

# Wild Species 2015

THE GENERAL STATUS  
OF SPECIES IN CANADA



Canadian Endangered Species Conservation Council  
National General Status Working Group



This report is a product from the collaboration of all provincial and territorial governments in Canada, and of the federal government.

Canada 

Manitoba 

Yukon

 Ontario



Government of  
Northwest Territories

Québec 



New Brunswick  Nouveau



 NOVA SCOTIA

Alberta 

Prince  
Edward  
Island  
CANADA



Government of  
Saskatchewan

 Newfoundland  
Labrador



Canadian Endangered Species Conservation Council. 2016. *Wild Species 2015: The General Status of Species in Canada*. National General Status Working Group: 128 pp.

Available in French under title: *Espèces sauvages 2015: la situation générale des espèces au Canada*.

## Abstract

In this report, the conservation status of 29 848 species has been assessed in Canada among 34 different taxonomic groups: selected macrofungi, macrolichens, bryophytes, vascular plants, sponges, corals, freshwater bivalves, terrestrial and freshwater snails and slugs, spiders, mayflies, dragonflies and damselflies, stoneflies, grasshoppers and relatives, lacewings, beetles, ants, bees, yellowjacket wasps, caddisflies, moths and butterflies, scorpionflies, black flies, mosquitoes, horse flies, bee flies, flower flies, decapods, sea cucumbers, sea urchins, fishes, amphibians, reptiles, birds, and mammals. Results indicate that the majority of species in Canada are secure. In fact, among species that are critically imperiled, imperiled, vulnerable, apparently secure or secure, 80% of species have a national rank of apparently secure or secure. However, 1659 species were identified as may be at risk in Canada. Of these, 1032 species have only a small part of their range in Canada (10% or less) and 498 are intermediary (from 11% to 74%). However, 129 species have 75% or more of their range in Canada, of which 99 species are thought to be endemic to Canada. A priority score was determined for each of the 1659 species that may be at risk, and 296 species had the highest priority scores (between 1 and 5). Some of these species have already been assessed in details by the Committee on the Status of Endangered Wildlife in Canada, and the remaining could be prioritized as potential candidates for detailed assessments. Results also underlined the presence of a large number of exotic species in Canada. In this report, a total of 2394 species were identified as exotic at the national level. Most of the exotic species are vascular plants (1315 species; 25% of all species of vascular plants in Canada are exotic). In total, 10 687 species were ranked as unrankable or unranked at the national level because of a lack of knowledge. We identified 578 migratory species in this report. Furthermore, the conservation status of species that were included in previous *Wild Species* reports was updated. Among the taxonomic groups that were reassessed in this report, 3301 species had a change in their national rank. A total of 449 species had an increased level of risk, 414 species had a reduced level of risk, and 1382 species were changed from or to the ranks unrankable, unranked, or not applicable. Also, 595 species have been added to the list and 461 have been deleted from the list. Most of the changes (50%) are due to an improved knowledge of the species. English and French common names were developed for several species. In the future, the *Wild Species* series will continue to consolidate our knowledge of species in Canada.

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# SECTION 1 – INTRODUCTION

Canada is a large country and home to thousands of species. The first step in preventing the loss of species is to know which species we have in Canada, where they occur and what their status is. The aim of the reports of the *Wild Species* series is to provide this overview.

## Why a report on species in Canada?

In 1996, the wildlife ministers in Canada signed the Accord for the Protection of Species at Risk (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=92D90833-1>), and made the key commitment to “monitor, assess and report regularly on the status of all wild species”. This ambitious goal is the mandate of the program on the General Status of Species in Canada. To achieve this mandate, the National General Status Working Group (NGSWG) was formed. This working group includes representatives from all provincial and territorial governments in Canada, and from the federal government.

A few years later, the federal government confirmed the commitment that was made under the Accord by including in the Species at Risk Act (<http://laws-lois.justice.gc.ca/eng/acts/S-15.3/>) section 128 that stipulates that “five years after this section comes into force and at the end of each subsequent period of five years, the Minister must prepare a general report on the status of wildlife species”.

Reports from the *Wild Species* series serve as the basis to fulfill both requirements. These reports are meant to inform Canadians about the status of species in the country, and to help prevent species in Canada from becoming extinct as a consequence of human activity.

To prevent species in Canada from becoming extinct, intervention at early stages is fundamental. In the National Framework for Species at Risk Conservation (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=236A2A34-1>), which is a document detailing how to implement the Accord for the Protection of Species at Risk, two main steps are identified in the species assessment process:

- 1- First, jurisdictions collectively review the general status of their wildlife species, using the best available information and inventory data, to determine whether any species under their jurisdiction may be at risk.
- 2- Next, those species that may be at risk are further examined, using a science-based approach, to more fully understand the nature and severity of the risk. The end result may be a classification as: extinct; extirpated, endangered; threatened; special concern; data deficient; or, not at risk.

The first step is conducted by the program on General Status of Species in Canada. The second step is done by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; <http://www.cosewic.gc.ca/>). COSEWIC is a committee of experts that does detailed assessments of species that are suspected of being at risk of extinction or extirpation. The species that are identified as may be at risk by the National General Status Working Group are species that could be potential candidates for more detailed assessments by COSEWIC.

## How many species in Canada?

The various types of habitats found in Canada, including for example the deciduous forest, the boreal forest, the tundra, or the ocean regions, support many different species. In the *Wild Species* 2010 report, the best available estimate indicated that about 70 000 species were known to occur in Canada. This number was based mainly on estimates dating from the 1990s, 1980s, and 1970s. For the *Wild Species* 2015 report, the National General Status Working Group, in collaboration with the Biological Survey of Canada (<http://biologicalsurvey.ca/>), reviewed the estimated total number of species present in Canada. The new estimate indicates that there are about 80 000 known species in Canada, excluding viruses and bacteria (Figure 1). These species are divided among five different kingdoms: the protozoa kingdom (about 1% of the known species in Canada); the chromist kingdom (about 4% of the known species in Canada); the fungi kingdom (about 16% of the known species in Canada); the plant kingdom (about 11% of the known species in Canada); and the animal kingdom (about 68% of the known species in Canada).

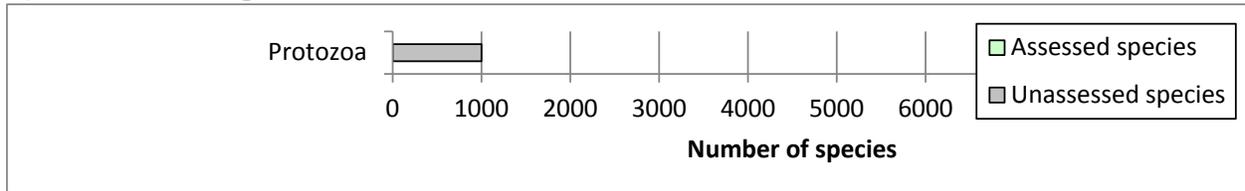
The animal kingdom contains the majority of known species. Interestingly, insects are the most diverse group, accounting for nearly 70% of the known animal species in Canada. Just four major taxonomic groups, the order Coleoptera (beetles), the order Hymenoptera (bees, wasps and relatives), the order Lepidoptera (moths and butterflies), and the order Diptera (flies), represent most of the insects in Canada.

In this report, the conservation status of about 30 000 species has been assessed. In the protozoa kingdom, 0% of the known species in Canada have been assessed. In the chromist kingdom, 0% of the known species in Canada have been assessed. In the fungi kingdom, about 8% of the known species in Canada have been assessed. In the plant kingdom, about 74% of the known species in Canada have been assessed. In the animal kingdom, about 42% of the known species in Canada have been assessed. Even though the number of animal species assessed is the highest, the plants have the highest proportion of species assessed.

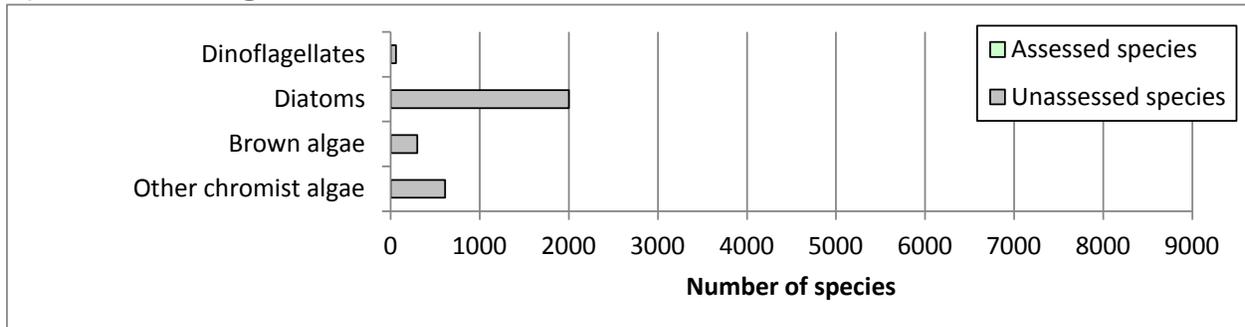
There are potentially many more unknown species in Canada. These unknown species could be species that are new to science or species that are already known to science but that have not yet been documented as occurring in Canada. As more of these unrecorded species are found, the estimation of the known species is likely to continue to increase. However, it is difficult to estimate the number of species that remain to be discovered. There are also many potential subdivisions below the species level. For example, subspecies, populations, stocks, or designatable units are divisions below the species

level. While these divisions have merit, there tends to be more disagreement over the precise limits and biological significance of differences observed at this finer scale. Moreover, relatively few species have been examined closely enough to distinguish whether or not subspecies or discrete stocks exist. These subdivisions are then often part of a more detailed assessment. Since the mandate of the program on General Status of Species in Canada is to provide an overview of the status of the species, and since a vast number of species are included, the assessments for the *Wild Species* reports are usually done only at the species level. The most familiar measure of diversity is the number of species, and these reports focus on that perspective of biodiversity.

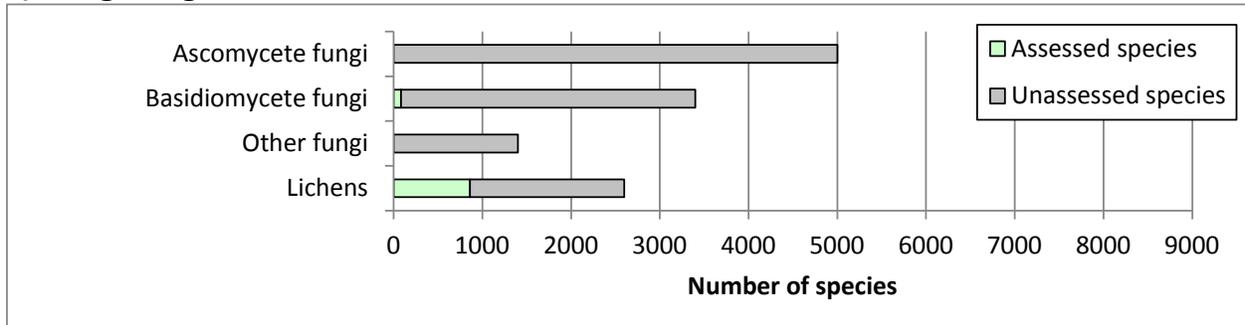
### a) Protozoa kingdom



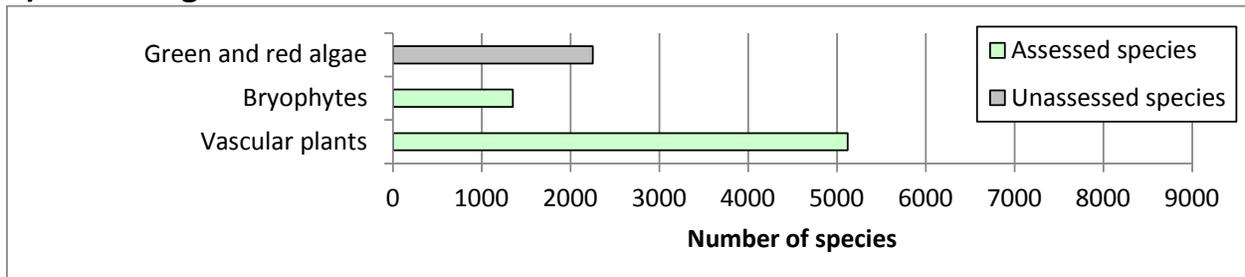
### b) Chromist kingdom



### c) Fungi kingdom



### d) Plant kingdom



### e) Animal kingdom

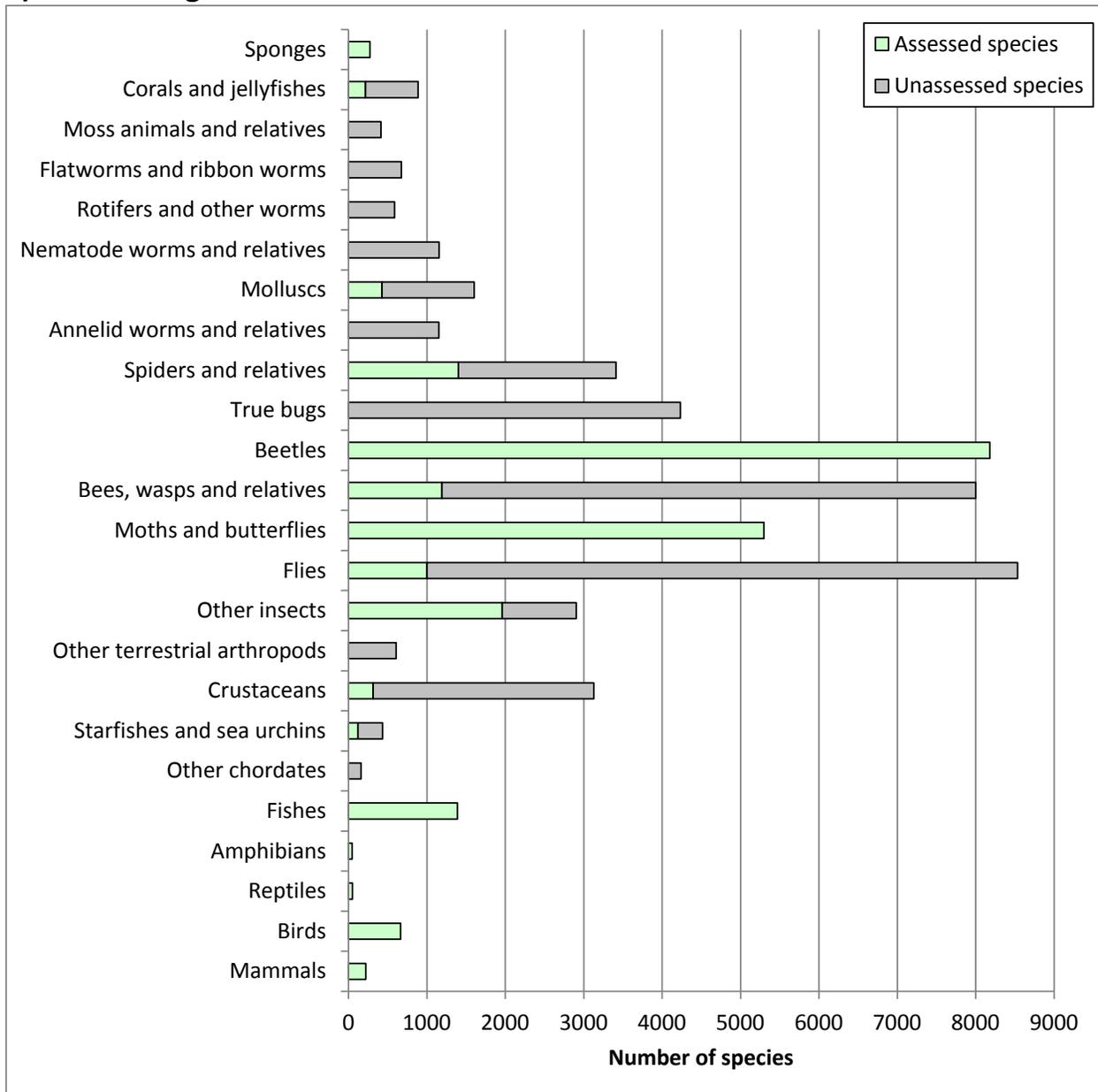


Figure 1. Total number of known species in Canada (about 80 000 species, excluding viruses and bacteria), and number of species assessed in this report (about 30 000 species).

## Previous *Wild Species* reports

The first report of the series was *Wild Species* 2000. In that report, a total of 1670 species were assessed. One of the greatest strengths of that report was to bring together, for the first time in Canada, the knowledge we had on most vertebrates of the country.

The second report of the series was *Wild Species* 2005. In that report, a total of 7732 species were assessed. One of the greatest achievements of that report was to assess for the first time the general status of all vascular plants in Canada. The addition of the vascular plants, which counted for more than 5000 species, was responsible for most of the increase in the number of assessed species.

The third report of the series was *Wild Species* 2010. In that report, a total 11 950 species were assessed. One of the greatest strengths of that report was to assess for the first time the conservation status of several groups of insects. To reflect this, a photo of a lady beetle was selected as the main feature of the report's cover page.

The *Wild Species* 2015 report is the fourth of the series. By assessing a total of 29 848 species, one of its greatest achievements is to start to cover a significant portion of Canada's diversity of species. For example, new groups of marine species were assessed and several large groups of insects were also added. A particular focus on pollinators was made, and a bee was selected for the main photo of the cover page.

## SECTION 2 – METHODOLOGY

### National General Status Working Group

The National General Status Working Group is composed of representatives from each of the Canadian provinces and territories and of the three federal agencies whose mandate includes wildlife (Canadian Wildlife Service of Environment and Climate Change Canada, Fisheries and Oceans Canada, Parks Canada). Members of the working group are responsible for completing the assessments of species in their respective jurisdictions. The National General Status Working Group is composed of three membership categories:

- Government representatives
- Conservation Data Centre specialists
- Ex officio members

The government representatives are the voting members on the working group, and have the final signoff on the ranks. They are accountable to the federal/provincial/territorial Canadian Wildlife Directors' Committee. The role of the Conservation Data Center specialists is to ensure data sharing and transfers. They are responsible for the integration of the results of the assessments into the conservation data centres. Ex officio members are key collaborators who provide special expertise and assistance in the assessments of some groups of species. There are currently three ex officio members in the working group: Agriculture and Agri-Food Canada, Natural Resources Canada, and the office of NatureServe Canada.

The National General Status Working Group is responsible to the Canadian Wildlife Directors' Committee, and ultimately to the Canadian Endangered Species Conservation Council, regrouping all wildlife ministers in Canada. For the contact information of all members of the working group, please consult Appendix 1 of this report.

### NatureServe

The National General Status Working Group is using the methodology of NatureServe ([www.natureserve.org](http://www.natureserve.org)) to assess the conservation status of species in Canada. NatureServe is an international network comprised of over 80 conservation data centres across the western hemisphere,

connecting science with conservation. These conservation data centres use common data standards, shared processes and regular information exchanges to track the status of biodiversity. NatureServe methodology was chosen to leverage international scientific standards and enable better integration with provincial and territorial governments in Canada through their conservation data centres. NatureServe Canada, a Canadian node of the international network, provides scientific and technical support to the members of the National General Status Working Group. This support is accomplished by integrating the results of the *Wild Species* reports into the NatureServe data management system. Once this integration is done, the results are also available on the NatureServe Explorer (<http://explorer.natureserve.org/>).

## Process for species assessment

The process to assess the conservation status of species is based on the best available knowledge (Figure 2). Various sources of knowledge indicate whether there is enough information available to move forward with the assessment of a specific taxonomic group. The most critical step is the development of the list of species for the selected taxonomic groups. The list indicates which species are currently known to be or to have been in Canada. For many groups of species in Canada, there is not enough knowledge to even build a species list, meaning that we do not know which species we have in the country. The conservation status of these species thus cannot be assessed. For groups of species with sufficient knowledge, information from the various sources is brought together to build the list of species in Canada. To validate the scientific names of species in the list, the National General Status Working Group uses world-class taxonomic references. This ensures that the most recognized scientific names of the species are used, and also confirms that the species are valid based on current knowledge. For example, when synonyms of the same species are found in different sources, the scientific name in the world-class reference is used. The list of world-class taxonomic references used for each group of species can be found in the database of the *Wild Species* report.

Once the list of species is developed, the next step is to assess the conservation status of the species. When a taxonomic group is selected, the conservation status of all species in this group is assessed. The assessments then do not focus only on the known rare or endangered species, but rather on all species in the group. The National General Status Working Group uses different strategies depending on the amount of information available. For well-known taxonomic groups, which consist mainly of vertebrate species (mammal, birds and others), the assessments are usually conducted directly by the working group. For the lesser-known taxonomic groups, which consist mainly of invertebrate species (insects and others), experts are hired to support the working group to undertake the assessments. The experts propose a list of species, and also suggest conservation status ranks. Depending on the number of species in a taxonomic group and on the availability of expertise, sometimes one national expert will be hired to assist all governments in Canada, and sometimes several regional experts will be hired. The list of experts involved in this report can be found in Appendix 2. The governments then review the ranks and add more information when possible. The government that has the final signoff on the ranks varies depending on the type of species. For most terrestrial species, the provincial and territorial governments have the final signoff on the ranks. For aquatic species, Fisheries and Oceans Canada (federal government) has the final signoff on the ranks. For migratory birds, the

Canadian Wildlife Service of Environment and Climate Change Canada (federal government) has the final signoff on the ranks. However, the ranks are usually done through a collaborative approach.

Once the conservation status assessments are completed, the ranks are integrated in the conservation data centers. The program on the General Status of Species in Canada is thus one of the main drivers to update the ranks in the conservation data centres. The National General Status Working Group also reviews the other information provided in the database of the *Wild Species* report. The information is then used for the production of the *Wild Species* reports. This process is repeated every five years. Because the *Wild Species* reports represent a snapshot in time, the federal, provincial and territorial governments should be contacted if more recent conservation status ranks are needed, or for conservation status ranks below the species level.

After the release of a *Wild Species* report, the National General Status Working Group prepares a five-year work plan for the next report. This five-year work plan determines the priority of the taxonomic groups to be included, and outlines the new assessments that will be aimed to be completed. The taxonomic groups are selected based on the availability of information, expertise, and resources. Usually, once a taxonomic group is included in an edition of the *Wild Species* report, the species are reassessed every five years in the subsequent reports. For each taxonomic group on the work plan, a leader within the working group is appointed. When necessary, the leaders help to identify experts that could be hired to support the assessments. The leaders also assist with the final revision of the results of their taxonomic groups before the release of the *Wild Species* report.

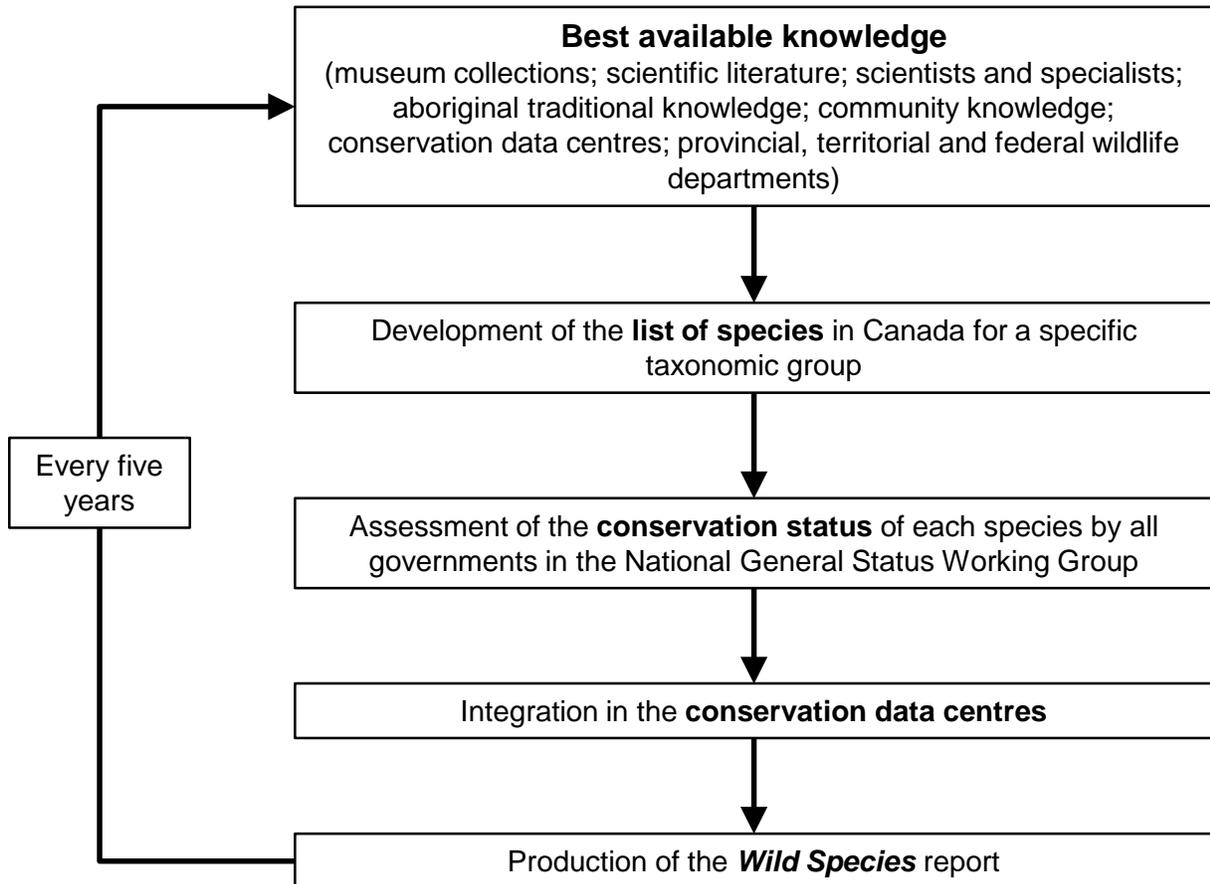


Figure 2. Process for species assessment in Canada.

## Ranking system

Each species assessed in the *Wild Species* reports received a rank in each province, territory, or ocean region in which they are known to be present, as well as an overall national rank for Canada. These ranks represent the conservation status of the species, based on the best available knowledge (Table 1). The National General Status Working Group is using the ranking system of NatureServe.

**Table 1. Ranking system of NatureServe used to assess the conservation status of species.**

Rank	Category	Description
<i>Geographic scale</i>		
N	National	Indicates a rank at the national level in Canada.
S	Subnational	Indicates a rank at the level of a province, territory, or ocean region in Canada.
<i>Conservation status</i>		
X	Presumed Extirpated	Species is believed to be extirpated from the jurisdiction (nation, province, territory, or ocean region). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
H	Possibly Extirpated	Known from only historical records but still some hope of rediscovery. There is evidence that the species may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include: (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
1	Critically Imperiled	At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
2	Imperiled	At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

3	Vulnerable	At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
4	Apparently Secure	At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
5	Secure	At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.
U	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
NR	Unranked	National or subnational conservation status not yet assessed.
NA	Not Applicable	A conservation status rank is not applicable because the species is not a suitable target for conservation activities. It includes exotic species (that have been moved beyond their natural range as a result of human activity), hybrids, or long distance migrants (accidental species occurring infrequently and unpredictably outside their usual range).
<i>Qualifier</i>		
?	Inexact Numeric Rank	Denotes inexact numeric rank. This designation should not be used with any of the X, H, U, NR or NA conservation status ranks.
B	Breeding	Conservation status refers to the breeding population of the species in the nation, province, territory, or ocean region.
N	Non-breeding	Conservation status refers to the non-breeding population of the species in the nation, province, territory, or ocean region.
M	Migrant	Conservation status refers to the migrant population of the species in the nation, province, territory, or ocean region.

The geographic scale is written first, followed by the conservation status, followed by the qualifier if necessary. For example, N5B means a national rank of secure that covers only the breeding population of the species. For example, N5? means a national rank of secure that is uncertain. The majority of ranks do not have qualifiers, such as N5 for example.

Range ranks can also be used. For example, N2N3 means that the national rank of the species in Canada is between imperiled and vulnerable. For example, N1N3 means that the national rank of the species in Canada is between critically imperiled and vulnerable. Range ranks are applied only for numerical conservation status and are used to indicate any range of uncertainty about the status of the species. Ranges cannot skip more than two ranks (NU is used rather than N1N4).

## Factors underlying general status assessments

To help determine the most appropriate rank for a species, the National General Status Working Group uses a tool called the rank calculator. The rank calculator was developed by NatureServe and can integrate the available information for 10 factors of rarity, threats, and trends (Table 2). These factors are used to determine the conservation status of a species.

**Table 2. List of factors included in the NatureServe rank calculator.**

Category	Factor
Rarity	Range extent
	Area of occupancy
	Number of occurrences
	Population size
	Good viability / ecological integrity
	Environmental specificity
Threats	Assigned overall threat impact
	Intrinsic vulnerability
Trends	Short-term trend
	Long-term trend

Not all factors need to be filled for each species. In many cases, there is not enough information to fill the rank calculator, and the species is then unrankable (U). To output a rank different than U, the rank calculator needs a minimum of two factors: two factors of rarity, or one factor of rarity and one factor of threats or one factor of trends. For species in well-known taxonomic groups, more than two factors are often filled. For species in lesser-known taxonomic groups, the two factors that are most often filled, when available, are the range extent and the number of occurrences.

For more information on these factors, or to download the rank calculator, please consult the NatureServe website (<http://www.natureserve.org/conservation-tools/conservation-rank-calculator>).

## Development of regional ranks

A regional rank is developed for each species in every province, territory, or ocean region where it occurs in Canada. For example, if a species occurs in Quebec and Ontario, then both provinces will have a regional rank. Figure 3 shows all the regions in Canada, and Table 3 defines the codes used for each region. Waters often have a shared jurisdiction in Canada. For aquatic species, the separation that we used was the difference between the fresh waters (lakes and rivers for example) and the salt waters. For species occurring in fresh waters, the ranks were placed in the provinces or territories. For species occurring in salt waters, the ranks were placed in the ocean regions. For species occurring in both fresh and salt waters, ranks were developed for the corresponding provinces, territories, and ocean regions.

The rank calculator is used to help determine each regional rank. If a species occurs in 10 provinces or territories, the rank calculator will then be filled 10 times with information specific to each region for this species.

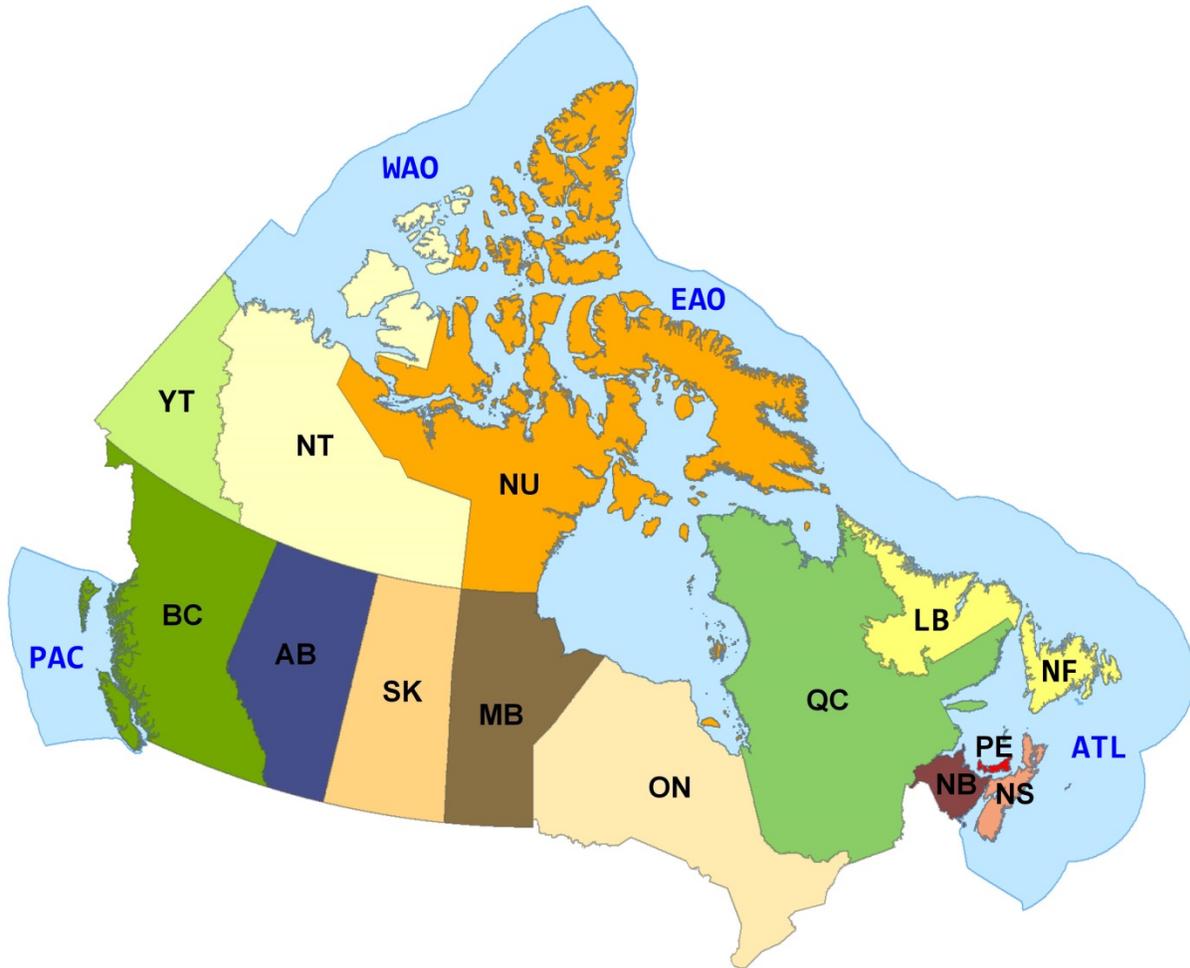


Figure 3. Map of Canada showing the regions (provinces, territories, oceans) for which general status ranks are generated.

**Table 3. Codes used to represent the regions in Canada.**

Code	Region
CA	Canada
YT	Yukon
NT	Northwest Territories
NU	Nunavut
BC	British Columbia
AB	Alberta
SK	Saskatchewan
MB	Manitoba
ON	Ontario
QC	Quebec
NB	New Brunswick
NS	Nova Scotia
PE	Prince Edward Island
LB	Labrador
NF	Newfoundland
PAC	Pacific Ocean
WAO	Western Arctic Ocean
EAO	Eastern Arctic Ocean
ATL	Atlantic Ocean

## Development of national ranks

Since species are assessed in all of the regions where they occur in Canada, the regional ranks offer a strong basis to determine the national ranks. In many cases, the National General Status Working Group uses rules to determine the most obvious national ranks. The rules deal with four main situations:

- 1- When a species is occurring in only one region in Canada, the national rank is then the same as the regional rank.
- 2- When a species is ranked SU, SNR, or SNA in all regions where it occurs in Canada, then the same rank is automatically given at the national level.
- 3- When a species is apparently secure or secure in at least one region in Canada, then the species is also apparently secure or secure at the national level.
- 4- When a species is vulnerable or more at risk in a region and there is uncertainty in other regions (the species is ranked SU or SNR in at least two other regions), then the national rank is NU.

Some exceptions can also be made to this general approach. For example, if a species is secure in one region, but an imminent threat is severely affecting the species elsewhere in Canada, the National General Status Working Group can decide to not rank the species as secure at the national level. In all other situations that are not covered by the rules, the working group uses the rank calculator to determine the national rank of a species.

## Ranking migratory species

Migratory species include for example most of the birds, as well as other species such as bats, butterflies, sea turtles, and cetaceans. Long-distance migratory species require a more precise categorical approach than is used for non-migratory species. Consequently, the qualifiers B (breeding), N (non-breeding), and M (migrant) are used for migratory species. Usually, B refers to summer, N refers to winter, and M refers to spring and fall. These qualifiers are applied both to the regional ranks and to the national ranks. If a species does not engage in long-distance migrations, these qualifiers should not be used. There are five main situations:

- The species stays year-round in the jurisdiction and does not migrate = normal rank without the B,N,M qualifiers (example: S4).
- The species stays year-round and some individuals migrate = use all qualifiers B,N,M.
- The species breeds and migrates (does not winter in the jurisdiction) = use qualifiers B,M.
- The species winters and migrates (does not breed in the jurisdiction) = use qualifiers N,M.
- The species only migrates through the jurisdiction = use only qualifier M.

These situations can often become complex. For example, only those birds that land on ocean waters during their migration will have a migrant qualifier in the oceans. Thus, a forest bird that flies over the Atlantic Ocean and does not land on the water will not have a rank in this ocean. Conversely, seabirds that lay their eggs on land will have their breeding qualifier in that province or territory, not in the ocean. However, whales that give birth in the ocean will have their breeding qualifier in the ocean.

## Categories of trends

Since species are usually reassessed every five years, a comparison of the national ranks is possible with the previous *Wild Species* reports. This enables us to see if the species' conservation status has changed over time. This will allow Canadians to begin to track patterns of improvement or decline through time, revealing which species are maintaining or improving their status and which are declining or facing new threats. Such patterns not only give a better indication of the nature and magnitude of a problem, but may also point the way to improved conservation practices. This comparison also highlights which information gaps have been filled, and where further information is still required.

The comparison between the various *Wild Species* reports is made by using rounded national ranks. The rounded ranks convert the range ranks into a single rank category, so that they are easier to compare. When range ranks have a difference of one interval, the most at risk rank becomes the rounded rank. For example, the rounded rank of N2N3 is N2, and the rounded rank of N4N5 is N4. When range ranks have a difference of two intervals, the middle rank becomes the rounded rank. For example, the rounded rank of N1N3 is N2, and the rounded rank of N3N5 is N4. When ranks have qualifiers, they are deleted in the rounded rank. For example, the rounded rank of N2? is N2. For migratory species, the rounded rank is based on the breeding qualifier. When there is no breeding qualifier, the rounded rank is based on the non-breeding qualifier. When there are no breeding and non-breeding qualifiers, the rounded rank is based on the migrant qualifier. For example, the rounded rank of N3B,NUM is N3.

Starting from the *Wild Species* 2015 report, the National General Status Working Group is using the ranking system of NatureServe. In the *Wild Species* 2000, 2005, and 2010 reports, a different customized ranking system was used. There is generally a good match between the rounded ranks of NatureServe and the categories of the previous General Status ranking system (Table 4). In this table, the ranks that are grouped are equivalent. To study trends, the previous national ranks of the *Wild Species* 2000, 2005 and 2010 reports were converted to the rounded national ranks of NatureServe. For example, if a species was ranked as undetermined (5) in 2005 and 2010, these national ranks were converted to unrankable (U). When there were two possibilities of ranks for the conversion, the same rank as in 2015 was selected to minimize the number of changes. For example, if a species was ranked as apparently secure (4) in 2015, and the species was ranked as secure (4) in 2010, the national rank of the *Wild Species* 2010 report was converted to apparently secure (4). For more information about the previous ranking system used by the National General Status Working Group, please consult the *Wild Species* 2010 report.

**Table 4. Comparison of the NatureServe rounded ranks with the previous General Status ranking system.**

Previous General Status ranking system		NatureServe rounded ranks		
Extinct	0.2	X		Presumed Extirpated
Extirpated	0.1	H		Possibly Extirpated
At Risk	1	1		Critically Imperiled
May Be At Risk	2	2		Imperiled
Sensitive	3	3		Vulnerable
			4	Apparently Secure
Secure	4	5		Secure
Undetermined	5	U		Unrankable
Not Assessed	6	NR		Unranked
Exotic	7	NA		Not Applicable
Accidental	8			

When determining the trends of the species at the national level, the National General Status Working Group also specifies the reason for change by using six categories (Table 5). For example, if the population size of a species is reduced following the spread of a disease, the reason for change would be a biological change (B). For example, if the population size of a species is reduced following habitat losses, the reason for change would be a biological change (B). For example, if a species was added to the list because it recently extended its range into Canada, the reason for change would be a biological change (B). For example, if new studies revealed that the population size of a species is much larger than first anticipated, the reason for change would be an improved knowledge of the species (I). For example, if a species was recently discovered in Canada through new inventories, but the species was probably always here before, the reason for change would be an improved knowledge of the species (I). For example, if incorrect information was used to determine an earlier conservation status, the reason for change would be an error in previous rank (E). For example, if a species was misidentified and never occurred in Canada, and this information was known at the time of the assessment, the reason for change would be an error in previous rank (E). For example, if the ranking methodology was changed and this caused a difference in the rank when considering the same information, the reason for change would be a procedural change (P). In some situations, there can be an overlap between these categories. In such cases, only the main category is selected. For example, if new information was made available through a new COSEWIC assessment, the main reason for change would be the new COSEWIC

assessment (C), not an improved knowledge. For example, if a species was split into two species following new taxonomic studies, the main reason for change would be a taxonomic change (T), not an improved knowledge.

**Table 5. Reasons for changes in the national conservation status of species.**

Code	Reason for change
B	Biological change in the population size, distribution, or threats of the species.
C	New COSEWIC assessment.
E	Error in previous rank.
I	Improved knowledge of the species.
P	Procedural change.
T	Taxonomic change.

## Helping COSEWIC to identify priority species

One of the goals of the program on the General Status of Species in Canada is to identify species that may be at risk. These species can be potential candidates for detailed assessments by COSEWIC. Because many species are assessed in the *Wild Species* reports, the National General Status Working Group has implemented a process to determine a priority score to identify the species that may be most at risk. This process is based on two factors. The first factor is the national rank. The species that have a national rank of NX, NH, N1 and N2 (including the range ranks) are considered in this process. The second factor is the percentage of the species range that occurs in Canada. This factor introduces an estimation of the Canadian responsibility. Even though it is important to maintain all species of Canada, for some species, the only place in the world where they can be found is here. We thus have a stronger responsibility toward these species, because if they disappear, they will be extinct forever. Other species that are present in Canada are also widespread in the United States of America for example, so the Canadian responsibility for these species is lower. A score is given to the classes of percentages of the range in Canada (Table 6). When combining the score of the national ranks and the score of the percentage of the range in Canada, we obtain a priority score (Table 7). The resulting priority score can vary from 1 to 10. The species that have a score of 1 have the highest priority and the species that have a score of 10 have a low priority.

**Table 6. Canadian responsibility score based on the percentage of the range in Canada.**

Score	Percentage of the range in Canada
1	Endemic: 100% of the range in Canada.
2	Very high: 75 to 99% responsibility.
3	High: 51 to 74% responsibility.
4	Moderately high: 30 to 50% responsibility.
5	Intermediate: 11 to 29% responsibility.
6	Low and widespread: <10% of global responsibility but occurs over 30% of Canada.
7	Low and localized.

**Table 7. Priority score given by the National General Status Working Group to identify the species that may be at risk in Canada. The species that have a score of 1 have the highest priority and the species that have a score of 10 have a low priority.**

National rank score		Canadian responsibility score based on the percentage of the range in Canada						
		1	2	3	4	5	6	7
NX, NH, N1	1	1	2	3	4	5	6	7
N1N2, N1?	2	2	3	4	5	6	7	8
N2	3	3	4	5	6	7	8	9
N1N3, N2N3, N2?	4	4	5	6	7	8	9	10

## Development of common names

Did you know that most species do not have a common name? Common names are often developed when a species is of interest to the public or to researchers because of economic importance, conservation status, abundance, social significance, or other reasons. For example, many species of mammals and birds have common names, while few species of insects do. As our knowledge on the diversity of Canadian species increases, the need for common names becomes more and more important.

Common names usually have two parts: one part that describes the taxonomic group where the species is classified, and the other part that describes a specific characteristic of the species. For example, the common name of the species *Hippodamia quinquesignata* is the Five-spotted Lady Beetle, where the part “Lady Beetle” describes the family where the species is taxonomically classified, and the part “Five-spotted” describes a distinctive feature of the species. The scientific name often provides inspiration for the development of the common name. For example, *quinquesignata* means five-spotted. The specific characteristic can also describe the habitat used by the species, a specific behavior, the name of the region where it occurs, the name of the location where it was found, or the name of the person who discovered or is related to the species.

The National General Status Working Group is facilitating the establishment of common names for all species in Canada. When a specific taxonomic group is selected, common names in English and French are developed for all Canadian species in this group. One advantage of this approach is to make sure that the most appropriate name is given to each species, and it also enables consistency when developing the names. A review process has been put in place to develop common names for the species in Canada. At the beginning of the process, experts are hired to provide suggestions of common names for the species in the taxonomic groups that they study. English experts provide suggestions for English common names, and French experts provide suggestions for French common names. The suggested common names are then reviewed by the Canadian Wildlife Service (Environment and Climate Change Canada), especially to ensure that the taxonomic logic of the common names is rigorous. This step warrants the standardization of the part of the common names that describes the group where the species is taxonomically classified, and ensures for example that all species of lady beetles are called “lady beetle” in their common names. The suggested common names are then reviewed by the Terminology Standardization Division of the Translation Bureau of the Government of Canada. This step warrants a linguistic review of the common names, both in English and French. If appropriate, it also provides an opportunity to align the English and French common names, so that they have a similar meaning. The common names are then reviewed by the National General Status Working Group. A special committee, the General Status Common Names Committee, has been created to support the working group in this task. Once this comprehensive review process is completed, the common names are then published on the *Wild Species* website, on the TERMIUM Plus® website ([www.btb.termiumplus.gc.ca](http://www.btb.termiumplus.gc.ca)), and on many others. In the *Wild Species* 2015 report, common names have been developed for many of the species assessed. The taxonomic logic of the common names is also described in the database. Most of the time, the taxonomic level of the family has been selected.

## ***Wild Species website***

All the results of the program on the General Status of Species in Canada are available on the *Wild Species* website ([www.wildspecies.ca](http://www.wildspecies.ca)). Results are also integrated in the Species at Risk Public Registry ([www.registrelep-sararegistry.gc.ca](http://www.registrelep-sararegistry.gc.ca)) of the federal government, in provincial and territorial websites, and in the NatureServe website. Appendix 3 lists the links of these websites.

## SECTION 3 – RESULTS

### Assessed taxonomic groups

In total, 29 848 species have been assessed in this report. These species are divided among 34 different taxonomic groups: selected macrofungi, macrolichens, bryophytes, vascular plants, sponges, corals, freshwater bivalves, terrestrial and freshwater snails and slugs, spiders, mayflies, dragonflies and damselflies, stoneflies, grasshoppers and relatives, lacewings, beetles, ants, bees, yellowjacket wasps, caddisflies, moths and butterflies, scorpionflies, black flies, mosquitoes, horse flies, bee flies, flower flies, decapods, sea cucumbers, sea urchins, fishes, amphibians, reptiles, birds, and mammals. Some of these taxonomic groups are assessed for the first time, while others are reassessments (Table 8).

**Table 8. Summary of the taxonomic groups assessed in the reports of the *Wild Species* series.**

#### a) Fungi kingdom

Taxonomic group	Year of the <i>Wild Species</i> report			
	2000	2005	2010	2015
Fungi				Selected macrofungi only
Lichens			Macrolichens only	Macrolichens only

**b) Plant kingdom**

Taxonomic group	Year of the <i>Wild Species</i> report			
	2000	2005	2010	2015
Bryophytes			Mosses only	All species
Vascular plants	Ferns and orchids only	All species	All species	All species

**c) Animal kingdom**

Taxonomic group	Year of the <i>Wild Species</i> report			
	2000	2005	2010	2015
Sponges				All species
Corals				All species
Bivalves		Freshwater mussels only	Freshwater mussels only	Freshwater bivalves only
Snails and slugs				Terrestrial and freshwater species only
Spiders			All species	All species
Mayflies				All species
Dragonflies and damselflies		All species	All species	All species
Stoneflies				All species
Grasshoppers and relatives				All species

Lacewings				All species
Beetles		Tiger beetles only	Predaceous diving beetles, ground beetles, and lady beetles only	All species
Ants				All species
Bees			Bumble bees only	All species
Yellowjacket wasps				All species
Caddisflies				All species
Moths and butterflies	Butterflies only		Butterflies and selected macromoths only	All species
Scorpionflies				All species
Black flies			All species	All species
Mosquitoes			All species	All species
Horse flies			All species	All species
Bee flies				All species
Flower flies				All species
Decapods		Crayfishes only	Crayfishes only	All species

Sea cucumbers				All species
Sea urchins				All species
Fishes	Freshwater species only	All species		All species
Amphibians	All species	All species	All species	All species
Reptiles	All species	All species	All species	All species
Birds	All species	All species	All species	All species
Mammals	All species	All species	All species	All species

# FUNGI KINGDOM

## Selected macrofungi



Fly Amanita (*Amanita muscaria*) © Rémi Hébert

Selected macrofungi refer to the genus *Amanita*, the family Nidulariaceae, and the family Phallaceae. In general, fungi are more closely related to animals than they are to plants. They cannot photosynthesize, so must obtain food by either associating with plants or parasitizing other organisms. The bulk of a fungus consists of threadlike hyphae (or mycelia, when many join together) that grow in soil or organic material. Complimentary mycelia fuse and produce a fruiting body, e.g. a mushroom, which in macrofungi is visible to the naked eye. These make spores which disperse to germinate and form new mycelia. The ecological and social importance of fungi cannot be overstated. Mycorrhizal associations, in which fungi provide water and nutrients to plants and receive sugars in return, benefit most plants in Canada (and the world), including the majority of economically important species. Most large mushrooms seen on the forest floor are involved in mycorrhizal associations. Our environment also depends on fungal decomposition of organic matter, which releases nutrients. The genus *Amanita* includes some of the most toxic known mushrooms found worldwide. However, other edible wild mushrooms are a multi-million dollar industry in Canada. Fungal research in Canada has focused on pathogens, mycorrhizae and decomposing fungi. Currently, genetic tools are being used to clarify their taxonomy and distribution. The largest threat to macrofungi is habitat destruction.

There are 87 known species of selected macrofungi in Canada (Figure 4). Many species are apparently secure or secure (26%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 64 species to give them a rank other than NU or NNR. No species of selected macrofungi are considered migratory.

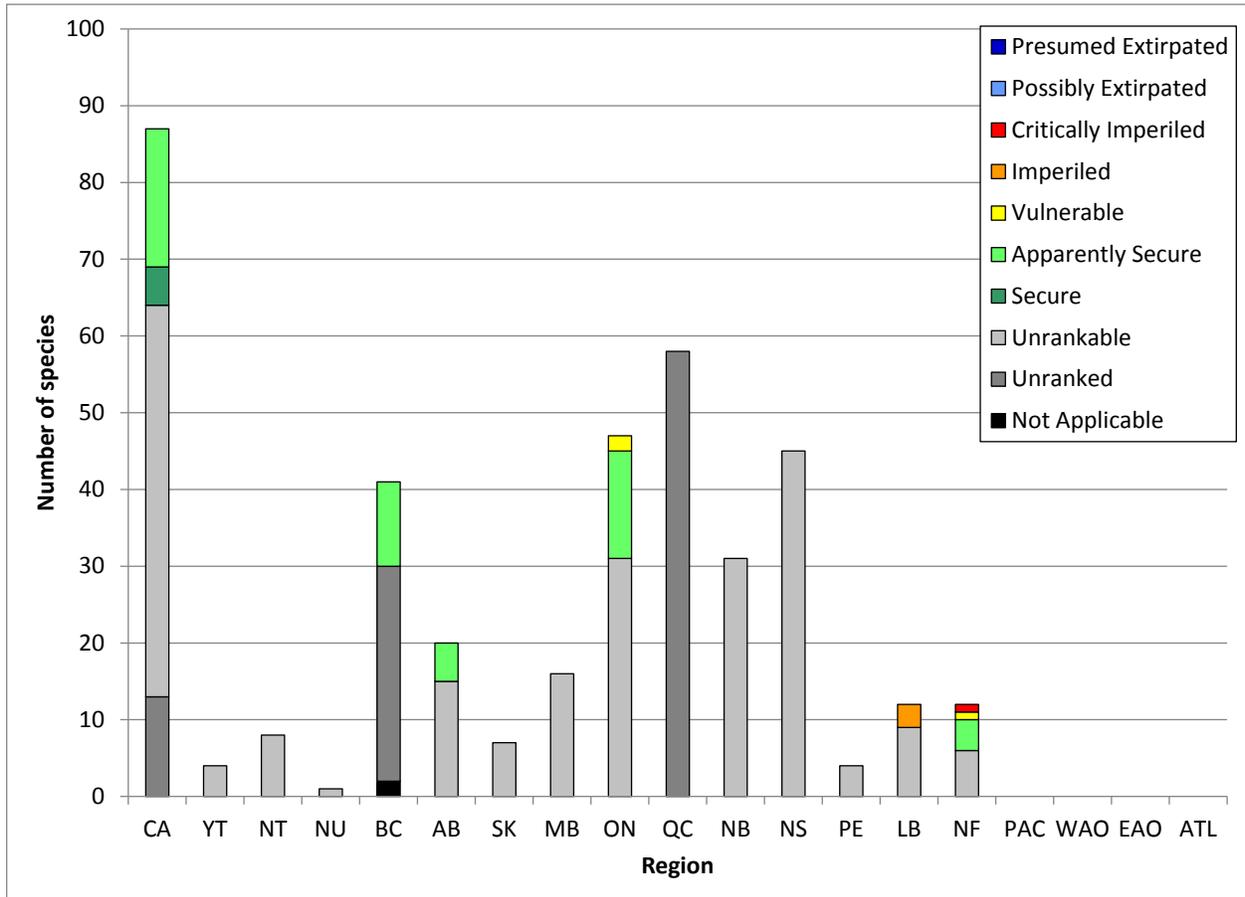


Figure 4. General status of selected macrofungi in Canada in 2015.

## Macrolichens



*Letharia columbiana* © Doug Waylett

Macrolichens do not refer to a specific taxonomic division. They are fungi that have established a relationship with an alga or cyanobacterium, wherein the fungus provides a physical structure and its partner provides carbohydrates obtained through photosynthesis. The fungus appears to contain all the genetic information it needs to create the characteristic form of the lichen, but requires the alga or cyanobacterium to “turn on” the lichenization genes. They grow on rocks, trees and soil, and do not appear to damage or even extract much moisture or nutrition from their substrate. Macrolichens can be leafy (foliose), branched (fruticose) or scale-like (squamulose). They usually reproduce asexually by producing specialized tissue fragments that disperse and grow into genetically identical copies of the parent. Lacking roots, transport vessels, or a cuticle to retain water, lichens absorb everything from the environment, including moisture, nutrients and toxins. In dry conditions, photosynthesis stops and respiration slows significantly. Dry lichen can quickly absorb from 3 to 35 times its weight in water, from dew, fog, humid air. Lichens are slow-growing and are particularly sensitive to air pollution, making them valuable environmental indicators. Their sensitivity to pollutants has received considerable study, but many parts of Canada still lack collection and distribution data. Threats include habitat loss and alteration and air pollution.

There are 857 known species of macrolichens in Canada (Figure 5). The majority of these species are apparently secure or secure (56%). There are 11 species that are possibly extirpated, 70 species that are critically imperiled, and 51 species that are imperiled. Of these 132 species, 77 have only a small part of their range in Canada (10% or less) and 44 are intermediary (from 11% to 74%). However, 11 species have 75% or more of their range in Canada. Among those, six species are thought to be endemic to Canada: *Blennothallia fecunda*, *Collema coniophilum*, *Dermatocarpon atrogranulosum*, *Dendriscoaulon oroboreale*, *Dendriscoaulon wrightii*, *Usnea fibrillosa*. In total, 29 species have a high priority score (between 1 and 5). We also identified one species that is exotic at the national level. We do not have enough knowledge on 181 species to give them a rank other than NU or NNR. No species of macrolichens are considered migratory.

All the macrolichens were assessed in the *Wild Species 2010* report. Since then, 334 species had a change in their status at the national level. A total of 18 species had an increased level of risk, 36 species had a reduced level of risk, and 124 species were changed from or to ranks U, NR, NA. Also, 76 species have been added to the list and 80 have been deleted from the list. Most of the changes (47%) are due to an improved knowledge of the species.

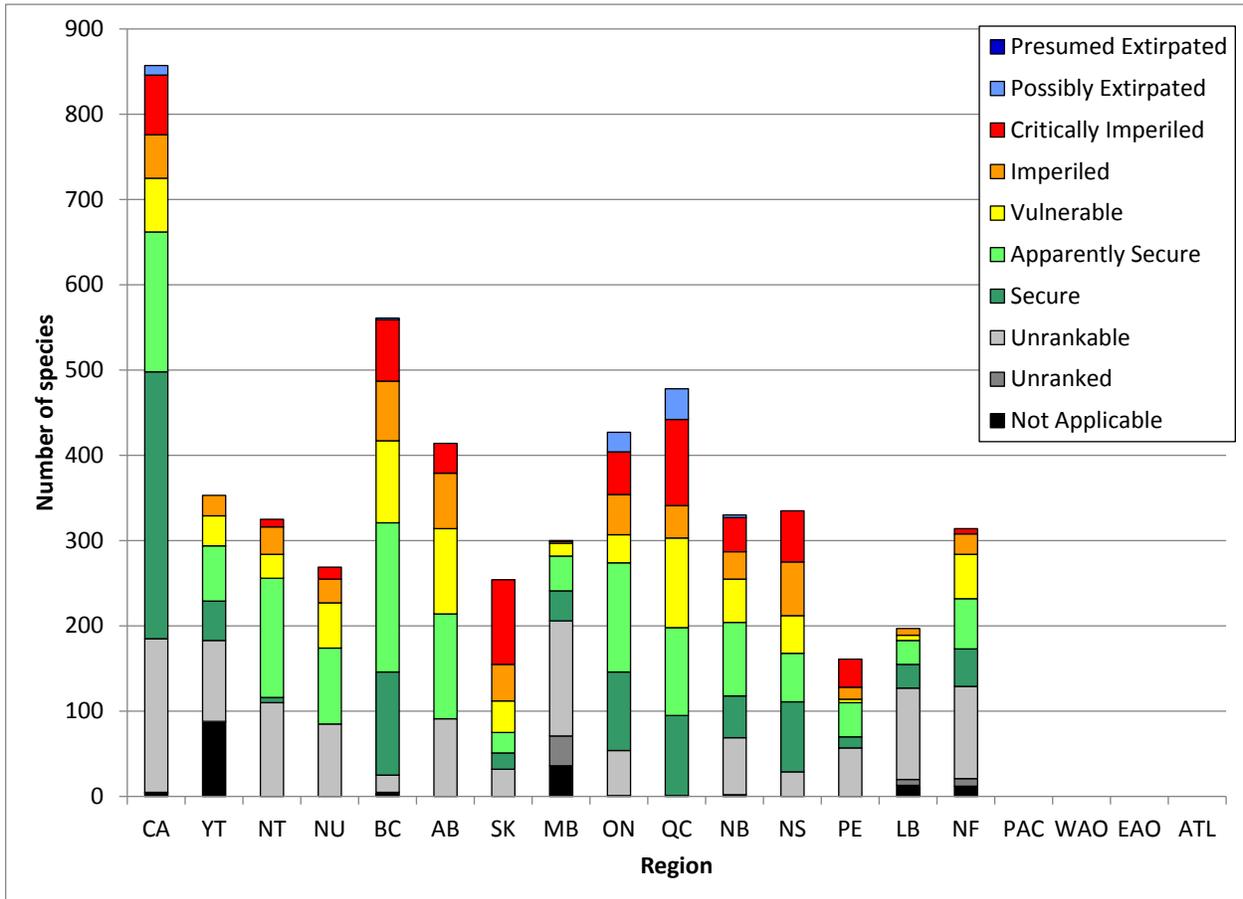


Figure 5. General status of macrolichens in Canada in 2015.

# PLANT KINGDOM

## Bryophytes



*Bartramia halleriana* © René Belland

Bryophytes refer to the phyla Marchantiophyta (liverworts), Bryophyta (mosses) and Anthocerotophyta (hornworts). They are simple plants that typically grow low to the ground in moist environments. Lacking true roots and vessels, they absorb water and nutrients directly across their surface. This limits their size, as without woody tissue they don't have the rigidity to grow tall. When dry, growth and metabolism stop until moisture revives them. They can reproduce asexually when water is scarce, or sexually by producing spores that are usually wind dispersed. Only a small fraction of spores land in conditions suitable for growth. Some species counter this by producing many millions of spores, while a few, such as the dung mosses, attract flies to deliver spores directly to their favoured growth medium: excrement. Bryophytes are ecologically significant, particularly in boreal and western coastal forest, alpine areas, and tundra. They colonize bare rock and affect water runoff, nutrient cycling, soil formation, and ground temperature. Sphagnum mosses are harvested on an industrial scale in several parts of Canada and used as soil amendments, chemical absorbent, wrapping material for plants, and component of menstrual pads. Canadian bryophyte distribution is understood at a general but not at a detailed scale, and mosses are better studied than either hornworts or liverworts. Threats to bryophytes include habitat loss and climate change.

There are 1375 known species of bryophytes in Canada (Figure 6). Many species are apparently secure or secure (47%). There are two species that are presumed extirpated, one species that is possibly extirpated, 75 species that are critically imperiled, and 85 species that are imperiled. Of these 163 species, 84 have only a small part of their range in Canada (10% or less) and 64 are intermediary (from 11% to 74%). However, 15 species have 75% or more of their range in Canada. Among those, eight species are thought to be endemic to Canada: *Anastrophyllum tenue*, *Calliargon orbicularicordatum*, *Frullania hattoriana*, *Neomacounia nitida*, *Scapania diphyloides*, *Seligeria careyana*, *Sphagnum venustum*, *Trematodon montanus*. In total, 27 species have a high priority score (between 1 and 5). We also identified nine species that are exotic at the national level. We do not have enough knowledge on 398 species to give them a rank other than NU or NNR. No species of bryophytes are considered migratory.

The mosses were assessed in the *Wild Species 2010* report. Since then, 305 species had a change in their status at the national level. A total of 49 species had an increased level of risk, 25 species had a reduced level of risk, and 158 species were changed from or to ranks U, NR, NA. Also, 52 species have

been added to the list and 21 have been deleted from the list. Most of the changes (72%) are due to a procedural change.

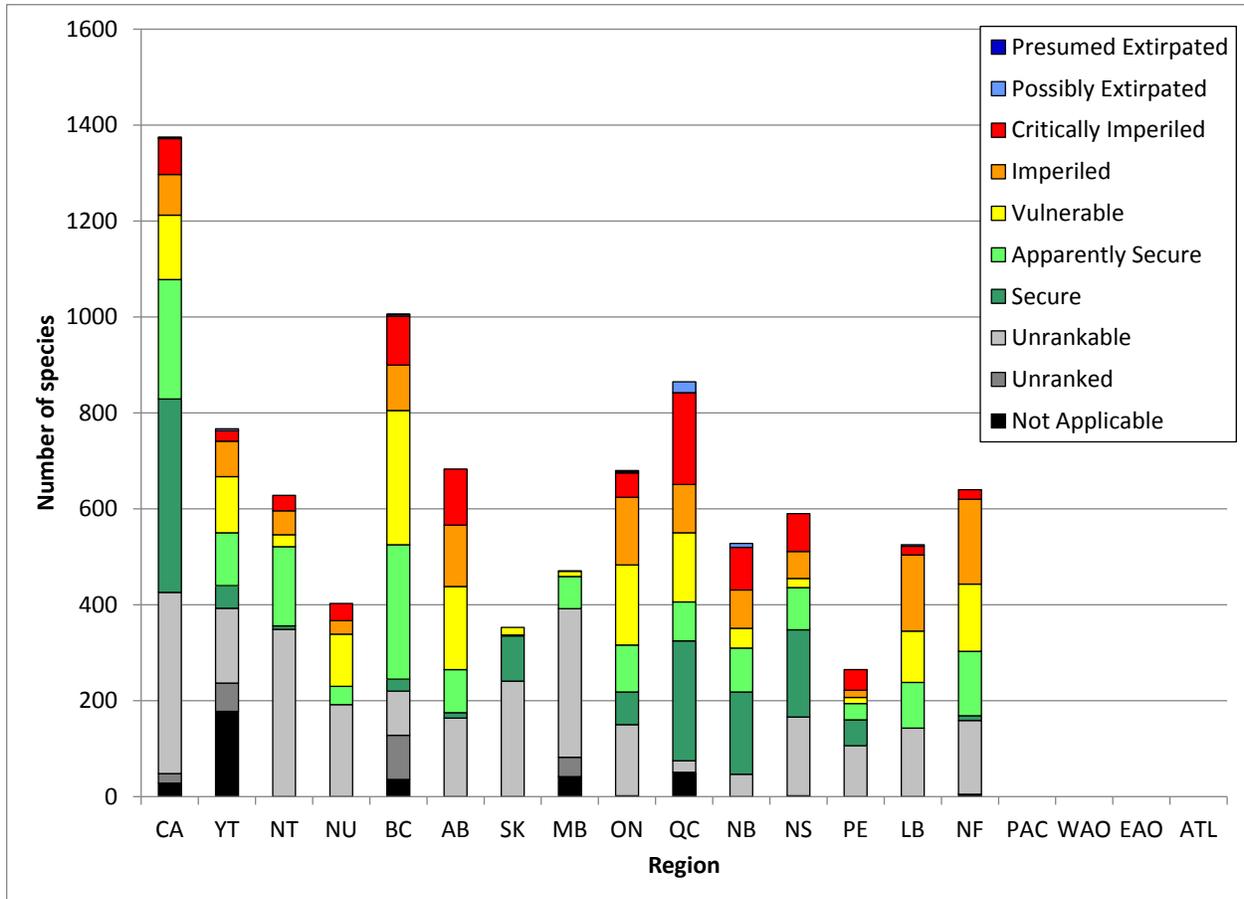


Figure 6. General status of bryophytes in Canada in 2015.

## Vascular plants



Drooping Trillium (*Trillium flexipes*) © Thomas G. Barnes

Vascular plants refer to the phylum Tracheophyta. Plants are critical to all life. They provide oxygen, food, and wildlife habitat. They regulate the climate, create soil, improve air and water quality, and reduce erosion. Vascular plants have roots, leaves, and vessels (i.e. a vascular system) to transport water and nutrients. They include plants with spores such as ferns, and cone-bearing plants like pine trees, but the vast majority are flowering plants (e.g. grasses, orchids, maple trees). To reproduce, they use the wind or animals to carry pollen from male to female flower parts, and flowers have developed showy petals, nectar, and alluring scents to attract pollinators. Seeds in turn may be wind-dispersed or may be enclosed in fruit to entice animals to eat and spread them. In nutrient poor wetlands, some species have gone carnivorous, and actually eat insects. The distribution and status of vascular plants is generally well known, particularly for southern Canada. Most current research focuses on species significant to agriculture, forestry, or medicine. Habitat loss, habitat degradation and invasive species are the major threats to vascular plants. Over-harvesting is a concern for some species, particularly those with high medicinal or aesthetic value.

There are 5211 known species of vascular plants in Canada (Figure 7). The majority of these species are apparently secure or secure (52%). There are 26 species that are presumed extirpated, 24 species that are possibly extirpated, 315 species that are critically imperiled, and 325 species that are imperiled. Of these 690 species, 396 have only a small part of their range in Canada (10% or less) and 240 are intermediary (from 11% to 74%). However, 54 species have 75% or more of their range in Canada. Among those, 42 species are thought to be endemic to Canada: Quebec Rockcress (*Boechera quebecensis*), False Northwestern Moonwort (*Botrychium pseudopinnatum*), Fernald's Braya (*Braya fernaldii*), Long's Braya (*Braya longii*), Hairy Braya (*Braya pilosa*), Newfoundland Chickweed (*Cerastium terrae-novae*), Elkwater Hawthorn (*Crataegus aquacervensis*), Dark Green Hawthorn (*Crataegus atrovirens*), Enderby Hawthorn (*Crataegus enderbyensis*), Orbicular-leaved Hawthorn (*Crataegus orbicularis*), Adams Creek Hawthorn (*Crataegus rivuloadamensis*), Battle Creek Hawthorn (*Crataegus rivulopugnensis*), Red Bracteole Hawthorn (*Crataegus rubibracteolata*), Sheila Phipps's Hawthorn (*Crataegus sheila-hippsiae*), Shuswap Hawthorn (*Crataegus shuswapensis*), Macoun's Cryptantha (*Cryptantha macounii*), Mackenzie Hairgrass (*Deschampsia mackenzieana*), Caswell's Draba (*Draba caswellii*), Cayouette's Draba (*Draba cayouettei*), Frankton's Draba (*Draba franktonii*), Kluane Draba (*Draba kluanei*), Puvirnituuq Mountain Draba (*Draba puvirnituuqii*), Dense Draba (*Draba pycnosperma*), Taylor's Draba (*Draba taylori*), Yukon Draba (*Draba yukonensis*), Ojibway Waterwort (*Elatine*

*ojibwayensis*), Peace River Fleabane (*Erigeron pacalis*), Queen Charlotte Avens (*Geum schofieldii*), Gaspé Saxifrage (*Micranthes gaspensis*), *Nymphaea loriana*, Mackenzie River Yellowcress (*Rorippa crystalline*), Seashore Stitchwort (*Sabulina litorea*), Green-scaled Willow (*Salix chlorolepis*), Barrens Willow (*Salix jejuna*), Blanket-leaved Willow (*Salix silicicola*), Turnor's Willow (*Salix turnorii*), Tyrrell's Willow (*Salix tyrrellii*), Mount Albert Goldenrod (*Solidago chlorolepis*), Gillman's Goldenrod (*Solidago gillmani*), *Solidago jejunifolia*, Gulf of St. Lawrence Aster (*Symphotrichum laurentianum*), Gulf of St. Lawrence Dandelion (*Taraxacum laurentianum*). In total, 138 species have a high priority score (between 1 and 5). We also identified 1315 species that are exotic at the national level. We do not have enough knowledge on 47 species to give them a rank other than NU or NNR. No species of vascular plants are considered migratory.

All the vascular plants were assessed in the *Wild Species 2010* report. Since then, 949 species had a change in their status at the national level. A total of 227 species had an increased level of risk, 195 species had a reduced level of risk, and 85 species were changed from or to ranks U, NR, NA. Also, 271 species have been added to the list and 171 have been deleted from the list. Most of the changes (35%) are due to an improved knowledge of the species.

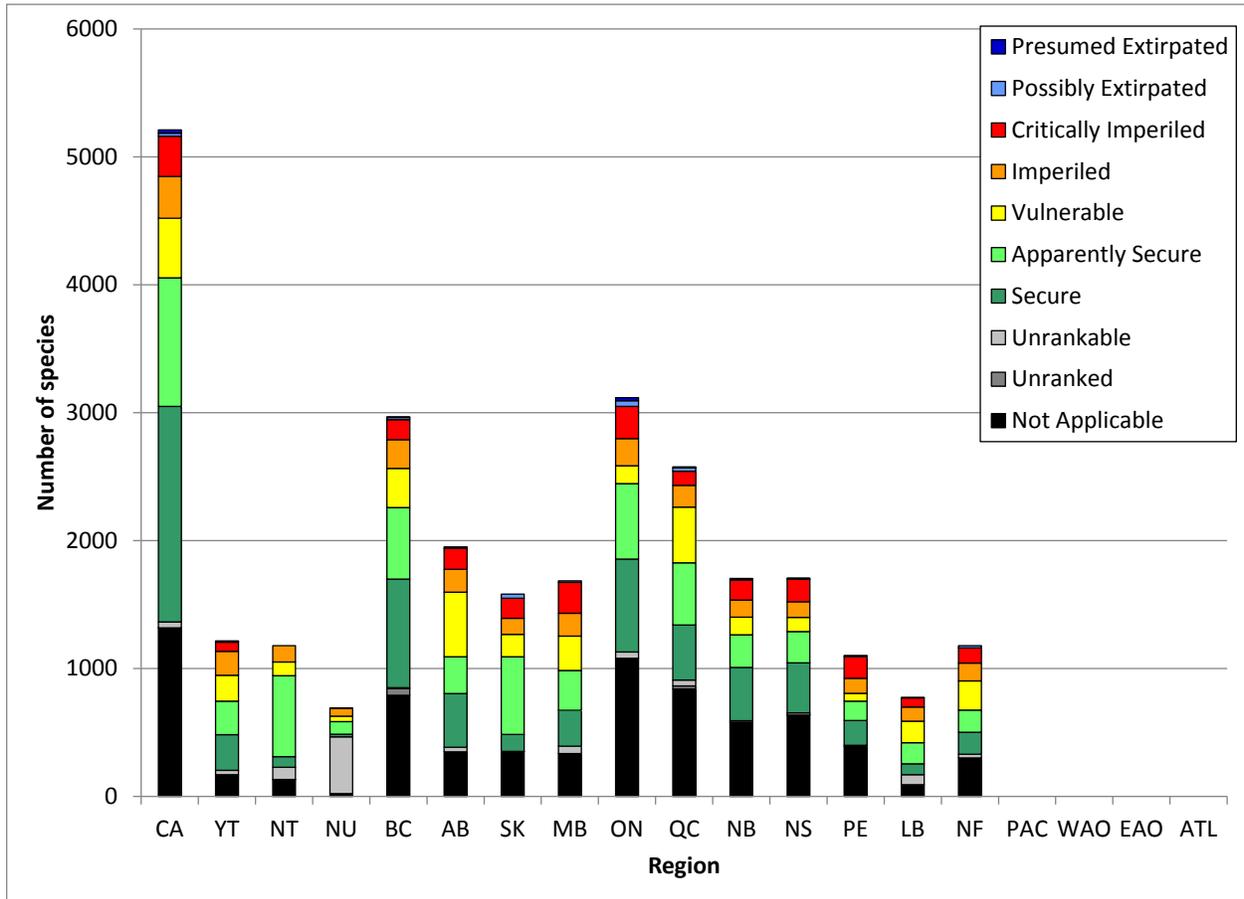


Figure 7. General status of vascular plants in Canada in 2015.

# ANIMAL KINGDOM

## Sponges



Glove Horny Sponge (*Amphilectus digitatus*) © John Rix

Sponges refer to the phylum Porifera. Sponges are simple, multicellular animals that vary in colour, shape and size and live attached to substrate such as the ocean floor. Most are marine species which live in Canada's three oceans, from intertidal zones to depths of 8 km. They play significant ecological roles, including filter-feeding bacteria, excreting nitrogen, and forming large colonies which provide important habitat for other animals. However, a few species of sponges also live in fresh waters. They are generally inconspicuous and green-coloured due to their symbiotic relationship with algae. Knowledge of sponges is very limited, but interest in the ecology and conservation of marine species is increasing. For example, the National Centre of Expertise in Cold-Water Corals and Sponge Reefs was established in Newfoundland in 2008. Scientific surveys and collections have begun, but many knowledge gaps remain regarding their distribution, reproduction, and resilience. Sponges are vulnerable to physical disturbance, particularly from bottom trawling, and a marine protected area for glass sponge reefs near Haida Gwaii is being established. Other threats include climate change impacts, ocean acidification, invasive species, and contamination.

There are 212 known species of sponges in Canada (Figure 8). Some species are apparently secure or secure (14%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 179 species to give them a rank other than NU or NNR. No species of sponges are considered migratory.

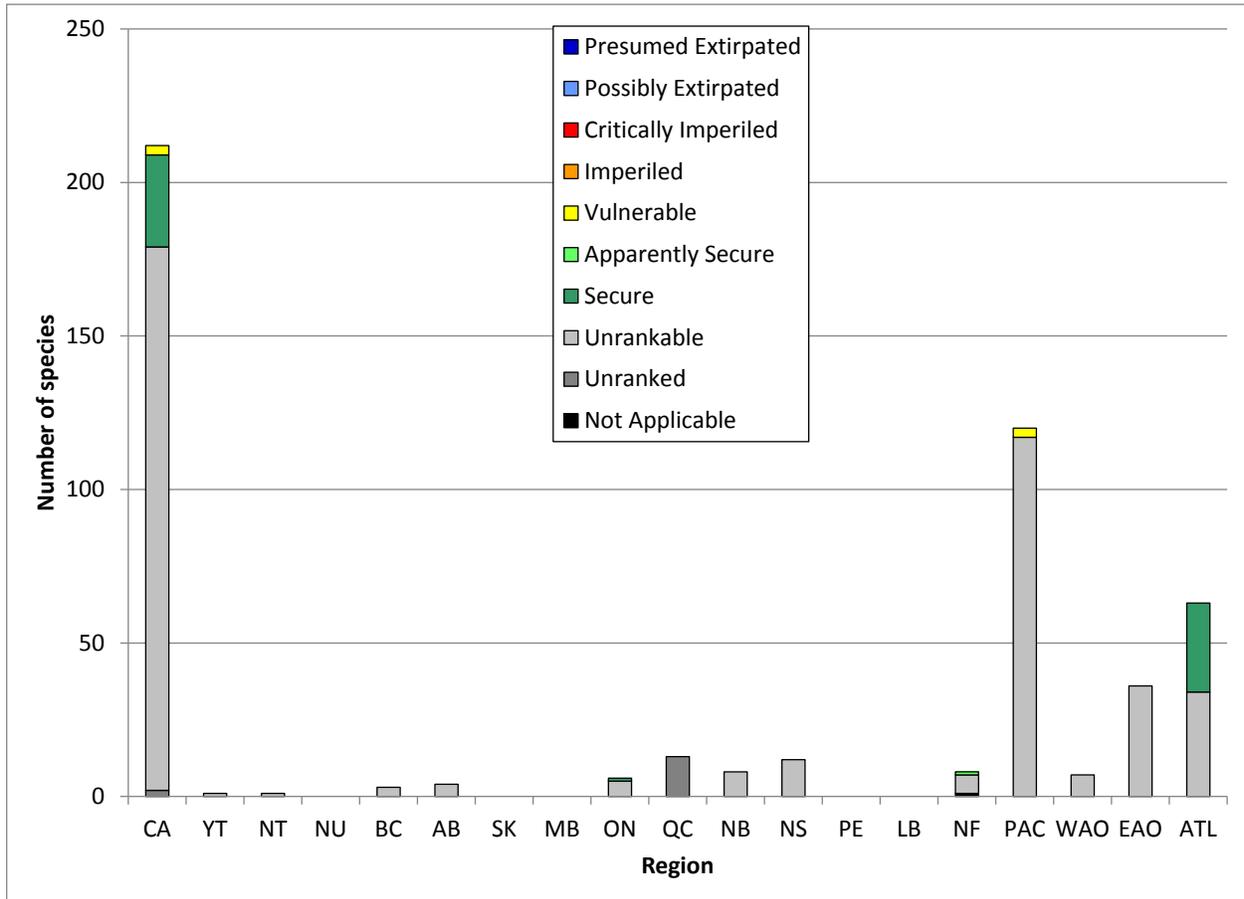


Figure 8. General status of sponges in Canada in 2015.

## Corals



Tree Bubblegum Coral (*Paragorgia arborea*) © Fisheries and Oceans Canada

Corals refer to the class Anthozoa. Corals are sedentary, multicellular animals that live on the ocean floor and form calcium carbonate skeletons. They generally refer to a group of polyps. However, polyps can be solitary or colonial. Their tentacles capture passing food, and unlike tropical corals, cold-water species have no symbiotic algae that require sunlight. They inhabit all Canada's oceans and range from intertidal zones to deep water. Corals can reproduce sexually or asexually, and some develop annual "growth rings" which provide insight into past ocean conditions. Coral reefs are one of the most complex deep-ocean habitats for animals to rest, feed, spawn, and avoid predators. They are correlated with fish abundance and diversity, and their conservation is increasingly recognized as a national and international priority. While recent research has increased our knowledge of coral distribution and biology, many areas remain un-surveyed, and information is lacking on their physiology, life-history, reproduction, and resilience. Threats to corals include mechanical damage (particularly from bottom fishing gear), siltation, ocean acidification, and climate change impacts.

There are 190 known species of corals in Canada (Figure 9). Some species are apparently secure or secure (10%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 133 species to give them a rank other than NU or NNR. No species of corals are considered migratory.

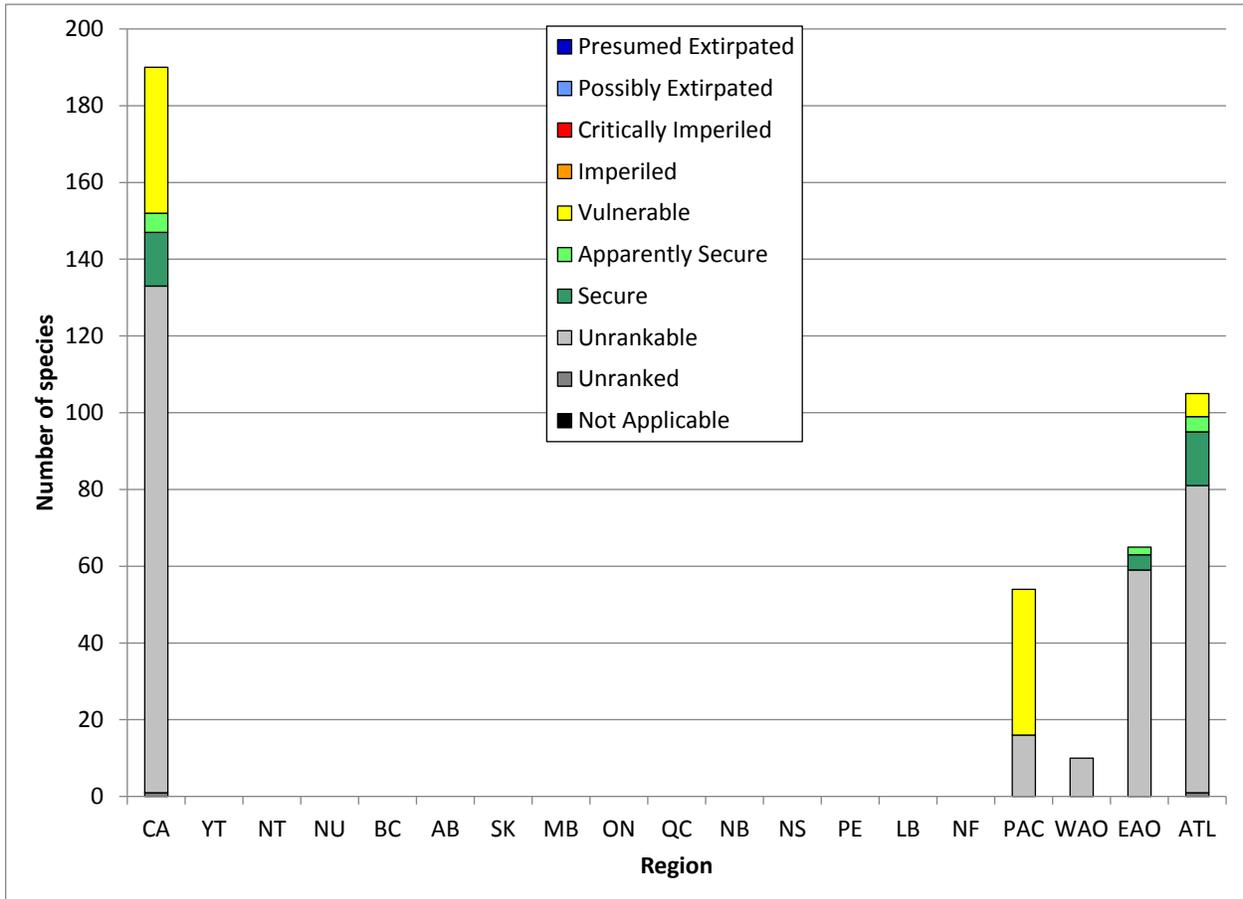


Figure 9. General status of corals in Canada in 2015.

## Freshwater bivalves



*Ptychobranchnus fasciolaris* © Todd Morris

Freshwater bivalves refer to the class Bivalvia (freshwater species only). They include species such as mussels and clams, and are soft-bodied animals that live in a hinged shell. Mussels are often fixed to hard substrate (though they can move slowly), while most clams burrow into sediment. All inhabit the bottoms of waterbodies, reaching their greatest diversity in the lower Great Lakes region. Most mussel larvae parasitize fishes, and some lure their potential hosts by resembling small prey. Adults feed by filtering bacteria and algae through their gills, thereby improving water clarity and quality. Being long-lived and mostly sessile filter feeders, they are good indicators of environmental health. Bivalve studies have been limited in Canada, though recent population declines have motivated new surveys, increasing our knowledge of their distribution, abundance, and habitat refuges. Research has focused on the impacts of exotic species like the Zebra Mussel (*Dreissena polymorpha*), which has altered aquatic ecosystems and dramatically reduced native bivalve populations by attaching to their shells, interfering with feeding, growth and reproduction. Other threats to bivalves (and to their host fish) include habitat destruction and alteration, siltation, and agricultural runoff.

There are 93 known species of freshwater bivalves in Canada (Figure 10). The majority of these species are apparently secure or secure (54%). There is one species that is presumed extirpated, one species that is possibly extirpated, 13 species that are critically imperiled, and nine species that are imperiled. Of these 24 species, 18 have only a small part of their range in Canada (10% or less) and six are intermediary (from 11% to 74%). In total, four species have a high priority score (between 1 and 5). We also identified seven species that are exotic at the national level. We do not have enough knowledge on one species to give it a rank other than NU or NNR. No species of freshwater bivalves are considered migratory.

The freshwater mussels were assessed in the *Wild Species* 2010 report. Since then, 14 species had a change in their status at the national level. A total of four species had an increased level of risk, seven species had a reduced level of risk, and three species were changed from or to ranks U, NR, NA. Most of the changes (57%) are due to a procedural change.

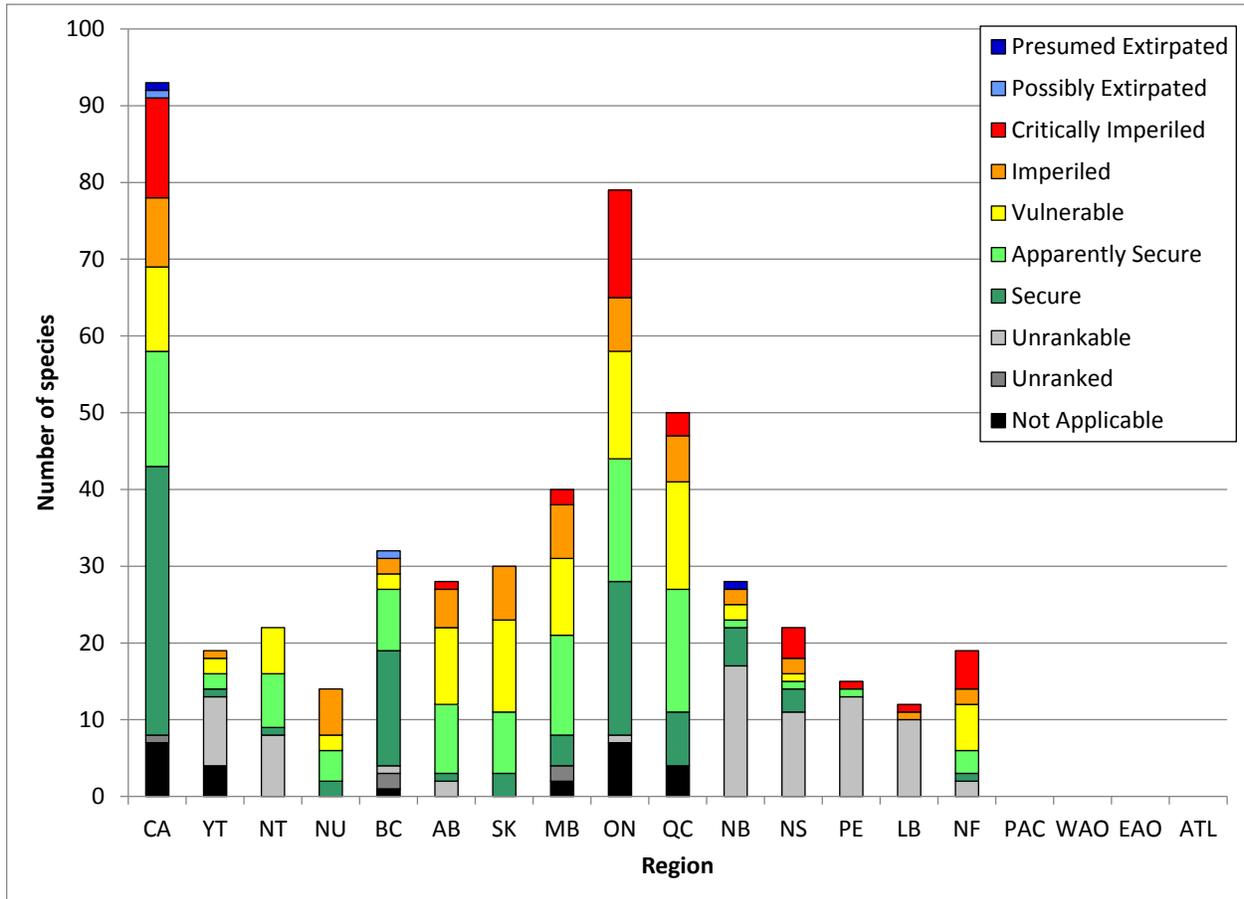


Figure 10. General status of freshwater bivalves in Canada in 2015.

## Terrestrial and freshwater snails and slugs



*Allogona townsendiana* © Kristiina Ovaska

Terrestrial and freshwater snails and slugs refer to the class Gastropoda (terrestrial and freshwater species only). They have a well-developed head, tentacles, a muscular foot for locomotion, and most have a shell to protect against predation and desiccation. Shells are reduced, internalized or absent in the slugs. Gastropods are generally scavengers and herbivores, and feed with their raspy, toothed tongue. Terrestrial species require moisture, and are often found in leaves or under logs and rocks. Many species are hermaphrodites, having both male and female sexual organs, though cross-fertilization is usually required for reproduction. Some species have very specific habitats, such as the endangered Banff Springs Snail (*Physella johnsoni*), whose world population is restricted to a micro-habitat in Banff National Park. Most species are poorly known in Canada, likely due to their small size, taxonomic difficulties and absence of accessible reference books. Threats include habitat destruction or degradation, invasive species, climate change and (for freshwater species) aquatic pollution.

There are 326 known species of terrestrial and freshwater snails and slugs in Canada (Figure 11). Many species are apparently secure or secure (35%). There is one species that is presumed extirpated, four species that are possibly extirpated, 15 species that are critically imperiled, and 25 species that are imperiled. Of these 45 species, 27 have only a small part of their range in Canada (10% or less) and 11 are intermediary (from 11% to 74%). However, seven species have 75% or more of their range in Canada. Among those, six species are thought to be endemic to Canada: *Oreohelix stantoni*, *Physella johnsoni*, *Physella wrighti*, *Planorbella columbiensis*, *Staalaa gwaii*, *Vallonia terraenovae*. In total, nine species have a high priority score (between 1 and 5). We also identified 45 species that are exotic at the national level. We do not have enough knowledge on 95 species to give them a rank other than NU or NNR. No species of terrestrial and freshwater snails and slugs are considered migratory.

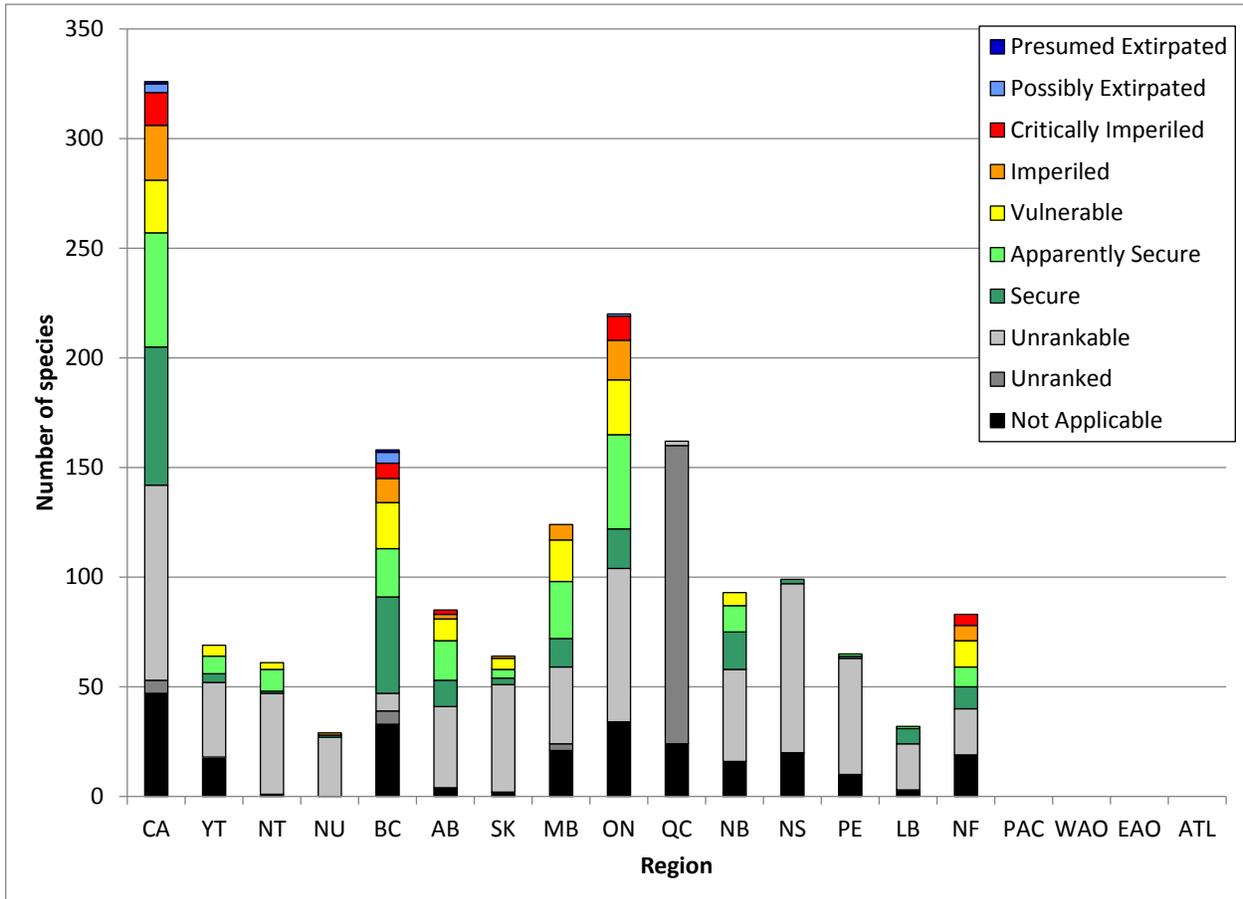


Figure 11. General status of terrestrial and freshwater snails and slugs in Canada in 2015.

## Spiders



Goldenrod Crab Spider (*Misumena vatia*) © Joanne Bovee

Spiders refer to the order Araneae. Spiders are 8-legged, silk-producing predators with venom-filled fangs. They differ from insects by having two body segments rather than three, simple rather than compound eyes, and no antennae or wings. Unlike most arthropods, spiders do not have extensor muscles in their limbs and instead extend them using hydraulic pressure. Silk is used for building webs, weaving cocoons, subduing prey (and sometimes mates), or traveling. Some species catch prey in webs, while others are active hunters, or sit-and-wait predators that ambush passing victims. The fishing spiders will pursue prey across land, water, or even dive underwater to catch the occasional minnow or tadpole. Some female spiders care for their young by carrying, protecting, and sharing food with them. Many species disperse by “ballooning”: releasing a silk thread that catches the wind, and flying with it for a few metres or up to many kilometres. While all spiders are poisonous to some degree, very few are harmful to humans. Spiders are increasingly recognized for their ecological importance, notably their role in controlling insect pests. Despite having captured the fascination of researchers and the public, they are generally poorly known in Canada, with only a few well sampled habitats. Threats include habitat loss, climate change and pesticides.

There are 1399 known species of spiders in Canada (Figure 12). The majority of these species are apparently secure or secure (55%). There are seven species that are critically imperiled and 37 species that are imperiled. Of these 44 species, 26 have only a small part of their range in Canada (10% or less) and 14 are intermediary (from 11% to 74%). However, four species have 75% or more of their range in Canada. These four species are thought to be endemic to Canada: Angulated Sac Spider (*Clubiona angulate*), Glassy Double-coiled Money Spider (*Disembolus hyalinus*), Quebec Litterweaver (*Mysmena quebecana*), Black-headed Erudite Money Spider (*Walckenaeria fusciceps*). In total, four species have a high priority score (between 1 and 5). We also identified 71 species that are exotic at the national level. We do not have enough knowledge on 460 species to give them a rank other than NU or NNR. No species of spiders are considered migratory.

All the spiders were assessed in the *Wild Species 2010* report. Since then, 235 species had a change in their status at the national level. A total of 19 species had an increased level of risk, 31 species had a reduced level of risk, and 112 species were changed from or to ranks U, NR, NA. Also, 46 species have been added to the list and 27 have been deleted from the list. Most of the changes (64%) are due to an improved knowledge of the species.

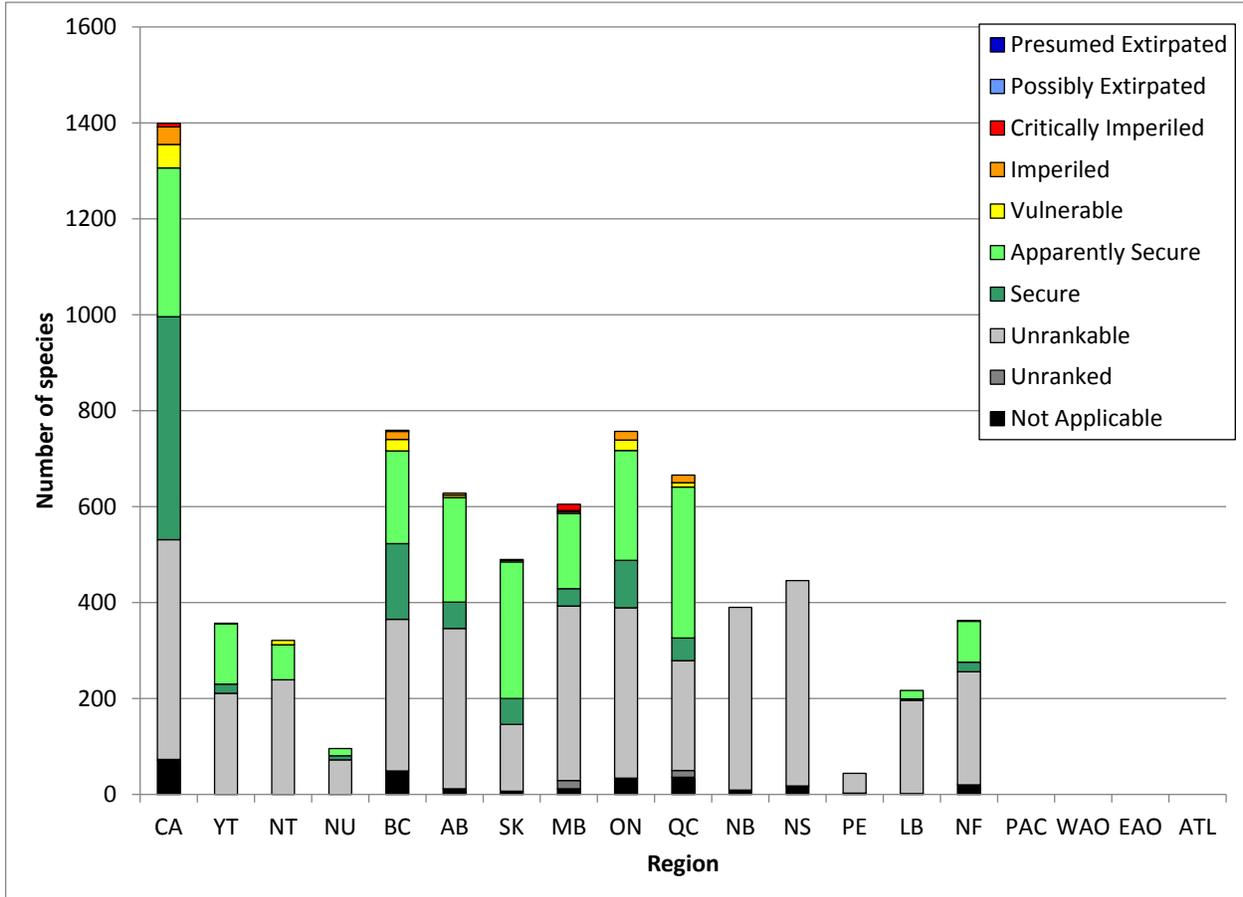


Figure 12. General status of spiders in Canada in 2015.

## Mayflies



Common Flat-headed Mayfly (*Stenacron interpunctatum*) © Tom D. Schultz

Mayflies refer to the order Ephemeroptera. Mayflies are aquatic insects since the larvae live in water for many months. They feed on algae, bacteria or fungi in flowing water. Mayflies are unique in having a sub-adult winged life stage, a subimago, which emerges from the water and moults into a sexually mature adult soon after. Adults have shiny bodies with two or three tail-like filaments, and translucent, triangular wings. They are best known for their mating swarms, which can appear blizzard-like and have been large enough to be detected by radar. Adults do not eat, and in their brief life (rarely lasting more than a day or two) they must reproduce and disperse as quickly as possible. Their emergence from the water is highly synchronized and males form swarms at specific times and locations. They grab passing females with their specialized claspers, copulate in mid-air, and females lay their eggs on the water soon after. Eggs are sometimes able to self-fertilize in the absence of sperm in a process called parthenogenesis. Mayflies are an important component of aquatic food webs. Some species are sensitive to pollution and are indicators of ecosystem health. The taxonomy, biology and ecology of mayflies are relatively well-studied, though comprehensive Canadian surveys are lacking. Threats include habitat loss, damming, eutrophication, pollution, and climate change.

There are 342 known species of mayflies in Canada (Figure 13). Some species are apparently secure or secure (21%). There is one species that is critically imperiled and two species that are imperiled. Of these three species, one has only a small part of its range in Canada (10% or less) and another is intermediary (from 11% to 74%). However, another species has 75% or more of its range in Canada. This species is thought to be endemic to Canada: Dark-winged Primitive Minnow Mayfly (*Parameletus croesus*). In total, one species has a high priority score (between 1 and 5). Also, there are no exotic species known at the national level. We do not have enough knowledge on 266 species to give them a rank other than NU or NNR. No species of mayflies are considered migratory.

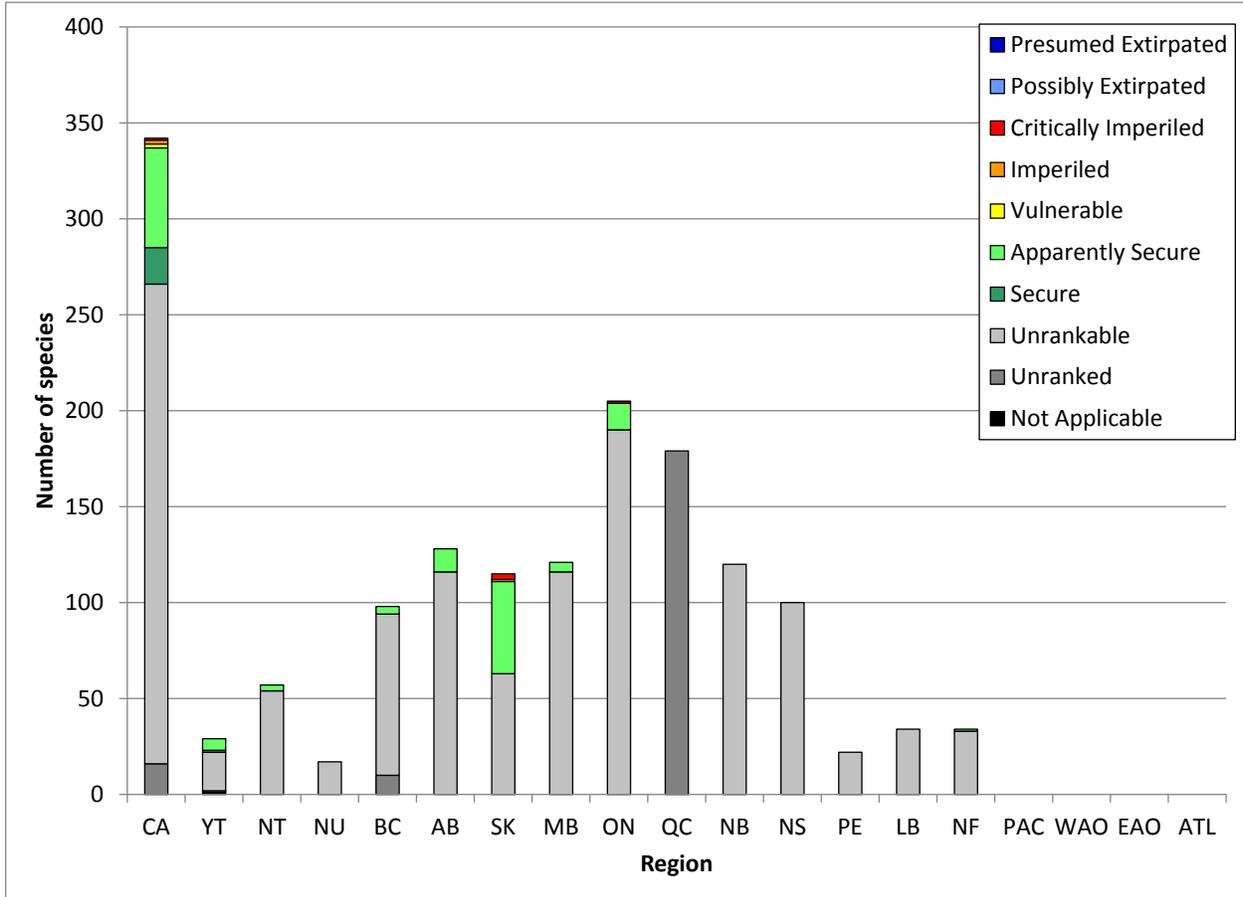


Figure 13. General status of mayflies in Canada in 2015.

## Dragonflies and damselflies



Pygmy Snaketail (*Ophiogomphus howei*) © Denis Doucet

Dragonflies and damselflies refer to the order Odonata. One of the oldest insect orders alive today, the dragonflies and damselflies are agile hunters with large eyes, long slender bodies, and vivid colouring when sexually mature. Dragonflies are generally faster and more robust; they spread their wings horizontally when resting while damselflies typically fold theirs up. Their favourite habitats are well-vegetated lakes, streams and ponds. The aquatic larvae capture insects, tadpoles, and even small fish. Adults mature in upland habitats before returning to the water to breed. Aerial to the extreme, they are able to hunt insects, eat, defend territories, mate, and lay eggs while in flight. As voracious predators and important prey, odonates play key roles in aquatic and terrestrial ecosystems. Of interest to outdoors-loving Canadians, both the larval and adult stages feed on mosquitos! Odonates are one of the best known insect groups, but understanding of many species' life history, distribution, and habitat requirements is lacking. Threats include habitat loss or degradation, pollution, human disturbance such as boat wakes, and invasive species.

There are 213 known species of dragonflies and damselflies in Canada (Figure 14). The majority of these species are apparently secure or secure (69%). There is one species that is possibly extirpated, 11 species that are critically imperiled, and 15 species that are imperiled. Of these 27 species, 25 have only a small part of their range in Canada (10% or less) and two are intermediary (from 11% to 74%). All species have a lower priority score. We also identified one species that is exotic at the national level. We do not have enough knowledge on four species to give them a rank other than NU or NNR. In total, four species of dragonflies and damselflies are considered migratory.

All the dragonflies and damselflies were assessed in the *Wild Species* 2010 report. Since then, 28 species had a change in their status at the national level. A total of 13 species had an increased level of risk, three species had a reduced level of risk, and six species were changed from or to ranks U, NR, NA. Also, four species have been added to the list and two have been deleted from the list. Most of the changes (50%) are due to an improved knowledge of the species.

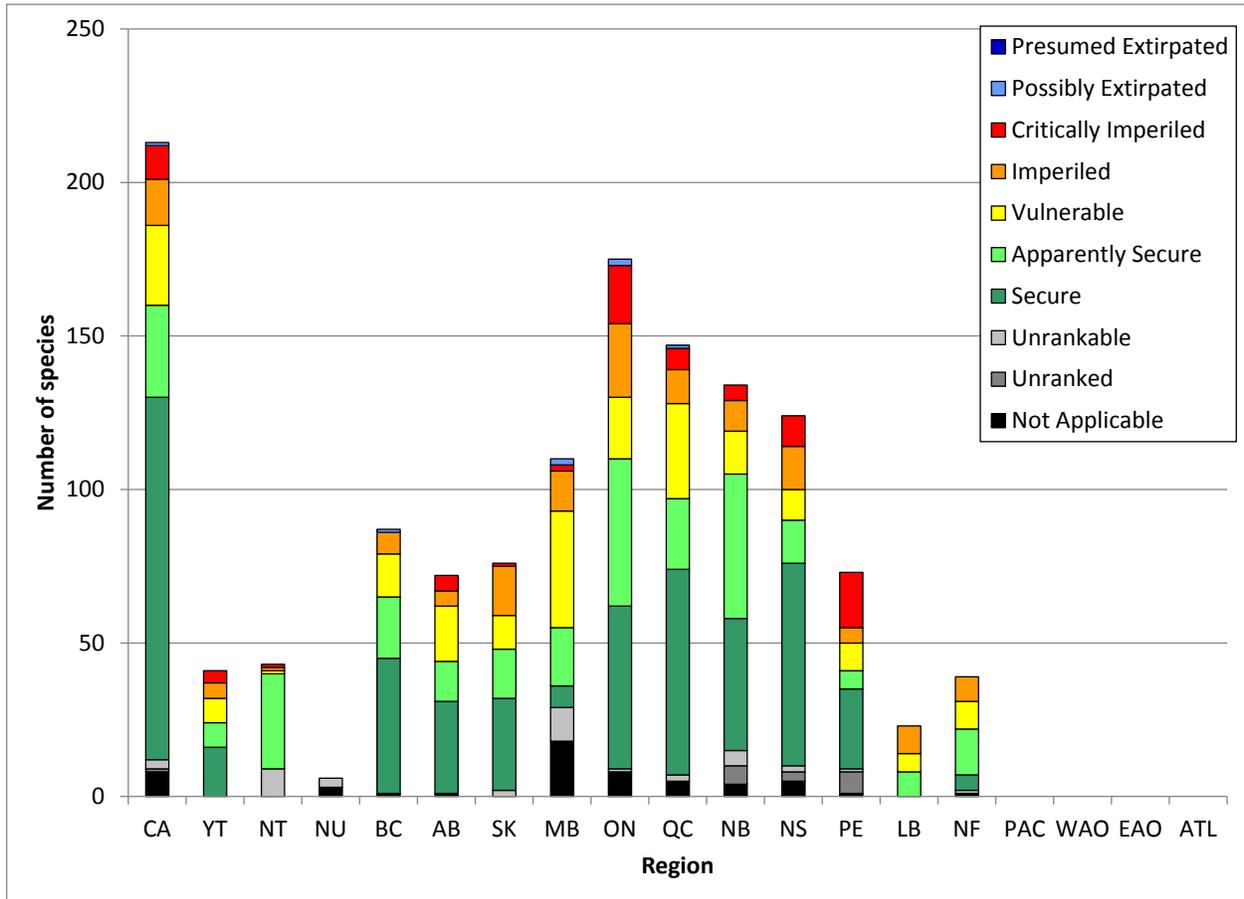


Figure 14. General status of dragonflies and damselflies in Canada in 2015.

## Stoneflies



Yellow Stripetail (*Isoperla decepta*) © Tom D. Schultz

Stoneflies refer to the order Plecoptera. Stoneflies are aquatic insects whose larvae and adults are similar in appearance, both having long antennae and tail-like filaments (cerci). Larvae have a flattened profile to cling to rocks in fast-flowing water. Some larvae do push-ups to increase water flow over their gills when required. They have a varied diet, including herbivory, omnivory, and predation. Adults have two pairs of translucent wings, though most are poor fliers. Adulthood is brief and feeding is uncommon. Males die soon after mating, while females live one to three weeks; those that eat algae scraped off of stones enjoying a slightly longer life. Larvae in the snowflies and willowflies families are remarkable in becoming dormant as summer approaches, and resuming growth and feeding in late fall. They emerge onto the ice in late winter to take advantage of the relative lack of predators while they seek their mates. Stoneflies require clean, cool, well-oxygenated water and, alongside mayflies and caddisflies, are important indicators of water quality. This is one focus of current stonefly research; their limited dispersal abilities also make them of interest to biogeographical studies. Most species are poorly known, and while some regional baseline data exists, no systematic national survey has been undertaken. Threats include the damming or eutrophication of waterways, pollution, and climate change.

There are 293 known species of stoneflies in Canada (Figure 15). Many species are apparently secure or secure (34%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 193 species to give them a rank other than NU or NNR. No species of stoneflies are considered migratory.

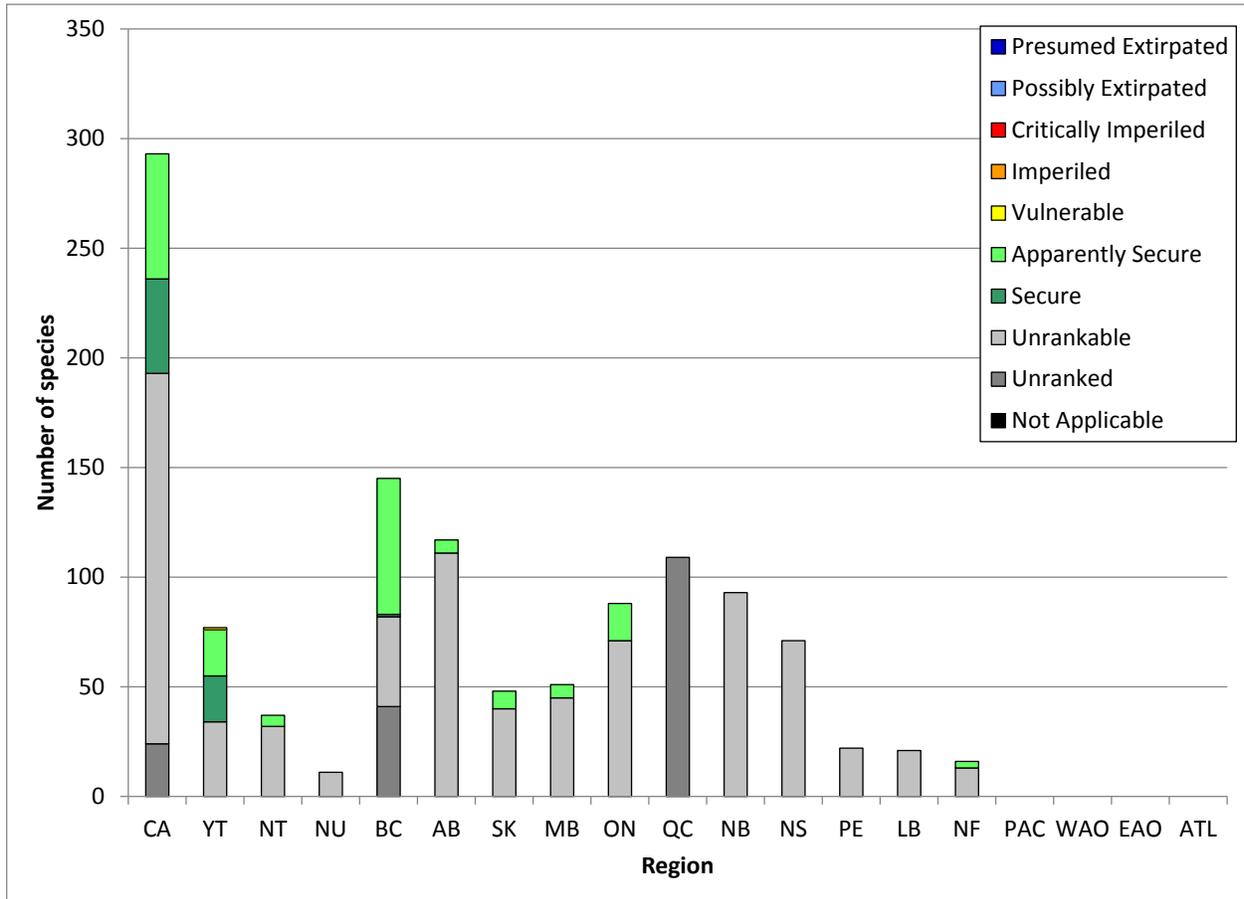


Figure 15. General status of stoneflies in Canada in 2015.

## Grasshoppers and relatives



Green-striped Grasshopper (*Chortophaga viridifasciata*)  
© Tom D. Schultz

Grasshoppers and relatives refer to the orders Dermaptera (earwigs), Orthoptera (grasshoppers, katydids and crickets), Notoptera (rock crawlers), Phasmida (walkingsticks), Mantodea (mantis), Blattodea (cockroaches), and Isoptera (termites). Collectively, they are often referred as the orthopteroid insects. The grasshoppers, katydids and crickets have chewing mouthparts, wings that fold back, and long hind legs modified for jumping. Eggs are laid in the soil, and nymphs (miniature adults that cannot fly or reproduce) moult successively into adulthood. Alongside mammals, grasshoppers are the greatest grazers of temperate grasslands. While some are major agricultural pests, others are beneficial by consuming weeds or plants toxic to cattle. Locusts are the swarming phase of a few grasshopper species. Environmental conditions can trigger them to band together by the millions, eat ravenously, and devastate enormous natural and agricultural areas. Rock crawlers, walkingsticks and mantis often have special habitat requirements or special morphologic features (for example, walkingsticks have a stick-like appearance). Earwigs, cockroaches and termites are often associated with human habitations. Economically important pest species are well studied in Canada, while orthopteroids in specialized habitats and un-surveyed regions are less known. Threats include habitat loss and alteration and pesticides.

There are 269 known species of grasshoppers and relatives in Canada (Figure 16). The majority of these species are apparently secure or secure (62%). There is one species that is presumed extirpated, eight species that are possibly extirpated, 12 species that are critically imperiled, and 12 species that are imperiled. Of these 33 species, 24 have only a small part of their range in Canada (10% or less) and seven are intermediary (from 11% to 74%). However, two species have 75% or more of their range in Canada. These two species, Gaspésie Grasshopper (*Melanoplus gaspensis*) and Magdalen Islands Grasshopper (*Melanoplus madeleineae*), are thought to be endemic to Canada. In total, six species have a high priority score (between 1 and 5). We also identified 29 species that are exotic at the national level. We do not have enough knowledge on 14 species to give them a rank other than NU or NNR. No species of grasshoppers and relatives are considered migratory.

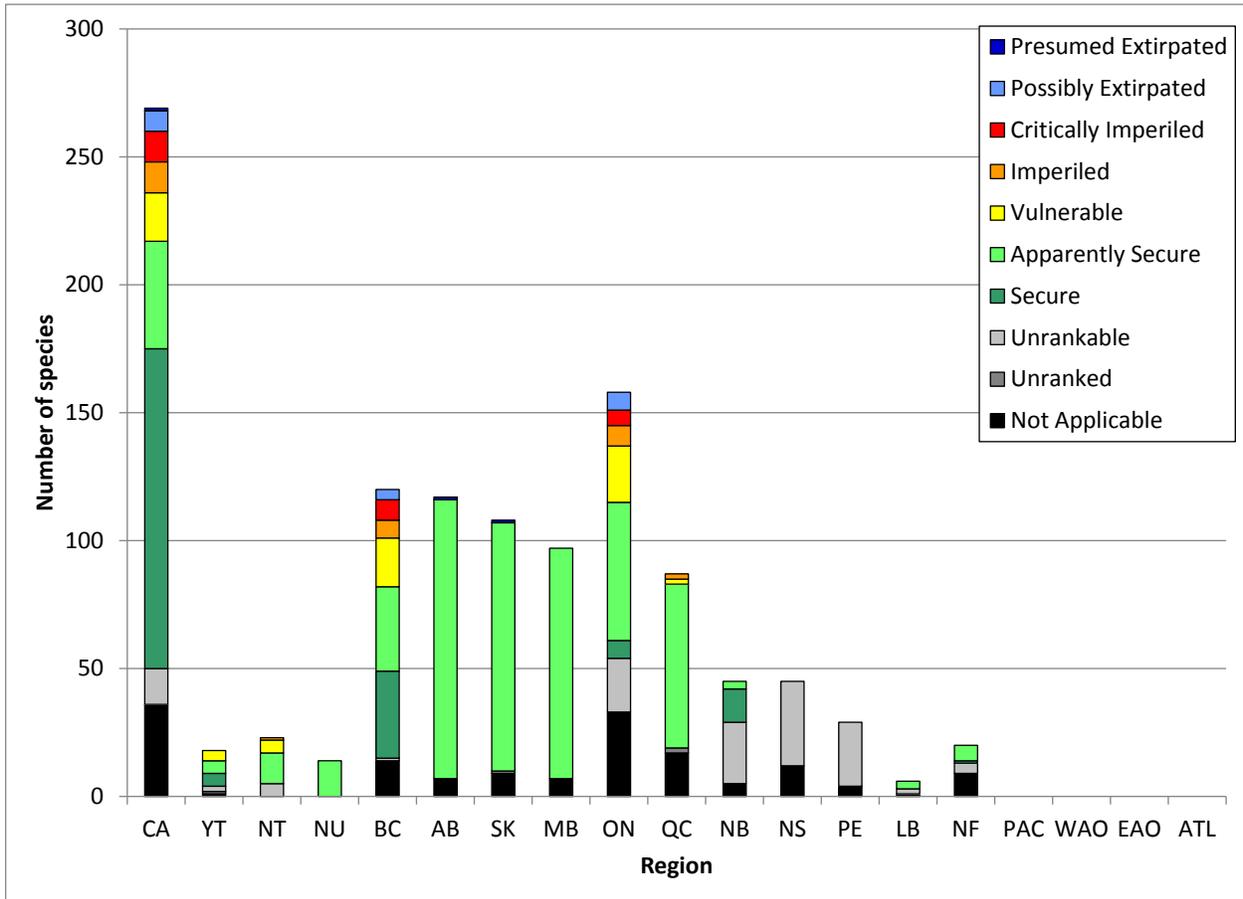


Figure 16. General status of grasshoppers and relatives in Canada in 2015.

## Lacewings



Golden-eyed Green Lacewing (*Chrysopa oculata*) ©  
Tom D. Schultz

Lacewings refer to the order Neuroptera. Neuroptera are soft-bodied insects named for the nerve-like pattern of veins on their wings. They undergo complete metamorphosis (egg, larvae, pupa and adult). They have chewing mouthparts, long thin antennae, and two pairs of wings folded tent-like over their abdomen when at rest. Adults are generally weak flyers; most species are predators though some feed on nectar and pollen. Courtship rituals can be intricate, and may involve abdominal drumming and acrobatic copulation that lasts for hours while dangling from a twig. Some lacewings produce thin stalks atop which they lay individual eggs, thus protecting them from predators (including newly-emerged siblings from adjacent eggs). Most larvae are predaceous and several species help agricultural production by hunting aphids, mites and scales. They include antlions, whose larvae dig pitfall traps in the sand, and bury themselves at the bottom leaving only their jaws exposed to devour any insect that slips down. There has generally been little research on Neuroptera in Canada, though their taxonomy is relatively well known, and agriculturally important species are better studied. The limited knowledge of Neuroptera biology and distribution make it difficult to assess their threats or conservation status.

There are 101 known species of lacewings in Canada (Figure 17). Some species are apparently secure or secure (18%). There are two species that are imperiled. Of these two species, one has only a small part of its range in Canada (10% or less) and the other is intermediary (from 11% to 74%). Both species have a lower priority score. We also identified six species that are exotic at the national level. We do not have enough knowledge on 73 species to give them a rank other than NU or NNR. No species of lacewings are considered migratory.

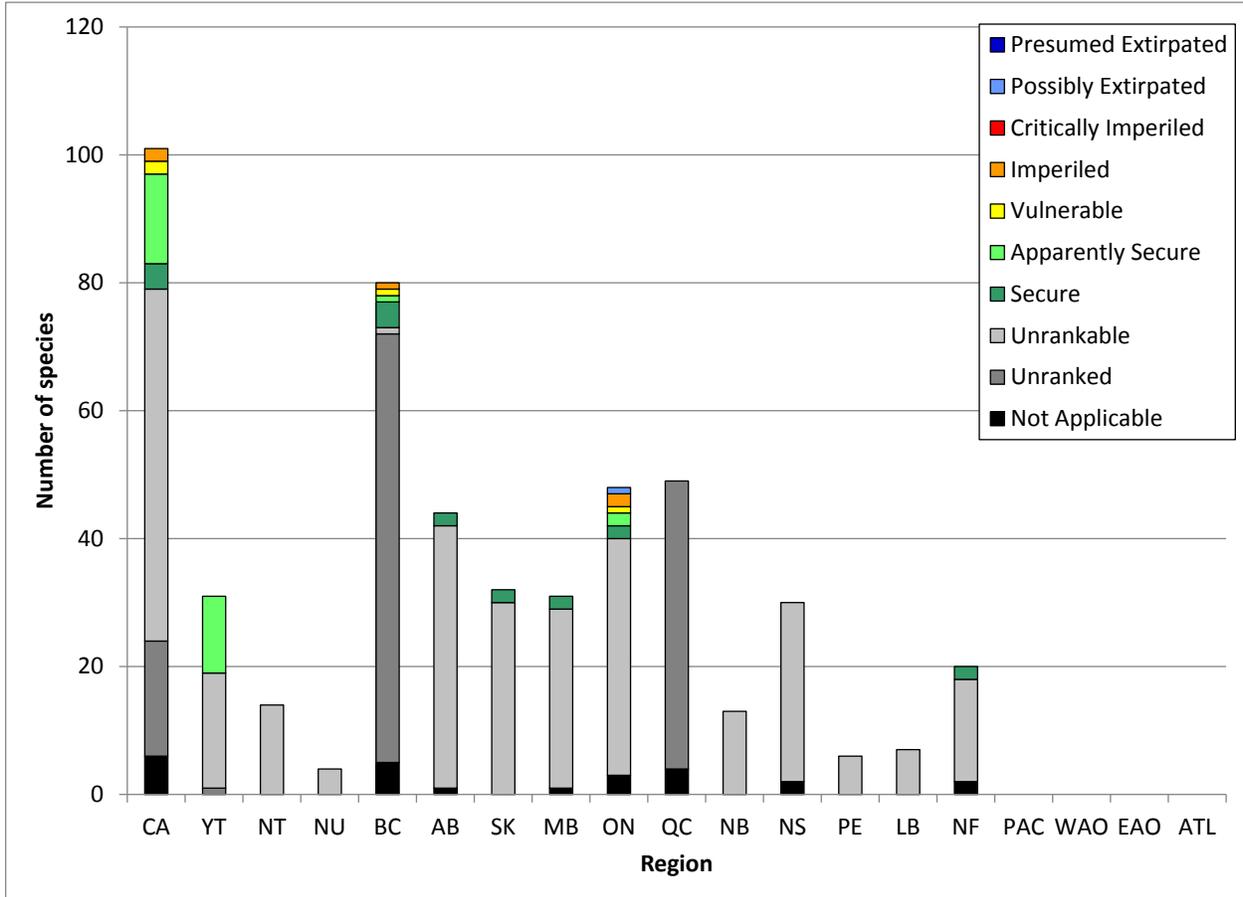


Figure 17. General status of lacewings in Canada in 2015.

## Beetles



*Cicindela marginipennis* © Henri Goulet

Beetles refer to the order Coleoptera. Beetles are an extremely diverse order of insects that make up about 25% of all animals on Earth. Their hardened, protective forewings (elytra) contribute to this success by enabling them to access habitats like crevices or burrows that more delicate animals cannot. They also undergo complete metamorphosis, whereby larvae and adults have distinct life habits and do not compete with each other. Beetles have tremendous ecological and social importance. Lady beetles and predaceous ground beetles control agricultural pests, while some weevils devour agricultural crops and grain. Certain wood borers can also profoundly impact forest ecosystems. Burying and dung beetles, on the other hand, process carcasses and excrement that would otherwise overwhelm us; enhancing the soil's fertility, permeability, and aeration in the process. Beetles are important pollinators and indicators of environmental health. They also fascinate! Fireflies lure mates through dazzling displays of bioluminescence (though some rogue species mimic a female's pattern to bait and eat the males). Tiger beetles are such fast hunters that their eyes cannot follow their prey! Their running speed often outruns their capacity to process light and to form an image of their prey. They must periodically stop, reorient, and resume the chase. Some beetles are relatively well-studied, particularly in human-managed systems. Threats include habitat loss, pesticides and competition from invasive species.

There are 7963 known species of beetles in Canada (Figure 18). Many species are apparently secure or secure (43%). There are 22 species that are possibly extirpated, 78 species that are critically imperiled, and 53 species that are imperiled. Of these 153 species, 115 have only a small part of their range in Canada (10% or less) and 26 are intermediary (from 11% to 74%). However, 12 species have 75% or more of their range in Canada. Among those, 11 species are thought to be endemic to Canada: *Hydnobius autumnalis*, *Lypoglossa manitobae*, *Macrohydlobius tibioalcaris*, *Mitosynum vockerothi*, *Nebria charlottae*, *Nebria louiseae*, *Ophraella nuda*, *Philonthus turbo*, *Sanfilippodytes bertae*, *Subhaida monticola*, *Tricholochmaea sablensis*. In total, 19 species have a high priority score (between 1 and 5). We also identified 624 species that are exotic at the national level. We do not have enough knowledge on 3624 species to give them a rank other than NU or NNR. No species of beetles are considered migratory.

The predaceous diving beetles, the ground beetles, and the lady beetles were assessed in the *Wild Species* 2010 report. Since then, 303 species had a change in their status at the national level. A total of 28 species had an increased level of risk, eight species had a reduced level of risk, and 216

species were changed from or to ranks U, NR, NA. Also, 12 species have been added to the list and 39 have been deleted from the list. Most of the changes (50%) are due to an improved knowledge of the species.

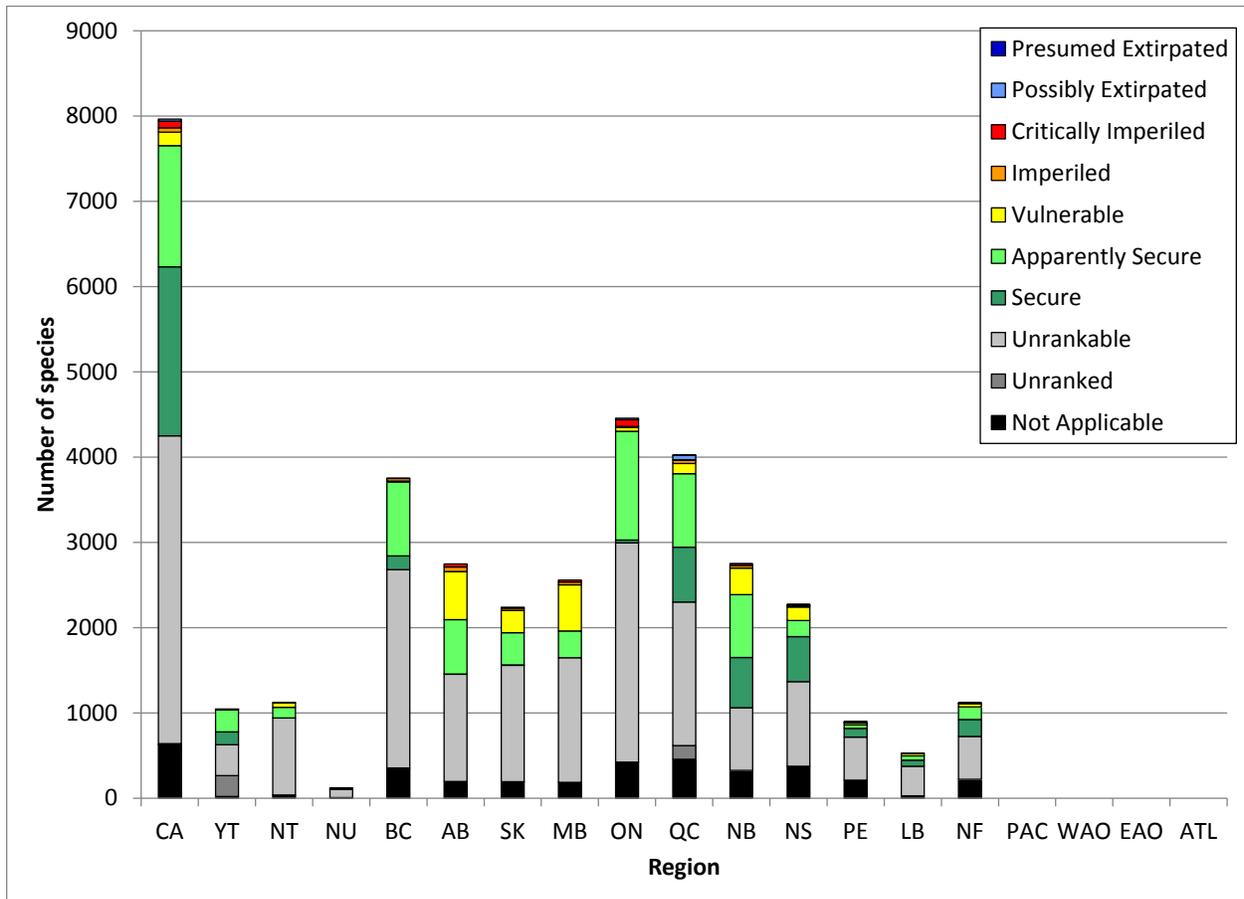


Figure 18. General status of beetles in Canada in 2015.

## Ants



Enviably Ant (*Manica invidia*) © Sean McCann

Ants refer to the family Formicidae. Ants are small social insects with slender waists and elbowed antennae. They are generally wingless and most are not aggressive, though some can sting or bite. They sometimes use formic acid for attack and defense purposes. Their colonies number in the hundreds to millions of individuals, and are divided into distinct social castes: the reproductive queen, the workers who do most of the brood rearing and foraging, and the males, who die shortly after mating. Most ants are omnivorous, and some are important predators of forest pests. Scouts search for food and leave a scented trail for other workers to follow back to its source. Some ants “farm” aphids in order to drink the sweet honeydew they exude. Dracula ants have the unique and rather disturbing habit of feeding almost entirely on the blood (haemolymph) of their own young. Adults being unable to eat solid food themselves, they provide a centipede to their brood, and then chew through their larvae’s exoskeletons to suck out the nutrients. Ants are the most abundant biota of many systems and play key ecological roles as seed dispersers, decomposers, and food for vertebrates and invertebrates. Their effects on soil mixing and aeration are comparable to those of earthworms. Ants have long fascinated people and they are relatively well known compared to most invertebrates. They are most threatened by habitat loss and competition from invasive species.

There are 212 known species of ants in Canada (Figure 19). The majority of these species are apparently secure or secure (65%). There are two species that are possibly extirpated. Both species have only a small part of their range in Canada (10% or less) and have a lower priority score. We also identified 15 species that are exotic at the national level. We do not have enough knowledge on 53 species to give them a rank other than NU or NNR. No species of ants are considered migratory.

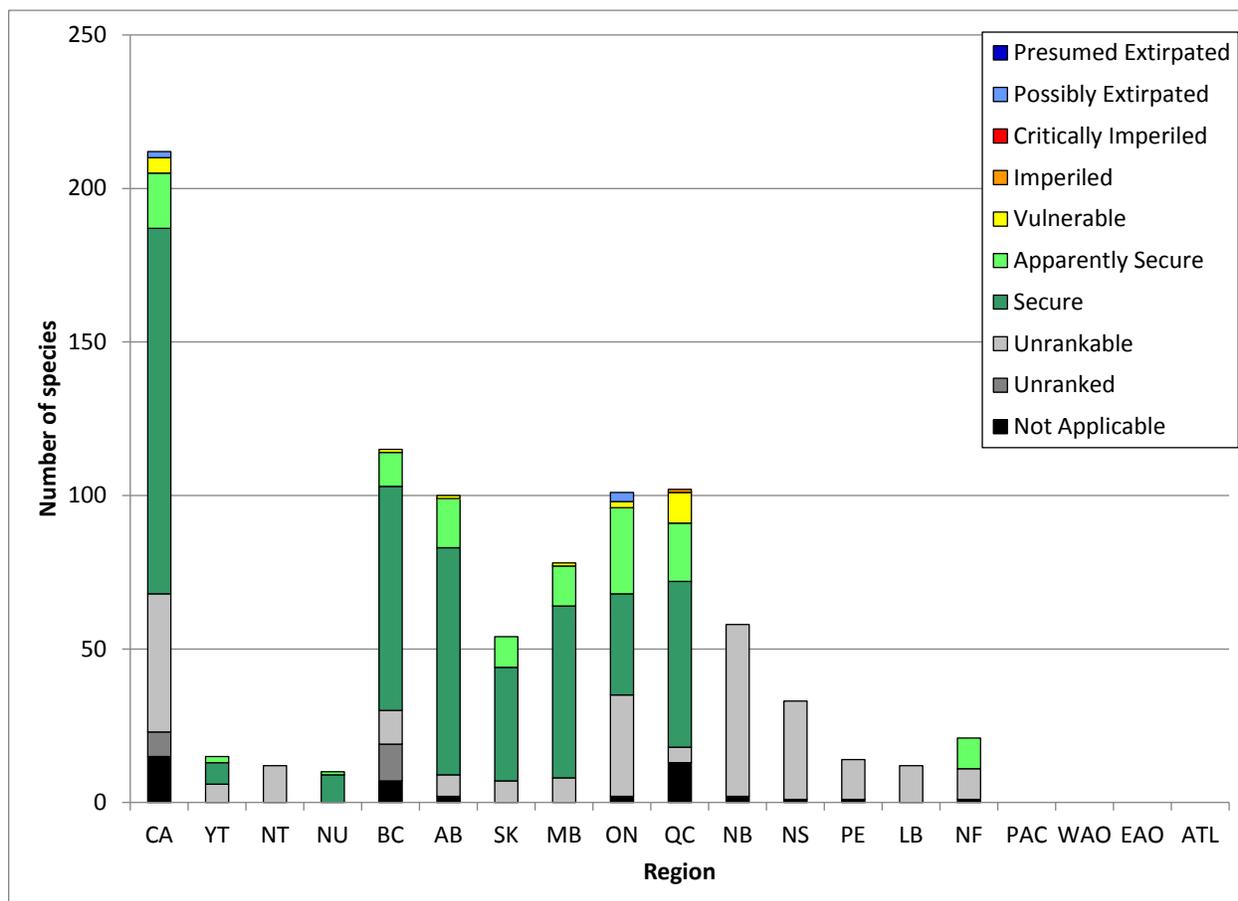


Figure 19. General status of ants in Canada in 2015.

## Bees



Tricoloured Bumble Bee (*Bombus ternarius*) © Yves Déry

Bees refer to the clade Anthophila. Bees are furry winged insects that feed entirely on flowers as both larvae and adults. Some have interesting social systems, ranging from simple shared nests to complex societies with division of labour. Most are solitary however, and some even lay eggs in other species' nests, allowing the hosts to feed their young. Native bees rarely sting and produce very little honey. Nectar is their main energy source and they collect protein-rich pollen for their young. Their contributions to pollination, and consequently to ecosystem function and food production, are enormous. Bumble bees are particularly efficient; they can forage in cool weather, their buzzing facilitates pollen release, and their hairy bodies pick up large amounts of pollen. With the onset of colony collapse disorder in honey bees, there is increased interest in native pollinators. However, more study is needed to establish baseline data, population trends, and conservation requirements. Threats include habitat loss and fragmentation, loss of food and nesting resources, pesticide exposure, disease and the transmission of pathogens from managed to wild bee populations, and climate change.

There are 805 known species of bees in Canada (Figure 20). Many species are apparently secure or secure (41%). There are four species that are critically imperiled and 30 species that are imperiled. Of these 34 species, 25 have only a small part of their range in Canada (10% or less) and seven are intermediary (from 11% to 74%). However, two species have 75% or more of their range in Canada. These two species are thought to be endemic to Canada: Sable Island Sweat Bee (*Lasioglossum sablense*), Yukon Sweat Bee (*Lasioglossum yukonae*). In total, three species have a high priority score (between 1 and 5). We also identified 18 species that are exotic at the national level. We do not have enough knowledge on 349 species to give them a rank other than NU or NNR. No species of bees are considered migratory.

The bumble bees were assessed in the *Wild Species* 2010 report. Since then, 25 species had a change in their status at the national level. A total of 22 species were changed from or to ranks U, NR, NA. Also, two species have been added to the list and one has been deleted from the list. Most of the changes (92%) are due to an improved knowledge of the species.

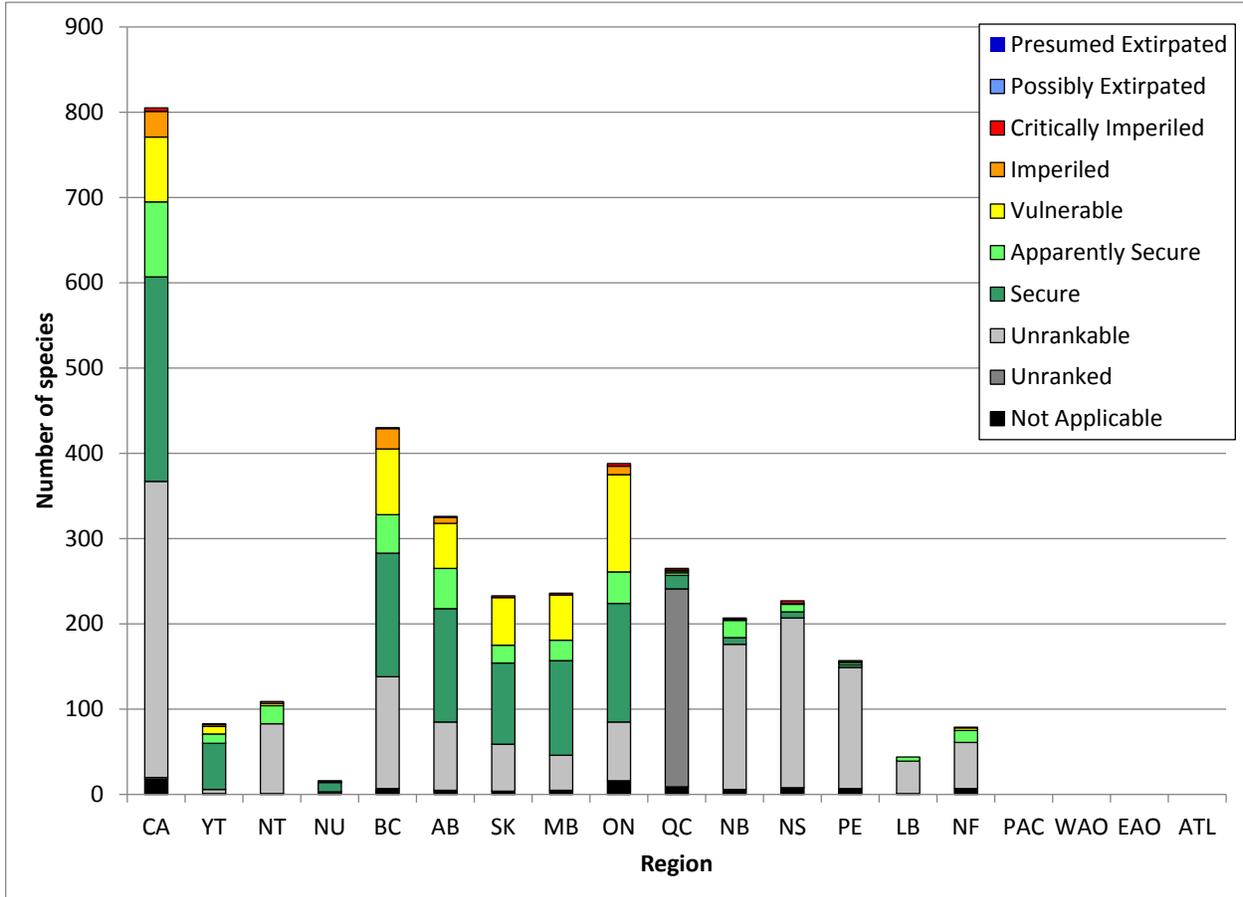


Figure 20. General status of bees in Canada in 2015.

# Yellowjacket wasps



*Vespula maculifrons* © Jeffrey L. Moore

Yellowjacket wasps refer to the family Vespidae. The vespids are a diverse family of wasps that include social species (e.g. yellowjacket wasps, hornets, paper wasps), as well as solitary ones. They vary in colour and pattern, with brighter “warning colouration” more common in social species. Their tapered abdomen and folded wings give them a narrow appearance, and their ovipositor may be modified into a stinger. Vespids construct nests using mud or chewed up plant material (i.e. paper) or tunnel them into wood or soil. Social species can be defensive near their hives, and when distressed will call on colony-members to help take care of threats. Unlike bees, wasps can sting repeatedly, though most vespids sting rarely if at all. They benefit humans by providing significant biocontrol of agricultural pests. Most species provision their young with immature insects, sometimes laying their eggs in live caterpillars to ensure a fresh food source for their larvae, who eat their host from the inside out. In fact, some plants have defensive compounds that call out to these wasps when they are being chewed on by caterpillars. Some adults are predators, while others are nectar-feeding pollinators. Vespids are generally well understood in Canada, particularly colony-forming species that live near humans. Their distribution and conservation status are poorly known in many parts of the country however. Threats include habitat loss and alteration and pesticides.

There are 101 known species of yellowjacket wasps in Canada (Figure 21). Many species are apparently secure or secure (37%). There are 12 species that are critically imperiled, and 19 species that are imperiled. Of these 31 species, 26 have only a small part of their range in Canada (10% or less) and five are intermediary (from 11% to 74%). All species have a lower priority score. We also identified six species that are exotic at the national level. We do not have enough knowledge on six species to give them a rank other than NU or NNR. No species of yellowjacket wasps are considered migratory.

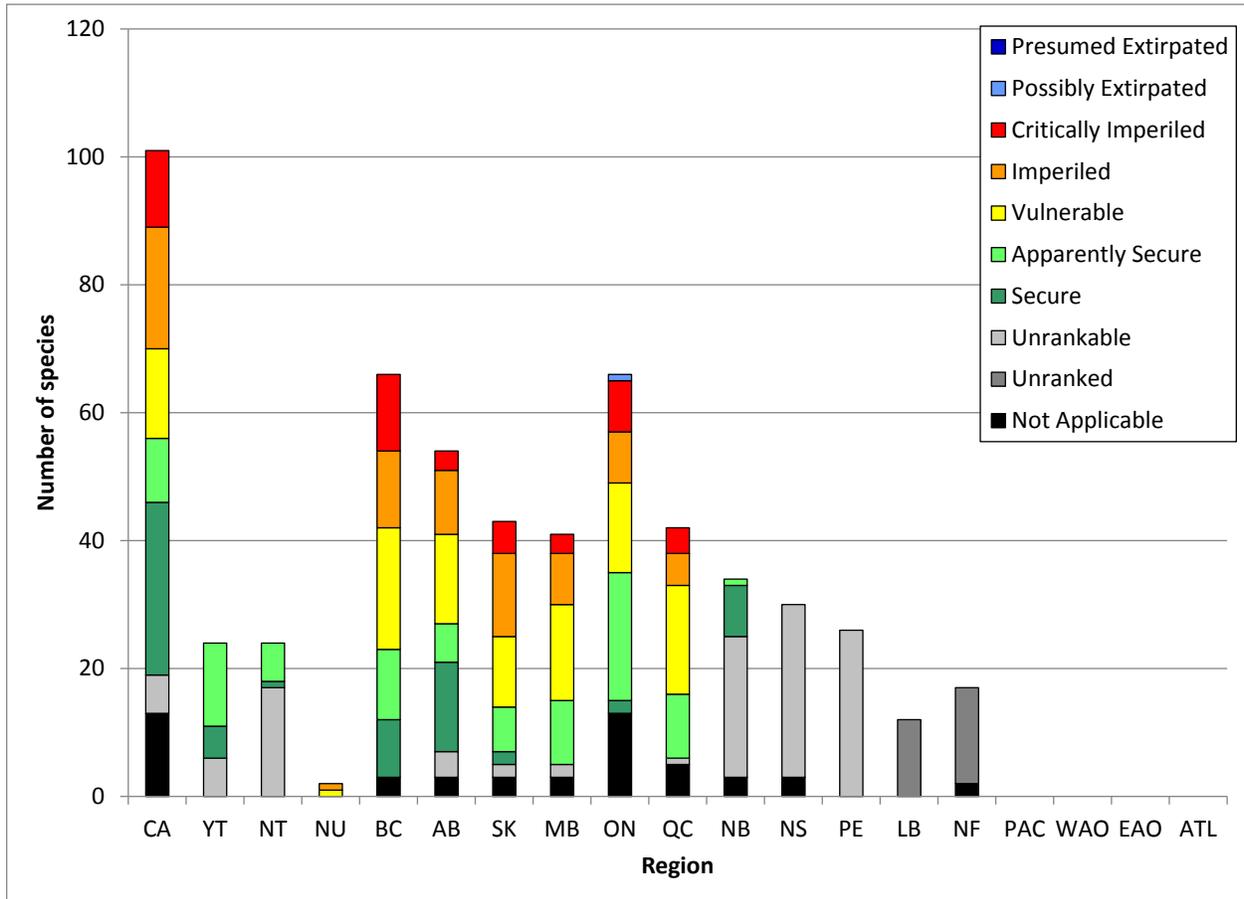


Figure 21. General status of yellowjacket wasps in Canada in 2015.

## Caddisflies



Solomon's Humpless Caddisfly (*Brachycentrus solomoni*) © David H. Funk

Caddisflies refer to the order Trichoptera. Caddisflies are moth-like insects with hairy wings that arch over their bodies when at rest. The aquatic larvae resemble caterpillars, and are famous for the protective cases that they construct of gravel, sand, and plant material bound up in silk. These can be striking, and artists have raised larvae to build cases using precious stones. Most larval species feed on decaying plant material, thereby promoting decomposition and cleaning the water. Some species have turned to gardening, and actually fertilize their surroundings by depositing excretions in favoured areas to promote algae growth, allowing them to feed closer to home. Adults are short-lived and are food for many recreational and commercial fish species. Caddisflies have been used as indicators of ecosystem health, and their systematics, biology and ecology are well studied in Canada. Knowledge of their general status and distribution, however, is incomplete. Threats include habitat loss and alteration, hydrological changes, pollution, water scarcity, and climate change particularly for some species restricted to glacier-fed mountains streams.

There are 688 known species of caddisflies in Canada (Figure 22). Many species are apparently secure or secure (31%). There is one species that is imperiled. This species has about 50% of its range in Canada and has a lower priority score. Also, there are no exotic species known at the national level. We do not have enough knowledge on 470 species to give them a rank other than NU or NNR. No species of caddisflies are considered migratory.

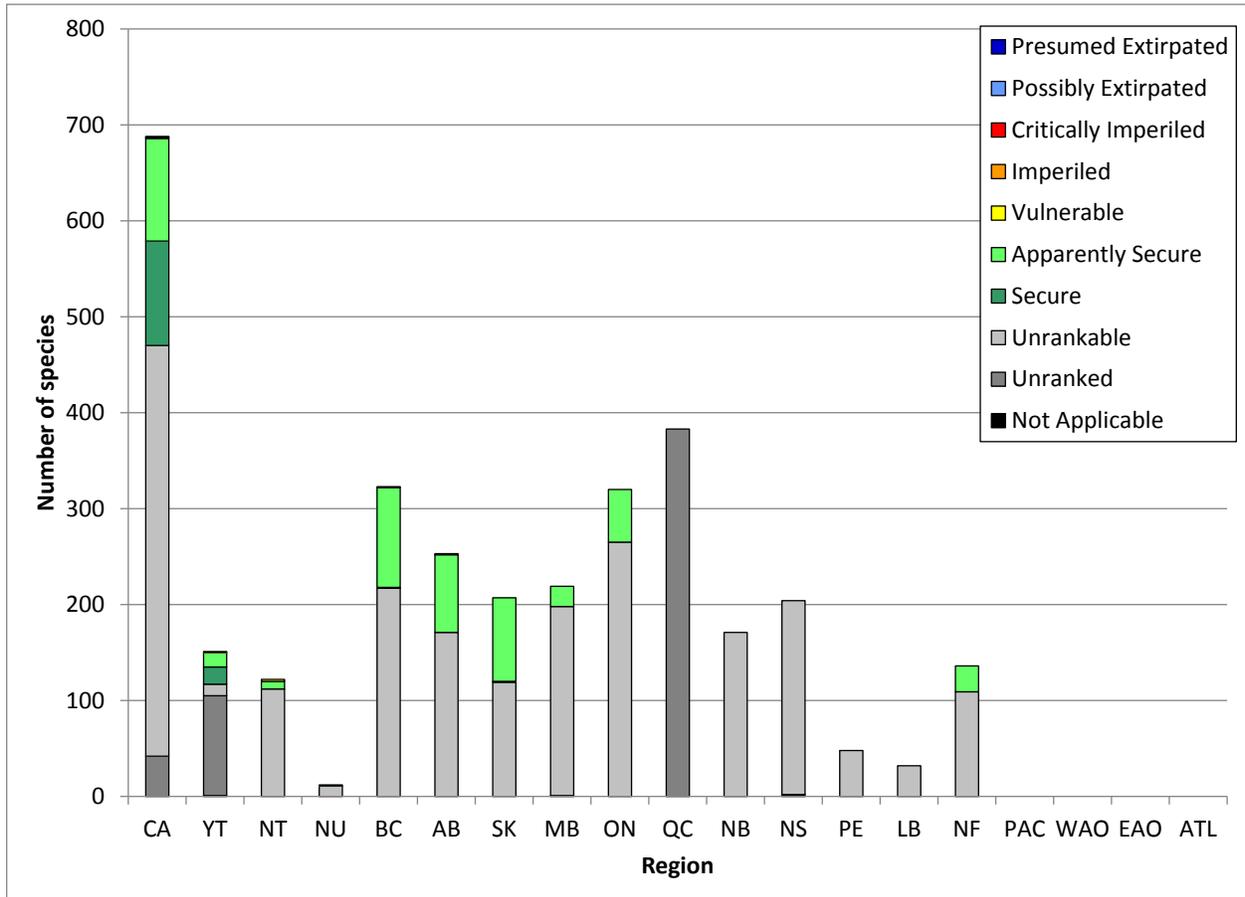


Figure 22. General status of caddisflies in Canada in 2015.

## Moths and butterflies



*Papilio canadensis* © Rémi Hébert

Moths and butterflies refer to the order Lepidoptera. The lepidopterans include brightly-coloured, daytime-flying butterflies and the less conspicuous nocturnal moths. Both have a coiled tongue, two pairs of scale-covered wings, and antennae. Eggs are laid on food plants favoured by the larva (i.e. caterpillar), which eats voraciously and moults its skin as it grows. The adult stage is brief and focused on reproducing. Butterflies generally use visual cues to find mates, while moths, renowned for their sense of smell, locate each other using long-range pheromones. Many adults feed on nectar, sometimes pollinating flowers in the process, while others do not eat at all, living on fat reserves they acquired as larvae. The showy orange and black Monarch (*Danaus plexippus*) is a well-loved butterfly whose caterpillars feed exclusively on milkweed. Adults travel to Mexico or California for the winter, conserving energy on their journeys by riding rising air currents, sometimes up to 1 km high. While more than 90% of lepidopterans are moths, the eye-catching butterflies attract significantly more attention, and are relatively well studied. Moths considered agricultural and forest pests have been researched, but our knowledge of most species is scant. The greatest threats to lepidopterans are habitat destruction and alteration, pesticides, pollution, exotic species, and, in the case of moths, artificial lighting.

There are 5257 known species of moths and butterflies in Canada (Figure 23). Many species are apparently secure or secure (31%). There is one species that is presumed extirpated, two species that are possibly extirpated, 33 species that are critically imperiled, and 56 species that are imperiled. Of these 92 species, 62 have only a small part of their range in Canada (10% or less) and 18 are intermediary (from 11% to 74%). However, 12 species have 75% or more of their range in Canada. Among those, 10 species are thought to be endemic to Canada: *Agrotis arenarius*, *Coenonympha nipsisquit*, *Colias johanseni*, *Colias rankinensis*, *Eucosma sableana*, *Euxoa unica*, *Lasionycta haida*, *Lasionycta macleani*, *Schinia verna*, *Xanthorhoe clarkeata*. In total, 15 species have a high priority score (between 1 and 5). We also identified 191 species that are exotic at the national level. We do not have enough knowledge on 3015 species to give them a rank other than NU or NNR. In total, 16 species of moths and butterflies are considered migratory.

The butterflies and the selected macromoths were assessed in the *Wild Species* 2010 report. Since then, 124 species had a change in their status at the national level. A total of 29 species had an increased level of risk, 13 species had a reduced level of risk, and 56 species were changed from or to

ranks U, NR, NA. Also, 15 species have been added to the list and 11 have been deleted from the list. Most of the changes (44%) are due to a procedural change.

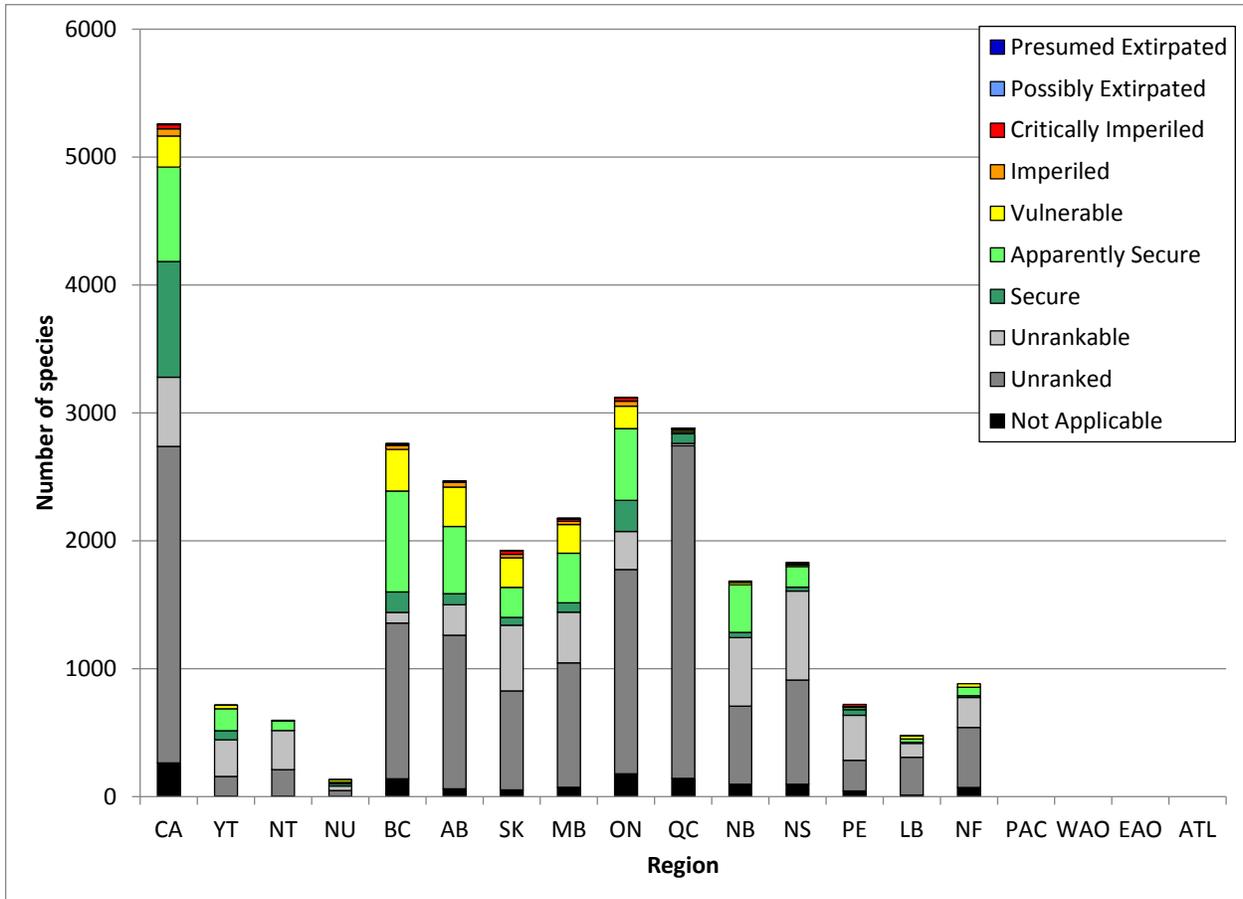


Figure 23. General status of moths and butterflies in Canada in 2015.

## Scorpionflies



Clear-winged Scorpionfly (*Panorpa claripennis*) © Steve Marshall

Scorpionflies refer to the order Mecoptera. Scorpionflies are medium sized insects with long, downward-facing beaks; so-named for the harmless appendage resembling a scorpion stinger on the abdomen of some males. Most live in the forest understory, and some species are active even on snow. Adults are omnivores, and may sneak meals out of spider webs (which results, perhaps predictably, in high predation from spiders) or capture bees with their hind legs and manoeuvre them carefully until they can be pierced. Some males offer food to females as an enticement (or distraction) for mating. These gifts, which are sometimes stolen from other males, increase the duration and success of copulation. Eggs are laid on or near the ground and the larvae, which resemble caterpillars or grubs, scavenge on insect, fungus, and plant matter. As they are rarely encountered, scorpionflies have been little-studied, making it difficult to assess their threats. Most species are generalist feeders and are not thought to be at risk; however some have very localized distributions and are threatened by habitat loss and degradation.

There are 25 known species of scorpionflies in Canada (Figure 24). Many species are apparently secure or secure (48%). There is one species that is critically imperiled and two species that are imperiled. Of these three species, one has only a small part of its range in Canada (10% or less) and another is intermediary (from 11% to 74%). However, another species has 75% or more of its range in Canada. This species is thought to be endemic to Canada: Island Snow Scorpionfly (*Boreus insulanus*). In total, one species has a high priority score (between 1 and 5). Also, there are no exotic species known at the national level. We do not have enough knowledge on eight species to give them a rank other than NU or NNR. No species of scorpionflies are considered migratory.

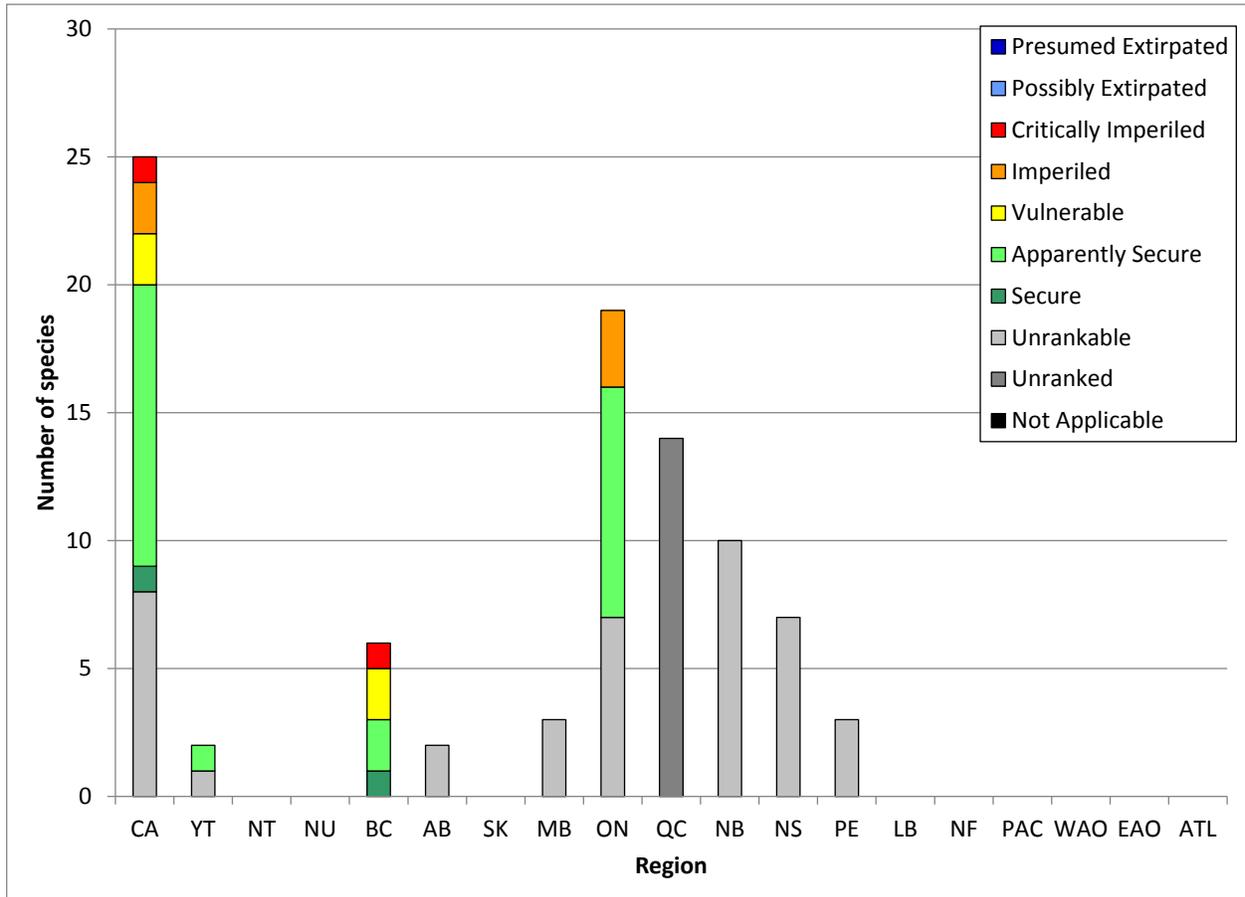


Figure 24. General status of scorpionflies in Canada in 2015.

## Black flies



*Simulium* sp. © Tom Murray

Black flies refer to the family Simuliidae. Small, dark, stout, and hunch-backed, black flies are most abundant in boreal areas but occur almost everywhere in Canada that moving water is present. The larvae attach themselves to substrate in streams and rivers and filter food from flowing water. The larvae contribute to nutrient cycling in aquatic environments, and their sheer numbers make them important players in the food web. Adults feed on nectar, and most females require a blood meal to mature their eggs. Their biting torments many animals (not least ourselves!) and has led to weight loss, decreased milk production and even death of Canadian livestock. Black fly harassment can decrease caribou feeding during their brief window of summer forage. Black flies have been fairly intensively studied since the 1950s, particularly with respect to their social impacts, but many regions, particularly in northern Canada, remain under-sampled. The biggest threats to black flies are water pollution and climate change.

There are 160 known species of black flies in Canada (Figure 25). The majority of these species are apparently secure or secure (61%). There is one species that is critically imperiled, and four species that are imperiled. These five species have a range in Canada that is intermediary (from 11% to 74%). In total, one species has a high priority score (between 1 and 5). Also, there are no exotic species known at the national level. We do not have enough knowledge on 42 species to give them a rank other than NU or NNR. No species of black flies are considered migratory.

All the black flies were assessed in the *Wild Species* 2010 report. Since then, 39 species had a change in their status at the national level. A total of eight species had an increased level of risk, three species had a reduced level of risk, and 24 species were changed from or to ranks U, NR, NA. Also, one species has been added to the list and three have been deleted from the list. Most of the changes (90%) are due to a procedural change.

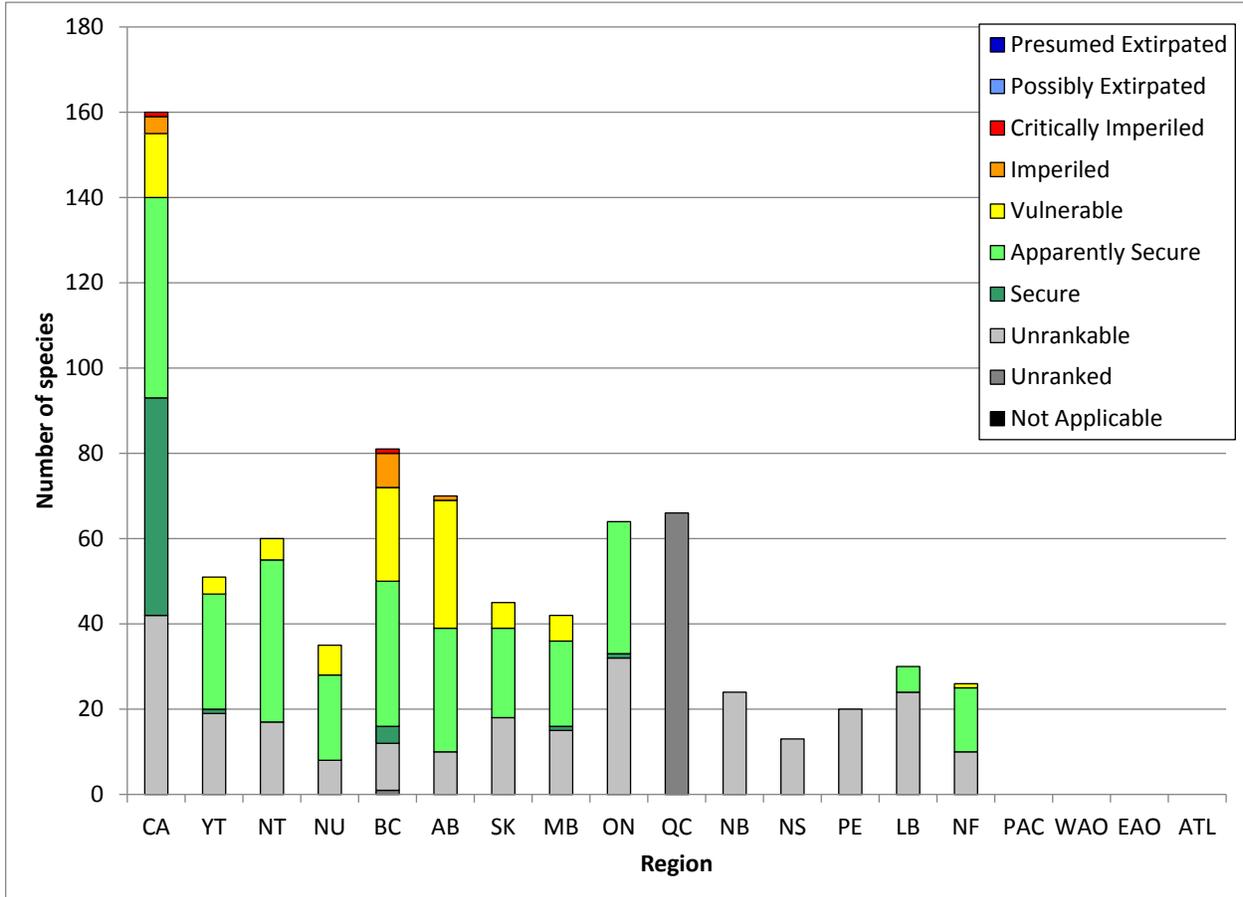


Figure 25. General status of black flies in Canada in 2015.

## Mosquitoes



Permanent Marsh Mosquito (*Anopheles walkeri*) ©  
Tom Murray

Mosquitoes refer to the family Culicidae. Mosquitoes are slender flies with long legs and an extended proboscis. Females lay eggs on the surface of stagnant water, and the aquatic larvae feed on organic detritus and breathe air through a tube at their tail end. They are fed on by fishes, larval dragonflies, and other aquatic invertebrates, while adults are prey to dragonflies, bats and birds. Nectar is the main energy source for all mosquitoes, but females also require blood to develop their eggs, and are attracted to the carbon dioxide and heat emitted by vertebrate hosts. While humans are not usually their first choice, our thin skin and relative hairlessness make us appealing targets. Once their first eggs are laid, females seek more blood for subsequent batches, and can transmit disease, such as West Nile Virus, when they sting more than one host. While nuisance and virus-transmitting species are well-researched, the majority of mosquitoes do not feed on humans and are poorly understood. Threats include wetland and forest loss, water pollution, pesticides (which can kill non-nuisance mosquitoes and lead to pesticide resistance), and climate change.

There are 80 known species of mosquitoes in Canada (Figure 26). The majority of these species are apparently secure or secure (80%). There are no species known as may be at risk at the national level. We also identified three species that are exotic at the national level. We do not have enough knowledge on 12 species to give them a rank other than NU or NNR. No species of mosquitoes are considered migratory.

All the mosquitoes were assessed in the *Wild Species 2010* report. Since then, 13 species had a change in their status at the national level. A total of 11 species were changed from or to ranks U, NR, NA. Also, one species has been added to the list and one has been deleted from the list. Most of the changes (62%) are due to a procedural change.

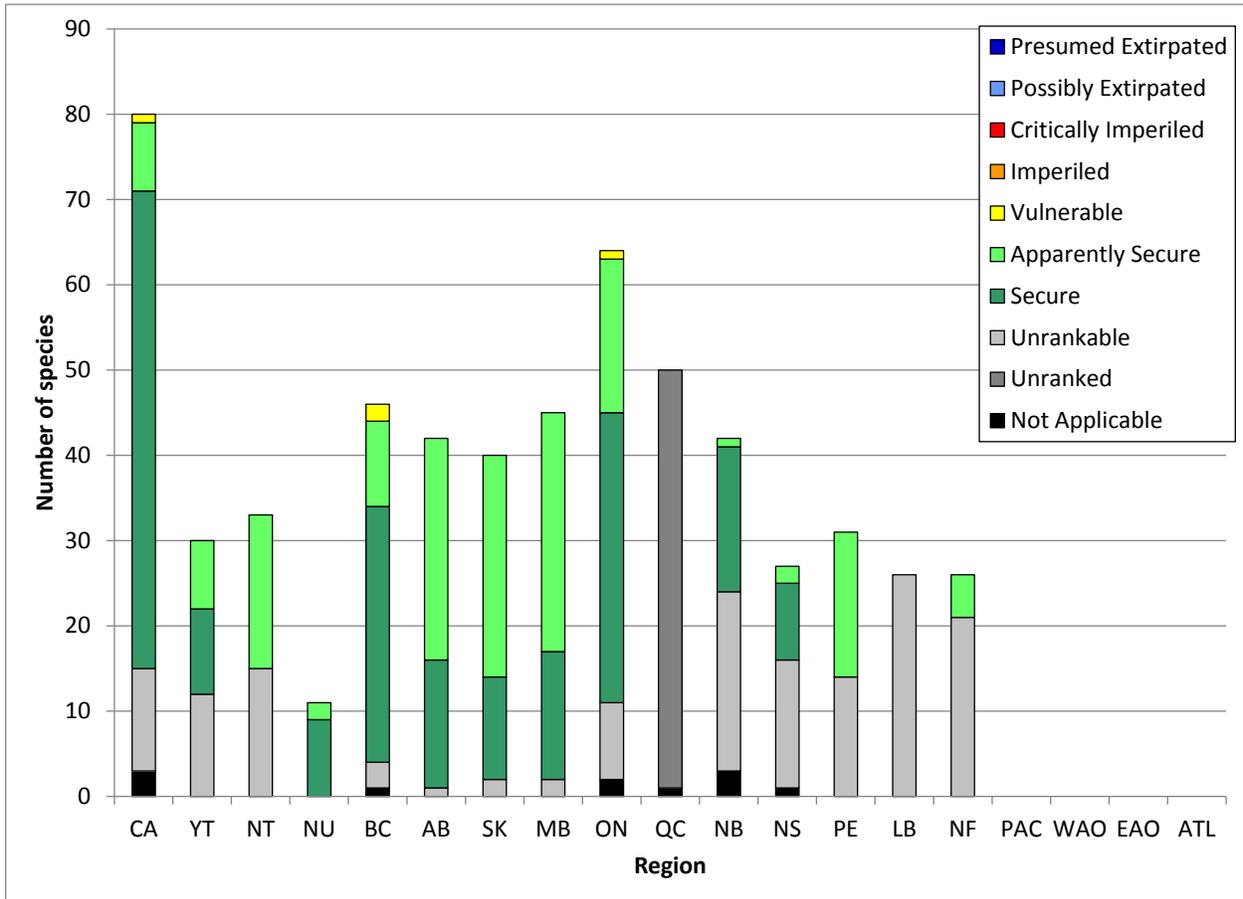


Figure 26. General status of mosquitoes in Canada in 2015.

## Horse flies



Agitated Deer Fly (*Chrysops excitans*) © Stephen Luk

Horse flies refer to the family Tabanidae. For many outdoor enthusiasts, horse flies need no introduction. They are large, aggressive, persistent, and they bite. Their prominent eyes are often iridescent, and in males can cover most of the head. Deer flies are a genus of this family that are smaller and have banded wings. Horse fly larvae are aquatic and hunt other immature insects. Adults feed on plant nectar and most females require a blood meal to mature their eggs. They feed on blood by using their knife-like mouthparts to slash skin, and then lap up the blood. Interesting fact, Hine's Horse Fly (*Hybomitra hinei*) is the fastest known flying insect, having been clocked at 145 km/h for a brief instant as it took flight. Many species often meet at hilltops to find each other, and males perform quick acrobatic manoeuvres to catch and mate with fast flying females. They are most active on warm sunny days. Horse fly adults are eaten by birds and flying insects, but egg predators, such as parasitoid wasps, are the most important control agents. While horse flies have gained research attention due to their biting habits, much remains to be learnt about their life history, taxonomy and ecology. Their broad distribution is known in Canada but many regional gaps exist. Potential threats include the loss or degradation of wetland and forest habitats.

There are 144 known species of horse flies in Canada (Figure 27). The majority of these species are apparently secure or secure (72%). There is one species that is possibly extirpated, four species that are critically imperiled, and seven species that are imperiled. Of these 12 species, 10 have only a small part of their range in Canada (10% or less) and two are intermediary (from 11% to 74%). All species have a lower priority score. Also, there are no exotic species known at the national level. We do not have enough knowledge on 22 species to give them a rank other than NU or NNR. No species of horse flies are considered migratory.

All the horse flies were assessed in the *Wild Species* 2010 report. Since then, 19 species had a change in their status at the national level. A total of five species had an increased level of risk, one species had a reduced level of risk, and 11 species were changed from or to ranks U, NR, NA. Also, one species has been added to the list and one has been deleted from the list. Most of the changes (63%) are due to a procedural change.

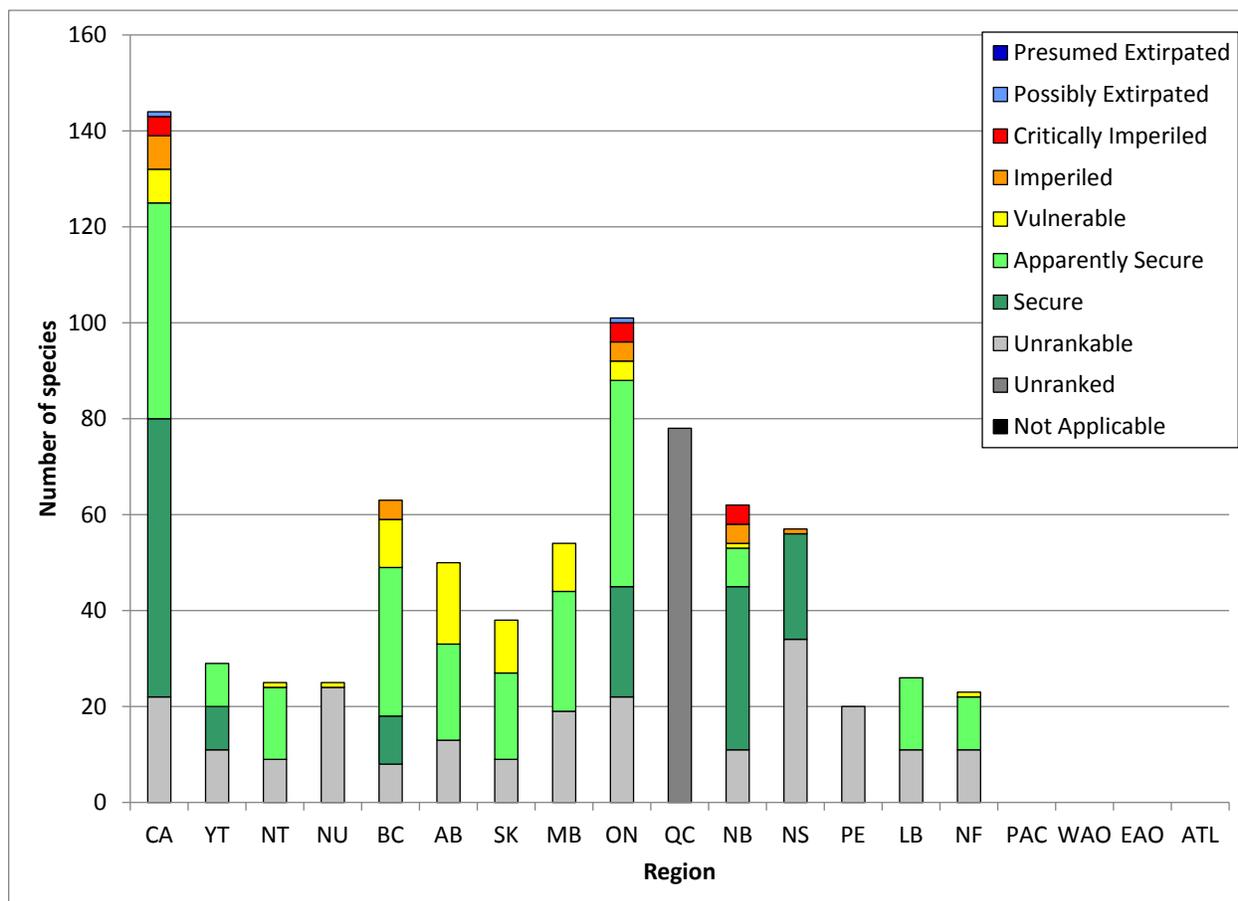


Figure 27. General status of horse flies in Canada in 2015.

## Bee flies



Bearded Bee Fly (*Anastoechus barbatus*) © Jeffrey P. Gruber

Bee flies refer to the family Bombyliidae. Some species of bee flies are covered with golden hairs, and are considered as the cutest insects ever. Bee flies often produce high-pitched buzzing sounds while hovering near flowers. Adults sip nectar through their long proboscis, and the sticky hairs on their legs and bodies make them effective pollinators. Larvae feed on immature insects, and help to control agricultural pests. Females coat their eggs with sand to protect them, and deposit them near a larval food source such as an insect nest. Once the larvae find a meal, they latch on with their mouth and proceed to slowly eat their host alive. Bee flies are poorly known in Canada though conspicuous species are fairly well represented in general collections. They are the focus of ongoing taxonomic research and there is increasing interest in their role as pollinators. Bee flies are most threatened by habitat loss, pesticides, and the use of fire for prairie maintenance.

There are 116 known species of bee flies in Canada (Figure 28). Many species are apparently secure or secure (28%). There is one species that is possibly extirpated, nine species that are critically imperiled, and six species that are imperiled. Of these 16 species, 15 have only a small part of their range in Canada (10% or less) and one is intermediary (from 11% to 74%). All species have a lower priority score. Also, there are no exotic species known at the national level. We do not have enough knowledge on 48 species to give them a rank other than NU or NNR. No species of bee flies are considered migratory.

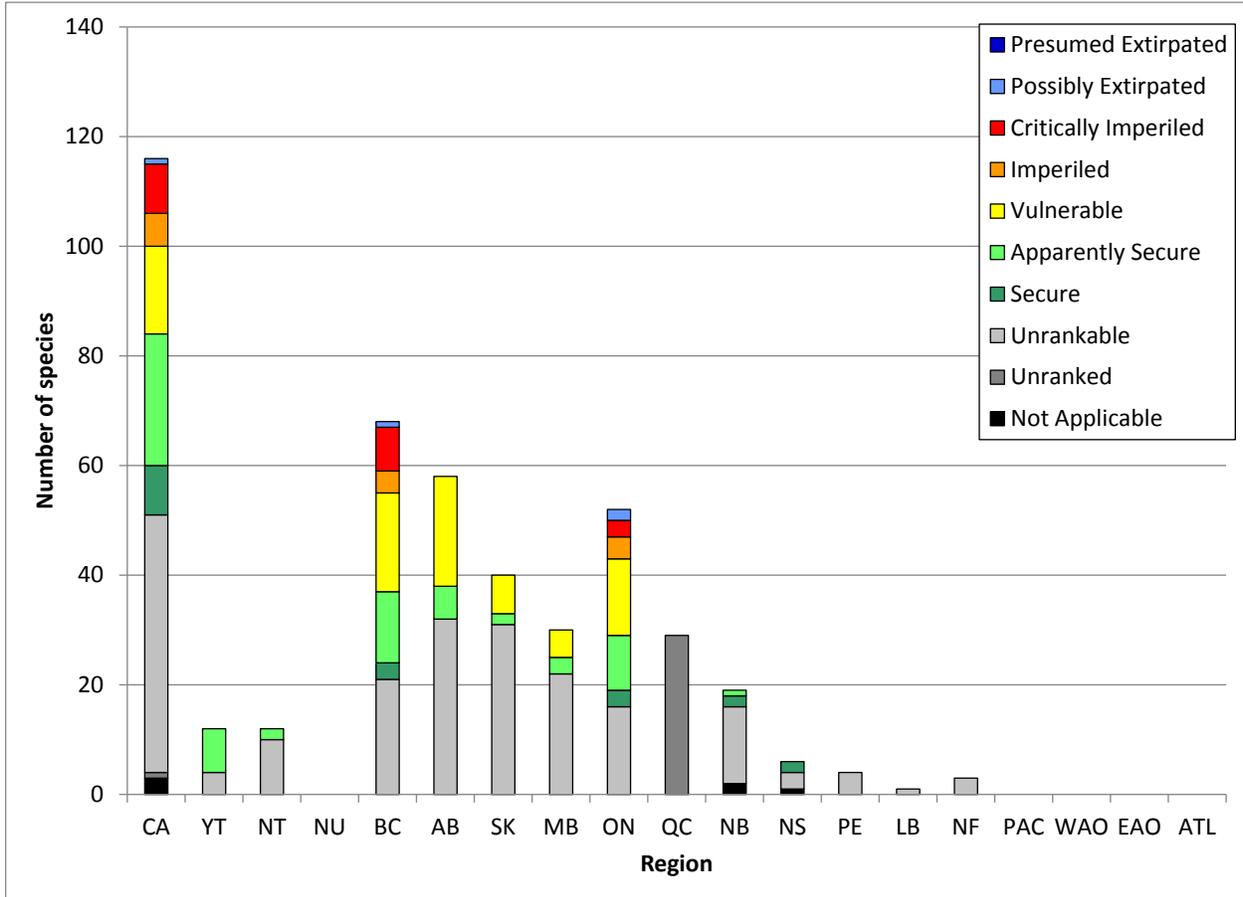


Figure 28. General status of bee flies in Canada in 2015.

## Flower flies



*Xanthogramma flavipes* © Tom D. Schultz

Flower flies refer to the family Syrphidae. Flower flies are colourful, conspicuous insects often found hovering near flowers. Many have yellow and black stripes, effectively mimicking bees and wasps to discourage potential predators. They do not sting however, and have two wings while bees and wasps have four. Flower flies have tremendous ecological and economic significance; the adults are important pollinators, and many larval species are voracious predators of agricultural pests like aphids. Still others are mimics in their own right, producing ant-like pheromones which allow them to live in ant colonies and feed on their hosts. While the life history, distribution and habitat requirements of some species are still poorly understood, research into their provision of environmental services has been increasing. Threats include habitat loss and alteration, pollution, insecticides, and urbanization. Species requiring specific environments such as hilltops or old-growth forest tree holes are most vulnerable.

There are 524 known species of flower flies in Canada (Figure 29). The majority of these species are apparently secure or secure (50%). There are four species that are critically imperiled, and 15 species that are imperiled. Of these 19 species, 11 have only a small part of their range in Canada (10% or less) and seven are intermediary (from 11% to 74%). However, one species has 75% or more of its range in Canada. This species is thought to be endemic to Canada: *Platycheirus hispidipes*. In total, three species have a high priority score (between 1 and 5). We also identified nine species that are exotic at the national level. We do not have enough knowledge on 189 species to give them a rank other than NU or NNR. No species of flower flies are considered migratory.

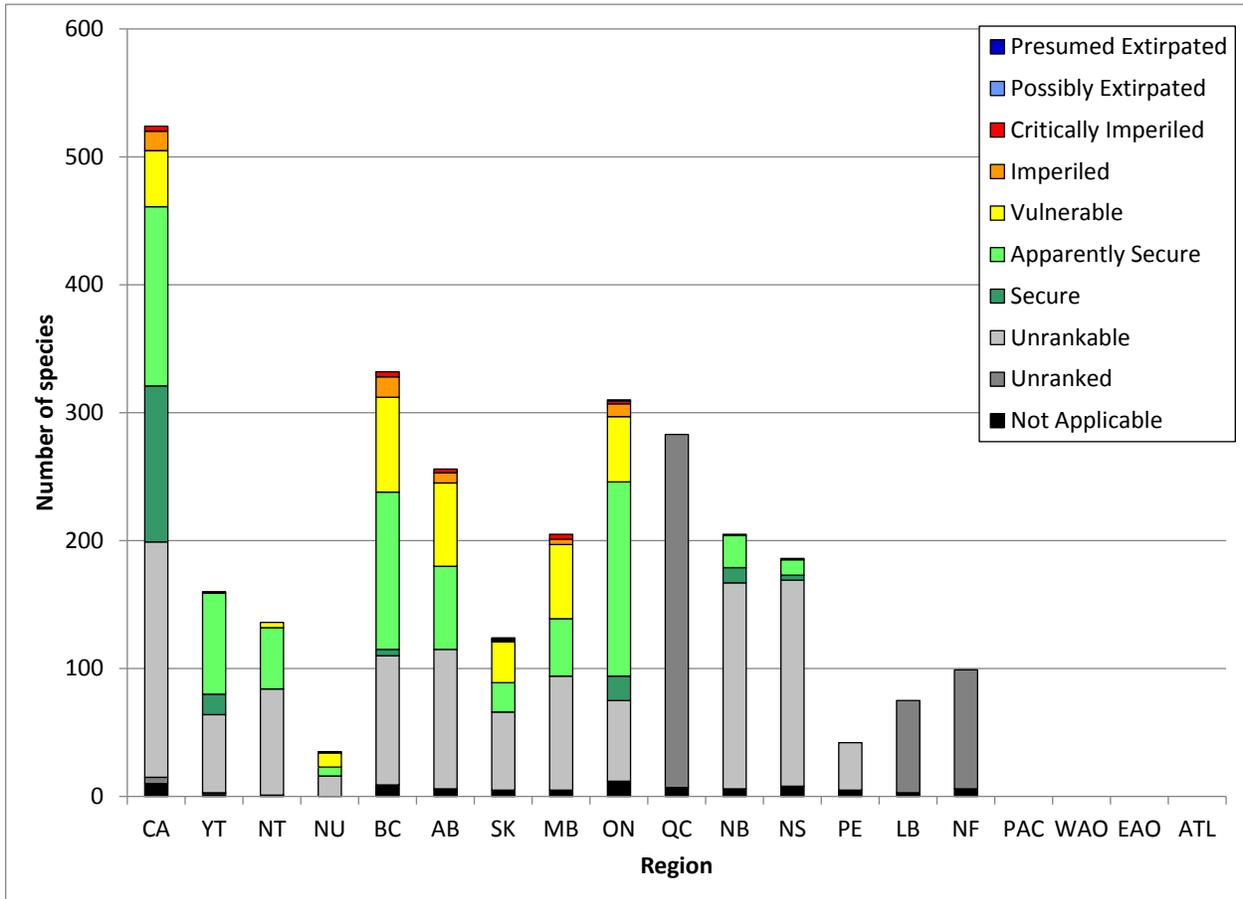


Figure 29. General status of flower flies in Canada in 2015.

## Decapods



Virile Crayfish (*Orconectes virilis*) © Casey Swecker

Decapods refer to the order Decapoda. Decapods are a large order of crustaceans that include both marine animals (lobsters, crabs, and shrimp), and freshwater species (crayfish). They breathe using gills and have 10 pairs of legs and stalked eyes which can see in all directions. Many are omnivorous, and they use their antennae to sense food in the water. They have a jointed exoskeleton which they moult several times as they grow. Marine decapods are ecologically significant; by suppressing herbivores, they help to maintain kelp forest, marsh grass, and other crucial habitats. They also contribute enormously to Canadian fishery revenue, and commercial animals have been well studied. Canadian researchers recently developed a method to age lobsters, crabs and shrimp by counting annual growth rings on their eye stalk, one of the few body parts not lost to moulting. This information is central to stock management. Threats to marine species include overfishing, pollution, acidification and climate change, while freshwater species are impacted by habitat loss, competition from exotic species, pollution and acidification.

There are 316 known species of decapods in Canada (Figure 30). Many species are apparently secure or secure (43%). There are no species known as may be at risk at the national level. We also identified five species that are exotic at the national level. We do not have enough knowledge on 148 species to give them a rank other than NU or NNR. No species of decapods are considered migratory.

The crayfishes were assessed in the *Wild Species* 2010 report. Since then, no species had a change in their status at the national level.

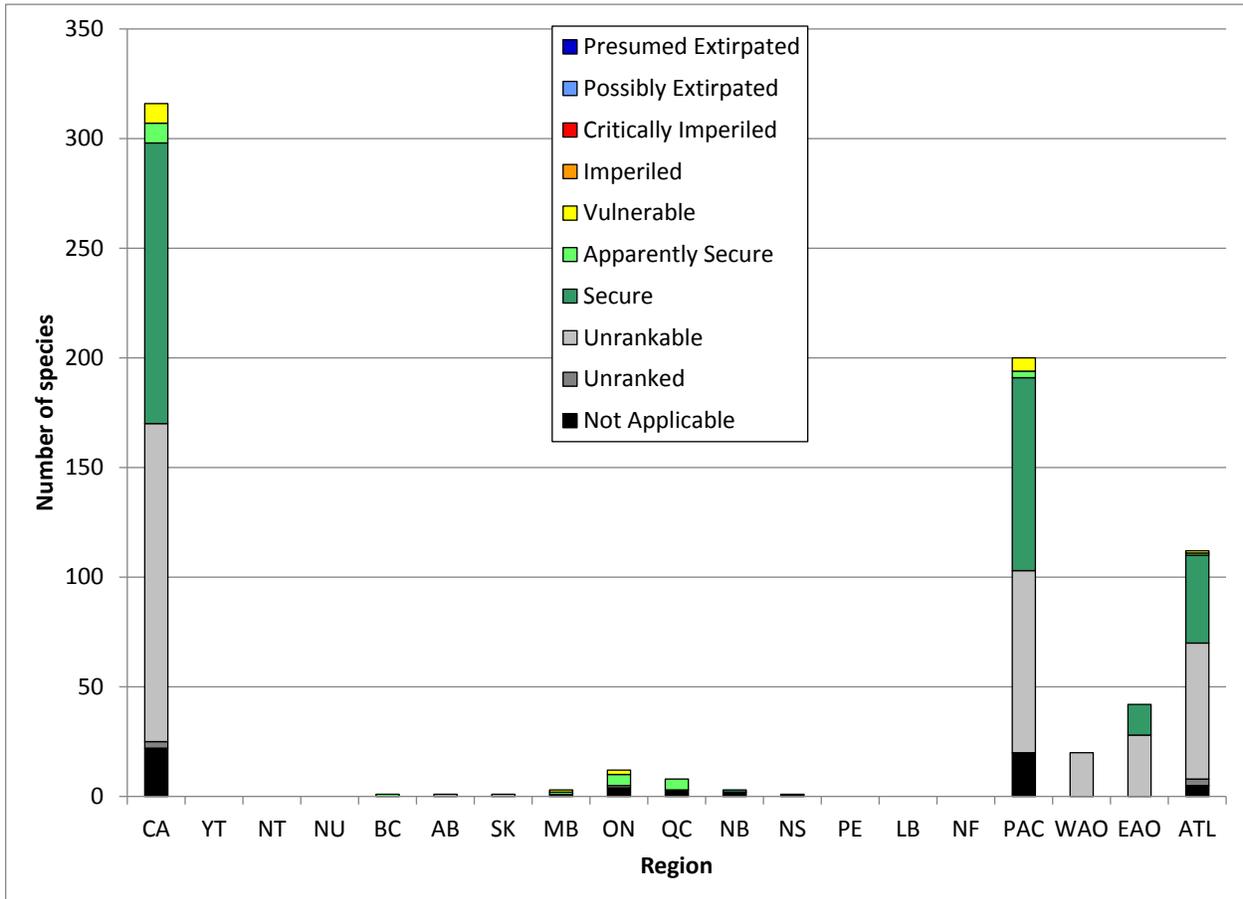


Figure 30. General status of decapods in Canada in 2015.

## Sea cucumbers



**White-knobbed Sea Cucumber (*Apostichopus leukothele*) © Neil McDaniel**

Sea cucumbers refer to the class Holothuroidea. Sea cucumbers are cylindrical, soft-bodied animals that live on the ocean floor. They have limited mobility, but can move a few metres in a day while feeding, and some undertake seasonal movements to different depths. They have a mouth at one end surrounded by sticky food-gathering tentacles, and an anus at the other that excretes waste and pumps water into its respiratory tree. Most mate by broadcasting their sperm or eggs into the surrounding water to be fertilized. The young float for a few weeks before settling, and in temperate regions, take several years to mature. Ecologically, sea cucumbers are nutrient recyclers and hosts to many commensal species that live on or inside them. When threatened, some species can expel their internal organs (which are later regenerated), ensnaring their predator in a tangled mess. Sea cucumbers have received increased attention in recent decades alongside their growing economic value. Despite increased study of commercial species, many knowledge gaps exist. It is difficult to observe juveniles or to age adults, making stock assessment a challenge. Threats include overfishing, by-catch mortality, dredging, oil spills, deforestation (which increases runoff), and hydrological changes from power dams.

There are 75 known species of sea cucumbers in Canada (Figure 31). The majority of these species are apparently secure or secure (59%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 29 species to give them a rank other than NU or NNR. No species of sea cucumbers are considered migratory.

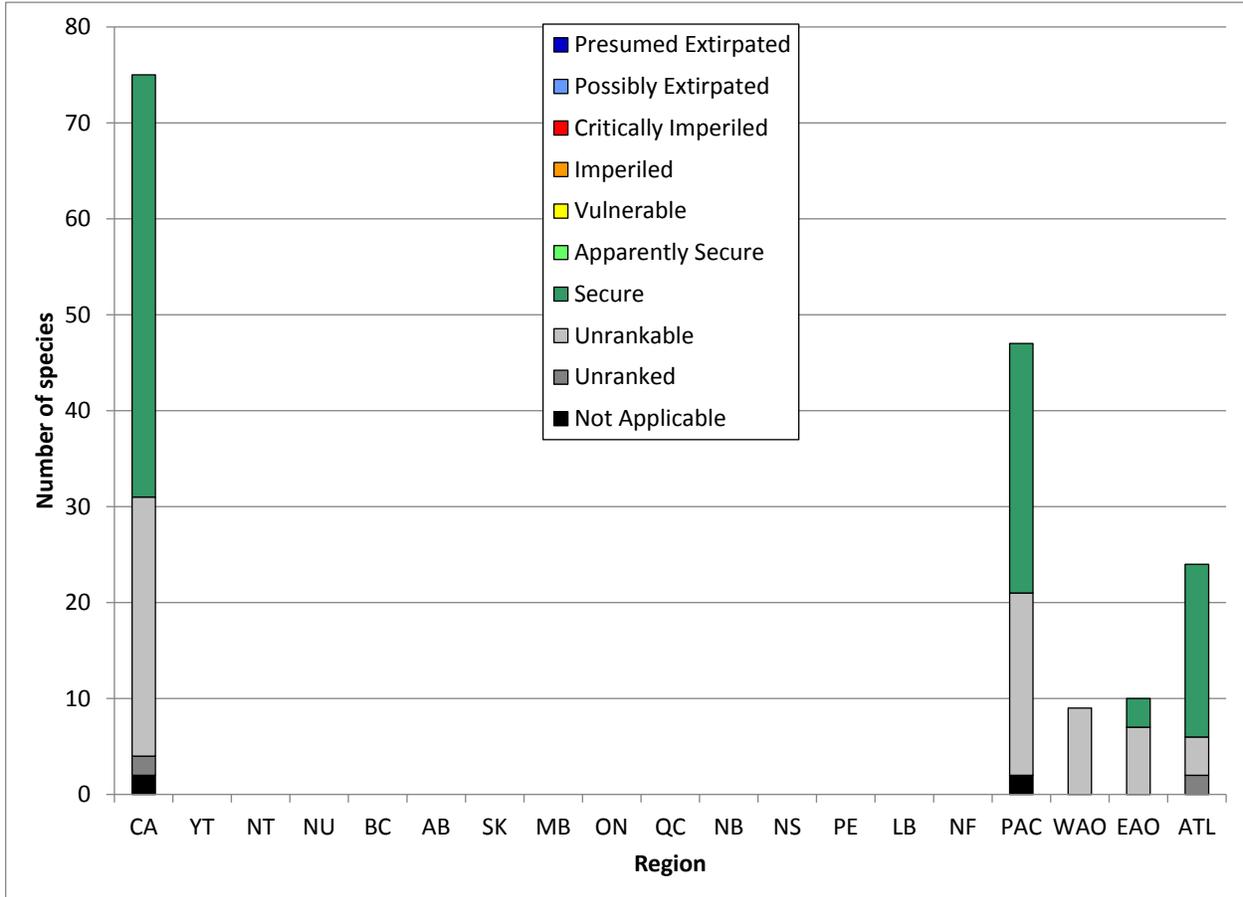


Figure 31. General status of sea cucumbers in Canada in 2015.

## Sea urchins



Purple Sea Urchin (*Strongylocentrotus purpuratus*) © Fletcher & Baylis

Sea urchins refer to the class Echinoidea. Sometimes referred to as porcupines of the sea, sea urchins are spherical invertebrate animals encased in a shell covered by spines. They move slowly over the ocean bottom using adhesive tube feet, and their downward-facing mouth has sharp teeth for scraping algae, crushing small animals, or excavating refuges in rock or coral. Females release millions of eggs for external fertilization, and the free-floating larvae need several months to complete their development before settling on the bottom and undergoing metamorphosis. Sea urchins are ecosystem engineers, capable of devastating the productivity of coastal areas by grazing kelp forests into “urchin barrens” when their populations are unchecked. Juveniles are vulnerable to predation and often shelter under the spines of their elders. Adults are more protected, though are hunted by crustaceans, fishes, and sea otters that use rocks to crack their shells. Canadian fisheries have developed for their roe (gonads). Threats to sea urchins include pollution and climate change. Some larvae are temperature-restricted, and a pathogen affecting populations in Atlantic Canada is increasing its range in conjunction with rising winter temperatures. Carbon dioxide-induced ocean acidification affects sea urchins’ ability to form shells, in turn impacting their growth, feeding, swimming, and sensitivity to water temperature.

There are 38 known species of sea urchins in Canada (Figure 32). The majority of these species are apparently secure or secure (55%). There are no species known as may be at risk at the national level. There are no exotic species known at the national level. We do not have enough knowledge on 16 species to give them a rank other than NU or NNR. No species of sea urchins are considered migratory.

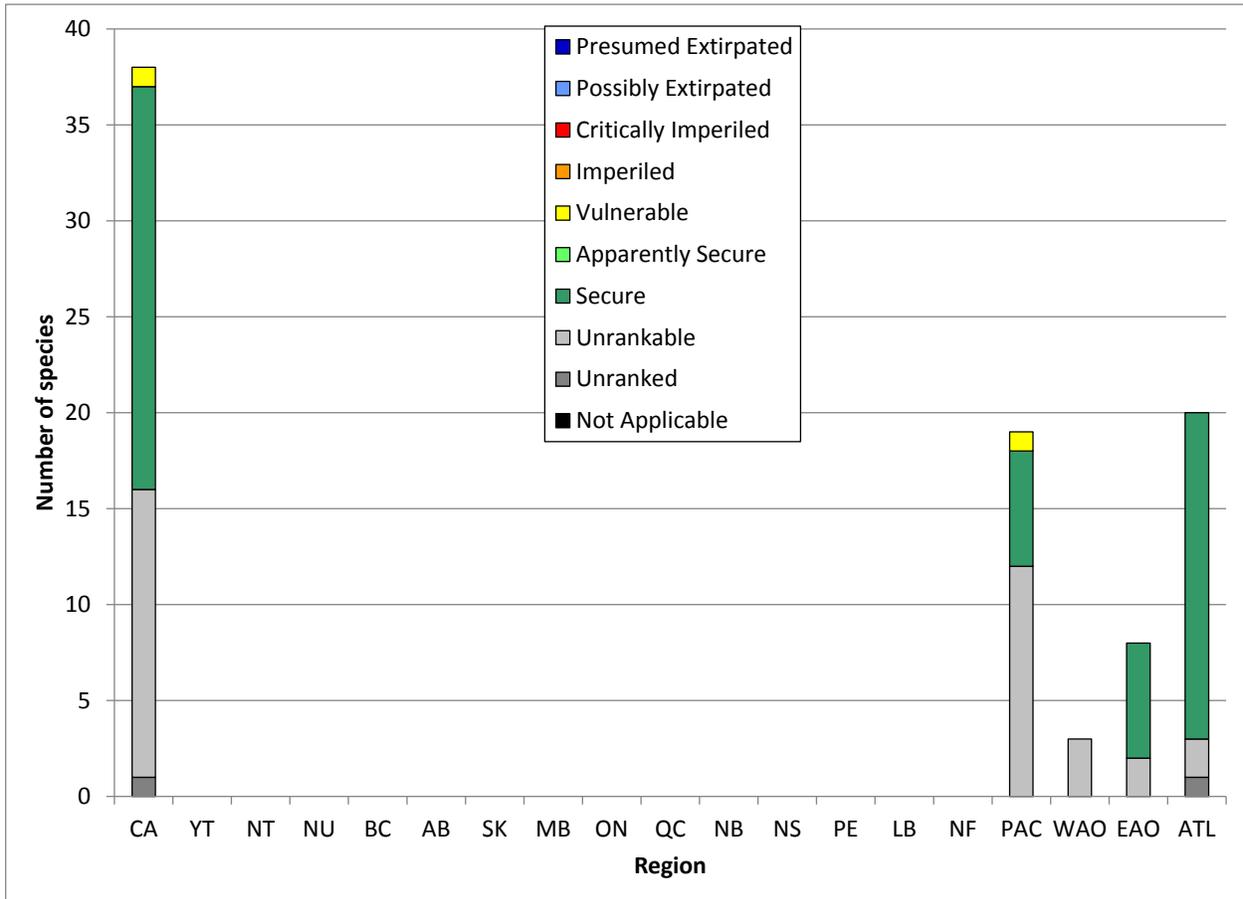


Figure 32. General status of sea urchins in Canada in 2015.

## Fishes



*Gadus morhua* © Kelly Bentham

Fishes refer to the superclass Agnatha (jawless fishes such as lampreys), the class Chondrichthyes (cartilaginous fishes such as sharks), and the superclass Osteichthyes (bony fishes such as salmon). Fishes have evolved following multiple events from different lineages. They are ectothermic (cold-blooded) vertebrates that live underwater, breathe with gills, and usually have scales. Some species live exclusively in fresh waters, others exclusively in salt waters, and others migrate from one to the other for reproduction. Fishes generally lay eggs and provide little care for their young. They eat a variety of foods including algae, plants, invertebrates, and other fishes. Active predators such as tunas are streamlined and fast; other lie-in-wait predators ambush passing prey; and plankton-feeders like herrings filter their food with gill rakers. Significant research has been done on important commercial and recreational species; others are less well understood, particularly deep-water marine and Arctic species. Overfishing is a significant threat to marine fishes. Some species had significant declines due to fishing activities. Other concerns for Canadian fishes include habitat loss and degradation, pollution, contamination, climate change, interactions with farmed fishes, and invasive species.

There are 1379 known species of fishes in Canada (Figure 33). Many species are apparently secure or secure (31%). There are three species that are presumed extirpated, one species that is possibly extirpated, nine species that are critically imperiled, and 25 species that are imperiled. Of these 38 species, 19 have only a small part of their range in Canada (10% or less) and 15 are intermediary (from 11% to 74%). However, four species have 75% or more of their range in Canada. Among those, three species are thought to be endemic to Canada: *Coregonus huntsmani*, *Entosphenus macrostomus*, *Moxostoma hubbsi*. In total, seven species have a high priority score (between 1 and 5). We also identified 15 species that are exotic at the national level. We do not have enough knowledge on 521 species to give them a rank other than NU or NNR. In total, 112 species of fishes are considered migratory.

All the fishes were assessed in the *Wild Species* 2005 report. Since then, 729 species had a change in their status at the national level. A total of 15 species had an increased level of risk, 29 species had a reduced level of risk, and 523 species were changed from or to ranks U, NR, NA. Also, 76 species have been added to the list and 86 have been deleted from the list. Most of the changes (88%) are due to an improved knowledge of the species.

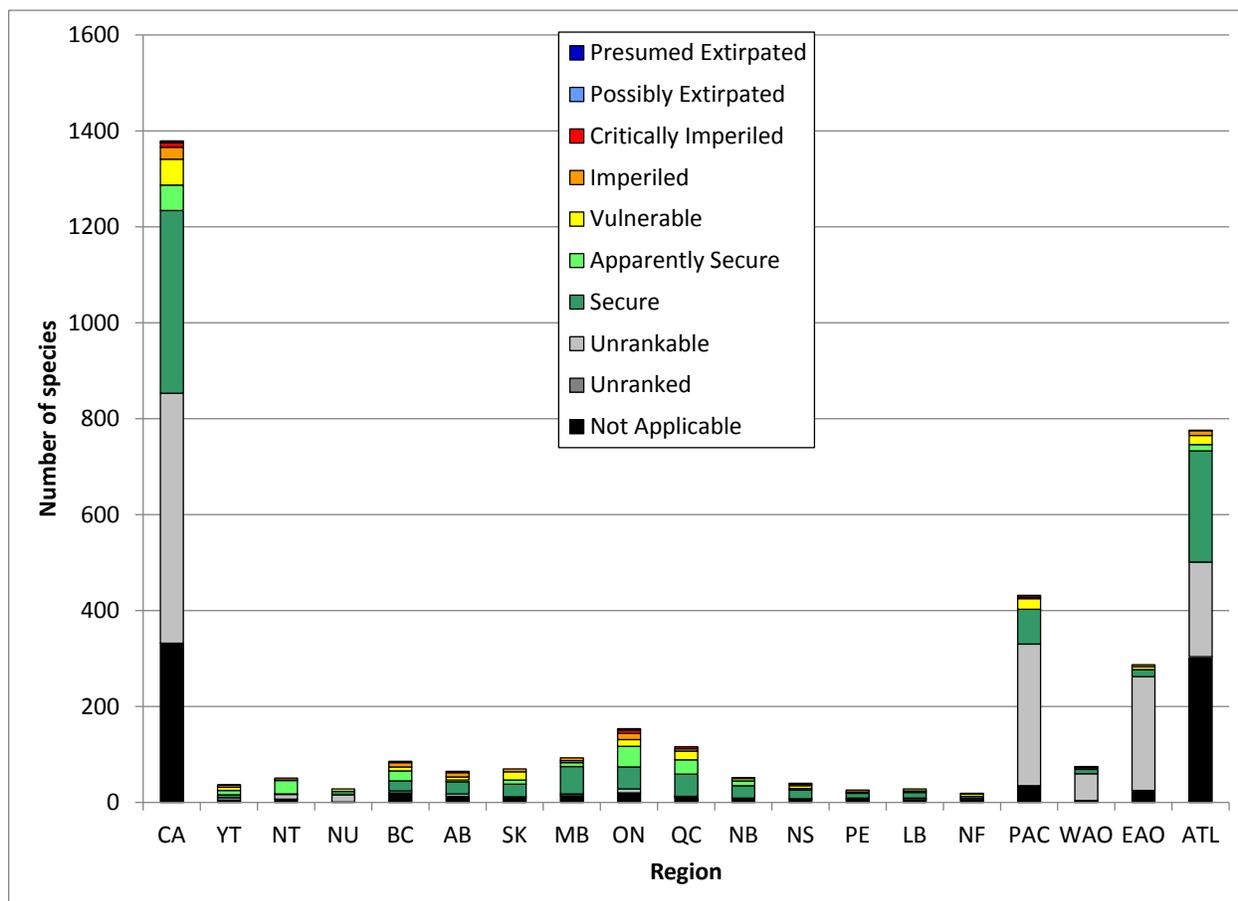


Figure 33. General status of fishes in Canada in 2015.

## Amphibians



Great Plains Toad (*Anaxyrus cognatus*) © Erik Enderson

Amphibians refer to the class Amphibia. Amphibians are ectothermic (cold-blooded) vertebrates with soft, moist skin. Many of Canada's frog, toad, newt and salamander species have aquatic larvae that develop into terrestrial adults. Amphibians can breathe through their skin, which is not waterproof. This puts them at risk of dehydration, and they are often active at night to reduce water loss. The Wood Frog (*Lithobates sylvaticus*) has the most northerly distribution, and produce antifreeze-like cryoprotectants to protect their tissues during hibernation. These are studied by researchers investigating methods to freeze organs for transplantation. The biology, physiology, and natural history of many species in Canada are well known. Less understood are the distribution, abundance and population structure of some regional groups. Monitoring is challenging due to the small size, cryptic appearance, and secretive behaviours of many species. Habitat loss and fragmentation are major threats to amphibians; in some parts of Canada, 90% of wetlands have been lost. Other threats include road mortality, pollution, contamination, and exotic species.

There are 48 known species of amphibians in Canada (Figure 34). The majority of these species are apparently secure or secure (63%). There is one species that is presumed extirpated, two species that are critically imperiled, and five species that are imperiled. All of these eight species have only a small part of their range in Canada (10% or less) and have a lower priority score. Also, there are no exotic species known at the national level. No species are ranked NU or NNR due to a lack of knowledge. No species of amphibians are considered migratory.

All the amphibians were assessed in the *Wild Species* 2010 report. Since then, 10 species had a change in their status at the national level. A total of three species had an increased level of risk, and six species had a reduced level of risk. Also, one species has been added to the list. Most of the changes (50%) are due to a procedural change.

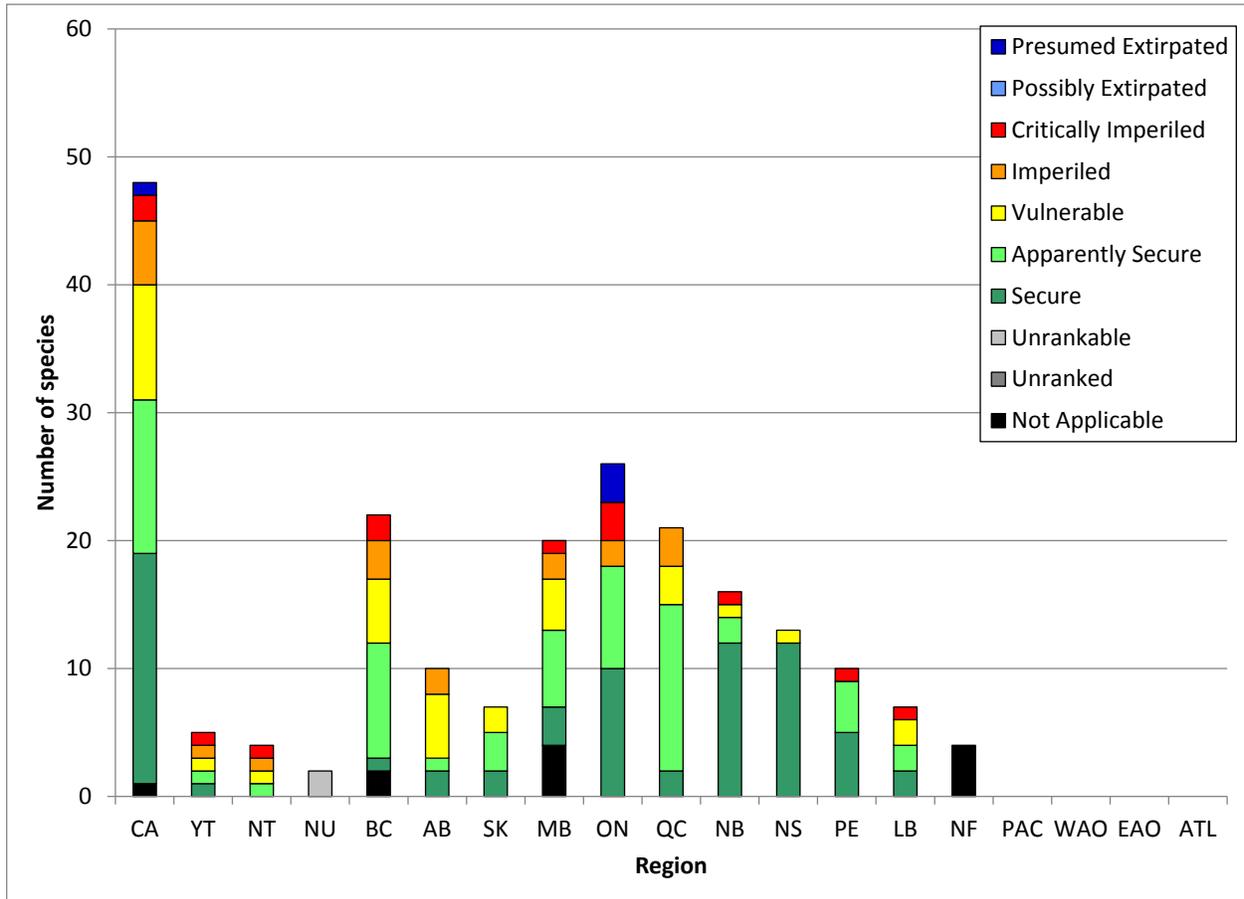


Figure 34. General status of amphibians in Canada in 2015.

## Reptiles



Wood Turtle (*Glyptemys insculpta*) © John Mosesso Jr.

Reptiles refer to the class Reptilia. Reptiles are vertebrates with scaly skin or bony shells. Most of our snakes, lizards, and turtles reach their northern limit in southern Canada. They are ectothermic (cold-blooded), and will bask in the sun or hide in the shade to regulate their temperature, and hibernate to escape the long cold winters. Reptiles generally lay soft, leathery eggs, but a few species give birth to live young, further protecting them from temperature extremes and predation. Some reptiles have additional sense organs: many snakes “smell” chemicals with their tongues, pit vipers sense the heat of warm-blooded prey, and sea turtles use magnetic fields to navigate thousands of kilometres to their tropical nesting beaches. While solitary, secretive species are not well researched, others, like the Common Gartersnake (*Thamnophis sirtalis*) which hibernate in communal dens of up to 10,000, are among the world’s best-studied snakes. Threats to terrestrial and freshwater reptiles include habitat fragmentation and destruction, road mortality, collection as pets, predators, pollution, invasive species, disease, and human persecution. Sea turtles are threatened by egg harvesting, loss and alteration of nesting beaches, pollution, consumption of garbage mistaken for prey, and injury from fishing equipment.

There are 49 known species of reptiles in Canada (Figure 35). Many species are apparently secure or secure (29%). There are four species that are presumed extirpated, five species that are critically imperiled, and six species that are imperiled. Of these 15 species, 13 have only a small part of their range in Canada (10% or less) and two are intermediary (from 11% to 74%). All species have a lower priority score. We also identified two species that are exotic at the national level. We do not have enough knowledge on two species to give them a rank other than NU or NNR. In total, four species of reptiles are considered migratory.

All the reptiles were assessed in the *Wild Species 2010* report. Since then, 17 species had a change in their status at the national level. A total of two species had an increased level of risk, 11 species had a reduced level of risk, and three species were changed from or to ranks U, NR, NA. Also, one species has been added to the list. Most of the changes (47%) are due to an improved knowledge of the species.

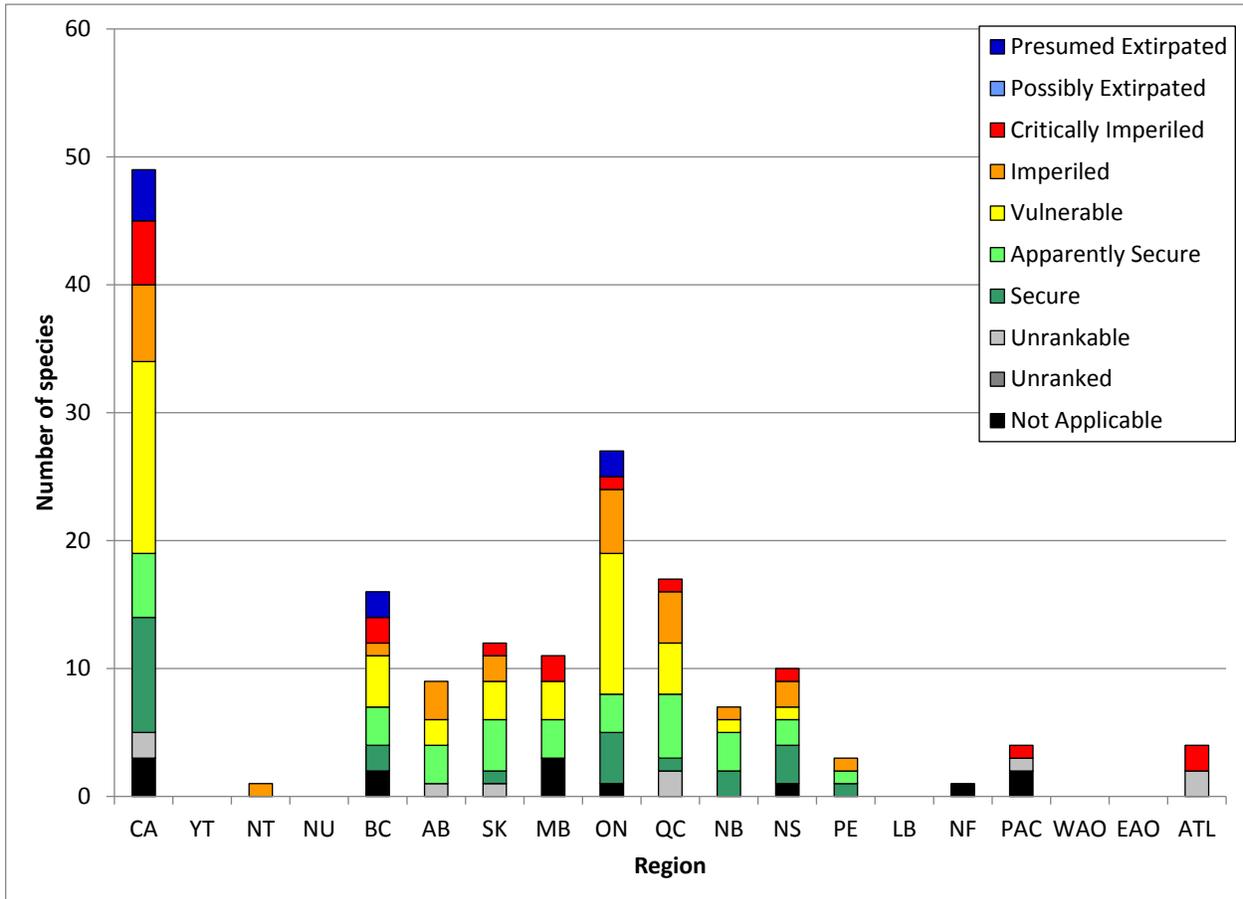


Figure 35. General status of reptiles in Canada in 2015.

## Birds



Red Knot (*Calidris canutus*) © Raymond Belhumeur

Birds refer to the class Aves. Birds are endothermic (warm-blooded) vertebrates that lay eggs and have feathers, wings, and a beak. Their ability to fly allows them greater access to habitats and resources. Most species of birds are migratory, reproducing in Canada during the summer and overwintering in southern countries. The Arctic Tern (*Sterna paradisaea*) is doing one of the longest migrations from the Arctic to the Antarctic. However, other species do not migrate and stay year-round in Canada. Bird courtship is fascinating, and includes complex songs and displays, provision of food to potential mates, or the building of multiple nests. Courtship study has led to many advances in the areas of evolution and sexual selection. Birds are well-studied because they are relatively easy to observe, and popular with scientists and the public. Long-term surveys allow estimations of population sizes and trends in Canada, though knowledge is limited for species that breed in the north and for those whose populations vary with cycles in their food supply. Threats, which can impact birds in Canada or at their wintering grounds, include habitat loss and fragmentation, pollution, contamination, predation (particularly by cats), parasitism, disease, over-exploitation, competition from invasive species, climate change, and collisions.

There are 678 known species of birds in Canada (Figure 36). The majority of these species are apparently secure or secure (51%). There are four species that are presumed extirpated, 26 species that are critically imperiled, and 14 species that are imperiled. Of these 44 species, 30 have only a small part of their range in Canada (10% or less) and 13 are intermediary (from 11% to 74%). However, one species had 75% or more of its range in Canada. In total, eight species have a high priority score (between 1 and 5). We also identified 10 species that are exotic at the national level. We do not have enough knowledge on 17 species to give them a rank other than NU or NNR. In total, 412 species of birds are considered migratory.

All the birds were assessed in the *Wild Species* 2010 report. Since then, 122 species had a change in their status at the national level. A total of 18 species had an increased level of risk, 38 species had a reduced level of risk, and 24 species were changed from or to ranks U, NR, NA. Also, 28 species have been added to the list and 14 have been deleted from the list. Most of the changes (37%) are due to a procedural change.

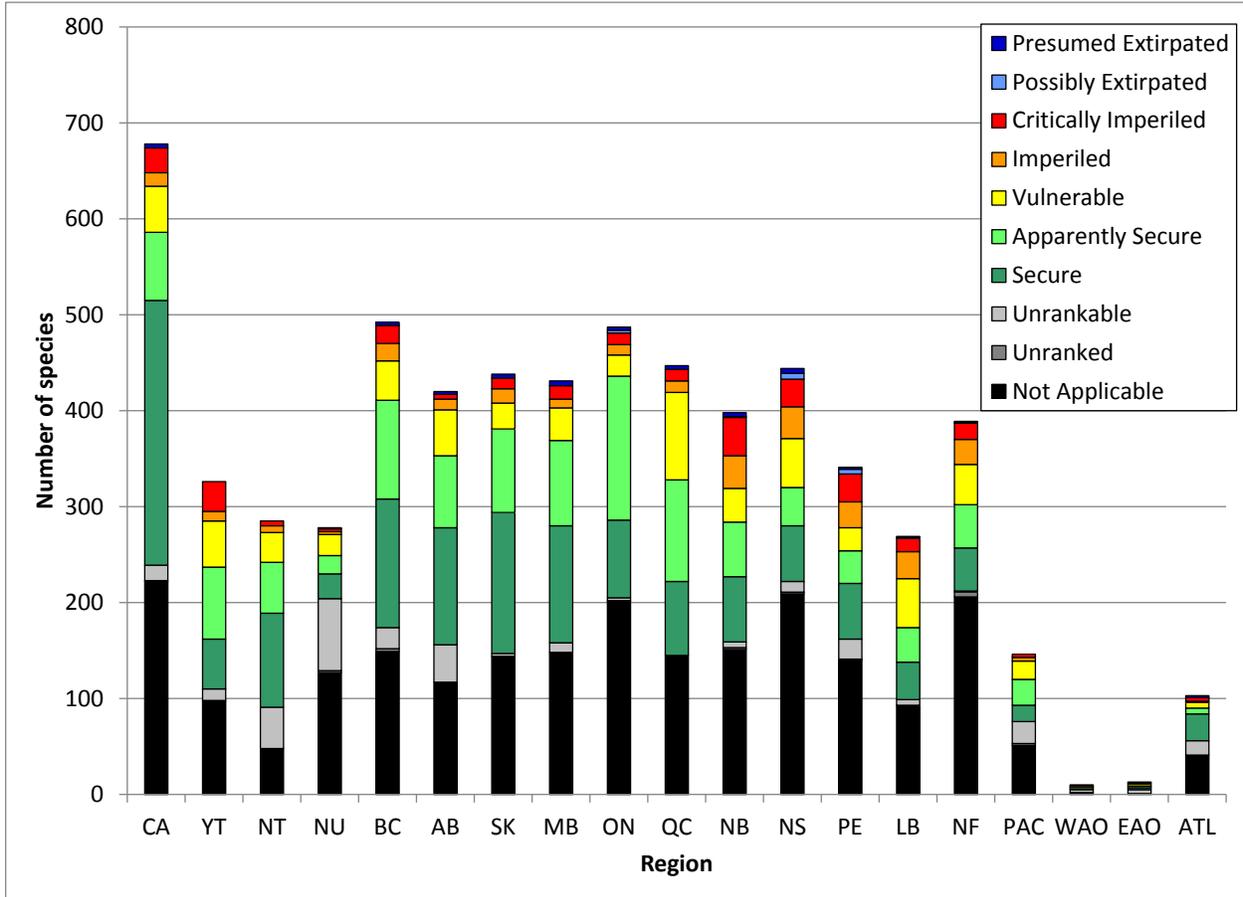


Figure 36. General status of birds in Canada in 2015.

## Mammals



Moose (*Alces americanus*) © Colin Pacitti

Mammals refer to the class Mammalia. Mammals are hairy, endothermic (warm-blooded) vertebrates that produce milk to feed their young. Since the disappearance of the dinosaurs, about 65 million years ago, mammals have spread and diversified to reach their present, global distribution. Arctic mammals are especially distinct, with adaptations to the cold that include thick fur coats (e.g. Arctic Fox, *Vulpes lagopus*); large, compact forms (e.g. Muskox, *Ovibos moschatus*); and specialized blood circulation (e.g. Caribou, *Rangifer tarandus*). Other mammals live in the Canadian oceans, such as whales and dolphins. Their biology, physiology, distribution and ecology are generally well understood, particularly for large species. Other smaller species are increasingly appreciated. For example, bats can help to control insect populations by consuming a large part of their body weight in a single night. Threats faced by mammals include habitat alteration, overexploitation, disease (such as the white-nose syndrome affecting bats), exotic species, hybridization and climate change. Threats specifically for marine species include fishing gear entanglement, boat collisions, seismic activity, noise pollution, and a relatively high vulnerability to contamination.

There are 222 known species of mammals in Canada (Figure 37). The majority of these species are apparently secure or secure (61%). There is one species that is presumed extirpated, one species that is possibly extirpated, 11 species that are critically imperiled, and 10 species that are imperiled. Of these 23 species, 16 have only a small part of their range in Canada (10% or less) and five are intermediary (from 11% to 74%). However, two species have 75% or more of their range in Canada. These two species are thought to be endemic to Canada: Ogilvie Mountains Collared Lemming (*Dicrostonyx nunatakensis*), Vancouver Marmot (*Marmota vancouverensis*). In total, four species have a high priority score (between 1 and 5). We also identified 12 species that are exotic at the national level. We do not have enough knowledge on eight species to give them a rank other than NU or NNR. In total, 30 species of mammals are considered migratory.

All the mammals were assessed in the *Wild Species* 2010 report. Since then, 35 species had a change in their status at the national level. A total of 11 species had an increased level of risk, eight species had a reduced level of risk, and four species were changed from or to ranks U, NR, NA. Also, eight species have been added to the list and four have been deleted from the list. Most of the changes (37%) are due to an improved knowledge of the species.

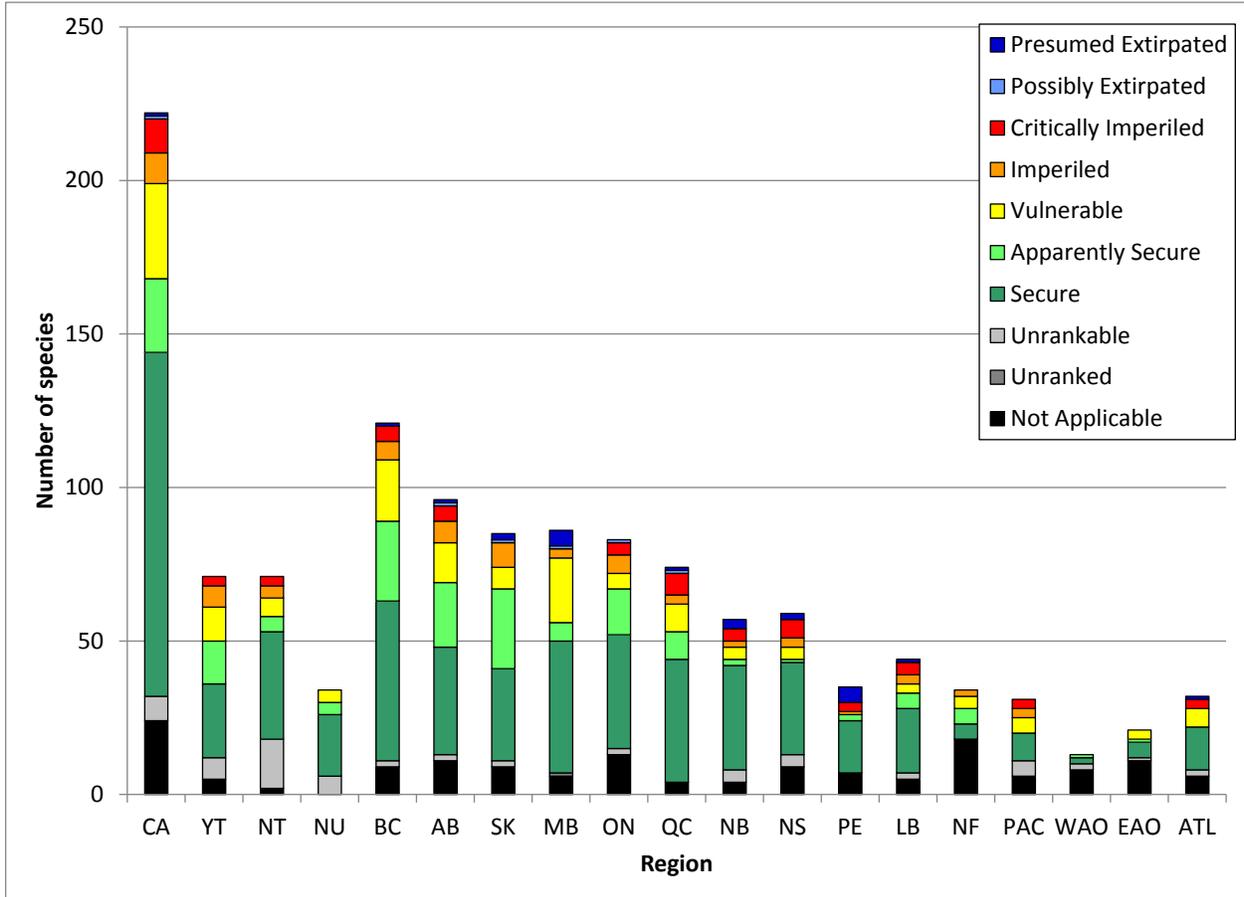


Figure 37. General status of mammals in Canada in 2015.

## SECTION 4 – CONCLUSION

This report represents a huge achievement by summarizing the general status assessments of a large number and variety of wild species occurring in Canada. The assessments inform on the conservation status of the species, and also inform on the level of knowledge we have on these species.

### Proportion of secure species

In total, 29 848 species have been assessed in this report (Figure 38). The total number of species found in each province, territory, and ocean region varies considerably. Among the taxonomic groups assessed, the most species-rich regions are Ontario (15 858 species), British Columbia (14 838 species) and Quebec (14 341 species).

Many species are secure. We present two calculations of the percentage of species that are apparently secure or secure in Canada. The first calculation includes all species assessed and indicates that 43% of species are apparently secure or secure. However, the percentage of species apparently secure or secure is low because of the high proportion of unrankable or unranked species. The second calculation includes only the numerical ranks (N1 to N5). This second calculation allows concentrating only on the species that are currently occurring in Canada and for which we know that the conservation status is between critically imperiled and secure. This calculation indicates that 80% of the species are apparently secure or secure at the national level in Canada. Compared to the previous *Wild Species* reports, this represents the highest percentage (Table 9). The differences are mainly explained by the increase in the number of taxonomic groups assessed in each report. For example, several lesser-known taxonomic groups were added. For these lesser-known taxonomic groups, we are often able to identify first the species that are widespread and secure, and then there is sometimes not enough information to assign the more at risk conservation status ranks for the other species.

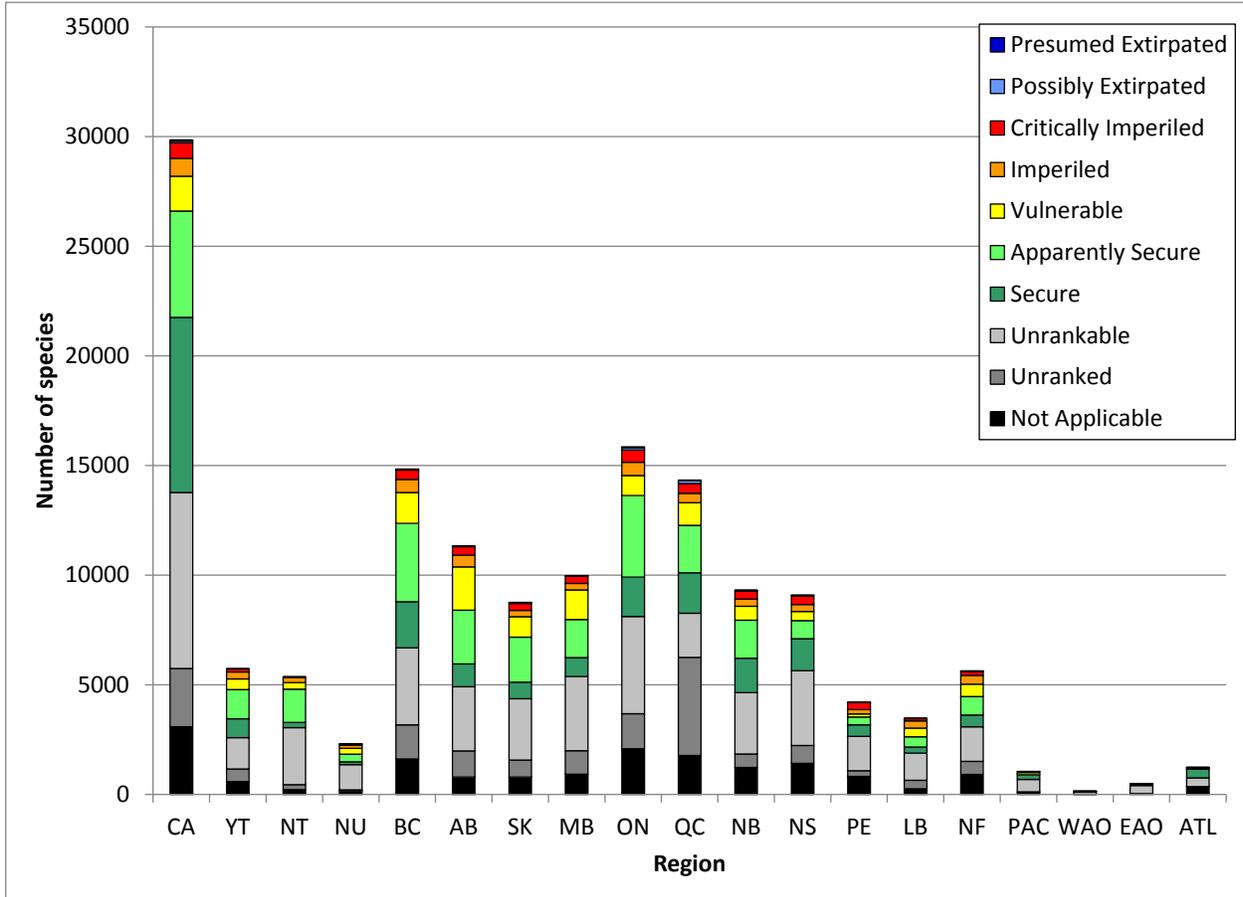


Figure 38. General status of all species assessed in the *Wild Species 2015* report.

**Table 9. Proportion of species that are apparently secure or secure in the reports of the *Wild Species* series.**

<i>Wild Species</i> report	Number of species assessed	Proportion of apparently secure or secure (all species)	Proportion of apparently secure or secure (numerical ranks only)
2000	1670	59%	74%
2005	7732	46%	70%
2010	11 950	55%	77%
2015	29 848	43%	80%

## The most imperiled species

In this report, a total of 1659 species have been ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada. The taxonomic groups that have the most of these species are the vascular plants, followed by bryophytes, beetles, macrolichens, and moths and butterflies.

On the 1659 species, 1032 species have only a small part of their range in Canada (10% or less) and 498 are intermediary (from 11% to 74%). However, 129 species have 75% or more of their range in Canada. Among those, 99 species are thought to be endemic to Canada. Vascular plants, beetles and moths and butterflies are the taxonomic groups that have the most endemic species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada. The list of all the scientific names of these species can be found in the database of the report.

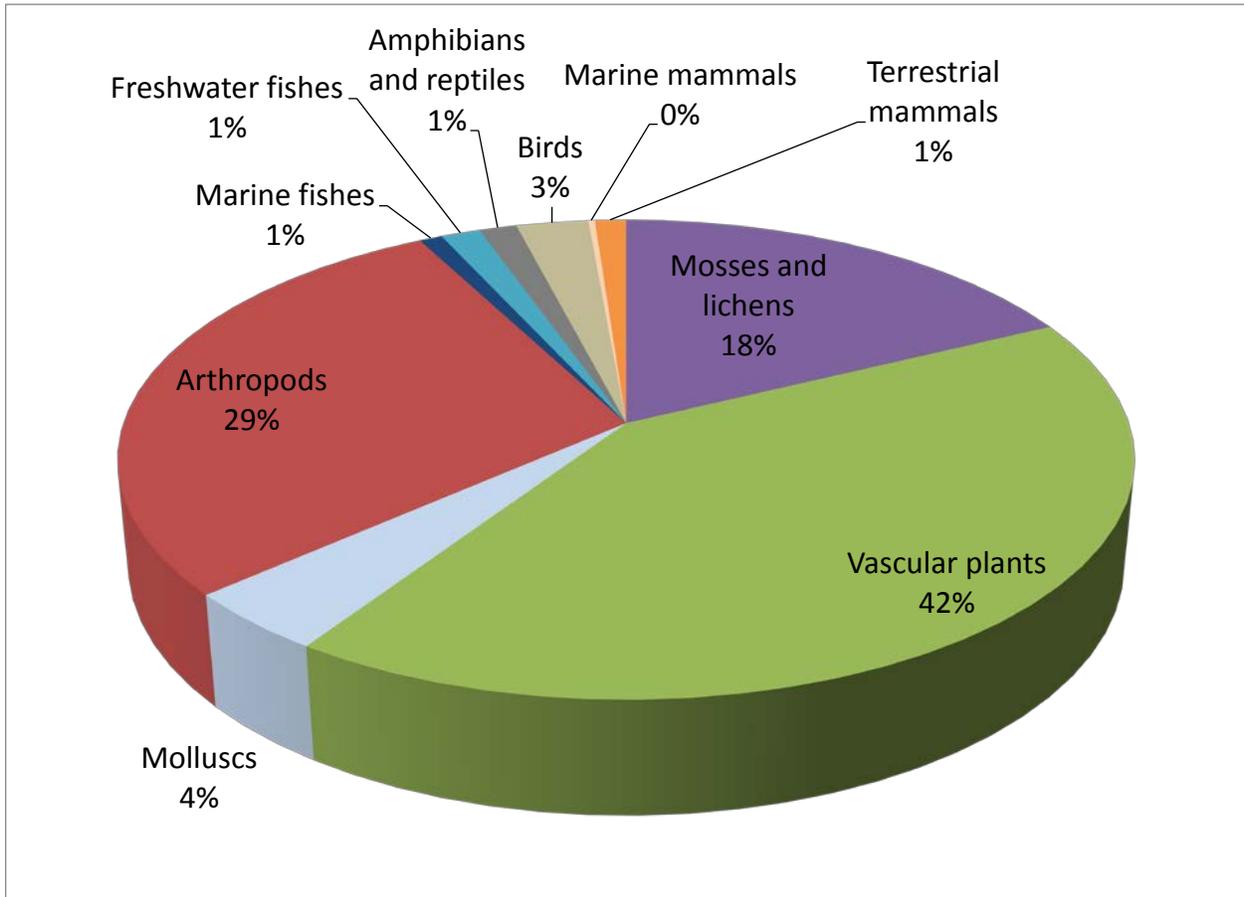
## Helping COSEWIC to identify priority species

The priority scores determined in this report by the National General Status Working Group can help COSEWIC to identify which species could be assessed in details. Of the 1659 species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada, 296 species have the highest priority scores (between 1 and 5). Some of these species have already been assessed in details by COSEWIC (Table 10). COSEWIC has assessed 65 species within the highest priority scores. The other species not included in this table and assessed by COSEWIC are subspecies or species that are more secure or data deficient.

COSEWIC has 10 subcommittees that focus on specific groups of species: mosses and lichens, vascular plants, molluscs, arthropods, marine fishes, freshwater fishes, amphibians and reptiles, birds, marine mammals, and terrestrial mammals. When we separate the 1659 species by each subcommittee, we see that three subcommittees (vascular plants, arthropods, and mosses and lichens) deal with most of the species that are ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada (Figure 39).

**Table 10. Priority score of species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada.**

Priority score	Number of species	Number of species assessed by COSEWIC
1 (highest)	37	11
2	27	6
3	30	6
4	80	17
5	122	25
6	87	16
7	565	134
8	261	18
9	224	57
10 (lower)	226	20
TOTAL	1659	310



**Figure 39. Proportion of species ranked by the National General Status Working Group as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada by each subcommittee of COSEWIC.**

## Exotic species

One of the issues highlighted in this report is the large number of non-native species in Canada. Exotic species are species that have been moved beyond their natural range as a result of human activity. Exotic species have thus been introduced to Canada, both deliberately and accidentally, from around the world. In addition, exotic species can also include native species that have been moved from regions of the country in which they traditionally occur, to regions in which they are not naturally found (to another province or territory for example). Whether from abroad, or from a different part of Canada, exotic species can cause problems for native species in a variety of ways, including competition for space and resources, predation, hybridization and introduction of new diseases.

In the ranking system of NatureServe, exotic species are included in the rank not applicable (NA). The National General Status Working Group intentionally included an additional column in the database to identify which of the not applicable species are exotic, so that we are able to track them. In this report, of the 29 848 species assessed, a total of 2394 species were exotic at the national level in Canada. Most of the exotic species were vascular plants (1315 species), representing 55% of all exotic species assessed in the report. Vascular plants have the highest proportion of exotic species of any other groups covered in this report: 25% of species of vascular plants established in the wild in Canada are exotic. Other taxonomic groups with many exotic species were the beetles (624 species) and the moths and butterflies (191 species). The list of all the scientific names of these exotic species can be found in the database of the report.

Governments in Canada are collaborating and have developed a national strategy on exotic species, called An Invasive Alien Species Strategy for Canada. This national strategy plays an important role in preventing new invasions, detecting and responding to new invasive alien species and in managing established invasive alien species through eradication, containment and control. The species that are ranked as exotic by the National General Status Working Group in the *Wild Species* reports could be used in this strategy. The *Wild Species* reports represent one of the most comprehensive sources of information to identify which exotic species are present in Canada. The strategy can use the *Wild Species* reports to do further analysis on the impact these exotic species have on our ecosystems.

## Lack of knowledge

The knowledge on species in Canada is variable. For example, we generally have more information on the vertebrates, which include species such as birds, mammal, and amphibians, and we generally have less information on the invertebrates, which include species such as insects, spiders, corals, and others. These lesser-known taxonomic groups are important in the program on the General Status of Species in Canada, since they represent the majority of species.

In this report, of the total 29 848 species assessed, 10 687 species were ranked as unrankable or unranked at the national level because of a lack of knowledge. The taxonomic groups that had the highest number of unrankable or unranked species were the beetles (3624 species) and the moths and butterflies (3015 species). However, the taxonomic groups that were the most unknown and had the highest proportion of species ranked as unrankable or unranked at the national level were the sponges, mayflies, selected macrofungi, and lacewings.

Moreover, some taxonomic groups also currently have a level of knowledge too low to be considered for inclusion in the *Wild Species* reports. For example, there are many groups of invertebrates for which we are unable to build a species list in Canada. The lists of species represent the first step to enable the assessment of the conservation status. We hope that more information will become available for those groups as well. Without information on the status of these species, it is difficult to judge how the human uses affect the ecosystems and species. As the National General Status Working Group assesses species groups which are not well-known or not well-studied in Canada, the total proportion of species that receive ranks of unrankable or unranked is likely to rise. One purpose of these reports is to encourage more information to be collected on species currently ranked as unrankable or unranked.

## Migratory species

The conservation of migratory species is more complex because the threats they face are more diverse and do not originate only from Canada. For example, when Canadian birds migrate south to overwinter in other countries, they can face different threats both during the migration and at the place where they overwinter. Within Canada, the use of the breeding, non-breeding, and migrant qualifiers enable to convey the complete status of these species, and help to determine if the threats are applicable to the entire species or only to a specific part of the species. The ranks can thus flag the need to work with international partners to maintain these species in Canada.

In this report, 578 migratory species were assessed (Table 11). The majority are birds (71%) and fishes (19%). There are three species that are presumed extirpated, 27 species that are critically imperiled, 20 species that are imperiled, 68 species that are vulnerable, 77 species that are apparently secure, 344 species that are secure, 38 species that are unrankable, and one species that is unranked.

**Table 11. Number of migratory species assessed in the *Wild Species* 2015 report.**

Taxonomic group	Number of migratory species
Dragonflies and damselflies	4
Moths and butterflies	16
Fishes	112
Reptiles	4
Birds	412
Mammals	30
TOTAL	578

## Trends of species

One of the important achievements of this report is to update the status assessments of taxonomic groups that were included in previous *Wild Species* reports. Among the taxonomic groups that were reassessed in this report, a total of 3301 species had a change in their national rank. In total, 449 species had an increased level of risk, 414 species had a reduced level of risk, and 1382 species were changed from or to ranks U, NR, NA. Also, 596 species have been added to the list and 461 have been deleted from the list. Compared to the previous *Wild Species* reports, a larger proportion of species have been changed from or to ranks U, NR, NA (Table 12).

In this report, a total of 163 changes were due to a biological change in the population size, distribution, or threats of the species, 39 changes were due to a new COSEWIC assessment, 212 changes were due to an error in previous rank, 1638 changes were due to an improved knowledge of the species, 901 changes were due to a procedural change, and 348 changes were due to a taxonomic change. Compared to the previous *Wild Species* reports, the procedural changes occupied a larger proportion of the changes in 2015, mainly due to the change from the previous General Status ranking system to the ranking system of NatureServe and the use of the rank calculator (Table 13). Except for the *Wild Species* 2005 report, the most important reason for changes is an improved knowledge of the species, and this reason accounted for about half of all the changes observed in the national ranks.

**Table 12. Description of the changes in the reports of the *Wild Species* series. There was no change in 2000 since it was the first report.**

Description	<i>Wild Species</i> 2005	<i>Wild Species</i> 2010	<i>Wild Species</i> 2015
Increased level of risk	69	95	449
Reduced level of risk	52	166	414
Changed from or to ranks U, NR, NA	47	102	1382
New species	33	162	595
Deleted species	35	101	461
TOTAL	236	626	3301

**Table 13. Reasons for changes in the reports of the *Wild Species* series. There was no change in 2000 since it was the first report.**

Reason	<i>Wild Species</i> 2005	<i>Wild Species</i> 2010	<i>Wild Species</i> 2015
Biological change in the population size, distribution, or threats of the species	11	63	163
New COSEWIC assessment	58	64	39
Error in previous rank	0	10	212
Improved knowledge of the species	29	343	1638
Procedural change	71	16	901
Taxonomic change	14	130	348
Not available	53	-	-
TOTAL	236	626	3301

## Common names

The common names represent an important tool to communicate the diversity of species in Canada. Common names were developed and standardized for several taxonomic groups (Table 14). In the next *Wild Species* reports, more common names will be developed.

**Table 14. Number of common names included in the database of the *Wild Species* 2015 report.**

Taxonomic group	Number of species	Number of English common names	Number of French common names
Selected macrofungi	87	87	87
Macrolichens	857	0	0
Bryophytes	1375	0	0
Vascular plants	5211	5151	5141
Sponges	212	212	212
Corals	190	190	190
Freshwater bivalves	93	0	0
Terrestrial and freshwater snails and slugs	326	0	0
Spiders	1399	1399	1399
Mayflies	342	342	342
Dragonflies and damselflies	213	213	0
Stoneflies	293	293	293
Grasshoppers and relatives	269	269	269
Lacewings	101	101	101
Beetles	7963	0	0
Ants	212	212	0
Bees	805	805	805
Yellowjacket wasps	101	0	0
Caddisflies	688	688	688
Moths and butterflies	5257	0	0
Scorpionflies	25	25	25
Black flies	160	160	160
Mosquitoes	80	80	80
Horse flies	144	144	144
Bee flies	116	116	116
Flower flies	524	0	524
Decapods	316	316	316
Sea cucumbers	75	75	75
Sea urchins	38	38	38

Fishes	1379	0	0
Amphibians	48	48	21
Reptiles	49	49	18
Birds	678	674	674
Mammals	222	222	93
TOTAL	29 848	11 909	11 811

## Next steps

Reports from the *Wild Species* series are the main product of an ongoing national program. One of the priorities for the next *Wild Species* report will be to continue to increase the number and variety of species included for conservation status assessments. There are still many species remaining to be assessed in Canada, and it is essential to determine what their conservation status is to prevent them from becoming extinct. Another priority will be to continue to reassess the species that were included in the previous *Wild Species* reports, to detect eventual changes in the conservation statuses of the species. In the future, the *Wild Species* series will continue to consolidate our knowledge of species in Canada.

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Bonnie Fournier, Rick Fournier, Marie-Ève Garon-Labrecque, Lynn Gillespie, Jim Goltz, Joyce Gould, Mike Gravel, Brian Green, Claudia Hanel, Jim Harris, Marsha Hayward, Nicholas Hill, Jeff Hollett, Allicia Kelly, Peter Kershaw, Tom Lakusta, Jane Lancaster, Brian Latham, Alice Legat, Karl-Erich Lindenschmidt, Frank Lomer, Michael MacDonald, Kate MacQuarrie, David Mazerolle, Dave McLeod, Sue Meades, Gisèle Mitrow, Steve Moore, Ruth Newell, Michael J. Oldham, Mireille Oldham, Jakub Olesinski, Rochard D. Olsen, Debbie Peck, Jenifer Penny, Richard Popko, Sarah Robinson, Sarah Rosolen, Beckie Rozander, Jeff Saarela, Lena Schofield, Phil Sheridan, Jennifer Skelton, Lisa Smith, Oliver Sonnentag, Vicki St-Germaine, Velma Sterenberg, Kevin Stevens, Rosanna Strong, Eleanor R. Thomson, Maureen Toner, Annika Trimble, Amanda Ward, David Watson, Dustin Whalen, Ellen Whitman, Marian Zinck.

### Sponges

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Leslie Barton, David Boguski, Palmira Boutillier, Charley Cyr, Graham Gillespie, Mark Hanson, Lei Harris, Georg Jorgenson, Kathleen Martin, Bernard Sainte-Marie, Chantelle Sawatzky, Mark Simpson, Carl Szczerski, Ross Tallman, Vonda Wareham), José Benchetrit, Cindy Grant, Lou Van Guelpen, Katie MacGregor.

Other experts: Michael Burzynski, John Maunder.

### Corals

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Leslie Barton, David Boguski, Palmira Boutillier, Charley Cyr, Graham Gillespie, Mark Hanson, Lei Harris, Georg Jorgenson, Kathleen Martin, Bernard Sainte-Marie, Chantelle Sawatzky, Mark Simpson, Carl Szczerski, Ross Tallman, Vonda Wareham), José Benchetrit, Cindy Grant, Lou Van Guelpen, Katie MacGregor.

Other experts: Philippe Archambault, Ashley Kling, Shannon MacPhee, Andy Majewski, Laure de Montety, Karine Robert.

### Freshwater bivalves

Leaders: Rémi Hébert, Jennifer Shaw.

Main experts: Gerry Mackie, Annegret Nicolai, Isabelle Picard.

Other experts: Dan Benoit, Joe Carney, Paul Catling, Nathalie Desrosiers, Lea Gelling, Stuart A. Harris, Andrew Hebda, Madeline Holloway, Glen Jamieson, Emily Jenkins, Susan Kutz, Dwayne Lepitzki, John Maunder, Donald McAlpine, Todd Morris, Robert Mulders, Annie Paquet, Bob Reid, Astrid Schwalb, Joshua Sullivan, Daelyn Woolnough, David Thomas Zanatta, Xinhua Zhu.

### Terrestrial and freshwater snails and slugs

Leader: Rémi Hébert.

Main experts: Robert Forsyth, Dwayne Lepitzki, Annegret Nicolai, Isabelle Picard.

Other experts: Dan Benoit, Joe Carney, Paul Catling, Jamie Chambers, Nathalie Desrosiers, Ian Gardiner, Lea Gelling, Stuart A. Harris, Andrew Hebda, Madeline Holloway, Glen Jamieson, Emily Jenkins, Susan Kutz, Gerry Mackie, John Maunder, Donald McAlpine, Todd Morris, Michael J. Oldham, Kristiina Ovaska, Bob Reid, Astrid Schwalb, Joshua Sullivan, Rick Taggart, Daelyn Woolnough, David Thomas Zanatta, Xinhua Zhu.

Spiders

Leader: Syd Cannings.

Main experts: Robb Bennett, Sarah Loboda.

Other experts: Gergin Blagoev, Joey Bowden, Don Buckle, Chris Buddle, Claudia Copley, Darren Copley, Rob Craig, Nathalie Desrosiers, John Klymko, Kyle Knysh, Maxim Larrivée, Nic Larter, Robin Leech, Robert Perry, Roger Pickavance, Jaime Pinzon, Norm Platnick, Cory Sheffield, Jim Sparling.

Mayflies

Leaders: Syd Cannings, Rémi Hébert.

Main experts: Colin Curry, Pierre-Paul Harper, Luke Jacobus.

Other experts: Nathalie Desrosiers, Donna Giberson.

Dragonflies and damselflies

Leaders: Syd Cannings, Colin D. Jones

Main experts: National General Status Working Group, Daniel Bert, Robert Cannings, David Halstead, John Klymko, Karin Newman, Michel Savard.

Other experts: Franco Alo, Paul Brunelle, Paul Catling, Rosemary Curley, Nathalie Desrosiers, Robert Harding, Doug Macaulay, Scott Makepeace, Dennis Paulson, Dwayne Sabine.

Stoneflies

Leaders: Syd Cannings, Rémi Hébert.

Main experts: Colin Curry, Pierre-Paul Harper.

Other experts: Nathalie Desrosiers, Donna Giberson, Doug Tate.

Grasshoppers and relatives

Leader: Rémi Hébert.

Main experts: Dan Johnson, James Miskelly.

Other experts: Marilyn Anions, Paul Catling, Nathalie Desrosiers, Peggy Dixon, Terry Galloway, John Lee, Donald McAlpine, Steven M. Paiero.

Lacewings

Leader: Syd Cannings.

Main experts: David Blades, Pierre-Paul Harper.

Other expert: Nathalie Desrosiers.

Beetles

Leader: Patrice Bouchard.

Main experts: Jane Allison, Tammy Andrews, Pierre Bélanger, Colin Jones, David Larson, Stephen Luk, Christopher Majka, Kimberley Rondeau, Andrew Smith, Thomas Théry, Chandra Venables, Charlene Wood.

Other experts: John Acorn, Danny Allaire, Robert Anderson, Libby Avis, Nathalie Desrosiers, Donna Giberson, Benoit Godin, Henri Goulet, Paul Grant, Mike Gravel, Bruce Hanna, Jennifer Heron, Darren Jacquard, Itai Katz, Dave Langor, David McCorquodale, Tamika Mulders, David Shorthouse, Danny Shepeley, Todd Ugine, Reginald Webster, Thomas Woodrock.

### Ants

Leader: Nicole Firlotte.

Main experts: Jennifer Heron, Gary Umphrey.

Other experts: Nathalie Desrosiers, Aaron Fairweather, André Francoeur, Barry Hicks, Donald McAlpine, Anthony Thomas.

### Bees

Leader: Rémi Hébert.

Main experts: Anne-Isabelle Gravel, Jennifer Heron, John Klymko, Cory Sheffield, Anna Maria Solecki.

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### Yellowjacket wasps

Leader: Syd Cannings.

Main experts: John Klymko, Robert Longair.

Other experts: Matthias Buck, Nathalie Desrosiers, Anthony Thomas.

### Caddisflies

Leaders: Syd Cannings, Rémi Hébert.

Main experts: Colin Curry, Pierre-Paul Harper, John Morse.

Other expert: Nathalie Desrosiers.

### Moths and butterflies

Leader: Gregory Pohl.

Main experts: National General Status Working Group, David Beadle, Mike Burrell, Alain Charpentier, Jeremy deWaard, Crispin Guppy, Daniel Handfield, Colin Jones, John Klymko, Maxim Larrivée, Ryan St. Laurent, Doug Macaulay, Christopher Majka, Richard Westwood.

Other experts: Gary Anweiler, Mark Arsenault, Libby Avis, Patricia Baines, David Barton, Charley Bird, David Blades, John Brown, Rob Cannings, Claudia Copley, Lars Crabo, Rosemary Curley, Doug Currie, Colin Curry, Rob Curtiss, Don Davis, Barbara Deneka, Nathalie Desrosiers, Peggy Dixon, Jason Dombroskie, Vladimir Dubatolov, Jim Edsall, Charley Eiseman, Cliff Ferris, Ken Fry, Larry Gall, Jeremy Gatten, Lea Gelling, Donna Giberson, Todd Gilligan, Daniel Glaeske, Jen Gleason, Louis Handfield, Robert Harding, Andrew Hebda, Christopher Heron, Jennifer Heron, Gerald Hilchie, Ron Hodges, Dave Holden, Ron Hooper, Brad Hubley, Lee Humble, Christi Jaeger, Shashi Juneja, Lauri Kaila, Ole Karsholt, Janis Klapecki, Denis Knopp, Norbert Kondla, Jim Kruse, Don Lafontaine, Bernard Landry, Jean-François

Landry, André Langlois, David Langor, Dave Lawrie, Sangmi Lee, Maria Leung, Don McAlpine, Dan McAskill, Alec McClay, Fritz McEvoy, Eric Metzler, Randy Mooi, Steve Nanz, Vazrick Nazari, Dean Nicholson, Erik van Nieukerken, Meghan Noseworthy, Caroline Parsons, Bob Patterson, Jonathan Pelham, Olle Pellmyr, Kenelm Philip, Ted Pike, Jerry Powell, Dwayne Sabine, Chris Schmidt, Jan Scott, Ryan Scott, Barb Sharanowski, Cory Sheffield, Jon Sheppard, Danny Shpeley, Cyndi Smith, Jae-Cheon Sohn, Felix Sperling, Ken Stead, Bill Taft, Angela Telfer, Tony Thomas, Jim Troubridge, Reginald Webster, Terry Wheeler, Bev Wigney.

#### Scorpionflies

Leader: Rémi Hébert.

Main expert: David Blades.

Other expert: Nathalie Desrosiers.

#### Black flies

Leader: Syd Cannings.

Main experts: Stéphanie Boucher, Patrick Schaefer, Anna Maria Solecki.

Other experts: Nathalie Desrosiers, Doug Currie, Andrew Smith.

#### Mosquitoes

Leader: Suzanne Carrière.

Main experts: Stéphanie Boucher, Fiona Hunter, Anna Maria Solecki.

Other experts: Karl Cox, Nathalie Desrosiers, Brett Elkin, Randy Gadawski, Patrick Schaefer, Andrew Smith, Iga Stasiak, Taz Stuart.

#### Horse flies

Leader: Syd Cannings.

Main experts: Amélie Grégoire-Taillefer, John Klymko, Patrick Schaefer, Anna Maria Solecki.

Other experts: Nathalie Desrosiers, Andrew Smith, Anthony Thomas.

#### Bee flies

Leader: Rémi Hébert.

Main experts: Stéphanie Boucher, Joel Kits, John Klymko.

Other experts: Nathalie Desrosiers, Jennifer Heron, Dwayne Sabine.

#### Flower flies

Leaders: Rémi Hébert, Donald A. Sutherland.

Main experts: Veronica Bura, Amélie Grégoire-Taillefer, John Klymko, Michelle Locke, Sarah Matheson, Jeff Skevington, Andrew Young.

Other experts: William J. Crins, Nathalie Desrosiers.

Decapods

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Leslie Barton, David Boguski, Palmira Boutillier, Charley Cyr, Graham Gillespie, Mark Hanson, Lei Harris, Georg Jorgenson, Kathleen Martin, Bernard Sainte-Marie, Chantelle Sawatzky, Mark Simpson, Carl Szczerski, Ross Tallman, Vonda Wareham), José Benchetrit, Cindy Grant, Lou Van Guelpen, Katie MacGregor.

Other experts: Philippe Archambault, Kimberly Heisler, Ashley Kling, Shannon MacPhee, Andy Majewski, Laure de Montety, Karine Robert.

Sea cucumbers

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Leslie Barton, David Boguski, Palmira Boutillier, Charley Cyr, Graham Gillespie, Mark Hanson, Lei Harris, Georg Jorgenson, Kathleen Martin, Bernard Sainte-Marie, Chantelle Sawatzky, Mark Simpson, Carl Szczerski, Ross Tallman, Vonda Wareham), José Benchetrit, Cindy Grant, Lou Van Guelpen, Katie MacGregor.

Other experts: Philippe Archambault, Kimberly Heisler, Ashley Kling, Shannon MacPhee, Andy Majewski, Laure de Montety, Karine Robert.

Sea urchins

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Leslie Barton, David Boguski, Palmira Boutillier, Charley Cyr, Graham Gillespie, Mark Hanson, Lei Harris, Georg Jorgenson, Kathleen Martin, Bernard Sainte-Marie, Chantelle Sawatzky, Mark Simpson, Carl Szczerski, Ross Tallman, Vonda Wareham), José Benchetrit, Cindy Grant, Lou Van Guelpen, Katie MacGregor.

Other experts: Philippe Archambault, Kimberly Heisler, Ashley Kling, Shannon MacPhee, Andy Majewski, Laure de Montety, Karine Robert.

Fishes

Leader: Jennifer Shaw.

Main experts: Fisheries and Oceans Canada (Dave Boguski, Hugo Bourdages, Lynn Bouvier, Charley Cyr, Al Dextrase, Karen Dunmall, Graham Gillespie, Mark Hanson, Lei Harris, Andrew Majewski, Nicholas Mandrak, Brian Moons, Jim Reist, Chantelle Sawatzky, Tim Siferd, Mark Simpson, Brenda Waddell, Doug Watkinson), National General Status Working Group, José Benchetrit, Lou Van Guelpen.

Other experts: Rod Bradford, Ruari Carthew, Kathryn Collet, Chris Connell, Pete Cott, Scott Douglas, Colin Gallagher, Mark Gautreau, Scott Gibson, Mark Hanson, Muhammad Janjua, Robert Kent, Ashley Kling, Kammie Kruse, Nic Larter, Ellen V. Lea, Tracey Loewen, Jeff Long, Rosanne MacFarlane, Shannon MacPhee, Neil Mochnacz, Robert Perry, Claude Renaud, Anna Soininen, Michelle Swallow, Daphne Themelis, Paul Vecsei, Jill Watkins, Doug Watkinson, Greg Wilson, Patricia Woodruff, Xinhua Zhu.

Amphibians

Leader: Donald A. Sutherland.

Main experts: National General Status Working Group, John Klymko, Nicolas Lecomte, Michael Patrick Marklevitz, Allison Siemens-Worsley.

Other experts: Kate Cannell, Tom Chowns, Rosemary Curley, Yohann Dubois, Orville Dyer, Troy Ellsworth, Maria Forzan, Purnima Govindarajula, Robert Harding, Rick Hawkins, Rhiannon Leshyk, Donald McAlpine, Michael J. Oldham, Simon Pelletier, Mike Sarell, Danna M. Schock, Brian Slough, Sarah Taylor, Emily Upham-Millis, Joanna Wilson.

### Reptiles

Leader: Donald A. Sutherland.

Main experts: National General Status Working Group, John Klymko, Michael Patrick Marklevitz, Allison Siemens-Worsley.

Other experts: Rosemary Curley, Yohann Dubois, Orville Dyer, Maria Forzan, Purnima Govindarajula, Robert Harding, Rick Hawkins, Jared Hobbs, Karl Larsen, Donald McAlpine, Michael J. Oldham, Simon Pelletier, Mike Sarell.

### Birds

Leader: Rémi Hébert.

Main experts: Canadian Wildlife Service of Environment and Climate Change Canada (Elizabeth Beck, Paul Chamberland, Liz Davidson, Connie Downes, Kevin Fort, Nancy Hughes, Stéphane Légaré, Erika Lok, Craig Machtans, Britney Niedzielski, Rhiannon Pankratz, Sébastien Paradis, Myra Robertson, Kate Robinson, Rich Russell, Pam Sinclair, Samantha Song, Josée Tardif, Peter Thomas, Russ Weeber, Steve van Wilgenburg), National General Status Working Group, Jared Clarke, Christopher Di Corrado, John Klymko.

Other experts: Kenneth F. Abraham, Danny Allaire, Tom Andrews, Christian Artuso, Jamie Bastedo, Fiep de Bie, Bob Bromley, Greg Campbell, Margaret Campbell, Tom Chowns, David Christie, Myke Chutter, Heather Clark, Dean Cluff, Wayne Condon, Kaytlin Cooper, Karl Cox, Rosemary Curley, Frank Doyle, Mark Drever, James Dubovsky, Wendy Easton, Cameron Eckert, Alastair Franke, Gilles Gauthier, Samuel Haché, Jim Hawkings, Reid Hildebrandt, Keith Hodson, Geoff Holroyd, Rick Howie, Jukka Jantunen, Mike Jennings, Jamie Kenyon, Steve Kraus, Patricia Lacroix, Myles Lamont, Tanya Luszczyk, Scott Makepeace, Steve Matthews, Dan McAskill, David McCorquodale, John McKay, Wanda McLeod, Ken Morgan, Dave Mossop, Marty Mossop, Ted Murphy-Kelly, John Nishi, Dwaine Oakley, Patrick O’hara, Julie Paquet, Kristen Peck, Bruce Pollard, Kim Poole, Elizabeth Portman, Jennie Rausch, Jim Richards, Bruce Rodrigues, Dwayne Sabine, Ben Schonewille, George Scotter, Chris Shank, Ken De Smet, Paul Allen Smith, Mikhail Solovlev, Jason Straka, Doug Tate, Lila Tauzer, Laura Tranquilla, Emily Upham-Mills, Gary Vizniowski, Brian Wheeler, Jim Wilson, Laurie Wilson, Kerry Woo, Cindy Wood, Cheryl Wray, Lynda Yonge, Stephanie Yuill, Ian Ziemann.

### Mammals

Leader: Thomas Jung.

Main experts: National General Status Working Group, Fisheries and Oceans Canada (Christine Abraham, Charley Cyr, Graham Ellis, Steve Ferguson, John Ford, Graham Gillespie, Mark Hanson, Lei Harris, Véronique Lesage, Kathleen Martin, Linda Nichol, Chantelle Sawatzky, Mark Simpson), Mike Burrell, John Klymko, Nicolas Lecomte, Michael Patrick Marklevitz, David Nagorsen, Jacques Prescott, Allison Siemens-Worsley.

Other experts: Jan Adamczewski, Danny Allaire, Terry Armstrong, Elaine Arnott, Stephanie Behrens, Dean Berezanski, Marsha Branigan, Mitch Campbell, Tom Chowns, Karin Clark, Dean Cluff, Joseph Cook, Kaytlin Cooper, Jonathan Cormier, Karl Cox, Bruno Croft, Rosemary Curley, Mirjam van Dalum, Tracy

Davison, Kim Dawe, Bob Decker, Nathalie Desrosiers, Brett Elkin, Graham Forbes, Bonnie Fournier, Kurt Galbreath, Rob Gau, Purnima Govindarajula, Anne Gunn, Bruce Hanna, David G. Hazlerigg, Eric Hoberg, James Hodson, Hank Hristienko, Donavan Joel Jackson, Allicia Kelly, Charlie Krebs, Dianna Krejsa, Susan Kutz, Gerald Kuzyk, Tom Lakusta, Nic Larter, Ainsley Latwaitis, Cori Lausen, Corin MacPhail, Rolland Makegana, Donald McAlpine, Donald S. McLennan, Dayna Meredith, Robert Mulders, Linh Nguyen, Emily Nichol, Link Olson, Jean Polfus, Adrienne Raniszewski, Ken Rebizant, Bob Reid, Jessica Reimer, Bruce Rodrigues, Francois Rossouw, Dwayne Sabine, Dale Shinavar, Jennifer Simons, Donald Stewart, Doug Tate, Alasdair Veitch, William Watkins, Rich Weir, Judy Williams, Joanna Wilson, Nigel G. Yoccoz.

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## Appendix 3 – Websites

*Wild Species: The General Status of Species in Canada*

[www.wildspecies.ca](http://www.wildspecies.ca)

Canada

<https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=37DB2E44-1>

<http://www.pc.gc.ca/eng/nature/eep-sar/index.aspx>

<http://www.dfo-mpo.gc.ca/aquatic-aquatique-eng.htm>

[http://www.registrelep-sararegistry.gc.ca/sar/assessment/general\\_e.cfm](http://www.registrelep-sararegistry.gc.ca/sar/assessment/general_e.cfm)

Yukon

<http://www.env.gov.yk.ca/animals-habitat/speciesrisk.php>

<http://www.env.gov.yk.ca/animals-habitat/cdc.php>

Northwest Territories

<http://www.nwt-species-at-risk.ca/generalstatusprogram>

<http://www.nwt-species-at-risk.ca/content/search-infobase>

Nunavut

<http://gov.nu.ca/environment/information/wildlife-management>

British Columbia

<http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk>

<http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre>

Alberta

<http://aep.alberta.ca/fish-wildlife/species-at-risk/albertas-species-at-risk-strategy/default.aspx>

<http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/>

Saskatchewan

<http://www.environment.gov.sk.ca/biodiversity>

<http://www.biodiversity.sk.ca/>

Manitoba

<http://www.gov.mb.ca/sd/wildlife/index.html>

<http://www.gov.mb.ca/sd/cdc/index.html>

Ontario

<https://www.ontario.ca/page/species-risk>

<https://www.ontario.ca/page/natural-heritage-information-centre>

Quebec

<http://mffp.gouv.qc.ca/the-wildlife/?lang=en>

[http://www.mddelcc.gouv.qc.ca/index\\_en.asp](http://www.mddelcc.gouv.qc.ca/index_en.asp)

<http://www.cdpmq.gouv.qc.ca/>

New Brunswick

[http://www2.gnb.ca/content/gnb/en/departments/erd/natural\\_resources/content/wildlife/content/GeneralStatusWildSpecies.html](http://www2.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/GeneralStatusWildSpecies.html)

<http://www.accdc.com/>

Nova Scotia

<http://novascotia.ca/natr/wildlife/genstatus/>

<http://www.accdc.com/>

Prince Edward Island

<http://www.gov.pe.ca/infopei/index.php3?number=15143&lang=E>

<http://www.accdc.com/>

Newfoundland and Labrador

[http://www.env.gov.nl.ca/env/wildlife/all\\_species/general\\_status.html](http://www.env.gov.nl.ca/env/wildlife/all_species/general_status.html)

<http://www.accdc.com/>

NatureServe

[www.natureserve.ca](http://www.natureserve.ca)

<http://explorer.natureserve.org/>

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Boreal Tufted Jumping Spider (*Phidippus borealis*) © Joanne Bovee

Plymouth Gentian (*Sabatia kennedyana*) © Nova Scotia Museum

Glove Horny Sponge (*Amphilectus digitatus*) © John Rix

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