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Wednesday, May 12th

Department of Zoology, University of Guelph*

MEETING SCHEDULE AND ABSTRACTS

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Department of Zoology, University of Guelph
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SCHEDULE

Oral Presentations

- 9:00-9:20 Kevin A. Judge & R.J. Brooks. **A test of the energy limitations hypothesis for chorus tenure in male bullfrogs (*Rana catesbeiana*).**
- 9:20-9:40 Luc F. Bussière. **The mating system of the long-tailed dance fly, *Rhamphomyia longicauda* Loew (Diptera: Empididae): females "pump up" while males prepare the meal.**
- 9:40-10:00 Mark J. Fitzpatrick, D.A. Gray & W.H. Cade. **Female choice and sexual selection on the courtship song of the field crickets, *Gryllus bimaculatus* and *G. integer*.**
- 10:00-10:20 Mark Horsburgh & J.C. Semple. **Investigation of the potential pollinators of *Symphytotrichum lanceolatum* (Willd.) Nesom and *Symphytotrichum lateriflorum* (L.) Love & Love in Waterloo county.**
- 10:20-10:40 **Break (Axel 265A)**
- 10:40-11:00 Istvan Imre & D.L.G. Noakes. **Influence of water velocity on the body shape of young-of-the-year brook charr (*Salvelinus fontinalis*).**
- 11:00-11:20 Brian D. Campbell. **Comparison of forest songbird communities in 30-year old post-logged and unlogged boreal mixedwood forest of northeastern Ontario.**
- 11:20-11:40 Christopher M. Somers & R.D. Morris. **Bird depredation of grapes in a Niagara vineyard: do predictable trends exist?**
- 11:40-12:00 Rebecca Vincent. **Historical collection data as a source for predicting patterns of species richness.**
- 12:00-1:00 **Lunch break and poster presentations (Axel 265A)**
- 1:00-1:20 Cindy Chu, N.C. Collins, C. Rejwan, M.S. Ridgway & J. Harker. **Importance of substrate composition in nest site selection of smallmouth bass (*Micropterus dolomieu*) in central Ontario lakes.**
- 1:20-1:40 Sarah J. Crabbe, D.L.G. Noakes & F. Whoriskey. **Use of small boreal stream tributaries by Atlantic salmon parr (*Salmo salar*).**
- 1:40-2:00 Elaine J. Matthews & R.J. Brooks. **The effects of ground cover, soil moisture, and soil urine content on nest-site selection of painted turtles (*Chrysemys picta*) in Algonquin Park, ON.**
- 2:00-2:20 Michael G. Jonz, A.J. Mercier & E. Riga. **Identification of the sex pheromone of the sugarbeet cyst nematode (*Heterodera schachtii*).**
- 2:20-2:40 **Break (Axel 265A)**
- 2:40-3:00 Robert J. Van Vlaenderen & R.J. Brooks. **Geographic variation in the life-history of the painted turtle (*Chrysemys picta*).**
- 3:00-3:20 Sarah M. Holt & R.J. Brooks. **The maintenance of temperature sex determination in snapping turtles (*Chelydra serpentina*): do the data support the theory?**

Poster Presentation

David L.G. Noakes, K. Cole & S. Sakakura. **Sometimes it's hard to be a hermaphrodite.**

The mating system of the long-tailed dance fly, *Rhamphomyia longicauda* Loew (Diptera: Empididae): females "pump up" while males prepare the meal.

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Although several researchers have postulated that the ornaments of female dance flies may be sexually selected characters, especially in putatively sex role-reversed species, there are few data to support this hypothesis. Swarming females of the long-tailed dance fly (*Rhamphomyia longicauda*) have large inflatable pleural sacs that appear to be ornaments for attracting prey-providing males (evolved in the context of sexual selection). Males transfer prey to females during “nuptial flights” which apparently represent the only source of food for adult females. Previous work has indicated that males approach large female models more often than smaller models. Consistent with the sexual selection hypothesis for pleural sac evolution, I demonstrate that the pleural sacs reliably indicate female body size and egg number, and that females possessing large pleural sacs fly lower within swarms than smaller rivals, where they are more likely to encounter prey-laden males entering the swarm. However, I find no evidence that mating females have larger pleural sacs than swarming females. The size of the members in a copulating pair is significantly correlated (size-assortative mating), likely because of limits in the load carrying capacity of males. Thus, although there is mounting evidence that pleural sacs are sexually selected, the fact that males must carry females during the nuptial flight imposes sexual selection on male body size as well.

Comparison of forest songbird communities in 30-year old post-logged and unlogged boreal mixedwood forest of northeastern Ontario.

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Ontario's boreal mixedwood forests harbors a diverse avifauna representing over 130 species of forest-dependent songbirds (Order Passeriformes). Extensive clear-cut harvesting in this region is proposed to result in shifts of songbird community composition that may exacerbate the overall North American decline of some species. However, there is no existing data to assess the long-term implications of this intensive form of silviculture on songbird communities.

A spatially nested study design was used to compare songbird community composition among 24, 30-year old post-mechanized logged and unlogged mixedwood stands in northeastern Ontario. Songbird communities were surveyed using unlimited radius point counts in the early summer of 1998. Forest structure was mensurated within sampled stands to examine patterns of variation in songbird communities among these forest types. Multivariate analysis methods of principal components analysis (PCA) and its canonical analog, redundancy analysis (RDA) were used as general linear models to derive unique and covariant sources of variation in songbird abundance. The first two model components returned eigenvalues that explained 40.6% (PCA) and 30.1% (RDA) of the variation in songbird abundance. The first axis was most closely correlated with ecozone, percent conifer tree retention, and foliage height diversity for both models. Forest management type, canopy closure and large tree (greater than 50.0 cm DBH) basal area were most closely correlated with the second axis for both models. Removing stand level habitat attributes as covariates, ecozone, forest management type, and combined ecozone and management accounted for 10.2%, 11.9%, and 14.8% of the variation in songbird abundance. The results indicate songbird communities are most strongly influenced by the conifer retention and management intensity, which differ among post-logged and unlogged forest types. Hence, representation of unlogged forest within managed landscapes of northern Ontario may help to maintain overall regional songbird biodiversity.

Keywords: boreal mixedwood, clear-cut, songbird communities, point count, general linear model, PCA, RDA, Ontario

Importance of substrate composition in nest site selection of smallmouth bass (*Micropterus dolomieu*) in central Ontario lakes.

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Relationships between nest density and substrate size were examined in four small Ontario lakes (<1000ha) and larger Lake Opeongo (5860ha), including one of its basins where there is particularly intensive nesting. The small lakes included both igneous and sedimentary basins. In each lake, substrate sizes were mapped as small (sand and silt), large (gravel, rock and logs) and mixed (a combination of small and large) during whole-lake shoreline surveys by snorkelers or via canoe. Active nests and the substrate for each were recorded annually over several years for each lake. Nest densities for each substrate type in each year and basin were calculated by dividing the number of nests on a substrate by the length of shoreline classified with that substrate. Treating data from different years as replicates within each lake, and adjusting for differences in total nest numbers among years, it was found that significant associations exist between nest density and substrate size in four of the basins studied. In the other two basins, the trend was also positive, but not statistically significant. Smallmouth bass therefore exhibit fairly consistent nesting substrate preferences through time within lakes, and among lakes that differ in geological origin.

Use of small boreal stream tributaries by Atlantic salmon parr (*Salmo salar*).

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Up and downstream movements of Atlantic salmon parr and brown trout (*Salmo trutta*) were studied on three small tributaries of the arctic Ponoï River, Russia. Two of the three tributaries were known not to be spawning areas for salmon (spawning status of the third was unknown), but juveniles entered all three from the mainstem. It has been argued that juvenile Atlantic salmon have high site fidelity and do not move away from their natal habitat. This has recently been criticized, and current studies have revealed movement to occur in some populations of juvenile salmonids. Upstream migration of salmon parr was detected for all tributaries, although the number of downstream migrants generally exceeded that of upstream. A small degree of salmon parr movement was observed throughout the summer, but a peak occurred when water temperatures reached 10-12 °C. These results indicate that salmon parr do leave their natal habitat to migrate upstream into small nursery tributaries, possibly to seek refuge from mainstem predators, cooler summer habitat or for increased food resources. Brown trout and burbot (*Lota lota*) were also found in the tributaries and are known predators of juvenile Atlantic salmon. Predation on salmon parr is not expected to be high, however, as the trout and burbot were similar in size to the salmon. Salmon parr, therefore, do show active exploratory behaviour in addition to the traditionally assumed sedentary, territorial behaviour.

Female choice and sexual selection on the courtship song of the field crickets, *Gryllus bimaculatus* and *G. integer*.

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There has been considerable work focusing on female choice mechanisms in crickets at the level of calling song phonotaxis. Courtship behaviour and courtship song are far less studied. Females are known to orient themselves towards attractive calling males. Previous studies have concluded that courtship song is simply a trigger for female mounting. Results from this study, using *G. bimaculatus*, suggest that females express choice during courtship implying there is important information present in courtship behaviour and song. Females are attracted to males with: 1) louder low frequency ticks (peak energy 4-6kHz) relative to high frequency ticks (peak energy >11kHz); 2) more low frequency ticks per high frequency tick period; and 3) younger males. Female reproductive expenditure is greater than that of males therefore choice by females at the courtship level is not surprising as it may serve as a means of evaluation to ensure mating with the best male. Current research, on *G. integer*, is incorporating precision sound recording instruments, along with synthetic generation and manipulation of courtship song to experimentally measure the precise components of the song in relation to female choice.

The maintenance of temperature sex determination in snapping turtles (*Chelydra serpentina*): do the data support the theory?

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There are several systems of sex determination in the Kingdom Animalia. The most common of these is chromosomal, or genetic sex determination (GSD), which depends on genetic variation alone. Environmental sex determination (ESD), found in over 40 families of reptiles, has recently been studied with the goal of understanding how post-fertilisation, environmental factors affect the sex of the offspring. The most common form of ESD is temperature sex determination (TSD) in which temperatures experienced by developing embryos determine their sex. It has been proposed that although TSD may cause an entire cohort of hatchlings to be extremely biased towards one sex, TSD may be evolutionarily maintained in long-lived species because annually biased sex ratios average to 50:50 throughout an individual's life. If this is in fact the case, there is concern that global warming may cause the extinction of species with TSD because an increase in mean seasonal temperature would cause an increase in, followed by the predominance of, individuals of the sex incubated at higher temperatures. For my thesis I intend to test these hypotheses using the longest data set (17 years) known to exist for a long-lived, TSD species: the snapping turtle (*Chelydra serpentina*).

Investigation of the potential pollinators of *Symphyotrichum lanceolatum* (Willd.) Nesom and *Symphyotrichum lateriflorum* (L.) Love & Love in Waterloo county.

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The pollination ecology of *Symphyotrichum lanceolatum* and *S. lateriflorum* was investigated with specific reference to the potential pollinators of these two species of aster, in order to determine if the set of floral visitors frequenting these asters differed or not. Both species of *Symphyotrichum* were visited by a wide array of, primarily, generalist floral visitors. The most important visitors were from the families Calliphoridae, Tachinidae and Syrphidae (Diptera) and Apidae, Halictidae and Vespidae (Hymenoptera). Although the two species of aster did share floral visitors (e.g. *Dolichovespula arenaria*) they both attracted a number of, sometimes, exclusive visitors - *Eristalis* spp., *Belvosia* spp., *Phasia* spp. And *Polistes fuscatus* for *S. lanceolatum*; and *Syrphus* spp., *Platycheirus* spp. and *Vespula maculifrons* for *S. lateriflorum*. These differences are probably largely attributable to the habitat preferences and/or morphological differences in floral traits of *S. lanceolatum* and *S. lateriflorum*. Pollinator importance was determined (indirectly) for important visitors using relative visitor abundances, floral foraging times, average pollen load and foraging behaviour. Honeybees (*Apis mellifera*) and yellow jacket wasps (*Dolichovespula arenaria*) were potentially the most important pollinators of *S. lanceolatum*, whereas, the potentially important pollinators of *S. lateriflorum* were two species of yellow jacket wasp (*D. arenaria* and *V. maculifrons*). Floral visitor assemblages differed significantly for a species of aster between study areas (that were separated by approximately 7km). Floral visitor composition varied throughout the season for both species of aster, with honeybees and *D. arenaria* (only on *S. lanceolatum*) decreasing markedly as the season progressed while Halictidae bees, *Polistes fuscatus*, *Eristalis tenax*, *V. maculifrons* and *D. arenaria* (only on *S. lateriflorum*) increased in relative abundance throughout the season.

Influence of water velocity on the body shape of young-of-the-year brook charr (*Salvelinus fontinalis*).

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This study investigated the influence of water velocity on the body shape of young-of-the-year (YOY) brook charr and the temporal persistence of the body shape dimorphism in the field noted by an earlier study. YOY brook charr were reared at 2 different water velocities in order to test the hypothesis that the difference in the body shape of YOY brook charr swimming at different water velocities is a result of phenotypic plasticity rather than genetically determined polymorphism. We predicted that fish reared at higher water velocity will have a more fusiform body shape than fish reared at lower water velocity. Samples were preserved at regular intervals and measured for a number of morphometric characters. Fish swimming in the high velocity treatment showed significant increases in their maximum caudal fin height. The minimum and maximum caudal fin height diverged markedly between experimental groups early in development. The differences in the caudal fin measures were result of phenotypic plasticity because the experiment was a common garden design. The field component found that fish swimming in slow runs vs. sidepools did not have differences in their body shape. This finding suggested that differences in body shape noted by an earlier study were probably due to phenotypic plasticity. The results of this study contribute to our understanding of the relative importance of phenotypic plasticity in determining fish body shape.

Identification of the sex pheromone of the sugarbeet cyst nematode (*Heterodera schachtii*).

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Pheromones of the sugarbeet cyst nematode, *Heterodera schachtii*, have not yet been isolated. We present the development of a reliable, sensitive means of identifying nematode sex attractants for use as an alternative to pesticides. Homospecific males displayed a dose dependent chemotactic response to water soluble chemicals produced by 1, 5, 10, and 20 females of *H. schachtii*. Electrophysiological assays are being developed to investigate the underlying chemosensory phenomena of this response, which may ultimately lead to characterization of a pheromone.

A test of the energy limitations hypothesis for chorus tenure in male bullfrogs (*Rana catesbeiana*).

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Choruses are groups of male anurans vocalizing to attract females and an individual male's attendance at a chorus, measured in numbers of nights, is his chorus tenure. Although male chorus tenure is positively correlated to his mating success, it has been shown to be costly, both in terms of increased predation risk and energy. We tested predictions of two complementary hypotheses concerning the energetic limitation of chorus tenure in a population of bullfrogs (*Rana catesbeiana*) in the Wildlife Research Area of Algonquin Park. 1. If males' chorus tenure is limited by the amount of energy that they can accumulate before their chorus tenure begins, then energetic condition should vary with chorus tenure in three, non-mutually exclusive ways. Males with longer chorus tenures will, other things being equal, have at least one of the following: higher initial energetic condition, lower final energetic condition or higher residual energetic condition change, relative to males with shorter chorus tenures. 2. If males' chorus tenure is limited by the amount of energy that they can accumulate during their chorus tenure, then males who have their energetic condition artificially supplemented should have longer chorus tenures than males who are not supplemented. The population of chorusing bullfrogs was censused on each night of the 1998 chorusing season. Each individual male was identified, weighed and randomly assigned to one of three treatments (fed, sham-fed and released) of a feeding experiment. An index of condition was generated by regressing male body mass on standard length and using the residuals as the measure of male energetic condition. Only final condition was significantly negatively related to chorus tenure in bivariate correlations. However in a multiple regression of chorus tenure on initial condition, final condition, residual condition change and feeding status, all four correlation coefficients were significant and as a whole explained 83.8% of the variation in chorus tenure. Post-hoc tests revealed that only final condition was significantly related to chorus tenure, indicating that bullfrog chorus tenure is limited by final energetic condition. It is unclear whether bullfrogs with longer chorus tenures are better able to recover lost condition or are more willing to incur any potential costs of decreased body condition.

The effects of ground cover, soil moisture, and soil urine content on nest-site selection of painted turtles (*Chrysemys picta*) in Algonquin Park, ON.

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Studies of nest-site selection on species with temperature-dependent sex determination usually focus on factors that affect offspring sex, however aspects of nest location can have a large impact on offspring survival. We tested the effects of soil moisture, the presence of ground cover, and the presence of turtle urine on nest-site selection of painted turtles (*Chrysemys picta*) in Algonquin Park, Ontario. We predicted that turtles would prefer sites lacking vegetation, because shade from ground cover would lower nest temperatures. As turtle urine is an indicator of the presence of nests and may indicate site suitability, it was predicted that females would prefer sites that had urine added. Eggs in dry nests are susceptible to desiccation, while eggs in very moist nests have a greater risk of freezing over winter. As soil moisture has such effects, it was predicted that females would be able to distinguish between moist and dry sites, although preference was not known. Ground cover was removed from five experimental blocks, and then each block was split into 8 treatment plots. The treatments were urine versus no urine, vegetation versus no vegetation, and water added versus no water added, making a 2X2X2 factorial design. Urine and vegetation were added at the beginning of nesting season, and water was added to plots daily. Nesting frequency was recorded for the entire nesting season. Contrary to our predictions, neither the presence of ground cover nor the presence of urine had a significant effect on nest frequency. Plots with no water added had significantly more nests than plots with water added. This indicates that nesting turtles possess the ability to evaluate soil moisture. Further, these results imply that to the nesting female soil moisture is an important indicator of nest-site suitability, while urine presence and this degree of ground cover are not.

Sometimes it's hard to be a hermaphrodite.

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The mangrove killifish (*Rivulus marmoratus*) is the only self-fertilizing vertebrate species. Most individuals initially develop ovarian tissue and then testicular tissue to become functional hermaphrodites. The other individuals develop directly as primary males. Later in life some hermaphrodites lose ovarian function and become secondary males. We are studying the details of ontogeny of sexual development and differentiation in this fish. Molecular genetic evidence has shown that this species reproduces sexually at some times. We are attempting to determine which individuals engage in sexual reproduction, and what factors regulate that behaviour.

Bird depredation of grapes in a Niagara vineyard: do predictable trends exist?

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Although local grape growers view bird depredation as a significant economic issue, the most recent research on the problem in the Niagara Peninsula is almost three decades old. We used a systematic field protocol to quantify spatial and temporal trends in bird damage to six european grape varieties from August 1998 - January 1999. Two predictable spatial trends were identified: (1) berry loss in three varieties was clinal from edge to center, and (2) in vines on a multi-tiered caning system berry loss was heaviest on upper clusters. There were no measurable spatial trends in the other three varieties. Damage was caused primarily by European Starlings (*Sturnus vulgaris*), and was concentrated proximate to suitable staging areas such as dead trees and power lines. The single temporal pattern identified to date is the damage of two late harvest varieties by large flocks of starlings. These results indicate a lower than expected level of bird depredation, at least this season in this vineyard.

Geographic variation in the life-history of the painted turtle (*Chrysemys picta*).

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This paper reports life history statistics of a northern population of painted turtles inhabiting Wolf Howl Pond in Algonquin Provincial Park, Ontario. Size of maturity of males was estimated from the ratio of foreclaw length to plastron length (PL) as 10 cm. Size of maturity of females was estimated from the mean PL of the smallest nesting females as 13.75 ± 0.15 cm. The relationship between age (t) and PL was estimated using the Von Bertalanffy growth interval model and non-linear regressions. The resultant Von Bertalanffy growth equations for males and females were $PL = 13.63(1 - 0.725e^{-0.125t})$ and $PL = 15.61(1 - 0.764e^{-0.100t})$, respectively. The mean clutch size of 92 nests was 7.2 ± 1.5 eggs. Annual clutch frequency was 0.62 clutches per females per year. An age-based life table was produced. Annual survivorship rate for early age classes was very low, and highly variable and estimated as 0.969 and 0.982 for all ages of adult males and females respectively. We hypothesised that *C. picta* have adopted a bet-hedging life-history strategy, and tested the pattern of life-history traits across many *C. picta* populations as described in the literature, to reveal a pattern of life-history variation which correlates well to long-term climate data. This study describes a geographic pattern of life-history traits that fits well with a pattern predicted by a model of the bet-hedging, life-history strategy. *C. picta* in cooler environments compared to warmer environments display reduced annual reproductive effort, juvenile survival that is more stochastic and lower relative to adults, increased longevity, and delayed maturity.

Historical collection data as a source for predicting patterns of species richness.

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A wealth of information is available in both publicly-owned and private insect collections, such as important baseline data on species distribution and range, hostplants, life history traits, phenotypic and genetic variation. Information obtained from these collections may also be useful for elucidating broader ecological trends such as range expansion, local or regional species introductions and extirpations, and patterns of biodiversity. However, because the specimens available originate from multiple sources, with no uniformity in collection technique or sampling effort, there is the potential for unknown bias which can compromise the validity of conventional statistical analysis. Relatively new data resampling techniques may be a better tool for working with this type of problem. In this study, resampling techniques are applied to such a data set composed of 6869 records, representing 412 noctuid moth species (Lepidoptera: Noctuidae) from the Fundy Coast of New Brunswick. Recorded information came from several private and public insect collections, publications, and modern systematic sampling programs. Our goal was to determine the probability that species had been extirpated from the study region, or subsets of the region. Results from these simulations show that for one subregion, Charlotte County, there is evidence that up to 13 extirpations may have occurred. When examining data for the entire region, it is possibly that up to 10 species have been extirpated. The resampling program also proved useful for tracking introductions of new species, especially European species such as *Noctua pronuba* (L.).