Canadian species index

Canadian Environmental Sustainability Indicators

Environment and Climate Change Canada
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Canada

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Table of contents

List of Figures

List of Tables

Canadian species index

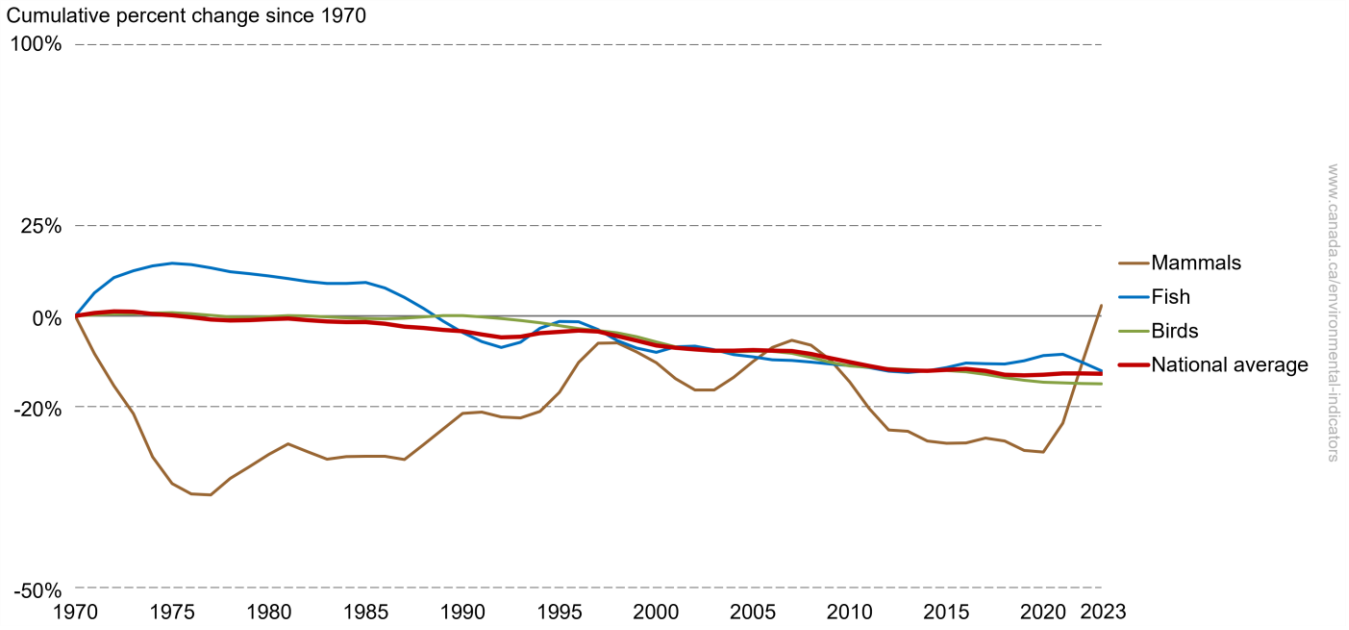
Vertebrate wildlife (animals with a spine) is one of the most visible and well-studied aspects of biodiversity. The 2024 Living Planet Index, which tracks populations of vertebrate species, indicates an average global decline of 73% in the relative abundance of monitored wildlife populations since 1970. This is an average annual decline of 2.6%.[1]

The Canadian species index uses similar methods to the Living Planet Index, but it is based on populations of vertebrate species regularly occurring in Canada. It shows how the average population abundance[2] of monitored vertebrate species has changed since 1970. The index is an "average of trends", rather than a measure of change in the total number of animals: each species, whether it is common or rare, has the same effect on the index. This, in turn, provides an integrated measure of the condition of our environment.

Key results

- Between 1970 and 2023,
  - the index for all monitored vertebrate species declined by 14% on average
  - the index for monitored bird and fish species decreased by 16% and 13% on average, respectively
- While the index for monitored mammal species appears to have increased in recent years by 3%, more data is needed to establish whether the increasing trend since 2020 is representative of mammals in Canada

Figure 1. Canadian species index, 1970 to 2023



Data for Figure 1

Note: Trends are calculated based on the proportional change in population abundance for monitored vertebrate species. All species are weighted equally, such that a species that doubled in population would be balanced out by a species that declined by half. The vertical axis is scaled to reflect the change in population required to balance out the opposite decrease or increase and is not symmetrical around zero. The degree of variability of the system analysis can be seen in Figure 5. Direct comparisons with the previous version of the index cannot be made

[1] WWF (2024) Living Planet Report 2024 – A System in Peril. WWF, Gland, Switzerland. Retrieved on March 31, 2026.

[2] Population abundance represents the size of the population of a species in an area. It can be measured in various ways, including population size (the number of individuals) and population density (the number of individuals per unit of area).

as there are differences in data availability across the whole time-series. See Recent changes.
Source: Zoological Society of London (2026).

The national index includes 902 species of birds, fish, mammals, amphibians and reptiles. The number of species represents 50% of the 1,798 native vertebrate species that regularly occur in Canada.[3] While there is an overall decrease in the national average trend across all monitored species, some species and species groups show an increasing trend.

The bird index includes 362 species and is the best represented group of species, covering 79% of the 457 regularly occurring native bird species in Canada.[3] Bird species populations have decreased on average, with the largest declines in populations of grassland birds, aerial insectivores, shorebirds, long-distance migrants, and Arctic birds (with the exception of Arctic waterfowl).[4]

The fish index includes 395 species of freshwater and marine fish, and accounts for 37% of the 1,057 native fish species.[3] While the initial decline is linked to the decline of marine populations until the early 2010s, declines in freshwater populations since the early 2000s have contributed to later declines.

The mammal index includes 106 species, which make up 54% of the 196 native mammal species.[3] While the average rate of change in mammal population abundance has varied over the decades, it was generally below the 1970 baseline until 2022. The decline of many mammal species is mainly attributed to fragmentation and loss of remaining habitat.[5] A wide range of species, from large bears to small squirrels, can have difficulty surviving in isolated and fragmented habitats.[6] While there was a substantial increase in the mammal index in recent years, there are far fewer populations contributing to the trend in these final few years, likely due to a lag between monitoring data collection and publication. For 2022, for example, 62% of the populations originated from one data source, representing 9 mammal species in Pukaskwa National Park in northern Ontario. The trend is therefore less geographically and taxonomically representative in the final years. More data is needed to determine whether this increase is representative of mammals in Canada more widely.

Some amphibians (25 species) and reptiles (14 species) are also included in the national species index. However, given the poor geographical extent and coverage across the reporting period in the Canadian species index dataset, the index for amphibians and reptiles may not be representative. Therefore, it is not shown separately. In Canada, amphibians and reptiles have a high proportion of species at risk of extinction. The General status of wild species indicator shows that 69% (29 of 42) of reptile species and 39% (18 of 46) of amphibian species are at risk of disappearing.[3,7]

[3] The number of native vertebrate species that regularly occur in Canada is based on the Wild Species 2020 report and does not include species classified as "Presumed Extirpated", "Probably Extirpated" and "Not Applicable."

[4] Birds Canada and Environment and Climate Change Canada (2024) State of Canada's Birds. Retrieved on March 31, 2026.

[5] Imre I and Derbowka D (2011) Major Threats Facing Terrestrial Mammals in Canada. *The Canadian Field Naturalist* 125(3): 213-219.

[6] Parks Canada (2024) Stressors. Retrieved on March 30, 2026.

[7] Species considered as at risk of disappearing include those with the NatureServe conservation status rank of "Vulnerable", "Imperiled", and "Critically imperiled".

Canadian species index by system

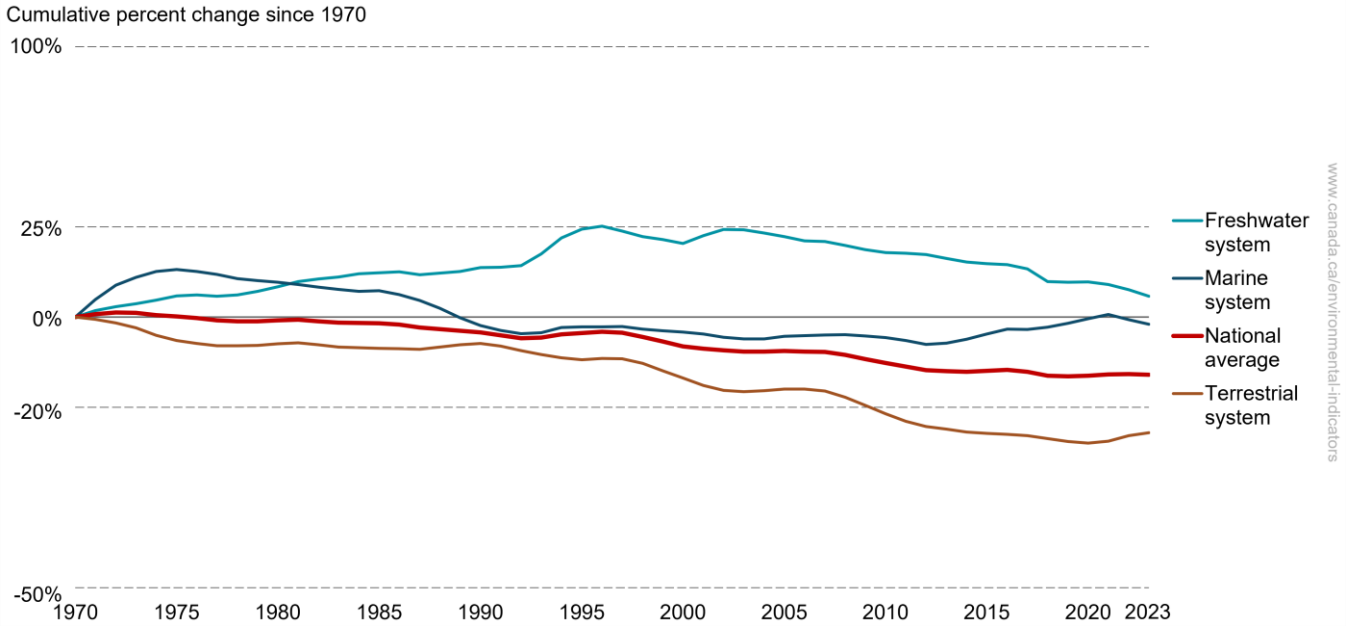
To calculate the index by system, wildlife species can be assigned to terrestrial, freshwater, or marine systems based on the location where the species was monitored and the species' biology.

Key results

From 1970 to 2023,

- the index for the terrestrial system, which includes most of the bird and mammal populations, and some reptiles and amphibians, decreased by 26%
- the index for the marine system, which includes mammals (such as whales and seals), seabirds, 1 reptile (the leatherback turtle) and marine fish populations, decreased by 2%
- the index for the freshwater system, which includes inland waterbirds and waterfowl, 3 mammals (beaver, muskrat and river otter), freshwater fish, and the majority of amphibian and turtle populations, increased by 5%

Figure 2. Canadian species index by system, 1970 to 2023



Data for Figure 2

Note: Trends are calculated based on the proportional change in population abundance for monitored vertebrate species. All species are weighted equally, such that a species that doubled in population would be balanced out by a species that declined by half. The vertical axis is scaled to reflect the change in population required to balance out the opposite decrease or increase and is not symmetrical around zero. The degree of variability of the system analysis can be seen in Figure 6. Direct comparisons with the previous version of the index cannot be made as there are differences in data availability across the whole time-series. See Recent changes.
Source: Zoological Society of London (2026).

In terrestrial systems, the decline is steep for mammals (29% decrease) and birds (25% decrease). Many groups of small mammals, reptiles and amphibians are underrepresented in this analysis and as such, this must be interpreted with caution.

Marine systems have remained relatively stable since 1970 (a slight decline of 2%). While marine bird populations have remained relatively stable (a slight increase of 2%), marine fish have declined (13% decrease). Overfishing remains the main threat to this group, but habitat loss and degradation, pollution, interactions with farmed fishes

and the presence of invasive species also have negative impacts.[8] An increase in the index was observed for marine mammals in recent years, partly due to the recovery of several whale species since the ban on commercial whaling in 1986.[9,10] More data is needed to ensure that this trend is reflective of marine mammals in general.

The freshwater system index increased by 5% primarily due to increases in freshwater birds (18%), fish (24%) and mammals (16% from 1970 to 2018). However, only 3 mammal species were included in the analysis for freshwater trends. Coupled with the wide confidence interval of the fish index (Figure 6), this suggests there is a lot of variation in the underlying trends. As a result, these final index values should be treated with caution.

About the indicator

What the indicator measures

The Canadian species index represents the average percent change in the abundances of Canadian vertebrate species' populations since 1970. The index is an "average of trends", rather than a measure of change in the total number of animals: each species, whether it is common or rare, has the same effect on the index. The index reports general trends rather than progress towards desired levels.

Why this indicator is important

Animal wildlife populations, such as vertebrate species, depend on healthy habitats and can be negatively impacted by threats such as urbanization, development or pollution that lead to habitat loss or degradation. The status of wildlife populations is a key factor that contributes to ecosystem health and species' resilience to threats. Trends in vertebrate populations can provide an indication of the health of biodiversity and ecosystems in Canada.

Related initiatives

This indicator supports the measurement of progress towards the 2022 to 2026 Federal Sustainable Development Strategy Goal 15: Life on land – Protect and recover species, conserve Canadian biodiversity.

This indicator also supports the measurement of progress towards the Canada's 2030 Nature Strategy Target 4: Species recovery.

The indicator also contributes to the Kunming-Montreal Global Biodiversity Framework. It is linked to Goal A – Protect and Restore:

- "The integrity, connectivity and resilience of all ecosystems are maintained, enhanced, or restored, substantially increasing the area of natural ecosystems by 2050;
- Human induced extinction of known threatened species is halted, and, by 2050, extinction rate and risk of all species are reduced tenfold, and the abundance of native wild species is increased to healthy and resilient levels;
- The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential."

It is also linked to Target 4 of the same framework: "Ensure urgent management actions, to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including

[8] Canadian Endangered Species Conservation Council (2023) Wild Species 2020: The General Status of Species in Canada. National General Status Working Group. Retrieved on March 31, 2026.

[9] Magera AM, Mills Flemming JE, Kaschner K, Christensen LB and Lotze HK (2013) Recovery trends in marine mammal populations. *PLOS One* 8(10): e77908.

[10] WWF-Canada (2025) Living Planet Report Canada 2025: Wildlife at home. Currie J & Snider J. World Wildlife Fund Canada. Toronto, Canada. Retrieved on March 31, 2026.

through in situ and ex situ conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence."

Related indicators

The Species at risk population trends indicator shows whether population and distribution trends of species at risk that are listed under the *Species at Risk Act* are consistent with recovery or management objectives.

The General status of wild species indicator reports extinction risks across many different groups of species and can reveal early signs of trouble before species reach a critical condition.

The Trends in Canada's bird populations indicator reports average population trends of various groups of native Canadian bird species.

The Population status of Canada's migratory birds indicator provides a snapshot of the general state of birds in Canada that are listed under the *Migratory Birds Convention Act*.

Data sources and methods

Data sources

Data on changes in the abundance of vertebrate populations are gathered from a variety of sources and collated in the Living Planet Database by the Zoological Society of London. Sources include peer-reviewed scientific literature, government reports, and authoritative online databases. Examples of important sources include the North American Breeding Bird Survey, the Fisheries and Oceans Canada Library and the Open Government Portal.

More information

Population data were gathered from the literature by performing online searches and by contacting experts. Birds have been monitored at the national level since about 1970 with high-quality data readily available for this species group. Fewer data are available for other species groups. To help address the imbalance in the data available for the different species groups, targeted searches were carried out for under-represented groups. Searches were also conducted to locate data for under-represented regions.

Data include counts of individuals, as well as proxy measurements such as indices of abundance, spawning density, or detection rates of individuals. Each record is also tagged with geographical and ecological information to allow for further analysis. Together, these records form the dataset used to calculate the indices.

Information for 902 (50%) of the 1,798 native regularly occurring vertebrate species has been captured in the dataset.[11] Birds are the best represented species group, with about 79% of all bird species regularly occurring in Canada represented.

While many fish species are included (395 species), they account for only 37% of the total number of fish species regularly occurring in Canada.[11]

While mammal species are included (106 species), they account for only 54% of the total number of mammal species regularly occurring in Canada.[11]

Amphibians and reptiles have the least number of species included. They include 25 species of amphibians and 14 species of reptiles, accounting for 54% and 33% of the total number of species of their respective taxon.[11]

The index has been calculated for the period 1970 to 2023, as this is the time period over which sufficient data exist for credible estimates.

[11] Data derived from Canadian Endangered Species Conservation Council (2023) Wild Species 2020: The General Status of Species in Canada. National General Status Working Group. It does not include species classified as "Presumed Extirpated", "Probably Extirpated" and "Not Applicable."

Methods

The trend in the population abundance of each species is estimated using all the information available for that particular species in Canada. This may include measurements from just one site/location, or measurements from a combination of sites/locations for the same species. These trends are averaged across all species to generate the Canadian species index.

The Canadian species index is broadly similar to the Living Planet Index and the Living Planet Index for Canada.[12] The latter uses the same methods as the Canadian species index and reports different sub-indices.

More information

Data collection and tagging

To be included in this index, a time series, drawn from Canadian data contained in the Living Planet Database, must meet all the following criteria:

- contain data for at least 3 years since 1970
- have been collected for a defined population using comparable methods across years
- use units of population abundance or a reliable proxy, such as spawning biomass or density
- have a referenced and traceable source

Each time series is referred to as a "population".

Each record is tagged with contextual information such as geographical region, species group and system. Data tags allow a subset of the database to be extracted for targeted analysis. Information for these tags is drawn from the original data source if possible. However, additional reference material is also used. Species that occur in more than one system type (terrestrial, freshwater or marine) are tagged as belonging to the system in which they were observed and on which they rely on for at least part of their life cycle. For example, a time series containing the number of salmon spawning in rivers would be considered freshwater, while one containing observations at sea would be considered marine. These 2 time series would be considered different populations, even though they may constitute the same population in the biological sense.

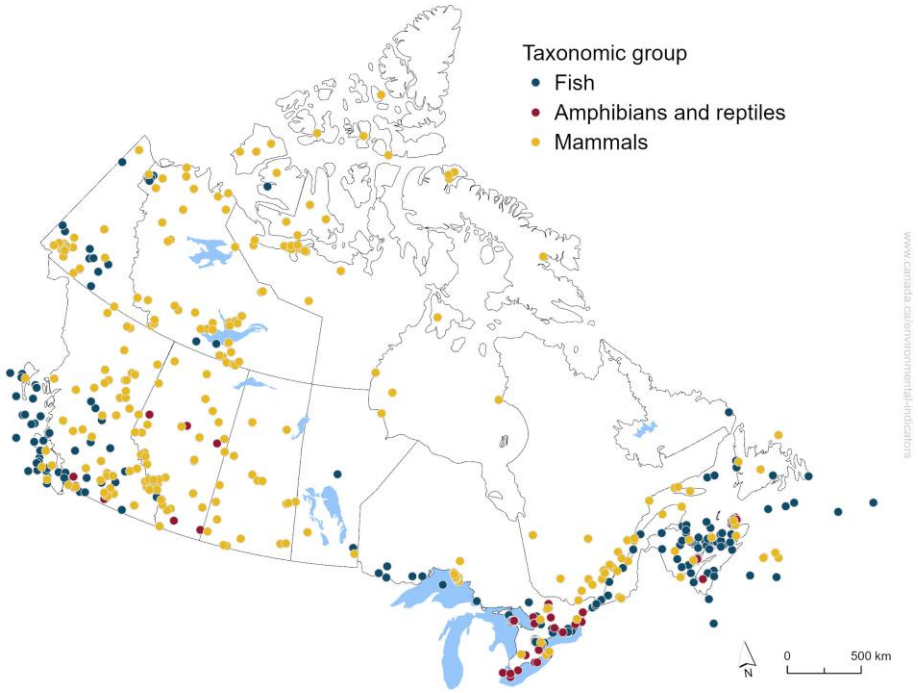
Below are maps that illustrate the geographic distribution of the populations with specific locations included in the dataset. Birds, as they are observed at the regional or the national level, and other species observed at a similar scale, were not included in the map. The map highlights that observations are concentrated along the southern parts of Canada, likely due to the accessibility of observation locations, and that more data are required in northern Canada.[13]

Figure 3 classifies the populations by the groups of species to which they belong. Figure 4 classifies the populations based on the systems to which they were assigned.

[12] For additional resources on the methodology refer to: Currie J et. al. (2026) Navigating methodological decisions: balancing rigor and data volume of the Canadian Living Planet Index. *FACETS* 11: 1-14, and Marconi V, et. al. (2021) Population declines among Canadian vertebrates: But data of different quality show diverging trends. *Ecological Indicators* 130: 108022.

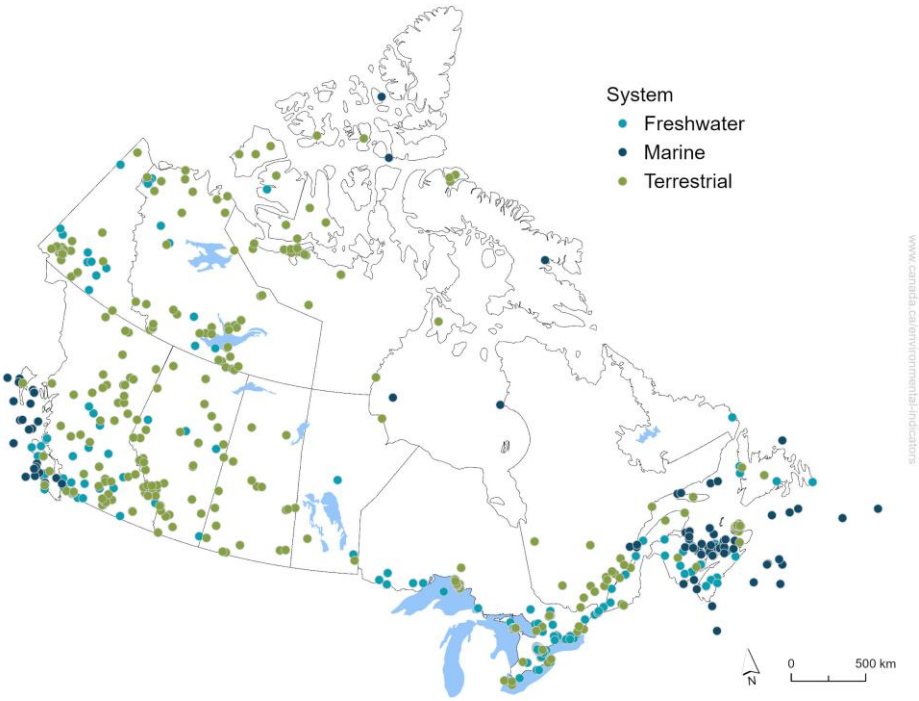
[13] For more information on sampling bias, refer to the Caveats and limitations section.

Figure 3. Geographic distribution of populations used in the index by species group, 1970 to 2023



Note: Species that were observed at national or regional scales, such as birds and some fish populations, were not included in the map as they have non-specific locations. The map includes replicate populations to show the geographic spread within the dataset.
Source: Zoological Society of London (2026).

Figure 4. Geographic distribution of populations associated with specific locations used in the index by system, 1970 to 2023



Note: Species that were observed at national or regional scales, such as birds and some fish populations, were not included in the map as they have non-specific locations. The map includes replicate populations to show the geographic spread within the dataset.
Source: Zoological Society of London (2026).

Preprocessing

Species selection

Data for the overall index were restricted to vertebrate species that regularly occur in Canada. Classification was based on the Wild Species 2020 report. Species that were classified as "Not Applicable" were not included in the dataset as this classification is reserved for species that are not considered a suitable target for conservation. This includes exotic, hybrid or accidental species occurring infrequently and unpredictably in Canada. Species classified as "Presumed Extirpated" or "Probably Extirpated" were also excluded from the dataset, since they no longer occur in Canada.

Increasing population abundances are generally interpreted as a sign of environmental improvement. However, a few bird species are known to have a population abundance that is above acceptable bounds (see the Population status of Canada's migratory birds indicator), and for these species, an increase in population is a negative outcome. Three (3) species, snow goose (*Anser caerulescens*; both subspecies), Ross's goose (*Anser rossii)* and Canada goose (*Branta canadensis*), have been excluded from the index for this reason.

Bird species whose range expanded into Canada after 1970 were also excluded due to their potential impact on the index (refer to Caveats and limitations for the list of species). As these species did not occur in Canada at the beginning of the index, the estimates of their population change would be extremely large and could present a non-representative increase for all bird populations in Canada.

Population modelling

For each population, a record of abundance over time is created. Modelling is used to reduce the effect of random variations and measurement noise. For time series containing at least 6 data points, trends were modelled using Generalized Additive Modelling. For shorter time series, and for any series that could not be modelled with Generalized Additive Modelling, a linear regression model was used. Time series are not extrapolated beyond the start and end date of observations.

In some years and for some time series, a 0 was recorded. In a few cases, this may be due to a local extinction, but more often, it is because wildlife were not observed. A failure to observe wildlife may be because there are few wildlife to observe, which is a genuine signal of low numbers. It could also mean that wildlife were simply not detected. When this happens, for example, if unusual weather conditions made movement patterns unpredictable; then a 0 would represent a missing value. For the purposes of the indicator, 0s have been treated as missing values, resulting in a conservative estimate of change.

Calculation of the index

Trends within a time series

For each time series, proportional change d_t is calculated for each year for which data exist, as follows:

$$d_t = log_{10}\left(\frac{N_t}{N_{(t-1)}}\right)$$

where:

N_t = modelled population abundance estimate in year *t*

$N_{(t-1)}$ = modelled population abundance estimate in year *t*-1

Index calculation

For species with more than 1 time series, the average proportional change (lambda, λ) is calculated for each year across all time series (including all subspecies) for that species.

Formally, for species *i* in year *t*:

$$\lambda_{i,t} = \frac{1}{m}\sum_{j=1}^{m} d_{i,j,t}$$

where:

$\lambda_{i,t}$ = average proportional change for species *i* in year *t*

$d_{i,j,t}$ = proportional change for time series *j*, for species *i* in year *t*

m = number of time series for species *i* in year *t*

For a species with only 1 time series:

$$\lambda_{i,t} = d_{i,t}$$

The overall annual change is calculated as the average lambda across all species with data for that time step. In other words, the index for 2014 is the average λ_i for all species with population estimates in 2013 and 2014. Species are weighted equally, regardless of data availability.

The index for a particular year is the sum of logged annual changes since 1970.

Percentage changes are calculated using the following formula:

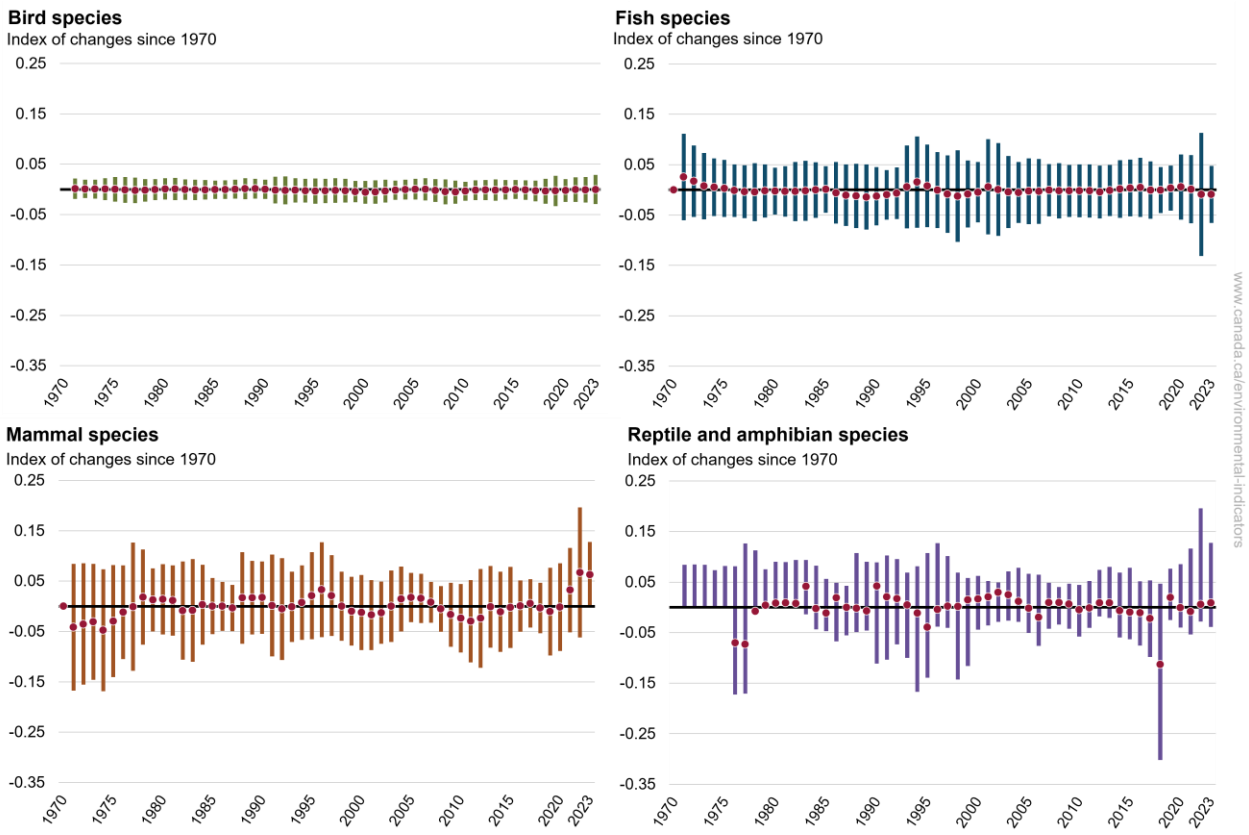
$$Percent\ change = (10^{\lambda} - 1) \times 100$$

Sub-indices, such as the indices for each species group and system, are calculated using the same methodology, but for a selected subset of species or populations.

Assessment of uncertainty

The degree of variability within the species-level lambdas (λ) for a given year provides an indication of whether trends are similar across the species included in the index (Figure 5 and Figure 6). A narrow interval means that most species are changing by similar proportions, while a wide interval means that there is a wide range of patterns. Because indexed species are not a random or representative selection of the species in the environment, this can only be a partial assessment of uncertainty. The uncertainty due to a non-representative sample of species cannot be measured.

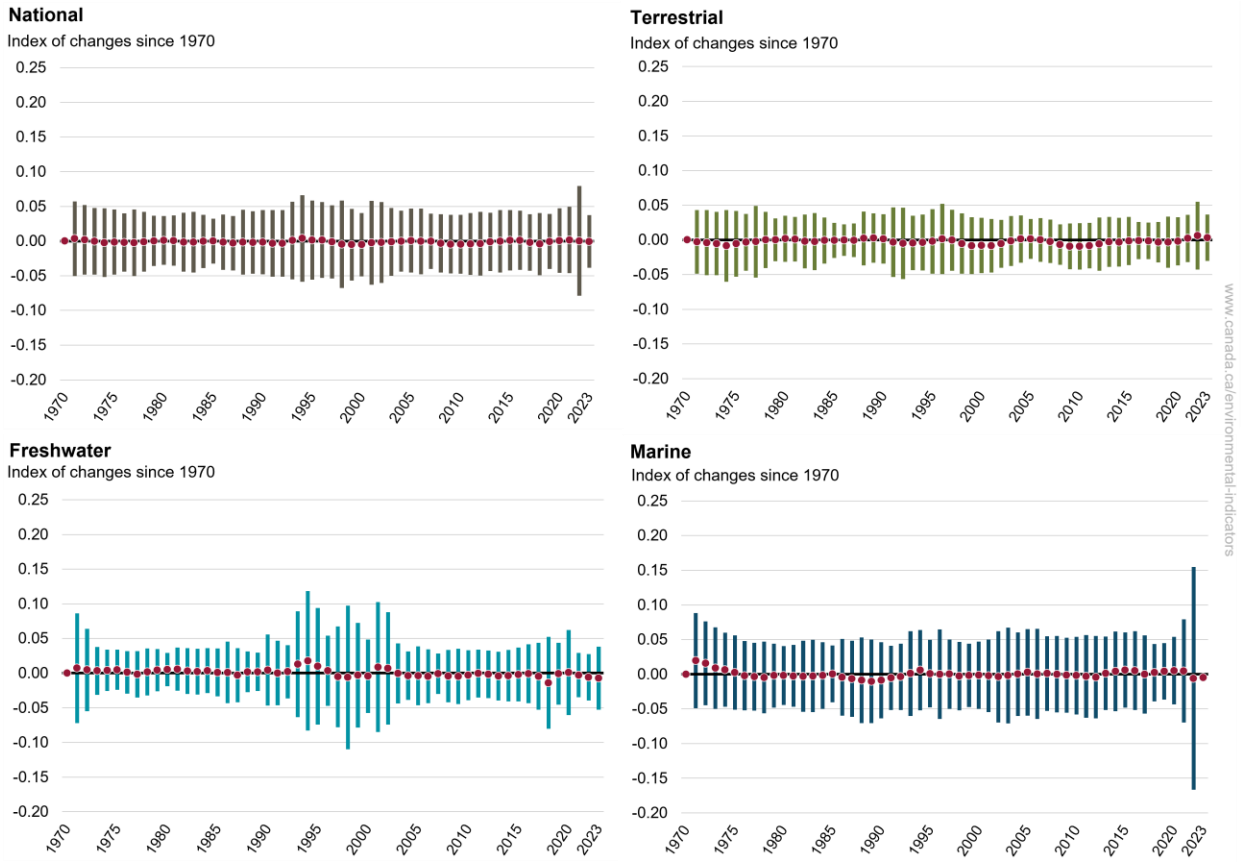
Figure 5. Distribution of species-level lambda values, species group, 1970 to 2023



Data for Figure 5

Note: The dots show the average annual lambda across all species. Vertical bars show the standard deviation of average annual lambda across all species. A narrow interval means that most species are changing by similar proportions, while a wide interval means that there is a wide range of interannual change values.
Source: Zoological Society of London (2026).

Figure 6. Distribution of species-level lambda values, national and by system, 1970 to 2023



Data for Figure 6

Note: The dots show the average annual lambda across all species. Vertical bars show the standard deviation of average annual lambda across all species. A narrow interval means that most species are changing by similar proportions, while a wide interval means that there is a wide range of patterns.
Source: Zoological Society of London (2026).

Recent changes

Previous iterations of the indicator required that populations have data for at least 2 years since 1970 to be considered in the indicator. This requirement was changed to at least 3 years of data since 1970 to raise the threshold for data inclusion in the index and reduce uncertainty from populations with only 2 years of data.

The previous version of the indicator used data from various sources to calculate the index for bird species. The current release leverages the State of Canada's Birds dataset to ensure that the most accurate abundance trend for each bird species is included. As a result, there was a change to the bird species included in the analysis compared to the last release. For example, bushtit was included in this version of the indicator whereas it had been excluded in the past. There was a drop in the overall number of bird species included.

An analysis was performed this year to identify potential biases in the data. For more information, refer to the Caveats and limitations section below.

Caveats and limitations

This indicator only captures changes in biodiversity since 1970 and likely underestimates the overall anthropogenic impact on species.

The Canadian species index indicator was developed from the Living Planet Index. It is calculated with the same method as the indices presented in the Living Planet Report Canada 2025, in which the Living Planet Index methodology has been revised and adapted to the Canadian dataset. However, as the Living Planet Database is

continuously augmented and the Living Planet Report Canada and the Canadian species index were calculated at different points in time, their index values will differ.

The national trend is the average rate of change across all monitored vertebrate species. The indices may reflect changes in data availability. Data are not available for all species and do not always cover the geographic range of each species or the whole time period reported.

The index uses available data; it is therefore less data-rich at the beginning of the trend. It is also biased towards certain species (for example, species that are easy to observe and species that are managed for human use or for conservation, and species with aesthetic appeal). Through a sampling bias analysis, it was identified that it is also biased towards locations that are more easily accessible (for example, populations closer to airports and roads). Birds are well represented, but most other vertebrate groups are not as comprehensively monitored. Some species are represented by data that come from a local study involving a small part of the total population. Also, in the instance of reptiles and amphibians, there is poor geographical coverage across the reporting period, with majority of observations coming from Ontario and Alberta. While there is considerable uncertainty surrounding the trends for these species, combining data for many species can provide an average signal for different taxonomic groups and systems.

While large scale trends broadly reflect environmental change, smaller scale subindices (i.e., when the analysis is reflective of specific subsets of populations) can present differing trends if a population trend with a different trajectory is present in the analysis.

The index is used to look at the trajectories of average change in monitored vertebrate populations. However, the underlying data can also be used to explore the drivers of change, as was done in a recent publication using a similar dataset.

There are similarities with the Canadian species index and the indicators used in the State of Canada's Birds report, in that both are averages of trends. However, there are also differences, as the Canadian species index for birds does not incorporate estimates of uncertainty in the data as they are not always included in the data source.

Species whose range expanded into Canada after 1970 were not included in the analysis. These are: Anna's hummingbird, black-necked stilt, blue-gray gnatcatcher, blue-winged warbler, Carolina wren, great egret, red-bellied woodpecker, and wild turkey.

The Canadian species index does not measure the change in the total number of birds or other species groups. By contrast, a recent scientific study showed an overall decline in the number of birds because it was much more sensitive to changes in populations of abundant species than changes in rare species, and many of our most abundant species have declined (for example, dark-eyed junco and savannah sparrow).[14]

Finally, new data for earlier time periods continue to be added to the database, improving estimates of change over time. For this reason, direct comparisons with the previous version of the index cannot be made.

The index should be interpreted with these caveats in mind.

More information

The Canadian species index has been developed from the Living Planet Index, originally conceived by the World Wildlife Fund and now developed in partnership with the Zoological Society of London. The index is based on a peer-reviewed method that can integrate many types of population measurements.[15]

The index is descriptive. Because the underlying data have been collected for other purposes, the set of species contained in the index has unknown sampling biases. For this reason, it does not meet the requirement for randomized sampling that is necessary for traditional statistical hypothesis testing, and changes in the index can therefore not be tested for statistical significance. It also does not incorporate estimates of uncertainty from the data sources as this information is not available for all of them. Trends in the index provide an indication of trends in the environment and can be used to identify where additional analysis or information is required.

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[14] Rosenberg KV et al. (2019) Decline of the North American avifauna. *Science* 366(6461): 120-124.

[15] Collen B et al. (2009) Monitoring Change in Vertebrate Abundance: the Living Planet Index. *Conservation Biology*: 23(2): 317-327.

An analysis was performed to identify potential biases in the dataset. On a taxon level, bird species were best represented overall. Small reptiles and amphibians, and large mammals and fishes with longer lifespans are better represented in the index than their counterparts (i.e., large reptiles and amphibians and small mammals and fishes with shorter lifespans). Furthermore, a temporal bias analysis showed that the number of populations and species contributing to the trend peaked in 2007, after which there is a gradual drop in these numbers, particularly for mammals, fish, reptiles and amphibians. This drop is partly related to time lags between data collection and publication. When disaggregated by system, the number of species and populations contributing to the terrestrial system index is relatively consistent over time, whereas those that contribute to the marine and freshwater system indices were variable. Future data collection efforts should continue to focus on adding more data for recent years. Last, populations in southern Canada are better represented than those in central and northern Canada, which require additional monitoring (Figure 3 and Figure 4).

Averaging trends across all populations within each species can obscure important variability among subspecies, varieties or geographic regions. Averaging trends across species may also obscure important variation among species. Analysis of different subsets of the dataset can help uncover these patterns.

Population abundance measurements always include some uncertainty, because not every individual animal can be found and counted at every sampling interval. The effect of uncertainty in measurement can only be separated from genuine changes in population abundance with statistically rigorous sampling designs, but not all datasets meet those standards. Random variability may lead to a few more or less individuals being counted. If this variability leads to a large proportional change, as is the case when the average number of individuals found is small, the resulting impact on the index can be large. However, uncertainty does average out over longer time series and over more species. For this reason, interpretation of small subsets of data must be done with an understanding of the context of the biology of the species that are included and the strengths and weaknesses of the monitoring protocols used for those species.

Only vertebrate species are included in the index, because they are the only group with sufficient population-level data. Invertebrates and other taxonomic groups, such as vascular plants and fungi, do not tend to be monitored using abundance data. As different data types are not readily integrated into the index, they are not included in the analysis.

Resources

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Related information

Arctic Species Trend Index (ASTI)

Annex

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Canadian species index, 1970 to 2023

Year	National index (cumulative percent change since 1970)	Bird index (cumulative percent change since 1970)	Mammal index (cumulative percent change since 1970)	Fish index (cumulative percent change since 1970)
1970	0.00	0.00	0.00	0.00
1971	0.77	0.31	-9.13	6.06
1972	1.18	0.52	-16.24	10.29
1973	1.10	0.66	-22.00	12.23
1974	0.55	0.78	-30.10	13.65
1975	0.21	0.84	-34.69	14.38
1976	-0.27	0.63	-36.41	13.98
1977	-0.85	0.19	-36.55	13.07
1978	-1.08	-0.24	-33.82	11.92
1979	-1.04	-0.32	-31.85	11.40
1980	-0.80	-0.10	-29.65	10.78
1981	-0.66	0.08	-27.74	10.03
1982	-1.04	0.00	-29.16	9.21
1983	-1.40	-0.24	-30.52	8.68
1984	-1.51	-0.46	-30.05	8.61
1985	-1.54	-0.60	-29.98	8.89
1986	-1.92	-0.68	-29.99	7.45
1987	-2.62	-0.58	-30.57	4.88
1988	-2.99	-0.23	-27.88	1.98
1989	-3.42	0.13	-24.98	-1.28
1990	-3.79	0.15	-21.93	-4.10
1991	-4.54	-0.20	-21.67	-6.26
1992	-5.27	-0.66	-22.65	-7.68
1993	-5.11	-1.09	-22.84	-6.44
1994	-4.27	-1.66	-21.53	-3.09
1995	-3.97	-2.42	-17.62	-1.33
1996	-3.63	-3.10	-11.13	-1.43
1997	-3.89	-3.59	-6.67	-3.34
1998	-4.94	-4.14	-6.61	-6.06
1999	-6.07	-5.11	-8.70	-7.82
2000	-7.20	-6.36	-11.22	-8.79
2001	-7.72	-7.51	-14.70	-7.52
2002	-8.13	-8.21	-17.17	-7.35

Year	National index (cumulative percent change since 1970)	Bird index (cumulative percent change since 1970)	Mammal index (cumulative percent change since 1970)	Fish index (cumulative percent change since 1970)
2003	-8.40	-8.57	-17.17	-8.24
2004	-8.45	-8.69	-14.42	-9.31
2005	-8.31	-8.62	-10.93	-9.86
2006	-8.42	-8.59	-7.68	-10.51
2007	-8.50	-9.03	-5.97	-10.68
2008	-9.19	-10.04	-7.11	-11.06
2009	-10.13	-11.15	-10.61	-11.47
2010	-11.07	-11.89	-15.39	-11.87
2011	-11.90	-12.23	-20.96	-12.29
2012	-12.69	-12.48	-25.18	-13.11
2013	-12.92	-12.75	-25.41	-13.37
2014	-13.02	-12.90	-27.26	-13.03
2015	-12.80	-12.96	-27.67	-12.28
2016	-12.58	-13.21	-27.60	-11.29
2017	-13.01	-13.80	-26.67	-11.39
2018	-13.89	-14.51	-27.25	-11.47
2019	-14.03	-15.08	-28.98	-10.71
2020	-13.90	-15.52	-29.27	-9.55
2021	-13.60	-15.63	-23.84	-9.30
2022	-13.55	-15.78	-11.12	-11.13
2023	-13.67	-15.81	2.74	-12.98

Note: Trends are calculated based on the proportional change in population abundance for monitored vertebrate species. All species are weighted equally, such that a species that doubled in population would be balanced out by a species that declined by half. The degree of variability of the system analysis can be seen in Figure 5. Direct comparisons with the previous version of the index cannot be made as there are differences across the whole time-series. See Recent changes.
Source: Zoological Society of London (2026).

Table A.2. Data for Figure 2. Canadian species index by system, 1970 to 2023

Year	Terrestrial index (cumulative percent change since 1970)	Freshwater index (cumulative percent change since 1970)	Marine index (cumulative percent change since 1970)
1970	0.00	0.00	0.00
1971	-0.60	1.67	4.63
1972	-1.49	2.74	8.48
1973	-2.66	3.50	10.73
1974	-4.55	4.45	12.36
1975	-5.76	5.61	12.96
1976	-6.49	5.88	12.41
1977	-7.03	5.46	11.50
1978	-7.03	5.83	10.29
1979	-6.99	6.85	9.78

Year	Terrestrial index (cumulative percent change since 1970)	Freshwater index (cumulative percent change since 1970)	Marine index (cumulative percent change since 1970)
1980	-6.62	8.09	9.32
1981	-6.38	9.50	8.70
1982	-6.85	10.27	7.94
1983	-7.34	10.79	7.30
1984	-7.52	11.70	6.83
1985	-7.67	11.97	6.96
1986	-7.74	12.24	5.88
1987	-7.87	11.46	4.32
1988	-7.39	11.95	2.25
1989	-6.78	12.41	-0.15
1990	-6.49	13.53	-2.15
1991	-7.16	13.57	-3.36
1992	-8.21	14.07	-4.17
1993	-9.13	17.50	-3.94
1994	-9.88	22.39	-2.64
1995	-10.30	25.18	-2.46
1996	-10.00	26.13	-2.45
1997	-10.06	24.59	-2.41
1998	-11.14	22.82	-3.01
1999	-12.82	21.96	-3.40
2000	-14.39	20.73	-3.74
2001	-16.01	23.16	-4.21
2002	-17.08	25.11	-5.02
2003	-17.35	24.99	-5.42
2004	-17.11	23.93	-5.38
2005	-16.81	22.79	-4.77
2006	-16.80	21.51	-4.66
2007	-17.22	21.29	-4.42
2008	-18.48	20.07	-4.40
2009	-20.17	18.78	-4.70
2010	-21.87	17.94	-5.13
2011	-23.33	17.77	-5.80
2012	-24.39	17.31	-6.73
2013	-24.88	16.15	-6.44
2014	-25.44	15.15	-5.52
2015	-25.72	14.61	-4.18
2016	-25.87	14.33	-3.02
2017	-26.12	13.11	-3.08

Year	Terrestrial index (cumulative percent change since 1970)	Freshwater index (cumulative percent change since 1970)	Marine index (cumulative percent change since 1970)
2018	-26.68	9.52	-2.56
2019	-27.22	9.29	-1.58
2020	-27.54	9.46	-0.38
2021	-27.16	8.73	0.70
2022	-26.11	7.23	-0.67
2023	-25.57	5.44	-1.76

Note: Trends are calculated based on the proportional change in population abundance for monitored vertebrate species. All species are weighted equally, such that a species that doubled in population would be balanced out by a species that declined by half. The degree of variability of the system analysis can be seen in Figure 6. Direct comparisons with the previous version of the index cannot be made as there are differences across the whole time-series. See Recent changes.
Source: Zoological Society of London (2026).

Table A.3. Data for Figure 5. Distribution of species-level lambda values, species group, 1970 to 2023

Year	Bird index, average lambda	Bird index, standard deviation	Bird index, number of species	Mammal index, average lambda	Mammal index, standard deviation	Mammal index, number of species	Fish index, average lambda	Fish index, standard deviation	Fish index, number of species	Reptile and amphibian index, average lambda	Reptile and amphibian index, standard deviation	Reptile and amphibian index, number of species
1970	n/a	n/a	325	n/a	n/a	27	n/a	n/a	84	n/a	n/a	n/a
1971	0.00132	0.02020	325	-0.04160	0.12592	32	0.02557	0.08604	91	n/a	n/a	n/a
1972	0.00092	0.01813	326	-0.03537	0.12047	33	0.01699	0.07101	82	n/a	n/a	n/a
1973	0.00059	0.01894	328	-0.03094	0.11527	39	0.00757	0.06589	97	n/a	n/a	n/a
1974	0.00054	0.02195	329	-0.04760	0.12108	36	0.00544	0.05725	107	n/a	n/a	n/a
1975	0.00024	0.02437	329	-0.02950	0.11106	34	0.00279	0.05667	94	n/a	n/a	2
1976	-0.00089	0.02571	331	-0.01160	0.09298	32	-0.00152	0.05239	104	-0.07000	0.10228	2
1977	-0.00192	0.02533	331	-0.00095	0.12731	39	-0.00350	0.05262	103	-0.07343	0.09742	2
1978	-0.00185	0.02232	333	0.01830	0.09441	28	-0.00443	0.05766	108	-0.00793	n/a	2
1979	-0.00037	0.02068	335	0.01275	0.06250	30	-0.00203	0.05268	113	0.00407	0.00770	1
1980	0.00097	0.02123	353	0.01380	0.06965	30	-0.00243	0.04660	117	0.00841	0.00156	1
1981	0.00078	0.02206	353	0.01159	0.06981	30	-0.00294	0.04996	119	0.00883	0.00096	1
1982	-0.00033	0.02019	353	-0.00863	0.09771	31	-0.00326	0.05857	122	0.00739	0.00300	2
1983	-0.00106	0.02001	353	-0.00837	0.10189	27	-0.00212	0.05965	128	0.04125	0.05529	2
1984	-0.00094	0.01934	357	0.00291	0.07924	31	-0.00025	0.05529	159	-0.00244	0.04119	2
1985	-0.00064	0.01838	357	0.00039	0.05560	32	0.00109	0.04624	131	-0.01141	0.03550	7
1986	-0.00035	0.01842	357	-0.00005	0.04871	30	-0.00577	0.06118	145	0.01899	0.08626	7
1987	0.00045	0.01907	358	-0.00363	0.04606	40	-0.01052	0.06100	162	-0.00013	0.05505	8
1988	0.00153	0.02092	358	0.01655	0.09093	39	-0.01217	0.06380	135	-0.00204	0.04674	7
1989	0.00157	0.01963	358	0.01710	0.07305	42	-0.01409	0.06454	159	-0.00725	0.03867	7
1990	0.00008	0.01917	359	0.01731	0.07186	48	-0.01262	0.05810	134	0.04207	0.15307	11
1991	-0.00151	0.02659	360	0.00146	0.10116	45	-0.00985	0.04937	157	0.02066	0.12402	13
1992	-0.00199	0.02762	360	-0.00547	0.10114	46	-0.00663	0.05129	148	0.01709	0.09038	14
1993	-0.00189	0.02438	360	-0.00107	0.06954	54	0.00577	0.08234	179	0.00488	0.10464	16
1994	-0.00251	0.02331	360	0.00733	0.07412	56	0.01528	0.09050	161	-0.01161	0.15581	18
1995	-0.00338	0.02499	361	0.02110	0.08641	58	0.00783	0.08202	152	-0.03949	0.09947	18
1996	-0.00305	0.02422	361	0.03294	0.09405	55	-0.00045	0.07532	155	-0.00457	0.03344	21
1997	-0.00217	0.02463	361	0.02127	0.08006	62	-0.00851	0.07687	132	0.00239	0.04320	23

Year	Bird index, average lambda	Bird index, standard deviation	Bird index, number of species	Mammal index, average lambda	Mammal index, standard deviation	Mammal index, number of species	Fish index, average lambda	Fish index, standard deviation	Fish index, number of species	Reptile and amphibian index, average lambda	Reptile and amphibian index, standard deviation	Reptile and amphibian index, number of species
1998	-0.00251	0.02383	361	0.00028	0.06852	60	-0.01240	0.09108	164	0.00184	0.14475	25
1999	-0.00440	0.02099	361	-0.00984	0.06814	63	-0.00821	0.06632	151	0.01453	0.13073	27
2000	-0.00575	0.02256	362	-0.01218	0.07456	62	-0.00460	0.05995	180	0.01643	0.06059	24
2001	-0.00538	0.02328	362	-0.01737	0.06952	66	0.00600	0.09447	162	0.02068	0.05640	25
2002	-0.00332	0.02251	362	-0.01275	0.06184	62	0.00080	0.09199	183	0.02963	0.05817	24
2003	-0.00167	0.01907	362	0.00001	0.07101	58	-0.00415	0.07160	228	0.02478	0.05101	24
2004	-0.00057	0.01978	362	0.01419	0.06437	52	-0.00514	0.06063	254	0.01187	0.04050	25
2005	0.00032	0.02043	362	0.01737	0.04876	54	-0.00264	0.06527	280	-0.00198	0.04871	25
2006	0.00011	0.02205	362	0.01553	0.04894	55	-0.00314	0.06448	270	-0.01957	0.05652	27
2007	-0.00209	0.02277	362	0.00800	0.04058	59	-0.00080	0.05180	299	0.00937	0.05161	20
2008	-0.00482	0.02460	362	-0.00528	0.04528	48	-0.00187	0.05465	277	0.00916	0.04346	17
2009	-0.00543	0.02316	362	-0.01670	0.06351	49	-0.00200	0.05164	280	0.00659	0.04873	17
2010	-0.00360	0.01869	361	-0.02386	0.06810	54	-0.00197	0.05232	276	-0.00464	0.05302	16
2011	-0.00170	0.01976	360	-0.02961	0.08180	51	-0.00204	0.05273	287	-0.00149	0.03916	15
2012	-0.00123	0.01989	360	-0.02382	0.09805	44	-0.00411	0.05252	283	0.00858	0.02646	14
2013	-0.00134	0.02129	360	-0.00133	0.08116	46	-0.00127	0.05062	266	0.00851	0.02973	15
2014	-0.00077	0.01917	360	-0.01091	0.07953	45	0.00170	0.05732	259	-0.00677	0.05269	13
2015	-0.00029	0.01878	360	-0.00247	0.08057	33	0.00372	0.05623	268	-0.00960	0.05340	16
2016	-0.00122	0.01944	359	0.00044	0.05090	31	0.00486	0.05873	259	-0.01109	0.06434	17
2017	-0.00297	0.02072	359	0.00558	0.04795	32	-0.00046	0.05685	188	-0.02184	0.07627	17
2018	-0.00362	0.02485	356	-0.00345	0.05001	29	-0.00042	0.04573	198	-0.11276	0.18899	11
2019	-0.00288	0.03007	353	-0.01047	0.08701	21	0.00370	0.04467	179	0.01956	0.04446	4
2020	-0.00224	0.02293	322	-0.00179	0.08695	25	0.00563	0.06447	149	-0.00092	0.03921	3
2021	-0.00057	0.02456	322	0.03214	0.08386	25	0.00122	0.06765	169	-0.00837	0.04512	3
2022	-0.00079	0.02514	246	0.06707	0.12915	21	-0.00886	0.12237	123	0.00594	0.03409	3
2023	-0.00015	0.02902	241	0.06296	0.06469	6	-0.00916	0.05650	59	0.00887	0.04769	2

Note: n/a = not applicable.
Source: Zoological Society of London (2026).

Table A.4. Data for Figure 6. Distribution of species-level lambda values, national and by system, 1970 to 2023

Year	National index, average lambda	National index, standard deviation	National index, number of species	Terrestrial index, average lambda	Terrestrial index, standard deviation	Terrestrial index, number of species	Freshwater index, average lambda	Freshwater index, standard deviation	Freshwater index, number of species	Marine index, average lambda	Marine index, standard deviation	Marine index, number of species
1970	n/a	n/a	436	n/a	n/a	264	n/a	n/a	73	n/a	n/a	100
1971	0.00334	0.05374	448	-0.00263	0.04588	267	0.00718	0.07915	74	0.01964	0.06862	108
1972	0.00177	0.05028	441	-0.00389	0.04690	268	0.00456	0.05936	73	0.01571	0.06035	101
1973	-0.00037	0.04817	464	-0.00519	0.04588	270	0.00321	0.03442	77	0.00893	0.05873	118
1974	-0.00236	0.04969	472	-0.00853	0.05179	269	0.00397	0.02968	73	0.00635	0.05342	131
1975	-0.00146	0.04682	459	-0.00555	0.04747	267	0.00479	0.02883	77	0.00229	0.05363	116
1976	-0.00210	0.04210	469	-0.00336	0.04105	265	0.00108	0.03072	78	-0.00210	0.04985	127
1977	-0.00253	0.04812	475	-0.00254	0.05173	269	-0.00170	0.03344	79	-0.00355	0.04905	128
1978	-0.00102	0.04307	471	0.00001	0.04059	263	0.00153	0.03389	77	-0.00475	0.05164	132
1979	0.00019	0.03614	479	0.00018	0.03082	266	0.00415	0.03045	78	-0.00199	0.04603	136
1980	0.00105	0.03518	501	0.00175	0.03319	281	0.00502	0.02408	83	-0.00183	0.04259	138
1981	0.00060	0.03623	503	0.00109	0.03225	281	0.00562	0.03111	84	-0.00246	0.04459	139
1982	-0.00162	0.04236	508	-0.00216	0.03887	279	0.00305	0.03312	81	-0.00307	0.05125	149
1983	-0.00160	0.04378	510	-0.00231	0.04118	279	0.00202	0.03313	82	-0.00258	0.05220	150
1984	-0.00050	0.03846	549	-0.00085	0.03324	282	0.00358	0.03219	89	-0.00191	0.04814	179
1985	-0.00012	0.03249	527	-0.00069	0.02513	283	0.00103	0.03439	86	0.00054	0.04087	159
1986	-0.00168	0.03976	539	-0.00034	0.02276	281	0.00105	0.04428	96	-0.00441	0.05523	163
1987	-0.00313	0.03922	568	-0.00061	0.02419	289	-0.00302	0.03899	92	-0.00644	0.05487	188
1988	-0.00162	0.04678	539	0.00226	0.03883	284	0.00189	0.02947	95	-0.00871	0.06158	162
1989	-0.00195	0.04505	566	0.00284	0.03554	289	0.00180	0.02755	95	-0.01030	0.06014	183
1990	-0.00168	0.04614	552	0.00138	0.03549	295	0.00429	0.05122	99	-0.00882	0.05500	159
1991	-0.00338	0.04823	575	-0.00316	0.05010	297	0.00016	0.04665	95	-0.00538	0.04628	184
1992	-0.00331	0.04812	568	-0.00491	0.05144	296	0.00193	0.03830	114	-0.00367	0.04790	159
1993	0.00074	0.05596	609	-0.00437	0.03907	302	0.01286	0.07644	118	0.00104	0.06109	191
1994	0.00379	0.06250	595	-0.00364	0.04039	302	0.01769	0.10071	125	0.00583	0.05790	169
1995	0.00137	0.05714	589	-0.00203	0.04653	306	0.00981	0.08414	122	0.00081	0.04870	162
1996	0.00155	0.05481	592	0.00149	0.05061	301	0.00326	0.05062	126	0.00006	0.06473	166
1997	-0.00120	0.05292	578	-0.00032	0.04400	309	-0.00534	0.07259	129	0.00020	0.04993	141

Year	National index, average lambda	National index, standard deviation	National index, number of species	Terrestrial index, average lambda	Terrestrial index, standard deviation	Terrestrial index, number of species	Freshwater index, average lambda	Freshwater index, standard deviation	Freshwater index, number of species	Marine index, average lambda	Marine index, standard deviation	Marine index, number of species
1998	-0.00474	0.06296	610	-0.00525	0.04354	306	-0.00620	0.10348	131	-0.00271	0.04947	174
1999	-0.00522	0.05176	602	-0.00827	0.04105	310	-0.00305	0.07546	147	-0.00174	0.04569	146
2000	-0.00525	0.04577	628	-0.00791	0.03982	309	-0.00441	0.05297	150	-0.00151	0.04835	169
2001	-0.00242	0.06052	615	-0.00827	0.03862	312	0.00866	0.09384	157	-0.00214	0.05230	147
2002	-0.00195	0.05838	631	-0.00558	0.03439	311	0.00683	0.08102	158	-0.00368	0.06585	164
2003	-0.00126	0.04898	672	-0.00141	0.03609	304	-0.00040	0.04340	164	-0.00184	0.06900	207
2004	-0.00022	0.04408	693	0.00126	0.03422	305	-0.00372	0.03477	161	0.00018	0.06026	233
2005	0.00064	0.04625	721	0.00155	0.02865	307	-0.00399	0.04242	162	0.00279	0.06236	259
2006	-0.00050	0.04736	714	0.00004	0.03143	305	-0.00458	0.03862	168	0.00051	0.06487	253
2007	-0.00038	0.03977	740	-0.00218	0.03131	305	-0.00079	0.02924	162	0.00107	0.05376	283
2008	-0.00330	0.04200	704	-0.00665	0.02930	296	-0.00439	0.03790	166	0.00011	0.05528	253
2009	-0.00455	0.04220	708	-0.00914	0.03309	297	-0.00468	0.03984	167	-0.00136	0.05391	254
2010	-0.00456	0.04251	707	-0.00930	0.03341	298	-0.00306	0.03589	162	-0.00199	0.05584	259
2011	-0.00407	0.04458	713	-0.00823	0.03265	295	-0.00066	0.03463	168	-0.00306	0.05965	256
2012	-0.00392	0.04595	701	-0.00601	0.03842	296	-0.00168	0.03442	166	-0.00431	0.05940	245
2013	-0.00114	0.04206	687	-0.00282	0.03589	294	-0.00433	0.03530	162	0.00135	0.05315	240
2014	-0.00050	0.04502	677	-0.00327	0.03514	296	-0.00373	0.03728	161	0.00425	0.05737	226
2015	0.00109	0.04360	677	-0.00161	0.03480	291	-0.00207	0.03889	158	0.00609	0.05434	234
2016	0.00110	0.04266	666	-0.00092	0.02694	291	-0.00106	0.04251	159	0.00524	0.05695	222
2017	-0.00212	0.04093	596	-0.00142	0.02626	292	-0.00467	0.04822	153	-0.00027	0.05629	153
2018	-0.00441	0.04486	594	-0.00334	0.02928	288	-0.01400	0.06640	147	0.00234	0.04147	161
2019	-0.00071	0.03974	557	-0.00319	0.03691	282	-0.00092	0.04481	136	0.00434	0.04074	141
2020	0.00065	0.04642	499	-0.00191	0.03473	267	0.00067	0.06141	101	0.00524	0.04853	131
2021	0.00150	0.04782	519	0.00227	0.03407	264	-0.00290	0.03196	116	0.00470	0.07453	139
2022	0.00025	0.07931	393	0.00619	0.04908	210	-0.00603	0.03336	111	-0.00596	0.16055	73
2023	-0.00059	0.03782	308	0.00318	0.03329	196	-0.00731	0.04529	106	-0.00480	0.00488	6

Note: n/a = not applicable.
Source: Zoological Society of London (2026).