

# Atlantic Society of Fish and Wildlife Biologists

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### ABSTRACTS

ORAL PRESENTATIONS (in order of presentation)



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## **ESTIMATING THE MAGNITUDE OF HUMAN-RELATED BIRD MORTALITY BY SECTOR WITHIN CANADA**

Richard D. Elliot<sup>1</sup>, Anna M. Calvert, Christine A. Bishop<sup>1</sup>, Elizabeth A. Krebs<sup>1</sup>, Craig S. Machtans<sup>2</sup>, and Gregory J. Robertson<sup>1</sup>

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Environment Canada recently developed the first estimates of the magnitude of annual human-related bird mortality in Canada, from about 20 industrial sectors and other human-related sources. All mortality from these sources, including destruction of nests and death of young and adult birds, was expressed demographically as “adult equivalents” to enable comparison across sectors. About two-thirds of all estimated mortality was from feral and pet cats, in excess of 100 million birds per year, mostly of species that nest or feed on or near the ground. However many other sources were important, including mortality from collisions of flying birds with vehicles, houses and transmission lines, each estimated to be between 10-100 million birds annually. Impacts of agricultural pesticides, collisions with industrial buildings, and mortality due to game bird sport harvest were each estimated at between 1-10 million birds annually. Mortality due to commercial forestry activities, agricultural mowing, tilling and harvesting, electrocution by power lines, maintenance of power line rights-of-way, and collisions with tall communication towers, were each estimated at between 100,000-1,000,000 birds annually. Many other sectors studied were estimated to kill less than 100,000 birds per year, including collisions with tall buildings, operation of hydro-electric reservoirs, marine fisheries bycatch, wind turbines and wind farms, terrestrial oil and gas, mining, road maintenance, and marine oil and gas (in approximate decreasing order). This unique set of estimates was published in ten scientific papers in October 2013 at [ace-eco.org](http://ace-eco.org), enabling Canadian management agencies and their conservation partners to appropriately target their efforts to minimize the population-level impacts on birds of human activities.

**Keywords:** Bird mortality, cats, collisions, industry impacts

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## **CONSERVATION PRIORITIES FOR BIRDS IN THE ATLANTIC REGION: WHAT ARE THE MOST IMPORTANT THREATS TO BIRDS IN OUR REGION?**

Anne Benoit

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Bird conservation planning has shifted its focus over the last twenty years towards a broader eco-regional planning context. Canada committed to developing twenty-five bird conservation strategies for all bird groups on its territory that will provide a set of conservation objectives and assist Environment Canada in fulfilling its mandate to manage all migratory bird populations. Environment Canada's Canadian Wildlife Service has just completed the drafting of six Bird Conservation Region Strategies covering all of the Atlantic region. From these documents, we have summarized and distilled key regional conservation priorities for birds in Atlantic Canada based on the magnitude assigned to threats to birds as well as the number of priority birds affected by those threats. Some of these conservation priorities identified are to address wide spread threats throughout the Atlantic region such as the lethal and sub-lethal effects on birds due to the chemical contamination from heavy metals or oil spills and discharges while others are more prevalent to Newfoundland and Labrador: activities from fishing and aquaculture industries or to the Maritimes provinces: agricultural practices. A suite of recommendations are also provided to anyone (governments; non-government organizations and academic community) wishing to address these priority or other threats to birds.

**Keywords:** Bird Conservation Region Planning, Atlantic

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## **NATURE CONSERVANCY OF CANADA – CONSERVATION PLANNING WORK AND OPPORTUNITIES FOR RESEARCH PARTNERSHIPS**

Laurel Bernard

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The Nature Conservancy of Canada (NCC) is a national non-profit land conservation organization that has helped protect over 2 million acres of ecological sensitive land across Canada in the over 50 years since its inception. This includes over 60,000 acres in Atlantic Canada. NCC is a science-based organization that completes Natural Area Conservation Plans which assesses biodiversity and threats at a landscape scale and identifies species and ecosystem targets for conservation to direct our conservation actions. NCC also creates management plans to direct our actions at a property level once we own the land. Within both of these processes knowledge gaps are identified which need to be filled to better guide our work. NCC would like to enhance partnerships with universities, government researchers and contractors to fill these knowledge gaps. This talk will delve into the conservation planning work NCC has completed in the Atlantic Region, and touch on some of the initial knowledge gaps identified which could be potential areas for collaboration with partner organizations and academic institutions.

**Keywords:** land conservation, landscape plans, research partnerships

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## **STUDENT PRESENTER**

### **TECHNOLOGICAL ADVANCES IN RESEARCH ON ATLANTIC STURGEON – NEW APPROACHES USING ULTRASONIC AND POP-UP SATELLITE ARCHIVAL TAGS**

Andrew D. Taylor and Matthew K. Litvak

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Over the past number of years, technological advances have allowed researchers to gain better information on fish distribution, activity and movement. We examined the movements, activity patterns, and seasonal distributions of Atlantic sturgeon adults (1.5 – 2.4 m TL) using Vemco V16 ultrasonic tags and Wildlife Computers pop-up satellite archival tags (PSATs). Forty-four ultrasonic tags were surgically implanted in Atlantic sturgeon from the Saint John River, NB, during the summers of 2010-2012. Fish were tracked using stationary receivers and a triangulation technique we developed was used to determine their precise location. Atlantic sturgeon adults were found primarily in lower river reaches throughout the summer months, mainly over sandy substrate in the mid water column. Tagged Atlantic sturgeon migrated out of the Saint John River primarily in August and September of each year. We used two types of PSATs (MK10 and MiniPATs) to investigate the activity of Atlantic sturgeon after they left the Saint John River. Eleven of 14 PSATs surfaced and began transmitting depth, temperature, and light level data for the duration of their deployment (121-302 days). 5 of the surfaced PSATs were recovered, allowing us to download complete archival data sets that provide extensive information on seasonal distribution. PSATs released in February and April were found in close proximity (~5-20km) offshore of the Saint John estuary, while tags released in June were scattered in near shore areas throughout the Bay of Fundy. We will use a back-calculation model of tag drift to determine the exact location of PSAT release through the winter months, which paired with the triangulation tracking approach, may lead to the discovery of a winter aggregation area in the Bay of Fundy. These results will help to develop population estimates and provide information for management of this threatened population.

**Keywords:** Atlantic Sturgeon, Habitat, Pop-up satellite archival, Ultrasonic telemetry

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## STUDENT PRESENTER

### TEMPORAL AND SPATIAL MOVEMENT PATTERNS OF STRIPED BASS IN THE MINAS PASSAGE AND MINAS BASIN, BAY OF FUNDY

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The Bay of Fundy's Minas Passage (with current speeds up to 6 m/s) is currently the site for in-stream tidal energy turbine testing, but is also a corridor used by important migratory fish species. Among these is a threatened striped bass (*Morone saxatilis*) population. The objectives of this project were to determine the movement patterns of striped bass within the passage to assess the potential risk of interaction with tidal energy turbines. Transmitter-tagged striped bass (27 post-spawners tagged in Stewiacke River, NS and 58 summer migrants tagged off Grand Pré and Kingsport, NS) were tracked from May to November 2011, and May 2012 to April 2013 using bottom-moored VEMCO acoustic receivers deployed in complete and partial lines across the passage. Detection data were retrieved from 38 of the 41 receiver locations. Of the 85 striped bass tagged, 45 were detected (53%). During the May-November 2011 deployment, there was no clear seasonal pattern of striped bass movement in the Minas Passage, but post-spawners were generally present more often during the summer months. During the full-year 2012-2013 deployment, smaller bass (<60 cm) were detected rarely and sporadically; larger individuals were detected much more frequently in the passage, especially in the winter months. Striped bass generally occupied the top 40 m of the water column, with some large bass using a wider range of depths. Receiver data indicated that striped bass swim through the proposed turbine test site at turbine depth. However, the ability of striped bass to detect and avoid turbines when travelling at high speeds remains unknown. The migratory behaviour of the population also requires further investigation. Data collected from receivers deployed along the shores of Minas Basin during the above study periods will be analysed to identify different movement patterns within the population and to help inform future conservation efforts.

**Keywords:** acoustic telemetry, Bay of Fundy, *Morone saxatilis*, striped bass, tidal energy

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## STUDENT PRESENTER

### MOVEMENTS AND POPULATION CHARACTERISTICS OF STRIPED BASS, *MORONE SAXATILIS* (WALBAUM, 1792), IN THE MIRA RIVER, NOVA SCOTIA

Colin Buhariwalla<sup>1</sup>, J. MacMillan,<sup>2</sup> I. Wirgin,<sup>3</sup> M.J. Stokesbury<sup>1</sup> and M.J. Dadswell<sup>1</sup>

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Striped bass in Atlantic Canada inhabit the northern extreme of the species' range. Past research efforts have been focused on five known spawning stocks in the St. Lawrence River, QC, Southern Gulf of St. Lawrence, and Bay of Fundy. Striped bass are known to occur in the waters of Cape Breton Island and along the coast of eastern Nova Scotia, however, their origin, movement, and characteristics are largely unknown. We investigated an aggregation of striped bass in the Mira River, Cape Breton, to determine their stock of origin, movements within the system, and population characteristics. Bass were angled (n = 56) May 2012 to October 2013, lengths and weight were recorded, scales and DNA samples were collected, and fish were tagged with unique, identifying dart tags. Thirty of these bass were also implanted with coded acoustic transmitters during 2012 (n = 14) and 2013 (n = 16) field seasons. Preliminary analyses of movements indicate overwintering within the mid estuary, upriver migration to freshwater in spring, and lower estuary occupancy during the summer and fall months. All mature bass implanted with long life acoustic tags (2+ years) were recorded in the estuary throughout the study period, which implies residency and lack of movement to other possible spawning locations. Length, weight, and age structure analysis reveals a wide size range (33.2-125.0 cm, total length; 0.50–20.5 kg) and age structure (3–18+ years old) within the aggregation. Gonads of three, mature female bass were sampled soon after the probable spawning season (early June to July) and contained spent gonads with reabsorbing eggs. DNA analyses are not yet complete but based on residency of large, mature bass we hypothesise the Mira population is a discrete stock.

**Keywords:** acoustic telemetry, striped bass, Mira River, residency, overwintering

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## STUDENT PRESENTER

### PASSIVE ACOUSTIC DETECTION OF HARBOUR PORPOISES (*PHOCOENA PHOCOENA*) IN THE MINAS PASSAGE, NOVA SCOTIA, CANADA

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Tidal power development sites introduce potential risks to marine mammals. Our project was focused on an assessment of harbour porpoise (*Phocoena phocoena*) activity at the Fundy Ocean Research Centre for Energy (FORCE) turbine test site in the Minas Passage. In this location, the maximum tidal range is 13 m; surface current speeds peak at about 6 m/s. The study also involved a comparison of the performance of two hydrophone types, the Chelonia Porpoise Detector (C-POD) and the icListenHF (Ocean Sonics Ltd). Diel, tidal and lunar patterns in porpoise activity were examined during the entire month of August 2012. The data contribute to an assessment of the potential risks of turbine-porpoise interaction at the FORCE site. Two C-PODs and one icListenHF were bottom moored and co-located in the FORCE test area. Detection positive minutes (DPMs, click train detection within each minute) were used to indicate porpoise presence. The icListenHF recorded approximately 10x more DPMs than the C-PODs, reflecting a listening volume for the icListenHF that is about 11x that of a C-POD. There were more DPMs at night than during the day, and more DPMs on neap tides than spring tides. Ambient noise levels, which were highest during a spring tide and higher during flood periods than during ebb periods, resulted in some lost detection time. At very high current speeds, the performance of both hydrophone types was affected by noise interference, presumably due to bedload transport and likely also due to noise generated by metal mooring components and hydrophone flow noise. This baseline study and a proposed 2013-2014 winter deployment contribute to the “before turbine deployment” dataset for a marine mammal impact assessment at FORCE.

**Keywords:** Minas Passage, Passive Acoustic Hydrophones (PAM), *Phocoena phocoena*, Harbour porpoise, Tidal Power

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## **AUTOMATED TELEMETRY ARRAYS: TRACKING BROAD-SCALE MOVEMENTS OF TERRESTRIAL ORGANISMS**

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We have established an automated network of VHF receivers to track the broad-scale movements of terrestrial organisms. Automated receivers (SensorGnomes; [www.sensorgnome.org](http://www.sensorgnome.org)) are coupled with towers and directional and non-directional antennas to continuously sample specific VHF frequencies. The receivers extract putative signals from organisms tagged with coded Lotek 'nano-tags'<sup>TM</sup> or simpler 'beeper' tags. Coded tags with different burst rates mean that several thousand individuals can be tracked on the same frequency and still be separately identifiable. We position towers in open areas with clear lines of sight so that in ideal circumstances tags can be detected at distances of up to 20 km. Common protocols for data collection and comparison of extracted signals to a master database ensure that all tags can be detected by any receivers within the broader 'telemetry array'. In 2013, nine partners from eight agencies and institutions tagged over 800 individuals of 12 species of vertebrates. Approximately 70 automated receiving stations were positioned from Nantucket Sound, MA through to Canso, Nova Scotia; some operated continuously from late April to now. Collectively, these stations have amassed over 20 million detections of individuals (many at colonies) and most researchers have observed individuals making movements outside of the area they were originally tagged. The telemetry array has revealed scales and patterns of movement never before observed: several individual gulls, terns, shorebirds and three species of passerine have been tracked over the entire extent of the array. In 2014 CFI Leading Edge funds to Acadia, Western and Guelph will allow us to expand the array to include an additional 150 receiving stations in Atlantic Canada and Ontario. The infrastructure is openly available to all scientists, agencies and private consultants and will be managed and operated with the help and oversight of Bird Studies Canada.

**Keywords:** Automated telemetry, migration, movement, birds, bats

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**DURATION OF STAY AND MOVEMENTS OF SEMIPALMATED SANDPIPERS  
(*Calidris pusilla*) DURING MIGRATORY STOPOVER IN THE UPPER BAY OF FUNDY  
– APPLICATION OF THE SENSORGNOME SYSTEM**

Diana Hamilton<sup>1</sup>, Julie Paquet<sup>2</sup>, Cheri Gratto-Trevor<sup>3</sup>, Sarah Neima<sup>1</sup>, and Abigail White<sup>1</sup>

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Semipalmated Sandpipers use the upper Bay of Fundy, Canada, as a critical stop-over site during their migration from Arctic to South America. Historical estimates suggest that individual birds spend approximately 2 weeks in the Bay, roughly doubling their weight during that time. However, recent apparent changes in diet, habitat use and movement have caused us to question some assumptions about these birds, and may require us to reconsider population estimates. In summer 2012 and 2013 we radiotagged a total of 134 sandpipers in the upper Bay of Fundy, and 46 birds (all in 2013) at James Bay. Birds were tracked throughout the Bay of Fundy by air and ground using mobile receivers, and using an array of Sensorgnomes deployed through the Bay, as well as on the eastern shore of Nova Scotia, and in the north-eastern United States. We also collected blood samples from 40 different birds in each year and compared isotopic signatures of plasma against those of the prey community. In 2012 we found very little movement between arms of the Bay and that diets differed somewhat between the areas. We noted no difference in length of stay between these two areas, suggesting the multiple diets can lead to similar rates of fattening. Duration of stay appears to have increased; the minimum mean stay was 20 days in 2012. Preliminary 2013 data suggest more movement and variability in length of stay, though the mean is similar. Surprisingly, birds from James Bay were detected passing by the Bay of Fundy, but few staged here. Several were detected in the United States, suggesting a different migratory pattern. Our results suggest that population estimates based on a 2-week turnover may be incorrect, and that the decline in birds staging in the Bay of Fundy may be larger than previously thought.

**Keywords:** Semipalmated Sandpipers, radiotracking, migratory stopover, Bay of Fundy

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## STUDENT PRESENTER

### SPRING AND FALL MIGRATORY MOVEMENTS OF THE IPSWICH SPARROW

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Migration is a crucial period for many bird species but is difficult to study because of the large spatial and temporal scales involved. Island breeding birds are ideal candidates for migratory study because their populations are clearly demarcated. The Ipswich Sparrow (*Passerculus sandwichensis princeps*) is a subspecies of the Savannah Sparrow that breeds exclusively on Sable Island, Nova Scotia. Twice annually, Ipswich sparrows must navigate the 120 km distance between the mainland and their breeding site. They continue their migration to wintering grounds along most of the Atlantic Coast of North America. The exact routes by which IPSP arrive at and leave Sable Island are unknown, but there are some routes that could bring them in proximity to flare stacks on platforms surrounding Sable Island. Migratory birds can be affected by offshore gas platforms through attraction to lights or flares so it is possible that IPSP may be negatively influenced by this human infrastructure. The goal of this study is to examine the movements of IPSP during spring and fall migration in order to determine their overwater migratory routes, and movements along coastal Nova Scotia. To do this, we used an array of automated VHF telemetry towers spanning most of the NS coast, and the island. Spring data suggest that many IPSP depart from Nova Scotia between Conrad's Beach and Clam Harbour with an overwater route of 230-270 km. Most birds were first detected at the West end of the island and established territories on the Western half. Male and female IPSP winter separately and could display differing migratory strategies. IPSP are currently migrating to their wintering grounds and results will be analyzed similarly to spring data with the inclusion of age and sex as factors influencing route and timing.

**Keywords:** *Passerculus sandwichensis princeps*, migration, telemetry

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## STUDENT PRESENTER

### **FORAGING MOVEMENTS OF BREEDING AND POST-BREEDING ARCTIC (*Sterna paradisaea*) AND COMMON TERNS (*Sterna hirundo*) AT MULTIPLE NESTING SITES**

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Seabird species often co-occur in space and time including during foraging, breeding, and roosting. Differences in foraging ecology are one hypothesis to explain the co-existence of similar species nesting at the same site. However, these mechanisms are poorly understood for many seabird species because it is difficult to observe and quantify interactions and behaviors at sea. Common (*Sterna hirundo*) and Arctic Terns (*Sterna paradisaea*) co-occur at breeding colonies on a number of islands along the NE Atlantic Coast, including Maine and Nova Scotia. Using VHF radio telemetry tags and a network of automated VHF receivers, we monitored the movements of both species during and following the breeding season from three different breeding colonies: Sable Island, Country Island and Petit Manan Island. Receivers were situated at and around the nesting sites, as well as along the Atlantic coast from Massachusetts through to NE Nova Scotia and on industry supply vessels that move between oil and gas platforms on the scotia shelf. We had two objectives. First, we were interested in inferring differences in foraging ecology between the species by examining patterns of local and broad scale movements. Second, we were interested in exploring whether terns interacted with offshore oil and gas platforms or supply vessels. Six such platforms operate within 5-50 km of Sable Island, but not in proximity to the other colonies. From continuous monitoring of colonies during the breeding season, we are able to examine change in colony attendance patterns, foraging bout durations, and direction of outgoing and incoming flights for foraging bouts. These basic measures will be compared between species at each site, and among sites, to gain insight into differences in foraging ecology of the two species, and propensity to interact with offshore human infrastructure.

**Keywords:** Sable Island, *Sterna paradisaea* *Sterna hirundo*, radio telemetry

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## STUDENT PRESENTER

### WHERE DO MIGRATORY BIRDS GO? DETERMINING MIGRATORY CONNECTIVITY FOR SWALLOWS USING GEOLOCATORS AND STABLE ISOTOPES

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Conditions on the wintering grounds and/or migratory routes are often cited as potential causes for declines of migratory birds. Therefore, identifying these areas is of increasing importance for conservation efforts. Recent advances in the miniaturization of geolocating devices have allowed researchers to attach these passive data-loggers to relatively small species (e.g., Barn Swallow, 17-20 g). The loggers continuously record light levels, and locations are approximated from sunrise and sunset transitions. While these devices can provide detailed information on the timing of migration, migration routes and overwintering sites, the individuals must be recaptured for the device (and its information) to be retrieved. Furthermore, the cost of these devices can be prohibitive, and establishing an unbiased sample can also be a challenge. Stable isotopes ( $\delta^2\text{H}$ ,  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) can be more cost-effective than geolocators, and multiple samples obtained more readily. Overwintering locations can be estimated based on stable-isotope ratios present in feathers molted on the wintering grounds. However, this method can be less precise and only identifies the region where the feather was molted, not the migratory route. Using both methods in conjunction, researchers can gain insight into the larger patterns of migratory connectivity within populations or across the range of a species. Swallows (Family: Hirundinidae) are declining across North America; these declines are particularly pronounced for long-distance migrants in the northeast. As part of a multi-year study to determine the effect of wintering ground conditions on declines, geolocators and stable isotopes will be used to identify the wintering grounds for four species of swallows found in the border region of New Brunswick and Nova Scotia. Range-wide patterns in migratory connectivity have previously been examined for the Barn Swallow (*Hirundo rustica*) and the results of this work for one site in New Brunswick will be presented as an example of these techniques.

**Keywords:** Geolocators, Migratory connectivity, Stable isotopes, Swallows

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## **CANADA'S RESPONSE TO WHITE-NOSE SYNDROME: PLANS, INFRASTRUCTURE AND ACTIONS**

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A fungus infection of the skin, White-nose syndrome (WNS), was first discovered on hibernating bats in 2006 near Albany, New York, and since then has spread to 22 states and 5 provinces where it has devastated bat populations. More than six million bats have been killed by *Pseudogymnoascus destructans* (formerly *Geomyces destructans*), which is a cold-loving fungus not native to North America. *Pseudogymnoascus destructans* appears as white, fuzzy growth on the muzzle, and creates lesions on the epidermis of bats. Hibernating bats are immunosuppressed because of their low body temperature allowing for severe infections of the fungus to occur. Infection leads to frequent arousals that deplete energy reserves, cause dehydration and very often is fatal. The Canadian Cooperative Wildlife Health Centre (CCWHC), an inter-agency partnership for wildlife health based at Canada's five veterinary colleges, is responsible for examining all submitted bats and diagnosing WNS, as well as coordinating Canada's response to this disease. Agency and university personnel with special interests in bats have formed an Inter-agency WNS Committee to collaborate and coordinate efforts, and have produced 'A National Plan to Manage White Nose Syndrome in Bats in Canada', which parallels that developed in the United States. Priority response actions have been identified and are implemented through five Technical Working Groups: Bat Population Monitoring, Surveillance and Diagnostics, Mitigation, Communication and Outreach and Data Management. Canada's response to WNS is limited both by resources and by incomplete knowledge of the ecology of the fungus, the susceptible bats species and the disease.

**Keywords:** Bats, CCWHC, White-nose syndrome

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# **THE WOOD FROG, *Rana sylvatica* (*Lithobates sylvaticus*), AS A MODEL TO STUDY THE PATHOGENESIS AND HOST-PATHOGEN INTERACTIONS OF FROG VIRUS 3 (FV3)**

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Ranaviruses, including Frog virus 3 (FV3), have arisen as significant pathogens in wild amphibians in Atlantic Canada, sometimes causing 90-100% mortality in tadpoles. Experimental infection of a native amphibian species with FV3 is an indispensable counterpart to ongoing field research. The wood frog, *Rana sylvatica*, serves as a good model for laboratory experimentation based on its wide distribution in North America and known susceptibility to ranavirus infection. A protocol for housing and reproduction of ranavirus-free wood frog populations in captive settings is necessary to firmly establish the species as an experimental model. The present work includes recommendations on housing and feeding of pre- and post-metamorphic frogs in the laboratory, oral dosing of post-metamorphic frogs for experimental infection with pathogens in liquid suspension, collection and evaluation of blood pre and post-infection to determine cellular and humoral responses to FV3. Based on these recommendations, an experimental infection was conducted in 40 wild-caught adult wood frogs to determine the pathogenesis of an FV3-infection based, initially, on histological examination of lesions. Frogs were acclimated to captivity for 6 months prior to infection. Oral dosing of 0.25ml of virus suspension equivalent to a TCID<sub>50</sub> 10<sup>3.03</sup> was administered to individually-housed frogs (day 0), which were subsequently euthanized at days 0.25, 0.5, 1, 2, 4, 9 and 14 post-infection (n=5 frogs at each time point, except n=3 at day 14). A necropsy examination was performed and all organs were fixed in 10% formalin for histological examination. The benefits, problems and future directions of this methodology will be discussed.

**Keywords:** FV3, pathogenesis, *Rana sylvatica*, ranavirus, wood frog

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## **BEYOND WETLANDS: TAKING A CLOSER LOOK AT AMERICAN BLACK DUCK BREEDING SUCCESS IN AGRICULTURAL LANDSCAPES**

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Habitat restoration and monitoring programs require information about habitat usage by target species. In the case of the American Black Duck (ABDU), previous regional species distribution modelling identified a positive association between breeding ABDU and active agricultural landscapes. Questions remain, however: are there limits to agricultural intensification? Are all types of agricultural activity equally attractive to breeding ducks? What are the broader environmental impacts of agricultural activity? Parallel monitoring of ABDU breeding activity in agriculturally-intensive portions of the maritimes, including PEI and the Annapolis Valley, permitted a closer examination of these questions. Evidence from the examination of errors in the model predictions ("residuals") revealed a number of things: agricultural landscapes appear to show net negative effects beyond 58% active agriculture; study sites in the Annapolis Valley are eutrophic to hyper-eutrophic (on the basis of total phosphorus and chlorophyll *a* values); and ABDU exhibit lower breeding activity and productivity than expected purely on the basis of landscape characteristics. This contrasts sharply with the Mallard (MALL), which breeds in larger numbers than expected based on landscape characteristics. A preliminary comparison of plots with fewer breeding pairs than expected ("worse" plots) with those with more pairs ("better" plots) suggests that ABDU are selecting more neutral wetlands with higher primary (chlorophyll *a*) and secondary productivity (macroinvertebrate biomass).

Future work, based on an examination of classified land cover imagery (SPOT and WorldView-derived, for 2012) will help to explore linkages between habitat characteristics and particular types of agricultural activity, leading to a comprehensive set of recommendations for selecting sites for habitat restoration.

**Keywords:** American Black Duck, habitat modelling, agriculture, trophic status

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## **STUDENT PRESENTER**

### **FACTORS AFFECTING PRODUCTIVITY OF DUCK BROOD REARING IN SMALL WETLANDS IN THE ANNAPOLIS VALLEY, NOVA SCOTIA**

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The creation and restoration/enhancement of wetlands has been prioritized by non-government organizations (NGOs) for decades. Wetlands have been disappearing at alarming rates around the world and by as much as 80 acres per day in Canada alone. Wetlands are important as they reduce flooding, purify water, replenish groundwater and are rich in biodiversity. The Nova Scotia Eastern Habitat Joint Venture (NS-EHJV) establishes the base for wetland conservation in Nova Scotia, under the mandate of the North American Waterfowl Management Plan (NAWMP). Ducks Unlimited Canada (DUC) has recently altered its outlook on the creation of wetlands in the agricultural portion of Nova Scotia. The need for small wetlands was decided preferable over large-scale wetlands for various reasons. It was determined that guidelines regarding implementation of these wetlands would be useful, increasing ecological potential, especially for ducks. A study to investigate the use by ducks of existing wetlands in the Annapolis Valley was initiated in 2009. This study has since broadened to incorporate land use influences around the sites, and the nutrient loading makeup (with pH) of the water over the duck breeding and brood rearing field season. Freshwater invertebrates were sampled during the brood's development to help understand the food resources during these period available during these periods. Brood surveys also were conducted to discover which wetland sites were being used and the magnitude of the usage. Adjacent land-use factors immediately surrounding the sites were also examined. This study aims to determine what mixture of limnetic factors, biological and physical factors, that best provides the adequate resources for duck brood rearing. This information may be applied to other agricultural landscapes in Canada, and around the world. Here we report on the duck breeding use and brood success in the wetlands.

**Keywords:** agriculture, Annapolis Valley, invertebrates, wetland

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## **STUDENT PRESENTER**

### **SPATIO-TEMPORAL PHENOLOGY OF MACROINVERTEBRATES AND BIRD USE OF A COASTAL WETLAND LANDSCAPE NEAR AULAC, NB**

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Waterfowl select habitats that provide sufficient food resources to meet nutritional and energetic demands. Wetlands are sought out for this purpose, as they can provide abundant and diverse foods. The isthmus that connects Nova Scotia and New Brunswick is a topographic low which supports an expansive marsh landscape; this is ideal habitat for nesting and migrating birds that use the area as a stopover site along the Atlantic flyway. Ducks Unlimited Canada manages several wetlands in the area, which represent potential habitat for waterfowl to supplement their diets with invertebrate nutrition. This study assesses invertebrate production and bird usage across a diversity of managed and naturally occurring wetlands. A selection of 11 wetlands, seven within close proximity (two with tidal influence) and four spatially distributed acting as references were chosen on the basis of habitat heterogeneity. In 2012, aquatic macroinvertebrates were collected using quantitative, standardized techniques during an intensive 12-week weekly sampling protocol (14 May- 31 July). This protocol allowed us to pinpoint peaks in macroinvertebrate abundance and diversity with good temporal precision, to assess if ponds across the landscape were reaching high invertebrate food densities in unison or at random. In 2013, we expanded our sampling period (16 April – 21 September), to allow us to consider year-to-year variability, as well as macroinvertebrate abundance at other stages of the year (notably spring and early fall migration). Preliminary data reveal that tidally-influenced sites support greater invertebrate biomass, yet freshwater sites show a greater taxonomic diversity. In 2013, we also conducted a bi-weekly bird survey on the wetlands; results will be assessed for correlations with invertebrate productivity in the study ponds. These data will allow us to delve deeper into understanding how each pond habitat operates within the larger Tantramar wetland landscape.

**Keywords:** Landscape Ecology, Phenology, Waterfowl Management

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## STUDENT PRESENTER

### THE GENETIC DIVERSITY OF *BORRELIA* ISOLATED FROM NEW BRUNSWICK TICKS

Kami Harris and Vett Lloyd

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**Background:** Lyme borreliosis (LB), commonly known as Lyme disease, is the most common tick-vectored zoonosis in North America and an emerging disease in New Brunswick. The causative agent is infection with the spirocheate bacterium *Borrelia burgdorferi*. Most first tier diagnostic tests are based on detection of antibodies to whole cell extracts of the canonical B31 strain of *Borrelia burgdorferi*, a clonal isolate from one of the original Lyme-disease ticks identified in the 1970s. However, other strains and genospecies of *Borrelia* have since been documented in both the United States and Canada and it is unclear if the commonly used ELISA and immunoblotting (Western blot) diagnostics will detect these variants.

**Objective:** To determine the frequency of variant strains and genospecies of *Borrelia* in New Brunswick.

**Methodology:** We sequenced amplicons spanning polymorphic regions of the *outer surface protein A (OspA)*, *flaggellin B (FlaB)* and *intergenic spacer (igs)* region of the nuclear rDNA region of *Borrelia*-infected ticks.

**Results:** We found that in addition to the B31 strain, the N40 strain of *B. burgdorferi* is also common in New Brunswick. We also found hybrid B31/N40 sequences. Additionally, we also found evidence of the newly described *Borrelia miyamotoi* genospecies in New Brunswick ticks.

**Significance:** There is considerable diversity in the genotypes of *Borrelia* strains and species present in New Brunswick ticks, which may pose a significant challenge in detection by traditional serological diagnostics.

**Keywords:** Borrelia, Lyme Disease, New Brunswick, Ticks

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# **LINKING STEWARDSHIP PROGRAM PARTICIPATION TO FARMER ENGAGEMENT IN BIODIVERSITY CONSERVATION PRACTICE**

Kate Goodale, Kate Sherren, and Karen Beazley

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The intensification of farming during the 20th century has resulted in increased yields, but at the expense of biodiversity. While issues surrounding agricultural pollution are often tackled by legislation, biodiversity conservation efforts are largely confined to voluntary programs. The Agricultural Biodiversity Conservation (ABC) program is a voluntary stewardship program in Nova Scotia that aims to increase biodiversity by increasing habitat quality, quantity and diversity. To achieve this goal the program aims to impact farmer attitude toward, knowledge of and action concerning biodiversity. After a site visit by an ABC planner, participating farmers are provided with suggestions of different activities targeting biodiversity that would be suitable on their property. The program is completely voluntary and free to join, but does not offer any financial incentives for participation. This research examines the link between engagement in biodiversity enhancing activities and participation in the ABC program. This investigation was completed through a quantitative survey measuring respondents' attitudes toward, knowledge of, and management to encourage biodiversity. Preliminary analysis revealed differences between the responses of farmers participating in the ABC program and a similar group of farmers that had not participated. These results suggested that the program did have an impact on participant behaviour. Other research, however, has suggested that different demographic factors may also impact the decision to participate in conservation. Therefore, further analysis using a logit model revealed a statistically significant link between engagement in certain biodiversity conservation activities and participation in the ABC program, while controlling for demographic factors (age, gender and education level). Results from both of these stages of analysis will help in improving delivery of the ABC program, as well as aid in the design of similar stewardship programs.

**Keywords:** biodiversity, conservation, farmers, stewardship

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## STUDENT PRESENTER

### UNDERSTANDING HOW FARMERS VALUE WETLANDS IN NOVA SCOTIA: GAUGING PRIVATE LAND CONSERVATION POTENTIAL

Simon Greenland-Smith and Dr. Kate Sherren

School for Resource and Environmental Studies, Dalhousie University

Wetlands are valuable landscape features on farms because they provide ecosystem goods and service such as water filtration, flood peak reduction, food chain support as well as cultural and aesthetic significance to farms and the greater society (Millennium Ecosystem Assessment, 2005; Williams, 1996; Zedler 2003). Despite their significance, Nova Scotia lacks comprehensive protection for wetlands. Therefore, future wetland conservation will depend on private landholder (including farmers) perceptions and their willingness to conserve wetlands (Sherren and Verstraten, 2012). The guiding question of my research is: how do farmers value wetlands and wetland species and what do these values reveal about farmers' willingness to conserve wetlands? To address this question, a qualitative method guided by Personal Construct Theory was employed. Thirty-minute, loosely structured interviews were performed with farmers in front of ~30 wetland areas. This included 12 'farm ponds', 8 marshes without open water and 8 with open water. *In situ* interviews elicited strongly-held participant values, which can be strong indications of behavior and constant through time (Kamakura and Mazzon, 1991; Owen *et al.*, 2009; Williams, 1979). A rapid plant species survey of each wetland was performed during late summer to compare with various species identified by farmers and to gauge biodiversity. Interview audio was transcribed and analyzed using qualitative data management software for common themes among interviews. The unpublished findings of this research provide interesting insight into how farmers perceive wetlands and adds to a growing body of N.S. specific literature about wetlands on farms that could possibly guide future implementation of effective conservation regulation. This research is also applicable to other maritime jurisdictions and the NE U.S.A.

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**Keywords** (agriculture, farmers, perceptions, values, wetlands)

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## **STUDENT PRESENTER**

### **ASSESSING SHORT TERM COASTAL DYNAMICS TO PREDICT IMPACTS FROM SEVERE WEATHER EVENTS ON PIPING PLOVER**

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Environment Canada is required under the Species at Risk Act (SARA) to identify critical habitat of listed species for which it is the lead agency. For some species it is relatively easy to delineate critical habitat, for others such as Piping Plover it is more problematic. Beaches are highly dynamic systems that can vary from year to year depending on storm activity. Storm surges, onshore winds and wave action can deposit beach material in previously unsuitable locations, changing characteristics of these sites to the degree that they may become preferred by the species during breeding. It is thus argued that entire beach systems, consisting of a mixture of suitable and unsuitable sites within their bounds, may over time contribute to meeting the species' habitat needs. The purpose of this analysis is to quantitatively assess evidence in support of that hypothesis. In July 2011 the Applied Geomatics Research Group (AGRG) concurrently collected Lidar and aerial photos along the Gulf of St. Lawrence from the Bouctouche Dune to Miscou Island. Similar data were collected in November 2009 for the Atlantic Canada Adaptation Collaborative by the New Brunswick Department of Environment and Local Government. Availability of two spatially corresponding datasets is central to this work as the winter 2010/11 season was one of the stormiest on record, with 32 instances where water levels exceeding 2 metres above chart datum, according to data from the tidal gauge at Escuminac, NB, while the 2009 winter season experienced only 13 such events. To explore the hypothesis, the study is divided into two main components. Part A is an object-oriented image classification to identify landcover classes. This output will be used in Part B to develop species distribution models to quantify the relationship between Piping Plover occurrence and newly created habitat. At present, Part A has been completed for the 2011 imagery and newly created 'overwash' sites have been identified with 87.5% accuracy. As a result, this presentation will focus on classification work completed to-date and outline how species distribution models in Part B will be developed in the coming year.

**Keywords:** Piping Plover, habitat suitability modeling, coastal, Gulf of St. Lawrence, geomatics

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## **STUDENT PRESENTER**

### **TEMPORAL EXAMINATION OF ROADWAY PASSAGES ON ANIMALS IN NOVA SCOTIA**

Brook Beauliua, Trevor Avery, and Stephen Mockford

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Road networks are known to have a wide variety of negative impacts on a diverse range of species. Mitigation has included the construction of animal passage corridors to reduce road mortality and maintain habitat connectivity, and much research has been done in these areas. There remains a lack of information on how road presence affects vulnerable animals during the installation process and over time, and how animal passage design alters the effectiveness of passageways. The goal of this study is to examine alterations in animal behaviour, diversity, and mortality levels temporally in relation to passageway installation and design. In Antigonish NS., a portion of Hwy 104 is being relocated and divided. The planned route will go through a wetland with a central brook. This area is recognised as suitable habitat for wood turtle (*Glyptemys insculpta*) and snapping turtle (*Chelydra serpentina*), which are both at-risk species. The study site is also populated with numerous mammal, bird, reptile, fish and amphibian species. Animal activity and mortality information was collected before passageway installation and continues. Road mortality and animal activity were observed along nearby existing roads using transects. Animal activity in the wetland was observed along the proposed highway route at set plots throughout the study area. Visual observations were supported by information collected through automated field “critter cameras”. Amphibians and fish were captured and tagged with visible elastomer tags (VIEAlpha) and released. Mark-recapture analysis will determine abundances and movement patterns. Turtle searching consisted of tracking and trapping. Animal passageway entrance/exit and barrier design will be altered post-installation in addition to continued monitoring.

**Keywords:** Wood turtle, Snapping turtle, Road impacts, Animal passages

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## STUDENT PRESENTER

### ALTERED ENVIRONMENTAL STRESSORS AND LONG-TERM EFFECTS ON POPULATIONS AND HABITATS OF COMMON EIDERS ON NOVA SCOTIA'S EASTERN SHORE

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Colonial nesting common eiders are an iconic, broadly-distributed, harvested sea duck. They are particularly vulnerable to a variety of threats, and some colonies in eastern North America have experienced significant declines over the past few decades. In eastern Nova Scotia, monitoring has been undertaken at the Eastern Shore Islands Wildlife Management Area for 36 years, and recent data and preliminary analyses indicate a decline in both the number of nesting eiders, as well as markedly reduced female survival. Observations suggest that natural and invasive habitat changes, as well as altered predator abundance may be contributing to these changes in local nesting populations. This study will evaluate which factors may be contributing to declines in eiders on these islands and consequences for nesting females using a variety of innovative techniques including: satellite and aerial imagery, remote cameras, and stress metrics. The results of this work should have immediate management implications.

**Keywords:** American common eider, Eastern Shore Islands Wildlife Management Area, habitat change, predation, *Somateria mollissima dresseri*

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## STUDENT PRESENTER

### POPULATION DYNAMICS OF INVASIVE GREEN CRABS ON MUDFLATS IN THE UPPER BAY OF FUNDY

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The European green crab (*Carcinus maenas*) is an invasive species that has altered the ecological balance of many ecosystems in which it has established populations. While green crabs have been present in the Bay of Fundy for over fifty years, they have only recently been observed on intertidal mudflats in the upper Bay, and their effects on soft-sediment habitats elsewhere indicate that they have the potential to cause significant ecological changes in this area. During summer and fall 2013 we investigated the extent of the invasion of green crabs in the upper Bay, and examined the breeding status of the population. Since May 2013, we have trapped green crabs every three weeks at distances corresponding to low, intermediate, and high tide levels at three mudflats and adjacent rocky intertidal sites in the upper Bay. These surveys are currently ongoing because data collected in October show a continued increase in abundance at some sites relative to previous sampling rounds. Preliminary results show that green crabs are present on two mudflats and all rocky sites. Ovigerous females were observed at one rocky site and newly settled juveniles were found at both mudflat and rocky sites. Data also suggest a pattern of spatial segregation between green crabs and native rock crabs, where green crab distribution tends to be more concentrated in the intermediate to high intertidal zone. Observed abundances and past invasion history indicate that green crab population dynamics warrant comprehensive study to inform and assist future management and conservation strategies, should they become necessary.

**Keywords:** green crab, invasive species, population dynamics

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## STUDENT PRESENTER

### DISTRIBUTION AND ANNUAL MOVEMENTS OF THE IVORY GULL (*PAGOPHILA EBURNEA*) IN THE CANADIAN ARCTIC

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The ivory gull (*Pagophila eburnea*) is an endangered seabird which spends its entire year in the Canadian Arctic environment. Breeding range is estimated to span the Canadian Arctic in the North Atlantic and Arctic Oceans, where ivory gulls require specialized but simple nesting habitat. Threats from various sources including illegal shooting and exposure to contaminants are thought to have contributed to a decline in numbers (80%) since the 1980s. This led to the Committee on the Status of Endangered Wildlife in Canada's (COSEWIC) uplisting of the ivory gull from threatened to endangered in 2006 and the federal government's uplisting to endangered in 2009. Due to the remote habitats of these birds and the corresponding challenges of observing and tracking them, we know little of their migration patterns and behaviour. Moreover, no multi-year research on movement and habitat use has been conducted in Canada.

As outlined in the Canadian ivory gull recovery strategy, information on annual movements is critical to obtain information of where and when they move as well as how they use these sites during breeding and non-breeding seasons. In 2010, satellite transmitters were attached to 12 ivory gulls on Seymour Island, NU (76.8° N, 101.3° W). To date, up to four breeding seasons of tracking data have been collected on these individuals, providing 50 277 useable, georeferenced locations for analysis. Using maps produced with Geographic Information Systems (GIS), we present the first evidence describing the annual movements and distribution of a subpopulation of the Canadian ivory gulls. Our results are consistent with predictions based on earlier banding or observational work, while some results of the current study markedly change our perception of ivory gull behaviour and migration.

**Keywords:** arctic, ivory gull, *Pagophila eburnea*, satellite telemetry

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## **STUDENT PRESENTER**

### **POPULATION CHARACTERISTICS OF A WINTER KILL OF STRIPED BASS DURING A SHUT-DOWN OF THE TRENTON POWER PLANT, PICTOU COUNTY, NOVA SCOTIA**

Mathieu Gregoire<sup>1</sup>, C. J. Buhariwalla<sup>1</sup>, M. J. MacMillan<sup>2</sup>, I. Wirgin<sup>3</sup>, M. J. Stokesbury<sup>1</sup>, and M.J. Dadswell<sup>1</sup>.

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During late January 2013 the Trenton Power Plant in Pictou County, Nova Scotia was shut down for a period of several days. It is well known that striped bass over winter annually in the heated water outflow from the plant and during the shut-down period several hundred bass died from cold shock and drifted ashore. A sample of 98 bass was collected from the kill and the fish were brought to the Coastal Ecology lab at Acadia University where morphometric measurements were obtained along with otolith, scale, DNA and stomach samples. The fork length of bass collected ranged from 10.9 – 56.2 cm. Scale and otolith aging indicated the sample consisted of YOY to 5 yr old fish with the majority of the sample consisting of YOY (64%) and 1+ bass (20%). The length-weight relationship, age structure, size structure and age-length relationship of the sample were determined. Many bass had been actively feeding and stomach analysis indicated a large degree of cannibalism. We await the results of the DNA analysis.

**Keywords:** Fish Kill, *Morone saxatilis*, population modelling

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## **DOCUMENTING CLIMATE-SENSITIVE RARE ARCTIC FLORA IN NORTHERN CAPE BRETON, NOVA SCOTIA**

Sean Blaney and David Mazerolle

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A regionally unique combination of oceanic influence and severe topography results in northern Cape Breton, Nova Scotia supporting the greatest diversity of arctic-affiliated vascular plant species within the Maritimes, despite its having neither the northernmost latitudes, the highest elevations, nor the coldest temperatures. Remnant Arctic-affiliated plant species in northern Cape Breton are at their southern range limits and are likely to be susceptible to warming conditions predicted to result from global climate change. Documenting their present status and locations are thus of particular importance.

We have undertaken three hiking trips in northern Cape Breton ravine systems to document occurrences of rare arctic-affiliated plant species, resulting in hundreds of occurrence records of provincially rare plants. Fieldwork at Lockhart Brook and Salmon River in 2009 and at Big Southwest Brook and the Southwest Aspy River in 2011 was primarily focused on revisiting hot spots of arctic plant diversity discovered in the 1950s. Fieldwork in 2013 around the Polletts Cove and South Blair River ravines included coverage of areas never previously visited by botanists and discovered additional sites having concentrations of northern plant species, including one new species for Nova Scotia. Our 2013 findings and the region's numerous ravines with little or no history of botanical exploration suggest other significant Arctic plant sites remain to be discovered in northern Cape Breton.

**Keywords:** disjunct Arctic flora, Cape Breton, botanical exploration

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## **MARITIMES BUTTERFLY ATLAS**

John Klymko

Atlantic Canada Conservation Data Centre

Launched in 2010, the Maritimes Butterfly Atlas is a 5-year citizen science project documenting butterfly occurrence in the New Brunswick, Nova Scotia, and Prince Edward Island. Data collected will greatly improve the understanding of the numbers, distribution, and status of butterfly species in the region, and will create a snapshot of current butterfly distributions against which future survey efforts can be compared. To date more than 18,000 butterfly records have been submitted by more than 300 volunteers. Atlasers have documented seven new provincial records and one new Maritimes record, and their efforts have greatly increased the known ranges for many species.

**Keywords:** Butterfly, Citizen-science, Conservation, Lepidoptera

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## **ROLE OF THE GOVERNMENT WILDLIFE BIOLOGIST – CURRENT FUNCTIONS, COMMON (MIS) PERCEPTIONS, AND FUTURE DIRECTIONS**

Sean P. Basquill

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The majority of professional wildlife biologists are employed in government and, yet, little has been written on the critical role they play in the broader discipline. Graduates emerging with university Biology or related environmental science degrees receive insufficient, if any, training on the skills required for government employment and have limited exposure to government career science. Moreover, many students, professors, and non-governmental scientists misconceive the operational and societal realities shaping government policy, conservation, and research. A brief summary of the current functions, common perceptions, and lesser known aspects of government wildlife biology will be provided. The overview is intended as a primer to promote awareness and to initiate discussion on future directions for wildlife conservation and management. The author has eighteen years of post-graduate experience, including eight years with federal and provincial government.

**Keywords:** Government, Biologist, Wildlife, Management, Role

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**Atlantic Society of Fish and Wildlife Biologists**

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**ABSTRACTS**

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## STUDENT PRESENTER

### ASSESSING HYBRIDIZATION BETWEEN *I. COOKEI* AND *I. SCAPULARIS* AS A FACTOR IN THE SPREAD OF LYME DISEASE IN NEW BRUNSWICK

Anna Duncan, K. Harris, C. Filiaggi, and V. Lloyd.

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Lyme disease is an illness caused by the spirochete bacterium *Borrelia burgdorferi* vectored by the bite of Ixodes ticks. In New Brunswick, *Ixodes scapularis* is the only tick species taken into consideration with respect to Lyme disease modelling and control efforts. However, the risk of Lyme disease has been observed to be at levels not expected until the year 2020, which has led to the hypothesis that there may be more than one significant vector carrying and transmitting this disease. Samples of closely related *Ixodes* tick, *Ixodes cookei* collected by passive surveillance in 2012 and 2013 throughout New Brunswick have shown that it is capable of carrying the bacteria as well as biting and feeding from humans. This study is aiming to reassess whether the close relation and proximity have given rise to hybridization between these two species, meaning *I. cookei* would need to be re-assessed as a vector of Lyme disease. An initial survey assessing the presence of intermediate morphologies between the two species collected determined overlap in palp length, hypostome length, palp to hypostome length, and scutum shape, however there is a significant difference between the ratio of palp length to palp width ( $p = 0.0025$ , two-tailed unpaired t-test). Thus, there is ambiguity in morphological characters between the collected samples of these two species. To determine if this morphological ambiguity reflects the presence of hybrid ticks, we will assess maternal lineage via CO1 barcoding, and then determine if hybridization is taking place by sequencing the nuclear 28S gene.

**Keywords:** *Borrelia burgdorferi*, hybridization, New Brunswick, Lyme disease

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## STUDENT PRESENTER

### ASSESSING THE RISK OF LYME DISEASE IN NEW BRUNSWICK

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Lyme borreliosis (LB), commonly known as Lyme disease, is an emerging disease in New Brunswick and is the most common arthropod-vector zoonosis in North America. Ticks of the *Ixodes* genus, like *Ixodes scapularis* and *Ixodes cookei* studied in this research, feed on a wide range of hosts including humans and other mammals, and can transmit pathogens, so therefore they can have an impact on public health. *Borrelia burgdorferi* is a spirochete bacteria which is the causative agent of Lyme disease, and can be transmitted through the bite of *Ixodes* ticks. The goal of this research is to determine the proportion of *Ixodes* ticks in New Brunswick that are infected, and compare the results from ticks collected in 2012 and 2013 to see if the risk of Lyme disease is increasing, decreasing, or stable. I found that the overall infection rate for ticks collected in 2012 was 44%, which is much higher than previously reported rates for Canada. Also, about 7X more ticks were received in the summer months of 2013 compared to 2012, even though the collection methods remained the same, which indicates that the tick populations in NB are increasing at an exponential rate. It is important to study and monitor tick populations in conjunction with the *Borrelia* bacteria, to assess the infection risk in different areas of the province as ticks and Lyme disease are a serious, and increasing, public health concern in New Brunswick and the rest of Canada.

**Keywords:** Borrelia, Lyme Disease, New Brunswick, Ticks

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## **ATLANTIC SALMON CONSERVATION FOUNDATION**

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The Atlantic Salmon Conservation Foundation (ASCF) is a volunteer, non-profit, charitable organization established with the goal of helping to achieve healthy and sustainable wild Atlantic salmon stocks in Atlantic Canada and Québec. Conservation projects and program administration are funded with support of an endowment fund provided by the Department of Fisheries and Oceans, together with other partnerships with the Foundation. The Foundation provides a source of funding for community volunteer organizations, encourages cooperation and partnership between governments, Aboriginal organizations and community volunteer groups, promotes conservation planning and management at the watershed level, and builds awareness of the importance of conservation of wild Atlantic salmon. Performance and accountability are emphasized by the Foundation.

Proposals to ASCF for project funding are received annually with an application deadline in mid-December. Project proposals are approved by the Board of Directors based on the advice and recommendations of expert Advisory Committees and ASCF staff. ASCF is interested in funding innovative projects that will have a high probability of success with measurable results for on-the-ground conservation. Larger scale projects that demonstrate clear conservation results are particularly encouraged. Consideration will be given to supporting a limited number of multi-year projects.

**Keywords:** Salmon, conservation, rivers, habitat, funding

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## **FISHERIES AND AQUATIC HABITAT MANAGEMENT AT 5<sup>TH</sup> CANADIAN DIVISION SUPPORT BASE GAGETOWN**

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5 CDSB Gagetown (formally known as CFB Gagetown) is home to several military units as well as the Army's Combat Training Centre and the Canadian Forces School for Military Engineering. Training activities include mounted and dismounted manoeuvres, small arms, artillery, demolition, bombing, urban operations and helicopter support. Approximately 110 000 ha in size, the base contains over 3200 km of watercourses, 156 ponds or lakes and 6487 ha of wetlands. These water-bodies support atlantic salmon, a locally important brook trout fishery among other fish species. Environmental stewardship, compliance, and sustainable ranges and training areas are key goals of the Army's Strategic Environmental Direction. Strategies to meet these goals with respect to the conservation of fisheries and aquatic habitats include: Environmental planning, protection and compliance; resource mapping; environmental monitoring; information and education; stream and wetland enhancement; and water crossing improvements.

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