often to study fish habitat requirements, we go around to different habitats and sample the fish either with nets or by electrofishing. Unfortunately, this requires capturing, handling, and identifying the fish as they are caught, which can be especially stressful for sensitive species at risk. Alternatively, fish can be tagged with transmitters that allow you to track them, but this can only be done to fish that are large enough to support the tags. An emerging alternative to these methods is to use cameras to detect fish at a given location. For this project, we set a camera at a given site, recorded the habitat characteristics (like depth and vegetation), and then leave the cameras to record at regular intervals. Each camera is also equipped with a dissolved oxygen and temperature sensor, and these are measured each time a video is recorded so that we know these parameters at the time the videos are recorded.

For this work, I placed cameras in the Old Ausable Channel, a freshwater channel that spans 14 km through Pinery Provincial Park near Grand Bend, Ontario. This channel is home to multiple fish species at risk including the threatened Pugnose Shiner (*Miniellus anogenus*) and the endangered Lake Chubsucker (*Erimyzon sucetta*). We're interested in learning more about the habitat requirements of these fish and how variation in temperature and dissolved oxygen affects where they are present.

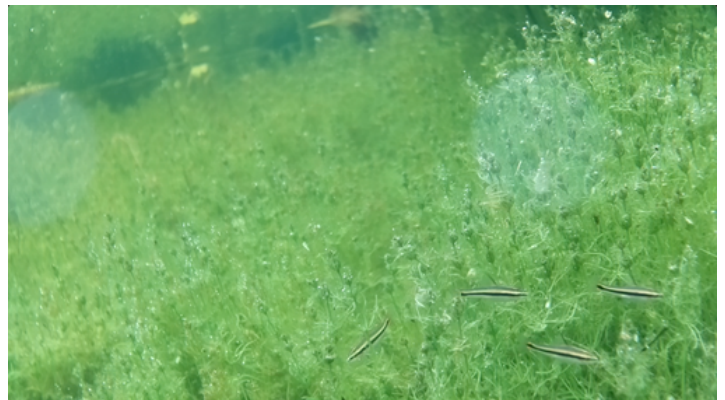
I used Raspberry Pi computer boards to build the cameras for this project, which not only cut the cost of equipment significantly but also allowed me to tailor the software more directly to the needs of the project. For underwater camera trapping, often GoPro cameras



Photo credits: Jessica Reemeyer

Setting up a camera to be deployed in the channel (left)

Adult Lake Chubsucker caught on camera in the channel (below)



Juvenile Lake Chubsucker caught on camera in the channel (above)

are used which generally only allow you to record video for ~30 minutes before the battery dies and at a limited number of settings. With my Raspberry Pi set up I can record at a significantly reduced frame rate to save on memory, as well as use a larger battery that allows me to deploy the cameras for up to a week.

Excitingly, we were able to capture Lake Chubsucker at multiple life stages using these cameras and are currently working to build habitat occupancy models based on the camera detection data. To see some of the footage we recorded check out our outreach Facebook page: Lambton Shores Endangered Fish Adventure.

Euclimatch: versatile Euclidean climate matching in R

Justin A. G. Hubbard, D. Andrew R. Drake, Nicholas E. Mandrak

Species are adapted to the climatic conditions of the environment of their native and established non-native ranges and are, thus, expected to have a greater probability of surviving in introduced regions with climatic conditions that are similar to their known ranges. Climate matching is a method used in biological risk assessment frameworks, such as horizon scanning and invasive species risk assessment tools (e.g., Freshwater Invasiveness Scoring Kit; FISK), to estimate non-native species survival in recipient non-native regions.

The Euclimatch R package (Hubbard, Drake, & Mandrak, 2023) provides a set of tools for climate matching with Climatch, a Euclidean distance algorithm (Crombie, Brown, Lizzio, & Hood, 2008). We provide an example of climate matching with Euclimatch using the popular aquarium species Oscar (*Astronotus ocellatus*). Climate match was modelled

globally under historical climatic conditions (1981-2000) and a projection model (MRI-ESM2-0) for 2061-2080 of a high-emissions scenario the shared-socioeconomic pathway SSP3-7.0 and showed an increase in climate match in parts of North America, Europe, and Asia under the climate change (Figure 1).

The Euclimatch R package rapidly computes and visualizes climate-match data for small to large numbers of species. The package provides versatile tools for simple, complex, or parallelized climate-matching workflows. Examples on the package website (<https://github.com/JustinHubbard/Euclimatch>) provide thorough details of Euclimatch functions, demonstrating the building of projects for a variety of use cases.

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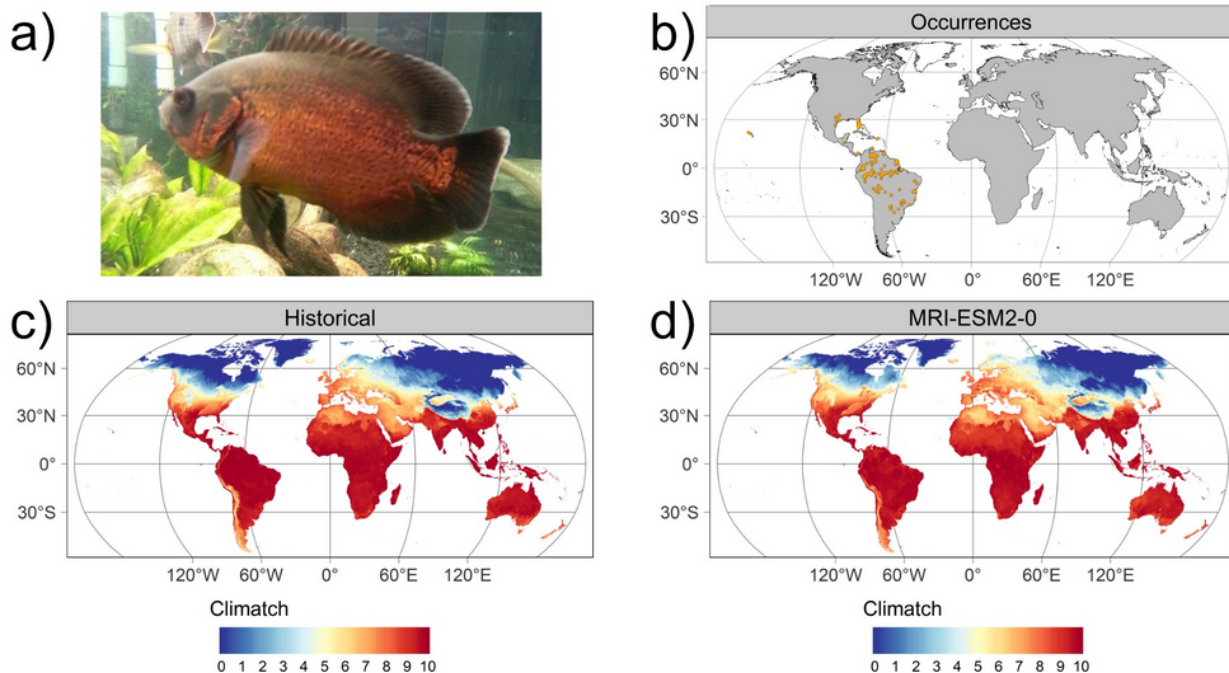


Figure 1. a) Image of an Oscar (*Astronotus ocellatus*); b) occurrences of Oscars from GBIF; c) global climatch scores (0-10) of occurrences under historical climatic conditions; and d) under climate projection MRI-ESM2-0 for the period 2061-2080 under emissions scenario SSP3-7.0.

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Thank you to all members who submitted their updates for this issue of REFLECTIONS

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