THE CANADIAN HERPETOLOGIST/ L'HERPÉTOLOGISTE CANADIEN

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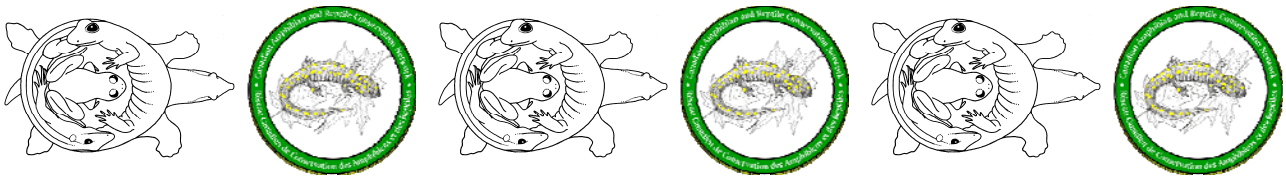

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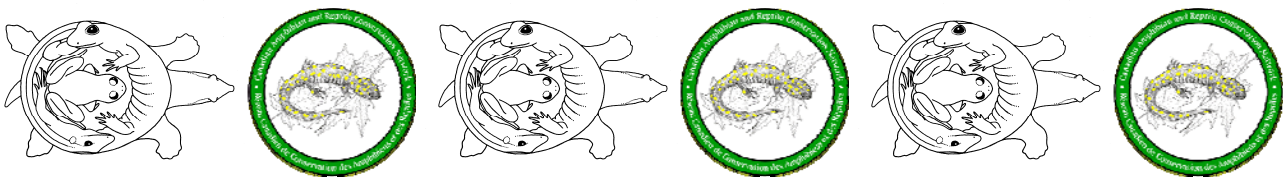

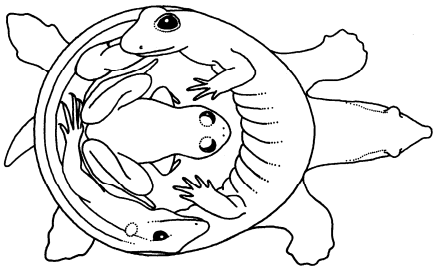

Canadian Association of Herpetologists/ Association Canadienne des Herpétologistes

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.

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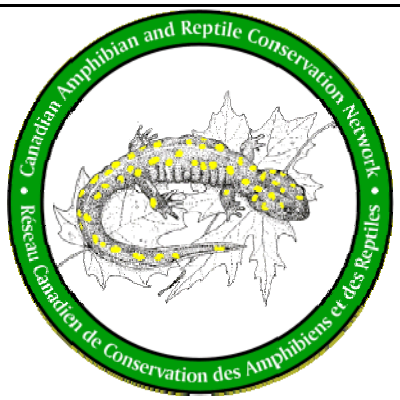

Amphibian and Reptile Conservation Network/ Réseau Canadien de Conservation des Amphibiens et des Reptiles

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 Editors (Litzgus or Ashpole).

EDITORIAL NOTES

Jacqueline Litzgus
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Welcome to spring… or is it? Back in March it seemed like summer. A few weeks ago we had 20 cm of snow in Sudbury, which blanketed the confused daffodils. Peepers were calling, then they stopped, then they were calling again. Leopard Frog egg masses were abundant at the site I surveyed two weekends ago. I wonder what this field season will be like? At first I was sure everything would be weeks early, but now I think it was a false start and everything may end up being just about on time. Better get out there and see!

Welcome to the third issue of TCH. In keeping with old and new traditions, this issue is full of great stuff. Our Feature Articles include the first of two in a series of accounts of Canadian reptile species. Some time ago, Larry Powell at the University of Calgary had proposed to gather reptile species accounts for a book that would be published by the Royal Alberta Provincial Museum; unfortunately, funds fell short and that endeavour did not come to fruition. But fortunately for us, many authors have agreed to publish their species accounts in TCH! The first pair of accounts, written by Linda Gregory, appear in this issue: Desert Nightsnake and Northwestern Garter Snake. Our third Feature Article is a contribution from Fred Scheuler and Aleta Karstad about how to distinguish the calls of Peepers and Chorus Frogs – a timely article for spring! Also included are some interesting Field Notes about an early spring encounter with a Snapping Turtle, and a new emerging infectious disease in rattlesnakes. In this issue you also will find news about upcoming meetings, and as usual, we also feature great herp images and highlight recent student theses and publications from our colleagues. I hope you enjoy reading this issue as much as I have enjoyed reviewing and compiling the diverse and interesting contributions!

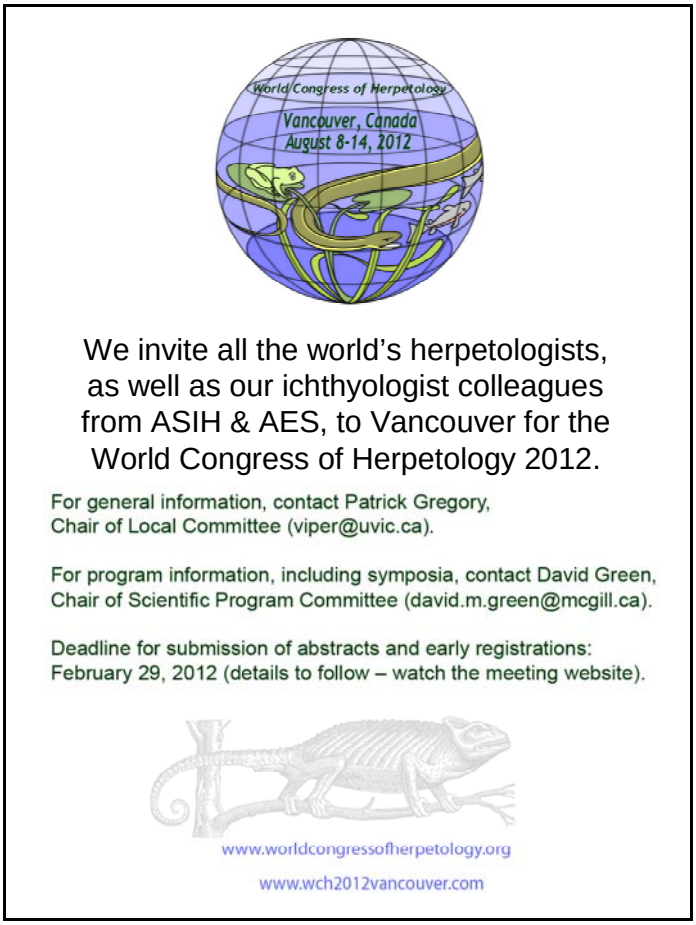
MEETINGS

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

Turtle Survival Alliance and Freshwater Turtle and Tortoise subcommittee of IUCN Meeting

The 10th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles will be hosted **16-19 August 2012 in Tucson, Arizona**. The meeting, sponsored by Zoo Med Laboratories, Inc., is co-hosted by the Turtle Survival Alliance and the IUCN Tortoise and Freshwater Turtle Specialist Group (TFTSG). The symposium has hosted an average of more than 200 attendees over the past six years and represents the largest gathering of non-marine turtle biologists in the world, providing an unmatched opportunity for networking and strategizing turtle conservation.

The host city of Tucson is in the heart of the Sonoran Desert. The months of July and August bring monsoon rains that make the desert spring to life with herps, providing wonderful opportunities to see some of North America's most charismatic reptiles. Please visit their website for more information or to register http://www.turtlesurvival.org/get-involved/conference



Note that the WCH7 also includes the 2012 meetings of CAH and CARCNET.

2012 World Congress of Herpetology Conference Travel Award from CARCNET

The Canadian Amphibian and Reptile Conservation Network/Réseau Canadien de Conservation des Amphibiens et des Reptiles (CARCNET/RÉCCAR) will provide five travel awards, valued at **$300** each, in support of Canadian students. Recipients will be selected by **random draw** and notified by email in advance with the award cheques issued to the recipient at the conference. Recipients will be recognized at the conference and on the CARCNET/RÉCCAR website and may be asked to volunteer for one to three hours during the conference. Students who have received the travel bursary previously, or who receive additional travel assistance, may also apply.

To qualify applicants must be:
1. Current CARCNET/RÉCCAR members.
2. Enrolled at a Canadian educational institute.
3. Presenting either a poster or a platform presentation at the conference.
4. Traveling greater than 500 km.
5. Complete the application form available on the website (www.carcnet.ca).

Questions and applications (English & French) can be directed to Sara Ashpole

Travel Award Application Deadline: 1 July 2012, by email to Sara Ashpole:
sashpole@uwaterloo.ca

FEATURE ARTICLES

Hypsiglena chlorophaea
Desert Night Snake – Couleuvre nocturne

Status / protection in Canada and globally: *Hypsiglena chorophaea* is red-listed in British Columbia, endangered by COSEWIC, S1 in British Columbia, N1 in Canada, G5.

Distribution: In Canada, *Hypsiglena chlorophaea* is found only in southern British Columbia, primarily from the southern Okanagan Valley. There are 20 verified and four unconfirmed records. The same species is found in the USA, south through central Washington and Oregon to northern Baja California, excluding western California, and in southwestern Idaho, Nevada, western Utah and north-western Arizona. The species *Hypsiglena chlorophaea* occurs in eleven of the western states of the USA, throughout Baja California and mainland Mexico, and along the Pacific slope of Central America to Costa Rica.

General Habitat Requirements: Desert Night Snakes are found in seasonally hot, dry areas that are associated with talus slopes or rock outcrops, including lava beds, and shrubs and grasses. In British Columbia, the range is within the bunch grass and Ponderosa Pine biogeoclimatic zones and is described as shrub-steppe with near desert conditions in some areas.

Hypsiglena chlorophaea with regurgitated prey (partial rattlesnake, *Crotalus oreganus*)
Photo by Tom Gore (but snake capture by Pat Gregory)
Reproduced with permission from Lacey et al. 1996

Critical Habitat Characteristics: There are only limited data on this species in British Columbia. However, given the habitat of this species in other parts of its range, the habitat required by more numerous co-existing species within British Columbia, and the habitat for the main food items of this species, potentially critical habitats are talus slopes, rock outcrops and sandy terraces.

Reproduction: Desert Night Snakes are oviparous. The SVL for 15 mature females from Idaho to Texas range from 338 to 553 mm, although a total length of 642 mm has been recorded, and large non-reproductive females (405 and 415 mm, SVL) have been found. The mean SVL and body mass (± SE) for 41 mature males from Idaho was 331 ± 5 mm and 12.1 ± 0.5 g, respectively. SVLs of 180 to 525 mm are recorded for 12 of the specimens from British Columbia. Of these, two (180 and 182 mm) were considered juveniles. Some preliminary data on adult Desert Night Snakes in Idaho suggest that spring-collected samples may be biased towards males; however, the sexes recorded for 13 of the

specimens from British Columbia do not show a male bias (8 females and 5 males captured).

Phenology: Desert Night Snakes may over-winter with other snakes elsewhere, but no hibernating sites have been observed in British Columbia. Mating probably occurs in spring. There are no reproductive data from Canada but data for the species from elsewhere suggest that oviposition of 3 to 8 eggs occurs between late April and early September.

Feeding: The only prey item reported for *Hypsiglena chlorophaea* in British Columbia is a neonate Western Rattlesnake. Food items for 89 individuals of the species *Hypsiglena chlorophaea* from across its range include 92 different prey items: lizards (52.2%), lizard and snake eggs (22.8%), frogs (12.0%), snakes (6.5%), insects (3.3%), and amphisbaenian (<1 %). Night Snakes are typically nocturnal and crepuscular and actively forage for food. However, in more northern areas where the nights can be cold even in summer, the species might be more diurnal.

Hypsiglena chlorophaea are rear-fanged snakes but do not always envenomate their prey. The symptoms after envenomation suggest that the venom contains a neurotoxin and hemorrhagic agent. The venom of Night Snakes is not known to be dangerous to humans.

Predators: The only documented predator is a Red-tailed hawk. Remains of an adult snake were found in a nest in Idaho.

Motility: There are no data on movements. The collection times for Night Snakes in British Columbia and Idaho represent an indication of activity periods and suggest a mainly spring/fall activity pattern. In addition, Desert Night Snakes may be more active on the surface after rain.

Other important behaviours or characteristics: The Desert Night Snake is small and may be confused with the young of other species that have blotched patterns, especially the Western Terrestrial Garter Snake (*Thamnophis elegans*). In addition, the species' small size and cryptic behaviour may limit observations of this largely nocturnal and crepuscular animal.

Economic / social importance: Desert Night Snakes, which may be confused with young rattlesnakes, may be unnecessarily killed.

Known / potential vulnerabilities: There is very little known about the biology of the Desert Night Snake in Canada or in general. However, its vulnerability with respect to potential habitat loss in Canada may be significant. The general habitat type where *Hypsiglena chlorophaea* is found in the dry interior of British Columbia is rapidly being modified by a general influx of people and an increase in agricultural activities.

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Thamnophis ordinoides
Northwestern Garter Snake – Couleuvre du Nord-Ouest

Status / Protection in Canada and globally: *Thamnophis ordinoides* is yellow-listed in British Columbia, designated Not at Risk by COSEWIC, S4 in British Columbia, N4 in Canada, G5.

Distribution: In Canada, *Thamnophis ordinoides* occurs in southwestern British Columbia, specifically on Vancouver Island, except perhaps in the central highlands, the Gulf Islands, the lower mainland and east along the Fraser Valley to Manning Park. Its range

extends south through western Washington and western Oregon to extreme northwestern California.

General Habitat Requirements: *Thamnophis ordinoides* is the most terrestrial of the garter snakes. It occurs within the coastal Douglas-fir and Western Hemlock biogeoclimatic zones of British Columbia. It occupies a broad range of terrestrial habitats, but not usually occur in dense forests. This species adjusts fairly well to human presence.

Critical Habitat Characteristics: Like other garter snakes, *Thamnophis ordinoides* requires basking areas, especially for gravid females, cover objects in the active season, and hibernating sites. It over-winters in a variety of sites including rocky outcrops, talus slopes, and holes associated with tree roots. Provision of cover objects in urban areas could contribute to the continued success of the Northwestern Garter Snake.

Reproduction: Like all garter snakes, the Northwestern Garter Snake is viviparous. Although the developing embryo is supplied with water and inorganic nutrients via the placenta, the yolk provides the principal source of organic nutrition. Mature females, 340 – 550 mm SVL, from Vancouver Island produced 2 – 19 young. However, larger mature females (up to 730 mm) and larger litter sizes (up to 28) have been found in more southerly locations.

Thamnophis ordinoides
Photo by Pat Gregory

Phenology: The Northwestern Garter Snake hibernates either communally or singly and known over-wintering sites are within or close to the summer range, which presumably reflects the relatively warm temperate climate where it occurs. The snakes mate in either spring or fall, and young are born from late July to late August.

Feeding: The Northwestern Garter Snake is a diurnal forager. It feeds almost exclusively on earthworms and slugs although a Red-legged Frog and plethodontid salamanders have been recorded in the diet in northern California.

Predators: Birds (robins, crows, various raptors) have been observed preying on the Northwestern Garter Snake.

Motility: One study of *T. ordinoides* on Vancouver Island found that snakes moved short distances (average of 41 m in a month, maximum 230 m), occupying home ranges that averaged 0.18 ha (range 0.01 - 0.33). There was no strong seasonal pattern of movement, except for increased activity of males during the mating period in spring. Movements were significantly directional, parallel to a lake, but the snakes showed no ability to use pheromonal or solar cues for orientation.

Other important behaviours or characteristics: The Northwestern Garter Snake exhibits no known territorial behaviour. The species is inoffensive and rarely, if ever, attempts to bite. These snakes do not move particularly quickly; this is especially true of gravid females, which are further encumbered by the mass of their developing young. Predator-evasion behaviours of female *T. ordinoides* differ between pregnant and postpartum conditions. Pregnant snakes exhibit less defensive behaviour and are more likely to reverse direction quickly after initial flight and then stop, relying on crypsis rather than flight to avoid capture.

Economic / social importance: The Northwestern Garter Snake is not commercially important, except perhaps occasionally in the European pet trade. It is not considered to be a pest in any way and is even valued by some gardeners because of its slug-eating habits.

This species has been the subject of interesting work concerning evolutionary aspects of its pronounced polymorphism in colour pattern. In particular, colour pattern is genetically correlated with antipredator behaviour in this species. Individual snakes are consistent over time in both colour pattern and escape behaviour.

Known / potential vulnerabilities: There are no obvious factors that make *T. ordinoides* especially vulnerable. Probably the major threats to this species are

of human origin: habitat destruction; highway mortality; predation by domestic cats; direct persecution by humans.

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Peepers and Creakers: Two species of *Pseudacris* with very different vocal variability in Eastern Ontario

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Introduction: We often say that mapping the range of Chorus Frogs in New York State in 1973 was our courtship display to each other (Schueler and Karstad 2011), and in that survey (Gibbs, *et al.* 2005), as in many since then, the primary control for the absence of Chorus Frogs (Creakers [1], or Ratchet Frogs [2] *Pseudacris "triseriata"* [3]) is the calling of Spring Peepers (*Ps. crucifer*). We've developed careful criteria for distinguishing the always-trilled call of the former from the sometimes-trilled call of the latter – Creakers never peep, but Peepers sometimes trill. We have listened to thousands of different Chorus Frog and Peeper choruses since then, and have had to hone our skills of differentiating the calls of the species. In early years we differed occasionally in our call identification, but now we agree every time – and often comment to one another that this or that trilling Peeper might easily mislead someone who hadn't studied the difference. Once you've learned the difference, it's as obvious as telling a percussion instrument from a wind instrument. We present this discussion of the issue in the hopes of clarifying it, and of giving others conceptualizations by which they can improve their identification of calling *Pseudacris*.

The classic study of Peeper vocalizations is Rosen and Lemon (1974), which characterized trilling as being given "when another calling individual is close by. The trill seems to reflect a higher degree of aggressive motivation than the peep call and may stimulate another individual to leave or else to call in the same manner. A trill encounter sometimes terminates with a brief physical interaction, after which one individual leaves" (from the abstract). Schwartz (1989) discussed variability of the duration of the trill in relation to stimuli. Probably due to these publications, the conventional wisdom is that "The aggressive call, given especially during encounters between males, is a stuttering trill, reminiscent of the calls of chorus frogs: *purrrreeeek*, usually rising in pitch towards the end" (Elliott et al. 2009, p 11).[4]

However, these studies of Peeper vocalization have been conducted in well-established nocturnal choruses during the active breeding season. Outside of such

1 thanks to F. D. Ross.

2 thanks to John Francis.

3 Moriarty Lemmon et al. 2007 – all populations discussed here are in the range of the *P. maculata* mitochondrial genotype.

4 thanks to Francis Cook

choruses, there seem to be other circumstances which promote trilling, and when we analysed "trilling in 27 of 1978 personal records of calling by *P. crucifer*... [we found that] trilling certainly occurs before 6 May, and before 21:30 hr, and within these limits at marginally cooler temperatures" (Schueler 2001). While it's plausible that aggressive trilling would be more frequent as choruses assemble early in the day or season, it's not clear why aggression should be stronger at lower temperatures or diurnally. We'd very much like to see quantitative study of the range of vocalizations we discuss, but we only discuss them qualitatively here.

We started to pay attention to trilling Peepers in 1971, when, having been introduced to Chorus Frogs the year before in travels across Ontario and the Prairies, Fred was astonished to hear a peepless daytime chorus of trills in a swamp in north central Massachusetts, hundreds of kilometres from the nearest Chorus Frogs. This was the beginning of calibrating our understanding of this phenomenon by listening to Peepers in situations when we know, from previous nocturnal listening or geographic remoteness or inappropriate habitat, that no Chorus Frogs were present. In 1996 we noticed that the Peeper trills in Renfrew County converged on those of Chorus Frogs, and Wanda Cook, in New Liskeard, well north of Chorus Frogs, reports this as a frequent style of calling from breeding ponds in the spring there.[4]

The present report presents verbalizations and descriptions of the calls of Peepers, primarily based on auditions through the morning and noontime of 23 March 2012 at a marsh near the Gunns Road/Pine River bridge, 22.1 km NW of Killaloe, and in other circumstances in the course of a survey of Chorus Frogs in Renfrew County, Ontario, during an unseasonal warm snap, in which daily temperature records were repeatedly broken, and many species emerged or called earlier than previously recorded. The Peepers recorded in detail were calling from a tussock marsh in an old river channel near a small rocky brownwater river and mixed knolly forest. The chorus had continued through the night with gradually decreasing intensity, always mostly peeps with always a few trills. At 06h59, with the first *Turdus migratorius* (Robin) song, the nocturnal chorus ended with a single peep and trill, and Fred then made notes on the character of calling through the morning. Much of our immediate concern with this question was prompted by discussion of a recording of diurnal trills by a presumed single individual that Bill Bowman submitted for discussion on the NatureList e-mail list-serve[5].

Results: Between 17 March and 7 April 2012 we recorded calling by Peepers 167 times. Of these, 111 were Wisconsin-index 2-3 full or small choruses (Mossman 1990), in 10 of which trilling was noted (9%), while in the 56 instances of sub-chorus calling, trilling was noted 7 times (13%).

Descriptions and remarks about calling through the morning of 23 March are presented in Appendix 1. Both trilling and peeping continued through the morning, and 24 of 31 records of calling (77%) included trills. Non-standard calls included "Sawwhet Owl-like (beep) series of peeps", "rough-sounding trilling", "very rough coarse trills", "very harsh trills", "few trills, bubbly and hollow", "two-note *Pseudacris regilla*-like 'kiddik' calls", "flat 'woot' peeps", "Goldfinch-like peeps", and "trills that seem strangled."

Notes on the character of the non-standard calls heard elsewhere are listed in Appendix 2. We concluded that Bill's recording was of a "very Chorus-Frog-like Peeper trill" and Dave Seburn and Emily Lemmon concurred with this identification.

Pond at Pine River
Painting by Aleta Karstad

Discussion: In the NatureList discussion of Bill Bowman's recording, Dave Seburn wrote:
"Definitely a Peeper. Not even as Chorus Frog-like as some Peeper trills. To me, this call sounds like a musical note that is extended and changes in tone. It is really lacking the creaking of a Chorus Frog... It's generally really obvious if it is a chorus of Chorus Frogs, it's just when you get one or two froggies giving wimpy little calls that it sounds half way between a Peeper and a Chorus Frog... My general sense is that the Peeper trill is more similar to the Peeper call in tone. The Chorus Frog call is more of a distinct ratcheting call, although when both are calling it can be hard to sort out."

5 On 1 April 2012, on Pine Road at the edge of Gatineau Park, about 17h00, of a single *Pseudacris* giving a trill

The difficulty in distinguishing these calls can mean that with an inexperienced auditor, Peeper trills can easily wind up in an atlas database as a Chorus Frog, which makes it important to get these identifications right, since it's effectively impossible, especially during the day when Peepers trill most frequently, to get close enough to the caller to make a visual identification. We verbalize the difference as a "prreeeeeep" trill, as opposed to the "grrriiiiick" of a Chorus Frog. Listening to mixed chorus of Peepers and Chorus Frogs doesn't help one learn the difference because ambiguous trills just get mixed in with those of the other species. You have to learn this with choruses known to be composed of only a single *Pseudacris* species.

In the March 2012 warm period, which could be thought of as a prolonged "getting started" for the spring, we were impressed by the generalization that Peepers, despite their various calls, ranging from "peep" to "squeak" to "brreep" to "beep" to "peedeedeedeep," always sound musical, like an ocarina, or other tiny wind instrument - but Chorus Frogs only have one kind of call, and that is a quick succession of clicks with a rising inflection - a ratcheting percussion instrument. The clicks are faster when the frog is warm, and slower when cold, but it is always distinctly percussive. No Peeper could make that sound - it would be like trying to get an English-speaking person to pronounce a Bushman language that's infused with clicks. There are no clicks in a Peeper's call! - however sometimes in the midst of a really deafening Peeper chorus, the listener's eardrums rattle with what might be a different call, or which might just be a combination of overtones.

Aleta spends hours sitting quietly and painting by the sides of roads and edges of marshes. This gives her plenty of time to notice what individual birds - and frogs - are 'saying", and she notes that when a single Peeper begins calling in the evening, it frequently starts as a tentative squeak as if it were clearing its throat, and gradually this one individual's call will strengthen to a trill, and finally to peeping, and that individuals also more often squeak and trill when they're just getting started up during the day (Appendix 1 notes 5 instances of calling beginning with trills and transitioning to peeping). If these preliminary trills are an aggressive call, this could be seen as "trying out" the immediate surroundings for competitors before beginning to give the peeping advertisement call.

A number of questions are raised here, some of which may be difficult to study because diurnally calling frogs are so shy of being approached. We wonder if Peepers don't trill so much when they're calling with many Chorus Frogs? Do female Chorus Frogs ever approach trilling Peepers? Do the various other Peeper calls have behavioural significance, or are just accidentally intermediate between "advertisement" peeps and "aggressive" trills? Is there geographic variation in the character and meaning of the trill? Is there a phylogenetic relationship or is there character displacement among the calling of the different species?

Postscript: This account was composed in the cold period that followed the late March 2012 warm snap, and since then we've completed the survey of the northern limit of the range of Chorus Frogs in southern Ontario, concluding, on the basis of isolation and habitat, that the outlying records of Chorus Frogs from the Ontario Herpetofaunal Summary and the Ontario Herp Atlas are very likely false leads – probably all were trilling Peepers reported by otherwise naive cottagers, confirming the importance of the problem addressed here (Schueler and Karstad, 2012, *in prep*, report to Canadian Wildlife Federation).

Acknowledgments: This spring's surveys are supported by a grant from the Canadian Wildlife Federation; Francis Cook, Mike Oldham, Stew Hamill, and especially Dave Seburn participated in the discussion of trilling on the NatureList, and Dave reviewed the manuscript.

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FIELD NOTES

Swamp Thing: How I learned to stop worrying and love *Chelydra serpentina*

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The spring sampling season for Jefferson Salamanders (*Ambystoma jeffersonianum*) (JESA) snuck up on us early this year, with the 'magic' happening in early March. Being almost a full month earlier than the previous season, the scramble for permitting was on. A few string pulls and promises of future beers later, I headed to the field with permits in hand to sample four potential breeding aggregation ponds, adjacent to proposed development sites, in Southern Ontario.

With hopes high and traps in tow, I set out on an unnervingly gorgeous early spring day: mid March, 2012, +/- 17 ^{o}C. After a brief hike through suburban constructs and an over-utilized trail system, I had arrived at our first location, a small pond demarcating the no-man's land between land uses: traditional agriculture lands slowly being overtaken by estate homes and urban sprawl on one side, with a typical transitional zone mid-late successional mixed forest on the other. While the forested area was oft bisected by unofficial trail systems (and the occasional burnt-out 1989 Buick LeSabre), it had at least moderate potential to provide habitat to JESA populations, as further evidenced by other documented populations in the area.

As one often does upon arriving at their first pond location, on their first day of spring sampling of the year that also happens to be a gorgeous day, I found myself pondering the great enjoyment of the small pleasures associated with field work, and the overall meanings of life outside of the office environ. Begrudgingly, these thoughts were quickly invaded by more earthly pursuits; why I was carrying such jagged-edged traps, what I wanted for dinner, and how to set traps to sample a still frozen pond. As I approached the pond edge and tested the ice with my wellingtons, it was clear how to proceed – this was going to be a stomp and set.

Upon my visual assessment of where my traps were going to end up, I proceeded to the first trap location where I crashed through a few centimeters of ice far enough from shore to submerge the trap. As I stood ankle deep in the early spring pond, a strange, leathery looking mass started emerging from the depths through the nearby hole. While I'm no newcomer to pond wading, the sudden presence of a large, unidentified brownish mass surfacing inches from my feet through a hole in the ice conjures deep-seeded childhood fears of 'Swamp Thing'-like creatures dragging me kicking and screaming into the depths to a certain watery doom. It took a few startled seconds to come to the realization that this Swamp Thing meant me no particular harm. Quickly identifying it as a Snapping Turtle (*Chelydra serpentina*), my shock became amusement, then reverence. This magnificent creature was sharing its first breath of the season with me, and in its own unique way saying thank you for breaking the ice to allow it to do so.

Chelydra serpentina breaking through pond ice
Photo by Erin Corstorphine

Perhaps this turtle and I forged a lifelong bond through a shared, pleasant, first-of-season experience and allowing itself to be admired and photographed was its way of cementing the bond… or perhaps it was just cold. While I am almost certain that this particular specimen was not consciously tracking my movements through inches of opaque ice with thoughts of potential freedom from its winter captivity, and further still

thanking me for its first breath, I do know that the same turtle showed up on each subsequent visit… and seemed to wink in my direction.

Massasaugas Succumb to Flesh-Eating Fungal Infections

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Multiple fatal fungal infections have been recorded in a wild population of Eastern Massasauga Rattlesnakes (*Sistrurus catenatus catenatus)* at Carlyle Lake, Illinois, U.S.A. Canadian investigators and resource managers who work with the species in Ontario should take note!

Carlyle Lake Population

The infected snakes were residents of a small population (50-60 adults) of Eastern Massasauga Rattlesnakes at Carlyle Lake in southern Illinois (not far from the infamous 'snake road'). Tests on infected tissue determined the cause to be a keratinophilic fungus *(Chrysosporium* sp.), a fungus which attacks keratin (skin), muscle, and bone. The infection causes severe facial swelling and grotesque disfiguration consisting of lesions and ulcers with microscopic hyphae (See Allender et al. 2011 for photos).

Dan Wylie, a Canadian Herpetologist working with the Illinois Natural Heritage Survey, first discovered signs of infection in 2008. Three diseased snakes were found and all died within three weeks of discovery. Despite long-term monitoring work on this population since 1999, which included radiotelemetry, mark-recapture, and health monitoring studies, no signs of disease were observed pre-2008. Since then, however, over five snake mortalities have been attributed to the fungal infection. Another severely infected snake was discovered this year and is currently undergoing treatment. Our colleagues in Illinois have found it extremely difficult to treat infected snakes and attempts thus far have been unsuccessful. One snake had to be euthanized despite being treated for more than a year.

Transmission is unknown and infected snakes have been recorded from two discontinuous sites at Carlyle Lake. Keratinophilic fungi are widespread and found naturally in the soil. Wiley speculates that extensive basking and proper feeding are what allow healthy snakes to overcome the infection naturally but immune compromised snakes (those with acute toxicity, bacterial infections, wounds from predators, etc.) succumb to severe infections and mortality.

Other Rattlesnakes

Captive reptiles aside, fatal skin infections have also been documented in wild populations of other species of rattlesnakes. In one case, multiple infections causing oral and facial lesions were recorded in a relatively large population (~600) of Pygmy Rattlesnakes (*Sistrurus miliarus barbouri)* in Central Florida (Cheatwood et al. 2003). Over the course of a five-year population study (1992-1997), 59 snakes were observed with moderate to severe lesions, and snakes with severe lesions were either found dead in the field or were moribund. More than one species of fungus was believed to be involved in the infections.

In a more recent case, infections were noted in a small population of Timber Rattlesnakes, *Crotalus horridus,* in New Hampshire (Clark et al. 2010). In 2006, many of the rattlesnakes were found with skin lesions around the head, chin and body (this population had been studied since 1992). Three of these snakes were later found dead of an undetermined cause, and many more were not relocated in subsequent surveys. The authors estimate that the population of only about 40 individuals had declined by roughly 50% between 2006 and 2007 (although skin lesions were not entirely to blame, morphological abnormalities were also observed in other individuals). Tissue was not thoroughly examined and it is unknown if the infections were fungal in origin (for photos, search "Timber rattlesnake lesions" at www.fieldherpforum.com).

Massasauga Rattlesnake
Photo by Joe Crowley

Ontario Massasaugas

Although reports of fungal infections in Ontario snakes have yet to surface, investigators here should be aware of the possibility. To assist with detection, Allender et al. (2011) recommend intensive health monitoring across the species range. Unfortunately, this approach is extremely expensive and time consuming and may not be practical given the constraints of many monitoring programs. Regardless, investigators should be on the lookout for puss scabs on the body of snakes shortly after emergence from hibernacula, and (unlike hibernation blisters which generally heal after first shed) persist and develop into more severe lesions and infections. If abnormalities are detected in Ontario snakes, it would be a good idea to seek advice from workers at the Illinois Natural History Survey, who have already had some experience with the disease.

Of course prevention is the best medicine. To date, no direct evidence has confirmed that handling techniques have been involved in fungal outbreaks or in the transmission of fungus to healthy snakes (see Cheatwood et al. 2003); nonetheless, we should take appropriate precaution. Cheatwood (2000) provides a discussion and protocol for safe handling and sampling of wild reptiles in order to prevent the spread of infectious diseases, and it is worthwhile to give our own protocols a thorough review.

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BOOK REVIEWS

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

Historical Herpetophiles

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Who put the Storer (not to mention the De Kay) into *Storeria dekayi*? To answer this question we turn to Tom Herman and his review of *The Eponym Dictionary of Reptiles* by Bo Beolens, Michael Watkins and Michael Grayson, recently released by the Johns Hopkins University Press.

The Eponym Dictionary of Reptiles

Reviewed by Tom Herman

What's an 'eponym', you ask? – Even if we don't know what they are, we're all familiar with eponyms. Like many terms associated with language….from homonym to homophone, and antonomasia to apothegm….we employ them without realizing it. By now I suspect you are wondering, and wandering cyberspace to find out, just when you last uttered a homophone or committed antonomasia!

An eponym, quite simply, is "one for whom or which something is named or supposedly named" (Webster's Third New International Dictionary, 1961), and in the present case the "something" are reptiles. This tome joins two others of a similar nature, one on birds (Whose Bird? – Beolens and Watkins, 2003) and one on mammals (The Eponym Dictionary of Mammals – Beolens, Watkins and Grayson, 2009). All three are delightful.

This is a monumental undertaking. More than 4,100 different eponymous reptile species, not to mention several dozen genera, have been tracked down. The tracks remind us of the deep and abiding connections we develop with the organisms we love. We all have our

favorite reptiles, and without exception each of those has an official, and sometimes unofficial, human associate. And it's those associates and their stories that are the subject of this book.

When you pick it up, you will first go to the species or the names that are closest or most familiar to you. But if you're like me you'll revert to the behavior of your childhood, when you went to the encyclopedia for one thing and ended up in a very different place, distracted, but much the richer and wiser for your wanderings.

So I immediately went to John Edwards Holbrook - a central figure in the history of North American herpetology and the taxonomic authority for my 'totem' species *Emydoidea blandingii*. And my journey began. I learned that Holbrook's research career fell victim to the spoils of war, terminating prematurely when his collections and manuscripts were looted by Union troops overrunning Charleston. Despite the profound impact this may have had on 19th century herpetology (Holbrook did no further work), there was nary a mention of it in my Grade 11 American History class! Who knew?

Blanding's Turtle
Photo by Joe Crowley

From there, I drifted to John Edward Gray, and the insights and discoveries continued. Gray, Keeper of Zoology at the British Museum and an admitted philatelist, not only described the Aldabra tortoise and elevated the Round Island Boa to its own genus, but named numerous other reptiles – many after himself! Following a severe stroke, Gray departed briefly from his self-absorption and actually named a lizard after his wife, who despite her preferences for conchology served as his amanuensis, and clearly tolerated his excesses and eccentricities.

In pursuit of another personal favorite, the St. Croix Ground Lizard *Ameiva polops*, I delved into the life of Edward Drinker Cope, who described this little island gem and dozens of other species. Most of you will probably know Cope from his famous "rule" regarding the evolution of body size through time. Cope was apparently so fond of his name and himself that he requested that his body be used as the holotype for *Homo sapiens*! However, the body turned out to be somewhat sub-standard (a bent frame, perhaps?) and Cope's request was not honored.

And this is only a small fragment of my journey, to provide taste and context. Some readers might have difficulty finding their favorites in this book. If your totem species is long extinct, or only recently and dubiously named, then you're out of luck. The book covers only extant or recently extinct reptiles; the authors deliberately avoid the murky, ephemeral, contentious and exponentially expanding world of fossil species. Similarly, they avoid those extant species recently named with questionable authority after former astronauts, favorite barkeeps, and relatives of famous train robbers.

But that still leaves more than 4,100 reasons to explore this lovely work. Should you buy it? If you're fascinated with the human dimensions of biodiversity, probably; if you're also a logophile, absolutely….but if you're not, you could always borrow it from a friend who is!

The Eponym Dictionary of Reptiles. Bo Beolens, Michael Watkins and Michael Grayson. 2011. The Johns Hopkins University Press. Baltimore. 296 pp.

About the reviewer—Tom Herman is the Vice-President Academic at Acadia University. Tom's research continues to play a pivotal role in the effort to restore the endangered Blanding's turtle and threatened ribbonsnake populations in Nova Scotia. Tom's focus on stewardship and public education has resulted in an amazing community of researchers and concerned citizens dedicated to the preservation and restoration of these species. To learn more about Tom's research visit:

http://www.speciesatrisk.ca/blandings/
http://vpacademic.acadiau.ca/biography.html

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 Editors.

Banger, N. M.Sc. 2012 University of Ottawa, Ottawa, ON. (co-supervisors: Gabriel Blouin-Demers and Steve Lougheed).
Consequences of multiple paternity for female fitness in an Ontario population of Northern Map Turtles, *Graptemys geographica*.

Map Turtle
Photo by Joe Crowley

Although sexual stereotypes paint males as being promiscuous and females as being choosy in order to increase their reproductive success, multiple mating by females is widespread and females of many taxa often produce progeny sired by multiple males – but why? In species in which there are no direct benefits associated with mating, females may adopt promiscuous mating strategies to increase their fitness through the acquisition of genetic benefits. Here, I examine the genetic mating system of Northern Map Turtles, *Graptemys geographica,* in Lake Opinicon. Based on the most conservative estimate, at least 71% of clutches in this population are sired by multiple males. There did not appear to be any relationship between female body size and frequency of multiple paternity. There was a marginally significant effect of multiple paternity on hatching success and survival of clutches, but there was no effect on hatchling morphology or locomotor performance.

Boenke, M. M.Sc. 2011. Redpath Museum, McGill University, Montreal, PQ. (Supervisor: David Green).
Terrestrial Habitat and Ecology of Fowler's Toads (*Anaxyrus fowleri*)

Fowler's Toad
Photo by Joe Crowley

Habitat loss is the primary driver of global amphibian declines and thus preserving habitat is our best hope for preserving these species at risk. The habitat needs of amphibians are complex due to terrestrial and aquatic requirements throughout their life history. Many pond breeding amphibians spend the majority of their life cycle within terrestrial environments and thus terrestrial habitats are critical to their persistence. Cryptic and fossorial behaviour makes observations of amphibians in terrestrial habitats difficult. Our knowledge of the terrestrial ecology of amphibians is therefore incredibly limited. I review the literature on habitat loss, amphibian declines, and terrestrial habitat use by amphibians with specific attention to refuge seeking behaviour (CHAPTER ONE). I used radio-tracking to investigate the behaviour of Fowler's toads *(Anaxyrus fowleri)* in the beach dune ecosystem of Long Point, Ontario. Refuge seeking behaviour by these animals is associated with specific components of the dunes and is predictable based on elevation, slope, and distance from the lakeshore. Refuge sites placement is not random, but instead represent a trade-off between risk and reward (CHAPTER TWO). Philopatry in Fowler's Toads is driven by fidelity to refugia. These locations are used repeatedly on consecutive days, and even when they are not new, sites within 10 m of the previous day's refuge are most often chosen. Occasionally, however, toads relocate their refuge sites as much as 700 m overnight (CHAPTER THREE). This contributes to the wide variation in the home range sizes of Fowler's Toads, as does method of calculation and

search effort, while there is little apparent influence of intrinsic biological factors. The effect of search effort on range size is reduced in robust location data sets with more than 30 locations for each animal. A minimum home range estimate of 3517 m^2 is suggested under the caveat that range sizes may have no hard upper limit (CHAPTER FOUR).

Krause-Danielsen, A. M.Sc. 2012. University of Manitoba, Winnipeg, MB. (Co-supervisors: Pamela Rutherford and Nicola Koper).

Using landowner knowledge and field captures to determine habitat use by the Northern Prairie Skink (*Plestiodon septentrionalis*) on exurban residential land in southwestern Manitoba.

Exurban development, consisting of low density residential housing in a rural setting, is steadily increasing in North America. This increase may have negative impacts on the habitat for some species, through the introduction of non-native plants and new predators such as house cats. The Northern Prairie Skink (*Plestiodon septentrionalis*) is listed as Endangered in Canada, occurring only in southwestern Manitoba.. The objectives of this study included: a) defining prairie skink microhabitat use on private land according to vegetation, temperature and cover availability, b) determining landowner awareness of prairie skinks on their property, and c) determining how landowner stewardship could be used in skink conservation. Methods of data collection included both quantitative habitat surveys and qualitative landowner interviews. I found that prairie skinks were most often found in prairie habitat, and were found most often in areas with a) high % artificial cover, b) high leaf litter, and c) more pieces of cover per acre. Landowners most often saw skinks near buildings, in flower beds, and in debris piles. Landowner attitudes towards skinks were positive though knowledge was lacking.

Moldowan, P. B.Sc. 2012. University of Guelph, Guelph, ON. (Co-supervisors: Ryan Gregory and Tom Nudds).

Influence of genome size on call complexity of anurans.

Genome size is the amount of haploid DNA in a nuclear genome. Cell size is strongly positively correlated with genome size in amphibians. Further, cell size exhibits a negative relationship with complexity of the anuran brain and central nervous system. In terms of behavioural consequences of this genome size-cell size-neural complexity relationship, it has been hypothesized that differences in DNA content may drive the differential call complexity observed between anuran taxa. If central nervous system and brain complexity decrease with increasing cell size (reported by Roth et al. 1994) it is expected that anurans with large genomes will have low call complexity. Despite well noted call structure modifications attributable to cell size in diploid-polyploid frogs, no investigation has yet compared more continuous genome size measurements with call complexity. In this study, six measures of call complexity are compared with genome size across a taxonomically diverse anuran sample, controlling for body size and evolutionary history. Dominant frequency and bandwidth demonstrate a significant negative correlation with call complexity. These results provide limited support for the proposed hypothesis and suggest that the cell size-neural complexity relationship is not a unifying mechanism controlling call complexity. Discussion is granted to the possible causal mechanism(s) responsible for the identified genome size-call complexity relationships. Alternative mechanisms describing the evolution of anuran call complexity are examined, including environmental and sexual selection, reproductive character displacement, genetic drift, and predator-prey interactions.

Northern Leopard Frog
Photo by Joe Crowley

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.

Cundall, D. and A. Pattishall. 2011. Foraging time investment in an urban population of watersnakes (*Nerodia sipedon*). J. Herpetol. 45: 174-177.

Cundall, D., E.L. Brainerd, J.A. Constantino, A. Deufel, D. Grapski, and N. Kley. 2012. Drinking in snakes: resolving a biomechanical puzzle. J. Exp. Zool. 317: 152-172.

Eigenbrod, F., S.J. Hecnar, and L. Fahrig. 2011. Sub-optimal study design has major impacts on landscape-scale inference. Biological Conservation 144(1): 298-305.

Forzán, M.J., R.V. Vanderstichel, C.T. Ogbuah, J.R. Barta, T.G. Smith. 2012. Blood collection from the facial (maxillary)/musculo-cutaneous vein in true frogs (family Ranidae). Journal of Wildlife Diseases 48(1): 176-180.

Hecnar, S.J., and D.R. Hecnar. 2011. Microhabitat selection of woody debris by Dekay's Brownsnake (*Storeria dekayi*) in a dune habitat in Ontario, Canada. Journal of Herpetology 45(4): 478-483.

Dekay's Brownsnake
Photo by Joe Crowley

Hecnar, S.J., F.N. Dawson, and W.F. Weller. 2011. Geographic distribution: *Chelydra serpentina serpentina* (Eastern Snapping Turtle). Herpetological Review 42(4): 564.

Hecnar, S.J., T. Dobbie, K. Leclair, R. Thorndyke. 2012. Hibernation: *Plestiodon fasciatus* (Five-lined Skink). Herpetological Review 43(1): 138.

Kingdon, K. 2011. Re-evaluation of the relative abundance of five frog and toad species in Riding Mountain National Park, Manitoba. Blue Jay 69(4): 168-177.

Larocque, S.M., S.J. Cooke, and G. Blouin-Demers. 2012. A breath of fresh air: avoiding anoxia and mortality of freshwater turtles in fyke nets by the use of floats. Aquatic Conservation: Marine and Freshwater Ecosystems (in press).

Larocque, S.M., A.H. Colotelo, S.J. Cooke, G. Blouin-Demers, T. Haxton, and K.E. Smokorowski. 2012. Seasonal patterns in bycatch composition and mortality associated with a freshwater hoop net fishery. Animal Conservation 15: 53-60.

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Larocque, S.M., P. Watson, S.J. Cooke, and G. Blouin-Demers. 2012. Accidental lure: do deceased fish increase freshwater turtle bycatch in commercial hoop nets? Environmental Management (in press).

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.

Lelièvre, H., P. Legagneux, G. Blouin-Demers, X. Bonnet, and O. Lourdais. 2012. Trophic niche overlap in two syntopic colubrid snakes (*Hierophis viridiflavus* and *Zamenis longissimus*) with contrasted lifestyles. Amphibia-Reptilia 33: 37-44.

McMaster, A. 2011 Northern Prairie Skink. Blue Jay 69(4): 184.

Millar, C.S. and G. Blouin-Demers. 2012. Habitat suitability modelling for species at risk is sensitive to algorithm and scale: a case study of Blanding's turtle, *Emydoidea blandingii*, in Ontario, Canada. Journal for Nature Conservation 20: 18-29.

Millar, C.S., J.P. Graham, and G. Blouin-Demers. 2012. The effects of sex and season on patterns of thermoregulation in Blanding's turtles (*Emydoidea blandingii*) in Ontario, Canada. Chelonian Conservation and Biology (in press).

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 (in press).

Row, J.R., G. Blouin-Demers, and S.C. Lougheed. 2012. Movements and habitat use of eastern foxsnakes (*Pantherophis gloydi*) in two areas varying in size and fragmentation. Journal of Herpetology (in press).

Weatherhead, P.J., G. Blouin-Demers, and J.H. Sperry. 2012. Mortality patterns and the cost of reproduction in a northern population of ratsnakes, *Elaphe obsoleta*. Journal of Herpetology (in press).

Weatherhead, P.J., J.H. Sperry, G.L.F. Carfagno, and G. Blouin-Demers. 2012. Latitudinal variation in thermal ecology of North American ratsnakes and its implications for the effect of climate warming on snakes. Journal of Thermal Biology (in press).

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.

NEWS AND ANNOUNCEMENTS

CARCNET/RÉCCAR Administrative Update

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Since the last AGM in September 2011, several significant changes to the administration of the society have taken place. The Board would like to welcome Dr. Steve Mockford as the new Chair of the Board of Directors, whose term will begin in August 2012. The Board of Directors thanks Dr. Pamela Rutherford for her service as past chair as well as Dr. David Green for assuming the role of Interim Chair until a new Chair was found.

Over the last six months, the Board has been hard at work to update CARCNET's governing documents, by-laws and terms of reference for officers and committees. These new documents are now available on our website. With these updated documents come a number of changes to the way that CARCNET operates, the most significant of which is greater membership involvement in the operation of the organization. First, participation in committees, which was previously restricted to Directors, is now open to the general membership. Committees are responsible for accomplishing specific projects or tasks and the new committee structure will help the organization move forward on important reptile and amphibian conservation work. Committees are also an excellent opportunity for members to become more involved in CARCNET's activities. A list of current committees and their function is available on CARCNET's website. Secondly, the membership will now be involved in election of new Directors, including the Vice-Chair (who is also the Chair-elect). When Board vacancies arise, members will be asked to nominate and elect new Board members.

Next steps:
1) There will be an election at the AGM (as part of the WCH) in August for a Vice-Chair (who will become the next Chair) and another Director. Information about the upcoming election will be sent out within the next few months.
2) The new governing documents, by-laws, and terms of reference will be ratified by the membership at the AGM in August.
3) If you are interested in becoming more involved with CARCNET's work, e-mail info@carcnet to inquire about joining a committee.

KLO Eco Club, Kelowna BC

Erin Loukras and T'keya Delwo

Two years ago, at KLO Middle School in Kelowna BC, we found baby Western Painted Turtles in our long jump sand pits. We brought the two turtles that survived into our classroom and two dedicated students fed them every day and changed the water from their terrarium weekly. After two months, we released them in Fascieux Creek that runs on our school property. We then realized that more turtle eggs must be already laid in the sand pits, we quickly took action. With the help of our Science teacher Mme Hamilton, two fences were built around the sand pits to protect the turtles nesting habitats. The fences are keeping the turtles protected from danger of students accidently stepping on them. We hope that in the springtime, the turtle offspring will make it safely to the creek without being disrupted by students.

We are currently trying to restore Fascieux Creek on our school ground and to build a wetland so the turtles

and other animals can live safely in it. Wetlands are important to so many animals like dragonflies and frogs as well as the turtles and restoring Fascieux Creek is very important to us. We would also like to add an outdoor class for hands-on learning. After four years spent on raising money and convincing the school board members regarding our project, we are hoping that this summer we will be able to restore the creek and build a wetland. We would like to thank Mrs. Sara Ashpole from the University of Waterloo for her great advice on Western Painted Turtles.

Club members include Grade 8 students Erin Loukras, Nyssa Morgan, Domonique Murdoch, and Gabby Mendler.

2011 CARCNET/RÉCCAR Scholarship

Congratulations to **Natasha Lukey** of the University of Waterloo for her research on the American Bullfrog!

Adaptive Management of Invasive Bullfrogs, *Lithobates catesbeiana*, in the South Okanagan Valley, British Columbia

The sensitive desert habitat of the South Okanagan Valley, British Columbia, is home to a shrinking group of amphibian species, half of which are provincially listed as threatened or endangered (British Columbia Ministry of Environment, 2007). A threat to the persistence of the Okanagan's amphibians is the introduced American Bullfrog, *Lithobates catesbeiana.* Listed as one of the top 100 of the world's worst invasive alien species (IUCN, 2010), introduced bullfrogs out-compete (Kats and Ferrer, 2003), predate (D'Amore et al., 2009), and transmit disease (Garner et al., 2006) to native amphibians. Accidentally introduced in the 1950's to the South Okanagan Valley, bullfrogs in recent years have been detected in 5 wetlands. In response to the bullfrog populations, an eradication program was instated in 2004. Since the implementation of the control program, detections have decreased from a high of 73 adults and/or juveniles in 2005, to 4 adults and/or juveniles in 2010 (Ashpole et al., unpubl. data). My research focuses on the post-removal period; I aim to determine 1) the proportion of wetlands vulnerable to recolonization, 2) human effort required through time for long-term bullfrog population suppression, and 3) the high risk, human related bullfrog vectors in the South Okanagan.

The habitat suitability model and human effort analysis will aid conservation decisions in determining how much and at which water bodies monitoring effort is required for long-term bullfrog population suppression. Continued population suppression will reduce the probability of bullfrog recolonization, and remove pressure on native herpetofauna populations. The provincially endangered Blotched Tiger Salamanders, who require the same habitat as invasive bullfrogs, will particularly benefit from continued bullfrog absence. This research directly contributes to the education of citizens regarding amphibian conservation. Awareness surveys were distributed with amphibian education sessions in grade-schools, natural history interpretive centers, and public venues such as farmers' markets. Surveys distributed to businesses and landowners were accompanied by educational articles and amphibian identification cards. Knowledge gained from the surveys will provide insight into where education efforts need to be focused for land owners, vector businesses, and the public. New landowners are aware of the The Land Conservancy BC, resulting from partnership in survey distribution. These landowners are potential partners in conserving, enhancing, or restoring wetlands on their property.

Hypotheses being tested:

1) Wetlands at highest risk of bullfrog invasion are stagnant and permanent, with invasive predatory fish present, surrounded by agricultural or urban land.
2) Monitoring effort required to suppress bullfrog populations will increase as detections decrease.
3) The majority of South Okanagan land owners, vector businesses, grade-school teachers, and public will hold little to no knowledge of bullfrog presence, identification, or reporting in the South Okanagan.

Proportion of wetlands vulnerable to bullfrog invasion: I am building a habitat-suitability model for 111 wetlands over a 360 km^2 study area. The model uses Geographical Information Software and MaxEnt (Philips et al., 2006; Bradley, 2010; Ficetola et al., 2010). MaxEnt software outperforms other commonly used habitat suitability modeling software (Philips et al., 2006; Elith et al., 2011) works well regardless of sample size (Hernandez et al., 2006), and requires presence-only data. The model is based on ecological niche theory, which assumes fitness of individuals is linked to their environment, and therefore, that species are adapted to survive within specific environmental constraints (Hirzel and LeLay, 2008; Grinnell, 1917). Environmental predictor variables in the model are distance from a known bullfrog breeding location (Ingram and Raney, 1943), hydro period, and water velocity (Wang and Li, 2009), land cover between water bodies (Maret et al., 2006), and presence of introduced predatory fish (Bunnell and Zampella, 2008). The output will be a map of the South Okanagan's water bodies ranked according to threat of bullfrog invasion. The model is being tested against historical bullfrog occurrences in the study region to increase the model's strength as a predictive tool. We will also use the model to predict future scenarios, including urbanization (changing land cover) of existing natural and agricultural habitat.

American Bull Frog
Photo by Joe Crowley

Human and trap effort required for long-term population suppression: I will use past bullfrog control data (Ashpole et al., unpubl. data) to determine the effort required to suppress and maintain bullfrog populations. The effort data available include capture method, time spent per capture/detection session, number/stage of bullfrogs detected/captured, and participant for the 8 years of the program. Effort will be divided into human effort for night-time auditory surveys, human effort for night-time canoe encounter searches, and trap effort for the wire mesh minnow trapping system. We will calculate per unit effort for each category of effort, using the standard catch per unit effort calculation (CPUE; Nelson and Clark, 1973). The CPUE will be plotted against time, and analyzed with logistic regression analysis to provide insight as to how much effort through time is required to suppress or eradicate the South Okanagan's bullfrog populations.

Citizen awareness and high risk human vectors: Four target groups received bullfrog awareness surveys in 2010-11: 1) grade-school teachers, 2) businesses that may act as potential bullfrog vectors, 3) land owners living adjacent to colonized or at-risk water bodies, and 4) the general public who recreationally use at-risk wetlands. The surveys were designed to determine the level of knowledge target groups hold regarding bullfrog presence, identification, and reporting in the South Okanagan. After the surveys, participants received articles about amphibian conservation and impacts of bullfrogs, amphibian identification cards, and a list of agencies to contact with observances. Three of the 5 grade schools in the Okanagan willingly participated, and 23 businesses, 67 members of the public, and 56 landowners received surveys. We will use standard descriptive statistics, using BioStats (AnalystSoft Incorporated, 2009) to characterize and quantify the level of knowledge South Okanagan residents hold regarding bullfrog identification, monitoring, and reporting. We will also use the information gained to tailor amphibian and bullfrog education programs to each target group.

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Ontario Reptile & Amphibian Atlas Update

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In 2009, Ontario Nature, in partnership with the Ontario Ministry of Natural Resources, Eastern Ontario Model Forest, and Environment Canada, began a provincial initiative to increase knowledge about the distribution and abundance of Ontario's herpetofauna. The Ontario Reptile and Amphibian Atlas (ORAA) uses data from existing databases, citizen scientists, and researchers to compile range maps based on 10 km^2 squares, covering the entire province. This information is critical for filling knowledge gaps for species at risk and developing baseline data for all species.

Data submitted in 2011 have now been incorporated into the atlas database and this year we had **51,018** new records from 888 'atlas squares.' This puts the atlas database of complete records at **153,024** submitted by over 600 participants. Join our ever growing list of contributors and help us break the 200,000 mark by submitting your observations of reptiles and amphibians! All new data has been used to update provincial range maps, so check them out on our website (www.ontarionature.org/atlas).

If you have an existing dataset of reptiles and amphibians in Ontario, we would love for this information to be incorporated into the atlas. Feel free to contact James Paterson at jamesp@ontarionature.org or by phone at 416-444-8419 x 243 for inquiries about data sharing, quality control, or other questions relating to the atlas.

Announcing the Manitoba Herps Atlas

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The Manitoba Herps Atlas (MHA) is a new citizen-science project operated by www.NatureNorth.com, Manitoba's online nature magazine. It began collecting location records for amphibians and reptiles in Manitoba in 2011. You can view the site at this URL, http://www.naturenorth.com/Herps/Manitoba_Herps_Atlas.html .

The MHA lets people enter records of herp locations and view the results online. It makes use of newly available, simple internet technologies such as Google Fusion Tables to collect and present location data. In its first year of operation, more than 1100 records have

been submitted, including many for a number of Species at Risk in the province. More than 40 individuals have submitted records so far. Initial analysis of the data has shown a range extension for the Mink Frog in southeast Manitoba, as well as other interesting records for a number of other species. The project is off to a good start, but needs to involve more people from remote and northern parts of the province in data collection.

The MHA is run by Manitoba biologist, Doug Collicutt, with funding from Manitoba's Sustainable Development Innovations Fund and the Endangered Species and Biodiversity Fund. Doug Collicutt can be reached at dcoll@mts.net.

The Canadian Field-Naturalist now fully on-line

Francis R. Cook, Associate Editor, Herpetology,
The Canadian Field-Naturalist

One of the oldest publications that features peer-reviewed original manuscripts on Canadian and adjacent United States natural history research and observations, including herpetology, is *The Canadian Field-Naturalist*. It is published by the Ottawa Field-Naturalist's Club which was founded in 1869 (*see* Origins and History of The Ottawa Field-Naturalist's Club *by* Daniel F. Brunton. (2004) *Canadian Field-Naturalist* 118(1): 1-38). The Club has published continuously since 1870 beginning with the *Transactions of the Ottawa Field-Naturalist's Club* in seven annual issues divided into two volumes. With volume 3, it was renamed *The Ottawa Naturalist* starting over as volume 1. It was renamed again in 1919 as *The Canadian Field-Naturalist* starting with volume 33 (*Transactions* volume 35).

In 2011, Dr. Carolyn Callaghan was appointed Editor and Jay Fitzsimmons to the newly created position of Journal Manager. Installation of new electronic systems will speed up review and publication of submissions (see editorials in 125(1): 1-6). The journal (including annual indexes) is now available online using the Open Journal System at <www.canadianfieldnaturalist.ca>. Volumes 107 to 125 are posted directly on the journal website and earlier issues are available through a link to *The Biodiversity Heritage Library (BHL)* which has scanned volumes 1-106 as well as all issues of the *Transactions.*

The journal welcomes submissions concerned with field-based original research and observations on natural history primarily in northern North America that is relevant to Canada. Detailed recent instructions for potential contributors are published in 125(2):190-192. Further information on content and policies, including page charges and colour for figures in the print copies, are available on the journal web site. Application at time of manuscript submission may be made for limited journal funds to offset page charges for authors who lack grant or institutional support for publication.

Access to current issues is free online at present during a systems trial period but will soon be available only by subscription. Print edition is also available by subscription.

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Passing of Ken Stewart

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Herpetologist and Ichthyologist Dr. Kenneth William Stewart died 3 July 2011 at Victoria General Hospital in Winnipeg. Professor Stewart was retired from the Zoology Department, University of Manitoba, where he had taught for 34 years after graduating from the University of British Columbia. Among successful PhD candidates he supervised were the Canadian herpetologists Patrick Gregory and Francis Cook. In retirement, Ken completed The Freshwater Fish of Manitoba coauthored with Doug Watkinson, published in 2004 by the University of Manitoba Press. A comprehensive tribute to Ken is in preparation for a future issue of *The Canadian Field-Naturalist.*

Ken with Garter Snake at Narcisse den site, 1983. Photographer unknown.

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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.

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Dr. Patrick Gregory – President and Treasurer CAH/ACH, Department of Biology,
University of Victoria, Victoria, B.C., V8W 2Y2.

Schueler and Karstad, Appendix 1. Calling from marsh 0.16 km NE of the Gunns Road/Pine River bridge, 22.1 km NW of Killaloe, Renfrew County Ontario, 45.68885ºN 77.63280ºW (WGS84), 23 March 2012.

Time	Peeper calling	Wood Frog	Weather
07h04	calling resumes with a few trilling - rosy glow on undersides of clouds	none	7C, cloudy, calm, dawn
07h08	a single Sawwhet-like series of peeps among a few trilling	-	
07h09	2-3 each peeping & trilling	-	
07h13	no Peeper calling - *Anas platyrhynchos* (Mallard) calling and *Turdus migratorius* (Robin) singing	-	
07h16	a brief pulse of index1 peeping	-	
07h22	a few trills, escalating to index1 calling	-	7C, clear, calm, dawn
07h32	trills continue with a few peeps	few calls	
07h41	no Peeper calling audible	-	
08h22	1 peeping, 1 trilling - cloud cover coalesced	-	7C, light overcast, calm
08h37	a very few trills, no peeping for a while.	-	sky back to cloudy
08h42	no Peeper calling - *Agelaius phoeniceus* (Redwinged Blackbird) 'burgalee'd	-	
08h50	rough-sounding trilling by a few for quite a while now	-	
09h04	brief burst of index 1 peeping after single-call trills-only, which resumes after about 15 seconds	-	sunny
09h17	few peeps, then silence, then very rough coarse trills	-	
09h35	sporadic calling, mostly peeps	-	
09h52	short burst of peeping with Sawwhet (beep) series and very harsh trills - you'd have to be us to know these weren't Chorus Frogs to call them Peepers.	-	
09h58	peeping picking up, almost to index2	-	
09h59	nearly silent - mostly trills	-	
10h00	one peeping with "goldfinch" calls	-	10C, overcast, calm
10h02	silence	-	
10h28	steady trills	-	
10h32	index2 peeps overlaid on constant 1 at a-time trills - we've heard *Turdus migratorius* (Robin), *Cyanocitta cristata* (Blue Jay), *Parus atricapillus* (Blackcap Chickadee) (feebee call), *Sayornis phoebe* (Eastern Phoebe), 1 *Corvus corax* (Raven) (1, vocally silent overhead)	-	10C, overcast, calm
10h38	long series of beeping (Sawwhet) peents, then an index 1 burst of peeping	-	
10h39	back to constant 1 at a-time trills	-	
10h45	constant 1 at a-time trills	first few chuckles	
10h47	constant 1 at a-time trills	few calling together - but no more thereafter	
11h02	first few trills, bubbly and hollow, after silence. There's peeping in the distance. both peeps and trills are subject to lots of variation including two-note *Pseudacris regilla*-like "kiddik" calls.	-	
11h04	index2 peeping, mostly in distance, nearby flat "woot" peeps. Then silent again	-	13C, light overcast, calm
11h20	"goldfinch"-like peeps by one	few calling	

11h23	index 2 small chorus of peeps and beeps	few calling	
11h29	subsided to a few trills, and then starting up towards index 2 peeps.	calling continues	
11h34	interval of index2 peeps that was launched by increasing trills and then peeps.	-	
11h35	1 at a-time trills including some that seem strangled	few calling	
12h03	index2 small chorus of peeps mostly and few trills, fading as this is typed	-	
12h19	few peeps & trills	small chorus	13C, light overcast, calm

Schueler and Karstad, Appendix 2. Remarks on non-standard calling by Peepers (*Pseudacris crucifer*) in eastern Ontario, 17 March - 7 April 2012.

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19 March 2012 - Limerick Forest/2.0 km SSW McReynolds, 44.86893N 75.63877W TIME: 2402-2407. AIR TEMP: 12, clear, calm. HABITAT: small Typha/Salix pond in Pine plantations. 2012/051/da, few nearby, some crinkly trills.

20 March 2012 - White Lake Road, 3.4 km SW Arnprior**,** 45.41381N 76.38237W TIME: 2407-2421. AIR TEMP: 15, clear, calm. HABITAT: pond in grassy field. FWS12Mar202407/a, few calling, giving some Chorus Frog-like trills.

22 March 2012 - Co Road 58, 15.3 km NW Killaloe.45.66883N 77.53645W TIME: 2340:43. AIR TEMP: 10, overcast, calm. HABITAT: small roadside marshlet, in woods. FWS12Mar222340/a, small chorus with "squeakers"giving musical trills - might well be taken for Chorus Frogs.

23 March - Red Rock Road, 9.4 km NNW Killaloe. 45.63665N 77.46301W TIME: 1516-1520. AIR TEMP: 17, sunny, breezy. HABITAT: flooded grassy field with ditch. FWS12Mar231516/a, few calling from field with ditch S of road. - some very Chorus Frog-like trills but just tipped "sweet" enough not to be.

23 March - Tramore Bridge Road, 8.3 km NNW Killaloe. 45.62887N 77.45477W TIME: 1522. AIR TEMP: 17, sunny, breezy. HABITAT: brushy/Typha pond. FWS12Mar231522/a, chorus of diverse calls from pond.

23 March - Co Road 8/11, 2.7 km SE Osceola. 45.60643N 76.92261W TIME: 1840-1842. HABITAT: swampy road intersection pond. FWS12Mar231840/a, chorus from pond NW of intersection. Giving a variety of calls, including trills.

25 March 2012 - Limerick Forest/2.0 km SSW McReynolds. 44.86893N 75.63877W TIME: 1901-1906. AIR TEMP: 11, clear, calm. HABITAT: small Typha/Salix/Grass pond in Pine plantations. 2012/062/ab, 1 giving sweet trills & then peeping.

7 April 2012 - Highway 7, 7.3 km ENE Kaladar, 44.68253N 77.04246W TIME: 1823-1830. AIR TEMP: 13, sunny, breezy. HABITAT: swampy roadside woods grassy narrow "marsh" Tsuga/White Pine/Thuja woods. FWS12Apr071823/b, few trilling as we stop. . . . until 18h28 when small chorus with trills starting as we start to leave - then stops.
