

Message from the President



Contents:

- * Message from the President...P1
- * 2020 AFS-OC AGM...P2-3
- * 150th AFS Annual Meeting...P3
- * AFS-OC Student Subunit...P4
- * Regional Events...P4
- * Fish Focus: Green Sunfish...P5
- * AFS-OC Fall Webinar... P6
- * Fish Around the World...P6
- * Fish Focus: Silver Shiner...P7
- * E.J. Crossman Awardees...P8-13
- * Fish Species Complexity-
Highlighting Diversity in Ontario
(Clonal Hybrids)...P14-15
- * Tubenose Goby in Lake Ontario...P16
- * Book Review: The Marsh Builders... P17-18
- * People in the Field...P19
- * We're Social...P19
- * Book Review: From Catastrophe
to Recovery...P20-21
- * Ranavirus...P22
- * "On the Hook!"...P23

The scientific community has long been providing evidence of the role humans play in altering our environment and the impacts this has had on ecological health, our climate, and our quality of life. Despite the growing evidence, the general public has viewed this information skeptically. Attempts to confuse and delay a response have complicated the messaging regarding the importance of this topic and the role people play in it. Confusion and doubt have had a history of being welcomed even when not well-founded as evidenced by the slow rate of change in political policies, public perspectives, and lifestyles. People tend to be uncomfortable with change in general, especially at the scale that it is being proposed by the scientific community to combat this problem. It's easy to understand the uncertainty of those not part of the scientific community when faced with the responsibility of making substantial lifestyle changes.

Changing consensus is hard, but not impossible, as the persistent scientists, activists, and educators who continue to relay their message of urgency and hope towards a better future have discovered. More than ever, it feels as though this effort is showing its value as general perception starts to shift and momentum builds towards understanding anthropogenic impacts on our environment. Scientific evidence keeps getting stronger, communication of the science has become more effective, impacts on individual health and safety are more prevalent globally, and the activism efforts of the younger generation have been inspiring. These efforts are pushing people to rethink their perspectives and increasingly our communities are starting to understand the importance of embracing this knowledge and the need for immediate change. As former American President Barack Obama once discussed, governments tend to ebb and flow in their opinions and political direction. Let us embrace and encourage this flow of acceptance towards improving our future through our politics, our communities, and our way of life. As members of the scientific community, we must continue to lead by example, engage in constructive conversation and communicate in a meaningful way. Only then can we pave the way for all of us to embrace change and protect our planet for future generations and all the species we live alongside.

Dan Moore, AFS-OC President
president@afs-oc.org

2020 AFS-OC Annual General Meeting



On February 20-22, the Ontario Chapter of the American Fisheries Society will host their 2020 Annual General Meeting and Conference at the YMCA—Geneva Park in Orillia, Ontario.

This year's conference theme is "What's the cost of doing nothing?". Our keynote speaker will be Dr. Brad Bass. On the Friday evening, there will be a mentoring session and social. On Saturday afternoon, we will host a telemetry workshop where Peter Davis from Lotek will talk about "A beginner's guide to freshwater telemetry".

Additional information will be provided on the afs-oc.org website. Register online at www.afs-oc.org/shop/. Special early bird registration rates apply until January 31, 2020. AFS-OC members and students are eligible for discounted rates.

Those planning to present papers or posters must submit abstracts by January 24, 2020. There are limited slots available for oral presentations. Poster presentations can be accommodated. Papers are solicited for all aquatic resource topics, and on completed studies, preliminary results, or case studies. Abstracts should be submitted in Microsoft Word format as email attachments to Craig Patterson (president-elect@afs-oc.org).

Student presenters are eligible for the E.J. Crossman Award and student posters for the President's Award. Your AFS-OC ExComm and Student Subunit will also be sponsoring two bursaries for travel and conference-related activities for this meeting:

- Up to \$250 for one Student or Young Professional AFS Ontario Chapter member
- Up to \$350 for one Regular AFS Ontario Chapter member

To apply, please submit via email a brief bio and explanation of how these additional funds could help pay your way to Geneva Park (3-4 paragraphs sufficient). All applications will be reviewed by the voting members of the AFS-OC ExComm/Student Subunit and awarded based on need. Please submit your application by email to president@afs-oc.org by January 24, 2020.

The Executive Committee looks forward to seeing you there!

Why you should attend this AGM?

Many of you may be wondering why you should attend this AGM, particularly when considering the tight budget and travel restrictions that are all too common these days. We would never discourage attending larger meetings, but many are unaware of the benefits of smaller, local meetings. Below is just a small sampling of these benefits:

- **Affordability:** Registration fees are about half the cost compared to a large national meeting. Due to the smaller size of these events, there are typically more cost-effective options for venues available, which lowers attendance fees. Often better accommodation rates are also often secured as well.
- **Connect with your peers:** Chapter meetings are more intimate than most Society meetings. You won't get lost in a sea of people, and it's easy to connect and re-connect with new and old friends alike. You're more likely to find someone who has worked with your boss/supervisor or in your program/agency and you can take some time to bond over your

2020 AFS-OC AGM — *cont.*

mutual likes and dislikes. As you attend more of these meetings, you will start to recognize faces and keep up-to-date with colleagues you don't get to see frequently.

- **Priority access to new research:** A Chapter meeting is one of the earliest opportunities most researchers have to spread the word about the important work they are doing and to get feedback from peers who are more likely to be familiar with the topic/geography/issues than most who might attend a larger meeting. It's also an opportunity to learn what others in your region are learning and developing, which could be important for future work. Wouldn't you love to finally put a face to the name you keep citing in your papers?
- **Career development:** There is so much to learn at a Chapter meeting, it's almost overwhelming! Aside from learning about all the amazing research being conducted in your local area, attendees also have the opportunity to develop their skills in Continuing Education workshops, and learn from the best about how to progress in your career at the Student Mentor session. Chapter meetings are also a great place for job seekers to find local jobs and for employers to meet potential candidates to fill an upcoming job opening.
- **Get inspired!** This is one of the best places to learn about innovative approaches to challenges in your region and interact with colleagues to develop creative solutions and collaborations to your own issues. The plenary sessions often inspire by revisiting the challenges and successes of a lifetime of work and encouraging the next generation to forge ahead in the face of the many challenges encountered along the way.
- **Have some fun!** It's not all work and no play! The Executive Committee makes sure you're taken care of by organizing fun events like a banquet that includes a dinner buffet and mixer, and a raffle to support the student subunit.

AFS 150th Annual Meeting Columbus, Ohio, Aug 30 - Sept 3, 2020

The theme for the 150th Annual Meeting of the American Fisheries Society is "Learning from the past, meeting challenges of the present, advancing to a sustainable future." Come celebrate 150 years of fisheries ecology, conservation, and management with fisheries students and professionals from across the world. There will be special exhibits and activities that highlight the achievements from all those who have contributed to the AFS mission over the past century and a half.

Call for symposia deadline: January 21, 2020

Call for abstracts deadline: March 20, 2020

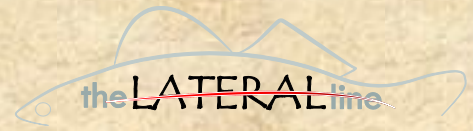
More information at <https://afsannualmeeting.fisheries.org/>.

Interested in attending the 150th AFS Annual Meeting in Columbus?

If so, please complete the poll to gauge interest from our chapter!

<https://www.surveymonkey.com/r/D7KNR93>

AFS-OC Student Subunit



The student subunit of the Ontario chapter had a busy summer in the field and is now coming together to organize events for the 2019/2020 semesters. As a newly appointed team, we plan to host a number of student lead outreach events that promote the sustainability and conservation of Ontario's wildlife. We plan to hold events, such as mentor mixers and Student Success/R-coding workshops, in both southwestern Ontario and the Ottawa region. These events will improve student skillsets in an effort to expand their knowledge base and ensure they have a solid foundation to contribute to the protection and sustainability of our precious natural resources. We also plan to keep our social media pages up to date with relevant information about scholarship deadlines, jobs, post-graduate positions, and fun fishy facts. If anything ever comes to your attention and you would like to share, please send it our way so we can post it. Find us on Facebook (**Student Subunit of the Ontario Chapter of the American Fisheries Society**), Twitter ([@afs_oc_su](https://twitter.com/afs_oc_su)), and Instagram ([@afs_oc_su](https://www.instagram.com/afs_oc_su)).

We have an open call for students to submit updates of their research and we will post it to our website. We are looking to highlight all the exciting and great work our students conduct across the province. Please send us along your brief or lengthy updates on any projects you are excited about or are looking to showcase (send to student-vice-president@afs-oc.org and be sure to include a picture or two if you would like). Additionally, we are looking for nominations for the 2020 Outstanding Mentor Award (2019 Award Winner: Dr. D. Andrew R. Drake) that will be presented at the AGM. Please send us nominations of an outstanding mentor to student-president@afs-oc.org. We are also excited to be planning the annual student lead raffle that will be taking place at the Ontario AGM. This raffle offers an exceptional opportunity for the student subunit to raise funds that support our outreach activities and bursaries for our members. We are in the process of obtaining sponsorships from local organizations in an effort to collect some awesome raffle prize packs for the event!

Stay tuned for future updates and we hope to see you at the AGM, February 20-22nd in Orillia.

Regional Events

Do you have an idea for an event in your area? If so, reach out your regional representative to make it happen! You can help to get the most out of your Chapter membership.

Ann Rocchi (Regional Representative Liaison): regional-rep@afs-oc.org

Robin Gaspard (Southwestern Ontario Regional Rep.): southwestern-rep@afs-oc.org

Megan Lloyst (Eastern Ontario Regional Representative): eastern-rep@afs-oc.org

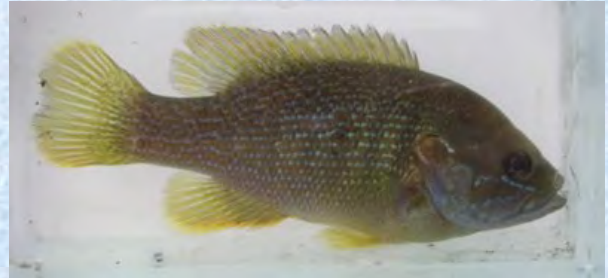
Kelly McLean (Greater Toronto Area Regional Representative): gta-rep@afs-oc.org

Fish Focus: **GREEN SUNFISH** (*Lepomis cyanellus*)

By Siobhan Ewert

Lepis: scale; *poma*: lid; refers to the scales on the gill cover; *Cyano*: dark blue; *ellus*: refers to the blue spots on the body.

Many sunfish species hybridize with each other, including the Green Sunfish. Offspring can be fertile, and exhibit features from both parents, making them difficult to identify.



Features: Small, deep-bodied fish with ctenoid scales (40-50 lateral scales). Dorsal fin with 9-11 spines, usually 10. The ear flap has a large black spot surrounded by a wide, pale red to yellow patch. There is a prominent black blotch near the posterior base of the dorsal fin. The tail and soft dorsal and anal fins have a white to orange edge. Spawning males have vertical bars on the sides and prominent pale edges on the tail, dorsal and anal fins.

Similar species: All sunfish, Black/White Crappie, Large/Smallmouth Bass, Rock Bass.

Diet: Aquatic insect larva, crustaceans, molluscs, and small fishes.

Reproduction: Spawning begins when water temperatures reach 15°C. In shallow water, males will hollow out a nest up to 38 inches in diameter by sweeping the bottom with his tail and removing stones with his mouth. Once the nest is constructed, the male will perform a courtship ritual to attract a female, rushing towards her, then slowly swimming back to his nest while making a grunting sound. Males and females will spawn with multiple mates, several times a year. Males care for the eggs and young until they leave the nest.

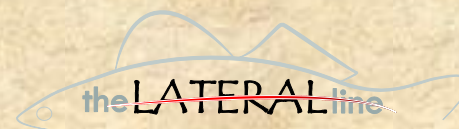
Habitat: Green Sunfish range from East of the Rocky Mountains in North America, from the Hudson Bay basin in Canada, to the Gulf Coast in the United States and northern Mexico. The Green Sunfish is indigenous to the Great Lakes and some basins of the Mississippi River. They inhabit warm waters of streams and wetlands with gravel, sand or bedrock bottoms. They are also tolerant of poor water conditions and can be found in turbid water.

Maximum Age: 8 years

Ontario Record: 13.8 cm

Ontario Average: 9.0 cm





AFS-OC Fall Webinar

Presented by Dr. Jack Stanford

The AFS-OC hosted a webinar on November 26, 2019 featuring Dr. Jack Stanford, who was the Director and Bierman Professor of Ecology from 1980-2016 at the Flathead Lake Biological Station-University of Montana. Dr. Stanford talked about “Ecology of the last great wild salmon rivers”, and made fantastic linkages between riverine processes and the complexity of fluvial fish species, life histories, and interrelationships. There were approximately 20 registrants, and this talk will be posted to both the website and social media.

Fish Around the World

“Our Planet: How to Save Our Fresh Water”. Fresh water is vital to people and nature. Sir David Attenborough explains how we can keep our rivers flowing.

https://youtu.be/pk_Y3g5qJN4

Connecting fish, rivers, and people: World Fish Migration Day is a one day global celebration to create awareness on the importance of free flowing rivers and migratory fish. The next WFMD is May 16, 2020.

<https://www.worldfishmigrationday.com>



The film “Artifishal - The Fight to Save Wild Salmon” is about people, rivers, and the fight for the future of wild fish and the environment that supports them. It explores wild salmon’s slide toward extinction, threats posed by fish hatcheries and fish farms, and our continued loss of faith in nature.

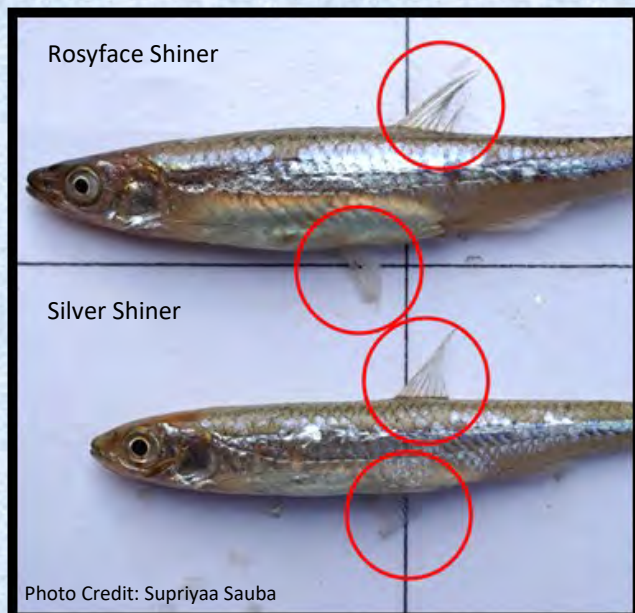
<https://youtu.be/XdNJ0JAwT7I>



Fish Focus: **SILVER SHINER** (*Notropis photogenis*)

By Jacob Burbank

Silver Shiner is an elongated small-bodied freshwater fish of the family Cyprinidae and the largest *Notropis* species found in Ontario (Maximum Size: 14.9 cm TL). The species only occurs in 4 drainages in Canada, which are concentrated within Southern Ontario (Bronte Creek, Grand River, Sixteen Mile Creek and Thames River). Silver Shiner was recently reclassified from a species of 'Special Concern' to 'Threatened' under Canada's *Species at Risk Act*. The species is easily confused with Emerald Shiner (*Notropis atherinoides*) and Rosyface Shiner (*Notropis rubellus*), but can be distinguished by a dorsal fin that originates within the pelvic fin base (shown below), and two black crescents that can sometimes be seen between the nostrils in adults.



The Silver Shiner occupies runs with moderate current and can be found near a variety of substrates ranging from sand to bedrock. The species is exciting to watch as individuals frequently rise to the surface to feed on a wide range of drifting terrestrial and aquatic invertebrates. Exploitation of terrestrial invertebrates appears to vary spatially and seasonally. Spawning occurs within the spring but has yet to be observed within most Canadian populations.



Maximum Age: 3-5 years

Ontario Record: 14.4 cm

The E.J. Crossman Award: Looking Back and Reconnecting with Awardees

By Warren Dunlop

Fifteen years have passed since the inaugural E.J. Crossman Award was presented in 2004, and it seems like a good time to take a look back.

When Dr. Edwin J. Crossman [passed away suddenly](#) in December of 2003, it shocked and saddened fisheries people across Canada. In remembrance of Dr. Crossman (pictured to the right), the Ontario Chapter of the American Fisheries Society (AFS-OC) created the [E.J. Crossman Award for the Best Student Oral Presentation](#) at the Annual General Meeting & Conference.

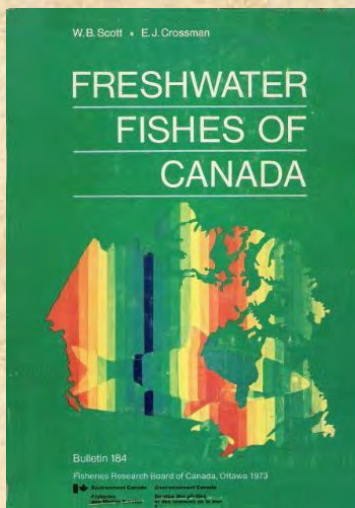
The award is intended to encourage participation at an American Fisheries Society (AFS) event. Eligibility for the award is open to graduate or undergraduate students enrolled at a university or college. The award includes financial travel support to attend a scientific meeting, a one-year student membership to the AFS and the AFS-OC, and a copy of [Scott and Crossman's Freshwater Fishes of Canada](#).

The Award has been presented fourteen times over the years, usually at the AGM. In 2008, the year that Ontario hosted the AFS Parent Society meeting in Ottawa, the award was presented at a special [E.J. Crossman Award Symposium](#). No award was presented in 2009, when the AFS-OC held a joint annual meeting with the Wisconsin and Minnesota Chapters in Duluth, Minnesota. Likewise, there was no award in 2014 when the AFS-OC AGM was held in conjunction with the AFS Parent Society meeting in Quebec City.

As someone who has been recruited to help judge student presentations at the AGM, I can attest to the high quality of the presentations and enthusiasm of the presenters. The final decision is never an easy one.

I thought it would be interesting to try to reconnect with awardees to find out where they are now, what they are up to, and what motivates them. I also wanted to hear their perspectives on the AFS-OC, the Crossman Award, and any lessons they've learned as they've navigated their career paths. I hope you will find their stories interesting and informative (I certainly have!); and I hope current students and early career professionals will perhaps find some guidance as they figure out their own paths.

This will be the first of two or three articles that profile the E.J. Crossman Award winners.



Dr. Dave Zanatta – E.J. Crossman Award Winner 2006

“Freshwater mussels are defined as “fish” [in the Canadian [Fisheries Act](#)] ... so I thought I would shake things up” says Dr. Dave Zanatta, Professor of Biology at Central Michigan University (CMU), in explaining what motivated him to present at the 2006 AFS-OC AGM.

And shake things up, he did! Dave’s presentation “*Evolution of active host-attraction strategies in the freshwater mussel tribe Lampsilini (Bivalvia: Unionidae)*” was awarded the best student oral presentation that year. Dave was enrolled in the Ph.D. program at the University of Toronto at the time, and considers it an honour to have presented and win the award.. He still uses the copy of Scott and Crossman that he received as part of the award.

Prior to undertaking his Ph.D. studies, Dave completed a B.Sc. degree at Laurentian University in Sudbury, and M.Sc. at the University of Guelph. After completing his Ph.D. in the fall of 2007, Dave had a brief NSERC-sponsored postdoc with Dr. Chris Wilson at Trent/OMNRF. In August 2008 he started a Tenure Track position in the Department of Biology, Institute for Great Lakes Research at CMU in Mount Pleasant, Michigan where he still is today.

At CMU, Dave conducts research on the ecology, evolution, population genetics, and conservation of freshwater mussels. This is not much different from what he was doing when he presented at the AFS-OC meeting. He teaches a variety of classes at CMU including: biodiversity, evolution, and invertebrate biology while mentoring numerous graduate and undergraduate students in research. He still manages to get into the field from time to time.

Dave is a member of the [Committee on the Status of Endangered Wildlife in Canada \(COSEWIC\)](#) Mollusc Sub-committee, and has authored or co-authored several freshwater mussel COSEWIC Status Reports dating back to his student days. He also contributes to species at risk management and research in Canada as a Principle Investigator with the recently formed [Canadian Freshwater Species at Risk Research Network](#).

“Biodiversity and protecting it still motivates me to seek funding, do research, publish, and mentor the next generation of scientists and global citizens”, says Dave.

Over the course of his career, Dave has learned that networking is critical. As a mentor, he encourages his students to meet people and create a network with which they are comfortable. He feels that students should attend meetings and publish their work in order to communicate their research.

With respect to his own career, Dave considers his Ph.D. advisor Dr. Bob Murphy (ROM / U of T), his M.Sc. advisor Dr. Gerry Mackie (U of Guelph), Janice Metcalfe-Smith (Environment Canada), Dr. Chris Wilson (OMNRF), and Dr. Nick Mandrak (U of T-Scarborough) among his most important mentors.

In addition to science in general, freshwater, and immersing himself in a river to search for mussels, Dave’s other loves include his wife Dr. Daelyn Woolnough, who is also a mussel biologist, their 7 year old son, travel, good food, good beer, baseball, football, and model railroading.

To-date, Dave remains the only malacologist to win the Crossman Award! You can find out more about Dr. Zanatta’s research activities by checking out his [CMU Lab Website](#) or by following him on [Twitter](#).



Mr. Zachery Wells – E.J. Crossman Award Winner 2016

“My experience with AFS-OC and the E.J. Crossman Award has had an obvious impact on my career in that it quite literally got me my first job”, says Zachery Wells, the 2016 Award winner, “there’s a little luck in everything.”

Zach completed his B.Sc. (Honours) in Biology at Queen's University, prior to receiving his M.Sc. in Fisheries Biology in the [Fraser Lab at Concordia University](#). Zach’s award winning presentation was based on his M.Sc. research and titled: “Investigating the effects of population size, divergence, and stress on outbreeding in fragmented populations of *Salvelinus fontinalis*”.

During the first year of his M.Sc., Zach had no idea what he wanted to do for a living. After meeting various consultants at the AFS-OC AGM, however, he began to think more about that line of work. He was working at a brewery after finishing up his graduate studies and was fortunate enough to have one of those consulting contacts put his name forth for a job with their firm.

Zach attended that first AGM because he loves public speaking, and also knew that you have to make yourself known if you want to land a career in the fisheries or environmental sector. Also, he will take any excuse to meet up with a group of enthusiastic and like-minded people, and encourages current students to do the same.

He stresses that students should talk to as many people as they can, but that doesn’t mean they have to engage in a scientific discussion. Zach points out that people are usually very happy to talk about themselves and give their advice on career opportunities. So his advice: start chatting about your drive up to the meeting with someone during a coffee break; sit with new people during supper; grab a beer and sit down with someone who you think has a career you’re interested in – the social night is a great time for that.

“Mentors are the key to a successful career”, according to Zach. For him, three important mentors have been [Kim LeBrun](#), [Kristen Harrison](#) and [Ann Rocchi](#). He says they have a wealth of knowledge when it comes to anything in his chosen field, and he thanks them very much for being there for him.

Zach and his wife live in Kingston where, for the past two years, he has been an environmental scientist and, for the past year, a partner at the transportation engineering firm, [BT Engineering Inc \(BTE\)](#). He is responsible for the natural environment components of Environmental Assessments and obtains all of the environmental permits. Day to day, he tends to be on various construction sites providing environmental inspection services for various municipal and provincial proponents. Proposal writing and completion of various environmental reports and deliverables keeps him busy otherwise. The extensive public and stakeholder consultation involved in moving forward with a project keeps him interested and excited about his work.

Zach maintains that “speaking with those outside of the construction bubble keeps your mind on the bigger picture.” Through those consultations he’s also learned that there will always be conflict, and that doesn’t mean that you’re doing a bad job. “There are often competing agendas at play, and neither are entirely correct or incorrect.”

Outside work, Zach is currently serving as Vice-President on the AFS-OC ExComm, enjoys playing ultimate frisbee, and maintains a healthy knowledge of the various craft beers available throughout southern Ontario. You can connect with him via [LinkedIn](#), [Twitter](#), or [Instagram](#), where he posts photos of the craft beers he discovers on his travels, oh... and photos of field work.



Dr. Sean Landsman – E.J. Crossman Award Winner 2010

Sean Landsman recently started as a full-time Instructor in Carleton University's new [Interdisciplinary Science and Practice \(ISAP\) program](#). His day-to-day activities involve a mixture of lesson planning, fielding student questions on assignments and course content, and grading. As this is his first semester in the position, he's also spending time planning for future courses and working with his colleagues to promote their new program. In addition to his teaching duties, he is occasionally involved in research, does some freelance writing, and provides various clients with photography services.

When asked if his path to this position was direct or indirect, Sean says it was neither; it was "more of a meander".



Sean was enrolled at Carleton working on his M.Sc. when he won the E.J. Crossman Award in 2010 for his presentation "*The Effects of Catch-and-Release Angling for Muskellunge*". Following his M.Sc., he took a two year break and then pursued a Ph.D. at the University of Prince Edward Island (UPEI) from 2013-2018. There he took on some teaching duties and after finishing his PhD in 2018, he remained at UPEI in a term Assistant Professor position, primarily focussed on teaching.

With no obvious permanent path forward in PEI, Sean turned to environmental consulting as a potential permanent career path. He followed his wife, Sarah McConnachie, to Vancouver Island where she had recently taken a job with Fisheries and Oceans Canada (DFO). There, he accepted an offer from [LGL Environmental Research Associates](#) in Sidney, BC.

Sean notes that "life moves in strange directions" and after a couple of months, he was in his current position at Carleton – meandering back to where his post-graduate studies had started. Sean says that this most recent move made the most sense for him, his wife, and their respective families. Having gone from PEI to Victoria to Ottawa in the span of 3 months, Sean knows far more about cross country moving than he ever thought he would, and, if you need it, has lots of advice to give!

Looking back, Sean saw the AFS-OC AGM as a chance to meet other "fish-heads" and potentially network with folks for future jobs. Newly arrived in the Ottawa area from Illinois, he didn't know many Ontario people outside of his lab group (with [Dr. Steven Cooke](#)). Also, at the time, he couldn't get enough of ice-fishing and the scheduled extra-curricular activity may have played a role in his attendance!

Receiving the E.J. Crossman Award was Sean's first experience that affirmed his talent for communicating science. It encouraged him to continue presenting at conferences and at outreach events. It also meant a tremendous amount to him personally, as he had named his M.Sc. project "[Project Noble Beast](#)", incorporating the phrase that Dr. Crossman coined to refer to the Muskellunge, both Sean and E.J.'s focal species.

Sean says it took him a long time to come to the realization that the traditional professorship stream is not the only worthy career path, but once he did he was much happier. He thinks students sometimes lose sight of the fact that there's so much you can do with a college diploma or university degree. Involvement in organizations like AFS-OC can show students these options. Sean recommends that you follow your passion, try to weave your interests together to mold your ideal career, and above all, find a good work-life balance.

Sean feels mentorship played an important role on his career journey. His earliest mentor, in high school, bent over backward to provide him with opportunities that would eventually propel him into his career. This has been a recurring theme with at least three other mentors since.

These experiences are not lost on Sean and he actively tries to emulate his mentors when working with students. Responding to student reference requests, cultivating their emerging talents as scientists or communicators, or just lending an ear when needed are ways he tries to be a person to whom they can turn.

When not in the classroom, Sean is often engaged in underwater photography of freshwater fishes.

You can connect with Dr. Landsman via [his photography website](#), [Instagram](#), or [Twitter](#).

Crossman Award Winners — *cont.***Ms. Andrea Reid – E.J. Crossman Award Winner 2019**

Andrea Reid is the most recent E.J. Crossman Award winner and a Ph.D. Candidate in the Department of Biology at Carleton University, focussing on Indigenous fisheries science. Her Ph.D. thesis is entitled “Fish-People-Place: Interweaving Knowledges to Elucidate Pacific Salmon Fate.” She is extremely passionate about her area of study. And for good reason. Her family hails from the Nisga’a First Nation on the BC-Alaska border, and while she didn’t grow up in the Nisga’a community or culture, she was raised on Prince Edward Island, surrounded by ocean and other fish-centric communities.

“I grew up with fish and water in my blood so to speak”, says Andrea “and through my scientific pursuits, I’ve been able to reconnect with my Nisga’a culture and I now centre this community at the heart of my work.”

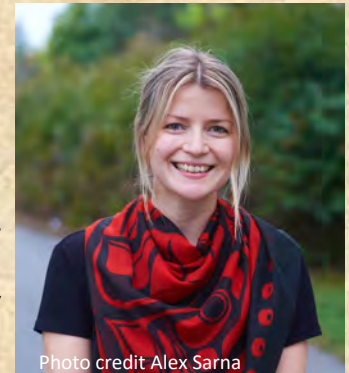


Photo credit Alex Sarna

Andrea became aware of AFS-OC when she first moved to Ontario to join Dr. Steven Cooke’s [Fish Ecology and Conservation Physiology Laboratory](#) at Carleton University. There was a strong culture of attending the AFS-OC AGM annually and some of her lab-mates played active roles in its organization. She was especially keen to attend in 2019 given the theme of “Sustainable Development and Fisheries, can the two co-exist?” and Gary Pritchard’s workshop on [“Maamwi naakii dad - working together”](#), both of which align closely with her research interests and activities.

Between degrees, Andrea took some time to ensure she was continuing along the right path. She is affiliated with the National Geographic Society, and during each of those “breaks” she led expeditions in distant locations from East Africa to the South Pacific. The time spent travelling, trying new things, and experiencing different cultures gave her confidence about each decision she made along her career path. Andrea found both her attendance at the AGM and receiving the E.J. Crossman Award very positive experiences, which left her feeling that she is very much on the right path.

“It means a great deal to me to see such positive reception of Indigenous paradigms and ways of knowing at an academic conference.”

Andrea counts mentorship as being critical throughout her academic career. Her first mentor, Dr. Colin Chapman at McGill University, first turned her head to ecological research as a career option. Since then, she feels that a string of important academic mentors in the aquatic sciences have made her the interdisciplinary aquatic scientist she is today: Dr. Lauren Chapman (McGill University), Dr. Tony Ricciardi (McGill University), Dr. Scott Hinch (University of British Columbia), Dr. Nathan Young (University of Ottawa) and Dr. Steven Cooke (Carleton University). She has also benefitted from strong non-academic mentorship: Ms. Corinne McKay (Secretary-Treasurer of the Nisga’a Nation), and Mr. Richard Alexander (Senior Fisheries Biologist, LGL Limited). She has also been guided and mentored by many Elders from Indigenous nations on the East and West coasts - to which she is extremely grateful for the knowledge, care, and support they have imparted on her.

In addition to her studies, Andrea is truly passionate about youth outreach. She leads science camps for youth in her Nation every summer (view a [short video summary](#)). She also recently co-launched [Riparia](#), a not-for-profit (and soon to be charity) that connects youth and science on the water. Their inaugural expedition in August 2019 was highly successful; providing youth who otherwise wouldn’t have access to such opportunities the chance to learn about freshwater systems through week-long canoe-camping trips.

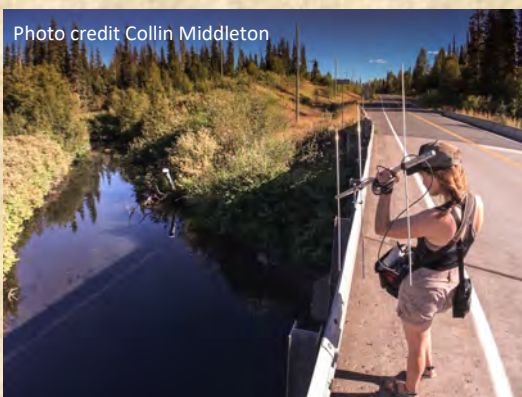


Photo credit Collin Middleton

When asked about the most important lessons she’s learned so far, Andrea cites the poem [“Unsolicited Advice”](#) by María E. Fernández-Giménez as summing it up perfectly.

In the autumn of 2020, Andrea will be relocating to Vancouver to take up an Assistant Professorship of Indigenous Fisheries at the [Institute for the Oceans and Fisheries](#), University of British Columbia. She is grateful to all who have guided her in her career, and hopes she can pay forward what they have given to her in confidence, direction, and support to her future students and mentees.

You can connect with Andrea via [Email](#), [Twitter](#), [Instagram](#), [Facebook](#), or her [Website](#).

Dr. William (Bill) Glass – E.J. Crossman Award Winner 2012

Bill Glass initially joined AFS-OC and attended his first conference looking for a networking opportunity. He also wanted a chance to reach an audience that would potentially find his research applicable to their work managing Ontario's fish and fisheries.

That first AFS-OC meeting turned out to be a great mix of students and professionals, including people from various sectors such as: research, government agencies, and consulting companies. That isn't always the case at other conferences Bill attends, which can tend to be narrower in scope; usually either mostly academic, or mostly fisheries management focussed. The AFS-OC meeting provided an opportunity to meet a diverse group who shared similar interests.

Essex County was where Bill grew up and gained a love of the outdoors and fishing, spending many days on Lake St. Clair, the Detroit River, and Lake Erie chasing Walleye, Yellow Perch, and just about anything else he could catch. He remained in Essex County to undertake his Ph.D. studies at the University of Windsor. It was during that time that Bill won the Crossman Award. His presentation was titled "*Novel molecular phylogeny of the Lepisosteidae and identification of specimens of unknown origin*". Much of his work focussed on [Spotted Gar](#) (*Lepisosteus oculatus*).

Bill is currently a Senior Biologist with the Fisheries and Oceans Canada (DFO) [Fish and Fish Habitat Protection Program](#) in the Burlington office. There, he supervises a small team of biologists whose role is to handle reports of potential Fisheries Act violations. The team determines the impacts of potential violations through site visits, assessments of habitat sensitivity, and the impact of the works. They work closely with DFO fishery officers to ensure that any restoration orders are followed, as well as making recommendations and providing expert witness reports for potential [charges under the Act](#).

Bill's career path to this position was fairly direct. Following completion of his Ph.D. research (where he was co-supervised by a DFO scientist), he went on to do a three year Post-Doctoral Visiting Fellowship with DFO, working with Species at Risk Science. After that, he was successful getting a biologist position with the Department, subsequently moving up to his current position.

"In addition to learning science, developing communication skills (both written and oral) is extremely important for career development", says Bill. "Being able to write in a clear and concise manner as well as interacting and talking about your work with people of varying degrees of subject knowledge is a great asset."

Mentorship can also play a key role in career development and Bill identifies two great mentors who helped him along the way: [Dr. Nicholas \(Nick\) Mandrak](#) and [Dr. Lynda Corkum](#). He credits them with not only teaching him a lot of important skills but also exposing him to great opportunities which led him to where he is today.



Bill served as AFS-OC President in 2017-18 and continues to be an active member of the Chapter, attending several AGMs since he won the Crossman Award. He still very much enjoys outdoor activities like fishing, hunting, canoeing, hiking, and photography; he especially enjoys sharing those activities with his wife Krista and daughter Kallie.

You can connect with Dr. Glass via his [work email](#).

Series: Fish Species Complexity — Highlighting Diversity in Ontario

Ontario's only asexual clonal fish hybrid

Kathryn Peiman | Ontario Federation of Anglers and Hunters

There are few vertebrate species that reproduce without sex. Asexual reproduction has evolved a mere 90 times in all the vertebrate lineages¹. These unisexual (almost always female) clonal hybrids reproduce by either parthenogenesis, hybridogenesis, or gynogenesis. Parthenogenesis does not require any male sperm to stimulate development; this reproductive strategy has evolved in snakes and lizards but is extremely rare in amphibians or fishes². Generally, asexual amphibians and fishes are dependent on the sperm from one of the sexual-reproducing parental species to reproduce. In hybridogenesis, the female genome is retained intact while the male genome is discarded every generation, while in gynogenesis, the sperm is necessary to stimulate egg development, but it does not contribute genes to the offspring³.

In Ontario, although many species of fish are known to hybridize, there is only one hybrid that reproduces by gynogenesis, thereby resulting in clonal, usually all female, offspring⁴. Male Northern Redbelly Dace (*Chrosomus eos*) and female Finescale Dace (*C. neogaeus*) have produced asexual hybrid lineages over much of their range⁵. Although hybrids were noted as early as 1929, the first study was only conducted in 1956⁶, and hybrids have continued to be misidentified since then. For example, a survey of Algonquin Park in 1991 did not record any hybrids, while a re-examination of those speci-

mens found that 41 of 143 lakes with at least one parental species also contained hybrids³. However, there is no evidence of current hybridization; rather, there are at least 14 hybrid lineages that are all approximately 50,000 years

old, suggesting that hybridization occurred in the Mississippi refuge during the Pleistocene⁵. Hybrids are found across the area of range overlap for the two parental species, and now often exist in areas with only one of the parental species (usually *C. eos* is present and *C. neogaeus* is absent)⁵.

Hybrid *C. eos-neogaeus* reproduction often has more complicated elements than most gynogenetic species. Though gynogenesis is their main type of reproduction producing hybrids (resulting in 'gynogens'), there are multiple other biotypes of hybrids that can form. When syngamy (cell fusion) between *C. eos* sperm and diploid hybrid eggs occurs, either triploids, with an extra set of chromosomes from one parental species, or mosaics, with variable proportions of diploid and triploid cells, are formed^{4,7,8}. Another biotype is produced when haploid *C. eos* eggs are fertilized by *C. eos* to produce individuals with a nuclear *C. eos* and a mitochondrial *P. neogaeus* genome^{7,8}. These



Figure 1. Top: *Chrosomus eos*; bottom: *C. neogaeus*. ©2019 Regents of the University of Michigan.

are termed cybrids, are morphologically identical to *C. eos*, reproduce sexually, and can act as the sperm donor to other biotypes^{3,9}. Though diploid and triploid offspring are not uncommon in gynogenetic species, *C. eos-neogaeus* has a much higher level of syngamy than other gynogenetic species; can produce diploid-triploid mosaic offspring which are extremely rare in other gynogenetic species; and depending on the biotype can exhibit both gynogenetic (in diploid and some mosaic individuals) and nonclonal (in triploid and some mosaic individuals) reproduction¹⁰. Additionally, recent evidence shows that cybrids, which were previously assumed to be uncommon, have actually replaced pure *C. eos* across much of their northern range, including some locations in Ontario⁹.

Sex is costly. It requires two individuals, and each only pass on half their genes. Therefore, asexual gynogenetic hybrids should outcompete their parental sperm-

Ontario's hybrid fish — cont.

donor species, leading to the extinction of both. So why do these complexes persist?

Though sex is costly, it also has benefits. The most obvious is that through genetic recombination, you can get different combinations of genes in offspring that are more suited for a particular environment, thus leading to evolution by natural selection. Genetic diversity in asexual species cannot come from genetic recombination as this no longer happens after the lineage arises. There are limited other ways genetic diversity may arise in asexual species. Across lineages, there is diversity when they arise from multiple hybridization events, but lineages don't combine and so this does not produce diversity within a lineage. Mutation is thus typically the only source of genetic diversity within an asexual lineage, sometimes leading to subclonal lineages¹¹. One advantage to sex is that some mutations are harmful, and sexual reproduction can reduce their accumulation¹².

For sexual and asexual species to coexist, they should reduce competition, and have stable or variable male mate preferences¹³. To reduce competition, some gynogenetic hybrids may have a general-purpose genotype, which would explain why they have colonized heterogeneous habitats without having the advantage of genetic recombination and adaptation⁵. For *C. eos-neogaeus*, this hypothesis is supported by several studies: in Algonquin Park, the two parental species occupy lakes that differ in physiochemical characteristics, while the hybrids show no such pattern³; these hybrids can tolerate lower oxygen concentrations than the parental species¹⁴; and the hybrids have

an intermediate dietary niche¹⁵. The cybrid biotype may provide an additional advantage for *C. eos-neogaeus*: the *C. neogaeus* mitochondrial genome is more cold-adapted than the *C. eos* genome, leading to a selective advantage for cybrids over pure *C. eos* in northern lakes⁹. Alternatively, hybrids may pay a performance cost, as *C. eos-neogaeus* are poorer swimmers than the parental species¹⁶. Stable mate preference occurs when the males of the donor species prefer to mate with conspecific females over hybrid females at an intermediate level – too strong a liking for conspecifics, and the asexual lineage goes extinct; too strong a liking for heterospecifics, and the sexual species goes extinct¹³. Alternatively, variation in male mate preference (i.e. frequency-dependent selection) can allow coexistence when males become more picky as asexuals become more common, or if pickier males pay a higher cost¹³.

The long-term persistence (~50,000 years) of *C. eos-neogaeus* demonstrates that asexual reproduction can be stable across space and time, and is not an evolutionary dead-end. The cryptic replacement of pure *C. eos* by cybrids is a good reminder to collect voucher specimens when possible, and to thoroughly search the existing literature for possible anomalies in your study species.

1: Dawley RM, Bogart JP, editors. (1989) Evolution and Ecology of Unisexual Vertebrates. Albany, New York: New York State Education Department. 302 p

2: Neaves WB, Baumann P. (2011) Unisexual reproduction among vertebrates. Trends in Genetics 27(3):81-88

3: Mee JA, Rowe L. (2010) Distribution of *Phoxinus eos*, *Phoxinus neogaeus*, and their asexually-reproducing hybrids (Pisces: Cyprinidae) in Algonquin Provincial Park, Ontario. PLoS ONE 5(10):e13185

4: Goddard KA, Megwinoff O, Wessner LL,

Giaimo F. (1998) Confirmation of gynogenesis in *Phoxinus eos-neogaeus* (Pisces: Cyprinidae). Journal of Heredity 89:151-157

5: Angers B, Schlosser IJ. (2007) The origin of *Phoxinus eos-neogaeus* unisexual hybrids. Molecular Ecology 16:4562-4571

6: New JG. (1962) Hybridization between two cyprinids, *Chrosomus eos* and *Chrosomus neogaeus*. Copeia 1962(1):147-152

7: Dawley RM, Schultz RJ, Goddard KA. (1987) Clonal reproduction and polyploidy in unisexual hybrids of *Phoxinus eos* and *Phoxinus neogaeus* (Pisces; Cyprinidae). Copeia 1987(2): 275-283

8: Goddard KA, Schultz RJ. (1993) Aclonal reproduction by polyploid members of the clonal hybrid species *Phoxinus eos-neogaeus* (Cyprinidae). Copeia 1993(3):650-660

9: Mee JA, Taylor EB. (2012) The cybrid invasion: widespread postglacial dispersal by *Phoxinus* (Pisces: Cyprinidae) cytoplasmic hybrids. Canadian Journal of Zoology 90 (5):577-584

10: Goddard KA, Dawley RM. 1990. Clonal inheritance of a diploid nuclear genome by a hybrid freshwater minnow (*Phoxinus eos* × *neogaeus*, Pisces: Cyprinidae). Evolution 44 (4):1052-1065

11: Angus RA, Schultz RJ. 1979. Clonal diversity in the unisexual fish *Poeciliopsis monacha-lucida*: a tissue graft analysis. Evolution 33 (1):27-40

12: Neiman M, Hehman G, Miller JT, Logsdon JM Jr, Taylor DR. (2009). Accelerated mutation accumulation in asexual lineages of a freshwater snail. Molecular Biology and Evolution 27(4): 954-963

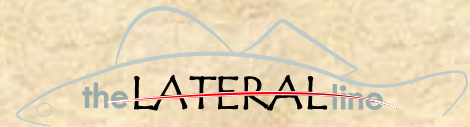
13: Mee JA, Otto SP. (2010) Variation in the strength of male mate choice allows long-term coexistence of sperm-dependent asexuals and their sexual hosts. Evolution 64 (10):2808-2819

14: Schlosser IJ, Doeringsfeld MR, Elder JF, Arzayus LF. (1998) Niche relationships of clonal and sexual fish in a heterogeneous landscape. Ecology 79 953-968

15: Mee JA, Noddin F, Hanisch JR, Tonn WM, Paszkowski CA. (2013). Diets of sexual and sperm-dependent asexual dace (*Chrosomus* spp.): relevance to niche differentiation and mate choice hypotheses for coexistence. Oikos, 122(7):998-1008

16: Mee JA, Brauner CJ, Taylor EB. 2011. Repeat swimming performance and its implications for inferring the relative fitness of asexual hybrid dace (Pisces: Phoxinus) and their sexually reproducing parental species. Physiological and Biochemical Zoology 84(3):306-315

Tubenose Goby in Lake Ontario



By Lake Ontario Prey Fish Technical Committee (MNRF, NYSDEC, USGS)

Freshwater Tubenose Goby (*Proterorhinus semilunaris*) were first reported in the Upper St. Lawrence River near Kingston in 2011. Since that detection through 2018, there hadn't been any additional detections during the Assessment Program (over 700 bottom trawls throughout Lake Ontario, with the majority focused on the Bay of Quinte and the Kingston Basin).



Since 2016, the Ontario Ministry of Natural Resources and Forestry (MNRF) Lake Ontario Management Unit (LOMU) has conducted a spring bottom trawl survey in partnership with the New York State Department of Environmental Conservation (NYSDEC) and the United States Geological Survey (USGS). Prior to 2016, the survey had been conducted in US waters only since 1978. The current survey regularly exceeds 200 bottom trawl tows throughout the main basin of Lake Ontario and many of the embayments including throughout the Bay of Quinte. Since 2016, MNRF-LOMU spring trawling has included a long term summer index site in the lower Bay of Quinte near Conway. In 2018, an effort was made in the spring to expand the number of sites throughout the Bay of Quinte by including sites not trawled since the 1970s as well as experimentally seeking new sites. The inclusion of these additional sites resulted in a much greater species diversity than observed at the single Conway site.

In 2019, a single Tubenose Goby was captured at one of the new trawl sites (April 8, 2019, 31m bottom depth). The specimen was 66 mm in total length and weighed 2.3 g. The specimen was preserved and species identification verified by Royal Ontario Museum (ROM) staff. In addition to the Tubenose Goby, 13 other species were captured in the same tow. The most abundant were Walleye (N = 40), Trout-Perch (N=20) and Round Goby (N = 9).

Details of the trawl program and other assessment activities can be found at the following links:

2019 Spring Trawl Alewife Report - http://www.glfco.org/pubs/lake_committees/ontario/2019_preliminary_status_of_Lake_Ontario_Alewife.pdf

MNRF-LOMU Annual Reports - http://www.glfco.org/loc_mgmt_unit/

NYSDEC Annual Reports - <https://www.dec.ny.gov/outdoor/27068.html>

USGS NAS database - <https://nas.er.usgs.gov/SightingReport.aspx>

Book Review



By Brent Tegler

The Marsh Builders: The Fight for Clean Water, Wetlands, and Wildlife by Sharon Levy. 2018. Oxford University Press. 248 pages, 39.95 CAD, Cloth. Also available as an E-book .

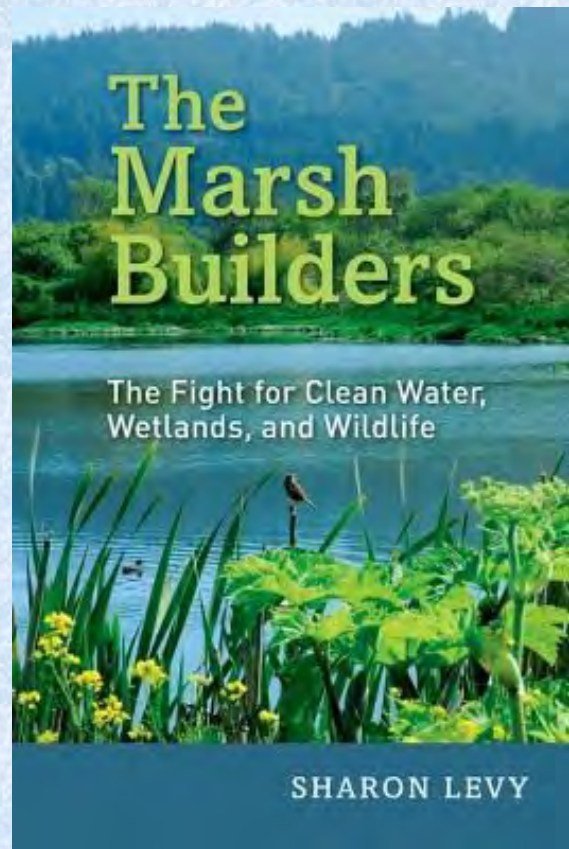
Reproduced with permission of the Ottawa Field-Naturalists' Club. This review was originally published as: Tegler, B. 2019. "The Marsh Builders: The Fight for Clean Water, Wetlands, and Wildlife" by Sharon Levy, 2018 (Book Review). *The Canadian Field-Naturalist*, 132(3), 309-310. DOI: <http://dx.doi.org/10.22621/cfn.v132i3.2265>

The Marsh Builders, a book about constructed wetlands? Well not exactly, but that appears to be what inspired Sharon Levy to embark on this historical account of human waste, wetland destruction, and the United States' *Clean Water Act* (CWA). The actual "marsh building" doesn't start until around halfway through the book!

Humanity's relationship with the environment has changed dramatically over the past 200 years. We all know this, but to write a book that documents our history from the perspective of human waste, wetlands, and water pollution is unique. Levy has obviously done extensive research; in fact, there is an extensive list of numbered references at the end of each chapter. As a result, the book provides an insightful and vivid account of the science and politics of dealing with a very real problem — what to do with human waste as cities like London and Berlin develop with populations of over a million people and growing. Piping waste to the nearest watercourse is fine, until your neighbours downstream become ill. The book draws the reader in with the first chapter, "Cholera's Frontiers", set in London, England,

around 1850.

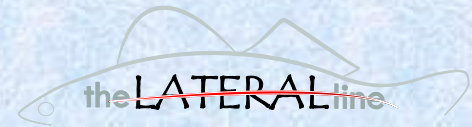
Chapters 2 and 3, "The Tides of Change" and "The Microbe Solution", document our evolving understanding of disease and its link to human waste. Initially disease was thought to arise from miasma, or the stench of human waste, but new tools, such as the microscope, and scientific approaches to treating human waste, such as the activated sludge process discovered in 1914, began to inform the politics of urban planning. Elected officials, then as now, were responsible for public wellbeing and working with limited funds and the best knowledge of the day, approved infrastructure projects to deal with human waste. The CWA created in 1971 transferred authority over sewage and industrial effluent regulation from individual states to the federal Environmental Protection Agency (EPA), mandating "a wildly idealistic goal that all such discharges into US waters should cease by 1985" (p. 75). To this day, individuals living in cities simply flush the toilet and turn on the tap for clean water, with little thought of



the long and continuing struggle to make this system work. Herein lies the heart of *The Marsh Builders*, the tension between science, politics, and human waste.

Chapter 6 describes "Fighting the Big Machine" — aka the Humboldt Bay Wastewater Authority (HBWA) — versus the small-town politics, petitions, committees, and legal battles that delayed conventional approaches to wastewater treatment long enough for a treatment alternative to emerge that would be replicated around the world. Levy gives a detailed account of the small, feisty town of Arcata, located on the Pacific coast of northern California, and its fight with the HBWA. It's a classic story of David fighting Goliath: big

Book Review: *The Marsh Builders* — cont.



government with federal funding intended to build a sewage treatment megaproject connecting small towns with a pipe running under Arcata Bay to a regional treatment plant on Humboldt Bay. Each town along the route was expected to join the project, including making enormous, sometimes bankrupting, financial contributions to building and maintaining the infrastructure.

Arcata had a different vision for wastewater treatment: a low cost, low energy, local solution using open surface water wetlands that would meet CWA guidelines, create wildlife habitat, and improve the ecology of Humboldt Bay. However, this had never been done before and few believed it would work. It was a fight against the bureaucratic and engineering status quo, and Arcata won in the end. But with the wetlands now almost 40 years old and losing their capacity to treat the ever-increasing volume of sewage, Arcata once again finds itself up against an “engineered” solution versus the original treatment wetlands now rich in native biodiversity.

As an ecologist, it is painful to read Chapter 7, “The United States of Vanished Wetlands”, that documents the once great bounty and biodiversity of coastal and inland wetlands in America that were demonized for health reasons, hated because they could not be traversed, and deemed unproductive until drained. *The Marsh Builders* details what early colonizers faced in America and describes how society’s perception of wetlands, disease, and pollution have

changed over time. The once Great Black Swamp, a wetland over 4000 km² in size, was a major impediment for people moving westward and seen as a breeding zone for mosquitos until it was drained and converted to farmland. Today, flooding and non-point sources of agricultural pollution causing toxic algal blooms in rivers and lakes have society revisiting their relationship with the Black Swamp, with calls to return 10% of the landscape to wetland.

The Marsh Builders also documents the introduction and rise of new exotic diseases associated with wetlands, such as malaria and yellow fever, which were brought to America with colonization. When science identified mosquitos as the insect vector for these diseases, government in its bid to protect citizens institutionalized the draining of wetlands and in the 1940s promoted the use of organochlorine pesticides such as DDT. Few drained wetlands are restored today, but fortunately where habitat is available wildlife is recovering following a ban on the use of DDT in 1972.

The last chapter of the book, “The Fight This Time”, highlights the fact that, while it is well known that nonpoint sources of pollution (mainly from agriculture) cause over 75% of rivers and lakes to fail water quality standards, the CWA exempts farmers from their standards. And the momentum building in the EPA to regulate non-point sources of pollution has been derailed by Scott Pruitt, appointed by President Trump to head the EPA.

While writing this review, I learned that Pruitt resigned as head of the EPA in December 2018. He will be replaced by Andrew Wheeler, a former coal lobbyist, dramatically highlighting the continuing saga of the tension between science, politics, and the world we choose to live in. *The Marsh Builders* is probably not the best title for the book, but that shouldn’t stop you from reading this excellent account of our relationship with water and wetlands over the past 200 years by veteran science journalist Sharon Levy.



The Ontario Freshwater Fishes Life History Database is a fully searchable database for all Ontario and adjacent Great Lakes freshwater fishes including introduced, extirpated and extinct species. It contains current information pertaining to life history, habitat, size and age, distribution, conservation status, ecological value, reproduction and nomenclature for 154 species, 3 subspecies and 2 established hybrids. The website also includes photographs, range maps, notes, Ontario record lengths and weights, information sources, glossary of terms and related web links.

Visit <http://www.ontariofishes.ca>.

People in the Field



Above: Bill Gardner and Lisa O'Connor insert an acoustic tag into American Eel, Bay of Quinte.

Right: Students Jed Moore and Samantha Ramirez about to start processing a Lake Sturgeon in Goulais Bay, Lake Superior.

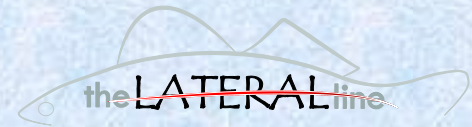


Above: Jessica Desforges releases a Lake Sturgeon captured in the Batchawana River, June 2019.

We're Social!

Want to keep up-to-date on the latest news and goings-on from your Chapter members? Follow us on Facebook, Twitter (@[afs_oc](#)) and now Instagram (@[afs_ontariochapter](#)). You can tag the group and we'll reshare the story on the chapter account. Or, you can also send pictures and descriptions of your activities, and we'll post directly (social-media@afs-oc.org). This is a way to share fun and educational tidbits so that we can learn more from each other.

Book Review



From Catastrophe to Recovery: Stories of Fishery Management Success

Edited by Charles C. Krueger, William W. Taylor, and So-Jung Youn.

The book can be purchased from the AFS bookstore: <https://fisheries.org/bookstore/all-titles/professional-and-trade/55080c/>

Often in the public media and the fisheries profession, only the cases where fisheries diminishing or have collapsed are the ones to gain recognition and notoriety. Unfortunately, this type of recognition highlights a failure to properly manage the world's valuable fisheries and aquatic resources and thus leads to the perception that fisheries professionals are unable properly manage these resources. Much less frequently, cases of restoration, recovery, and sustainable management practices are heralded as the success stories of our profession and allied disciplines. In these case, our abilities as scientists, policymakers, and managers have made a genuine difference in maintaining and enhancing productive fisheries – these are the cases where our individual and collective knowledge and experience have succeeded! This book provides eyewitness “good news” accounts of true stories of successful fishery management in action that have resulted in bringing fish populations from the brink of extinction to full recovery with viable naturally reproducing, self-sustaining, and productive populations. The text provides incontrovertible evidence that good things can indeed happen with well- thought out and implemented fish management programs, demonstrating that fishery professionals working together with their stakeholders can make a difference in restoring and maintaining fish and their habitats to productive levels.

Here are the abstracts of the four chapters with stories about the Laurentian Great Lakes:

Recovery of Saginaw Bay Walleye, Lake Huron (David G. Fielder and James P. Baker)

Saginaw Bay is a large cool water region of Lake Huron and Walleye is the apex predator. The fishery collapsed in the 1940s due to declining water quality, habitat degradation, and effects of invasive species. After clean water legislation in the 1970s and the closure of the commercial fishery, a new period of improvement was achieved. Walleye fingerling stocking was implemented and a recreational fishery emerged. Recovery plans sought to restore spawning habitat and improve survival of walleye fry by creating a predation barrier to the predatory effects of the invasive Alewife. A series of cascading food-web changes took place resulting in the sudden collapse of Alewives and Walleye natural reproduction surged beginning in 2003. Walleye stocking was discontinued and recovery targets were met in 2009. Key lessons learned include; (1) eliminating or reducing obstacles to reproduction such as habitat and water quality issues. (2) maintaining populations (via of stocking) to ensure brood fish are available when conditions improve; (3) ecosystems are resilient and will improve when released from stressors (4) great value exists in long-term data sets for guiding restoration; (5) resolve and commitment by natural resource professionals, administrators, and stakeholders is critical for sustaining restoration efforts.

FROM CATASTROPHE TO RECOVERY

STORIES OF
FISHERY
MANAGEMENT
SUCCESS



CHARLES C. KRUEGER, WILLIAM W. TAYLOR,
AND SO JUNG YOUN, EDITORS.

Back from the Brink: Sustainable Management of the Lake Erie Walleye Fishery (Christopher S. Vandergoot, Matthew D. Faust, James T. Francis, Donald W. Einhouse, Richard Drouin, Charles Murray, Roger L. Knight)

Intensive fishery exploitation during the 1950s combined with declining environmental conditions collapsed the Walleye stock during the early 1960s, but the fishery persisted at low levels until 1970 when the fishery was closed (1970-1972) due to elevated mercury concentrations in tissue samples. Lake Erie fishery managers recognized the need for a coordinated, multi-agency approach to protect this ecologically, economically, and socially important resource. In 1976, an inter-agency management framework was established, which relied on a coordinated, science-based management philosophy consisting of estimating safe harvest levels, performing applied safe harvest levels, performing applied research,

Book Review: From Catastrophe to Recovery — cont.



and conducting annual population assessments. Today, Lake Erie Walleye support one of the largest self-sustaining freshwater fisheries in North America. Lake Erie managers have iteratively adopted changes to their population assessment model and altered harvest policies to avoid future fishery and population collapses, and more than 40 years later, Lake Erie continues to support commercial and recreational fisheries lake wide. Through time, the resurgence of this fishery can be attributed to lessons learned from coordinated management efforts associated with conducting routine population assessments, using science-based research to address key uncertainties, adopting modern stock assessment approaches, incorporating stakeholder input into the quota setting process, and addressing environmental concerns collaboratively at the lake level.

Lake Ontario Deepwater Sculpin Recovery: An Unexpected Outcome of Ecosystem Change

(Brian C. Weidel, Michael J. Conner-ton, Maureen G. Walsh, Jeremy P. Holden, Kristen Holeck, Brian F. Lantry)

Fish population recoveries can result from ecosystem change in the absence of targeted restoration actions. In Lake Ontario, native Deepwater Sculpin *Myoxocephalus thompsonii* were common in the late 1800s, but by the mid-1900s the species was possibly extirpated. During this period, mineral nutrient inputs increased and piscivore abundance declined, which increased the abundance of the nonnative planktivores Alewife *Alosa pseudoharengus* and Rainbow Smelt *Osmerus mordax*. Deepwater Sculpin larvae are pelagic and vulnerable to predation by planktivores. Annual bottom trawl surveys did not capture Deepwater Sculpin from 1978 to 1995 ($n = 6,666$ tows) despite sampling appropriate habitat (trawl depths: 7–170 m). The absence of observations during this time resulted in an elevated conser-

vation status for the species, but no restoration actions were initiated. In 1996, three individuals were caught in bottom trawls, the first observed since 1972. Since then, their abundance has increased, and in 2017, they were the second most abundant Lake Ontario prey fish. The food-web changes that occurred from 1970 through the 1990s contributed to this recovery. Alewife and Rainbow Smelt abundance declined during this period due to predation by stocked salmonids and legislation that reduced nutrient inputs and food web productivity. In the 1990s, proliferation of nonnative, filter-feeding dreissenid mussels dramatically increased water clarity. As light penetration increased, the early-spring depth distribution of Alewife and Rainbow Smelt shifted deeper, away from larval Deepwater Sculpin habitat. The intentional and unintentional changes that occurred in Lake Ontario were not targeted at Deepwater Sculpin restoration but resulted in conditions that favored the species' recovery. While standard surveys documented the recovery, more diverse information (e.g., observations in deep habitats and early-life stages) would have improved our understanding of why the species recovered when it did. Annual Lake Ontario trawl surveys have collaboratively expanded their spatial extent and diversified habitat sampled, based on lessons learned from the Deepwater Sculpin recovery.

Restoration of Lake Trout in Lake Superior through Inter-agency Cooperative Management

(Michael J. Hansen, Charles R. Bronte)

The Lake Trout *Salvelinus namaycush* is a keystone species in the Laurentian Great Lakes that supported valuable fisheries throughout the basin until the 1950s. However, Lake Trout populations declined to near extirpation in nearly all of the lakes by the 1960s because of the combined effects of overfishing, Sea Lamprey *Petromyzon marinus* preda-

tion, and habitat degradation. To restore self-sustaining Lake Trout populations in Lake Superior, state, provincial, federal, and tribal agencies agreed to an interjurisdictional management framework that allowed them to articulate and institute (1) clear and common goals and actions for recovery, (2) early and intensive lakewide stocking of hatchery-reared Lake Trout to enhance failing stocks, (3) early and effective lakewide controls on mortality caused by Sea lampreys and fisheries, and (4) standardized lakewide evaluations of population trajectories and performance. Stocking was initiated in Lake Superior in 1950 and expanded after 1953, prior to effecting Sea Lamprey or fishery controls, thereby introducing large numbers of hatchery-origin fish that grew to maturity shortly after mortality was reduced. Abundant suitable nearshore spawning habitat was widely available for naive lean hatchery-origin Lake Trout, and native lean Lake Trout persisted in some areas. The Sea Lamprey-selective pesticide TFM (3-trifluoromethyl-4-nitrophenol) was applied first in Lake Superior in 1958 because of the presence of remnant native Lake Trout populations, which set the stage for closure of fisheries and good survival of newly stocked and remnant wild fish. As a consequence of these four factors, stocked fish exceeded historical density of wild fish by the 1980s in many areas and thereby generated enhanced reproductive potential when combined with remnant wild fish. Lake Trout recovery in Lake Superior is an extraordinary example of agency cooperation toward a common goal for managing recovery of an ecologically important shared resource.

Ranavirus-associated Mortality Event in Frogs in Ontario

This past September, Credit Valley Conservation (CVC) staff collecting terrestrial field data discovered numerous dead and dying frogs at a location in the Credit River watershed. Specimens were collected and submitted for analysis to the Canadian Wildlife Health Cooperative (CWHC) at the University of Guelph. Ranavirus was confirmed in one specimen and suspected in another. (<http://blog.healthywildlife.ca/ranavirus-associated-mortality-event-in-frogs-in-ontario/>). Ranavirus mainly affects Ranid frogs, but can affect other amphibians, reptiles and fish. Ranavirus was recently confirmed in Ontario turtles as well (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6532614/>).

The virus can be spread through water, or by infected animals or carcasses. CVC staff are following the decontamination protocol (<http://www.cwhc-rcsf.ca/docs/HHWG%20Decontamination%20Protocol%202017-05-30.pdf>) for all terrestrial and aquatic monitoring activities and although there is no ranavirus confirmation in the Credit River itself, they are considering an extensive portion of the river as impacted as well. Unlike VHS, complete drying of equipment will not destroy ranaviruses; the veterinary disinfectant F10 SC is being used at CVC as it is effective against ranaviruses and other diseases, and it is easier and faster to use and is less toxic than chlorine bleach.

These mortality events are not well documented in Ontario, but would be expected to occur more in the spring when frogs are already physiologically stressed and congregated for breeding. Know the signs of ranavirus infection for these different taxa and keep a vigilant watch when you are out in the field. If you see numerous dead or lethargic amphibians or reptiles (and dead fish with no other cause), document and collect for analysis: http://www.cwhc-rcsf.ca/report_submit.php.

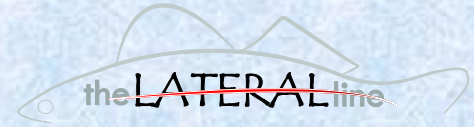
Ranavirus factsheet:

http://www.cwhc-rcsf.ca/docs/fact_sheets/Ranavirus_Fact_Sheet.pdf

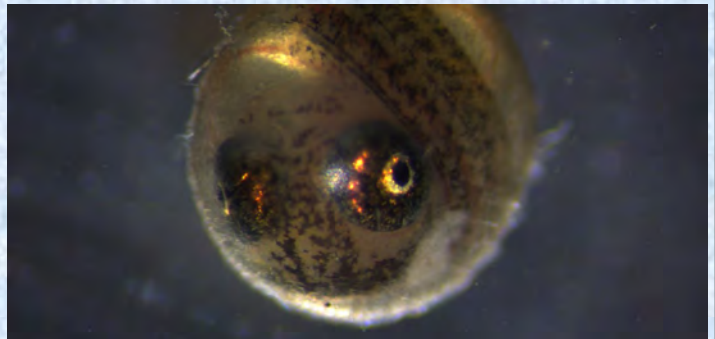
Barrier Mitigation Workshop

The AFS-OC in partnership with the Nottawasaga Valley Conservation Authority will be hosting an Instream Barrier Removal Workshop on April 7, 2020 at the Tiffin Centre for Conservation. Please stay tuned to the [AFS-OC website](#) and social media for more details!

“On the Hook!”



Killifish eggs can hatch after being eaten by birds. <https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/ecy.2774>



The oldest known freshwater bony fish is the Bigmouth Buffalo (*Ictiobus cyprinellus*) at 112 years old. <https://www.nature.com/articles/s42003-019-0452-0>

Fish kills on the Ottawa river from July 2019 are still under investigation. Gas bubble disease from a hydro dam is currently the top theory. <https://ottawacitizen.com/news/local-news/company-blamed-in-fish-kill-suggests-full-story-is-not-yet-known>



From renowned marine biologist Daniel Pauly, a fascinating analysis of our collapsed global fisheries and a revolutionary vision for their future. <https://thenarwhal.ca/aquacalypse-now-end-fish/>