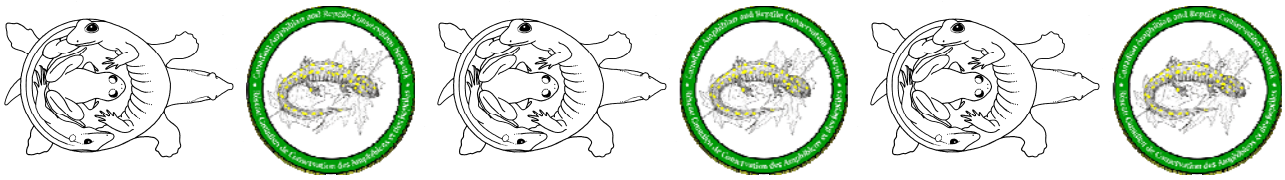
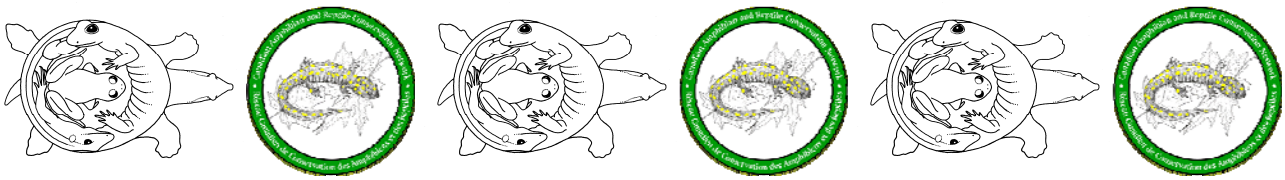
THE CANADIAN HERPETOLOGIST/ L'HERPÉTOLOGISTE CANADIEN

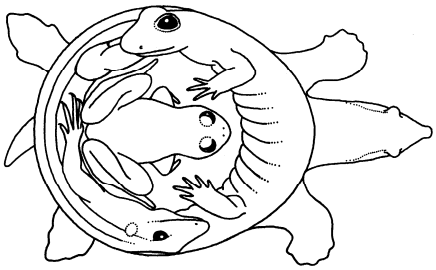
A joint publication of
The Canadian Association of Herpetologists/Association Canadienne des Herpétologistes (ISSN 0847-1118)
and
The Canadian Amphibian and Reptile Conservation Network/Réseau Canadien de Conservation des Amphibiens et des Reptiles (ISSN 1206-7814)



Volume 2, Number 2 – Fall 2012

Table of Contents

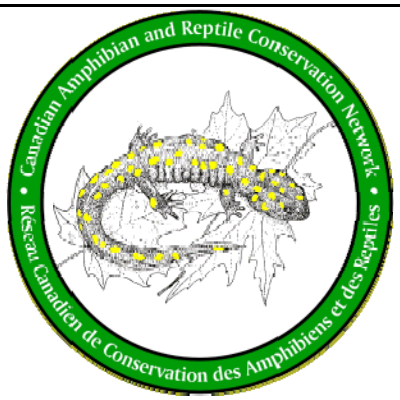




Canadian Association of Herpetologists/ Association Canadienne des Herpétologistes

THE CANADIAN HERPETOLOGIST (TCH) is a publication produced twice each year by the Canadian Association of Herpetologists and the Canadian Amphibian and Reptile Conservation Network. Correspondence should be addressed to the Editors (Litzgus (CAH) and Ashpole (CARCNET)).
Opinions expressed by authors contributing to The Canadian Herpetologist are not necessarily shared by the publication, its editors, or the two societies.

L'HERPÉTOLOGISTE CANADIEN (LHC) est une publication biannuelle publiée par l'Association Canadienne des Herpétologistes et le Réseau Canadien de Conservation des Amphibiens et des Reptiles. Faites parvenir votre correspondance aux Éditeurs (Litzgus (ACH) et Ashpole (RÉCCAR)).
Les opinions exprimées par les auteurs qui collaborent au L'Herpétologiste Canadien ne sont pas nécessairement partagées par la publication, ses éditeurs, ou les deux sociétés.



Amphibian and Reptile Conservation Network/ Réseau Canadien de Conservation des Amphibiens et des Reptiles

Instructions for Authors

We will print articles and news of interest to herpetologists in Canada. These may be in the form of short announcements or letters, or may be written as longer articles. We especially request news of your lab and current research activities, lists of your latest publications (up to one year old), travel plans, new students, grants, awards, fellowships, new books or book reviews, trivia or concerns. Please send your submissions as MS Word documents as email attachments to the Editor (Litzgus or Ashpole).

EDITORIAL NOTES

Sara Ashpole
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It is already fall, but I am still buzzing from the World Congress this past August. Pat Gregory and David Green organized a very successful and memorable conference – the most ever attended with 1675 registered participants representing 48 counties. The talks and posters were outstanding and I appreciated hearing about research from far reaching places. Some of the highlights for myself include Richard Wassersug and Jim Bogart's recognition for their contributions to Herpetology; watching Jose Lefebvre auction off Joe Crowley's Blanding turtle blanket for $175. A great line was when the Elasmobrach Plenary speaker Lara Ferry said only snake people up shark researchers for the most wicked tattoos – meanwhile flashing a few extreme photos that none of us would think unusual.

We are very excited to announce that our **2013 joint CARCNET and CAH conference will be held next fall in Sherbrooke, Quebec.** If you are interested in volunteering with the preparations, including French translation of our website and supporting materials, you can email info@carcnet.ca. I would like to continue to encourage our student members to apply for bursaries and scholarships. This year, every CARCNET student who applied received funds to assist with travel to the World Congress. CARCNET scholarship applications for research or outstanding volunteer contributions to the study and conservation of Amphibians or Reptiles are due 1 Dec. 2012.

Finally, it is wonderful to see CARCNET collaborating with CAH more and I have enjoyed being co-editor with Jackie and previously the editor of the CARCNET Boreal Dipnet. However, there is time for change and this will be my last edition as co-editor. Thank you to all the contributors over the years!

Note from the CARCNET chair

by Steve Mockford
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I am pleased to have been afforded the opportunity to assume the position of Chair of CARCNET, and with it the opportunity to participate in directing a vital organization that has an important role to play in the conservation of our amphibians and reptiles. I would like to thank David Green who stepped in and served as the acting chair. While there he took the opportunity to rewrite CARCNET's Governing Documents and guide their approval by both the board and the membership. This has had a significant impact on the organization in several ways. First it establishes a greater role for the membership in both the election of board members and in participating in the operation of CARCNET through greater participation in committees. Second, it establishes a Vice-Chair who will be the next Chair, a Chair, and a Past Chair; this provides CARCNET with a clear line of succession. This might all sound a little dry for an introductory message, but these changes are important as they should make CARCNET a more vital and responsive organization – thanks David.

Steve Mockford, Chair
CARCNET

So, don't be surprised if you are approached to participate in a CARCNET committee. In fact, if there is a committee that you feel you could contribute to, feel free to contact me, or the committee chair. The Important Amphibian And Reptile Areas (IMPARA) program is being revitalized; so expect to see more areas recognized in the near future. Anyone can nominate an area for recognition, so if you know of an area that is deserving of recognition (and who doesn't), visit the CARNET webpage and download the nomination document.

The Annual General Meeting took place at the World Congress of Herpetology in Vancouver, BC. The conference was a great opportunity and CARCNET was well represented. At that meeting three new board members were elected and, while their terms do not officially start until the New Year, I would like to welcome Scott Gillingwater, (Upper Thames River Conservation Authority, ON), Yohann Dubois (Ministère des Ressources naturelles et de la Faune, QC), and Jackie Litzgus (Laurentian University, Sudbury, ON) to the board. Scott will become the new Vice-Chair.

With David and the board having put the organization on a new footing, I couldn't have asked for a better time to take over as Chair. I look forward to working with all of you.

MEETINGS

TCH will post announcements about upcoming herpetological meetings and provide reports of recently-held meetings.

WORLD CONGRESS OF HERPETOLOGY VANCOUVER, BC

#WCH2012: Apocalypse is the New Ecological Normal

by Leslie Anthony
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If you read my 2008 book*, Snakebit: Confessions of a Herpetologist* you'll know I poke fun at this motley sect, but also hold them in great esteem. After all, they're up against a lot. At that point, our heroes were a decade into the fight against *Batrachochytrium dendrobatidis* (chytrid fungus), the microscopic meteor plowing through the world's 6,000-plus amphibian species and leaving a trail of extinctions. They were battling big invasive species fires—global incursions of the Cane Toad and Bullfrog, overrunning (ha ha) of Guam by the Asian Brown Treesnake, and an emergent population of Burmese Pythons in Florida's Everglades that seemed more novelty than threat. Debate also lingered over disfigured frogs that had become increasingly common in agricultural ponds in the mid-nineties; something was happening at a critical stage in development. Disease? A toxin? It would be uncovered that parasites—larvae of a common liver fluke—could cause the observed polymelia and polydactyly by burrowing into tadpoles while their limbs were forming. But the *reason* parasites were so prevalent, and the amphibians so susceptible, was exposure to chemicals: fertilizer in the former, immunity-destroying pesticides in the latter—both exacerbated by increasing water temperatures tied to a warming climate.

To catch up on the latest swell research into all this fun, I attended the 7th World Congress of Herpetology in Vancouver. Though admirably executed by esteemed snake-wrangler, Pat Gregory, the almost 2,000 participants seemed uncharacteristically subdued, their usual posturing replaced by palpable gloom. Funding issues loomed large but there was more. Symposia titles were dominated by the Four Horsemen of the Apocalypse: war (invasion, eradication, translocation, reintroduction), famine (collapsing food webs), disease (chytrid, ranavirus, chelonian herpesvirus etc.), and death (species and populations disappearing at a rate explicable only by the previous factors + climate change, which was *everywhere*). Thus the scary phrase voiced outside every session: The New Normal. No longer hoping to fix things, many seemed resigned to simply coping with the disaster upon us—and learning enough to deal with the coming ecological collapse.

Cavalier chemical practices of big agriculture are responsible for "colony collapse syndrome" in honeybees and a precipitous decline in butterflies, but it now also appears that aerosolized, hormone-disrupting pesticides from California's Central Valley—which grows 50 per cent of America's food—are carried to high-altitude areas that have seen massive frog die-offs. This montane paradigm also holds in Central and South America, areas of the worst chytrid disasters. Research has found that the fungus has long co-existed with amphibians, but new strains are emerging and/or being moved around with invasive species to confront already immune-compromised animals. The unstoppable chytrid epidemic, like the deformities, has more than one cause.

Another take-home was that both aquatic and terrestrial ecosystems are on the edge globally, and though studying proximal causes and celebrating local conservation victories are fine, there's an elephant in the room: *every* study points back to loss or degradation of habitat. It's simple: animals dwelling in non-optimal conditions are already ecologically and genetically stressed; add a litany of toxic chemicals, a rapidly changing climate, and a host of competing invasive species and you have a formula for emerging disease, collapsing food webs, population crashes, and extinctions.

If I write *Snakebit, Too* someday, I hope it isn't a eulogy.

The recipient of the CAH's Rankin Distinguished Herpetologist Award for 2012 was Dr. Richard Wassersug.

By Jacqueline Litzgus
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The award is presented by the Canadian Association of Herpetologists/Association Canadienne des Herpétologistes in recognition of outstanding service to the advancement of herpetology in Canada. The award

Richard Wassersug,
Distinguished Herpetologist
Photo provided by UBC

is named in honour of the late Michael Rankin. Richard received a B.A. in Geology and Biology from Tufts University in 1967 and a Ph.D. from University of Chicago in 1973. The majority of his scientific career has been spent studying the functional morphology and behaviour of anuran larvae, and he has dedicated himself to science communication. Richard's more recent work focuses on prostate cancer and the psychology of androgen deprivation. Richard spent most of his career at Dalhousie University in the Department of Anatomy and Neurobiology, arriving there in 1981. Now in semi-retirement, he holds a Visiting Professor position in the Department of Urologic Sciences at the University of British Columbia. Richard was presented with the Rankin Award by CAH President Pat Gregory at the World Congress of Herpetology in Vancouver in August 2012. Congratulations Richard!

CARCNET Blue Racer Award 2012

By David Green
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The CARCNET **Blue Racer Award** is presented to an individual in recognition of cumulative contributions to research and conservation of amphibians and reptiles Canada. The award for 2012 was presented to **Dr. Jim Bogart**, University of Guelph, during the WCH7 plenary by David Green. Jim has devoted his career to understanding the evolution and diversity of amphibians and, in the process, became a highly respected and internationally recognized expert in amphibian genetics and president of the Herpetologists' League. His primary contribution to science is his monumental work unraveling the genetic and reproductive peculiarities of the diploid-polyploid complex of hybridogenic and unisexual salamanders related to *Ambystoma jeffersonianum* and *A. laterale*. These salamanders have a unique genetic system. Each individual carries the genomes of more than one bisexual species of *Ambystoma*. But, as Jim figured out, they are not hybrids. They have a nuclear genomic constitution consisting of at least one genome like that of *Ambystoma laterale* (L) and up to four other genomes from *A. laterale* and any of four other species. They are, effectively, sexual parasites, and require the sperm of diploid males of related, co-occurring bisexual species of *Ambystoma* in order to reproduce. This reliance exposes them to a unique threat since several of their sexual host populations are considered endangered or in decline. Unisexual *Ambystoma* usually outnumber their sexual host species. However, since they cannot reproduce, and therefore cannot survive as a population, without the presence of diploid males of their sexual hosts, the loss of the diploids means eventual doom for the unisexual population.

Jim Bogart, Blue Racer Recipient, Hilton Falls
Photo by Jo Ellen Bogart

Early in his career, Jim, like most scientists at the time, was not fully aware of the vulnerabilities of amphibian populations and their decline. But he quickly realized that to study these animals was not enough – they had to be protected, too. Consequently, Jim devoted a great deal of his time towards conservation issues, mainly directed towards the salamanders he has studied so intently for so long. He is Chair of the Jefferson Salamander Recovery Team and he has worked with local organizations such as the Ontario Vernal Pool Association and the Friends of the Cawthra Bush to make people aware of salamanders and their importance. He has worked internationally with his former graduate student, Barbara Zimmerman, to establish a scientific

research station with the Kayapo Indians of Brazil in aid of the study and conservation of rainforest amphibians in their territory.

Through his graduate program and undergraduate teaching in Herpetology at the University of Guelph, Jim trained a generation of Canadian herpetologists, and former students of Jim's who have gone on to contribute service in aid of conservation of amphibians include Barbara Zimmerman, Les Lowcock, Barb Mable, Jim Austin, Karine Beriault and David Green. Now that he has retired as a professor, Jim has agreed to take on the job of co-chair of the COSEWIC Amphibians and Reptiles Subcommittee. Jim's lifetime of devotion to amphibians makes him a worthy recipient of the Blue Racer Award.

CARCNET Silver Salamander Award 2012

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The CARCNET **Silver Salamander Award** is presented to an individual or an organization in recognition of a specific contribution to the conservation of amphibians and reptiles in Canada. The award for 2012 was presented to Purnima Govindarajulu in recognition of the **BC Western Painted Turtle Working Group** by Sara Ashpole during the CARCNET AGM.

Western Painted Turtle
Photo by Purnima Govindarajulu

The Western Painted Turtle is a species of conservation concern in British Columbia and there are a number of efforts under way to conserve the species, decrease threats and restore and enhance habitats. The British Columbia Western Painted Turtle Working Group formed in 2009 as a way to share knowledge and resources, standardize survey and monitoring methodology, test and improve habitat restoration methods, collaborate on research, share public education and outreach materials, and collaborate on grant writing and fund raising proposals. Members come from diverse organizations including government agencies, non-government environmental groups, stewardship organizations, and academia. The group meets once or twice a year to coordinate projects/initiatives and sometimes hold training workshops. The group also serves as a source of expertise and rapid response if there are threats or issues concerning Western Painted Turtles in B.C. Looking forward, the group is hoping to host the first Western Painted Turtle survey blitz in B.C. on World Turtle Day, 23 May 2013.

CARCNET Student Awards

By Joe Crowley
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Since this year's CARCNET meeting took place at the World Congress of Herpetology, there was a CARCNET student award session for students to present their research on topics relevant to Canadian amphibian and reptile conservation and compete for the CARCNET Best Student Platform Presentation Award. Eligible posters were also judged for the CARCNET Best Student Poster Award. This year's CARCNET posters and presentations were excellent and covered a range of issues related to Canadian amphibian and reptile conservation, including landscape genetics, community ecology, threat assessment and research into specific management strategies for species at risk. Presentations and posters were scored against a number of criteria including scientific design, clarity, content, relevance to conservation and presenter performance or layout.

We would like to congratulate Christina Davy, PhD candidate at the Royal Ontario Museum, for being this year's winner of the CARCNET Best Student Platform Presentation Award. Her talk about landscape genetics of Spotted Turtle populations in Ontario provided a glimpse into the past, present and future of this species in Ontario and it was delivered exceptionally well (clear, concise and with lots of enthusiasm). This year's CARCNET Best Student Poster Award went to James Baxter-Gilbert, MSc candidate at Laurentian University,

for his informative and interesting poster on road ecology and the effects of a major highway (and the proposed mitigation) on several reptile species at risk in Ontario. Congratulations James! Both Christina and James received an award of $250. The detailed abstracts for Christina's presentation and James' poster can be read below. We would like to thank everyone who participated in the presentation and poster sessions and look forward to another great meeting next year.

James Baxter-Gilbert, CARCNET Poster Award
Photo by Jolene Laverty

Poster Presentation

James Baxter-Gilbert. On The Road Again: Measuring the Effectiveness of Mitigation Structures for Reducing Reptile Road Mortality.
(Supervisors: David Lesbarrères and Jacqueline D. Litzgus, Laurentian University, Sudbury, ON)

Many reptile populations are negatively impacted by roads, especially because seasonal migratory movements increase individual encounters with traffic. The Highway 69/400 corridor, connecting southern and northern Ontario, runs along the eastern Georgian Bay Coast, one of Canada's richest areas of reptile biodiversity. A section of new 4-lane highway has been designed to include mitigation structures (*e.g.*, eco-passages, fences) intended to lessen the detrimental effects this major roadway poses to numerous Species-at-Risk (SAR) reptiles. Using a Before-After-Control-Impact-Paired (BACIP) study design, we will quantify reptile road mortality present on the existing, non-mitigated 2-lane highway (in spring and summer 2012) and compare it to mortality on the new, mitigated 4-lane highway (in spring and summer 2013). In both years of the study, a control site without any mitigation measures will also be monitored. If the exclusion structures (*e.g.*, fences) of the new highway are effective, animals should be prevented from accessing the road and we should therefore observe a reduction in road mortality. Radio telemetry, automated PIT tag readers, and wildlife cameras will be used to monitor reptile movements around and under the road via population connectivity structures (*e.g.*, eco-passages). Additionally, a "willingness to utilize" experiment will be conducted, which will assess turtle behaviour in response to the eco-passage. If the population connectivity measures are effective, movements between habitats on either side of road, and use of the eco-passages are expected. Conclusions drawn from our study will allow development of recommendations for future road mitigation structures to reduce road mortality, and counteract the decline of reptile biodiversity.

Platform Presentation

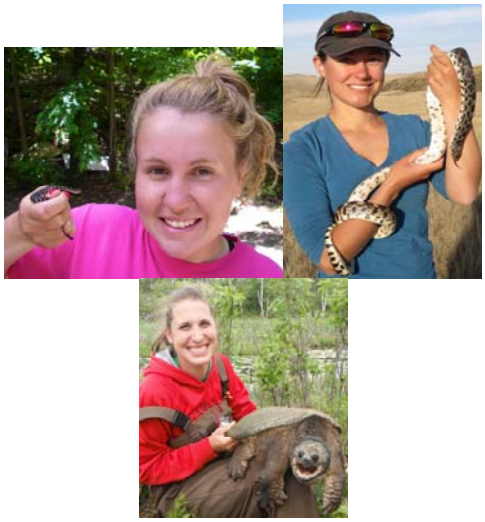
Christina M. Davy. Genotypes and ghosts - comparative landscape genetics of a northern turtle community.
(Supervisor: Robert W. Murphy, Royal Ontario Museum, Toronto, ON)

Christina Davy, CARCNET Platform Award
Photo by Amelia K. Whitear

Conservation and landscape genetics analyses of reptiles often assume that related species will respond to factors which can influence their genetic structure (for example, population fragmentation) in a similar way. There are many conservation genetics studies of individual snake, lizard or turtle species, but data from multiple species are not often integrated. We use landscape genetics analyses to investigate variation in genetic population structure among three turtle species with differing

behaviours, life history strategies and degrees of endangerment and population fragmentation. Using microsatellite genotype data from Spotted Turtles, Blanding's Turtles and Snapping Turtles we test hypotheses about the genetic effects of population fragmentation on these three species. We also use standard landscape genetic analyses to test hypotheses about the relative influence that major landscape features in southern Ontario have had on the population structure of each species and discuss important similarities and differences between them.

CARCNET Travel Bursary 2012



Congratulations to (clockwise top left) Lauren Stoot (photo by N. Cairns), Laura Gardiner (photo by M. McDermid), Julia Riley (photo by S. Boyle), and Amanda Xuereb (missing) recipients of the CARCNET travel bursary, WCH7 Vancouver, BC.

FEATURE ARTICLES

Northern Alligator Lizard - Lezard-alligator Boreal (*Elgaria coerulea principis*)

By Pamela Rutherford
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Status/Protection in Canada and globally: COSEWIC (NAR), British Columbia (S4), Canada (T5), Global (G5).

Distribution: In Canada they occur in southern British Columbia, north to Clearwater and Stuie including eastern Vancouver Island and several Gulf Islands. They are found as far east as Creston, British Columbia. In the United States they are found south along the coasts of Washington, Oregon and California to Little Sur River in Monterrey County and in the Sierra Nevada past Sequoia National Forest, Kern County. They occur on several islands off the coasts of Washington and California. Their distribution extends east to the north tip of Idaho and northwestern Montana.

General Habitat Requirements: They can be found in dry woodland, in grassland, along the banks of creeks, and on ocean beaches. They are often associated with rocky outcroppings, talus slopes, northern and montane coniferous forests, and streams. In addition, this species thrives in disturbed areas, such as logging mills, hydrocuts and clearcuts, where there is an abundance of surface debris.

Critical Habitat Characteristics: This species requires rocks and surrounding vegetation for hiding and they have high site-fidelity. Basking typically occurs in protected areas such as crevices or under rock cover. They are often found on forest edges or in forests but their association with forests is not clear. Hibernation requires access to rock crevices below the frost-line.

Reproduction: In British Columbia, Northern Alligator Lizards are viviparous with an unknown mating system. Females breed the third spring after birth and breed every year; male breeding age is unknown. Females may breed until seven years of age; males as old as eight years of age have been captured. There are no mating displays; males actively pursue females. Copulation is likely a risky undertaking as it may take place in the open and may continue for up to twelve hours. Average clutch size is five, ranging from two to eight young. Reproductive females are site-faithful; these sites may provide protection from predators and necessary thermal requirements to complete gestation.

Phenology: In British Columbia, animals emerge from hibernation in mid-April. Mating takes place shortly after emergence from hibernation from mid-April to late-May. Young are born from mid-August to mid-September. Animals enter hibernation in late-September. The active period is extended in United States populations.

Feeding: They are diurnal foragers and typically active in late afternoon. Adults eat larger insects (beetles,

caterpillars, and grasshoppers), spiders, snails, scorpions, and millipedes. They will eat stinging and biting animals, although invertebrates having offensive secretions seem to be avoided. It is likely that invertebrates are consumed in available proportions, but food consumption in nature has not been studied. Newborn lizards likely eat smaller insects, although little is documented about their food habits, even in captivity.

Predators: Known predators include: racers, rattlesnakes, garter snakes, rubber boas, shrikes, red-tailed hawks, and cats. They use their tail as a decoy and are likely to autotomize their tail if captured.

Motility: At Creston, British Columbia, hibernation occurs in the summer habitat with no seasonal migration, although movement away from hibernation sites has been reported for some United States populations. They are site-faithful; individuals are typically recaptured within ten metres of a previous capture, both within a summer season and from year to year. Movements of greater than one hundred metres are rare.

Alligator Lizard
Photo by Pam Rutherford

Other important behaviours or characteristics: In British Columbia, Northern Alligator Lizards spend much of their time in the soil and leaf litter and are uncommon in the open. Individuals are most easily located in early spring during the breeding season. Gravid females are easily located in late summer on a cooler day. Unlike many reptiles they are less likely to bask in early morning and are most active in mid-afternoon presumably when their body temperatures have reached some threshold.

Economic/social importance: Their dull colour and secretive nature makes them unattractive and difficult for most people to capture. British Columbian populations of this species are at the northern limit of the range making them genetically important to the species and possibly susceptible to extinction.

Known/potential vulnerabilities: Their site-fidelity and dependency on rock and vegetative cover makes them vulnerable to modification of their localized habitat. Some habitat has been removed for road construction and quarrying. They are disturbed by people moving near basking sites and this disturbance may be detrimental to gravid females. In addition, the thermoregulatory constraints of gravid females means that a cool summer may reduce reproductive output. There is likely little road mortality; although roads may act as barriers. Illegal collecting appears minimal based on my personal experience and not damaging to the population. Predators include feral and domestic cats, in addition to natural predators such as rubber boas and small raptors.

Suggested references:

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Common Five-lined Skink - Scinque pentaligne (*Plestiodon fasciatus*)

By Carolyn N.L. Seburn[1] and Briar J. Howes[2]
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Status/Protection in Canada and globally: Designated Special Concern in Ontario, Endangered (Carolinian population) and Special Concern (Great Lakes/St. Lawrence population) in Canada. S3 in Ontario, N3 in Canada, G5.

Distribution: The Canadian distribution is limited to two disjunct series of populations in Ontario: 1) southwestern Ontario (Carolinian population) and, 2) central Ontario (Great Lakes/St. Lawrence population), along the southern edge of the Canadian Shield from Georgian Bay east to the St. Lawrence River. While the two series of populations belong to the same evolutionary (mitochondrial DNA) lineage, they show considerable genetic divergence. Moreover, the Carolinian and Great Lakes/St. Lawrence populations belong to different biogeographic regions and have distinct habitat and microhabitat requirements. The species is the most widely distributed lizard in eastern North America, occurring in the eastern United States from Vermont to Minnesota, south to Florida and the Gulf of Mexico.

General Habitat Requirements: The species is found within the eastern deciduous forest region of North America. In Canada it is limited to open deciduous forests and forest clearings, and inhabits two very different types of habitat. The Carolinian population is found near Lakes Huron and Erie, where it uses vegetated sand dunes. The Great Lakes/St. Lawrence population is found along the southern edge of the Canadian Shield, where it inhabits open rocky areas.

Microhabitat Characteristics: The species is generally found in open areas that are early successional habitats. Basking usually occurs in protected situations such as crevices, small openings under cover or on trees and shrubs. Hibernation requires access to soil or rock crevices below the frost line. Access to morning sunlight and surface water also appears to be important. This species requires relatively large cover objects such as moderately decayed logs, boards and large rocks, for hiding and nesting. In the Carolinian population, individuals use woody debris as shelter. In the Great Lakes/St. Lawrence population, individuals are often associated with cover rock located on open rock outcrops

Reproduction: The Five-lined Skink is oviparous with a polygamous mating system. Males seek and defend potential mates from intruders and can be aggressive towards other males during the breeding season. Based on genetic data, multiple paternity has been documented in a Great Lakes/St. Lawrence population. In Ontario, females breed the second spring after hatching. Males are sexually mature at that time but may not necessarily have mating opportunities. The average clutch size is 9 eggs and breeding is presumed to be annual. The reproductive life span is unknown but it is unlikely that many individuals in the wild live beyond 5 years. Females excavate nest chambers under cover or within logs or stumps. Nest sites must have sun exposure and be large enough to resist desiccation. More than one female may nest in the same area or even in the same nest. Females brood the eggs until they hatch or shortly thereafter, tending to them to maintain appropriate moisture and thermal levels and defending them against predators.

Phenology: In Ontario, emergence from hibernation takes place from mid to late April. Peak breeding is in late May or early June. Eggs are laid in July and hatch 3-5 weeks later. Males appear to aestivate in late summer and adults tend to enter hibernation in late September. Hatchlings may be active a few weeks later.

Five-lined Skink
Photo by Scott Gillingwater

Feeding: Skinks are active foragers and feed on insects such as crickets, beetles, moths and flies as well as snails, spiders and earthworms. They forage in leaf litter and in trees and shrubs. Adults may be cannibalistic on eggs or hatchlings.

Predators: Known predators include shrews, weasels, snakes, hawks and cats but it is likely that any generalist

predator would take skinks. Skinks will break their tail in response to a predation threat or careless handling. The bright blue tail of juveniles is considered a decoy attracting attention to the tail and away from the body.

Motility: Five-lined Skinks do not occupy home ranges as such but a series of activity areas over the course of the year. Females seek nest sites in areas distinct from their usual activity areas. Maximum annual movements are on the scale of 100 m; however, daily movements are probably on the order of 1-5 m.

Other important behaviours or characteristics: Five-lined Skinks spend most of their time under cover or within the soil and leaf litter, although they are also known to climb trees. Because individuals are often in refugia under rocks or logs or even below the surface, they are rarely seen unless an effort is made to locate them.

Economic/social importance: This species is illegally collected for the pet trade which poses a threat to some populations. It is the only species of lizard found in Ontario, and the only lizard found in all of eastern Canada.

Known/potential vulnerabilities: Loss of important cover elements has been demonstrated to be a threat in one Carolinian population: a significant population decline in one National Park from 1990-1995 was linked to high human disturbance, including removal and destruction of cover objects by park staff and visitors. Following changes in park management practice to actively maintain cover objects, a reduction of visitors to areas of high skink concentration, and greater inputs of naturally occurring debris, the population showed an increase in abundance from 1997-2001 and analysis of abundance from 1990-2010 indicates a relatively stable but variable population. Poaching is another threat to population persistence, and it is known to occur on a regular basis in one well-studied Carolinian population. The impact of microhabitat loss and poaching to Great Lakes/St. Lawrence populations along the Shield is less clear.

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FIELD NOTES

Sharp-tailed Snake Discovery

By Leslie Anthony
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A funny thing happened on the way to the 2011 Whistler BioBlitz — I found a snake that no one knew was there.

Searching for Rubber Boas on a hillside in the nearby town of Pemberton to include in a display during Whistler's annual 24-hour celebration of flora and fauna, I pulled up a piece of bark on a downed log and observed a thin, dusky-pink snake coiled in the rotten wood. At 30

cm and slender as a pencil, it clearly wasn't a baby Rubber Boa (also pinkish) or any of three species of Gartersnake known from the area. I was shocked to recognize it as a Sharp-tailed Snake (*Contia tenuis*), a secretive, provincially threatened animal never before confirmed on the mainland of British Columbia.

Sharp-tailed snake
Photo by Leslie Anthony

Nocturnal, fossorial, and exceptionally scarce outside of spring (my find was made in August), the species is known from only a handful of sites on the southern Gulf Islands and Vancouver Island, over 200 km away. The nearest mainland population (in Washington state) lies even further distant. The discovery added to the already high biodiversity of the Pemberton Valley, 20 minutes north of Whistler, a transitional area between wet coastal and dry interior habitats. Kari Nelson, Chair of the BC MOE's Sharp-tailed Snake Recovery Team, welcomed the opportunity to increase understanding of the species' habitat and distribution. I searched the Pemberton area intensively in spring 2012 and found several more adults in the 20-30 cm range, as well as a couple of bright-red hatchlings at 5 separate sites along a several-kilometre ridgeline. Heartened to discover an extensive, breeding population of a rare snake, I'm equally disheartened that the ridgeline is currently under development for a massive housing project.

An unconfirmed report of the species from near Chase, BC in 1964 has largely been dismissed as a case of erroneous labeling, but the Pemberton Sharp-tailed Snake record again opens up the possibility that this rare and endangered snake exists in other suitable mainland locations that may be discovered through occupancy modeling and comparison of the habitats it already occupies in BC.

Automated Audio Monitoring of Introduced American Bullfrogs in the Okanagan, BC

By Natasha Lukey, Mike Baxter, Sara Ashpole
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American bullfrogs, *Lithobates catesbeianus,* were introduced into the South Okanagan in the 1950s. Since initial introductions, American bullfrogs have populated 5 wetlands throughout the Okanagan. Native to Eastern North America, introduced bullfrogs outcompete, predate, and transmit disease to native amphibians. Introduced bullfrog's impacts on native wildlife have earned the species a spot in the International Union for Conservation of Nature's "top 100 of the world's worst invasive species" list. Immediately upon detection in 2004, concerned with the potential negative effects from bullfrogs on the native Okanagan fauna, we launched an intensive, ongoing bullfrog eradication program in partnership with Environment Canada, the Ministry of Environment, the University of Waterloo, and local stewardship organizations. Until recently, our control efforts relied heavily on human power in the field for monitoring and removals. Our intense efforts have resulted in this year being our second year of zero bullfrog detections, by both human monitoring and song meter analysis. To validate the songscope software analysis, volunteer students at the University of Waterloo in 2011 blindly listened to all of the sound files manually for confirmation. However, zero detections does not necessarily equal zero bullfrogs. Throughout the progression of the bullfrog eradication program, as bullfrog abundances and funding decreased, we needed to seek new ways of optimizing monitoring efforts while decreasing human and financial resource input. For the last two years we have implemented automated auditory monitoring, using SM2 Songmeters (Wildlife Acoustics Inc.) permanently set at various high-risk bullfrog locations. As with any field research technique, we have experienced some successes and challenges with automated auditory monitoring. The following details our experience with the automated auditory recording process and the equipment we chose to use.

Our decision to use an automated auditory monitoring technique was partially based on the reduced probability

of detecting individuals at a low abundance, and the likelihood of reduced funding in upcoming years. Initially, a setback was justifying the high start-up costs of purchasing the recording devices and software, and the amount of time required to learn the software, and generate and test a bullfrog recognizer. We found the instruction manual for the Songscope software difficult to use when first learning the software because the step-by-step instructions were intermingled with technical explanation of the algorithms behind the software. Although the technical information was valuable and did play into decision making with the analysis parameters, a quick-start guide with simple, linear instructions would have made the software learning process run more smoothly. Another major complication we experienced was the seemingly random cessation of recording by the songmeters throughout the season. We checked the units once a week, and found that the units occasionally did not record full sessions, or did not record data at all. We believe the cease in recording is associated with battery power, as we recorded 14 hours each day, and the issue became more apparent as our use of the same rechargeable batteries increased. Depending on the duration of recording with the songmeters, battery replacement will drive up the cost of the use of the units.

Our challenges with the recording and analysis were offset by the efficiency of analyzing hundreds of hours of field data and the power of the software. On average, we were able to analyse 7 hour sessions in half to three quarters of an hour. Apart from the slightly overly complex instruction manual, the software itself was laid out well and easy to install and learn. We found the software a powerful tool, on par with other professional, industry standard audio software. The songmeters produced high quality recordings, and withstood 5 months of field exposure. The software allowed for precise isolation of specific sounds, and allows users to run multiple species recognizers simultaneously.

We found a major benefit to automated recording is the observer's ability to repetitively play questionable sounds until identification of the source is determined. Repeating sounds for the purpose of identification is not a luxury in the field, and plays into the confidence in results when considering rates of false positive or false negative detections. We found the ability to repeat sounds we heard in the field especially beneficial in areas with high background noise, such as traffic, wind, or running water. The Songscope software addressed false positive detection rates well. There are multiple parameters built into the software that allow the user to adjust the amount of potential false positives detected by the software. The user can also create a species' call recognizer as acoustically complex as they wish, and reduce the quality of detections to minimize false negative detections.

Songmeter location (red box), South Okanagan Valley oxbows.
Photo by Natasha Lukey

The largest benefit to choosing Wildlife Acoustics as the recording device and software provider was the excellent, extremely accessible customer service. In the beginning of our field season, we experienced difficulty reprogramming the songmeters from the previous season's schedule. We spent hours on the phone with a patient Wildlife Acoustics technician. In the end, we discovered that we were the lucky ones who triggered a previously undetected bug in the system. Once the bug was discovered, the technician quickly gave us an alternative programming solution and we were able to collect data immediately. The company addressed the bug and sent a firmware update within two weeks.

We found the ease and efficiency of analyzing hundreds of hours of audio files outweighs the initial time and money investment of automated audio recording. While we do not recommend entirely replacing in situ human observation effort with automated observation effort, and recommend diligent monitoring of the recording devices, the automated monitoring greatly increased the amount of time and probability of detecting rogue bullfrog individuals. We are planning continued use of this method in the future with the SM2 Songmeters and Songscope software, and are considering purchasing additional devices.

REVIEWS

This section of TCH includes reviews of not just books but other vehicles for the dissemination of information that might interest Canadian herpetologists.

Toad-al Invasion

By Joshua Amiel
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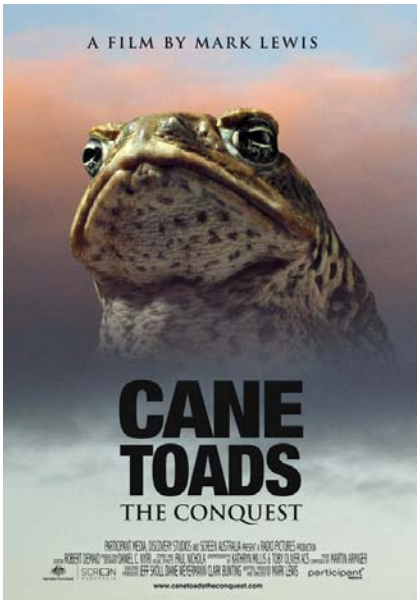

Cane Toads: The Conquest
Photo provided by
www.canetoadstheconquest.com

Remaking classic movies has become common practice in the film industry, taking popular heroes and villains from the past and transporting them into modern settings. Remakes have the ability to rejuvenate iconic roles and introduce new generations to time-honoured characters. Of course, when poorly executed, they also have the ability to destroy the legacy of an original. Dan Noble reviews Mark Lewis' new film "Cane Toads: The Conquest", an update of "Cane Toads: An Unnatural History" and tells us how this version stacks up against its predecessor.

Cane Toads: The Conquest

Director Mark Lewis, 2010

By Dan Noble
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Kangaroos, Koalas, Devils, and Platypuses are all internationally recognized icons of Australian fauna. However, an alien vertebrate has recently stolen the spotlight, garnering a huge amount of media attention. This intruder has been wreaking havoc on native Australian animals and conquering some of Australia's harshest terrain. The "alien" I am referring to is the Cane Toad (*Rhinella marina*). Loved by some and loathed by many, the toad was introduced from Central America in 1935 in an attempt to control Australia's cane beetle population. Such a simple and well-intended act has had catastrophic consequences for Australia, with millions of dollars invested into efforts to control the spread of toads.

Mark Lewis' original 1988 documentary, "Cane Toads: An Unnatural History", details the movement of cane toads through Australia, as well as the toad's relationship with humans and native fauna. This rather old and quirky coverage of the cane toad in Australia became a cult hit and introduced people worldwide to the disastrous impact of this anthropogenically introduced species. But how have the toads fared over the years? Are their numbers still increasing? Where are toads now? Can they be stopped? Mark Lewis provides answers to these questions in his new and updated documentary, "Cane Toads: The Conquest".

The new film features a more contemporary flare on the impact of cane toads in Australia. While bringing back classic characters in their present day form, Lewis also introduces some new protagonists to explore whether Australians have warmed-up to the ugly invader. The new documentary follows a similar theme to its predecessor but focuses more heavily on the movements of toads across Australia's Northern Territory and the impacts they have had along the way. Lewis highlights the work of distinguished scientists whose research has contributed to the understanding of cane toad dispersal and faunal interactions in Australia. "The Conquest" also documents the incredible ability of these toads to invade extremely arid environments, too harsh even for most native animals. Finally, this film features the inventive ways in which Australians have capitalized on the toad's presence, establishing "flourishing" businesses dealing in unusual cane toad art and obscure ways of controlling the toad's invasion front. Although a little redundant and jumpy at times Lewis adds greater depth to the story of cane toads in Australia while creating something that appeals to a wide audience. I found the newer version delightful and highly informative, touching on issues from ecology to animal welfare. Regardless of how much you know—or don't know—about the devastating effects of cane toads in Australia, the information presented in "Cane Toads: The Conquest" will provide you with a deep appreciation for both the versatility of

the cane toad and the perils of human-mediated species introductions.

Cane Toads: The Conquest. Motion Picture. Directed by Mark Lewis. Radio Pictures, 2010.
Cane Toads: An Unnatural History. Motion Picture. Directed by Mark Lewis. Film Australia, 1988.

About the reviewer — Dan Noble is a Canadian herpetologist, currently in the final year of his PhD candidature with Martin Whiting at Macquarie University. Dan has a broad range of research interests in behavioural ecology and animal behaviour, with a particular interest in sexual selection. For more information on Dan's work check out his website: http://nobledan.com/

THESIS ABSTRACTS IN CANADIAN HERPETOLOGY

TCH publishes abstracts of recently completed Honours, M.Sc., and Ph.D. theses from Canadian universities and professors. Students or their supervisors are invited to send abstracts to the Editor.

Boyle, K. M.Sc. 2012. University of Victoria. Victoria, BC. (Supervisor: Pat Gregory)

Life in a Drawdown Zone: Natural history, reproductive phenology, and habitat use of amphibians and reptiles in a disturbed habitat.

Canada is the second highest producer of hydroelectric energy in the world. Nearly 50 of the hydroelectric reservoirs in the country have a capacity larger than 1 billion m^3. Despite the great number and extent of hydropower developments in Canada and around the world, relatively little is known about how dams and their operations influence terrestrial and semi-aquatic wildlife. Reservoirs at northern latitudes are characterized by large fluctuations in water level, which create modified shorelines called drawdown zones. To evaluate the impact of these disturbances on amphibians and reptiles, I conducted visual encounter surveys at two sites in the drawdown zone of Kinbasket Reservoir, near Valemount, B.C. From April to August of 2010 and 2011, I documented the habitat use, reproductive phenology, and body condition of two amphibian species (*Anaxyrus boreas* and *Rana luteiventris*) as well as the growth, movements, diet, and distribution of one species of garter snake (*Thamnophis sirtalis*). At two sites in the drawdown zone, *A. boreas* and *R. luteiventris* were present for the duration of the summer and utilized several ponds for reproduction. The presence and abundance of *Rana luteiventris* eggs were generally associated with ponds that had higher mean temperatures, higher mean pH, and the presence of fish. In 2010, there was sufficient time for amphibian breeding and metamorphosis to occur before the reservoir inundated the drawdown zone, but low precipitation levels in that year led to desiccation of many breeding ponds. In 2011, high rainfall and snowmelt led to early inundation of breeding ponds, and thousands of tadpoles were presumably swept into the reservoir. Gravid *Thamnophis sirtalis* were found at just one of two sites in the drawdown zone, but both sites were frequented by foraging individuals of this species. *Anaxyrus boreas* appears to be the primary prey of *T. sirtalis* in the drawdown zone. An improved understanding of how the amphibians and reptiles at Kinbasket Reservoir have persisted in this highly disturbed environment may be vital to their conservation — the activation of a new generating unit at Mica Dam in 2014 will alter the pattern and timing of reservoir inundation for the first time since it was constructed 40 years previously.

Perez, A. M.Sc. 2012. Université de Montréal, Montréal. PQ. (Supervisors: Marc J. Mazerolle and Jacques Brisson)

Le roseau commun (*Phragmites australis*) influence-t-il la composition spécifique et le développement larvaire d'amphibiens?

Les plantes envahissantes sont considérées comme l'une des plus grandes menaces sur la diversité, mais leurs impacts sur les amphibiens demeurent peu connus. L'objectif de ce projet est de déterminer l'effet de l'établissement du roseau commun (*Phragmites australis*) sur la répartition des amphibiens et sur leur développement larvaire. Il est présumé que cette plante s'accapare l'espace et les ressources disponibles en produisant une importante biomasse, qu'elle peut modifier l'hydrologie des milieux humides et la structure des communautés d'amphibiens. J'ai évalué les facteurs influençant la répartition des amphibiens selon les caractéristiques des étangs et du paysage dans 50 sites envahis ou non à divers degrés. Des expériences ont également été menées afin d'étudier les répercussions de trois densités de roseau sur des têtards de la Grenouille des bois (*Lithobates sylvaticus*) et sur la qualité de son habitat.

Mes résultats suggèrent que le roseau à forte densité ralentit le développement larvaire de la Grenouille des bois et influence les assemblages phytoplanctoniques.

Cependant, il n'y a aucune relation entre la densité de la plante et la survie, la morphologie des têtards et les caractéristiques biotiques et abiotiques de l'eau. Dans notre aire d'étude, le paysage autour des étangs a une plus grande influence sur la répartition des amphibiens que l'établissement du roseau. Toutefois, la probabilité d'assèchement est plus élevée lorsque la plante est établie en grande quantité, ce qui, si l'envahissement s'intensifie, aura un effet néfaste sur la survie des têtards et mettra en péril la persistance des populations.

Invasive plants are considered one of the greatest threats to animal and plant diversity, but their impact on habitat quality for amphibians is still poorly understood. The objective of this project is to determine the effect of the establishment of common reed (*Phragmites australis*) on amphibian distribution and larval development. It is thought that this plant monopolizes space and resources by producing a large biomass, and may alter wetland hydrology and amphibian community structure. I evaluated the factors influencing amphibian distribution according to the characteristics of ponds and the surrounding landscape in 50 sites invaded by reeds to varying degrees (0-64%). Experiments were also conducted to study the impacts of three reed densities on wood frog tadpoles (*Lithobates sylvaticus*) and the quality of their environment.

My results suggest that high reed density slows wood frog larval development and influences phytoplankton assemblages. However, there is no relationship between, on one hand, plant density and on the other hand, survival, tadpole morphology and water physical and chemical characteristic. In our study area, the landscape surrounding ponds has a greater influence on amphibian distribution than does reed establishment. However, the desiccation probability is higher when the plant is established in high quantities, which in the long run, will have an adverse effect on tadpole survival and therefore population persistence.

Riley, J. M.Sc. 2012. Laurentian University, Sudbury, ON. (Supervisor: Jacqueline Litzgus)

The Importance of Nest Environment for Turtle Conservation, Hatchling Overwintering Strategy, and Fitness.

In Algonquin Provincial Park, Ontario, I examined how nest environment affects the biology of *Chrysemys picta*, and a conservation technique used to recover at-risk turtle populations. Firstly, I evaluated three types of nest cages which are used to protect turtle nests from unnatural levels of nest depredation. I tested if nest caging affected the nest environment and hatchling fitness. Differences were found in daily temperature variance between nest cage types in *Chelydra serpentina*. Also, in some cases, nest cages were found to have a positive influence on hatchling fitness. In the shallow-nesting species tested, *C. picta*, wooden-sided cages were found to promote hatchling body condition. Whereas, in the deeper nesting species tested (*C. serpentina*) below-ground cages were found to promote hatchling fitness. Overall, evaluation of widely-used conservation methods is crucial to understand their potential long-term population-level implications. I also examined whether overwintering strategy occurrence in hatchling painted turtles is passively related to nest environmental variables, or is beneficial to hatchling survival. There was no substantial evidence that environmental factors influence overwintering strategy. Fall emergence was associated with nests that were infested by Sarcophagid fly larvae, a direct mortality threat. Also, hatchlings in poor body condition were found to emerge from the nest in the fall, suggesting that these hatchlings may require additional time to forage and build up fat and water reserves required to survive the winter. This study was a first step in revealing the sources that cause intra-population variation in *C. picta* hatchling overwintering strategy in a natural setting.

RECENT PUBLICATIONS IN CANADIAN HERPETOLOGY

TCH lists recent publications by Canadian herpetologists working in Canada and abroad. Please send to the Editor a list of your recent papers, and send citation information for new papers as they come hot off the presses.

Hopkins, G.R., Gall, B.G., French, S.S. and E.D. Brodie, Jr. 2012. Interfamily variation in amphibian early life-history traits: raw material for natural selection? Ecology and Evolution 2(7): 1637-1643.

Leduc, J.C., K.J. Kozlowicz, J.D. Litzgus, and D. Lesbarrères. 2012. Ecology of herpetofaunal populations in smelting wetlands. Herpetology Notes 5: 115-125.

LeGros, D.L. 2011 Communal oviposition in the northern two-lined salamander (*Eurycea bislineata*) in Algonquin Provincial Park, Ontario. The Canadian Field-Naturalist 125(4): 363-365.

Moore, J.-D. 2010. Comparison of a population of eastearn redback salamanders, *Plethodon cinereus*, under native dominant wood coverboard and natural cover object. Canadian Field-Naturalist 123: 210-214.

Moore, J.-D. and R.L. Wyman. 2010. Eastern red-backed salamanders (*Plethodon cinereus*) in a very acid forest soil. American Midland Naturalist 163: 95-105.

Moore, J-D., and J. Gilhen. 2011. Two amelanistic eastern red-backed salamanders (*Plethodon cinereus*) from eastern Canada. Canadian Field-Naturalist 125 (1): 58-60.

Russell, R.W., W. Breslin, M. Hudak, A. Ogunbiyi, A. Withrow, and J. Gilhen. 2011. A second amelanistic eastern red-backed Salamander. *Plethodon cinereus*, from Nova Scotia, Canada. Canadian Field-Naturalist 125(4): 359-362.

Moore, J-D., J. Gilhen and M. Ouellet. 2012. Phénotypes de la salamandre cendrée (*Plethodon cinereus*) dans le nord-est de l'Amérique du Nord. Le Naturaliste Canadien. 136: 69-72.

Paterson. J.E., B. Steinberg, and J.D. Litzgus. 2012. Generally specialized or especially general? Habitat selection by snapping turtles (*Chelydra serpentina*) in central Ontario. Canadian Journal of Zoology 90: 139-149.

Paterson, J.E., B.D. Steinberg, and J.D. Litzgus. 2012. Revealing a cryptic life history stage: Differences in habitat selection and survivorship between hatchlings of two turtle species at risk (*Glyptemys insculpta* and *Emydoidea blandingii*). Wildlife Research 39(5): 408-418.

Paterson, J.E., B.D. Steinberg, and J.D. Litzgus. 2012. Not just any old pile of dirt: Evaluating the use of artificial nesting mounds as conservation tools for freshwater turtles. Oryx (in press).

Riley, J.L., J.E. Paterson, and J.D. Litzgus. 2012. *Emydoidea blandingii* (Blanding's Turtle). Record clutch size. Herpetological Review 43(2): 326-327.

Seburn, D. 2011. [Book review]: Venomous Reptiles of the United States, Canada, and Northern Mexico. Volumw2, *Crotalus*. By C.H. Ernst and E.M. Ernst. Canadian Field-Naturalist 125(4): 384-385.

Tuttle, K.N., and P.T. Gregory. 2012. Growth and maturity of a terrestrial ectotherm near its northern distributional limit: Does latitude matter? Canadian Journal of Zoology 90: 758-765.

Yagi, K.T. and J.D. Litzgus. 2012. The effects of flooding on the spatial ecology of spotted turtles (*Clemmys guttata*) in a partially mined peatland. Copeia 2012(2): 179-190.

WORLD CONGRESS OF HERPETOLOGY 7
SELECT ABSTRACTS

The Canadian Herpetofauna: What are the Threats?

By D. Lesbarrères[1] and B. Pauli[2]
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Pacific Treefrog
Photo by Joe Crowley

There is increasing awareness from the scientific community that amphibian populations are facing a global decline. In recent decades, at least 43% of amphibian species have declined, 32.5% are globally threatened, 37 species are extinct, and an additional 88 species are possibly extinct. These species suffer from a suite of threats including habitat destruction, alteration and fragmentation, introduced species, over-exploitation, climate change, UV-B radiation, chemical contaminants, diseases and the synergisms between them. While some hot spots are of particular concern, Canadian herpetofauna is as much at risk. In total, 20 amphibians and 37 reptiles are listed by the Committee on the Status of Endangered Wildlife in Canada, from Special Concern (26%) to Threatened (28%) and Endangered (46%). With more than 6000 km from East to West and more than 40º latitude from North to South, Canada presents a diversity of threats on its species at least equal to any other country.

This Symposium brought together scientists from all over Canada to discuss the different threats that reptiles and amphibian are facing today. An important outcome of this symposium will be developing new research collaborations and identifying strategies aimed at reducing or preventing the loss of amphibian and reptile biodiversity. At a time when multidisciplinary approaches are encouraged by both governmental and funding agencies, this symposium presented a unique opportunity to bring together researchers with different research scope in order to improve our understanding of the amphibian and reptile population declines in Canada.

Insights from standardized threat assessments for herpetofauna in British Columbia, Canada

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In British Columbia, 55% of native amphibian species (11/20) and 66% of native reptile species (8/12) are of conservation concern at the provincial or national level, or both. The threat classification system developed by the World Conservation Union and Conservation Measures Partnership (IUCN-CMP) provides a standardized way of classifying threats facing these species. Threats are classified into 11 categories, such as urban and residential development, transportation corridors, and climate change. The impact of each threat is estimated by the interaction between the scope (proportion of the species expected to be affected by the threat within 10 years), and the severity of the threat within the scope (degree of population reduction in 10 years or three generations). Impact is measured as a proportion of total population reduction within the range. When the IUCN-CMP threat classification system is applied to amphibians of conservation concern in B.C., invasive species have a high or very high impact (40% -75% declines) on 5/11 species, transportation corridors have a medium to high impact (15% - 40% declines) on 8/11 species, and agriculture, biological resource use (logging), pollution, and climate change have a medium impact (15% declines) on greater than half of the species. The very high impact of invasive species is due to the potentially catastrophic effects of chytridiomycosis infection. While Bd presence in pervasive in B.C., factors that lead to mortality from chytridiomycosis are not well understood. The threat assessment highlights this significant knowledge gap in the management and conservation of amphibians in B.C. When the standardized threat classification is applied to the reptiles of conservation concern in B. C., transportation corridors have a high to medium impact (15% - 40% declines) on 7/9 species, followed by residential and agricultural developments which have a medium impact (15%) on greater than half the listed species. Again the threat assessment highlights a significant knowledge gap as methods for mitigation of road mortality on herpetofauna are not well understood and have not been widely tested for effectiveness. The IUCN-CMP threat classification while useful should be applied with caution as much of the quantification of impact is based on expert opinion and not on scientifically collected population trend data. The lack of basic population information, quantification of threat impacts, and monitoring of conservation actions remain significant barriers to the effective management of herpetofauna in B.C.

Western Rattlesnake
Photo by Joe Crowley

Canadian endangered species legislation: How effective is it for herpetofauna?

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The Canadian Species at Risk Act (SARA) is complex legislation that aims to offer protection to endangered and threatened wildlife and plants in Canada. The long and difficult political process that culminated in its proclamation into law in 2003 resulted in a bill with tangible strengths, abundant compromises and many weaknesses. SARA has three primary components. One is the assessment and legal listing of wildlife species at status, the second is effecting the recovery is listed species, and the third deals with prohibitions, penalties and compliance measures. Assessment of species by COSEWIC is highly effective and proactive. To date, virtually all species of amphibians and reptiles in Canada that might be at some risk have been assessed at least once. Formulation of remediation measures, however, has been slow and implementation of recovery strategies for amphibians and reptiles has been even slower. Prohibitions and compliance measures are ineffective. In large measure, this is because SARA

applies mainly to federal lands and waters and is unable to override numerous other statutes, including aboriginal land claims agreements. SARA is a classic Canadian compromise, relying on federal/provincial/territorial co-operation and good will. That is its great strength, and great vulnerability.

Going beyond descriptive habitat selection studies: Making the link with fitness is paramount in a conservation context

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There are hundreds of habitat selection studies published annually. Most of these studies are descriptive and only compare habitat use to habitat availability. It is often possible, and I will argue it is almost always desirable, to go beyond simple descriptions of habitat association. It is desirable, especially in a conservation context, to make the link between habitat selection and fitness. Failing to do so could lead us to define habitats for conservation that in fact are not suitable for the species. I will plea for the broader adoption of an approach that attempts to link habitat selection to fitness. I will illustrate how ecophysiology, for instance, can be used to bridge the gap between habitat selection and fitness. I will illustrate the ecophysiological approach with our data on several species of reptiles to show that habitat selection, via its impact on thermoregulation, improves several performances that are related to fitness. I will also illustrate how information on population fitness in various habitats is a pressing conservation problem in our efforts to define critical habitat for species at risk.

Phylogeographic perspectives on conservation of Canadian herpetofauna: Past insights and future research

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Over the last 2 decades, the phylogeographic literature has burgeoned to include over 20,000 articles. These papers collectively have helped us to understand the effects of Pleistocene-induced range fragmentation and postglacial population dynamics on genealogical relationships within species. They also have provided insights into the impacts of orogenesis, riverine barriers, changing sea levels and historical vegetation shifts on rates and patterns of diversification, and have revealed cryptic species (by no means is this an exhaustive list). Importantly, some phylogeographic research has provided key inputs into conservation strategies for species listed as vulnerable or endangered, primarily in the domain of prioritization of focal populations. However, in my view there remain some key deficits in our knowledge particularly in the application of phylogeographic data to conservation and management of species at risk. Relevant questions include: 1. Do diagnosed lineages in any way reflect adaptive diversity or potential? 2. Are well-supported lineages identified in phylogeographic studies incipient species? 3. What are the consequences of secondary contact and are these crucibles of new species origins? In this talk, I will use published studies and data from my own laboratory to explore these issues with a focus on Canadian herpetofauna.

Herpetological conservation on Canadian landscapes altered by industry

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Industries based on the extraction of renewable and nonrenewable natural resources have long been fundamental to the Canadian economy. Agriculture, forestry, hard rock mining, hydropower generation, oil and gas extraction can have profound and lasting effects on terrestrial and freshwater habitats used by amphibian and reptile species. The application of systems designed to classify and calculate threats offers a promising approach for assessing the potential impact of industrial activities on individual species over a broad geographical area, for example, at the provincial level. Integrated landscape management, which recognizes the combined effects of multiple industries, offers a promising approach for conserving multiple species simultaneously on a smaller, but still regional, scale. Meaningful conservation of individual populations of amphibians and reptiles on industrial landscapes often requires a mix of habitat preservation, restoration, and creation. For many species, a lack of knowledge of their basic biology in Canada still remains among the biggest threats to their persistence on landscapes shaped by resource-based industries.

Road impacts on amphibians and reptiles: Paving the way for future research

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With the increase of the human population and expansion of road networks, many efforts have been devoted to investigating the effect of roads on amphibians and reptiles in different areas of the globe. Habitat loss and individual mortality on the road from collisions with vehicles are direct results of road establishment. However, road effects can extend to adjacent populations and manifest themselves through occurrence and abundance patterns or genetic structure. Behaviour and movement patterns can also be disrupted by road structures and vehicular traffic, but other impacts are more insidious. For instance, road runoff modifies water chemistry and can decrease larval development or survival. Salt and other deicing agents are of particular concern in Canada, as these substances are spread on roads in very large quantities. Forestry and mining activities in northern Canada are increasing due to demand for natural resources and are generating large road networks. However, their effects are largely undocumented. Despite the wealth of observational studies on the effects of roads on amphibians and reptiles worldwide, manipulative experiments remain scarce. For instance, studies could be bonified by using controlled impact (BACI) designs (before and after road construction) to distinguish the effects of habitat loss from the effects of traffic intensity, and quantify these effects across time. Another research need involves the estimation of vital rates for individuals in populations adjacent to roads differing in traffic intensity.

Infectious diseases as a threat to Canadian amphibian populations

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Infectious diseases are a normal component of all ecosystems, contributing to their stability and evolution through host population regulation. However, they can threaten the long-term persistence of host populations under several circumstances. For example, situations that compromise host immune defences can be expected to intensify or prolong the impacts of pathogens. Consequently, environmental stressors such as contamination and altered environmental conditions can interact with pathogens in ways that tip disease dynamics in directions that promote the collapse of host populations. The spread/translocation of novel pathogens (or novel strains of pathogens) into new geographic areas can also threaten host populations (or species) with no innate immune defences to the pathogen. Sublethal effects of infectious diseases can also present serious threats to host populations. Although mass mortality events of hosts are often recognized for the potential effects that they may have on host population ecology, sublethal effects are often overlooked. Growth rates, predator avoidance, and fecundity rates can all be affected by infectious diseases, and the effects are much more difficult to detect, particularly in the absence of long-term monitoring. A key characteristic of most pathogens, including amphibian pathogens, is that they are capable of infecting and completing their lifecycles in multiple species. Another characteristic of many amphibian pathogens is that there can be marked differences among amphibian species in the levels of disease that results from infection. As a result, some amphibian species may serve as reservoirs of infection for other species. This can become a critical challenge for conservation measures when a widespread, resistant host species can harbour pathogens that cause lethal infections in rare host species. Amphibian pathogens documented in Canada include ranaviruses, chytrid fungus, Saprolegnia, opportunistic bacteria such as Aeromonas, and a variety of relatively poorly understood parasites such as “protists” like trypanosomatids, and helminths such as tapeworms and lungworms. Each of these groups of infectious agents will be used as case studies to highlight the scenarios described above where infectious diseases can become threats to amphibian populations.

Barriers to predicting pesticide effects: An amphibian perspective

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One important objective of pesticide research is identifying what application rate results in unacceptable risk to non-target species. A common component of risk assessment involves comparing predicted worst case environmental exposure concentrations to median toxicity values (e.g. LC50) derived from laboratory and mesocosm studies. These median toxicity values provide useful benchposts for setting water quality guidelines. However, LC50 and LD50 estimates can vary widely for the same pesticide due to i) differences among formulations, ii) interspecific differences in sensitivity, iii) among-population differences, iv) individual-level

differences in sensitivity, v) exposure history, and vi) experimental venue (i.e. laboratory, mesocosm, and field). We will present a review of amphibian toxicity studies with an emphasis on glyphosate-based herbicides, and attempt to partition variability in estimated LC50's among these potential sources. We will discuss how this variability is potentially relevant to water quality guidelines.

Cumulative effects on wetland landscapes: Can we reconnect amphibian habitat through small pond creation on private land?

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The arid south Okanagan Valley, British Columbia is a highly modified landscape, where wetland and riparian habitat loss exceed 85%. Increasing regional land development, agricultural contamination, invasive predatory species, and roadway expansion provide a multi-stressor landscape for amphibian species at risk. During 2003 to 2006, 74% of discrete valley bottom wetland sites had less than two of six native amphibian species detected annually. Moreover, absence of reproductive success or low relative amphibian abundance (<10 individuals) was observed among 67% sites. Consequently a collaborative multi-stakeholder approach to habitat restoration and species recovery was adopted through private landowner stewardship. The goal was to increase the quantity and quality of lowland wetland habitat by reconnecting known amphibian-breeding sites with constructed and/or enhanced ponds. Amphibian monitoring data determined strategic locations for wetland construction and/or restoration (N_{2003} = 24 sites; N_{2004} = 53 sites; N_{2005} = 71 sites; N_{2006} = 108 sites). These sites were selected based on: 1) proximity to known breeding locations, 2) distance to adjacent water bodies, 3) at least 500m to roadways, and 4) historic infilling knowledge or partnership with local Conservation Authorities. Since 2006, 21 wetlands were restored within the study area, effectively doubling the number of available fishless ponds. Restoration outcomes include ten newly constructed ponds, eight re-contoured wetlands after historic infilling, and invasive predatory species (*Lithobates catesbeianus; Carassius auratus*) mitigation at three sites. Restored sites and surrounding priority wetlands are monitored annually for the presence of adults, eggs, and metamorph emergence. Early signs of immigration and metamorphic success for Great Basin Spadefoot (*Spea intermontana*) and Pacific Chorus frog (*Pseudacris regilla*) populations have been observed in twelve of 21 restored ponds. Wetland restoration has increased the number of available breeding ponds within the study area, engaged landowners, and possibly aided species recovery. Yet, local threats to upland terrestrial and breeding habitat continue to escalate which impede amphibian movement corridors and population expansion.

Spatial and temporal dynamics of amphibians: From populations and metapopulations to metacommunities

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Considerable progress has been made since alarms were sounded about global amphibian declines over two decades ago. We now better understand the magnitude of decline and some of its causes. Advances in ecology provide us with a better appreciation of the importance of scale in determining status of amphibians. However, serious gaps of knowledge still exist that hamper our efforts to understand the spatial and temporal dynamics of amphibian populations and communities and to accurately assess species status. Abundance is inherently variable in populations making trend detection difficult, but presence-absence studies can reveal the underlying dynamics and spatial structure of populations at larger scales. Application of the metapopulation concept to amphibians has been questioned, or its usefulness remains untested. I used intensive surveys to examine the dynamics of 13 species at 39 sites over 20 years in Southern Ontario. Site characteristics and stochastic events influence species turnover, but asynchrony among sites at larger scales buffers trends in incidence as theory predicts. However, 20 years of study reveals subtle but significant trends in incidence. Overall, species richness is slowly increasing with 4 species declining, 3 increasing and 3 showing no trend in incidence. My results and those of others demonstrate the efficacy of using metapopulation approaches to describe amphibian spatial and temporal dynamics. Although few long-term studies exist, sufficient evidence indicates that a broad definition of the metapopulation incorporating a variety of spatial structures describes how amphibian populations function at landscape and regional scales. Likewise, because species interact, the more recent application of the metacommunity concept to amphibian faunas provides an appropriate and useful framework for studying regional amphibian dynamics. Metacommunity paradigms such as metapopulation, mass-effect, and filtering appear to successfully categorize amphibian dynamics. Despite our

conceptual advances, numerous gaps of knowledge remain for most species (dispersal, natural history, distribution). Long-term large-scale studies remain rare and existing monitoring programs lack sufficient power to discern trends.

Dynamics on the edge: Turtles, trials and tribulations

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Despite their long evolutionary history and ability to survive past cataclysmic environmental change, turtles today are at tremendous risk worldwide. As a group turtles are characterized by long generation time, high adult survival, low but variable juvenile survival, high spatial discrimination and strong site affinities for reproduction and/or overwintering/aestivation. Populations are vulnerable to slight shifts in adult survival. Because of considerable time lags associated with extreme longevity and late maturation, changes in vital rates may go unnoticed until it is too late; logistic and funding constraints further confound our ability to detect these changes. In Canada all turtle species exist at or near their northern range limits; coincidentally these species ranges are largely congruent with areas of highest human population density and growth, greatest degree of landscape degradation from agricultural, industrial and residential development, and transportation networks associated with all of the above. Conventional wisdom holds that edge-of-range populations tend to be small, fragmented and constrained in ability to disperse successfully. Although these populations may support reduced genetic variation, they may be able to respond more rapidly to environmental change than centre-of-range populations. Under present climate change scenarios, with isotherms and ranges advancing northward, dispersers should be at selective advantage, and Canadian populations should expand. However, continuing fragmentation and degradation of habitats that accompany these changes in climate will likely continue to compromise Canadian turtle populations. Existing data from nearly all Canadian turtle species point to significant declines in both absolute numbers and numbers of populations. In addition, genetic structuring in some species, on fairly fine spatial scales, has recently been documented. New analytical tools allow us to reconstruct population histories, source/sink dynamics and responses to past environmental change; these may help to guide us in modeling and managing future population dynamics.

The challenge of reptile and amphibian conservation in Canada's southern latitudes

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The pocket desert of the south Okanagan valley, in the province of British Columbia, is a rare ecozone in Canada which is populated by the highest number of Species at Risk (>60 species) and one of the fastest developing communities in the country. Habitats for wildlife were fragmented within this rich agricultural landscape in the past 100 years but it is quickly becoming a more urban culture with condominium and highway expansions that will further compromise the remaining habitat. The quantity of the habitat has shrunk through the loss of more than 84% of wetlands and 87% of

Constructed wetland at the Osoyoos Desert Center, Okanagan Valley BC.
Photo by Sara Ashpole

riparian habitats. None of this bodes well for the survival of 15 species of amphibians and reptiles native to this valley with two species already extirpated and the majority of the rest listed as endangered, threatened or special concern in Canada. The quality of the remaining habitat is degraded by the removal of water for irrigation, vehicle collisions, pesticide use, and introduction of invasive species. However, initiatives to create new habitat by building ponds on lands protected through conservation covenants, exclusion fencing for livestock

and restoration of habitats in federal National Wildlife, have started to show success less than a decade after their inception

Implementing recovery actions for freshwater turtles in Canada

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Decreases in biodiversity and increases in human threats to the natural world have prompted government agencies to create legislation to protect species at risk of extinction and their habitats. In Canada, at the federal level there is the Species at Risk Act (SARA) which protects residence for threatened, endangered, and extirpated species on federal lands. The federal government will also identify critical habitat (habitat needed for survival) for threatened and endangered species. To date, critical habitat has only been identified for one freshwater turtle, the Nova Scotia population of the Blanding's Turtle (*Emydoidea blandingii*). At the provincial level in Ontario, there is the Endangered Species Act (ESA). Species that may be at risk are reviewed by a team of experts (by COSEWIC at the federal level and by COSSARO at the provincial level). If upon completion of review a species is listed as at risk, the government is required to outline steps that will be taken towards species recovery in a Recovery Strategy for endangered and threatened species, and in a Management Plan for species of special concern. In Ontario, the government must respond to the Strategy or Plan within 9 months via a Government Response Statement which summarizes their intended actions and priorities for species recovery. The Canadian government created various funding programs to support stewardship activities for species at risk, including the Habitat Stewardship Program, the Interdepartmental Recovery Fund, and the Aboriginal Fund for Species at Risk. In 2007 the Ontario government created the Species at Risk Stewardship Fund which provides funding on a competitive basis to individuals and organizations for stewardship activities that support implementation of the ESA. Of the 8 species of turtles in Ontario, 7 of which are considered to be at risk, to date only the Wood Turtle (endangered) has an approved provincial Recovery Strategy and Government Response Statement, under which the species' habitat is regulated. Case studies describing recovery actions for Canadian turtles will be discussed.

NEWS AND ANNOUNCEMENTS

Amphibian Conservation – Call for Evidence

By Rebecca Smith
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ConservationEvidence.com
Providing evidence to support decisions about nature conservation

The Conservation Evidence project at the University of Cambridge is focusing on amphibians this year. Conservation Evidence publishes a website, a journal and a series of books providing evidence to support decisions about nature conservation. We are currently developing a new synopsis of evidence on **amphibian conservation** funded by Synchronicity Earth. This involves listing all possible conservation interventions for amphibians, anywhere in the world, and compiling evidence for the effectiveness of each.

We need your help: Have you written a paper or report describing the effects of a management intervention to conserve amphibians? Have you tried a novel technique for the conservation of an amphibian species? It could be anything from protecting, restoring or creating habitat to captive breeding and releases. If the intervention was directly tested and its effects monitored quantitatively, we would like to include your evidence in our synopsis.

Please note, we focus entirely on how to protect or boost wild amphibian populations by intervening to restore natural processes or mitigate threats. We do not cover

evidence about how species are changing or what is causing their decline.

Conservation Evidence has completed synopses of evidence on bird conservation and wild bee conservation. Another synopsis is almost complete for wildlife conservation in European farmland. These are available on our website www.conservationevidence.com in a searchable database of evidence.

We aim to complete the amphibian synopsis by June 2013. It will then be made available as a searchable database, a book and a free pdf.

Please contact Rebecca Smith if:

- You have evidence of the effectiveness of conservation interventions for amphibians.
- You would like an electronic copy of the amphibian synopsis once it is available.

ACO Wildlife Products and Road Mitigation Solutions in Herpetology

By Kari Gunson,
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As the human population grows, so do our road networks required to establish connections between industrial, urban and residential centres. This growth has a significant effect on wildlife populations, resulting in a loss of natural wildlife habitat and an increasing number of wildlife-vehicle collisions as wildlife cross roads to access required resources. One aspect of road ecology is to study the impacts of roads on wildlife in order to devise informed mitigation solutions to alleviate these harmful impacts. The most effective and proven solution to date are the use of wildlife tunnels and bridges commonly termed 'ecopassages' and associated fencing to guide animals to a road crossing area. For smaller wildlife, such as amphibians and reptiles, ecopassages are often enhanced culvert tunnels that accommodate the preferred crossing conditions for its target species.

In August of 2012, ACO Systems attended the World Congress of Herpetology in Vancouver, British Columbia as an exhibitor showcasing ACO Wildlife products - tunnels and guide fencing designed specifically for herpetofauna. ACO has been involved in finding solutions and designing products to minimize amphibian deaths on roads for over 20 years, and ACO products have been commonly used in Europe since the 1990s and are now being used in North America.

These tunnels are enhanced for several reasons. From an engineering perspective they are made from durable precast polymer concrete that is insensitive to freeze-thaw cycles, very low temperatures, salt and hydrocarbons. From a biological perspective, they have small openings in the top portion of each 1 m monoblock unit that allow the abiotic conditions (e.g. light, moisture and temperature) to equilibrate with the interior tunnel conditions. However, probably the most important feature is their affordability. The tunnels are approximately $1/5^{th}$ the cost of other concrete box culverts traditionally used in roads for hydrology purposes. In addition, the 1 m monoblock units facilitate implementation into the road shortening the length of road closures to 1 lane at a time.

ACO ecopassage construction
Photo provided by Parks Canada

After the WCH conference, ACO exhibitor and road ecologist, Kari Gunson, travelled to Oliver, British Columbia and Waterton National Park, Alberta to view the use of these products first hand. Oliver, B.C. had used the fencing to connect two metal drainage culverts already established in the road, while Waterton Park had used the ACO tunnels with their own homemade recycled fencing made from cut pieces of metal culverts. Both these cost-effective projects have found that their systems reduce road mortality and allow wildlife passage for the Long-toed Salamander (*Ambystoma macrodactylum*) in Waterton National Park, and the Spadefoot (*Spea Intermontana*) in Oliver, B.C.

Crosby, J.E., S.L. Ashpole, S.D. Murphy, B. Persello. Investigating road permeability strategies and

amphibian movement within British Colombia's South Okanagan: A landscape level approach. World Congress of Herpetology. Vancouver, BC. August 2012

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Road Ecology and the Effectiveness of Stewardship

By Mandy Karch
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Roads and traffic challenge reptiles and amphibians as they move to and from critical habitat. Often, the toll road mortality takes on a population is unknown. It is not uncommon for motorists commuting daily on a given segment of road bisecting wetland to say 'what road mortality?', but, for the people, the volunteer citizen scientists, who devote countless hours walking roadsides witnessing, recording and submitting wildlife/road interactions, the reality and the volume of kills is eye-opening. Reesor Road in Rouge Park and Heart Lake Road in Brampton, Ontario provide some examples of road segments approximately 2 km in length where in one season thousands of vertebrate deaths (largely frogs, toads, snakes and hatchling turtles) were recorded. The Ontario Road Ecology Group (OREG) with its partners and teams of dedicated citizen scientists has collected the data with the goal of working with local officials to mitigate and protect biodiversity, including Species at Risk. Data collection as an initial step is vital to the process and without stewardship and the support of the public some hotspots (i.e. areas of mass mortality due to wildlife/vehicle collisions) may persist and result in the loss of a wildlife population.

Stewardship is critical and effective. In some cases, the data have led to municipal action geared at mitigating the road to improve habitat connectivity for wildlife. If you need help initiating a productive and safe community wildlife/road monitoring project, OREG can provide you with helpful tips. For more information please contact OREG Chair Dave Ireland davei@rom.on.ca.

The Indian River Reptile Zoological Park-a brief overview

By Kyle O'Grady
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Since its establishment in 1999, the Indian River Reptile Zoological Park is the only facility dedicated to reptiles that is an accredited institutional member of the Canadian Association of Accredited Zoos and

Toronto River Conservation Athority Staff and Heart Lake Road Ecology Monitoring Project Volunteers. Photo by Mandy Karch

Aquariums (CAAZA- formerly CAZA). This accreditation allows the facility to function as a zoological operation, participating directly in many programs designed to preserve reptile species.
Prominently through its history, the zoo has trained nearly every Environment Canada (Federal) Officer, and has trained Royal Canadian Mounted Police, various Provincial Police (including OPP) and countless municipal law enforcement officers, as well as MNR, Humane Societies and SPCA staff nationwide. Additionally, the zoo has trained federal officers from as far away as Chile, all in the identification, safe handling and first aid of venomous reptiles. This course, whose

rights are owned by the zoo, has prepared hundreds of field officers to safely deal with potentially dangerous situations involving reptiles, from combating the illegal wildlife trade at our borders to confiscation of illegal collections. The zoo serves as domicile for the animals which are taken from such confiscations as the cases work their way through the legal system.

Preservation of herpetofauna can be an ambitious undertaking, and with such a limited number of facilities accredited to care for these animals, the zoo must use diligence when participating in its *ex situ* conservational efforts to prevent genetic contamination. In 1986, the Association of Zoos and Aquariums (AZA) enacted the Species Survival Plan (SSP), a national data base designed to preserve the genetic integrity of endangered species through a coordinated effort of AZA zoos. More recently, CAAZA has been recognized as an association able to participate within this prestigious program and work in conjunction with AZA zoos.

Black breasted leaf turtle (*Geoemyda spengleri*) hatchling at the Indian River Reptile Zoo. This animal hatched on October 1, 2011. Vital data submitted to ISIS and SSP co-ordinator. Photo by Kyle O'Grady

However, within zoological herpetoculture there are a few obstacles. One is that many of the reptile species survival plans are young, with insufficient genetic diversity to contribute significantly to long term species survival. While hurdles such as this are continuously overcome, many survival plans remain stalled indefinitely due to limited captive population, unknown animal origins and limited resources.

The line between a "zoo" and "zoological" facility is a clear one. A zoo by definition is a facility that displays animals, most often for profit. With the suffix "logical" added as the defining factor, a zoological facility maintains a logical reason to have the animals in its care. It justifies the keeping of animals in captivity by participating in *in/ex situ* conservation efforts and only breeding when recommendations are given. This regulation provides integrity to a species captive population, with understanding and forethought giving priority to future sustainability. Only accredited zoos can work within programs such as the Species Survival Plan.

While we participate in several SSP programs, most recently, the Indian River Reptile Zoo has received attention within the SSP of the Black breasted leaf turtle (*Geoemyda spengleri*). Having previous success in reproduction and receiving further breeding recommendations for this term. The zoo has also documented a *G. spengleri* in oviposition on film, perhaps a world's first. Vital data are routinely collected to further the understanding of this species. Evidence is strong that this diminutive turtle has temperature sex determination and understanding the species specific temperature threshold is critical to planning future sex ratios. An egg remains in incubation at the zoo as advised by the species coordinator and at the time of this writing is developing normally.

Conservation efforts at the zoo span from training officers of the law so they can be better prepared to stop illegal trade, to providing regulated quality care to species in need with the goal of long term preservation. The zoo makes itself available to suggestions for research projects and takes all proposals into consideration.

The Indian River Reptile Zoo has perhaps been best known to provide antisera to snake bitten individuals. As a facility that works with a diverse collection of venomous snakes, a responsibility to keep antivenin for all venomous species maintained in the zoo collection is a must. By proxy, the Indian River Reptile Zoo has been used as a lifeline to save the lives of those facing consequences of envenomation, from cottagers on Georgian Bay (when serum supplies run low at local hospitals) to private hobbyists who do not keep a reserve on hand. This can jeopardize keeper safety for the duration of time it takes to replace serum supply. The Indian River Reptile Zoo and Toronto Zoo are the only facilities in Canada which stock antivenin for their collections.

Most importantly, the zoo operates as a not for profit charity, registered with Revenue Canada (#80522-2253-RR001). One must take a moment to pause and think that we are not keeping charismatic mega fauna on our grounds. Our facility focuses on the underdogs of the

natural world. While the zoo works to uphold integrity, and educate using humane practice and factual information in lieu of shock value and bulk performance, we face struggles as society has yet to come to terms with our world's scaly creatures. While nicely maintained grounds, facilities, and an emphasis of maintaining our green spaces helps us to put our best foot forward, we ask that you, the reader, take a moment to ponder the value of supporting accredited institutions which directly aid the preservation of species we are all so passionate about. Enacting the legitimate conservation, proper and humane education, and research a zoological facility is known for, is cornerstone to providing a better existence to all living things.

Call for Nominations and Book Authors - IMPARA

By Steve Hecnar
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The Important Amphibian and Reptile Areas (IMPARA) designation program is a major conservation initiative of CARCNET. There are three kinds of IMPARA sites: 1) Sites containing species of conservation concern, 2) Sites containing a high diversity of species, and 3) Sites that fulfill important life history functions for herpetofauna. Patterned upon, and complementing the Important Bird Areas of Canada criteria, the objective of site designation as an IMPARA is to raise awareness, and hopefully stewardship, for these sites.

At present, there are five IMPARA sites designated in Canada: Okanagan-Similkameen Valley and the Creston Wildlife Management Area in British Columbia, the Narcisse Wildlife Management Area in Manitoba, Cootes Paradise, Carroll's Bay, Grindstone Creek Valley Nature Sanctuaries, and Pelee Island in Ontario. A sixth site, Kejimkujik National Park in Nova Scotia, is in the process of being designated. Within the next year, CARCNET would like to extend this program to include at least one IMPARA site in every province of Canada.

The Important Amphibian and Reptile Areas Program (IMPARA) Site Criteria are intended to be guidelines for identifying the importance of a site, and are somewhat flexible, depending on the specifics of the site. These criteria are intended to be the first step in a dialogue between the nomination compiler and CARCNET.

Anyone can nominate a site and we are seeking nominations now. To nominate a site as an IMPARA, you simply complete a Site Nomination Form available on the web site. Before doing this, it is useful to read the IMPARA Site Criteria. There are two ways to complete the Site Nomination form: you may print a copy of the form using your browser's print function and complete it by hand, or download a rich text format version of the form and complete it on a word processor. Then you can send finished forms and all accompanying information to info@carcnet.ca.

CARCNET also plans to publish a full-sized coffee table book highlighting the IMPARA program and drawing attention to individual sites. This is an ideal opportunity for CARCNET or CAH members to fast-track the nomination of important Canadian herpetological areas with which they are familiar or interested. The goal is to produce an edited multi-authored book of well researched, informative, and concise site accounts with representative photographs and site maps. The plan is to have at least 20 sites covered across Canada with each province represented.

If you are interested in suggesting or nominating an area, and/or interested in researching and writing a particular account, there is a simple template available on the website, you can also contact Dr. Stephen Hecnar (shecnar@lakeheadu.ca) with questions. Once receiving ideas and offers from prospective authors, the IMPARA Committee and CARCNET Board will proceed further with selecting sites for inclusion in the book and contacting authors with further instructions.

Call for Book Authors

Deadline: 31 January 2013, using the online template form, to info@carcnet.ca

Contact: Dr. Stephen Hecnar, Department of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, ON, P7B 5E1. Email: shecnar@lakeheadu.ca.
Telephone: 1-807-343-8250
http://www.carcnet.ca/english/important_areas/intro.php

2012 CARCNET/RÉCCAR Scholarship

The Canadian Amphibian and Reptile Conservation Network/Réseau Canadien de Conservation des Amphibiens et des Reptiles (CARCNET/RÉCCAR) is offering a scholarship programme consisting of one or more **$500.00** scholarships awarded annually to Canadian students conducting research to support amphibian and reptile conservation in Canada.

Applicants must submit a complete application form (available online: www.carcnet.ca) and one electronic copy of an academic transcript.

Questions can be directed to Sara Ashpole: sashpole@uwaterloo.ca

Scholarship Application Deadline: 1 December 2012, by email to info@carcnet.ca.

Postdoctoral Research Position – Amphibian health as an indicator of ecosystem health Department of Veterinary Pathology University of Saskatchewan

A post-doctoral researcher is being sought to assist with experimental design, data analysis, and manuscript preparation related to priority substances detected in environmental samples and wild amphibian tissue samples from the oil sands region of Alberta. Information from this component of the project is being integrated with other components of the project including infectious disease dynamics, malformation rates and biochemical indicators of chronic stress. The successful applicant will have formal training and research experience in wetland ecology, amphibian ecology, environmental chemistry, or ecotoxicology, and demonstrated experience managing, analyzing and publishing projects that involve large ecological datasets. Previous experience with laboratory and/or field experiments that relate to ecologically relevant levels and forms of heavy metals, naphthenic acids, and/or polycyclic aromatic hydrocarbons is strongly preferred. Most datasets related to this position are already in-hand. Analyses of those datasets by the successful applicant will be used to inform the design and implementation of future field work. This position is based in the Department of Veterinary Pathology at the University of Saskatchewan, which is located in Saskatoon, SK. Please note that a DVM degree is not required for this position.

Salary for this position is $44,000/year and major funding and support for this position is being provided through Environment Canada, Keyano College, and the University of Saskatchewan. The position is currently funded for 1 year but may be extended depending on satisfactory progress and subsequent funding.

Applications must include a brief cover letter highlighting qualifications for the position, current CV, and the names and contact information for 3 references.

For more information or to submit your application materials (via email only) contact Dr. Danna Schock at danna.schock@keyano.ca

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Request for Egg Photos Toronto Zoo

The Toronto Zoo is putting together an egg identification guide for the reptiles and amphibians of Ontario. But we need your help! If you have any photos of individual eggs, egg masses, and/or nests that you would like to donate for use in the guide or on our website. Specifically, we are missing good photographs of the nests and eggs (and egg mass if applicable) of:

- Blanding's turtle
- Northern map turtle
- Midland and Western painted turtles
- Spotted turtle
- Red eared slider turtle
- Ring-necked snake
- Eastern hognosed snake
- Red spotted newt
- Eastern redback salamander
- Central newt
- Allegheny mountain dusky salamander
- Pickerel frog
- Mink frog
- American bullfrog
- Boreal chorus frog
- Northern cricket frog

For more information or to donate photographs contact Saachi, Assistant to the Curator of Amphibians and Reptiles (working in partnership with the Adopt-A-Pond Programme at Toronto Zoo, by email: bctemp5@torontozoo.ca

Canadian Association of Herpetologists / Association Canadienne des Herpétologistes

Membership in the CAH/ACH

The Canadian Association of Herpetologists is a scientific organization of professionals, students and interested amateurs. Its goals are to foster herpetological research and to aid communication among researchers in Canada. Membership in CAH is open to all whose work in concerned with the biology of amphibians and reptiles, particularly those who are located in Canada, who are working with Canadian populations, or who are interested in herpetology in Canada.

L'Association Canadienne des Herpétologistes est une organisation scientifique regroupant des professionnels, des étudiants et des amateurs intéressés par l'herpétologie. Les buts de l'association sont de promouvoir la recherche en herpétologie et de favoriser la communication entre les chercheurs canadiens. L'adhésion à l'ACH est ouverte à tous ceux dont le travail est relié à la biologie des amphibiens et des reptiles, particulièrement à ceux qui exercent leur travail au Canada, à ceux qui s'intéressent aux populations canadiennes, ou à ceux qui, de façon générale, sont intéressés par l'herpétologie au Canada.

Membership Form

Name: _____

Address: _____

_____

_____

Email: _____

Telephone: _____ office cell home

Annual Dues

_____ Regular Member ($20.00) _____ Renewal _____ New Member (welcome!)

_____ Student Member ($10.00) Please indicate membership year: _____

(Supervisor signature to confirm student status _____)

Please check appropriate items.

Please mail this form with correct dues (payable to the Canadian Association of Herpetologists) to:
Dr. Patrick Gregory – President and Treasurer CAH/ACH, Department of Biology,
University of Victoria, Victoria, B.C., V8W 2Y2.

CARCNET - RÉCCAR

Canadian Amphibian and Reptile Conservation Network/ Réseau Canadien de Conservation des Amphibiens et des Reptiles

For the first time we are pleased to offer multi-year memberships. This allows you to avoid the hassle of re-registering every year and protects you from increases in membership fees. Membership is from January 31 of each given year.

Student Membership: $10/ year CDN ☐ **or $30/ 3 years** ☐

Non-Student Membership: $20/ year CDN ☐ **or $100/ 5 years** ☐

Yes, I wish to donate to the on-going work of the CARCNET/ RÉCCAR including the IUCN/SSC Task Force on Declining Amphibian Populations in Canada (DAPCAN) in the amount of:

$25 ☐ **$50** ☐ **$100** ☐ **Other (Please specify):_____**

Total Amount Paid:_____

Please make cheques or money orders payable to: ***CARCNET/ RÉCCAR Please fill out and mail, along with your membership fee, to:***

Jose Lefebvre Acadia University, Biology Dept. 33 Westwood Ave, Wolfville, NS, B4P 2R6.

Title:_____ First Name:_____ Last:_____

Institution:_____

Department:_____

PO box / Unit / Building:_____

Street:_____ City:_____

Province / State:_____ Postal / Zip code:_____ Country:_____

Email:_____

Phone:_____ Fax:_____