Canadian Herpetological Society
Société d'Herpétologie du Canada

toronto ZOO

3rd Annual Meeting of the Canadian Herpetological Society

3ème Congrès Annuel de la Société d'Herpétologie du Canada

Toronto Zoo
Toronto, Ontario, 2016

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Hosting Organization: Toronto Zoo

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Acknowledgements

Local Organizing Committee:

- Amelia Argue, Ontario Ministry of Natural Resources and Forestry
- Amanda Bennett, Trent University
- Sue Carstairs, Ontario Turtle Conservation Centre
- Leanne Collett, Toronto Zoo
- Joe Crowley (co-chair), Ontario Ministry of Natural Resources and Forestry
- Andrew Lentini (co-chair), Toronto Zoo
- Julia Phillips, Parks Canada
- Nicole Richards, Royal Ontario Museum
- Crystal Robertson, Toronto Zoo
- John Urquhart, Blazing Star Environmental
- Paul Yannuzzi, Toronto Zoo

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Conference Logo Design: Amanda Bennett

Special Thanks to:

- Field trip hosts: Toronto Zoo and Rouge National Urban Park
- Workshop leads: Tanya Pulfer, Joe Crowley, Andrew Lentini and Sue Carstairs
- Jose Lefebvre (CHS Treasurer)
- Drew Hoysak (CHS Webmaster)
- CHS Meetings and Workshop Committee
- CHS Board of Directors
- Silent auction and book raffle contributors
- Toronto Zoo staff and volunteers

This event is climate friendly!

Climate change is a threat to many reptile and amphibian species in Canada and around the globe. The Toronto Zoo is committed to lowering its carbon footprint by producing renewable energy onsite and reducing energy usage. The 2016 CHS conference was estimated to have a carbon footprint of 20 metric tonnes, primarily from travel. Conference proceeds were used to offset this carbon, making this event climate friendly! Thank you Canadian Herpetologists!

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Schedule of Presentations and Events

* Denotes the speaker when there are multiple authors
[S] Indicates a student award competitor

Friday September 16, 2016	
12:00-13:00	**Workshop lunch** - Toronto Zoo: Administration Complex Atrium
13:00-17:00	**Workshops** - Toronto Zoo: A) **Field Techniques** - Education Auditorium B) **Conservation Across Canada -** Administration Complex Atrium
19:00-22:00	**Registration** - Delta Toronto East: York Room **Wine and cheese reception** - Delta Toronto East: York Room

Saturday September 17, 2016	
07:45	Shuttle bus from Delta Toronto East Hotel to Toronto Zoo
08:00-08:30	**Registration** - Toronto Zoo: Education Auditorium
08:30-08:45	**Opening remarks** - Toronto Zoo: Education Auditorium
08:45-09:45	**Saturday Plenary Speaker:** **Dr. Ariadne Angulo** Co-Chair of the IUCN SSC Amphibian Specialist Group **ACT LOCAL, THINK GLOBAL: LINKING CANADA'S AMPHIBIAN RESEARCH AND CONSERVATION TO THE GLOBAL AMPHIBIAN CONSERVATION COMMUNITY**
09:45-10:15	**Break**
Session 1 – Emerging Infectious Diseases Chair: Joe Crowley Toronto Zoo: Education Auditorium	
10:15-10:30	**WHAT SHAPES THE AMPHIBIAN SKIN MICROBIOME? FROM METABOLOME TO MICROBIOME** Brandon J. Varela*[S], David Lesbarrères, Roberto Ibáñez, and David M. Green
10:30-10:45	**EMERGING INFECTIOUS DISEASES IN LOW-DIVERSITY NORTHERN ECOSYSTEMS** Joe-Felix Bienentreu*[S], Danna M. Schock, and David Lesbarrères
10:45-11:00	**PILOT RING-TEST EVALUATING PCR TESTING FOR SELECTED WILDLIFE PATHOGENS IN 19 DIAGNOSTIC AND RESEARCH LABORATORIES** María J. Forzán*, John Wood, J. Patrick Power, and Raphaël Vanderstichel
11:00-11:15	**IS SNAKE FUNGAL DISEASE REALLY AN EMERGING INFECTIOUS DISEASE – OR JUST AN OVERLOOKED ONE?** Christina M. Davy*, Lenny Shirose, and Doug G. Campbell

11:15-11:45 ***Lightning Talks***	**SWABBING FOR BSAL ON WILD AND CAPTIVE SALAMANDERS IN BRITISH COLUMBIA** Kristiina Ovaska* et al.
	SNAKE FUNGAL DISEASE IN ONTARIO Julie C. F. Ellis* and James Kamstra
	INVESTIGATING SNAKE FUNGAL DISEASE IN MASSASAUGAS AND EASTERN FOXSNAKES ACROSS ONTARIO Monique E. Aarts* and John Urquhart
	EMERGING REPTILE AND AMPHIBIAN INFECTIOUS DISEASES IN CANADA Joe F. Crowley
	AMPHIBIAN SPECIALIST GROUP CANADA CONSERVATION INITIATIVES Kristiina Ovaska* and Sara Ashpole
11:45-12:45	**Lunch: Education Auditorium**
Session 2 – Applied Conservation (Part 1) Chair: John Urquhart Toronto Zoo: Education Auditorium	
12:45-13:00	**THE ROYAL TREATMENT: USING A COLLABORATIVE FRAMEWORK TO ADDRESS KNOWLEDGE GAPS FOR THE ENDANGERED QUEENSNAKE (*Regina septemvittata*)** Rachel C. White*, Allan H. Edelsparre, Tanya L. Pulfer, Jonathon Choquette, Jennifer I. McCarter, Heather Fotherby, John Urquhart, Jenna Quinn, Scott Gillingwater, and Peter Carson
13:00-13:15	**ASSESSING THE POPULATION SIZE, GENETIC STRUCTURE, CRITICAL HABITAT, AND PREDATION THREATS IN SMALL-MOUTHED SALAMANDERS (*Ambystoma texanum*)** Thomas J. Hossie*, Jim Bogart, Jeff Bowman, Jeff Hathaway, Alex Myette, Chris Wilson, and Dennis Murray
13:15-13:30	**REALIZING THE BENEFITS OF THE OVERALL BENEFIT PERMIT PROCESS FOR JEFFERSON SALAMANDER (*Ambystoma jeffersonianum*)** Jessica E. Linton*, James P. Bogart, Al P. Sandilands, and Heather A. Fotherby*
13:30-13:45	**RESPONSES OF BUTLER'S GARTERSNAKE (*Thamnophis butleri*) AND EASTERN FOXSNAKE (*Pantherophis gloydi*) TO RELOCATION AND RESTORATION OF TALLGRASS PRAIRIE HABITAT AND KEY HABITAT FEATURES** Megan Hazell*, Joel Jameson, Steve Marks, Russ Jones, and Roxanne Dibbley
13:45-14:00	**SLOW PROGRESS FOR CANADA'S FASTEST TURTLE: RESEARCH AND RECOVERY EFFORTS FOR THE SPINY SOFTSHELL TURTLE (*Apalone spinifera*) IN ONTARIO** Scott D. Gillingwater
14:00-14:20 ***Lightning Talks***	**MEASURING DETECTION PROBABILITY OF MASSASAUGAS AND EASTERN FOXSNAKES** John W. Urquhart* and Monique Aarts
	MAPPING IMPORTANT AMPHIBIAN HABITAT Stephanie B. Muckle* and Danijela Puric-Mladenovic
	EVALUATING SUCCESS IN CONSERVATION INTERVENTIONS Amanda Bennett, Jessica Steiner*, et al.
	CORVIDS AS SUBSIDIZED PREDATORS OF NESTING TURTLES Patrick D. Moldowan
14:20-14:45	**Break**

Session 3 – General Herpetology (Part 1) Chair: Nicole Richards Toronto Zoo: Education Auditorium	
14:45-15:00	**MODELING THE RESPONSE OF TEMPERATURE-DEPENDENT SEX DETERMINATION TO CLIMATE CHANGE IN THE SNAPPING TURTLE, *C. serpentina*** Melanie D. Massey*[S], Ronald J. Brooks, and Njal Rollinson
15:00-15:15	**SEX DOLLS AND ACTION CAMS: A FIELD TEST OF INTERSEXUAL SELECTION IN THE NORTHERN MAP TURTLE** Grégory Bulté*, Ryan J. Chlebak, Jeffrey Dawson, and Gabriel Blouin-Demers
15:15-15:30	**CAUSES AND CONSEQUENCES OF DISPERSAL INFERRED FROM SEX AND SIZE FREQUENCIES OF SNAPPING TURTLES (*Chelydra serpentina*) OBSERVED ON ROADS** Matthew G. Keevil*[S], Natasha Noble, Sean Boyle, David Lesbarrères, Ronald J. Brooks, and Jacqueline Litzgus
15:30-15:45	**LARVAL DENSITY-DEPENDENT EFFECTS ON PERFORMANCE IN JUVENILE FOWLER'S TOADS** Katharine T. Yagi*[S], and David M. Green
15:45-16:00	**NEST-SITE FIDELITY, SEARCH TIME AND NEST PREDATION IN PAINTED TURTLES (*Chrysemys picta*)** Steven J. Kell*[S], Jacqueline D. Litzgus, Ron Brooks, and John Fryxell
16:00-17:00	**Annual General Meeting: open to all members and guests** Toronto Zoo: Education Auditorium
17:00-17:30	**Poster set-up**
17:30-19:00	**Poster Session and Social** Toronto Zoo: Administration Complex Reception Space (just outside the Atrium)
19:00-22:30	**BANQUET** Toronto Zoo: Administration Complex Atrium **Travelogue:** PARADISE FOUND, PARADISE LOST, *PARADISE IN LIMBO*: HERPETOLOGY AND CONSERVATION ON THE ISLAND OF MAURITIUS **Patrick Moldowan** **CHS Awards Ceremony** **The Great Canadian Herp Quiz!**
22:45	Shuttle bus from Toronto Zoo Administration Complex to Delta Toronto East hotel

Sunday September 18, 2016		
08:00	Shuttle bus from Delta Toronto East hotel to Toronto Zoo	
08:15-08:45	**Registration** – Toronto Zoo: Wildlife Marquee Tent	
08:45-9:45	**Sunday Plenary Speaker: Dr. Jacqueline Litzgus** Professor of Biology, Laurentian University **SERENDIPITY, SIBLINGS, SPOTTED TURTLES, AND SOLUTIONS** Wildlife Marquee Tent	
9:45-10:15	**Break**	
Session 4 – Concurrent Talks		
	Education Auditorium: **Species & Habitats** Chair: Steve Hecnar	Wildlife Marquee Tent: **Roads & Conservation** Chair: Jonathan Choquette
10:15-10:30	**LONG-TERM STRUCTURAL STABILITY OF A COASTAL ZONE HERPETOFAUNAL COMMUNITY IN THE SOUTHERN LAURENTIAN GREAT LAKES** Stephen J. Hecnar*, Darlene R. Hecnar, and Daniel J. Brazeau	**EFFECTIVENESS OF A UNIQUE DESIGN OF BARRIER WALL AND UNDERPASS ON REDUCING TURTLE ROAD MORTALITY** Paul C. Heaven
10:30-10:45	**INITIAL DISPERSAL AND HABITAT USE OF NEWLY INTRODUCED MINK FROGS IN WESTERN NEWFOUNDLAND, CANADA** Dion O. Kelly*[S], Robert J. Scott, Christine E. Campbell, and Ian G. Warkentin	**ROAD MORTALITY OF REPTILES AND OTHER WILDLIFE AT THE OJIBWAY PRAIRIE COMPLEX AND GREATER PARK ECOSYSTEM IN SOUTHERN ONTARIO** Jonathan D. Choquette* and Lindsey Valliant
10:45-11:00	**A COMPARISON OF HABITAT SPECIALIST BUTLER'S GARTERSNAKE (*Thamnophis butleri*) AND GENERALIST EASTERN GARTERSNAKE (*Thamnophis sirtalis*) ACROSS THE FRAGMENTED LANDSCAPE OF SOUTHWESTERN ONTARIO** Megan Snetsinger*[S], Jeffery R. Row, Megan E. Hazell, and Stephen C. Lougheed	**WILLINGNESS TO UTILIZE MITIGATION TUNNELS IN EASTERN GARTER SNAKES** Rachel M. Dillon*[S], Sean P. Boyle, and David Lesbarrères
11:00-11:15	**IMPACT OF NATURAL RESOURCE EXTRACTION ON THERMAL PROPERTIES OF WOOD TURTLE (*Glyptemys insculpta*) HABITAT** Geoffrey N. Hughes*[S] and Jacqueline D. Litzgus	**ROAD MORTALITY HOTSPOTS AND POTENTIAL MITIGATION IN MUSKOKA, ONTARIO** Jeff Hathaway*, Carlos Milburn, and Darrelle Moffat
11:15-11:30	**HABITAT USE BY BULLSNAKES AT THEIR NORTHERN RANGE LIMIT IN SASKATCHEWAN: VARYING SPACE REQUIREMENTS AMONG POPULATIONS** Tera L. Edkins*[S], Christopher M. Somers, and Ray G. Poulin	**DO ANTHROPOGENIC FACTORS AFFECT CHRONIC STRESS IN FRESHWATER TURTLES?** Hannah M[C]Curdy-Adams*[S], Gabriela Mastromonaco, Jeff Hathaway, and Jacqueline Litzgus

11:30-11:45	**URBAN HABITAT SELECTION AND RESOURCE USE OF WESTERN PAINTED TURTLES NEAR THE NORTHERN LIMIT OF THE SPECIES RANGE** Kelsey A. Marchand*[S], Christopher M. Somers, and Ray G. Poulin	***Lightning Talks*** **FREQUENCY OF LIVING/DOR TURTLES OBSERVED IN EASTERN ONTARIO** Frederick W. Schueler* and Aleta Karstad **SEX MATTERS NOT** Sue J. Carstairs* et al. **EVALUATING ROADKILL MITIGATION** Sara L. Ashpole* et al.
11:45-13:15	**Lunch: Wildlife Marquee Tent** **Silent auction/book raffle closes at 13:00**	
Session 5 – Concurrent Talks		
	Education Auditorium: **Environment & Physiology** Chair: Amanda Bennett	Wildlife Marquee Tent: **Citizen Science** Chair: Julia Phillips
13:15-13:30	**TEMPERATURE AND OXYGEN AVAILABILITY GOVERN THE EVOLUTION OF BODY SIZE IN AMPHIBIANS OF THE WORLD** Njal Rollinson	**LONG-TERM PLETHODONTID SALAMANDER MONITORING AT THE rare CHARITABLE RESEARCH RESERVE: THE FIRST TEN YEARS** Jenna T. Quinn
13:30-13:45	**TOO HOT TO HIDE? THE INTERACTIVE EFFECT OF TEMPERATURE AND PREDATION RISK ON TADPOLE BEHAVIOUR, GROWTH, AND MORPHOLOGY** Amanda M. Bennett* and Dennis L. Murray	**THE QUANTIFIABLE VALUE OF OUTREACH TO HERPETOFAUNAL CONSERVATION** Sean P. Boyle*[S], Chantal Barriault, Jacqueline D. Litzgus, and David Lesbarrères
13:45-14:00	**NEUROBIOLOGICAL AND PHYSIOLOGICAL LINKS UNDERLYING PHENOTYPIC PLASTICITY IN ANURAN LARVAE** Jessica N. Longhi*[S], Leslie R. Kerr, and Dennis L. Murray	**THE EFFICACY OF MONITORING AMPHIBIAN POPULATION TRENDS THROUGH CITIZEN SCIENCE** Amy J. Clement*[S], Thomas J. Hossie, Amanda M. Bennett, and Dennis L. Murray
14:00-14:15	**FLUCTUATING ASYMMETRY IN SPOTTED SALAMANDER (*Ambystoma maculatum*) SPOT PATTERNS IN RESPONSE TO PREDATION RISK** Pat S. Heney*[S], Thomas J. Hossie, and Dennis L. Murray	**HAS THE EASTERN RED-BACKED SALAMANDER (*Plethodon cinereus*) DECLINED IN ONTARIO?** David C. Seburn*, Erin Mallon, and Tanya L. Pulfer
14:15-14:30	**CORTICOSTERONE AFFECTS BEHAVIOUR, MORPHOLOGY AND TISSUE REGENERATION RATE IN THE AXOLOTL (*Ambystoma mexicanum*)** Shawn P. H. MacFarlane*[S], Amy J. Clement, Thomas J. Hossie, Leslie R. Kerr, and Dennis L. Murray	**DISAPPEARING COMMON SPECIES? THE UPS AND DOWNS OF CITIZEN SCIENCE DATA** Tanya L. Pulfer

14:30-14:45	**EXAMINING LONG TERM CONSEQUENCES OF A MASS MORTALITY EVENT IN THE LONG-LIVED SPECIES, *Emydoidea blandingii*** Donnell M.L. Gasbarrini*S, David Lesbarrères, Anna C. Sheppard, Edward Morris, and Jacqueline D. Litzgus	***Lightning Talks*** **CITIZEN SCIENCE ENGAGEMENT AND TECHNOLOGY** Smera S. Sukumar
		TURTLE POPULATION IN CREATED WETLANDS Marc Dupuis-Désormeaux
		HOW ORAA DATA INFORMS MUDPUPPY CONSERVATION Emma J. Horrigan* and Tanya L. Pulfer
14:45-15:15	**Break – Book Raffle Draw**	
Session 6 – Concurrent Talks		
	Education Auditorium: **General Herpetology (Part 2)** Chair: Yohann Dubois	Wildlife Marquee Tent: **Applied Conservation (Part 2)** Chair: Steve Marks
15:15-15:30	**PREDATOR AVOIDANCE AND DEFENSIVE BEHAVIOUR OF MOLE SALAMANDERS (GENUS: AMBYSTOMA) ON PELEE ISLAND** Alexander L. Myette*S, Thomas J. Hossie, and Dennis L. Murray	**HORMONAL INDUCTION OF SPAWNING AND ITS APPLICATIONS TO AMPHIBIAN CONSERVATION** Maria Vu*S and Vance L. Trudeau
15:30-15:45	**DISTANCE DEPENDENT DEFENSIVE COLORATION IN THE POISON FROG *Dendrobates tinctorius* DENDROBATIDAE** James B. Barnett*, Konstantinos Michalis, Nicholas E. Scott-Samuel, and Innes C. Cuthill	**USING MOVEMENT PATTERNS OF HEADSTART BLANDING'S TURTLES (*Emydoidea blandingii*) TO EVALUATE RELEASE TYPES** Tisha S. TanS
15:45-16:00	**GENOMIC INSIGHTS INTO THE INTRASPECIFIC DIVERSITY OF SPRING PEEPERS (*Pseudacris crucifer*)** Nicholas A. Cairns*S and Stephen C. Lougheed	**COMPARISON OF BEHAVIOUR, BODY CONDITION, AND SURVIVORSHIP AMONG COHORTS OF HEADSTARTED WOOD TURTLES (*Glyptemys insculpta*)** Damien I. Mullin*S, Rachel C. White, Jory L. Mullen, and Jacqueline D. Litzgus
16:00-16:15	**THE CHORUS FROG PROTECTION & THE EMERGENCY ORDER FOR SCIENTIFIC KNOWLEDGE – A FROG PEOPLE STORY** Yohann Dubois	**FORCED HIBERNATION: A TECHNIQUE TO ENSURE OVERWINTER SURVIVAL OF TEMPERATE NEONATAL SNAKES** Anne R. Yagi* and Glenn J. Tattersall
16:15-16:30		**FIELD TECHNIQUE ADVANCEMENTS ON THE LARGEST STUDY OF SNAKES IN CANADA** Steve Marks
16:30-17:00	**Conference wrap-up, silent auction announcement** Toronto Zoo: Wildlife Marquee Tent	
17:30	Shuttle bus from Toronto Zoo (Front Entrance) to Delta Toronto East hotel	

Monday September 19, 2016 - Field Trip	
9:00-9:15	Welcome to the Toronto Zoo and brief overview of the field trip agenda **Leanne Collett (Toronto Zoo)** – meet in Parking Lot 3 at the Toronto Zoo (see map at the end of the program). Please note that field trip participants are responsible for arranging their own transportation to and from the Toronto Zoo on Sept. 19th. Transportation will be provided during the course of the field trip to move participants to and from each site.
9:15-9:30	Travel to a wetland complex in Rouge National Urban Park
9:30-10:30	Radio-track Blanding's turtles and participate in a short hike to see some wetland restoration initiatives that support wildlife recovery in Rouge National Urban Park. Discuss FrogWatch citizen science partnerships and ways to get community groups involved **Julia Phillips (Parks Canada), Paul Yannuzzi (Toronto Zoo), Shannon Ritchie (University of Toronto), Andrew Ramesbottom (TRCA)**
10:30-10:45	Travel to Milksnake and salamander cover board project area in RNUP
10:45-12:15	Survey for Milksnakes and salamanders. Talk about wildlife ecopassages and other projects to mitigate wildlife road mortality in Rouge National Urban Park **Marcus Maddalena (University of Waterloo), Cass Stabler (Parks Canada), Emma Followes (TRCA)**
12:30-13:00	**Lunch at Toronto Zoo Atrium**
13:00-13:30	Meet and greet with "Toady" the Mascot, "Captain Sunshine" the Blanding's Turtle, and "Timothy" the Wood Turtle **Rick Vos & Crystal Robertson (Toronto Zoo)**
13:30-15:00	Tour Toronto Zoo's Americas Pavilion to learn about amphibian and reptile conservation projects and visit on-site vernal pool restoration projects to search for newts, salamanders, frogs and toads **Nigel Parr & Leanne Collett (Toronto Zoo)**
15:00-16:30	Free time to explore the Toronto Zoo
16:30	Field trip participants depart. Please note that Toronto Zoo closes at 4:30 PM on weekdays in September.

Posters

[S] Denotes student award competitor

1	**OVERWINTERING ECOLOGY OF HEAD-STARTED BLANDING'S TURTLES (*Emydoidea blandingii*) IN A RESTORED WETLAND** Shannon D. Ritchie[S], Nicholas E. Mandrak, Marc W. Cadotte, Andrew M. Lentini
2	**QUANTIFYING THE SUCCESS OF REHABILITATION IN SNAPPING TURTLES (*Chelydra serpentina*) THROUGH POST RELEASE MEASURES OF BODY CONDITION AND BEHAVIOUR.** Matthew Q. Kennedy[S], Geoffrey N. Hughes, and Jacqueline D. Litzgus
3	**INVESTIGATION INTO CAUSES OF A MASS MORTALITY OF BLANDING'S TURTLES (*Emydoidea blandingii*) IN MISERY BAY PROVINCIAL PARK, ONTARIO** Donnell M.L. Gasbarrini[S], David Lesbarrères, Anna C. Sheppard, Edward Morris, Jacqueline D. Litzgus
4	**THE THERMAL LANDSCAPE AS A PREDICTOR OF WOOD TURTLE (*GLYPTEMYS INSCULPTA*) NEST-SITE SELECTION** Geoffrey N. Hughes[S] and Jacqueline D. Litzgus
5	**LIFE ON THE NORTHERN EDGE: OVERWINTERING ECOLOGY OF THE WESTERN PAINTED TURTLE IN REGINA, SASKATCHEWAN** Kelsey A. Marchand[S], Christopher M. Somers, Ray G. Poulin
6	**EVALUATING THE EFFECTIVENESS OF HEADSTARTING FOR WOOD TURTLE (*Glyptemys insculpta*) RECOVERY IN SOUTHWESTERN ONTARIO** Damien I. Mullin[S], Rachel C. White, Jory L. Mullen, and Jacqueline D. Litzgus
7	**IDENTIFYING SERIAL FATHERS THROUGH GENOTYPE COMPOSITES: PARENTAGE STUDY OF WOOD TURTLES** Cindy Bouchard[S], Nathalie Tessier, and François-Joseph Lapointe
8	**MECHANISMS OF HATCHING SYNCHRONY IN FRESHWATER TURTLES** Sean T. Hudson, Coral Frenette-Ling, and Christina M. Davy
9	**HOTSPOTS FOR DEAD STUFF: WHY TEMPORAL VARIATION IN HERPTILE ROAD MORTALITY SHOULD CONCERN ALL OF US** Patricia Charlebois-Page, Hower Blair, and Christina Davy
10	**NOW WHERE CAN I PUT THIS? COMPARISON OF METHODS FOR IDENTIFYING IDEAL LOCATIONS FOR ROAD-EFFECT MITIGATION** Sean P. Boyle[S], Chad Cordes, Jacqueline D. Litzgus, and David Lesbarrères
11	**ROAD MORTALITY MITIGATION: THE EFFECTIVENESS OF PLASTIC SOLID FENCE VERSUS MESH FENCE** John Carlos Milburn Rodríguez
12	**ROAD EFFECTS ON PAINTED AND SNAPPING TURTLE POPULATIONS IN ALGONQUIN PARK, ON.** Steven J. Kell[S], Ron Brooks, and Jacqueline D. Litzgus
13	**FRESHWATER TURTLE NEST PREDATION PATTERNS IN RELATION TO ANTHROPOGENIC DENSITY** Hannah MCCurdy-Adams[S], Jeff Hathaway, Jacqueline Litzgus
14	**SURVIVING THE CONCRETE JUNGLE: ADAPTIONS BY EASTERN WATER DRAGONS (*Intellagama lesueurii*) TO URBANISATION** James Baxter-Gilbert[S] and Martin J. Whiting

15	**MULTI-SCALE PATTERNS OF HABITAT USE, BEHAVIOUR, AND DISTRIBUTION OF EASTERN MILKSNAKES (*Lampropeltis triangulum*) IN ROUGE NATIONAL URBAN PARK AND THE SURROUNDING AREA** Marcus P. Maddalena[S], Jeffrey R. Row, and Bradley C. Fedy
16	**HUMAN DIMENSIONS OF MASSASAUGA RECOVERY AT AN URBAN PARK SYSTEM IN SOUTHWESTERN ONTARIO** Jonathan D. Choquette and Alexis Hand
17	**ASSESSING TEMPORAL PATTERNS IN OCCUPANCY AND LANDSCAPE EFFECTS FROM A 20-YEAR MONITORING PROGRAM IN QUEBEC** Thierry Calvé[S], Marc J. Mazerolle, and Louis Imbeau
18	**LATE SUMMER MOVEMENTS OF THE COMMON FIVE-LINED SKINK (*Plestiodon fasciatus)* IN ONTARIO'S CAROLINIAN ZONE** Dan J. Brazeau[S], Stephen J. Hecnar, and Tamara Eyre
19	**HYDROLOGICAL AND THERMAL DYNAMICS OF MOSS ON ROCK BARRENS: IMPLICATIONS FOR ENDANGERED REPTILE HABITAT** Alanna G. Smolarz[S], Paul A. Moore, and James M. Waddington
20	**PLUNGING PANTHEROPHIS: DIVING BEHAVIOUR IN EASTERN FOXSNAKE (*Pantherophis vulpinus*)** Amelia K. Whitear and Christina M. Davy
21	**IMPACT OF IRREGULAR SHELTERWOOD ON POPULATION DYNAMICS OF TERRESTRIAL SALAMANDERS** Mathilde Lapointe St-Pierre[S], Marc J. Mazerolle, and Louis Imbeau
22	**A PROVINCIAL STRATEGY FOR FINDING EURYCEA** Frederick W. Schueler
23	**eDNA AS A NOVEL TOOL FOR DETERMINING AMPHIBIAN SPECIES COMPOSITION** Madison J. H. Wikston[S], Dennis L. Murray and Amanda M. Bennett
24	**RANAVIRUS AND FROG VIRUS 3: DETERMINING STRAIN VARIATION AND TRACKING VIRAL SPREAD ACROSS ONTARIO AND CANADIAN WATERS** Samantha A. Grant[S], Christopher J. Kyle, and Craig R. Brunetti
25	**INVESTIGATING THE USE OF eDNA AS A POPULATION ABUNDANCE TOOL FOR LARVAL AMPHIBIANS** Brie-Anne A. Breton[S], Dennis L. Murray, Amanda M. Bennett
26	**EFFECTS OF ATRAZINE AND RU-486 ON THYMUS GLAND SURFACE AREA OF *Xenopus laevis* TADPOLES** Babsola Fateye, Sara L. Ashpole, Alex M. Schreiber, Andrew M. Nolan, Alaina White, and Grace Besette
27	**GLOBAL AMPHIBIAN DECLINE: UNDERGRADUATE PEDAGOGY INCORPORATING EXPERIENTIAL LEARNING AND RESEARCH** Sara L. Ashpole, Andrew M. Nolan, and Babasola Fateye
28	**INTRASPECIFIC CALL DIVERGENCE IN THE SPRING PEEPER** Amanda S. Cicchino[S], Nicholas A. Cairns, and Stephen C. Lougheed
29	**SEX CHROMOSOMES EVOLUTION IN PIPID FROGS** Caroline M. S. Cauret[S] and Ben J. Evans

Travel and Parking

Directions between Delta East and Toronto Zoo

Start: Delta Hotels Toronto East, 2035 Kennedy Road, Scarborough, ON
Head South on Kennedy Road
Use the right lane to take the ramp onto ON-401 E
Take exit 389 for Meadowvale Road
Turn left onto Meadowvale Road
Follow signs for Toronto Zoo (main entrance)
End: Toronto Zoo, 2000 Meadowvale Road, Toronto, ON

Parking

Parking at the Toronto Zoo is free for conference participants. Please park in the main entrance parking lot and proceed through to guest services at the front gate to be admitted into the Toronto Zoo. Proceed to the Education Centre (just north of the conservation carousel) on Saturday or to the Wildlife Marquee (in the Discovery Zone) on Sunday for the opening remarks.

Shuttle Bus

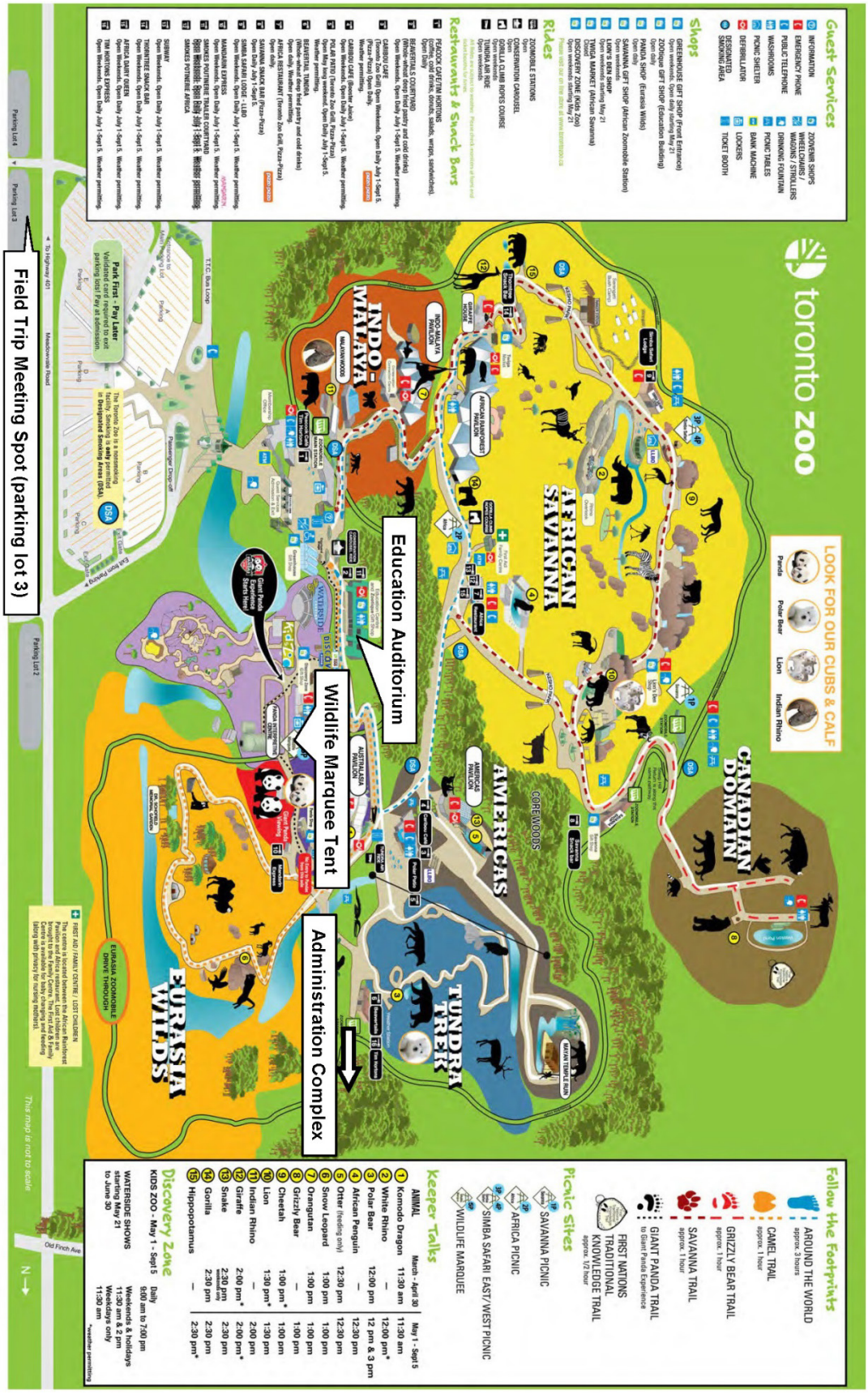
We are pleased to offer a free shuttle bus service between the Delta Toronto East hotel and the Toronto Zoo on both Saturday and Sunday. Seating will be provided on a first-come, first-served basis. Details for the Pacific Western shuttle bus service:

Saturday Sept 17th
7:45 am: Bus departs from the front entrance of Delta Toronto East Hotel
22:45 pm: Bus departs from Toronto Zoo Administration Building (361A Old Finch Ave)

Sunday Sept 18th
8:00 am: Bus departs from the front entrance of Delta Toronto East Hotel
17:30 pm: Bus departs from Toronto Zoo Main Entrance (2000 Meadowvale Road)

Carpooling

As CHS is a climate-friendly event, the Organizing Committee is encouraging conference attendees to seek carpooling arrangements. We have created a Carpool Page (www.groupcarpool.com/t/gsan5r) for individuals who are interested in sharing a ride to the conference. Carpooling is a great way to re-connect with old acquaintances, make new friends and to contribute to the protection of our environment. Thanks for car…ing!!



Abstracts

INVESTIGATING EXTENT, PREVALENCE AND RATE OF SPREAD OF SNAKE FUNGAL DISEASE IN MASSASAUGAS (*Sistrurus catenatus*) AND EASTERN FOXSNAKES (*Pantherophis gloydi*) ACROSS ONTARIO

Monique E. Aarts* and John Urquhart

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Snake fungal disease (SFD) is a serious, emerging threat to massasaugas (*Sistrurus catenatus*), eastern foxsnakes (*Pantherophis gloydi*) and other snake species' in Ontario. SFD cases have been found throughout much of the massasauga's range in the US. SFD has been confirmed in an eastern foxsnake in southern Ontario. Massasaugas with SFD symptoms have been found in Windsor and Georgian Bay. Studies have shown that temperature is a major factor determining the growth of the fungus responsible for SFD, *O. ophiodiicola*. Therefore, snake populations in Ontario may become more vulnerable to SFD as global temperatures continue to increase due to climate change. Blazing Star Environmental is conducting a project which will gather information about the extent, prevalence and rate of spread of SFD in Ontario. A long term plan to monitor and mitigate SFD will be created and shared with government agencies and land managers. This very preliminary results and lessons learned from the first year of this study will be presented.
Lightning

ACT LOCAL, THINK GLOBAL: LINKING CANADA'S AMPHIBIAN RESEARCH AND CONSERVATION TO THE GLOBAL AMPHIBIAN CONSERVATION COMMUNITY

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The global amphibian decline and extinction crisis is now a well-accepted reality among the scientific and conservation communities. Addressing this crisis has not only presented some significant challenges but, most importantly, has also given rise to meaningful and far-reaching opportunities. One such opportunity has been the development of a global network of amphibian researchers and conservationists who act on a regional/local scale and, by working in cooperation with other similar groups around the world, are able to amplify their impact both at home and on the global conservation stage. Another opportunity has been to establish a global hub for partnerships for amphibian conservation action, collaborating with a diverse set of partners including governments, businesses, and non-profit organizations to address a broad array of amphibian threat drivers and challenges. We will

provide an overview of these initiatives, their constitution, how they work (both on their own and together), and how Canadian research and conservation can be a part of this global collaboration.
Plenary presentation

EVALUATING ROADKILL MITIGATION STRUCTURE COST AND LONGEVTY

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Within British Columbia's south Okanagan valley there is particular concern that the Nationally listed amphibian species are vulnerable to road effects, notably during annual breeding migrations. The ecological benefits of a mitigation fence constructed after a 3-km highway expansion project in 2010 and open to traffic use in 2011 significantly reduced amphibian mortalities ($\bar{x}$2010= 13.2 ± 32.5, $\bar{x}$2011= 4.7 ± 12.8, $\bar{x}$2012= 2.3 ± 7.3; 2010 vs. 2012: W= 1535.5, p<0.001). Roadkill mitigation structures proved effective in reducing observed amphibian road occurrence of the entire passing lanes transect as well as at distances 100 m and 200 m from examined culverts. Fenced areas covering both sides of the highway resulted in a 94% reduction in amphibian road occurrence. However, sustaining the management and maintenance of the fencing has proven challenging with expenditures for fencing upkeep and repair ranging from $2000 to 10,000 CDN dollars annually since installation. The longevity and maintenance of the fencing was grossly underestimated in the original planning and makes for continued challenges when determining road mitigation structures.
Lightning

GLOBAL AMPHIBIAN DECLINE: UNDERGRADUATE PEDAGOGY INCORPORATING EXPERIENTIAL LEARNING AND RESEARCH

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Global amphibian decline is an introductory theoretical and hands on mixed methods undergraduate research course examining the ecology and conservation of amphibians. The global decline of amphibians is applied as a proxy for assessing large-scale environmental degradation and interdisciplinary approaches to research, management, and policy. Lecture topics include: key aspects of amphibian ecology, habitat destruction, environmental contamination, introduced species, infectious

diseases, over exploitation, climate change. Students use case studies to compare local to global responses regarding the global decline of amphibians through lectures, documentaries, readings, and media investigation. A future direction of the course hopes to include live web-based conferencing with experts. Learning outcomes include 1. To acquire an understanding of ecological principles related to the conservation of species, as well as an awareness of the interconnectedness between the responses of nature to human activities, 2. To develop field research skills and geospatial literacy through repeat data collection and preparation of a hypothesis based written report demonstrating synthesis of spatial and temporal movements of amphibians, 3. To become familiar with basic laboratory procedures needed to test and design hypotheses associated with a standard experimental dosing and exposure study, 4. To use real-time recorded frog calls for a soundscape (bioacoustical) analysis as a tool to identify and interpret dynamic frog behavior that can be influenced by biological processes, landscape structure, and human activity. At each of the learning outcome stages students have the opportunity to refine and develop their original research for the review process. The advantages of a mixed method experiential and research centered teaching and learning approach is in the effectiveness to develop process and an evidence-driven approach, while incorporating reflection that builds innovation and creativity in solving complex environmental problems.
Poster

DISTANCE DEPENDENT DEFENSIVE COLORATION IN THE POISON FROG *Dendrobates tinctorius* DENDROBATIDAE

James B. Barnett[1]*, Konstantinos Michalis[1], Nicholas E. Scott-Samuel[2] and Innes C. Cuthill[1]

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The Neotropical poison frogs (Dendrobatidae) are well known for their bright conspicuous colours which act to warn potential predators of their potent chemical defences. Greater conspicuousness has been repeatedly linked with increased speed and longevity of predator avoidance learning, however, under natural conditions poison frogs are not immune from predation and increasing conspicuousness may increase encounters with naïve or specialised predators which ignore the warning. Recent research into animal colouration suggests that it may be possible for animals to combine the benefits of salient warning signals with a low predator encounter rate by taking advantage of limitations in predator visual acuity. Using field and laboratory psychophysics, and visual modelling, we find that the seemingly conspicuous yellow-and-black colours of the dyeing poison frog (*Dendrobates tinctorius*) are highly detectable when viewed at close range, but match the background when viewed from greater distances. These data suggest that *D. tinctorius* combines specific colours to maximise saliency at close range while producing effective and targeted background matching camouflage when viewed from a distance.
Platform

TOO HOT TO HIDE? THE INTERACTIVE EFFECT OF TEMPERATURE AND PREDATION RISK ON TADPOLE BEHAVIOUR, GROWTH, AND MORPHOLOGY

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Tadpoles show well-characterized changes in tail depth, activity level, and growth rates in response predation risk cues from larval dragonflies (family: Aeshnidae). However, the magnitude of the anti-predator response expressed by a tadpole varies by experimental venue; tadpoles in outdoor mesocosms tend to show greater tail depth responses than tadpoles reared under laboratory conditions. The mechanism underlying this variation in expression remains unknown. We hypothesized that an inability to thermoregulate under constant temperature conditions (e.g., in lab studies) limits the expression of anti-predator responses. We reared wood frog (*Lithobates sylvaticus*) tadpoles under three temperature conditions (18.5, 23, and 26.5^{o}C), with and without exposure to dragonfly predator cues (caged Aeshnid larvae fed two tadpoles, thrice weekly), and measured behaviour, morphology (relative tail depth), growth, and development for three weeks. We predicted that tadpole growth, development, and anti-predator response would increase with higher temperatures, such that tadpoles reared at 26.5^{o}C would be larger, further developed, and would have relatively deeper tails and lower activity levels in comparison to tadpoles at either 18.^{5oC} or 23^{o}C. Contrary to our prediction, tadpoles actually showed the greatest increase in mass and development in the median temperature treatment (23^{o}C; though developmental stage did not differ significantly between 23 and 26.5^{o}C). Tadpoles in all temperature treatments dropped activity levels in response to predation risk, however predator-exposed tadpoles at 26.5^{o}C were significantly more active than either control or risk-exposed tadpoles at 18.5^{o}C or 23^{o}C. Tadpoles in all temperature treatments increased relative tail depth in response to predation risk, however, tadpoles at the median temperature treatment (23^{o}C) showed the greatest morphological response. There appears to be an optimal temperature for tadpole growth and anti-predator responses; differences in anti-predator responses among experimental venues likely reflect differences in the availability of optimal temperatures within the experimental unit.
Platform

"DOES IT WORK?" DOESN'T WORK: EVALUATING SUCCESS IN CONSERVATION INTERVENTIONS

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Conservation interventions such as translocations, re-introductions, and ex situ breeding can keep critically endangered species from extinction, and stabilize threatened populations. However, it is

challenging to scientifically evaluate the effectiveness of such interventions because of the case-by-case, species-specific approaches and small sample sizes inherent to species conservation. As a result, debates about whether a particular method is successful ("Does it work?") may become entrenched in an uninformative yes-no framework, also known as "vote-counting". One example of this is turtle head-starting, a conservation tool that has attracted strong opinions but little robust data to either side of the argument. Logistical limitations such as the long-lived life history strategy of turtles have slowed experimental evaluation of turtle head-starting. Evaluations of success among head-started individuals and populations have largely lacked adequate replication or experimental controls, and few have clearly defined milestones for "success". To address these concerns and facilitate informative evaluation of conservation tools such as head-starting, we provide a road map to guide experimental evaluation of conservation interventions in logistically challenging systems. Our road map can improve program design and reporting, and will facilitate constructive evaluation of interventions within and among conservation programs.

Lightning

EMERGING INFECTIOUS DISEASES IN LOW-DIVERSITY NORTHERN ECOSYSTEMS

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Two kinds of pathogens threaten amphibians all around the globe: the chytrid fungi (*Batrachochytrium dendrobatidis*, hereafter: Bd; and *Batrachochytrium salamandrivorans*), and Ranavirus, a genus of viruses in the family Iridoviridae. Both pathogens are capable to cause severe infections, may lead to population die-offs, and ultimately species extinctions. Several morbidity and mortality events in Canadian amphibian populations have been linked to Bd and Ranavirus. Unfortunately, there have been only few studies that assessed the dynamics of these EIDs in northern Canada, therefore, the true dimension of pathogen associated declines and die-offs is likely under reported. The purpose of my project is to close important knowledge gaps on the epidemiology of Ranavirus and Bd north of the 59th parallel in northern Alberta and the Northwest Territories. To this end, I assessed the presence, prevalence of the pathogens through non-lethal sampling methods, using molecular tools for pathogen detection and identification. The research area spans approximately 21,000 km² in Wood Buffalo National Park and surrounding areas, located in northern Alberta and the South Slave Region in the NWT. The field sites show a low diversity of amphibians, with a maximum of three hosts (Wood Frog *Lithobates sylvaticus*; Boreal Chorus Frog *Pseudacris maculata*; Canadian Toad *Anaxyrus hemiophrys*). Due to their complexity, host-pathogen systems are often difficult to tease apart, but the low amphibian diversity in research area provides an ideal system to investigate the effects and dynamics of EIDs in species-poor communities. In 2015 and 2016 I sampled a total of 801 individuals to investigate the spatial patterns of the two pathogens, particularly at the edge of host distribution and in relation to species assemblage and environmental variables.

Platform

IDENTIFYING SERIAL FATHERS THROUGH GENOTYPE COMPOSITES: PARENTAGE STUDY OF WOOD TURTLES

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Mating system is a primordial component for the elaboration of conservation strategies and long-term survival of threatened species. Namely, promiscuity and sperm storage may favor the survival of long-lived organisms by increasing genetic diversity in offspring and delaying the impact of a bottleneck. Considering the conservation status of the Wood Turtles (*Glyptemys insculpta*), we deemed necessary to study multiple paternity of one of the largest populations in Canada. Basic knowledge of the mating system of Wood Turtles will provide a better understanding of ecological requirements for population conservation, such as successful and continued recruitment. To do so, we used microsatellite analysis to study the mating system and parentage of Wood Turtles over two nesting seasons. We sampled 38 clutches in the Shawinigan River (Québec) over two nesting seasons (2006 and 2007), and genotyped 253 offspring and 84 candidate parents using seven microsatellite loci. The frequency of multiple paternity in all clutches was estimated at 37% for both seasons, by a consensus of three methods (allele count, GERUD and COLONY). The reconstructed genotypes of the fathers revealed that reproductive success varies greatly among males, with offspring numbers ranging from to 1 to 32. Repeat paternity was observed for 88% of the females under study. This important percentage may suggest either a frequent use of sperm storage, or mating with the same partner in successive years. Finally, our analyses also identified small groups of individuals that exclusively reproduce with each other. The implications of these results will be discussed with respect to a conservation strategy of Wood Turtle populations in Québec.

Poster

THE QUANTIFIABLE VALUE OF OUTREACH TO HERPETOFAUNAL CONSERVATION

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Citizen science has proven its ability to produce enormous data sets that can guide policy and conservation. Outreach programs are often considered valuable tools for attracting citizen scientists, but also for engaging a general interest in conservation. A mixed-methods approach was used to evaluate the success of outreach programs to youths and to identify specific cues that elicited positive

responses from participants. Grade nine students (n = 175) were asked to self-evaluate their likelihood of participating in conservation directly (i.e. helping a turtle across the road) and indirectly (i.e. participation in herp citizen science programs) before and after outreach presentations. Next, for students that admitted to a change in behaviour as a result of outreach, we asked if there was a certain part of the presentation which most affected their decision to change their self-evaluation. Outreach was successful as students were significantly more likely to consider contributing directly and indirectly to herpetofauna conservation after, than before the program. Magnitude of changes was approximately 20% for both of these changes. Students identified specific cues from both the presentation and presenters which influenced their willingness to participate in conservation activities, and these cues were grouped into core themes. Integration of these core themes and specific cues into future outreach presentations optimize outreach effectiveness. Effective outreach plays a vital role in engagement and advocacy for conservation action. This is particularly significant because the perceived importance of conservation action plays a critical role in the creation and execution of conservation policy.

Platform

NOW WHERE CAN I PUT THIS? COMPARISON OF METHODS FOR IDENTIFYING IDEAL LOCATIONS FOR ROAD-EFFECT MITIGATION.

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Road mortality is globally recognized as a significant driver of local and broad landscape scale extinctions of herpetofauna. Systems of mitigating road mortality for herpetofauna have varied greatly with regards to approach, scale, and design. This lack of consistency can hinder conservation of species at risk, as well as the progress of road ecology in general. We propose that in order to advance our ability to mitigate successfully, projects require comprehensive mitigation strategies that incorporate several layers of baseline data. Using two methods of identifying road mortality hotspots, we demonstrate that relying on limited data can prevent effective application of mitigation infrastructure. Using daily road surveys, we pinpointed road mortality hotspots via comparison of the spatial distribution of road survey data points to a random distribution. Additionally, we identified road mortality hotspots using *Circuitscape*, a program that simulates animal movement through a landscape using aerial imagery and expert knowledge of animal habitat use. Road survey hotspots can be determined on a species-specific basis, while maintaining precision; their accuracy, however, relies on rigorous data collection. *Circuitscape* analysis requires little data collection; however, although the results are useful as preliminary guidance or in situations where no baseline data are available, they lack precision compared to standardized road surveys. Our study provides a critical examination of tools available to wildlife managers responsible for planning road mortality mitigation projects. Further, we demonstrate that when used in conjunction, road surveys and *Circuitscape* provide complementary results that aid in the optimization of mitigation effectiveness.

Poster

LATE SUMMER MOVEMENTS OF THE COMMON FIVE-LINED SKINK (*Plestiodon fasciatus)* IN ONTARIO'S CAROLINIAN ZONE

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Individuals of most animal species must move about in space to acquire critical resources. Understanding the nature of a species movements is valuable for effective conservation and can assist interpretation of local ecological processes. Patterns of habitat use and population dynamics of the Common Five-lined Skink (*Plestiodon fasciatus*) have been studied, however details of dispersal remain largely unknown. Previous mark-recapture studies of this secretive species have had low recapture rates, ultimately yielding little information on dispersal ability or daily habits of individuals. Advances in transmitter technology and success of radio-tracking the closely-related Northern Prairie Skink (*Plestiodon septentrionalis*) by researchers in Manitoba inspired us to test the use of radio-telemetry on the Common Five-lined Skink. We fitted 31 skinks with external transmitters that provided up to 16 consecutive days of dispersal information. We found that skinks are much more mobile than previously thought. While some stayed close to initial capture sites, most moved 10s to 100s of meters over short periods of time. Most individuals made regular linear movements while occasionally returning to the same locations, supporting the previous idea that skinks occupy more of a 'shifting' than traditional home range. We also found that skinks use trees, grass tussocks, and underground locations more than previously thought. Tracked individuals on average spent over 30 percent of their time underground or inside standing trees. These observations help to explain why recapture rates are so low in traditional mark-recapture studies as well as why observations in visual surveys of cover objects are so much lower following the annual peak of activity. Our study demonstrates the efficacy of radio telemetry for the Five-lined Skink and revealed aspects of late summer skink behaviour that will be valuable for future monitoring and management efforts.

Poster

INVESTIGATING THE USE OF eDNA AS A POPULATION ABUNDANCE TOOL FOR LARVAL AMPHIBIANS

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As amphibian populations continue to decline globally, there is increasing incentive to collect data that accurately reflects amphibian distribution and population trends. However, due to lack of resources, antiquated methods are continuously relied upon to assess the status of amphibian populations.

Traditional methods such as dipnet surveys, call surveys and visual encounter surveys can be destructive to habitats and misrepresentative of species composition and abundance, leaving significant gaps in distribution and population trend data. eDNA (environmental DNA) is an emerging aquatic monitoring technique that may play a critical role in obtaining accurate and reliable data in order to properly assess the status of amphibian populations. This new monitoring method uses genetic material shed by individuals to detect species presence in aquatic environments. Recent studies indicate a correlation between eDNA concentrations and population density, suggesting that eDNA may provide data beyond presence/absence. This study investigates the quantitative correlation between eDNA concentrations and population abundance for two Ontario frog species (*Lithobates pipiens, Lithobates sylvaticus)* at their larval, aquatic-obligate life-stages in both controlled mesocosm experiments and at field sites in central Ontario. eDNA will be collected and extracted using two different methods, and eDNA shedding rates for both species will be compared. Results will indicate the extent to which eDNA can be used to determine amphibian population abundance in natural settings, and further the implementation of eDNA as a monitoring tool for amphibians globally.

Poster

SEX DOLLS AND ACTION CAMS: A FIELD TEST OF INTERSEXUAL SELECTION IN THE NORTHERN MAP TURTLE

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Female northern map turtles (*Graptemys geographica*) can exceed twice the length of males making this species an example of extreme sexual size dimorphism (SSD) in vertebrates. While selection for fertility in females appears to be an important factor for the maintenance of female biased SSD, the role of intersexual sexual selection via male mate choice has received relatively little attention. Male mate choice is expected to contribute to SSD in species in which fertility increases with female body size which is the case in the northern map turtle. Moreover, physiological and ecological constraints may exacerbate the need for males to carefully choose females in this species. We tested the hypothesis that, everything else being equal, male northern map turtles would choose to mate with larger females. During the spring mating season, we deployed pairs of models of mature female northern map turtles. The models were created on a 3D printer and differed only in size. We recorded how free ranging males interacted with the models using action cameras. Over 100 interactions of males with the models, including several mating attempts were recorded. Males interacted and attempted to mate with the larger models significantly more than with the smaller models supporting the hypothesis that intersexual selection via male mate choice contributes to the extreme sexual size dimorphism observed in this species. The combination of 3D printed models and action cameras offer great promises for the study of reproductive behaviours in freshwater turtles.

Platform

GENOMIC INSIGHTS INTO THE INTRASPECIFIC DIVERSITY OF SPRING PEEPERS (*Pseudacris crucifer*)

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Gene flow is a key element in the origins of biodiversity. In some cases, it acts as a homogenizing force among populations preventing divergence. Alternatively, cessation or restriction of gene flow provides opportunities for differences to accrue between populations and underlies classical models of speciation. We can use molecular data and individual gene trees to quantify the influence of gene flow both within and between species. Our research focuses on the range-wide intraspecific diversity of the broadly distributed treefrog, *Pseudacris crucifer* (spring peeper). Previous research using mitochondrial DNA (mtDNA) suggests that this species has a complex evolutionary history evident in 6 lineages of varying ages distributed across eastern North America. Our aim is to use genomics to gain a better resolution of the genealogical history of *P. crucifer* and to test for signatures of gene flow across the range of this species. Using samples collected first hand and those donated by other researchers, we surveyed panels of single nucleotide polymorphisms (SNPS) representing thousands of loci. Preliminary results reveal a discordance between SNPs and mtDNA, with the former showing three strongly supported clades with deep divergence between the north and south, as well as a divergent lineage within the northern clade encompassing regions west and north of the Ozark-Ouachita highlands. In areas of contact between the clades, individuals remain diagnostically distinct at scales of less than 6km, possibly implying reproductive isolation. As with our earlier work, these genomic data reveal marked intraspecific diversity. This, together with new ecological data, will serve to be the basis for future work investigating contact zones at a fine scale and extrinsic pressures facing this species range-wide.
Platform

ASSESSING TEMPORAL PATTERNS IN OCCUPANCY AND LANDSCAPE EFFECTS FROM A 20-YEAR MONITORING PROGRAM IN QUEBEC

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The Quebec provincial government, in collaboration with the Ecomuseum zoo, developed a route-based amphibian monitoring program in 1993 and that is still ongoing today. Anuran surveys are conducted 2–3 times per year by volunteers in the province along road segments of 8 km. Each road segment consists of 10 stops spaced at 800 m intervals, where volunteers use call surveys to detect the presence

of wood frogs (*Lithobates sylvaticus*), American toads (*Anaxyrus americanus*), and spring peepers (*Pseudacris crucifer*). We used the data collected on the 166 routes surveyed in 1993–2013 to investigate large-scale and temporal occupancy patterns of each species. Specifically, we quantified temporal patterns in occupancy across latitude for the data spanning 20 years. As a second objective, we assessed the influence of anthropic factors on occupancy for the 2010-2013 period of the program using landscape cover data from recent forest inventory maps. We hypothesized that occupancy dynamics are more variable at the northern latitudes, where species are closer to the end of their range, and that occupancy decreases with anthropic land cover and road density. We are testing these hypotheses with dynamic occupancy models implemented in a mixture of Bayesian and maximum likelihood frameworks.
Poster

SEX MATTERS NOT: ROADS ARE AN EQUAL-OPPORTUNITY THREAT TO TURTLES

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The Ontario Turtle Conservation Centre (formerly the Kawartha Turtle Trauma Centre) houses the only operational wildlife rehabilitation centre in Canada that is fully dedicated to freshwater turtles. We rehabilitate and release hundreds of turtles each year, and hatch and release thousands of eggs collected from injured females. Injured turtles are brought to the centre from across southern Ontario by members of the public or transferred from other rehabilitation centres. Through our high intake numbers and large catchment area, our admissions data provide a uniquely representative snapshot of the characteristics associated with turtle road injuries. We used this dataset to test the commonly proposed hypothesis that turtle road mortality is sex-biased. Contrary to this assertion, we found that although injured females are admitted more frequently during the nesting season, injured males represent an almost equal proportion of injuries over the course of the season. Our results indicate seasonal differences in dispersal among sexes, but do not support sex-biased mortality from roads. We discuss implications of our data for head-starting programs that control the sex-ratio of the eggs they are incubating, which could have important implications for conservation of Ontario's turtles.
Lightning

SEX CHROMOSOMES EVOLUTION IN PIPID FROGS

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Sexual reproduction allows recombination to occur between chromosomes, and increases phenotypic variation and thus the efficacy of natural selection. In animals, sex is determined by genetic and/or environment mechanisms. In the case of genetic sex determination, being a female or a male results from differences between sex-chromosomes which often include a region that lacks recombination. Due to a lack of recombination, sex-chromosomes diverge from one another, as is the case for the X/Y chromosomes in humans that differ in both size and gene content. In many frogs, however, the sex-chromosomes are non-diverged and morphologically similar (homomorphic). This is believed to be due either to the persistence of recombination (the "fountain of youth" hypothesis) or frequent changes of the trigger for sex-determination (the "high-turnover" hypothesis). In some frogs, sex-determining system is known to evolve rapidly. Studies have shown that within African clawed frogs (genus *Xenopus*), variation exists in which genes trigger sex-determination. For example, in *X. laevis* the *DM-W* gene is involved in sex-determination but is absent in other species such as *X. tropicalis*. Even within a species (ex. *X. tropicalis*) we can observe multiple sex-determining systems, including where the master sex-determining gene is in females (ZW system), or in males (XY system). Our goal is to better understand how homomorphy of sex-chromosomes is maintained, through the use of new genomic data from *Hymenochirus* and *Pipa (*similar to *Xenopus*, these genera are in the family Pipidae). We also to plan to compare the sex linked genomic regions in these frog species to other species with an aim of testing whether certain genes tend to be repeatedly co-opted ("recycled") for sex determining function.
Poster

HOTSPOTS FOR DEAD STUFF: WHY TEMPORAL VARIATION IN HERPTILE ROAD MORTALITY SHOULD CONCERN ALL OF US.

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Road mortality has been described as the "sleeping giant" of conservation biology, and severely threatens terrestrial fauna such as reptiles and amphibians which use a variety of habitats. Road mortality occurs when species move across roads within their home ranges, and when they migrate seasonally to find suitable reproductive, foraging or overwintering habitat. Attempts to mitigate road mortality often assume low temporal variation, and may recommend costly interventions such as over- or under-passes based on only a year's worth of data. Here, we use four years of road mortality data from Rondeau Provincial Park to test the hypothesis that road mortality is not temporally stable. Surveys in our data set were conducted twice a week on roads with regular vehicular traffic. We identified areas of high mortality for amphibians, snakes, and turtles, and contrasted patterns of mortality among years to assess temporal variation in road effects. We also assess variation in mortality across seasons. Our data suggest that temporal variation in road mortality among years make it difficult to identify "hotspots" for herptile mortality. Temporal variation creates problems for conservation practitioners in determining the best strategies for road mortality mitigation, but awareness of this issue may also help prioritize the most appropriate sites for costly mitigation measures.
Poster

HUMAN DIMENSIONS OF MASSASAUGA RECOVERY AT AN URBAN PARK SYSTEM IN SOUTHWESTERN ONTARIO

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Recovery of the Ojibway population of Massasaugas (*Sistrurus catenatus*) will require proper management of human-snake conflict in order to reduce intentional killing, detrimental translocations, and snakebite. Anthropogenic sources of mortality as well as negative public opinion have the potential to hinder important recovery efforts. Our goal is to explore the nature of human-snake conflict in the Ojibway Prairie Complex and Greater Park Ecosystem (OPCGPE), as it relates to Massasauga recovery. Our objectives include: 1) Characterize the frequency and spatial extent of human-snake conflict, 2) Identify how human-snake conflict is managed, and 3) Estimate the level of support for Massasauga recovery among local residents. In 2015 and 2016 we conducted a door-to-door questionnaire with residents living adjacent to Massasauga habitat in LaSalle, Ontario. Approximately 340 dwellings were targeted with a response rate of 32%. We also conducted an open ended survey by telephone with 18 agencies involved in wildlife rehab., animal removal/pest control, emergency response, and/or park administration. Interim results suggest that the majority of residents know that Massasaugas are present locally and feel very safe living near Massasauga habitat. Almost three quarters of the target population support Massasauga recovery and most people do not know Massasaugas are legally protected. Very few respondents had a problematic encounter with any snake on their property, however, results suggest that several agencies are currently involved in managing human-snake conflict. A subset of those agencies report removing/in-taking over 10 snakes per year, combined, from residential and commercial properties in the study area and beyond (including Species at Risk). Snakes were translocated both short and long distances and very little data were recorded on the details of these translocations. This project will help us to better understand human-dimensions of Massasauga recovery in order to plan for and undertake appropriate wildlife management strategies at OPCGPE.
Poster

ROAD MORTALITY OF REPTILES AND OTHER WILDLIFE AT THE OJIBWAY PRAIRIE COMPLEX AND GREATER PARK ECOSYSTEM IN SOUTHERN ONTARIO

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The Ojibway Prairie Complex (OPC) in Windsor contains the largest protected tallgrass prairie ecosystem in Ontario and supports numerous species at risk. Also, the OPC and Greater Park Ecosystem was

recently designated as an Important Amphibian and Reptile Area by the Canadian Herpetological Society. Despite its ecological significance, it is crossed by multiple high-traffic roads. Road mortality is a major threat to endangered species in Canada, particularly reptiles. The main goal of this study was to describe the nature and extent of vertebrate road mortality, with a focus on reptiles, on roads bisecting the Ojibway Prairie Complex and Greater Park Ecosystem, in Windsor and LaSalle, Ontario. A systematic road mortality survey was conducted by bicycle along seven roads (12.5 km) in 2010, 2012, and 2013. Also, opportunistic observations (n = 103) spanning over 30 years were assembled from a variety of sources. In total, 2083 vertebrates (49 species), including 446 reptiles (11 species), were recorded "dead on road" during systematic surveys. The highest diversity of reptiles was recorded on Matchette Road, whereas the highest rate of reptile mortality was recorded on Malden Road. We recorded one of the highest rates of snake road mortality in Ontario. Reptile species at risk were killed on all roads surveyed. Combining systematic and opportunistic data, we found seven reptile species at risk: Butler's Gartersnake (*Thamnophis butleri*), Eastern Foxsnake (*Pantherophis vulpinus*), Eastern Massasauga (*Sistrurus catenatus catenatus*), Blanding's Turtle (*Emydoidea blandingii*), Eastern Musk Turtle (*Sternotherus odoratus),* Northern Map Turtle (*Graptemys geographica*), and Snapping Turtle (*Chelydra serpentina*). Reptile road mortality "hotspots" occurred where each road is intersected by a naturalized utility right-of-way. Our results can be used to focus mitigation efforts in space and time to reduce mortality rates and enhance connectivity in the Ojibway Prairie Complex and Greater Park Ecosystem.
Platform

INTRASPECIFIC CALL DIVERGENCE IN THE SPRING PEEPER

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A major goal in evolutionary biology is to understand the forces that underpin diversification and speciation. Working under the Biological Species Concept, a species is a group of individuals that actually or potentially interbreed, thus implicating reproductive isolation as the hallmark of speciation. Traits involved in reproduction and mating displays may evolve over time in isolation and form impediments to breeding between diverging populations, leading to complete reproductive isolation. *Pseudacris crucifer* is a North American tree frog species that uses advertisement calls to attract females during the breeding season. Recent genomic insights from our lab suggest that this species is comprised of three evolutionary lineages that originated in geographic isolation, but are now in contact. Using a phylogenetic framework, this study investigates advertisement call structure across these lineages to determine whether genealogical divergence is mirrored by call differences. Results show significant differences in call variables between the three lineages, though not paralleling genealogical history. Ongoing research is investigating possible selective pressures on these advertisement calls, and preliminary data suggests that calling behaviour, habitat, and morphology may be contributing to acoustic differences. Divergent acoustic signals and varying selective pressures acting on these signals, suggests the potential for advertisements calls to act as an intraspecific barrier to mating.
Poster

THE EFFICACY OF MONITORING AMPHIBIAN POPULATION TRENDS THROUGH CITIZEN SCIENCE

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Amphibians are important constituents of most freshwater and terrestrial ecosystems, and owing to their ongoing global population declines there is an urgent need to document amphibian patterns of site occupancy and population change. Yet, because amphibians are cryptic, seasonally observable, and have high population variability, development of effective monitoring protocols can be challenging. In many countries, citizen science (CS) programs, through which volunteers document animal presence and abundance, have become an important form of monitoring biodiversity, and in Canada CS programs serve as the sole means of monitoring amphibian populations over large spatial scales and across multiple years. We examined the amount and quality of amphibian site occupancy and abundance data provided by CS programs in Canada, to determine the adequacy of these techniques in monitoring Canada's biodiversity. We collected amphibian observations from 5 CS programs across Canada and show that of the ~35,000 unique locations visited from 1995-2014, 93.6% were monitored during a single year. For locations that were visited in multiple years, 41.2% were monitored in only two consecutive years and <3% were visited in at least 10 consecutive years. Over 55.3% of unique sampling locations are within 1 km of a road, and concentrated in areas with high human density. Some amphibian species have large numbers of CS observations, but many, including most salamanders, have too few to be of use in population monitoring. Our evidence showing strong temporal, spatial, and species bias in CS amphibian monitoring programs indicate that the state of the data available for amphibian monitoring in Canada is not adequate for documenting potential changes in distribution and abundance. There is an urgent need to adopt more standardized and validated methods for monitoring amphibians in Canada.

Platform

EMERGING REPTILE AND AMPHIBIAN INFECTIOUS DISEASES IN CANADA

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Batrachochytrium salamandrivorans (Bsal) and Snake Fungal Disease (SFD) are two infectious diseases that have recently emerged as potential threats to Canada's herpetofauna. Bsal is not known to occur in North America, but if introduced it has the potential to cause widespread decline of North America's salamanders. Snake Fungal Disease (SFD), which is caused by the fungus *Ophidiomyces ophiodiicola*, was first documented in the U.S. in 2006 and has caused mortality and population decline in several snake

species throughout the eastern United States (Allender et al. 2015b). SFD was confirmed in southwestern Ontario in 2015 and 2016, and the fungus has been detected at several other sites across southern Ontario. In 2015, a national inter-agency working group was formed to help coordinate Canada's response to the potential threat posed by Bsal, and the mandate of this group was recently expanded to include all health issues related to Canada's reptiles and amphibians. This presentation will provide an overview of recent monitoring, prevention and education efforts within Canada and internationally, highlight resources that are available to the scientific community and the public, and identify opportunities for the Canadian herpetological community to assist in reptile and amphibian disease monitoring and prevention.
Lightning

IS SNAKE FUNGAL DISEASE REALLY AN EMERGING INFECTIOUS DISEASE – OR JUST AN OVERLOOKED ONE?

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Snake Fungal Disease (SFD) is an emerging disease of snakes in eastern North America. The disease is caused by infection with the fungus *Ophidiomyces ophiodiicola*, (formerly *Chrysosporium ophiodiicola*). The fungus is capable of producing a wide range of lesions in affected snakes. These range from a mild dermatitis with hyperkeratosis, scabs and crusts, to premature shedding of the skin, subcutaneous nodules and corneal opacities of the eye. SFD is confirmed in snakes from several states in the northeastern U.S.A., and is now also confirmed in Canada. We review the known Canadian distribution of *O. ophiodiicola* and SFD, and identify major knowledge gaps in our understanding of this disease system. We also report on the first case (to our knowledge) in which an individual known to have SFD is monitored in the wild, and we report on the progress of SFD in a wild snake in the absence of intervention. The data on SFD in Canada are still extremely limited, but we highlight some problematic assumptions that are gaining traction. This disease is often treated as a conservation threat analogous to white-nose syndrome in bats, and is heralded as a major conservation crisis. But have we even decided how exactly to define SFD? Is SFD truly the conservation concern it has been framed as, or is it simply an opportunistic pathogen on immunocompromised snakes? How can we design research programs to tell the difference - and how would the results inform management and mitigation of SFD in the wild?
Platform

WILLINGNESS TO UTILIZE MITIGATION TUNNELS IN EASTERN GARTER SNAKES

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Many declines in herpetofauna populations have been associated with human activity. In particular, the effects of roads on herpetofauna have become increasingly well studied and are considered of critical importance to reptile conservation. Roads are not only a source of direct mortality, but also affect gene flow by fragmenting the landscape. Attempts to mitigate these threats commonly include fencing to prevent wildlife from accessing the road and ecopassages to provide safe crossing points. Mitigation is often species-specific, and while reports of ecopassage usage have become common, the dynamics of mitigation success and species-specific responses are poorly understood. The Eastern Garter Snake (*Thamnophis sirtalis*) is commonly killed by cars so we conducted a willingness to utilize (WTU) experiment with this species in order to understand their behaviours when interacting with ecopassages. Snakes were collected in Presqu'ile Provincial Park, ON, Canada, where under-road mitigation tunnels have been recently installed, and used in two arena trials to 1) determine WTU ecopassages when forced to either cross or remain in the arena, and 2) assess the diversity of responses associated with usage when given other crossing options than the ecopassage. Preliminary results suggest all snakes are willing to use the tunnels when forced but when given a choice, only 62.5% of them will choose to use the tunnels, while the rest choose to exit along the fence line. Across all trials, mean time to decision was under one minute and mean time to successfully cross and exit the tunnel was just over three minutes. Analyzing the behaviours of specific species interacting with mitigation measures broadens our understanding of how connectivity structures facilitate gene flow and access to critical resources, and ultimately increases our ability to mitigate road effects successfully.
Platform

THE CHORUS FROG PROTECTION & THE EMERGENCY ORDER FOR SCIENTIFIC KNOWLEDGE – A FROG PEOPLE STORY

Yohann Dubois

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On June 22nd 2016, the federal government announced the «Emergency Order for the Protection of the Western Chorus Frog» to address imminent threat to the recovery of the species around Montreal, Qc. For the first time in history of the federal Species at Risk Act, an emergency order was taken to protect the habitat of a species at risk on private land. This will be our case study to highlight the emergency need for scientific knowledges to meet conservation goal. Assuming the urban expansion cannot be 100% stopped, conservation objective should be to maintain viable populations instead of protecting each square meter of residual habitat. The fulfillment of this objective first requires to quantify some variables like: the input values to run population viability analysis, the habitat needs, the impact of habitat alteration and other human activities within and around protected area, the effect of mitigation measures. Without those values, «expert opinions» without empirical support are used to predict when a development project can jeopardize the persistence of a species at risk population. This can leads to conflicting predictions among stakeholders. The herpetologist's community is then needed to provide empirical and thorough predictions on which a political choice can be made. At the end, the political will

is needed to apply existing regulation to protect species at risk when predicted impacts prevent population's persistence. This case study is an example that political will can be there.
Platform

CHARACTERIZATION OF THE TURTLE POPULATION IN VARIOUS CREATED WETLANDS AT TOMMY THOMPSON PARK, TORONTO, ONTARIO

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Many regional conservation bodies invest heavily in the creation of wetlands. The Toronto Regional Conservation Authority (TRCA) has been restoring and developing the Tommy Thompson Park (TTP) into a wildlife refuge for many years. What is now the TTP started as the Leslie Street Spit, a 500 hectare site created in the late 1950s for the disposal of dredged material from the Toronto port's outer harbour as well as surplus clean fill from various development sites within Toronto. This study is the first to survey the turtle population that has taken residency in the various water bodies at TTP. We used a capture-recapture methodology to survey the turtle population. We also used radio telemetry to obtain preliminary data on the movement patterns of two species at risk or of special concern, the Blanding's turtle (*Emydoidea blandingii*) and Snapping turtle (*Chelydra serpentina*). We will also use radio telemetry to pinpoint exact overwintering locations that will help inform future creation of wetlands. Lastly, we also collected DNA samples for 4 Blanding's turtles, in order to better understand the source population of these turtles. We will be reporting on these preliminary results.
Lightning

HABITAT USE BY BULLSNAKES AT THEIR NORTHERN RANGE LIMIT IN SASKATCHEWAN: VARYING SPACE REQUIREMENTS AMONG POPULATIONS

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Bullsnakes (*Pituophis catenifer sayi*) are currently listed as Data Deficient by COSEWIC. This species reaches its northern range limit in southern Saskatchewan and Alberta, where conservation threats to snakes may be exacerbated by the harsh climate. Little is currently known about bullsnake space use and habitat requirements in Canada. Our study used radio-telemetry to examine bullsnake movements and habitat use in Saskatchewan's Big Muddy (BMV; N=7), South Saskatchewan River (SSRV; N=14), and Frenchman River (FRV, N=9) valleys. To date we have found that bullsnakes in the FRV have larger home ranges than those in the BMV (95% Kernel density estimates: BMV mean=33.6 ha; FRV=265.5 ha). Bullsnakes in the FRV also have spatially distinct summering and wintering areas, whereas snakes in the BMV occupy one small area year-round. Bullsnakes in the BMV select for areas in close proximity to

burrows, with low grass cover and high shrub cover, which differs slightly from habitat selection in the FRV. We conclude that space use and habitat selection by bullsnakes are population-specific. The major factors potentially influencing among-population variation are currently being examined.
Platform

SNAKE FUNGAL DISEASE (*OPHIDIOMYCES OPHIODIICOLA*) IN ONTARIO

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In March 2015, the Canadian Wildlife Health Cooperative (CWCH) confirmed the presence of Snake Fungal Disease (SFD) in Ontario. SFD is caused by the fungus *Ophidiomyces ophiodiicola.* The disease is also present in the United States where it has been associated with significant morbidity and mortality in snakes (CWHC, 2016). SFD has been paralleled to White-Nose Syndrome (WNS), caused by the fungus *Pseudogymnoascus destructans*, which is the leading cause of population declines in various Ontario's bat species. Given the high proportion of Ontario snake species already experiencing population declines, should SFD proliferate like WNS then early detection and reporting to the CWHC will be paramount in combating this disease. This talk will explore how practitioners in the field can contribute to the protection of snakes through SFD identification and reporting to the CWHC. It will also explore potential impacts of this disease to Ontario snakes and highlight the need for environmental consultants to communicate with the academic community with respect to detection, reporting and potential mitigation measures for projects involving snakes potentially affected by SFD.
Lightning

EFFECTS OF ATRAZINE AND RU-486 ON THYMUS GLAND SURFACE AREA OF *XENOPUS LEAVIS* TADPOLES

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Atrazine, a herbicide that is heavily used in agriculture, has been shown to cause various endocrine disrupting effects in amphibians such as sexual dimorphism. We report here that, like glucocorticoids (stress hormones), atrazine dose-dependently induces the shrinking of the thymus gland. Given the importance of the thymus gland in the immune system, this may have important consequences in amphibian health. In this study we look at whether Atrazine elicits its effect on the thymus gland via the glucocorticoid receptor in African Clawed Frogs (*Xenopus laevis*) tadpoles in Nleuwkoop Faber stage 42 (NF-42). If Atrazine acts like glucocorticoids on the Thymus, we hypothesized that the combination of

Atrazine with the glucocorticoid receptor antagonist (RU-486) will reverse the effect of atrazine on the thymus. Low and high concentration levels of Atrazine and RU-486 were used. Low concentration levels of Atrazine and RU-486 used in this study were 15 mcl in 500ml of water. High concentration levels were 50 mcl of both Atrazine and RU-486 in 500 ml of water. Tadpoles in each group (~25 tadpoles/group) were exposed for 5 days. Thymus surface area was measured using a stereomicroscope and analyzed using ImageJ software. Our initial results were statistically significant (p-value = 0.101) and show that tadpoles exposed to both atrazine and RU-486 will have similar thymus surface area to the control group, thus indicating that atrazine and RU-486 are acting on the same receptor pathways.
Poster

PILOT RING-TEST EVALUATING PCR TESTING FOR SELECTED WILDLIFE PATHOGENS IN 19 DIAGNOSTIC AND RESEARCH LABORATORIES

María J. Forzán[1,2]*, John Wood[3], J. Patrick Power[3] and Raphaël Vanderstichel[2]

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Research and diagnostic laboratories throughout the world run PCR tests to detect wildlife pathogens. Standardization of methodologies is difficult, and only a few laboratories acquire a certification granted by organizations such as the American Association of Veterinary Laboratory Diagnosticians or ISO committees. To provide an accessible method for quality control/quality assurance that will allow participating laboratories to confidentially evaluate the quality of their own results, the Canadian Wildlife Health Cooperative (CWHC), with the support of Environment and Climate Change Canada, conducted a pilot ring test specific to the emerging amphibian pathogens *Batrachochytrium dendrobatidis* and *B. salamandrivorans*. A set of 12 blinded randomized samples was shipped to each participating laboratory. The samples, prepared by Pisces Molecular, included plasmid DNA with the PCR/qPCR target sequences for one or both pathogens at varying concentrations (1.3 to 1.3x106 copies/µL), and blanks. Test sample randomization, labeling and mailing was done at and by the CWHC, acting as an independent agent. Results from 19 participating laboratories, from 4 different countries, were received. Tests were run as per each laboratory's routine protocols and results reported as "positive" or "negative" and, if run by qPCR, included their respective Ct (Cq) values and estimated copy numbers. Results from each laboratory were compared against the known composition of the samples and against other laboratory's results; laboratories were informed of where their results stood in comparison to others, but the standings of individual laboratories remained confidential. All laboratories detected medium and high concentrations, 7 laboratories failed to detect the smallest concentration (1.3 copies/µL). No laboratory reported false positive results. Reported copies/µL varied greatly, as much as 4 orders of magnitude. We expect this pilot ring test to serve as the first step towards establishing a formal peer-based validation system for PCR tests of wildlife pathogens.
Platform

EXAMINING LONG TERM CONSEQUENCES OF A MASS MORTALITY EVENT IN THE LONG-LIVED SPECIES, *Emydoidea blandingii*

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Little information pertaining to long-term effects of mass mortality events (MMEs) exists in the primary literature, especially in relation to long-lived species such as chelonians. A MME of Blanding's turtles (*Emydoidea blandingii*) in Misery Bay Provincial Park (MBPP), Ontario, was first reported and has been under investigation since 2013. With 53 dead (Nadult=44, Nsubadult=6, Njuvenile=2, Nunkown=1) and a current population estimate of 47 live resident Blanding's turtles, this event appears to have removed over half of the resident breeding population. Adult survivorship is essential for population persistence, as age at first reproduction is at least 14 years for males and 18-22 years for females, and vulnerable eggs and juveniles experience high mortality rates. Given the life history of Blanding's turtles, it is expected that the population at MBPP will continue to decline if unaided. Population viability analyses were conducted to examine and compare potential recovery strategies, and we found that nest protection, the introduction of juveniles, and the introduction of adults were each increasingly successful, though overall none of these strategies resulted in stable or positive population growth surpassing four Blanding's turtle generations into the future. The most successful strategy tested was a combination of nest protection and annual introduction of 25 female turtles at 2 years of age over a 50-year period. It is of the utmost importance to be aware of the natural and human-associated threats to species at risk, such as chelonians, and the long-term effects that these threats will have on population and species' persistence. Despite the limitations of modeling, our analyses generated a recommendation for potential conservation strategies for the MBPP population, and will aid in the management of future MMEs elsewhere.

Platform

INVESTIGATION INTO CAUSES OF A MASS MORTALITY OF BLANDING'S TURTLES (*Emydoidea blandingii*) IN MISERY BAY PROVINCIAL PARK, ONTARIO

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Mass mortality events (MMEs) can devastate populations by removing up to 90% of individuals, which is particularly damaging in long-lived species. While MMEs are being documented with increased frequency, a limited understanding of the causes and consequences of these events remains. Our study aims to determine the causes of a MME of Blanding's turtles (*Emydoidea blandingii*), a threatened

species, in a relatively pristine habitat at Misery Bay Provincial Park (MBPP), Ontario. The typical anthropogenic threats to turtles are minor or virtually absent in MBPP, and yet 53 Blanding's turtles were found dead without obvious cause in 2013. Thus, we investigated several potential natural causes of mortality, including predation in the active season and failed overwintering through either metabolic/respiratory acidosis, freezing, and winter predation. Telemetry and mark-recapture techniques were used to follow living turtles to allow inferences about dead turtles, and to generate a population size estimate. Motion-sensor activated trail cameras were paired with Blanding's turtle decoys to identify predators within the park. Potential predators identified included the North American river otter (*Lontra canadensis*), mink (*Neovison vison*), coyote (*Canis latrans*), and raccoon (*Procyon lotor*). Overwintering sites were located through telemetry, and temperature and dissolved oxygen content of water were measured to determine differences between known overwintering sites and sites which yielded carcasses, but no significant differences were found. Based on evidence collected, predation as the cause of death has received the most support. The results of our study will be informative for the conservation of the study population, and more generally for the management of future MMEs of turtles.
Poster

SLOW PROGRESS FOR CANADA'S FASTEST TURTLE: RESEARCH AND RECOVERY EFFORTS FOR THE SPINY SOFTSHELL TURTLE (*Apalone spinifera*) IN ONTARIO

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The Spiny Softshell Turtle (*Apalone spinifera*) is listed as Endangered by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC), and Threatened both Provincially and Federally. Threats include habitat loss (e.g. oviposition sites destroyed or damaged by invasive plants, cattle, human use and flooding), capture on fish hooks, illegal collection for the pet and food trade, increased mammalian depredation and climate change. Over the past few decades, increases in these threats have led to significant declines of Spiny Softshell Turtles in Ontario. Since 1994, one of Canada's longest running reptile research and recovery programs has been in place through the Upper Thames River Conservation Authority. Despite significant efforts, early surveys in the mid-1990s resulted in only limited observations of large adult animals, and almost no juveniles detected. Questions about the lack of observations in general, but more specifically why there were no, or few, juveniles in these populations emerged. Over the past 23 years, the answers to these questions have been revealed, though the threats facing this species are far more complex than we could have anticipated. Due to the large, and increasing, array of stressors leading to the decline of Spiny Softshell Turtles in Canada, recovery efforts need to include long term research and monitoring, habitat improvement, creation and maintenance, relevant and ongoing threat mitigation efforts, increased enforcement, landowner stewardship and public education. Since intensive research and recovery efforts began in the 1990s, some local Spiny Softshell Turtle populations have shown significant improvements, though for every bit of progress, mounting pressures continue to slow overall success.
Platform

RANAVIRUS AND FROG VIRUS 3: DETERMINING STRAIN VARIATION AND TRACKING VIRAL SPREAD ACROSS ONTARIO AND CANADIAN WATERS

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Effective disease prevention often requires controlling the source to prevent further spread to susceptible populations. Tracking the presence and absence of wildlife disease across geographical regions as well as various landscape features (waterbodies, mountains, human settlement, etc.) is often done to target a source. Tracking is also accomplished through comparing the genetics of the disease found across varying geographic scales. In the past 20 years, amphibian and reptile pathogens have become more prevalent around the world. Frog Virus 3 (FV3) is a highly characterized species of ranavirus that is widespread across North American wetlands, killing amphibians at alarming rates. Little is known about the virus outside of the general presence or absence of the pathogen in different wetlands throughout each year. By genetically analyzing FV3 where the virus is present, we may be able to determine how the virus has moved over time. Comparing genetic similarities and differences of a disease across a geographical scale is often used to determine the point of origin, means of transmission between locations, and predict future spread. My study is determining if genetic variations (variants) of FV3 exist and, if yes, where are these genetic variants located across Ontario and how do they relate to disease movement. Swabs of frogs at any life stage were taken from Ontario waterbodies as a model, and are also compared to FV3 samples in other Canadian regions to track on a larger geographic scale. By comparing different variants and relating those to the region they were found in, I may be able to track the overall spread of FV3 to a source or possible reservoirs where the virus first emerges each year. Understanding the movement and predicting future spread, we can then target our control efforts to prevent further outbreak.

Poster

ROAD MORTALITY HOTSPOTS AND POTENTIAL MITIGATION IN MUSKOKA, ONTARIO

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Four years of road mortality observations resulting from the Saving Turtles at Risk Today (START) project in Muskoka were analyzed using SIRIEMA to identify hotspots. The results will be presented along with preliminary concepts for future mitigation plans for these locations. Next steps for this process and larger developments with the START project will be discussed.

Platform

RESPONSES OF BUTLER'S GARTERSNAKE (*Thamnophis butleri*) AND EASTERN FOXSNAKE (*Pantherophis gloydi*) TO RELOCATION AND RESTORATION OF TALLGRASS PRAIRIE HABITAT AND KEY HABITAT FEATURES

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Relocation of animals, habitat restoration and creation are common conservation and mitigation techniques that have been applied to a number of species through the implementation of recovery strategy plans or compensation of development impacts. However long term, comprehensive studies documenting the outcomes or effectiveness of these strategies as mitigation tools are rare. Our study assesses the how the federally and provincially endangered Butler's Gartersnake and Eastern Foxsnake respond to relocation efforts and the creation of key habitat features as well as habitat management activities. The study occurs in Windsor, Ontario as part of the provincial Endangered Species Act (2007) permit requirements for the Right Honorable Herb Gray Parkway, a recently constructed extension of the 401 to the Gordie Howe International Bridge into Michigan. The study involves monitoring > 3000 snakes through daily radio telemetry and mark recapture surveys. Results indicate that relocation success varies according to the extent of displacement from their original home range and the distance at which the animal is relocated. Levels of site fidelity to core use areas in relocated versus non-relocated Eastern Foxsnakes is also significantly different for each sex; relocated females demonstrate stronger site fidelity to their new habitat areas than relocated males. Both species will use newly created habitat features such as hibernacula, live birthing areas and thermoregulation features, however habitat selection by relocated versus non-relocated snakes differs in the type of preferred cover. Responses to management activities such as prescribed burns are varied, however preliminary analysis suggests some level of avoidance of burn areas by Butler Gartersnakes. This species appears to prefer a dense thatch layer in areas comprised of cool season grasses. Therefore preliminary analysis suggests that management for pure tallgrass prairie habitat may have to be balanced with the provision of older more cultural meadow species.

Platform

EFFECTIVENESS OF A UNIQUE DESIGN OF BARRIER WALL AND UNDERPASS ON REDUCING TURTLE ROAD MORTALITY

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With the fragmentation of the landscape by an ever expanding network of roads, road mortality is considered to be a high level of concern for Ontario's turtle populations. Much work has been done on

mitigating the impacts of roads on turtle populations, ranging from the installation of signage, to engineered barrier walls and underpasses. However many solutions are temporary, ineffective and/or expensive and therefore unfeasible for installation at the municipal and provincial level. Glenside Ecological Services Limited, in partnership with the Haliburton Highlands Land Trust and U-Links, investigated the effectiveness of a unique design of barrier wall fabricated from High Definition Polyethylene (HDPE) pipe partnered with an existing semiaquatic culvert as an underpass. Two control sites and one test site were selected and each site was 500m in length, with adjacent wetlands connected under the road by an existing culvert. Blanding's Turtle (*Emydoidea blandingii*), Snapping Turtle (*Chelydra serpentina*) and Painted Turtle (*Chrysemys picta*) were present at all three sites. The sites were monitored for 7 hours/day during May and June for 3 years. After the first year of monitoring, mitigation consisting of a 220m long and 0.75m high barrier wall was installed on both sides of the road at the test site. The ends of the barrier wall were curved back on themselves with the intent of deflecting turtle movements towards the underpass and wetland. The investigation examined the effectiveness of the barrier wall in reducing the number of turtles on the road. Turtle activity beyond the barrier wall was also assessed to determine whether turtles were circumnavigating the barrier wall. Finally, post-mitigation turtle use of the existing semiaquatic culvert underpass was quantified to determine whether the barrier wall was prohibiting migration between wetlands. The information provides valuable insight into barrier wall and underpass design for turtle road mortality mitigation.
Platform

LONG-TERM STRUCTURAL STABILITY OF A COASTAL ZONE HERPETOFAUNAL COMMUNITY IN THE SOUTHERN LAURENTIAN GREAT LAKES

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Relatively few studies of herpetological communities exist and there are few studies of any faunal communities in coastal dune systems. We conducted annual surveys of reptiles and amphibians to determine species membership, relative abundance and biomass occurring in coastal dune-savanna habitats fringing Lake Erie at Point Pelee National Park over 25 years. We observed 4,529 individuals of 12 species (9 reptiles, 3 amphibians) co-occurring in stabilized dune and cedar savanna. The ranked order of the five most abundant species, Common Five-lined Skink (*Plestiodon fasciatus*), Dekay's Brownsnake (*Storeria dekayi*), Common Gartersnake (*Thamnophis sirtalis*), Eastern Foxsnake (*Pantherophis gloydi*), and American Toad (*Anaxyrus americanus*) was highly concordant across all years. All species were observed under or near woody debris that entered the system naturally as driftwood, blowdown, or debris placed for habitat restoration. Five-lined Skinks dominated the community in relative abundance and biomass. The guild displayed a common trend of increasing abundance over time responding to active microhabitat management as woody debris availability was nearly doubled from ca. 2,500 to >5,000 objects. More recently we also found similar communities dominated by skinks and other squamates in the coastal fringing habitats at Rondeau and Pinery Provincial Parks suggesting that this type of community was historically more common. Most of the species we found feed largely

on arthropods and other invertebrates that are abundant in coastal environments. Coastal zones provide important habitats that support diverse herpetofaunal communities in the southern Great Lakes of North America that likely play an important role in ecosystem function. Further studies of both lacustrine and marine coastal zone communities are needed.
Platform

FLUCTUATING ASYMMETRY IN SPOTTED SALAMANDER (*Ambystoma maculatum*) SPOT PATTERNS IN RESPONSE TO PREDATION RISK

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Stress has been correlated with increased fluctuating asymmetry (FA) in a number of taxa, but tests in amphibians have been largely correlational and their results equivocal. We tested the hypothesis that predator-induced stress altered the FA of spotted salamanders (*Ambystoma maculatum*) by exposing larvae to perceived predator risk in the lab and testing for differences in bilateral symmetry in the post-metamorphic head and dorsal spot pattern. We found that individuals exposed to predation risk in the larval stage had greater levels of FA in the head spot pattern, but not in the dorsal spot pattern, post-metamorphosis. This outcome persisted for several months post-metamorphosis, although we noted that an individual's spotting pattern itself varied through the 6 months following metamorphosis. This study is among the first to reveal expression of FA in amphibians exposed to perceived predation risk, and future research should investigate how other stressors (both natural and anthropogenic) may affect FA in amphibians, and whether the location and duration of the FA response varies according to stressor type and conditions of exposure.
Platform

HOW DATA FROM THE ONTARIO REPTILE AND AMPHIBIAN ATLAS INFORMS MUDPUPPY (*Necturus maculosus*) CONSERVATION

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Led by Ontario Nature since 2009, the Ontario Reptile and Amphibian Atlas (ORAA) is a citizen science project that tracks the distributions and spatial trends of reptiles and amphibians across the province over time. The over-arching goal is to increase the collective knowledge base of reptiles and amphibians, results that can be used to help inform the status of many species. One example of how data from the ORAA has helped answer questions about a species current and future status can been seen with the Mudpuppy (*Necturus maculosus*), Ontario's only aquatic salamander. Although not currently listed as a species-at-risk in Ontario threats to this species include pollution, habitat loss, disease, and fishing by-

catch, and has led the Committee on the Status of Endangered Wildlife in Canada to list Mudpuppies as high priority for a new assessment. Using Mudpuppies as an example, this presentation will outline how data from the ORAA can help provide baseline information that supports future monitoring work and conservation decisions.
Lightning

ASSESSING THE POPULATION SIZE, GENETIC STRUCTURE, CRITICAL HABITAT, AND PREDATION THREATS IN SMALL-MOUTHED SALAMANDERS (*Ambystoma texanum*)

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The small-mouthed salamander (*Ambystoma texanum*) is among the most enigmatic of Canada's amphibians. Although the small Canadian population of this species was first identified by COSWEIC as Endangered in 2004, our knowledge of this population remains course and limited. The entire Canadian population of *A. texanum* is restricted to Pelee Island, and has been difficult to study because they breed in March before seasonal ferry service to/from the mainland resumes. In addition, Pelee Island is home to a unique variety of unisexual salamanders that are visually similar to *A. texanum*, and are only differentiated reliably by genetic methods. In 2015 our team initiated a research program on Pelee Island to assess population size, genetic structure, critical habitat, and predation threats for this complex of salamanders. To date we have individually marked over 400 adult salamanders on the island, from which we have taken genetic samples to assess individual genotype and to establish genetic structure of each sub-population. Our efforts have already identified key breeding ponds on the island that were previously unknown. Repeated sampling from larval ponds will help us determine how the composition of genotypes changes year-to-year as well as over the larval period. Morphological data collected from the adults enables us to estimate size-specific growth rates, and determine whether any combination of morphological traits can distinguish *A. texanum* from unisexuals. Microhabitat data collected at each capture site is being used to better understand habitat needs, and to examine niche partitioning among genotypes. As the project continues, recapturing marked adults will enable us to estimate size-dependent survival, population size, home range size, and dispersal distance. In this talk I will share the insights we have gleaned about this population to date.
Platform

MECHANISMS OF HATCHING SYNCHRONY IN FRESHWATER TURTLES

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Turtles exhibit remarkable synchrony in both hatching and emergence of young from the nest, where synchronous hatching may increase nest survivorship through effects such as predator dilution. However, mechanisms of hatching synchrony remain unclear. Embryo-to-embryo communication has been proposed as an important mechanism of synchrony, and potential physical and acoustic mechanisms, such as vocalizations, have been described in several turtle species. To explore the hypothesis that embryonic communication synchronizes hatch date, we designed an experiment to test the relative effects of factors including; 1) contact among eggs, 2) physical movements by embryos and hatchlings, and 3) vocalizations between nest mates. We conducted ex-situ incubation of Spiny softshell (*Apalone spinifera*) and Map turtle (*Graptemys geographica*) eggs, recording hatch dates and the occurrence of embryonic and post-hatching vocalizations. By comparing developmental rates in clustered and single eggs from older and younger clutches, we also tested the hypothesis that embryos can modify their developmental rates to synchronize hatching. Additionally, our experimental design addressed potential costs of accelerated development. Our results implicate noise pollution as a potential threat to incubating turtle nests. From a management perspective, our results also address the potential fitness costs of mixing clutches within ex-situ incubation programs.
Poster

IMPACT OF NATURAL RESOURCE EXTRACTION ON THERMAL PROPERTIES OF WOOD TURTLE (*GLYPTEMYS INSCULPTA*) HABITAT

Geoffrey N. Hughes* and Jacqueline D. Litzgus

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Wood turtle habitat is shrinking across the species' range, largely due to human activities, including natural resource extraction (e.g., forestry, aggregate extraction, agriculture). We examined the thermal consequences of forestry and aggregate extraction on wood turtle habitat in the Sudbury District of Ontario by measuring the differences in temperature (overall temperature and min/max extreme temperatures), thermal landscape "topography", and habitat thermal quality among relatively undisturbed sites (n = 2), harvested forestry sites (n = 2), and aggregate pits (n = 2) in the 2015 field season. We also tested the potential use of the thermal landscape concept as a predictor of habitat thermal quality. Undisturbed habitats were generally cooler and their temperatures less variable than in impacted habitats, and were of higher thermal quality for wood turtles. The thermal landscape concept provided a useful predictor of habitat thermal quality, so long as the influence of time of day was factored into the predictive model. Data collected for our study are important in considering

conservation and management of wood turtles, by illuminating the thermal impacts of natural resource extraction on the habitat of an Endangered species, and guiding the development of mitigation and rehabilitation plans, by providing measures of, and targets for, habitat thermal quality.
Platform

THE THERMAL LANDSCAPE AS A PREDICTOR OF WOOD TURTLE (*GLYPTEMYS INSCULPTA*) NEST-SITE SELECTION

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Wood turtle (*Glyptemys insculpta*) females are noted for their intensive and extensive nest-searching activities, often spending days probing their nesting beaches before laying their eggs. Presumably, these behaviours are indicative of a highly-choosy nest-selection regime, the benefit of which is increased female fitness. We examined wood turtle nest-site selection to determine if and how much temperature drives this selection process, and subsequently whether thermal imagery could be a useful tool for predicting high quality nesting habitat. We selected three known wood turtle nesting beaches and collected thermal imagery, soil moisture content, and soil grain size distribution, to determine the strongest driver of female attention to different areas of the beaches. In contrast to our prediction, temperature did not show the strongest predictive utility for female nest-searching attention; instead, soil grain size (i.e. texture) appeared to be an important cue. Wood turtle females either selected their nesting sites based on a mix of correlated environmental cues, or a cue that our statistical models were not sensitive enough to detect. As wood turtles do not have temperature-based sex determination, temperature may not be the most important cue for their nest site selection. Temperature did not show a consistent ability to predict female attention; more traditional methods of nest surveying, such as looking for the distinctive wood turtle trackways, may be more useful and cost-effective than thermal imagery.
Poster

CAUSES AND CONSEQUENCES OF DISPERSAL INFERRED FROM SEX AND SIZE FREQUENCIES OF SNAPPING TURTLES (*Chelydra serpentina*) OBSERVED ON ROADS

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Aquatic turtles encounter roads when seeking nesting habitat, when roads bisect habitat within individual home ranges, and during dispersal. We examined the demographic frequency of Snapping Turtles (*Chelydra serpentina*) observed on roads at multiple sites in Ontario in order to infer juvenile dispersal patterns. Hypotheses about the adaptive value of dispersal make differing predictions about sex-biases among dispersers. Inbreeding avoidance and kin competition for mates predict sex-biased dispersal while kin competition for resources predicts that both sexes disperse. Late age of maturity implies that resource competition may begin much earlier in life than mate competition or potential inbreeding. Therefore, we predicted that if local resource competition drives dispersal, then juveniles of both sexes will be overrepresented in our road sample. Conversely, if the function of dispersal depends mainly on selective pressures that operate after maturity, then we predict a later age and greater sex-bias among dispersers. Individuals observed on roads were measured and dead juveniles were retained to be sexed by dissection. We constructed integral projection models (IPMs) based on data from long-term studies in Algonquin Provincial Park to generate estimates of overall body size distributions within the study populations. We will test the relative representation of size and sex classes on roads against expected frequencies generated by IPMs. Individual contributions to population growth and viability depend on both age and sex, and knowledge of age and sex ratio of dispersers is critical for understanding how roads and other threats causing dispersal mortality might affect populations.
Platform

NEST-SITE FIDELITY, SEARCH TIME AND NEST PREDATION IN PAINTED TURTLES (*CHRYSEMYS PICTA*)

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Female turtles should choose nesting locations to both maximize embryonic development and minimize nest predation. Nest-site fidelity, the tendency for a female to return to a given nesting location, may result in minimizing search time and therefore time susceptible to terrestrial predators while gravid. Similarly, nesting near one's primary aquatic habitat should reduce exposure time to predators, but can lead to high nest densities and therefore high predation rates through increased predator search efficiency. If female painted turtles (*Chrysemys picta*) show fidelity, search time should decrease with age as a result of gaining nesting experience. Furthermore, if predation rates are highest at high nest density, this may counteract the potential benefits of fidelity. Using nesting location data from the Algonquin Park long-term study database and time-lapse videos of the main nesting embankment (230m2), fidelity, search time, and nest predation data were collected and quantified. Females showed varying levels of fidelity by returning to the same 10m2, 30m2, 50m2, 80m2 section of embankment in 47%, 60%, 69%, and 80% of study years, respectively. As female age increased, the number of nesting attempts each year increased, and older females nested in higher nest density areas. Across sites, intermediate nest densities had the lowest predation rates but within a site, nest survival was highest at high nest densities. This suggests that as females age, they increase search time to find better nesting locations and nest in higher density areas which could benefit nest survival through nest and scent

saturation. These findings can hopefully be used to in future conservation efforts to better understand the impacts that disruption and removal of nesting sites have on turtle populations.
Platform

ROAD EFFECTS ON PAINTED AND SNAPPING TURTLE POPULATIONS IN ALGONQUIN PARK, ON

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Road mortality is thought to be a major cause of turtle population decline and has contributed to potential deleterious changes in population demography. Road mortality can occur during annual nesting migrations of females, dispersal of juveniles, movements to escape unfavorable habitat conditions or find suitable habitat, or to find mates. We hypothesize that proximity to roads will decrease the health and fitness of turtle populations due to an increase in mortality from vehicle collisions. To test this, we will survey turtle populations in 10 impact sites (wetlands along the major highway corridor) and 10 non-impact sites (wetlands >3km from roads) in Algonquin Park, ON. Snapping Turtles and Painted Turtles from these wetlands will be sampled using late summer trapping and spring surveys by canoe and dip net to determine and compare body sizes and condition, injury rates, stress through cortisol levels in toe nail clippings, population age structure and sex ratio, and population density between impacted and non-impacted sites. It is predicted that non-impact sites will show larger body sizes, less injury and stress, older aged individuals, and a more even sex ratio. Age of turtles will be estimated through a novel method using Pentosidine assays. In addition, a comparison of abiotic conditions between natural and indirectly artificial nesting sites (human-made but not directly for turtle nesting, such as along roads and trails) for both Painted and Snapping turtles will be conducted. Predator abundance will also be quantified using trail cameras between natural and artificial nesting sites. Through this study we will be able to quantitatively determine whether roads negatively influence turtle populations. This research can be used to inform future implementation of barrier fencing and ecopassages on roadways, and to inform nest caging protocols to reduce predation of eggs.
Poster

INITIAL DISPERSAL AND HABITAT USE OF NEWLY INTRODUCED MINK FROGS IN WESTERN NEWFOUNDLAND, CANADA

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Insular Newfoundland has no native amphibians. While global amphibian populations are declining at alarming rates, populations of introduced anurans (frogs and toads) continue to expand in western Newfoundland, Canada. However, we expected the establishment and dispersal of the most recently introduced species, Mink Frog (*Lithobates septentrionalis*), to be influenced by competitive exclusion and/or niche differentiation with the previously introduced and ecologically similar Green Frog (*Lithobates clamitans*). We used a combination of anuran calling surveys and pond-edge surveys to assess the relative regional distribution, local habitat use, and ongoing dispersal for these two species in western Newfoundland. The recently established Mink Frog has dispersed ~3.8 km/year northeast from the original (2001) discovery location and ~2.6 km/year southwest; binary logistic and co-occurrence analyses revealed that this population displayed an unexpected habitat and spatial separation from long-established Green Frog populations, at landscape and local scales. This niche differentiation appears to be further defined by the influence of pH on species presence; acidic environments negatively affect Mink Frog presence while favouring Green Frogs.
Platform

QUANTIFYING THE SUCCESS OF REHABILITATION IN SNAPPING TURTLES (*Chelydra serpentina*) THROUGH POST RELEASE MEASURES OF BODY CONDITION AND BEHAVIOUR.

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The goal of wildlife rehabilitation is to return unhealthy or injured individuals to their native home ranges such that they no longer require human assistance for survival, and can assimilate into the already established population. Our project sought to investigate the success of rehabilitation on snapping turtles (*Chelydra serpentina*), a species of Special Concern in Canada. Five snapping turtles from the Wild at Heart Animal Refuge Centre in Lively, Ontario were released after rehabilitation, and their body condition and spatial ecology monitored using radio telemetry. Body condition was quantified based on the residuals of a regression of body size (carapace length) on body mass for each turtle; positive residuals indicate good condition whereas negative residuals indicate poor condition. Mean body condition of the 5 rehabilitated turtles did not differ from that of 45 wild snapping turtles. Spatial ecology was quantified as size of home range during the 2015 active season. The home range sizes of 3 radio-tagged rehabilitated turtles were significantly smaller than those of 11 radio-tagged wild snapping turtles. These data can provide important information on the success of rehabilitation on freshwater turtles as we consider more conservation techniques to counteract declining populations.
Poster

IMPACT OF IRREGULAR SHELTERWOOD ON POPULATION DYNAMICS OF TERRESTRIAL SALAMANDERS

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Ecosystem-based management aims to preserve old-growth forest attributes using techniques mimicking natural disturbances. Irregular shelterwood logging is a new method applied to mixed forest, but its impacts on forest floor organisms are still unknown. In this study, we quantified the effects of three different treatments of irregular shelterwood and old-growth forest controls on salamanders using woody debris. To do so, we focused on the red-backed salamander (*Plethodon cinereus*), a completely terrestrial salamander strongly associated with woody debris and a key species of the forest floor. We studied abundance dynamics, vertical migration, and body condition of individuals among treatments in sixty-four sites during each of two field seasons. We sampled salamanders at each site with coverboards and quadrat searches in the leaf litter during 10 sampling occasions. We also measured site characteristics such as the woody debris volume and the canopy closure. We will use *N*-mixture models to estimate the impact of treatments and other site characteristics on salamander population parameters. We predict that treatments maintaining woody debris and minimizing canopy opening increase the size of salamander populations and body condition, while the time since precipitation decreases the probability of salamanders to move underground, particularly for shelterwood treatments.
Poster

REALIZING THE BENEFITS OF THE OVERALL BENEFIT PERMIT PROCESS FOR JEFFERSON SALAMANDER (*Ambystoma jeffersonianum*)

Jessica E. Linton[1]*, James P. Bogart[2], Al P. Sandilands[3], Heather A. Fotherby[4]*

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A comprehensive two year research program on the Jefferson Salamander (*Ambystoma jeffersonianum*) was developed and executed as part of an "Overall Benefit" permit under the Ontario Endangered Species Act to assist recovery efforts for the species. The first objective of the research program was to determine the current status of a specific population and identify its limiting factors to more completely understand genetic and ecological factors that threaten it, and possibly many other similar populations in Ontario. A multi-faceted field program was completed which involved a combination of minnow and pitfall trapping, egg mass surveys, and marking individuals using VIE tags. This portion of the research

program confirmed the absence of a sperm donor for unisexual Ambystoma in the population and allowed for important insights into the complex reproductive strategies of *A. jeffersonianum*. This included the rejection of the hypotheses that unisexual salamanders use *A. maculatum* as a sperm donor, or that they reproduce parthenogenetically when acceptable sperm donors are not available. The second objective of the research program was to complete a two year study on juvenile dispersal, which has been identified as a major knowledge gap in the Recovery Strategy. Because there was no unisexual recruitment at the original study location, the second phase of the study was carried out at a contingency study area. A complex arrangement of strategically placed pitfall traps was employed to capture and tag adults, juveniles and recent metamorphs. This phase of the study (ongoing) provides data on the timing, direction, distances, and conditions under which metamorphs disperse from their natal ponds and subsequent movements of juveniles and adults in terrestrial habitats. It has also allowed for the collection of data on population genotype ratios between adults and juveniles, providing insights into the proportional abundance of different genomes of adults and metamorphs.
Platform

SERENDIPITY, SIBLINGS, SPOTTED TURTLES, AND SOLUTIONS

Jacqueline D. Litzgus

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I have had the rare privilege to turn my childhood fascination into a career. Since I was a child, I have loved snakes and turtles, mostly on account of an older brother who inspired my passion for catching these and other critters while toting me up and down the creek and into the woods by our house. Eventually my brother and I become biology instructors at a canoe-tripping camp and there discovered old mark-recapture records for Spotted Turtles; that treasure trove of data became the basis of my career. You can't predict how one life event or decision, or series of events, will impact your career path. My path has followed this population of Spotted Turtles for decades, and such long-term data are essential for elucidating patterns in population parameters for long-lived species and are invaluable for monitoring species at risk. Despite the study site being relatively pristine, and no appreciable changes in search effort, the numbers of turtles captured during spring surveys and the estimated population size have declined to approximately half of former numbers, and I don't know why; such are the challenging questions that inspire research. The research my students and I do has taken us down new paths that include multiple species of turtles and even some snakes, and is based on the premise that to conserve anything, you need solid science to inform policy and decisions, and a passion for the animals you wish to protect. We focus on the practical: applied research to test the efficacy of recovery actions on a foundation of basic life history and natural history data. I will discuss the challenges of doing such conservation research, and offer case studies and solutions to these challenges, in the face of increasing threats to reptiles from natural and anthropogenic sources.
Plenary Presentation

NEUROBIOLOGICAL AND PHYSIOLOGICAL LINKS UNDERLYING PHENOTYPIC PLASTICITY IN ANURAN LARVAE

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Predation risk shapes life history of amphibian prey through behavioural, morphological, and physiological changes. Such changes are linked to increased corticosterone (CORT), which can lead to a disproportionate increase in tail depth size relative to body size, but currently the neurobiological factors governing morphological plasticity in amphibians remains elusive. Our study used immunofluorescence to quantify protein expression in the tadpole brain to assess the role of the growth inhibiting neuropeptide somatostatin (SOM) on anti-predator responses of leopard frogs (*Lithobates pipiens*), and show that predator cues alter SOM levels in both the stress and growth related brain areas. This finding may be related to higher CORT levels and developmentally early increases in a growth regulating hormone (insulin-like growth factor 1; IGF-1) in tadpole livers. Increased IGF-1 paralleled increased CORT, however, unlike CORT, IGF-1 levels were maintained throughout development. Further, a gradual increase in IGF-1 corresponded with increased tail depth in predator naïve tadpoles. These results suggest that SOM influences threat detection coordinating stress and growth axes to increase whole body CORT and liver IGF-1 levels, thereby accelerating timing of tail depth growth and increasing survival probability.
Platform

CORTICOSTERONE AFFECTS BEHAVIOUR, MORPHOLOGY AND TISSUE REGENERATION RATE IN THE AXOLOTL (*AMBYSTOMA MEXICANUM*)

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Axolotl (*Ambystoma mexica*num) larvae are highly cannibalistic and used extensively as a model of tissue regeneration. Yet, it is unclear how regeneration is affected by the stress hormone corticosterone (CORT), which has been shown to be a key modulator of behavioural, morphological and physiological responses to environmental stressors in amphibians. In a controlled experiment, we found that tail ablation affects behaviour by reducing feeding and locomotion, whereas exogenous CORT exposure increased these behaviours. An interaction between tail condition and CORT was identified with respect to growth rate and head width (larger head width being indicative of cannibalistic morphology). Exogenous CORT was found to have a positive effect on both of these metrics in tail-ablated individuals, but no effect on tail-intact controls. The main response to tail clipping was lower head width and growth

rate, and CORT exposure reduced tail regeneration rate. Our findings provided support for the hypothesis that CORT affects morphological and behavioural responses in axolotls in manner that is similar to anti-predator responses, which are observed in many other larval amphibians. We also provided support that CORT reduces rate of tissue regeneration, as may be expected due to the immunosuppressive effects of CORT. The axolotl regenerative model may provide an opportunity for future study to understand molecular mechanisms governing the effects of stress on amphibian behaviour, growth, and the regenerative process.
Platform

MULTI-SCALE PATTERNS OF HABITAT USE, BEHAVIOUR, AND DISTRIBUTION OF EASTERN MILKSNAKES *(Lampropeltis triangulum)* IN ROUGE NATIONAL URBAN PARK AND THE SURROUNDING AREA.

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The decline of species with specific habitat needs and listing decisions for many specific at risk can be attributed to human caused habitat destruction and fragmentation. The eastern milksnakes historic Canadian range is centered in Ontario's most developed regions, but a lack of demographic and ecological information on the species makes it difficult to assess the impact of perceived threats on the species, or devise effective conservation strategies. We used radio telemetry and large-scale occurrence data, to 1) quantify local-scale habitat use, and movement patterns of milksnakes in a developed region (Rouge National Urban Park [RNUP]), and 2) determine the large-scale landscape characteristics driving the distribution of milksnakes across the Greater Toronto Area (GTA). At the local scale we compared movement rates (home range size, daily movement rates) and habitat utilization to milksnakes in a relatively undisturbed environment to determine the degree to which behaviours are modified in human influenced environments. We predict that individuals in RUNP will have more constrained movements due to their reluctance to cross features such as roads and rail lines. At the landscape scale, we combined existing occurrences with records collected through a regional cover board program and developed Species Distribution Models (SDMs) using three methods; Generalized Liner Models (GLM), Maximum Entropy (MAXENT), and Random Forest (RF). The distribution models consistently suggest that milksnakes are selecting for meadow and forest habitats while avoiding human influenced landscapes such as suburban and agricultural areas. This research provides insight into how human development impacts milksnake populations, and establishes an effective framework for future range-wide distribution modelling. It will ultimately allow for specific recommendations on how to conserve and monitor milksnakes within RUNP and across disturbed regions in Ontario.
Poster

LIFE ON THE NORTHERN EDGE: OVERWINTERING ECOLOGY OF THE WESTERN PAINTED TURTLE IN REGINA, SASKATCHEWAN

Kelsey A. Marchand*[1], Christopher M. Somers[1], Ray G. Poulin[2]

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The ability to find suitable overwintering conditions is a limiting factor of the northern distribution of herpetofauna in Canada. As ectotherms in northern environments, they are faced with harsh climatic conditions and must seek refuge from freezing temperatures for a large majority of their seasonal cycle, unlike their southern conspecifics. In Canada, freshwater turtles are able to buffer these harsh winter elements by seeking refuge in ice-covered waterbodies. However, conditions in these areas can also be harsh and turtles will be subject to low water temperatures and limited access to oxygen. In choosing a suitable location, turtles must fund an area which enables them to prevent freezing and reduce the risk of metabolic acidosis. In this study, we are examining an urban population of western painted turtle near the northern limit of the species range in Regina, Saskatchewan, Canada. Using radio telemetry, we located overwintering sites of 13 individuals. We will be observing site selection on microhabitat and macrohabitat scales to compare chosen overwintering habitat to available overwintering habitat. Variables that will be measured include ice thickness, water depth, water temperature, and dissolved oxygen content of the water. In 2016 we found that the turtles chose to be in areas with lower dissolved oxygen content, warmer water temperatures, and deeper water depths compared to sites available to them throughout the marsh. Our work will continue to provide information on important aspects of overwintering ecology of this species near the northern limit of its range, in a previously unstudied urban habitat.
Poster

URBAN HABITAT SELECTION AND RESOURCE USE OF WESTERN PAINTED TURTLES NEAR THE NORTHERN LIMIT OF THE SPECIES RANGE

Kelsey A. Marchand*[1], Christopher M. Somers[1], Ray G. Poulin[2]

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Reptiles in Saskatchewan live on the edge; the environment is extreme, and the anthropogenic influence on their habitat is extensive. The western painted turtle (*Chrysemys picta bellii*) is one of the most widely distributed subspecies of the painted turtle in North America, reaching the northern limit of its natural range in western Canada. In the western provinces, populations are in decline largely due to habitat fragmentation and road mortality. In Saskatchewan, they are not considered at risk of extinction however, little is known about the ecology or population biology of the species. Over two years, we are conducting a study on turtles living in Regina's Wascana Marsh to begin to understand the habitats and resources required to survive in this urban environment. The primary goals of the project are to determine population size and demography, home range size, habitat use, and resource use of the population throughout the active season. This will be accomplished through a mark-recapture study, radio-telemetry, and stable isotopes analyses. During 2015 we processed 61 turtles (4 juveniles, 38

females, 19 males) and 25 (18 females, 7 males) were outfitted with radio transmitters, one of which a female with a carapace length of 266 mm, the largest on record. We found that overall, females had larger home range sizes across the active season than the males, and both exhibited shifts in habitat preferences. Stable isotope analyses showed a variance in isotopic values between sexes, which will be examined further during summer 2016. Our work will continue to provide information on important aspects of the ecology of western painted turtles in the province of Saskatchewan.
Platform

FIELD TECHNIQUE ADVANCEMENTS ON THE LARGEST STUDY OF SNAKES IN CANADA

Steve Marks

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In 2006, an investigation began into the Endangered Species slated to be potentially impacted by construction of the Rt. Hon. Herb Gray Parkway, an extension of Highway 401 through the City of Windsor, and bumping up against the edges of the Ojibway Prairie Complex. Eastern Fox Snakes and Butler's Garter Snakes are the subject of full field studies which began in 2009, and will continue until 2021, monitoring the populations throughout all phases of the Project: pre-construction exploration, construction mitigation and direct protection, and post-construction monitoring to determine the impacts and successes. To date, more than 5500 captures have been processed. Daily radio telemetry of 20-30 of each species for the last 8 years, will continue for another 5 years. Decades of cumulative experience in fieldwork with snakes, certain recent advances in technology, and successes of this particular project bring certain tweaks of long standing field methodologies that may benefit other researchers. Discussed with photos and videos, these updated methodologies are presented.
Platform

MODELING THE RESPONSE OF TEMPERATURE-DEPENDENT SEX DETERMINATION TO CLIMATE CHANGE IN THE SNAPPING TURTLE*, C. serpentina*

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Many reptiles exhibit temperature-dependent sex determination (TSD), where sex is determined during embryonic development and is influenced by temperature. Species with TSD have been dubbed "canaries in the coal mine" for global warming, as a warming climate has the potential to skew sex ratios by raising nest temperatures, potentially leading to demographic collapse or localised extinction. The ability to predict the effects of climate change on sex ratios is therefore critical in the adaptive management of species with TSD. While many TSD studies have been conducted in labs, they are widely criticized for poorly representing natural conditions. Additionally, few studies have incorporated long-

term monitoring data from wild nests, a critical component for testing model predictions. This study addresses the gap in the literature by examining two decades of wild sex ratio data from the Snapping Turtle, *Chelydra serpentina*. These data were collected during the long-term (1983-1999) monitoring of *C. serpentina* in Algonquin Park, conducted under Dr. Ronald J. Brooks, with additional data from clutches laid in Summer 2016. *C. serpentina* nests from identified females were excavated shortly after they were laid, embryos were weighed and measured, and then subsequently reburied in their original location, occasionally with temperature loggers, in protective enclosures. Nests were later excavated in Fall, and late-term embryos sexed via macroscopic dissection. We explore whether air temperature is a good predictor of sex ratios in the wild, and whether a long-term trend in annual sex ratio production is apparent. In the future, we aim to parametrize a model that predicts how local weather influences natural nests, and to extrapolate how climate change has and will affect sex ratios.
Platform

DO ANTHROPOGENIC FACTORS AFFECT CHRONIC STRESS IN FRESHWATER TURTLES?

Hannah M[C]Curdy-Adams[1]*, Gabriela Mastromonaco[2], Jeff Hathaway[3], Jacqueline Litzgus[1]

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Wildlife near human altered landscapes can experience stress, but animals can adapt to chronic high stress situations such that their stress hormone levels readjust to new baselines. Chronically high stress hormone levels have been associated with decreased fitness in some reptile and amphibian species, but very little research has been completed on stress hormone levels in turtles, a taxon of particular conservation concern. We examined chronic stress hormone levels in Painted Turtles (*Chrysemys picta marginata*), Snapping Turtles (*Chelydra serpentina*), and Blanding's Turtles (*Emydoidea blandi*ngii) in areas with varying densities of anthropogenic structures. Enzyme immunoassays were run on claws sampled from turtles to obtain concentrations of corticosterone (CORT). In general, males of all three species were more likely than females to have above-baseline CORT. Surprisingly, anthropogenic density did not seem to affect CORT levels, although variation in the date turtles were captured and the date enzyme immunoassays were run complicated our interpretations. CORT is not solely a byproduct of stress and more research needs to be done to understand the complex relationships among animals, anthropogenic influences, and stress. Globally, turtles are among the most at risk species and understanding turtle stress physiology can help inform mitigation strategies to improve their fitness.
Platform

FRESHWATER TURTLE NEST PREDATION PATTERNS IN RELATION TO ANTHROPOGENIC DENSITY

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Abundances of animals that predate turtle eggs are higher where anthropogenic sources of food and decreases in populations of top predators allow middle-sized mesopredators to flourish. Many studies have found that the highest predation risk to turtle nests is within the first week after the eggs are laid, but other studies have found that depredation of turtle nests occurs throughout incubation.
We hypothesized that if human presence increases mesopredator abundance, then the frequency of depredation events on turtle nests will be greater and will occur over a longer period of time at field sites closer to anthropogenic structures than at more pristine field sites. We monitored 3 roads in Ontario that connect high road and building density areas (Anthropogenic Density Area, ADA) to low ADA, for 3 species of nesting turtles in June, and determined the rate and pattern of nest depredation throughout incubation. We calculated the percentage of predator interactions with nests that occurred weekly and compared it among turtle species and to an expected predation rate based on published studies. The 3 species of turtles had similar patterns of nest predation that were all significantly different than the expected distribution. Using a non-parametric product-limit survival analysis, we found that the nests of all 3 species had similar probabilities of survival. Predator exclusion cages on nests and higher road densities close to a turtle nest increased nest survival. Relative nest mesopredator abundance indices, calculated from trail camera photos, did not differ among sites with varying ADA, but were highest during the nesting season. Contrary to some nest caging protocols, our data suggest that nest cages should be kept on nests until the turtles hatch and priority should be given to caging nests in low road density areas to help increase population recruitment.
Poster

THREATS FROM THE SKIES: CORVIDS AS SUBSIDIZED PREDATORS OF NESTING TURTLES

Patrick D. Moldowan

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Subsidized predators are animals, native or introduced, whose populations proliferate through association with humans or human-altered landscapes owing to access to food, water, shelter, and/or release from predation pressure. Subsidized predators threaten turtle populations primarily though the predation of nests and secondarily through the maiming or mortality of juvenile and adults. During overland nesting forays, female turtles are particularly vulnerable to predation. The affinity of nesting turtles to disturbed landscapes (e.g., paved and unpaved roads, hydro cuts, railway tracks) increases vulnerability to subsidized predators. Multiple mammal species are recognized as potential subsidized predators (e.g., raccoon, skunk, red fox, coyote); however, corvids, namely the common raven (*Corvus corax*), also pose a considerable predation threat to turtle eggs, young, and adults. In this presentation, case studies of raven predation of nesting turtles (principally from southern and northern Ontario) will be shared. Occupancy data demonstrates a significant increase in raven populations across Ontario and much of eastern Canada. The number of turtle predation events attributable to ravens, the number of

turtles involved in each case, and the broad geographic area over which these predation events have occurred suggests that these incidences are likely more common and widespread than currently recognized. Owing to the bet-hedging life history strategy of turtles, the loss of reproductive females has a disproportionate negative effect on population viability. Corvid predation of reproductive female turtles may represent unsustainable population loss due to overkill by a subsidized predator.
Lightning

MAPPING IMPORTANT AMPHIBIAN HABITAT USING STANDARDIZED VEGETATION SAMPLING

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Vernal pools provide predator free breeding and nursery habitat for forest-dwelling amphibian species such as wood frogs (*Lithobates sylvaticus*) and mole salamanders (*Ambystoma* spp.). Mapping and sampling vernal pools is necessary for monitoring this critical habitat. Currently there is no comprehensive spatial or field data of these important habitats which inhibits their protection and management. Vegetation Sampling Protocol (VSP), a spatial multipurpose monitoring protocol, can be used to map and characterize vernal pools. Adopted by many conservation groups and municipalities in Ontario, VSP uses a fixed area plot determined by a randomly stratified grid imposed on the landscape to inventory vegetation and describe physical features that facilitates predictive modeling in GIS software. The vernal pool module in VSP provides a standardized method for mapping vernal pools as well as monitoring hydrological characteristics long-term since plots are resampled at regular intervals. We used VSP on Ontario Nature Reserves this summer to identify vernal pools and sample associated vegetation. This has enabled us to map vernal pools so we can better understand the availability and connectivity of breeding habitats. Moreover, we can analyze vernal pool data with species distributions from the Ontario Reptile and Amphibian Atlas to investigate spatial and temporal correlations.
Lightning

COMPARISON OF BEHAVIOUR, BODY CONDITION, AND SURVIVORSHIP AMONG COHORTS OF HEADSTARTED WOOD TURTLES (*GLYPTEMYS INSCULPTA*)

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Headstarting is a conservation tool applied to turtles that includes collection of wild eggs, hatching and rearing the hatchlings in captivity until a certain size is reached, and then releasing them back into the wild. By definition, headstarted turtles have a larger body size compared to non-headstarted wild

turtles, which should increase survivorship of headstarted turtles (i.e. "bigger is better" hypothesis). Although headstarting has been used for population augmentation for several turtle species, there are still unanswered questions about the success of the practice. A population of endangered Wood Turtles (*Glyptemys insculpta*) from southwestern Ontario was studied extensively beginning in 1988. By the late 1990s, a suspected poaching event resulted in removal of approximately 70% of the population. A population viability analysis determined that extirpation was inevitable if no intervention was undertaken. A headstarting project was initiated in 2003, with the first release of headstarted turtles in 2005. Our goal is to quantitatively test the assumption of "bigger is better" by comparing three groups of turtles: (1) 15 turtles headstarted for 2 years, (2) 15 turtles headstarted for 1 year, and (3) 15 turtles hatched in captivity then released (i.e. no headstarting). Groups 1 & 2 were released on 24 June 2016, while group 3 was released in August 2016 (near hatch date). We will compare spatial behaviour (home-range size, daily-distance moved), body condition, and survivorship among the three groups. Preliminary results will be presented. Given the growing number of headstarting projects globally, our study will help to determine the optimal amount of time that turtles should be headstarted. Our study is also part of a larger study with multiple partners to quantitatively assess the success of the 11-year headstarting program.

Platform

EVALUATING THE EFFECTIVENESS OF HEADSTARTING FOR WOOD TURTLE (*GLYPTEMYS INSCULPTA*) RECOVERY IN SOUTHWESTERN ONTARIO

Damien I. Mullin[1]*, Rachel C. White[2], Jory L. Mullen[2], and Jacqueline D. Litzgus[1]

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Headstarting is a conservation tool applied to turtles that includes collection of wild eggs, hatching and rearing the hatchlings in captivity for some period of time, and then releasing them back into the wild once they have reached a size that should increase survivorship. A population of endangered Wood Turtles (*Glyptemys insculpta*) from southwestern Ontario was studied extensively beginning in 1988. By the late 1990s, a suspected poaching event resulted in removal of approximately 70% of the population. A population viability analysis determined that extirpation was inevitable if no intervention was undertaken and so a headstarting project was initiated in 2003 and the first cohort was released in 2005. Our goal is to quantitatively assess the effectiveness of the 11-year headstarting project using population modelling tools to compare demographic parameters (e.g. population size and sex ratios, adult survivorship, fecundity) before and after the poaching event. We will also model population growth rates and life stage sensitivities based on different headstarting scenarios to determine the next phase of recovery. To meet our goal, we are conducting mark-recapture surveys and radio telemetry of wild adult turtles (10 males; 10 females), headstarted turtles (10 juveniles from cohorts spanning 2008-2015; 15 two-year-olds; 15 one-year-olds) and non-headstarted hatchlings (15). Adults are being tracked to monitor behaviour (mating, habitat use) and to gather eggs for headstarting. Headstarts are being tracked to monitor growth rates and development to sexual maturity, and to look at the relationship

between body size and survivorship. In 2017, additional effort will be put into egg collection (i.e. tracking more females to find nests) to compare maternal investment into eggs between headstarted and non-headstarted adult females. Preliminary results will be presented. Given the growing number of headstarting projects globally, our study will aid in bettering the practice.
Poster

PREDATOR AVOIDANCE AND DEFENSIVE BEHAVIOUR OF MOLE SALAMANDERS (GENUS: *AMBYSTOMA*) ON PELEE ISLAND

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Many chemically defended animals use defensive posture and/or body size to deter predators from attacking them, however there is uncertainty as to how such traits interact with each other to reduce predator attack rates, including in amphibians. Using a 2 by 2 factorial design, we tested predation risk of mole salamanders (*Ambystoma* spp.) according to their body size and posture by monitoring evidence of predatory attacks using clay models. We deployed 1600 clay models between 4 sites on Pelee Island, ON (March – August 2016) and after 30 days of deployment we documented evidence of attack by various predators, including raccoons (*Procyon lotor*), wild turkey (*Meleagris gallopavo*), and some Passeriformes (e.g. common grackle, red-winged blackbird). Overall we recorded a relatively high monthly predation rate on our models; 44% were attacked, with preliminary analysis suggesting that size, but not posture, deterred predatory attacks, and that size and posture acted independently rather than in synergy to reduce predation risk. In addition, we found that predation risk varied both spatially and temporally, with higher predation rates in late spring/early summer and at one of our sites, where rates were 11% greater than the mean rate. Overall, avian predators had the highest rate of attack with the greatest proportion of attacks made by wild turkey, however cause-specific attack rates varied according to site and attacks by some predators were spatially clustered. We found that more attacks were placed on the tail when models were in the defensive posture, and that the location attacks were placed on models varied depending on treatment and predator. Since predation by wild turkey is suggested as a potential threat to the status of endangered smallmouth salamanders (*A. texanum*) on Pelee Island, our results have implications relevant to conservation efforts.
Platform

AMPHIBIAN SPECIALIST GROUP CANADA (ASG-CANADA) CONSERVATION INITIATIVES

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ASG Canada is a nation-wide regional group associated with the global IUCN Amphibian Specialist Group, focusing on conservation issues pertinent to Canadian amphibians. Through collaborations with relevant national and regional groups, including Canadian Herpetological Society, we aim to address emerging issues in amphibian conservation, provide resources, and fill in key information gaps. Our overall objectives are to 1) Expand our understanding of the causes of amphibian declines in Canada; 2) Continue to document amphibian diversity in Canada, and how it is changing; 3) Clarify protection, management, and habitat restoration needs for Canadian amphibians; 4) Collaborate with existing national and regional organizations and groups focusing on amphibian conservation; and 5) Promote outreach and mentorship initiatives & expertise networking. Examples of specific tasks include providing input on recovery strategies for amphibians at risk posted for comments at the SARA registry, support and facilitate the establishment of regional amphibian atlas projects, and compile resources related to Canadian amphibian declines and conservation. IUCN specialist groups work on 4-year cycles, and a new cycle for 2017 – 2020 will be starting this fall. ASG-Canada is actively recruiting new members interested in joining the group.
Lightning

SWABBING FOR *BATRACHOCHYTRIUM SALAMADRIVORANS* (BSAL) ON WILD AND CAPTIVE SALAMANDERS IN BRITISH COLUMBIA

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Batrachochytrium salamadrivorans is a fungus that causes potentially fatal skin disease in salamanders. Originally from Asia, this disease has spread to Europe, where it has caused mass declines in native salamander populations. While not yet recorded from North America, the concern is that native salamanders could be infected through the release of infected pet salamanders or Bsal-contaminated aquarium water into the environment. This pilot study tests for Bsal on wild and pet traded salamanders, focusing on southern Vancouver Island. The focal native species is the Rough-skinned Newt (*Taricha granulosa*), which has been identified as particularly susceptible to BSal. Thus far, 88 wild newts and 2 salamanders from a Victoria pet store have been swabbed; swabs will be sent for PCR analysis. Additional swabs have been taken through Habitat Acquisition Trust's amphibian roadkill monitoring project. Swabbing protocol was based on the Chytrid Swab Protocol of AmphibiaWeb (Briggs NIH research group, 2009). Our intention is to determine best practices for sampling wild and captive salamanders for early Bsal detection, and to understand potential routes of its introduction through the pet trade. This information could lead to changes in legislation and pet trade practices.
Lightning

DISAPPEARING COMMON SPECIES? THE UPS AND DOWNS OF CITIZEN SCIENCE DATA

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Since 1984, Ontario has had a citizen science based reptile and amphibian atlas. Citizen science data offers advantages – such as covering a wide geographic area with little cost. Atlas data have been used to track trends in distribution with observations gathered from people with a wide variety of expertise, interests and dedication. This data can be used to identify species and areas of potential conservation concern by comparing current known ranges with historical ranges (defined as areas with observations over 20 years old). However, with no standardized method for data collection, how do we know if the data shows a true signal of decline? Here we explore the case of the Queensnake and the American Toad. Using these two examples we will show two extremes of a true decline and a false signal of a decline. Atlas data can be very useful in the conservation of species and often acts as first step in identifying declines. However, we illustrate here the need for either validating these data in a subset on the ground (e.g. Seburn et al. 2016), or develop other methods (e.g. Total Snake Index presented by Paterson at CHS 2015), to accompany trends in atlas data.
Platform

LONG-TERM PLETHODONTID SALAMANDER MONITORING AT THE rare CHARITABLE RESEARCH RESERVE: THE FIRST TEN YEARS

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In 2004, the Ecological Monitoring and Assessment Network (EMAN) and Parks Canada published a joint National Monitoring Protocol for plethodontid salamanders. The goals of this protocol were to work alongside a suite of other standardized protocols to act as an early detection of ecological change and environmental issues. In 2006, rare established this protocol creating a permanent forest monitoring plot in a fragmented old growth forest and later expanding to an additional forested site. Artificial cover objects were placed in each forest and monitoring occurs annually each fall, where cover objects are checked weekly for a nine week period. Initial years of monitoring has resulted in the collection of valuable baseline data regarding salamander populations in these areas that face external land use pressures such as aggregate extraction, agricultural production, and housing developments on neighbouring lands. Abundance, species composition, size class comparisons are all examined annually as well as a suite of environmental parameters. An important part of rare's Mirrored Research program, this protocol has been adopted into educational programming for high school students allowing them to experience monitoring protocols first hand and explore the scientific method from forming hypotheses to collecting and interpreting data.
Platform

OVERWINTERING ECOLOGY OF HEAD-STARTED BLANDING'S TURTLES (*Emydoidea blandingii*) IN A RESTORED WETLAND

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The Blanding's turtle (*Emydoidea blandingii*) is a Threatened species in Ontario, and without mitigation is expected to become extirpated in urban environments, such as the Greater Toronto Area. For three years, the Toronto Zoo's Adopt-A-Pond Wetland Conservation Programme has been supplementing the Blanding's turtle population in Rouge National Urban Park (RNUP) with captive-raised, two-year old juvenile turtles, "head-starts", in conjunction with habitat restoration work. The Rouge River in RNUP has tributaries, which act as movement corridors for a small, local, population of Blanding's turtles. However, the availability of wetland habitat is minimal and mainly composed of restored or artificial wetlands. Environmental variables directly influence the physiological conditions and survival of overwintering turtles. The selection and availability of appropriate overwintering sites can minimize threats to mortality, such as acidosis and tissue freezing. This research project is examining the location and ecology of successful overwintering sites used by head-started Blanding's turtles living in a restored wetland. The relationship between site selection, survival and environmental conditions such as temperature, dissolved oxygen content, vegetation, substrate, and water depth is being evaluated. The results of this research will provide important insight for future wetland restoration design and turtle population supplementing programs around the Great Lakes basin.
Poster

ROAD MORTALITY MITIGATION: THE EFFECTIVENESS OF PLASTIC SOLID FENCE VERSUS MESH FENCE

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It is important to understand the effects of roads on terrestrial and aquatic ecosystems. Most commonly, amphibians, and in some places reptiles, are the animal groups most abundantly killed on roads. Constructing measures like exclusion structures and/or population connectivity structures to reduce fragmentation, these impacts can be reduced. However, many types of exclusion structures exist for this purpose. This study tries to fill the gap in knowledge of the effectiveness of mesh fence versus a solid plastic barrier for road mortality mitigation. I placed snakes, frogs and turtles individually for an hour in a square with two sides composed of mesh fence, jointed together, and two sides composed of solid fence. The behaviour and location of each animal was monitored every minute and Excel was used

to analyse the data and find correlations between the variables. The frog group shows that once they reached the mesh fence they rarely left, which is why their average proportion of time spent in the mesh fence was highest, followed by snakes and then turtles. The snakes and turtles attempted to escape the mesh fence during more than twice as many trials as the solid fence. All the species other than Midland Painted Turtles successfully escaped mesh fence; however none escaped the solid fence. Since individuals are able to see or smell through the mesh fence, they spend more time trying to escape through the holes or climb it. This means that the herpetofauna will not be directed as easily towards the ecopassage with the mesh fence as in the case of a solid barrier. Furthermore, mesh fence can cause collateral damage to some herpetofauna during escape attempts and fence testing. Therefore the solid plastic barrier is recommended over mesh fence for use as a mitigation measure.
Poster

TEMPERATURE AND OXYGEN AVAILABILITY GOVERN THE EVOLUTION OF BODY SIZE IN AMPHIBIANS OF THE WORLD

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When ectotherms are reared under warm conditions, they grow quickly but mature at a smaller body size than under cool temperatures. This pattern has been observed in over 80% of ectothermic species examined to date, and therefore comprises one of the most predictable and widespread patterns of phenotypic plasticity among animals. Given that metabolic rate is high under warm conditions, temperature-induced changes in body size are hypothesized to represent adaptive phenotypic plasticity of ectotherms in response to oxygen availability, where oxygen demand and supply are optimized by reducing body size in warm conditions, and scope for aerobic activity can therefore be maintained. In accordance with this hypothesis, previous work has demonstrated that the effect of temperature on body size is most pronounced among aquatic ectotherms, which is expected because oxygen solubility in water (but not in air) decreases as temperature increases. Here I show that the concept of temperature-dependent oxygen limitation, which was developed largely to explain phenotypic plasticity, can be extended to explain patterns of macroevolution in aquatic amphibians, both for juvenile and adult body size. Drawing from a large database of amphibian life-histories, I use phylogenetically comparative methods to demonstrate that species-mean body size decreases as environmental temperature increases in aquatic amphibians, from the giant Asiatic salamanders to the tiny paedomorphic plethodontids of North America. Interestingly, this macroevolutionary pattern is not restricted to adult size: juvenile body size of aquatic-breeding species declines as environmental temperature increases, and the decline is strongest for species where aquatic larvae cannot rely on aerial respiration before metamorphosis. For terrestrial species, temperature is not related to body size at any life stage. This work provides the first phylogenetically comparative evidence that oxygen limitation is fundamental to patterns of macroevolution among amphibians, and ectotherms more broadly.
Platform

A PROVINCIAL STRATEGY FOR FINDING *EURYCEA*

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Eurycea bislineata (Two-lined Salamander), is one of the cases where Ontario has one species from what is a whole guild of species farther south, and the map of the species occurrence in Ontario is mostly made up of holes between central southern Ontario and isolated records on the Moose River, Manitoulin, Moose Creek, and north of Sudbury. I've contributed a few of the isolated records, but I've also been guilty of not turning Eurycea-ish rocks along a lot of streams, partly because there's no planned protocol for such a search, comparable to the 100-stones protocol for *Acroloxus* limpets. I'll present a strategy for filling those holes or confirming the isolation of the outlying populations, based on my experience and contributions from colleagues in and outside Ontario.
Poster

THE FREQUENCY OF LIVING/ROAD-KILLED TURTLES OBSERVED IN EASTERN ONTARIO SINCE 2007: HOW DO WE MEASURE THE EFFECT OF CONSERVATION?

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In the course of our activities, we try to record every Turtle we see on the roads. In 2007, comparing records of the nesting seasons of May & June in 1991-1999 with 2000-2007, we reported a significant decrease in the proportion of roadkills in these observations (from 54% roadkills (60 DOR 52 AOR), to 32% (30 DOR, 65 AOR, p=0.0014 that these are the same) which we correlated with the erection of Turtle Crossing signs and educational publicity. This result, combined with the increased concern expressed about road-crossing Turtles by many People, led us to suspect that drivers on provincial highways and county & township roads in Eastern Ontario might be actively avoiding collisions with Turtles. From 2008-2016 the May-June figure was 42% DOR (60 DOR, 83 AOR, with 2 WOR, 16.1 Turtles/year) which was intermediate between the ratios for the previous decades, and not significantly different from either of them. We will discuss psychological, social, and biological factors which may bear on this result.
Lightning

HAS THE EASTERN RED-BACKED SALAMANDER (*PLETHODON CINEREUS*) DECLINED IN ONTARIO?

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Amphibians are known to be declining around the world. Although frog declines have received most of the attention, salamanders are also declining. Data from the Ontario Reptile and Amphibian Atlas suggest that woodland salamanders have declined across Ontario. For example, the Eastern Red-backed Salamander (P*lethodon cinereus*) has no recent records (defined as the last 20 years) from over 400 10x10 km grid squares where it was historically reported. To test whether this decline was real or a result of lack of recent observations, we conducted targeted surveys in 25 grid squares with no recent records. The Eastern Red-backed Salamander was detected in 84% of surveyed squares. It made up 90% (183 of 202) of individuals of all six species of salamanders encountered. The median number of cover objects needed to detect a species was 34 (range: 1-145) for Eastern Red-backed Salamanders, 129.5 (range: 34-204) for Blue-spotted Salamanders (*Ambystoma laterale*), and 154 (range: 6-187) for Spotted Salamanders (*Ambystoma maculatum*). Our study suggests that the lack of recent records of the Eastern Red-backed Salamander is not the result of a decline.
Platform

HYDROLOGICAL AND THERMAL DYNAMICS OF MOSS ON ROCK BARRENS: IMPLICATIONS FOR ENDANGERED REPTILE HABITAT

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Climatic limitations and landscape constraints of Ontario's near-north habitat restrict the existence of several reptile species such as the COSEWIC designated threatened Blanding's Turtle (*Emydoidea blandingii*) and Massasauga Rattlesnake (*Sistrurus catenatus*). In the eastern Georgian Bay region, these at-risk reptiles select moss dominated habitats for critical life stages, including hibernation, gestation, and nesting because moss provides moisture and temperature conditions conducive to the thermoregulatory needs of these reptiles. However, the moss habitats that often develop in Canadian Shield rock barren depressions are sensitive to land-use change (*e.g.* road construction, urbanization) and climate-mediated disturbances (*e.g.* drought, flooding). As such, the landscape constraints for these reptiles are likely to worsen as habitat structure and function are directly and indirectly impacted by the effects of climate change and development. Using previous reptile radio-telemetry studies and an understanding of representative habitat, we examined the hydrological and thermal dynamics of critical habitat areas in rock barrens along eastern Georgian Bay. We characterized the distribution, vegetative composition, and depth of the organic matter at 20 sites to provide valuable information on specific habitat features which may dictate habitat suitability for reptile use. These surveys complemented measurements of site-specific micrometerological conditions, canopy openness, water table position, as well as subsurface temperature and moisture dynamics. By studying the habitat that occupies bedrock

depressions on a variety of scales, from small vernal pools to large bogs, we can gain an integrative understanding of the factors which control the resilience (and vulnerability) of these network systems. The long-term aim of our research is to develop moss habitat conservation and adaptation strategies along eastern Georgian Bay to ensure the sustained existence of these reptile Species at Risk in an era of climate change and persistent anthropogenic land development.
Poster

A COMPARISON OF HABITAT SPECIALIST BUTLER'S GARTERSNAKE (*Thamnophis butleri*) AND GENERALIST EASTERN GARTERSNAKE (*Thamnophis sirtalis*) ACROSS THE FRAGMENTED LANDSCAPE OF SOUTHWESTERN ONTARIO

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Most ecosystems are impacted by the pervasive effects of human activity. Development has been linked with biodiversity loss worldwide through the fragmentation and loss of native habitats, resulting in reduced genetic diversity and small population sizes, and ultimately threatening species persistence. Understanding and mitigating these effects are important themes in conservation biology. However, not all species react equally to the same anthropogenic forces. Our study assesses how the Endangered Butler's Gartersnake (*Thamnophis butleri*), a marsh/prairie habitat specialist, differs from the generalist Eastern Gartersnake (*T. sirtalis*) across the Canadian range of *T. butleri*, southwestern Ontario, where much of the available land has been converted to agriculture. We obtained DNA samples of 233 *T. butleri* and 162 *T. sirtalis* from throughout that area as well as from adjacent Michigan populations, which we genotyped for 14 DNA microsatellite loci. Bayesian clustering analysis revealed that *T. butleri* are divided into genetically distinct populations, implying geographical isolation and reduced gene flow. Conversely, *T. sirtalis* show little structure over the same area. We propose that, as a specialist species *T. butleri* is more susceptible to the effects of fragmentation than is *T. sirtalis*. We will augment these findings by undertaking basic landscape analysis of the areas sampled, with the ultimate goal of discerning how current landscape features shape population connectivity and dispersal. The differences in genetic structure between the species provide insights into how divergent life histories shape genetic diversity and distributions, and can inform conservation efforts for habitat specialists like Butler's Gartersnake.
Platform

CITIZEN SCIENCE ENGAGEMENT AND TECHNOLOGY

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Citizen science programs aim to engage the public and obtain data that otherwise goes unreported. The Ontario Reptile and Amphibian Atlas (ORAA), managed by Ontario Naturesince 2009, focuses on herpetofaunal data collection in Ontario. Globally, reptiles and amphibians are showing steep declines, therefore information on species distribution is invaluable when determining where conservation efforts should be directed. The implementation of technological advances have increased public usership of the atlas, and provided up to date information regarding the distribution of herpetofauna. The launch of the mobile application and online form in 2012 simplified the submissionprocess and led to increased public engagement. To date, the online form and application are the most popular options for records submitted by the public. This preference by current and new contributors was learnt from surveys conducted at outreach events. Live-updating dynamic maps have been produced, delineating the distribution of each species across the province in real time. Future efforts will be focused on updating our mobile application and creating static maps on a regular basis to be used in publications and reports.
Lightning

USING MOVEMENT PATTERNS OF HEADSTART BLANDING'S TURTLES (*EMYDOIDEA BLANDINGII*) TO EVALUATE RELEASE TYPES

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Headstarting can be used as a conservation tool for the recovery of imperiled freshwater turtle populations. However, headstarting is still generally considered to be an experimental recovery method. As such, husbandry and release practices vary amongst conservation programs. One highly debated discrepancy in headstart initiatives is the release method. A soft release is considered to be beneficial to released animals, as it provides an opportunity for acclimation in a novel environment. However, a hard release is more cost-effective for conservation programs and may not be as detrimental to animal success as previously thought. In this study, both release types were scrutinized for any effects on animal movement patterns and home range establishment. Twenty-four juvenile Blanding's turtles (Emydoidea blandingii) were released into an urban wetland complex. Half were released using a hard-release method while the other half was soft-released. Turtles were located using radiotelemetry three times a week over the course of the summer. Home ranges were projected using minimum convex polygons and kernel density estimates. Hard-release turtles moved farther distances, had larger home range sizes, and had fewer recurring locations than soft-release turtles. Altogether, this shows that turtles that are hard-released perform more exploratory behavior upon translocation into a novel environment, whereas soft-released turtles favour exploiting nearby resources. In landscapes that are of low-quality habitat, a hard release should be favoured to allow for turtles to explore and gather crucial information about suitable resource patches. However, in areas where the risk of mortality is high, a soft release is more appropriate, as it reduces risky movement. The results show that choosing the correct release type for the context can help improve headstart success.
Platform

MEASURING THE DETECTION PROBABILITY OF MASSASAUGAS AND EASTERN FOXSNAKES USING STANDARD SURVEY PROTOCOLS FOR ONTARIO

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The Ontario Ministry of Natural Resources has drafted a standardized provincial protocol that describes the recommended method to conduct presence-absence surveys for snakes in Ontario. This protocol targets consultants and conservation professionals trying to determine whether a particular snake species is present or be reasonably confident it is absent (typically to the 95% threshold). Estimating the amount of search effort required to be confident a species is absent relies heavily on the detection probability of the target species using the chosen survey method. There is a paucity of data to demonstrate the detection probability of the new standardized method. Blazing Star Environmental has completed the first year of a two-year study to measure the range wide detection probability of eastern foxsnakes and massasaugas using the provincial protocol. This presentation will describe site selection, survey methods and cofactors. Of particular interest is the measurement of the experience level of the observer. This project will generate recommendations to determine the minimum experience required to conduct presence-absence surveys for SAR snakes. Preliminary estimates of detection probability and lessons learned from the first field season will also be presented.
Lightning

WHAT SHAPES THE AMPHIBIAN SKIN MICROBIOME? FROM METABOLOME TO MICROBIOME

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The amphibian skin microbiome has been suggested to form an integral part of the amphibian immune system. Specific bacterial taxa on the amphibian skin may be able to deter fungal diseases such as chytridiomycosis. However, the complex microbial communities of the skin of amphibians are poorly understood and critical questions remain unanswered. Are the factors shaping the amphibian skin microbiome host-associated (i.e. phylogenetic signal, ecology and metabolome of the host) or are they site-specific (i.e. biotic and abiotic)? We sampled skin microbiomes from over 350 frogs of 7 species within the Family Dendrobatidae, ranging from highly toxic (*Phyllobates lugubris*) and moderately toxic (*Dendrobates auratus*) species to presumably non-toxic species (*Allobates talamancae*), from seven sites in Bocas del Toro, Panama. After extracting DNA from swabs, we amplified the 515F and 806R regions of 16S rRNA, and sequenced bacterial communities using an Illumina MiSeq platform. This is the first study

focusing on phylogenetically close species within the chemically complex dendrobatid frogs. Our comprehensive sampling will enable us to start to understand evolutionary patterns of the amphibian skin microbiome and its interactions with pathogens such as chytrid fungi.
Platform

HORMONAL INDUCTION OF SPAWNING AND ITS APPLICATIONS TO AMPHIBIAN CONSERVATION

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The recent decline and disappearance of many amphibians around the world is thought to be a sign of an impending sixth mass extinction that is driven by disease, habitat loss and pollution. Reproductive technologies are now necessary to establish captive colonies followed by reintroduction into suitable habitats. AMPHIPLEX is a hormone mixture created in the Trudeau lab that has successfully stimulated spawning in several amphibians. However, its extensive application requires further experimentation regarding the basic neuroendocrine control of reproduction in amphibians. The hypothalamus is a part of the brain that releases neuropeptides and neurotransmitters to control the pituitary gland. Across vertebrates, the peptide gonadotropin-releasing hormone is a principal stimulator of pituitary luteinizing hormone and follicle-stimulating hormone synthesis and secretion that is required for sperm release and ovulation. The role of the catecholamine neurotransmitter dopamine in this regulatory pathway was investigated. Extensive evidence in teleosts reveals a potent inhibitory role of dopamine on luteinizing hormone release. Preliminary studies suggest that this may be a conserved action in amphibians. Gonadotropin-releasing hormone agonist and dopamine antagonist were administered alone and in combination at various doses in two distantly-related frog species: the Northern leopard frog (*Lithobates pipiens*) and the Western clawed frog (*Silurana tropicalis*). Time- and dose-response analysis of these treatments on pituitary luteinizing hormone, follicle-stimulating hormone and gonadotropin-releasing hormone receptor gene expression were performed. Such molecular mechanisms were linked to spawning output including amplexus, ovulation and fertilization rate. This fundamental framework will have potential for the recovery of amphibians to meet conservation goals.
Platform

THE ROYAL TREATMENT: USING A COLLABORATIVE FRAMEWORK TO ADDRESS KNOWLEDGE GAPS FOR THE ENDANGERED QUEENSNAKE (*REGINA SEPTEMVITTATA)*

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Collaborations using a standardized methodology allows for the most informed conservation plans. The endangered Queensnake, *Regina septemvittata*, is a cryptic species whose Canadian range is limited to seven isolated populations west of the Niagara Escarpment in southern Ontario. Very little is known about Queensnakes throughout their range. In past years, population-specific studies have attempted to fill many knowledge gaps that exist for this species including habitat, population size, threats, and detection rates. In 2015, several conservation agencies began working together to study Queensnakes across their Ontario range. Through this project, most of the recovery actions identified in the Ontario government response statement will be addressed. The goal is to collect high quality data, using a standardized methodology, that would lead to a better understanding of Queensnake habitat requirements, prey interactions, effective population, and gene flow between the populations. Standardized survey methods were first developed for the Maitland River population in 2013. These methods were then refined and adapted to suit Queensnake surveys in different habitats in their range. Field teams collect Queensnake observations (range), genetic samples (effective population and gene flow between populations), and conduct crayfish (prey) and habitat surveys. Queensnake distribution (occupancy) will be estimated. Further, by using standardized methods we will describe detection probability for this species across its range, something that has not been well documented in any Ontario snake species. This method has been drawn upon for studying other snakes in Ontario. Preliminary results from the 2015 Queensnake field season will be presented. The collaborative framework used by the non-government agencies, conservation authorities, academics, consulting companies, and government scientists involved in this project enables a significant province-wide effort that could not be achieved by any group in isolation, ultimately leading to better conservation of this endangered species.

Platform

PLUNGING PANTHEROPHIS: DIVING BEHAVIOUR IN EASTERN FOXSNAKE (*Pantherophis vulpinus*)

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Eastern foxsnakes (*Pantherophis vulpinus*) use both terrestrial and aquatic habitats, and are frequently observed swimming. However, they have not been previously reported diving underwater. During a radio-telemetry study of Eastern Foxsnakes at Rondeau Provincial Park, we observed a male Eastern Foxsnake remaining submerged for > 20 minutes on two separate occasions. The observations occurred on May 9 and 10, 2016. The snake moved approximately 40m from one day to the next. On both days

we located it approximately 22 m from the shore in a *Typha* marsh. The snake was coiled at the bottom of a clump of vegetation beneath about 0.5 m of water, and did not emerge on its own. When we picked it up, it acted normally and appeared healthy. Based on its implanted, temperature-sensitive transmitter, its body temperature on April 9th was 16.5˚C, and although we could not record the ambient air temperature, the air was cooler than the water. Our observation suggests that foxsnakes are capable of diving behaviour and prolonged submergence, and we hypothesize that they may use this strategy for thermoregulation. Impacts on cryptic, submerged foxsnakes should be considered when planning recreational or construction activities in coastal marshes.
Poster

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eDNA AS A NOVEL TOOL FOR DETERMINING AMPHIBIAN SPECIES COMPOSITION

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Obtaining long term amphibian distribution and population trend information is critical for understanding and responding to the global amphibian decline. However, there remains a substantial gap in long term trend information for amphibian populations around the world, and the majority of data is either anecdotal or from short-term monitoring studies. In addition to limited funding and piecemeal efforts to collect amphibian population trend data, limitations of traditional monitoring methods are also problematic. Many monitoring techniques only target specific life stages or orders of amphibians, and collecting information about cryptic, rare, or at-risk species remains challenging. New, more effective methods of amphibian monitoring may play a pivotal role in the collection of amphibian distribution and population trend data. eDNA (environmental DNA) is a new tool for monitoring aquatic species that uses molecular techniques to detect sloughed genetic material in water bodies. To date, eDNA has not been developed for use in monitoring amphibians in Canada. This study uses eDNA methodology to determine amphibian species composition at 30 sites throughout central Ontario. Results of amphibian species composition determined from eDNA will be compared to our results involving traditional monitoring techniques including dipnet, breeding call, and visual encounter surveys in the same areas. Results from this work will inform on the utility of eDNA in monitoring amphibians in Ontario and beyond, and help establish protocols for robust assessment of amphibian site occupancy and population trends.
Poster

FORCED HIBERNATION: A TECHNIQUE TO ENSURE OVERWINTER SURVIVAL OF TEMPERATE NEONATAL SNAKES

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Temperate snakes spend more than half their life underground to cope with suboptimal surface temperatures. However, little is known about the thermal and physical parameters of the underground space during successful overwintering events. We hypothesized that overwinter survival in temperate snakes is only possible if the vertical space they occupy is aerobic, frost and flood-free. This space we define as the "Life Zone". To test this hypothesis, we referred to 15 years of life zone thermal and hydrological data collected from a known hibernation area within a peatland, to design, build and deploy artificial burrows for controlled snake hibernation. The Eastern gartersnake (*Thamnophis s. sirtalis*) was chosen as the model organism. In the fall of 2014 and 2015, gartersnakes were collected from the peatland (N2014=11, N2015=10), and placed into artificial burrows. The burrows were installed vertically into the ground near areas of known snake hibernacula, and removed the following spring (~182 days). I-Button© temperature dataloggers were used to monitor thermal profiles within the burrows and, frost and ground water levels were measured weekly . Results showed 91% survival in 2014, and 100% survival in 2015. Evidence suggests the single mortality in 2014 was by predation. Although the amount of Life Zone physical space changed, the burrow did not freeze to the bottom or flood to the surface. This test supports the Life Zone hypothesis that snakes survive within a vertical space that does not freeze or flood completely, although the amount of available space may change. Forced hibernation into the Life zone is a useful method to test habitat suitability for overwinter survival of temperate snakes.

Platform

LARVAL DENSITY-DEPENDENT EFFECTS ON PERFORMANCE IN JUVENILE FOWLER'S TOADS

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Carry-over effects occur when an animal's early life experience has lasting long term effects. These effects may become apparent in parameters such as the animal's behavior, body condition or performance. It is understood that high density conditions impair growth rate and survival of individuals, and it has been well documented in amphibians. Since pond-breeding amphibians have bi-phasic life histories, where the larvae are naturally exposed to high densities, we can determine if carry-over effects are present by examining the effect larval density has on juvenile performance. Fowler's toad (*Anaxyrus fowleri*) tadpoles were raised in a range of eight density levels during the summer of 2014, in floating pens of various sizes within semi-artificial ponds in Long Point, Ontario. Following metamorphosis, individual toadlets raised as larvae at varying density levels, were used in locomotor performance tests before being released to the terrestrial habitat. The performance test involved gently prodding individuals up to 60 times on the urostyle to instigate movement, or a "jumping segment". The tests were filmed and jumping segments were measured for each toadlet using imageJ. We calculated a

performance index, using the slope of the jump number versus distance regression line, where negative slopes indicated a lower performance level. Our results indicated that toadlet body length, more than density predicted toadlet locomotor performance level. This suggests that larval density causes carry-over effects in juvenile performance indirectly, by directly affecting body size. Further examination is needed, to determine the extent carry-over effects change performance and behavior in later life stages of animals with complex life histories.

Platform