The Science and History of Sable Island

May 1st and 2nd

University of Kings College, Halifax, NS

Presented by:

FRIENDS OF SABLE ISLAND

THE NOVA SCOTIAN INSTITUTE OF SCIENCE 1862

DALHOUSIE UNIVERSITY

Conference Schedule

Sable Island Conference 2015 - Science and History of Sable Island

May 1-2, 2015

Friday May 1, 2015 – Alumni Hall	
6:30pm	Registration
7:00pm	Conference Opening: Martin Willison (Conference Chair)
7:10pm	Welcome: Megan Leslie (MP for Sable Island)
7:20pm	Presentations
8:40pm	Panel Discussion and Q&A: "The Significance of Sable Island"
Saturday May 2, 2015 – Alumni Hall	
7:30am	Registration
8:15am	Welcome and Introductions: Martin Willison (Conference Chair)
8:20am	Presentations
10:00am	Bio Break (Refreshments)
10:20am	Presentations
12:00pm	Lunch Break
1:00pm	Presentations
3:00pm	Bio Break (Refreshments)
3:20pm	Presentations
5:20pm	"Nova Scotia's Interest in Sable Island": Labi Kousoulis (MLA for Sable Island)
5:30pm	Conference Closing: Martin Willison (Conference Chair)
Saturday May 2, 2015 – Posters and Exhibits	
8:00am – 6:00pm	SI2015-16 Poster: "Sounds of Sable Island; Savouring an Icon – An Auditory Tour of a Treasured Island" - Doran Hayes
	SI2015-22 "Glacial and post-glacial geomorphic evolution of Sable Island and the surrounding Sable Island Bank – Part I; Today's Seabed" - E.L. King (??)
	SI2015-25 Poster: "Taxonomical characterization of Red Fescue (***Festuca rubra*** L., Poaceae) on Sable Island, Nova Scotia, Canada" - Martin Dubé
	SI2015-27 Poster: "Where has Sable Island been for the Past 200 Years?" - David H. Gray
	Tables for Various Artists and Organizations including Nova Scotia Institute of Science, Friends of Sable Island, Mary O'Hara, Jill Martin

Friday, May 1st, 6:30 – 9:00 pm

Friday's Program

Friday May 1, 2015 – Alumni Hall, New Academic Building, University of King's College (Registration open at 6:30pm)					
7:00pm	Conference Opening: Martin Willison (Conference Chair)				
7:10pm	Welcome: Megan Leslie (MP for Sable Island)				
7:20pm	Session A	"Return to Sable" - Jill Martin	"Our Sable Island Home: Life on Sable Island in the very early 1950s" - Sharon O'Hara	"The History of the Natural History of Sable Island" - Ian A. McLaren	"How Sable Island Came to Be a National Park" - Kevin McNamee
8:40pm	Panel Discussion and Q&A: "The Significance of Sable Island" – All Speakers				

Welcome

The Honourable Megan Leslie, MP for Halifax, Nova Scotia

As Member of Parliament for Halifax, I am proud to represent a special place off the coast of Nova Scotia that has long captured the imagination of local residents and people across our country: Sable Island. Sable Island is one of our most treasured wild spaces not only in Atlantic Canada, but in the country. It is unique in many ways, from its windswept landscape, to its population of wild horses, and its status as a haven for several species at risk. It is a place like no other, and I am honoured to have played a small role in preserving this iconic element of the Canadian landscape.

At the end of the Parliamentary session in 2013, I worked on the bill that created Sable Island National Park Reserve, and helped to ensure that it passed before a prorogation of Parliament, that would effectively kill the bill, and start the legislative process all over again. This bill was the culmination of years of community advocacy, consultation and co-operative work between the federal government, the Nova Scotia government, industry and other stakeholder groups and resulted in the formation of a new National Park.

By designating the island as a National Park we have guaranteed that the island receives enhanced ecological protections, an ongoing source of funding and a more coherent management plan than ever before. This designation was the first step in protecting Sable Island and its ecosystem, and in allowing future generations to enjoy its countless natural wonders for many years to come.

Return to Sable

Jill Martin, Author, educator, former principal of Lunenburg Academy, Lunenburg, NS

Writing under the pseudonym Jill Martin-Bouteillier in honour of her family, Jill's novel Return to Sable (2015) opens the portal to life on Sable Island before the installation of both the telephone and the wireless. Although her motives in writing the book are personal, her narrative illuminates both the challenges and the wonderment of life on Sable Island 100 years ago. Her book chronicles her great grandfather RJ Bouteillier's residency on Sable Island from 1879 to 1913 during which he served first in the capacity as foreman of carpentry and then beginning in 1884, as Superintendent. As part of the research to write this book, she consulted RJ Bouteillier's yearly logs; the Marconi records held in the National Archives in Ottawa, and the Bodleian Library, Oxford University; and personal letters and artefacts in her possession. In the second year of her research, she conducted qualitative interviews with children of two of the main characters. From the late 19th Century and into the early 20th Century, RJ championed stewardship of Sable Island in a variety of ways: his dutiful care of the wild horses, documentation of yearly dune erosion, collection and recording of meteorological data and bird migration, but without a doubt the most important duty during those years - lifesaving. Her work sheds light on a period in Sable Island's history of which few people have any knowledge.

Friday, May 1st, 6:30 – 9:00 pm

Our Sable Island Home: Life on Sable Island in the very early 1950s

Sharon O'Hara

My goal is to contribute, albeit in a small way, to the vast recorded cultural history of our newest national park. I will attempt to paint a picture of life on Sable in the early 1950's, more than sixty years ago, when twenty-five people including my family called Sable Island their home. I will describe some of the characters that dwelt on the Island, and a few of my thoughts about why they may have come to such a desolate place. In those days it took twenty- four hours to travel to and from Sable, and the supply ship didn't come that often. You will learn how the residents obtained the necessities of life; and how some were able to socialize in order to deal with the long lonely winters, while others could not. I will also talk about the glorious summers and falls, and tell you how those months made life beautiful – a paradise for some of the residents. The organization of the island in the early 1950's Sable Island will also be discussed: who was in charge, what happened in emergencies, and in disputes. Finally, what it felt like to live there as a children with Sable Island as our huge playground.

The History of the Natural History of Sable Island

Ian A. McLaren

The earliest published observations on the biota of Sable Island, along with casual observations in the logbooks of successive superintendents, are vague and emphasize natural resources. John .B. Gilpin's visits during summer 1854 and early September 1855 were the first by a knowledgeable naturalist. He published sketchy descriptions of the flora and more thorough (although sometimes inaccurate) accounts of the island's pinnipeds, birds, and marine molluscs. Intense study of the island's birds began with J. W. Maynard's 1868 collection of a migrating Ipswich Sparrow in coastal Massachusetts. This led to recognition in 1884 of eggs from that new 'species' that had been sent from the island to the US National Museum by Superintendent Dodds in 1862, and encouraged New York naturalist Johanthan Dwight to visit the island June-July1894 primarily to study the sparrow and produce a substantial monograph. He also enthused Superintendent Bouteiller's family to send him many specimens of birds, some very unusual, now in the American Museum of Natural History. The Bouteillers also published systematic bird observations, 1901-1907. A visit in summer 1999 by Dominion Botanist John Macoun produced the first reasonably complete survey of the island's plants, but only casual reports on the fauna (but he did collect the once-thought-endemic freshwater sponge Anheteromenia ryderi). He probably also encouraged the futile efforts at tree-planting in May 1901 under the direction of W.E. Saunders, who published a few observation s on the Ipswich Sparrow and other birds. This 'history' conveniently closes with Harold St. John's, visit to the island in 1913. As a student of the illustrious botanist, M.L. Fernald, he produced the first truly modern survey of the island's flora.

How Sable Island Came to Be a National Park

Kevin McNamee Director, Protected Areas Establishment Branch, Parks Canada

Sable Island was officially protected as a national park reserve under the Canada National Parks Act in December 2013. This presentation will summarize the history and issues that arose during the establishment phase, how they were dealt with, and what this means for the future management of this iconic island.

Saturday, May 2nd, 8:00 am – 6:00 pm

Saturday May 2, 2015 – Alumni Hall, New Academic Building, University of King's College (Registration open at 7:30am)							
8:15am	Welcome and Introductions: Martin Willison (Conference Chair)						
8:20am	Session B Chaired by Martin Willison	"Glacial and post-glacial geomorphic evolution of Sable Island and the surrounding Sable Island Bank – Today's Seabed" - E.L. King	"Sedimentation in the shallow-marine area around Sable Island" - Robert W. Dalrymple	"Insights Into Shoreline Dynamics based on Repetitive Shore Surveys (1975-1985) on Sable Island, Nova Scotia" – R. B. Taylor	"Enabling High-Precision, Position Monitoring of Sable Island through the Nova Scotia Coordinate Referencing System" – Jason Bond	"Mapping the Landscape of Sable Island" - David Colville	
10:00am	Bio Break (Refreshments)						
10:20am	Session C Chaired by Peter Tyedmers	"Sable Island Dune Morphology: a comparison of change over twenty years" - Mary-Louise Byrne	"The Ocean Tracking Network's Sable Island Acoustic array and its link to regional aquatic telemetry activities"- Frederick Whoriskey	"The Hydrogeology of Sable Island" - Terry W. Hennigar	"The status, ecology, and conservation of Sable Island's seabirds" - Robert A. Ronconi	"Post-breeding movements of a migratory songbird reveal dramatic differences between adults and fledglings" - Zoe J. Crysler	
12:00pm	Lunch Break						
1:00pm	Session D Chaired by Peter Wells	"Ecological footprints of grey seals on and off Sable Island" – W. D. Bowen	"Using the Sable Island grey seal as a biological probe" - Nell den Heyer	"Population Dynamics and Sociality of Sable Island horses" - Sarah Medill	"A genetic toolbox for research on the ecology, evolution and conservation of Sable Island horses" - Jocelyn Poissant	"How Many Vessels Have Wrecked at Sable Island" - Aaron Mior	"The Simon Douglas MacDonald Map of the *'Known Wrecks on Sable Island Compiled from Official Reports'"*– Alan Ruffman
3:00pm	Bio Break (Refreshments)						
3:20pm	Session E Chaired by Patrick Ryall	"Overview of Settlement History at Sable Island" - Aaron Mior	"Assessing Sable Island's Archaeological Resources – 5 Centuries of Heritage" - Daniel Finamore	"Footprints in the Sand: The Surviving Trail of Pre-1867 Government Records for Sable Island" – Nova Scotia Archives	"Monitoring visitor experience aboard expedition cruises to Sable Island National Park Reserve" – Patrick T. Maher	"Archaeological Resource Inventory and Protection for Sable Island National Park Reserve" - Charles A. Burke	"An ecological and biodiversity assessment of Sable Island National Park Reserve" - Jonathan Sheppard
5:20pm	"Nova Scotia's Interest in Sable Island": Labi Kousoulis (MLA for Sable Island)						
5:30pm	Conference Closing: Martin Willison (Conference Chair)						

Glacial and post-glacial geomorphic evolution of Sable Island and the surrounding Sable Island Bank – Today's Seabed

E.L. King[1] *, A. Ruffman[2], M. Li[1], and K. Webb[3]
[1]Geological Survey of Canada-Atlantic (GSC-A), Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia, B2Y 4A2
[2]Geomarine Associates Ltd., P.O. Box 41, Station M, Halifax, Nova Scotia, B3J 2L4
[3]Tota (France), Pau, France, formerly affiliated with GSC-A
*Presenter and Corresponding Author

Mapping the seabed topography around Sable Island started with British hydrographers Des Barres (1776), Bayfield (1853) and Orelebar (1859). All were lead-line, celestial navigation surveys. The first rigorous sonar hydrography was by Canadian Hydrographic Service (CHS) 1961 and 1963 from *CSS Kapuskasing* though these surveys kept to the offshore.

With early petroleum exploration, detailed sonar survey work began; an early contractor entrenched the term "Sand Waves" but sand migration was not understood. A commercial gas find prompted 1981-82 CHS surveys (*CSS Baffin*) producing three charts close to the Island. Further exploration and development necessitated challenging surveys of the East and West Bars. Detailed contour charts (1 and 2 m intervals) were produced at five and 19-year spans, towards serial comparison for evaluating bedform migration.

With growth of engineering seabed infrastructure and need for sediment dynamics understanding, the GSC and CHS conducted multibeam sonar bathymetry (CSS F.G. Creed, 1996 to 2001) covering small, selected sites and some repeat coverage to establish temporal change. These and the early CHS spot depths were quality controlled, and a mosaic produced, culminating in a striking colour-shaded Sable Island Bank bathymetry map presented here. Analysis of the detailed maps and sand cores with unique age-dating helped quantify sand migration.

Drifting sand is the quintessential realm of Sable Island and its environs yet imaging the seabed is but one component toward understanding the forming processes. How it came to be is a question also addressed by imaging geologic strata below the seabed, topics for future presentation.

Sedimentation in the shallow-marine area around Sable Island

Robert W. Dalrymple, P.Geo., Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario, Canada
Eric L. Hoogendoorn, WorleyParsons, Edmonton, Alberta, Canada

The shallow marine area surrounding Sable Island is floored by sand. The grain size of the seafloor sediment becomes finer eastward, with gravel occurring on the west end of Sable Island Bank, passing eastward to medium sand around most of the Island, with the proportion of fine sand increasing toward the east end of the Island. This sediment is subjected to an intense wave and current regime during storms. Storm-generated currents, supplemented by intense wave action, cause sediment movement from west to east, and has created a complex seafloor morphology. In water depths greater than 15-20 m, a series of elongate sand ridges occurs along the entire southern side of the Island and its submerged extensions. Additional ridges occur north of the Island. The southern ridges reach 20 km in length, have

spacings of 1.5-8 km, and heights of 3-10 m. Their internal structure shows they are migrating eastward. More than one metre of sediment can be deposited on their eastern flank in a single storm, causing migration rates up to 50 m/a. These ridges are unusual globally because they are more nearly orthogonal to the shoreline than such ridges elsewhere. This is attributed to the existence of obliquely shoreward-directed bottom currents during storms that move sand onshore; this presumably nourishes the southern side of the Island. Thus, the stability of the Island is linked with the dynamics of the shallow-water areas around it. Almost nothing is known, however, about the shoreface that links the shallow seafloor with the beach.

Insights Into Shoreline Dynamics based on Repetitive Shore Surveys (1975-1985) on Sable Island, Nova Scotia

R. B. Taylor, Emeritus
Geological Survey of Canada Atlantic, Dartmouth, Nova Scotia

Sable Island is one of the longest continuous sand beaches and largest dune systems found in Atlantic Canada yet little has been written about its beach and nearshore dynamics and their relationship to backshore dune stability. Between 1975 and 1985 repetitive cross-shore surveys and depth of disturbance rods were used to measure spatial and temporal variations in sediment transport and beach mobility at a number of sites, particularly where foredune restoration was occurring. Insights from the program are presented including recognition of the diversity of nearshore bar features and the impact of their variability on beach stability; the complexity of beach response to waves on north and south beaches during the same ten day period; and the impact of wave overwash and backshore flooding on foredune rebuilding compared with barrier beaches on mainland Nova Scotia. Mean decadal shoreline recessions of 2 to 6.1 m/a were observed at a few sites along north and south Sable Island; however, short term fluctuations in beach width of 32-48 m can occur in response to nearshore bar dynamics. Daily recordings of beach sediment movement illustrate berm building versus erosion on opposite shores. A natural mechanism of landward barrier beach migration during rising sea level is by wave washover and backshore extension. A different dynamic for sedimentation in dune cuts and long term dune recovery occurs on Sable Island because of increased seawater ponding during storm wave overwash.

Enabling High-Precision, Position Monitoring of Sable Island through the Nova Scotia Coordinate Referencing System

Jason Bond, PhD, PEng, Geodetic Engineer, Service Nova Scotia

Since the 1960s, the Province of Nova Scotia has carried a mandate of providing spatial referencing infrastructure for its citizens. This infrastructure is known as the Nova Scotia Coordinate Referencing System (NSCRS) and allows property, engineering works and natural features to be spatially related within the Province (including Sable Island).

Traditionally, thousands of survey monuments have provided access the NSCRS for surveying and engineering work. Of the original 23,000 monuments installed in the 1970s and 80s, many have been destroyed. In the case of Sable Island, most have been enveloped by sand and the sea. In 2013, the Province began implementing a modernized strategy for delivering spatial referencing services to its citizens using permanent GPS stations. One of these stations was installed at Main Station on Sable Island in June of 2014.

The GPS infrastructure has already had a positive impact by:

a) Allowing for preliminary position trends (e.g. settlement) to be quantified with millimeter level accuracy at Main Station;
b) Enabling LiDAR and aerial photography surveys to be consistently referenced within a global coordinate system; and
c) Allowing natural features to be quickly measured with millimeter level accuracy and consequently enabling long term, position trends of these features (e.g., Bald Dune) to be determined on a go-forward basis

Each of these topics is discussed and a history of the NSCRS on Sable Island is presented.

Mapping the Landscape of Sable Island

David Colville[1*], Brittany Reeves[1], Bill Livingstone[1], Heather Stewart[2]
[1] Applied Geomatics Research Group (AGRG), NSCC, Middleton, NS
[2] Sable Island National Park Reserve, Parks Canada, Halifax, NS
[*] Presenter

In September 2014 the Applied Geomatics Research Group (AGRG) completed a third aerial mapping campaign of Sable Island. The AGRG first mapped the island in early October 2002 with an aerial photography survey. Then in August 2009 AGRG conducted an aerial photography and Light Detection And Ranging (LiDAR) survey. Five years later, in September 2014, these same technologies were deployed again.

Each of these surveys led to a photo-mosaic of the island and a mapping of the land cover. The 2009 and 2014 surveys also produced Digital Surface Models (DSMs) derived from the LiDAR data. Ground-truthing efforts associated with each survey provided data to assist with the interpretation of the aerial imagery. In 2014 the fieldwork efforts resulted in more than 100 ground-truth plots being sampled across the entire island.

This mapping of Sable Island's landscape has resulted in the quantification of the various land cover classes (i.e., vegetative communities, ponds, sand) and comparisons of how and where these have changed over the years. The LiDAR-derived data has resulted in a mapping of the topography of the island and an excellent opportunity to quantify the landscape changes that have occurred on the island over the last five years.

AGRG is working with Parks Canada to better understand how the topography (i.e., shape, size, and heights of dunes) and land cover (i.e., vegetation communities) are changing. This understanding will help Parks Canada fulfil their ecological monitoring requirements and guide them as they prepare a management plan for one of Canada's newest national parks.

Sable Island Dune Morphology: a comparison of change over twenty years

Mary-Louise Byrne, Geography and Environmental Studies, Wilfrid Laurier University

The dunes of Sable Island can be categorized into four physiographic regions: the west spit, the main body, the wide flat beaches on the south part of the island including the plain of former Wallace Lake, and the east spit. Five profiles were measured using a theodolite and stadia rod in 1987 and 1988 across the island to define its basic morphology and dimensions. Using 2009 digital images and data similar profiles were digitized to determine changes that have occurred in the dune geomorphology over the twenty-year

period. A summary of the results is outlined in this paper. In addition the dune morphology and a classification of the dunes, based on physiographic processes, vegetation cover, and morphology is presented.

The morphology of the dunes is variable, with elevation increasing toward the east, and width of the dune belt changing along the length of the island according to variations of width of the beaches and the Sandy Plain. The unvegetated dunes can be classified as primary (dunes that develop as a result of wind action and the movement of sand over a uniform surface) or secondary (dunes that involve the deposition of sand on or behind a pre-existing obstacle that slows wind speed in its lee). Vegetated dunes may be primary, secondary, or tertiary, depending upon the type of vegetation, the rate of change, and stability of the formation.

The Ocean Tracking Network's Sable Island Acoustic array and its link to regional aquatic telemetry activities

Frederick Whoriskey[1*], Sara Iverson, Don Bowen, Damian Lidgard, Greg Skomol, John Chisholm, Brendal Davis and Richard Davis

[1] Ocean Tracking Network, Dalhousie University, 1355 Oxford Road, POB 15,000, Halifax, NS, Canada B3H 4R2

[*]Presenter

Starting in 2008, Dalhousie University's Ocean Tracking Network (OTN) began deploying Canadian state-of-the-art acoustic receivers and oceanographic monitoring equipment in key global ocean locations. These are being used to document the movements and survival of marine animals carrying acoustic tags ("pingers"), and to document how both are influenced by oceanographic conditions. The species tracked include marine mammals, sea turtles, squid, and fishes including sharks, sturgeon, eels, tuna, salmon, and cod, depending on regional interests. OTN first placed receivers off of Sable Island in 2013, as part of its North West Atlantic Ocean telemetry coverage. A key impetus for the Sable Array was a tagging program for white sharks initiated by US researchers in Massachusetts; they believed that a significant fraction of their white sharks would travel to Sable Island to feed on grey seals. The Sable Array also supports a team of Dalhousie University/Bedford Institute of Oceanography researchers who use acoustic telemetry to track the movements and intra and inter-specific associations of grey seals. More recently, a study has begun to examine the movements, survival and inter-year site fidelity of immature female blue sharks tagged off Halifax. At least one of these animals has traveled to Sable Island. The Sable Island Array is serviced by state-of-the-art autonomous vehicles piloted from Halifax, making it one of the most advanced acoustic telemetry facilities in the world.

The Hydrogeology of Sable Island

Terry W. Hennigar, P.Eng., FCSCE, and Gavin W. Kennedy, P. Geo. FGC

The study of hydrogeology is a science which is still in its infancy, being practiced for only 50 years in Nova Scotia. This paper will present an overview of the hydrogeology, with a focus on the fresh water resources, of Sable Island. The role of the sand deposits, morphology and dynamics of the dune structures and systems, precipitation, and tidal influences will be discussed. The distribution, quality, and importance of both surface water and groundwater resources of the island will be discussed.

Long-term water level trends and an approach to assess the sustainable groundwater withdrawals from the fresh water lens underlying the island will be presented. The location and rates of groundwater

withdrawals will be considered to support a future development of an eco-tourism program that may be permitted by Parks Canada.

The Federal-Provincial-Territorial Committee on Drinking Water in Canada has recommended a multi-barrier approach to protecting drinking water supplies. The Province of Nova Scotia, through the Department of Environment, has developed a process, guidelines, and regulations for the development, management, and protection of Municipal Drinking Water sources and supplies. The operation of Municipal drinking water systems requires certified operators of the utilities, the co-operation and input of the general public, and participation of various levels of government.
A brief overview will be provided outlining the monitoring, data collection, and reporting that is standard practice to ensure that due diligence is being followed in protecting the health of the public from the various sources of contamination that pose risks in drinking water.

The status, ecology, and conservation of Sable Island's seabirds

Robert A. Ronconi

Sable Island is the most isolated seabird colony site in eastern Canada, offering a unique opportunity to study the ecology and population dynamics of terns and gulls in an area removed from the influences of many coastal human activities. In this presentation I will summarize some of the key results from recent and historical research that has been conducted on Sable Island's tern and gull populations. Historically, the island was thought to harbour one of the largest aggregations of breeding terns in the North Atlantic, suggesting that it was once a globally significant breeding colony. Though the tern population declined dramatically sometime around the 1940s, trends over the past 50 years suggest that the tern population is recovering while gull populations have been gradually declining. Collections of Herring Gull eggs have revealed contaminant concentrations that are higher on Sable Island than at many other colonies across Canada. Dietary analysis suggests prey partitioning among tern and gull species, and changes in gull diets over the past 40 years. Finally, tracking studies of gulls are revealing individual specialization in foraging tactics including round-trips of more than 100 km, associations with offshore natural gas platforms, and year-round use of Sable Island. Together these research projects highlight some of the unique aspects of the ecology of terns and gulls that breed on Sable Island.

Post-breeding movements of a migratory songbird reveal dramatic differences between adults and fledglings

Zoe J. Crysler*, Robert A. Ronconi & Philip D. Taylor
* Presenter

Post-breeding dispersal is a crucial yet challenging period for migratory birds. It is poorly understood due to difficulties in tracking cryptic, and sometimes far ranging birds preparing for migration. Island breeding birds are ideal candidates for breeding ground studies because their populations are clearly demarcated and movement is confined. The Ipswich Sparrow (*Passerculus sandwichensis princeps*), a subspecies of the Savannah Sparrow, is a species of special concern, that breeds exclusively on Sable Island, Nova Scotia. Automated digital telemetry was used to assess the dispersal and movement behaviour of adult and fledgling Ipswich Sparrows on their breeding grounds. Here we seek to answer the following questions with regard to the various dispersal hypotheses: 1) does use of primary sites vary by age or body condition; 2) does movement behaviour (direction of movement and distance of uninterrupted flights) change as migration approaches; and 3) does the type of behaviour (movement *vs*. stationary) change with time of day or location. We found that adult and fledgling breeding ground dispersal is distinctly different. Adults were present at primary sites for a significantly higher proportion of time and were not detected at any

other location on the breeding grounds suggesting very little dispersal. Alternately, fledglings appear to use primary sites much less frequently, and have numerous broad scale movements dependent on approaching migration initiation date.

Ecological footprints of grey seals on and off Sable Island

W. D Bowen* and C. den Heyer

* Presenter

Grey seals numbers were reduced by hunting to the point of being considered rare in eastern North America through the 1950s. The largest grey seal breeding colony is now located on Sable Island. In the early 1960s, several hundred pups were born on the island. Since then the numbers of pups born has increased exponentially and by 2010 some 62,000 were born. Estimates birth and survival rates, from long-term observations on marked individuals, coupled with estimates of pup production from aerial photographic survey are used to estimate Sable Island herd at about 500,000 in 2013. Reproductive performance of females improves with age but senescence is evident in females in their late twenties and older. Survival rates of adults are high, but drop off rapidly in males aged 20+ and in females aged 30+ years. Adults fitted with satellite tags and from which blubber biopsies were taken provide an understanding of the foraging distribution and diet. Males and females exhibit strong seasonally-dependent, sex segregation in foraging distribution and diet with males using deeper and more seaward areas to the southwest of Sable Island and females using area shoreward and to the northeast. Along with population size these data provide an estimate of population prey consumption and the growing ecological foot print of this large predator on and off the Island. Sable isotope analysis indicates that grey transport significant quantities of marine nutrient to the island through faeces and carcasses which influence the flora and ultimately the horses of Sable Island.

Using the Sable Island grey seal as a biological probe

Nell den Heyer

Damian Lidgard[1], Don Bowen[2], Sara Iverson[1], Nell den Heyer[2*]

[1] Department of Biology, Dalhousie University, Halifax

[2] Population Ecology Division, Bedford Institute of Oceanography, Dartmouth

* Presenter

Top marine predators, such as grey seals, have significant influences on marine ecosystems. Centrally located on the Scotian Shelf, Sable Island is home to the world's largest grey seal breeding colony. This abundant predator may impact highly valued fish populations, such as Atlantic cod and salmon. However, encounters between seals and fish are poorly understood due to their inaccessibility. We used a novel combination of acoustic and GPS technology to examine patterns of encounters between grey seals and several fish species. Acoustic transmitters were placed in hundreds of Atlantic cod, Atlantic salmon and other fish species, over a four-year period. During the same period, 73 grey seals on Sable Island were equipped with a GPS transmitter and an acoustic receiver, which could detect these tagged fish. Each seal was tracked for about 7 months. About 40% of the tagged seals encountered seven species of tagged fish and one invertebrate. Encounters with tagged cod and salmon were generally brief with no evidence of predation suggesting seals simply use the same habitat as these fish. In contrast, encounters with bluefin tuna often extended over one week suggesting seals might be targeting the same highly productive areas as tuna. Our study shows that this novel approach offers promise to answer questions about predator-prey and competitor interactions in the open ocean, and may contribute toward easing conflicts between

marine predators and fisheries. Sable Island plays a critical role in our ability to use this innovative approach.

Population Dynamics and Sociality of Sable Island horses

Sarah Medill[1*], Philip D. McLoughlin[1]

[1] Department of Biology, University of Saskatchewan, Saskatoon, SK

[*] Presenter

Understanding why populations grow and decline, and what answers mean to the evolution and conservation of species, is not an easy task. In part, this is because of the complex nature of ecology and the existence of very few systems that can serve as real-world models outside of the lab, especially for large mammals. In this regard, Sable Island and its feral horses present an unparalleled opportunity for science and society. The horses live in a natural though simplified system (no predation, human interference, or other herbivores as competitors for food), and careful study of the population permits us to decompose population growth into contributions from each and every horse (their reproduction and survival), and link these to the particular traits that define individuals (including age, sex, morphology, behaviour, and underlying genetics). Since 2008, the University of Saskatchewan has been monitoring all horses in the population, which are individually known (N = 552 horses in 2014; 874 life histories from 2008–2014). There is variation across the island in density and sex ratio which interacts with resources and climate to influence rates of reproduction and survival. Additionally, climate, resources, and individual characteristics act upon group structure and horse movements. This presentation will describe the survey and data collection ongoing for Sable Island horses by the University of Saskatchewan, some of our recent findings, and plans for future work.

A genetic toolbox for research on the ecology, evolution and conservation of Sable Island horses

Jocelyn Poissant[1,2,3*], John Gilleard[2], Philip McLoughlin[3]

[1] jocelyn.poissant@ucalgary.ca

[2] Faculty of Veterinary Medicine, Department of Comparative Biology and Experimental Medicine, University of Calgary, Calgary, Alberta

[3] Department of Biological Sciences, University of Saskatchewan, Saskatoon, Saskatchewan

[*] Presenter

As part of our long-term individual-based study of Sable Island horses initiated in 2007, we are developing a molecular genetics toolbox that will provide insights into the population's natural history and ecology, and allow quantifying and monitoring its adaptive potential, evolution and health. This includes molecular markers to reconstruct the population's pedigree, genomic tools to estimate neutral and adaptive genetic diversity, and ultra-high-throughput sequencing technologies to characterize individual-level variation in intestinal parasite communities. In this presentation, we will introduce our efforts to develop a comprehensive genetics research program on Sable Island horses, discuss some of the challenges involved, and present preliminary findings.

How Many Vessels Have Wrecked at Sable Island

Aaron Mior

Partially due to its alluring environment and cultural history, Sable Island has found a place within the Canadian psyche. Stories and tales of shipwreck lore have been told and re-told since the 16th century with the Island gaining the well-deserved moniker "Graveyard of the Atlantic".

A significant amount of literature is available detailing the variety of cultural events on Sable Island, especially during the years of the Humane Establishment in the 19th and 20th centuries. Although written for a variety of audiences, these historical sources provide invaluable insight into the details and circumstances of specific maritime events and disasters occurring at the Island. In an effort to quantify the level of maritime disasters on the Island, some sources have attempted to determine the number of shipwrecks at Sable Island, with estimates ranging from 185 to over 500, although the estimate most commonly published in recent times is "over 350 wrecks since 1583".

Having consulted over 300 primary source documents and more than 50 published secondary sources, this paper will critically assess the historical sources documenting Sable Island shipwrecks and will evaluate the ability to determine just how many vessels actually wrecked at Sable Island.

The Simon Douglas MacDonald Map of the 'Known Wrecks on Sable Island Compiled from Official Reports'

Alan Ruffman, Geomarine Associates Ltd., Halifax, Nova Scotia

This map has only ever been known as a printed lithograph sheet dated February, 1883 with a second printed edition dated March, 1890. An unknown manuscript copy of this map has recently been identified and restored. MacDonald drafted this map initially in December 1882. He was not a trained scientist. He apparently obtained a qualification in dentistry later in the 1880s. The first edition was published by the federal Department of Marine and Fisheries. MacDonald continued to maintain and update the map over the next seven years when the same agency published a second edition. MacDonald continued to update his manuscript map into the early 1900s.

Revisions were done by a J.A. Browne on March 12, 1920 and a probable third edition dated March, 1923 was credited to a J.A. Leger, District Engineer of the Department of Marine in Dartmouth. The basic map has been popularised in an early 1960s version produced by the N.S. Department of Education. Two Halifax bookshops have produced souvenir blueprint editions.

The MacDonald manuscript map was drafted on original linen-backed drafting velum. A local conservator spent a week removing 30 pieces of an early generation of 'cello' tape from the obverse and a further 15 pieces used in a later 'repair' on the face of the map. The resultant pieces of the upper (Eastern) edge of the manuscript map were reassembled as a very fragile jigsaw and then stabilized with a new backing of lightweight Japanese paper. The map was cleaned and the restoration completed with a re-backing of the whole map which should be good for another 135 years.

Overview of Settlement History at Sable Island

Aaron Mior

This paper will provide an overview of the settlement and human occupation on Sable Island which can be divided into two distinct periods, the pre-1801 human occupation on the Island and the post-1801 Humane Establishment Period, which initiated the continued settlement on the Island to the present day.

In addition to the huts occupied by seasonal fishermen and sealers, there were many attempts to colonize the Island before the 19th century including those initiated by Baron De Levy, Marquis de La Roche-Mesgouez, Andrew LeMercier, Jesse Lawrence and Andrew and William Miller.

Further known and suspected human occupation on Sable Island prior to the 19th century includes the shipwreck survivors and associated encampments connected to the wrecks of Sir Humphry Gilbert's expedition in 1583, the *Mary and Jane* in 1634, *Saint Jerome* in 1714, *Cathrine* in 1737, the wrecked vessel associated with the voyage under Major Robert Elliot in 1760 and the occupation on the island by the survivors of the wrecked *Princess Amelia* in 1797.

Since the initiation of the Humane Establishment in 1801, Sable Island continues to be occupied to the present day. Discussion of the Humane Establishment Period will focus on the variety of structures and buildings constructed during the 19th and 20th centuries including those occupied by the Humane Establishment employees and their families, structures affiliated with the lifesaving establishment such as lighthouses, fog whistles and lookout towers and various temporary structures and survival huts built to provide shelter to shipwreck victims.

Assessing Sable Island's Archaeological Resources – 5 Centuries of Heritage

Daniel Finamore, Ph.D.* and William Barton

* Presenter

The project looks at the history (1500s – 1900s) of temporary and semi-permanent settlements on Sable Island, ranging from shipwrecked sailor encampments, fishing camps, salvage/wrecking operations and lifesaving stations. Archaeological evidence of these diverse uses is part of the island's, the country's and international maritime history's cultural heritage. In August 2010 a four day initial site survey of pedestrian transects and surface reconnaissance was targeted at locations derived from historic maps, aerial photography, written accounts, art and the likely needs of shipwreck survivors/inhabitants with the goal of assessing the feasibility of future investigations of greater depth.

Although weather conditions and time allowed for visiting a limited number of areas, several sites were identified, including one with early 18th-century or late 17th-century artifacts predating the Humane Establishment by a century.

The project's findings suggest that a more complete understanding of Sable's archaeological resources and early occupation can be achieved through future investigations. This will likely require repeated surface surveys after erosion and dune blowout. Considerable "local knowledge" of historic sites has been lost in the decades since the close of the Humane Establishment. A higher level of awareness among island visitors regarding the significance of cultural resources and the systematic reporting of relics would add to the knowledge base and protect disappearing and deteriorating cultural resources. The investigators are planning a second survey to examine areas of the island not covered in the first study and to observe the effects of dune erosion over time at previous sites.

Footprints in the Sand: The Surviving Trail of Pre-1867 Government Records for Sable Island

Nova Scotia Archives

Paul Maxner, Senior Archivist, Online Resources, and Heather Allen, Archivist, Government Records
Nova Scotia Archives, 6016 University Avenue, Halifax, Nova Scotia, Canada B3H 1W4

The Nova Scotia Archives acquires, preserves and makes available the province's documentary heritage — recorded information of provincial significance created or accumulated by government and the private

sector over the last 300 years. The institutional website (http://novascotia.ca/archives) is widely recognized for its innovative approach to online digital resources that encourage Nova Scotians everywhere to explore the history of their province, its communities and its people.

The Archives is currently building a new web resource showcasing the surviving records of government involvement in Sable Island before 1867. Digitized for online research, these original hand-written documents include accounts of voyages; information about shipwrecks, lighthouses, settlement and settlers; descriptions of the Island and its ecology; details concerning the early 'humane establishment' (life-saving station); accounts of early settlers and officials; agreements with ships' captains; receipts and lists of supplies, services and labourers' wages; and details of government funds allocated to support the Island. To complement the pre-1867 records, the new resource will also include digitized maps, charts and diagrams, as well as a variety of historical photographs depicting Island life at the turn of the 20th century and in the 1930s.

When completed, this resource will present for online exploration, several thousand documents never before seen outside the Nova Scotia Archives, and will stimulate new research into and analysis of Sable Island's history. Currently in production, an abridged version of the resource will be available for preview in May 2015.

Monitoring visitor experience aboard expedition cruises to Sable Island National Park Reserve

Patrick T. Maher, Ph.D., Cape Breton University

Expedition cruise ships visit many remote regions of the world. These smaller expedition vessels carry fewer passengers and offer an increased educational program with onboard teams of environmental and cultural guides (Walker & Moscardo, 2006). Expedition cruises are interested in "finding new unspoilt, previously unvisited locations with a strong natural or cultural appeal" (Ellis & Kriwoken, 2006, p. 251), and Sable Island certainly fits the bill.

In August 2013, CBC reported that Sable Island National Park Reserve would welcome a schedule of cruise visitors in the summer of 2014 (see CBC, 2013). This exploratory research was set up to collect data from this critical baseline season with hopes that it will assist in designing and implementing appropriate management strategies in the future.

Data was collected from both *Adventure Canada* voyages to the island in 2014. The project used a pre-and-post survey method on board the cruises asking questions that the tourists themselves were the knowledge holders (i.e. opinions and personal thoughts). Without a permanent, general public type of population on Sable Island this data was collected to provide insights into both expectations and initial reflections of the experience from that a general public-type of perspective. Contextual input, such as landing sites, weather patterns, etc. could be gained from the tour operator or Parks Canada.

Survey responses were 81 pre and 87 post trip, with a largely Canadian bias to the group. Initial analyses indicate that a very positive experience was encountered by these visitors, but that there is certainly room to improve with regards to education and management. Analysis of the data is ongoing and final results should be available in May.

Saturday, May 2nd, 8:00 am – 6:00 pm

Archaeological Resource Inventory and Protection for Sable Island National Park Reserve

Charles A. Burke, Senior Archaeologist, Archaeology and History Branch, Parks Canada, 1869 Upper Water Street, Suite AH 201, Halifax, Nova Scotia

Although Sable Island's natural history, ecosystems, and marine heritage are well documented, the evidence of human occupation on the Island's environment is less well known. Attempts to settle the Island from the 16th to the 18th century, establishment of life-saving stations in the 19th century, and the impact of hundreds of shipwreck and survivor activities are events that generally leave archaeological traces in the Island's sand. As the Federal administrator of the Sable Island National Park Reserve, Parks Canada is obligated to manage and protect the Island's cultural resources through its Cultural Resource Management Policy. With the goal of developing a long-term cultural resource monitoring and management program for Sable Island, we developed a geo-referenced inventory of known and assumed historic site locations, archaeological sites, and artifact finds. The primary focus of the 2015 Sable Island archaeological field survey is to confirm these site locations, assess their condition, and record new archaeological sites when discovered. This presentation will provide an overview of both the goals and challenges of developing an archaeological resource management plan for Sable Island National Park Reserve.

An ecological and biodiversity assessment of Sable Island National Park Reserve

Jonathan Sheppard, Sable Island National Park Reserve, Parks Canada

Sable Island has been the focus of a great deal of research over the past century or more. As new custodians of the island, it is important that Parks Canada draw upon this extensive base of knowledge and experience as a foundation for management of the national park reserve. Scientific experts were engaged in a collaborative process to synthesize and analyze critical elements of past research and monitoring and to identify information needs and knowledge gaps to inform future work. The synthesis of information on the current state of the species, habitats, ecosystem functions, and prevailing environmental influences on Sable Island contained in this "*Ecological and Biodiversity Assessment of Sable Island*", provides an important background analysis for park management planning.

Nova Scotia's Interest in Sable Island

The Honourable Labi Kousoulis, MLA for Halifax Citadel-Sable Island

Sable Island is truly an invaluable part of our Nova Scotian heritage. This remote, breathtaking vista is a staple of Maritime pride, not just because of its riveting history, but for inspiring extensive scientific research into its unique ecology. From the iconic wild horses roaming the sprawling sand dunes, to its indispensable home for a breeding grey seal population, the flora and fauna of Sable Island are a breathtaking reminder of our province's natural beauty. This gem of Atlantic Canada has been featured in numerous photographic works, exhibits, songs and documentaries, and has certainly earned its keep as a national treasure. The exceptional works of organizations such as the Friends of Sable Island Society, and individuals like naturalist Zoe Lucas, have continued its remarkable conservation legacy. It is because of these tireless efforts that awareness and interest in the island spans many groups, from our local residents to dedicated, enthusiastic researchers. I am proud to represent such a vital part of Nova Scotia's heritage as part of my riding; like so many of us, I look forward to a bright future for Sable Island as a national park reserve under Parks Canada. This beautiful, untouched crescent of land is a cornerstone in the foundation of Atlantic Canada's compelling identity.

Saturday, May 2nd, Posters Exhibit

Saturday May 2, 2015 – Scotia Bank Room, New Academic Building, University of King's College					
8:00am – 6:00pm	Session F Posters	"Sounds of Sable Island (An Auditory Tour of a Treasured Island)" - Doran Hayes	"Glacial and post-glacial geomorphic evolution of Sable Island and the surrounding Sable Island Bank – Today's Seabed" - E.L. King	"Taxonomical characterization of Red Fescue (***Festuca rubra*** L., Poaceae) on Sable Island, Nova Scotia, Canada" - Martin Dubé	"Where has Sable Island been for the Past 200 Years?" - David H. Gray
	Tables for Various Artists and Organizations including Nova Scotia Institute of Science, Friends of Sable Island, Sharon O'Hara, and Jill Martin				

Sounds of Sable Island (An Auditory Tour of a Treasured Island)

Doran Hayes, MSc. Audiology, Dalhousie University, BA Music, Acadia University

Countless photographs, documentary videos, scientific and historic publications can be found in stores, schools, universities, libraries and on the shelves in many homes reminding us of an iconic treasured island off the Atlantic coast of Nova Scotia. This mysterious and isolated place with its beautiful yet sometimes harsh environment is Sable Island.

Imagine having the opportunity to hear the many daily sounds nature has imbued in it hundreds of years ago. You will open your ears and hear something unimaginable when you listen to this impressive recording of one of nature's wonders. The sound of the winds through the grasses and over the dunes, the rippled sands singing to the rhythm of the pounding surfs, and then creatively orchestrated to welcome into its composition the sounds of terns, sparrows, seals, and the magnificent long-haired horses.

The making of this auditory tour will involve extensive research, a sufficient amount of time on the island using the latest in audio technology to record the wide variety of sounds specific to Sable Island. Following the visit will be many hours in postproduction and editing to produce an unforgettable auditory experience for all to enjoy.

The final product will be a digital audio recording that will be available in both CD and downloadable formats to continue supporting the efforts of the Friends of Sable Island.

Glacial and post-glacial geomorphic evolution of Sable Island and the surrounding Sable Island Bank – Today's Seabed

E.L. King[1] *, A. Ruffman[2], M. Li[1], and K. Webb[3]

[1]Geological Survey of Canada-Atlantic (GSC-A), Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia, B2Y 4A2

[2]Geomarine Associates Ltd., P.O. Box 41, Station M, Halifax, Nova Scotia, B3J 2L4

[3]Tota (France), Pau, France, formerly affiliated with GSC-A

*Presenter and Corresponding Author

Mapping the seabed topography around Sable Island started with British hydrographers Des Barres (1776), Bayfield (1853) and Orelebar (1859). All were lead-line, celestial navigation surveys. The first rigorous sonar hydrography was by Canadian Hydrographic Service (CHS) 1961 and 1963 from *CSS Kapuskasing* though these surveys kept to the offshore.

With early petroleum exploration, detailed sonar survey work began; an early contractor entrenched the term "Sand Waves" but sand migration was not understood. A commercial gas find prompted 1981-82 CHS surveys (*CSS Baffin*) producing three charts close to the Island. Further exploration and development necessitated challenging surveys of the East and West Bars. Detailed contour charts (1 and 2 m intervals) were produced at five and 19-year spans, towards serial comparison for evaluating bedform migration.

With growth of engineering seabed infrastructure and need for sediment dynamics understanding, the GSC and CHS conducted multibeam sonar bathymetry (CSS F.G. Creed, 1996 to 2001) covering small, selected sites and some repeat coverage to establish temporal change. These and the early CHS spot depths were quality controlled, and a mosaic produced, culminating in a striking colour-shaded Sable Island Bank bathymetry map presented here. Analysis of the detailed maps and sand cores with unique age-dating helped quantify sand migration.

Drifting sand is the quintessential realm of Sable Island and its environs yet imaging the seabed is but one component toward understanding the forming processes. How it came to be is a question also addressed by imaging geologic strata below the seabed, topics for future presentation.

Taxonomical characterization of Red Fescue (Festuca rubra L., Poaceae) on Sable Island, Nova Scotia, Canada

Martin Dubé, Campus d'Edmundston, Université de Moncton, Edmundston, NB

In Canada, ***Festuca rubra*** is known to include both native plants and introduced plants. There is no agreement on the taxonomical treatment to be applied on these. At the same time, authors tend to admit that some native variants could be candidates for formal taxa recognition, if better known.

For Sable Island, Catling, Freedman & Lucas (1984) listed three taxa: ***F. rubra***, ***F. rubra var. juncea*** and ***F. rubra var. glaucescens***. To say the least, these names are not widely accepted. Sable Island, contrary to other extensive sand dunes places, is no longer inhabited. This fact, combined with the size and the dynamics of the dunes, is a good factor to preserve the native status of these plants. Moreover, as no salt marshes are found on the island, we may think that ***F. rubra*** populations there may represent a nice example of what a sand dune variant could look like. This is what I want to establish. The most tangible result of this project will be knowing exactly what ***F. rubra*** is made of on Sable Island. The poster shows a Sable Island specimen of a sand dune variant of ***F. rubra***, some of its characters and the sampling so far completed.

Catling, P.M., B. Freedman & Z. Lucas 1984. The vegetation and phytogeography of Sable island, Nova Scotia. Proc. Nova Scotian Inst. Sci. 34:180-247.

Where has Sable Island been for the Past 200 Years?

David H. Gray, Definitive Hydrographic & Geodetic Consulting, Ottawa, Ontario

The location of Sable Island (44°N, 60°W) has been positioned by six independent surveys over the past 200 years. This paper correlates the surveys based on the limited number of common points and comments on the surveying methods that were employed and concludes that the various positions are more due to the quality of surveying than to the shifting of the island. The implications, both in terms of hydrographic charting and legal basis of sovereignty of maritime areas, are also discussed.
International Hydrographic Review; 69 (2):1992. Also CISM Journal ACSGC; 46 (3): 1992.