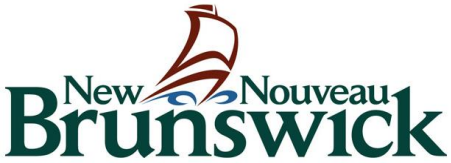
Wild Species 2020

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.



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Summary

Canada is home to about 80 000 species (excluding viruses and bacteria). With the inclusion of 50 534 species, an increase of over 20 000 species from the previous report, the *Wild Species* 2020 report represents the most complete understanding we have ever had on the status and distribution of wild species in Canada. This report makes a key contribution to supporting the protection of biodiversity in Canada – it does more than meet regulatory requirements; it makes the data on species accessible to the Canadian public and partners working to protect species. It reflects the collaboration of hundreds of Canadian scientists over five years in partnership with federal, provincial and territorial governments through the National General Status Working Group. The number of species covered by the report has grown largely due to this cooperation.

Results of our assessments at the national level indicate that 873 species are critically imperiled, 1 245 are imperiled, 2 765 are vulnerable, 9 562 are apparently secure, and 10 038 are secure. Among those species, 20% (one in five) have some level of risk in Canada. In addition, 40 species are presumed extirpated and 95 are possibly extirpated, meaning they have likely disappeared from Canada. Finally, 20 448 species are unrankable and 1 549 are unranked due to lack of sufficient data, and 3 919 are accidental or were introduced into Canada, so ranks are considered not applicable.

This report flags those species that may be high priorities for conservation actions. We identified 2 253 species that may be at risk in Canada (consisting of species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level). Of these, 137 species have 75% or more of their range in Canada, including 105 species that are thought to be endemic to Canada (i.e., they do not occur anywhere else in the world). Canada has a particular responsibility to conserve these species.

Among all the species included in the report, 47 314 are native to Canada and 3 220 are exotic, which means that they have been introduced as a result of human activities. These exotic species can cause problems for species that are naturally occurring in Canada.

This report updates the conservation status of taxonomic groups that were included in the *Wild Species* 2015 report, providing a measure of change. The national rank of 8 107 species changed between these reports, mainly due to new information on the species (71% of changes). In total, 1 199 species were assigned an increased level of extinction risk, and 1 186 species were assigned a reduced level of extinction risk. Of 4 214 species that changed from or to the categories unrankable, unranked, or not applicable, there was a net gain of 2 132 species assigned to other categories. In addition, among species groups included in the 2015 report, 1 186 species were added to the list and 322 deleted (the remaining new species were species groups not previously included).

The large number of species currently unrankable or unranked highlights the need for increased effort to understand their conservation status (Figure 1). Furthermore, there are at least 30 000 species for which we do not have lists of where they occur in Canada. If not documented, species might disappear

without us noticing. In future reports, efforts will be made to expand coverage to additional species groups to address these gaps in our knowledge of Canada's biodiversity.

All the results of the program on the General Status of Species in Canada are available on the *Wild Species* website. A newly developed species search tool facilitates searching through all species included in all *Wild Species* reports and comparing changes over time.

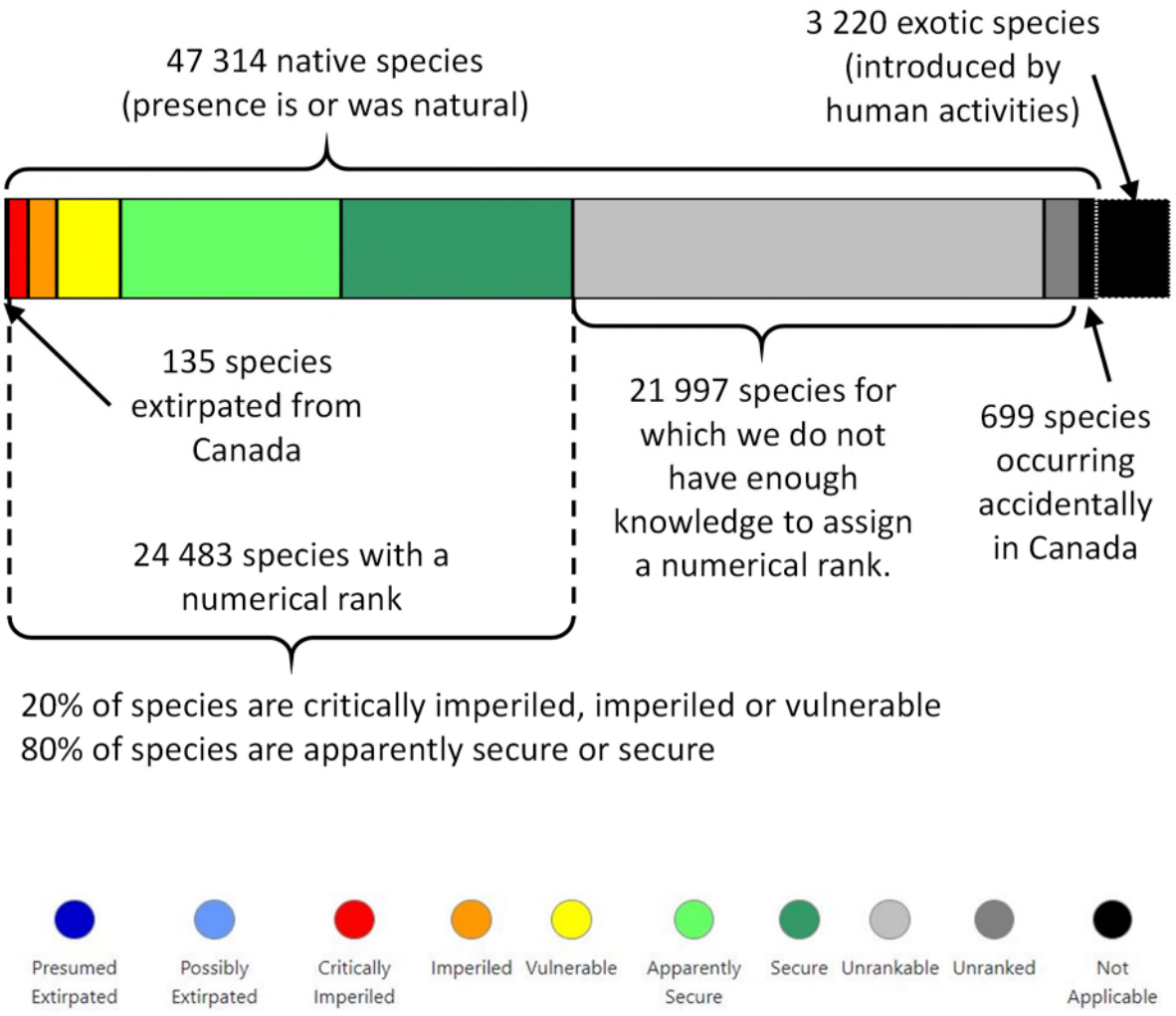

Figure 1. Summary of the conservation status of the 50 534 species included in the *Wild Species* 2020 report.

Highlights

- This report is one of the most comprehensive national level inventories of species for any country in the world.

- This report makes a key contribution to supporting the protection of biodiversity in Canada – it does more than meet regulatory requirements; it makes the data on species accessible to the Canadian public and partners working to protect species.

- The number of species included in the *Wild Species* reports has steadily increased:

Year of the report	Number of species included
2000	1 670
2005	7 732
2010	11 950
2015	29 848
2020	50 534

- The *Wild Species* 2020 report is the fifth of the series. For the first time, this report includes more than half of all known species in Canada. The largest group of species added to the report is the macrofungi. A photo of a mushroom was selected for the cover page of the report to recognize the crucial role of fungi in ecosystems, as well as to recognize the efforts of all mycological clubs in Canada in supporting assessment of this group.

- The 50 534 species included in the report represent about 63% of the known species in Canada in the animal kingdom, about 75% in the plant kingdom, about 77% in the fungi kingdom, none in the chromist kingdom, and about 29% in the protozoa kingdom.

- The total number of species found in each province, territory, and ocean region varies considerably. Among the taxonomic groups included, the regions that had the most species were Ontario (25 776 species), British Columbia (24 540 species) and Quebec (21 933 species).

- The number of species that may be at risk detected in the *Wild Species* reports has continuously increased since the first report, as more groups are included. We identified 2 253 species that may be at risk in Canada. Of these, 137 species have 75% or more of their range in Canada, including 105 species that are thought to be endemic to Canada (i.e., they do not occur anywhere else in the world). Furthermore, 618 of the species that may be at risk have an intermediate part of their range (11% to 74%) in Canada, and 1 498 have only a small part of their range (10% or less) in Canada.

- Among the 135 species that are presumed or possibly extirpated, seven were thought to be endemic to Canada, and thus are probably extinct globally.

- A priority score was assigned to each of the species that may be at risk, based on the level of risk and the percentage of their world range in Canada. In total, 322 species have a high priority score. Of these, 78 have already been assessed in detail by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The remaining species could be prioritized as potential candidates for future detailed assessments.

- The *Wild Species* reports represent one of the most comprehensive sources of information on which exotic species are present in Canada. Exotic species are those that have been introduced accidentally or deliberately by human activities. They can cause problems for species that are naturally occurring in Canada. Among the 3 220 exotic species identified, the taxonomic groups with the highest number of exotic species were the vascular plants, beetles, true bugs, and moths and butterflies. Further analysis could be undertaken on the impact these exotic species have on our ecosystems.

- In total, 17 781 species occurred in only one region in Canada. Species with smaller geographic distributions may be more restricted to specific habitats. When considering all species, on average, each species occurs in 3.7 regions in Canada.

- The majority of migratory species are birds and fishes. However, we also identified some species of cephalopods, dragonflies and damselflies, moths and butterflies, reptiles, and mammals that are migratory. Of the 574 migratory species identified, 24% have some level of conservation concern. Conservation of these species in Canada depends on collaboration with international partners.

- This report presents standardized common names, in English and French, for more than 21 000 species, many of which are newly developed for this report. Common names represent an important communication tool for engaging with the public on the diversity of species in Canada and on the need to conserve them.

- A focus of future *Wild Species* reports will be continuing to fill information gaps. For the 2025 report, the program is currently supporting efforts to build species lists, by jurisdiction, for several additional species groups, of which the largest is the flies (Diptera) believed to have more than 8 000 species.

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SECTION 1 – CONTEXT

Canada is a large country and home to an estimated 80 000 species. The first step in preventing the loss of species is to identify those that exist in Canada, where they occur and their status. The *Wild Species* series of reports aims to achieve this goal.

For each species included in these reports, their distribution among jurisdictions is documented, and their conservation status is assessed using a standardized methodology that is now based on the NatureServe approach (see Appendix 1 for details).

Why a report on wild species in Canada?

In 1996, the wildlife ministers in Canada signed the Accord for the Protection of Species at Risk, making the 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. The National General Status Working Group (NGSWG) was formed to achieve this mandate. The working group includes representatives from all provincial and territorial governments in Canada, and from the federal government. Appendix 2 lists the contact information of all members of the working group for this 2020 report.

A few years later, the federal government confirmed the commitment made under the Accord by including in the Species at Risk Act 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 inform Canadians about the status of species in the country, and provide information that can help prevent species in Canada from becoming extirpated as a consequence of human activity.

To prevent species in Canada from becoming extinct, intervention at early stages is fundamental. The National Framework for Species at Risk Conservation, which details how the Accord for the Protection of Species at Risk will be implemented, identifies two main steps 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 program on the General Status of Species in Canada conducts the first step. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) undertakes the second step. COSEWIC is a committee of experts that conducts detailed assessments of species that are suspected of being at risk of extinction or extirpation. The species identified as "may be at risk" by the National General Status Working Group through this report could be potential candidates for more detailed assessments by COSEWIC.

How many species occur in Canada?

The various types of habitats found in Canada, including for example deciduous forests, boreal forests, tundra, and the ocean regions, support many different species. Our most recent estimate indicates that there are about 80 000 described species in Canada, excluding viruses and bacteria. 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).

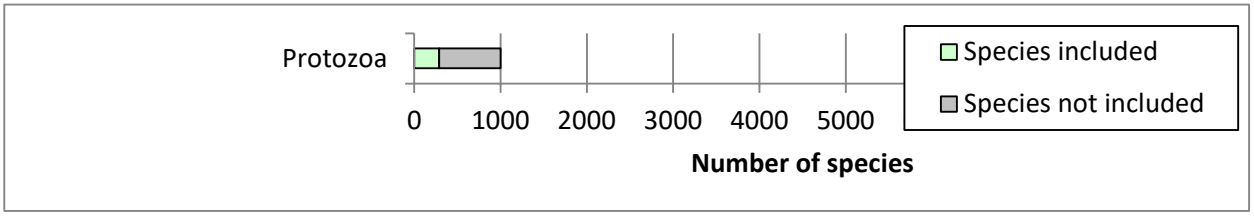
The animal kingdom contains the majority of known species. Interestingly, insects are the most diverse group, accounting for nearly 70% of the known animal species in Canada. Just four major taxonomic groups, the order Coleoptera (beetles), the order Hymenoptera (bees, wasps and relatives), the order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

This report includes 50 534 species (Figure 2). This represents about 29% of the known species in Canada in the protozoa kingdom, none in the chromist kingdom, about 77% in the fungi kingdom, about 75% in the plant kingdom, and about 63% in the animal kingdom. Even though the number of animal species included is the highest, the fungi have the highest proportion of species included.

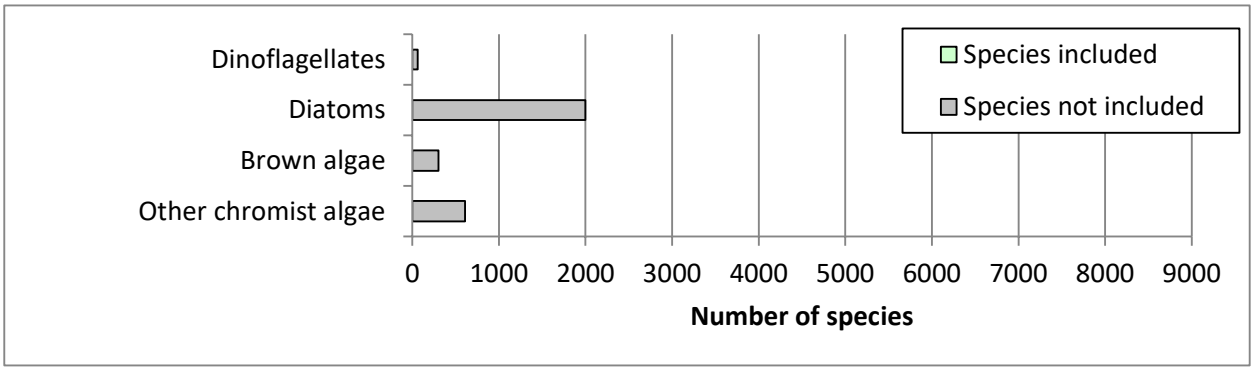
There are potentially many more unknown species in Canada. These unknown species could be species that are new to science or are already known, but have not yet been documented as occurring in Canada. As more of these unrecorded species are found, the estimated number of species is likely to continue 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, or stocks are divisions below the species level (which may be considered designatable units by COSEWIC). 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 the General Status of Species in Canada is to provide an overview of the status of species, and since such a large number of species are included, the assessments for the *Wild Species* reports are

undertaken 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.

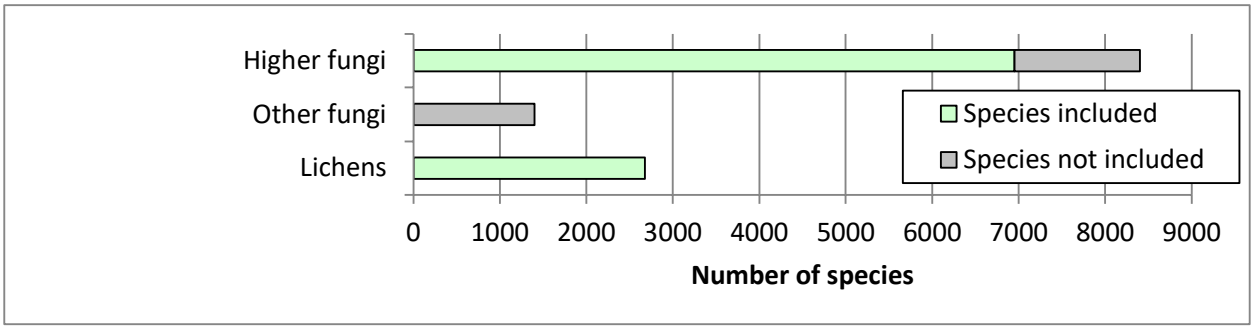
a) Protozoa kingdom



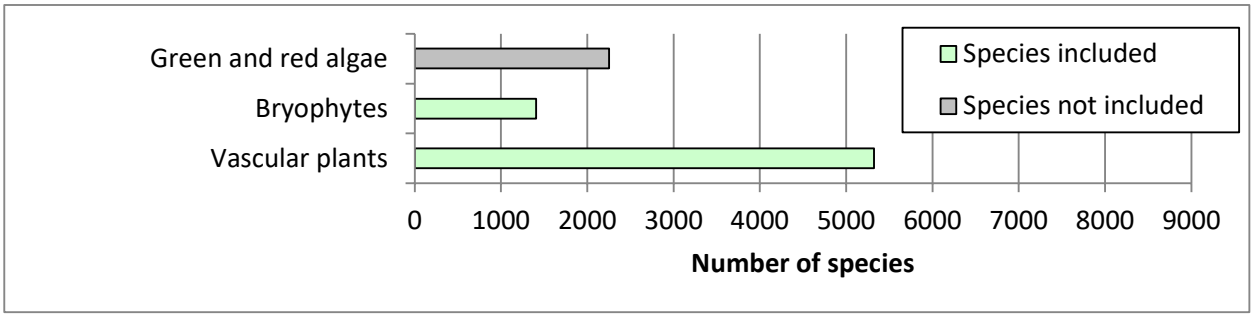
b) Chromist kingdom



c) Fungi kingdom



d) Plant kingdom



e) Animal kingdom

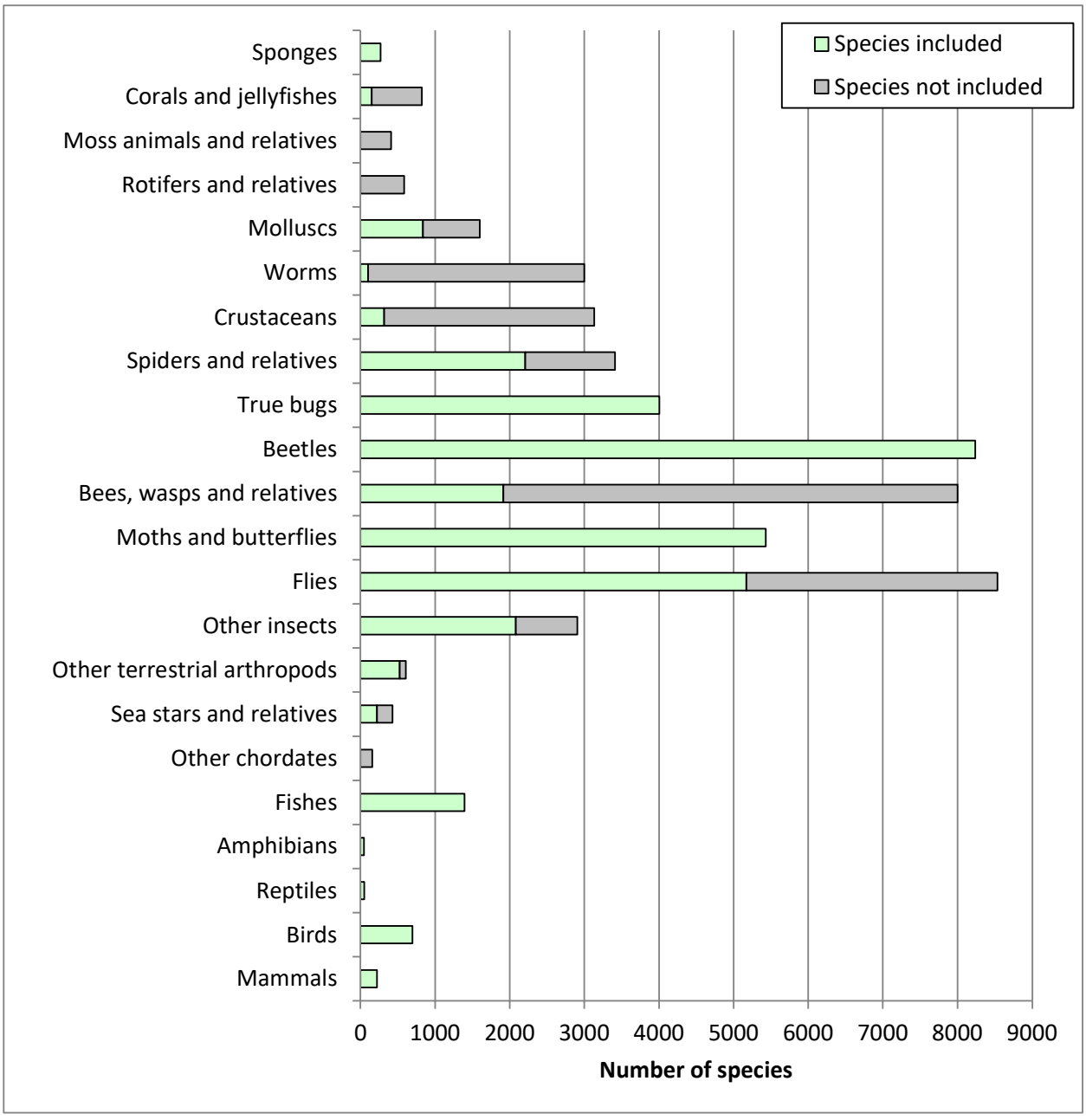


Figure 2. Total number of species included in this report (50 534) out of the total known species in Canada (about 80 000 species, excluding viruses and bacteria) separated by taxonomic groups.

Previous *Wild Species* reports

The first report of the series was *Wild Species* 2000. In that report, 1 670 species were included. 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, 7 732 species were included. 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 vascular plants, which accounted for more than 5 000 species, was responsible for most of the increase in the number of included species.

The third report of the series was *Wild Species* 2010. In that report, 11 950 species were included. 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 fourth report of the series was *Wild Species* 2015. By assessing 29 848 species, one of its greatest achievements was to start to cover a significant portion of Canada's diversity of species. For example, new groups of marine species were included and several large groups of insects were added. There was a particular focus on pollinators, and a sweat bee was selected for the main photo of the cover page.

The *Wild Species* 2020 report is the fifth of the series. For the first time, this report includes more than half of all known species in Canada, with a total number of 50 534 species included. The largest group of species added to the report is the macrofungi. A photo of a mushroom was selected for the cover page of the report to recognize the crucial role of fungi in ecosystems, as well as to recognize the efforts of all mycological clubs in Canada in supporting assessment of this group.

SECTION 2 – OVERALL RESULTS

This report represents a significant achievement in that it summarizes the general status assessments of a large number and variety of wild species occurring in Canada. The assessments provide information on both the conservation status of species, as well as the level of knowledge that currently exists on each species.

Species richness

In total, 50 534 species have been included in this report (Figure 3). The total number of species found in each province, territory, and ocean region varies considerably. Among the taxonomic groups included, the regions that had the most species were Ontario (25 776 species), British Columbia (24 540 species) and Quebec (21 933 species).

We also divided the number of species in each region by the area of the region, to calculate an index of species richness per unit area (Table 1). Prince Edward Island, Nova Scotia, and New Brunswick are the most species-rich regions according to their area.

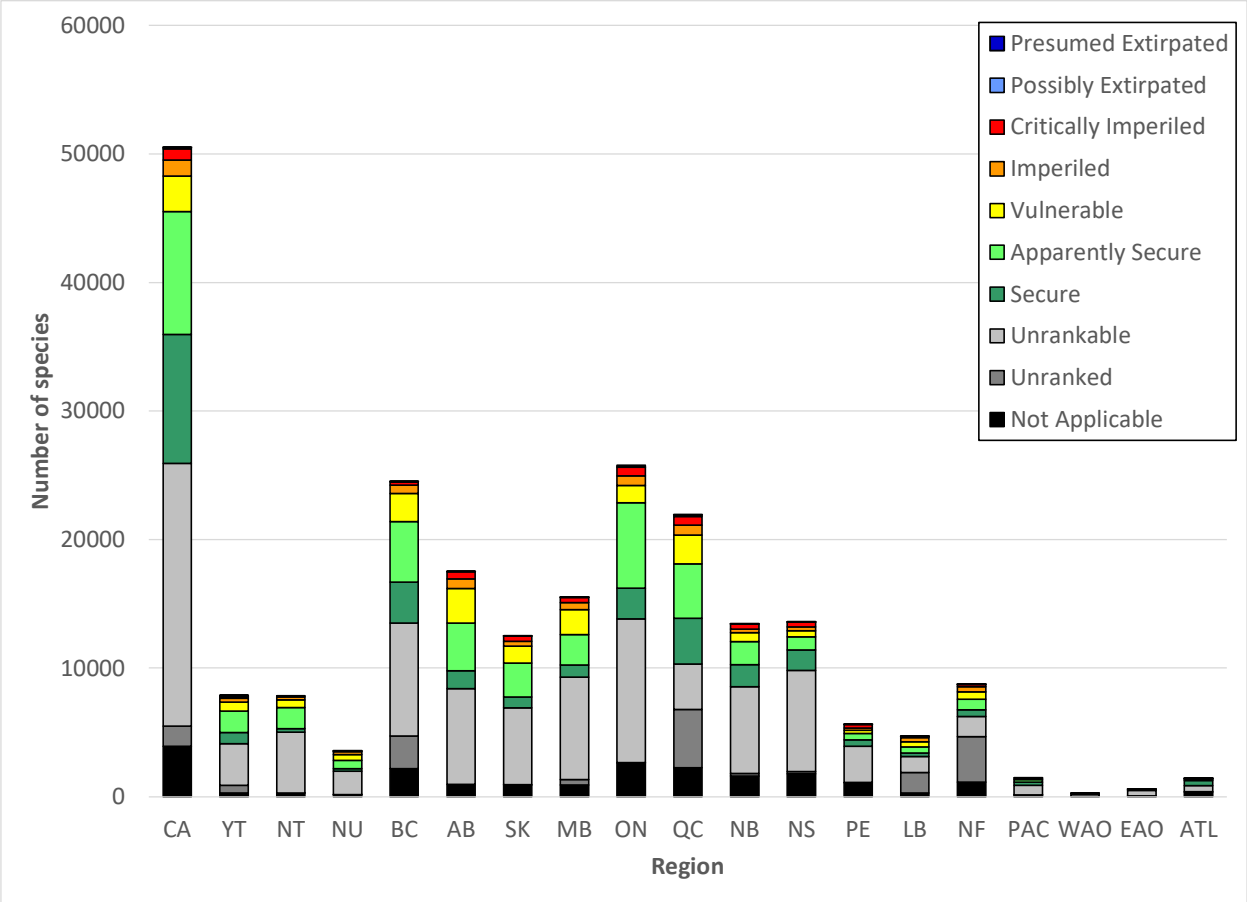


Figure 3. General status of all species included in the *Wild Species* 2020 report.

Table 1. Species richness (number of species per area) for each region in Canada for all taxonomic groups included in the *Wild Species* 2020 report.

Region	Area (km²)	Number of species	Species richness (number of species per km²)
Prince Edward Island	5 660	5 641	0.9966
Nova Scotia	55 284	13 604	0.2461
New Brunswick	72 908	13 462	0.1846
Newfoundland	111 390	8 746	0.0785
Alberta	661 848	17 523	0.0265
British Columbia	944 735	24 539	0.0260
Manitoba	647 797	15 522	0.0240
Ontario	1 076 395	25 776	0.0239
Saskatchewan	651 036	12 511	0.0192
Yukon	482 443	7 880	0.0163
Labrador	294 330	4 701	0.0160
Quebec	1 542 056	21 933	0.0142
Northwest Territories	1 346 106	7 817	0.0058
Pacific Ocean	352 852	1 467	0.0042
Nunavut	2 093 190	3 560	0.0017
Atlantic Ocean	1 705 325	1 431	0.0008
Eastern Arctic Ocean	2 027 283	592	0.0003
Western Arctic Ocean	1 560 643	261	0.0002

Proportion of secure species

The proportion of species in each rank category has changed over time (Figure 4), partly due to changes in which species groups are included. We present two calculations of the percentage of species that are apparently secure or secure in Canada. The first calculation indicates that, if all the species included in the report are taken into account, 39% of species are apparently secure or secure. The percentage is low due to the high proportion of unrankable or unranked species. The second calculation indicates that, if we consider only the numerical ranks (from critically imperiled to secure – N1 to N5), then 80% of the species are apparently secure or secure. The percentage for the *Wild Species* 2020 report is the same as in the *Wild Species* 2015 report (Table 2). Differences with earlier reports are mainly due

to the increase in the number of taxonomic groups included in each report. For example, several lesser-known taxonomic groups were added over the years. For lesser-known taxonomic groups, we are often able to identify the species that are widespread and secure first, and there is often not enough information to assign the more at risk conservation status ranks for other species, so they are included as unrankable or unranked.

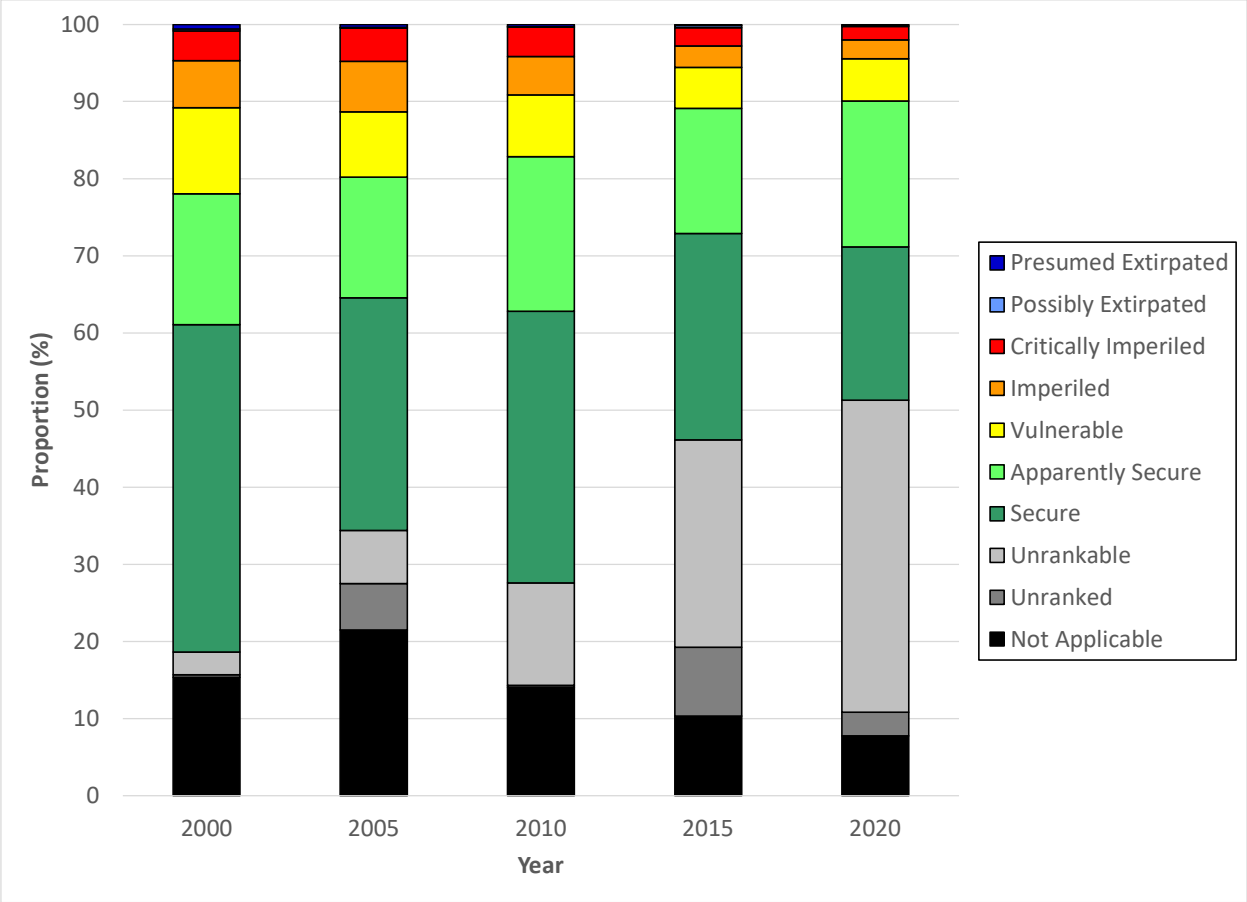


Figure 4. Proportion of each rank category at the national level in the reports of the *Wild Species* series.

Table 2. Proportion of species that are apparently secure or secure in the reports of the *Wild Species* series.

Wild Species report	Number of species included	Proportion of apparently secure or secure (all species)	Proportion of apparently secure or secure (numerical ranks only)
2000	1 670	59%	74%
2005	7 732	46%	70%
2010	11 950	55%	77%
2015	29 848	43%	80%
2020	50 534	39%	80%

The most imperiled species

One of the main goals of this report is to flag species that are the most at risk. We identified 2 253 species that may be at risk in Canada (consisting of species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level). The taxonomic groups that have the most of these species are the vascular plants, followed by lichens, macrofungi, bryophytes, beetles, and moths and butterflies. Since 2000, the number of species that may be at risk identified in the *Wild Species* reports has continuously increased (Figure 5), largely due to the increased number of species included.

Of the 2 253 species, 137 species have 75% or more of their range in Canada, including 105 species that are thought to be endemic to Canada (i.e., they do not occur anywhere else in the world). Furthermore, 618 of the species that may be at risk have an intermediate part of their range (11% to 74%) in Canada, and 1 498 have only a small part of their range (10% or less) in Canada. Vascular plants, moths and butterflies, and beetles 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, and common names where they exist, can be found in the databases of the reports.

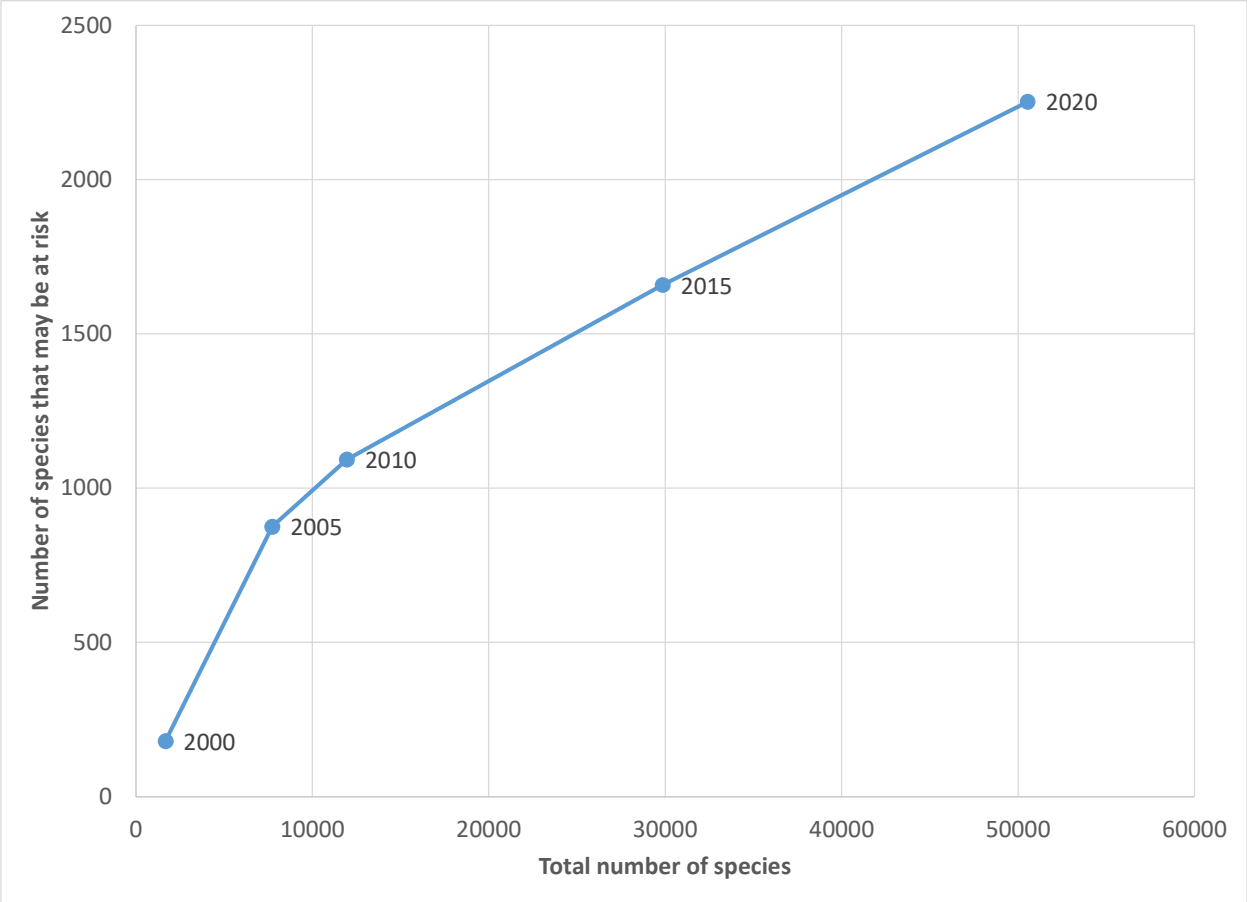


Figure 5. Number of species that may be at risk detected in the *Wild Species* reports, in relation to the total number of species included in the reports.

Helping COSEWIC to identify priority species

A priority score was assigned to each of the species that may be at risk, based on the level of risk and the percentage of their world range in Canada. These priority scores, determined by the National General Status Working Group, can help COSEWIC to identify which species could be assessed in detail. Of the 2 253 species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada, 322 species have the highest priority scores (between 1 and 5). COSEWIC has assessed 78 species with these highest priority scores (Table 3). Most of the other species that have been assessed by COSEWIC that are not included in this table are subspecies or designatable units that the *Wild Species* reports do not evaluate, 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, freshwater fishes, marine fishes, amphibians and reptiles, birds, terrestrial mammals, and marine mammals. Seven subcommittees (molluscs, freshwater fishes, marine fishes, amphibians and reptiles, birds, terrestrial mammals, and marine mammals) are assigned to 9% of the species that may be at risk, and three subcommittees (mosses and lichens, vascular plants, and arthropods) are assigned to 80% of the species that may be at risk. It is important to note that for 11% of the species that may be at risk, no subcommittees exist (Figure 6).

Table 3. Priority score of species ranked as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada in 2020.

Priority score	Number of species	Number of species assessed by COSEWIC
1 (high)	46	12
2	24	7
3	39	11
4	79	18
5	134	30
6	117	20
7	656	167
8	379	28
9	366	75
10 (low)	413	37
Total	2 253	405

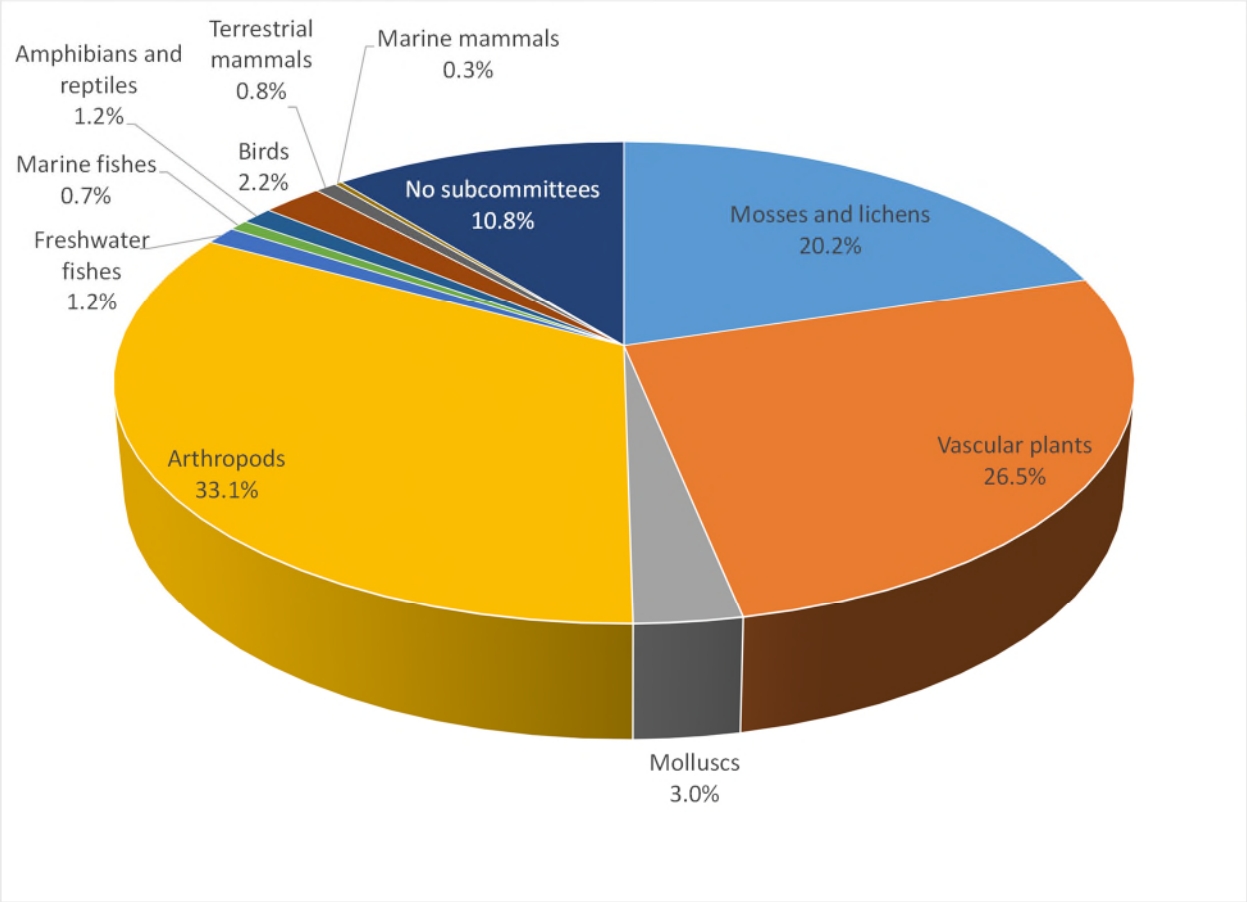


Figure 6. Proportion of species ranked by the National General Status Working Group as presumed extirpated, possibly extirpated, critically imperiled, and imperiled at the national level in Canada by each subcommittee of COSEWIC.

Extirpated species

We identified 135 species that are presumed extirpated or possibly extirpated in Canada (Table 4). Of these, 10 species had 75% or more of their range in Canada, including seven species that were thought to be endemic to Canada (were not occurring anywhere else in the world), and thus are probably extinct globally. Furthermore, 21 of the species had an intermediate part of their range (11% to 74%) in Canada, and 104 had only a small part of their range (10% or less) in Canada. Vascular plants and beetles are the taxonomic groups that have the greatest number of extirpated species.

Table 4. Extirpated species in Canada.

Taxonomic group	Scientific name	Common name	Approximate percentage of previous world range in Canada
Macrofungi	*Myriostoma coliforme*		<5%
Lichens	*Leptogium byssinum*	Granular Jelly Lichen	5%
Lichens	*Parmelina coleae*	Cole's Temperate Lichen	15%
Lichens	*Parmotrema cetratum*	Shield Ruffle Lichen	5%
Lichens	*Parmotrema margaritatum*	Southeastern Ruffle Lichen	<5%
Lichens	*Parmotrema subtinctorium*	Mottled Ruffle Lichen	5%
Lichens	*Sticta canariensis*	Canary Islands Lung Lichen	5%
Bryophytes	*Fabronia pusilla*		<5%
Bryophytes	*Frullania riparia*		5%
Bryophytes	*Gemmabryum demaretianum*		5%
Bryophytes	*Neomacounia nitida*		100%
Bryophytes	*Sphenolobopsis pearsonii*		<5%
Vascular plants	*Agrostis clavata*	Clubbed Bentgrass	5%
Vascular plants	*Anemone piperi*	Piper's Anemone	25%
Vascular plants	*Angelica venenosa*	Hairy Angelica	5%
Vascular plants	*Asclepias variegata*	White Milkweed	<5%
Vascular plants	*Cercis canadensis*	Eastern Redbud	<5%
Vascular plants	*Chamaelirium luteum*	Devil's-bit	<5%
Vascular plants	*Chenopodium nitens*		2%
Vascular plants	*Collinsia verna*	Spring Blue-eyed Mary	<5%
Vascular plants	*Crataegus beata*	Dunbar's Hawthorn	15%
Vascular plants	*Crataegus intricata*	Copenhagen Hawthorn	5%
Vascular plants	*Crataegus nitidula*		<5%
Vascular plants	*Cuscuta indecora*	Large Alfalfa Dodder	5%

Taxonomic group	Scientific name	Common name	Approximate percentage of previous world range in Canada
Vascular plants	*Desmodium illinoense*	Illinois Tick-trefoil	<5%
Vascular plants	*Desmodium marilandicum*	Smooth Small-leaved Tick-trefoil	<5%
Vascular plants	*Desmodium sessilifolium*	Sessile-leaved Tick-trefoil	<5%
Vascular plants	*Dichanthelium commonsianum*		1%
Vascular plants	*Downingia elegans*	Common Downingia	<10%
Vascular plants	*Draba kluanei*	Kluane Draba	100%
Vascular plants	*Draba murrayi*	Murray's Draba	50%
Vascular plants	*Epilobium torreyi*	Brook Spike-primrose	<5%
Vascular plants	*Erigeron leibergii*	Leiberg's Fleabane	15%
Vascular plants	*Erigeron muirii*	Muir's Fleabane	20%
Vascular plants	*Fuirena pumila*	Dwarf Umbrella Sedge	<5%
Vascular plants	*Gamochaeta purpurea*	Purple Cudweed	<5%
Vascular plants	*Geum virginianum*	Pale Avens	5%
Vascular plants	*Gilia sinuata*	Rosy Gilia	<5%
Vascular plants	*Gillenia trifoliata*	Bowman's Root	<5%
Vascular plants	*Greeneochloa coarctata*	Small Reedgrass	5%
Vascular plants	*Hibiscus laevis*	Halberd-leaved Rose-mallow	<5%
Vascular plants	*Hieracium longipilum*	Hairy Hawkweed	<5%
Vascular plants	*Isotria verticillata*	Large Whorled Pogonia	5%
Vascular plants	*Lasthenia glaberrima*	Rayless Goldfields	<10%
Vascular plants	*Lechea minor*	Thyme-leaved Pinweed	<5%
Vascular plants	*Lupinus oreganus*	Oregon Lupine	<5%
Vascular plants	*Lysimachia lanceolata*	Lance-leaved Yellow Loosestrife	<5%
Vascular plants	*Muhlenbergia sobolifera*	Rock Muhly	5%
Vascular plants	*Paronychia canadensis*	Smooth Forked Nailwort	5%
Vascular plants	*Phlox pilosa*	Downy Phlox	<5%
Vascular plants	*Piptochaetium avenaceum*	Black-seed Speargrass	<5%
Vascular plants	*Platanthera ciliaris*	Yellow Fringed Orchid	<5%
Vascular plants	*Poa banffiana*		20-30%
Vascular plants	*Polygala aquilonia*	Cross-leaved Milkwort	<5%
Vascular plants	*Potentilla subjuga*	Colorado Cinquefoil	25%
Vascular plants	*Ranunculus lobbii*	Lobb's Water Buttercup	5%
Vascular plants	*Rhododendron maximum*	Great Laurel	<5%
Vascular plants	*Rubus alaskensis*		50%
Vascular plants	*Sabatia angularis*	Square-stemmed Rose Gentian	<5%
Vascular plants	*Scirpus ancistrochaetus*	Northeastern Bulrush	5%
Vascular plants	*Senecio hydrophilus*	Water Ragwort	9%
Vascular plants	*Thaspium barbinode*	Bearded Meadow-parsnip	5%
Vascular plants	*Trifolium reflexum*	Buffalo Clover	<5%
Bivalves	*Alasmidonta heterodon*		5%
Bivalves	*Sphaerium patella*		<5%

Taxonomic group	Scientific name	Common name	Approximate percentage of previous world range in Canada
Terrestrial and freshwater snails and slugs	*Cryptomastix devia*		5%
Terrestrial and freshwater snails and slugs	*Galba vancouverensis*		~80%
Terrestrial and freshwater snails and slugs	*Planorbella columbiensis*		100%
Terrestrial and freshwater snails and slugs	*Ventridens suppressus*		<5%
Terrestrial and freshwater snails and slugs	*Vertigo clappi*		25%
Myriapods	*Aniulus paludicolens*		50-75%
Mayflies	*Nixe horrida*	Rough Flat-headed Mayfly	30-50%
Mayflies	*Paraleptophlebia brunneipennis*	Amber-winged Prong-gilled Mayfly	50-60%
Mayflies	*Parameletus croesus*	Dark-winged Primitive Minnow Mayfly	100%
Dragonflies and damselflies	*Stylurus plagiatus*	Russet-tipped Clubtail	<5%
Grasshoppers and relatives	*Ceuthophilus uhleri*	Uhler's Camel Cricket	<5%
Grasshoppers and relatives	*Dendrotettix quercus*	Post Oak Grasshopper	<5%
Grasshoppers and relatives	*Ellipes gurneyi*	Gurney's Pygmy Mole Grasshopper	<5%
Grasshoppers and relatives	*Melanoplus spretus*	Rocky Mountain Grasshopper	10-30%
Grasshoppers and relatives	*Metator nevadensis*	Nevada Band-winged Grasshopper	<5%
Grasshoppers and relatives	*Orchelimum delicatum*	Delicate Meadow Katydid	<5%
Grasshoppers and relatives	*Orchelimum silvaticum*	Long-spurred Meadow Katydid	<5%
Grasshoppers and relatives	*Stenopelmatus longispinus*	Long-spined Jerusalem Cricket	<5%
Lacewings	*Dichochrysa macleodi*	MacLeod's Green Lacewing	15%
Beetles	*Copris minutus*	Small Black Dung Beetle	<8%
Beetles	*Cyrtinus pygmaeus*	Pygmy Long-horned Beetle	<5%

Taxonomic group	Scientific name	Common name	Approximate percentage of previous world range in Canada
Beetles	*Dorcaschema alternatum*	Alternated Long-horned Beetle	<5%
Beetles	*Elaphrus cicatricosus*	Scarred Marsh Ground Beetle	1-15%
Beetles	*Goes tigrina*	Tiger Long-horned Beetle	<5%
Beetles	*Graphoderus manitobensis*	Manitoba Predaceous Diving Beetle	<5%
Beetles	*Judolia cordifera*	Chestnut Long-horned Beetle	<5%
Beetles	*Necrophilus pettitii*	Flightless Primitive Carrion Beetle	<5%
Beetles	*Neoclytus caprea*	Banded Ash Long-horned Beetle	<12%
Beetles	*Nicrophorus americanus*	American Burying Beetle	<10%
Beetles	*Obrium maculatum*	Beige Long-horned Beetle	<5%
Beetles	*Oncideres cingulatus*	Twig Long-horned Beetle	<5%
Beetles	*Pachybrachis calcaratus*	Spurred Case-bearing Leaf Beetle	5-15%
Beetles	*Pachybrachis subfasciatus*	Indistinct Case-bearing Leaf Beetle	<5%
Beetles	*Platysoma bifoveolatum*	Two-pitted Clown Beetle	75-100%
Beetles	*Schizogenius amphibius*	Amphibious Pedunculate Ground Beetle	<15%
Beetles	*Statira gagatina*	Coal Darkling Beetle	<15%
Beetles	*Strangalia acuminata*	Pointed Long-horned Beetle	<5%
Beetles	*Strangalia bicolor*	Bicoloured Long-horned Beetle	<5%
Beetles	*Tricholochmaea sablensis*	Sable Island Flea Beetle	100%
Beetles	*Typocerus lugubris*	Mournful Long-horned Beetle	<5%
Ants	*Camponotus castaneus*	Chestnut Carpenter Ant	<5%
Ants	*Forelius pruinosus*	High Noon Ant	<5%
Ants	*Solenopsis texana*	Texas Thief Ant	<5%
Caddisflies	*Beraea fontana*	American Spring-loving Caddisfly	50-75%
Caddisflies	*Hydroptila eramosa*	Prolonged Microcaddisfly	50-75%
Caddisflies	*Neophylax ottawa*	Ottawa Little Caddisfly	100%
Moths and butterflies	*Callophrys irus*		<5%
Moths and butterflies	*Copablepharon absidum*		<5%
Moths and butterflies	*Plebejus samuelis*		5%
Moths and butterflies	*Staphylus hayhurstii*		<5%
Moths and butterflies	*Udea alaskalis*		<5%
Selected flies	*Anthrax argyropygus*	Silver-tailed Coal Bee Fly	<5%
Selected flies	*Rhagoletis persimilis*		100%

Taxonomic group	Scientific name	Common name	Approximate percentage of previous world range in Canada
Selected flies	*Zodion triste*		5%
Fishes	*Coregonus johannae*		40%
Fishes	*Coregonus reighardi*		40%
Fishes	*Erimystax x-punctatus*		<5%
Fishes	*Polyodon spathula*		<5%
Amphibians	*Acris blanchardi*	Blanchard's Cricket Frog	<5%
Reptiles	*Actinemys marmorata*	Western Pond Turtle	<5%
Reptiles	*Crotalus horridus*	Timber Rattlesnake	<5%
Reptiles	*Phrynosoma douglasii*	Pygmy Short-horned Lizard	<5%
Reptiles	*Terrapene carolina*	Eastern Box Turtle	<5%
Birds	*Camptorhynchus labradorius*	Labrador Duck	>75%
Birds	*Ectopistes migratorius*	Passenger Pigeon	40-50%
Birds	*Gymnogyps californianus*	California Condor	10%
Birds	*Pinguinus impennis*	Great Auk	25-60%
Birds	*Tympanuchus cupido*	Greater Prairie-Chicken	1-20%
Mammals	*Cryptotis parvus*	Least Shrew	<5%
Mammals	*Mustela nigripes*	Black-footed Ferret	10%

Exotic species

This report highlights the large number of non-native species in Canada. Exotic species (also called alien species) are those that have been moved beyond their natural range as a result of human activity. Exotic species have 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 naturally occur, to regions in which they were not naturally found (to another province or territory for example). Whether from abroad, or from a different part of Canada, exotic species may cause a variety of problems for native species, including competition for space and resources, predation, hybridization and introduction of new diseases.

Of the 50 534 species included, 3 220 species in total were exotic at the national level in Canada. The taxonomic groups with the highest number of exotic species were the vascular plants (1 372 species), beetles (673 species), true bugs (443 species), and moths and butterflies (208 species). The taxonomic groups with the highest proportion of exotic species were the earthworms (67%), ticks (31%), vascular plants (26%), and myriapods (24%). When considering all the taxonomic groups of the *Wild Species* 2015 report reassessed in the 2020 report, 161 exotic species were added to the list and 23 deleted. Since 2000, the number of exotic species detected in the *Wild Species* reports has continuously increased (Figure 7).

The list of all the scientific names of these exotic species, and common names where they exist, can be found in the databases of the reports.

All governments in Canada are collaborating on An Invasive Alien Species Strategy for Canada, which is a national strategy on exotic species. Invasive exotic species are those that are spreading extensively and that are very harmful to native species. 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 list of species ranked as exotic by the National General Status Working Group in the *Wild Species* reports could be used in this strategy to support further analysis on the impact of these exotic species on our ecosystems. The *Wild Species* reports represent one of the most comprehensive sources of information on which exotic species are present in Canada.

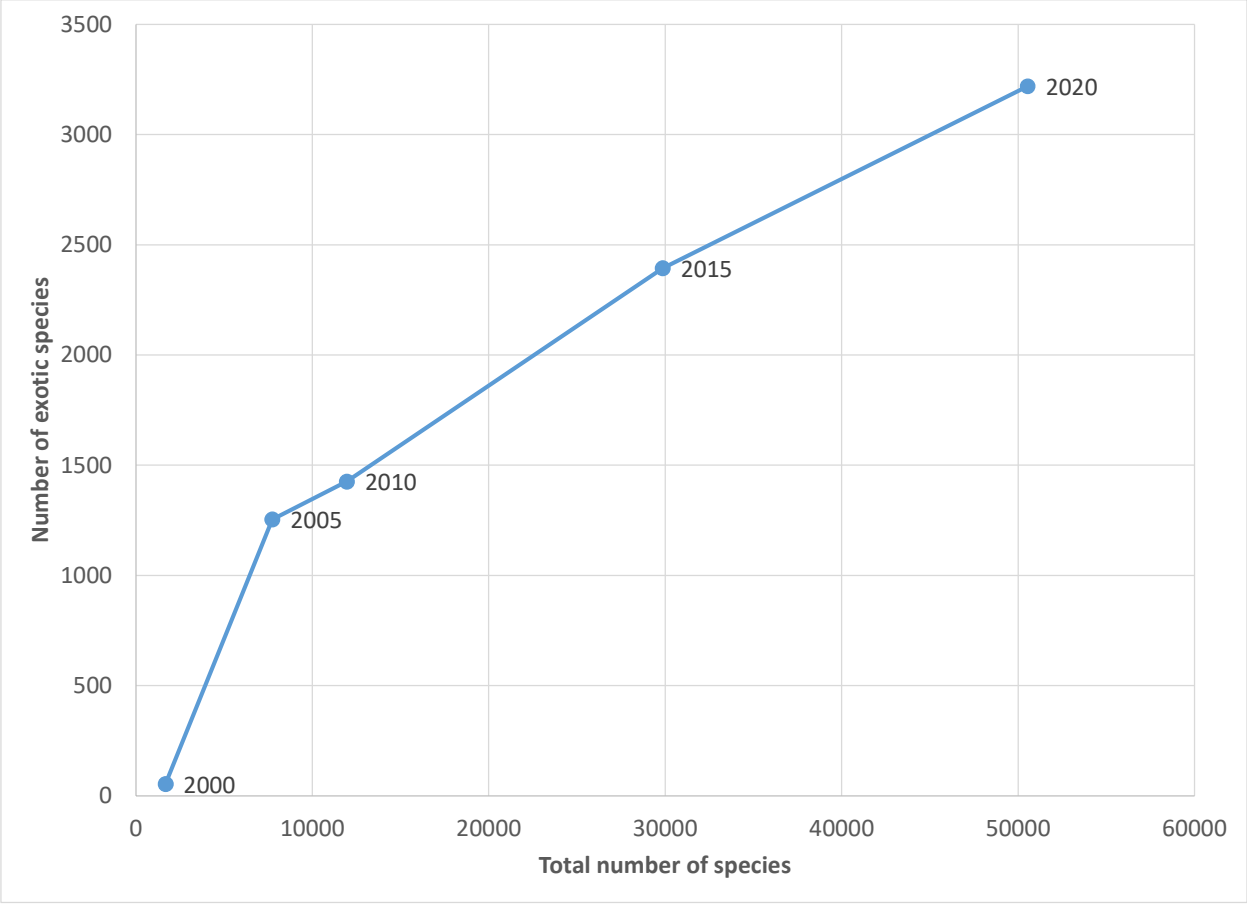


Figure 7. Number of exotic species detected in the *Wild Species* reports, in relation to the total number of species included in the reports.

Number of regions

For each species included in this report, we determined the number of regions (provinces, territories, and ocean regions) in which they occur. The average number of regions per species within each taxonomic group gives an idea of the relative geographic spread of species in that group. The taxonomic groups that had species with the broadest distributions in Canada were the birds, bryophytes, earthworms, and dragonflies and damselflies. Groups of marine species occurred in the lowest number of regions in Canada (Table 5). Species with smaller geographic distributions may be more restricted to specific habitats.

On average, each species occurred in 3.7 regions in Canada. In total, 17 781 species occurred in only one region in Canada (Figure 8). However, only five species occurred in all the 18 regions of Canada: Glaucous Gull (*Larus hyperboreus*), Ivory Gull (*Pagophila eburnea*), Common Eider (*Somateria mollissima*), King Eider (*Somateria spectabilis*), and Arctic Tern (*Sterna paradisaea*).

Table 5. Mean number of regions in which each species occurs for each taxonomic group included in the *Wild Species* 2020 report.

Taxonomic group	Number of species	Mean number of regions in which each species occurs
Birds	696	8.3
Bryophytes	1 406	5.9
Earthworms	30	5.4
Dragonflies and damselflies	219	5.3
Mammals	223	4.8
Yellowjackets and relatives	105	4.7
Spiders	1 439	4.5
Vascular plants	5 324	4.5
Moths and butterflies	5 430	4.3
Lichens	2 677	4.2
Terrestrial and freshwater snails and slugs	320	4.1
Lacewings	102	4.0
Leeches	73	3.9
Sawflies	702	3.8
Beetles	8 238	3.8
Caddisflies	679	3.8
Mayflies	342	3.7

Taxonomic group	Number of species	Mean number of regions in which each species occurs
Selected flies	5 172	3.6
Amphibians	47	3.5
Ants	205	3.5
Bees	903	3.5
Grasshoppers and relatives	271	3.4
Fleas	153	3.4
True bugs	4 007	3.3
Ticks	49	3.2
Stoneflies	292	3.1
Slime moulds	290	3.0
Harvestmen	38	2.9
Macrofungi	6 951	2.7
Scorpionflies	25	2.7
Water mites	653	2.7
Pseudoscorpions	24	2.5
Reptiles	49	2.4
Springtails	385	2.2
Bivalves	416	2.1
Myriapods	138	1.9
Fishes	1 395	1.8
Solifuges	3	1.7
Sea stars	115	1.4
Sponges	270	1.3
Decapods	318	1.3
Corals	152	1.2
Sea urchins	32	1.2
Sea cucumbers	75	1.2
Cephalopods	100	1.1
Horseshoe crabs	1	1.0

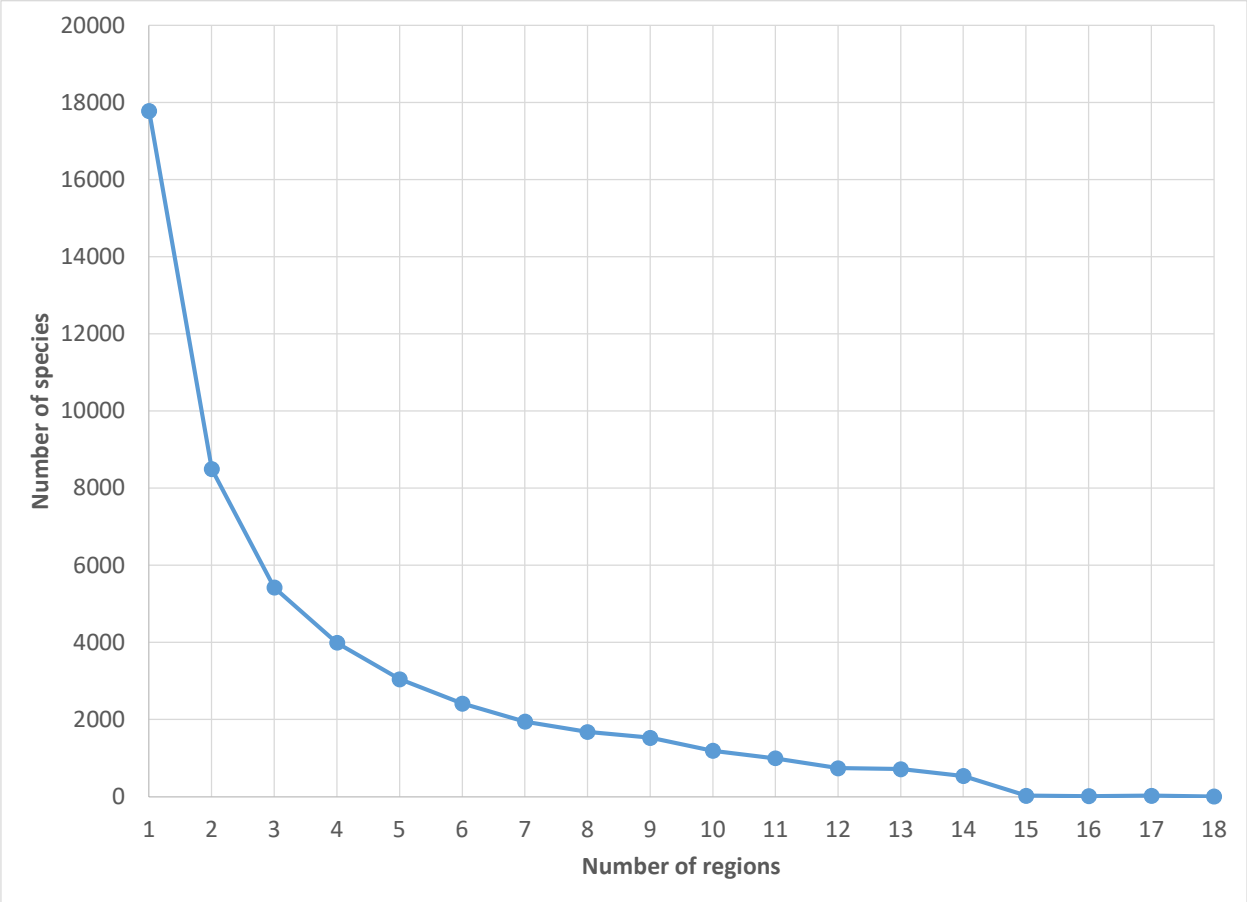


Figure 8. Number of regions where each species occurred in Canada.

Migratory species

The conservation of migratory species is complex because the threats they face are more diverse and do not originate only from within Canada. For example, when Canadian birds migrate south to overwinter in other countries, they can face different threats both during migration and at the location where they overwinter. The ranks can thus identify the need to work with international partners to maintain these species in Canada.

In this report, 574 migratory species were assessed (Table 6). The majority are birds (71%) and fishes (19%). Results of our assessments at the national level for migratory species indicated that three species are presumed extirpated, none are possibly extirpated, 25 are critically imperiled, 27 are imperiled, 72 are vulnerable, 91 are apparently secure, 306 are secure, 46 are unrankable, four are unranked, and none are not applicable (accidental species are not considered migratory). When only considering species from critically imperiled to secure, 76% are apparently secure or secure.

Table 6. Number of migratory species assessed in the *Wild Species* 2020 report.

Taxonomic group	Number of migratory species
Cephalopods	2
Dragonflies and damselflies	7
Moths and butterflies	19
Fishes	108
Reptiles	4
Birds	405
Mammals	29
Total	574

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, the national rank of 8 107 species has changed. In total, 1 199 species were assigned an increased level of extinction risk, and 1 186 species were assigned a reduced level of extinction risk. Of 4 214 species that changed from or to the categories unrankable, unranked, or not applicable, 455 species changed from other ranks to these three categories, 2 587 changed from these three categories to other ranks, and 1 172 changed within these three categories (there was a net gain of 2 132 species assigned to other ranks). In addition, among the taxonomic groups that were reassessed, 1 186 species were added to the list and 322 deleted (Table 7).

In this report, a total of 92 changes were due to a genuine change in the conservation status of the species, 5 776 changes were due to new information not reflecting genuine change, 52 changes were due to a new interpretation of the same information, 349 changes were due to incorrect data used previously, 288 changes were due to a taxonomic level change only, and 1 550 changes were due to a revision in the criteria used to assess species. Most of the changes (71%) were due to new information (Table 8).

We calculated a species change index, to determine whether the overall status of species has been improving or deteriorating over time (including all reasons for changes). The index is calculated by dividing the number of species that had a reduced level of risk by the number of species that had an increased level of risk. If the result is one, it means that on average, the status of species has been stable. If the value is higher than one, it means that on average, the status of more species has been improving, while if the value is lower than one, it means that on average, the status of more species has been deteriorating. The trend of the species change index is decreasing slightly in Canada (Figure 9). As we are increasing the number of species included in the *Wild Species* reports, and more changes are detected, the measure becomes more precise. When considering all the changes from all the reports, the value of the species change index is 1.00.

Table 7. Description of the changes in the reports of the *Wild Species* series. There were no changes in 2000 since it was the first report.

Description	Year of the *Wild Species* report			
	2005	2010	2015	2020
Increased level of risk	69	95	449	1 199
Reduced level of risk	52	166	414	1 186
Changed from or to ranks U, NR, NA	47	102	1 382	4 214
New species	33	162	595	1 186
Deleted species	35	101	461	322
Total	236	626	3 301	8 107

Table 8. Reasons for changes in the reports of the *Wild Species* series. There were no changes in 2000 since it was the first report.

Reason	Year of the *Wild Species* report			
	2005	2010	2015	2020
Genuine change in status	11	63	163	92
New information not reflecting genuine change	29	343	1 638	5 776
New interpretation of the same information	58	64	39	52
Incorrect data used previously	0	10	212	349
Taxonomic level change only	14	130	348	288
Criteria revision	71	16	901	1 550
Other or unknown	53	-	-	-
Total	236	626	3 301	8 107

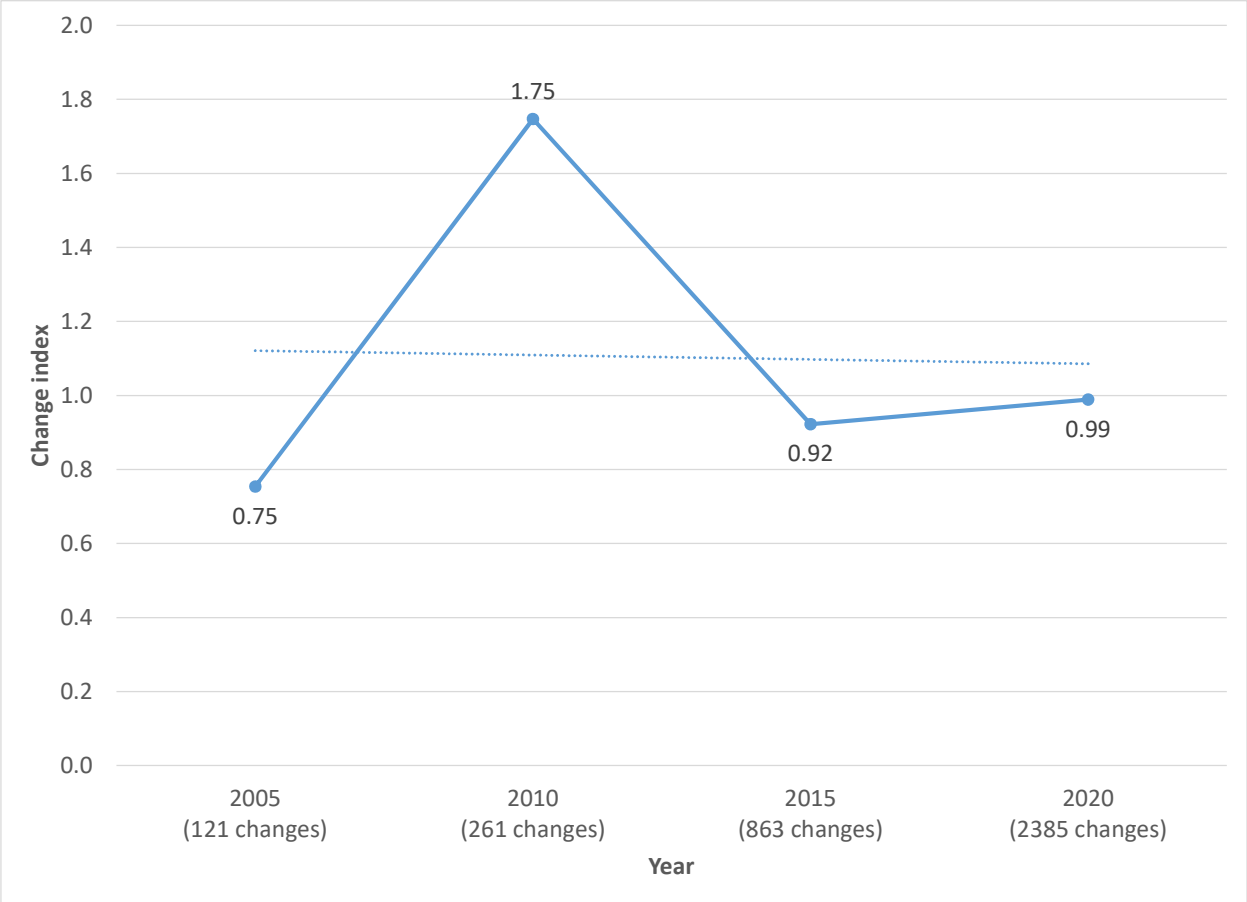


Figure 9. Species change index in Canada. A value of one indicates that the overall status of species is stable; a value higher than one indicates that the overall status of species is improving; and a value lower than one indicates that the overall status of species is deteriorating. The dotted line represents the trend. There were no changes in 2000 since it was the first report.

Knowledge gaps about species

The knowledge on species in Canada varies amongst taxonomic groups. We generally have more information on vertebrates, which include birds, mammals, and fishes for example, and we generally have less information on invertebrates, which include insects, spiders, corals, and others. These lesser-known taxonomic groups are important to the program on the General Status of Species in Canada, since they represent the majority of species occurring in the country.

In this report, 50 534 species were included, of which 21 997 species were unrankable or unranked at the national level due to a lack of knowledge. Most taxonomic groups have more than half of their species for which the conservation status could not be determined due to lack of knowledge (Table 9).

Moreover, some taxonomic groups also currently have a level of knowledge which is too low to be included in the *Wild Species* reports. For example, there are many groups of invertebrates for which we do not yet have a comprehensive list of species in Canada, which is the essential first step in assessing the conservation status. Without knowing which species exist in Canada and where they occur, it is difficult to predict the impact of humans and anthropogenic changes on ecosystems and species. As the National General Status Working Group includes more species groups which are not well-known or not well-studied in Canada, the total proportion of species that are unrankable or unranked will likely rise. It is our aim that the *Wild Species* reports encourage more information to be collected on these species, so that their conservation status can be properly assessed in the future.

Table 9. Proportion of unrankable or unranked species due to lack of knowledge for taxonomic groups included in the *Wild species* 2020 report.

Taxonomic group	Number of species that are unrankable or unranked at the national level	Total number of species	Percentage of species that are unrankable or unranked
Horseshoe crabs	1	1	100%
Springtails	355	385	92%
Sponges	237	270	88%
Pseudoscorpions	21	24	88%
Sawflies	557	702	79%
Mayflies	256	342	75%
Slime moulds	215	290	74%
Water mites	465	653	71%
Leeches	51	73	70%

Taxonomic group	Number of species that are unrankable or unranked at the national level	Total number of species	Percentage of species that are unrankable or unranked
Lacewings	71	102	70%
Cephalopods	67	100	67%
Caddisflies	451	679	66%
Bees	595	903	66%
Macrofungi	4 517	6 951	65%
Corals	96	152	63%
Myriapods	86	138	62%
Selected flies	3 180	5 172	61%
Harvestmen	23	38	61%
Stoneflies	176	292	60%
True bugs	2 330	4 007	58%
Sea urchins	18	32	56%
Sea cucumbers	42	75	56%
Sea stars	61	115	53%
Bivalves	220	416	53%
Fleas	78	153	51%
Decapods	150	318	47%
Lichens	1 252	2 677	47%
Beetles	3 475	8 238	42%
Spiders	512	1 439	36%
Scorpionflies	8	25	32%
Terrestrial and freshwater snails and slugs	90	320	28%
Fishes	382	1 395	27%
Moths and butterflies	1 460	5 430	27%
Ants	47	205	23%
Bryophytes	289	1 406	21%
Ticks	10	49	20%
Earthworms	6	30	20%
Grasshoppers and relatives	17	271	6%
Yellowjackets and relatives	6	105	6%
Reptiles	2	49	4%
Mammals	8	223	4%
Birds	21	696	3%
Dragonflies and damselflies	5	219	2%
Vascular plants	88	5 324	2%
Amphibians	0	47	0%
Solifuges	0	3	0%
Total	21 997	50 534	44%

Common names

Common names represent an important communication tool for engaging with the public on the diversity of species in Canada and on the need to conserve them. For many taxonomic groups where no common name previously existed, the *Wild Species* reports have developed and standardized English and French common names. Common names are now available for almost half of the species included in the *Wild Species* 2020 report (Table 10). More common names will be developed and presented in future *Wild Species* reports.

Table 10. Number of common names included in the database of the *Wild Species* 2020 report.

Taxonomic group	Number of species	Number of English common names	Number of French common names
Slime moulds	290	0	0
Macrofungi	6 951	127	127
Lichens	2 677	903	903
Bryophytes	1 406	0	0
Vascular plants	5 324	5 103	5 092
Sponges	270	270	270
Corals	152	152	152
Bivalves	416	0	0
Terrestrial and freshwater snails and slugs	320	0	0
Cephalopods	100	0	0
Leeches	73	0	0
Earthworms	30	30	30
Myriapods	138	0	0
Decapods	318	318	318
Horseshoe crabs	1	1	1
Water mites	653	0	0
Ticks	49	49	49
Harvestmen	38	38	38
Solifuges	3	3	3
Pseudoscorpions	24	24	24
Spiders	1 439	1 439	1 439
Springtails	385	0	0
Mayflies	342	342	342
Dragonflies and damselflies	219	213	0
Stoneflies	292	292	292

Taxonomic group	Number of species	Number of English common names	Number of French common names
Grasshoppers and relatives	271	271	271
True bugs	4 007	0	0
Lacewings	102	102	102
Beetles	8 238	8 238	8 238
Sawflies	702	0	0
Ants	205	205	6
Bees	903	903	903
Yellowjackets and relatives	105	105	105
Caddisflies	679	679	679
Moths and butterflies	5 430	0	0
Scorpionflies	25	25	25
Fleas	153	0	0
Selected flies	5 172	498	1 023
Sea stars	115	0	0
Sea urchins	32	32	32
Sea cucumbers	75	75	75
Fishes	1 395	0	0
Amphibians	47	47	21
Reptiles	49	49	18
Birds	696	696	696
Mammals	223	219	93
Total	50 534	21 448	21 367

Beyond the *Wild Species* 2020 report

Reports of the *Wild Species* series are the main product of an ongoing national program, and research is already underway for the 2025 report. In the future, the *Wild Species* series will continue to consolidate our knowledge of species in Canada. Future *Wild Species* reports aim to continue to increase the number and variety of species included for conservation status assessments. It is also important to ensure that all species included in this report continue to be reassessed, to track changes in their conservation status. Determining the conservation status of species and reporting on changes, both at the individual species level and through summary statistics, are key steps in preventing extinction and further biodiversity loss.

SECTION 3 – SPECIFIC RESULTS FOR EACH TAXONOMIC GROUP

Taxonomic groups included

The 50 534 species included in this report are divided among 46 different taxonomic groups: slime moulds, macrofungi, lichens, bryophytes, vascular plants, sponges, corals, bivalves, terrestrial and freshwater snails and slugs, cephalopods, leeches, earthworms, myriapods, decapods, horseshoe crabs, water mites, ticks, harvestmen, solifuges, pseudoscorpions, spiders, springtails, mayflies, dragonflies and damselflies, stoneflies, grasshoppers and relatives, true bugs, lacewings, beetles, sawflies, ants, bees, yellowjackets and relatives, caddisflies, moths and butterflies, scorpionflies, fleas, selected flies, sea stars, sea urchins, sea cucumbers, fishes, amphibians, reptiles, birds, and mammals. Some of these taxonomic groups are assessed for the first time, while others are reassessments (Table 11).

Table 11. Summary of the taxonomic groups included in the reports of the *Wild Species* series.

a) Protozoa kingdom

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Slime moulds					All species

b) Fungi kingdom

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Macrofungi				Selected macrofungi only	All species
Lichens			Macrolichens only	Macrolichens only	All species

c) Plant kingdom

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Bryophytes			Mosses only	All species	All species
Vascular plants	Ferns and orchids only	All species	All species	All species	All species

d) Animal kingdom

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Sponges				All species	All species
Corals				All species	All species
Bivalves		Freshwater mussels only	Freshwater mussels only	Freshwater bivalves only	All species
Snails and slugs				Terrestrial and freshwater species only	Terrestrial and freshwater species only

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Cephalopods					All species
Leeches					All species
Earthworms					All species
Myriapods					All species
Decapods		Crayfishes only	Crayfishes only	All species	All species
Horseshoe crabs					All species
Water mites					All species
Ticks					All species
Harvestmen					All species
Solifuges					All species
Pseudoscorpions					All species
Spiders			All species	All species	All species
Springtails					All species
Mayflies				All species	All species

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Dragonflies and damselflies		All species	All species	All species	All species
Stoneflies				All species	All species
Grasshoppers and relatives				All species	All species
True bugs					All species
Lacewings				All species	All species
Beetles		Tiger beetles only	Predaceous diving beetles, ground beetles, and lady beetles only	All species	All species
Sawflies					All species
Ants				All species	All species
Bees			Bumble bees only	All species	All species
Yellowjackets and relatives				All species	All species
Caddisflies				All species	All species
Moths and butterflies	Butterflies only		Butterflies and selected macromoths only	All species	All species

Taxonomic group	Year of the *Wild Species* report				
	2000	2005	2010	2015	2020
Scorpionflies				All species	All species
Fleas					All species
Flies			Black flies, mosquitoes, and horse flies only	Black flies, mosquitoes, horse flies, bee flies, and flower flies only	Selected flies only
Sea stars					All species
Sea urchins				All species	All species
Sea cucumbers				All species	All species
Fishes	Freshwater species only	All species		All species	All species
Amphibians	All species	All species	All species	All species	All species
Reptiles	All species	All species	All species	All species	All species
Birds	All species	All species	All species	All species	All species
Mammals	All species	All species	All species	All species	All species

PROTOZOA KINGDOM

Slime moulds

***Fuligo septica* © Rémi Hébert**

Slime moulds refer to the class Myxomycetes. Slime moulds have existed for over 600 million years, yet they confound us still. They are neither plant, nor animal, nor fungus. Slime moulds are amoeba-like cells that roam through humid, terrestrial habitats like moist soil or decaying vegetation. They recycle nutrients by eating bacteria and other microbes, and are in turn eaten by nematodes and insects. If they find themselves in water, some will develop flagella and swim, while in dry conditions they can enter a hard, dormant state for up to several years. When food is scarce, tens of thousands of individual cells congregate into a plasmodial phase that is colourful, gelatinous, and visible to the naked eye. They can then coordinate their movement, detect food sources from airborne chemicals, and even reach speeds of 1 cm/h. When food runs out, they produce fruiting bodies and their spores disperse to start the cycle anew. Their abilities are quite remarkable, and they have impressed researchers by solving mazes, selecting foods with optimal nutrient ratios, and traveling between food sources in ways that mimic sophisticated transportation networks. Though still technically a unicellular organism (with many nuclei), slime moulds are able to behave in ways comparable to animals with muscles, brains and nerves. Research continues into these not-so-humble organisms, with some science suggesting that slime moulds exemplify "learning" that predates the development of a nervous system.

There are 290 known species of slime moulds in Canada (Figure 10). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, two are critically imperiled, six are imperiled, 34 are vulnerable, 26 are apparently secure, seven are secure, 215 are unrankable, none are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 44% are apparently secure or secure.

We identified eight species of slime moulds that may be at risk in Canada. Of these, one species has an intermediate part of its range (11% to 74%) in Canada, and seven have only a small part of their range (10% or less) in Canada. In total, one species has a high priority score (between 1 and 5).

Among the known species of slime moulds, all are native to Canada. On average, each species of slime moulds occurs in 3.0 regions in Canada. No species of slime moulds are considered migratory.

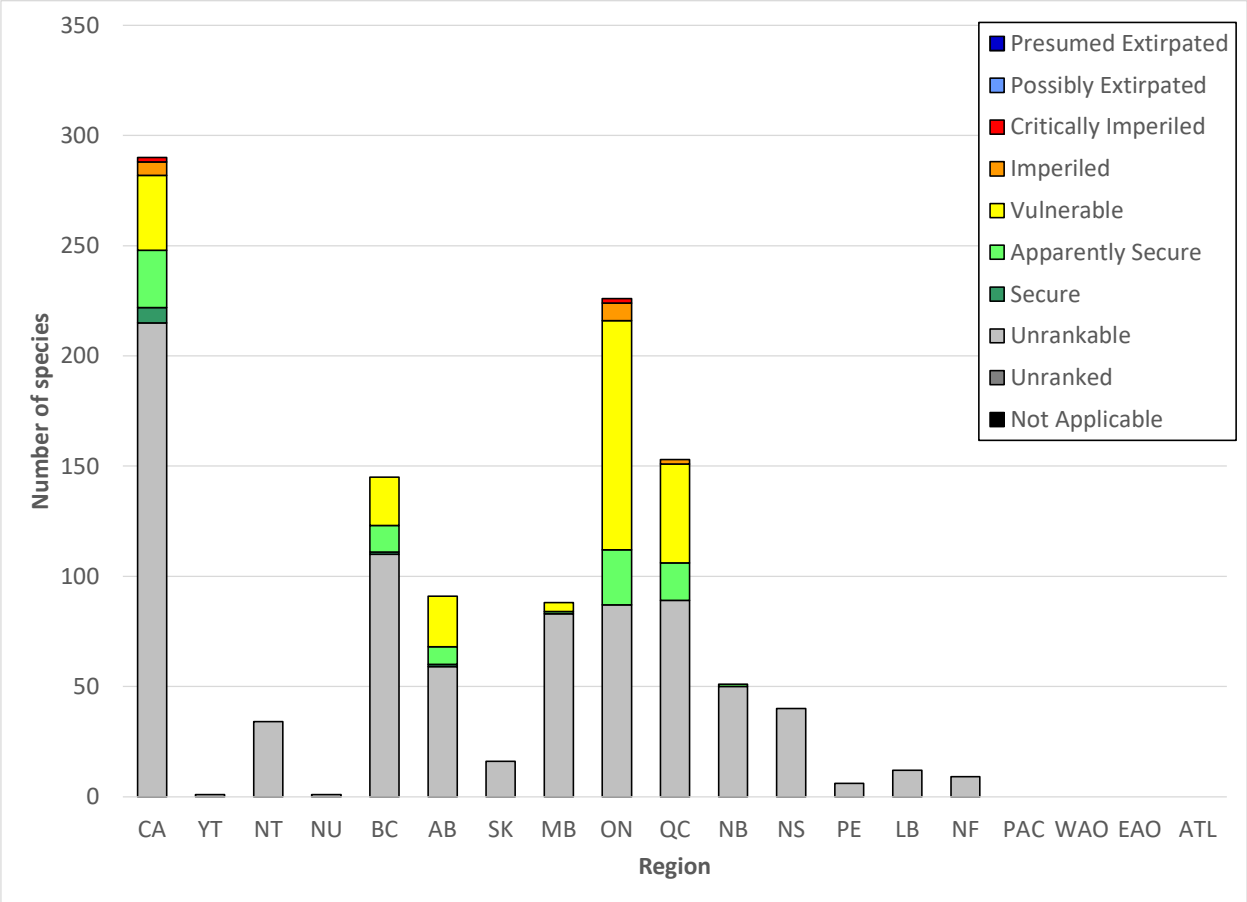


Figure 10. General status of slime moulds in Canada in 2020.

FUNGI KINGDOM

Macrofungi

Fly Amanita (*Amanita muscaria*) © Rémi Hébert

Macrofungi do not refer to a specific taxonomic division. They represent fungal species that have a large fruiting body easily visible to the naked eye. 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. These make spores, which can disperse to germinate and form new mycelia. Available data is based on the observations of the fruiting bodies since the underground parts are not visible. 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 Amanitas include some of the most toxic known mushrooms found worldwide. However, 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 6 951 known species of macrofungi in Canada (Figure 11). Results of our assessments at the national level indicated that no species are presumed extirpated, one is possibly extirpated, 76 are critically imperiled, 151 are imperiled, 310 are vulnerable, 1 424 are apparently secure, 457 are secure, 4 300 are unrankable, 217 are unranked, and 15 are not applicable. When only considering species from critically imperiled to secure, 78% are apparently secure or secure.

We identified 228 species of macrofungi that may be at risk in Canada. Of these, six species have 75% or more of their range in Canada, including two species that are thought to be endemic to Canada: *Aleurodiscus dendroideus* and *Vararia athabascensis*. Furthermore, 55 of the species have an intermediate part of their range (11% to 74%) in Canada, and 167 have only a small part of their range (10% or less) in Canada. In total, 19 species have a high priority score (between 1 and 5).

Among the known species of macrofungi, 6 937 are native to Canada and 14 are exotic. On average, each species of macrofungi occurs in 2.7 regions in Canada. No species of macrofungi are considered migratory.

Three groups of macrofungi (the genus *Amanita*, the family Nidulariaceae, and the family Phallaceae) were included in the *Wild Species* 2015 report (87 species). Since then, the national rank of 101 species has changed. In total, two species were assigned an increased level of extinction risk, seven species a reduced level of extinction risk, and 35 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 49 species were added to the list and eight deleted. Most of the changes (97%) are due to new information.

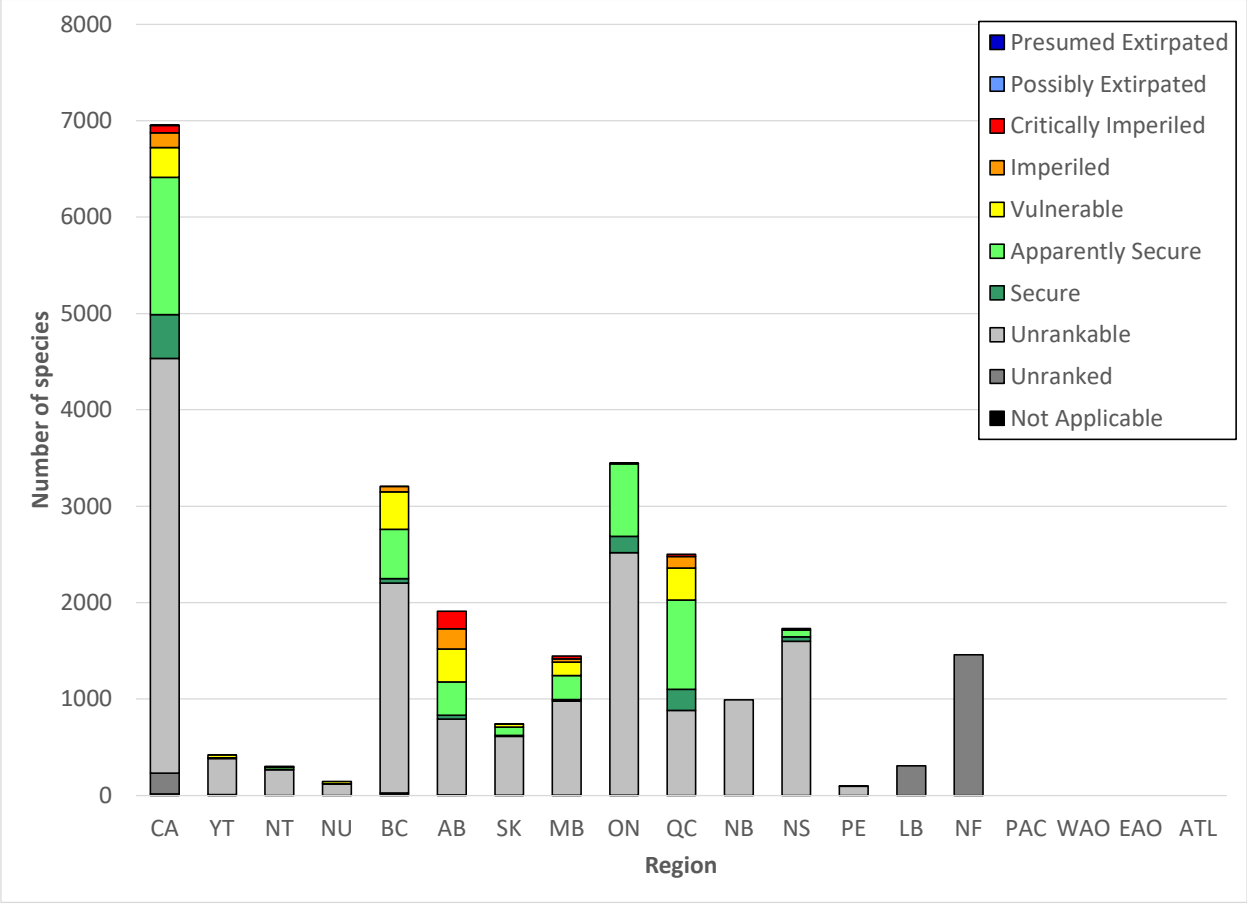


Figure 11. General status of macrofungi in Canada in 2020.

Lichens

Brown-eyed Wolf Lichen (*Letharia columbiana*)
© Doug Waylett

Lichens 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. Lichens can form a crust (crustose), can be leafy (foliose), branched (fruticose), scale-like (squamulose) or other. 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, or 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 2 677 known species of lichens in Canada (Figure 12). Results of our assessments at the national level indicated that no species are presumed extirpated, six are possibly extirpated, 127 are critically imperiled, 97 are imperiled, 104 are vulnerable, 404 are apparently secure, 685 are secure, 1 136 are unrankable, 116 are unranked, and two are not applicable. When only considering species from critically imperiled to secure, 77% are apparently secure or secure.

We identified 230 species of lichens that may be at risk in Canada. Of these, 15 species have 75% or more of their range in Canada, including six species that are thought to be endemic to Canada: *Aspicilia bicensis*, *Aspicilia uplandica*, Crumpled Jelly Lichen (*Collema coniophilum*), Snow Shingle Lichen (*Psoroma nivale*), Arctic Orangebush Lichen (*Seirophora aurantiaca*), and Fibrous Beard Lichen (*Usnea fibrillosa*). Furthermore, 80 of the species have an intermediate part of their range (11% to 74%) in Canada, and 135 have only a small part of their range (10% or less) in Canada. In total, 46 species have a high priority score (between 1 and 5).

Among the known species of lichens, 2 676 are native to Canada and one is exotic. On average, each species of lichens occurs in 4.2 regions in Canada. No species of lichens are considered migratory.

Only the macrolichens were included in the *Wild Species* 2015 report (857 species). Since then, the national rank of 352 species has changed. In total, 57 species were assigned an increased level of extinction risk, 99 species a reduced level of extinction risk, and 112 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 69 species were added to the list and 15 deleted. Most of the changes (66%) are due to new information.

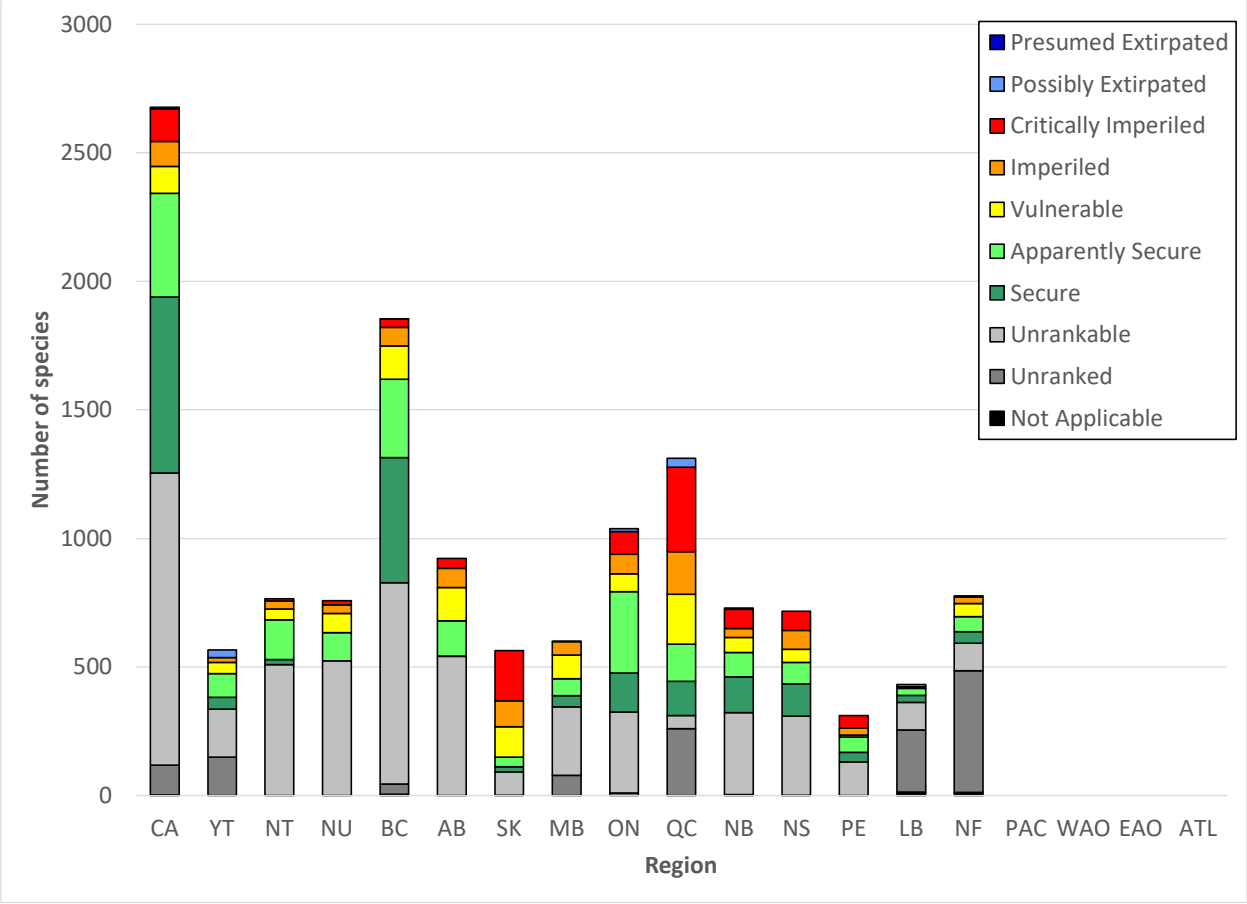


Figure 12. General status of lichens in Canada in 2020.

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 do not 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 1 406 known species of bryophytes in Canada (Figure 13). Results of our assessments at the national level indicated that one species is presumed extirpated, four are possibly extirpated, 75 are critically imperiled, 146 are imperiled, 184 are vulnerable, 296 are apparently secure, 387 are secure, 287 are unrankable, two are unranked, and 24 are not applicable. When only considering species from critically imperiled to secure, 63% are apparently secure or secure.

We identified 226 species of bryophytes that may be at risk in Canada. Of these, eight species have 75% or more of their range in Canada, including six species that are thought to be endemic to Canada: *Calliergon orbicularicordatum*, *Crossocalyx tenuis*, *Neomacounia nitida*, *Seligeria careyana*, *Sphagnum venustum*, and *Trematodon montanus*.. Furthermore, 89 of the species have an intermediate part of their range (11% to 74%) in Canada, and 129 have only a small part of their range (10% or less) in Canada. In total, 22 species have a high priority score (between 1 and 5).

Among the known species of bryophytes, 1 389 are native to Canada and 17 are exotic. On average, each species of bryophytes occurs in 5.9 regions in Canada. No species of bryophytes are considered migratory.

All the bryophytes were included in the *Wild Species* 2015 report (1 375 species). Since then, the national rank of 460 species has changed. In total, 118 species were assigned an increased level of extinction risk, 92 species a reduced level of extinction risk, and 167 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 57 species were added to the list and 26 deleted. Most of the changes (56%) are due to new information.

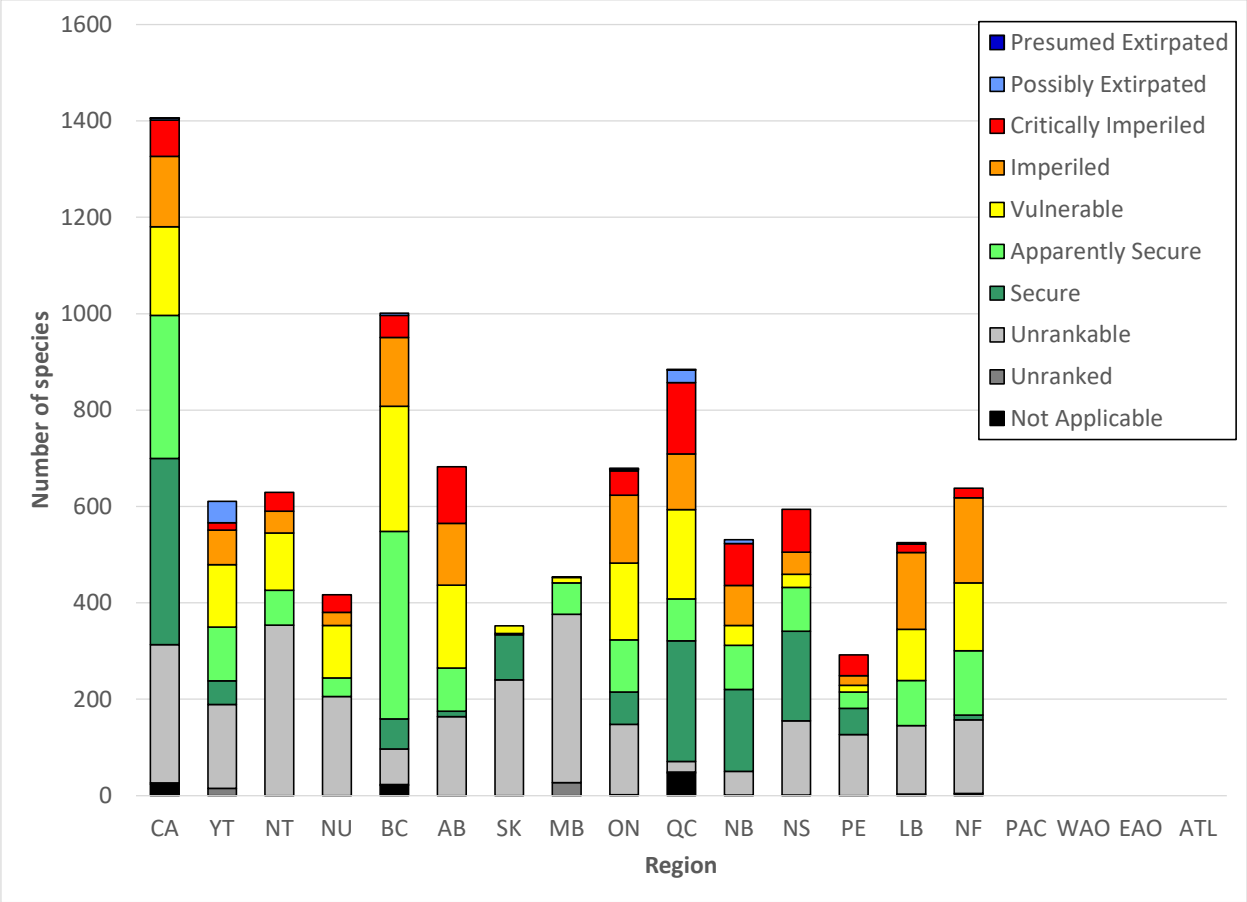


Figure 13. General status of bryophytes in Canada in 2020.

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. Many 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 become 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 5 324 known species of vascular plants in Canada (Figure 14). Results of our assessments at the national level indicated that 20 species are presumed extirpated, 31 are possibly extirpated, 254 are critically imperiled, 293 are imperiled, 418 are vulnerable, 852 are apparently secure, 1 989 are secure, 84 are unrankable, four are unranked, and 1 379 are not applicable. When only considering species from critically imperiled to secure, 75% are apparently secure or secure.

We identified 598 species of vascular plants that may be at risk in Canada. Of these, 41 species have 75% or more of their range in Canada, including 36 species that 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*), Adams Creek Hawthorn (*Crataegus rivuloadamensis*), Battle Creek Hawthorn (*Crataegus rivulopugnensis*), Red Bracteole Hawthorn (*Crataegus rubribracteolata*), Macoun's Cryptantha (*Cryptantha macounii*), Mackenzie Hairgrass (*Deschampsia mackenzieana*), Klaza Draba (*Draba bruce-bennettii*), Caswell's Draba (*Draba caswellii*), Cayouette's Draba (*Draba cayouettei*), Frankton's Draba (*Draba franktonii*), Kluane Draba (*Draba kluanei*), Puvirnituq Mountain Draba (*Draba puvirnituqii*), Dense Draba (*Draba pycnosperma*), Yukon Draba (*Draba yukonensis*), Ojibway Waterwort (*Elatine ojibwayensis*), Burgundy Eyebright (*Euphrasia vinacea*), Queen Charlotte Islands Fescue (*Festuca pseudovivipara*), Gaspé Saxifrage

(*Micranthes gaspensis*), Lori's Water-lily (*Nymphaea loriana*), Mackenzie River Yellowcress (*Rorippa crystallina*), Seashore Stitchwort (*Sabulina litorea*), Green-scaled Willow (*Salix chlorolepis*), Barrens Willow (*Salix jejuna*), Raup's Willow (*Salix raupii*), Blanket-leaved Willow (*Salix silicicola*), Turnor's Willow (*Salix turnorii*), Gillman's Goldenrod (*Solidago gillmanii*), *Solidago jejunifolia*, Gulf of St. Lawrence Aster (*Symphyotrichum laurentianum*), and Gulf of St. Lawrence Dandelion (*Taraxacum laurentianum*). Furthermore, 172 of the species have an intermediate part of their range (11% to 74%) in Canada, and 385 have only a small part of their range (10% or less) in Canada. In total, 99 species have a high priority score (between 1 and 5).

Among the known species of vascular plants, 3 952 are native to Canada and 1 372 are exotic. On average, each species of vascular plants occurs in 4.5 regions in Canada. No species of vascular plants are considered migratory.

All the vascular plants were included in the *Wild Species* 2015 report (5 211 species). Since then, the national rank of 1 003 species has changed. In total, 84 species were assigned an increased level of extinction risk, 597 species a reduced level of extinction risk, and 81 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 177 species were added to the list and 64 deleted. Most of the changes (45%) are due to new information.

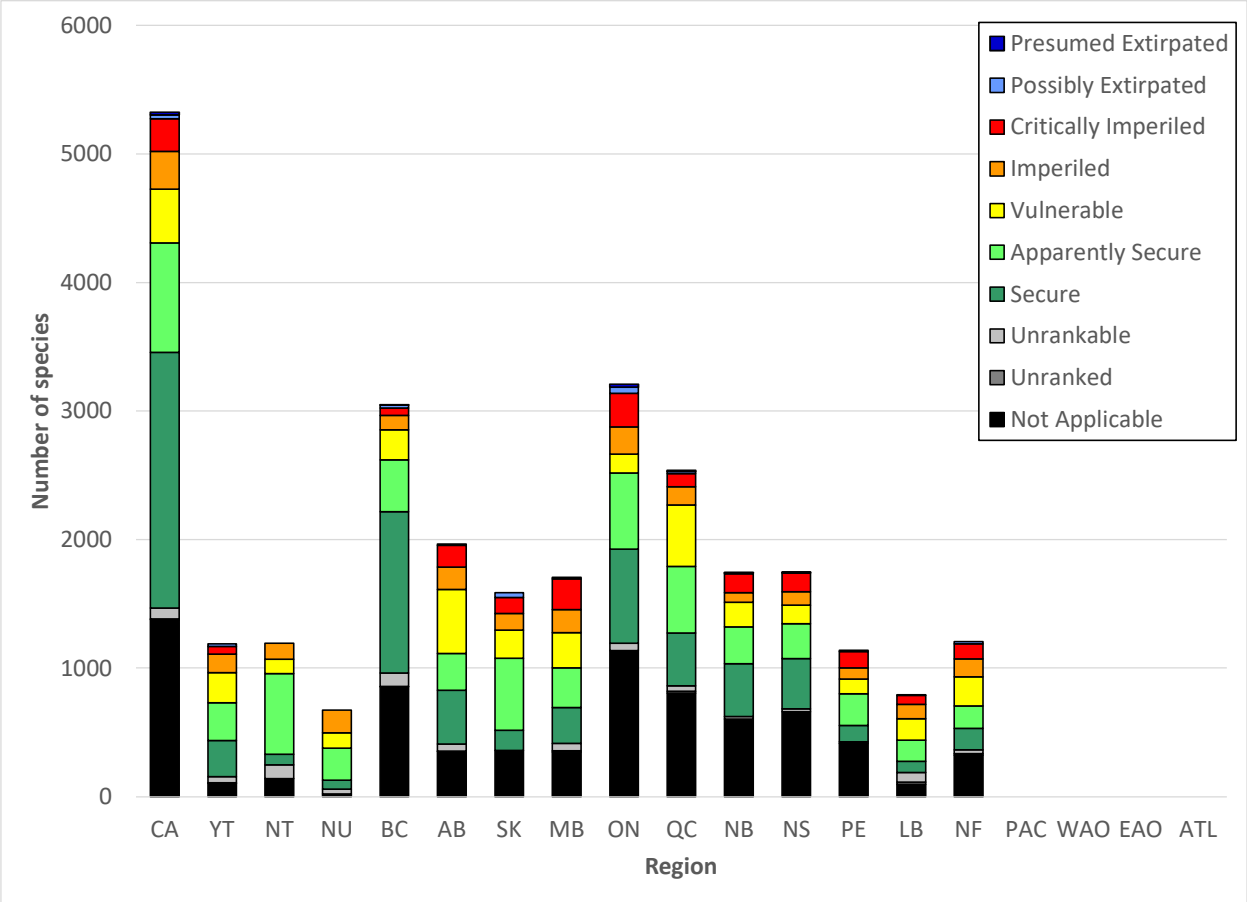


Figure 14. General status of vascular plants in Canada in 2020.

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 water. 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 disturbances, particularly from bottom trawling. A marine protected area for glass sponge reefs was established in 2017 near Haida Gwaii, in the Pacific Ocean. Other threats include climate change impacts, ocean acidification, invasive species, and contamination.

There are 270 known species of sponges in Canada (Figure 15). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, nine are vulnerable, none are apparently secure, 24 are secure, 234 are unrankable, three are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 73% are apparently secure or secure.

We did not identify any species that may be at risk in Canada. Among the known species of sponges, all are native to Canada. On average, each species of sponges occurs in 1.3 regions in Canada. No species of sponges are considered migratory.

All the sponges were included in the *Wild Species* 2015 report (212 species). Since then, the national rank of 106 species has changed. In total, one species was assigned an increased level of extinction risk, no species a reduced level of extinction risk, and 31 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 66 species were added to the list and eight deleted. Most of the changes (79%) are due to new information.

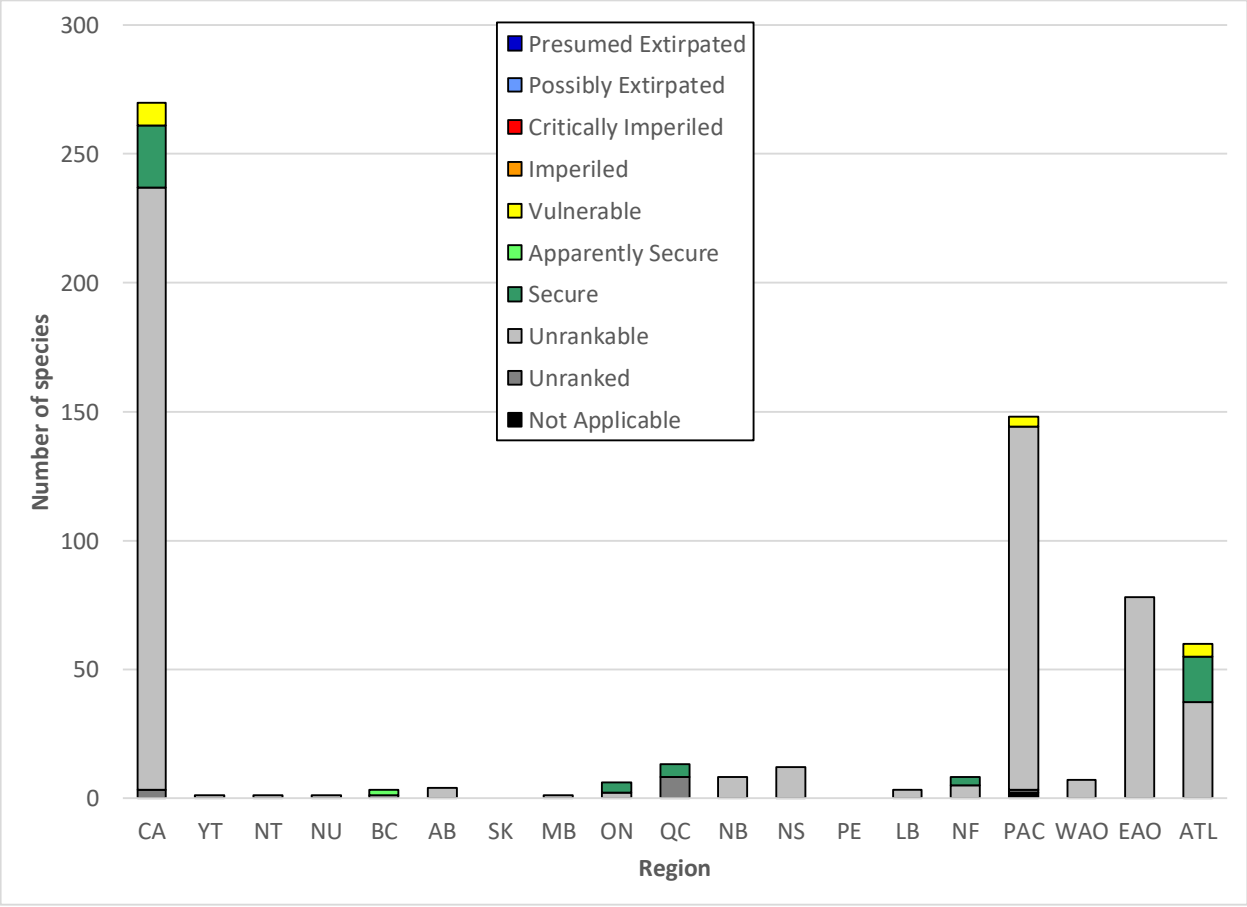


Figure 15. General status of sponges in Canada in 2020.

Corals

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

Corals are part of the phylum Cnidaria and 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. 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 oceanic conditions. Coral reefs are one of the most complex deep-ocean habitats where other animals can 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 152 known species of corals in Canada (Figure 16). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, one is imperiled, 40 are vulnerable, four are apparently secure, 11 are secure, 95 are unrankable, one is unranked, and none are not applicable. When only considering species from critically imperiled to secure, 27% are apparently secure or secure.

We identified one species of corals that may be at risk in Canada. This species has an intermediate part of its range (11% to 74%) in Canada. This species does not have a high priority score (between 1 and 5).

Among the known species of corals, all are native to Canada. On average, each species of corals occurs in 1.2 regions in Canada. No species of corals are considered migratory.

All the corals were included in the *Wild Species* 2015 report (190 species). Since then, the national rank of 62 species has changed. In total, one species was assigned an increased level of extinction risk, no species a reduced level of extinction risk, and three species changed from or to the categories unrankable, unranked, or not applicable. In addition, 10 species were added to the list and 48 deleted. Most of the changes (81%) are due to incorrect data used previously.

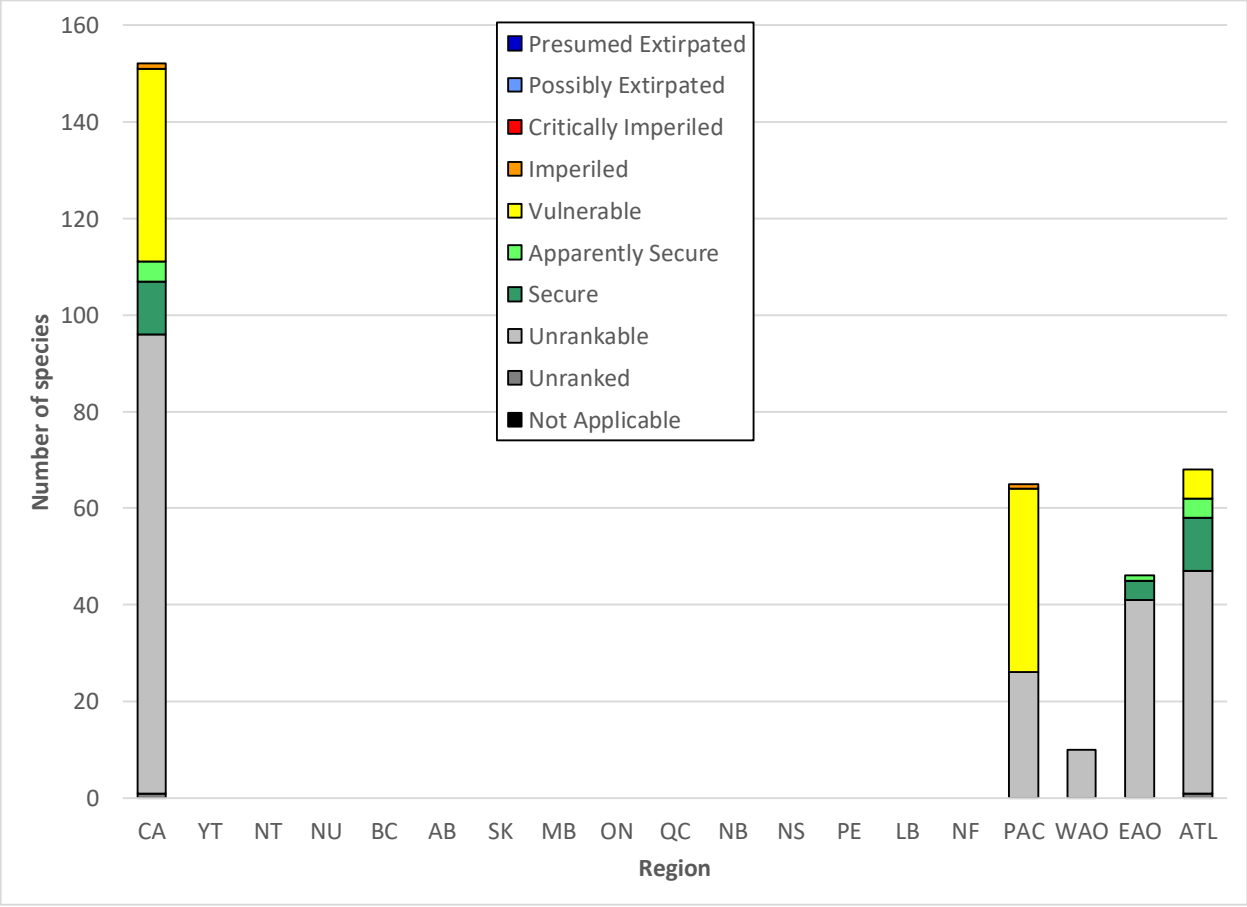


Figure 16. General status of corals in Canada in 2020.

Bivalves

***Ptychobranchus fasciolaris* © Todd Morris**

Bivalves are part of the phylum of the molluscs and refer to the class Bivalvia. They include species such as mussels, clams, oysters, and scallops. Bivalves are aquatic molluscs whose soft bodies are enclosed in a hinged shell. Most species are marine, but Canada also has a high diversity of freshwater clams and mussels. They are generally sedentary, some using a muscular foot to burrow into the sediment, though scallops can propel themselves by clapping their shells to expel water. Bivalves can have separate sexes, be hermaphroditic (be male and female at the same time), or, in the case of some oysters, alternate sexes throughout their lives. Fertilization is usually external with larvae going from free-swimming to fixed stages. The larvae of freshwater mussels parasitize fishes (often luring hosts in creative ways, such as mimicking their prey), which allows them to disperse upstream. Bivalves have tremendous ecological value. As filter feeders, their gills capture and filter large quantities of dissolved and suspended particles out of the water, which has led to their use to in ecosystem remediation. Bivalves are eaten by many vertebrate and invertebrate animals, and their waste feeds other organisms that further enhance fish populations. Marine bivalves have been important to the diet of coastal people for thousands of years, and are valuable aquaculture species. Threats include reduced water quality, pollutants (such as microplastics), invasive species, habitat alteration, climate change, and the loss of larval host fishes.

There are 416 known species of bivalves in Canada (Figure 17). Results of our assessments at the national level indicated that one species is presumed extirpated, one is possibly extirpated, 12 are critically imperiled, 11 are imperiled, 12 are vulnerable, 90 are apparently secure, 53 are secure, 219 are unrankable, one is unranked, and 16 are not applicable. When only considering species from critically imperiled to secure, 80% are apparently secure or secure.

We identified 25 species of bivalves that may be at risk in Canada. Of these, six species have an intermediate part of their range (11% to 74%) in Canada, and 19 have only a small part of their range (10% or less) in Canada. In total, four species have a high priority score (between 1 and 5).

Among the known species of bivalves, 400 are native to Canada and 16 are exotic. On average, each species of bivalves occurs in 2.1 regions in Canada. No species of bivalves are considered migratory.

Only the freshwater bivalves were included in the *Wild Species* 2015 report (93 species). Since then, the national rank of 11 species has changed. In total, eight species were assigned an increased level of extinction risk, three species a reduced level of extinction risk, and no species changed from or to the

categories unrankable, unranked, or not applicable. In addition, no species were added or deleted from the list. Most of the changes (73%) are due to criteria revision.

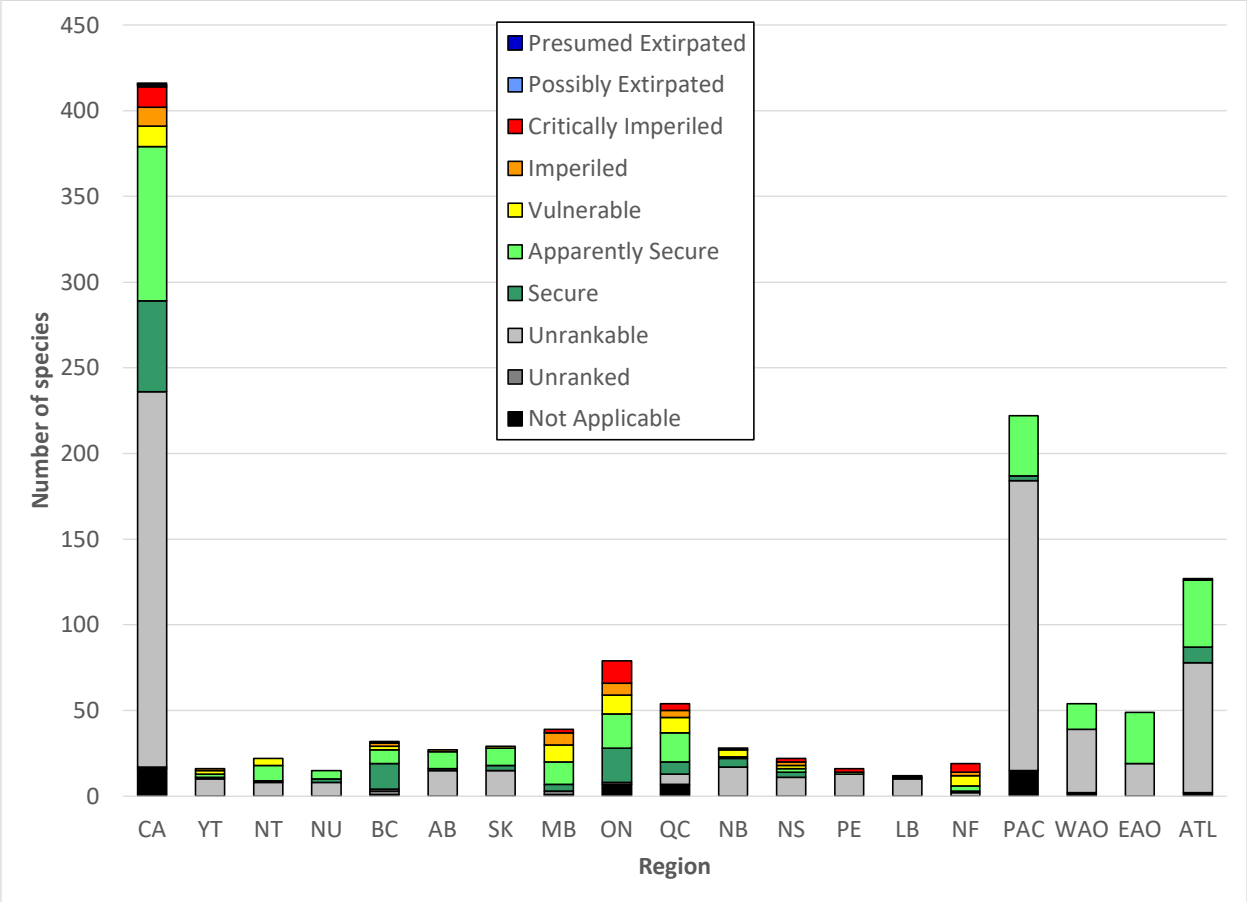


Figure 17. General status of bivalves in Canada in 2020.

Terrestrial and freshwater snails and slugs

***Allogona townsendiana* © Kristiina Ovaska**

Terrestrial and freshwater snails and slugs are part of the phylum of the molluscs and refer to the class Gastropoda (terrestrial and freshwater species only). They have a well-developed head, tentacles, a muscular foot for locomotion, and most species 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 320 known species of terrestrial and freshwater snails and slugs in Canada (Figure 18). Results of our assessments at the national level indicated that one species is presumed extirpated, four are possibly extirpated, 14 are critically imperiled, 23 are imperiled, 28 are vulnerable, 53 are apparently secure, 61 are secure, 85 are unrankable, five are unranked, and 46 are not applicable. When only considering species from critically imperiled to secure, 64% are apparently secure or secure.

We identified 42 species of terrestrial and freshwater snails and slugs that may be at risk in Canada. Of these, five species have 75% or more of their range in Canada, including four species that are thought to be endemic to Canada: *Physella johnsoni*, *Planorbella columbiensis*, *Staala gwaii*, *Vallonia terraenovae*. Furthermore, 11 of the species have an intermediate part of their range (11% to 74%) in Canada, and 26 have only a small part of their range (10% or less) in Canada. In total, nine species have a high priority score (between 1 and 5).

Among the known species of terrestrial and freshwater snails and slugs, 275 are native to Canada and 45 are exotic. On average, each species of terrestrial and freshwater snails and slugs occurs in 4.1 regions in Canada. No species of terrestrial and freshwater snails and slugs are considered migratory.

All the terrestrial and freshwater snails and slugs were included in the *Wild Species* 2015 report (326 species). Since then, the national rank of 33 species has changed. In total, seven species were assigned an increased level of extinction risk, no species a reduced level of extinction risk, and six species

changed from or to the categories unrankable, unranked, or not applicable. In addition, seven species were added to the list and 13 deleted. Most of the changes (39%) are due to taxonomic changes.

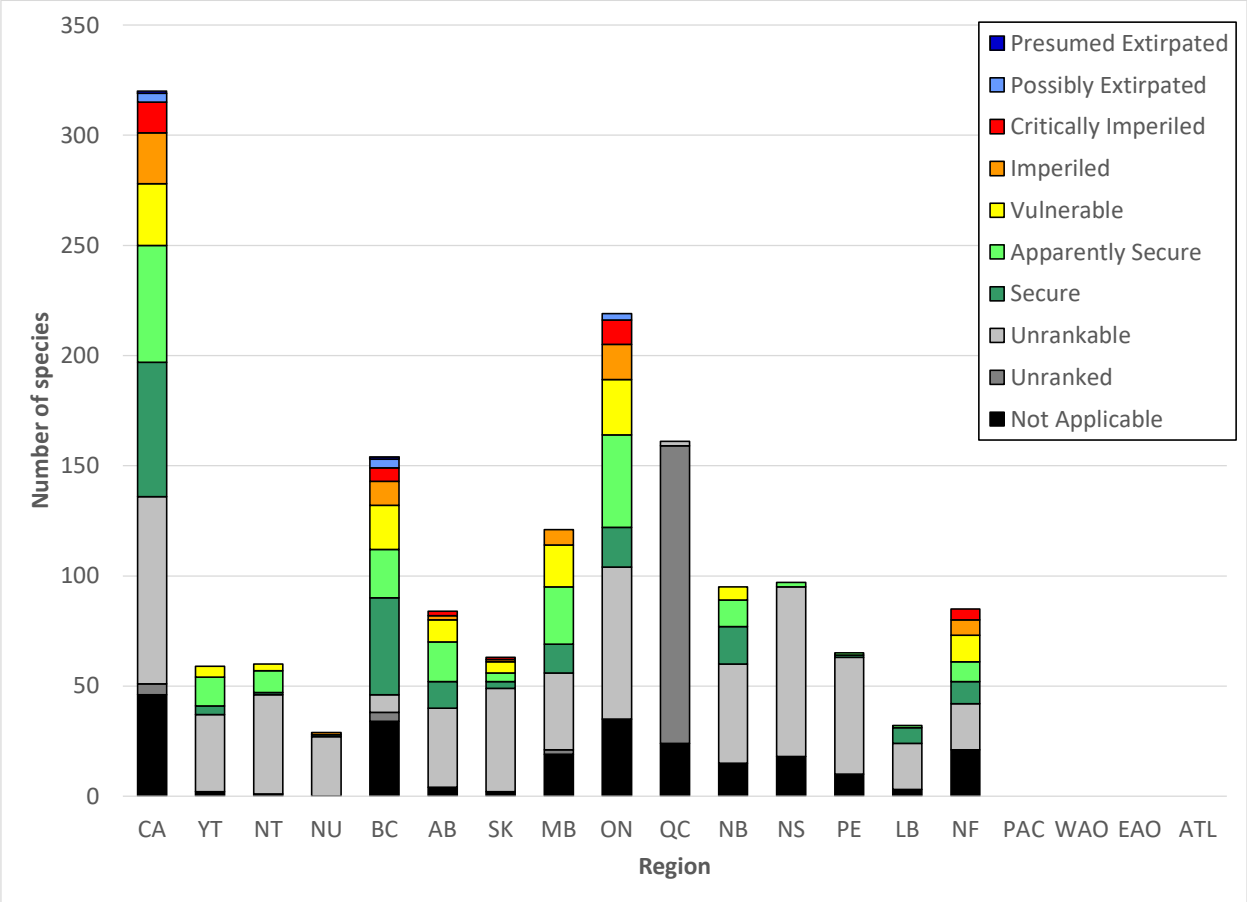


Figure 18. General status of terrestrial and freshwater snails and slugs in Canada in 2020.

Cephalopods

***Doryteuthis opalescens* © Neil McDaniel**

Cephalopods are part of the phylum of the molluscs and refer to the class Cephalopoda. Cephalopods are the quickest, most agile, and most intelligent of the molluscs. These marine invertebrates include nautiluses (who live coiled in a chambered shell); cuttlefishes (which are relatively stout and inactive); squids (torpedo-shaped and fast); and octopuses (sea bottom dwellers that can walk on their arms). The latter three groups have exchanged the protection of a shell for highly developed brains and senses; strong nimble arms; and a talent for hiding using camouflage, mimicry, or a well-aimed jet of ink. Most species have eight suckered arms; squids and cuttlefishes also have two tentacles for striking prey. Cephalopods are hunted by fishes, seabirds and marine mammals, with squids making up the bulk of the sperm whales' diet. The sucker scars observed on the whales' bodies from the Giant Squid (*Architeuthis dux*; which at 450 kg, is the world's largest invertebrate animal) attest to their grand battles. Cephalopod reproduction can involve intricate courtship prior to mating, and both parents usually die soon after. Female octopuses forgo eating while guarding their eggs, and eventually starve. The abilities of cephalopods to remember, learn, and experiment fascinate both researchers and the public. Some octopuses, for example, have learned how to enter lobster traps to enjoy a meal. They are difficult to study, however, due to their relatively short life span (rarely up to seven years and often much less) and reclusive nature. Cephalopods are fished largely for bait or for export, and are a large component of incidental bycatch.

There are 100 known species of cephalopods in Canada (Figure 19). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, none are vulnerable, 23 are apparently secure, 10 are secure, 67 are unrankable, none are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 100% are apparently secure or secure.

We did not identified any species that may be at risk in Canada. Among the known species of cephalopods, all are native to Canada. On average, each species of cephalopods occurs in 1.1 regions in Canada. We also identified two species of cephalopods considered to be migratory.

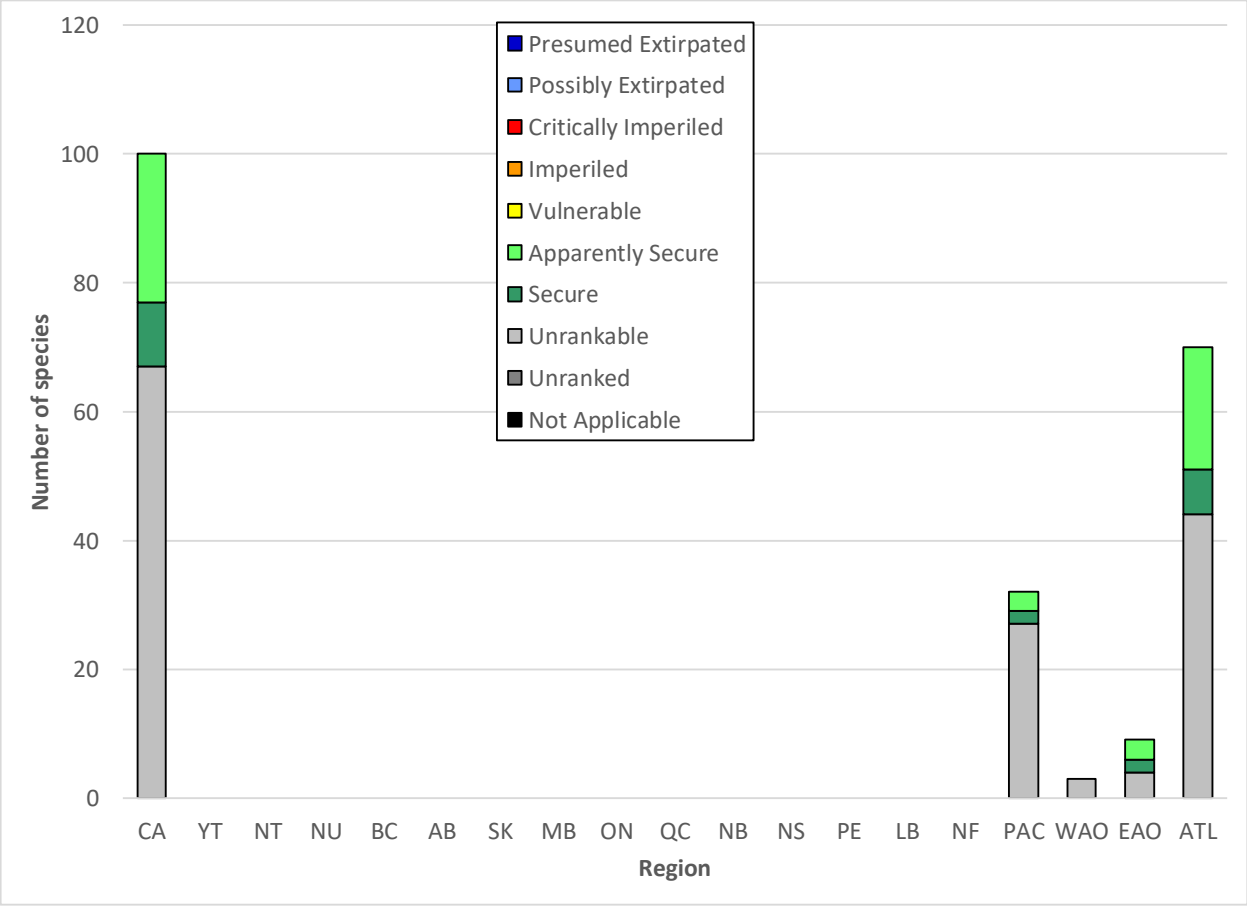


Figure 19. General status of cephalopods in Canada in 2020.

Leeches

***Piscicola geometra* © Wolfgang Pöelzer**

Leeches are part of the phylum of the annelids and refer to the subclass Hirudinea. Despite popular perception, most leeches are not, in fact, interested in sucking the blood of unwary humans. Most species are predators, parasites, or scavengers on other animals, including fishes, turtles, ducks or amphibians. Leeches are found in freshwater and marine environments throughout Canada, most commonly in warm waters, where they lurk under stones and vegetation. They have flattened cylindrical bodies, lack limbs, and have a sucker on each end for attachment, feeding, and movement. Leeches are hermaphrodites (having both male and female sexual organs), but cannot self-fertilize. Most species excrete their eggs along with a protective cocoon; some go a step further and keep their eggs safely attached to their belly. Adults may consumed their own eggs in high density populations. The young bypass larval stages and hatch directly into small versions of adults, which are preyed upon by beetles, amphibians, fishes, and birds. The North American Medicinal Leech (*Macrobdella decora*) has powerful anticoagulants allowing it to feed on human (and other) blood, and it can consume over half of its body weight in one feeding. While less commonly used than its counterpart, the European Medicinal Leech (*Hirudo medicinalis*; which can consume four times its weight in blood), the North American species is also used in hirudotherapy – a medical treatment consisting of attaching leeches to a patient's skin to promote blood circulation after re-attachment or transplant surgery.

There are 73 known species of leeches in Canada (Figure 20). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, none are vulnerable, 11 are apparently secure, nine are secure, 49 are unrankable, two are unranked, and two are not applicable. When only considering species from critically imperiled to secure, 100% are apparently secure or secure.

We did not identify any species that may be at risk in Canada. Among the known species of leeches, 71 are native to Canada and two are exotic. On average, each species of leeches occurs in 3.9 regions in Canada. No species of leeches are considered migratory.

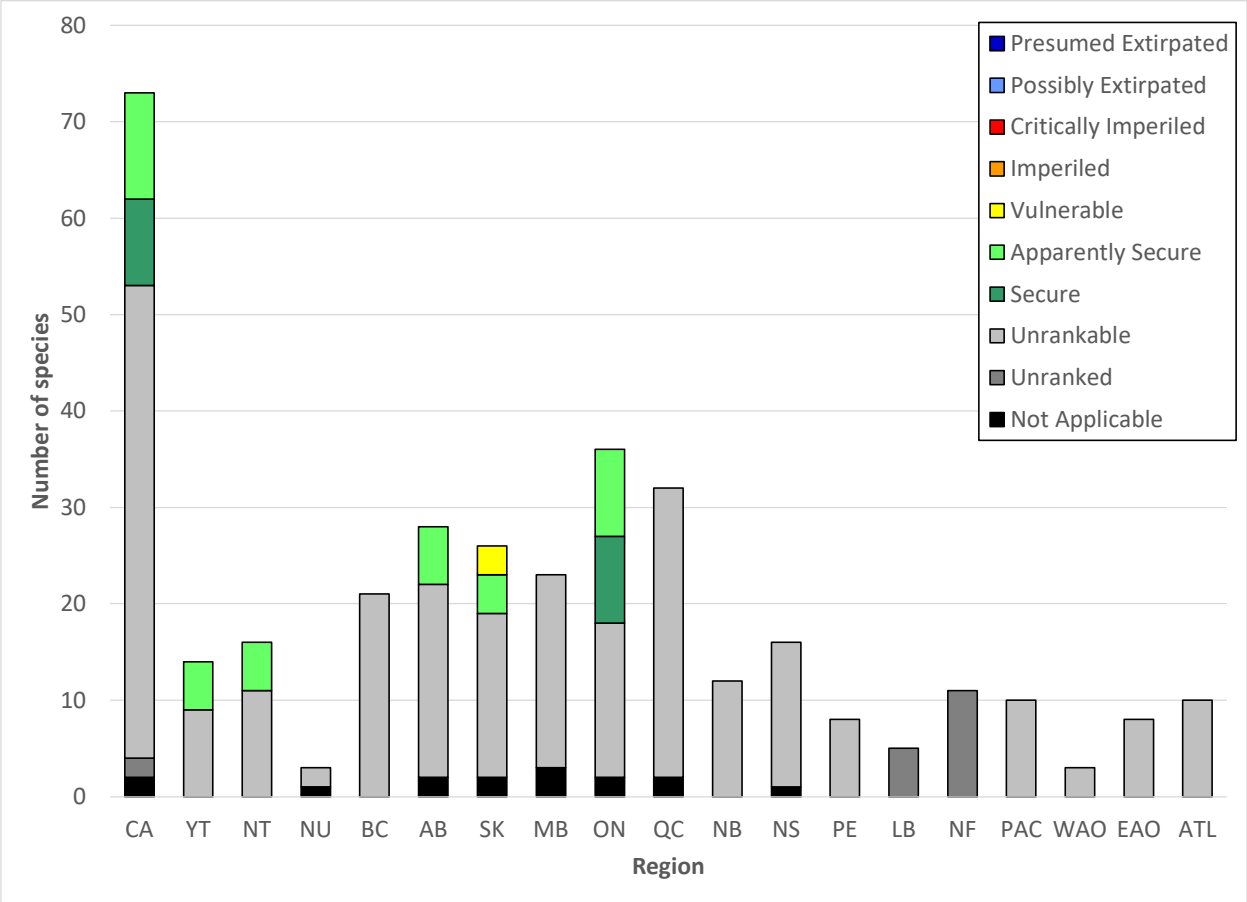


Figure 20. General status of leeches in Canada in 2020.

Earthworms

Common Earthworm (*Lumbricus terrestris*)
© Paul Starosta

Earthworms are part of the phylum of the annelids and refer to the suborder Lumbricina. Earthworms are familiar to many of us as reddish-grey tube-shaped worms that live in our gardens or are used as fish bait. They move with the help of short bristles (called setae) that allow them to grip as they burrow through the soil. Earthworms eat as they go – up to a third of their body weight daily – consuming soil and extracting nutrients from decomposing organic matter. They breathe through their skin, which must remain moist. This affects their distribution: the dry prairies, for example, have fewer earthworms than more humid regions. Earthworms are hermaphroditic (having both male and female sexual organs), and while some self-fertilize, most reproduce by mating. They secrete cocoons containing fertilized eggs, which hatch into juveniles without a larval stage. Earthworms are keystone species of soil ecology. They mix the soil, transport and cycle nutrients (making them available to plants), and create pores and burrows which enhance aeration, drainage and root penetration. While these activities benefit agriculture, they can have negative impacts on forests in areas where earthworms are not native. While glaciers removed native earthworms from the majority of Canada, our forests subsequently evolved without them, becoming adapted to slow soil formation and nutrient release. Most earthworms in Canada are introduced species from Europe. In areas where they have been introduced, the forest must cope with the decomposition of organic matter faster than it is being built, the exposure of subsoil, and the removal of seedling root zones. This has resulted in the decline of understorey plant diversity in some parts of Canada.

There are 30 known species of earthworms in Canada (Figure 21). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, three are critically imperiled, none are imperiled, none are vulnerable, one is apparently secure, none are secure, five are unrankable, one is unranked, and 20 are not applicable. When only considering species from critically imperiled to secure, 25% are apparently secure or secure.

We identified three species of earthworms that may be at risk in Canada. Of these, all species have 75% or more of their range in Canada, including one species that is thought to be endemic to Canada: Lawrence's Earthworm (*Bimastos lawrenceae*). In total, the three species have a high priority score (between 1 and 5).

Among the known species of earthworms, 10 are native to Canada and 20 are exotic. On average, each species of earthworms occurs in 5.4 regions in Canada. No species of earthworms are considered migratory.

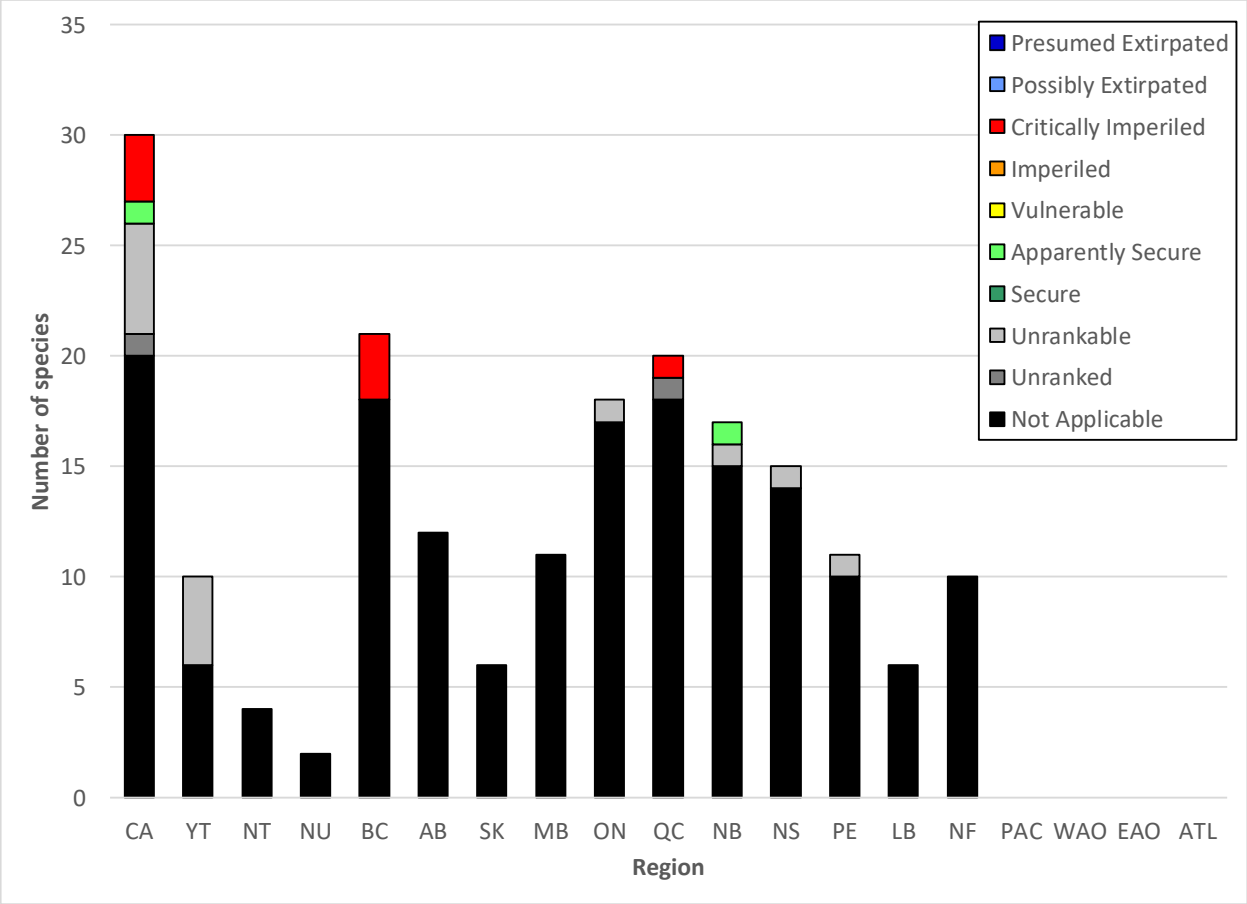


Figure 21. General status of earthworms in Canada in 2020.

Myriapods

***Geophilus vittatus* © Rob Curtis**

Myriapods are part of the phylum of the arthropods and refer to the subphylum Myriapoda. Myriapods, meaning “many legged ones”, include centipedes, millipedes, and similar species. They were one of the first groups of animals to come to land, prior to insects. Lacking a waxy cuticle, these arthropods are vulnerable to water loss and live in humid environments. They have one pair of legs per body segment – though millipedes appear to have two pairs due to the fusing together of their segments. Millipedes evolved earlier than centipedes and have higher species diversity. They eat decaying plant material and play an important role in forest litter breakdown and nutrient cycling. In coastal British Columbia, millipedes can be the most important forest floor invertebrates, potentially consuming over a third of the needle litter (20 kg/hectare every day!), and enhancing nitrogen release in the process. Poison is their primary defense, and some species have vivid colours and patterns to warn off predators. Centipedes on the other hand are fast hunters and their first pair of legs are modified into “poison claws” to inject venom into their prey. They are relatively harmless to humans, though the bite of the species *Scutigera coleoptrata*, which is found in our houses, could sting (but they do help to control ants, flies, or cockroaches in one’s home). Myriapods reproduce sexually and the young hatch from eggs appearing as shorter versions of their adult selves. Their body accumulates segments (and legs) with each successive molt. While research into myriapods is generally lacking, they often inspire considerable popular interest.

There are 138 known species of myriapods in Canada (Figure 22). Results of our assessments at the national level indicated that no species are presumed extirpated, one is possibly extirpated, one is critically imperiled, none are imperiled, one is vulnerable, two are apparently secure, 14 are secure, 86 are unrankable, none are unranked, and 33 are not applicable. When only considering species from critically imperiled to secure, 89% are apparently secure or secure.

We identified two species of myriapods that may be at risk in Canada. Of these, one species has an intermediate part of its range (11% to 74%) in Canada, and the other has only a small part of its range (10% or less) in Canada. In total, one species has a high priority score (between 1 and 5).

Among the known species of myriapods, 105 are native to Canada and 33 are exotic. On average, each species of myriapods occurs in 1.9 regions in Canada. No species of myriapods are considered migratory.

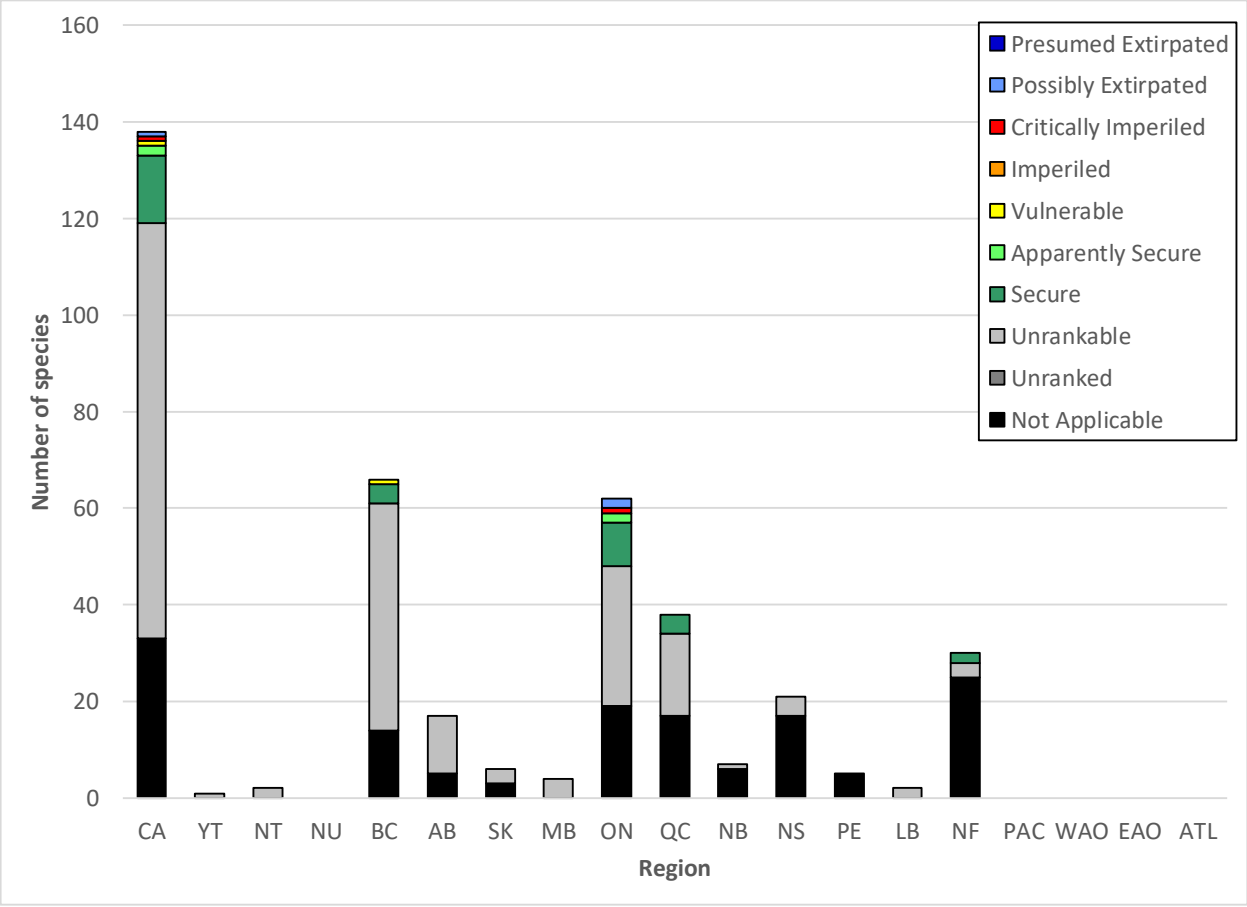


Figure 22. General status of myriapods in Canada in 2020.

Decapods

Virile Crayfish (*Faxonius virilise*) © Casey Swecker

Decapods are part of the phylum of the arthropods (subphylum of the crustaceans) and refer to the order Decapoda. Decapods are a large order 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 318 known species of decapods in Canada (Figure 23). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, one is critically imperiled, none are imperiled, nine are vulnerable, 13 are apparently secure, 127 are secure, 147 are unrankable, three are unranked, and 18 are not applicable. When only considering species from critically imperiled to secure, 93% are apparently secure or secure.

We identified one species of decapods that may be at risk in Canada. The species has only a small part of its range in Canada (10% or less). This species does not have a high priority score (between 1 and 5).

Among the known species of decapods, 313 are native to Canada and five are exotic. On average, each species of decapods occurs in 1.3 regions in Canada. No species of decapods are considered migratory.

All the decapods were included in the *Wild Species* 2015 report (316 species). Since then, the national rank of 27 species has changed. In total, one species was assigned an increased level of extinction risk, one species a reduced level of extinction risk, and 19 species changed from or to the categories unrankable, unranked, or not applicable. In addition, four species were added to the list and two deleted. Most of the changes (70%) are due to incorrect data used previously.

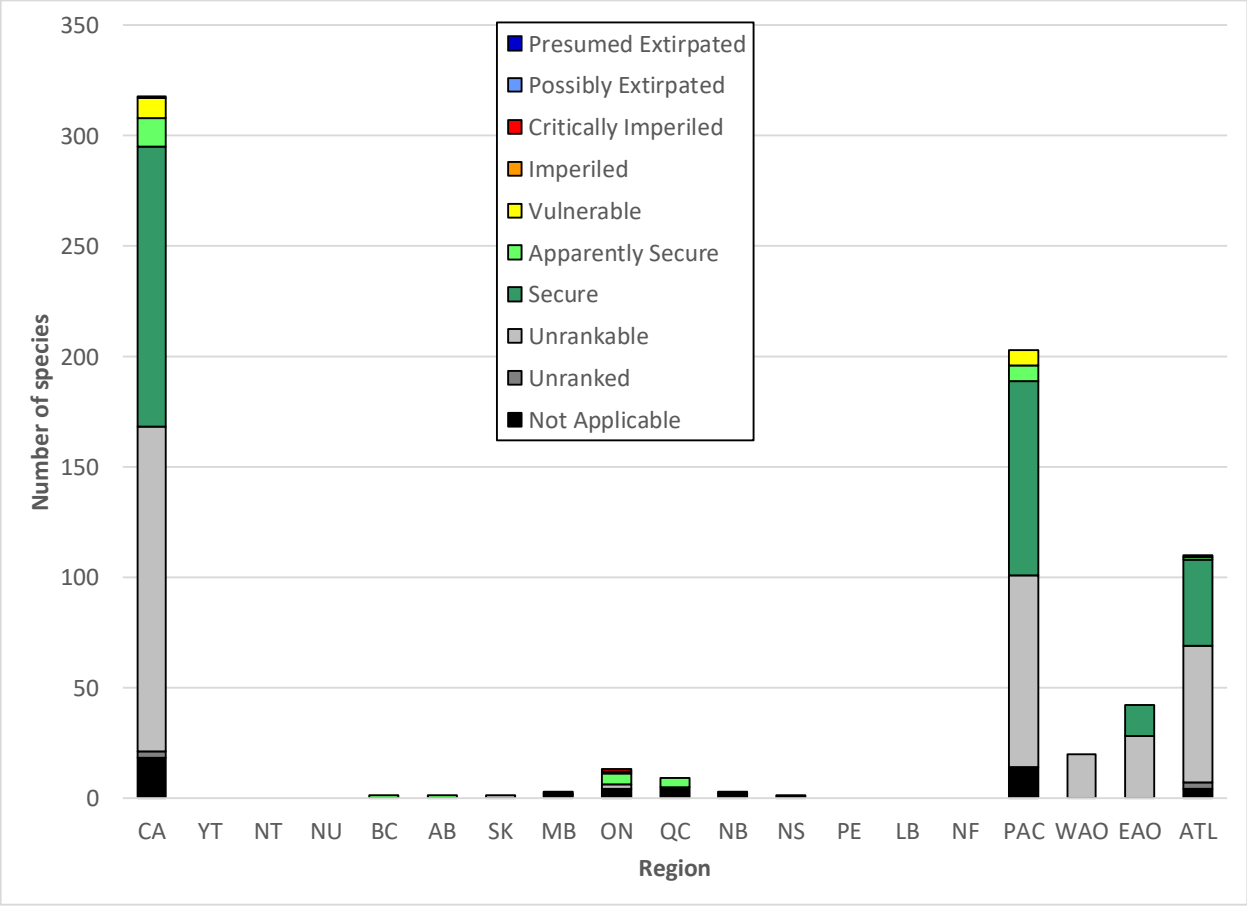


Figure 23. General status of decapods in Canada in 2020.

Horseshoe crabs

Atlantic Horseshoe Crab (*Limulus Polyphemus*)
© Jo O'Keefe

Horseshoe crabs are part of the phylum of the arthropods (subphylum Chelicerata) and refer to the family Limulidae. Having been on Earth nearly half a billion years with little apparent change, horseshoe crabs may be the epitome of a "living fossil". These marine arthropods where often thought to be related to crabs because of their hard protective carapace. However, they are actually more closely related to spiders than to crabs. They have five pairs of legs, nine eyes, and a tail which helps them to steer while swimming and to flip over if they get stuck on their back. Lacking teeth, their legs grind their food – largely clams and worms – and pass it to their mouth. Horseshoe crabs breed on the beach, the timing being synchronized to lunar cycles. Females lay eggs in nests that are just deeper than the bills of probing shorebirds. Larvae start their lives in the intertidal flats, and with each molt move deeper into the ocean. Horseshoe crabs (or their eggs) are important food for many species, including endangered sea turtles and shorebirds, and their shells provide habitat for mussels, oysters, and barnacles. They are harvested mainly for bait, though the medical community is collecting their blood to make Limulus Amebocyte Lysate (LAL), a substance used as the global standard for screening medical equipment for bacterial contamination. Population numbers have declined in recent decades; threats include over-harvesting, loss of shoreline, and climate change impacts on spawning habitats.

There is one known species of horseshoe crab in Canada (Figure 24). Results of our assessments at the national level indicate that this species is unrankable.

We did not identify any species that may be at risk in Canada. The known species of horseshoe crab is native to Canada. The species is present in only one region in Canada. The species is not considered migratory.

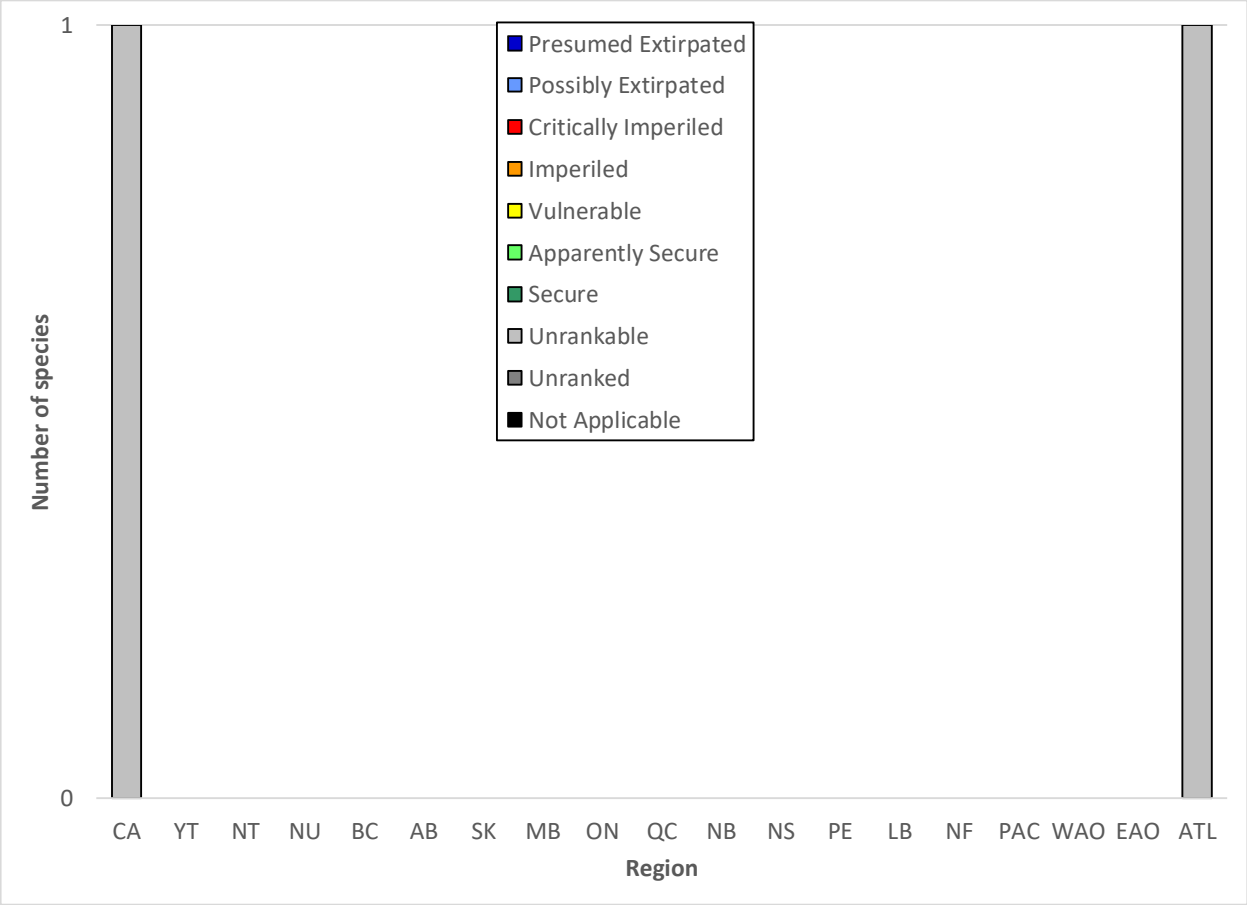


Figure 24. General status of horseshoe crabs in Canada in 2020.

Water mites

***Hydrachna* sp. © Stephen Luk**

Water mites are part of the phylum of the arthropods (class of the arachnids) and refer to the group Hydrachnidia. Though unfamiliar to many of us, water mites are among the most ecologically important arthropods in freshwater systems. They are generally less than 4 mm long, and like other arachnids, have two main body segments and four pairs of legs. Water mites are abundant and diverse. A square metre of rocky stream or lake substrate can contain up to 50 or 75 different water mite species respectively. Those that live in streams are often wedge-shaped, allowing them to squeeze into crevices to avoid the current; walking forms have short stocky legs; and swimmers have long legs with swimming hairs. Predictably, they play an important role in many freshwater food webs. Larvae parasitize aquatic insects such a flies, dragonflies, and caddisflies, with black flies being a favourite of those living in running water. In so doing, larvae gain not only food, but also dispersal to new water bodies. Adults are predators that can only ingest fluids. Digestion begins outside their body: they inject digestive juices into their prey and suck in semi-digested material. Many species are brightly coloured, particularly red and orange, which is uncharacteristic of freshwater animals. This could be to signal unpalatability to predators, or to maximize solar energy capture in cold water. Water mites can be excellent indicators of water quality. Even minor contamination will change the composition of species in an area; moderate contamination will reduce species abundance; and intense contamination will cause their collapse.

There are 653 known species of water mites in Canada (Figure 25). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, seven are critically imperiled, six are imperiled, 68 are vulnerable, 107 are apparently secure, none are secure, 392 are unrankable, 73 are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 57% are apparently secure or secure.

We identified 13 species of water mites that may be at risk in Canada. Of these, three species have an intermediate part of their range (11% to 74%) in Canada, and 10 have only a small part of their range (10% or less) in Canada. In total, no species have a high priority score (between 1 and 5).

Among the known species of water mites, all are native to Canada. On average, each species of water mites occurs in 2.7 regions in Canada. No species of water mites are considered migratory.

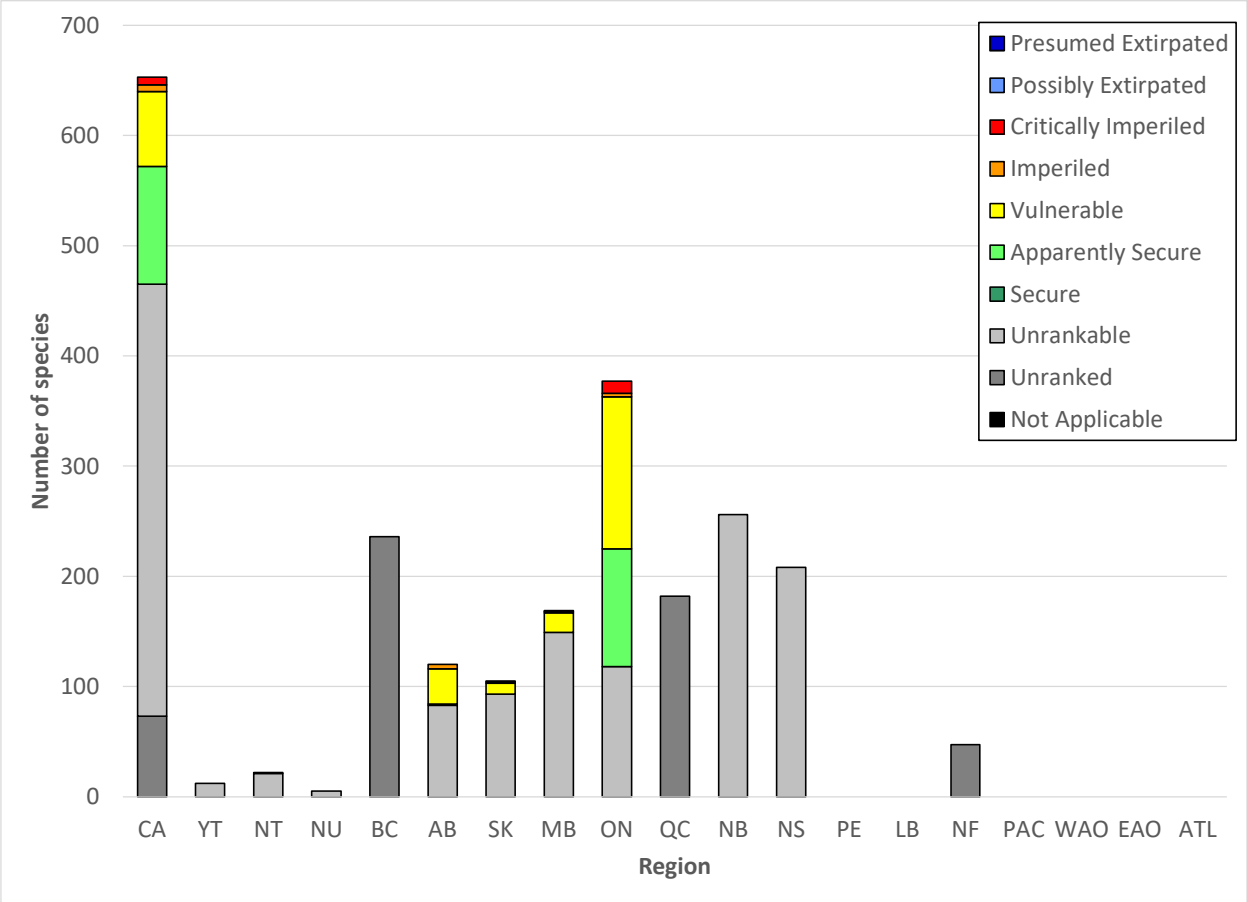


Figure 25. General status of water mites in Canada in 2020.

Ticks

Black-legged Tick (*Ixodes scapularis*) © Alain Hogue

Ticks are part of the phylum of the arthropods (class of the arachnids) and refer to the order Ixodida. Ticks are parasitic arachnids that feed exclusively on blood. Like their cousins the spiders, they have eight legs and separate head and body segments. Some are called “soft ticks”; these lack shells, remain sheltered during the day, and feed intermittently on sleeping hosts at night. Most species are “hard ticks”; they are small and protected by a hard shell, making them difficult to kill. All life stages – larva, nymph, and adult – feed on terrestrial vertebrate blood. Ticks are attracted to the odour, vibrations, and carbon dioxide of potential hosts. Being unable to jump, hard ticks climb up vegetation, extend their front legs, and clasp onto a passing animal. They feed slowly over several days, growing larger as they become engorged with blood. After feeding, they drop off their host, moult, and seek out the next (usually larger) animal host. Some ticks have one or two hosts over their lives; most have three. When they reach adulthood, they feed one last time, then females lay their eggs and die. Ticks are surpassed only by mosquitos as vectors of human pathogens. Infections of Lyme disease, transmitted by the Black-legged Tick (*Ixodes scapularis*) and the Western Black-legged Tick (*Ixodes pacificus*), have increased sharply in Canada in recent years. Climate change is expanding the geographic ranges of many ticks (and tick-borne diseases). The Lone Star Tick (*Amblyomma americanum*), a new arrival to Canada, is a case in point, and brings with it an allergy which causes a severe reaction to eating red meat. While some ants, spiders, and birds feed on ticks, they do so only occasionally, and exert little control on their populations.

There are 49 known species of ticks in Canada (Figure 26). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, two are imperiled, three are vulnerable, six are apparently secure, 11 are secure, 10 are unrankable, none are unranked, and 17 are not applicable. When only considering species from critically imperiled to secure, 77% are apparently secure or secure.

We identified two species of ticks that may be at risk in Canada. Of these, one species has an intermediate part of its range (11% to 74%) in Canada, and the other has only a small part of its range (10% or less) in Canada. Both species do not have a high priority score (between 1 and 5).

Among the known species of ticks, 34 are native to Canada and 15 are exotic. On average, each species of ticks occurs in 3.2 regions in Canada. No species of ticks are considered migratory.

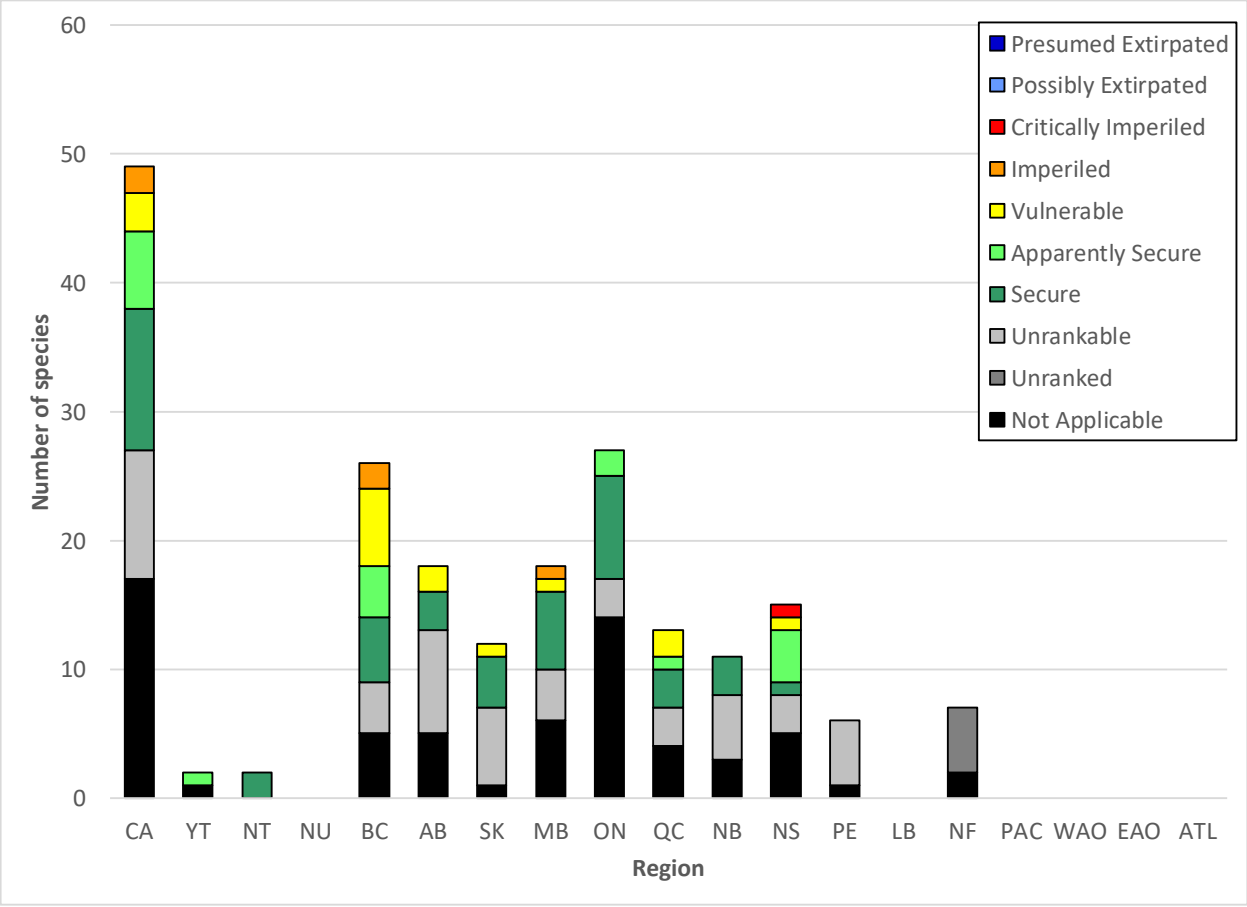


Figure 26. General status of ticks in Canada in 2020.

Harvestmen

Spurred Harvestman (*Leiobunum calcar*) © Alain Hogue

Harvestmen are part of the phylum of the arthropods (class of the arachnids) and refer to the order Opiliones. Harvestmen are arachnids with soft, fused bodies and eight long, thin legs. They resemble spiders, but lack venom, silk, or sharp teeth. Their vision is very limited; harvestmen receive information mainly through touch or short-range chemical signals from sensory organs located on their second pair of legs. Predators include birds, amphibians, mammals and spiders. Harvestmen defend themselves through camouflage (sticking debris onto their bodies); playing dead; and vibrating rapidly to cause confusion. Losing limbs to predators is common, and compromises their movement and foraging. Losing their second pair of "sensory" legs causes them to become reluctant to move, eat, drink, or mate. They are harmless to humans; most are omnivores that eat soft-skinned invertebrates, plants, and fungi. Their lifecycle typically lasts a year and includes eggs, larvae which undergo a series of moults, and adults. Most species overwinter as eggs, though some overwinter as adults, aggregating in caves. Harvestmen were among the first land animals to evolve internal fertilization; their penises and ovipositors (the female organ for depositing eggs) can be as long as their bodies. To reproduce, females visit a male's territory, copulate, and lay eggs on the undersides of leaves. Some males sneak onto other males' territories to attempt, often successfully, to mate with egg-guarding females.

There are 38 known species of harvestmen in Canada (Figure 27). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, two are imperiled, one is vulnerable, six are apparently secure, none are secure, 23 are unrankable, none are unranked, and six are not applicable. When only considering species from critically imperiled to secure, 67% are apparently secure or secure.

We identified two species of harvestmen that may be at risk in Canada. Of these, one species has 100% of its range in Canada and is thought to be endemic to Canada: Hairless Harvestman (*Liopilio glaber*). Furthermore, the other species has an intermediate part of its range (11% to 74%) in Canada. In total, one species has a high priority score (between 1 and 5).

Among the known species of harvestmen, 32 are native to Canada and six are exotic. On average, each species of harvestmen occurs in 2.9 regions in Canada. No species of harvestmen are considered migratory.

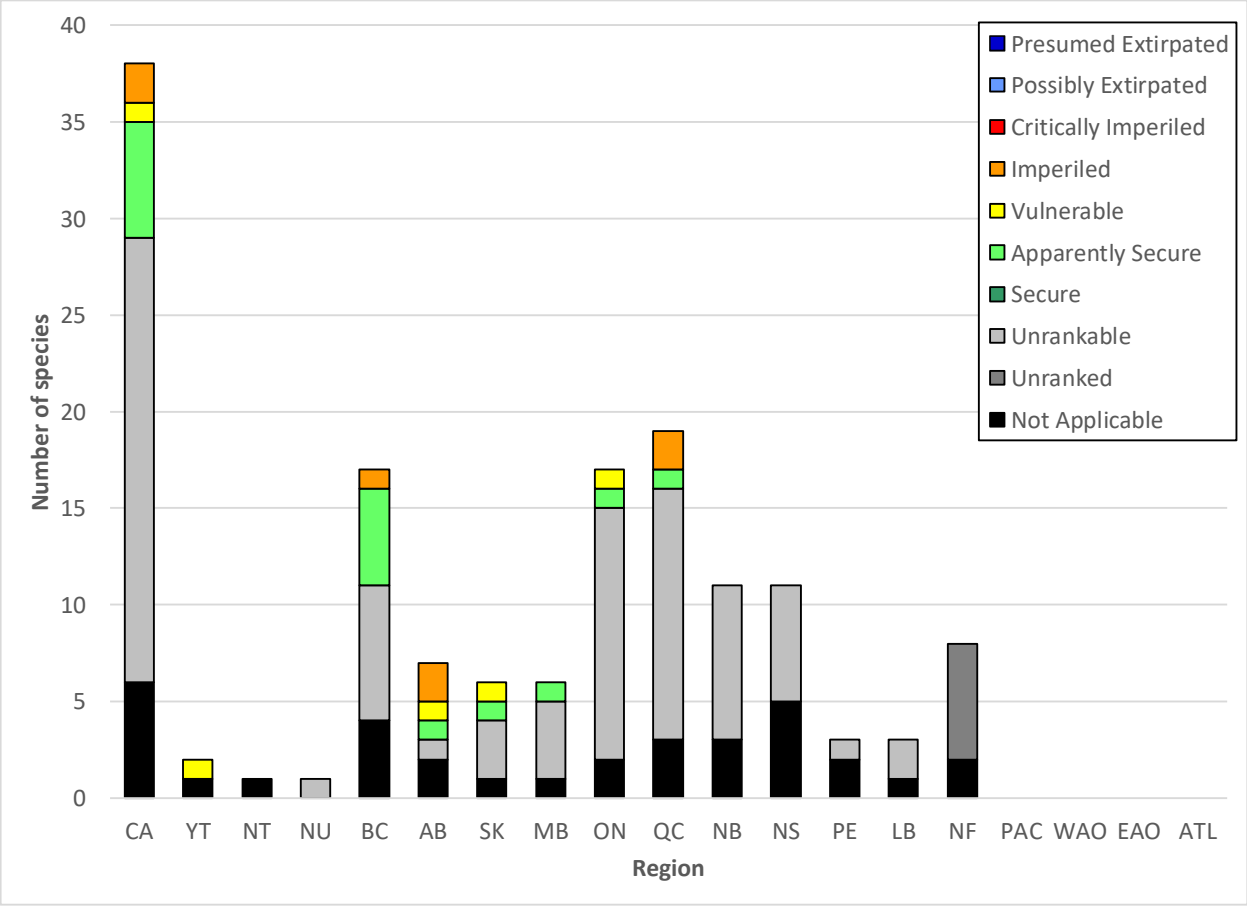


Figure 27. General status of harvestmen in Canada in 2020.

Solifuges

Rough Solifuge (*Eremobates scaber*) © Nathan Tyner

Solifuges are part of the phylum of the arthropods (class of the arachnids) and refer to the order Solifugae. They are hairy, predacious arachnids most noted for their massive jaws (chelicerae). These are scissor-like instruments used for crushing their prey, fighting, burrowing, and mating. Their bodies are usually about 2-4 cm long and covered in tactile hairs. The backs of many species have a prominent arch, roughly reassembling scorpions (though they are not scorpions, nor spiders). Solifuges have adhesive pads on the ends of their leg-like pedipalps, which help them to capture their insect prey and to climb up smooth, vertical surfaces. Females are generally larger than males, and have heartier appetites, sometimes hunting scorpions or small lizards. Solifuges live primarily in dry, desert environments. They are nocturnal hunters, quick and aggressive, and spend the daytime sheltered in burrows or under stones, wood, or dung. Males of some species will court females, while in other species, they appear to actively subdue females with their chelicerae in order to mate with them. For their part, the females of many species will try to eat their mates post-copulation, and may select males based on their nutritive value. Females dig a burrow to lay eggs; some species abandon them to their fate, while others feed and care for their young. Solifuges go through a post-embryo stage and 8-10 nymphal instars until they reach adulthood. They are generally harmless to humans, though they will bite if they feel threatened.

There are three known species of solifuges in Canada (Figure 28). Results of our assessments at the national level indicate that two species are critically imperiled and one is imperiled. When only considering species from critically imperiled to secure, none is apparently secure or secure.

We identified three species of solifuges that may be at risk in Canada. The three species have an intermediate part of their range in Canada (11% to 74%). In total, two species have a high priority score (between 1 and 5).

Among the known species of solifuges, all are native to Canada. On average, each species of solifuges occurs in 1.7 regions in Canada. No species of solifuges are considered migratory.

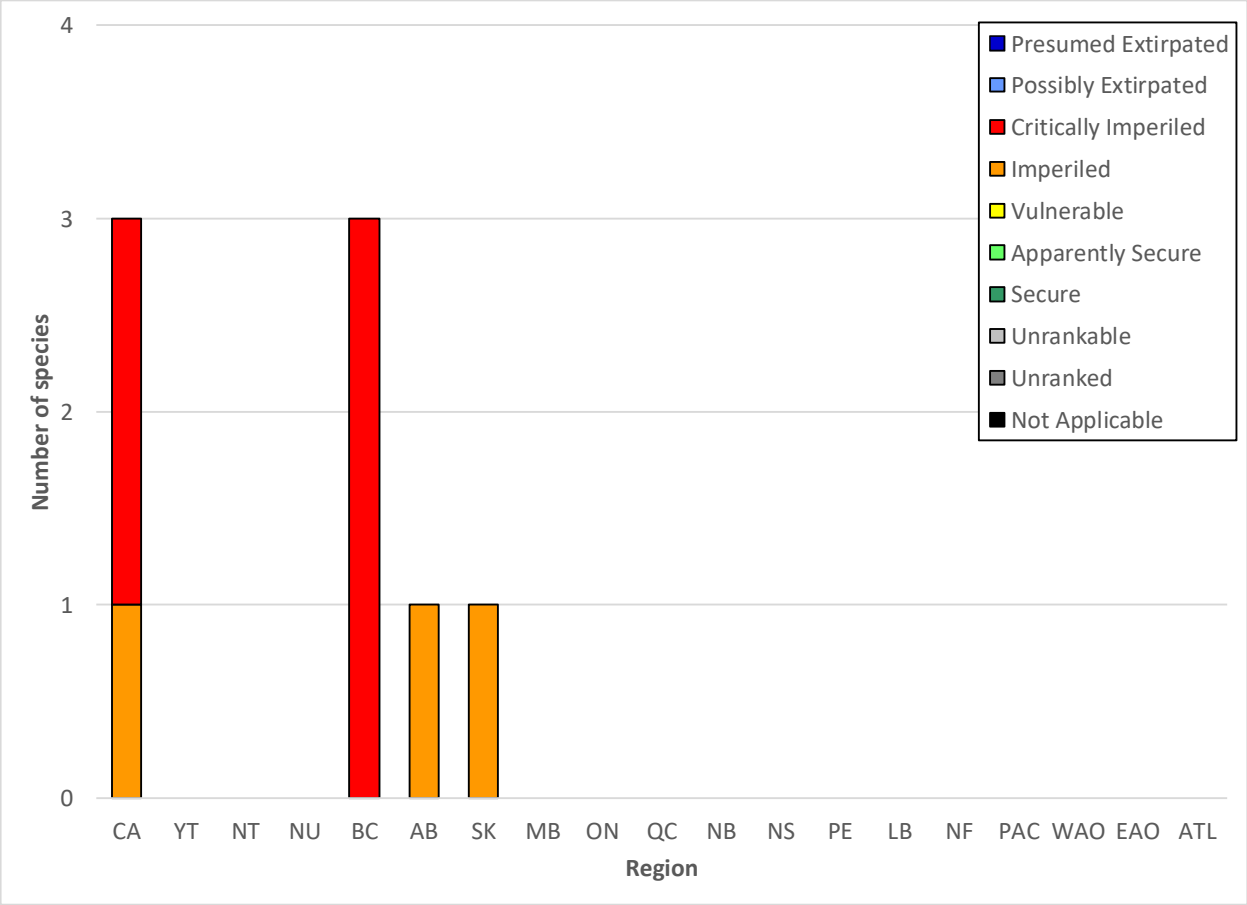


Figure 28. General status of solifuges in Canada in 2020.

Pseudoscorpions

Small Pseudoscorpion (*Microbisium parvulum*)
© Tom Murray

Pseudoscorpions are part of the phylum of the arthropods (class of the arachnids) and refer to the order Pseudoscorpiones. They are small arachnids that look like miniature scorpions without the stinging tail. They are generally less than 5 mm long, dorsoventrally flattened, and have eight legs. Some species have simple eyes, but all rely on hairs covering their bodies to sense the environment. They live in dark, humid habitats; eat small invertebrates; and many disperse by hitchhiking on birds or beetles. Pseudoscorpions were among the oldest known animals that produce silk, which they use to construct chambers for moulting and hibernation. One species, the Arctic Pseudoscorpion (*Wyochernes asiaticus*), lives in Yukon and can survive under cold water for days. While some arachnids can breathe under water for a few hours using gill-like structures, these pseudoscorpions appear to stop breathing altogether. Another species, the House Pseudoscorpion (*Chelifer cancroides*), often resides in our homes, but does not harm humans (indeed, they feed on book lice, fungus moths and carpet beetles). Mating behaviour is intricate: males rub their ventral surface over a territory, and break into a vibrating dance when a female arrives. They show off their long first pair of legs and pincer-like claws, deposit a sperm sac, and guide their prospective mate to pick it up. Females carry their eggs in a pouch and care for their young, which are called nymphs and resemble extra-tiny adult pseudoscorpions.

There are 24 known species of pseudoscorpions in Canada (Figure 29). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, one is vulnerable, two are apparently secure, none are secure, 20 are unrankable, one is unranked, and none are not applicable. When only considering species from critically imperiled to secure, 67% are apparently secure or secure.

We did not identified any species that may be at risk in Canada. Among the known species of pseudoscorpions, all are native to Canada. On average, each species of pseudoscorpions occurs in 2.5 regions in Canada. No species of pseudoscorpions are considered migratory.

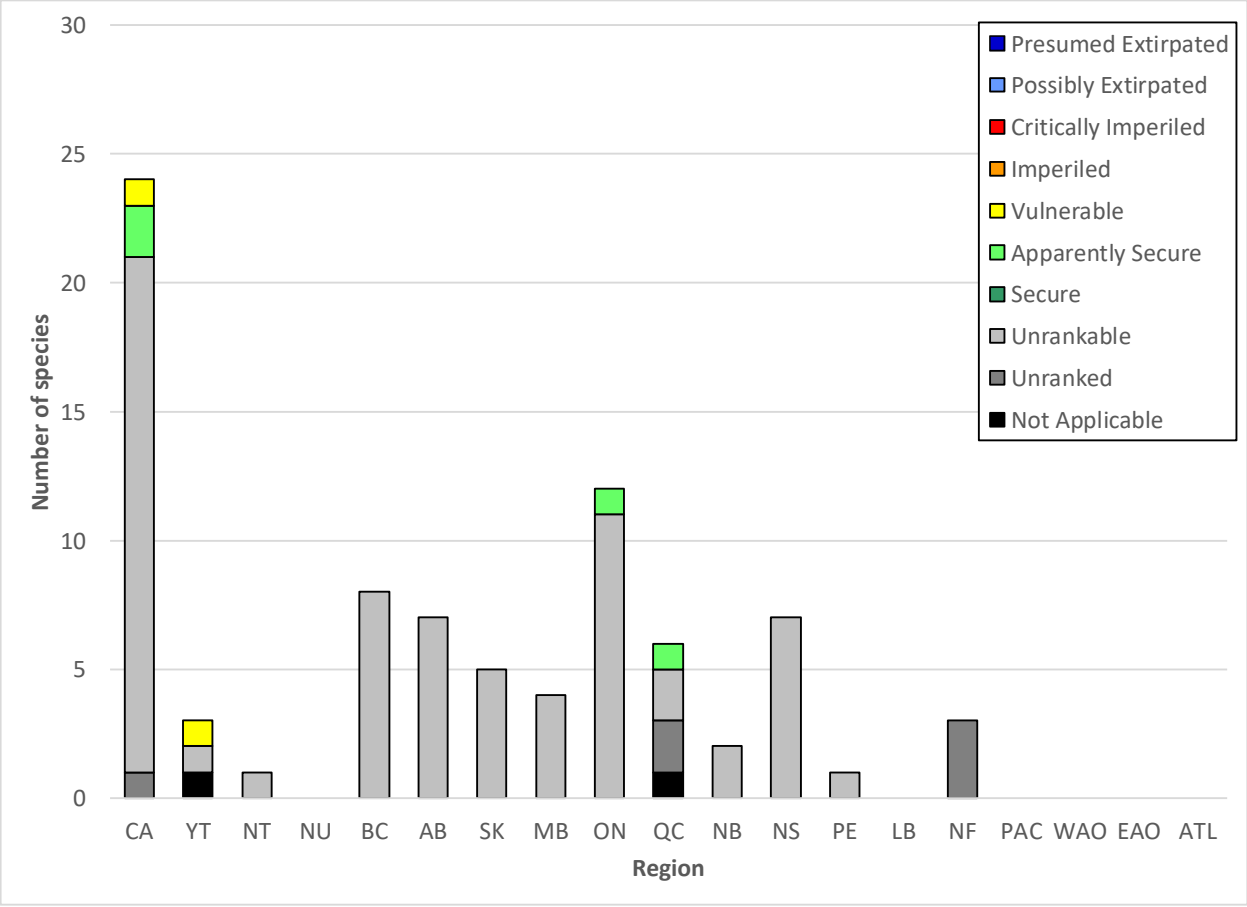


Figure 29. General status of pseudoscorpions in Canada in 2020.

Spiders

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

Spiders are part of the phylum of the arthropods (class of the arachnids) and 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 can 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, having been well studied in only a few habitats. Threats include habitat loss, climate change and pesticides.

There are 1 439 known species of spiders in Canada (Figure 30). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, 17 are critically imperiled, 30 are imperiled, 39 are vulnerable, 422 are apparently secure, 344 are secure, 481 are unrankable, 31 are unranked, and 75 are not applicable. When only considering species from critically imperiled to secure, 90% are apparently secure or secure.

We identified 47 species of spiders that may be at risk in Canada. Of these, five species have 75% or more of their range in Canada, including three species that are thought to be endemic to Canada: Glassy Double-coiled Money Spider (*Disembolus hyalinus*), Quebec Litterweaver (*Mysmena quebecana*), and Black-headed Erudite Money Spider (*Walckenaeria fusciceps*). Furthermore, 20 of the species have an intermediate part of their range (11% to 74%) in Canada, and 22 have only a small part of their range (10% or less) in Canada. In total, eight species have a high priority score (between 1 and 5).

Among the known species of spiders, 1 364 are native to Canada and 75 are exotic. On average, each species of spiders occurs in 4.5 regions in Canada. No species of spiders are considered migratory.

All the spiders were included in the *Wild Species* 2015 report (1 399 species). Since then, the national rank of 206 species has changed. In total, 136 species were assigned an increased level of extinction risk, three species a reduced level of extinction risk, and 25 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 41 species were added to the list and one deleted. Most of the changes (76%) are due to criteria revision.

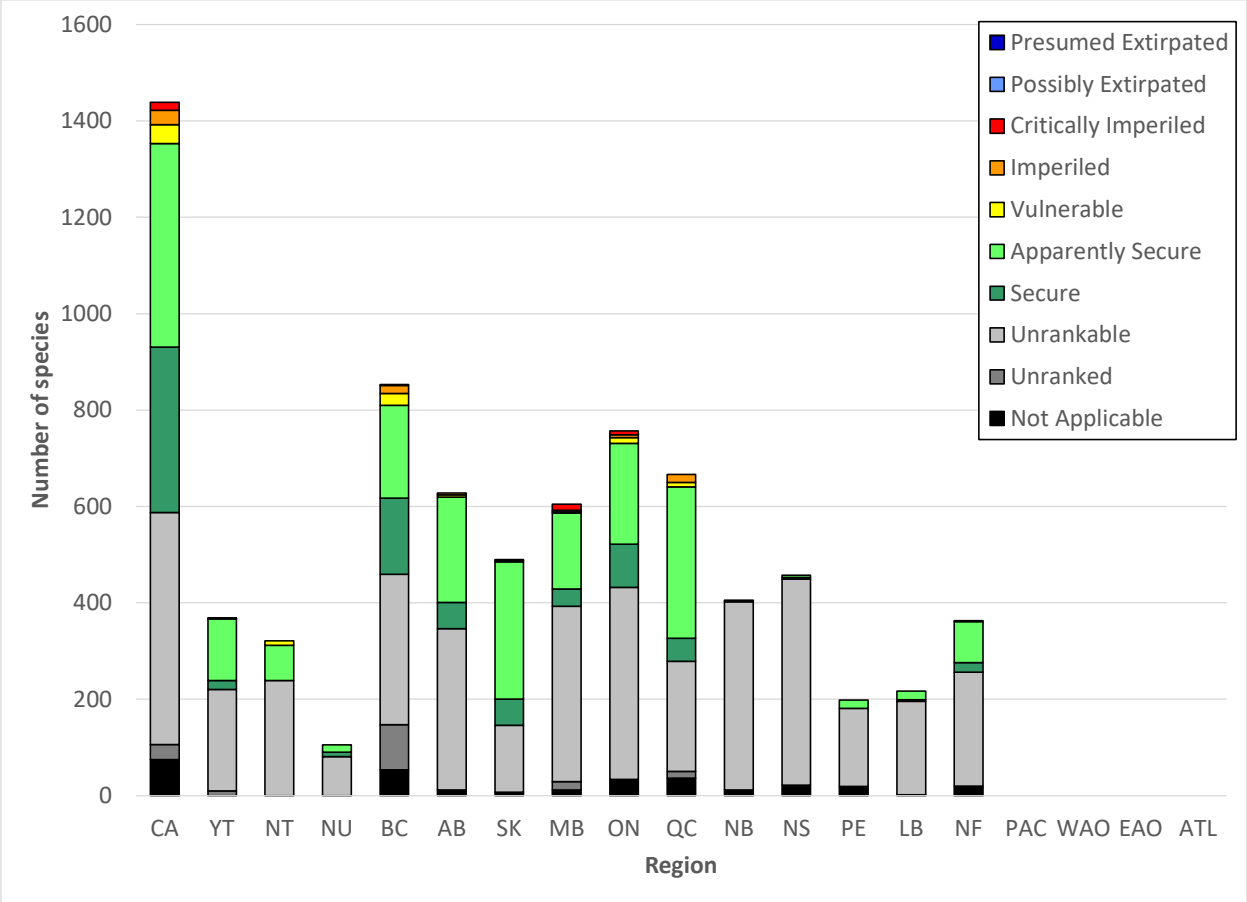


Figure 30. General status of spiders in Canada in 2020.

Springtails

***Entomobrya griseoolivata* © Alain Hogue**

Springtails are part of the phylum of the arthropods and refer to the class Collembola. Springtails are tiny arthropods that live in soil and leaf litter the world over, feeding on fungi, decaying plants, and microorganisms. Their bodies are segmented, 1-5 mm long, and they have three pairs of legs. While they regularly crawl, all species have a jumping structure which allows them to leap many times their body length to evade predation. Springtails are one of the earliest recorded terrestrial animals, dating back almost 400 million years, and one of the most widespread. Mating is indirect: males deposit sperm packets (spermatophores) for females to find and pick up. To increase the likelihood of their detection, some will aggregate in groups of up to millions of individuals. Males may try to entice females over their spermatophore, and some eat the spermatophores of other males to gain a competitive advantage. Females lay eggs in or on the ground, and leave them to their fate. The young moult 3-12 times to reach maturity, and continue moulting thereafter, alternating between feeding and reproductive stages. Some species are even active on snow, appearing as dark specks on the late winter snow, jumping and searching for pollen spores. These withstand extreme cold thanks to a protein that prevents ice crystallization, which may have applications for preserving human organs for transplantation. While in some instances they can be agricultural pests, springtails are ecologically and agriculturally valuable: they break down organic matter, enhance nutrient cycling, control pathogenic fungi such as those causing the damping-off disease, and are important food for mites and spiders.

There are 385 known species of springtails in Canada (Figure 31). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, none are vulnerable, 22 are apparently secure, none are secure, 318 are unrankable, 37 are unranked, and eight are not applicable. When only considering species from critically imperiled to secure, 100% are apparently secure or secure.

We did not identify any species that may be at risk in Canada. Among the known species of springtails, 377 are native to Canada and eight are exotic. On average, each species of springtails occurs in 2.2 regions in Canada. No species of springtails are considered migratory.

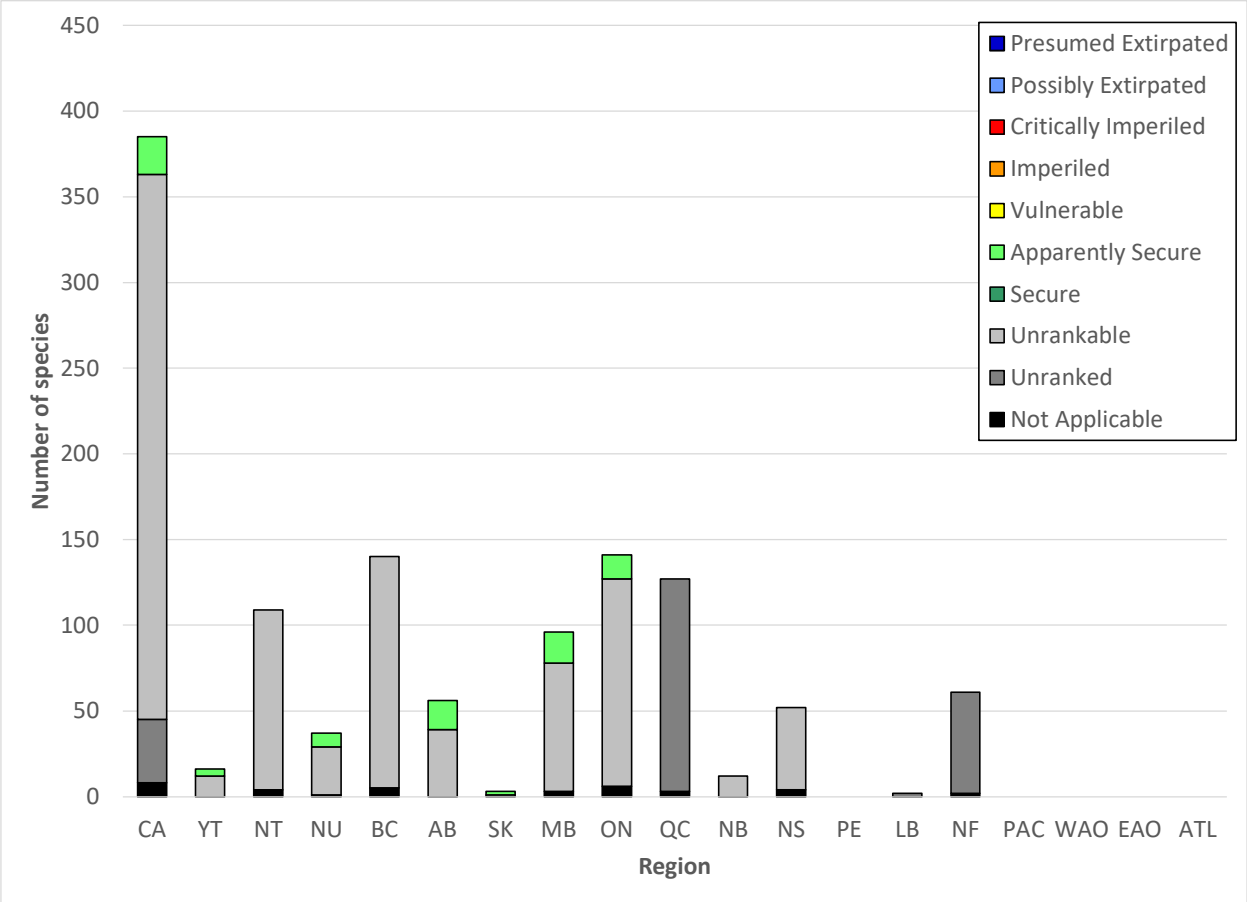


Figure 31. General status of springtails in Canada in 2020.

Mayflies

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

Mayflies are part of the phylum of the arthropods (class of the insects) and 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 the only insects that have an intermediary sub-adult winged life stage that lasts a few hours, called a subimago, which emerges from the water and moults finally into a sexually mature adult. 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 disperse and reproduce 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 of rivers, eutrophication, pollution, and climate change.

There are 342 known species of mayflies in Canada (Figure 32). Results of our assessments at the national level indicated that no species are presumed extirpated, three are possibly extirpated, two are critically imperiled, none are imperiled, one is vulnerable, 75 are apparently secure, five are secure, 220 are unrankable, 36 are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 96% are apparently secure or secure.

We identified five species of mayflies that may be at risk in Canada. Of these, one species has 100% of its range in Canada, and is thought to be endemic to Canada: Dark-winged Primitive Minnow Mayfly (*Parameletus croesus*). Furthermore, three of the species have an intermediate part of their range (11% to 74%) in Canada, and one has only a small part of its range (10% or less) in Canada. In total, four species have a high priority score (between 1 and 5).

Among the known species of mayflies, all are native to Canada. On average, each species of mayflies occurs in 3.7 regions in Canada. No species of mayflies are considered migratory.

All the mayflies were included in the *Wild Species* 2015 report (342 species). Since then, the national rank of 52 species has changed. In total, 17 species were assigned an increased level of extinction risk, no species a reduced level of extinction risk, and 31 species changed from or to the categories unrankable, unranked, or not applicable. In addition, two species were added to the list and two deleted. Most of the changes (67%) are due to criteria revision.

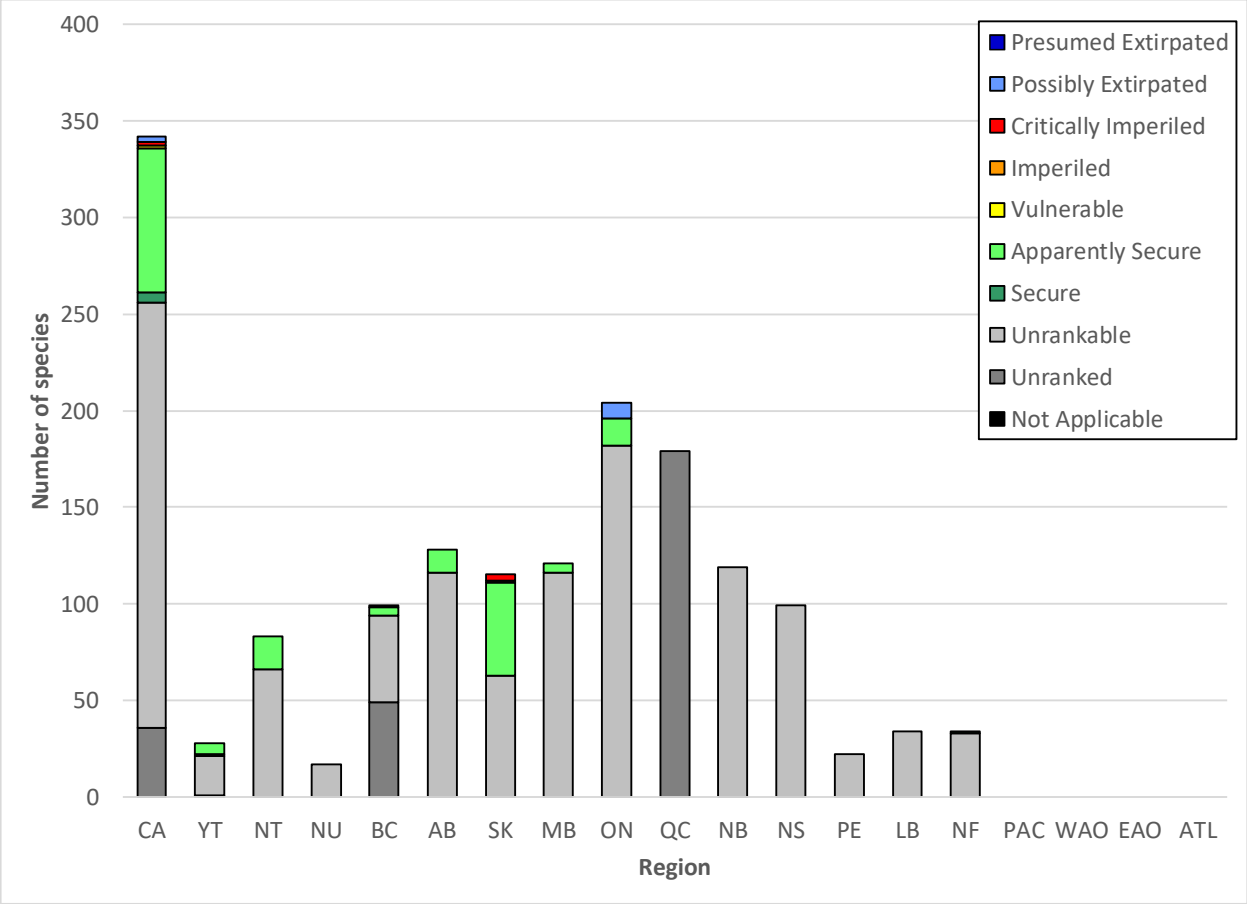


Figure 32. General status of mayflies in Canada in 2020.

Dragonflies and damselflies

Pygmy Snaketail (*Ophiogomphus howei*)
© Denis Doucet

Dragonflies and damselflies are part of the phylum of the arthropods (class of the insects) and 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 than damselflies; 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 may live and feed 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 219 known species of dragonflies and damselflies in Canada (Figure 33). Results of our assessments at the national level indicated that no species are presumed extirpated, one is possibly extirpated, nine are critically imperiled, 15 are imperiled, 24 are vulnerable, 40 are apparently secure, 116 are secure, two are unrankable, three are unranked, and nine are not applicable. When only considering species from critically imperiled to secure, 76% are apparently secure or secure.

We identified 25 species of dragonflies and damselflies that may be at risk in Canada. Of these, two species have an intermediate part of their range (11% to 74%) in Canada, and 23 have only a small part of their range (10% or less) in Canada. In total, no species have a high priority score (between 1 and 5).

Among the known species of dragonflies and damselflies, 216 are native to Canada and three are exotic. On average, each species of dragonflies and damselflies occurs in 5.3 regions in Canada. We also identified seven species of dragonflies and damselflies considered to be migratory.

All the dragonflies and damselflies were included in the *Wild Species* 2015 report (213 species). Since then, the national rank of 33 species has changed. In total, six species were assigned an increased level of extinction risk, 18 species a reduced level of extinction risk, and three species changed from or to

the categories unrankable, unranked, or not applicable. In addition, six species were added to the list and none deleted. Most of the changes (76%) are due to new information.

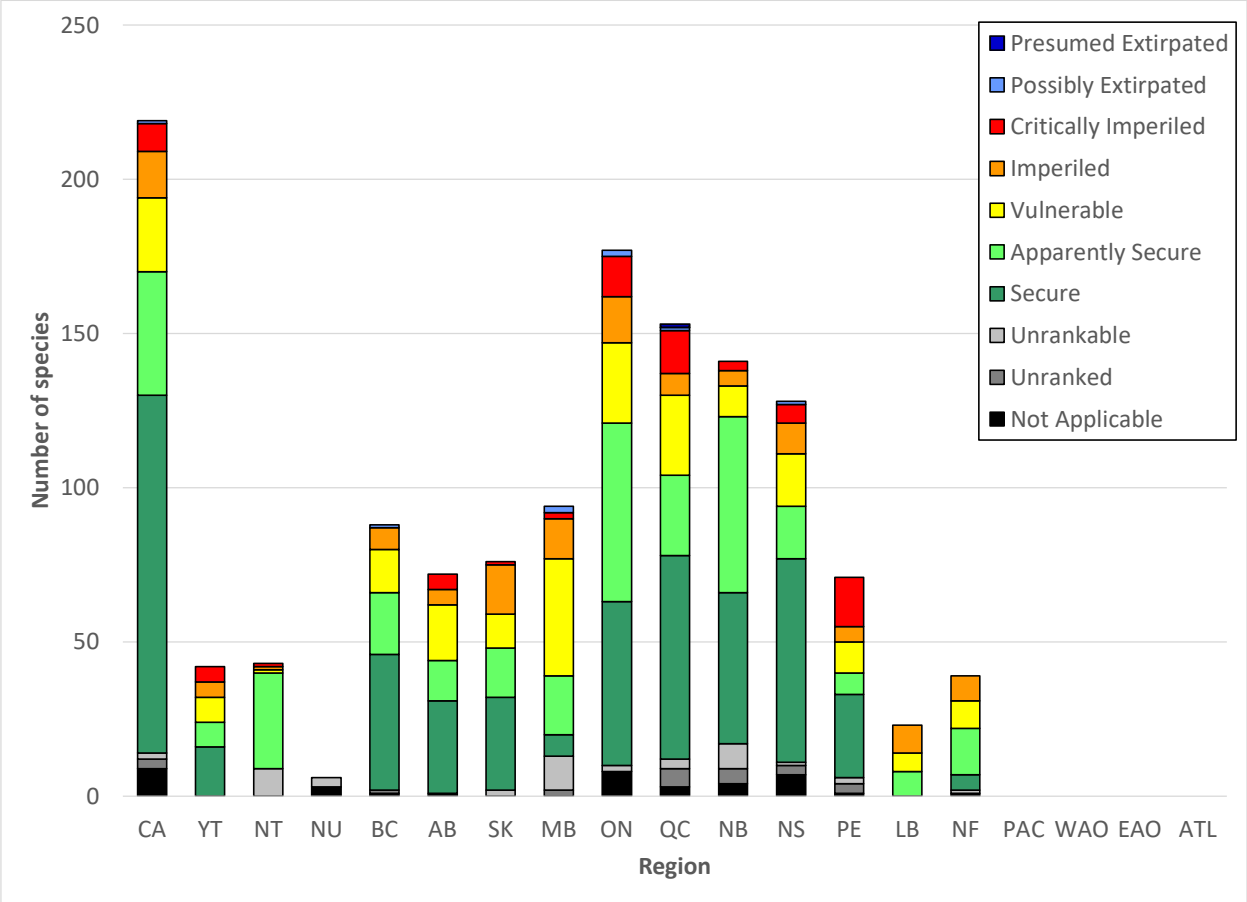


Figure 33. General status of dragonflies and damselflies in Canada in 2020.

Stoneflies

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

Stoneflies are part of the phylum of the arthropods (class of the insects) and 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. The diet varies among species, with some being herbivorous, and others omnivorous or strictly predatory. Adults have two pairs of translucent wings, though most are poor fliers. Adulthood is brief, and the majority of species do not feed at this stage of their life. 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 292 known species of stoneflies in Canada (Figure 34). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, two are imperiled, one is vulnerable, 82 are apparently secure, 31 are secure, 151 are unrankable, 25 are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 97% are apparently secure or secure.

We identified two species of stoneflies that may be at risk in Canada. Both species have an intermediate part of their range in Canada (11% to 74%). In total, no species have a high priority score (between 1 and 5).

Among the known species of stoneflies, all are native to Canada. On average, each species of stoneflies occurs in 3.1 regions in Canada. No species of stoneflies are considered migratory.

All the stoneflies were included in the *Wild Species* 2015 report (293 species). Since then, the national rank of 34 species has changed. In total, 13 species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and 17 species changed from or to the categories

unrankable, unranked, or not applicable. In addition, one species was added to the list and two deleted. Most of the changes (50%) are due to new information.

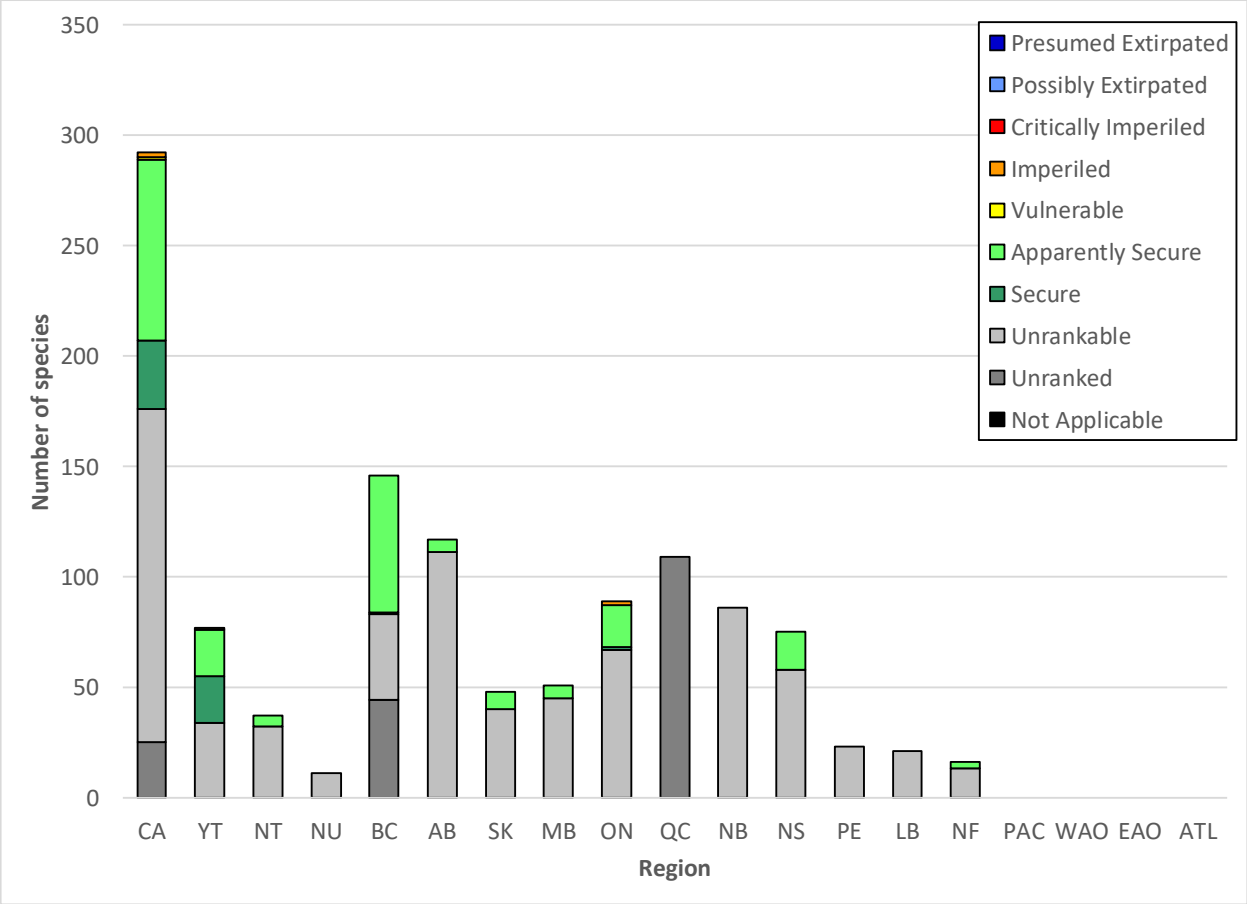


Figure 34. General status of stoneflies in Canada in 2020.

Grasshoppers and relatives

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

Grasshoppers and relatives are part of the phylum of the arthropods (class of the insects) and 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 hatch into nymphs that resemble small adults without wings. They moult successively as they grow until they become reproductive adults. Alongside mammals, grasshoppers are the greatest grazers of temperate grasslands. While some are major agricultural pests, others benefit humans 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 (which often resemble twigs) and mantis often have specialized habitat requirements. Earwigs, cockroaches and termites are often associated with human habitations. Economically important pest species are well studied in Canada, while other orthopteroids that occur in specialized habitats have not been surveyed in many regions. Threats include habitat loss and alteration and pesticides.

There are 271 known species of grasshoppers and relatives in Canada (Figure 35). Results of our assessments at the national level indicated that one species is presumed extirpated, seven are possibly extirpated, 11 are critically imperiled, 16 are imperiled, 21 are vulnerable, 62 are apparently secure, 98 are secure, 17 are unrankable, none are unranked, and 38 are not applicable. When only considering species from critically imperiled to secure, 77% are apparently secure or secure.

We identified 35 species of grasshoppers and relatives that may be at risk in Canada. Of these, one species has 100% of its range in Canada, and is thought to be endemic to Canada: Gaspésie Grasshopper (*Melanoplus gaspesiensis*). Furthermore, eight of the species have an intermediate part of their range (11% to 74%) in Canada, and 26 have only a small part of their range (10% or less) in Canada. In total, four species have a high priority score (between 1 and 5).

Among the known species of grasshoppers and relatives, 241 are native to Canada and 30 are exotic. On average, each species of grasshoppers and relatives occurs in 3.4 regions in Canada. No species of grasshoppers and relatives are considered migratory.

All the grasshoppers and relatives were included in the *Wild Species* 2015 report (269 species). Since then, the national rank of 57 species has changed. In total, 37 species were assigned an increased level of extinction risk, six species a reduced level of extinction risk, and eight species changed from or to the categories unrankable, unranked, or not applicable. In addition, four species were added to the list and two deleted. Most of the changes (47%) are due to criteria revision.

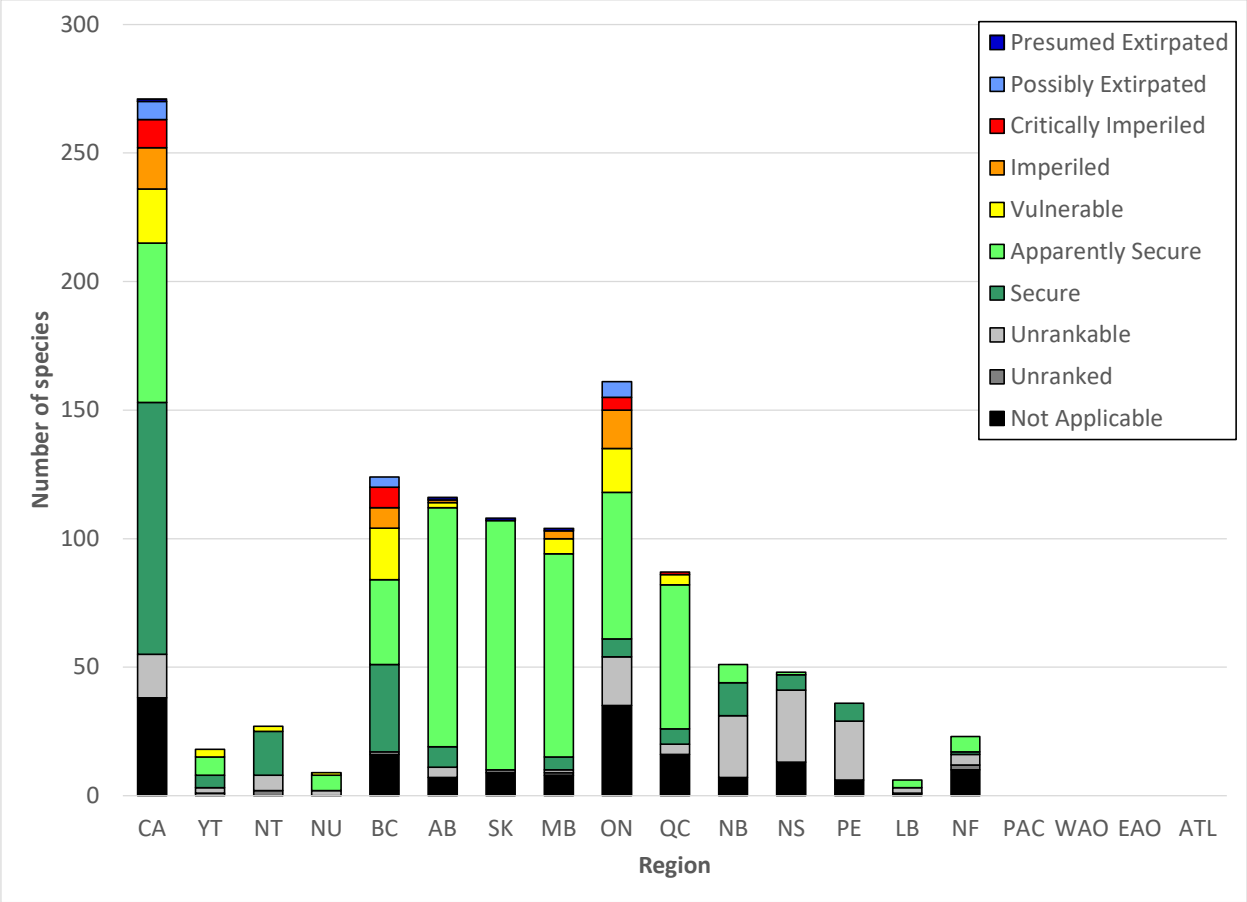


Figure 35. General status of grasshoppers and relatives in Canada in 2020.

True bugs

***Perillus exaptus* © Karl Hillig**

True bugs are part of the phylum of the arthropods (class of the insects) and refer to the order Hemiptera. They are a diverse group, ranging from bed bugs to cicadas. Some cicadas may live for many years as larvae underground, and then emerge as adults that can produce among the loudest sounds of any insects during the warm days of summer. True bugs have a characteristic first pair of wings that are partially rigid and membranous. They typically have long antennae, tiny pores (spiracles) in their abdomen through which they breathe, and tube-like mouthparts for their liquid (or liquified) diets. Many species inject enzymes into their food to start the digestive process externally prior to feeding. Most feed on plants and several (including many aphids) are considered as crop pests in Canada. Some are predators, such as assassin bugs which stalk their prey, stab them with toxic saliva, and suck out their bodily fluids; or giant water bugs which hunt small fishes and crustaceans. Bed bugs are a parasitic form of true bugs that feed on the blood of humans and other vertebrates. They can survive for months without food, and their infestations are increasing worldwide. True bugs have an incomplete metamorphosis: the young, called nymphs, look similar to adults, and the resemblance increases as they undergo successive moults to maturity. Reproduction is varied. Mating can include courtship dancing and copulation (which may last for hours). Traumatic insemination, wherein the male bypasses the female's genitalia to penetrate her body wall, is common in bed bugs. The eggs of some species can develop without fertilization by males; and some groups give birth to live young.

There are 4 007 known species of true bugs in Canada (Figure 36). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, 12 are critically imperiled, 50 are imperiled, 94 are vulnerable, 727 are apparently secure, 351 are secure, 1 777 are unrankable, 553 are unranked, and 443 are not applicable. When only considering species from critically imperiled to secure, 87% are apparently secure or secure.

We identified 62 species of true bugs that may be at risk in Canada. Of these, three species have 100% of their range in Canada, and are thought to be endemic to Canada: *Athysanella resusca*, *Attenuipyga joyceae*, and *Sagatus flavalis*. Furthermore, four of the species have an intermediate part of their range (11% to 74%) in Canada, and 55 have only a small part of their range (10% or less) in Canada. In total, four species have a high priority score (between 1 and 5).

Among the known species of true bugs, 3 564 are native to Canada and 443 are exotic. On average, each species of true bugs occurs in 3.3 regions in Canada. No species of true bugs are considered migratory.

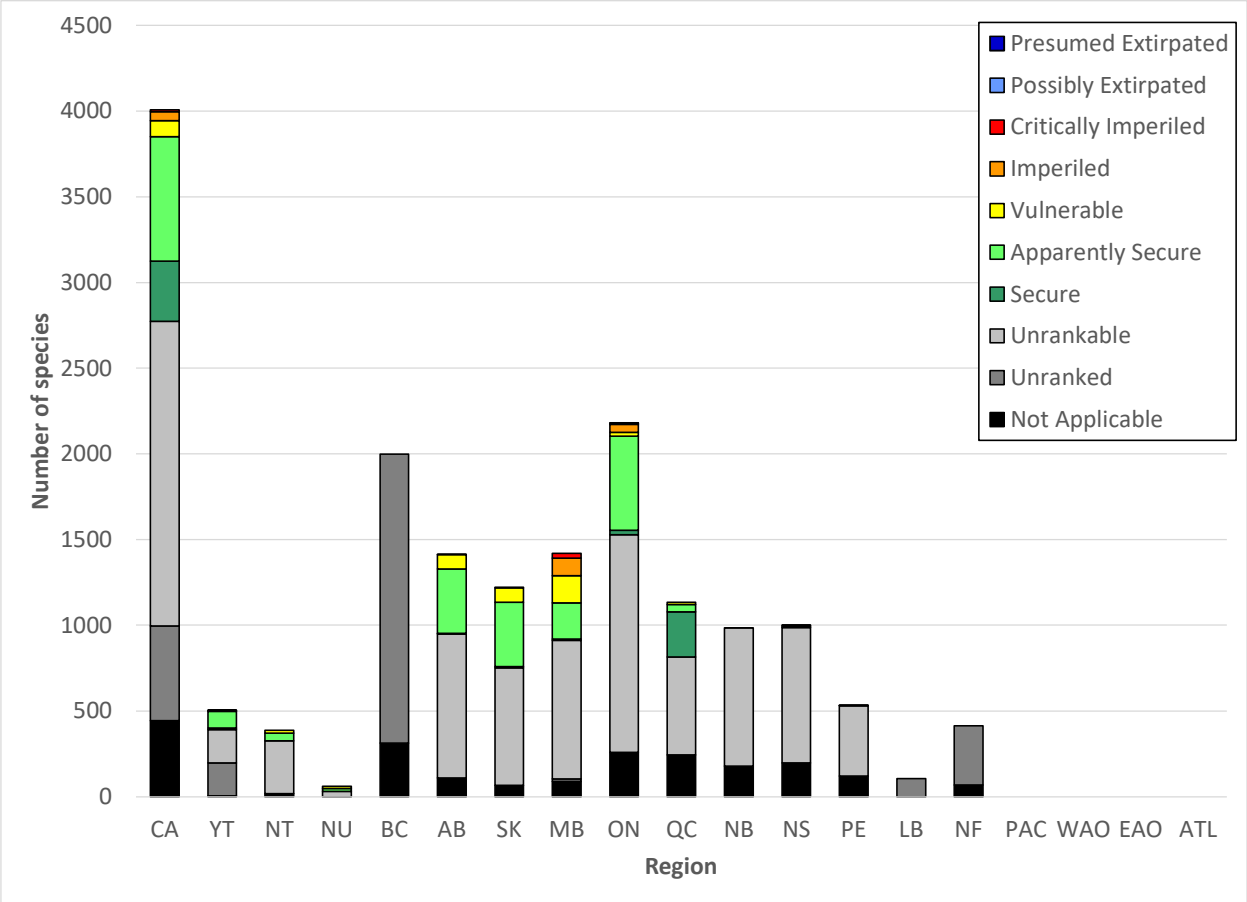


Figure 36. General status of true bugs in Canada in 2020.

Lacewings

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

Lacewings are part of the phylum of the arthropods (class of the insects) and 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 providing some protection from predators – which may include newly-emerged siblings from adjacent eggs. Most larvae are predaceous and several species help agricultural production by hunting aphids, mites and scales. Neuroptera 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. Pesticides probably affect them. However, the limited knowledge of their biology and distribution makes it difficult to assess their threats or conservation status.

There are 102 known species of lacewings in Canada (Figure 37). Results of our assessments at the national level indicated that no species are presumed extirpated, one is possibly extirpated, one is critically imperiled, three are imperiled, two are vulnerable, 14 are apparently secure, four are secure, 53 are unrankable, 18 are unranked, and six are not applicable. When only considering species from critically imperiled to secure, 75% are apparently secure or secure.

We identified five species of lacewings that may be at risk in Canada. Of these, two species have an intermediate part of their range (11% to 74%) in Canada, and three have only a small part of their range (10% or less) in Canada. In total, one species has a high priority score (between 1 and 5).

Among the known species of lacewings, 96 are native to Canada and six are exotic. On average, each species of lacewings occurs in 4.0 regions in Canada. No species of lacewings are considered migratory.

All the lacewings were included in the *Wild Species* 2015 report (101 species). Since then, the national rank of five species has changed. In total, one species was assigned an increased level of

extinction risk, no species a reduced level of extinction risk, and three species changed from or to the categories unrankable, unranked, or not applicable. In addition, one species was added to the list and none deleted. Most of the changes (80%) are due to new information.

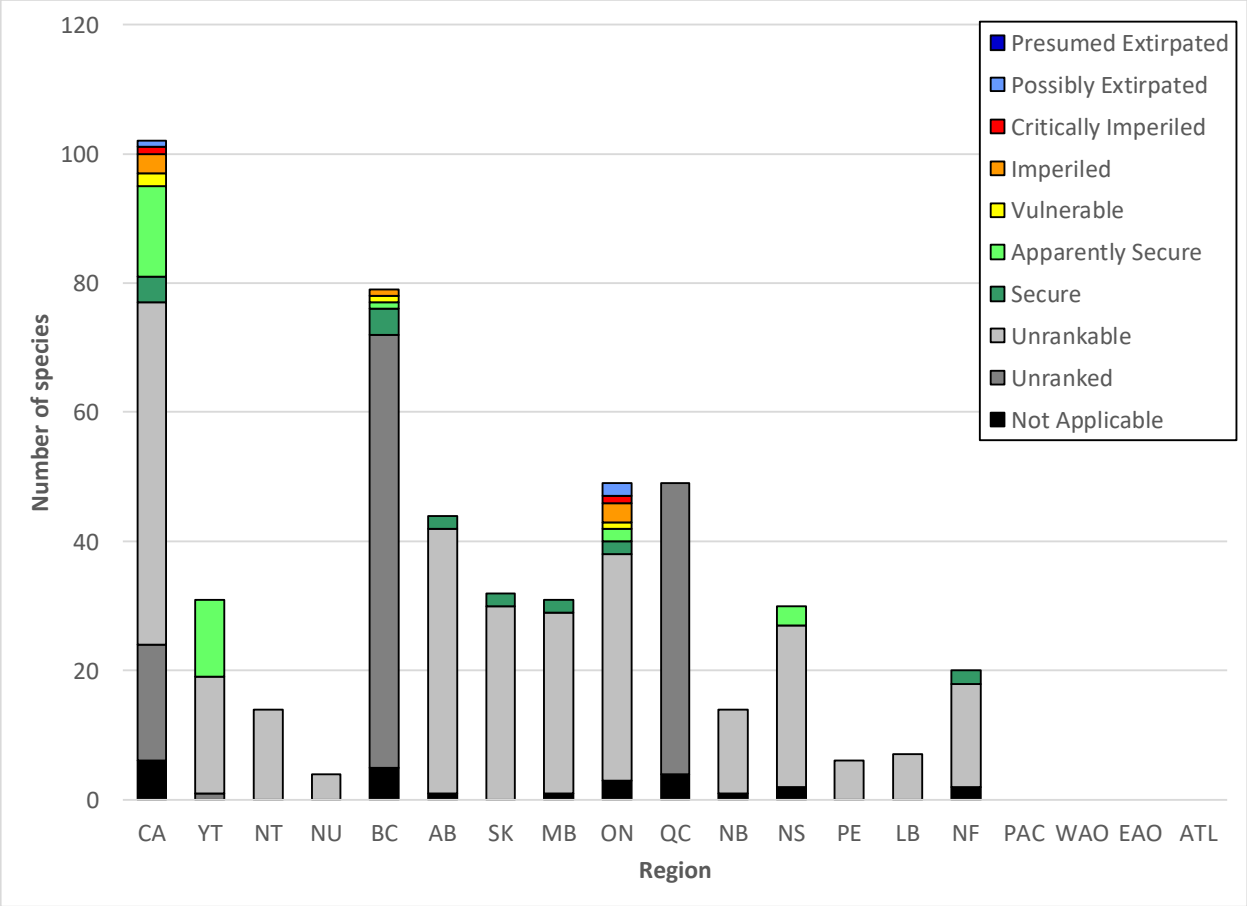


Figure 37. General status of lacewings in Canada in 2020.

Beetles

Cobblestone Tiger Beetle (*Cicindela marginipennis*)
© Henri Goulet

Beetles are part of the phylum of the arthropods (class of the insects) and refer to the order Coleoptera. Beetles are an extremely diverse order of insects that make up about 25% of all known 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 help to break down carcasses and excrement, 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 8 238 known species of beetles in Canada (Figure 38). Results of our assessments at the national level indicated that no species are presumed extirpated, 21 are possibly extirpated, 97 are critically imperiled, 77 are imperiled, 324 are vulnerable, 1 841 are apparently secure, 1 729 are secure, 3 450 are unrankable, 25 are unranked, and 674 are not applicable. When only considering species from critically imperiled to secure, 88% are apparently secure or secure.

We identified 195 species of beetles that may be at risk in Canada. Of these, 13 species have 75% or more of their range in Canada, including 12 species that are thought to be endemic to Canada: Prickly Minute Seed Weevil (*Asperosoma echinatum*), Autumnal Round Fungus Beetle (*Hydnobius autumnalis*), Brownish Minute Rove Beetle (*Lypoglossa manitobae*), Calcareous Round Fungus Beetle (*Macrohydnobius tibiocalcaris*), Vockeroth's Spiny-legged Rove Beetle (*Mitosynum vockerothi*), Graham Island Gazelle Beetle (*Nebria charlottae*), Louise Island Gazelle Beetle (*Nebria louiseae*), Relict Ocellate Rove Beetle (*Omalonomus relictus*), Arctic Flea Beetle (*Ophraella arctica*), Naked Flea Beetle (*Ophraella nuda*), Bert's Predaceous Diving Beetle (*Sanfilippodytes bertae*), Sable Island Flea Beetle (*Tricholochmaea sablensis*). Furthermore, 35 of the species have an intermediate part of their range (11% to 74%) in Canada, and 147

have only a small part of their range (10% or less) in Canada. In total, 24 species have a high priority score (between 1 and 5).

Among the known species of beetles, 7 565 are native to Canada and 673 are exotic. On average, each species of beetles occurs in 3.8 regions in Canada. No species of beetles are considered migratory.

All the beetles were included in the *Wild Species* 2015 report (7 963 species). Since then, the national rank of 1 118 species has changed. In total, 363 species were assigned an increased level of extinction risk, 47 species a reduced level of extinction risk, and 391 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 296 species were added to the list and 21 deleted. Most of the changes (51%) are due to new information.

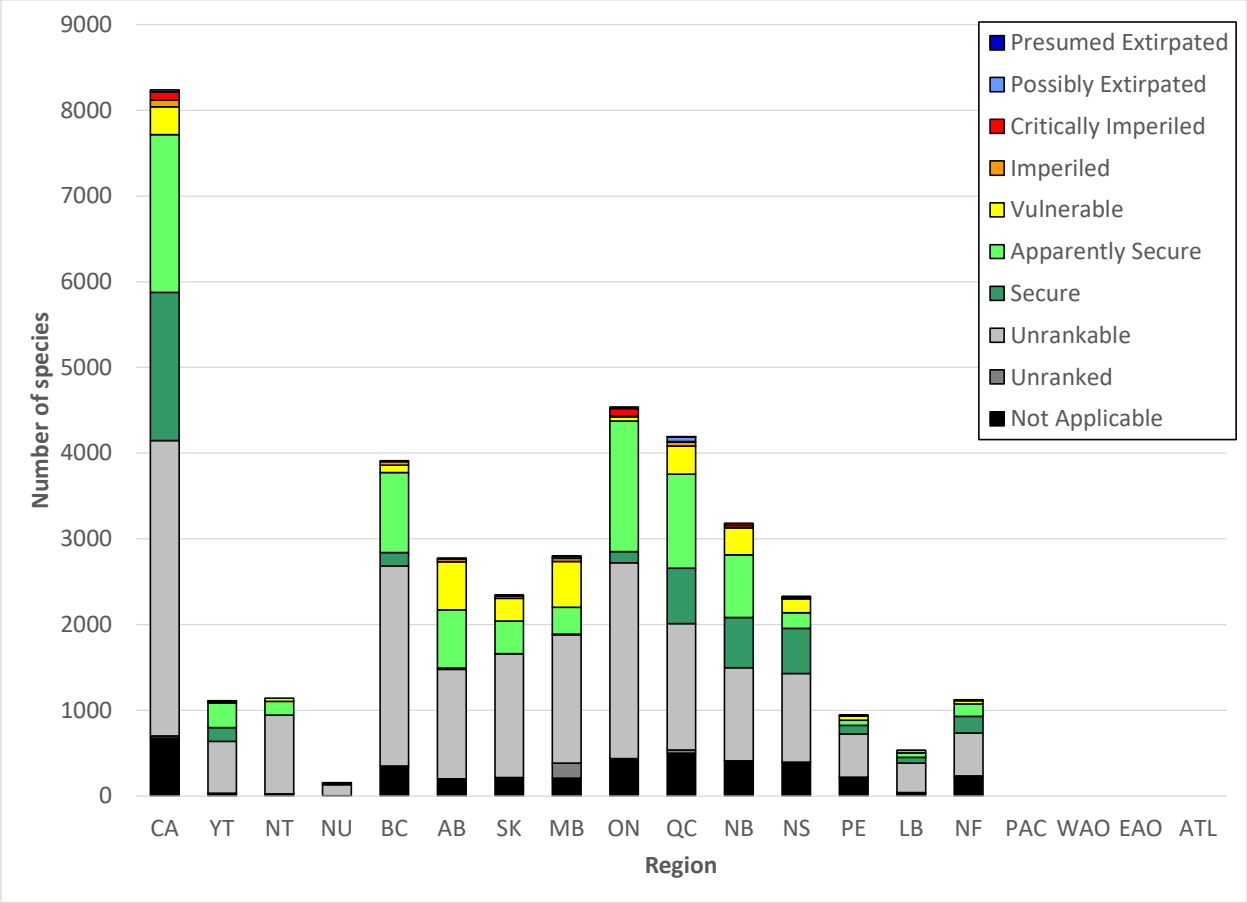


Figure 38. General status of beetles in Canada in 2020.

Sawflies

***Sirex areolatus* © Tom Murray**

Sawflies are part of the phylum of the arthropods (class of the insects) and refer to the suborder Symphyta in the order Hymenoptera. Sawflies are insects in the order Hymenoptera, which also includes wasps, bees, and ants. They have two pairs of wings and resemble stout-bodied wasps, lacking the abdominal constriction present in most of their relatives. Though it gives the impression of a stinger, the saw-like appendage is an ovipositor that females use to cut into plants and lay their eggs. While a few species feed on insects, most adults and all larvae are herbivorous. Sawflies are generally host-specific, feeding and living on one plant species. They do not typically cause excessive damage, though notable pests include the species *Neodiprion sertifer*, *Pristiphora erichsonii*, and *Cephus cinctus*, the later being one of most significant insect pests on wheat. Predators of sawflies include parasitic wasps, birds, small mammals, and beetles. Sawflies undergo complete metamorphosis (egg, larva, pupa, adult). Pheromones guide males and females to each other to mate, though the females of some species can reproduce without males. Larvae resemble caterpillars but are smooth and hairless (or almost so). They generally feed together, and repel predators by vomiting a foul-smelling liquid en masse when disturbed. Some individuals opt out of regurgitating – it uses considerable energy, and hampers growth and survival if done frequently. These “cheaters” benefit from their siblings’ energy expenditures, providing researchers with interesting subjects to study the evolution of cooperation.

There are 702 known species of sawflies in Canada (Figure 39). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, one is vulnerable, 84 are apparently secure, none are secure, 459 are unrankable, 98 are unranked, and 60 are not applicable. When only considering species from critically imperiled to secure, 99% are apparently secure or secure.

We did not identify any species that may be at risk in Canada. Among the known species of sawflies, 642 are native to Canada and 60 are exotic. On average, each species of sawflies occurs in 3.8 regions in Canada. No species of sawflies are considered migratory.

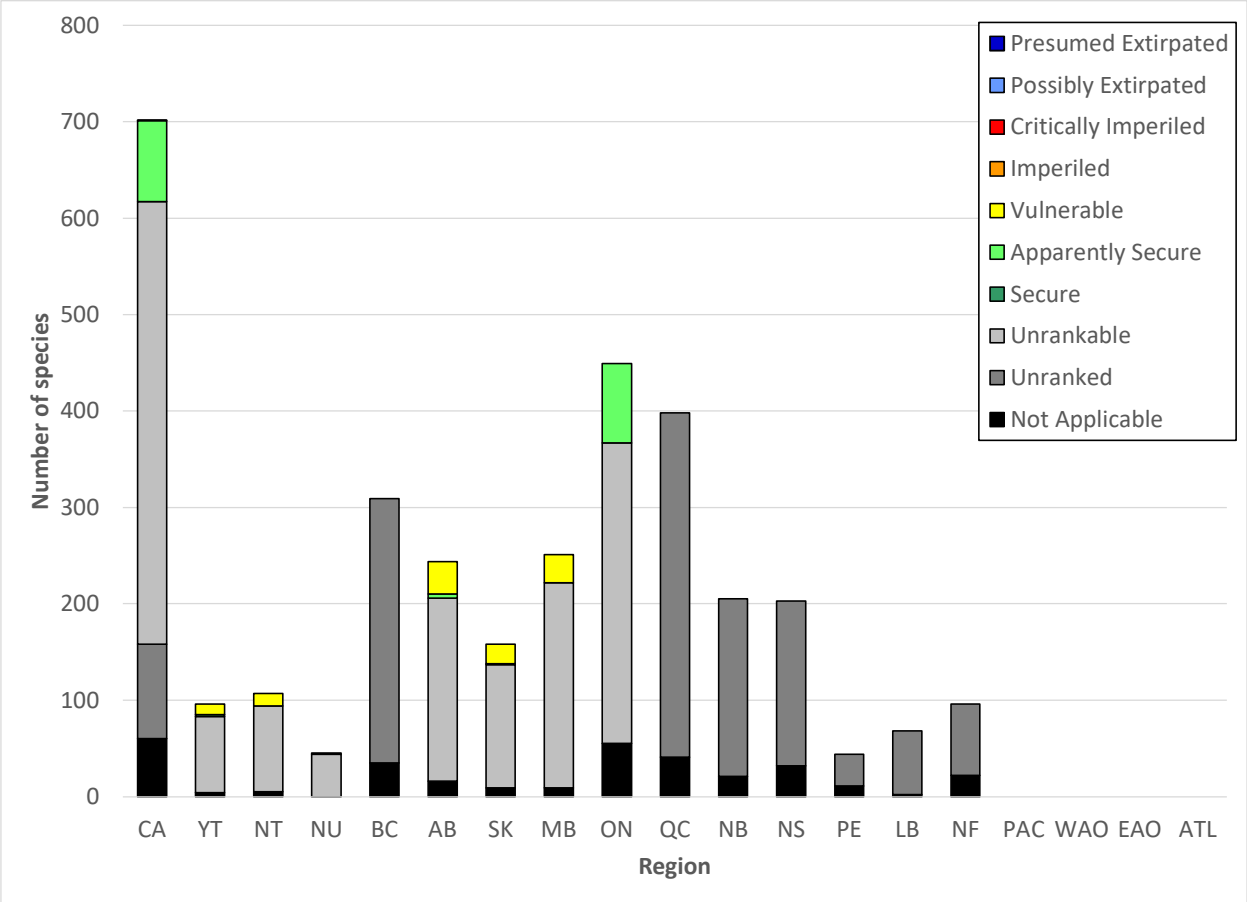


Figure 39. General status of sawflies in Canada in 2020.

Ants

Enviable Ant (*Manica invidia*) © Sean McCann

Ants are part of the phylum of the arthropods (class of the insects) and refer to the family Formicidae in the order Hymenoptera. 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. 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 (genus *Stigmatomma*) have the unique and rather disturbing habit of feeding 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. Some species are threatened by habitat loss and competition from invasive species.

There are 205 known species of ants in Canada (Figure 40). Results of our assessments at the national level indicated that no species are presumed extirpated, three are possibly extirpated, none are critically imperiled, none are imperiled, five are vulnerable, 22 are apparently secure, 113 are secure, 47 are unrankable, none are unranked, and 15 are not applicable. When only considering species from critically imperiled to secure, 96% are apparently secure or secure.

We identified three species of ants that may be at risk in Canada. All three species have only a small part of their range in Canada (10% or less). In total, no species have a high priority score (between 1 and 5).

Among the known species of ants, 190 are native to Canada and 15 are exotic. On average, each species of ants occurs in 3.5 regions in Canada. No species of ants are considered migratory.

All the ants were included in the *Wild Species* 2015 report (212 species). Since then, the national rank of 26 species has changed. In total, nine species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and five species changed from or to the categories

unrankable, unranked, or not applicable. In addition, two species were added to the list and nine deleted. Most of the changes (62%) are due to new information.

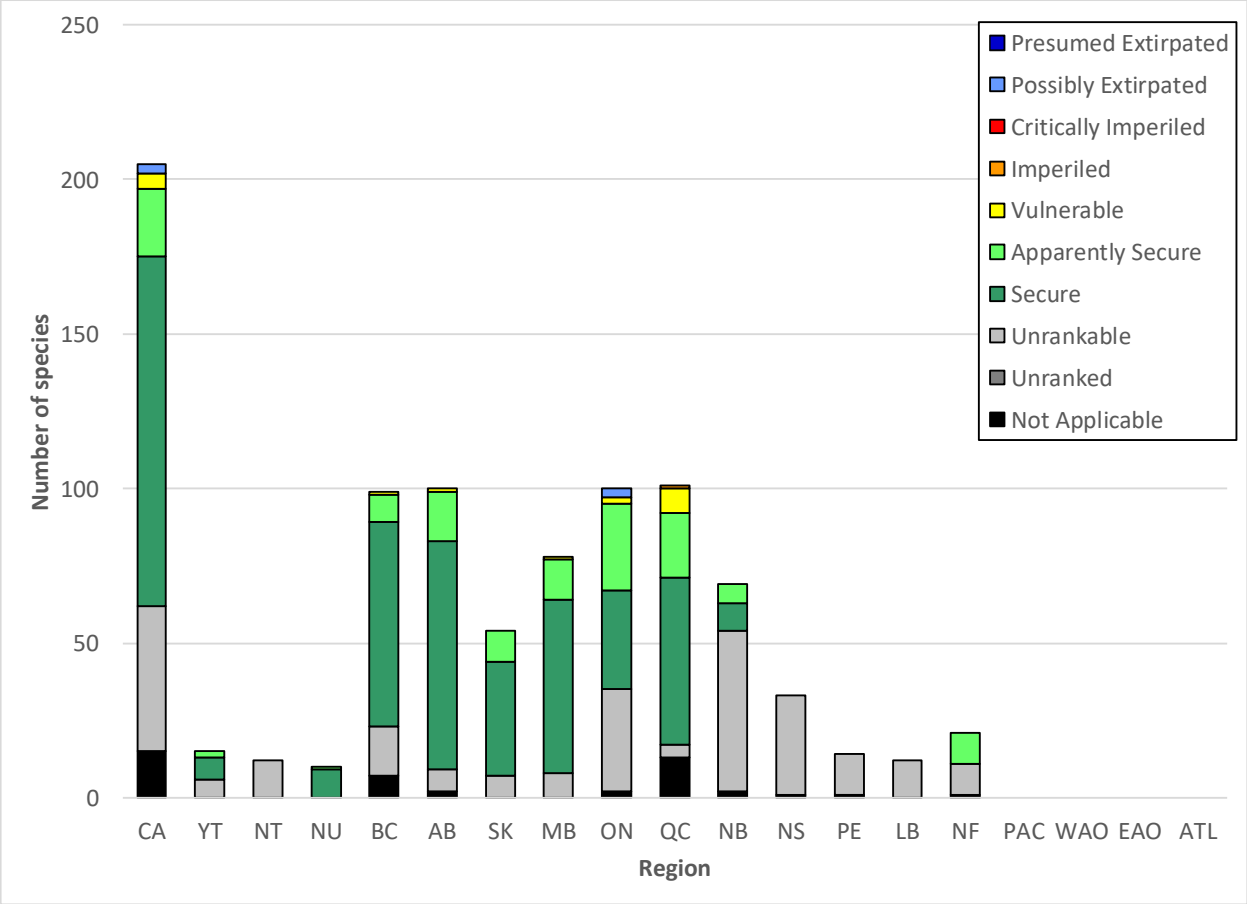


Figure 40. General status of ants in Canada in 2020.

Bees

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

Bees are part of the phylum of the arthropods (class of the insects) and refer to the clade Anthophila in the order Hymenoptera. Bees have a furry body with two pairs of wings, and feed entirely on flowers as both larvae and adults. They can have varied social systems, ranging from simple shared nests to complex societies with division of labour. However, most are solitary, 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 pollinators; 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 the European Honey Bee (*Apis mellifera*), there is increased interest in the role of 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 903 known species of bees in Canada (Figure 41). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, four are critically imperiled, 11 are imperiled, 16 are vulnerable, 67 are apparently secure, 186 are secure, 590 are unrankable, five are unranked, and 24 are not applicable. When only considering species from critically imperiled to secure, 89% are apparently secure or secure.

We identified 15 species of bees that may be at risk in Canada. Of these, two species have 100% of their range in Canada, and are thought to be endemic to Canada: Sable Island Sweat Bee (*Lasioglossum sablense*), and Yukon Sweat Bee (*Lasioglossum yukonae*). Furthermore, three of the species have an intermediate part of their range (11% to 74%) in Canada, and 10 have only a small part of their range (10% or less) in Canada. In total, two species have a high priority score (between 1 and 5).

Among the known species of bees, 879 are native to Canada and 24 are exotic. On average, each species of bees occurs in 3.5 regions in Canada. No species of bees are considered migratory.

All the bees were included in the *Wild Species* 2015 report (805 species). Since then, the national rank of 371 species has changed. In total, 19 species were assigned an increased level of extinction risk,

30 species a reduced level of extinction risk, and 204 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 108 species were added to the list and 10 deleted. Most of the changes (95%) are due to new information.

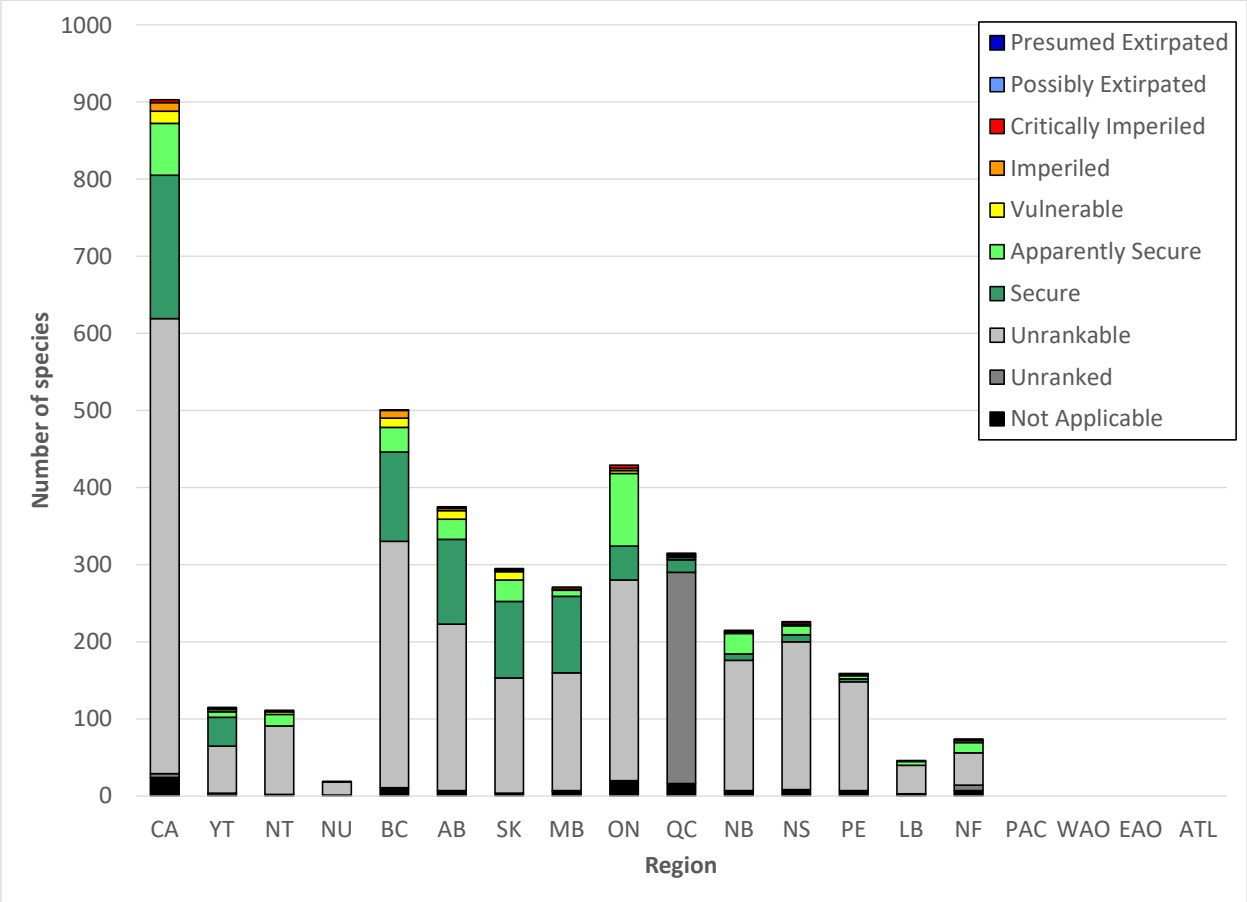


Figure 41. General status of bees in Canada in 2020.

Yellowjackets and relatives

Eastern Yellowjacket (*Vespula maculifrons*)
© Jeffrey L. Moore

Yellowjackets and relatives are part of the phylum of the arthropods (class of the insects) and refer to the family Vespidae in the order Hymenoptera. The vespids are a diverse family of wasps that include social species forming colonies (e.g. yellowjackets, hornets, paper wasps), as well as solitary species. 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 some bees, wasps can sting repeatedly, though most species rarely sting people. They benefit humans by providing significant biocontrol of agricultural pests. Most species provision their young with immature insects. 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 105 known species of yellowjackets and relatives in Canada (Figure 42). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, 12 are critically imperiled, 21 are imperiled, 15 are vulnerable, 13 are apparently secure, 24 are secure, six are unrankable, none are unranked, and 14 are not applicable. When only considering species from critically imperiled to secure, 44% are apparently secure or secure.

We identified 33 species of yellowjackets and relatives that may be at risk in Canada. Of these, four species have an intermediate part of their range (11% to 74%) in Canada, and 29 have only a small part of their range (10% or less) in Canada. In total, no species have a high priority score (between 1 and 5).

Among the known species of yellowjackets and relatives, 98 are native to Canada and seven are exotic. On average, each species of yellowjackets and relatives occurs in 4.7 regions in Canada. No species of yellowjackets and relatives are considered migratory.

All the yellowjackets and relatives were included in the *Wild Species* 2015 report (101 species). Since then, the national rank of nine species has changed. In total, three species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and one species changed

from or to the categories unrankable, unranked, or not applicable. In addition, four species were added to the list and none deleted. Most of the changes (67%) are due to new information and criteria revision.

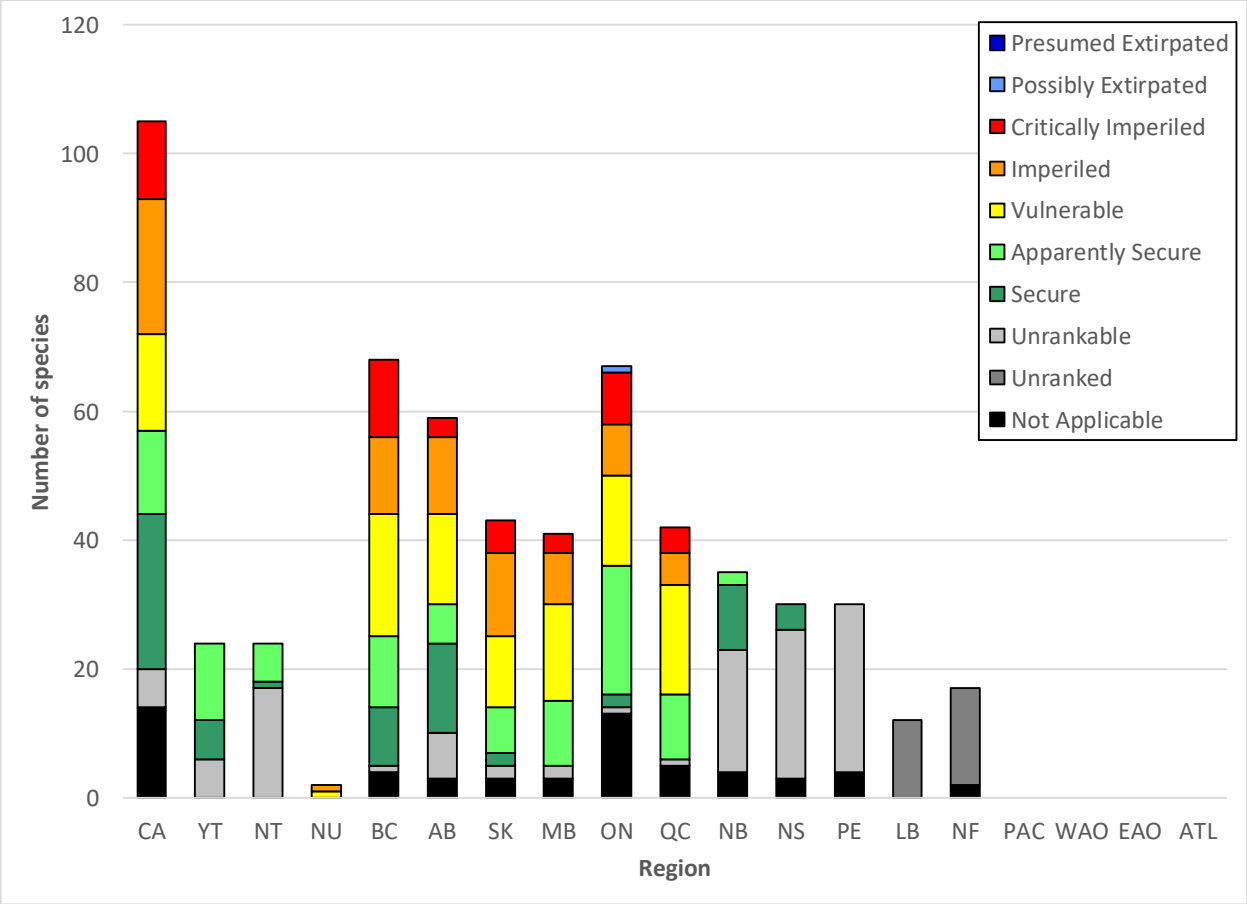


Figure 42. General status of yellowjackets and relatives in Canada in 2020.

Caddisflies

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

Caddisflies are part of the phylum of the arthropods (class of the insects) and 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 species at the larval stage 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 mountain streams.

There are 679 known species of caddisflies in Canada (Figure 43). Results of our assessments at the national level indicated that no species are presumed extirpated, three are possibly extirpated, none are critically imperiled, none are imperiled, two are vulnerable, 159 are apparently secure, 64 are secure, 406 are unrankable, 45 are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 99% are apparently secure or secure.

We identified three species of caddisflies that may be at risk in Canada. Of these, one species has 100% of its range in Canada, and is thought to be endemic to Canada: Ottawa Little Caddisfly (*Neophylax ottawa*). Furthermore, two of the species have an intermediate part of their range (11% to 74%) in Canada. In total, three species have a high priority score (between 1 and 5).

Among the known species of caddisflies, all are native to Canada. On average, each species of caddisflies occurs in 3.8 regions in Canada. No species of caddisflies are considered migratory.

All the caddisflies were included in the *Wild Species* 2015 report (688 species). Since then, the national rank of 83 species has changed. In total, 45 species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and 20 species changed from or to the categories unrankable, unranked, or not applicable. In addition, four species were added to the list and 13 deleted. Most of the changes (54%) are due to criteria revision.

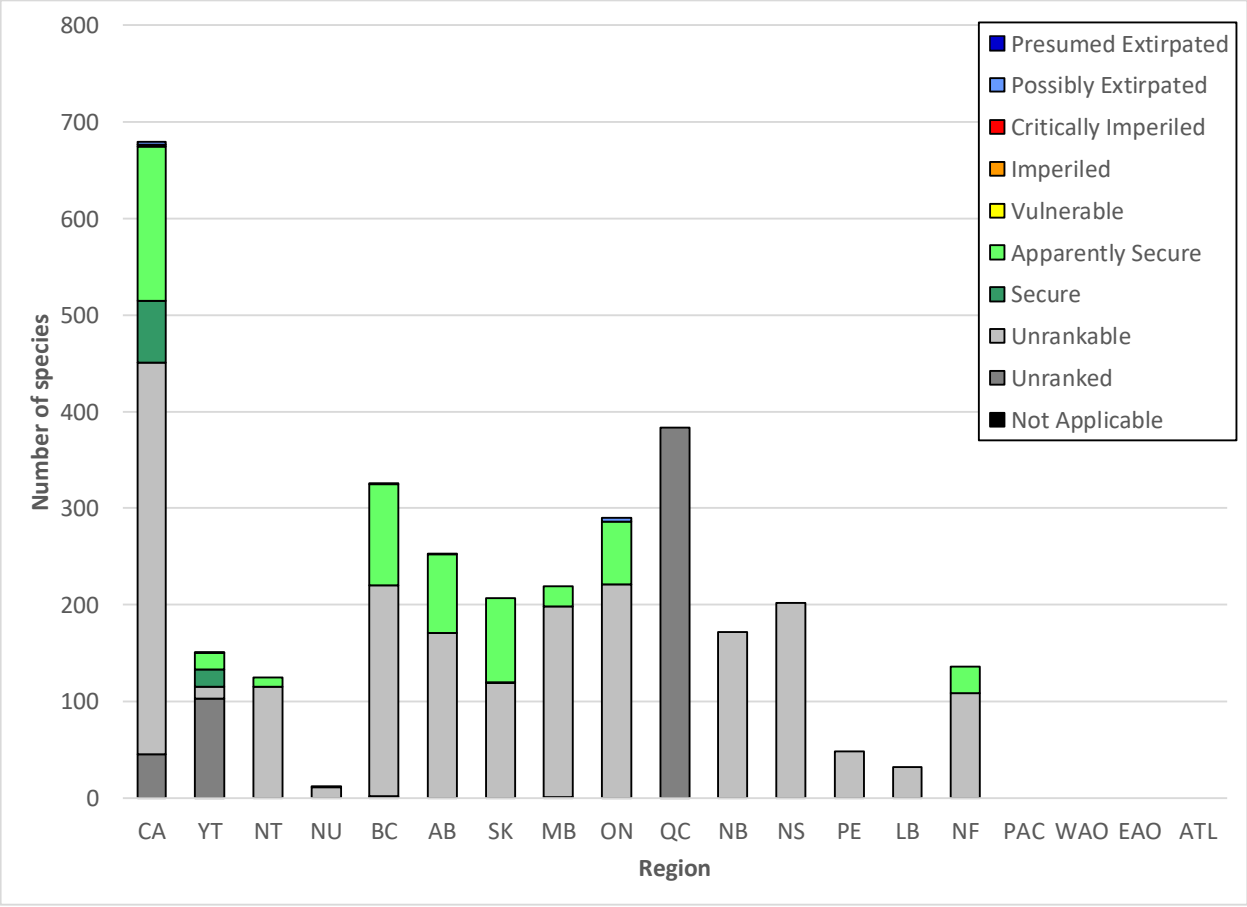


Figure 43. General status of caddisflies in Canada in 2020.

Moths and butterflies

***Papilio canadensis* © Rémi Hébert**

Moths and butterflies are part of the phylum of the arthropods (class of the insects) and 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 larvae (i.e. caterpillars), which eat voraciously and moult their skin as they grow. 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 other 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 5 430 known species of moths and butterflies in Canada (Figure 44). Results of our assessments at the national level indicated that two species are presumed extirpated, three are possibly extirpated, 47 are critically imperiled, 136 are imperiled, 448 are vulnerable, 1 336 are apparently secure, 1 704 are secure, 1 426 are unrankable, 34 are unranked, and 294 are not applicable. When only considering species from critically imperiled to secure, 83% are apparently secure or secure.

We identified 188 species of moths and butterflies that may be at risk in Canada. Of these, 16 species have 75% or more of their range in Canada, including 13 species that are thought to be endemic to Canada: *Agrotis arenarius*, *Animomyia hardwicki*, *Chelis lafontainei*, *Coenonympha nipisiquit*, *Colias johanseni*, *Dodia verticalis*, *Eucosma sableana*, *Euxoa muldersi*, *Euxoa unica*, *Lasionycta haida*, *Lasionycta macleani*, *Schinia verna*, and *Xanthorhoe clarkeata*. Furthermore, 28 of the species have an intermediate part of their range (11% to 74%) in Canada, and 144 have only a small part of their range (10% or less) in Canada. In total, 23 species have a high priority score (between 1 and 5).

Among the known species of moths and butterflies, 5 222 are native to Canada and 208 are exotic. On average, each species of moths and butterflies occurs in 4.3 regions in Canada. We also identified 19 species of moths and butterflies considered to be migratory.

All the moths and butterflies were included in the *Wild Species* 2015 report (5 257 species). Since then, the national rank of 3 283 species has changed. In total, 84 species were assigned an increased level of extinction risk, 193 species a reduced level of extinction risk, and 2 765 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 207 species were added to the list and 34 deleted. Most of the changes (96%) are due to new information.

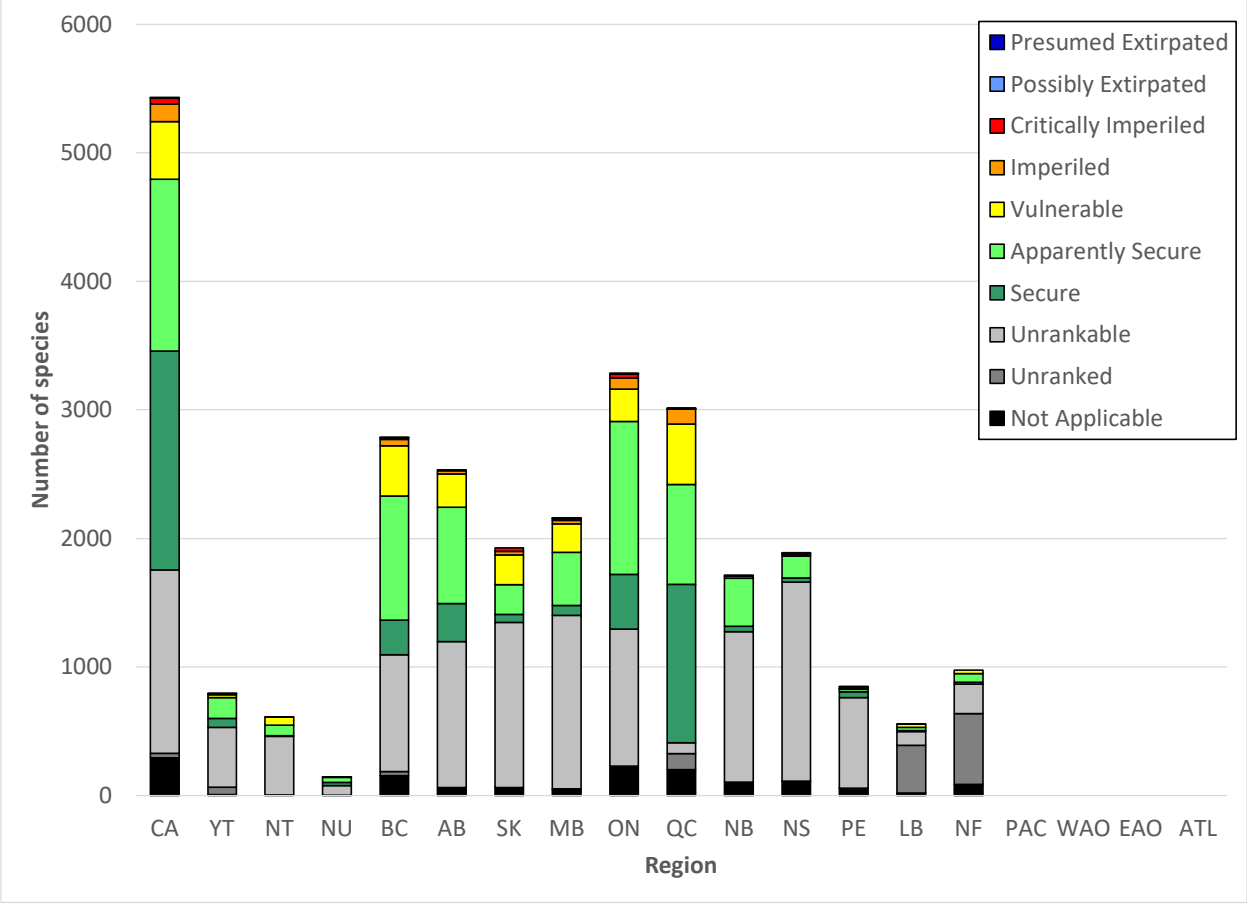


Figure 44. General status of moths and butterflies in Canada in 2020.

Scorpionflies

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

Scorpionflies are part of the phylum of the arthropods (class of the insects) and refer to the order Mecoptera. Scorpionflies are insects with long, downward-facing beaks, 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 manoeuver 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 insects, fungi, 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 45). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, three are critically imperiled, none are imperiled, two are vulnerable, 10 are apparently secure, two are secure, eight are unrankable, none are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 71% are apparently secure or secure.

We identified three species of scorpionflies that may be at risk in Canada. Of these, one species has 100% of its range in Canada, and is thought to be endemic to Canada: Island Snow Scorpionfly (*Boreus insulanus*). Furthermore, one of the species has an intermediate part of its range (11% to 74%) in Canada, and one has only a small part of its range (10% or less) in Canada. In total, one species has a high priority score (between 1 and 5).

Among the known species of scorpionflies, all are native to Canada. On average, each species of scorpionflies occurs in 2.7 regions in Canada. No species of scorpionflies are considered migratory.

All the scorpionflies were included in the *Wild Species* 2015 report (25 species). Since then, the national rank of three species has changed. In total, two species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and no species changed from or to the

categories unrankable, unranked, or not applicable. In addition, no species were added or deleted from the list. All the changes (100%) are due to new information.

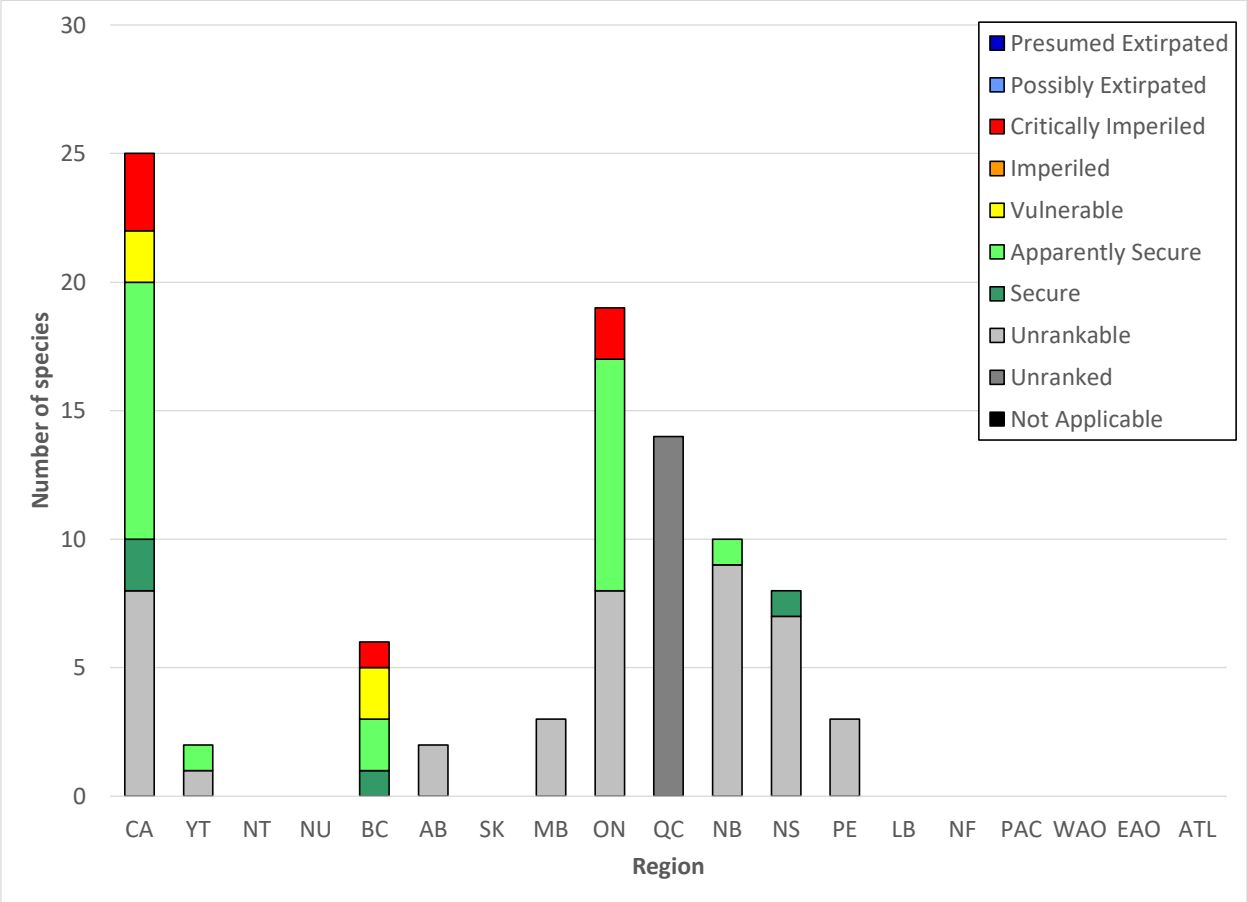


Figure 45. General status of scorpionflies in Canada in 2020.

Fleas

***Orchopeas howardi* © Tom Murray**

Fleas are part of the phylum of the arthropods (class of the insects) and refer to the order Siphonaptera. Fleas are small parasitic insects that live on mammals (and less commonly birds), and feed on their blood. They have wingless, yellow-brown bodies, and are generally less than 5 mm long. Their strong legs end in grasping claws, and their flat shape and backward-pointed hairs allow them to move quickly through their host animal's fur. Their eyes are simpler than those of most insects, and their antennae are small and generally hidden. Fleas are renowned jumpers. An elastic protein at the base of their hind legs acts like a coiled spring, helping to propel them onto moving hosts. A blood meal triggers sexual development in many species. Fleas mate while on their host, and their eggs generally fall to the ground. Larvae are wormlike and eat organic debris, including the feces of adult fleas. They pupate in a cocoon, and emerge as adults ready to find their own host, which they detect using cues such as sound, vibration, temperature changes and carbon dioxide. If no host is readily available, fleas can lay dormant for up to a year. While generally no more than a nuisance, fleas can carry deadly diseases such as plague, typhus, and tularemia. Our hominid ancestors began contending with fleas almost 2 million years ago, when they shifted to fixed home bases, allowing fleas to complete their life cycle. As human parasite loads increased, hairlessness may have become favoured by natural selection, as it was beneficial for avoiding fleas and other parasites.

There are 153 known species of fleas in Canada (Figure 46). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, one is critically imperiled, five are imperiled, 11 are vulnerable, 18 are apparently secure, 33 are secure, 74 are unrankable, four are unranked, and seven are not applicable. When only considering species from critically imperiled to secure, 75% are apparently secure or secure.

We identified six species of fleas that may be at risk in Canada. Of these, one species has 100% of its range in Canada, and is thought to be endemic to Canada: *Epitedia scapani*. Furthermore, five of the species have an intermediate part of their range (11% to 74%) in Canada. In total, three species have a high priority score (between 1 and 5).

Among the known species of fleas, 146 are native to Canada and seven are exotic. On average, each species of fleas occurs in 3.4 regions in Canada. No species of fleas are considered migratory.

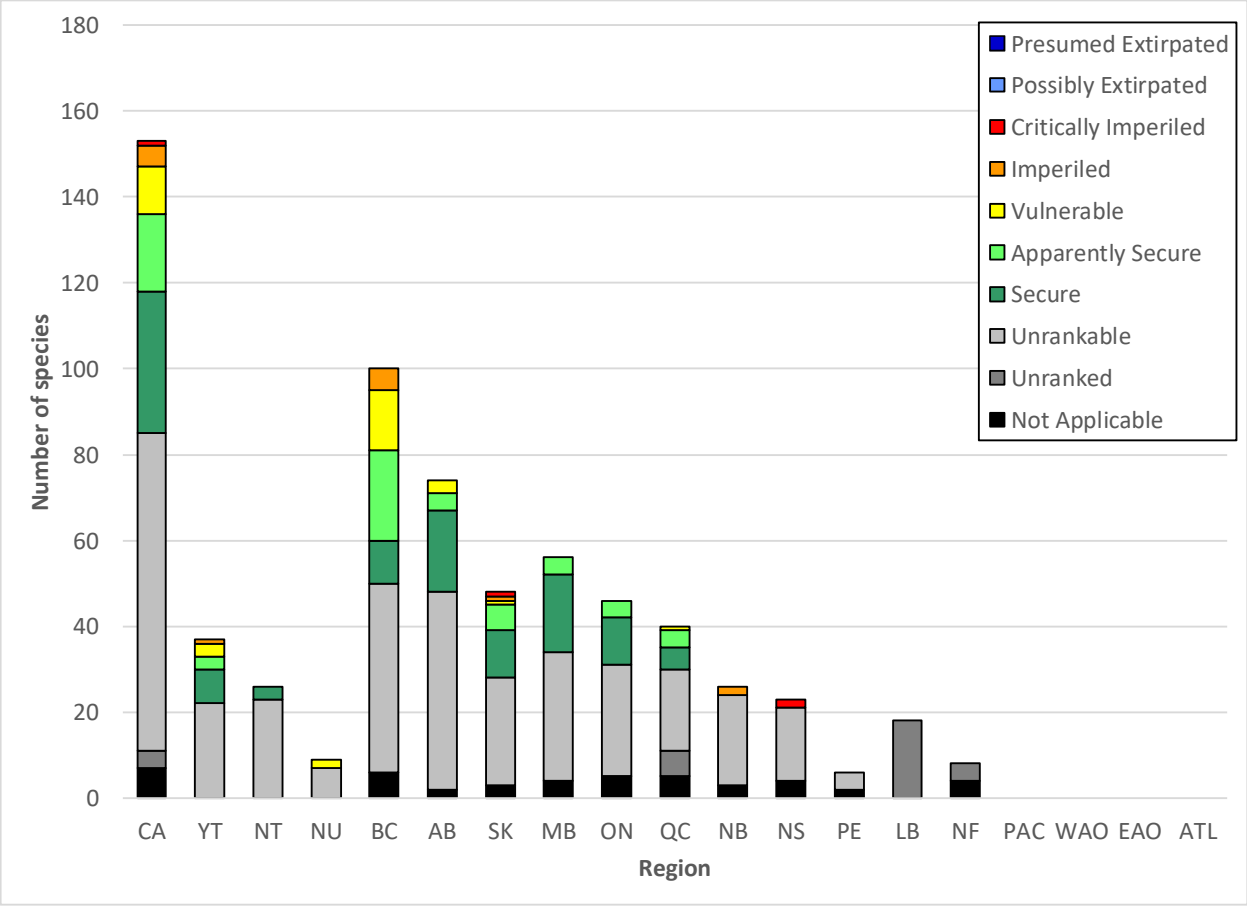


Figure 46. General status of fleas in Canada in 2020.

Selected flies

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

Flies are part of the phylum of the arthropods (class of the insects) and refer to the order Diptera. In this report, only 72 families of flies were included. Flies are characterized by having only one pair of wings, the hindwings having evolved into advanced mechanosensory organs known as halteres, which act as high-speed sensors to assist flight. Flies are an extremely diverse group. They include the bee flies, some of which are covered with golden hairs, and are considered as the cutest insects ever. The 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. Some families of flies will feed on humans, including mosquitoes. 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. Once their first eggs are laid, females seek more blood for subsequent batches of eggs, and some species can transmit diseases, such as West Nile Virus, when they sting more than one host. Overall, flies are important pollinators, being second in importance after the wasps, bees and relatives (order Hymenoptera). Other flies play a large ecological role in recycling waste, such as dung and corpses. The main threats to flies include pesticides, water pollution, and degradation of wetland and forest habitats.

There are 5 172 known species of flies in these 72 families in Canada (Figure 47). Results of our assessments at the national level indicated that no species are presumed extirpated, three are possibly extirpated, 31 are critically imperiled, 62 are imperiled, 368 are vulnerable, 914 are apparently secure, 536 are secure, 2 980 are unrankable, 200 are unranked, and 78 are not applicable. When only considering species from critically imperiled to secure, 76% are apparently secure or secure.

We identified 96 species of these flies that may be at risk in Canada. Of these, seven species have 75% or more of their range in Canada, including six species that are thought to be endemic to Canada: *Efferia okanagana*, Melander's Black Fly (*Parasimulium melanderi*), Constricted Black Fly (*Prosimulium constrictistylum*), *Protocalliphora spenceri*, *Rhagoletis persimilis*, and *Themira maculitarsis*. Furthermore, 36 of the species have an intermediate part of their range (11% to 74%) in Canada, and 53 have only a small part of their range (10% or less) in Canada. In total, 18 species have a high priority score (between 1 and 5).

Among the known species of flies in the 72 families, 5 097 are native to Canada and 75 are exotic. On average, each species of these flies occurs in 3.6 regions in Canada. No species of these flies are considered migratory.

Only five families of flies were included in the *Wild Species* 2015 report (1 024 species). Since then, the national rank of 177 species has changed. In total, 69 species were assigned an increased level of extinction risk, 30 species a reduced level of extinction risk, and 47 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 15 species were added to the list and 16 deleted. Most of the changes (53%) are due to criteria revision.

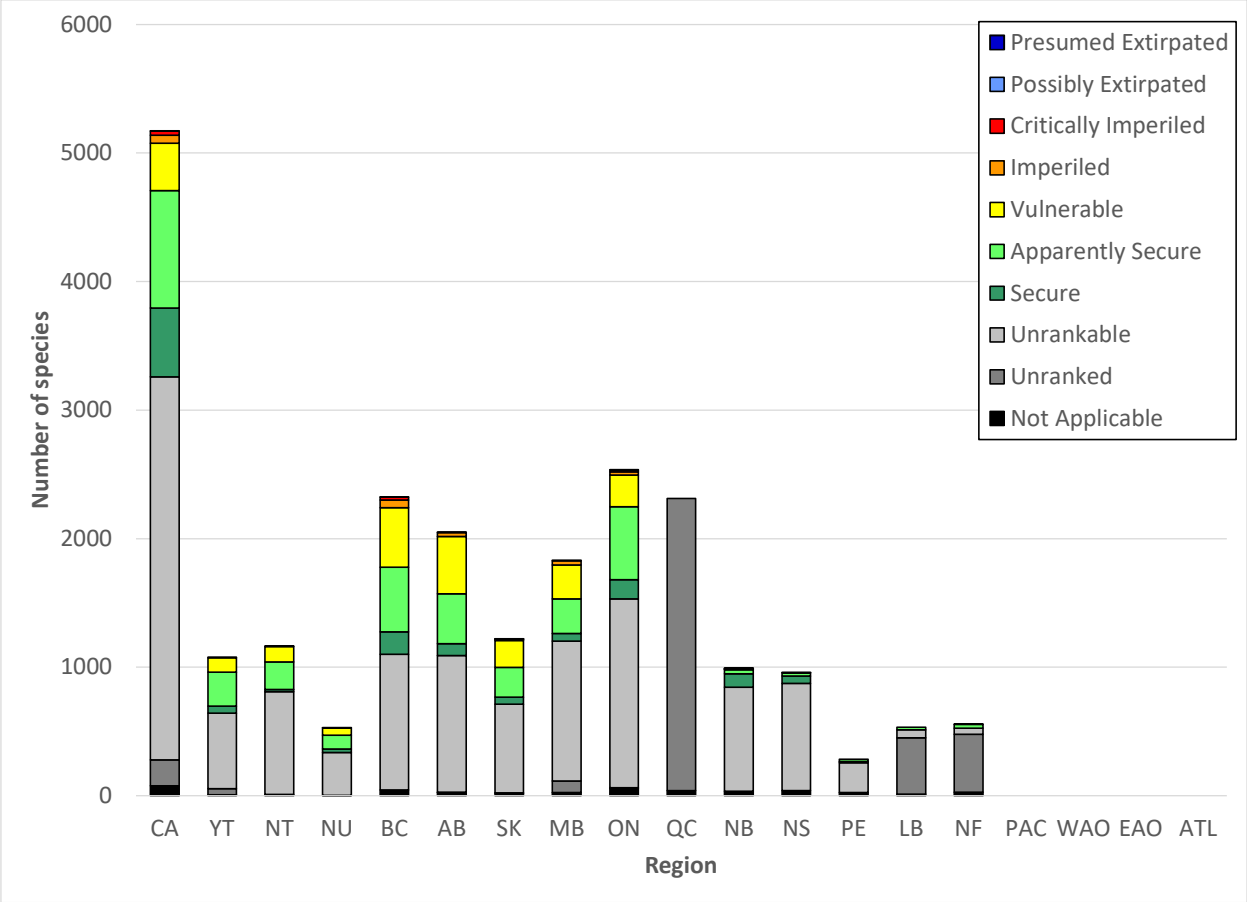


Figure 47. General status of selected flies in Canada in 2020.

Sea stars

***Mediaster aequalis* © Neil McDaniel**

Sea stars are part of the phylum of the echinoderms and refer to the class Asteroidea. Sea stars are marine invertebrate animals that live in all oceans bordering Canada, but cannot tolerate freshwater. They are notable for their five-part symmetry, as demonstrated by the sea star's five arms (or a multiple thereof) surrounding a central disk. Their bodies are covered with small spines and the undersides have tube feet used for attaching to substrate, moving, feeding, or burrowing. Sea stars live in a range of habitats, from rocky intertidal zones to the deep ocean. Canada's Pacific coast is a hotspot of diversity. They feed in a variety of ways including sweeping organic debris into their mouth; swallowing prey whole; everting their stomach to digest food externally; and, where prey is scarce, eating mud and digesting the organic material. Sea stars reproduce by releasing sperm and eggs into the water to be fertilized and live as free-floating larvae. Some reproduce by splitting into two, with both parts regenerating into whole sea stars (sea stars can also regenerate lost arms). In recent years, millions of sea stars along the west coast of North America have died of Sea Star Wasting Disease, possibly one of the largest wildlife die-offs in history. Infected animals become twisted, deflated, develop lesions, and their tissues degrade. Because sea stars play such an important ecological role, the impacts are far-reaching. Sea urchins, freed from their sea star predators, have increased in population and have decimated kelp beds in many areas, which provide food, cover, and oxygen for many species. The Sea Star Wasting Disease is thought to be caused by a virus, and is exacerbated by warmer waters.

There are 115 known species of sea stars in Canada (Figure 48). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, three are imperiled, seven are vulnerable, 20 are apparently secure, 24 are secure, 61 are unrankable, none are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 81% are apparently secure or secure.

We identified three species of sea stars that may be at risk in Canada. The three species have an intermediate part of their range in Canada (11% to 74%). In total, no species have a high priority score (between 1 and 5).

Among the known species of sea stars, all are native to Canada. On average, each species of sea stars occurs in 1.4 regions in Canada. No species of sea stars are considered migratory.

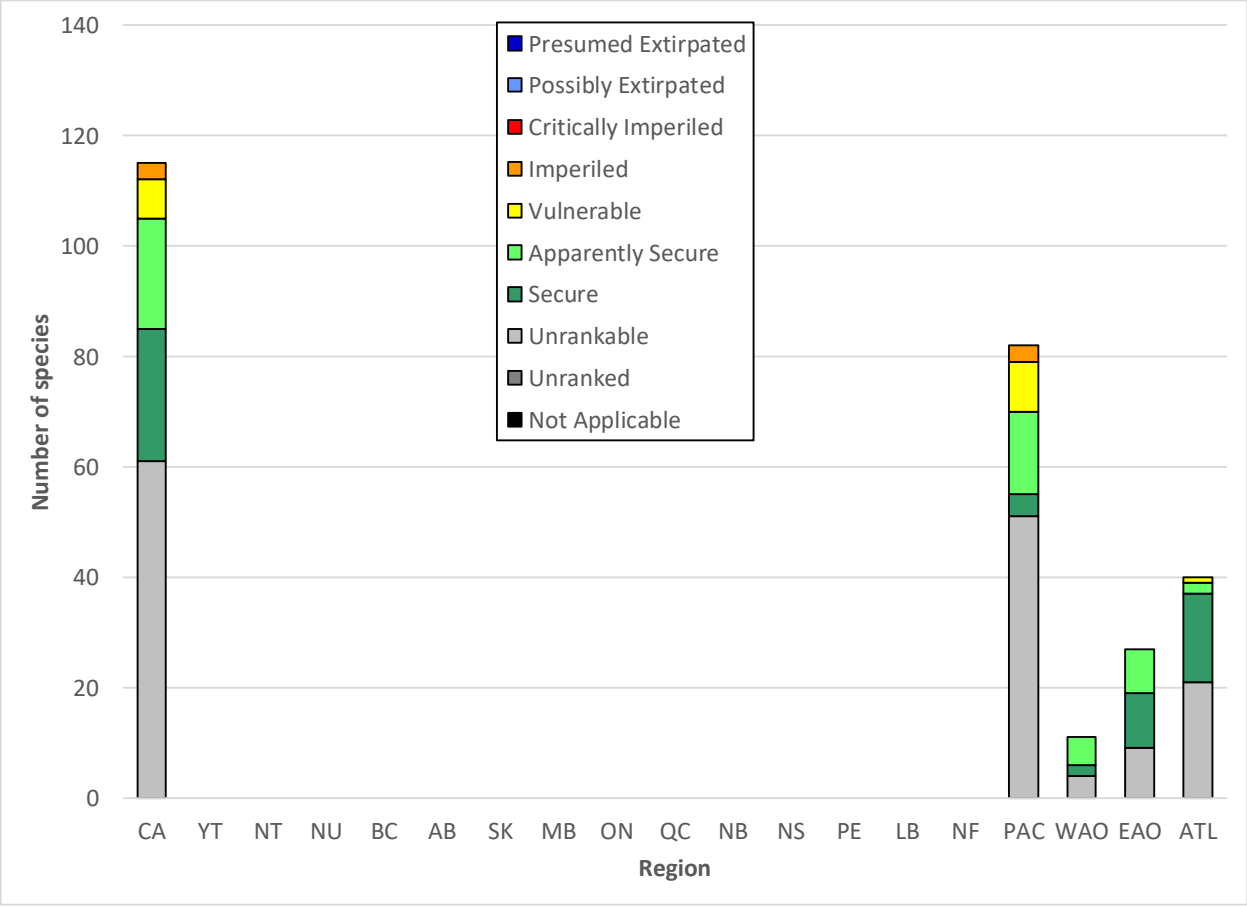


Figure 48. General status of sea stars in Canada in 2020.

Sea urchins

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

Sea urchins are part of the phylum of the echinoderms and 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. 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. 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 sea stars, 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 32 known species of sea urchins in Canada (Figure 49). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, none are vulnerable, one is apparently secure, 13 are secure, 17 are unrankable, one is unranked, and none are not applicable. When only considering species from critically imperiled to secure, 100% are apparently secure or secure.

We did not identified any species that may be at risk in Canada. Among the known species of sea urchins, all are native to Canada. On average, each species of sea urchins occurs in 1.2 regions in Canada. No species of sea urchins are considered migratory.

All the sea urchins were included in the *Wild Species* 2015 report (38 species). Since then, the national rank of 11 species has changed. In total, no species were assigned an increased level of extinction risk, one species a reduced level of extinction risk, and four species changed from or to the categories unrankable, unranked, or not applicable. In addition, no species were added to the list and six deleted. All the changes (100%) are due to incorrect data used previously.

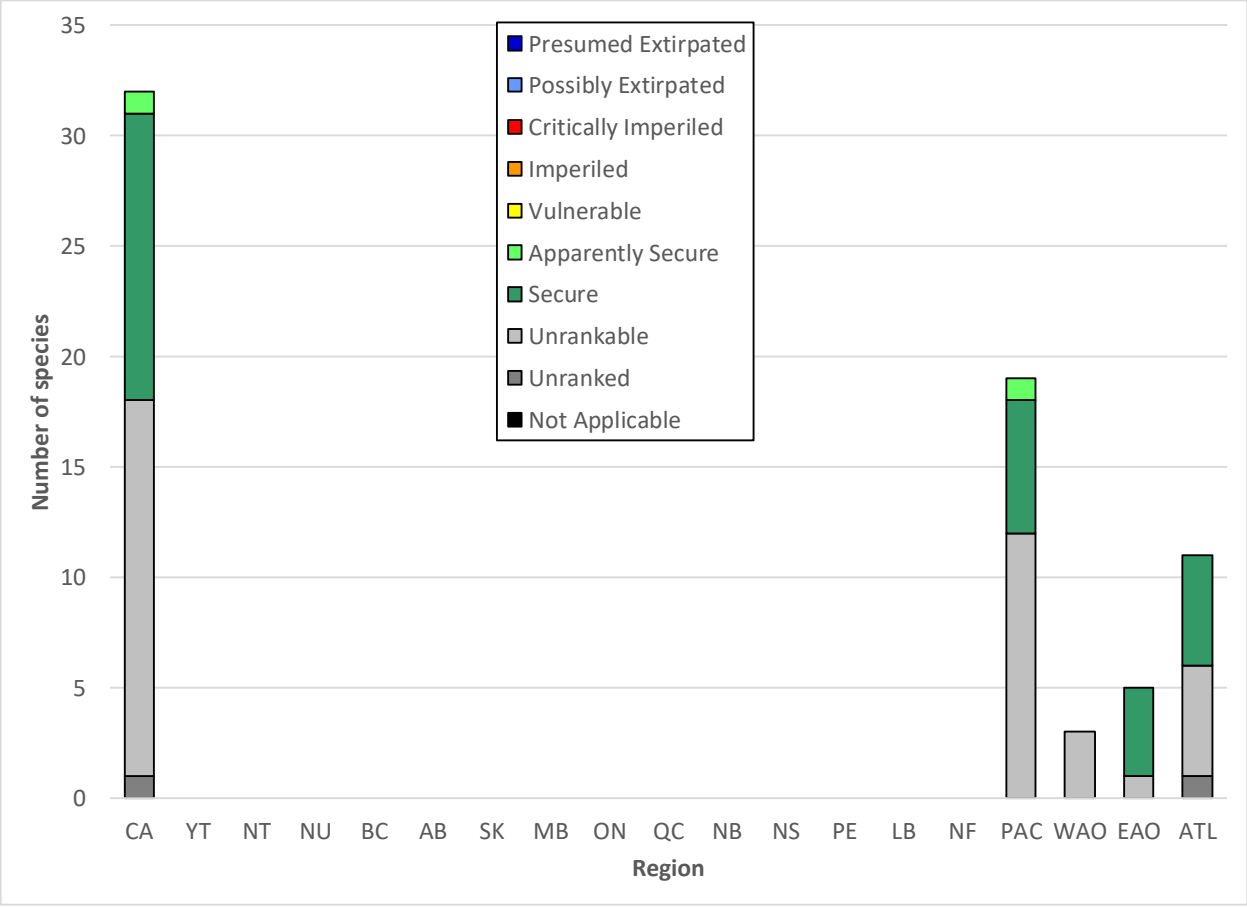


Figure 49. General status of sea urchins in Canada in 2020.

Sea cucumbers

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

Sea cucumbers are part of the phylum of the echinoderms and 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 due to their growing economic value. Despite increased study of commercial species, many knowledge gaps exist. It is difficult to observe juveniles or to determine the age of adults, making stock assessment a challenge. Threats include overfishing, by-catch mortality, dredging, and oil spills.

There are 75 known species of sea cucumbers in Canada (Figure 50). Results of our assessments at the national level indicated that no species are presumed extirpated, none are possibly extirpated, none are critically imperiled, none are imperiled, none are vulnerable, one is apparently secure, 32 are secure, 40 are unrankable, two are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 100% are apparently secure or secure.

We did not identify any species that may be at risk in Canada. Among the known species of sea cucumbers, all are native to Canada. On average, each species of sea cucumbers occurs in 1.2 regions in Canada. No species of sea cucumbers are considered migratory.

All the sea cucumbers were included in the *Wild Species* 2015 report (75 species). Since then, the national rank of 23 species has changed. In total, no species were assigned an increased level of extinction risk, no species a reduced level of extinction risk, and 17 species changed from or to the categories unrankable, unranked, or not applicable. In addition, three species were added to the list and three deleted. Most of the changes (83%) are due to incorrect data used previously.

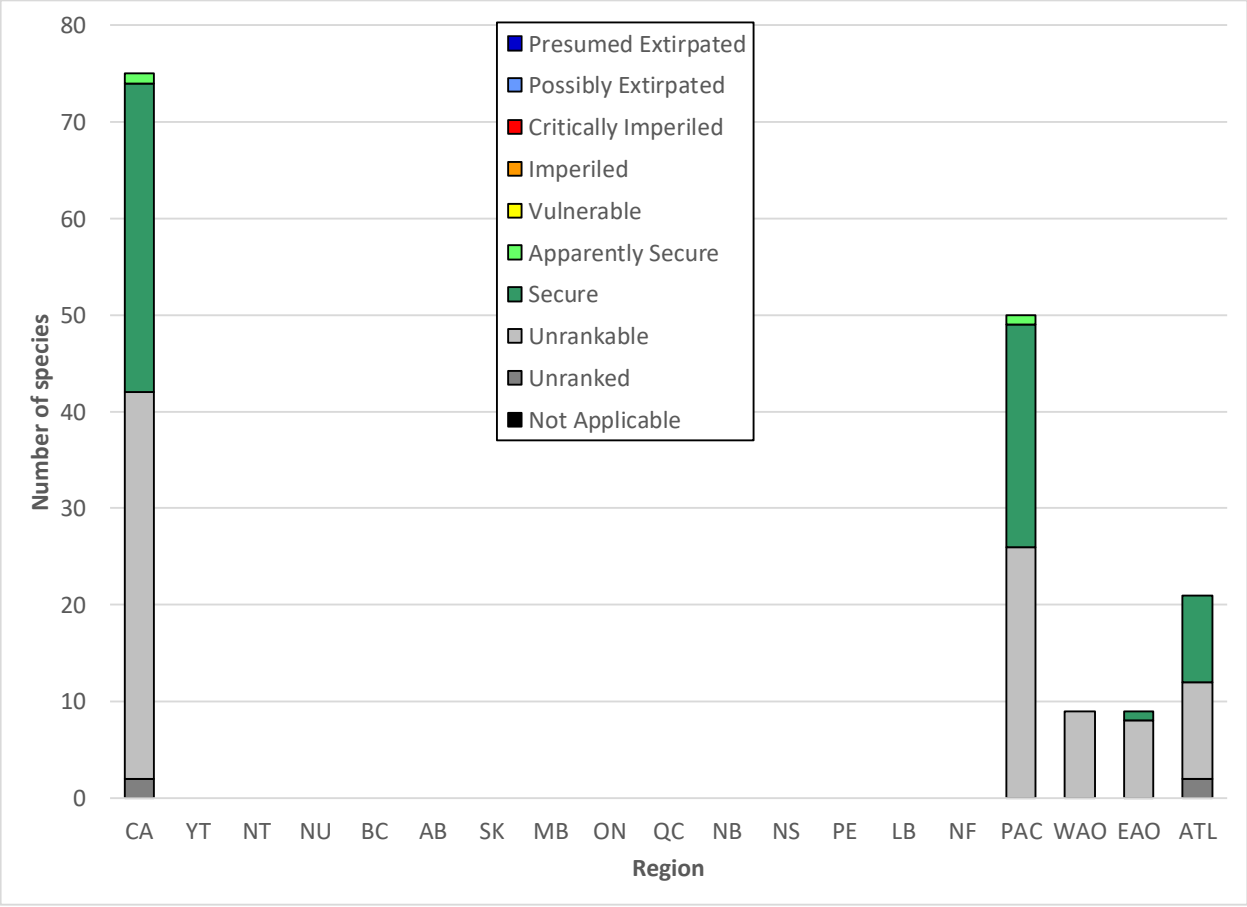


Figure 50. General status of sea cucumbers in Canada in 2020.

Fishes

***Gadus morhua* © Kelly Bentham**

Fishes are part of the phylum of the chordates (subphylum of the vertebrates) and 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 salmons). 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 water, others exclusively in salt water, 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 have declined significantly due to overfishing. Other concerns for Canadian fishes include habitat loss and degradation, pollution, contamination, climate change, interactions with farmed fishes, and invasive species.

There are 1 395 known species of fishes in Canada (Figure 51). Results of our assessments at the national level indicated that three species are presumed extirpated, one is possibly extirpated, 11 are critically imperiled, 28 are imperiled, 51 are vulnerable, 189 are apparently secure, 396 are secure, 382 are unrankable, none are unranked, and 334 are not applicable. When only considering species from critically imperiled to secure, 87% are apparently secure or secure.

We identified 43 species of fishes that may be at risk in Canada. Of these, four species have 75% or more of their range in Canada, including three species that are thought to be endemic to Canada: *Coregonus huntsmani*, *Entosphenus macrostomus*, and *Moxostoma hubbsi*. Furthermore, 16 of the species have an intermediate part of their range (11% to 74%) in Canada, and 23 have only a small part of their range (10% or less) in Canada. In total, seven species have a high priority score (between 1 and 5).

Among the known species of fishes, 1 379 are native to Canada and 16 are exotic. On average, each species of fishes occurs in 1.8 regions in Canada. We also identified 108 species of fishes considered to be migratory.

All the fishes were included in the *Wild Species* 2015 report (1 379 species). Since then, the national rank of 301 species has changed. In total, 46 species were assigned an increased level of

extinction risk, 23 species a reduced level of extinction risk, and 198 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 25 species were added to the list and nine deleted. Most of the changes (84%) are due to new information.

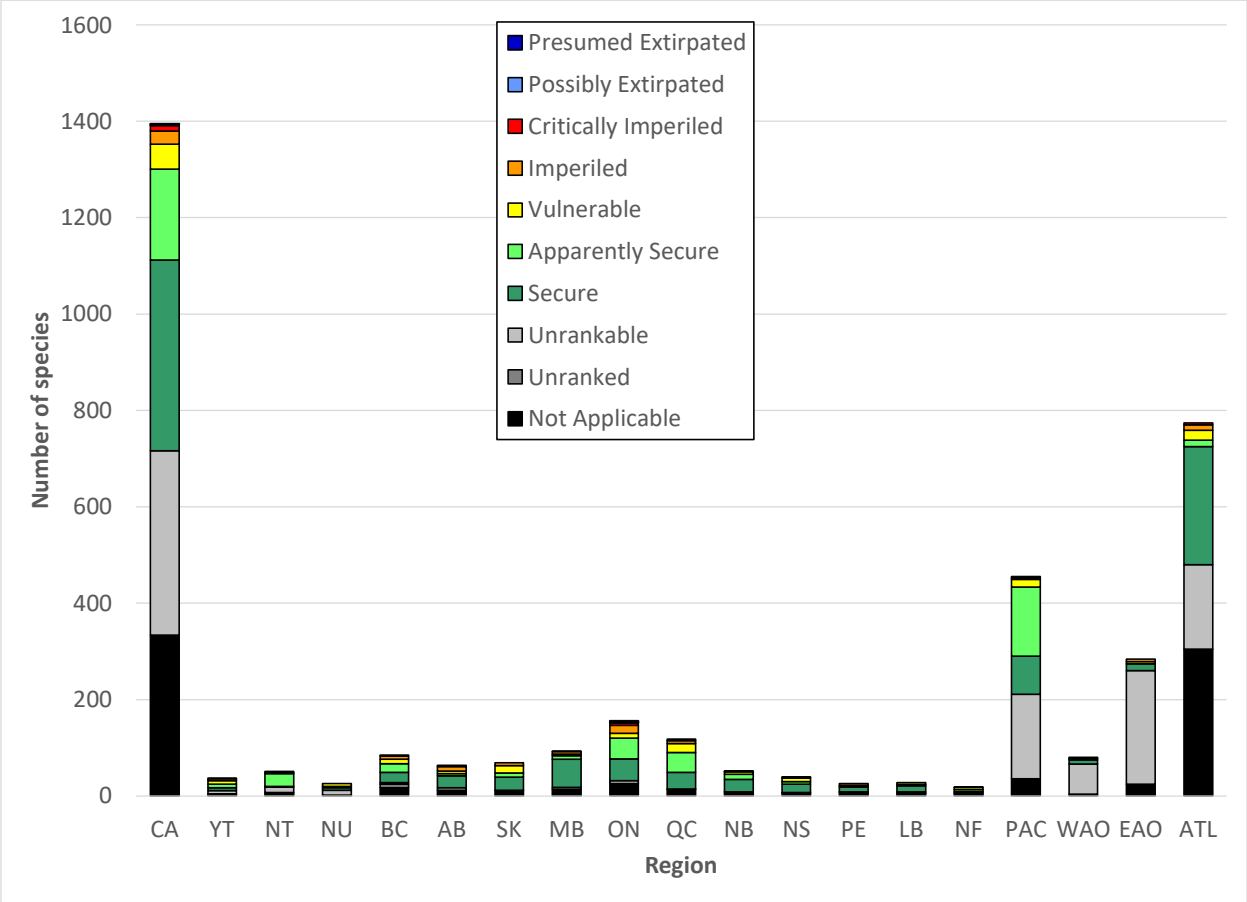


Figure 51. General status of fishes in Canada in 2020.

Amphibians

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

Amphibians are part of the phylum of the chordates (subphylum of the vertebrates) and 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 terrestrial species are often active at night to reduce water loss. The Wood Frog (*Lithobates sylvaticus*) has the most northerly distribution, and produces 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 regionally restricted species. 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. Chytridiomycosis, which is a fungal disease that has devastated amphibian populations in many parts of the world, occurs in Canada, but its population impacts are uncertain.

There are 47 known species of amphibians in Canada (Figure 52). Results of our assessments at the national level indicated that one species is presumed extirpated, none are possibly extirpated, three are critically imperiled, five are imperiled, 10 are vulnerable, nine are apparently secure, 19 are secure, none are unrankable, none are unranked, and none are not applicable. When only considering species from critically imperiled to secure, 61% are apparently secure or secure.

We identified nine species of amphibians that may be at risk in Canada. All species have only a small part of their range in Canada (10% or less). In total, no species have a high priority score (between 1 and 5).

Among the known species of amphibians, all are native to Canada. On average, each species of amphibians occurs in 3.5 regions in Canada. No species of amphibians are considered migratory.

All the amphibians were included in the *Wild Species* 2015 report (48 species). Since then, the national rank of eight species has changed. In total, four species were assigned an increased level of extinction risk, three species a reduced level of extinction risk, and no species changed from or to the categories unrankable, unranked, or not applicable. In addition, no species were added to the list and one

deleted. Most of the changes (75%) are due to new information and new interpretation of same information.

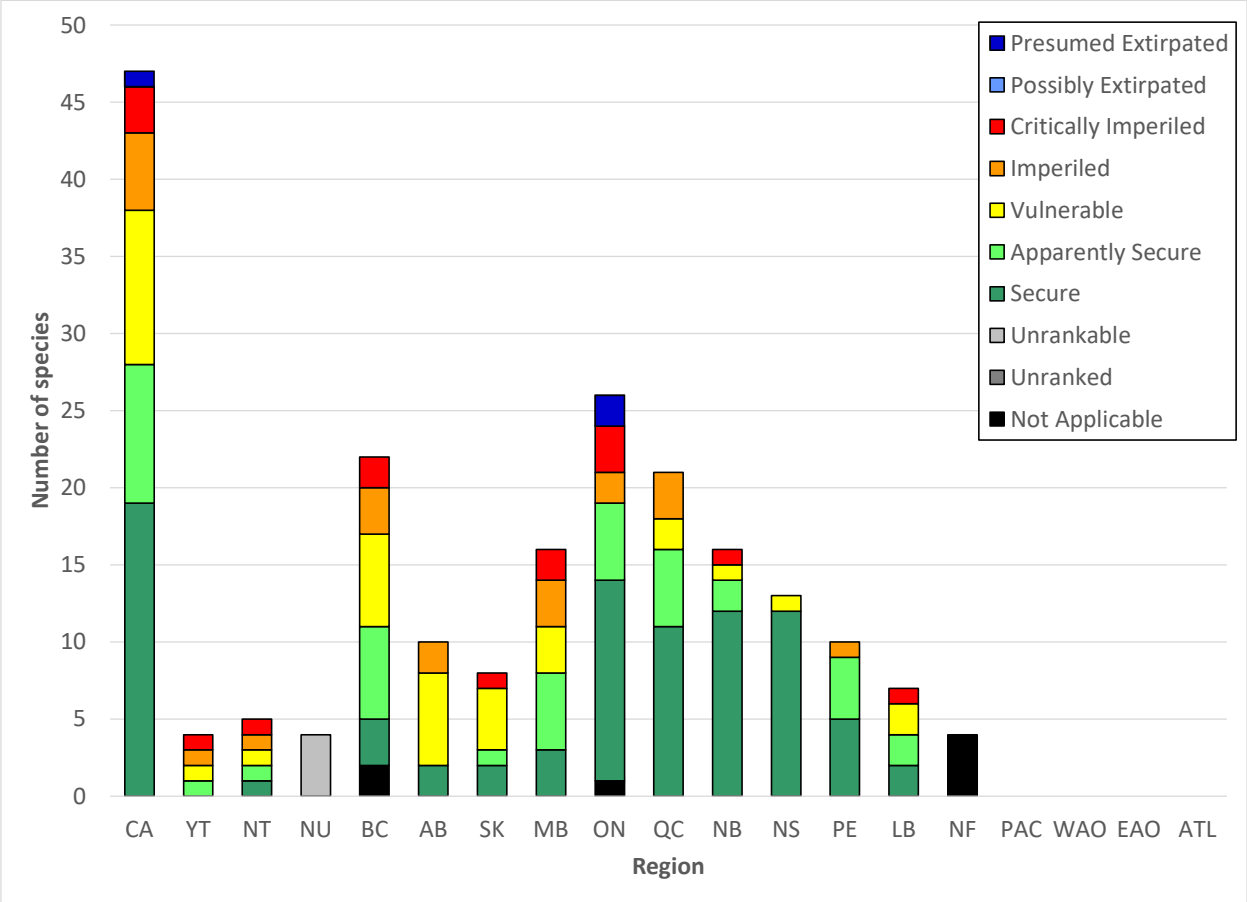


Figure 52. General status of amphibians in Canada in 2020.

Reptiles

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

Reptiles are part of the phylum of the chordates (subphylum of the vertebrates) and 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. They hibernate to survive 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 53). Results of our assessments at the national level indicated that four species are presumed extirpated, none are possibly extirpated, four are critically imperiled, nine are imperiled, 16 are vulnerable, two are apparently secure, nine are secure, two are unrankable, none are unranked, and three are not applicable. When only considering species from critically imperiled to secure, 28% are apparently secure or secure.

We identified 17 species of reptiles that may be at risk in Canada. Of these, three species have an intermediate part of their range (11% to 74%) in Canada, and 14 have only a small part of their range (10% or less) in Canada. In total, no species have a high priority score (between 1 and 5).

Among the known species of reptiles, 47 are native to Canada and two are exotic. On average, each species of reptiles occurs in 2.4 regions in Canada. We also identified four species of reptiles considered to be migratory.

All the reptiles were included in the *Wild Species* 2015 report (49 species). Since then, the national rank of eight species has changed. In total, six species were assigned an increased level of extinction risk, two species a reduced level of extinction risk, and no species changed from or to the categories

unrankable, unranked, or not applicable. In addition, no species were added or deleted from the list. All the changes are due to new information or new interpretation of the same information.

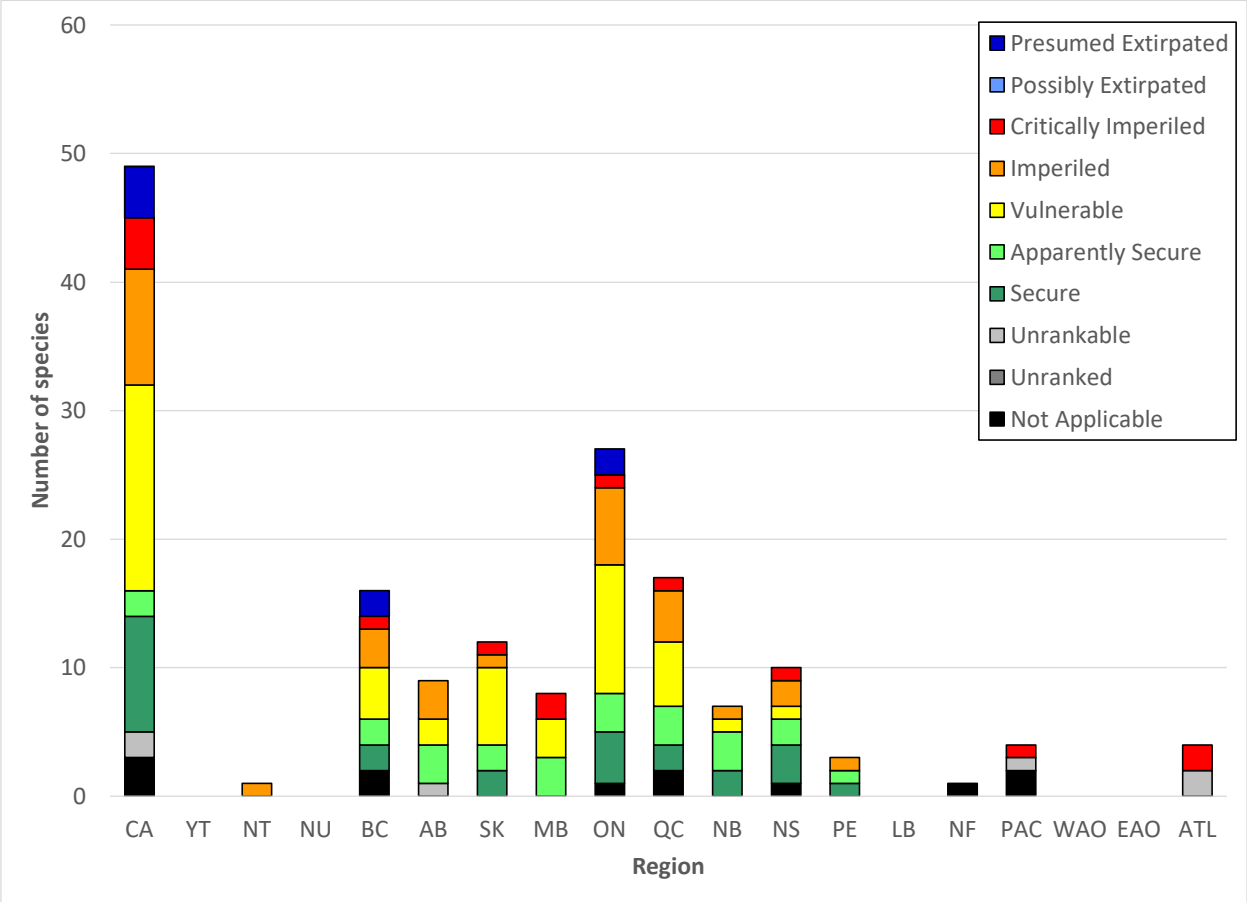


Figure 53. General status of reptiles in Canada in 2020.

Birds

Red Knot (*Calidris canutus*) © Raymond Belhumeur

Birds are part of the phylum of the chordates (subphylum of the vertebrates) and 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 access to diverse 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*) performs 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 of birds 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 are popular with scientists and the public. Long-term surveys allow estimation 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 with human structures, especially windows.

There are 696 known species of birds in Canada (Figure 54). Results of our assessments at the national level indicated that five species are presumed extirpated, none are possibly extirpated, 23 are critically imperiled, 22 are imperiled, 52 are vulnerable, 84 are apparently secure, 255 are secure, 18 are unrankable, three are unranked, and 234 are not applicable. When only considering species from critically imperiled to secure, 78% are apparently secure or secure.

We identified 50 species of birds that may be at risk in Canada. Of these, one species has 75% or more of its range in Canada. Furthermore, 13 of the species have an intermediate part of their range (11% to 74%) in Canada, and 36 have only a small part of their range (10% or less) in Canada. In total, nine species have a high priority score (between 1 and 5).

Among the known species of birds, 685 are native to Canada and 11 are exotic. On average, each species of birds occurs in 8.3 regions in Canada. We also identified 405 species of birds considered to be migratory.

All the birds were included in the *Wild Species* 2015 report (678 species). Since then, the national rank of 113 species has changed. In total, 46 species were assigned an increased level of extinction risk,

18 species a reduced level of extinction risk, and 19 species changed from or to the categories unrankable, unranked, or not applicable. In addition, 24 species were added to the list and six deleted. Most of the changes (32%) are due to new information.

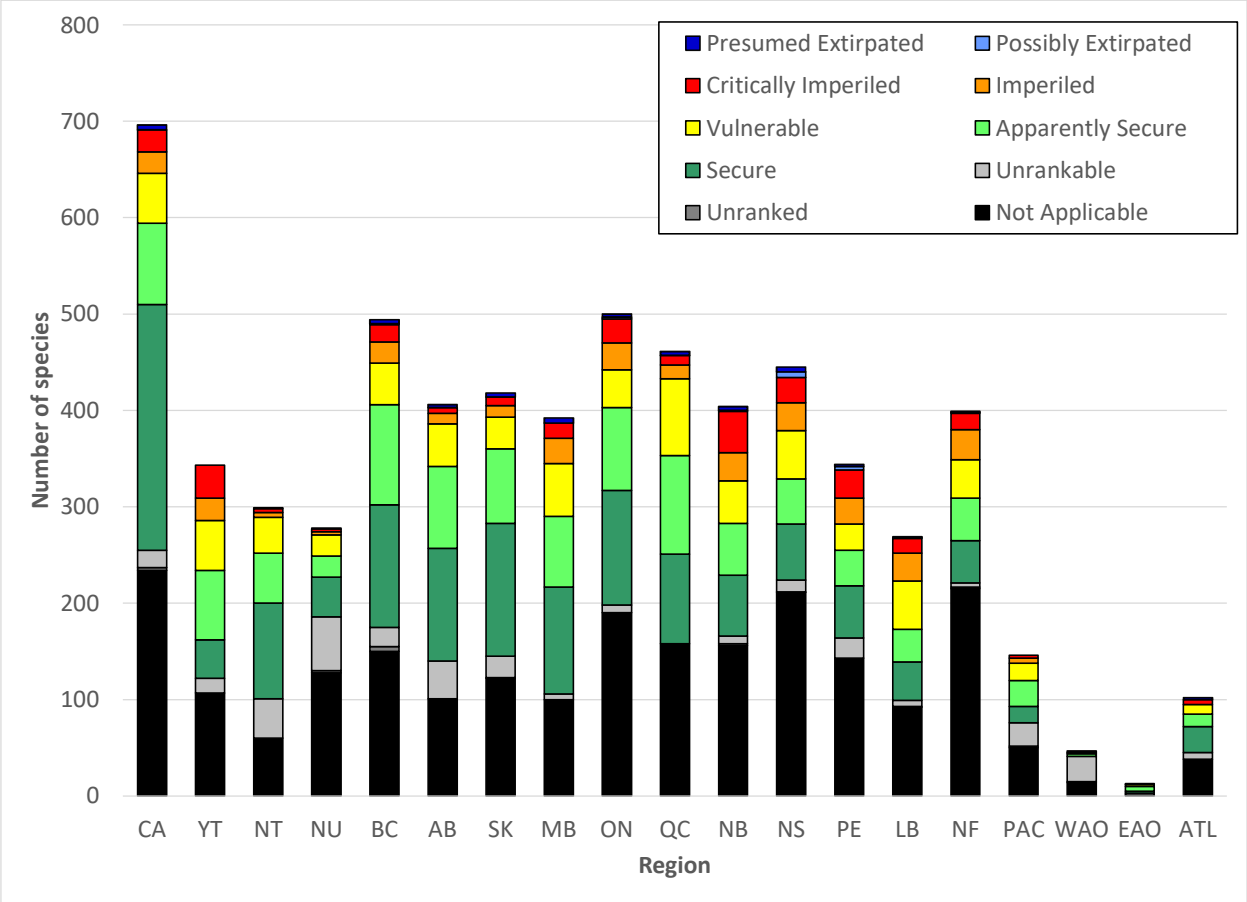


Figure 54. General status of birds in Canada in 2020.

Mammals

Moose (*Alces alces*) © Colin Pacitti

Mammals are part of the phylum of the chordates (subphylum of the vertebrates) and 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 223 known species of mammals in Canada (Figure 55). Results of our assessments at the national level indicated that one species is presumed extirpated, one is possibly extirpated, 11 are critically imperiled, 11 are imperiled, 33 are vulnerable, 28 are apparently secure, 105 are secure, eight are unrankable, none are unranked, and 25 are not applicable. When only considering species from critically imperiled to secure, 71% are apparently secure or secure.

We identified 24 species of mammals that may be at risk in Canada. Of these, two species have 100% of their range in Canada, and are thought to be endemic to Canada: Ogilvie Mountain Collared Lemming (*Dicrostonyx nunatakensis*) and Vancouver Marmot (*Marmota vancouverensis*). Furthermore, four of the species have an intermediate part of their range (11% to 74%) in Canada, and 18 have only a small part of their range (10% or less) in Canada. In total, four species have a high priority score (between 1 and 5).

Among the known species of mammals, 212 are native to Canada and 11 are exotic. On average, each species of mammals occurs in 4.8 regions in Canada. We also identified 29 species of mammals considered to be migratory.

All the mammals were included in the *Wild Species* 2015 report (222 species). Since then, the national rank of 31 species has changed. In total, 14 species were assigned an increased level of extinction risk, eight species a reduced level of extinction risk, and two species changed from or to the categories unrankable, unranked, or not applicable. In addition, four species were added to the list and three deleted. Most of the changes (42%) are due to criteria revision.

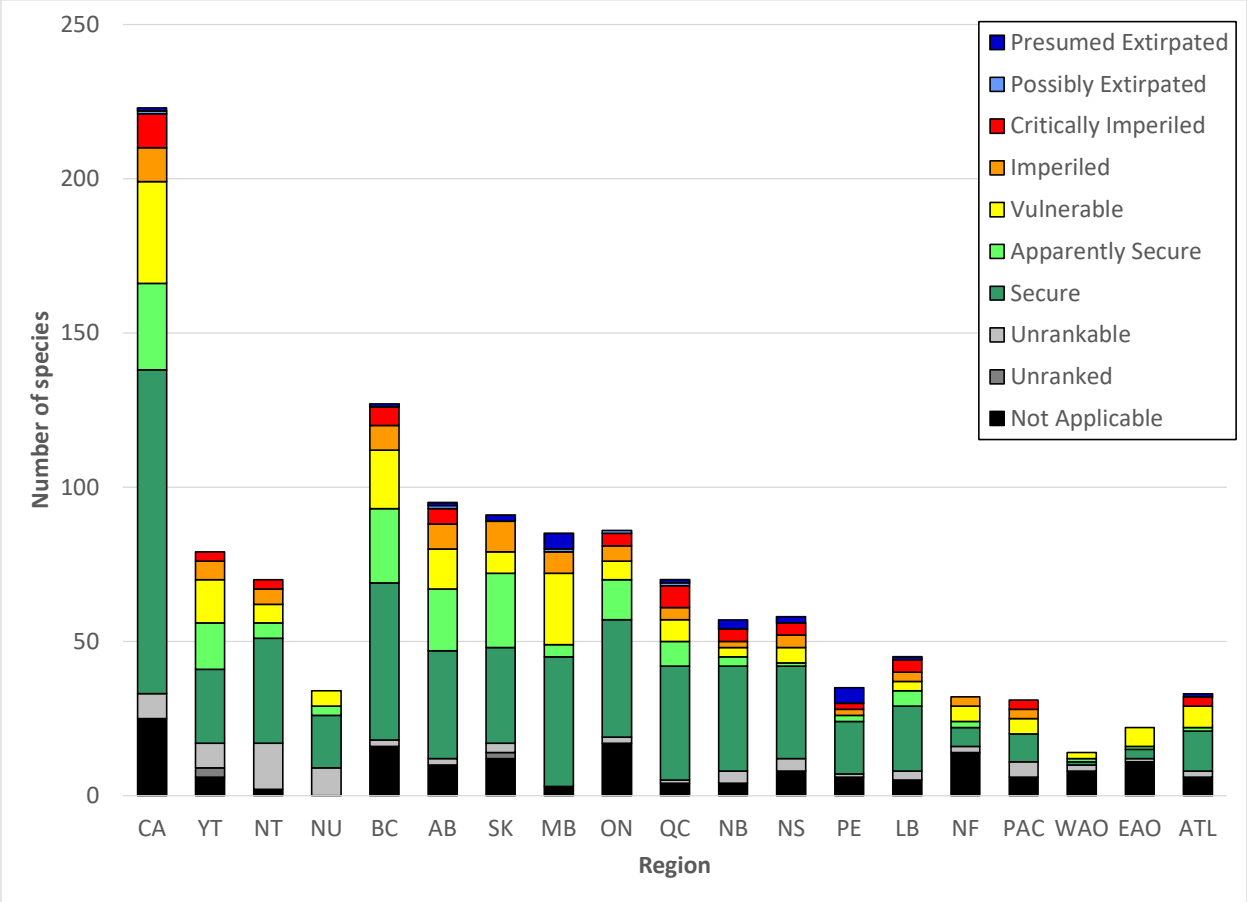


Figure 55. General status of mammals in Canada in 2020.

APPENDIX 1 – METHODOLOGY

National General Status Working Group

The National General Status Working Group is composed of representatives from each of the Canadian provincial and territorial governments, 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. This category usually includes the biologists who organize the revision of the conservation status ranks of the species. The category of Conservation Data Centre specialists usually includes the coordinators of the Conservation Data Centres. 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 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.

NatureServe

The National General Status Working Group uses the methodology of NatureServe to assess the conservation status of species in Canada. The NatureServe network is comprised of over 60 provincial, territorial and state Conservation Data Centres in North America. These Conservation Data Centres use common data standards, shared processes and data management tools, and regular information exchanges to track the status of biodiversity. The NatureServe methodology was selected in order 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, including by helping to integrate the results of the *Wild Species* reports into the NatureServe data management system. Once this integration is complete, the results are also available on the NatureServe Explorer website.

Process for species assessment

The process to assess the conservation status of species is based on the best available knowledge (Figure 56). Various sources of information are used to assess each 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 yet enough information compiled to create a species list, meaning that we do not know which species exist 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 consider all species in the group, not just those believed to be rare or endangered. The National General Status Working Group uses different strategies depending on the amount of information available. For well-known taxonomic groups (e.g. vertebrates such as mammals or birds), the assessments are usually conducted directly by the working group. For lesser-known taxonomic groups (e.g. invertebrates such as insects), experts are engaged to support the working group to undertake the assessments. The experts propose a list of species and suggest conservation status ranks. Depending on the number of species in a taxonomic group and on the availability of expertise, either a national expert who will support all governments in Canada will be engaged, or several regional experts

may be engaged. The list of experts involved in this report can be found in Appendix 2. The governments then review the ranks and add more information, where 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 retain the final signoff on the ranks. For aquatic species, Fisheries and Oceans Canada (federal government) retains the final signoff on the ranks. For migratory birds, the Canadian Wildlife Service of Environment and Climate Change Canada (federal government) retains the final signoff on the ranks. It is important to note that rankings are normally completed applying a collaborative approach.

Once the conservation status assessments are completed, the ranks are integrated in the database of 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 of 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 completion of each *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 which new assessments will 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 engaged 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.

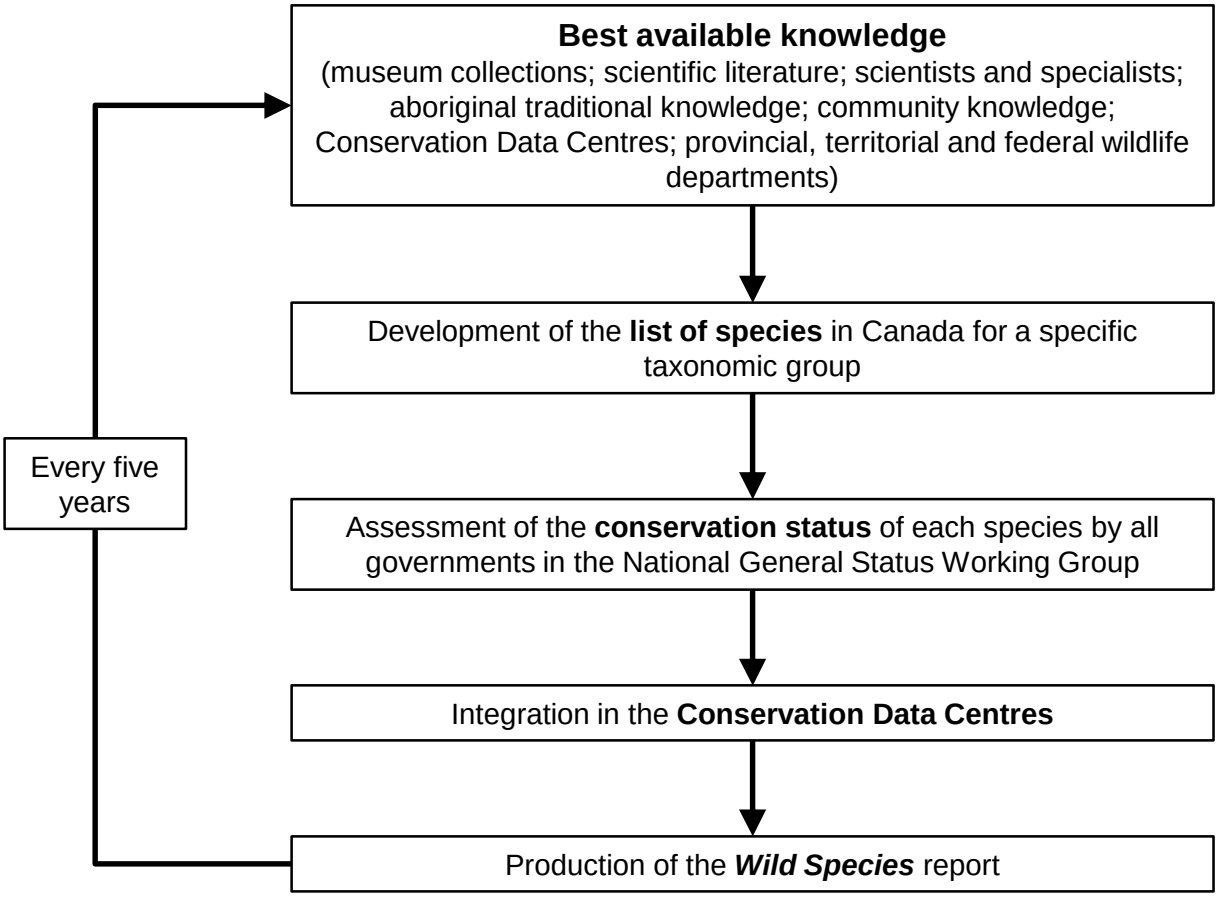


Figure 56. Process for species assessment in Canada.

Ranking system

Each species included in the *Wild Species* reports receives 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 12). The National General Status Working Group is using the NatureServe ranking system.

Table 12. Ranking system of NatureServe used to assess the conservation status of species.

Rank	Category	Description
Geographic scale		
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.
Conservation status		
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. This includes exotic species (that have been moved beyond their natural range as a result of human activity) or accidental species (naturally occurring infrequently and unpredictably outside their usual range).
Qualifier		
?	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, and 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 to reflect uncertainty in knowledge about the status for a species. For example, N2N3 means that the national rank of the species in Canada is between imperiled and vulnerable, and 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 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 the NatureServe rank calculator, which integrates the available information for 10 factors related to rarity, threats, and trends (Table 13). These factors are used to determine the conservation status of a species.

Table 13. 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 complete the rank calculator, and the species is then unrankable (U). To result in a rank other than U, the rank calculator requires a minimum of two factors comprised of one of the following: 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 populated. For species in lesser-known taxonomic groups, the two factors that are most often populated, 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.

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 establish a regional rank. Figure 57 shows all the regions in Canada, and Table 14 defines the codes used for each region. Waters often have a shared jurisdiction in Canada. For aquatic species, the separation that we used is the difference between the fresh water (lakes and rivers for example) and the salt water. For species occurring in fresh water, the ranks were placed in the appropriate provinces or territories. For species occurring in salt water, the ranks were placed in the ocean regions. For species occurring in both fresh and salt water, separate ranks were developed for the corresponding provinces, territories, and ocean regions. The ocean regions include only the areas in which Canada has sovereign rights, which correspond to the exclusive economic zone, and thus exclude the international waters. The Federal Marine Bioregions are used to define the ocean regions. The Pacific Ocean (PAC) includes the Strait of Georgia, the Southern Shelf, the Offshore Pacific, and the Northern Shelf. The Western Arctic Ocean (WAO) includes the Arctic Basin, the Western Arctic, and the Arctic Archipelago. The Eastern Arctic Ocean (EAO) includes the Eastern Arctic, and the Hudson Bay Complex. The Atlantic Ocean (ATL) includes the Newfoundland-Labrador Shelves, the Scotian Shelf, and the Gulf of St. Lawrence. Since the Great Lakes are fresh water, they are included with the province of Ontario. If a marine species also uses terrestrial land, it should then have a rank in the ocean regions and in the provinces or territories where it is present.

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

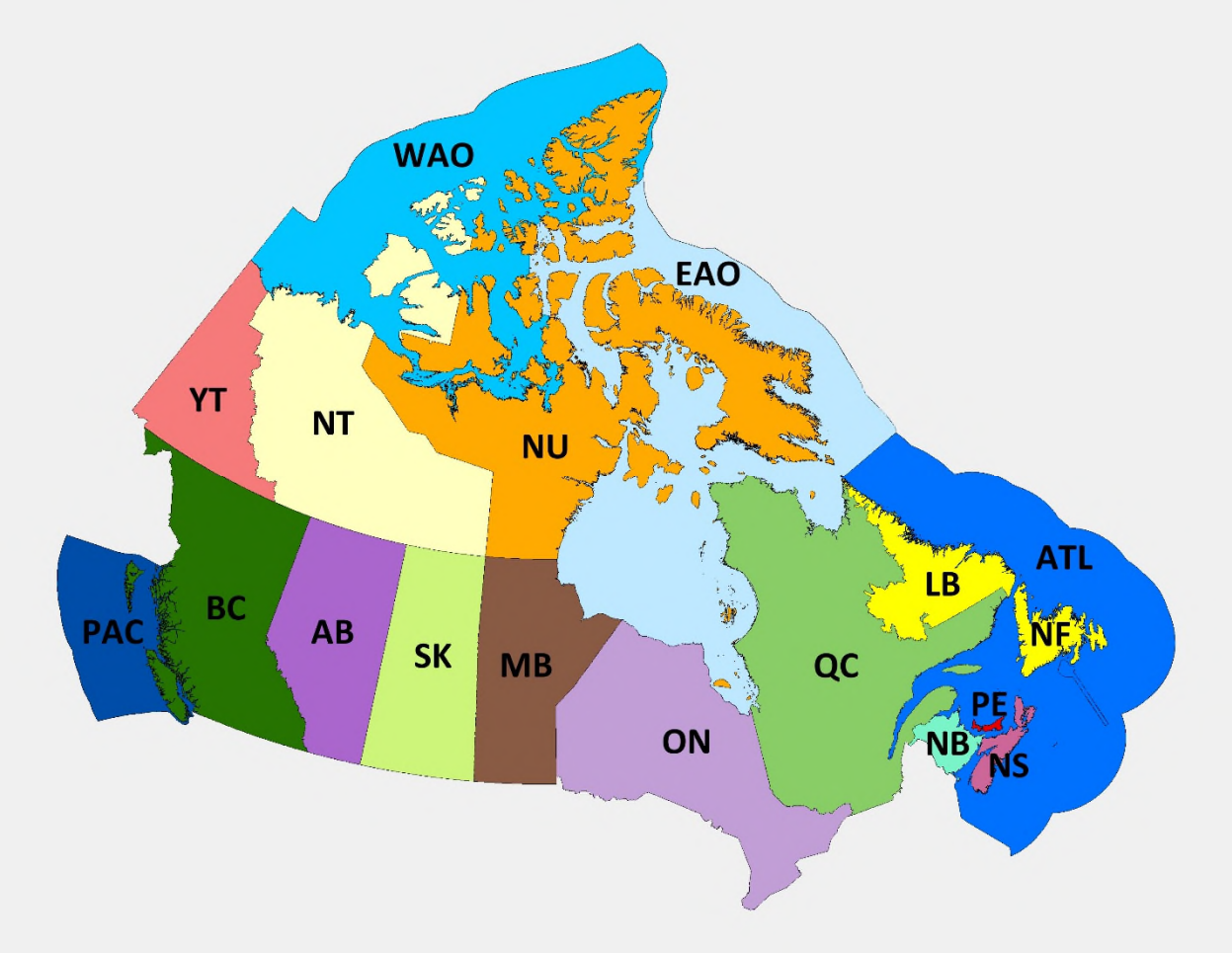


Figure 57. Map of Canada showing the regions (provinces, territories, oceans) for which general status ranks are generated.

Table 14. 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

As 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. The National General Status Working Group uses rules to determine most national ranks. The rules deal with three main situations:

1- When a species occurs in only one region in Canada, the national rank is the same as the regional rank.

2- When a species is ranked SU, SNR, SNA, SH, or SX in all regions where it occurs in Canada, then the same rank is automatically assigned at the national level. If there is a mix of these ranks, the priority order is SU > SNR > SNA > SH > SX.

3- When a species has at least one numerical rank (S1 to S5) in a region, the rules in table 15 are used to determine the national rank. The first part applies for the secure and apparently secure categories. The second part applies for the sensitive, imperiled, and critically imperilled categories. However, for species in the second part, when there are also at least two SU or SNR ranks in other regions, then the national rank is NU.

Table 15. Modifiers used to determine the national ranks according to the most secure regional ranks.

Part 1: the most secure regional rank is in the secure or apparently secure category		
Most secure regional rank	If one or two ranks in the most secure category, the national rank is:	If three or more ranks in the most secure category, the national rank is:
S5	N5	N5
S4S5	N4N5	N5
S4	N4	N4N5
S3S5	N3N5	N4N5
Part 2: the most secure regional rank is in the sensitive, imperiled, or critically imperilled category		
Most secure regional rank	If one to six ranks in the most secure category, the national rank is:	If seven or more ranks in the most secure category, the national rank is:
S3S4	N3N4	N4
S3	N3	N3N4
S2S4	N2N4	N3N4
S2S3	N2N3	N3
S2	N2	N2N3
S1S3	N1N3	N2N3
S1S2	N1N2	N2
S1	N1	N1N2

Here are some examples:

- If a species occurs in four regions and has the regional ranks SU, SU, S4, S4, the national rank is N4 (rule 3, part 1, two ranks in the apparently secure category).
- If a species occurs in three regions and has the regional ranks S3S5, S4 and S4, the national rank is N4N5 (rule 3, part 1, three ranks in the apparently secure category).
- If a species has the regional ranks S4S5, S4 and S4, the national rank is N5 (rule 3, part 1, three ranks in the apparently secure category).
- If a species occurs in two regions and has the regional ranks S3 and S3S4, the national rank is N3N4 (rule 3, part 2, two ranks in the sensitive category).
- If a species occurs in four regions and has the regional ranks SU, S1, S3 and S3, the national rank is N3 (rule 3, part 2, two ranks in the sensitive category).
- If a species occurs in eight regions and all regional ranks are S2S4, the national rank is N3N4 (rule 3, part 2, more than seven ranks in the sensitive category).
- If a species occurs in three regions and has the regional ranks SU, SU and S2, the national rank is NU (rule 3, part 2, two SU ranks).

It is important to note that these rules represent shortcuts customized for Canada, used to facilitate the assessment of a large number of species. They do not comply with the official NatureServe methodology, which requires the use of the rank calculator to determine the national rank for all species. However, the rank calculator is sometimes used to confirm the national rank of a few species. There are also some exceptions 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, or there is evidence of large-scale declines, the National General Status Working Group can decide to not rank the species as secure at the national level.

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 provides a measure of Canada's global responsibility for the species. Even though it is important to maintain all species of Canada, some species do not occur anywhere else. 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 16). 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 17). The resulting priority score can vary from 1 to 10. The species that have a score of 1 have a high priority and the species that have a score of 10 have a low priority.

Table 16. 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 17. 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 a high priority and the species that have a score of 10 have a low priority.

		Canadian responsibility score based on the percentage of the range in Canada						
National rank score		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

Exotic and accidental species

Exotic and accidental species are grouped under the “not applicable” category. To be considered exotic (introduced), species must have been brought into Canada by human activities. For example, if a species is native to the United States of America and was brought by human activities into Canada, then it is exotic in Canada. If a species was brought by human activities to the United States of America (and is thus exotic in that country), but the species arrived by itself in Canada because it expanded its range from the United States of America (invasive species), the species is still considered exotic in Canada because it would not be here without the human activity that first brought it into North America.

When species arrive naturally by themselves, without any direct human activity, they are considered native. For example, if a species is native to the United States of America and probably arrived by itself in Canada, then it is also native to Canada. The species is native even if it accidentally occurs in Canada (naturally occurring infrequently and unpredictably outside its usual range). Native means that the presence of the species in the region is the result of only natural processes, with no human intervention. The term native does not imply that an organism necessarily originated or evolved where it is found. Through geological times, the boundaries of Canada have changed a lot and it would be difficult to determine which species have evolved in Canada. Also, if an accidental species starts to reproduce and becomes established in Canada, it will be assigned ranks in the same manner as any other native species (not an exotic status). Accidental species are therefore considered native, because they naturally arrived by themselves, without a direct human activity. An accidental species cannot be considered migratory, so no qualifiers are used with the rank “not applicable”.

In the database of the *Wild Species* report, the working group created a column for each jurisdiction to differentiate the exotic and the native species. To be included in the *Wild Species* report, an exotic species must be wild, meaning it has escaped human control. For example, if a species is cultivated in a field and stays in the field, the species is not included in the report because it is still under human control. However, if the species spreads into the surrounding areas, then it is included in the report because it is also present in the wild and has escaped human control. If a species is living in human related habitat but has escaped human control and reproduces by itself for at least a few generations, the species is also included in the report. For example, if a species of cockroach lives in heated buildings, the species is included because it has escape human control (the type of habitat does not matter). Some species living in urban areas are thus included, like for example the exotic Brown Rat (*Rattus norvegicus*). When an exotic species is no longer present in a jurisdiction, it is simply deleted from the list and is not ranked extirpated.

Ranking migratory species

A migratory species is a species that leaves a region (nation, province, territory, or ocean region) to engage in long-distance seasonal movements. Migratory species include for example most of the birds,

as well as some species in other groups 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. 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).
- Some members of the species stay year-round in the jurisdiction and other individuals migrate = use all qualifiers B,N,M.
- The species breeds and migrates (does not remain in the jurisdiction during the non-breeding season) = use qualifiers B,M.
- The species spends the non-breeding season in the jurisdiction and migrates (does not breed in the jurisdiction) = use qualifiers N,M.
- The species only migrates through the jurisdiction = use only qualifier M.

However, if the M qualifier has the same rank as the B or N qualifier, it is not written (not included in the rank). For example, we write S5B instead of S5B,S5M to be shorter. If both the B and N qualifiers are used but are different, the M qualifier is not mentioned if its status is the same as the more secure of the two. For example, S1B,S5N means S1B,S5N,S5M.

These qualifiers are applied both to the regional ranks and to the national ranks. For example, if a species migrates outside Canada, the species will then have qualifiers at the regional level and at the national level. However, if a species migrates within Canada but does not migrate outside the country, then the species will have qualifiers in the provinces, territories, or ocean regions where it migrates, but will not have qualifiers at the national level. If a species does not engage in long-distance migrations in a region, these qualifiers should not be used in this region.

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 determine whether 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 provide 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.

Prior to the *Wild Species* 2015 report, when the report adopted the NatureServe ranking system, a customized ranking system was applied. There is generally a good match between the rounded ranks of NatureServe and the categories of the previous General Status ranking system (Table 18). 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 18. Comparison of the NatureServe rounded ranks with the previous General Status ranking system. Rank categories that are regrouped together are equivalent.

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 changes in the ranks of species at the national level, the National General Status Working Group also specifies the reasons for these changes. We also converted the reasons for changes from the previous General Status system to the reasons for changes of NatureServe. There is generally good agreement between the two sets of reasons for changes (Table 19). The reasons for changes enable understanding as to why the ranks have changed. Here are some examples:

- If the population size of a species has reduced following the spread of a disease, the reason for change would be a genuine change (G).
- If the population size of a species has reduced following habitat loss, the reason for change would be a genuine change (G).
- If a species was added to the list because it recently extended its range into Canada, the reason for change would be a genuine change (G).
- If new studies revealed that the population size of a species is much larger than previously thought, the reason for change would be new information on the species (I).

- If a species was recently discovered in Canada through new inventories, but the species was probably already present in the past, the reason for change would be new information on the species (I).
- If a species was assessed by COSEWIC and it brought a different interpretation of the status of the species, the reason for change would be a new interpretation of the same information (N).
- If incorrect information was used to determine an earlier conservation status, the reason for change would be incorrect data used previously (D).
- 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 incorrect data used previously (D).
- 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 criteria revision (C).

In some situations, there can be an overlap between these categories. In such cases, only the main category is selected. 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 new information on the species (I).

Table 19. Comparison of the NatureServe reasons for changes with the previous General Status reasons for changes. Reasons for changes that are regrouped together are equivalent.

Previous General Status reasons for changes		NatureServe reasons for changes	
Biological change in the population size, distribution, or threats of the species.	B	G	Genuine change in status.
Improved knowledge of the species.	I	I	New information not reflecting genuine change.
New COSEWIC assessment.	C	N	New interpretation of the same information.
Error in previous rank.	E	D	Incorrect data used previously.
Taxonomic change.	T	T	Taxonomic level change only.
Procedural change.	P	C	Criteria revision.
Not available (used only in 2005).	N	O	Other or unknown (used only in 2005).

Development of common names

Did you know that many 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, most 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 to engage with the public, as they are easier to understand than scientific names.

Common names usually have two parts: one part that describes the taxonomic group in which 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 in which 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 a person associated with 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 also to ensure 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 engaged 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 includes standardizing the part of the common names that describes the taxonomic group of the species (for example, ensuring 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 includes 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, and elsewhere as appropriate. In the *Wild Species* 2020 report, common names have been developed for many of the species included. The taxonomic logic of the common names is also described in the common name database. Most of the time, names are developed at the taxonomic level of the families.

Wild Species website

All the results of the program on the General Status of Species in Canada are available on the *Wild Species* website. A species search tool has been developed to enable searching in one place all species included in all *Wild Species* reports, and to compare the results over time. The reports are also integrated in the Species at Risk Public Registry of the federal government, in provincial and territorial websites, and in the NatureServe website. Appendix 3 lists the links of these websites.

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Sea cucumbers
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Appendix 4 – Websites

Wild Species: The General Status of Species in Canada
www.wildspecies.ca
https://search.wildspecies.ca/

Canada
https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/general-status.html

Yukon
https://yukon.ca/en/species-risk
https://yukon.ca/biodiversity

Northwest Territories
https://www.enr.gov.nt.ca/en/services/biodiversity/nwt-species-reports
https://www.enr.gov.nt.ca/en/services/biodiversity/nwt-species-infobase

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

British Columbia
https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk
https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre

Alberta
https://www.alberta.ca/general-status-of-alberta-wild-species.aspx
https://extranet.gov.ab.ca/env/wild-species-status/default.aspx
https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/

Saskatchewan
https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/wildlife-and-conservation/wildlife-species-at-risk
http://biodiversity.sk.ca/

Manitoba
https://www.gov.mb.ca/fish-wildlife/wildlife/ecosystems/index.html
https://www.gov.mb.ca/fish-wildlife/cdc/index.html

Ontario
https://www.ontario.ca/page/species-risk
https://www.ontario.ca/page/natural-heritage-information-centre

Quebec
https://mffp.gouv.qc.ca/the-wildlife/?lang=en
https://www.environnement.gouv.qc.ca/index_en.asp

New Brunswick
https://www2.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/GeneralStatusWildSpecies.html
http://www.accdc.com/

Nova Scotia
https://novascotia.ca/natr/wildlife/genstatus/
http://www.accdc.com/

Prince Edward Island
https://www.princeedwardisland.ca/en/information/environment-water-and-climate-change/species-risk-pei
http://www.accdc.com/

Newfoundland and Labrador
https://www.gov.nl.ca/ffa/wildlife/
http://www.accdc.com/

NatureServe
https://www.natureserve.org/canada
https://explorer.natureserve.org/

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