ALGONQUIN WILDLIFE RESEARCH STATION

2020
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.

AWRS

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A MESSAGE FROM THE CHAIR OF THE BOARD OF DIRECTORS

Greetings friends of the Algonquin Wildlife Research Station!

Well, things have certainly been different this past year. As I write this message, we mark one year since the declaration of the COVID-19 pandemic. I sincerely hope you have all managed to navigate your way through the associated challenges relatively unscathed and with hope for the vaccine roll-out now underway. Operations at the Station were certainly impacted by the pandemic, but by following Public Health and Ontario Parks guidance, with staggered building use, and with strict health and safety protocols in place, we were able to host researchers from the long-term projects. So I am pleased to report that there were no holes in the data collection of these decades-long projects. Manager Kevin Kemmish and Assistant Manager Hayden March-Wilson took advantage of the relatively quiet season at the Station to do some cleaning-up and deferred infrastructure repairs, so we are ready to open up when it is safe to do so. Unfortunately, we were not able to host any field courses or large groups in 2020, but we are looking forward to when we can swing open the Cookhouse and Rye Upper Lab doors to welcome back students to learn in the magnificent natural classroom that is Algonquin Park. We anticipate that the 2021 field season will also be a relatively quiet one, and we will follow all Public Health guidelines again as we consider applications from researchers and small groups to use the Station. Switching for a moment from my Board Chair hat to my Research Project PI hat, I am excited to celebrate the 50th anniversary of the long-term turtle project in 2021.

I am pleased to share with you the 2020 AWRS Research Report, our 13th annual report. Despite the more limited research season, we still have some great science to showcase. Thanks again to our NOHFC Intern, Samantha Stephens, for her creative photography and layout skills, making the report both highly attractive and very informative. Sam's NOHFC Internship recently wrapped up, but we are not willing to let her go! We are hoping to bring her back on as staff, pending support from grant applications that are currently under review.

I continue to be extremely thankful for the hard work and dedication of Manager Kevin Kemmish, especially through this challenging year that required quick changes, increased logistical planning, and enhanced safety and cleaning protocols. I am also very grateful for the advice, support, and activities of our volunteer Board of Directors. The Board members all have "real jobs" that keep them very busy, and even more so than usual this past year because of the pandemic, yet they graciously give their already-limited time to help the Station. As always, please feel free to reach out to any of us with questions or comments about matters pertaining to the Station; Board contact information can be found on the AWRS website (www.algonquinwrs.ca).

Like last year, our AGM will be held online using ZOOM this year, sometime in June 2021. I will keep you posted about the exact date and time via our email newsletter. Although we again 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 2021 research season. I look forward to seeing you at the Cookhouse when it is again safe to gather there.

Dr. Jackie Litzgus
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,

It is without question that 2020 was one of the strangest years on recorded for the Algonquin Wildlife Research Station. Buildings, which for 75 years were busy hubs of activity, had a summer of rest. However, the Station was not completely empty; while field courses, workshops and large research groups were not able to operate, careful precautions allowed us to have a number of core researchers and a small staff team.

As you will see here, despite the small team sizes and numerous logistical challenges, a successful field season was forged for our long-term projects ensuring that there wasn't a year missing from these valuable datasets. Also, with the heavily reduced number of Station users, the staff team was able to take the opportunity to make much needed major improvements to Station infrastructure such as replacing flooring and updating electrical services. These improvements would not have been possible without contributions from a wide variety of supporters. In 2020, we introduced a new way to support the Station: our Patreon community. Through our Patreon page, you can sign up to contribute a small monthly amount (starting at $1.50 CAD) and in return gain access to exclusive behind-the-scenes content and other perks. Every dollar truly makes a difference in helping us maintain our facilities and support our projects.

This is our 13th annual publication of the AWRS Research Report. Since it began, this publication has been an important tool for demonstrating the Station's high-quality research, public outreach efforts, and experiential learning opportunities to our members, supporters, and partner organizations. Our success in 2020 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 this year's small but strong staff team made up of Samantha Stephens and Hayden March-Wilson. Without their dedication and hard work last year's successes would not have been possible. Lastly, thank you to the contributors of this report, who have taken the time to share their research.

I encourage you to visit our website, support us on Patreon or follow us on Facebook, Twitter and Instagram for news, updates and reports from the field. If you are interested in becoming part of our rich history, please do not hesitate to contact us by email at algonquinwildliferesearch@gmail.com or by phone at 705-633-5621.

I hope you enjoy the 2020 Research Report!

Kevin Kemmish

Kevin Kemmish
Station Manager

CATCHING UP WITH THE SALAMANDERS

AMPHIBIAN UPS & DOWNS

Patrick D. Moldowan (*University of Toronto*) & Dr. Njal Rollinson (*University of Toronto*)

Field season 2020 was shaping up to be a bumper year for amphibian research at the AWRS. In January, our team was at the University of Otago, Aotearoa, New Zealand for the 9th World Congress of Herpetology. This meeting brought together nearly 900 scientists and practitioners from 57 countries to share discoveries, promote education, and address amphibian and reptile conservation concerns. Patrick was awarded a full scholarship to attend and presented a mash-up of herpetological-botanical research about the salamander-eating pitcher plants. The conference was a terrific opportunity for learning, sharing, making new friends and catching-up with old ones, and seeing the stunning wildlife and landscapes of New Zealand. Patrick continued island hopping in the Pacific throughout the late winter, returning home just in time to plan for spring thaw. The annual Algonquin march of the salamanders was almost on. . .

A YEAR IN REVIEW

Bat Lake thawed on April 26th, consistent with the average thaw date from the preceding decade. Salamanders began their overland journey, but the typical student crew was not in tow. Provincial COVID-19 lockdowns, for what would become known as the 'first wave', stymied research activities. The spring field season was mothballed except for a late salvage of salamander egg mass counts. In 2020, egg mass counts were among the lowest recorded in 13 years of monitoring. Figure 1 shows the maximum egg mass counts since the project began in 2008. The spring and summer turned into statistical analysis, research writing, and plenty of screen time from the kitchen table. A full dive back into field time would have to wait …

Come August, with necessary safety precautions in place, student Mariel Terebiznik headed to the field to catch-up with metamorphic Spotted Salamanders emerging from the lake (Image 1). Patrick continued daily surveys throughout September and October. The low egg deposition year translated to a low number of emergent Spotted Salamanders (1531 individuals, approximately half of the number of individuals counted in 2019). Having collected egg mass abundance data in the spring and metamorph emergence data in the late summer/autumn over several years, we will be estimating survival throughout the poorly known aquatic larval stage.

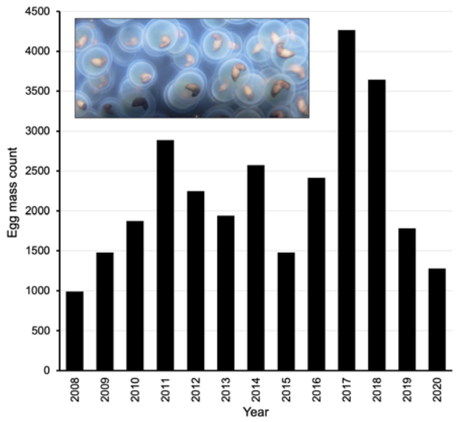

Figure 1. Maximum eggs mass counts from each year since the project began in 2008. Photo by Patrick Moldowan.

THE LIFE UNDERGROUND

Spotted Salamanders spend most of their life underground, yet they rely on aboveground environmental cues for key life cycle events, namely reproduction. Directly tracking the activities and behaviour of subterranean animals is fraught with difficulty. Fortunately, other sources of information can provide hints about their hidden lives. To better inform our understanding of how climate (change) might affect salamanders, among other soil dwellers, we planted temperature

Image 1. Recently metamorphosed Spotted Salamanders demonstrating variation in colour and pattern. Photo by Patrick Moldowan.

data loggers in the soil several years ago. These loggers have recorded temperature every couple hours at different soil depths (surface, 0 m; subsurface, -0.5 m and -1.0 m) at multiple locations around Bat Lake. This autumn we retrieved the dataloggers, downloaded the data, and began to construct a picture of the life underground. The temperature profiles (Figure 2) nicely show how variable surface (air) temperature is compared to relatively stable underground temperatures. As might be expected, a subterranean lifestyle moderates exposure to temperature extremes—it's not too hot and not too cold in this 'Goldilocks zone'! A particularly neat observation was the stabilizing and insulating effect of the snowpack on soil surface temperature. Most pertinent to our study was the determination of the depth of freezing temperatures in winter, which would dictate overwintering depth of the salamanders, and soil temperature in summer. Our related research has shown that salamander breeding body condition is sensitive to summer temperatures, with warmer summer temperatures leading to reduced condition. Underground temperatures combined with knowledge of salamander habitat use and physiology (metabolism) are helping to explain our observed trend in declining salamander body condition over the past decade (Figure 3) and inform how these important members of the forest community are responding to climatic change.

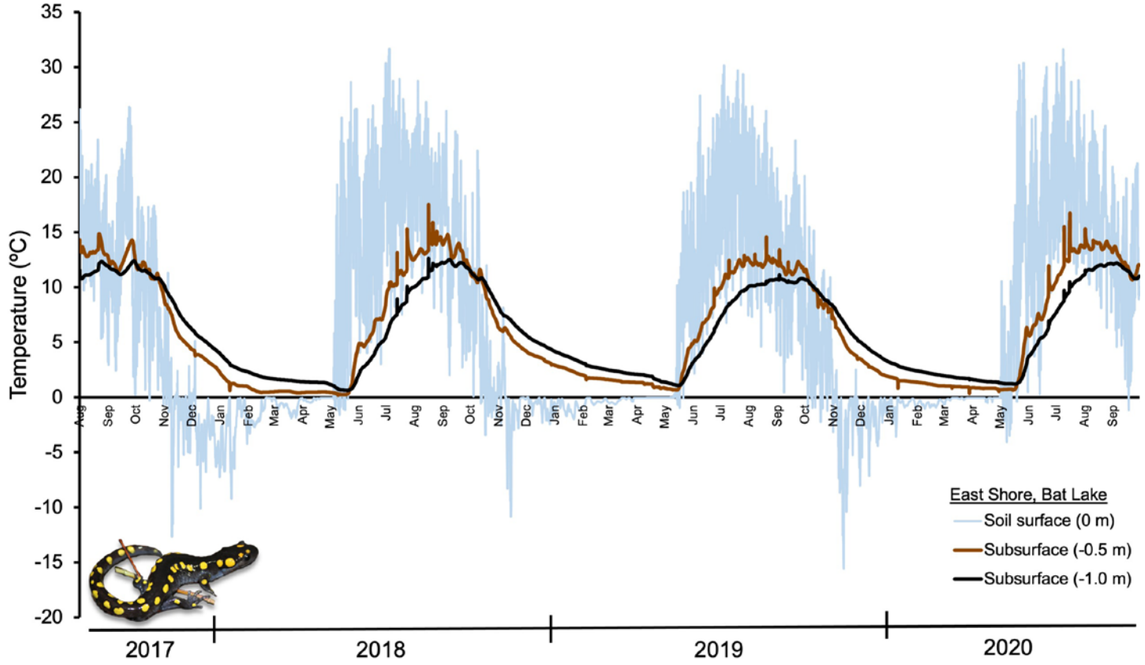

Figure 2. Temperature profile of soil surface (0 m) and subsurface (0.5 m & 1.0 m depths) at Bat Lake, Algonquin Provincial Park (August 2017–September 2020).

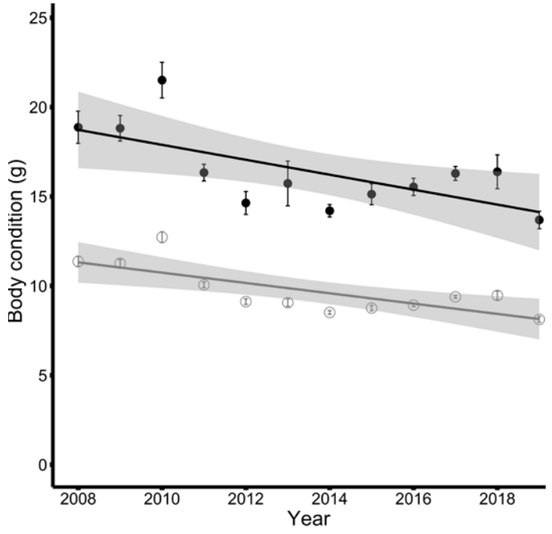

Figure 3. Female (black circles) and male (grey circles) Spotted Salamanders have experienced a decline in breeding body condition (2008–2019). Evidence suggests that warmer autumn and/or summer temperatures may be responsible for reduced condition. (Plotted: Annual population mean body condition with 95% confidence intervals for females and males; best fit line from weighted linear regression shown with 95% confidence intervals.)

> “SPOTTED SALAMANDERS SPEND MOST OF THEIR LIFE UNDERGROUND, YET THEY RELY ON ABOVEGROUND ENVIRONMENTAL CUES FOR KEY LIFE CYCLE EVENTS, NAMELY REPRODUCTION”

ON THE HORIZON

Patrick is currently in the later stages of his PhD and working to complete his remaining projects, including an analysis of Bat Lake salamander population biology and an investigation comparing the efficacy of different field methods for sampling salamander populations. These research papers, alongside several busy years of summer student research projects are in preparation. As part of succession planning, we will soon be welcoming a new graduate student onboard for amphibian studies at the AWRS. There is lots on the horizon for AWRS amphibian research over the next few years! ♦

A NEW CHAPTER FOR THE SALAMANDER–PITCHER PLANT PROJECT

Amanda Semenuk (*University of Guelph*), Patrick D. Moldowan (*University of Toronto*) & Dr. M. Alex Smith (*University of Guelph*)

With the months of uncertainties brought by COVID-19, a sense of normalcy was restored by returning to the bog for another August of the salamander-pitcher plant project. If you haven't heard, some juvenile Spotted Salamanders making their first migration from their natal pond to the surrounding forest each summer are being intercepted by pitcher plant leaves—fluid-filled traps specialized for capturing arthropod prey.

NEW QUESTIONS

We have now followed this phenomenon each summer since its discovery in 2017, and this summer was particularly exciting as it marked the first field season of my Master's project. Here, I investigated some of the major questions that have arisen since the discovery of salamander-eating Northern Pitcher Plants and hopefully lay the groundwork for future researchers! The main questions are: 1) what are the attractive qualities of the pitcher plant through the eyes of an emerging juvenile salamander, and 2) what is the impact of salamanders as an (apparent) nutrient source for pitcher plants?

A MESSY START

The field season of late-summer 2020 began with a muddy Easter egg hunt for plant markers that had sunk into the Sphagnum moss under the weight of ice and snow. We went forth with daily surveys of our study group of Northern Pitcher Plants, investigating their contents, and this year we included plants accessed by boat. Despite plenty of warm and rainy days, there were notably fewer salamander captures this season compared to 2019, with a mere ~50 captures rather than the previous 136. While we could entertain the idea of amphibians 'smartening up', it is more likely a product of lower salamander egg masses laid during the preceding spring.

WEATHER & THE FATE OF SALAMANDERS

Daily surveys reveal patterns that would otherwise go overlooked if we surveyed less frequently. For instance, while the rate of captures is relatively continuous, we often observed pulses of both salamander deaths and escapes from the pitcher leaf. The spread of these events across several plants within a small timeframe suggests environmental conditions may be responsible. Thanks to a scene starring a Spotted Salamander orchestrated by a visiting film crew, we confirmed that large amounts of water (such as that from heavy rainfall) fill up the pitchers, providing the trapped amphibians with a brief window of escape. As for a source of mortalities, temperature data loggers placed in pitcher fluid revealed temperatures exceeding the critical thermal maximum–the temperature above which organisms can no longer survive. This

"THE SPREAD OF THESE EVENTS ACROSS SEVERAL PLANTS WITHIN A SMALL TIME-FRAME SUGGESTS ENVIRONMENTAL CONDITIONS MAY BE RESPONSIBLE"

supports the thermal stress hypothesis, one of four hypotheses put forward in our publication of this discovery as an explanation for the demise of trapped metamorphs. However, as this explanation doesn't account for deaths occurring on cooler days later in the season, there is most certainly more to the story! The next steps in our investigation will include confirming both an increase in escapees after heavy rainfall and higher mortality rates on warmer summer days.

SALAMANDERS IN THE SPOTLIGHT

In September, we were joined by a film crew to capture the salamander-pitcher plant phenomenon for an upcoming documentary series. Nighttime filming afforded glimpses of salamander behaviour and their interactions with the plants. Unfortunately, we're sworn to secrecy and that's all we can say for now. Stay tuned!

ACKNOWLEDGEMENTS

I have received tremendous support from my friends and colleagues throughout this project, and to me, that is what makes science so rewarding. Thank you to Dr. M Alex Smith, Dr. Shoshanah Jacobs, and Patrick Moldowan for guiding me in my research and discussing endless 'what ifs' that have arisen from this neat interaction. Thanks to Samantha Stephens for lending me her brilliant photographs of the project for presentations and being an always welcomed field partner. Also, thanks to Hayden March-Wilson, Mariel Terebiznik, Jasmine Veitch, and Sarah Falconer for help with plant surveys. This research is supported by the University of Guelph, the National Science and Engineering Council of Canada, and the German Carnivorous Plants Society. ♦

CATCHING UP WITH THE CANADA JAYS

MONITORING BREEDING PHENOLOGY & SPATIAL ECOLOGY

Matthew Fuirst (*University of Guelph*) & Dr. Ryan Norris (*University of Guelph*)

21 February, 2020. *"The air is cold and crisp, but the blue skies and bright midday sun begin to melt away the fresh snow. The research team stands along the Leaf Lake ski trail watching a pair of Canada Jays feed. Suddenly, the male breaks off a small twig from a Balsam Fir and bee-lines into the forest. This bird was the first to begin build-ing a nest for the breeding season."*

It would take months of monitoring before knowing if the pair would succesfully reproduce. . .

The 2020 field season was the 56th year of moni-toring the Canada Jay population in Algonquin Pro-vincial Park. Each winter, graduate students from the University of Guelph study the breeding ecology of Canada Jays that occupy territories along the Highway 60 corridor. In 2020, we monitored 16 active territo-ries from late-February when the jays begin building nests until the end of May. Our goals were three-fold. First, we set out to find the location of each breeding pair's nest on each of the 16 active territories. We then monitored each nest until the eggs either hatched, or the nest failed (i.e. it was predated). Finally, we banded and radio-tagged the nestlings at each successful nest.

AN UNFORGIVING SEASON

The winter season started off smoothly with only a moderate amount of snow to trek through! Compared to 2019, we had two additional occupied territories. We had active nests ranging from Arowhon Road all the way to the East Gate entrance of the park. Nest building began in late-February and on March 4th we spotted the first pair to begin incubating eggs. In mid-March, four of the 16 nests suffered a predation event by terrestrial predators, which caused those pairs to build another nest and start their breeding process all over again. Unfortunately, none of these four re-nest-ing pairs had successful nests since their offspring hatched in late-April into May when spring preda-tors, such as migratory raptors, became much more abundant. By the time May rolled around, only five of the 16 nests monitored in 2020 had successfully fledged offspring. Midway through the spring season (mid-April) we also observed two predation attacks on adult jays. One of the breeding males along Ope-ongo Road was attacked by a merlin, causing him to spend his spring tailless! The second predation event was less fortunate for the jay; another breeding male along Opeongo Road was killed and a local juvenile male filled his spot on the territory.

> "BY THE TIME MAY ROLLED AROUND, ONLY FIVE OF THE 16 NESTS MONITORED IN 2020 HAD SUCCESSFULLY FLEDGED OFFSPRING"

JAY RELATIONSHIPS

Many of the breeding adult jays in our study popula-tion are individuals who inherited or claimed a breed-ing position after their first year of life. This is exciting to see juveniles that are born in the population stay and breed for many years later. Currently, the breed-ing female at the Boardwalk territory by Spruce Bog is an individual that was born at the Cliff territory along Opeongo Road. Similarly, the current male breeder at the Cameron Lake Road territory was previously a ju-venile adopted as a first-year bird by the pair residing in North Bog along Hermit Creek. The breeding male at the Arowhon territory was born at that very terri-tory in 2015 and inherited the breeding position after his father died and his mother left.

SUMMER TRACKING

Most of the research on Canada Jays in Algon-quin Provincial Park has been focused on the winter breeding ecology of adults. We know virtually nothing about where adults go in the summer and what they eat during this time. This summer we radio-tagged 12 adult jays to determine what habitats they use during the non-breeding season. From early May until the end of July, each tagged bird was tracked twice a week using a hand-held antennae and radio receiver. Fasci-natingly, some of the birds spend their summer over 1.5km away from their breeding territory and use pre-dominantly coniferous forests and wetland habitats. The tracking this summer revealed that Canada Jays, which are known to act as nest predators for song-birds, also occasionally feed on mushrooms, freshwa-ter invertebrates, and even adult Spotted Salamanders and American Toads!

ACKNOWLEDGEMENTS

We are very thankful that our team was able to continue our research during 2020. We would like to thank Rick Stronks for enabling us to conduct our research during the public park closure. Additionally, we are very thankful for the AWRS for allowing us to continue to access our Bat Lake territory. We thank Dan Strickland for his countless pieces of advice and insight on Canada Jays and Dr. Ryan Norris for fund-ing and supervising our 2020 field season. The 2020 field season would not have been possible without the assistance of field crew members Joschka McLeod, Andre Picard, and Cheyenne Paterson. We are excited to welcome MSc student Karen Ong to the project! ♦

A QUIET YEAR WITH THE TURTLES

Carter Rouleau (*Laurentian University*), Dr. Jacqueline Litzgus (*Laurentian University*), Dr. Njal Rollinson (*University of Toronto*) & Dr. Ronald Brooks (*University of Guelph*)

The summer of 2020 was like no other, and for the first time in our 49-year history, the turtle project's unbroken streak of field seasons was in jeopardy. Fortunately, we were able to safely get into the field for another season with the turtles. Our team was much smaller than normal, but we were still up to the task, capturing 401 Painted Turtles and 35 Snapping Turtles across four study sites. After a record late nesting season in 2019, conditions this year were much more typical, and the team noted nests from 205 Painted Turtles and 25 Snapping Turtles.

BASKING BUDDIES

Fieldwork in the 2020 season revolved primarily around a study of Painted Turtle basking behaviour, ongoing since 2019. Our objective was to describe the basking habits of the Painted Turtle population in Wolf Howl Pond, one of our three primary study sites along the Mizzy Lake Trail. Regular visitors to the trail are sure to have noticed the conspicuous basking groups formed by the resident Painted Turtles–the largest on record is 24 turtles! Scientific evidence suggests that this tendency to form groups is indicative of conscious social choice by individual turtles. In other words, individuals of many species who share this tendency often form social bonds with specific other individuals and are frequently seen basking together. In many cases, these bonds are formed between family members. Behaviours of this nature are largely unexamined in turtles, and we decided that our long-term study provided the perfect opportunity to test the social capabilities of the Painted Turtle.

Across our two years of study, we were able to find a number of strong social associations between turtles in Wolf Howl Pond. Furthermore, many of these were formed by close-kin, and in some cases siblings or parents and offspring! This is a completely novel finding for a turtle species, and speaks to the value of long-term research in the exploration of animal life history. Our examination of basking behaviour was made possible by the turtle identification system and life history data previously collected through long-term study.

"OUR TEAM WAS MUCH SMALLER THAN NORMAL, BUT WE WERE STILL UP TO THE TASK, CAPTURING 401 PAINTED TURTLES & 35 SNAPPING TURTLES ACROSS FOUR STUDY SITES"

THE BENEFITS OF LONG-TERM STUDY

Having run continuously for nearly 50 years, our study affords opportunities for research available only through the collection and maintenance of long-term life history data. Ongoing monitoring is made possible largely through identification methods such as notch-

code markings on the shells as well as tags, sometimes called 'license plates.' In many of our study locations throughout the park, population estimates suggest we have marked and identified upwards of 95% of the total population. This means that the vast majority of our observations and captures are of previously-marked individuals. By knowing the identity of the turtles we work with, we are able to associate every piece of data collected on an individual with a larger pool of life history information gathered through previous capture of that individual. This proved particularly useful in our examination of basking behaviour in Wolf Howl Pond. As one of our oldest and most thoroughly surveyed study sites, over 98% of the Wolf Howl Pond turtle population is marked. Because of this, every observation of basking by an individual (or pair of individuals) could be examined in the context of their life history. Rather than simply knowing that certain turtles basked in certain locations, we were able to examine and compare the life histories of these turtles, considering questions like: are these turtles the same age? Were these turtles born in the same pond? Are these turtles members of the same family? By including life history data in observational studies of this nature, we can suggest more detailed and comprehensive biological explanations for the patterns we observe.

TURTLE OBSERVATIONS IN ALGONQUIN PARK

The Highway 60 corridor through Algonquin Park is often a hotspot for turtle activity. Unfortunately, this also presents a great deal of risk for turtles attempting to cross the road, or nest on the gravel shoulders. If you are fortunate enough to come across a turtle on your drive through the park, please help it cross the road in the direction it is travelling, provided it is safe for you to do so. Saving one turtle from road mortality can have a tangible impact on its population. We are also interested in collecting information about road use by turtles in the park. If you do observe a turtle on the highway, please report your sighting to naturalists at the park Visitor's Center (located at km 43 south of Highway 60), or email an observation to crouleau@laurentian.ca. Any photos or additional information accompanying observations would also be greatly appreciated.

> "THIS IS A COMPLETELY NOVEL FINDING FOR A TURTLE SPECIES, AND IT SPEAKS TO THE VALUE OF LONG-TERM RESEARCH IN THE EXPLORATION OF ANIMAL LIFE HISTORY"

ACKNOWLEDGEMENTS

We were happy to welcome Brooke Carroll to the team for the 2020 field season. Brooke hopes to return the park to lead the turtle project in 2021. ♦

OUTREACH & PARTNERSHIPS

Our team was incredibly fortunate to partner for a fourth consecutive year with Barrie Subaru, who once again provided our field vehicle for the 2020 season. We have been grateful for their support the past four years. After a long life in the field, the Turtle Car has finally been retired. We hope to continue our partnership with Barrie Subaru in the future.

CATCHING UP WITH THE SMALL MAMMALS

DO MICE KNOW THERE'S A GLOBAL PANDEMIC?

Sarah Falconer (*Laurentian University*), Jasmine Veitch (*Laurentian University*), Dr. Jeff Bowman (*MNRF/Trent University*) & Dr. Albrecht Schulte-Hostedde (*Laurentian University*)

While almost every aspect of daily life changed this year due to the COVID-19 pandemic, there were some things that remained constant. The sun still rose in the east and set in the west, the Toronto Maple Leafs played poorly in the playoffs, and the small mammal project ran at the Algonquin Wildlife Research Station. This summer marked the 69th consecutive year of the long-term research study, which has collected data on small mammal communities in the park since 1952. As one of Canada's longest-running population studies, we were thrilled we didn't lose a year of valuable data.

AN UNUSUAL YEAR

Although 'sm'mammal' research did continue this year, day-to-day operations looked a little different to make sure the research team and the animals were safe and stayed healthy. Because we didn't know whether COVID-19 could be transmitted between rodents and humans, we wore masks at all times when handling the animals (on top of our regular safety gear, which includes gloves, traffic vests, and protective bug jackets). Our research team consisted of just two, and we worked in a bubble to minimize exposure. And while we still managed to get a good six weeks of data, the field season itself was shortened due to lockdown restrictions in the province. By the time we arrived at the station in July, the black flies AND the small mammals were at peak densities!

HIGH SM'MAMMAL ABUNDANCE

Despite the modifications, summer 2020 proved to be an incredibly productive year. Small mammal populations typically cycle between high and low abundance years, and this year was definitely high! In our shortened season we processed a total of 216 Deer Mice, 42 Eastern Chipmunks, 22 Woodland Jumping Mice, 21 Southern Red-backed Voles, 16 North American Red Squirrels and one Northern Flying Squirrel. In a rare turn of events for the project, Jasmine also came across a Short-tailed Weasel who had entered a trap looking for a snack! Small mammal population fluctuations can affect animals farther up the food chain, and so it is important to monitor our small, furry friends to understand the overall health of the ecosystem. As always, animals that were trapped were given a metal ear tag with a unique number. Information on the species, age, sex, reproductive status, and external parasites (fleas, ticks, and mites) of each animal caught was recorded. Data collected this year is already being used in a study looking into parasite communities in this ecosystem!

> "SMALL MAMMAL POPULATIONS TYPICALLY CYCLE BETWEEN HIGH AND LOW ABUNDANCE YEARS, AND THIS YEAR WAS DEFINITELY HIGH!"

IN CONCLUSION

It was comforting to rely on the relative normalcy of conducting this research project amidst all the strangeness of 2020. Although there were fewer personnel at the Station than normal, we are grateful to everyone who lent a hand this summer (at the proper social distance of course). Thanks as well to the Ontario Ministry of Natural Resources and Forestry for their continued support. In the face of this overwhelming pandemic, it can be helpful to remember that all change is relative. While we all had to adapt to new and unusual daily habits, for the mice of Algonquin Provincial Park…it was just another summer. ♦

Sarah Falconer

CONTINUED RESEARCH ON SMALL MAMMAL PARASITES

Jasmine Veitch (*Laurentian University*), Sarah Falconer (*Laurentian University*), Dr. Jeff Bowman (*MNRF/Trent University*) & Dr. Albrecht Schulte-Hostedde (*Laurentian University*)

While many creepy crawlies tend to go overlooked and unloved, parasites can play a powerful role behind-the-scenes of many ecosystems. They are hugely important in driving evolution and biodiversity and shaping the natural world that we enjoy today. At the AWRS, we recognize the importance of these small organisms and have focused research into improving our understanding of parasite ecology. Recent parasite research from the small mammal project has focused on three major areas of interest: patterns of parasite infestations, parasite community ecology, and the effects of parasites on their hosts.

PATTERNS OF PARASITE INFESTATIONS

Identifying characteristics that make an animal more susceptible to parasites, and when they are most at risk, is a longstanding area of research in disease and parasite ecology. How often or how many parasites are in an ecosystem is not consistent over time or even between habitats. This can change based on environmental conditions, host characteristics like body size and age, and even based on the parasites themselves. Our team has been investigating how patterns of parasitism change across different small mammal species, forest types, host characteristics, as well as recording their seasonal distribution. For example, infestation rates of fleas and mites tend to increase throughout the summer months, along with the mosquitos and ticks that come out to bite us! This research will help improve our ability to predict which animals are likely to become infested with parasites. With the long-term data we have, we can also understand how parasite infestations change over time and across different habitats.

PARASITE COMMUNITY ECOLOGY

Parasites do not exist in isolation, instead they often interact with other parasite species. However, very little research has addressed what the relationships between parasite species look like. Recent work from the small mammal project has identified multiple relationships between external parasites of Deer Mice, including a competitive interaction between a mite and a bot fly species. The ability of parasites to travel from one host to another, and their impact on said hosts, may be strongly impacted by interactions with other parasite species. We have more work on parasite communities from wild mice and squirrels coming out soon!

> "OUR MOST RECENT PUBLICATION TELLS A STORY OF THE DIFFICULTIES A MOUSE FACES IN THE WILD, INCLUDING PARASITES, REPRODUCTION & AGING"

EFFECTS OF PARASITES ON THEIR HOSTS

By feeding and living off of their hosts, parasites can inflict a range of negative consequences. For example, these little hitchhikers can alter their hosts' behaviour, reproduction, and survival. We have investigated the effects of external parasites on host body condition, hematology, and glucocorticoids (hormones involved in regulation of the immune system and stress response). Our most recent publication tells a story of the difficulties a mouse faces in the wild, including parasites, reproduction, and aging. We found that removing fleas from mice reduced glucocorticoids, suggesting that these parasites do harm their hosts.

Figure 1. Glucocorticoids (hormones involved in the immune system and stress response) of mice decreased after fleas were removed, suggesting that fleas may act as a stressor to mice. These hormones also increased during the breeding season and decreased with age. Artwork by Amanda Semenuk.

However, troubles with attracting love interests or growing up are likely to be larger challenges in the life of a mouse (Figure 1).

Having long-term data from the small mammal project is invaluable in addressing these questions about parasite ecology. The wealth of data collected at the AWRS allows us to assess trends over a large time scale, which not many research studies are able to do! Although there is still a lot left to discover, this research so far has gotten us a giant step closer to understanding these tiny animals and their powerful effects.

Jasmine Veitch

ACKNOWLEDGEMENTS

Behind every research project is a team of passionate and driven individuals. We'd like to thank our many collaborators, including Gabriela Mastromonaco at the Toronto Zoo, Dr. Terry Galloway at the University of Manitoba, Dr. Heather Proctor at the University of Alberta, and Dr. Robbin Lindsay at the Public Health Agency of Canada. Thanks as well to the Ontario Ministry of Natural Resources and Forestry, Ontario Parks, and the Natural Sciences and Engineering Research Council of Canada for their financial support. We are also grateful to the many 'sm'mammalers' that have supported data collection for these projects over the years, including Arianne Sawyer, Charlie Wilkes, Hayden March-Wilson, Natalia Hrynko, Erica Fellin and Jon Curtis. ♦

PUBLICATIONS

2020 PEER-REVIEWED RESEARCH PAPERS

Angell CS, S Curtis, A Ryckenbusch & HD Rundle. 2020. **Epicuticular compounds of *Protopiophila litigata* (Diptera: *Piophilidae*): identification and sexual selection across two years in the wild**. Annals of the Entomological Society of America 113(1): 40-49.

Angell CS, MJ Oudin, NO Rode, BS Mautz, R Bonduriansky & HD Rundle. 2020. **Development time mediates the effect of larval diet on ageing and mating success of male antler flies in the wild**. Proceedings of the Royal Society B 287(1938): 20201876.

Connoy JWH, JA Leivesley, RJ Brooks, JD Litzgus & N Rollinson. 2020. **Body size of ectotherms constrains thermal requirements for reproductive activity in seasonal environments**. Canadian Journal of Zoology 98(10): 651-659.

Denomme-Brown ST, K Cottenie, JB Falls, EA Falls, RJ Brooks & AG McAdam. 2020. **Variation in space and time: a long-term examination of density-dependent dispersal in a woodland rodent**. Oecologia 193(4): 903-912.

Freeman NE, DR Norris, AO Sutton & AEM Newman. 2020. **Raising young with limited resources: supplementation improves body condition and advances fledging date of Canada Jays**. Ecology 101(1): e02909.

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

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

Moldowan PD, RJ Brooks & JD Litzgus. 2020. **Sex, shells and weaponry: Coercive reproductive tactics in the Painted Turtle, *Chrysemys picta***. Behavioural Ecology and Sociobiology 74(12): 142.

Otter KA, A McKenna, SE LaZerte & SM Ramsay. 2020. **Continent-wide shifts in song dialects of White-throated Sparrows**. Current Biology 30(16): 1-5.

Terebiznik M, PD Moldowan, JA Leivesley, MD Massey, C Lacroix, JWH Connoy & N Rollinson. 2020. **Hatchling turtles ingest natural and artificial incubation substrates at a high frequency**. Behavioural Ecology and Sociobiology 74(11): 130.

Veitch JSM, J Bowman & AI Schulte-Hostedde. 2020. **Parasite species co-occurrence patterns on Deer Mice (*Peromyscus maniculatus*): Joint species distribution modelling**. International Journal for Parasitology: Parasites and Wildlife 12: 199-206.

MEDIA

2020 MEDIA APPEARANCES

GENERAL

Cottage Life. May 2020. Will wildlife behave differently post-lockdown? (*Online*) featuring Patrick Moldowan.

SMALL MAMMALS

MuskokaRegion.com. August 2020. Yes, there are more chipmunks in Muskoka and area in 2020–here's why. (*Online*) featuring Jasmine Veitch.

SALAMANDERS

CBC's Quirks & Quarks. September 2020. Summer Science Special. (*Online*) featuring Amanda Semenuk.

'Nature's Pitfall' Images photographed by Samantha Stephens awarded: *Grand Prize*, Visualizing Science Image Contest by Canadian Science Publishing, *Best in Show* (Micro/Macro/All Other Wildlife) 2021 Showcase by North American Nature Photography Association, *Category Winner* (Other Animals) Nature Photographer of the Year 2020.

'A Deadly Hiding Spot' Image photographed by Amanda Semenuk awarded *Jury Prize* in NSERC's Science Exposed Image Contest.

bioGraphic. September 2020. A Novel Demise. (*Online*) featuring Samantha Stephens.

PBS Eons. October 2020. How Plants Became Carnivores. (*Online*) featuring Patrick Moldowan.

TURTLES

The Raven. Fall 2020, Vol. 61, No. 3. The Tell-Tale Shell: An update from the Turtle Project. (*Online*) featuring Patrick Moldowan.

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

Herpetological Highlights. March 2020, episode 064. The Art of the Turtle War. (*Online Podcast*) featuring Patrick Moldowan.

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

TVO Kids FishHeads series. May 2020. Trappin' Snappers. (*Broadcast & Online Video*) featuring Carter Rouleau and Jenna Kentel.

Rebalancing Act. October 2020. Let's talk turtles: Conservation and climate data coming to the rescue for the places you love. (*Online Podcast*) featuring Dr. Jackie Litzgus.

WHITE-THROATED SPARROWS

A selection of the outlets featuring the recent publication on White-throated Sparrows' song dialects: *Smithsonian*, *NPR*, *National Geographic*, *The New York Times*, *The Guardian*, *Audubon*, *Science Daily*, *Daily Mail*, *The Atlantic*, *Popular Science*, *Medium*, *Forbes*.

OUR 2020 TEAM ON THE GROUND

ROW 1 Samantha Stephens (S), Mariel Terebiznik (B), Amanda Semenuk (P)
ROW 2 Peter Simons (N), Henrique Pacheco (N)
ROW 3 Sarah Falconer (SM), Jasmine Veitch (SM)
ROW 4 Hayden March-Wilson (S), Kevin Kemmish (S)
BELOW, LEFT Brooke Carroll (T), Carter Rouleau (T)
BELOW, RIGHT Patrick Moldowan (B/P)

B: Bat Lake Inventory of Spotted Salamanders
N: Algonquin Provincial Park Naturalist
P: Pitcher Plants
S: Staff
SM: Small Mammals

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 2020.

GRADUATE

Fellin, E. 2020. Ixodid tick effects on Deer Mice *(Peromyscus maniculatus)* hematology and ectoparasite community assemblages across populations of varying tick exposure. ***MSc Thesis***. Department of Biology, Laurentian University.

Freeman, NE. 2020. Early-life carry-over effects on physiology and survival in a food-caching passerine. ***PhD Thesis***. Department of Integrative Biology, University of Guelph.

Rouleau, C. 2020. Socioecology of the Midland Painted Turtle *(Chrysemys picta marginata)*. ***MSc Thesis***. Department of Biology, Laurentian University.

Sutton, AO. 2020. Demographic and environmental drivers of Canada Jay population dynamics in Algonquin Provincial Park, ON. ***PhD Thesis***. Department of Integrative Biology, University of Guelph.

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

UNDERGRADUATE

McLeod, J. 2020. Summer habitat use of adult Canada Jays *(Perisoreus canadensis)* in Algonquin Provincial Park. ***Bsc Thesis***. Department of Integrative Biology, University of Guelph.

SUPPORTERS & MAJOR USERS

As a not-for-profit, the AWRS and the long-term projects we host 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. In spring 2020 we launched a new way to support the Station—our Patreon membership community. We now have over 50 members in this community who support the Station with a small monthly contribution. Our Patrons have been a life-line for the Station in 2020 and into 2021.

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