









# 2018-19 ANNUAL REPORT

The largest natural history museum in Canada known for: nature inspiration and engagement; Arctic knowledge and exploration; species discovery and change; and a 14.6 million specimen collection housed at a 76-hectare research campus.



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Judith LaRocque Chairperson

#### Message from the Chair

I am pleased to present the Canadian Museum of Nature's annual report for the 2018-19 fiscal year.

This year the national museum of natural history and natural sciences has again demonstrated its role as a national leader, and important international contributor, to the increasingly important field of collectionbased scientific research. And we also demonstrated how "Our Museum" inspires! The Canadian Museum of Nature's vision is to advance understanding and respect for nature by providing evidence-based insights, inspiring visitor experiences, and real engagement with nature's past, present and future. It is our hope, and indeed it is our mission, that people so inspired will develop the understandings required to make and support the decisions needed to ensure the sustainability of nature and our world.

With respect to nature, where is the world leading today? There is cause for concern. Scientists predict an Arctic Ocean free of summer sea ice by 2050 or sooner, with sea levels rising by 20 cm or more – enough to displace 400 million people – by 2100. We are in the Anthropocene era and are bearing witness to the world's 6th mass extinction of species – it is happening right now - with biodiversity declining at rates not seen for 65 million years. This year, we heard headline news about an "insect Armageddon", the devastating loss of insect life across the globe. Yes, across the globe but also in our own backyards! Insects support higher level species of fauna up the food web, and support flora as pollinators. If this trend continues, questions abound of the repercussions of a "tipping point". What will happen if or when we, or our children, reach it?

This does not sound like a path for a sustainable future. If we are now leading the wrong way, then we need to inspire ourselves and our leaders to find a new way. To find the right path forward, you need to know the territory. And that is where the Canadian Museum of Nature helps.

Our scientific collection is literally the evidence of "the territory". The National Natural History Collection of 14.6 million specimens, which the Museum creates and maintains, is the record in geospatial time of what "the territory" is and the flora and fauna living there. Its specimens and data tell us: what rocks and minerals are in the ground where; what plants live on it or lived on it; and like-wise what animals does it or did it support? And as the collection forms a record over time, it tracks changes. So as climate changes, we are measuring the impacts to the life on earth that result and providing the evidence to develop the knowledge to understand interdependencies.

Our scientists are experts in botany, earth and marine biology, mineralogy and palaeontology. They not only actively explore and discover but they also interpret the evidence of our collection so that we can understand what is, what was, and what is changing in our natural world. This is so important in order to enable us to have the knowledge to sustainably manage our natural future.

> Today the World's direction is threatened by fake news, polarized opinions that go unchallenged by fact, and by national reactions that are often impotent in addressing global problems. In the face of this, the Canadian Museum of Nature is playing its part to help "save the world" through evidence, knowledge and inspiration. The Museum inspires the almost 500,000 visitors that come through our doors at the historic Victoria Memorial Museum Building in Ottawa. We also engage millions more through visits to our travelling exhibits in locations across Canada and abroad or visits online at nature.ca. Through us, people get to know, engage with, and care for, nature. We hope that in turn will lead them to engage with finding the right path for our natural future.

We do all this with the able support of the Board of Trustees, a group of individuals committed to the Museum's mission and mandate. This year we said farewell to Board members Byron Neiles, Reg Manhas, Nicholas Offord and Erin Rankin Nash, while we welcomed new members Linda Nowlan, Christian Robin, Judith Pereira, Allan Adam and Glenn Sakaki.

As you read the annual report on our progress over this past year, we hope that you too will be inspired.



Margaret Beckel President and Chief Executive Officer

# Message from the President and Chief Executive Officer

Fiscal 2018–19 was a year of biodiversity, butterflies, brain talks, courage, passion and a new bank in Canada! I am pleased to share some of the highlights below.

Biodiversity conservation symposium hosted by the Beaty Centre for Species Discovery assessed the current state of biodiversity conservation in Canada and offered an outlook on sustainable use into the next 150 years.

*Butterflies in Flight* delighted thousands of visitors young and old, especially those wearing bright colours.

We opened a boutique operation with new products, staff and inspired connections to Museum exhibits and scientific research.

*Brain: The Inside Story* inspired and engaged thousands of visitors during its run through the spring and summer of 2018. Content and interactives for all ages provided an understanding of how our brain works and does not.

*Brain Talks* presented four sold out discussions about brain science organized by the Ontario Brain Institute in collaboration with the Museum's program team.

*Courage and Passion: Canadian women in natural sciences* celebrated the 100<sup>th</sup> anniversary of the removal of gender as a barrier to voting in federal elections. This exhibit also featured Viola MacMillan, the Museum's first \$1 million donor who died 25 years ago.

The research scientists and collections care experts created and advanced new knowledge about the natural world with over 30 research projects involving over 200 days in the field.

Budget 2016 made possible the acquisition of essential scientific research equipment such as the new x-ray diffractometer supporting mineral sciences at the Museum.







Museum science was in the news featuring new discoveries and unexpected namings including a toothless turtle fossil find and the naming of the Bautista beetle.

POLAR 2018 in Davos, Switzerland. The Centre for Arctic Knowledge and Exploration was well profiled at the Arctic Science Summit Week that coincided with the Antarctic Science Summit Week in Davos.

A new national bank was launched in Canada at the Canadian Museum of Nature. The National Biodiversity Cryobank of Canada was officially opened in September 2018. This bank will receive and hold deposits of plant and animal tissue samples that need to be frozen at extremely cold temperatures to be preserved for future scientific study. A first for Canada!

*Survival of the Slowest* in collaboration with Ray's Nature Centres opened to rave visitor reviews. The response demonstrates the power of encounters with nature up close and personal (and live!). From sloths to spiders, from bats to boas... this exhibit drew smiles, sighs and screams.

Making it all possible were the hundreds of passionate people dedicated to our purpose.

# CORPORATE OVERVIEW

### **Corporate Overview**

The Canadian Museum of Nature pursues its national mandate as described in the *Museums Act*, within the context of the governance and accountability regime established in Part X of the *Financial Administration Act*.

The Museum's Board of Trustees and management are firmly committed to managing the public and private funds invested in the institution in a transparent, accountable manner, and to optimizing the value of the contribution the Museum makes to Canadians and Canadian society.

National museums are a key component of Canada's social and natural capital.

National museums reflect who we are as a country by virtue of what we value, save, share and protect: Art, History, Science & Innovation, Human Rights, Immigration and Nature. Canada's national museums have a local, national and international role. Local, as visitor destinations that inspire through evidence-based story telling. National and Global, as creators and distributors of Canada's stories, through outreach programs and events in cities across Canada and around the world. Through collection loans to museums, galleries, libraries and community centres, through collaborative research on natural and cultural heritage. With digital content in virtual exhibits, digital apps, on-line collections, downloadable resource materials and all social media platforms, through access to physical and digital content as source information for content producers in TV, Radio, Film, News, education, research and public policy. And finally, with international programming through exhibits, programs, collaborative research, conference presentations and content co-creation. National museums play a vital role as trusted sources of contextualized knowledge, as keepers of the record of our past and as catalyzers of conversations about our future aspirations.

The Canadian Museum of Nature is one of Canada's national museums, each committed to reflecting who we have been, who we are now and who we aspire to be as a country and as Canadians. Canada's national museums reflect what we value as a country and as citizens by virtue of what we collect, preserve, study and share knowledge about: Art, History, Human Rights, Immigration, Science & Innovation and Nature. As part of the portfolio of Canadian Heritage institutions, we reflect the past, contextualize the present and anticipate and inspire a better future.

The Canadian Museum of Nature became a Crown corporation on July 1, 1990 through the *Museums Act*. The Museum is named in Part 1 of Schedule III to the *Financial Administration Act* and is subject to the control and accountability requirements set out for Crown corporations in that *Act*. It reports to Parliament through the Minister of Canadian Heritage and Multiculturalism.

The Museum is responsible for two facilities, the Victoria Memorial Museum Building (VMMB) in Ottawa, ON and the Natural Heritage Campus (NHC) in Gatineau, QC. The Museum's galleries and most of the exhibitions and programmes are offered at the VMMB. The campus is situated on 76 hectares of land and was designed to provide the standards of safety, security and preservation necessary to safeguard Canada's natural history collection.

#### Vision

A sustainable natural future.

#### Mission

To save the world for future generations with evidence, knowledge and inspiration.

At the highest level, the mission of the Canadian Museum of Nature is nothing less than to support making the vision of a sustainable natural future a reality. As current trends of greenhouse gas emissions, mass species extinctions, and their causal factors run counter to this vision, the Museum's mission is one of inspiring change. We are an instrument, one of many working in concert within the scientific community, for providing the foundation required to foster the change required to "save the world". It is a foundation built on evidence, knowledge and inspiration, which are the mainstays of our work.

At a micro level, we are already "saving the world", as we build and maintain the National Natural History Collection, a scientifically active collection of over 14 million specimens which creates a geo-temporal record of nature – e.g. what is, and what is living on, the world where and when. From this evidence of the world and life on it, we can develop knowledge of interdependencies, a record of change, and a basis to understand impacts and where change is leading.



#### Position

A national museum of international first rank known for excellence in arctic knowledge and species discovery and for evidence-based insights, inspiring visitor experiences and real engagement with nature's past, present and future.

Dynamic change is required to seize opportunities in the Museum's nature inspiration, Arctic knowledge and species discovery activities. Environmental trends will increase the value of the Museum's mandate over the planning period, but the Museum needs to adapt significantly to deliver. The ability to invest in change will be conditioned by the Museum's financial framework which demands new sources of revenue and efficiencies in order to sustain its operations. The commemoration of the 150<sup>th</sup> anniversary of confederation allowed the Museum to seize many opportunities to extend the reach and impact of our public engagement and our research and discovery programs. The opening of the Canada Goose Arctic Gallery last year demonstrated the Museum's expertise in Arctic knowledge and exploration and it provided an inspiring space for learning about our natural world.





#### **Fulfilling the Mission**

Knowing more about nature gives us the tools to make better decisions about resources. It provides the basis for new technologies and developments, and promotes a better understanding of how we affect, and are affected by, the natural world.

The Museum is home to one of the world's largest and finest natural history collections. Comprised of 26 major science collections of more than 14.6 million specimens, the Museum's holdings cover four billion years of Earth history.

In addition to preserving these precious specimens for posterity, the collection is a vital resource for scientists, researchers and museums in Canada and around the world. For instance, by examining past patterns of species distribution, climate change and extinction, palaeobiology research helps scientists understand natural events that occur during environmental changes and assists in predicting future consequences.

At the Museum, we use the past to prepare for the future. Our specimens provide the backbone for our many special exhibitions and signature galleries, and they greatly enhance our educational programmes, designed for adults, teens and children, about the natural world.

#### **Our Mandate**

The Canadian Museum of Nature has its origins in the Geological Survey of Canada, which was formed in 1842. Nearly 150 years later, on July 1, 1990, the Museum became a Crown Corporation by an Act of Parliament.

The *Museums Act* was a significant event in the history of the Museum. With Crown Corporation status came a new name, a new "arms-length" status and an expanded mandate.

"The purpose of the Canadian Museum of Nature is to increase throughout Canada and internationally, interest in, knowledge of and appreciation and respect for the natural world by establishing, maintaining and developing for research and posterity a collection of natural history objects, with special but not exclusive reference to Canada, and by demonstrating the natural world, the knowledge derived from it and the understanding it represents."

- from the *Museums Act*, Section II (1990, c. 3)

#### Putting Our Mandate to Work

The Canadian Museum of Nature's vision is to inspire understanding and respect for nature. We advance this vision by providing evidence-based insights, inspiring visitor experiences, and real engagement with nature's past, present and future.

Our Experience and Engagement division is leading our effort to deliver dynamic personal experiences, powerful dialogue and debate, expert narratives and extraordinary chronicles about our collections. A connection with the Museum promises to inspire connections with nature and explorations of our natural future.

Through the activities of our Research and Collections division, the Museum continues to conserve and maintain its natural history collections, for which it has developed considerable expertise in the areas of collection conservation and collection management. In the research area, activities are focused on major areas of interest and relevance to society. Our key efforts are directed towards the discovery of new knowledge, and the gathering and analysis of scientific information to increase our understanding of natural diversity.

The wealth of knowledge gained through our natural history collections and leading-edge research forms the core of the Museum's exciting exhibitions and educational initiatives. As a result, our public programmes engage Canadians in guided dialogues about nature and challenge fixed opinions and views. In all activities, we aim to interpret natural history and science themes in an exciting and interactive way. We seek to increase nature literacy and science literacy among Canadians of all ages.





# OUR PEOPLE

## **Board of Trustees**

The Board of Trustees is the Museum's governing body, responsible to Parliament through the Minister of Canadian Heritage and Multiculturalism. The 10 members are Governor-in-Council appointees from all regions of Canada. Through accountability and strategic policy and planning frameworks, the Board provides corporate direction and delegates authority to the President and CEO for the management of the Museum. In 2018-19, the Board met three times, either in person, by conference call or by videoconference. Ten meetings of the Committees of the Board were held.

#### STANDING COMMITTEES

#### **Executive Committee**

Judith LaRocque, Chair

Mandate: The Executive Committee's sole purpose is to act for the Board on urgent matters arising between regular Board meetings in cases where it is not possible to convene a meeting of the Board, and to do other things as delegated by the Board to the Committee.

#### Audit and Finance Committee

Ron Calderoni, Chair

Mandate: The Audit and Finance Committee is responsible for overseeing the Canadian Museum of Nature's standards of integrity and behaviour, the integrity and credibility of the Canadian Museum of Nature's financial reports, and the systems and practices of internal control.

#### **Governance and Nominating Committee**

Nicholas Offord, Chair

Mandate: The Governance and Nominating Committee is responsible for monitoring adherence to Board policies, monitoring when terms of office for members of the Board of Trustees expire and for recommending to the Board individuals to be encouraged to participate in the Government of Canada appointment process. The Committee also leads the annual review of the President's performance and provides oversight for key human resources policies approved by the Board.

#### **BOARD OF TRUSTEES**

#### Judith LaRocque

Chairperson Hawkesbury, Ontario (14-Dec-17 to 13-Dec-20)

#### Nicholas Offord

Vice-Chairperson Toronto, Ontario (30-Sep-10 to 10-Dec-18) \*Replaced by Glenn Sakaki

#### Glenn Sakaki

Vice-Chairperson Toronto, Ontario (25-Mar-19 to 24-Mar-22)

Allan Adam Paddockwood, Saskatchewan (25-Mar-19 to 24-Mar-22)

Ron Calderoni Boucherville, Québec (05-Apr-12 to 20-Feb-22)

#### Doug Feasby

Ottawa, Ontario (06-Mar-14 to 05-Mar-18) \*Trustees continue in office until replaced

Susan Knott Vancouver, British Columbia (10-Apr-14 to 9-Apr-20)

Reg Manhas Dallas, Texas (01-Mar-12 to 29-Feb-16) \*Replaced by Linda Nowlan

#### Alice McCarron Halifax, Nova Scotia (21-Dec-10 to 20-Dec-13) \*Trustees continue in office until replaced

#### Byron Neiles

Calgary, Alberta (20-Oct-11 to 19-Oct-15) \*Replaced by Christian Robin

Linda Nowlan Vancouver, British Columbia (25-Jun-18 to 24-Jun-21)

**Judith Pereira** Toronto, Ontario (25-Jun-18 to 24-Jun-21)

Erin Rankin Nash London, Ontario (24-Feb-08 to 29-Feb-16) \*Replaced by Judith Pereira

**Christian Robin** Winnipeg, Manitoba (25-Jun-18 to 24-Jun-21)

**Corporate Secretary** Skye Cameron

#### EXECUTIVE STAFF

Margaret Beckel President and Chief Executive Officer

**Ailsa Barry** Vice President, Experience and Engagement Charles Bloom Vice President, Corporate Services

Mark Graham Vice President, Research and Collections Ikram Zouari Chief Financial Officer & Director of Finance

#### MANAGEMENT TEAM

Laura Evans Director, Advancement

Jean-Marc Gagnon Section Head, Zoology

Lynn Gillespie Section Head, Botany

Angeline Laffin Director, Visitor Experience Martin Leclerc Director, Facilities and Protection

Jordan Mallon Section Head, Palaebiology

Paula Piilonen Section Head, Mineralogy

Sylvie Saureault Interim Director, Human Resources John Swettenham Director, Marketing and External

Relations

Stacy Wakeford Director, Content



# ASSESSMENT OF RESULTS FOR 2018-19

# Strategic Objectives, Activities and Results 2018-19

In 2018–19, the Museum advanced its year five of a strategic plan that **leverages its research and collections** strengths in Arctic Knowledge and Species Discovery and builds on the experience of previous years.

New approaches to the design and delivery of visitor experiences enabled the Museum to attract and inspire new audiences. These new engaging experiences resulted in higher memberships, higher membership renewal and provided a foundation for enhanced fundraising. **Overall higher levels of engagement inspire a better understanding of and connection with Canada's natural world.** 

#### Strategic Objective #1:

Create a Centre for Arctic Knowledge and Exploration that **transforms people's understanding of Canada's Arctic** and its relationship with Canada as a country in a 21<sup>st</sup> century global context.

**Strategies:** Advance a multi-year program to enhance and advance the research, collections, education and exhibition programs focused on Canada's Arctic within a national and global context.

- Promote and leverage arctic content. Gallery, maps, exhibits, programs
- Invest in Arctic knowledge sharing with post docs, graduate students and global science forums
- Grow the Arctic collection through field work
- Share the evidence with the world through enhanced digitization
- Recruit high profile volunteers committed to supporting our profile raising and fundraising aspirations

Outcome #1: Be a global museum leader in Arctic Knowledge and Exploration.

Outcome	Measure	2018-19 Performance Target	2018-19 Results
Be a global museum leader in Arctic Knowledge and Exploration	Number of participants in Arctic themed experiences: gallery, exhibit, program, digital	500,000	576,109
	Funds raised supporting Arctic research, collections and engagement programming	\$400,000	\$508,500
	Number of contacts with the Museum of Nature and its experts and collections for Arctic related content, expertise and collaboration	75	84
	Awareness of the Museum's Arctic content and expertise as measured by media mentions, stories, etc.	110 stories and 75 mentions: 185	36 stories and 9 mentions: 45

#### **Performance Measures:**

Media stories lower than expected due to timing of an arctic discovery. Moved into next fiscal.

#### Strategic Objective #2:

Create a Centre for Species Discovery and Change that **transforms people's understanding of the relevance of species diversity** to their lives now and in the future.

**Strategies:** Advance a multi-year program to advance and disseminate the research, collections, education and exhibition programs explaining Canada's species diversity aligned with the United Nations Convention on Biodiversity 2020 program.

- Promote and leverage species content in permanent galleries, travelling exhibits and programs
- Invest in scientific talent with a scientific training program, post docs and succession planning
- Share our knowledge through digitized data, traditional and new digital publications, conferences, workshops and committee leadership
- Build the body of evidence through private collections, field work and strategic collection loans
- Create, share and leverage digital profiles of our scientific research to ensure our expertise is known and used by the local, national and international community

**Outcome #2:** Be a national leader and global influencer in advancing and sharing knowledge about species discovery and change.

Performance	Measures:
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Outcome	Measure	2018-19 Performance Target	2018-19 Results
Be a national leader and global influencer in advancing and sharing knowledge about species discovery and change	Number of publications	50	59
	Number of new species described by the Museum	20	25
	Number of collaborators involved in the work the Museum does	250	231
	Number of new experts being guided by us	25	25
	Amount of data shared digitally through nature.ca	20 million	32 million

Number of collaborators tied to current scientific staff. Retirements result in loss of collaborators tied to their research.

#### Strategic Objective #3:

Create a Centre for Nature Inspiration and Engagement that transforms people's expectations of the Canadian

**Museum of Nature as a destination** for discussion, connection and exploration with nature's past, present and future that advances understanding and respect for Canada's natural world.

**Strategies:** Advance a multi-year program of inspiration and engagement activities on-site and off-site that deliver a different and compelling approach to connection and engagement with nature.

- Confirm a content refresh plan based on the natural history issues environmental scan
- Prioritize content plan investments to guide fundraising focus
- Invest in best practice and new practice learning in public engagement
- Leverage partnerships with specialized expertise that enhances program design and delivery
- Co-create with new partners reaching new Museum audiences
- Create a multi-year and multi-layered digital engagement strategy targeting our public program audiences

Outcome #3: Be a national leader in nature inspiration experiences on-site and off-site.

Outcome	Measure	2018-19 Performance Target	2018-19 Results
Be a national leader in nature inspiration experiences on-site and off-site	Number of visitors attending the VMMB and NHC generated experiences	1.5 million	1,221,024
	Change in membership renewal rate and total memberships	5,000 and 55% renewal	6,002 and 64% renewal
	Change in reach of Museum expertise demonstrated by number of collaborations, conference presentations and workshop	30 events	19 events
	Number of organizations collaborating with the Museum for content and experience creations	75 collaborators	149 collaborators
	Funds raised in support of nature inspiration, content and experiences	\$500,000 annually	\$841,242

#### Performance Measures:

Visitor numbers for VMMB and NHC experiences tied to United States (US) venues with larger visitor draws. Delay in receipt of visitor numbers for one US based travelling exhibit.

#### Strategic Objective #4:

**Position the Natural Heritage Campus as a centre of excellence** in collections management and knowledge creation, advancement and sharing by becoming a collections collaborator with institutions around the world seeking to collect, preserve, digitize and disseminate specimens that document the nature of Canada.

**Strategies:** Advance a multi-year program that positions the Campus as a globally excellent research, collections, administration and experience site that advances understanding and respect for nature.

- Invest in building infrastructure with Budget 2016 funding
- Invest in scientific equipment with Budget 2016 funding and philanthropy
- Raise the profile of our experts. Focus on popular subjects and issues in the media
- Open our doors physically and digitally with the Open House, digital narratives and digital publications
- Share our resources in Library, archives, conservation and collections care best
  practice
- Raise the profile of our Natural Heritage Campus excellence by launching a profile-raising campaign with a major broadcast partner

**Outcome #4:** Be a global museum leader in natural heritage collections storage, study, preservation, digitization and dissemination.

Outcome	Measure	2018-19 Performance Target	2018-19 Results
Be a global museum leader in natural heritage collections storage, study, preservation, digitization and dissemination	Number of roles in national and international collections management and research bodies	35	122
	Growth of collections through new signature public and private sources gifted to the Canadian Museum of Nature	22,000	21,305
	Collection lots digitized number and percent	850,000 / 26%	891,750 / 27%
	Attract in-kind support from research collaborators to fund field and lab research	\$450,000	\$532,610

#### Performance Measures:

Growth in collections impacted by lack of major insect collection donation in this fiscal.

#### Strategic Objective #5:

Create a **sustainable business enterprise model of operation** that leverages the Museum's strategic imperatives: knowledge and discovery, inspiration and engagement, presence, performance and advancement.

**Strategies:** Advance a multi-year program of continuous innovation in all aspects of the Museum operation in order to create a financial and operational model that sustains the Museum now and into the future.

- Solidify the Sustainable Museum Enterprise (SME) approach across all divisions
- Establish a data management system for SME objectives
- Invest in professional development that advances and supports SME
- Benchmark the metrics that strengthen the Museum's operating model and diversifies our sources of revenue
- Develop and launch a multi-year strategy to collect, house and leverage financial data that informs decision making across the museum enterprise

**Outcome #5:** Be a national leader in sustainable museum enterprise operations within an international best practice context.

Performance I	measures:
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Outcome	Measure	2018-19 Performance Target	2018-19 Results
Be a national leader in sustainable museum enterprise operations within an international best practice context	Earned revenue as % of total budget	25%	25%
	Penetration of tourist market	12%	11%
	Advancement revenue as % of earned revenue	19%	19%
	Number of experience connections per FTE	20,000	47,065
	Number of media mentions and stories	1,500	2,002
	Align the performance management and succession plans to support the enterprise model with the skills and human resource practices needed	Fully integrated PMP, health and wellness and succession plan	Fully integrated PMP and succession plan. Health and wellness framework underway.

The transition to Office365 enabled advanced data sharing and analysis that supported real time decision making in marketing and program delivery.





# SCIENTIFIC RESEARCH PROGRAM FOR 2018-19

## Scientific Research Program for 2018-19

The Museum has Research Scientists, Curators and Senior Research Assistants who create and develop this program of work. Each of the multi-year projects draws upon the resources of the Museum as well as contributions from a significant list of collaborators.

This list is a reference to understand the topics being investigated, the range of activities, and who is involved. The information in this document is summarized from the pages of the detailed research proposals (available upon request), and also provides links to the corresponding Research and Collections web pages at nature.ca.

This fiscal year there was a total of 20 projects. In this document we detail 17 of them. The other three will follow when the new scientists who are in the process of being hired have arrived and established their activities in Botany, Mineralogy and Zoology.

The proposals presented are continued from last year, and in many cases the abstracts have been improved, the titles may have been tweaked, and the list of collaborators and students have been updated, as has the related travel.

## Mineralogy

#### 1.

### Title: The Speciation and Evolution of Alkaline Environments: Trace Elements, Accessory Minerals and Magma

**Principal Investigator:** P.C. Piilonen (http://nature. ca/en/research-collections/research-projects/ evolution-alkaline-environments)

Abstract: The foci of this study are extremely evolved suites of highly alkaline basalts and syenitic rocks. These rocks record melting in specialized environments at various depths within our planet, coupled with extreme evolution, that together produce exotic and sometimes economic deposits of rare metals such as niobium, zirconium, thorium and rare-earth elements. The complex chemistry of the deposits is typically concentrated in accessory minerals; consequently, studies concentrating on the chemistry of these minerals are among the best ways to trace the evolution of their hosts. Key goals of the study are to determine how these elements behave during the generation and evolution of magmas, and to discover new ways that these elements and their mineral hosts can be used to study the generation and evolution of magmas.

#### 2.

### Title: Atomistic processes in mineral growth and stability: investigations into nanomineral behaviour and mechanisms of compositional zoning

Principal Investigator: A. J. Lussier

Abstract: Analytical advances have greatly enhanced our ability to characterize complex Earth materials. However, despite the resulting insight into mineral occurrences in geological systems, there is comparatively less understanding of the complex atomic mechanisms that govern their growth and stability. Developing such an atomic-scale understanding of mineral processes would allow refined interpretations of emplacement histories as well as predictions of future behaviours. The work proposed here endeavours to elucidate such fine-scale processes as they: (1) link the behaviours of nanoscale and macro-scale mineral species in diverse geological (and biological) systems; and (2) relate structure to composition of chemically-zoned single crystals.



# Palaeobiology

#### 1.

#### Title: Species coexistence and change during the Late Cretaceous of North America

**Principal Investigator:** Jordan Mallon (http://nature. ca/en/research-collections/research-projects/ palaeo-ecology-canadian-dinosaurs)

Abstract: The Late Cretaceous period of North America (-85-66 Ma) witnessed an explosion in dinosaur diversity, followed by a decline in some groups leading up to the end-Cretaceous mass extinction. Internal processes, like niche partitioning, and external processes, like sea level and climate change, are among the factors that have been invoked to account for the rise and subsequent fall of dinosaur diversity. Addressing these matters may therefore shed light on related conservation issues today. My approach combines fieldwork with integrative and collaborative research to investigate the evolution and palaeoecology of Canadian dinosaurs within this broader context.

#### 2.

### Title: Spatiotemporal change in mammal communities under Cenozoic climate change

**Principal Investigator**: Danielle Fraser (http://nature. ca/en/research-collections/research-projects/ spatiotemporal change in mammal communities under Cenozoic climate change)

Abstract: The Cenozoic (66 Ma - present) is characterized by repeated events of climate change. Mammalian responses to climate perturbation include, but are not limited to, speciation, extinction, body size change, niche expansion and contraction, and changes in community structure. I quantify changes in mammalian communities through time using a unique combination of palaeoecological methods, including field work, phylogenetics, dietary inference, and biogeochemistry. Characterizing the past responses of mammals to environmental change will allow me to develop a baseline for their response in the absence of humans and to determine whether human activities have completely altered the ways in which communities respond.







# 3. Title: Study on the Mesozoic reptiles (mainly diapsids) from Canada and China

**Principal Investigator:** Xiao-Chun Wu (http://nature.ca/en/ research-collections/research-projects/reptiles-mesozoic-era)

**Abstract:** Studies of vertebrate faunas (mainly dinosaurs and crocodiles) of the Cretaceous and Paleogene in Canada and China may have a significant impact on the diversity and number of dinosaurs and other vertebrates before and after the K-Pg extinction. This work will increase our knowledge of the impact of the vertebrate assemblages to their paleoenvironments and geological events which happened during the J-K and K-Pg transitions.

Studies of new findings of sauropterygians, thalattosaurs, marine archosauromorphs, and turtles from the Triassic of China and Canada and new dinosaurs and other vertebrates from the terrestrial Jurassic of both countries will be significant to our better understanding of faunal changes during the Triassic and the Tr-J transition from marine to terrestrial environments in a global scale.

Information derived from the aforementioned projects can be used to answer questions, such as the magnitude of those extinctions, climate-environmental changes, and faunal exchanges and correlations between North America and Asia during the Tr-J and K-Pg transitions, respectively.



#### 1.

### Title: Biodiversity of the Canadian Arctic Flora

**Principal Investigators:** Lynn Gillespie (http:// nature.ca/en/research-collections/researchprojects/canadian-arctic-flora-biodiversitychange), Jeffery Saarela (http://nature.ca/en/ research-collections/research-projects/canadianarctic-flora-biodiversity-change), and Troy McMullin

Abstract: This research program aims to increase knowledge of the diversity of Canadian Arctic vascular plants and lichens, which is fundamental to understanding how the Arctic flora may be impacted by environmental change, and provides baseline data for conservation, ecological monitoring, and predictive modeling studies. The main goals of the program are to produce a new flora treating all Canadian Arctic vascular plant species; characterize biodiversity of Arctic lichens and produce a checklist of Canadian Arctic lichens: produce DNA barcode data for Canadian Arctic vascular plants and lichens; undertake field expeditions to the Arctic to conduct floristic studies of botanically underexplored regions; analyse patterns of species and genetic diversity across the Canadian Arctic; and conduct systematic studies of taxonomically problematic species complexes.

#### 2.

# Title: Taxonomy and phylogenetics of grasses (Poaceae) and their monocot relatives

**Principal Investigator:** Jeffery M. Saarela (http:// nature.ca/en/research-collections/researchprojects/taxonomy-phylogenetics-grassespoaceae-their-relatives)

Abstract: I conduct taxonomic and phylogenetic research on grasses, sedges and their relatives. I conduct collections-based studies, which provide comprehensive baseline data on plant nomenclature, morphology, and distribution in time in space, providing up-to-date information that is critical for understanding and monitoring organismal responses to environmental change. I use DNA sequence data to produce DNA-based identification tools, identify major lineages and reconstruct their evolutionary relationships, develop and clarify taxonomic classifications, characterize patterns of molecular evolution, and understand patterns of morphological change within and among lineages. I make extensive field collections, and all material is deposited in the National Herbarium of Canada.





#### 3.

### Title: Phylogenetic and molecular systematics of flowering plants with a focus on grasses and spurges

**Principal Investigator:** Lynn Gillespie (http://nature. ca/en/research-collections/research-projects/ understanding-evolutionary-history-floweringplants)

Abstract: This research program aims to increase our knowledge of the systematics and evolution of flowering plants, focusing on the grass tribe Poeae and the spurge family Euphorbiaceae. I use phylogenetic analyses of molecular data and detailed morphological studies to assess current taxonomy and classification, explore the evolution of morphological and ecological traits, and examine historical biogeography. The goals are to understand evolutionary relationships over time and space, devise new classifications reflecting phylogenetic history, discover species and genera new to science, and produce taxonomic revisions and floristic treatments.

#### 4.

Title: Freshwater micro-organism diversity and environment (FMODE): multi-proxy approach to systematics, global biodiversity, Arctic toxicology, impact assessment and environmental change using conventional and genetic marker

Principal Investigator: Paul B. Hamilton (http:// nature.ca/en/research-collections/researchprojects/freshwater-micro-organisms-systematicsbiodiversity-toxicolog), **Supervising Scientist:** Lynn Gillespie, Section Head

Abstract: Diatoms are markers of habitat integrity, anthropogenic impacts and environmental change. This research is within two strategic themes (directive to inspire understanding & respect for nature). Diversity in environmentally stressed systems will be aligned with Canadian and global biodiversity. Impacts of mercury and organic contaminants will be assessed in the Canadian Arctic. The taxonomy of Neidium, Pinnularia, Surirella and Nitzschia will be studied. Diatoms are biomarkers for nutrient and metal pollution. A multi-proxy protocol will be taken to evaluate cryptic species using morphology and gene barcoding. The objective is to link global microbial biodiversity with environmental health and biogeography.


## 5. Title: The biogeography, ecology, and taxonomy of Canadian lichens

Principal Investigator: Troy McMullin

Abstract: The aim of my research program is to advance our knowledge of the Canadian lichen biota. I will conduct interdisciplinary collectionbased research throughout the country with a focus on regions, habitats, and species that are poorly understood. My objectives are to: 1. develop regional base-line data for areas with knowledge gaps, 2. address taxonomic uncertainties using morphometrics, metabolite determinations, and phylogenetic analyses, and 3. resolve unknown questions in lichen ecology.

### 6. Title: Bryophytes of Canada

Principal Investigator: Jennifer Doubt (http:// nature.ca/fr/recherche-collections/projetsrecherche/bryophytes-canada), **Supervising** Scientist: Lynn Gillespie (http://nature.ca/fr/ recherche-collections/scientifiques/michel-poulin)

Abstract: This research on mosses, liverworts and hornworts supports the understanding of plant diversity and conservation in Canada, and builds a key strength of the National Herbarium of Canada. Bryophytes provide all the ecosystem services that plants provide worldwide, while also filling unique roles specific to their distinctive size and biological traits, making life possible in extreme terrestrial environments, notably the Arctic. Bryophytes have yet to be studied in detail in most parts of Canada, creating abundant opportunity for discovery and meaningful contribution to natural history knowledge.



## Zoology

### 1.

## Title: Systematics of New World Weevils (Coleoptera: Curculionidae)

**Principal Investigator:** Robert S. Anderson (http://nature.ca/en/research-collections/ research-projects/taxonomy-weevils-americas)

**Abstract:** This ongoing project on the systematics of weevils of the New World uses standard methods of morphological systematics to assess the taxonomy, classification, distribution and natural history for various taxa. The primary focus will be on systematics, biogeography and evolution of the fauna of leaf litter, particularly those members of the tribe Lymantini (Molytinae) as well as on Tropiphorini from southwestern USA. Primary target areas for study are Central America, the West Indies and North America. Studies will include taxonomic revisions, descriptions of new species, biogeographic assessments of endemism and species richness and faunal reviews. Opportunities for collaboration on molecular studies will be pursued where appropriate.

#### 2.

## Title: Living on the cold ocean floor: biodiversity and the effects of icebergs, natural gas and resource extraction

**Principal Investigator:** Kathleen Conlan (http:// nature.ca/en/research-collections/science-experts/ kathleen-e-conlan)

Abstract: This research explores the diversity and patterns of marine life on various ocean floors: the Arctic, Antarctic, Australia and the abyssal deep. Numerous unusual and unknown species are being discovered and community patterns are being assessed in relation to impacts from iceberg groundings, natural gas seeps and hydrocarbon extraction. The results will enhance our understanding of the diversity and dynamics of life on the seafloor and will help us to predict responses to climate change and seafloor resource extraction.



### 3.

## Title: Population dynamics, diversity and distribution of Arctic small mammals

#### Principal Investigator: Dominique Fauteux

Abstract: Small mammals are a group of species central to northern terrestrial ecosystems because of their predominance in the diet of predators and their high consumption of crop production. Their distribution and diversity in the Arctic need to be updated as it depends on fragmentary and ad hoc data obtained 40 years or more ago. Since these species are subject to abundance cycles that can lead to extremely low densities (nearly 0 ind./ha) it is imperative to sample each area over a complete abundance cycle (~4 years). This will also make it possible to document its population dynamics, which are subject to significant changes due to global warming. Three sites located in the high Arctic (Bylot Island) and the low Arctic (Cambridge Bay and Salluit) were selected. Among the species studied, the Ungava lemming, a species endemic to Quebec and Labrador, will be monitored in Salluit, Quebec, in order to study in detail its ecology, which is still very unknown. New specimens will be collected at each site for taxonomic purposes. National and international collaborations will compare Canadian population cycles with those of other sites in Canada, Greenland, Fennoscandia and Russia.

#### 4. Titl

## Title: Ecology and Taxonomy of Northwest Atlantic/Arctic Marine Invertebrate Species

**Principal Investigator:** Jean-Marc Gagnon (http:// nature.ca/en/research-collections/researchprojects/ecology-taxonomy-northwest-atlanticmarine-species)

Abstract: This research project contains four collaborative activities that examine taxonomic, biogeographic and ecological questions for North Atlantic and Arctic species of crustaceans, mollusc and polychaete. The first activity looks at population differentiation and distribution for the Lady Crab (Ovalipes ocellatus) in the Northwest Atlantic; a collaboration with DFO- Moncton. The second activity was started in June 2012, with Barcode of Life and DFO (IML, Mont-Joli) researchers, comparing morphological traits and DNA information for scavenging amphipods of the northwest Atlantic and Canadian Arctic. The third activity (with a Ph.D. candidate from Florida) aims to describe a new Chaetopterus species (Polychaeta) from the St. Lawrence Estuary. The fourth activity (with DFO-Halifax and Florida researchers) is a continuation of the research on the newly described species of giant file clam, Acesta cryptadelphe. New data from the US continental slope of the Northwest Atlantic will result in the description of the distribution of the latter species.

#### 5.

## Title: Morphogenetic Characterizations of Large Carnivores and Implications for their Conservation in Canada

**Principal Investigator:** Kamal Khidas (http:// nature.ca/en/research-collections/researchprojects/morphogenetic-characteristics-largecarnivores-canada-implica)

Abstract: Morphogenetic characteristics and their variation are studied in the Canada Lynx, Grey Wolf, Polar Bear and Brown Bear to identify significant evolutionary units and, possibly, to validate taxa, previously described or to be revealed, by elucidating the mechanisms of adaptation and evolution (microevolution) of populations. Influential environmental factors and revelations that will be made about the impacts of spatial habitat patterns and environmental changes on the distribution of these units are an important part of these studies. It will finally be possible to refine strategies for the conservation of these species.

## 6.

### Title: Native freshwater mussels of Canada: taxonomy, distribution & decline

**Principal Investigator:** André L. Martel (http:// nature.ca/en/research-collections/researchprojects/freshwater-mussels-marine-musselscanada-studies-taxonomy-dis)

Abstract: This research focuses on a speciose yet declining group of bivalve molluscs within Canada, native freshwater mussels (Unionacea). (1) Species differentiation and taxonomy are studied by comparative morphology of siphonal apertures of adults, early shell morphology, as well as by mtDNA. (2) Distribution is assessed during field surveys in selected rivers and lakes. (3) Temporal changes in freshwater mussel communities are evaluated, with emphasis on species loss, by comparing results from recent field surveys with past surveys and historical collection records, as well as by evaluating the impact of the invasive zebra mussel and changes in fish communities (host fishes).

# COMMUNICATING RESEARCH RESULTS

## **Research and Collections Staff**

Museum staff published 59 refereed articles, which have other scientists review all articles submitted before they are accepted for publication - and 66 non-refereed publications. A complete list follows (names in boldface are Museum staff members). Publications are listed in the language in which they are written.

## **Refereed publications**

#### Journal articles and book chapters

Marshall, S.A. and **R.S. Anderson**. 2018. Superfamily Curculionoidea. *In* S.A. Marshall (ed.). Beetles. The Natural History and Diversity of Coleoptera. Firefly Books, Richmond Hill, Ontario, pp. 614-627.

Anderson, R.S, R.G. Oberprieler and G.P. Setliff. 2018. A review of the *Araucaria*-associated weevils of the tribe Orthorhinini (Coleoptera: Curculionidae: Molytinae), with description of new species of *llacuris* Pascoe, 1865 and Notopissodes Zimmerman & Oberprieler, 2014 and a new genus, *Kuschelorhinus* Anderson & Setliff. Diversity, 10(54):1-25. https://doi.org/10.3390/d10030054.

Anderson, R.S. 2018. *Anthonomus trica* Clark new for Colombia and representing the first fern association for the genus (Curculionidae, Curculioninae; Anthonomini). The Coleopterists Bulletin, 72(4):758-759. https://doi.org/10.1649/0010-065x-72.4.758.

Anderson, R.S. 2018. *Purealus beckelorum*, a new genus and species of cleonine weevil from western Texas and eastern New Mexico (Coleoptera: Curculionidae; Lixinae; Cleonini). Zookeys, 785:1-10.

Anderson, R.S. 2018. *Stockwellius fasciatus*, a new genus and new species of *Litosomina* (Coleoptera: Curculionidae: Dryophthorinae; Rhynchophorini) from Panama. The Coleopterists Bulletin, 72(2):301-304. https://doi.org/10.1649/0010-065x-72.2.301.

**Anderson, R.S.** 2018. Taxonomic revision of the genus *Phyxelis* Schoenherr 1843 (Coleoptera: Curculionidae; Entiminae; Tropiphorini). Insect Systematics and Diversity, 2(5):2, 1-11. https://doi.org/10.1093/isd/ixy011. Anderson, R.S. 2018. The genus *Sicoderus* Vanin 1986 in the West Indies (Coleoptera: Curculionidae; Curculioninae; Erodiscini). Zootaxa, 4497(3):301-345. https://doi.org/10.11646/zootaxa.4497.3.1.

Anderson, R.S. and M.C. Caterino. 2018. A revision of the genus *Eurhoptus* LeConte 1876 (Curculionidae: Cryptorhynchinae) of America north of Mexico. Zookeys, 787:37-80. https://doi.org/10.3897/ zookeys.787.26948.

Anderson, R.S., R. Caldara and S.S. Anzaldo. 2018. *Mecinus linnavuori* (Korotyaev), an Iraqi weevil species new to southwestern North America (Coleoptera: Curculionidae, Curculioninae, Mecinini). The Coleopterists Bulletin, 72:126-128. https://doi. org/10.1649/0010-065x-72.1.126.

Anderson, R.S., R.G. Oberprieler and G.P. Setliff. 2018. Validation of the names of five weevil taxa described by Anderson et al., a review of the *Araucaria*-associated weevils of the tribe Orthorhinini (Coleoptera: Curculionidae: Molytinae), with description of new species of *llacuris* Pascoe, 1865 and *Notopissodes* Zimmerman & Oberprieler, 2014 and a new genus, *Kuschelorhinus* Anderson & Setliff. Diversity, 10(83):1-3. https://doi.org/10.3390/ d10030083.

Smith, J.D., F.F. Dinassa, **R.S. Anderson**, F.S. Su and R. Srinivasan. 2018. Identification of major insect pests of *Amaranthus* spp. and germplasm screening for insect resistance in Tanzania. International Journal of Tropical Insect Science, 38:261-273. https://doi. org/10.1017/s1742758418000115.

Whitehead, D.R., M.L. Chamorro and **R.S. Anderson**. 2018. An illustrated key to the species of *Curculio* Linnaeus (Coleoptera: Curculionidae) of North America east of the Mississippi River. Proceedings of the Entomological Society of Washington, 120(3):616-641. https://doi.org/10.4289/0013-8797.120.3.616.

McKenna, D., Clarke, D., **Anderson, R.**, Astrin, J., Brown, S., Chamorro, L., Zhang, G. 2018. Morphological and molecular perspectives on the phylogeny, evolution, and classification of weevils (Coleoptera: Curculionoidea): Proceedings from the 2016 International Weevil Meeting. Diversity, 10(64):1-33. https://doi.org/10.3390/d10030064. **Conlan, K.E., E.A. Hendrycks** and A.E. Aitken. 2019. Dense ampeliscid bed on the Canadian Beaufort Shelf: an explanation for species patterns. Polar Biology, 42(1):195-215. https://doi.org/10.1007/ s00300-018-2417-z.

Panchen, Z.A., J. Doubt, H.M. Kharouba and M.O. Johnston. 2019. Patterns and biases in an Arctic herbarium specimen collection: implications for phenological research. Applications in Plant Sciences, 7(3): e01229. https://doi.org/10.1002/aps3.1229.

Domine, F., G. Gauthier, V. Vionnet, **D. Fauteux**, M. Dumont and M. Barrère. 2018. Snow physical properties may be a significant determinant of lemming population dynamics in the high Arctic. Arctic Science, 4(4):813-826. https://doi.org/10.1139/ as-2018-0008.

Fauteux, D., G. Gauthier, D. Berteaux, R. Palme and R. Boonstra. 2018. High Arctic lemmings remain reproductively active under predator-induced elevated stress. Oecologia, 187(3):657-666. https://doi. org/10.1007/s00442-018-4140-4.

**Fraser, D.**, R.J. Haupt and W.A. Barr. 2018. Phylogenetic signal in tooth wear dietary niche proxies. Ecology and Evolution, 8:5355-5368. https://doi.org/10.1002/ece3.4052.

**Fraser, D.**, R.J. Haupt and W.A. Barr. 2018. Phylogenetic signal in tooth wear dietary niche proxies: what it means for those in the field. Ecology and Evolution, 8:11363-11367. https://doi.org/10.1002/ece3.4540.

Pearson, J.M.N., J.A. Kidd, K.M. Knysh, M.R. Van den Heuvel, **J.-M. Gagnon** and S.C. Courtenay. 2019. Identification of native and non-native grass shrimps *Palaemon* spp. (Decapoda: Palaemonidae) by citizen science monitoring programs in Atlantic Canada. Journal of Crustacean Biology, 39(2):189-192. https:// doi.org/10.1093/jcbiol/ruy116.

Darling, J. and **F. Génier**. 2018. Revision of the taxonomy and distribution of the Neotropical *Copris incertus* species complex (Coleoptera: Scarabaeidae: Scarabaeinae). The Canadian Entomologist, 150(5):539-577.

**Génier, F.** and M. Cupello. 2018. *Canthidium alvarezi* Martínez and Halffter, 1986: a remarkable *Ateuchus* Weber, 1801 (Coleoptera: Scarabaeidae: Scarabaeinae). Insecta Mundi, 646:1-4.

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Cardinal-McTeague, W.M., K.J. Wurdack, E.M. Sigel and **L.J. Gillespie**. 2019. Seed size evolution and biogeography of *Plukenetia* (Euphorbiaceae), a pantropical genus with traditionally cultivated oilseed species. BMC Evolutionary Biology, 19:29. https://doi. org/10.1186/s12862-018-1308-9.

Gillespie, L.J., R.J. Soreng, E. Cabi and N. Amiri. 2018. Phylogeny and taxonomic synopsis of *Poa* subgenus *Pseudopoa* (including *Eremopoa* and *Lindbergella*) (Poaceae, Poeae, Poinae). Phytokeys, 111:69-102. https:// doi.org/10.3897/phytokeys.111.28081.

Soreng, R.J. and **L.J. Gillespie**. 2018. *Poa secunda* J. Presl (Poaceae): a modern summary of infraspecific taxonomy, chromosome numbers, related species and infrageneric placement based on DNA. Phytokeys, 110:101-121. https://doi.org/10.3897/phytokeys.110.27750.

Hutchinson, S.J., **P.B. Hamilton**, R.T. Paterson, J.M. Galloway, A. Nasser, C. Spence and H. Falck 2019. Diatom ecological response to deposition of the 833–850 CE White River ash (east lobe) ashfall in a small subarctic Canadian Lake. PeerJ, 7:e6269. https:// doi.org/10.7717/peerj.6269.

Long, S-X., **P.B. Hamilton**, Y. Yang, C. Chen and R. Tao 2018. Differential bioaccumulation of mercury by zooplankton taxa in a mercury-contaminated reservoir, Guizhou China. Environmental Pollution, 239:147-160.

Tiam, A.K., I. Lavoie, C. Doose, **P.B. Hamilton** and C. Fortin 2018. Morphological, physiological and molecular responses of *Nitzschia palea* under cadmium stress. Ecotoxicology, 27:675–688. https://doi. org/10.1007/s10646-018-1945-1.

Vidakovic, D., Z. Levkov and **P.B. Hamilton.** 2019. *Neidiopsis borealis* sp. nov., a new diatom species from the mountain Shar Planina. Phytotaxa, 402(1):21-18. https://doi.org/10.11646/phytotaxa.402.1.3.

Wishkerman, A. and **P.B. Hamilton**. 2018. Shape outline extraction software (DiaOutline) for Elliptical Fourier analysis application in morphometric studies. Applications in Plant Sciences, 6(12):e1204. https://doi. org/10.1002/aps3.1204.

Zhu, Y., **P.B. Hamilton**, X. Wang and L. Liang. 2018. Water footprint assessment considering intermediate products: Model and a 2016 case study of China. Water and Environment Journal, 33(2):230-240. https:doi. org/10.1111/wej.12394. Zhu, Y., **P.B. Hamilton,** X. Wang, Z. Zhang and L. Liang. 2018. Game theory analysis of the virtual water strategy. Water Resources Management, 32(14): 4747-4761. https://doi.org/10.1007/s11269-018-2081-7.

Mallon, J.C. and D.B. Brinkman. 2018. *Basilemys morrinensis*, a new species of nanhsiungchelyid turtle from the Horseshoe Canyon Formation (Upper Cretaceous) of Alberta, Canada. Journal of Vertebrate Paleontology, 38:e1431922. https://doi.org/10.1080/027 24634.2018.1431922.

Mallon, J.C., D.M. Henderson, C.M. McDonough and W.J. Loughry. 2018. A "bloat-and-float" taphonomic model best explains the upside-down preservation of ankylosaurs. Palaeogeography, Palaeoclimatology, Palaeoecology, 497:117-127. https://doi.org/10.1016/j. palaeo.2018.02.010.

Stewart, R.F. and **J.C. Mallon**. 2018. Allometric growth in the skull of *Tylosaurus proriger* (Squamata: Mosasauridae) and its taxonomic implications. Vertebrate Anatomy Morphology Palaeontology, 6:75-90. https://doi.org/10.18435/ vamp29339.

Bourgeois-Roy, A., H. Crites, P. Bernatchez, D. Lacelle and **A.L. Martel**. 2018. Abrupt mortality of marine invertebrates at the Younger Dryas – Holocene transition in a shallow inlet of the Goldthwait Sea. The Holocene, 28(12):1894-1908. https://doi. org/10.1177/0959683618798130.

Martel, A.L. and J.B. Madill. 2018. Twenty-six years (1990-2015) of monitoring annual recruitment of the invasive zebra mussel (*Dreissena polymorpha*) in the Rideau River, a small river system in Eastern Ontario. Canadian Journal of Zoology, 96:1071-1079. https://doi. org/10.1139/cjz-2017-0360.

Maloles, J.R., **R.T. McMullin**, J.A. Consiglio, C.J. Chapman and L. Riederer. 2018. Lichens and allied fungi of the Credit River Watershed, Ontario, Canada. Rhodora, 120: 229–253. https://doi.org/10.3119/17-27.

Boluda, C.G., V.J. Rico, P.K. Divakar, O. Nadyeina, L. Myllys, **R.T. McMullin**, J.C. Zamora, C. Scheidegger and D.L. Hawksworth. 2019. Evaluating methodologies for species delimitation: the mismatch between phenotypes and genotypes in lichenized fungi *(Bryoria* sect. *Implexae*, Parmeliaceae). Persoonia, 42:75– 100. https://doi.org/10.3767/persoonia.2019.42.04.



McMullin, R.T. and L. Sharp. 2018. Lichens of Canada exsiccati, fascicle I, nos. 1-25. Opuscula Philolichenum, 17:335-341. http://sweetgum.nybg.org/science/op/ biblio\_list.php?BucVolume\_tab=17.

McMullin, R.T. and Y.F. Wiersma. 2019. Out with OLD-growth, in with ecological continNEWity: new perspectives on forest conservation. Frontiers in Ecology and the Environment, 17:176-181. https://doi. org/10.1002/fee.2016.

McMullin, R.T., J. Maloles, S. Selva and S.G. Newmaster. 2018. A synopsis of the genus *Chaenotheca* in North America, including a new species from southern Ontario, *C. selvae*. Botany, 96:547–553. https://doi. org/10.1139/cjb-2018-0042.

McMullin, R.T., R. Cameron, R.T. Caners, J. Doubt and D.L. Haughland. 2018. A preliminary list of the bryophytes and lichens of the Old Annapolis Road Nature Reserve in Nova Scotia, Canada. Evansia 35:81-94. https://doi.org/10.1639/0747-9859-35.3.081.

Pearson, K., R.P. Cameron and **R.T. McMullin**. 2018. Habitat associations and distribution model for *Fuscopannaria leucosticta* in Nova Scotia, Canada. The Lichenologist, 50:487–497. https://doi.org/10.1017/ S0024282918000300.

Rapai, S.B., **R.T. McMullin**, J.R. Maloles, M-H Turgeon and S.G. Newmaster. 2018. An ecological restoration approach to biological inventories: A case study in the collection of a vegetation biolayer that will inform restoration planning. Ecological Restoration, 36(2): 116-126. doi: 10.3368/er.36.2.116.

Rapai, S.B., **R.T. McMullin**, S.G. Newmaster and R. Hanner. 2018. Restoring *Cladonia* subgenus *Cladina* in a post mine environment. Forestry Chronicle, 94:283-291. https://doi.org/10.5558/tfc2018-041. Tripp, E.A., R. Agabani and **R.T. McMullin**. 2018. New and noteworthy reports on Colorado lichens and lichen allies, 1: *Phaeocalicium polyporaeum*. Opuscula Philolichenum, 17:362–367. http://sweetgum.nybg.org/ science/op/biblio\_list.php?BucVolume\_tab=17.

Piilonen, P.C., L. Sutherland, M. Danišík, G. Poirier, J.A. Valley and R. Rowe. 2018. Zircon xenocrysts from Cenozoic alkaline basalts of the Ratanakiri Volcanic Province (Cambodia), Southeast Asia – trace element geochemistry, O-Hf isotopic composition, U-Pb and (U-Th)/He geochronology – revelations into the underlying lithospheric mantle. Minerals, 8:556-589. https://doi.org/10.3390/min8120556.

Cooper, M.A., G. Raade, N.A. Ball, Y.A. Abdu, F.C. Hawthorne, **R. Rowe**. 2018. Folvikite, Sb5+Mn3+(Mg,Mn2+)1008(B03)4, a new oxyborate mineral from the Kitteln mine, Nordmark ore district, Värmland, Sweden: description and crystal structure. Mineralogical Magazine, 82(4):821-836.

Givnish, T.J., A. Zuluaga, D. Spalink, M. Soto Gomez, V.K.Y. Lam, **J.M. Saarela**, C. Sass, W.J.D. Iles, D.J.L. de Sousa, J. Leebens-Mack, J. Chris Pires, W.B. Zomlefer, M.A. Gandolfo, J.I. Davis, D.W. Stevenson, C. dePamphilis, C.D. Specht, S.W. Graham, C.F. Barrett and C. Ane. 2018. Monocot plastid phylogenomics, timeline, net rates of species diversification, the power of multi-gene analyses, and a functional model for the origin of monocots. American Journal of Botany, 105:1888-1910. https://doi. org/10.1002/ajb2.1178.

Savoie, A.M. and G.W. Saunders. 2019. A molecular assessment of species diversity and generic boundaries in the red algal tribes Polysiphonieae and Streblocladieae (Rhodomelaceae, Rhodophyta) in Canada. European Journal of Phycology, 54:1-25. https://doi.org//10.1080/09670262.2018.1483531. Wu, X.-C., C. Li and Y.-Y. Wang. 2018. Taxonomic reassessment and phylogenetic test of *Asiatosuchus nanlingensis* Young, 1964 and *Eoalligator chunyii* Young, 1964. Vertebrata PalAsiatica, 56(2):137-146. https://doi.org/10.19615/j.cnki.1000-3118.170803.

Li, C., **Wu, X.-C.** and **Rufolo, S.J.** 2019. A new crocodyloid (Eusuchia: Crocodylia) from the Upper Cretaceous of China. Cretaceous Research, 94:25-39. https://doi.org/10.1016/j.cretres.2018.09.015.

Li, C., N.C. Fraser, O. Rieppel and **X.-C. Wu**. 2018. A Triassic stem turtle with an edentulous beak. Nature, 560:476-479. https://doi.org/10.1038/ s41586-018-0419-1.

Wang, W., C. Li and **X.-C. Wu.** 2019. An adult specimen of *Sinocyamodus xinpuensis* (Sauropterygia: Placodontia) from Guanling, Guizhou, China. Zoological Journal of the Linnean Society, 185:910–924. https://doi.org/10.1093/zoolinnean/zly080.

#### Report

Paquet, A., N. Desrosiers and **A.L. Martel**. 2018. Rapport sur la situation de l'anodonte du gaspareau (*Anodonta implicata*) au Québec. Ministère des Forêts, de la Faune et des Parcs, Direction générale de la gestion de la faune et des habitats, 54 p. ISBN : 978-2-550-61895-9 (version imprimée). ISBN: 978-2-550-61896-6 (version PDF).

### Other

Lendemer, J.C, J.A. Allen, **R.T. McMullin** and E.A. Tripp. 2018. *Rinodina chrysomelaena*. The IUCN Red List of Threatened Species 2018: e.T80703073A80703076.

Lendemer, J.C., J.A. Allen and **R.T. McMullin**. 2018. *Loxospora assateaguensis*. The IUCN Red List of Threatened Species 2018: e.T80702946A80702949.

## Non-refereed publications

#### Scientific Presentations (Abstracts)

Dittmann, S., O.L. Gordillo, R. Baring and **K. Conlan**. 2018. [Abstract]. Depth related changes of benthic assemblages from canyons to intertidal coasts. Australian Marine Sciences Association 55th Annual Conference, Adelaide, Australia, 1-5 July.

Doubt, J.C., L.C. Gualtieri, C.M. Robillard, L.A. Sharp, P.C. Sokoloff and J.M. Saarela. 2018. [Abstract]. Liberating Arctic botanical biodiversity data at the Canadian Museum of Nature. ArcticNet Annual Scientific Meeting, Ottawa, Ontario, 10-14 December.

Doubt, J.C., L.C. Gualtieri, C.M. Robillard, L.A. Sharp, P.C. Sokoloff and J.M. Saarela. 2018. [Abstract]. Liberating Arctic botanical biodiversity data at the Canadian Museum of Nature. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June.

Fauteux, D. 2019. [Abstract]. La recherche scientifique au Musée Canadian de la Nature. Réunion des équipes scientifiques de l'Île Bylot, Rimouski, Québec, Canada, 31 janvier-2 février.

Fauteux, D., E. Schmidt, J.-F. Therrien, Y. Seyer and G. Gauthier. 2018. [Abstract]. Improving terrestrial predators' diet assessments with rodent mandibles. ArcticNet Annual Scientific Meeting, Ottawa, Canada, 10-14 December.

Fauteux, D., N.G. Yoccoz, A. Stien, R. Ims and E. Fuglei. 2019. [Abstract]. Invasion au Svalbard: dynamique de population d'un campagnol sans compétiteur direct, ni prédateur spécialiste. Conférence du Centre d'Études Nordiques, Québec, Canada, 7-8 février.

**Fauteux, D.**, G. Gauthier and D. Berteaux. 2018. [Abstract]. La boîte à lunch de l'Arctique: effets de la prédation sur les lemmings. Séminaire départemental, Université de Sherbrooke, Sherbrooke, Canada, 10 mai.

**Fraser, D.**, A. Simpson and L.C. Soul. 2018. [Abstract]. Unbounded diversity dynamics in Cenozoic carnivorous mammals. Geological Society of America Annual Meeting (Evolution of Terrestrial Ecosystems symposium), Indianapolis, Indiana, USA, 4-7 November. **Fraser, D.**, A. Villaseñor, M. Balk, J.T. Eronen, A.B. Tóth, ETE Working Group, A. K. Behrensmeyer and S.K. Lyons. 2018. [Abstract]. Profound late Quaternary biotic homogenization of North American Mammal Faunas. Society of Vertebrate Paleontology 78th Annual Meeting (Symposium on Big Data and Big Questions in Paleontology), Albuquerque, New Mexico, USA, 17-20 October.

**Fraser, D.**, B.E. Christison, **M. Currie** and **M. Gilbert**. 2018. [Abstract]. First record of Mioceneaged mammals from Grasslands National Park, Saskatchewan. Canadian Society of Vertebrate Paleontology 6th annual conference, Canadian Museum of Nature, Ottawa, Ontario, 14-16 May.

Christison, B. E., F. Gaidies, S. Pineda-Munoz, A. Evans and **D. Fraser**. 2018. [Abstract]. Comparison of creodont and carnivoran dental morphology from the Calf Creek Local Fauna (late Eocene) of Saskatchewan. Society of Vertebrate Paleontology 78th annual meeting, Albuquerque, New Mexico, USA, 17-20 October.

**Graham, M.** and **J.M. Saarela.** 2018. [Abstract]. Canada C3: A natural history museum's role on a ship-based mission around Canada. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June.

Ageli, M., D. Haffner, **P.B. Hamilton**, J. Russell and H. Vogel. 2018. [Abstract]. Ecosystem switches over millennia: diatom assemblages in Lake Towuti paleocores. Sial 8th Speciation in Ancient Lakes, Entebbe, Uganda, 29 July-3 August 2018.

Cvetkoska, C., Z. Levkov and **P.B. Hamilton**. 2018. [Abstract]. Observation and distribution of the diatom genus *Surirella* Turpin in ancient lakes Ohrid and Prespa. 13th Croatian Biological Congress, Poreč, Croatia, 19-23 September.

Jovanovska, E., B. Stelbrink, **P.B. Hamilton**, J. Stone, C. Cocquyt, F. Schrenk and C. Albrech. 2018. [Abstract]. Diversification of the diatom genus *Afrocymbella* in the East African rift lakes. Sial 8th Speciation in Ancient Lakes, Entebbe, Uganda, 29 July-3 August.

Levkov, Z., **P.B. Hamilton**, S. Tofilovska and L. Melovski. 2018. [Abstract]. High species diversity of *Neidium* Pfitzer in an alpine intermittent pond on Mt. Shar Planina, Republic of Macedonia. 25th International Diatom Symposium, Berlin, Germany, 25-30 June. Wishkerman, A. and **P.B. Hamilto**n. 2018. [Abstract]. DiaCurv: curvature analysis in diatom research. 25th International Diatom Symposium Berlin, Berlin, Germany, 25-30 June.

Simo-Matchim, A.-G., P.B. Hamilton and M. Poulin. 2018. [Abstract]. Reassessment of the biodiversity of unicellular eukaryotes in the Arctic. ArcticNet 2018 Annual Scientific Meeting, Ottawa, 10-14 December.

Frutos, I., A.M. Jażdżewska and **E. Hendrycks**. 2018. [Abstract]. Discovering biodiversity with genetics and morphology: a new deep-sea amphipod family. 9th International Crustacean Congress, Washington DC, USA, 22-25 May.

Jażdżewska, A.M., L. Corbari, A. Driskell, I. Frutos, C. Havermans, **E. Hendrycks,** L. Hughes, A.-N. Lörz, B. Stransky, A.H.S Tandberg, W. Vader and S. Brix. 2018. [Abstract]. A genetic fingerprint of Amphipoda from Icelandic waters—the baseline for further biodiversity and biogeography studies. 15th Deep-Sea Biology Symposium, Monterey, CA, USA, 9-14 September.

Khidas, K. and S. Tessier. 2018. [Abstract]. Building next-generation collections: natural history specimens, just one click away! Joint meeting of the Society for the Preservation of Natural History Collections (SPNHC) and Biodiversity Information Standards (TDWG), Dunedin, New Zealand, 25 August-1 September. Biodiversity Information Science and Standards, 2:e26145. https://doi.org/10.3897/ biss.2.26145.

Leckie, C., L. Cipera and E. Range. 2018. [Abstract]. How to label everything – a review of current best practices in natural history labelling. American Institute for Conservation of Historic & Artistic Works 46th Annual Meeting, Houston, Texas, USA, 29 May – 3 June.

**Lussier, A.J.** and F.C. Hawthorne. 2018. [Abstract]. Graphical and geometrical stereoisomerism in edgesharing chains of octahedra in minerals: a structure hierarchy approach. Meeting of the International Mineralogical Association, Melbourne, Australia, 13-17 August.

Mallon, J.C. and D.B. Brinkman. 2018. [Abstract]. A new species of nanhsiungchelyid turtle from the Horseshoe Canyon Formation (Upper Cretaceous) of Alberta, Canada. 6th Annual Meeting of the Canadian Society of Vertebrate Palaeontology, Canadian Museum of Nature, Ottawa, 14-16 May. Mallon, J.C., J.R. Bura and D. Schumann. 2018. [Abstract]. A problematic tyrannosaurid (Dinosauria, Theropoda) skeleton and its implications for tyrannosaurid diversity in the Horseshoe Canyon Formation (Upper Cretaceous) of Alberta. Society of Vertebrate Paleontology 78th Annual Meeting, Albuquerque, New Mexico, USA, 17-20 October.

Lendemer, J., J.L. Allen and **R.T. McMullin.** 2018. [Abstract]. A standard protocol for selecting rare or threatened lichens for IUCN red listing: Results from trial implementation in North America. The 11th International Mycological Congress, San Juan, Puerto Rico, 16-21 July.

Wiersma, Y.F. and **R.T. McMullin**. 2018. [Abstract]. Seeing the trees for the forest: Microlandscapes of arboreal lichens. International Association for Landscape Ecology, Chicago, Illinois, USA, 8-12 April.

Wiersma, Y.F., D. Sleep and **R.T. McMullin**. 2018. [Abstract]. Strategies for conservation of species at risk across spatial scales. North American Congress for Conservation Biology, Toronto, Ontario, 21-26 July.

Wigle, R., Y.F. Wiersma, **R.T. McMullin** and A. Arsenault. 2018. [Abstract]. Drivers of arboreal lichen community structure on the Avalon Peninsula. The Canadian Society for Ecology and Evolution Annual Meeting, Guelph, Ontario, 18-21 July.

Rand, G. and K. Khidas. 2018. [Abstract]. Canadian Museum of Nature life list: a checklist of the avian collection. 27th International Ornithological Congress, Vancouver, British Columbia, 19-26 August.

Saarela, J.M. 2018. [Abstract]. Arctic Evidence Eight: An alliance of global Arctic natural history museums. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June.

Saarela, J.M. 2018. [Abstract]. The Centre for Arctic Knowledge & Exploration at the Canadian Museum of Nature. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June.

Saarela, J.M., L.J. Gillespie, R.T. McMullin, P.C. Sokoloff and R.D. Bull. 2018. [Abstract]. Biodiversity of Canadian Arctic plants and lichens: Field work and floristics. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June. Saarela, J.M., L.J. Gillespie, R.T. McMullin, P.C. Sokoloff and R.D. Bull. 2018. [Abstract]. Biodiversity of Canadian Arctic vascular plants and lichens: field work, floristics and museum collections. Arctic Biodiversity Congress 2018, Rovaniemi, Finland, 9-12 October.

Duvall, M.R., **J.M. Saarela**, S.V. Burke, W.P. Wysocki, M.D. Barrett, L.G. Clark, J.M. Craine, P.M. Peterson, R.J. Soreng and M.S. Vorontsova. 2018. [Abstract]. A 250 plastome phylogeny of the grass family (Poaceae). Monocots VI - 6th International Conference on Comparative Biology of Monocotyledons and 7th International Symposium on Grass Systematics and Evolution Natal, Brazil, 7-12 October.

Givnish, T.J., A. Zuloaga, D. Spalink, M. Soto Gomez,
V.K.Y. Lam, J.M. Saarela, C. Sass, W.J.D. Iles, D.J. Lima
deSousa, J. Leebens-Mack, J.C. Pires, W.B. Zomlefer,
M.A. Gandolfo, J.I. Davis, D.W. Stevenson,
C. DePamphilis, C. Specht, S.W. Graham, C. Barrett
and C. Ane. 2018. [Abstract]. Monocot plastid
phylogenomics, timeline, and the power of multi-gene
analyses. Botany 2018, Rochester, Minnesota, USA,
21-25 July.

Peterson, P.M., R.J. Soreng, K. Romaschenko,
P. Barberá, C.A. Pérez and J.M. Saarela. 2018.
[Abstract]. A phylogeny of Poeae chloroplast group 1 including genera in the Agrostidinae, Anthoxanthinae, Aveninae, Brizinae, Calothecinae, Echinopogoninae,
Phalaridinae, and Torreyochloinae (Poaceae:
Pooideae). Monocots VI – 6th International Conference on Comparative Biology of Monocotyledons and 7th International Symposium on Grass Systematics and Evolution, Natal, Brazil, 7–12 October.

Sokoloff, P.C., A. Srivastava, R.T. McMullin, Y. Murakami, A. Stepanova, J. Clarke, P. Knightly, A. Mangeot, C.-M. LaRoche, A. Beattie, R. Zubrin and S. Rupert. 2018. [Abstract]. Lichen biodiversity and ecology at two Mars Analog Sites: the Flashline Mars Arctic Research Station (Nunavut, Canada) and the Mars Desert Research Station (Utah, USA) [poster]. Arctic Biodiversity Congress, Rovaniemi, Finland, 9-12 October.

Sokoloff, P.C., J. Doubt, J.M. Saarela, L.J. Gillespie, R.T. McMullin, R.D. Bull, L.A. Sharp, C.M. Robillard, L.C. Gualtieri, C. Deduke and P. Hamilton. 2018. [Abstract]. Beyond the gallery: Full spectrum Arctic botany outreach at the Canadian Museum of Nature. ArcticNet Annual Scientific Meeting, Ottawa, Canada, 10-14 December.

#### Sokoloff, P.C., J.M. Saarela, L.J. Gillespie,

**R.T. McMullin, R.D. Bull, J. Doubt**, J. Steele, C. Iburg, E. McCrea, **L. MacIvor, C. Lanthier** and **K. Day**. 2018. [Abstract]. From galleries to gruits, blogs to botanical gardens: the many facets of public engagement on Arctic biodiversity research at the Canadian Museum of Nature. Arctic Biodiversity Congress, Rovaniemi, Finland, 9-12 October.

## Sokoloff, P.C., M. Graham, R.T. McMullin, N. Alfonso, R. Bull, J. Doubt, M. Edwards, C. Fox, P. Hamilton,

E. Hendrycks, L. Kresky, J. LaRoche,
R. Moore, P. Piilonen, V. Sahanatien, M.Y. Tsang,
P. Van Buren, M. Wong and J.M. Saarela. 2018.
[Abstract]. A 23 000 km transect: new Arctic plant and lichen collections from the Canada C3 expedition.
Arctic Biodiversity Congress 2018, Rovaniemi, Finland, 9-12 October.

Sokoloff, P.C., M. Graham, R.T. McMullin, N. Alfonso,
R. Bull, J. Doubt, M. Edwards, C. Fox, P. Hamilton,
E. Hendrycks, L. Kresky, J. LaRoche,
R. Moore, P. Piilonen, V. Sahanatien, M.Y. Tsang,
P. Van Buren, M. Wong and J.M. Saarela. 2018.
[Abstract]. A 23 000 km transect: new Arctic plant and lichen collections from the Canada C3 expedition.
ArcticNet Annual Scientific Meeting, Ottawa, Canada,

**Tessier, S.** and **K. Khidas**. 2018. [Abstract]. The Herpetology and Ichthyology Collections of the Canadian Museum of Nature: an overview of two unique and rich repositories. Joint Meeting of Ichthyologists and Herpetologists, Rochester, New York, 11-15 July.

Majewska, R., S. Tessier, L. Scheinberg, N. Robinson,
E. Lazo-Wasem, L. Rojas, T. Pinou, K. Zyskowski,
B. Van de Vijver, P. Hamilton and M. Poulin. 2018.
[Abstract]. A forgotten treasure: how zoological museum collections can contribute to epizoic diatom research. 25th International Diatom Symposium, Berlin, Germany, 25-30 June.

#### Reports

Alfonso, N., B.W. Coad, C.D. Sawatzky and J.D. Reist. 2018. Distributional records for Marine Fishes of Arctic Canada. Canadian Data Report of Fisheries and Aquatic Sciences, 1287:xxii +295 p. https://wavesvagues.dfo-mpo.gc.ca/Library/40724888.pdf.

McMullin, R.T. 2018. Wildlife Species Rationale for Priority Assessment: *Lichinodium sirosiphoideum* (Iron Filings Lichen). Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. 8 pp.

McMullin, R.T., F. Anderson, H. Clapp, J. Edwards, J. Gallop, T. Neily, C. Pepper, M. Smith, B. Toms and N. van Miltenberg. 2019. Results from a rare lichen survey at Kejimkujik Seaside National Park in Nova Scotia, Canada. Report prepared for Parks Canada, Maitland Bridge, Nova Scotia. 23 pp.

Saarela, J.M., R.T. McMullin and P.C. Sokoloff. 2019. Botanical survey of Qaummaarviit and Sylvia Grinnell Territorial Parks, Baffin Island, Nunavut. Preliminary report prepared for Nunavut Parks. Iqaluit, Nunavut. 10 pp.

#### **Magazine Articles**

Mallon, J.C. 2018. HELICERATOPS! Helicopter lift of a horned dinosaur skull in Alberta. Prehistoric Times, 127:60-61.

Sokoloff, P.C. 2018. Understanding grass species in the Arctic. Above & Beyond Canada's Arctic Journal. November/December 2018: 45-47. http://arcticjournal.ca/health-science/science/ understanding-grass-species-in-the-arctic/.

#### **Blog Posts**

**Brooksbank, S.** 2018. Museum's millions-strong Arctic marine invertebrates collection gets digitized. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2018/05/30/arctic-marine-invertebratescollection-gets-digitized/, 30 May.

**Conlan, K.E.** 2018. Cruising the globe undetected. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress.com/2018/11/28/ cruising-the-globe/, 11 November.

**Conlan, K.E.** 2018. *In* Jassa mating: A thumb matters. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2019/03/06/jassa-mating/, 6 March.

10-14 December.



Fauteux, D. 2018. Vivre au bord du précipice: les campagnols au Svalbard. Canadian Museum of Nature Blog. https://museecanadiendelanature.wordpress. com/2018/07/25/les-campagnols-au-svalbard/, 25 juillet.

Fraser, D. 2018. Biting into the past. Canadian Museum of Nature Blog. https://canadianmuseumofnature. wordpress.com/2018/05/02/biting-into-the-past/, 2 May.

Gilbert, M. 2018. Women in Science: What's Your Impression? Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2018/08/08/women-in-science/, 8 August.

Lussier, A. 2018. Solving the mystery of a metal-oxide coating threatening to cover Mi'kmaq Petroglyphs in Nova Scotia. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress.com/2018/10/17/ solving-the-mystery-of-a-metal-oxide-coating-threatening-to-cover-mikmaq-petroglyphs-in-nova-scotia/, 17 October.

Mallon, J.C. 2018. Fossil solved great dinosaur cheek debate. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress.com/2018/10/03/ fossil-solved-great-dinosaur-cheek-debate/, 3 October.

McDonald, A. 2018. Is the world's largest Triceratops skull sitting in our collection? Canadian Museum of Nature Blog. https://canadianmuseumofnature. wordpress.com/2018/05/16/is-the-worlds-largesttriceratops-skull-sitting-in-our-collection/, 16 May. McDonald, A. 2018. Triceratops skull delivers a Wow! of a Christmas gift. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2018/12/, 12 December.

McMullin, R.T. 2018. One hundred lichens new to Quebec, Canada, and North America from the Gaspé Peninsula. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2018/10/31/100-lichens, 31 October.

McMullin, R.T. 2018. Undiscovered backyard biodiversity: New lichen species discovered in Guelph, Canada. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2018/09/26/undiscovered-backyardbiodiversity/, 26 September.

Robillard, C.M. 2018. Art and Science: A Natural Mix. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress.com/2018/04/18/ art-and-science-a-natural-mix/, 18 April.

Rufolo, S.J. 2018. The new Arctic Gallery: Reconciliation, humans and natural history. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress. com/2018/04/04/the-new-arctic-galleryreconciliation-humans-and-natural-history/, 4 April.

**Rufolo, S.J.** 2019. Zeroing in on Inuit origins through archaeology and ethnography. Canadian Museum of Nature Blog. https://canadianmuseumofnature. wordpress.com/2019/01/23/inuit-origins/, 23 January. 51

Saarela, J.M. 2018. Botanist reveals his favorite grass. Canadian Museum of Nature Blog. https:// canadianmuseumofnature.wordpress.com/2018/07/11/ botanist-reveals-his-favourite-grass/, 11 July.

#### Other

Sawatzky, C. D., **N. Alfonso**, **B.W. Coad** and **J. Reist**. 2019. Database of the distributions of Marine Fishes of Arctic Canada. Fisheries and Oceans Canada, https://open.canada.ca/data/en/dataset/ de50ac30-ab0d-4bf2-b9af-362977edde3a.

Thorn, G., A. Voitk and **C. Deduke.** 2018 [2019]. Faculty Foray at Cape St. Mary's: More Birds than Mushrooms. Omphalina, XI(9):28-29.

Treau de Coli, L, **J.-M. Gagnon** and P. Archambault. 2018. [Abstract]. Geometric morphometrics analysis: a complement to the revision of whelk taxonomy in the Arctic. 4th World Conference on Marine Biodiversity (WCMB), Montréal, Canada, 13-16 May. https://peerj. com/preprints/26730.pdf.

**McMullin, R.T.** 2018. President's Message. Field Botanists of Ontario Newsletter, 30(3):2.

Saarela, J. 2018. Publications Committee. *In* D. Lepage (ed.). Minutes of the 139th Annual Business Meeting of the Ottawa Field-Naturalists' Club March 21, 2016; and Annual Reports of OFNC for October 2016-September 2017. Canadian Field-Naturalist 132(1): 87-94. pp. 91-93.

## **Research/Museum Associates**

## **Refereed publications**

#### Journal articles, books and book chapters

Savage, J., A. Borkent, F. Brodo, J.M. Cumming,
G. Curler, D.C. Currie, J.R. deWaard, J.F. Gibson,
M. Hauser, L. Laplante, O. Lonsdale, S.A. Marshall,
J.E. O'Hara, B.J. Sinclair and J.H. Skevington. 2019.
Diptera of Canada. ZooKeys, 819:397-450. https://doi. org/10.3897/zookeys.819.27625.

Lendemer, J.C. and **I.M. Brodo**. 2018. Studies in lichens and lichenicolous fungi – No. 21: Notes on *Lambiella caeca* and *L. fuscosora*. Opuscula Philolichenum, 17:269-274. http://sweetgum.nybg.org/science/op/ biblio\_list.php?BucVolume\_tab=17.

**Brunton, D.F.** and A. Troia. 2018. Global review of recent taxonomic research into *Isoetes* (Isoetaceae), with implications for biogeography and conservation. Fern Gazette (UK), 20(8):309-333.

**Brunton, D.F.**, J.R. Campbell and A.A. Reznicek. 2018. *Eleocharis elegans* (Cyperaceae) new to Florida and a possible native addition to the flora of the United States. Journal of the Botanical Research Institute of Texas, 12(1):249-255.

Brunton, D.F. and P.C. Sokoloff. 2018. Isoetes ×robusta, comb. nov., the appropriate name for *I. echinospora* × septentrionalis (Isoetaceae). Rhodora, 120:300-309. https://doi.org/10.3119/18-01.

**Coad, B.W.** 2018. Review of the bitterlings of Iran (Family Acheilognathidae). Iranian Journal of Ichthyology, 5(4):257-267.

**Coad, B.W.** 2018. Review of the danionids of Iran (Family Danionidae). International Journal of Aquatic Biology, 6(4):179-188.

**Coad, B.W.** 2018. Freshwater Fishes of Iraq. Alghadeer Co. Ltd., Basra, Iraq (Marine Science Centre, Basra University and Ministry of Environment, Iraq). 248 pp., 166 figures, 3 tables, 16 colour plates (55 photos). In Arabic, translated by N.A. Salman.

Zareian, H., H.R. Esmaeili, A. Gholamhosseini, N. Alwan and **B.W. Coad.** 2018. Comments on the Mond Scraper, *Capoeta mandica* (Teleostei: Cyprinidae): Re-description, molecular systematics and distribution modeling. Journal of Ichthyology, 58(3):283-295. https://doi.org/10.1134/s0032945218030153. Cumbaa, S.L., R. Day, M. Gingras, J.W. Haggart, R.B. Holmes, A.M. Murray, C. Schroder-Adams. 2018. Lac des Bois, a locality in the northern Western Interior Seaway (Canada) with Tethyan faunal connections during the Cenomanian/Turonian Thermal Maximum. Cretaceous Research, 91:412-428. https://doi. org/10.1016/j.cretres.2018.07.012.

Pardo, J.D., **R. Holmes** and J.A. Anderson. 2018. An enigmatic braincase from Five Points, Ohio (Westphalian D) further supports a stem tetrapod position for aïstopods. Earth and Environmental Science Transactions of the Royal Society of Edinburgh, 108:1-10. https://doi.org/10.1017/ s1755691018000567.

Levin, G.A., G. J. Wilder and J. M. McCollom. 2018. Phyllanthus debilis J. G. Klein ex Willd. (Phyllanthaceae) newly reported for North America. Journal of the Botanical Research Institute of Texas, 12:245-248.

Montero Muñoz, I., J. M. Cardiel and **G.A. Levin**. 2018. A new species of *Acalypha* subgenus *Linostachys* (Euphorbiaceae, Acalyphoideae) from Madagascar. South African Journal of Botany, 119:420-423. https:// doi.org/10.1016/j.sajb.2018.09.037.

Montero Muñoz, I., J. M. Cardiel and **G.A. Levin**. 2018. Nomenclatural review of *Acalypha* (Euphorbiaceae) of the Western Indian Ocean Region (Madagascar, the Comoros Archipelago, the Mascarene Islands, and the Seychelles Archipelago). PhytoKeys, 108:85-116. https:// doi.org/10.3897/phytokeys.108.27284.

**Outridge, P.M.**, R. Mason, F. Wang, S. Guerrero and L.-E. Heimbürger-Boavida. 2018. Updated global and oceanic mercury budgets for the 2018 United Nations Global Mercury Assessment. Environmental Science & Technology, 52:11466–11477. https://doi.org10.1021/acs. est.8b01246

**Peck, S.B.** and J. Cook. 2019. The Leiodidae (Coleoptera) of the Biologia Centrali-Americana, with descriptions of new species. The Coleopterists Bulletin, 73:78-84. https://doi.org/10.1649/0010-065X-73.1.78

Shear, W.A. and **S.B. Peck**. 2018. *Cyrtodesmus berti*, n. sp., a cryptic millipede from the Galapagos Islands, Ecuador (Diplopoda, Polydesmida, Cyrtodesmidae). Zootaxa, 4388:417-424. https://doi.org/10.11646/ zootaxa.4388.3.7. Gourdal M., M. Lizotte, G. Massé, M. Gosselin, **M. Poulin**, M. Scarratt, J. Charrette et M. Levasseur. 2018. Dimethyl sulfide dynamics in first-year sea ice melt ponds in the Canadian Arctic Archipelago. Biogeosciences, 15:3169-3188. https://doi.org/10.5194/bg-15-3169-2018

Limoges A., G. Massé, K. Weckström, **M. Poulin**, M. Ellegaard, M. Heikkilä, N.-X. Geilfus, M.K. Sejr, S. Rysgaard, et S. Ribeiro. 2018. Spring succession and vertical export of diatoms and IP25 in a seasonally icecovered high Arctic fjord. Frontiers in Earth Science, 6:226. https://doi.org/10.3389/feart.2018.00226.

Chevrinais, M., Z. Johanson, K. Trinajstic, J. Long, C. Morel, **C.B. Renaud** and R. Cloutier. 2018. Evolution of vertebrate postcranial complexity: Axial skeleton regionalization and paired appendages in a Devonian jawless fish. Palaeontology, 61:949-961. https://doi. org//10.1111/pala.12379.

Buckley, M., C. Lawless and **N. Rybczynski**. 2019. Collagen sequence analysis of fossil camels, *Camelops* and c.f. *Paracamelus*, from the Arctic and sub-Arctic of Plio-Pleistocene North America. Journal of Proteomics, 194:218-225. https://doi.org/10.1016/j.jprot.2018.11.014.

Bouchard, P., A.J. Brunke, A.E. Davies, H. Douglas, A.B.T. Smith and J. Manoogian. 2018. 150 years of new beetles (Coleoptera) described in The Canadian Entomologist and associated publications (1868-2017). The Canadian Entomologist, 150:685-696. https://doi. org/10.4039/tce.2018.48.

Smith, A.B.T. and A.V. Evans. 2018. Taxonomic review of *Athliini* (Coleoptera: Scarabaeidae: Melolonthinae), a new tribe of scarab beetles endemic to South America. Zootaxa, 4471:279–308. https://doi.org/10.11646/ zootaxa.4471.2.3.

Cui, H., J.A. Macklin, J. Sachs, A. Reznicek, **J.R. Starr**, B. Ford, L. Penev and H.-L. Chen. 2018. Incentivising use of structured language in biological descriptions: Author-driven phenotype data and ontology production. Biodiversity Data Journal, 6:e29616. https://doi.org/10.3897/BDJ.6.e29616.

Léveillé-Bourret, É., **J.R. Starr** and B.A. Ford. 2018. A revision of *Sumatroscirpus* (Sumatroscirpeae, Cyperaceae) with discussions on Southeast Asian biogeography, general collecting, and homologues with *Carex* (Cariceae, Cyperaceae). Systematic Botany, 43:510-531. https://doi.org/https://doi. org/10.1600/036364418X697247.



Spalink, D., J. Pender, M. Escudero, A.L. Hipp, E.H. Roalson, **J.R. Starr**, M.J. Waterway, L. Bohs and K.J. Sytsma. 2018. The spatial structure of phylogenetic and functional diversity in the United States and Canada: An example using the sedge family (Cyperaceae). Journal of Systematics and Evolution, 56:449-465. https://doi.org/10.1111/jse.12423.

Semmouri, I., K. Bauters, É. Léveillé-Bourret, J.R. Starr, P. Goetghebeur and I. Larridon. 2019. Phylogeny and systematics of Cyperaceae, the evolution and importance of embryo morphology. The Botanical Review, 85:1-39. https://doi.org/10.1007/ s12229-018-9202-0.

Muschick, M., J.M. Russell, E. Jemmi, J. Walker, K.M. Stewart, A.M. Murray, N. Dubois, J.C. Stager, T.C. Johnson and O. Seehausen. Arrival order and release from competition does not explain why haplochromine cichlids radiated in Lake Victoria. Proceedings of the Royal Society B: Biological Sciences, 285(1878):20180462. https://doi.org/10.1098/ rspb.2018.0462.

Urano, Y., **K. Tanoue**, R. Matsumoto, S. Kawabe, T. Ohashi and S. Fujiwara, S. 2018. How does the curvature of the upper beak bone reflect the overlying rhinotheca morphology? Journal of Morphology, 279: 636-647. https://doi.org/10.1002/jmor.20799.

## Non-refereed publications

#### Scientific Presentations (Abstracts)

Dudgeon, T.W., **H.C. Maddin**, D.C. Evans, and **J.C. Mallon**. 2018. [Abstract]. The morphology and function of the inner ear of Champsosaurus (Diapsida, Choristodera). Society of Vertebrate Paleontology 78th annual meeting, Albuquerque, New Mexico, USA, 17-20 October.

Dudgeon, T.W., **H.C. Maddin**, D.C. Evans, and **J.C. Mallon**. [Abstract]. The internal cranial anatomy of Champsosaurus lindoei (Diapsida: Choristodera) and its functional implications. Canadian Society of Vertebrate Paleontology 6th annual conference, Canadian Museum of Nature, Ottawa, Ontario, 14-16 May.

**Poulin, M.** 2018. [Abstract]. *Michelangeli quebecensis*: vérité ou fausse nouvelle! Journées scientifiques, Colloque 15 : Atlantic microalgae, Université de Nantes, Nantes, France, 1 juin.

Poulin, M., I. Melnikov, T. Juul-Pedersen, B. Bluhm and E. Collins. 2018. [Abstract]. Sea ice biodiversity. Circumpolar Biodiversity Monitoring Programme (CBMP) – Expert Network Annual Meeting, Rovaniemi, Finlande, 8-12 October.

Hop, H., B.A. Bluhm, I.A. Melnikov, M. Poulin,
M. Vihtakari, R.E. Collins, R. Gradinger, T. Juul-Pedersen and C. von Quillfeldt. 2018. [Abstract]. Sea ice biota: findings and recommendations from the State of the Arctic Marine Biodiversity Report. World Conference on Marine Biodiversity, Montréal, 13-16 May.

Lovejoy, C., C. von Quillfeldt, R.R. Hopcroft, **M. Poulin** and M. Thaler. 2018. [Abstract]. State of the Arctic marine biodiversity report: plankton across sectors. POLAR 2018. Where the Poles come together. Open Science Conference, Davos, Switzerland, 19-23 June.

Lovejoy, C., C. von Quillfeldt, R.R. Hopcroft, **M. Poulin,** M. Thaler, K. Arendt, H. Debes, Á. Gíslason et K. Kosobokova. 2018. [Abstract]. State of the Arctic marine biodiversity report: plankton. World Conference on Marine Biodiversity, Montréal, 13-16 May.

von Quillfeldt, C., H. Hop, M. Vihtakari, B. Bluhm, I. Melnikov, **M. Poulin**, E. Collins, R. Gradinger and T. Juul-Pedersen. 2018. [Abstract]. Sea ice—State of the Arctic Marine Biodiversity. 2nd Arctic Biodiversity Congress, Rovaniemi, Finland, 9-11 October.

Boivin-Rioux, A., J. Charette, M. Blais, **M. Poulin** and M. Gosselin. 2018. [Abstract]. Phytoplankton functional types are changing in the North Water Polynya. World Conference on Marine Biodiversity, Montréal, Quebec, 13-16 May.

Simo-Matchim, A.-G., M. Gosselin, M. Poulin and S. Lessard. 2018. [Abstract]. Challenging *Phaeocystis pouchetii* against diatoms during the summer bloom of phytoplankton in Labrador fjords (Eastern Canada). ArcticNet 2018 Annual Scientific Meeting, Ottawa, 10-14 December.

Starr, J.R., B. Ford, É. Léveillé-Bourret, A.T. Vũ and T.K.T. Nguyễn . 2018. [Abstract].The rediscovery and conservation of the rare Vietnamese endemic *Eriophorum scabriculme* and its importance to generic circumscription in the Cariceae-Dulichieae-Scirpeae clade (Cyperaceae). Botany 2018 - Thriving with Diversity. Joint meeting of the Botanical Society of America and the Canadian Botanical Association/ L'Association Botanique du Canada, Rochester, Minnesota, 21-25 July.

Granados Mendoza, C., X. Granados-Aguilar, S. Donadío, G.A. Salazar, M. Flores-Cruz, E. Hágsater, J.R. Starr, G. Ibarra-Manríquez, I. Fragoso-Martínez and S. Magallón. [Abstract]. 2018. Geographic structure in two highly diverse lineages of *Tillandsia* (Bromeliaceae). Botany 2018 - Thriving with Diversity. Joint meeting of the Botanical Society of America and the Canadian Botanical Association/ L'Association Botanique du Canada, Rochester, Minnesota, 21-25 July. Larridon, I., I. Semmouri, É. Léveillé-Bourret, G. Brewer, N. Epitawalage, F. Forest, P. Goetghebeur, J. Kim, O. Maurin, L. Pokorny, **J.R. Starr** and W.J. Baker. 2018. [Abstract.] Changing tribal and generic concepts in Cyperaceae, new insights from phylogenomics. Monocots VI - International Conference on Comparative Biology of Monocotyledons, Natal, Brazil, 7 - 12 October.

Léveillé-Bourret, É., **J.R. Starr**, B. Ford, C. Gilmour, S. Donadío, R.F.C. Naczi, T.K.T. Nguyễn, A.T. Vũ, B. Chen, X. Jin, D. Spalink, E.M. Lemmon, A.R. Lemmon and K.J. Sytsma. 2018. [Abstract]. Finding the sister to sedges (*Carex*): a new tribal and generic classification for the Cariceae-Dulichieae-Scirpeae Clade (Cyperaceae). Botany 2018 - Thriving with Diversity. Joint meeting of the Botanical Society of America and the Canadian Botanical Association/ L'Association Botanique du Canada, Rochester, Minnesota, 21-25 July.

Spalink, D., J. Pender, M. Escudero, A. Hipp, E. Roalson, **J.R. Starr**, M. Waterway and L.A. Bohs. 2018. [Abstract]. The spatial structure of phylogenetic and functional diversity in the United States and Canada: an example using sedges (Cyperaceae). Botany 2018 - Thriving with Diversity. Joint meeting of the Botanical Society of America and the Canadian Botanical Association/ L'Association Botanique du Canada, Rochester, Minnesota, 21-25 July.

#### Reports

**Brodo, F.**, 2018. Report on Crane Flies (Diptera: Tipulidae, Limoniidae and Pediciidae) collected during the BioBlitz in Forêt Boucher, Gatineau, QC. Fondation Forêt Boucher, 15-16 June.

Oliver, L.E. and **D.J. Leaman**. 2018. Protecting Goldenseal: how status assessments inform conservation. Herbalgram, 119: 40-55. http://cms. herbalgram.org/herbalgram/issue119/hg119-featgoldenseal.htmlfeat-goldenseal.html.

Tremblay J.-É., M. Gosselin, P. Archambault,
S. Bélanger, Y. Gratton, K. Juniper, P. Larouche,
C. Lovejoy, C. Nozais, **M. Poulin** and Y. Simard.
2018. Marine biological hotspots: Ecosystem
services and susceptibility to climate change. *In*M. Lemay, A. Gaden and C. Barrette (eds.). Impacts
of Environmental Change in the Canadian Coastal
Arctic: A Compendium of Research Conducted

During ArcticNet Phase III (2014-15), pp. 177-205. ArcticNet Inc., Québec, Canada.

Tremblay J.-É., P. Archambault, M. Gosselin, S. Bélanger, J. Cullen, D. Dumont, C. Lovejoy, C. Nozais, **M. Poulin** and S. Rysgaard. 2018. Arc3Bio (Marine biodiversity, biological productivity and biogeochemistry in the changing Canadian Arctic). *In* M. Lemay, A. Gaden and C. Barrette (eds.). Impacts of Environmental Change in the Canadian Coastal Arctic: A Compendium of Research Conducted During ArcticNet Phase IV (2016-17), pp. 279-303. ArcticNet Inc., Québec, Canada.

Tremblay J.-É., P. Archambault, M. Gosselin, S. Bélanger, J. Cullen, D. Dumont, C. Lovejoy, F. Maps, C. Nozais, **M. Poulin** and S. Rysgaard. 2018. Arc3Bio (Marine biodiversity, biological productivity and biogeochemistry in the changing Canadian Arctic). *In* M. Lemay, A. Gaden and C. Barrette (eds.). Impacts of Environmental Change in the Canadian Coastal Arctic: A Compendium of Research Conducted During ArcticNet Phase IV (2015-16), pp. 259-283. ArcticNet Inc., Québec, Canada.

#### **Blog Post**

**Coad, B.W.** 2019. A possible new species almost found - but lost. Canadian Museum of Nature Blog. https://canadianmuseumofnature.wordpress. com/2019/02/20/possible-new-species/, 20 February.

## Other

**Brunton, D.F.** 2018. [Book Review]. (Burzynski et al. 2017). Exploring the Limestone Barrens of Newfoundland and Labrador. Canadian Field-Naturalist, 131:374.

**Brunton, D.F.** 2018. [Book Review]. (Wunderlin, Hansen and Franck. 2016). Flora of Florida Volume IV (Dicotyledons, Combretaceae through Amaranthaceae). Canadian Field-Naturalist, 131:375.

**Brunton, D.F.** 2019. The Ramsay Prairie: High Plains of the Ottawa Valley. Trail & Landscape, 53:29-34.

Bickerton, H. and **D.F. Brunton**. 2019. Crazy Horse Bog: A small gem on the Carp Ridge with a new plant species for the City of Ottawa. Trail & Landscape, 53:17-23.

**Ercit, T.S.** 2018. In Memory of Dr. Petr Černý (1934–2018). The Canadian Mineralogist, 56(5):847. https://doi.org/10.3749/canmin.OBIT00006.

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# BUILDING THE EVIDENCE

## **Building the Evidence**

# Canadian Museum of Nature Collection Growth at a Glance

The Canadian Museum of Nature (CMN) collections grew by over 20,000 specimens or lots during 2018-19 fiscal year with a focus on Canadian specimens but enjoying a global reach. Specimens acquired via 126 transactions originated in 26 different countries with a little more than half of all acquisition lots processed originating in Canada. Every year, a large portion of acquired material is a result of CMN field work highlighting the close relationship between the CMN's research and collection activities. The 2018-19 fiscal year saw a renewed effort across all collection areas to acquire and process specimens and lots in the CMN collections backlog.

Section	Transactions	Specimens or Lots	Percentage of all transactions
Botany	77	10,392	61.1 %
Nature Art	1	23	0.8 %
Mineralogy	17	20	13.5 %
Fossil	3	42	2.4 %
Zoology	28	10,828	22.2 %

**Figure 2** Acquisitions made during 2018-19 originated in 26 different countries contributing to the global representation of specimens

Figure 1 The CMN's collection grew in 2018-19. Both Botany and Zoology added a comparable number of new specimens but the Botany specimens originated from significantly more sources than

all other sections during the same

period.

in the collection. Specimens of Canadian origin continue to make up the majority of acquisitions (65%).



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Transaction Type	Number of Transactions	Botany	Nature Art	Mineralogy	Fossil	Zoology	Totals
Donation	70	5,648	23	0	1	5,082	10,754
Donation for Tax Receipt	6	682	0	0	1	5,703	6,386
Exchange	6	723	0	1	0	0	724
Purchase	16	0	0	19	0	0	19
Staff Field Trip	28	3,339	0	0	40	43	3,422

**Figure 3** The CMN's curatorial team takes advantage of all of acquisition methods at their disposal with donations and staff field trips being the primary methods used.

#### Nature Art

Established in the 1990s, the Nature Art collection is responsible for acquiring and preserving mostly Canadian artwork relating to our natural world. This year we were pleased to acquire 23 wood carvings by the Ottawa valley region carver, John "Les" Leslie Wilson (d.). The works are illustrative of the intersection of fine art and folk art, which is often seen in the Nature Art collection. The sculptures were inspired by Earl Godfrey's (former Curator of Ornithology at the National Museum of Natural Science in Ottawa, now the Canadian Museum of Nature) seminal work, The Birds of Canada (1966). The sculptures were donated to the Nature Art collection by the artist's children. The wood carvings complement the 256 decoys, 116 ceramic mushrooms, and the bronze and jade sculptures already in the Nature Art collection.



**Figure 4** The works "Two Blue Jays and a Red-breasted Nuthatch (1988)" and "Wood duck, adult male in breeding plumage (1986)" are some of the excellent representations of the birds of Canada found in Nature Art collection's most recent acquisition (A2018.0042).

### Botany

Botany acquisitions in 2018-19 emphasized lichens and vascular plants. Almost 50 lichen batches, totalling over 2,500 specimens (about 75% of which were collected on staff field trips) were accepted into the lichen collection. The 14 vascular plant batches acquired prioritized Arctic material, owing to its relevance to the Museum's current Arctic Flora research and Sitka Foundation-supported Arctic Collection Digitization Project activities. Most of the 5,800 new vascular plant specimens were collected by CMN staff and direct contacts, or liberated from backlog cabinets in the National Herbarium. A major donation of Canadian specimens from a private herbarium accounted for about half of the 1,400 bryophyte specimens acquired this year. New vascular and bryophyte specimens were prepared, digitized and filed away by Museum staff and a highly prized team of over two dozen volunteers and students.



**Figure 6** CMN volunteers and student staff like Erin Johnston (University of Ottawa) made it possible, in 2018–19, for the National Herbarium to add thousands of securely-mounted, digitized new specimens to the evergrowing physical record of wild plants in Canada.



Figure 5 One of many notable lichen acquisitions included the holotype (CANL 132548) of the stubble lichen Chaenotheca selvae Maloles & McMullin. This new species was discovered in an urban setting, within well-studied natural area: the University of Guelph Arboretum.



**Figure 7** CMN staff have already begun the process of sorting, mounting, and labeling the mostly tropical Coleoptera (beetles) from this year's large invertebrate donation to the collection.

### Zoology

The Invertebrate collection acquired nearly 5,000 non-insect lots (mostly preserved in ethanol) and 5,680 dry insect specimens in 2018-19. The latter donations are mostly tropical Coleoptera (beetles), greatly augmenting our Insect collection, which is recognized world-wide as one of the best tropical and neo-tropical beetle collections. The other invertebrates acquired ranged greatly in diversity, from Arctic sponges and other planktonic and sea-bottom invertebrates, to parasites of frogs and fish. Invertebrate type specimens acquired by the Museum included a new species of cave crustacean, hydrothermal vent mollusc, and a freshwater clam. About 4,300 lots were promptly processed and databased as part of the Arctic Collection Data Digitization Project.

The Vertebrate collections acquired 90 specimens/lots, including birds, fish and reptiles. Of particular interest is an acquisition of 30 birds that struck windows in the Ottawa valley area, donated by Safe Wings Ottawa (Ottawa Field-Naturalists' Club). An informal agreement was arranged between the CMN staff and Safe Wings to allow the CMN to be a priority destination for bird specimens obtained in this manner. Selection of specimens is completed as per the Vertebrate collection's development plan. Forty fish specimens/lots were acquired for tissue collection development. The specimens were processed, and accessioned.

#### Fossil

The Fossil collection at the CMN primarily grows through staff involvement with field work. This year, CMN researchers conducted field work in Cypress Hills, Saskatchewan collecting fossil mammal material for the National Collection. Due to legislation in most Canadian Provinces and Territories restricting the removal of fossils from certain regions, certain fossils collected by CMN researchers will be returned to those provinces and territories at the end of the research projects and not accessioned into the National Collection.



Figure 8 CMN Research crew working a dig site along the South Saskatchewan River in Alberta, Canada, during the Summer 2018 field season. (Left Scott Rufolo, Zoe Landry, Tom Dudgeon)

#### Mineralogy

The acquisitions for the Mineralogy collection reflect that geology knows no borders and that it is important to have representation of the diversity of minerals around the world. Since minerals have value and an active collectors market, the museum purchases many of its acquisitions in order to fill gaps in the National Collection. New acquisition highlights include a canary yellow brucite from a new find in Pakistan, an amethyst (purple variety of quartz) from a new find in Newfoundland, Canada, and a stunning aquamarine (blue variety of beryl) with contrasting red spessartine from Pakistan with interesting growth textures.



Figure 9 rhodochrosite specimens, like this one from Ontario, are fine examples of how the Minerology collection straddles the realms of "objet d'art" and "objet scientifique".





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University of Chicago, Chicago, Illinois

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University of Cincinnati, Cincinnati, Ohio University of Colorado, Boulder, Colorado University of Helsinki, Viikinkaari, Finland University of Kansas, Lawrence, Kansas University of Lodz, Lodz, Poland University of Maine, Fort Kent, Maine University of Minho, Braga, Portugal University of Nebraska-Lincoln, Lincoln, Nebraska University of New England, Armidale, Australia University of New Mexico, Albuquerque New Mexico University of Oslo, Oslo, Norway University of Porto, Porto, Portugal University of Vermont, Burlington Vermont University of Vienna, Vienna, Austria University of West Alabama Herbarium, Moulton, Alabama University of Wisconsin, Madison, Wisconsin Victoria Museum, Melbourne, Australia Victoria University, Victoria, Australia Western Pennsylvania Conservancy, Pittsburgh, Pennsylvania

Witswatersrand University, Witz, South Africa

# National

# Alberta

Angkor Gold Corporation, Sexsmith Geological Survey of Canada, Calgary Philip J. Currie Dinosaurs Museum, Wembley Royal Alberta Museum, Edmonton Royal Tyrrell Museum of Palaeontology, Drumheller University of Alberta, Edmonton

# **British Columbia**

Bamfield Marine Science Centre, Bamfield

Beaty Biodiversity Museum, University of British Columbia, Vancouver

Chu Cho Environmental, Prince George

Hakai Institute, Calvert Island

Ministry of Environment and BC Parks, Victoria

**Museum of Archaeology and Ethnology**, Simon Fraser University, Vancouver

Ocean Bridge Youth Program, Vancouver

Ocean Literacy Coalition, Vancouver

Ocean Literacy Conference, Vancouver

OceanWise (Vancouver Aquarium), Vancouver

Parks Canada, Pacific Rim National Parks Reserve, Ucluelet

Resources for Future Generations, Vancouver Royal British Columbia Museum, Victoria

# Manitoba

Fisheries and Oceans Canada, Winnipeg The Manitoba Museum, Winnipeg University of Manitoba, Winnipeg

# **New Brunswick**

Fisheries and Oceans Canada, Moncton New Brunswick Museum, Saint John New Brunswick Provincial Museum, St. John Université de Moncton, Edmundston & Moncton University of New Brunswick, Fredericton

### Newfoundland and Labrador

Canadian Forest Service, Corner Brook Geological Association of Canada, St. John's Memorial University of Newfoundland, St. John's

### **Northwest Territories**

Government of NWT, Yellowknife Prince of Wales Northern Heritage Centre, Yellowknife

### Nova Scotia

Acadia University, Wolfville

Fisheries and Oceans Canada, Dartmouth Geological Survey of Canada, Bedford Research Institute, Dartmouth

Mersey Tobeatic Research Institute, Caledonia Nova Scotia Environment, Halifax Nova Scotia Museum of Natural History, Halifax Nova Scotia Natural History Museum, Halifax Oceans Research in Canada Alliance, Halifax Parks Canada, Kejimkujik National Park and National Historic Site, Maitland Bridge

Saint Mary's University, Halifax

### Nunavut

Government of Nunavut, Iqaluit Kitikmeot Heritage Society, Cambridge Bay Nunavut Parks, Iqaluit PCSP - NRC Research Station, Resolute, Resolute Polar Knowledge Canada, Cambridge Bay

### Ontario

ABC Life Literacy Canada, Toronto Agriculture and Agri-Food Canada, Ottawa Agriculture et Agroalimentaire Canada, Ottawa Algonquin College Event Management program, Ottawa Algonguin College Tourism Program, Ottawa Alpine Gems, Kingston Art of the Plant, Ottawa Beau's Brewery, Ottawa Biodiversity Institute of Ontario, Guelph Botley's Bootle Blast, Toronto BrainBuddies Outreach, Ottawa Bruyere Research Institute, Ottawa Canada Science and Technology Museum, Ottawa Canada Wide Science Fair, Ottawa Canadian Association for Conservation of Cultural Property, Ottawa Canadian Biodiversity Information Facility, Ottawa Canadian Committee for the International Union for Conservation of Nature, Ottawa Canadian Conservation Institute. Ottawa Canadian Federation of Earth Sciences, Ottawa Canadian Forest Service, Ottawa Canadian Geographic, Ottawa Canadian Medical Association, Ottawa Canadian Parks Council, Ottawa Canadian Wildlife Federation, Ottawa Canadian Wildlife Service, Ottawa Canderel - Constitutions Square, Ottawa Carleton Society for Neuroscience - Ottawa Chapter, Ottawa Carleton University, Biology Department, Ottawa

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### Carleton University, Ottawa

Centre for Canadian Historical Horticultural Studies, Royal Botanical Gardens, Burlington

Centre for Neuroscience at Queen's University, Kingston

Children hospital of Eastern Ontario - Pediatric Neurology, Ottawa

Children hospital of Eastern Ontario Research Institute, Ottawa

Children hospital of Eastern Ontario, Ottawa

City of Pickering, Pickering

**Committee of Canadian Botanical Art Organization**, Ottawa

Couchiching Conservancy, Orillia

CP-NET Youth Advisory Committee, Dancing with Parkinson's, Ottawa,

Credit Valley Conservation Authority, Mississauga

Department of Fisheries and Oceans, Ottawa

Dynamic Brain, Ottawa

Embassy of the Federal Republic of Germany, Ottawa Epilepsy Ottawa & Épilepsie Outaouais, Ottawa Eplink, Toronto Escape Manor, Ottawa Field Botanists of Ontario, Ottawa Fisheries and Oceans Canada, Burlington and Ottawa Foreign Affairs, Trade and Development, Ottawa Fur Institute of Canada, Ottawa Geological Survey of Canada, Ottawa GlowFair, Ottawa Grey Roots Museum & Archives, Owen Sound Grimsby Museum, Grimsby Heart and Stroke Foundation Canada, Ottawa Interaxon, Toronto Jump, Toronto Laurentian University, Sudbury Lennox & Addington Museum & Archives, Lennox Minden Hills Museum & Heritage Village, Windsor Mining Matters, Toronto Mood Disorders Association of Ontario, Toronto Museum Windsor, Windsor

National Capital Commission, Ottawa			
National Wildlife Research Centre, Environment			
Canada, Ottawa			
Natural Resources Canada, Ottawa			
Natural Sciences and Engineering Research Council of Canada, Ottawa			
Nature Conservancy of Canada, Carden and Ottawa			
Niagara Parks Commission, Niagara Falls			
North American Caribou Workshop, Ottawa			
Nunavut Sivuniksavut, Ottawa			
Oceans North, Ottawa			
Ontario Brain Institute, Toronto			
Ontario Geoscience Laboratories, Sudbury			
Ontario Ministry of Natural Resources and Forestry, Pembroke & Peterborough, Thunder Bay			
<b>Ontario Natural Heritage Information Centre</b> , Peterborough			
Ontario Nature, Toronto			
Ottawa Capital Pride, Ottawa			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa Parks Canada, Ottawa and Smith Falls			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa Parks Canada, Ottawa and Smith Falls Parliament, Ottawa			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa Parks Canada, Ottawa and Smith Falls Parliament, Ottawa Peel Art Gallery, Brampton			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa Parks Canada, Ottawa and Smith Falls Parliament, Ottawa Peel Art Gallery, Brampton Peterborough Centennial Museum & Archives, Peterborough			
Ottawa Capital Pride, Ottawa Ottawa Field-Naturalists' Club, Ottawa Ottawa Riverkeeper, Ottawa Parkinson's Canada, Ottawa Parks Canada, Ottawa and Smith Falls Parliament, Ottawa Peel Art Gallery, Brampton Peterborough Centennial Museum & Archives, Peterborough Pickering Museum Village, Pickering			

Quantum Writing, Ottawa

Ray's Reptiles, Ottawa

Royal Canadian Geographical Society (Canadian Geographic), Ottawa

Royal Ontario Museum, Toronto

Science Borealis, Ottawa

Science North, Sudbury

Sick Kids, Toronto

Sport Research - Intelligence Sportive, Ottawa

Synaptive Medical, Toronto

TD Bank, Toronto

The Einstein Lab, Toronto

The Royal - Mood Disorders Research Unit, Ottawa

The Royal - Women's Mental Health, Ottawa

The Royal's Institute of Mental Health Research, Ottawa

Think First Parachute, Toronto

Thunderbird Partnership Foundation, Bothwell

Timmins Museum, Timmins

University of Guelph, Guelph

University of Ottawa, Ottawa

University of Windsor, Windsor

Wildlife Conservation Society of Canada, Toronto

Wilfrid Laurier University, Waterloo

Youth Science Canada, Pickering

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# Quebec

Archives du Jardin botanique de Montréal, Montreal Bibliothèque Gaby-Farmer-Denis, Les Cèdres Bibliothèque Louis-Ange-Santerre, Sept-Iles Canada C3, Gatineau Canadian Museum of History, Gatineau Centre des sciences de Montréal, Montreal Centre d'Études Nordiques, Rimouski CHSLD Vigi Outaouais, Gatineau Commission géologique du Canada / RNCan, Gatineau Coordination Mechanism of the Global Taxonomy Initiative. Montreal Englobe, Montreal **Environment and Climate Change Canada** Institut Maurice Lamontagne, Pêches & Océans, Mont Joli Institut National de la Recherche Scientifique, Quebec Kenauk Institute. Montebello La Branche culturelle, Brownsburg-Chatham, Quebec Les Scientifines, Montreal McGill University, Montreal Mineralogical Association of Canada, Quebec Ministère des forêts, de la Faune et des Parcs du Québec and Chibougamau Ministère des Pêches et des Océans-DFO, Mont Joly

Musée des Hospitalières de l'Hôtel-Dieu de Montréal, Montreal Musée du Fjord, La Baie Musée McCord, Archives Notman, Montreal Musée McCord, Montreal Parc national de la Gaspésie, Sainte-Anne-des-Monts Parc national de Plaisance, Plaisance Redpath Museum, Montreal Société Québécoise de bryologie, Saint-Valérien-de-Rimouski Students on Ice, Gatineau Université de Québec en Abitibi-Témiscamingue, Rouyn-Noranda Université de Sherbrooke, Sherbrooke Université du Québec à Rimouski, Rimouski Université du Québec à Trois Rivières. Trois-Rivières Université de Laval, Quebec Yes Montréal, Montreal

### Saskatchewan

Lloydminster Cultural & Science Centre, Lloydminster Royal Saskatchewan Museum, Regina T. Rex Discovery Centre, Eastend University of Saskatchewan, Saskatoon

# Yukon

Canadian Wildlife Service

Environment Canada, Whitehorse

Yukon Territory Conservation Date Centre, Whitehorse





MANAGING OUR FINANCIAL RESOURCES

The Canadian Museum of Nature (the "Museum") pursues its national mandate as described in the *Museums Act*, within the context of the governance and accountability regime established in Part X of the *Financial Administration Act*. The Museum's Board of Trustees and management are firmly committed to managing the public and private funds invested in the institution in a transparent, accountable manner, and to optimizing the value of the contribution the Museum makes to Canadians and Canadian society.

# **Management Discussion and Analysis**

# **Financial Overview**

The Museum's mission extends, through public engagement, to inspire people to know, engage with, and care for, nature with a hope that in turn will lead them to engage with finding the right path for our natural future. The 2018-19 fiscal year provided further opportunities to strengthen the Museum's programs of research and discovery while sharing the knowledge locally, nationally and internationally through onsite, offsite and online visitor experiences. A theme for 2018-19 was positioning the Museum as a vital player in the global mission to save the world for future generations with evidence, knowledge and inspiration. This communications theme is enabling the Museum to profile the value and impact of its collections, scientific research and public engagement programs. During 2018-19, over 462,000 visitors came through the museum doors, and millions more engaged through visits to its travelling exhibits in locations across Canada and abroad, or by simply visiting the Museum's web site nature.ca.

Through a combination of revenue generation and expenditure reduction measures implemented over the past years, the Museum has made significant progress towards achieving financial sustainability. In order to maintain financial sustainability, the Museum will strive to increase selfgenerated revenues by 5% annually while limiting increases in expenditures to 1% annually. Revenue generation measures in 2018-19 included:

- Implementing a plan to increase revenue by capitalizing on the VMMB's commercial operations, especially in the areas of attendance and membership fees, rental of facilities, ticketed programs, boutique and online sales;
- Expanding the Museum's virtual presence and attracting new audiences through the use of new digital strategies including digital storytelling, digital apps, digital natureART exhibits, and downloadable teacher resources.
- Enhancing existing marketing and awareness campaigns, including the Museum's social media marketing campaign;

- Building and strengthening the Museum's exhibitions and public-education programming with a view to continuously increasing overall attendance and diversifying its audience base;
- Evolving the business model for the travelling exhibitions program at the Museum; and monetizing the physical assets of the Museum at the VMMB and NHC sites.

To enable that outcome, the Museum is shifting from an appropriation dependant operating model to a sustainable museum enterprise operating model. This shift is meant to foster innovation and calls for new skills and accountabilities for staff and volunteers since growth and new programs will be earned revenue growth dependant rather than appropriation growth dependant. The ongoing challenge for the Museum is ensuring this shift happens at the required pace through recruitment, training and performance management.

An example of this shift to a sustainable museum enterprise operating model is the success of the live Butterflies in Flight temporary exhibition opened from October 2018 to April 2019, then extended to October 2019 due to its popularity. In addition, the success of Survival of the Slowest major temporary exhibition opened from December 2018 to April 2019. Both exhibitions aided the Museum to partially offsetting the drop in attendance during its summer major temporary exhibition The Brain: The inside Story. The lower summer attendance was mainly due to the re-entry of the new Canada Science and Technology Museum (Ingenium), having returned after a 3-years hiatus and given its appeal to our core family market segment and the extreme hot weather which curtailed attendance by local audiences.

The Museum also continued its partnership program with Escape Manor targeting the key young adult segment to attract new visitors within a new context. Again, this year, programs such as *Nature Nocturne* and *Nature Tastes* evenings have also contributed to the increase in revenue. These adult only evenings continue to be a successful program and a new perspective on the Museum as a place for young adults. The aforementioned revenue generation measures are in addition to those initiated in previous years such as the introduction of a new pricing structure for admissions, surcharges for major temporary exhibitions and value-based pricing for education programs. Other important initiatives were new programming such as the 3D Theatre, Nature Scoop, Nature Sleepovers, Birthday parties, a new hybrid model for the Nature Boutique, automated parking and aggressive membership marketing. 2018-19 was another successful year for memberships sold reaching 6,000 members, 1,000 above target. Furthermore, the Museum continued its revenue generating initiative from collections storage and management service fees and facility leasing fees to fund strategic investments in the Centre for Arctic Knowledge & Exploration and the Centre for Species Discovery & Change. In 2018-19, the Museum generated revenue excluding specimen donations and in-kind sponsorships equivalent to 25% of base operating costs, compared to 27% in the previous year, meeting its target of 25% despite the drop in attendance during the summer.

An important element of a current and relevant visitor experience will be the continuous investment in foundational research to deepen the understanding of our audience, a key step to ensure public offers are strategically developed for maximum return. The Museum continues to focus on increasing and enhancing all touch points of the visitor journey to create a world-class offer that deepens engagement and increases loyalty. The Museum also continues to effectively manage the visitor flow through frontline employee and volunteer engagement and intelligent signage. It also increases revenue from ancillary operations and aligns all commercial offerings within the Museum's mission and mandate.



The Museum continuously reviews its program, its means of delivery and its supporting activities to ensure they remain relevant to Canadians. Family Programming department refreshed its offer and increased its volunteer base to increase and improve public reach and engagement during key periods and to continue to attract those visitors who are not motivated by our special temporary exhibitions.

Given the expenditure reduction measures implemented in previous years and recognizing the financial pressures of many museums across the country, the Museum embarked on collaborations with Science North in Sudbury, Parks Canada, the National Film Board of Canada, Vancouver Aquarium, and Canadian Geographic Enterprises to create and deliver programs to Canadians. This collaboration approach reflects a direction the Museum will continue to pursue to leverage scarce resources to best effect.

Furthermore, the Museum continues to identify and act on opportunities for collaboration with the other national museums that improve effectiveness and efficiency. The national museums now have a systematic approach for identifying and advancing coprocurement projects, cooperative exhibit scheduling and cooperative marketing projects. In addition, the new National Museum's Passport introduced in August 2016, with an offer that targets tourist visitors to the National Capital, saw continued strong growth in 2017 and further promotion in external markets in 2018 and beyond. Operational objectives include ensuring there is a strategic approach to digital output, and an ongoing and efficient operation of the Museum's online presence across its website and social media channels. During 2018-19, the Museum continued to refine and improve digital performance measures and data collection methods to provide relevant and timely tactical and strategic information to guide decisions on content and user experience.

Building a high performance advancement operation focused on developing a pipeline of annual, sponsorship and major gift prospects and donors is an important element of the sustainable museum enterprise operating model and to the success of the Museum in the future. The Museum's advancement strategy focuses on building support from individual, corporate and foundation donors that includes a naturePATRON fundraising program and a National Nature Council major gift program to raise the Museum's profile and raise funds in support of the Museum's position as a leader in Arctic research and species discovery. Advancement programs fund both operations and special projects such as galleries, fieldwork, scientific equipment and landscaping. In the fall of 2016, a group of individuals incorporated the Canadian Museum of Nature Foundation (the "Foundation") as a not-for-profit corporation. This corporation was granted charitable status in the fall of 2017. The directors of this Foundation are raising funds in support of the research, collections care and education programs of the Museum. During 2018-19,



around \$91,000 was approved to be transferred to the Museum for the first time. Gifts were from the corporate community, with the balance from several individuals.

The Museum was successful in significantly expanding its pipeline of potential donors, while acknowledging that much more work needs to be done to achieve a robust group of prospective supporters to achieve the \$25 million overall fundraising goal.

In 2018-19, total support raised from individual and corporate donations, sponsorships, memberships, collaborations, and in-kind support for research and collections and from the media amounted to \$6.5 million, exceeding the annual goal of \$5.8 million. These cash and in-kind commitments secured through the Museum's fundraising activities are broader in scope than the contributions recognized on the Museum's Statement of Operations.

In spite of the progress towards achieving financial sustainability, addressing the financial pressures related to operating the two facilities under its stewardship remains the most critical issue facing the Museum, as it is still vulnerable to the impact of inflation on key inputs such as utilities and property taxes. Budget 2016 provided funding to help Canada's national museums address immediate operational and capital pressures including the gap between established appropriations provided for payment in lieu of taxes (PILT) purposes and the actual amount of PILT being paid, and deferred recapitalization projects, primarily those related to immediate health and safety issues.

Through Budget 2016, the Museum received \$4.6 million in 2018-19. Of this amount, \$4.3 million was to address the backlog of health and safety and other recapitalization needs, and \$0.3 million was to address the gap between the level of funding it currently receives in appropriations and the PILT level that is due to Public Services and Procurement Canada (PSPC) each year, based on estimates for 2016 provided by PSPC. This, however, does not offset the \$1.0 million in property taxes paid on the Gatineau site. The costs of managing the Museum's two buildings have increased since the completion of the renovated VMMB. The Museum has in place a number of strategies designed to manage both known and anticipated pressures. An enterprise risk management approach is being used to manage these strategies and pressures in support of the vision to inspire understanding and respect for nature.

# **Financial Performance**

# **REVENUE AND PARLIAMENTARY APPROPRIATIONS**

Revenue and parliamentary appropriations increased to \$46.2 million in 2018-19 from \$43.2 million in 2017-18 with appropriations representing 75% of the total in 2018-19 compared to 78% in 2017-18.

The Museum had established a target of generating revenue excluding specimen donations and in-kind sponsorships equivalent to 25% of base operating costs. In 2018-19, with attendance reaching 461,797 (489,289 in 2017-18), 23,203 below target due to the attendance drop during summer as detailed above. The Museum, however, met its gross revenue target with revenue excluding specimen donations and in-kind sponsorships equivalent to 25% of base operating costs (27% in 2017-18).

# **Parliamentary Appropriations**

On an accrual basis, parliamentary appropriations increased by \$1.2 million to \$34.8 million in 2018-19 from \$33.6 million in 2017-18, mainly due to the deferral of parliamentary appropriations received during the year for capital projects.

### **Admission and Program Fees**

Revenue associated with admission and program fees increased by \$0.7 million to \$5.0 million in 2018-19 from \$4.3 million in 2017-18. This increase is partially due to the increase in surcharge revenue related to major temporary exhibitions. The Museum did not have major temporary exhibitions in 2017-18. The increase is also due to one-time deferred revenue adjustment of membership revenue during 2017-18.

Fees from programs delivered at the Museum have totaled \$0.7 million in 2018-19 compared to \$0.6 million in 2017-18, the \$0.1 million increase is mainly due to the continuous success of *Nature Nocturne* evenings.

On an accrual basis, membership revenue includes \$524,929 of membership revenue recorded for the year ended March 31, 2019.

### **Ancillary Operations**

Revenue associated with ancillary operations includes rentals of facilities, boutique sales, cafeteria leases, and parking. Revenue from ancillary operations increased by \$0.1 million to \$2.2 million in 2018-19 from \$2.1 million in 2017-18. The \$0.1 million increase is mainly due \$0.5 million increase attributable to the change of the Nature Boutique operation from leasing to a hybrid business model offset by \$0.2 million decrease in

# Revenue

(Excluding parliamentary appropriations and in-kind sponsorships and specimen donations)



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revenue related to the rental of facilities, \$0.1 million decrease in parking revenue, and \$0.1 million one-time adjustment related to prior years Catering and Nature Café revenue.

# Contributions

Contributions recognized as revenue vary from year to year based upon the resources required to fund research, collections and public education programs including installing new permanent galleries. On an accrual basis, contributions including donations, sponsorships, in-kind sponsorships and specimen donations increased by \$0.5 million to \$2.9 million in 2018-19 from \$2.4 million in 2017-18. The increase is mainly due to higher sponsorships, donations, and the recognition of restricted contributions related to the arctic digitization project.

# Interest

Interest revenue on cash and restricted cash held in the Museum's bank account increased by \$0.1 million to \$0.4 million in 2018-19 from \$ 0.3 million in 2017-18. The increase is attributable to higher interest rates during 2018-19.

### Other

Other revenue increased by \$0.3 million to \$0.9 million in 2018-19 from \$0.6 million in 2017-18 mainly due to higher revenue generated from travelling exhibitions and scientific services.

# EXPENSES

Expenses increased by \$3.1 million to \$44.1 million in 2018-19 from \$41.0 million in 2017-18.

# **Inspiration and Engagement**

Inspiration and engagement increased to \$11.7 million in 2018-19 from \$10.6 million in 2017-18. The increase of \$1.1 million is mainly due to the change of the Nature Boutique operation from leasing to a hybrid business model and higher exhibition expenses. The Museum did not have major temporary exhibitions in 2017-18.

# **Collections Care and Access**

Collections care and access decreased to \$3.2 million in 2018-19 from \$3.4 million in 2017-18. The decrease of \$0.2 million is mainly due to lower in-kind sponsorships and specimen donations.

# **Research and Discovery**

Research and discovery increased to \$4.6 million in 2018-19 from \$3.9 million in 2017-18. The \$0.7 million increase is mainly due to higher personnel and training cost.

## **Internal Support Services**

Internal support services increased to \$5.9 million in 2018-19 from \$5.3 million in 2017-18. The \$0.6 million increase is attributable to higher personnel cost and lower capitalization during 2018-19.

# **Buildings and Grounds**

Expenses related to the Museum's buildings and grounds increased to \$18.7 million in 2018-19 from \$17.8 million in 2017-18. The \$0.9 million increase is mainly attributable to lower capitalization during 2018-19 and higher property management, and security costs related to both buildings.

### Expenses

(Excluding in-kind sponsorhips and specimen donations)



# NET RESULTS OF OPERATIONS

Compared to the plan, the net results of operations generated a surplus of \$2.0 million in 2018-19, which can be attributed to the following:

- Excluding in-kind sponsorships and specimen donations, the Museum recorded \$0.4 million in revenue in excess of the plan, as interest and parking revenue were respectively \$0.3 million and \$0.1 million, higher than planned.
- The Museum recorded \$0.1 million in contribution revenue attributable to the recognition of restricted contributions related to the Arctic digitization project.
- The Museum recorded \$0.6 million savings in operation and maintenance of building expenses as a result of decreased operating costs related to the VMMB property taxes.
- The Museum recorded \$0.2 million savings in exhibition expenses as a result of lower costs related to the Brain exhibition expenses.
- The Museum recorded \$0.7 million savings in personnel costs due to vacant positions.

# FINANCIAL SITUATION

### Assets

Cash increased by \$3.4 million to \$18.5 million in 2018-19 from \$15.1 million in 2017-18. This increase is attributable to the operation surplus as explained above as result of higher interest revenue and savings on personnel and operation costs and timing difference of payment of invoices.

Capital assets decreased by \$7.6 million to \$175.8 million in 2018-19 from \$183.4 million in 2017-18 due to amortization expense of \$9.5 million offsite by acquisition of capital assets of \$1.9 million.

# Liabilities

Deferred revenue, contributions and parliamentary appropriations increased by \$2.3 million to \$7.2 million in 2018-19 from \$4.9 million in 2017-18. This increase is mainly attributable to capital parliamentary appropriations received in current year through Budget 2016 and deferred for future capital projects.

Deferred capital funding decreased by \$6.6 million to \$162.9 million in 2018-19 from \$169.5 million in 2017-18. The decrease is due to lower parliamentary appropriations used for the acquisition of capital assets reclassified as deferred capital funding.

# Accumulated Deficit

The accumulated deficit of \$2.2 million as at March 31, 2019, is mainly due to the accounting treatment related to the Museum's Natural Heritage Campus located in Gatineau, Quebec, which is recorded on the Statement of Financial Position as an obligation under capital lease. This accounting treatment will keep the Museum's accumulated deficit in a deficit position for many years due to the interest expense on the capital lease obligation being higher in the earlier years than in the years closer to the end of the lease term. Accordingly, the accumulated deficit related to this accounting treatment will begin to reverse in 2019-20 until it is fully eliminated by the end of the lease term in 2031. This does not impact the Museum's cash flow or financial stability in any way.

# **OBJECTIVES FOR 2019-20 AND BEYOND**

In 2019-20, the Museum will continue to make strategic investments in scientific equipment, scientific talent, specimen acquisitions, natural sciences content and refreshed visitor experiences. A theme for 2019-20 is leveraging the Museum's position as a national leader and global influencer in Arctic knowledge and species discovery for impact on visitor understanding of the natural world. This theme will enable the Museum to profile the value and impact of its collections, scientific research and public engagement programs. New approaches to the design and delivery of visitor experiences will enable the Museum to attract and inspire new audiences. These new engaging experiences will lead to higher memberships, higher membership renewal and will provide a foundation for enhanced fundraising. In 2019-20 and beyond, the gap in funds to operate the two facilities under the stewardship of the Museum is the most critical issue facing the Museum.

The Museum sets out five strategic objectives for the 2019-20 to 2023-24 planning period:

- Transform people's understanding of Canada's leadership in Arctic knowledge and its importance to our global natural future and be a global museum leader that engages in and influences global dialogue about the Arctic and its importance to our collective future.
- Transform understanding of the relevance and influence of species knowledge to people's lives now and, in the future, and be a national museum leader that contributes to the understanding of Canada's biodiversity and geodiversity.
- Transform understanding and engagement with nature by leveraging expert narratives, extraordinary collections, personal experiences and powerful dialogue and be a leader and collaborator in innovative and sustainable nature inspiration and engagement.

- Play a vital role on the national and global stage to advance understanding and respect for nature and be a known, respected, and active and called upon player locally, nationally and globally.
- Evolve the museum enterprise model to embrace new technology, data analysis and employee engagement and be a global leader in sustainable museum enterprise model application and development.

The strategic directions for the Museum acknowledge the intent to be a leading source of natural history knowledge and scientific inquiry for scientists and the public, thus contributing a distinctly Canadian perspective to the global body of knowledge. The Museum will disseminate the results of this scientific inquiry, thus helping inspire Canadians to act conscionably about the natural environment. As a public institution, the Museum also wishes to continue to demonstrate accountability, value and fiscal effectiveness through achieving measurable, meaningful results.

These measures combined with the continuing support of the Government of Canada and a highly motivated and skilled team will allow the Museum to continue to fulfill its mandate to "...increase throughout Canada and internationally, interest in, knowledge of and appreciation and respect for the natural world..."

The Museum's mandate also feeds into a global natural history and nature conservation vision to save the world for future generations with evidence, knowledge and inspiration.

# **RISK ANALYSIS**

The Museum has in place an enterprise risk management framework designed to effectively and proactively manage the risks that could prevent the Museum from achieving its objectives. The Museum identifies four risks and their related mitigation strategies. The risk mitigation step involves development of mitigation strategies designed to manage, eliminate, or reduce risk to an acceptable level, ideally low. Once a strategy is implemented, it is continually monitored to assess its efficacy with the intent of revising the course of action if needed.

Summary of key risks and mitigation strategies are as follows:

- Structural Deficit Risk that the structural deficit will continue to increase due to expenses increasing at a greater rate than revenue, such as utilities, property, taxes and general inflation. This is mitigated by a continuous process of expenditure review, admission revenue monitoring and earned revenue growth.
- Advancement Risk that a limited donor pipeline may constrain financial resources available to support the investment required for initial implementation of the Museum's strategic objectives. This is mitigated by a comprehensive advancement program that identifies, cultivates, solicits and stewards donors and prospects, led by a team of fundraising professionals and a new group of committed fundraising volunteers and Board members.
- Succession Risk that a significant number of employees are eligible for retirement resulting in the loss of corporate memory and key skills. To mitigate this risk the Museum developed and monitors a succession plan that includes skills development.
- Budget 2016 Risk that capital projects funded through budget 2016 would not be completed on time and on budget to meet the required scope. Quarterly tracking internally will ensure the Museum fulfills its spending commitments.

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# Management's responsibility for financial reporting

Management is responsible for establishing and maintaining a system of books, records, internal controls and management practices to provide reasonable assurance that: reliable financial information is produced; the assets of the Corporation are safeguarded and controlled; the transactions of the Corporation are in accordance with the relevant legislation, regulations and by-laws of the Corporation; the resources of the Corporation are managed efficiently and economically; and, the operations of the Corporation are carried out effectively.

Management is also responsible for the integrity and objectivity of the financial statements of the Corporation. The accompanying financial statements were prepared in accordance with Public Sector Accounting Standards. The financial information contained elsewhere in this annual report is consistent with that in the financial statements.

The Board of Trustees is responsible for ensuring that Management fulfils its responsibilities for financial reporting and internal control. The Board exercises its responsibilities through the Audit and Finance Committee, which includes a majority of members who are not officers of the Corporation. The Committee meets from time to time with Management, the Corporation's internal auditors and the Office of the Auditor General of Canada to review the manner in which these groups are performing their responsibilities and to discuss auditing, internal controls, and other relevant financial matters. The Board of Trustees has reviewed and approved the financial statements following the audit of the Office of the Auditor General of Canada.

The financial statements have been audited by the Auditor General of Canada. The report offers an independent opinion on the financial statements to the Minister of Canadian Heritage and Multiculturalism.

Margaret Beckel President and Chief Executive Officer

June 20, 2019 Ottawa, Canada

Phemiponani

Ikram Zouari, CPA, CGA Chief Financial Officer



Bureau du vérificateur général du Canada

# INDEPENDENT AUDITOR'S REPORT

To the Minister of Canadian Heritage

Office of the

of Canada

Auditor General

### **Report on the Audit of the Financial Statements**

Opinion

We have audited the financial statements of the Canadian Museum of Nature (the Corporation), which comprise the statement of financial position as at 31 March 2019, and the statement of operations, statement of changes in accumulated deficit and statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Corporation as at 31 March 2019, and the results of its operations and its cash flows for the year then ended in accordance with Canadian public sector accounting standards.

### Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report. We are independent of the Corporation in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

#### Other Information

Management is responsible for the other information. The other information comprises the information included in the Annual Report, but does not include the financial statements and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to



	- 3 -
	<ul> <li>Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.</li> </ul>
	<ul> <li>Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Corporation's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Corporation to cease to continue as a going concern.</li> </ul>
	<ul> <li>Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.</li> </ul>
We pla de	e communicate with those charged with governance regarding, among other matters, the inned scope and timing of the audit and significant audit findings, including any significant ficiencies in internal control that we identify during our audit.
Re	port on Compliance with Specified Authorities
Op	inion
In Ca Th Ao Ca Fir	conjunction with the audit of the financial statements, we have audited transactions of the nadian Museum of Nature coming to our notice for compliance with specified authorities. e specified authorities against which compliance was audited are Part X of the <i>Financial ministration Act</i> and regulations, the <i>Museums Act</i> and regulations, the by-laws of the nadian Museum of Nature, and the directive issued pursuant to section 89 of the pancial Administration Act.
In du sp we sta	our opinion, the transactions of the Canadian Museum of Nature that came to our notice ring the audit of the financial statements have complied, in all material respects, with the ecified authorities referred to above. Further, as required by the <i>Financial Administration Act</i> , report that, in our opinion, the accounting principles in Canadian public sector accounting indards have been applied on a basis consistent with that of the preceding year.
Re	sponsibilities of Management for Compliance with Specified Authorities
Ma au to	nagement is responsible for the Canadian Museum of Nature's compliance with the specified thorities named above, and for such internal control as management determines is necessary enable the Canadian Museum of Nature to comply with the specified authorities.

Auditor's Responsibilities for the Audit of Compliance with Specified Authorities

Our audit responsibilities include planning and performing procedures to provide an audit opinion and reporting on whether the transactions coming to our notice during the audit of the financial statements are in compliance with the specified authorities referred to above.

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Ston Met

Etienne Matte, CPA, CA Principal for the Interim Auditor General of Canada

Ottawa, Canada 20 June 2019

# **Statement of Financial Position**

	at March 31	at March 31
(in thousands of dollars)	2019	2018
Assets		
Current		
Cash and cash equivalents (Note 3)	18,475	15,076
Restricted cash (Note 3)	332	190
Restricted investments (Note 5)	1,516	1,500
Accounts receivable		
Trade	734	914
Government departments and agencies (Note 18)	183	250
Canadian Museum of Nature Foundation (Note 19)	91	-
Inventories	164	44
Prepaid expenses	1,164	1,221
	22,659	19,195
Collections (Note 4)	1	1
Employee advances (Note 24)	505	538
Restricted investments (Note 5)	1,500	1,500
Investments (Note 6)	968	1,000
Capital assets (Note 7)	175,802	183,446
	201,435	205,680
Liabilities	201,435	205,680
Liabilities Current	201,435	205,680
Liabilities Current Accounts payable and accrued liabilities	201,435	205,680
Liabilities Current Accounts payable and accrued liabilities Trade	<b>201,435</b> 4,724	<b>205,680</b> 5,478
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18)	<b>201,435</b> 4,724 632	<b>205,680</b> 5,478 971
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8)	<b>201,435</b> 4,724 632 1,065	<b>205,680</b> 5,478 971 964
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9)	<b>201,435</b> 4,724 632 1,065 7,233	<b>205,680</b> 5,478 971 964 4,908
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9) Employee future benefits (Note 10)	<b>201,435</b> 4,724 632 1,065 7,233 223	<b>205,680</b> 5,478 971 964 4,908 242
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9) Employee future benefits (Note 10)	<b>201,435</b> 4,724 632 1,065 7,233 223 13,877	<b>205,680</b> 5,478 971 964 4,908 242 12,563
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9) Employee future benefits (Note 10) Obligation under capital lease (Note 8)	201,435 4,724 632 1,065 7,233 223 13,877 23,943	205,680 5,478 971 964 4,908 242 12,563 25,008
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9) Employee future benefits (Note 10) Obligation under capital lease (Note 8) Deferred capital lease (Note 1)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522
Liabilities Current Accounts payable and accrued liabilities Trade Government departments and agencies (Note 18) Obligation under capital lease (Note 8) Deferred revenues, contributions and parliamentary appropriations (Note 9) Employee future benefits (Note 10) Obligation under capital lease (Note 8) Deferred capital funding (Note 11) Employee future benefits (Note 10)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741
Liabilities         Current         Accounts payable and accrued liabilities         Trade         Government departments and agencies (Note 18)         Obligation under capital lease (Note 8)         Deferred revenues, contributions and parliamentary appropriations (Note 9)         Employee future benefits (Note 10)         Obligation under capital lease (Note 8)         Deferred capital funding (Note 11)         Employee future benefits (Note 10)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889 203,588	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741 209,834
Liabilities         Current         Accounts payable and accrued liabilities         Trade         Government departments and agencies (Note 18)         Obligation under capital lease (Note 8)         Deferred revenues, contributions and parliamentary appropriations (Note 9)         Employee future benefits (Note 10)         Obligation under capital lease (Note 8)         Deferred capital funding (Note 11)         Employee future benefits (Note 10)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889 203,588	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741 209,834
Liabilities         Current         Accounts payable and accrued liabilities         Trade         Government departments and agencies (Note 18)         Obligation under capital lease (Note 8)         Deferred revenues, contributions and parliamentary appropriations (Note 9)         Employee future benefits (Note 10)         Obligation under capital lease (Note 8)         Deferred capital funding (Note 11)         Employee future benefits (Note 10)         Accumulated Deficit         Unrestricted	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889 203,588	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741 209,834
Liabilities         Current         Accounts payable and accrued liabilities         Trade         Government departments and agencies (Note 18)         Obligation under capital lease (Note 8)         Deferred revenues, contributions and parliamentary appropriations (Note 9)         Employee future benefits (Note 10)         Obligation under capital lease (Note 8)         Deferred capital funding (Note 11)         Employee future benefits (Note 10)         Accumulated Deficit         Unrestricted         Investment in capital assets (Note 13)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889 203,588	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741 209,834 7,894 (12,048)
Liabilities         Current         Accounts payable and accrued liabilities         Trade         Government departments and agencies (Note 18)         Obligation under capital lease (Note 8)         Deferred revenues, contributions and parliamentary appropriations (Note 9)         Employee future benefits (Note 10)         Obligation under capital lease (Note 8)         Deferred capital funding (Note 11)         Employee future benefits (Note 10)         Accumulated Deficit         Unrestricted         Investment in capital assets (Note 13)	201,435 4,724 632 1,065 7,233 223 13,877 23,943 162,879 2,889 203,588 9,932 (12,085) (2,153)	205,680 5,478 971 964 4,908 242 12,563 25,008 169,522 2,741 209,834 7,894 (12,048) (4,154)

The accompanying notes form an integral part of the financial statements.

Contractual Obligations, Contractual Rights and Contingencies (Notes 20, 21 and 22).

Approved by the Board of Trustees:

Judith A. LaRocque Chair of the Board of Trustees

Ron Calderoni, CPA, CA Chair of the Audit and Finance Committee

Recommended by Management:

Meg Beckel President and Chief Executive Officer

mitoriari

Ikram Zouari, CPA, CGA Chief Financial Officer

# Statement of Operations for the year ended March 31

(in thousands of dollars)	2019	2018
Revenue		
Admission and program fees (Note 15)	4,962	4,254
Ancillary operations (Note 16)	2,240	2,154
Contributions (Note 17)	2,762	2,382
Contributions from the Foundation (Notes 17 & 19)	91	-
Interest and Investment Income	405	262
Other	903	641
	11,363	9,693
Expenses (Note 25)		
Inspiration and engagement	11,697	10,569
Collections care and access	3,195	3,362
Research and discovery	4,546	3,949
Internal support services	5,949	5,320
Buildings and grounds	18,738	17,838
	44,125	41,038
Net result of operations before government funding	(32,762)	(31,345)
Parliamentary appropriations (Note 14)	34,763	33,547
Net result of operations	2,001	2,202

The accompanying notes form an integral part of the financial statements.

# Statement of Changes in Accumulated Deficit for the year ended March 31

(in thousands of dollars)	Unrestricted	Invested	2019	2018
		in capital		
		assets		
Accumulated deficit, beginning of year	7,894	(12,048)	(4,154)	(6,356)
Net result of operations	2,001	-	2,001	2,202
Net change in investment in capital assets (Note 13)	37	(37)	-	-
Accumulated deficit, end of year	9,932	(12,085)	(2,153)	(4,154)

The accompanying notes form an integral part of the financial statements.

A statement of remeasurement gains and losses has been excluded as there have been no remeasurement gains or losses.

# Statement of Cash Flows for the year ended March 31

(in thousands of dollars)	2019	2018
Operating activities		
Cash receipts - customers and donors	9,719	7,544
Cash receipts - parliamentary appropriations	26,900	27,460
Cash disbursements - employees	(15,672)	(13,385)
Cash disbursements - suppliers	(16,143)	(14,423)
Interest received	384	272
Interest paid	(2,536)	(2,627)
Cash provided by operating activities	2,652	4,841
Capital activities		
Acquisition of capital assets	(2,427)	(8,425)
Disposition of capital assets	-	11
Cash used in capital activities	(2,427)	(8,414)
Investment activities		
Acquisition of restricted investment	-	(3,000)
Acquisition of investment	-	(1,000)
Cash used in investing activities	-	(4,000)
Financing activities		
Obligation under capital lease	(964)	(873)
Parliamentary appropriations received for purchase of capital assets	4,280	6,072
Cash provided by financing activities	3,316	5,199
Increase (decrease) in cash and restricted cash	3,541	(2,374)
Cash and cash equivalents, beginning of year	15,076	14,190
Restricted cash, beginning of year	190	3,450
Cash and cash equivalents and restricted cash, end of year	18,807	15,266
Cash and cash equivalents, end of year	18,475	15,076
Restricted cash, end of year	332	190
Cash and cash equivalents and restricted cash, end of the year	18,807	15,266

The accompanying notes form an integral part of the financial statements.

# Notes to the Financial Statements for the year ended March 31, 2019

# 1. Authority and Mission

The Canadian Museum of Nature (the "Corporation") was established by the *Museums Act* on July 1, 1990. It is an agent Crown corporation named in Part I of Schedule III of the *Financial Administration Act* (FAA) and is not subject to the provisions of the *Income Tax Act*. The Corporation is classified as a government not-for-profit organization (GNPO).

The Corporation's mission is to increase, throughout Canada and internationally, interest in, knowledge of and appreciation and respect for the natural world by establishing, maintaining and developing for research and posterity a collection of natural history objects, with special but not exclusive reference to Canada, and by demonstrating the natural world, the knowledge derived from it and the understanding it represents.

Brief descriptions of the Corporation's activities are as follows:

### Inspiration and engagement

The Corporation develops and maintains exhibitions, programs, the nature.ca website, electronic and print publications, revenue generating activities and other activities to foster an understanding of, and respect for, nature.

### Collections care and access

The Corporation acquires, develops, preserves and makes accessible collections of natural history specimens, objects and information to meet the growing needs of the public and private sectors for research, education and informed decision-making about the natural world.

### Research and discovery

The Corporation studies the past and helps Canadians prepare for the future by conducting systematics and applied research, and by developing and maintaining networks and linkages with Canadian and international science communities.

### Internal support services

The Corporation develops and implements the policies, processes and an accountability structure to oversee the fulfilment of its mandate, including governance, strategic direction, corporate services, monitoring of corporate performance, and reporting to Parliament.

#### Buildings and grounds

The Corporation provides secure and functional facilities that meet all safety and building code requirements. Among these facilities is the renovated Victoria Memorial Museum Building that furthers the vision and mandate of the Corporation. On July 16, 2015, the Corporation was directed by the Governor General in Council (P.C. 2015-1105) pursuant to Section 89 of the *FAA* to align its travel, hospitality, conference and event expenditure policies, guidelines and practices with Treasury Board policies, directives and related instruments on travel, hospitality, conference and event expenditures in a manner that is consistent with its legal obligations, and to report on the implementation of this directive in the Corporation's Corporate Plan. Effective February 1, 2017, the Corporation has complied with this directive and has aligned its policies and practices to the Treasury Board policies, directives and related instruments for travel, hospitality and event expenditures.

# 2. Significant Accounting Policies

### A) Basis of Presentation

The financial statements have been prepared in accordance with Canadian Public Sector Accounting Standards (PSAS), and reflect the application of the Section 4200 series for GNPOs.

#### **B) Inter-Entity Transactions**

Inter-entity transactions are transactions between commonly controlled entities. Inter-entity transactions, other than restructuring transactions, are recorded on a gross basis and are measured at the carrying amount, except for the following:

i) Inter-entity transactions are measured at the exchange amount when undertaken on similar terms and conditions to those adopted if the entities were dealing at arm's length, or where costs provided are recovered.

ii) Goods or services received without charge between commonly controlled entities are unallocated costs not recovered by the recipient and not recorded by the Corporation. Services received by the Corporation without charge include audit services from the Office of the Auditor General of Canada and pension services from Public Services and Procurement Canada.

### **C)** Measurement Uncertainty

The preparation of financial statements in accordance with PSAS requires Management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses for the year. Employee future benefits, the estimated useful lives of capital assets, and the fair market value of specimens donated to the collections are the most significant items for which estimates are used. Actual results could differ significantly from those estimated. These estimates are reviewed annually and as adjustments become necessary, they are recorded in the financial statements in the fiscal year in which they become known.

### **D)** Inventories

Inventories are valued at the lower of cost and net realizable value. Inventory cost is determined by using the weighted average cost method, and net realizable value is based on retail price.

### E) Collections

The Corporation holds and preserves invaluable collections of natural history specimens for the benefit of Canadians, present and future. The collections are shown as an asset in the Statement of Financial Position at a nominal value of \$1,000 due to practical difficulties in determining a meaningful value for these assets. Specimens purchased for the collections are recorded as an expense in the year of acquisition.

### F) Capital Assets

- Capital assets are recorded at cost, including material, equipment and other expenses acquired for the purpose of the design and the development of permanent exhibitions.
- Assets recorded as capital leases are initially recorded at the present value of the minimum lease payments at the inception of the lease.
- Land and building owned by the Government of Canada and that are under the control of the Corporation are recorded at their estimated cost.

Asset	Useful life		
Victoria Memorial Museum Building	40 years		
Property under capital lease	7E vere		
Collection cabinets and compactors	ss years		
Furnishings and office equipment			
General equipment	10 years		
Permanent exhibitions	io years		
Research equipment			
Building improvements	5 to 25 years		
Leasehold improvements	5 years to end of lease term		
Computer equipment	3 years		

Amortization is calculated on the straight-line method using rates based on the estimated useful life of the assets, except for leasehold improvements which are amortized on a straight-line basis over the shorter of the term of the lease agreement and the asset's useful life.

When conditions indicate that an asset no longer contributes to the Corporation's ability to provide its services, the cost of the asset is written down to its residual value, if any.

### G) Employee Future Benefits

### i) Pension benefits

Substantially all the employees of the Corporation are covered by the public service pension plan (the "Plan"), a contributory defined benefit plan established through legislation and sponsored by the Government of Canada. Contributions are required by both the employees and the Corporation to cover current service costs. Pursuant to legislation currently in place, the Corporation has no legal or constructive obligation to pay further contributions with respect to any past service or funding deficiencies of the Plan. Consequently, contributions are recognized as an expense in the year when employees have rendered service and represent the total pension obligation of the Corporation.

## ii) Severance benefits

Employees are entitled to severance benefits up to March 31, 2012, as provided for under labor contracts and conditions of employment.

The severance benefit obligation for employees who retire or resign, that accrued up to March 31, 2012 and

remains unpaid, is measured using the projected benefit method. The actuarial gains (losses) are recognized on a systematic basis over the expected average remaining service life of the related employee group.

Other event driven termination benefits are recognized in the period when the event that obligates the Corporation occurs.

### iii) Sick leave benefits

The Corporation provides sick leave benefits for employees that accumulate but do not vest. The Corporation recognizes a liability and an expense for sick leave in the period in which employees render services in return for the benefits. The cost of the accrued benefit obligations related to sick leave entitlement earned by employees is actuarially determined using the projected benefit method prorated on service and Management's best estimate of inflation, discount rate, employee demographics and sick leave usage of active employees. Actuarial gains (losses) are recognized on a systematic basis over the remaining service life of active employees covered by these sick leave benefits.

### **H) Revenue Recognition**

### i) Admission and program fees, ancillary operations and other revenues

Revenues from admission and program fees, ancillary operations, and other revenues are recognized when persuasive evidence of an arrangement exists between the two parties, goods have been delivered or services have been provided to the customers, price is fixed and determinable and collection is reasonably assured. The Corporation also records deferred revenue when amounts are received in advance of providing goods and services.

#### ii) Contributions

Contributions are comprised of donations received from individuals, foundations and corporations. The Corporation applies the deferral method to recognize its contributions as applicable for not-for-profit organizations.

Unrestricted contributions are recognized as revenue in the Statement of Operations when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Contributions externally restricted for specific projects or expenses are deferred in the Statement of Financial Position and recognized as revenue in the Statement of Operations in the fiscal year in which related obligations are fulfilled and the related expenses are incurred.

Investment income related to restricted contributions is first recorded in the Statement of Financial Position as deferred revenues and then recognized as revenue in the Statement of Operations in the fiscal year in which the related expenses are incurred.

### iii) In-kind sponsorships and specimen donations

In-kind sponsorships involve obtaining non-financial support for a project, activity or product in return for substantial public relations benefit. An in-kind sponsorship is recognized if the contributed good or service is used in the normal course of operations and would otherwise have been purchased, and once the exchange has taken place. In-kind sponsorships are recorded at their fair market value as contributions with an offset to the related expense in the Statement of Operations.

Specimens donated to the collections are recorded as contributions with an offsetting expense to collections care and access at fair market value, when the following three criteria are met: i) a fair market value has been established for the specimen; ii) the acquisition has been approved; and iii) transfer of the specimen's title to the Corporation has taken place.

### iv) Parliamentary appropriations

The Government of Canada provides financing to the Corporation through parliamentary appropriations.

The parliamentary appropriations for operating expenditures are recognized as revenue in the fiscal years for which they are approved.

The parliamentary appropriations for the purchase of depreciable capital assets are recorded as deferred parliamentary appropriations in the Statement of Financial Position. When the depreciable capital assets are purchased, the portion of the parliamentary appropriations used for acquisition of these capital assets is then reclassified as deferred capital funding in the Statement of Financial Position and recognized as revenue in the Statement of Operations on the same basis as the amortization of the corresponding capital assets.

Parliamentary appropriations for specific expenses are recorded as deferred parliamentary appropriations in the Statement of Financial Position and recognized as revenue in the Statement of Operations in the fiscal year in which the related expenses are incurred.

The Corporation is required to report on the spending of appropriations in its annual report.

### v) Restricted investments

Spend-down amounts and investment income distributed from the fund for the purchase of depreciable capital assets are recorded as deferred revenues in the Statement of Financial Position. When the depreciable capital assets are purchased, the portion of the revenues used for acquisition of these capital assets is then reclassified as deferred capital funding in the Statement of Financial Position and recognized as revenue in the Statement of Operations on the same basis as the amortization of the corresponding capital assets. Spend-down amounts and investment income distributed from the fund for specific expenses are deferred in the Statement of Financial Position and recognized as revenue in the Statement of Financial Position and recognized as revenue in the Statement of Operations in the fiscal year in which related obligations are fulfilled and the related expenses are incurred.

#### vi) Investments

Investment income distributed from the term fund is recognized as revenue in the Statement of Operations.

### I) Volunteer Services

Volunteers contribute a significant number of hours every year. Due to the difficulty of determining their fair value, those contributed services are not recognized in the financial statements.

#### J) Financial Instruments

The Corporation's financial assets and financials liabilities are measured at cost or amortized cost. Financial assets include cash and cash equivalents, restricted cash, restricted investments, investments and accounts receivable while financial liabilities include accounts payable and accrued liabilities.

Financial instruments are tested annually for impairment at the financial statements date, and any permanent impairment is reported in the Statement of Operations.

Transaction costs are added to the carrying value of items in the cost when they are initially recognized.

### **K)** Restricted investments

Restricted Investments within the Ottawa Community Foundation (OCF) as spend-down fund are recorded at amortized cost on the Statement of Financial Position, Spend-down amounts and investment income distributed from the fund for the purchase of depreciable capital assets are recorded as deferred revenues in the Statement of Financial Position.

Service fees charged by the OCF for the management of the fund are recorded as expenses in the Statement of Operations in the year incurred.

### L) Investments

Investments within OCF as 10-year term fund is recorded at amortized cost in the Statement of Financial Position.

Service fees charged by the OCF for the management of the fund are recorded as expenses in the Statement of Operations in the year incurred.

### **M)** Allocation of Expenses

The Corporation does not apply the method of allocating costs for the purpose of distributing expenses between functions.

# 3. Cash and Cash Equivalents and Restricted Cash

Cash and Cash equivalents and restricted cash consist of balances with banks.

Restricted cash includes deferred contributions. Restricted cash accounts are managed in accordance with the donor's wishes and are invested in accordance with the Investment Policy of the Corporation.

As per the Corporation's Investment Policy, operating funds are invested in short-term money market instruments that are rated AA or better and guaranteed by the Government of Canada, a provincial government or the Canadian Imperial Bank of Commerce (CIBC). The investment vehicles consist of banker's acceptances, promissory notes and term deposits. Exceptions to the investment policy require the Board of Trustees approval.

During this fiscal year, the Corporation did not have investment vehicles and did not earn interest on investment vehicles (2017-18 - \$22,000), the entire amount being held in cash.

The Corporation is no longer holding funds in trust on behalf of the Alliance of Natural History Museums of Canada. (2017-18 - \$66,486).

# 4. Collections

The entire Museum's collections including library and archives consist of over 14.6 million specimens and objects. The natural history collections consist of 3.37 million specimen lots, and grew by 21,305 specimen lots this fiscal year (2017-18 -100,960). These are exceptional scientific resources that are available nationally and internationally for research, exhibits and education.

The Corporation maintains multiple collection groupings, with the major collections as noted below divided into four discipline-related groups:

- the Earth Sciences collection (minerals, rocks, gems, fossils),
- the Vertebrates collection (mammals, birds, fish, amphibians and reptiles),
- the Invertebrates collection (molluscs, insects, crustaceans, parasites, annelids), and
- the Botany collection (algae, vascular plants, bryophytes, lichens).

The collections are managed and cared for through a collection risk assessment process that seeks to preserve the value of collections and uses a rational process for the establishment of priorities for their care. The Corporation has incurred \$2.8 million in 2018-19 (2017-18 – \$2.6 million) for the management, protection and conservation of its collections.

During the year, the Corporation purchased \$33,115 (2017-18 – \$22,595) and acquired through donation \$118,040 (2017-18 – \$477,528), of specimens for the collections.

There were no sales of specimens related to the collections during the year (2017-18 - nil).

# 5. Restricted Investments

On February 23, 2017 the Corporation received a large philanthropic gift of \$4 million from the Ross Beaty family in Vancouver, which will enhance the Museum's national research and collections efforts focused on species discovery. Three million of the \$4 million gift is restricted to support the creation of a national cryogenic facility and the digitization of the Corporation's collections.

The Corporation established a \$3 million spend-down fund within the OCF in order to maximize earnings while meeting the Museum's needs. With a spend-down fund, the capital is invested in the OCF's investment pool, with the intention of paying out the capital in agreed upon intervals, until the fund is fully depleted. This option allows the spend-down schedule to be determined by the Museum, while also providing flexibility for its own needs, with similar pay out and approach as for endowed funds. The OCF investment pool is mainly comprised of cash and short-term deposits, bonds and debentures and equities. The \$3 million was transferred to the OCF on April 26, 2017.

The fair market value of the spend-down fund amounts to \$3,169,719 according to the OCF's March 31, 2019 investment statement.

The investment income on spend-down fund during the year is \$ 71,638 (2017-18 - \$78,633). Service fees for the management of the fund expensed during the year is \$ 55,153 (2017-18 - \$33,242).

# 6. Investments

On October 4, 2017 the Corporation established a \$1 million 10-year term fund within the OCF in order to maximize earnings and create the Arctic Post-Doctoral Fellowship for Arctic Knowledge and Exploration. The principal amount is invested in the OCF's investment pool. In the event that the Corporation decides not to maintain the Fellowship, the fund shall be transferred back to the Corporation.

The fair market value of the term fund amounts to \$1,004,457 according to the OCF's March 31, 2019 investment statement.

The investment income on term fund during the year is \$23,299 (2017-18 - \$3,655). Service fees for the management of the fund expensed during the year is \$13,299 (2017-18 - \$2,508).

# 7. Capital Assets

			March 31			March 31
(in thousands of dollars)			2019			2018
	Cost	Accumulated	Net book	Cost	Accumulated	Net book
		amortization	value		amortization	value
Land	627	-	627	627	-	627
Victoria Memorial Museum	204,783	58,929	145,854	204,783	53,925	150,858
Building						
Property under capital lease	35,040	22,805	12,235	35,040	21,814	13,226
Permanent exhibitions	10,122	4,228	5,894	10,011	3,217	6,794
Leasehold improvements	10,995	6,984	4,011	10,522	6,632	3,890
Research equipment	4,805	2,470	2,335	3,596	2,157	1,439
Collection cabinets and	3,840	2,401	1,439	3,840	2,290	1,550
compactors						
Computer equipment	4,619	3,491	1,128	3,283	2,434	849
Building improvements	4,099	3,089	1,010	4,056	2,560	1,496
General equipment	1,056	337	719	574	235	339
Furnishings and office equipment	1,530	1,365	165	1,519	1,299	220
Work in progress - Assets	385	-	385	2,158	-	2,158
	281,901	106,099	175,802	280,009	96,563	183,446

The amortization expense for the year amounts to \$9,536,000 (2017-18 - \$9,002,000). During the year, the Corporation did not sell or retire assets. During the prior year, the Corporation sold two assets in the category of research equipment for \$11,000 with a recorded cost of \$150,733 and accumulated amortization of \$140,894 resulting in a gain of \$1,161.
## 8. Obligation Under Capital Lease

The Natural Heritage Campus houses the Corporation's natural history collections and administrative functions, on the Corporation's site in Gatineau, Quebec. The Corporation is acquiring the building through a lease purchase agreement with a term of 35 years. It is committed to pay rent under all circumstances and in the event of termination of the lease, at the Corporation's option or otherwise, pay sufficient rent to repay all financing on the building. Management intends to completely discharge its obligation under the lease and obtain free title to the building in 2031, after the Corporation uses its right to purchase the building for ten dollars.

Future minimum lease payments in aggregate, under the financing obligation are as follows:

(in thousands of dollars)	March 31 2019	March 31 2018
Total minimum future payments (1	43,750	47,250
Deduct: Imputed interest	(18,742)	(21,278)
Present value of financing obligations (2	25,008	25,972
Current portion	1,065	964
Long term portion	23,943	25,008
	25,008	25,972

1) The amounts payable under the capital lease are based on the fixed interest rate of 9.88%, for a period of 35 years, established at the time of signing the lease.

2) The present value of the capital lease obligation based on a current market interest rate of 8.75% is estimated at \$27 million.

Future minimum lease payments, by year under the financing obligation are as follows:

(in thousands of dollars)	2020	2021	2022	2023	2024	thereafter
Future minimum payments	3,500	3,500	3,500	3,500	3,500	26,250

# 9. Deferred Revenues, Contributions and Parliamentary Appropriations

Deferred revenues, contributions and parliamentary appropriations were as follows:

(in thousands of dollars)	March 31 2019	March 31 2018
Deferred contributions from non-government sources	1,979	3,028
Deferred parliamentary appropriations	4,715	1,353
Total deferred contributions and parliamentary appropriations	6,694	4,381
Deferred revenues - goods and services	539	527
	7,233	4,908

Changes in the deferred revenues, contributions and parliamentary appropriations were as follows:

(in thousands of dollars)	March 31 2019	March 31 2018
Balance, beginning of year	4,908	5,793
Add:		
Restricted contributions received	400	215
Restricted parliamentary appropriations received	4,280	6,072
Deferred revenue and contribution for the provision of goods and	1,141	1076
services		
	5,821	7,363
Less:		
Restricted contributions recognized	(1,450)	(459)
Restricted parliamentary appropriations spent	(917)	(6,960)
Deferred revenue for the provision of goods and services recognized	(1,129)	(829)
	(3,496)	(8,248)
Balance, end of year	7,233	4,908

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## 10. Employee Future Benefits

#### i) Pension benefits

The Corporation and all eligible employees contribute to the public service pension plan (the "Plan"). The Plan provides benefits based on years of services and average earnings at retirement. The benefits are fully indexed to the increase in the Consumer Price Index. The Corporation's and employees' contributions to the Plan during the year were as follows:

(in thousands of dollars)	2019	2018
Corporation's contributions	1,187	1,121
Employees' contributions	1,198	1,123

The President of the Treasury Board of Canada sets the required employer contributions based on a multiple of the employees' required contribution. The required employer contribution rate for 2019 was dependent on the employee's employment start date. For employment start dates before January 1, 2013, the Corporation's contribution rate effective at year end was 1.01 times (2017-18 – 1.01) the employee's contribution; and for employment start dates after December 31, 2012, the Corporation's contribution rate effective at year end was 1.00 times (2017-18 – 1.01) the employee's contribution rate effective at year end was 1.00 times (2017-18 – 1.01) the employee's contribution rate effective at year end was 1.00 times (2017-18 – 1.00) the employee's contribution.

The Government of Canada holds a statutory obligation for the payment of benefits relating to the Plan. Pension benefits generally accrue up to a maximum period of 35 years at an annual rate of 2 percent of pensionable service times the average of the best five consecutive years of earnings. The benefits are coordinated with Canada/ Quebec Pension Plan benefits and they are indexed to inflation.

#### ii) Severance benefits

Since April 1, 2012, employees no longer accumulate severance benefits payable upon resignation or retirement. Employees were given the option to be paid the full or partial value of benefits earned at that date or to defer this payment until their departure from public service. The severance benefit liability represents the portion that employees chose to defer. This benefit plan is unfunded and thus has no assets, resulting in a plan deficit equal to the accrued benefit obligation. Benefits will be paid from future appropriations. The estimated average remaining service period of the employees is 8 years. The actuarial loss of severance benefits is amortized over 8 years.

Information about the Plan, evaluated by an actuary as at March 31, 2019, is as follows:

(in thousands of dollars)	2019	2018
Accrued severance benefits obligation, at the beginning of year	631	831
Interest cost on benefit obligation	13	17
Actuarial loss on obligation	1	1
Severance benefits paid during the year	(7)	(218)
Accrued severance benefits obligation, end of year	638	631
Short term portion	97	107
Long term portion	541	524
	638	631

Assumptions in the actuarial evaluation include a discount rate of 1.69% (2017-18 – 2.10%), as well as an inflation rate of 2.00% (2017-18 – 1.80%). Included in the severance benefits obligation is a non-amortized actuarial loss of \$4,545 (2017-18- \$6,641).

#### iii) Sick leave benefits

The Corporation has recorded an obligation related to sick leave benefits for its employees. The estimated average remaining service period of the employees is 14 years. The Corporation amortizes the actuarial gain of sick leave over the 14 years.

Information on these benefits, evaluated by an actuary as at March 31, 2019, is as follows:

(in thousands of dollars)	2019	2018
Sick leave obligations, at the beginning of year	2,352	2,251
Current service cost	166	156
Interest cost on benefit obligation	33	35
Actuarial gain on obligation	(63)	(62)
Sick leave used during the year	(14)	(28)
Sick leave benefits, end of year	2,474	2,352
Short term portion	126	135
Long term portion	2,348	2,217
	2,474	2,352

Assumptions in the actuarial evaluation include a discount rate of 1.78% (2017-18 – 2.14%) as well as an inflation rate of 2.00% (2017-18 – 1.80%). Included in the sick leave obligation is a non-amortized actuarial gain of \$1,252,658 (2017-18 – \$877,488).

#### 11. Deferred Capital Funding

Deferred capital funding represents the portion of the parliamentary appropriations and contributions from nongovernment sources used to purchase depreciable capital assets.

The deferred capital funding consists of the following:

(in thousands of dollars)	March 31 2019	March 31 2018
Used for acquisitions:		
Deferred capital contributions from non-government sources	2,361	1,994
Deferred capital funding through parliamentary appropriations	160,518	167,528
	162,879	169,522

Changes in the deferred capital funding balance are as follows:

(in thousands of dollars)	March 31 2019	March 31 2018
Balance, beginning of year	169,522	169,324
Add: Capital asset acquisitions	1,892	8,151
Less: Capital asset disposals	-	(1)
	1,892	8,152
Less amounts recognized as revenue:		
Contributions	(499)	(412)
Parliamentary appropriations	(8,036)	(7,542)
	(8,535)	(7,954)
Balance, end of year	162,879	169,522

### 12. Endowment Restrictions

An endowment fund for Systematic Entomology was received from Anne and Henry Howden in the principal amount of \$305,000, as well as a significant entomological collection. The endowment was established to enable professional studies and research of entomological collections for the Corporation. The principal amount was transferred to the OCF in 2014. In the event that the Corporation decides not to maintain entomological collections, the Systematic Entomology Endowment Fund shall be transferred, along with any entomological collections, to the Royal Ontario Museum.

On February 23, 2017 the Corporation received a large philanthropic gift of \$4 million from the Ross Beaty family in Vancouver, which will enhance the Museum's national research and collections efforts focused on species discovery. One million of the \$4 million gift was endowed through the OCF to create the Beaty Post-Doctoral Fellowship for Species Discovery, which will fund post-doctoral scientists to investigate species at risk. For the remaining \$3 million, the Corporation established a spend-down fund within the OCF as detailed in Note 5

The net investment income earned on resources held for endowment during the year is \$55,679 (2017-18 - \$55,679). The total accumulated amount of deferred investment income earned is \$85,253 (2017-18 - \$60,121). During the year, \$30,547 was recognized in the Statement of Operations (2017-18 - \$57,942).

#### 13. Investment in Capital Assets

The investment in capital assets consists of the following:

(in thousands of dollars)	March 31 2019	March 31 2018
Capital assets	175,802	183,446
Less amounts financed by:		
Capital lease	(25,008)	(25,972)
Deferred capital funding	(162,879)	(169,522)
	(12,085)	(12,048)

The net change in investment in capital assets is calculated as follows:

(in thousands of dollars)	March 31 2019	March 31 2018
Capital asset additions	1,892	8,151
Less: capital asset disposals	-	(10)
Add: repayment of obligation under capital lease	964	873
Less: capital assets financed with deferred capital funding	(1,892)	(8,151)
Capital assets purchased with the Corporation's funds	964	863
Amortization of deferred capital funding	8,535	7,954
Amortization of capital assets	(9,536)	(9,002)
Net change in investment in capital assets	(37)	(185)

# 14. Parliamentary Appropriations

To achieve its mission, the Corporation relies on government funding. This government funding is comprised as follows:

(in thousands of dollars)	2019	2018
Appropriations received and receivable:		
Operating and capital budgets	31,081	33,051
Supplementary budgets	34	218
	31,115	33,269
Portion of parliamentary appropriations received in current year deferred for future capital projects	(4,715)	(1,353)
Previous year's appropriations used in current period to complete specific projects	1,353	2,240
Appropriations used to purchase depreciable capital assets	(1,026)	(8,151)
Amortization of deferred capital funding	8,036	7,542
Appropriations recognized during the year	34,763	33,547

## **15. Admission and Program Fees**

Admission and program fees are comprised as follows:

(in thousands of dollars)	2019	2018
Admission fees - general	3,010	3,233
Admission fees - temporary exhibitions	748	211
Memberships	525	247
Programs	679	563
	4,962	4,254

# **16. Ancillary Operations**

Ancillary operations are comprised as follows:

(in thousands of dollars)	2019	2018
Parking	906	984
Rental of facilities	707	930
Boutique revenues	598	141
Cafeteria leases	29	99
	2,240	2,154

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## 17. Contributions

Contributions are comprised as follows:

(in thousands of dollars)	2019	2018
Cash contributions and sponsorships	2,134	1,400
Cash Contributions from the Foundation	91	-
In-kind sponsorships	510	504
Specimen donations	118	478
	2,853	2,382

# **18. Related Party Transactions**

The Corporation is related to all Government of Canada departments, agencies and Crown corporations. In addition to those related party transactions disclosed in Note 19, the Corporation conducted transactions with these entities in the normal course of operations, under the same terms and conditions that applied to outside parties and recorded at the exchange amount.

(in thousands of dollars)	2019	2018
Revenues from Government of Canada related parties:		
Ancillary operations	4	32
Other	72	80
	76	112

(in thousands of dollars)	2019	2018
Expenses with Government of Canada related parties:		
Personnel costs	1,518	1,438
Real property taxes	1,217	1,108
Professional and special services	162	114
Information management infrastructure and systems	14	12
Marketing and communications	10	3
Freight and cartage	7	8
Repairs and maintenance	1	1
Operation and maintenance of buildings	-	2
	2,929	2,686

The following balances with Government of Canada related parties were outstanding at the end of the year:

(in thousands of dollars)	2019	2018
Due from related parties	183	250
Due to related parties	632	971

Services received by the Corporation without charge include audit services from the Office of the Auditor General of Canada and pension services from Public Services and Procurement Canada as indicated in Note 2B.

The Corporation's related parties also include its key management personnel which consist of 5 members of its senior management team and 10 members of its Board of Trustees, and their immediate family members. Transactions with these individuals, excluding compensation arrangements, include contributions of \$50,875 (2017-18 - \$74,486), recorded at exchange amounts.

#### 19. Canadian Museum of Nature Foundation

The Canadian Museum of Nature Foundation (the "Foundation") was incorporated under the *Canada Not-forprofit Corporations Act* on November 29, 2016. The purpose of the Foundation is to receive or maintain a fund or funds and to transfer from time to time all or part therefore or the income therefrom to the Corporation. This is a separate and distinct legal entity, non-share Capital Corporation. On September 28, 2017 the Foundation received its registered charitable status under the *Income Tax Act*.

The Foundation's role is to design and implement a strategy and development plan that will raise as much financial support as possible to advance the mandate and vision of the Corporation with a focus on major donations. In 2018-19 the Foundation raised \$70,548 (2017-18- \$ 20,000) and made a contribution to the Corporation of \$90,542 (2017-18 - nil).

The Corporation and the Foundation are related by virtue of the Corporation's economic interest in the Foundation. The Corporation is considered to have significant influence based on the Foundation's purpose being integrated with that of the Corporation, the Corporation's involvement in the Foundation strategic planning, the development of the Foundation's fundraising priorities, and the significant amount of funds to be raised by the Foundation for the benefit of the Corporation.

In 2018 -19, direct expenses related to the setting up of the Foundation absorbed by the Corporation and recorded directly in the Corporation's financial statements were in the amount of \$16,736 (2017-18 - \$3,933).

The Corporation does not allocate the costs relating to building and equipment maintenance, administration services, and information technology to other functions of the Corporation and to the Foundation. These administrative support costs provided without charge to the Foundation are estimated at \$20,000 (2017-18 - \$3,000). The financial statements of the Foundation have not been consolidated in the Corporation's financial statements and are available upon request.

As at March 31, 2019, the amount due from the Foundation to the Corporation was \$90,542 (2017-18- nil).

## 20. Contractual Obligations

As of March 31, 2019, the Corporation has contracts for the operation and maintenance of the building, professional and special services, information management infrastructure and systems, marketing and communications, and exhibitions with a remaining value of \$7,044,000 (2017-18 – \$5,457,000). Estimated future minimum payments under these contracts for the next 5 years are as follows:

(in thousands of dollars)	2020	2021	2022	2023	2024
Future minimum payments	5,029	1,341	292	244	138

## 21. Contractual Rights

As of March 31, 2019, the Corporation has various revenue contracts including rentals of public spaces, leases of office and storage space, collection management and care services, food services agreements and travelling exhibition fees.

Major contractual rights that will generate revenues in future years and that can be reasonably estimated are summarized in the table below. As of March 31, 2019, the estimated future minimum receipts under these contracts amounts to \$1,089,000 (2017-18 - \$1,494,000). The estimated future minimum receipts under these contracts for the next 5 years are as follows:

(in thousands of dollars)	2020	2021	2022	2023	2024
Lease space at the National Heritage	145	146	148	-	-
Campus					
Collection management and care	264	269	117	-	-
	409	415	265	-	-

## 22. Contingencies

In the normal course of its operations, the Corporation becomes involved in various claims or legal actions. Some of these potential liabilities may become actual liabilities when one or more future events occur or fail to occur. To the extent that the future event is likely to occur or fail to occur, and a reasonable estimate of the loss can be made, an estimated liability and an expense are recorded in the Corporation's financial statements.

As of March 31, 2019, and March 31, 2018, there were no claims against the Corporation.

## 23. Financial Instruments

#### **Financial Risk Management**

The Corporation has exposure to the following risks from its use of financial instruments: credit risk, market risk and liquidity risk.

The Corporation uses an enterprise risk management approach to manage risks proactively and prudently. The Corporation's Board of Trustees and Management ensure that an accountability regime, a governance structure, and systems are in place to appropriately manage risks through the systematic consideration of risk at the functional level. Management, in a timely and proactive manner will identify, assess, mitigate and monitor risks that may prevent the Corporation from achieving its objectives and priorities.

#### i) Credit risk

The credit risk is one party to a financial instrument that causes a financial loss for the other party by failing to meet its financial commitments. Such risks arise principally from certain financial assets held by the Corporation consisting of accounts receivable, cash and cash equivalents (unrestricted and restricted) and investments (unrestricted and restricted).

The maximum exposure to credit risk of the Corporation at March 31, 2019 is the carrying value of these assets.

#### Accounts receivable

The Corporation is exposed to credit risk, through its normal commercial activities, on its accounts receivable of \$1,008,334 (2017-18 - \$1,164,040). Accounts receivables from Government of Canada departments, agencies and Crown corporations comprise 27% (2017-18 -22%) of the Corporation's accounts receivable, and no allowance has been provided for these amounts. In order to reduce this risk, the Corporation closely monitors the issuance of credit and collection of commercial clients, and the concentration of this risk is also minimized because the Corporation has a large and diverse customer base.

As at March 31, 2019, \$108,378 were past due (2017-18 - \$69,730), an allowance of \$1,365 has been provided (2017-18- nil). The allowance for doubtful accounts is based on an account by account analysis that considers the aging of the account and the current creditworthiness of the customer. Accounts which have exceeded 120 days are considered past due.

#### Cash, investments, and restricted cash and investments

The Corporation manages its credit risk surrounding cash, investments, and restricted cash and investments by dealing solely with reputable banks and organizations, and utilizing an investment policy and risk management framework to guide their investment decisions. During 2017-18, the Corporation invested \$3 million contributions and \$1 million cash to earn investment income with the objective to maintaining safety of principal and maximizing earnings while meeting the Museum's needs. The Corporation monitors the performance and the status of its investments on a quarterly basis. In a year of negative investment performance, the Corporation may decide to hold the distribution of the capital and investment income of its funds to a further year with a positive return in order to mitigate credit risk.

#### ii) Liquidity risk

Liquidity risk is the potential inability to meet financial obligations as they become due. The Corporation manages this risk by maintaining detailed cash forecasts, as well as long-term operating and strategic plans. The management of liquidity requires a constant monitoring of expected cash inflows and outflows which is achieved through a forecast of the Corporation's liquidity position, to ensure adequacy and efficient use of cash resources. The Corporation's financial liabilities are due within three months of the date of the Statement of Financial Position.

## iii) Market risk

Market risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market prices, whether those changes are caused by factors specific to the individual financial instrument of its issuer, or factors affecting all similar financial instruments traded in the market. The Corporation is exposed to market risk on its investments and restricted investments. The Corporation monitors closely the performance of its investments and restricted investments to ensure market risks are being mitigated.

In a year of negative investment performance, the Corporation may decide to hold the distribution of the capital and investment income of its funds to a further year with a positive return. Market risks comprise three types of risk: Currency risk, Interest rate risk, and Price risk.

#### Currency risk

Currency risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in foreign exchange rates. The Corporation is exposed to currency risk on its investments and restricted investments. Currency risk is managed by hedging the portfolio with forward currency contracts or through portfolio diversification which acts as a hedge on its own. The Corporation's currency risk is not considered significant.

#### Interest rate risk

Interest rate risk is the risk that the fair value of future cash flows of a fixed income investments will fluctuate because of changes in market interest rates. The Corporation is exposed to interest risk on its investments and restricted investments. The Corporation's interest rate risk is not considered significant.

#### Price risk

Price risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. The Corporation is exposed to price risk on its investments and restricted investments. Price risk is managed through portfolio diversification. The Corporation's price risk is not considered significant.

## 24. Employee advances

On January 10, 2018, the Corporation implemented payment in arrears, an industry-standard payroll practice. All employees who were paid on a bi-weekly basis under the previous payroll system, received a one-time transition payment in the same manner as their regular pay. The transition payment ensured that no employee would experience financial hardship because of the transition to payment in arrears. This one-time payment was equal to an employee regular pay received on December 28, 2017 and recorded as employee advances on the Statement of Financial Position. The Corporation will recover this payment when the employee leaves. The recovered amount will include all applicable deductions.

As at March 31, 2019, employee advances due to the transition to payment in arrears amount to \$504,510 and no allowance has been provided for this amount (2017-18 - \$538,000).

## 25. Summary of Expenses by Object

(in thousands of dollars)	2019	2018
Personnel costs	15,239	14,611
Amortization of capital assets	9,536	9,002
Operation and maintenance of buildings	4,481	4,158
Professional and special services	4,121	3,438
Interest on capital lease obligation	2,536	2,627
Real property taxes	2,392	2,277
Information management infrastructure and systems	1,503	1,633
Marketing and communications	1,241	1,184
Exhibitions	1,229	420
Repairs and maintenance	683	635
Travel	510	374
Cost of goods sold - natureBOUTIQUE	294	19
Objects for collections	151	500
Freight and cartage	60	61
Other	149	99
	44,125	41,038





# Canadian Museum of Nature nature.ca

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