

Abstracts

Ansell, April, Millar, J. S., and Longstaffe, F.

University of Western Ontario

Isotopic variation in deer mouse diets: inferences about habitat quality

Most terrestrial vertebrate populations are constrained by food, both quality and quantity. However, most studies on food limitation have focused on quantity, with few studies on food quality. McAdam and Millar (1999) observed the effects of high quality food (high protein) on deer mice in the laboratory which resulted in increased nestling growth rates and earlier maturation of females which leads to increased fitness and densities. The effects of high quality food on deer mice however, have not been documented in the wild. Deer mice (*Peromyscus maniculatus*) in the Kananaskis Valley, Alberta occur in varying densities in different habitat types. We hypothesized that food quality differs among habitats with different population sizes. Thus, we predicted that high nitrogen isotopic signature of mice would be associated with high population densities because they will be feeding on high quality protein. We sampled blood and hair from deer mice in seven different habitat types. We obtained nitrogen and carbon isotopic compositions and examined the isotopic variation in the deer mice. We found that isotopic signature varies among habitat type. The $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were, however, influenced by factors such as date captured, and the sex and age of the individual, resulting in interactions with habitat type. Our results showed that high population density does not coincide with high nitrogen values of mice, suggesting that factors such as amount of animal protein available and intraspecific competition may play a role in the density of deer mice. We recommend that when sampling isotopic signatures in the wild, it is important to take habitat types as well as temporal variation into account as food availability changes.

Barclay, M., and Quinn, J.

McMaster University

Mate choice in a joint-nesting plural breeding species, the smooth-billed ani (*Crotophaga ani*)

In most species females are choosy about mating partners and numerous studies on a variety of mating systems have examined what characteristics females are using to assess male quality. Mate choice criteria have received little attention in plural-breeding birds such as the smooth-billed ani (*Crotophaga ani*). Smooth-billed anis have a complex mating system in which socially monogamous males and females form breeding groups and share a single nest. Preliminary genetic analysis showed that both sexes may mate multiply, resulting in extra-pair young. This is an interesting system for looking at mate choice because being in a group may allow females to assess easily the quality of more than one male and to choose the best mate. Such a system affords females some of the mate evaluation benefits of a lek.

We will examine what characteristics females use to assess male quality and whether females pick extra-pair mates that are of higher genetic quality than their social mates. Male anis are slightly larger than females and have a larger crest on their upper bill. We predict that a female ani's extra-pair mate has (1) fewer blood-borne parasites, (2) fewer ectoparasites, (3) a greater mass versus tarsus length residual value, (4) greater UV reflectance from feathers, (5) a larger bill depth, and (6) offspring with greater immune response to PHA-P than her social mate. We also predict that males will have greater UV reflectance from their feathers than females if it is a sexually selected trait.

Beall, Benjamin

University of Western Ontario

Grazing and nutrient supply shape the heterotrophic prokaryotic community in the Northeastern Pacific Ocean

The heterotrophic prokaryotic community in marine waters is a vital component of the marine microbial community. The heterotrophic prokaryote community can be divided into two groups, low-nucleic-acid (LNA) and high-nucleic-acid (HNA) cells. These groups are thought to differ in their taxonomy and productivity. However, the effect of grazing and the supply of nutrients, two processes that can control the productivity and abundance of heterotrophic prokaryotes, on these groups is unexplored. The effects of grazing and nutrient supply on the prokaryotic community in the oceanic subarctic Pacific Ocean were examined in a series of experiments in the summer of 2006. Grazing was observed to be a significant factor controlling the net growth and abundance of all heterotrophic prokaryotic cells and significantly higher on the LNA cells. In addition, the addition of organic carbon preferentially stimulated the growth of the HNA group, while iron additions increased the net growth rate of LNA cells. These results suggest that grazing is the dominant and potentially selective process, while the availability of organic carbon and iron may also have roles in determining the abundance and community structure of marine heterotrophic prokaryotes.

Bechard A., and Mason, G.

University of Guelph

Weaning age and stress in the laboratory mouse

Most animals raised in captivity are removed from their mother earlier than would occur in nature, yet early loss of the mother impairs abilities to cope with stress later in life. In standard management of laboratory mice (*Mus musculus*), one of the most common research animals, maternal separation is imposed at 3 weeks although natural dispersal occurs much later, at 6-7 weeks. We sought to investigate the effects of this artificial, premature disruption to the mother-young bond (weaning), by weaning C57Bl6 (B6) and CD-1 litters at the standard 21 days or the more naturalistic 35 days. Offspring from 14 litters were screened for anxiety (elevated plus-maze, open field, acoustic startle responses) at age 2-3 months. Stereotypic behavior (e.g. bar-mouthing, somersaulting) and alopecia, likely due to alloplucking was assessed when offspring were 6-7 months. Preliminary results suggest that delayed weaning reduces anxiety in adult mice. Specifically, delayed weaned offspring spent more time on the open arms of an elevated plus-maze ($p < 0.05$). In females, weaning at a later age seems to decrease the prevalence of both alopecia ($p < 0.01$) and stereotypic behavior ($p < 0.1$) in adulthood. There was also a 30% reduction in the acoustic startle responses for delayed weaned mice ($p < 0.05$), although these findings need replicating on a larger scale. Overall, early results suggest that delaying weaning may promote more stress-resistant phenotypes with better health and welfare.

Bustos, Claudia, and Corkum, L. D.

University of Windsor

Egg hatching explains the shift in dominance of burrowing mayfly species (Ephemeroptera: Hexagenia) in the western basin of Lake Erie

Burrowing mayfly species recolonized the western basin of Lake Erie after the lake's recovery of hypoxia at the sediment-water interface. Our adult monitoring program showed that *H. rigida* was more successful than *H. limbata* during the initial recolonization period, but *H. limbata* is now dominant. We sought to explain this pattern by conducting a lab experiment to compare egg hatching between the species under natural conditions (no incubation) and cold storage incubation (mimicking winter conditions). Without incubation, first hatch date of larvae for *H. rigida* was one day earlier than *H. limbata*. The extent of egg hatching (5 d) and time for peak egg hatch (23 d) was the same for both species. However, *H. rigida* (95.4 ± 2.02) ($P=0.01$). After egg hatching of 1st instar larvae than *H. limbata* (85.0 ± 3.20 months of cold storage, *H. limbata* hatched 5 days earlier, had 50% of eggs hatch 2 d earlier, and exhibited a longer extent of egg hatching (17 d vs. 12 d) compared with *H. rigida*. There was no significant difference in the mean percentage of egg survival (ca 63%) between species ($P=0.749$). After 6 months of cold storage, *H. limbata* exhibited an earlier first hatching date by 4 d and had 50% of eggs hatch 7 d earlier than *H. rigida*. The extent of egg hatching was similar between species (12-13 d). No significant difference in mean percentage of egg hatching to larvae existed between *H. limbata* (56.1 ± 4.15) and *H. rigida* (65.3 ± 4.15) ($P=0.152$). The patterns exhibited by *H. limbata* and *H. rigida* with respect to time of first hatch, extent of hatching and egg survivorship accounts for observed differences in the relative abundance of these species in the western basin of Lake Erie.

Dixon, L.M., Duncan, I.J.H and Mason, G.J.

University of Guelph

Why do they do it? Using fixed action pattern' morphology to investigate the motivation basis of harmful allo-pecking in hens

Like many captive animals, hens used for agricultural production perform abnormal behaviours. They are particularly prone to harmful allo-pecking in which cagemates feathers are plucked out, a behaviour that can eventually lead to cannibalism. The cause of such feather-pecking is unknown, but the two main hypotheses concern motivations to forage or to dustbathe being frustrated, leading to redirected behaviour. Previous work (e.g. on autoshaping) shows that the detailed morphology of pecks involved in drinking and feeding, or in working for food or water, involve distinct fixed action patterns. We therefore used this approach to quantify the motor patterns involved in foraging and dustbathing pecks, for comparison to feather-pecking pecks. Sixty chickens were videoed while pecking at forages, dustbaths, novel objects, water, and bird models which could be feather-pecked. We recorded the peck durations, head fixation before the peck, and from head fixation to beak contact with the stimuli. Mixed models assessed whether feather pecks resembled or differed from either dustbath or foraging pecks. The motor patterns involved in pecking during dustbathing and foraging differed ($P<0.0001$ for all measures). Feather pecks proved similar to forage pecks (NSD: power >0.95), but different from all other pecks including dustbathing ($P<0.0001$ for all measures). These results indicate that feather-pecking derives from frustrated motivations to forage, not to dustbathe. More broadly, they suggest that finely analyzing fixed action pattern morphology can help elucidate the motivational bases of puzzling abnormal behaviours in captive animals.

Fernandez, R. J., Rennie, M. D., and Sprules, W. G.

Changes in nearshore zooplankton communities associated with the introduction of non-indigenous invertebrates (dreissenid mussels and *Bythotrephes longimanus*), and potential effects on larval Lake Whitefish (*Coregonus clupeaformis*)

University of Toronto at Mississauga

In this study we examined changes in the nearshore zooplankton communities of South Bay, Lake Huron following the introduction of dreissenid mussels and the spiny water flea, *Bythotrephes longimanus*. We also examined changes in total plankton abundance, and identified shifts in the nearshore plankton community which might directly influence the diet of larval lake whitefish (*Coregonus clupeaformis*). Comparisons were made from May to July in 1982 and 2005 in order to determine zooplankton community changes before and after the invasion. Comparisons were made between samples taken 2002-2005 to determine the degree of annual variation not associated with novel species invasions. Correspondence analysis (CA) showed that nearshore zooplankton communities changed after the invasion, driven largely by a decline in abundance of bosminid and chydorid cladocerans. Factorial ANOVAs demonstrated significant declines in the abundance of Cladocera ($p=0.001$), specifically *Bosmina* ($p=0.003$), which is a key dietary item of larval lake whitefish. Species undetected in the post invasion period included *Leptodora kindtii* and *Sida crystallina*. Factorial ANOVAs also revealed a significant increase in total zooplankton abundance and an increase in species richness post-invasion, primarily due to higher copepod diversity. For early larval whitefish stages, we expect that the copepod increase will offset the reduction in bosminids. However as larvae descend through the metalimnion, consumption of *Bosminia* increases considerably, and their reduced abundance may have severe implications.

Ford, T.

University of Western Ontario

The effect of ultraviolet light and light intensity on foraging in threespine stickleback (*Gasterosteus aculeatus*)

Threespine stickleback have the ability to perceive ultraviolet light. This study examined the effects of light intensity and ultraviolet light on the foraging success of threespine stickleback foraging on live *Artemia*. I found an effect of both light intensity and ultraviolet light on latency of the first strike and foraging rate. With the removal of ultraviolet light, high intensity light saw a decrease in the latency time and a decreased foraging rate. With the removal of ultraviolet light, low intensity light saw a decreased latency of the first strike and an increased foraging rate. Low intensity light is more representative of the natural conditions threespine stickleback forage in. The interaction between light intensity and ultraviolet light may be used by threespine stickleback to aid them in foraging.

Hain, T. J. A., and Neff, B. D.

University of Western Ontario

Multiple mating and kin recognition in a guppy population

Help directed toward kin (nepotism) is an important example of social behaviour. Such helping behaviour requires a mechanism to distinguish kin from non-kin. The prevailing kin recognition hypothesis is that when familiarity is a reliable cue of relatedness, other mechanisms of recognition will not evolve. However, when familiarity is an unreliable cue of relatedness, kin recognition by phenotype matching is instead predicted to evolve. We use genetic markers to show that guppies (*Poecilia reticulata*) from a population in a tributary of the Paria River in Trinidad are characterized by a high degree of multiple mating with 95% of broods having more than one sire and some dams having offspring sired by six males. These levels of multiple mating are the highest reported among live-bearing fishes. The mean relatedness of brood-mates was 0.36 (as compared to 0.5 for full-siblings). Using two-choice behavioural trials, we also find that juveniles from this population use both phenotype matching and familiarity to distinguish kin

from non-kin. The use of both familiarity and phenotype matching is discussed in the context of the Paria River guppy population's mating system and level of predation.

Judge, K. A.

University of Toronto at Mississauga

Condition dependence of female choice for an honest indicator of male quality in a field cricket

When picking a mate, females generally choose males that produce the loudest, brightest, or most elaborate sexual displays. In this case, variation in male mating success may be explainable solely in terms of the vigour of the male's display, without reference to any specific female preference. This 'passive choice' model is particularly relevant to mating systems, like that of field crickets (Gryllinae), in which males attract females using acoustic signals. In the fall field cricket, *Gryllus pennsylvanicus*, previous work has shown that males in good condition sing for a greater proportion of time (i.e. greater calling effort) and live longer than males in poor condition. In this experiment, I tested whether female condition, as manipulated through diet, affected: 1) their attraction to songs of varying calling effort, 2) their ability to discriminate between songs of different calling effort, and 3) the amount of time that females paid attention to song before choosing. In a series of two-speaker phonotaxis trials, females preferred greater calling effort regardless of their condition, and this preference weakened when: a) the difference in calling effort between the speakers decreased, and b) the speaker broadcasting high calling effort was apparent after increasing durations - results consistent with a passive choice model. However, high condition females took significantly longer to make a choice and were more likely to fail to choose within the time allotted for a phonotaxis trial, showing that females may exert control over their sensitivity to male song.

Kilburn, V., Green, D.M., Ibanez, R., Bermingham, E. and Sanjur, O

McGill University, Smithsonian Tropical Research Institute

Persistence and prevalence of the chytrid fungus (*Batrachochytrium dendrobatidis*) at varying elevations and stages of epidemic decline in Panama

Recently global amphibian declines have received much scientific attention. Habitat destruction was once cited as the major factor limiting amphibians, but recent evidence shows that amphibians living in pristine, montane regions of the tropics are subject to the majority of declines and extinctions. It is thought that a disease outbreak, caused by the vertebrate chytrid fungus *B. dendrobatidis*, can be implicated. Many scientists believe that the only hope for amphibian conservation is through ex situ breeding programs and subsequent reintroduction. Research sites were established at varying stages of infection and elevation throughout Panama, and the examination of pre and post-infection abundance data is currently being done for all communities. Through sensitive DNA-based Real-Time qPCR Amplification, chytrid prevalence will be determined. Chytrid is anecdotally known to exist in frog populations at lower elevations, but the extent to which it exists in other organisms and the effect it has on frog populations there is poorly understood. Preliminary results show that chytrid is found in lizards in addition to amphibians, and that lowland populations harbour infection and appear to succumb to it much like their high elevation counterparts. Furthermore, sites hit by the epidemic nearly 20 years ago still show infection. These results suggest that the primary assumption of chytrid ecology, which is that it acts fatally only in areas of low temperatures and high moisture (highlands), may be incorrect. If the infection can remain in frog communities and other organisms for long periods of

time, it appears that reintroduction of captive-bred amphibians is not a plausible management plan for amphibian conservation.

Miller, J., Parrott, J., Quinn, J. and Sherry J.

McMaster University

Heritable genetic damage and other effects in fathead minnows exposed to contaminated sediments near Randle Reef, Hamilton Harbour

This study aims to provide baseline data for investigating possible long-term health and reproductive effects in fish exposure to contaminated water and sediments near Randle Reef in Hamilton Harbour. Our primary goal is to investigate possible biological impacts of sediment contamination near Randle Reef. Randle Reef is a well characterized area of moderate to high polycyclic aromatic hydrocarbon pollution within the sediment, and is considered a high priority area for remediation. Data from this study will be contrasted with future trials to evaluate the effectiveness of future remediation work at this site. Juvenile fathead minnows (*Pimephales promelas*) were exposed in-situ to contaminated sediments and water near Randle Reef in Hamilton Harbour for seven weeks in 2006. Fish were held in modified minnow traps suspended 1 meter off the bottom and were fed brine shrimp 2 - 3 times per week. Following exposure, the fish were transferred to laboratory tanks and upon development of secondary sexual characteristics were separated into breeding pairs. Pairs were monitored daily and all eggs were collected, assessed, and hatched in separate tanks. 2-3 day old fry were preserved for DNA analysis, and all fry were assessed for mortality and deformities. Following breeding, measures of adult body condition were also taken, and tissue samples collected. In addition to looking for reproductive and other effects using more traditional endpoints (fecundity, deformity rates, circulating steroid levels, etc), we will also use microsatellite DNA markers to determine whether such exposures lead to elevated germ-line mutation rates among the unexposed offspring.

Marentette, J.R., Fitzpatrick, J.L., Berger, R.G., & Balshine, S

McMaster University

An initial description of alternative male reproductive tactics in the Round Goby (*Neogobius melanostomus*)

Alternative reproductive tactics (ART) are found in many fishes, with some males courting females (parental males), and others sneaking fertilizations. Selective pressures shaping male anatomy and physiology differ between tactics, as sneakers always experience sperm competition, while parental males only experience sperm competition when a sneaker is present. ART have been suggested in the round goby (*Neogobius melanostomus*), a recent prolific Great Lakes invader, but never fully documented. We report convergent lines of evidence supporting the existence of ART in round gobies. Sneakers invested more in reproduction than parental males, while parental males exhibited secondary sexual characteristics. Both male morphs had enlarged urogenital papillas, but papillas were longer in sneakers. Parental males had higher plasma 11-ketotestosterone than sneakers. Our data strongly argue for the presence of ART in this species, and we plan to examine how ART affect population dynamics of round gobies and hence on efforts to control them.

Mensink, P., and Scott, R.

University of Western Ontario

Fluctuating asymmetry in wing characteristics of *Limenitis arthemis*: examining the *Limenitis arthemis arthemis* and *Limenitis arthemis astyanax* (Nymphalidae Limenitidinae) cline from southern Ontario, Canada

Fluctuating asymmetry (FA) may be a good indicator of overall developmental stability in organisms. FA levels were examined in several traits across the *Limenitis arthemis* cline in southern Ontario. The FA of the white band showed a significant increase within the suspected hybrid zone possibly due to the breaking up of co-adapted gene complexes that regulate symmetry. FA of the tip spots and ventral spots did not increase in the hybrid zone possibly due to the fact that both subspecies share these characteristics. This study has serious implications for the evolutionary studies of mimetic and non-mimetic butterfly species clines, the hybridization of the species, and developmental stability of these populations.

Ngan, Sybil C.

University of Toronto, Mississauga

Changes in home range and resource ranking in meadow voles (*Microtus pennsylvanicus*) in response to habitat fragmentation

Adverse effects of habitat fragmentation are evident at the primary consumers' level. Since undisturbed, high-cover vegetative grasses support higher activity levels in meadow voles (*Microtus pennsylvanicus*), set areas of their habitat were mowed to determine if home ranges were impacted by fragmentation. After treatment, home ranges in undisturbed areas were found to be larger than in the control condition ($P < 0.05$). Voles likely moved into these high-cover areas, as demonstrated by higher population density in those patches ($P < 0.05$), and as result of intraspecific competition, individuals needed to forage further to attain food sources. These results were observed despite an increase in food availability in disturbed sites, indicating that voles ranked the security of high-cover grasses above food, for both males and females of all age categories (juveniles, subadults, and adults). Results from this study imply that comprehensive understanding of primary consumers' dynamics is required to protect species at the higher levels.

Poe, Allison

University of Western Ontario

The effects of foraging habitat on echolocation call variation in *Lasiurus cinereus semotus* (the Hawaiian hoary bat)

The Hawaiian hoary bat, *Lasiurus cinereus semotus*, is the only known extant bat species found on the Hawaiian archipelago. This creates a unique opportunity to investigate intraspecific variation in echolocation because there is no interspecific overlap in echolocation call parameters that have resulted in species misidentification in previous acoustic studies. For this study, I assessed the intraspecific variation in the echolocation calls of *L. c. semotus*, specifically examining differences in echolocation call characteristics between foraging habitat types (open and edge). I hypothesized that when foraging at open locations, *L. c. semotus* would use echolocation calls best suited for long-range prey detection, and short-range calls while foraging along forest edges. Using an Avisoft recording system, I recorded free flying bats from five locations (2 open and 3 edge) at weekly intervals from May through August, 2006, on the Big Island of Hawaii. I also used radio-telemetry to assess whether variation in echolocation call characteristics between habitat types could be attributed to individual plasticity. Preliminary results suggest that echolocation calls may be accurately classified to foraging habitat type, and that these differences may be attributed to intra-individual variation.

Prairie, Marie-Pier, and Green, David M.

McGill University

Landscape ecology of an amphibian community: a study of recruitment success

Amphibian decline in pond-breeding amphibian species is challenging to study, because these populations fluctuate tremendously between years, and pond-breeding species are differentially affected by the decline. Recruitment success, the proportion of eggs surviving metamorphosis in order to become new adults, is now known to predict breeding success and population viability more accurately than hatching success. There is a need to develop tools for predicting successful recruitment, because it does not always seem to be correlated with breeding effort, and is not known to occur consistently at the same breeding sites every year. Twenty-four breeding sites distributed across a 400-hectare forest remnant have been characterized in terms of environmental and biological factors. The presence of breeding calls, eggs, tadpoles and metamorphs have also been determined for five species at those breeding sites. Canonical correspondence and logistic regression analyses were used to find the main factors affecting recruitment, and to elucidate whether particular species have successful recruitment at sites showing particular environmental conditions, and whether a correlation exists between sites in which calls, eggs and tadpoles are present and those where recruitment is found to be successful. Based on data measured in the field, a model predicting population dynamics for different weather conditions (e.g. wet or dry year) was designed, accounting for habitat preferences of each species. This will help to better understand the dynamics of amphibian communities, enabling the most effective management strategies and questioning current amphibian sampling methods used to assess breeding success such as call and egg mass surveys.

Qureshi, Nabeel and Corkum, Lynda

University of Windsor

Gravid female round goby (*Neogobius melanostomus*) response to odours of conspecific males injected with Gonadotropin Releasing Hormone (GnRH)

The round goby (*Neogobius melanostomus*) (RG), a fish species invasive to the Great Lakes, exploits pheromones as a means of conspecific communication which has generated optimism that a pheromonal trap, analogous to ant traps, may be used to capture gravid females and therefore manage the species. Gravid females (GF) are attracted to pheromone-containing scents exuded by reproductive males (RM) and respond to these odours with an increase in gill ventilation. We know that the pheromones are steroids and furthermore that Gonadotropin Releasing Hormone (GnRH) targets LH and FSH which stimulate steroidogenesis in the gonads. We therefore expect RM injected with GnRH (inj-RM) to elicit a stronger ventilatory response from GF than RM not injected with GnRH (non-inj-RM). To investigate this, we videotaped the response of a GF placed in a 10L tank to RM odours for 30min (15min acclimation/control period followed by a 15min stimulus period), with n=5 of 8 replicates. One of 8 treatments was introduced during the stimulus period. To obtain the treatments, RM were placed in water prior to injection and after injection (non-inj-RM-water and inj-RM-water; 2 treatments). Both pools were collected and underwent solid-phase-extract (SPE) to obtain a steroid-containing methanol extract (non-inj-RM-MeOH and inj-RM-MeOH; 2 treatments) and a non-steroid Aqueous phase (non-inj-Aqueous-Phase and inj-Aqueous-Phase; 2 treatments). The remaining 2 treatments were dechlorinated-water. Our results show significant differences among replicates ($P=0.03$) but not treatments ($P=0.58$), and no effect of GnRH on ventilation of GF and higher ventilation of GF in

response to dechlorinated-water than the Aqueous Phase. With the limited number of replicates analysed, there is no difference in the ventilation response of GF to inj-RM and non-inj-RM.

Qureshi, Nadia, Daly, C. A and Ciborowski, J. J. H

University of Windsor

Effects of organic reclamation materials on planktonic microbial community biomass and production in constructed wetlands of the Alberta oil sands region

Following oil sands mining and extraction in the Athabasca oil sands region, wetlands are constructed as part of the effort to restore the environment. Since microbes comprise the base of aquatic food webs in terms of carbon, they are a good environmental indicator of productivity of the wetlands. Some have been constructed using oil sands mine-process material (OSPM) sometimes with a 30cm layer of peat added to speed reclamation. We compared bacterioplanktonic production in reference and OSPM-affected wetlands and examined how addition of peat in these wetlands affects the production. We also estimated relative contributions of picoplankton and nanoplankton to total production. Bacterial production was measured in six water samples randomly collected from each of two reference and three OSPM-affected wetlands (>7years old). Production was quantified by passing samples through appropriate size fraction filters and incubating for 1 h after adding 3H-leucine (a radioactive label). The rate at which the 3H-leu was incorporated by the bacteria was then measured and converted to production rate values. Picoplankton and nanoplankton each contributed approximately equally to total production. There was a significant difference between mean \pm SE production rates in OSPM affected wetlands and reference wetlands. There was marginally significant more production in peat-amended wetlands than in wetlands that did not receive peat (main effects ANOVA). This suggests that wetlands constructed using oil sands processed materials (water containing salt, silt, clay, naphthenic acids) are as productive as reference wetlands and that the addition of peat further increases production and thus is an effective reclamation strategy.

Rehan, S and Richards, M.

Brock University

Life history and maternal quality in a twig-nesting carpenter bee, *Ceratina calcarata* (Hymenoptera, Apidae).

Ceratina are small carpenter bees from the subfamily Xylocopinae. This taxonomic placement is due to a preference for nesting in wood shared with related bees like *Xylocopa*, the large carpenter bees. *Ceratina calcarata* nests were collected in 2006 from twigs of raspberry (*Rubus ideaus*) and staghorn sumac (*Rhus typhina*) growing on the Brock University campus and at the Glenridge Quarry Naturalization site in St. Catharines, Ontario. In addition, bees were collected using pan traps to characterize foraging and emergence phenology. This small carpenter bee is a good candidate for parental investment study because of its solitary, univoltine life history, as well as maternal longevity and nest loyalty throughout the entire breeding season. *Ceratina calcarata* are solitary bees with equal investment between the sexes. Females are larger than males and receive considerably more maternal investment; this unequal cost ratio is balanced by a male biased numerical sex ratio. Maternal quality explains both sex allocation and size variation among offspring. Larger mothers invest more in individual progeny and produce more female offspring than smaller mothers. Maternal investment decreases in offspring of both sexes due to their wear and age throughout the season. Seasonal variation does not influence sex allocation. Mothers produce male and female offspring throughout the season in equal proportion.

Stoltz, J.A., Elias, D.O. & Andrade, M.C.B.

University of Toronto, Scarborough

The energetic cost of male courtship in the Australian redback spider (*Latrodectus hasselti*)

Courtship is thought to be costly for a variety of reasons including include increased susceptibility to predation, decreased foraging and a decrease in future mating opportunities. The energetic expenditure associated with courtship signalling is an often mentioned but rarely measured cost of courtship which may have profound implications for behavioural strategies. Redback spiders (*Latrodectus hasselti*) are ideal for investigating questions related to courtship energetics. Males engage in vibratory courtship for prolonged periods prior to copulation (up to 8 hr), and courtship duration may be an important criterion for female choice. Moreover, measurements of courtship energetics are simplified because males will court on webbing in the absence of the female. This allowed us to estimate the cost of courtship using stop-flow CO₂ respirometry without any confounding effects of variation in female energetic output. Here we compare the resting and courting energetics of male redback spiders to determine the energetic cost of courtship. We also examine whether variance in males resting or courtship performance is explained by morphological or developmental characteristics and speculate on the effects of the male condition on courtship energetics.

Szuroczi, Dorina, and Richardson, Jean M. L.

Brock University

The Effect of Temporal Variation in Predation Risk on the Growth Rate of *Rana catesbeiana*

This study examines how temporal variation in predation risk using two different predators (natural and novel) affects growth rate in the common bullfrog (*Rana catesbeiana*). Tadpoles spent 0%, 28%, 60% and 100% (6 hours/day, 16 hours/day and 106 hours) of a 5 day trial period in the presence of a novel predator (*Anax junius*) or a natural predator (*Lepomis gibbosus* or *Lepomis macrochirus*). Two different chemical cue treatments were used to heighten the predation risk: predatory cues were added to the fish and *Anax* treatments and dietary cues were added only to the *Anax* treatments. Tadpole anti-predator behaviour was quantified by examining growth rate, which decreases with a decrease in activity. Growth rate was measured by weighing tadpoles pre- and post-trial to determine weight gain or loss. The results show that tadpole growth rate is affected by both predator treatments and temporal treatments. Tadpoles responded in a time-dependent manner to the *Anax* predator combined with dietary cues. In contrast, tadpoles responded the least to the sunfish with the exception of the 28% treatment where growth decreased relative to the control. A similar trend was also observed in the *Anax* predator 28% treatment. The results of this study are consistent with bullfrog tadpoles practicing threat-sensitive anti-predator behaviour and learned predator recognition. In addition, the study implies that bullfrog tadpoles follow the rules of the risk-allocation hypothesis. The behavioural response of these tadpoles depends on the type of chemical cue, duration of perceived risk and the type of predator present.

Ting, J. J.

University of Toronto, Mississauga

Do females differentially allocate to the offspring of high quality mates using song as a cue?

When females choose mates, selection can act on male traits and displays that communicate information about the male's quality. In crickets one such display is male acoustic cues. I rejected the hypothesis that a close-contact signal – courtship song – can be used by females in assessing male quality because there was no difference between the courtship songs of male crickets (*Gryllus pennsylvanicus*) differing in condition (as controlled by diet). Despite this result there is a female preference (regardless of condition) for high quality males. Previous work has, however, shown differences in the long-distance signal – calling song – of these males. I verified that females respond quicker to high quality calling songs than to low quality calling songs. There was a non significant trend in which females paired with experimentally-silenced males allocated more resources (number of eggs) while hearing calling songs of males reared on high quality diet compared to females hearing low quality diet calls. These findings confirm previous studies indicating females utilize calling songs in mate choice and highlight a trend of calling song influencing female reproductive resource allocation. The trend seen in female preference for high quality males merits further study to determine the role of courtship song in *G. pennsylvanicus*.

van Stam, Elisabeth

University of Western Ontario

Are there vocal signatures in the echolocation calls of wild Big Brown bats (*Eptesicus fuscus*)?

Echolocation calls are normally used by microchiropteran bats to locate and identify obstacles in their path including prey. Variability in echolocation calls and responses of bats to playback presentations of these calls demonstrates that these signals may also serve a communication function. Previous laboratory-based studies of the Big brown bat, *Eptesicus fuscus*, have indicated that their echolocation calls are variable and contain individual-specific information. Preliminary results for my study indicate that echolocation calls from known, wild Big brown bat can be correctly classified to individual and roost. Call variation is a potentially useful resource both for bats to acquire essential information concerning conspecifics and for researchers attempting to census bat populations.

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Prey availability to *Myotis lucifugus* at Chautauqua, New York

Anecdotal evidence suggests that the bat population, consisting mainly of little brown bats (*Myotis lucifugus*), has declined in the past 15 years at the Chautauqua Institution, Chautauqua, New York. There are several theories as to the cause, one of which suggests food resources as a limiting factor. A study done during the summers of 1991/92 determined the composition and distribution of the insect population in the Institution. To discover if the insect population had changed, the study was partially replicated during June 2006. It was found that the insect order composition had not changed, and that the bats were feeding opportunistically. Insects were more abundant at shoreline locations as compared to inland traps, and this was where bat feeding activity was concentrated. It is recommended that conservation efforts focus on bat roosts as food resources do not seem to be a limiting factor.

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Anthropogenic land use and bird species richness in Southern Ontario

Land use in Southern Ontario, Canada is predominantly agricultural and urban, both of which are anthropogenic in nature. This study examines the impact that human use of a temperate landscape has on bird species richness and community composition. The analysis was performed using surveying data from the Ontario Breeding Bird Atlas (BBA). Transects along an urban-rural gradient were developed using BBA squares to examine trends in bird species richness based on land use. Through this examination it has been discovered that bird species richness declines as urban land use increases ($p < 0.05$). It was also indicated that agricultural development has a quadratic relationship with species richness ($p < 0.001$), where bird richness is highest at an intermediate level of agriculture. Bird community composition varied only moderately between locations, suggesting a homogenized landscape may be developing in Southern Ontario. Beta Diversity ranged from 1.34 to 2.01, and Jaccard's Index of Similarity varied from 0.50 to as high as 0.88 (mean = 0.73). These results shed light on the growing impact that human land use has on species richness, and that excessive land transformation may ultimately lead to the loss of many species, with a few synanthropic birds dominating the biota across the globe.