ALGONQUIN WILDLIFE RESEARCH STATION

2019
RESEARCH REPORT

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THE ALGONQUIN WILDLIFE RESEARCH STATION IS AN INDEPENDENT NOT-FOR-PROFIT FIELD STATION IN ALGONQUIN PROVINCIAL PARK ADMINISTERED BY A VOLUNTEER BOARD OF DIRECTORS AND A SMALL TEAM OF STAFF.

JOIN US IN THE FIELD. . . VIRTUALLY

This year we joined a new platform, *Patreon*, to bring our community of supporters behind-the-scenes here at the AWRS. At the same time, this platform allows us to raise financial support for the Station through monthly subscriptions. Here we'll host live 'Ask-the-Researcher' events, share videos and photos from the field, and provide our Patrons with various other ways to connect with us. Check out our *Patreon* page at patreon.com/awrs.

PATREON

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AWRS

A MESSAGE FROM THE CHAIR OF THE BOARD OF DIRECTORS

Greetings friends of the Algonquin Wildlife Research Station!

I am excited to share with you the 2019 AWRS Research Report, our 12th annual report. Thanks to our NOHFC Intern, Samantha Stephens, and her creative photography skills, you will undoubtedly notice a new colourful appearance to the report. Each eye-catching page is loaded with the great science and outreach that is conducted within the natural laboratory of Algonquin Park, a place in which we are privileged to learn and work. Last year, 2019, was a very special year for the Station – our 75th birthday! We welcomed 140 alumni and friends of the Station over the weekend of September 13th-15th, and partnered with the Algonquin Art Centre to host Robert Bateman's keynote speech under the stars. Mr. Bateman is an AWRS alumnus, and he spoke about how his time at the Station influenced his life and work. For any of us who have spent time at the Station, we could connect with Mr. Bateman's keynote.

We are grateful for our partnerships. We are extremely thankful to Ontario Parks for their ongoing support of the Station, and especially for the grading and belly-loads of gravel for the Station road in 2019! We continue our productive long-term partnership with the Friends of Algonquin Park (FOAP) to deliver our very successful Meet the Researcher Day outreach event which allows us to deliver our messages about ecological integrity and the value of long-term research to hundreds of people through hands-on activities and engagement. We are also thankful to our university partners whose membership dues and user fees help support the Station so that we can keep hosting world-class field courses and researchers. The AWRS is home to some of the longest-running research projects in the world, and research based here has resulted in over 700 peer-reviewed papers and 150 student theses and dissertations. There is no doubt about the impact, merit, and value of these deliverables.

I am extremely thankful for the hard work of Manager Kevin Kemmish. The day-to-day and on-the-ground operations of the Station are Kevin's responsibility, and he has shown the perfect balance of independence and consultation needed to make everything run smoothly. His tasks are wide-ranging, from budget projections to construction and plumbing to marketing, attesting to his broad skill-set. I also continue to be grateful for the advice, support, and activities of our volunteer Board of Directors. The Board members all have "real jobs" that keep them too busy, yet they give their already-limited time to help the Station. Contact information for the Board members can be found on the AWRS website (which has been overhauled!); I encourage you to communicate with any of us about any matters pertaining to the Station.

Our AGM will be a little different this year… With social distancing and travel restrictions in light of the COVID-19 pandemic, we will be meeting

virtually using the ZOOM platform on Thursday, June 4th at 10:00 am. Although we can't meet face-to-face, I look forward to connecting with our users and partners virtually. I sincerely hope you and yours are keeping well through these unusual times.

All the best for a successful and productive 2020 research season. I hope to see you at the Cookhouse soon,

Jackie Litzgus
AWRS Board Chair

OUR MISSION

TO INSPIRE
Environmental stewardship, a community of collaboration, and a connection with nature through educational workshops, public events and social media.

TO EDUCATE
Scientists, the public, and policy makers by facilitating peer-reviewed publications, producing research reports, and hosting field courses and workshops.

TO CONSERVE
Biodiversity, ecological integrity, and a culture of field-based learning by providing facilities and logistical support for research projects, with an emphasis on long-term ecological studies.

FROM THE MANAGER'S DESK

Dear AWRS alumni, supporters and friends,

Since 1944, the Algonquin Wildlife Research Station has provided a wealth of discovery and learning opportunities. Last September, we were joined by nearly 140 alumni, representing each decade since the Station's establishment, to celebrate our rich history of 75 field seasons. As you will see, the 2019 field season was another successful and productive year for research and education.

After three quarters of a century, the AWRS still continues to experience new challenges each year, and 2020 is no exception. As the world faces unprecedented events, the AWRS faces what is perhaps the quietest field season in its history. Research activity has been minimized, but like the wildlife that has been studied here for decades, the Station will continue to adapt and persist. Our efforts continue to be driven by our vision to be a leader in wildlife research through experiential learning, and we hope that this year's report will demonstrate how we've been realizing that vision. This is our 12th annual publication of the AWRS Research Report. Since it began, our publication has been an incredibly important tool for demonstrating the high-quality research, public outreach efforts, experiential learning opportunities, and documentation of Algonquin's wildlife to our members, supporters, and partner organizations.

Our many successes in 2019 would not have been possible without the dedicated support of our Board of Directors, the MNRF, MECP, Ontario Parks, and our various other partner organizations. A special thanks to Hayden March-Wilson, Delaney Kelm, Amanda Semenuk, Randolph Mabaquiao, Hailey Smith and Samantha Stephens who together made up the 2019 staff team.

I encourage you to continue to visit our website, (updated in 2019), support us on *Patreon* or follow us on Facebook, Twitter and Instagram for news, updates and reports from the field. If your research, institution or field course is interested in becoming part of our rich history, please do not hesitate to contact us. Because of the unwavering dedication of the contributors to this report, the board of directors, and the Station's many collaborators and partners, the AWRS continues to fulfil our mission.

I hope you enjoy the 2019 Research Report. For more information or to be added to our newsletter e-mail list, please contact me at algonquinwildliferesearch@gmail.com, (705) 633-5621 or visit our website at www.algonquinwrs.ca.

Kevin Kemmish

Kevin Kemmish
Station Manager

CELEBRATING 75 YEARS

Over the years, some people have stayed at the Station only a few days while others have called the Station a second home for many years, but for almost everyone who has visited, it holds a special place in their hearts. On behalf of the AWRS, we want to extend a sincere thank you to those who came back to the Station, travelling from far and wide, to celebrate our 75th anniversary and reminisce on the memories made here. It is with much gratitude that we acknowledge our alumni and close friends for their ongoing support.

The Algonquin Wildlife Research Station was established in 1944, when 7,770 hectares north of Lake Sasajewun was closed to the public and set aside as a 'wilderness area'. The Station was first under the operation of the Department of Lands and Forests (now the Ministry of Natural Resources and Forestry), became inherited by a dedicated group of Universities when government funding for the Station was lost in the 1980s, and now operates, as of 2010, as a registered, idenpendent not-for-profit. Over the years, this place has inspired generations of students to pursue careers in the natural sciences, and has contributed significantly to educational opportunties and scientific research.

As we reflect on our rich history, we are also looking towards the future. The growing popularity of both social media and natural history programming has opened up new avenues for the Station to share it's science and engage our community in nature. We look forward to exploring what these opporutnities hold, and developing new partnerships with the media, businesses, organizations and individuals in our community to do even more. We are so very excited to see what the next 75 years has in store for us!

EVENTS OF THE REUNION WEEKEND

On September 13th-15th, 2019 we invited alumni and friends to celebrate 75 years of history and community with us. We were fortunate to be joined by nearly 140 AWRS alumni for the reunion, including some who were present for the early years of the Station's establishment. Guests were welcomed on Friday night so they would be well-rested in advance of the weekend festivities. Everyone rose early on Saturday morning for a breakfast followed shortly thereafter with a welcoming address by Dr. Jackie Litzgus, AWRS Board Chair. We gathered for a celebration of life in honour of Dr. Leslie Rye (1962-2018), a devoted educator and close friend of the AWRS. Joined by Leslie's sister Karen, Leslie's daughters, Natalie and Meredith, and their father Ian, we dedicated the newly renovated Rye Upper Lab in her memory. More than ever this lab will serve as a valuable teaching and learning space for students and honour Leslie's *raison d'être*: "I tried to leave the place better than I found it". The afternoon afforded the opportunity to catch-up among friends, and explore familiar forests and waterways.

On Saturday night, we were thrilled to partner with the Algonquin Art Centre to welcome Robert Bateman, acclaimed wildlife artist and AWRS alumnus, who delivered a presentation about his inspirations, art, and connections to Algonquin Park and the AWRS. Mr. Bateman received the second annual Legacy Award from the Algonquin Art Centre in front of a packed (sold-out!) crowd of 300 attendees. Celebrations continued back at the AWRS with a bonfire at the old volleyball court extending into the wee hours of the morning. A Sunday brunch wrapped-up formal proceedings of the 75th Reunion and provided additional time to catch-up with friends. Some wrapped-up their AWRS visit with a hike to Bat Lake—including a serendipitous sighting of Snapping Turtle 887 trekking to her overwintering site and plenty of recently metamorphosed salamanders—among other ambles in nature.

ARCHIVING OUR HISTORY

Our Photojournalist-in-Residence, Samantha Stephens, along with Patrick Moldowan and Station alumnus Steven Kell, took the opportunity to sit down with alumni to record video interviews. These alumni told stories about how projects were started, how the Station and wildlife research has changed over time, and how the Station influenced their careers. Despite great effort, there just wasn't enough time to include everyone during this short weekend. But, we are continuing this effort to archive the history of the Station, and we are still looking to connect! We will continue to reach out with interview requests, but we also welcome you getting in touch if you are particularly interested in participating in this effort. We are also very much interested in written memories and photographs. We are happy to accept documents, slides and printed photos which we will digitize and promptly return to you. ♦

PREVIOUS Ed Addison revisits the old moose pens, where he and Rose Addison conducted many years of influencial research on Algonquin's iconic mammal. Later, in the Cookhouse, alumni from the early years of the Station reminisce over photos of their time at the Station.
ABOVE Robert Bateman delivers a sold-out talk at the Algonquin Art Centre to over 300 people about his life's work, including his time at the AWRS.
BELOW The newly renovated Upper Labs has its name changed to the Rye Upper Labs in dedication to long-time Station user and friend Dr. Leslie Rye (1962-2018). [PHOTOS Samantha Stephens]

WHY I'M DONATING/GETTING LOST

BY SANDRA STEPHENSON

Sandra Stephenson and her sisters grew up at the AWRS while their father, Bruce Stephenson, served as the Director throughout much of the 1960s. She has published a book about her early years spent here titled, "Children of Sasajewun". This year she has made a generous contribution to ensure the AWRS reamins a place for research, exploration and camaraderie.

I can't tell whether I learned to be comfortable in the woods by domesticating them in my head, or whether they are just not as frightening as all that when you get out in them. At least by day. Even night walks have done little other than reassure me, as long as the people with me were not my Dad, who loved to experiment with people's fear triggers.

Most of my stories of Algonquin Research Station in the little book, *Children of Sasajewun*, centre around human constructions. Blazed trails, observation platforms, shelters. The haunts of my sisters and myself gravitated around the dam, wolf pens, diving raft, the roads and sand pits. I've never been as sure in the woods on my own, or leading a pack when a single expression of doubt by one person sends my inner compass spinning. My family knew what it could mean to lose the trail. On the Fool's Lake hike there were no blazes, but Dad read the ridges and sloughs, hardwood and hemlocks, for an indication of where we were. The last leg of that hike was directed by a growth of cedars that his knowledge told him would lead down a wet slope to the lake. That I sank to my knees in mud under my heavy pack was of less concern than finding our way there.

My sisters and my older son are less domestic than I am in trekking the wild - what's left of it - and all of us have been lost, at least for a few minutes or hours. It started to happen to Dad too, about 10 years before his death. He would find himself on a ridge he'd been on a hundred times, and not be able to orient himself, not even by the inukshuks he had erected. There was a time when beaver dams were his bridges and deer trails his highways. He knew well the difference between moose, deer, porcupine and bear scorings on trees. He studied scat, knew whose they were and what they'd eaten, probably where they'd found it; knew bird calls and the names of every bush, flower, tree and fern in English, variants, and in Latin. If he "got lost," he didn't need to get home. I can never fathom the worry and deep faith my mother lived with even after he retired and continued to tromp through the tangled forests of their farmland. They tried walkie-talkies and considered cell phones, but simple acceptance seemed to work best.

If I have inherited a small fraction of these traits, along with the ability to declare, as he once did when Dave Johnston worked with him, "It's too hot and buggy to go into that swamp today," and sit sipping cold beer from the truck instead, then I am grateful for that ease. I'm grateful for the ability to get lost and found again, especially in these disorienting times. To my parents, to the forest ecosystems and to the half-wild campus of Algonquin Wildlife Research Station: I'm grateful for the wonder that the natural world is not my enemy, is full of newness and even eagerness to show itself behind its caution. I also know not to mess with it because it has a mind of its own. I want researchers to continue to observe and document the natural world, in respect and with appropriate distance, attention and awe. I want them to have a place to stay and find camaraderie while doing so. That, I believe, is the legacy of the MNRF, the Universities and the AWRS. That's why I'm donating some of the funds Dad left to me to maintain the beloved buildings. ♦

SMALL MAMMAL PROJECT

COMPARING CREEPY CRAWLIES TO CONSIDER COMMUNITY CONCEPTS

The long-term projects hosted at the AWRS provide the opportunity for shorter-term collaborative projects to benefit from the established fieldwork regimes and historical data to investigate additional questions. Erica Fellin reports on her project in collaboration with the long-term small mammal project.

PARASITE RANGES ARE EXPANDING

Though small in stature, parasites can have big impacts on the abundance of animals in a population. Even large mammals can be killed by the presence of many small blood-sucking parasites. There is evidence of Moose (*Alces alces*) being killed by Winter Ticks (*Dermacentor albipictus*), and Caribou calves (*Rangifer tarandus*) being killed by Arctic Mosquitoes (*Aedes nigripes*). As climate warming continues, the geographic ranges of many parasites are predicted to expand farther north, and their active seasons will lengthen. This will give these blood suckers more opportunities to feed on their hosts, in turn allowing for more casualties. One particular creepy crawly that has been moving farther north over time is the Black-legged or Deer Tick (*Ixodes scapularis*). Deer Ticks are the major vector of Lyme Disease transmission to humans and are often found on White-footed Mice (*Peromyscus leucopus*) and Deer Mice (*Peromyscus maniculatus*).

ALGONQUIN AS A CONTROL SITE

This summer, data was collected periodically in Algonquin Park as part of a study examining differences in ectoparasite communities across a latitudinal gradient representing the expected range expansion path of the Deer Tick. Thankfully, Algonquin is still Deer Tick-free, and acted as a control site in this research. Ectoparasites – parasites found living externally on the host – were collected from Deer Mice, the most common rodent in Ontario, to compare community assemblages in areas where there are different establishment levels of Deer Ticks. This project also included Long Point Provincial Park (the longest known Deer Tick establishment site), Koffler Scientific Reserve at Joker's Hill (where Deer Ticks have been established since 2012), and Queen Elizabeth II Wildlands (where Deer Ticks are expected to soon establish, but currently only Wood Ticks [*Dermacentor variabilis*] are present).

> "AS CLIMATE WARMING CONTINUES, THE GEOGRAPHIC RANGES OF MANY PARASITES ARE PREDICTED TO EXPAND FURTHER NORTH"

THE RESULTS

In Algonquin, species of fleas, mites, botflies, and a single tick – most likely identified as the Squirrel Tick (*Ixodes marxi*) – were found between June and August, though identification of collected specimens is still underway. Orange Mites (*Neotrombicula microti*), have not been found in other parts of southern Ontario but have been identified and studied previously in Algonquin Park. Botfly larvae (*Cuterebra sp.*) parasitize mice under the flesh and are considered endo (internal) parasites. Late in the season (mid-August), two Deer Mice were found with botfly larvae inside them. Analyses are forthcoming, but it appears that Algonquin's mice host a greater variety of parasites compared to conspecifics in areas where Deer or Wood Ticks are present. Overall in Algonquin, 8% of captured mice were parasitized by botflies, 29% by Orange Mites, 33% by White Mites and

37.5% by fleas (species unknown at this time).

In comparison, at Long Point 10% of mice were parasitized by fleas, 8% by White Mites, and 88% of by Wood and Deer Ticks. At the Koffler Scientific Reserve 29% of mice were parasitized by fleas, 57% by White Mites, and 29% by Deer Ticks. At Queen Elizabeth II Wildlands 21% of mice were parasitized by fleas, 58% by White Mites, and 33% by Wood Ticks.

IN CONCLUSION

This particular study hopes to understand the role Deer Ticks play in ectoparasite communities and how community assemblages may differ when these parasites are present or absent. By better understanding the different species associating together on a host, we can be aware of potential diseases that may spread from these animals to other organisms, including humans. It is important to understand how these ectoparasites interact with one another and what kind of infections they may spread. With climates warming, parasites such as the Deer Tick are moving farther North in Ontario and will affect how parasite communities are interacting. By understanding the differences in communities and potential diseases that come with these interactions (between different parasites and between parasites and hosts) we can make better predictions regarding how these communities will change over time.

ACKNOWLEDGMENTS

This project could not have been done without the considerable help of field technician Jon Curtis, as well as our collaborators at Long Point Bird Observatory, Kate Brown and her team at the Koffler Scientific Reserve, Phil Careless and Ron Reid, Dr. David Lesbarrères, Ontario Parks, and of course, the AWRS Staff. Special thanks to all for your contributions! ♦

> "BY BETTER UNDERSTANDING THE DIFFERENT SPECIES ASSOCIATING TOGETHER ON A HOST, WE CAN BE AWARE OF POTENTIAL DISEASES THAT MAY SPREAD FROM THESE ANIMALS TO OTHER ORGANISMS, INCLUDING HUMANS"

ABOVE Erica and Jon use tweezers to comb through a Deer Mouse's fur looking for ectoparasites. [PHOTO Samantha Stephens]

ABOVE A Deer Mouse (Peromyscus maniculatus) with Orange Mites (Neotrombicula microti). One of two Deer Mice found with a botfly (Cuterebra sp.) inside him in the lower belly area. [PHOTOS Jon Curtis]
BELOW Mites and fleas that were found on Deer Mice (Peromyscus maniculatus) in Algonquin are observed under the microscope. These are common species found across Ontario. [PHOTOS Erica Fellin]

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CATCHING UP WITH THE SALAMANDERS

AN AMPHIBIOUS UPDATE FROM BAT LAKE

"30 April, 2019. Calm, overcast morning with scattered clearing in early afternoon. Took the team to Bat Lake in late morning. Everyone got a look at their first Algonquin salamander today: a Blue-spotted Salamander, male, captured at drift fence near boat launch where local snow had melted. This salamander seems ahead of the pack." Even then, we would have to wait several more days before we would be rewarded with another glimpse. . .

This was the second spring of drift fence monitoring and the 12th consecutive year of salamander population research at Bat Lake. Presently, the objectives of our research are to: i) Determine the best method to sample salamander populations to inform continued long-term ecological and population study, ii) present a synthesis of population vital rates for the salamanders of Bat Lake (e.g., abundance, survival, longevity, sex ratio), and iii) investigate how the environment influences and is influenced by salamanders.

A BIG SEASON

The season was slow to build but build it did! Weather conditions throughout spring 2019 were cool and wet, consistently good for amphibian migration. This meant that salamanders and anurans (frogs and toads) were regularly on the move, to and from the lake, in contrast to the punctuated periods of migration amid the warm and dry spring conditions of 2018. Week after week, new species would appear at the drift fence and in our aquatic traps, offering a new source of excitement for team members. When all the salamander activity settled and we had washed the slime off our hands, it was a big year: drift fence captures of 10 amphibian species nearly reached 15,500 individuals! These data also informed concurrent summer student projects, including the study of amphibian abnormalities in our reference population and possible sampling biases imposed by trapping methodologies.

OLD FRIENDS

I have recently resolved a backlog of recaptured salamander identities (using their unique spot pattern) in preparation for our population modelling analysis. I am excited to report that many Spotted Salamanders captured in the early years of the study are still with us, such as salamander 0076 who boasts an impressive recapture history dating back to the inaugural year of the Bat Lake Inventory of Spotted Salamanders (BLISS) study in 2008!

BEYOND RESEARCH

Beyond research, members of the salamander team learned news skills and insights: paddling, keeping a safe distance from moose(!), identifying frog calls, teamwork, what rocks you're likely to find snakes under, problem solving, the persistence of black flies, open air camping (in the rain!), and critical thinking, just to name a few.

“I AM EXCITED TO REPORT THAT MANY SPOTTED SALAMANDERS CAPTURED IN THE EARLY YEARS OF THE STUDY ARE STILL WITH US”

PREVIOUS An adult Blue-spotted Salamander.
ABOVE Patrick measures a Spotted Salamander found at the drift fence.
MIDDLE An adult Spotted Salamander. [PHOTOS Samantha Stephens]
BELOW The same individual Spotted Salamander (0076) first captured in 2008 was recaptured periodically up until 2017.

ACKNOWLEDGMENTS

In am very thankful for the efforts and laughs provided by the 2019 salamander crew: Hayley Vlcek, Jared Connoy, Gloria Gao, Claudia Lacroix, Lucas Warma, and Danté Ravenhearst. Also, a very sincere thank you to fellow Rollinson Lab Ph.D. student Jessica Leivesley for her invaluable assistance, from interviews to wrangling the field crew. The 2019 field season would not have been possible without you all! I also want to thank Patagonia who supplied the AWRS with in-kind rain gear that will be put to full use during field season 2020! Also, thank you to our visitor Leslie Anthony who wrote “Wild Life” an excellent feature article for Mountain Life magazine, Blue Mountains edition (Fall 2019 issue), about our salamander research and the AWRS at large. This research is supported by the University of Toronto, Algonquin Provincial Park, Ontario Parks, and the National Science and Engineering Council of Canada. ♦

“IT WAS A BIG YEAR: DRIFT FENCE CAPTURES OF 10 AMPHIBIAN SPECIES NEARLY REACHED 15, 500 INDIVIDUALS!”

ABOVE Patrick weighs and measures a juvenile Spotted Salamander found at the drift fence in the fall. (Image by Samantha Stephens) Other amphibians were also documented at the fence, such as these Wood Frogs. [PHOTO Patrick Moldowan]
BELOW The 2019 Bat Lake field crew (L to R): Claudia, Gloria, Jessica, Danté, Lucas, Patrick & Hayley, Jared.

THIS REPORT CONTRIBUTED BY:

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CAN THEIR SKIN PROTECT THEM?

DYNAMICS OF SKIN MICROBIOME VARIATION IN CANADIAN URODELANS

Although amphibians have existed on Earth for more than 350 million years and survived four mass-extinctions, they are currently experiencing a drastic global decline, with a third of the species described so far being globally endangered. A major threat they are facing is the rapid spread of infectious diseases carried by bacteria, viruses, and fungi.

BSAL

Batrachochytrium salamandrivorans (Bsal), a fungus carrying the deadly disease "chytridiomycosis", has recently spread in Europe where it is decimating salamander populations. It specifically harms Urodelans (salamanders and newts). Bsal has not been detected in North America yet, but considering the intensity of worldwide illegal amphibian trafficking, and global human travel, we have reasons to be concerned for Canadian salamanders and newts. As with many amphibian pathogens, Bsal attacks the skin of its host. This is their most precious organ, through which they breath and hydrate. Infected individuals eventually die of cardiac arrest.

THERE IS HOPE

Fortunately, recent research revealed that some bacteria living on the skin of amphibians could confer pathogen resistance upon them. Therefore, the natural skin community of bacteria (referred to as the "microbiome") offers a glimmer of hope for amphibian conservation.

OUR PROJECT

It is in this context that our research project investigates the dynamics of the skin bacterial communities in Urodelans. We conducted our fieldwork in Algonquin Park from April to September 2019, sampling all life stages of two local species of salamanders and one species of newt. We are still in the process of sequencing the DNA of the bacteria we gathered, which will enable us to identify the microbiome composition of each life stage of each of the species studied.

The results of this research will broaden our knowledge of the microbiome ecology of Urodelans and will give insight into the susceptibility of the species found in Algonquin Park to emerging infectious diseases. Stay tuned for pending publications!

ACKNOWLEDGMENTS

We are grateful to all the members of the AWRS family for their help and support! Many thanks to our assistants César & Noah, and to Ontario Parks for supporting our project! ♦

"THE SKIN COMMUNITY OF BACTERIA, REFERRED TO AS THE MICROBIOME, OFFERS A GLIMMER OF HOPE FOR AMPHIBIAN CONSERVATION"

LEFT This sampling method of skin swabbing allows us to gather a sample of skin bacteria without harming the animal.
ABOVE Léa uses a dip net to find salamander larvae and newts. [PHOTOS Samantha Stephens]
MIDDLE An adult Blue-spotted Salamander and an adult Spotted Salamander, the two species of salamander focused on in this project. [PHOTO Léa Fiéschi-Méric]
BELOW Léa identifies a salamander larvae. Noah dip-nets for larvae. [PHOTO Samantha Stephens]

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NATURE'S PITFALL

A NEW INTERACTION DISCOVERED BETWEEN TWO COMMON SPECIES

In the 2018 report we hinted at an exciting new discovery. We found that carnivorous Northern Pitcher Plants, typically known to consume insect prey trapped in their bell-shaped leaves, were consuming something else: juvenile Spotted Salamanders. This discovery became the first documented case of Northern Pitcher Plants regularly consuming a vertebrate prey. In 2019 we continued to investigate why these salamanders are becoming trapped and how the plants may be benefiting.

ONGOING INVESTIGATION

A recent discovery showed that even areas that have been explored for decades by keen ecologists and naturalists can hold exciting surprises for a lucky observer. Famous for their diet of insects and other arthropods, a population of Northern Pitcher Plants has been found trapping juvenile Spotted Salamanders by the dozens, reported for the first time by Moldowan et al. (2019). Now known to be a yearly occurrence, this behaviour raises several questions, such as whether a recent change has occurred in the local habitat and the potential ecological consequences of this interaction. These captures are obviously a grim ending for the wandering salamander, but what does this mean for the plants?

Seeking an answer to this question began with daily trips to the bog, using a headlamp to peer into each pitcher of 90 marked Northern Pitcher Plants, often racing the sunset when the already concealed plants would become impossible to find. From surveys conducted between August and October of 2019, we found that nearly half the plants were successful in catching at least one salamander, and in one case four salamanders were observed in a single pitcher at one time!

At first, this large bout of nutrients might be thought of as the Pitcher Plant's version of an all-you-can-eat buffet. But upon further consideration this is not necessarily the case. More may not be better for the Pitcher Plant. First, this massive prey often rots before being fully digested, indicated by putrid smells experienced on particularly warm days. Second, excessive nutrient input can have detrimental effects to plant growth and survival. To investigate the impacts of this feast on the nutrient content of the plant's tissue we collected samples of plant material. Using stable isotope analysis, we were able to identify the type, quantities and origin of key nutrients, such as nitrogen and carbon, within the

plant tissues. This allowed us to estimate which prey items are contributing to the Pitcher Plant's growth. Each salamander holds nearly 400 times the amount of nitrogen compared to that found in a single ant (a common prey item), so we expected to see relatively more of the salamander-based nitrogen being integrated into 'salamander-eating' plants compared to 'non-salamander-eating' plants.

THE RESULTS

Contrary to expectation, we did not detect elevated levels of salamander-based *nitrogen* in 'salamander-eating' plants (perhaps an artefact of our sampling methodology), but our hunch was supported by a surprise related finding. Some of the carnivorous plants, which typically feast on terrestrial-living insects, had *carbon* signatures in their tissue that suggested they were eating aquatic prey: recently metamorphosed salamanders! Further investigations will reveal what repercussions this has for the Pitcher Plant population, but these carnivorous plants seem to be 'double-dipping' from aquatic and terrestrial food sources! Future studies will continue to investigate the impact of salamanders on Northern Pitcher Plant health (and vice versa), and hopefully uncover the mysteries behind the attractive qualities of the watery trap for amphibians. Next time you find yourself sloshing around the bog, take a look to see what critters may have been fooled by the remarkable Northern Pitcher Plant.

ACKNOWLEDGMENTS

Thank you to Samantha Stephens, Hayden March-Wilson (*Team Juicy!*), Jenna Kental, Delaney Kelm, Jon Curtis, and Erica Fellin for their help with field surveys. Thank you to Dr. Aaron Fisk, Ida Ostovar, Taya Venert-Johnson, Koley Freeman, and Marie Gutgesell for their help with processing samples, including stable isotope analysis. I'd also like to thank Dr. Shoshanah Jacobs for being the Second Reader on my project.

LEFT Two juvenile Spotted Salamanders trapped in a Pitcher Plant and floating at the surface of the liquid contained within the bell-shaped leaves.
ABOVE Amanda surveys marked Pitcher Plants for trapped juvenile Spotted Salamanders.
MIDDLE An adult Spotted Salamander compared to a juvenile. [PHOTOS Samantha Stephens]

THIS REPORT IS CONTRIBUTED BY:

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CATCHING UP WITH THE TURTLES

AN UPDATE ON THE LONG-TERM STUDY

The countdown to 50 years of turtles has begun! The 2019 field season marked the 48th consecutive year of turtle research at the Algonquin Wildlife Research Station. Since the tagging of our first Snapping Turtle in 1972, turtle researchers have worked tirelessly for nearly half a century exploring the lives of these enigmatic reptiles. Being incredibly long-lived and unique animals, our turtles have proven to be both frustrating and highly rewarding study subjects for nearly 100 students who have spent time on the project.

The 2019 field season got off to a quick start, with an early thaw allowing us to hit the ponds in earnest in the first week of May. Despite a chilly spring with snow persisting into June, the turtles were highly active throughout the season. The team captured 501 Painted Turtles and 93 Snapping Turtles across 12 study sites. A record late onset of nesting season still yielded nests from 217 Painted Turtles and 20 Snapping Turtles.

BASKING BUDDIES

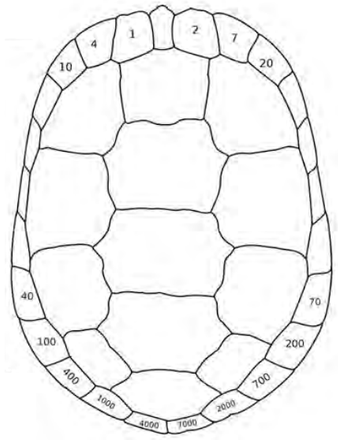
This year, visitors to the Mizzy Lake Trail may have noticed that Wolf Howl Pond, where the turtle research information plaque is displayed beside the trail, was marked with numbered signs throughout the summer. These signs are part of a new line of research examining the basking habits of Wolf Howl Pond's resident Painted Turtles. There is a growing body of scientific evidence suggesting that the habits and behaviours of reptiles may be much more coordinated than was previously believed, particularly with respect to social interactions between individuals. A number of reptile species across the globe have been shown to form long-term, stable social bonds. In many cases, these bonds are formed early in life between family members. These bonds have been demonstrated most clearly through studies of communal basking. In social bond-forming species, the bonds are most readily seen when individuals bask together.

In 2019, we examined two components of the Painted Turtle's basking behaviour: site fidelity (the tendency of an individual to return to the same location regularly), and group stability (the tendency for individuals to consistently associate with each other). Twice daily, we observed the location of each basking group, and the individuals in the groups. These data will be used in a forthcoming study of social grouping behaviour in the Wolf Howl Pond turtles. Stay tuned for an article on this study in the 2020 report!

NOTABLE CAPTURES & LONG ABSENCES

To mark newly captured individuals in our study, we file a unique combination of triangular notches into the marginal scutes of the turtle's carapace. Each individual scute has a numerical value, and the combination of notches on each individual adds up to a unique number code. These notches are a semi-permanent marking tool. As turtles grow, the notches become shallower and, over time, can become completely grown in. When an individual has not been captured for a number of years, their notches can be very difficult to discern.

Over the course of our nearly half-century of research, turtle researchers have captured over 1,500 individual turtles from wetlands along a nearly 40 km stretch of the Highway 60 corridor. As a consequence of this large study area, some individuals "fall through the cracks" for many years, often to be rediscovered after long absences from the study. These captures are among the most exciting for our team, and identifying these individuals can be quite the challenge. In 2019, we captured 7 Painted Turtles who had been



absent from the study for over 10 years - the most 'MIA turtle' returns within a season in the project's recent memory. One turtle was captured after a 19-year hiatus, one of the largest gaps between captures in the project's history. Welcome back Painted Turtle K10!

Our project centers primarily around Algonquin Park's two most abundant turtle species: Painted and Snapping Turtles. However, from time to time individuals from less common species are captured. Blanding's Turtles occur at very low densities on the west side of the park, and we have captured two individuals multiple times throughout the project's history. In 2019, with help from the keen eyes of a park naturalist, our team captured 3 Blanding's Turtles! We were able to catch up with our two resident individuals, and also capture a third turtle who was new to the study. Blanding's Turtles are a globally endangered species whose range spans primarily the northeastern United States, Nova Scotia, and southern Ontario. There are multiple conservation efforts underway to maintain Blanding's Turtle populations, but our understanding of their exact range and habitat choices is incomplete. If you are fortunate enough to come across a Blanding's Turtle (or any turtle for that matter!) during your visit in Algonquin, particularly one on a road, please report your sighting to naturalists at the park's Visitors Center, or email an observation to crouleau@laurentian.ca. Any photos accompanying observations would also be greatly appreciated.

"THE TEAM CAPTURED 501 PAINTED TURTLES AND 93 SNAPPING TURTLES ACROSS 12 STUDY SITES"

OUTREACH & PARTNERSHIPS

Our team was once again fortunate to partner with Barrie Subaru for the 2019 season. For a third year running, they provided us with a fantastic field vehicle. If you visited the park last summer, you may well have seen us out and about – we're hard to miss when we're driving! We look forward to continuing our partnership with Barrie Subaru in 2020. Stay tuned for updates in the spring as the Turtle Car returns for its fourth season of work in Algonquin!

In 2019, turtle researchers partnered with Karen Hawes and her team from Fifth Ground Entertainment for an episode of the TVO Kids program *FishHeads*, which explores the lives of aquatic and semi-aquatic animals around Ontario. We were very excited by the opportunity to work with Karen and her team to document a day in the life of a Snapping Turtle researcher. Our episode has aired is now available on the TVO YouTube channel.

ABOVE The marginal scutes of turtles are marked with notches adding up to a unique number code.

ACKNOWLEDGMENTS

We were happy to welcome a large contingent of new researchers to the turtle team in 2019: Jenna Kentel, Hayley Vlcek, Jared Connoy and Jessica Leivesley. Thank you all for your great work! Jessica will be returning to the field in 2020 to continue her Ph.D. work and lead the turtle team alongside Carter, who will be returning for the final field season of his M.Sc. We would like to thank the Portage Store for their support in keeping the team afloat with gently used canoes. ♦

"ONE TURTLE WAS CAPTURED AFTER A 19-YEAR HIATUS, ONE OF THE LONGEST GAPS BETWEEN CAPTURES IN THE PROJECT'S HISTORY"

ABOVE Three Blanding's Turtles were caught in 2019. A new individual was fitted with a radiotransmitter before being released.
BELOW Painted Turtles released back into Wolf Howl Pond after being processed and having unique ID notch codes transcribed as painted numbers on their shells. [PHOTOS Samantha Stephens]

ABOVE Barrie Subaru supported our project for a thrid year through the use of a vehicle for our field season.
BELOW In addition to the standard measurement of growth and assessment of body condition, Carter collects blood samples to assess relatedness. Carter and Jenna sneak up to basking sites in a canoe at Wolf Howl Pond and observe who is basking with who. [PHOTOS by Samantha Stephens]

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SEX, SHELLS AND WEAPONRY

CONTINUED DISCOVERY ABOUT THE LOVE LIFE OF THE PAINTED TURTLE

It was in the 2014 AWRS Research Report that I last reported on research about the unexpected mating strategy of the Painted Turtle. To catch everyone up-to-speed, we found that: i) male turtles have enlarged tooth-like cusps, called tomiodonts, at the front of their beak; ii) females disproportionately bear injuries from the aggressive advances of males; iii) males undergo a shift in reproductive tactics from courtship to coercion as they grow; iv) males match their morphology (ornament/weapon) to their mating strategy (courtship/coerion). This was all very surprising because up to this point the Painted Turtle was recognized as the epitome of a gentleman suitor. A few questions remained, particularly about the putative shell weaponry of males . . .

THE LASTEST DISCOVERY

The latest research by Hawkshaw et al. (2019) compared shell shape between the sexes of Painted Turtles using the long-term study population in Algonquin Park as well as museum specimens. The shell of males had a significantly more serrated and projecting shape compared to females, lending support for the proposed sexual weapon hypothesis. As a follow-up, Moldowan et al. (2020) used 24 years of accumulated data to demonstrate that females experienced more wounding than adult males or juveniles, and that larger females had a greater probability of wounding than smaller females. Wounding was concentrated on the upper head and neck of females, consistent with the expectation of sexual coercion. Elevated rates of fresh wounding occurred during late summer, concurrent with the breeding period. Based on assessments of morphology and wounding patterns there is growing evidence that the tomiodonts and shell of male Painted Turtles function as sexual weapons. These findings shed new light on our understanding of mating system complexity in an often-overlooked and difficult-to-observe group of animals, and overturns long-held assumptions about the reproductive biology of these turtles. A capstone research paper in this series about Painted Turtle reproductive biology is currently in review. Stay tuned for more on this in 2020! ♦

"BASED ON ASSESSMENTS OF MORPHOLOGY AND WOUNDING PATTERNS THERE IS GROWING EVIDENCE THAT THE TOMIODONTS AND SHELL OF MALE PAINTED TURTLES FUNCTION AS SEXUAL WEAPONS"

LEFT The tomiodonts and shell of a male Painted Turtle. [PHOTO Courtney LeGros]
ABOVE The tomiodonts of a male Painted Turtle. A male Painted Turtle biting a female during coercion and a wound on the neck of a female turtle. [PHOTOS Patrick Moldowan]

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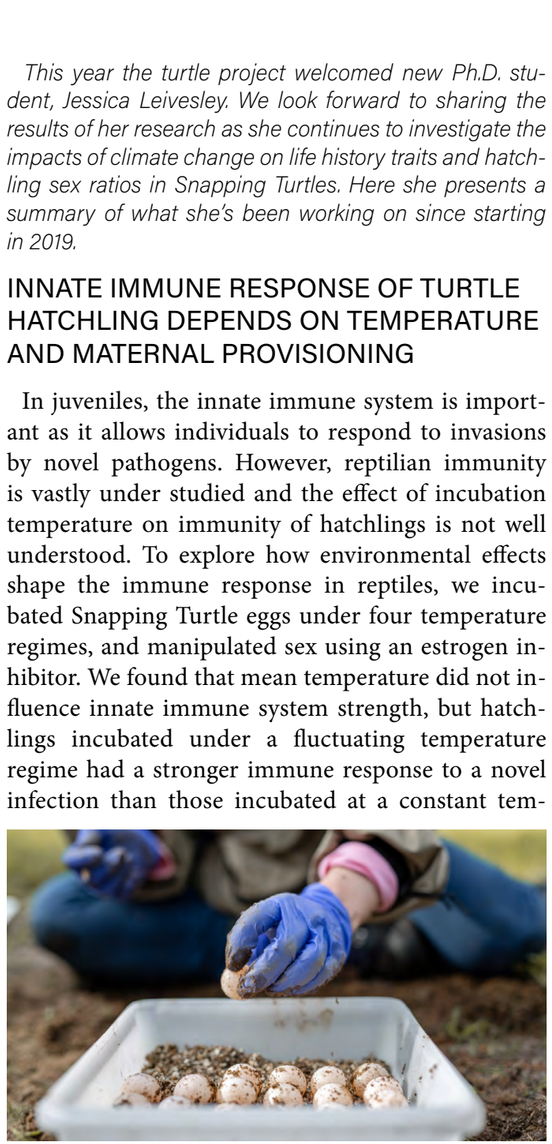
MORE TURTLE DISCOVERIES

STUDENT PROJECTS BY JESSICA LEIVESLEY, HAYLEY VLCEK, & CLAUDIA LACROIX

This year the turtle project welcomed new Ph.D. student, Jessica Leivesley. We look forward to sharing the results of her research as she continues to investigate the impacts of climate change on life history traits and hatchling sex ratios in Snapping Turtles. Here she presents a summary of what she's been working on since starting in 2019.

INNATE IMMUNE RESPONSE OF TURTLE HATCHLING DEPENDS ON TEMPERATURE AND MATERNAL PROVISIONING

In juveniles, the innate immune system is important as it allows individuals to respond to invasions by novel pathogens. However, reptilian immunity is vastly under studied and the effect of incubation temperature on immunity of hatchlings is not well understood. To explore how environmental effects shape the immune response in reptiles, we incubated Snapping Turtle eggs under four temperature regimes, and manipulated sex using an estrogen inhibitor. We found that mean temperature did not influence innate immune system strength, but hatchlings incubated under a fluctuating temperature regime had a stronger immune response to a novel infection than those incubated at a constant temperature. Hatchlings from heavier eggs also had a stronger immune response. This work has important implications for conservation programs, especially those that incubate hatchlings in a constant-temperature environment for release, and sheds light on the factors that influence variation in reptilian immune system strength. ♦



LEFT Jessica counts the eggs Snapping Turtle M16 laid in her nest.
RIGHT Snapping Turtle M16 nesting. [PHOTOS Samantha Stephens]

Each year, the Research Experience Program (REP) at the University of Toronto provides undergraduate students the opportunity to work on both the long-term turtle project and the BLISS project here at the Station. In addition to working as field assistants, these students also complete their own investigations that complement these long-term projects. Here Hayley Vlcek presents a summary of her REP study.

DO TURTLES PREFER TO NEST IN DISTURBED SOIL?

Anecdotally, turtles appear to nest in human-disturbed soil at high frequency. Turtles can be found nesting in piles of clean fill and areas with uprooted trees near shorelines. We investigated whether turtles prefer to nest in disturbed soils, and if they do, whether the turtles locate these sites via olfactory cues from the soil. We developed a randomized block design at our long-term nesting site, where ten blocks were divided into four sections with three treatment plots to be monitored during the nesting season: moderately disturbed, severely disturbed, severely disturbed with added organic material and an undisturbed control. We found that turtles exhibited no preference for disturbed or highly organic soil compared to the control. This suggests that disturbed soil is not a preferred nest environment for turtles, and that the plural of anecdote is not data. ♦

Claudia Lacroix assisted in the field with the turtle project and the BLISS project in 2019. Additionally, she completed her third year thesis back in the Rollinson Lab at the University of Toronto. Below she summarizes the results of her thesis project.

HATCHLING SNAPPING TURTLE VOCALIZATIONS

We investigated whether Snapping Turtle hatchlings vocalize during nest emergence. We collected Snapping Turtle eggs from the AWRS, and placed the eggs and a microphone inside a simulated nest cavity at the University of Toronto. We simultaneously captured still images of eggs hatching and hatchling movements within the nest. Vocalizations were detected, coinciding with egg hatching and movement in the nest, and we classified vocalizations into six different types. This is especially exciting, as some sounds show remarkable resemblance to sounds produced by the Arrau Turtle (*Podocnemis expansa*) and the Northern Snake-necked Turtle (*Chelodina oblonga*), suggesting that vocalisations may share a common communicative function. We speculate that Snapping Turtles vocalize to synchronise nest emergence, however the behavioural function ultimately remains unknown. Nonetheless, this project is contributing to a growing literature that suggests that turtle vocalizations are indicative of sociality. ♦

ABOVE Snapping Turtle eggs are numbered as they're counted, so they can be returned to the nest in the same order they were deposited.
MIDDLE Snapping Turtle H6 nesting.
BELOW Hayley collects nesting data from her experimental plots. [PHOTOS Samantha Stephens]

A SEASON IN THE WILD

REFLECTIONS ON A CANADIAN CONSERVATION CORPS PLACEMENT BY LESLEE BROWN

Last year I was fortunate enough to have the opportunity to partake in a youth program through the Canadian Wildlife Federation. The Canadian Conservation Corps is a service corps program through the Canadian Government that provides youth the opportunity to get involved in conservation related activities in different parts of Canada. In stage one of the program my cohort and I took off on a 12 day sea kayaking trip on the Bay of Fundy in New Brunswick. For stage 2, James Pinto and I were sent to the AWRS for nearly 3 months to volunteer.

A PLACE LIKE NO OTHER

It's hard to really put my time at the Station into words, as it was quite an unbelievable experience. I'm still processing the fact that I got to live in a cabin in the woods on a lake and spend so much time in the wilderness with some of the coolest, most down to earth people imaginable. Every day was a new adventure. We fixed up some old buildings for the 75th anniversary, maintained trails, analyzed an insane amount of salamanders, cooked and danced in the kitchen, searched for newts, saw a lot of moose, beavers, loons, and all sorts of birds, watched turtles nest, heard wolves howling, kayaked and canoed every day, explored the backcountry, experienced many, many bugs, bushwhacked for moose antlers, hiked trails, listened to naturalist's talks, identified butterflies and odonates, swam in the Sas, checked out High Falls and the Barron Canyon, and danced at the Blackfly festival…and that's just to name a few of the experiences.

My time here was short but so very sweet. This place has an incredible amount to offer and there are worlds beyond worlds to experience and embrace. I feel so blessed to have been placed at the AWRS and will always know where to go for a good time in the great outdoors! ♦

WORKSHOPS & FIELD COURSES

At the AWRS we foster a culture of field-based research, and we know that field courses offer an important opportunity for undergraduate students to learn field, research and naturalist skills that will prepare them for careers in the natural sciences. In addition to offering post-secondary field courses and professional development workshops in the natural sciences, we also see the opportunity to expand our programming to include skills that are complementary to the sciences. For example, this year we were excited to offer photography workshops, and we look forward to developing more programs on science communication and outdoor skills.

2019 WORKSHOP HIGHLIGHTS

March of the Salamanders: Spotted Salamander Research in Algonquin Park. Offered by Patrick Moldowan, lead researcher on the Station's long-term amphibian project in partnership with the Friends of Algonquin Park.

Amphibian Identification and Biology, with an emphasis on larval amphibians. Offered by Peter B. Mills, author of *the* field guide, ***METAMORPHOSIS: Ontario's amphibians at all stages of development***.

Beginner photography: how to shoot outside the automatic mode. Offered three times by Samantha Stephens, science and conservation photojournalist and National Geographic Explorer.

Wildlife Tracking in Algonquin Park. Offered twice a year by Earth Tracks.

Intermediate-level coding in R. Offered by Trent University and taught by Marcel Dorken (Trent University) and Erica Newton (MNRF).

2019 FIELD COURSE HIGHLIGHTS

Alan Wormington Memorial Young Birders Camp. Offered by the Ontario Field Ornithologists.

Blyth Academy Wildlife Photography & Leadership Courses. Offered multiple times a year by Canadian Adventure Expeditions.

University of Guelph Field Ecology (BIOL 4410). Taught by Dr. Amy Newman, Sheri Hincks and Matt Fuirst.

Lakehead University Field School (ENSU 3013 & ENSU 4013). Taught by Dr. Gerado Reyes.

Georgian College Field School. Taught by Dr. Jeremey Fromanger.

PUBLICATIONS

A BIBLIOGRAPHY OF PEER-REVIEWED RESEARCH PAPERS

Addison, E.M., Fraser, D.J.H., & R.F. McLaughlin. 2019. Grooming and rubbing behavior by Moose experimentally infected with Winter Ticks (*Dermacentor albipictus*). Alces 55: 23-35.

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Freeman, N.E., Norris, D.R., Sutton, A.O., & A.E.M. Newman. 2020. Raising young with limited resources: supplementation improves body condition and advances fledging date of Canada Jays. Ecology 101(1): e02909.

Hawkshaw, D.M., Moldowan, P.D., Litzgus, J.D., Brooks, R.J., & N. Rollinson. 2019. Discovery and description of a novel sexual weapon in the world's most widely studied freshwater turtle. Evolutionary Ecology 33: 889-900.

López-Garcia, J., Angell, C, and D. Martín-Vega. 2020. Wing morphometrics for the identification of Nearctic and Palaearctic Piophilidae (Diptera) of forensic relevance. Forensic Science International 309: 110192.

Massey, M.D., Congdon, J.D., Davy, C., & N. Rollinson. 2019. First evidence of metabolic heating in a freshwater turtle (*Chelydra serpentina*). Chelonian Conservation and Biology 18(2): 145-152.

Massey, M.D., Nancekivell, G., Brooks, R.J., & N. Rollinson. 2019. Measurement and modelling of primary sex ratios in a species with temperature dependent sex determination. Journal of Experimental Biology 222: jeb190215.

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Moldowan, P.D., Brooks, R.J., & J.D. Litzgus. 2020. Demographics of injuries indicate sexual coercion in a population of Painted Turtles (*Chrysemys picta*). Canadian Journal of Zoology 98(4): 269-278.

Rouleau, C.J., Massey, M.D., & N. Rollinson. 2019. Temperature does not affect hatch timing in Snapping Turtles (*Chelydra serpentina*). Journal of Herpetology 53: 165-169.

Rollinson, N., Massey, M.D., Meron, M., & J. Leivesley. 2019. A low cost, efficient, and precise technique to quantify key life cycle events in nests of oviparous reptiles. Journal of Herpetology 53(4): 302-309.

Schmidt, E., Mykytczuk, N., & A.I. Schulte-Hostedde. 2019. Effects of the captive and wild environment on diversity of the gut microbiome of Deer Mice (*Peromyscus maniculatus*). The ISME Journal 13: 1293-1305.

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Valenzuela, N., Literman, R., Neuwald, J.L., Mizoguchi, B., Iverson, J.B., Riley, J.L., and J.D. Litzgus. 2019. Extreme thermal fluctuations from climate change unexpectedly accelerate demographic collapse of vertebrates with temperature-dependent sex determination. Scientific Reports 9: 4254.

DEFENDED THESES & STUDENT PROJECTS

The AWRS has been a host to many graduate students since its inception in 1944. We continue to provide exceptional opportunities for students to gain invaluable knowledge in field biology. Listed here are the student projects that were completed in 2019 and early 2020.

GRADUATE

Sutton, A.O. 2020. *Demographic and environmental drivers of Canada Jay population dynamics in Algonquin Provincial Park, Ontario*. ***Ph.D. Thesis***, Department of Integrative Biology, University of Guelph.

Veitch, J.S.M. 2020. *Ectoparasitism of rodent hosts in Algonquin Provincial Park, Ontario, Canada: Infestation patterns, host glucocorticoids, and species co-occurrence*. ***M.Sc. Thesis***, Department of Biology, Laurentian University.

UNDERGRADUATE

Connoy, J. 2020. *Maternal phenotype and the evolution of temperature-dependent sex determination in reptiles.* ***REP***, Ecology and Evolutionary Biology, University of Toronto.

Gao, Gloria. 2020. *Frequency of abnormalities of Spotted Salamanders in natural ecosystems.* ***REP***, Ecology and Evolutionary Biology, University of Toronto.

Lacroix, C. 2020. *Hatchling Snapping Turtle vocalizations.* ***B.Sc. Thesis***, Ecology and Evolutionary Biology, University of Toronto.

Semenuk, A. 2019. *Carnivorous plants, arthropods and salamanders: space and stable isotopes.* ***IBIO4510***, Department of Integrative Biology, University of Guelph.

Ravenhearst, D. 2020. *Fine scale local recapture rates of Spotted Salamanders at a long-term study site.* ***REP***, Ecology and Evolutionary Biology, University of Toronto.

Vlcek, H. 2020. *Do turtles prefer to nest in disturbed soil?* ***REP***, Ecology and Evolutionary Biology, University of Toronto.

IN THE MEDIA

THE STATION

Wild Life. Fall 2019. Mountain Life: Blue Mountains Magazine. (*Print*)

75 Years of Wildlife Research. December 2019. The Raven, Vol. 60, No. 5. Written by AWRS reseacher and Board member Patrick Moldowan. (*Print & Online*)

SALAMANDERS

Carnivorous Pitcher Plants found at Algonquin. November 2019. Ontario Parks Blog. Written by Photojournalist-in-Residence Samantha Stephens. (*Online*)

Salamanders Vs Plants July 2nd, 2019. Herptological Highlights 052. (*Online Podcast*)

The discovery of salamanders trapped in pitcher plants received wide-spread international attention. **Here we list a few online outlets where it was featured:** *Newsweek*, *CBC*, *CTV News*, *National Geographic*, *Mother Nature Network*, *Smithsonian Magazine*, *AAAs EurekaAlert!*, *NewScientist*, *Vice*, *Sci-News*, *FOX News*, *Global News*, *The Guardian*, *The Independent*, *LiveScience*, and *Environmental News Network*.

ANTLER FLIES

One Moose's Trash is Another Fly's Treasure: Antler Flies Teach Biologists about Love, Life and Death. July 2019. The Raven, Vol. 60, No. 2. Written by AWRS researcher Chris Angell. (*Online & Print*)

Why you should let fallen antlers lie: they're still in use. November 2019. Cottage Life. (*Online*)

CANADA JAYS

Canada Jay hides food for winter, but sometimes nature's freezer lets it spoil. April 15, 2019. Ottawa Citizen. (*Online*)

TURTLES

Hooked on Turtles: What to do if you catch a turtle on a fish hook. 2019. Filmed and directed by AWRS alumnus Steven Kell. (*Online video*)

Echoes from the 80's- Algonquin's Turtles Tell a Story. August 2019. The Raven, Vol. 60, No. 3. Written by AWRS researcher Matt Keevil. (*Online & Print*)

As mating rituals go, Valentine's Day isn't so bad. February 2020. The New York Times. (*Online*)

The Art of the Turtle War. March 4th, 2020. Herpetological Highlights 064. (*Online Podcast*)

Understanding the habits of nesting turtles is key to conservation efforts. May 2020. Cottage Life. (*Online*)

TVO Kids FishHeads series: Trappin' Snappers. May 2020. Starring AWRS researchers Carter and Jenna. (*Broadcast & Online video*)

OUR 2019 TEAM ON THE GROUND

BACK ROW: Jared Connoy (B/T), Delaney Kelm (S), Jenna Kentel (T), Amanda Semenuk (S), Leslee Brown (CCC), Tracey Yu (A), Chris Angell (A) **MIDDLE ROW:** Hayden March-Wilson (S), James Pinto (CCC), Carter Rouleau (T), Noah Loiselle (SA) **FRONT ROW** Samantha Stephens (P), Léa Fiéschi-Méric (SA), Kevin Kemmish (S), Patrick Moldowan (B), Hayley Vlcek (B/T), Mariel Terebiznik (T)

MISSING: Randolph Mabaquiao (S), Gloria Gao (B), Lucas Warma (B), Danté Ravenhearst (B), César (SA), Jessica Leivesley (T), Erica Fellin (SM), Jon Curtis (SM), Claudia Lacroix (B), Hailey Smith (S). In addition to our group of core researchers, we also welcomed numerous technicians from the MNRF conducting the long-term Small Mammal fieldwork and those on Dr. Jay Malcolm's team investigating beetle diversity under varying logging practices.

A: Antler Flies
B: Bat Lake Inventory of Spotted Salamanders
CCC: Canadian Conservation Corps
P: Photographer-in-Residence
S: Staff
SA: Salamander Microbiome
SM: Small Mammals
T: Turtles

SUPPORTERS & MAJOR USERS

As a not-for-profit, the AWRS and the long-term projects it hosts rely on the financial and logistical support of many individuals, institutions and organizations. We would like to thank all of our users, supporters and contributors for their generosity. We are truly grateful for your belief in the mission of the AWRS. Additionally, we would like to thank everyone who supported us by attending the 75th Reunion weekend, Elizabeth Ann Francis for her beautiful artwork featured on our first series of notecards, and Samantha Stephens for her work as a Photojournalist-in-Residence during the 2019 field season.

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THANK YOU FOR ENJOYING OUR 2019 RESEARCH REPORT!

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