



# THE BIOTA OF CANADA: A CENSUS OF CANADIAN SPECIES

**A new Biological Survey of Canada initiative**  
*Biota: the sum total of all species within a geographical area*

## The diversity of Canadian species

The terrestrial, aquatic and marine ecosystems of Canada are collectively home to an amazing diversity of life. In 1995, it was reported that about 71,000 species, spanning all 6 Kingdoms of life, were known from Canada and that an additional 68,000 species are likely to occur (Mosquin et al. 1995). The species richness and distribution of some groups such as plants and vertebrates are well known. However, many groups of organisms, especially those that are hyper-diverse and contain largely species of small physical size (e.g., invertebrate animals, bacteria, fungi), are much more poorly known owing to inadequacy of surveys and the lack of means to identify species. For some groups of organisms, recent lists of species occur and are readily accessible, but for many groups information about species present in Canada is highly scattered and poorly accessible. Recent initiatives such as the Canadian Registry of Marine Species (CaRMS) ([www.marinespecies.org/carms/](http://www.marinespecies.org/carms/)), Bio-Blitzes organized by the Biological Survey of Canada

## Importance of species to Canadians

Species have value and importance to humanity. Canada's natural ecosystems are the result of species, the functions they perform, and the physical structures they create. Human health, security and prosperity are intimately dependent on (or impacted by) biota and the economic, ecological and social bounty that species provide. Species provide us with oxygen, food, clean water, clothing, shelter, medicines, recreation, intellectual and emotional stimulation and spiritual enrichment. Parasitic and disease-causing species have negative impacts on human health. Consequently, knowledge about the biota among which humans live, interact with and depend upon is of importance to Canadian society, and improvement of such knowledge has been the subject of considerable investment of time, effort, ingenuity, and finances since the arrival of the human species on the territory that we now call Canada. Consequently, we know a lot about the native and non-native (=introduced) biota of Canada in terms of composition,

### Taxonomy: A classification and filing system for biodiversity

Information about Canada's biota is accessed and organized through a 'filing system' based on the scientific names of species. The determination of species and the assignment of names are outcomes of the science of taxonomy. Simply, taxonomic science is the study of variation within biota, and leads to decisions about what constitutes a species, where it best fits relationally to other species (=classification), and the assignment of a binomial Latin name (=nomenclature) that facilitates communication and storage/retrieval of information about the species. Tens of thousands of named species are known from Canada and additional tens of thousands await discovery, particularly invertebrates, fungi and micro-organisms.

([www.biology.ualberta.ca/bsc/english/bioblitz.htm](http://www.biology.ualberta.ca/bsc/english/bioblitz.htm)), and the Canadian Journal of Arthropod Identification ([www.biology.ualberta.ca/bsc/ejournal/ejournal.html](http://www.biology.ualberta.ca/bsc/ejournal/ejournal.html)) are greatly enhancing our understanding of the diversity of Canadian species and our capacity to identify them. The science of taxonomy (see text box) provides the fundamental underpinnings to the recognition, description and classification of species, and hence to biodiversity science.

distribution and functional roles. Nonetheless, there are still enormous information gaps, particularly concerning hyper-diverse groups that are relatively poorly studied, yet these groups likely play a much more important role in human health and prosperity than some other better known groups. Clearly, much remains to be discovered about most of Canada's biota. *At this time we do not even have an inventory of which species live in Canada.*



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## What is a species inventory?

In its basic form, an inventory is a species list for a geopolitical region, ecological unit (e.g., habitat) or management unit (e.g., park). However, the production of a species list requires that species names are current, are based on current taxonomic acceptance, and are organized within a classification system that is current and widely accepted. An inventory typically will highlight the currently accepted species names, but underlying is a much longer list (catalogue) of synonyms that must be tied to the senior synonym (i.e., the currently accepted name by which the species is now known) to facilitate complete compilation of historical information which has frequently been published, organized or filed under junior synonyms.

## Why do we need a species inventory for Canada?

The fact that the well-being of Canadians is intimately tied to other species means that there is no comfort or wisdom in remaining blissfully ignorant about the biological entities upon which we depend. Our capacity to respond to and predict societal emergencies involving other species (e.g., pests, diseases, resource depletion) requires detailed understanding of how we interact with those species and the roles that they play in the ecosystems on which we depend. As well, biodiversity is good for the Canadian economy (Canadian Business and Biodiversity Council). Canadian capacity to recognize and pursue novel innovative products and services generated from other species is directly proportional to the richness of our knowledge about other species. Canada's capacity to meet international obligations (e.g., Convention on Biological Diversity (CBD) Aichi Targets) and fully implement the Canadian Biodiversity Strategy (CBS) depends on understanding the diversity of organisms and their ecological roles. Finally, the matrix of species which surrounds us is dynamic, changing in ways that are neutral, beneficial and detrimental to Canadians. Clearly, Canadians need to be knowledgeable concerning the diverse species webs of which we are an integral part.

Achieving an understanding of the Canadian 'species-landscape' that is sufficient to ensure the safety, security, and prosperity of Canadians and the well-being of the species on which we depend is a long-term and step-wise process. Detailed biological study of all species in Canada is likely not achievable or affordable in the lifetimes of current Canadians, and the justifications for such investments still require debate and rationalization in light of other societal needs. However, a basic inventory of species that occur in Canada, including 'vital statistic' information about their known distribution, functional roles, habitat affinity, relative commonness, and population trends is an achievable goal that is foundational to meet the higher level goals established in the CBD and CBS.

Development of a census of life in Canada does not require starting from scratch. A large amount of such information already exists but is highly scattered. As well there are a wide variety of organizations (governments, ENGOs, professional societies, universities) and individuals involved in the collection, organization, mobilization and analysis of biodiversity information. What is needed is an organized effort to bring the scattered information about the biotic diversity of Canada together by first mobilizing the community of biodiversity expertise to create a comprehensive assessment of Canada's biotic wealth and then developing a gateway to information about species diversity in Canada. Canada is poised with institutional and individual capability to achieve this goal, and is already active in assembling many of the parts that are needed to build this product, albeit under a variety of institution umbrellas with varying mandates and scope. A new initiative is needed to rally Canada's biodiversity resources to achieve a modern census of life in our country.

## The Biota of Canada project: an ambitious proposal

The Biological Survey of Canada (see text box) is proposing to facilitate development of a comprehensive census of species diversity in Canada and to provide easy access to information about the diversity of Canada's biota. There is no better time to embark on this ambitious undertaking than during the United Nations Decade on Biodiversity: 2011-2020. To achieve this goal the BSC is building a consortium of partners to design and launch a new project to collate, summarize, analyze and disseminate to the general public information about the species diversity of Canada. The Biota of Canada project is inspired by and will be somewhat modelled after an earlier BSC project that culminated in the publication of *Canada and Its Insect Fauna* (Danks 1979). However, there are three major differences between the earlier project/product and the Biota of Canada project. First, whereas the earlier project focused on insects and





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other terrestrial arthropod taxa, together representing >60% of Canada's biodiversity, the new initiative will be comprehensive by expanding coverage to all species in Canada. Inherently this means that the team required to build the new product will require the broadest possible range of taxonomic expertise. Second, whereas the earlier project resulted in a hard copy book, the new project proposes to build an open-access, web-based and dynamic product that is regularly updated as new information is provided by knowledgeable contributors. Third, whereas the earlier project had a finite and short life-span, the new initiative proposes to build a tool and content that can be updated continuously and into the foreseeable future.

The Biota of Canada project is envisioned to have a phased implementation. Initially, an inventory of known (=described) species richness will be compiled for each group of organisms based on all available sources of information. In subsequent phases, it is anticipated that distribution maps based on specimen and observation data, identification tools (keys, photos), habitat information, and other types of data and information can be added. Some of this information is being developed now by other organizations such as NatureServe Canada, Canadensys, the National General Status Working Group, and the Canadian Registry of Marine Species. To avoid duplication of effort, existing information and data sources can simply be linked to the Biota of Canada project, while other information and data will be compiled de novo as part of the project.

## You are needed!

In order to ensure its relevance, viability and long-term success, the Biota of Canada project must be built by those who best know and understand the supply of and demand for biodiversity information, i.e., a bottom-up rather than a top-down approach. Front-line biodiversity scientists and bioinformatics experts must work together to determine the content, design and scope of

the project and products. The planning for this project is in its earliest stages and the BSC desires broad feedback from potential partners, contributors and users to ensure that the project is built in a way (content and functionality) that is realistic, useful, user-friendly and meets a variety of needs. The BSC is in the process of engaging with current and potential partners to develop a strategy for designing, implementing and funding the Biota of Canada initiative. Concurrently, the BSC will be soon initiating a process for biodiversity scientists and bioinformatics specialists to start sharing ideas about how the project should be designed in terms of information architecture, content and functionality. At this time the BSC seeks to encourage you to think about the following issues and assess if you are interested in participating in this exciting new initiative.

1. Do you see that there is a need for a coordinated national initiative to develop an inventory of species in Canada? In other words, do you buy into the vision? Is there a niche for this?
2. What sort of content would you like to see collated for all taxa, in the short-term and long-term?
3. What partners do you think the BSC should engage to contribute to this effort?
4. Are there models elsewhere that we should seek to emulate in whole or in part or seek to avoid?
5. What are some pitfalls that we should seek to avoid?
6. Are you interested in contributing to this initiative? What sort of role do you envision for yourself?

### References:

- Danks, H.V. 1979. (Ed.). 1979. Canada and its insect fauna. Mem. Ent. Soc. Can. 108. 573 pp.
- Mosquin, T., Whiting, P.G., and McAllister, D.E. 1995. Canada's biodiversity: the variety of life, its status, economic benefits, conservation costs and unmet needs. Canadian Museum of Nature, Ottawa, ON, 293 pp.

## Biological Survey of Canada: Documenting Canada's Biodiversity

The Biological Survey of Canada (BSC) has a 35-year history of collecting, collating, analyzing and disseminating information about Canada's biological diversity. The BSC is a non-profit, charitable organization consisting of biodiversity scientists across the country, and in other countries, who have an interest in Canadian biota. The BSC prides itself in identifying and filling biodiversity information needs using a bottom-up organizational structure, whereby front-line workers identify the needs and work to address them. The BSC has successfully demonstrated its capacity to advance national level biodiversity science and knowledge concerning terrestrial arthropods, which account for >60% of Canadian species, and is now reaching out to the broader biological community to bring together those who are experts with other taxa and who share a common vision and goal of making biodiversity information more accessible.





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## Get Involved!

This is an opportunity for you to become involved in the earliest stages of this project and have an influence on how it evolves. We would appreciate your candid feedback.

**Please send your feedback  
either via email to David Langor  
([dlangor@nrcan.gc.ca](mailto:dlangor@nrcan.gc.ca))  
or by using the SurveyMonkey  
questionnaire available at  
<http://www.surveymonkey.com/s/N8D58PP>**

### Biota of Canada: Next steps

The BSC will be initiating the following activities to set the groundwork for the project:

- Advertising the project vision and opportunities for involvement to the widest possible audience of front-line biodiversity scientists and biodiversity informatics specialists;
- Providing opportunities for an open sharing of ideas about the construction, content and functionality of this project;
- Initiating conversations with other organizations (government entities, ENGOs, biological societies, and projects) towards the goal of developing a consortium of partners and a strategic approach to ensure relevance and viability of the project; and
- Exploring opportunities for direct and in-kind support.

Already the word is spreading about this new initiative and the team is rapidly expanding. The future is ripe with possibilities and Canada has the opportunity, expertise and innovative capacity to build a biodiversity information architecture that will serve our national needs and set a global standard for the management and application of biodiversity information.

