Australia's Threatened Species Index

Summary of trends up to 2021
Released December 2024

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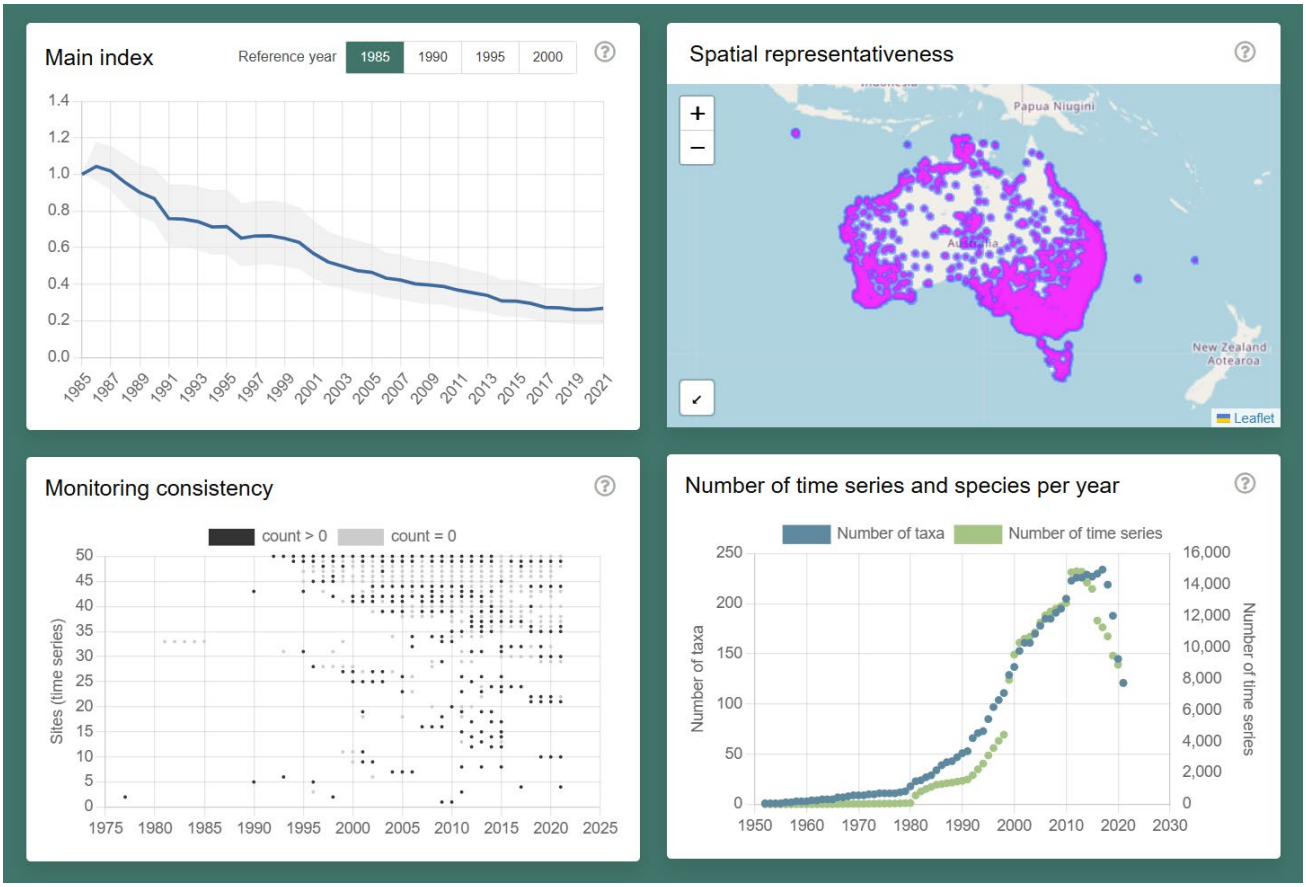

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Background

Over 2,000 species and subspecies of flora and fauna are classified as near-threatened, threatened or extinct in Australia. Monitoring of threatened species plays a critical role in assessing how populations are changing over time and helps to identify where management actions are and are not working.

In recent decades, hundreds of threatened species have been monitored across Australia by dozens of different government, non-government, and community groups. Previously, however, there has been no means of bringing these data together to assess long-term trends, and to assess the status of different groups of species across different regions of Australia.

The Threatened Species Index (TSX)

The TSX aims to provide reliable and robust measures of change in the relative abundance of Australia's threatened and near-threatened species, with data currently collated for birds, mammals, plants and amphibians. Understanding these changes in species populations is crucial for monitoring progress towards Australia's conservation targets.

The TSX has been managed since 2021 by the Australian Government's NCRIS-enabled ecosystem observatory, TERN Australia. Formerly, it came under the Australian Government's National Environmental Science Program, where it was established in 2016 with the not-for-profit organisation BirdLife Australia, as part of the *Threatened Species Index Recovery Hub*.

The TSX brings together thousands of monitoring datasets from across Australia and releases trend updates annually. Trends are calculated using the *Living Planet Index* (LPI) methodology, developed by the World Wildlife Fund and the Zoological Society of London. The LPI method enables trends from different species to be aggregated together at a national scale, as well as across jurisdictional, taxonomic and other groupings (e.g., for different functional groups and management categories).

Assembling all the data is a big task and is being staged. Data and trends for threatened birds, mammals and plants were released between 2018 and 2020. In 2021 and 2022, new data was collated for the existing groups, and in 2023 a comprehensive update to the Threatened Bird Index occurred. In 2024, along with updates to the existing groups, a pilot *Threatened Frog Index* has been created and is the first addition of an entirely new index to the TSX since 2020.

What is this document for?

This document provides government and non-government data contributors and collaborators from across Australia with a summary of the results from the *Threatened Species Index 2024*. Below you will find national trends along with a break-down of trends among species groups. Similar information is provided at the state and territory levels. The full set of trends can be viewed here. See also **Figure A1** in the Appendix illustrating how to interpret the Threatened Species Index trend graphs.

Note that a 3-year lag is implemented, given the time it takes for the data collectors to process, archive, and share the data with the index. **As such, the 2024 release includes trends up to 2021**. Note also that all species and subspecies classified as threatened or near-threatened according to the Australian Government's Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the International Union for Conservation of Nature's (IUCN) Red List and/or The Action Plan for Australian Birds 2020 (Garnett & Baker, 2022) are considered for inclusion in the Threatened Species Index 2024.

Further information

If you require clarification of any of the content in this document, would like more information about the project or to become a *Friend of TSX* and receive updates on our progress of the project, please contact the TSX Team at tsx@tern.org.au.

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The Threatened Species Index 2024

The dataset

Taxa represented	335 (up 49 from 2023)
○ *Birds*	73 (up 1 from 2023)
○ *Mammals*	86 (up 8 from 2023)
○ *Plants*	149 (up 13 from 2023)
○ *Amphibians*	27 (new group in 2024)
EPBC Act listed taxa represented	299
National priority taxa represented	38
IUCN listed taxa represented (threatened)	137
IUCN listed taxa represented (near-threatened)	42
2020 Bird Action Plan listed taxa represented	59
Total data sources	316 (up 86 from 2023)
Total number of time series	24,243 (up 1383 from 2023)

Key findings: National trends

Overall trends

At the national scale, threatened and near-threatened species have experienced significant long-term losses, with an **average decline of 73% in relative abundance since 1985** for the 335 taxa represented (**Figure 1, Tables A1 and A2, see here for a list of taxa).** Overall, the abundance of threatened and near-threatened species in the TSX dataset has declined by 1.8% per annum between 2000 and 2021.

From 2020 to 2021, the overall trend across all groups shows a slight increase of 0.7%, based on data from 121 taxa and 7,748 time series. This change is largely driven by the stabilisation and increases observed among birds, plants, and amphibians during this period (**Figure 1**).

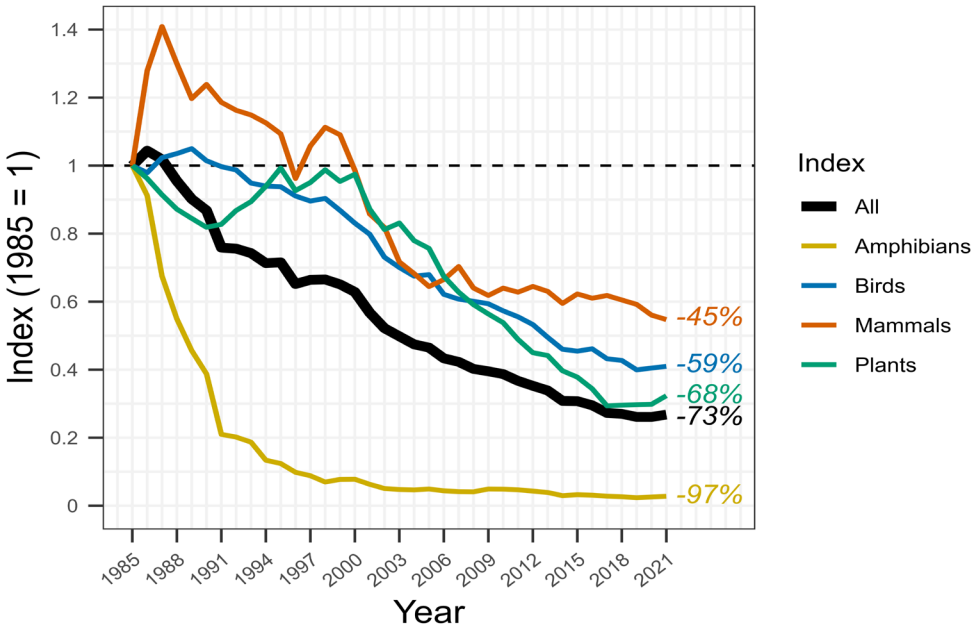

Figure 1. The Threatened Species Index 2024, showing trends up to 2021 across all taxa and separately for birds, mammals, plants and amphibians. Each line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. Confidence limits for the 2021 index values are provided in Table A1.

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The trend for **birds** follows a similar shape to the main index, with an **average decline in relative abundance of 59% since 1985** across the 73 taxa represented (**Figure 1**). Overall, birds have declined by an average 2% per annum between 2000 and 2021.

The trend for **mammals** is less severe. Across the 86 taxa for which the TSX has data, the **average decline in relative abundance is 45% since 1985** (**Figure 1**). Overall, mammals have declined by an average 2.1% per annum between 2000 and 2021 but have displayed an overall relatively stable trend since 2005.

Across the 149 **plant** taxa for which the TSX has suitable data, the **average decline in relative abundance is 68% since 1985** (**Figure 1**). Overall, plants have declined by an average 3.1% per annum between 2000 and 2021.

The trend for **amphibians** shows a precipitous decline through to 2000. For the 27 taxa covered by the current dataset, **relative abundance has declined by 97% on average since 1985** (**Figure 1**). Overall, amphibians have declined by an average 0.2% per annum between 2000 and 2021. While declines since 2000 are ongoing, the trend indicates some stabilisation, albeit at extremely reduced populations.

The **addition of amphibian data** had a measurable impact on the overall TSX, with an **average decline of 73% since 1985 when amphibians are included, compared to 59% when they are excluded** (**Figure A2**). Including amphibians has smoothed the steep declines observed around 2000, making the trend more linear and highlighting greater declines between 1985 and 2000. Notably, the trends both with and without amphibians show signs of stabilisation in recent years. Overall, the inclusion of amphibians has strengthened the robustness of the index, producing tighter confidence limits while preserving the significant declines since 1985.

Trends for National Priority Species

The TSX holds time-series data for 38 of Australia's 110 National Priority Species, as listed under the Australian Government's Threatened Species Strategy. This includes 9 bird taxa, 13 mammal taxa, 11 plant taxa and 5 amphibian taxa (**see Table A3**), totalling 1,982 time series.

The average trend across these datasets is shown in **Figure 2**. On average, the relative abundance of the 38 National Priority Species for which the TSX holds data has **declined by 82% since 1990**. Declines were steep from 1998, with some stabilisation since 2011.

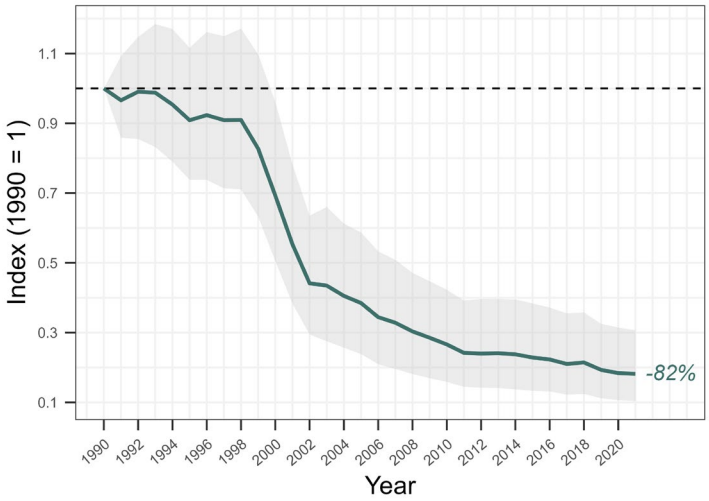

Figure 2. The trend for National Priority Species between 1990 and 2021. The green line shows the average change in relative abundance compared to the baseline year of 1990 where the index value is set to 1. The shaded areas show the confidence limits.

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Comparison of trends among species groups

Data collated for the TSX may be used to compare the trends for major phylogenetic, morphological or ecological species groups within the four major groups currently represented — birds, mammals, plants and amphibians. **Table 1** provides a comparison of trends for the species groupings monitored in the TSX, since the year 2000.

Table 1. Species groups ranked according to their change in abundance since 2000. The number of taxa included in each group, and the number of monitoring datasets (time series) available for each group, are also provided.

Group	Percent change since 2000	Number of taxa	Number of time series
Terrestrial Breeding Amphibians	-90.4% #	7	170
Wetland Breeding Amphibians	-85.8% #	8	376
Herbaceous Plants	-74.7%	20	151
Orchids	-74.0%	42	297
Chytrid non-impacted Amphibians	-71.4% †	9	87
Terrestrial Birds	-58.2%	44	12,216
Shrubs	-54.7%	80	468
Critical Weight Range Mammals	-53.5%	59	2,157
Chytrid-impacted Amphibians	-52.6% †	18	500
Terrestrial Mammals	-49.8%	78	2,626
Shoreline (Migratory) Birds	-47.4%	13	7,238
Marine Birds	-36.5%	15	588
Small Mammals	-27.6%	12	211
Stream Breeding Amphibians	+6.7% #	13	53
Marine Mammals	+19.3%	8	49
Trees*	+34.1% *	14	50
Large Mammals	+70.5%	14	305

** This trend is from 1995, given insufficient data in 2000.*
† This trend is from 1997, given insufficient data in 2000 across all chytrid-related amphibian groupings.
 # This trend is from 2001, given insufficient data in 2000 across all breeding-related amphibian groupings.

Declines for **birds** were relatively modest compared to other groups, with averages declines ranging from **36.5% for Marine Birds** to **58% for Terrestrial Birds**, since 2000. Data for **Shoreline (Migratory Birds)** suggest **declines of 47%** on average since 2000.

Datasets held for Marine Mammals and Large Mammals (>5000 g body weight) suggest significant population **increases of 19% for Marine Mammals** and **71% for Large Mammals** since the year 2000. However, sample sizes for these groups are relatively low. This is particularly problematic for **Marine Mammals**, for which very significant population growth of large cetaceans (e.g., Southern Right Whale) skew the data towards an upward trend overall. Among the mammal groups, the trend for **Critical Weight Range Mammals** was the most severe, with an average **decline of 53.5%** since 2000.

Declines for plant groups varied significantly, with data suggesting significant declines for **Herbaceous Plants (-75%)** and **Orchids (-74%)** since 2000. In contrast, **Trees** exhibited a significant average **increase of 34%** since 1995 (note that trends cannot be generated for Trees with a 2000 baseline due to limited data in that year).

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Using 2001 as the reference year (the first with sufficient data for all groups), trends for **amphibians** based on breeding type suggest very significant declines for **Terrestrial Breeding (-90%)** and **Wetland Breeding Amphibians (-86%)**, while **Stream Breeding Amphibians showed a modest increase (+7%)**. Across the datasets compiled so far, **Chytrid-impacted Amphibians have declined by 53% on average since 1997, compared with 71% among Chytrid non-impacted Amphibians**. It is important to note that the number of taxa included for these groups in the pilot *Threatened Frog Index* for 2024 remains limited.

Key findings: State and Territory trends

A comparison of the average trend across all groups for Australia's states and territories is provided in **Table 2** and **Figure 3** for the period 2000–2021. Considering the significant variation in species and ecosystems represented by these jurisdictions, there is remarkable consistency in trends.

South Australia, Queensland, the Northern Territory, Western Australia and New South Wales + ACT show **average declines in relative abundance ranging from 45% to 58% since 2000** (**Figure 3B, 3C, 3D, 3E and 3F**). **Victoria** exhibited the most pronounced losses, with an **average decline of 63.5%** in the relative abundance of threatened and near-threatened species since 2000 (**Figure 3A**). In contrast, data held for **Tasmania** suggest an **average decline of 27%** across the 34 taxa represented for that State (**Figure 3G**).

Table 2. Comparison of trends for Australia's states and territories. The average trend from 2000–2021 is shown across all taxa for each jurisdiction.

State	Percent change since 2000	Number of taxa	Number of time series
Victoria	-63.5%	71	5,585
South Australia	-57.8%	79	2,867
Queensland	-52.6%	62	3,617
Northern Territory	-51.8%	29	644
Western Australia	-49.1%	81	3,137
New South Wales + ACT	-45.8%	124	5,625
Tasmania	-27.2%	34	552

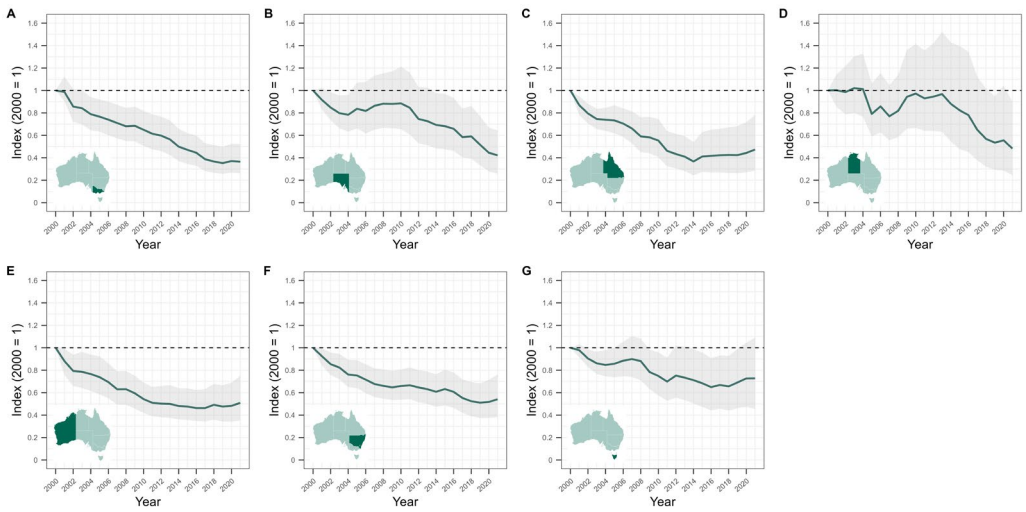

Figure 3. The Threatened Species Index 2024 for each state and territory; **A)** Victoria, **B)** South Australia, **C)** Queensland, **D)** the Northern Territory, **E)** Western Australia, **F)** New South Wales and the Australian Capital Territory, and **G)** Tasmania. The green lines show the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits.

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Table 3 provides a breakdown of the overall trends displayed in **Table 2** for all taxonomic groups included in the index for the period 2000–2021.

For **birds**, notable trends include **declines of 66% in Queensland**, and **54% in South Australia**. No state or territory had an average increasing trend for birds, although declines in the **Northern Territory** were significantly less than elsewhere **(-19%)** across the 18 bird taxa represented for that Territory.

Trends for **mammals** are highly variable across jurisdictions. The strongest declines in abundance were seen in the **Northern Territory** for the period 2000–2021, at **86%** on average across the 10 taxa represented. Significant declines were also apparent in **New South Wales + ACT** (-**61%**). Data for **Tasmania** and **South Australia** suggest considerable increases in the abundance of threatened and near-threatened mammals covered by the TSX, with **increases of 76% and 68%** respectively from 2000–2021. These increases reflect the benefits of active management for terrestrial mammals, with the species and locations represented for these States including sites where re-introduction and predator control or exclusions are occurring.

Trends for **plants** reflect the declines noted at the national level. **Insufficient data** is available to produce trends for threatened and near-threatened plants for **Queensland**, **Tasmania** and the **Northern Territory**. For the remaining jurisdictions, significant declines are apparent in the data for plants in **Victoria (-90%)** and **Western Australia (-72%)**. The average extent of decline is also high for South Australia the **(-50%)**. In **New South Wales + ACT**, the average **decline** across the 56 species represented was **37%**.

For this year's **pilot *Threatened Frog Index***, data are currently sufficient to build trends for **amphibians** in only 2 jurisdictions: **New South Wales + ACT** and **Queensland**, showing declines of **32%** and **39%** respectively from 2000 to 2021. Given data limitations across both space and time (**Figure 10**) we advise caution with these trends, particularly for Queensland.

Table 3. Comparison of trends across states and territories for all groups included in the Threatened Species Index 2024. Estimated average change in relative abundance from 2000–2021 is shown for each group for each jurisdiction. 'ID' = insufficient data to generate a reliable trend.

State	Birds			Mammals		
	% change since 2000	Taxa	Time series	% change since 2000	Taxa	Time series
Victoria	-47.1%	32	4,319	-39.8%	10	933
South Australia	-64.3%	28	2,202	+67.8%	15	219
Queensland	-66.3%	25	3,205	+39.9%	23	356
Northern Territory	-18.8%	18	433	-86.4%	10	210
Western Australia	-32.4%	23	2,839	-40.1%	28	211
New South Wales + ACT	-46.6%	37	4,555	-60.6%	20	476
Tasmania	-31.4%	21	381	+76.2%	8	164
State	**Plants**			**Amphibians**		
	% change since 2000	Taxa	Time series	% change since 2000	Taxa	Time series
Victoria	-89.5%	24	155	ID	5	178
South Australia	-49.6%	36	446	ID	0	0
Queensland	ID	3	16	-39%	11	40
Northern Territory	ID	1	1	ID	0	0
Western Australia	-72.4%	27	52	ID	3	35
New South Wales + ACT	-36.9%	56	262	-32%	11	332
Tasmania	ID	4	5	ID	1	2

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Key findings: Management

The Threatened Species Index is a crucial source of information on the impacts of management on the trajectories of Australia's threatened and near-threatened species. At present, time series for mammals and plants have been categorised as stemming from sites that are either 'actively managed' for conservation purposes or at which there is 'no known management'. **Figures 4 and 5** provide a comparison of trends between these management categories and show that trends are considerably better at actively managed sites.

For **mammals**, abundance at **actively managed sites has declined by an average 35% since 1990 but has stabilised** since 2001. While some species at certain sites continue to decline (as shown by the 95% confidence interval being below 1), the weight of the confidence limits above 1 suggests that more species trajectories are improving than declining. In contrast, sites with **no known management show widespread declines, with relative abundance decreasing by an average of 53% since 1985** (**Figure 4**).

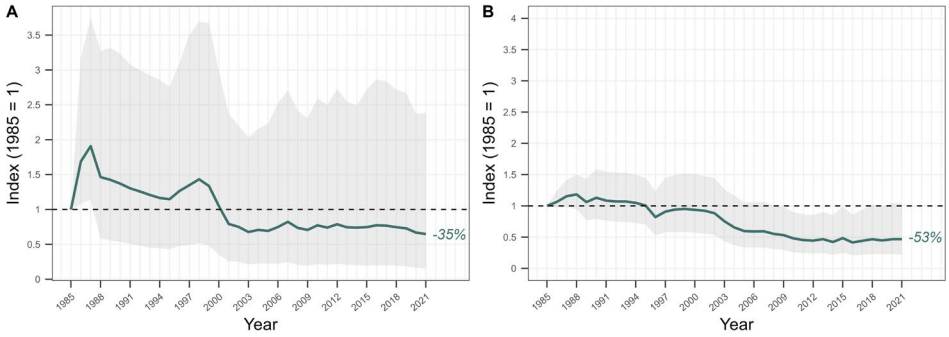

Figure 4. The difference in trends for mammals from actively managed sites **(A)** versus those from sites with no known management **(B)** between 1985 and 2021. The green lines show the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits.

For **plants**, abundance at **actively managed sites have, on average, stabilised: the index value for 2021 is a 10% increase from 1990** (**Figure 5**; note that trends cannot be generated for plants with a 1985 baseline due to limited data in that year). This is not true at sites with no known management, at which abundance has been falling in a linear fashion since ~1996 and the confidence limits demonstrate that all populations have significantly depressed abundance relative to 1990 (**Figure 5**). On average, **populations at sites with no known management have declined by 78%** since 1990.

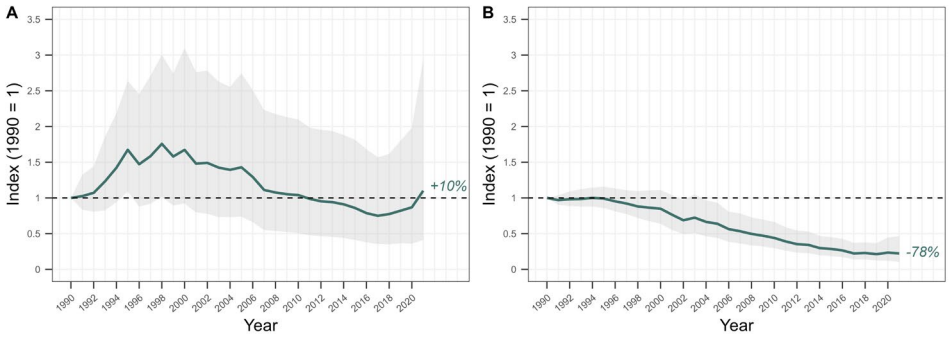

Figure 5. The difference in trends for plants from actively managed sites **(A)** versus those from sites with no known management **(B)** between 1990 and 2021. The green lines show the average change in relative abundance compared to the baseline year of 1990 where the index value is set to 1. The shaded areas show the confidence limits.

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What we should know about the data

The multi-species trends listed above represent the best available data for Australia's threatened and near-threatened species. Data quality was maximised by 1) confirming that each dataset had been produced by standardised monitoring and 2) by assessing the trends in collaboration with data custodians. Nevertheless, it is important to consider the taxonomic, spatial and temporal biases when interpreting the trends generated from these data, and the uncertainty around the trends.

National trends

Data for All Groups

The National trends are based on monitoring data for 335 species and 24,243 time-series datasets. However, these data stem largely from the south and east of the continent, with less representation of inland areas and limited representation of arid Australia (**Figure 6**). While this means the more developed parts of the country are represented, it is also true that the distribution of threatened species aligns with this spatial pattern.

The temporal accumulation of data must also be considered when interpreting the national trends. In 1985 (the reference year), data were available for 34 species (10% of total) from 1,254 time series (5% of total). Species and time series included in the calculation of the index grew rapidly after 1990 before declining in more recent years (**Figure 6**). In turn, data quality is weakest early and late in the time series.

Perhaps of greatest importance for interpreting the national trends is the dominance of birds in the dataset. Birds make up 22% of species represented in the index and 83% of time-series datasets. As such, the overall national trend closely follows the trend for birds (**see Figure 1**).

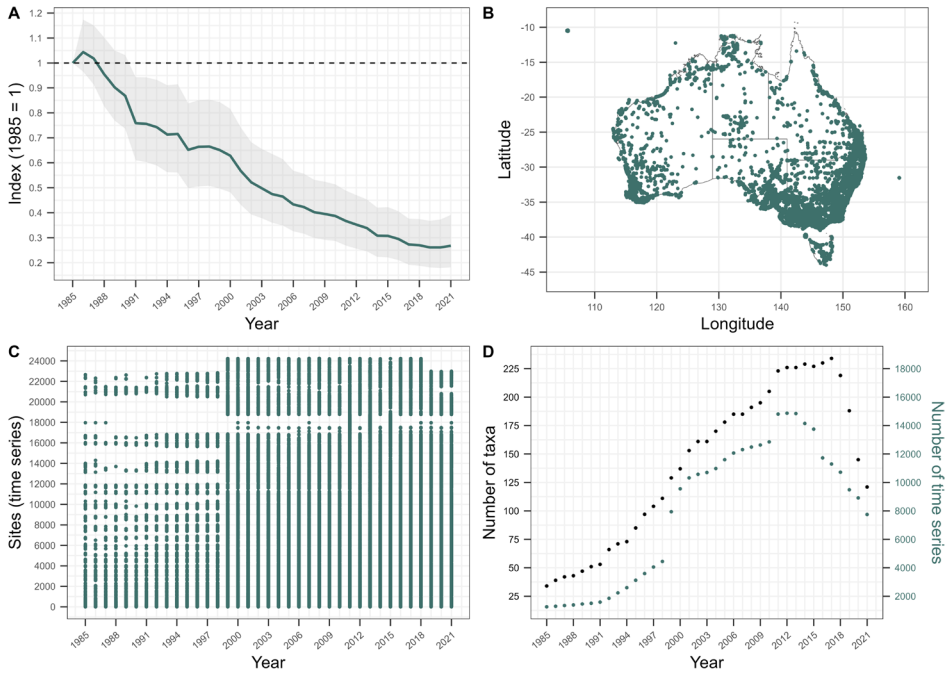

Figure 6. A) The Threatened Species Index 2024 based on the data provided for all species groups. The green line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the monitoring data, submitted to the index, were recorded in Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the national index for each year.

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Data for Birds

Data for birds covers 73 species from a total of 20,044 time series. As in previous years, the data for birds are representative of most eastern states. Data coverage for Western Australia and the Northern Territory has increased since the index was first released in 2018, but remains marginal for inland, particularly arid, regions (**Figure 7**). The number of sites and species monitored has substantially increased since 1985, at which time there were only 1,119 time series (6% of total) for 11 species (15% of total).

Data for birds are dominated by Terrestrial Birds (44 species, 12,216 time series) and Shoreline (Migratory) Birds (13 species, 7,238 time series). Data for Marine Birds covers 15 species and 588 time series. Wetland Birds are not yet sufficiently represented in the index.

Data for Terrestrial Birds are dominated by Woodland Birds (7 species, 3,736 time series) and Island Endemics (7 species, 1,680 time series), with 4 or less species represented for the remaining terrestrial categories (Grassland Birds, Heathland Birds, Rainforest Birds, Mallee Birds and Tropical Savanna Birds).

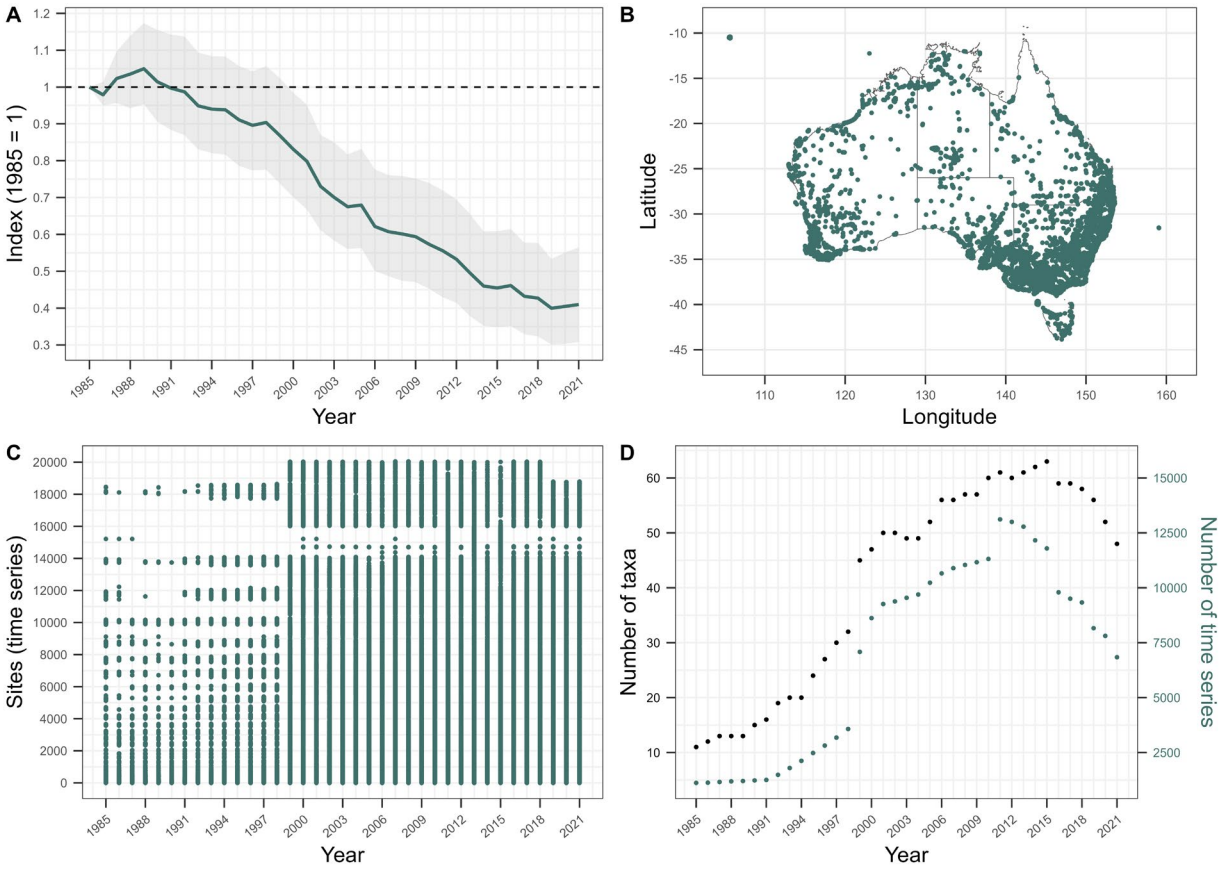

Figure 7. A) The Threatened Species Index 2024 based on all data provided on threatened and near-threatened bird taxa. The green line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened bird data, submitted to the index, were recorded in Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Threatened Bird Index for each year.

Data for Mammals

Mammals are represented in the index by 86 species from a total of 2,675 time series. Data for mammals are spatially patchy (**Figure 8**), with major clusters of sites from south-east Queensland, coastal regions of New South Wales, southern Victoria, central Tasmania, inland and coastal South Australia (including offshore islands), south-western Western Australia, Pilbara and coastal areas of central Western Australia, the Kimberley and the Top End of the Northern Territory. Scattered sites occur in the southern Northern Territory and western Queensland; however, inland (particularly arid) areas are poorly represented.

Time series and species have accumulated in a roughly linear fashion since 1985. For that year, monitoring data are available for 10 species (12% of total), from 80 time series (4% of total). Data are again sparse for the most recent years, after 2016 (**Figure 8**).

Data for mammals primarily come from Terrestrial Mammals (78 species, 2,626 time series), with few Marine Mammals currently included (8 species, 49 time series). Among Terrestrial Mammals, Small Mammals (<50 g body weight) are represented by 12 species and 211 time series and Large Mammals by 14 species and 305 time series. Critical Weight Range Mammals therefore dominate the Terrestrial Mammal dataset (59 species, 2,157 time series); however, these species make up a high proportion of Australia's threatened mammals.

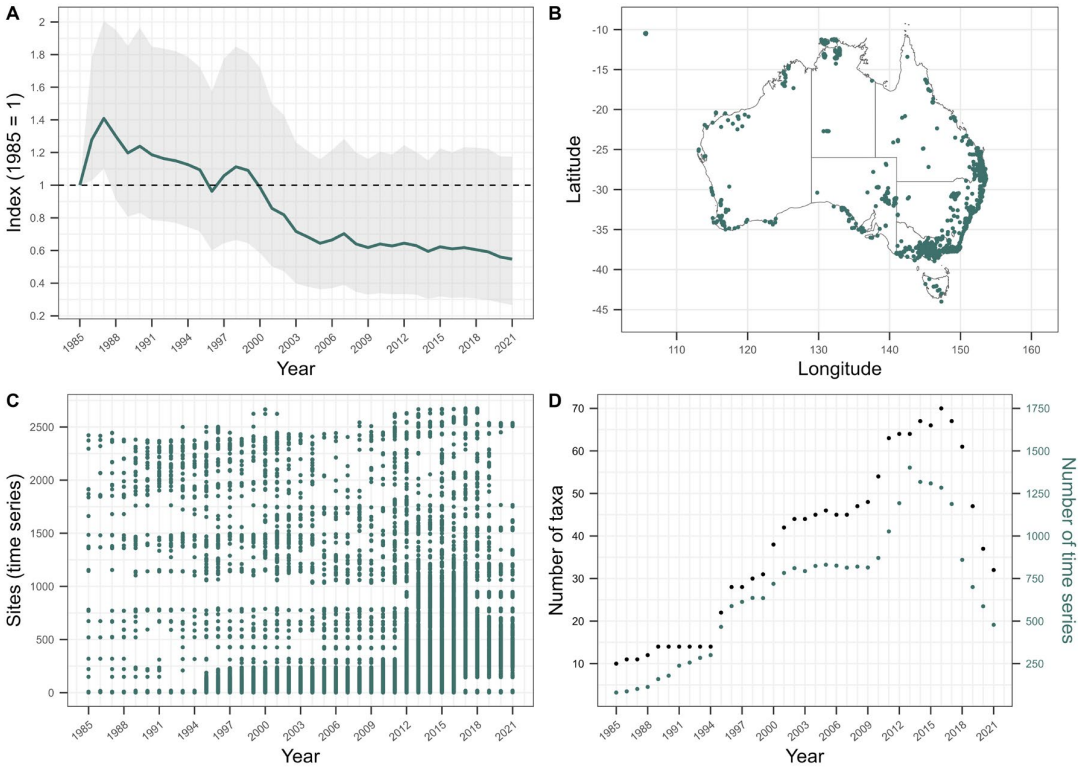

Figure 8. A) The Threatened Species Index 2024 based on all data provided on threatened and near-threatened mammal taxa. The green line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened mammal data, submitted to the index, were recorded in Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Threatened Mammal Index for each year.

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Data for Plants

Some 147 species of plants are represented in the TSX from a total of 937 time series. Plant data collated for the TSX is considerably spatially biased, with all data coming from the southern half of the continent (**Figure 9B**). The monitoring data almost entirely originates from south-eastern Queensland, eastern New South Wales, southern Victoria, eastern South Australia and south-west Western Australia.

Plant monitoring data in the index also display a stronger temporal bias than for birds, mammals and amphibians. Data are sparse before 1995, and time series have accumulated in an exponential fashion since 1985 (**Figure 9D**). In that year, monitoring data are available for 8 species (5% of total) from just 26 time series (3% of total). However, data are not as sparse for more recent years relative to birds and mammals, with a less significant drop off in time series after 2015 (**Figure 9D**).

Plants covered by the index are dominated by Shrubs and Orchids. In total, 80 species of Shrubs are represented in the index from 468 time series, with 42 Orchids from 297 time series. Herbaceous plants are represented by 20 species (151 time series) and Trees by 14 species (50 time series).

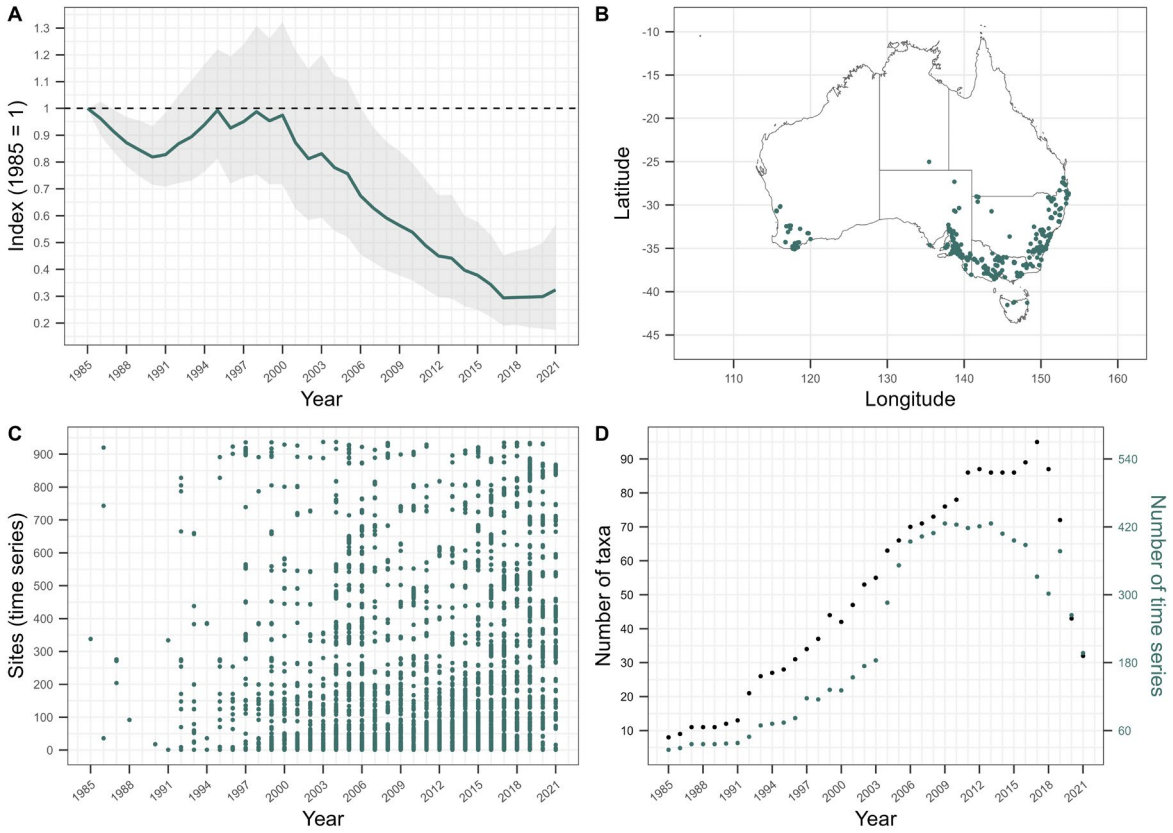

Figure 9. A) The Threatened Species Index 2024 based on all data provided on threatened and near-threatened plant taxa. The green line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened plant data, submitted to the index, were recorded in Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Threatened Plant Index for each year.

Data for Amphibians

Trends for the pilot *Threatened Frog Index* are based on data for 27 taxa from a total of 587 time series. Data are primarily from eastern Australia, in line with the distribution of threatened and near-threatened Australian amphibians (**Figure 10B**). Tasmania is represented by a single species and Western Australia by 3 species. No suitable monitoring data were obtained for South Australia or the Northern Territory.

In 1985, data were available for only 4 taxa (16% of total) from 29 time series (5% of total) (**Figure 10D**). The number of taxa and time series included in the calculation of the index grew rapidly during the 1990s (**Figure 10D**) as monitoring of chytrid impacted species increased. Data availability, both in terms of time series and species coverage, declines slightly in more recent years, but not drastically so (**Figure 10D**).

An important additional factor that must be considered when interpreting the national amphibian trend is that all data acquired prior to 1992 were for chytrid impacted taxa, particularly those showing rapid population crashes in eastern Australia (such as North Queensland). Very steep declines early in the time series (**Figure 10A**) reflect these declines. Likewise, the lack of recovery of many taxa and populations impacted by chytrid, along with declines among non-impacted taxa for which data was accrued from 1992 onwards, effectively holds the national trend at a very low level subsequent to ~2000.

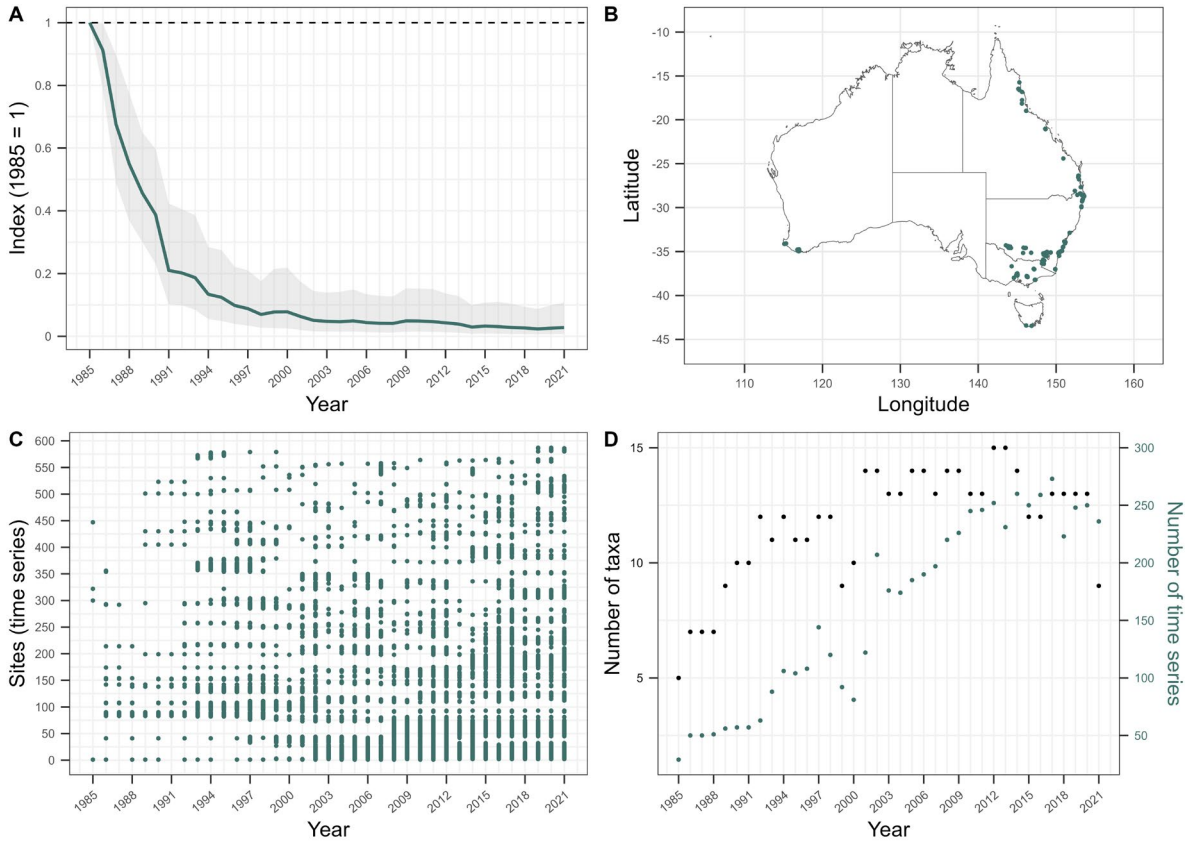

Figure 10. A) The Threatened Species Index 2024 based on all data provided on threatened and near-threatened amphibian taxa. The green line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened amphibian data, submitted to the index, were recorded in Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Threatened Frog Index for each year.

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State and Territory trends

Data for Queensland

The data for Queensland has good coverage for both the central and south-east coast but are marginal for northern Queensland and in the arid zones (**Figure 11B**). Across all groups, both the number of sites and the number of taxa being monitored in Queensland has substantially increased since 1992, with data in the index peaking between 2012 and 2014 (**Figure 11C and 11D**).

QLD Index - Quick Facts

Reference year	2000
2021 index value	0.474
% change from 2000	*-52.6%*
Time series	3617
Taxa	62
Av. time-series length	15.0
Data sources	57

You can find a summary of the taxa included in the Queensland index, and explore additional trends, on the TSX visualisation tool.

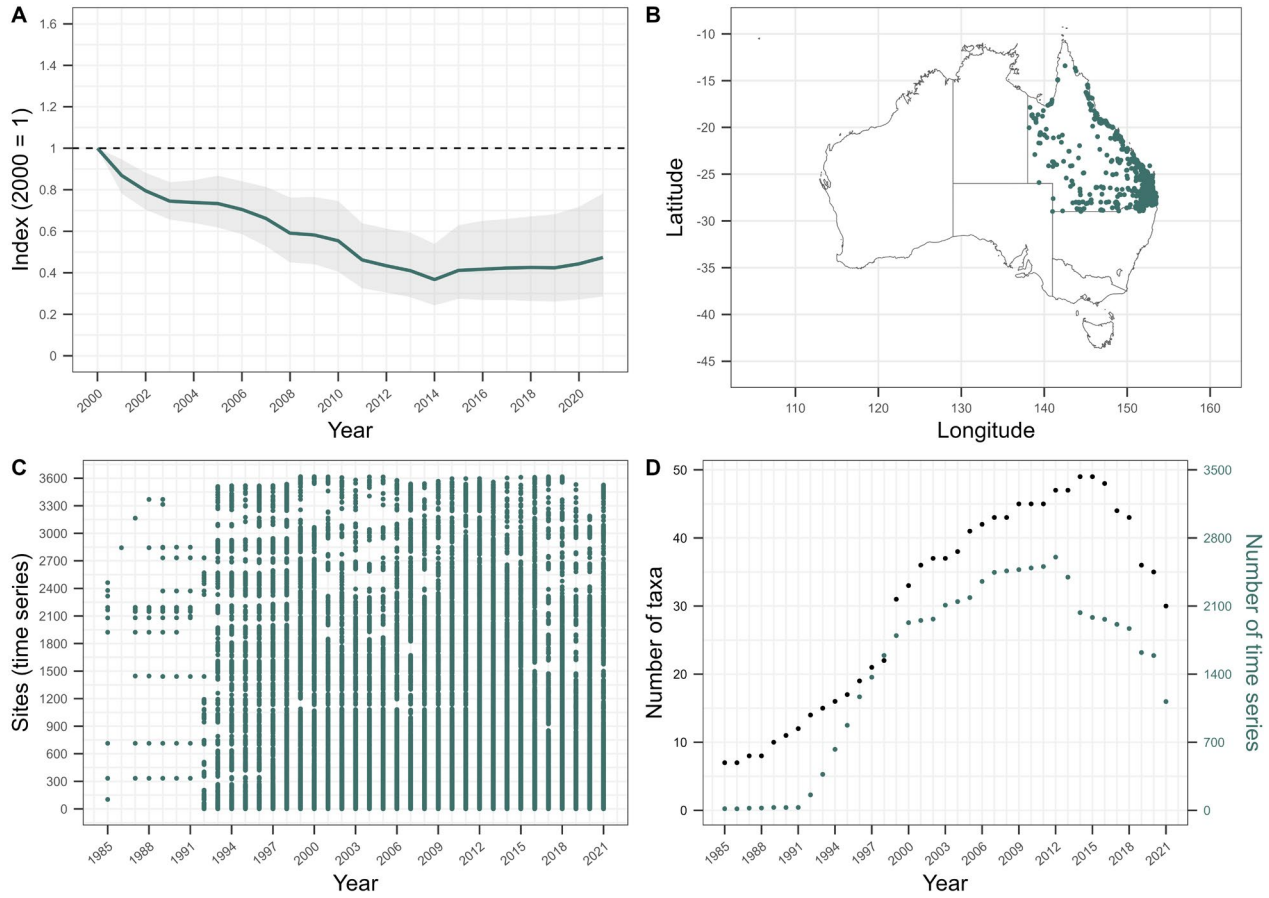

Figure 11. A) The Threatened Species Index 2024 for Queensland**.** The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in Queensland. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Queensland. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Queensland index for each year.

Data for New South Wales and the Australian Capital Territory

The data for New South Wales and the Australian Capital Territory are concentrated in the east of the combined area of these jurisdictions, with less data from western NSW (**Figure 12B**). The number of available taxa for all groups increased in a linear fashion from 1985 before peaking in 2018 (**Figure 12D**). The number of time series for the NSW + ACT index increase exponentially from around 1995, peaking in 2017 (**Figure 12D**).

NSW + ACT Index - Quick Facts

Reference year	2000
2021 index value	0.542
% change from 2000	*-45.8%*
Time series	5625
Taxa	124
Av. time-series length	11.5
Data sources	128

You can find a summary of the taxa included in the NSW + ACT index, and explore additional trends, on the TSX visualisation tool.

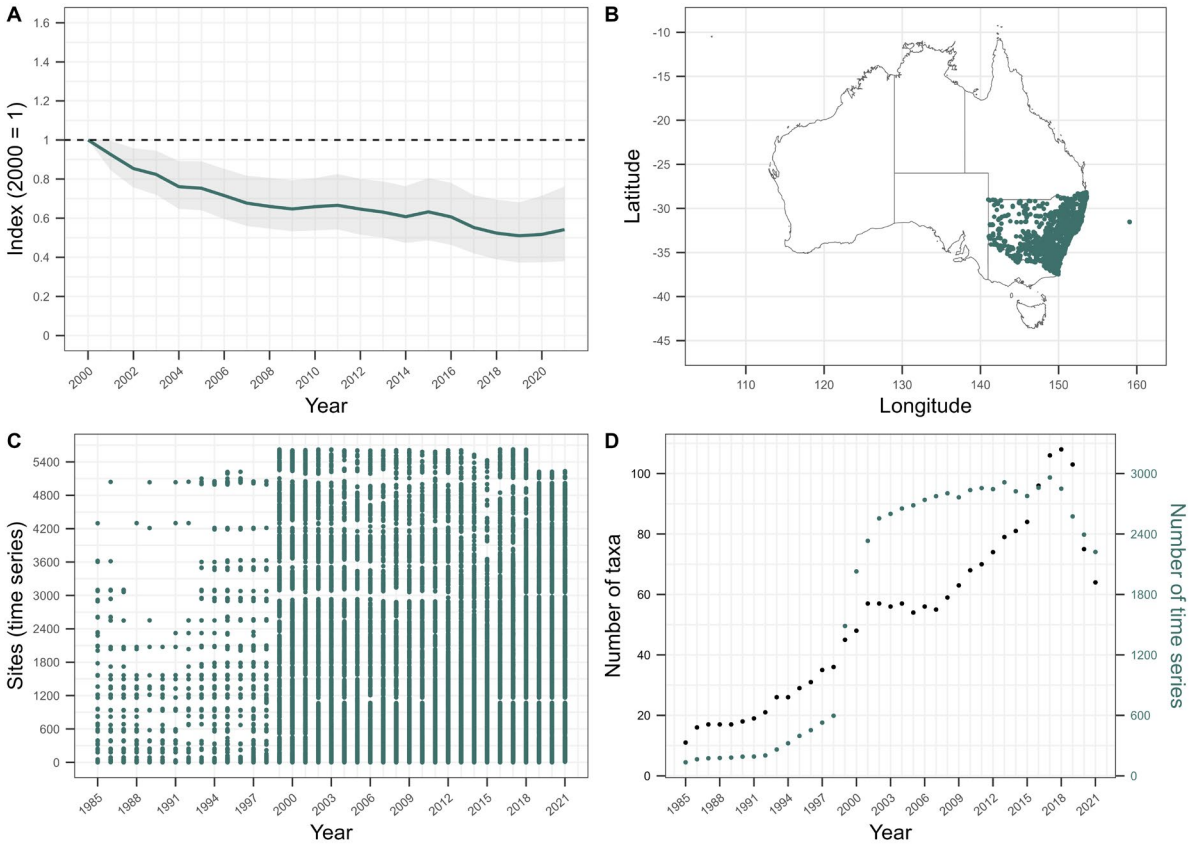

Figure 12. A) The Threatened Species Index 2024 for New South Wales (NSW) and Australian Capital Territory (ACT). The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in NSW + ACT. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in NSW + ACT. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the NSW + ACT index for each year.

Data for Victoria

The data for Victoria have the highest within-state spatial representativeness of anywhere in the country, covering all major biomes (**Figure 13B**). This coverage is driven strong by data for birds, with data for mammals, plants and amphibians being sparser, particularly in north-west Victoria. The number of taxa represented each year increased in a roughly linear fashion from 1985, with the number of time series increasing in an exponential fashion. Both have declined in more recent years (**Figure 13C and 13D**).

Vic Index - Quick Facts

Reference year	2000
2021 index value	0.365
% change from 2000	***-63.5%***
Time series	5585
Taxa	71
Av. time-series length	12.5
Data sources	33

You can find a summary of the taxa included in the Victoria index, and explore additional trends, on the TSX visualisation tool.

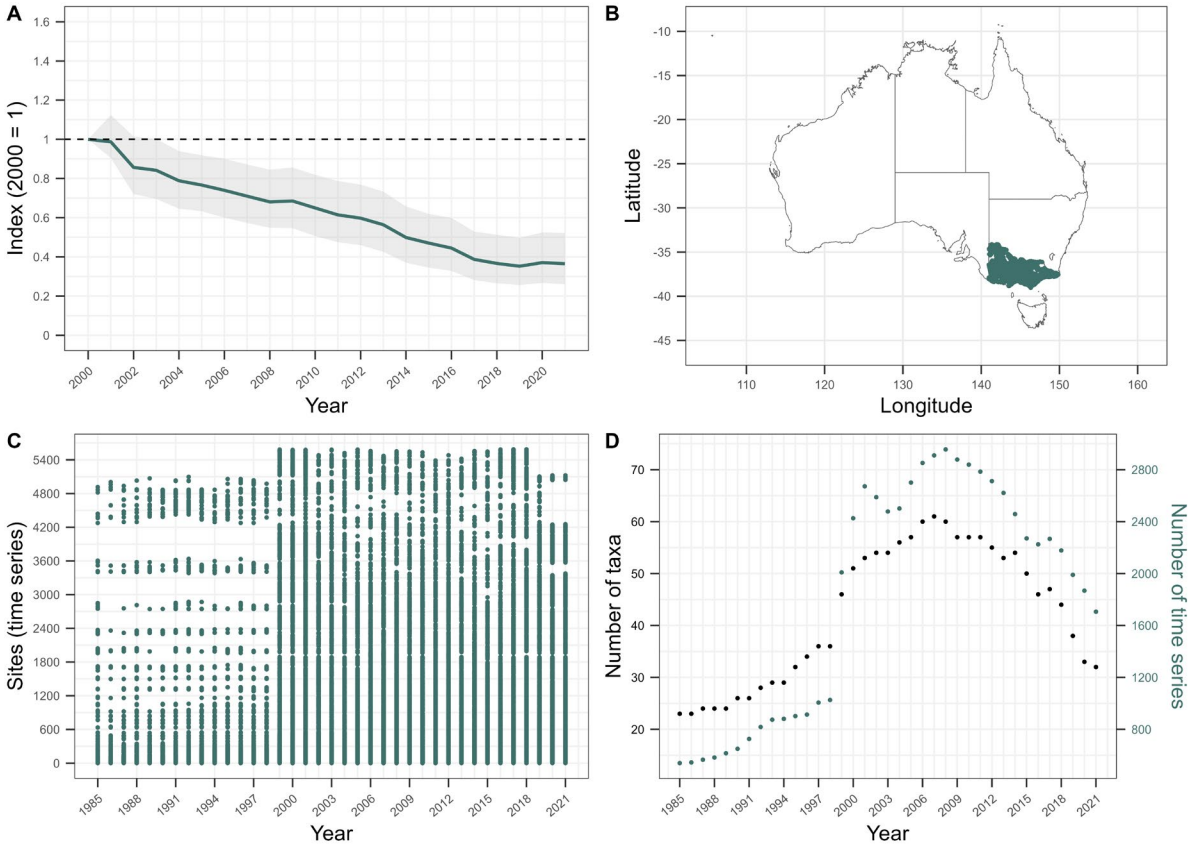

Figure 13. A) The Threatened Species Index 2024 for Victoria. The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in Victoria. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Victoria. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Victoria index for each year.

Data for Tasmania

There is relatively good spatial coverage for Tasmania's data (**Figure 14B**), except for the wet forests of the west and south of the State. The trend for Tasmania also includes data for Macquarie Island (9 species and 24 time series). Across all groups, the number of taxa represented each year, and the number of time series increased exponentially between 1985 and 1995. Data for Tasmania peaked in 2012 and has declined in more recent years (**Figure 14C and 14D**).

Tas Index - Quick Facts

Reference year	2000
2021 index value	0.728
% change from 2000	***-27.2%***
Time series	552
Taxa	34
Av. time-series length	18.8
Data sources	19

You can find a summary of the taxa included in the Tasmania index, and explore additional trends, on the TSX visualisation tool.

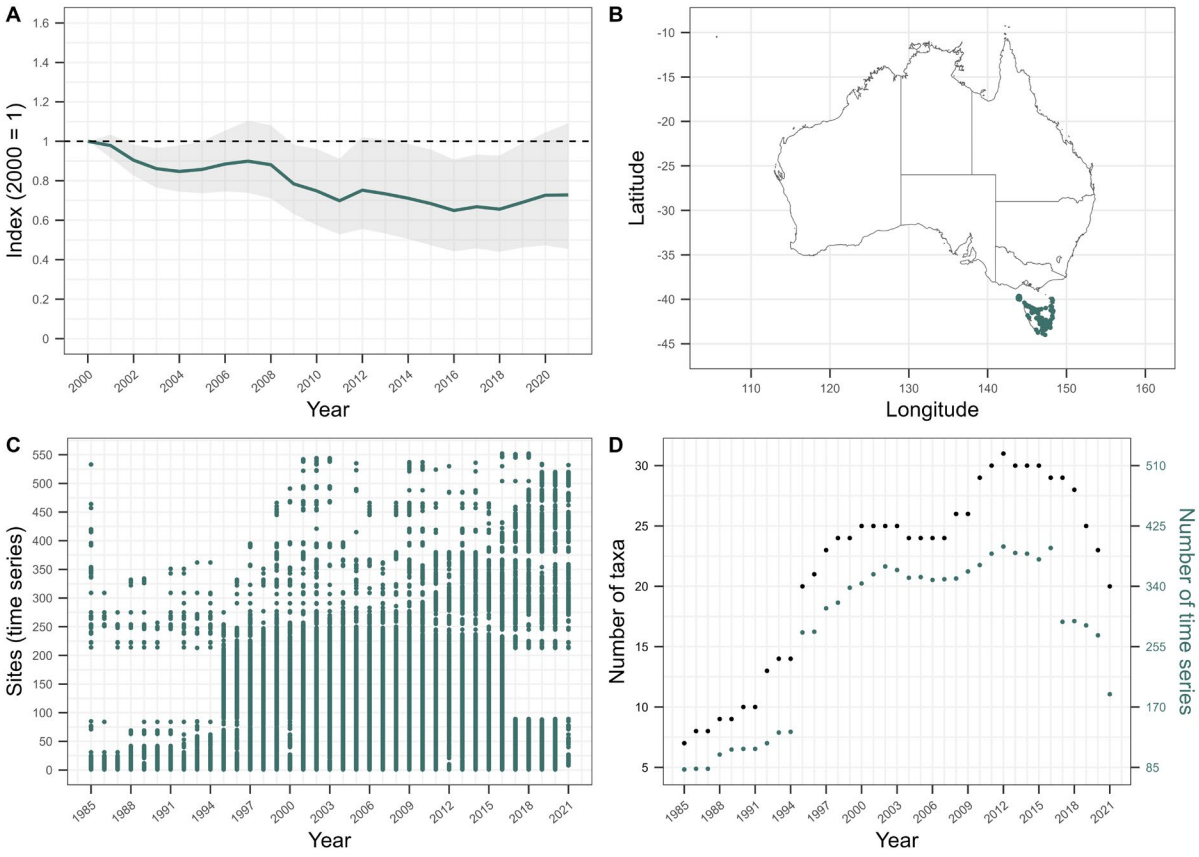

Figure 14. A) The Threatened Species Index 2024 for Tasmania. The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in Tasmania. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Tasmania. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Tasmania index for each year.

Data for South Australia

Unsurprisingly, the majority of monitoring sites in South Australia from which the TSX has received data are in the south-east, with few datasets in the semi-arid and arid parts of the state (**Figure 15B**). The number of taxa represented each year in the SA index increased in a roughly linear fashion from 1985, peaking at around 2012 (**Figure 15D**). The number of time series available for each year of the index increased steeply from 1998 and has declined since 2012 (**Figure 15D**).

SA Index - Quick Facts

Reference year	2000
2021 index value	0.422
% change from 2000	*-57.8%*
Time series	2867
Taxa	79
Av. time-series length	13.5
Data sources	43

You can find a summary of the taxa included in the South Australia index, and explore additional trends, on the TSX visualisation tool.

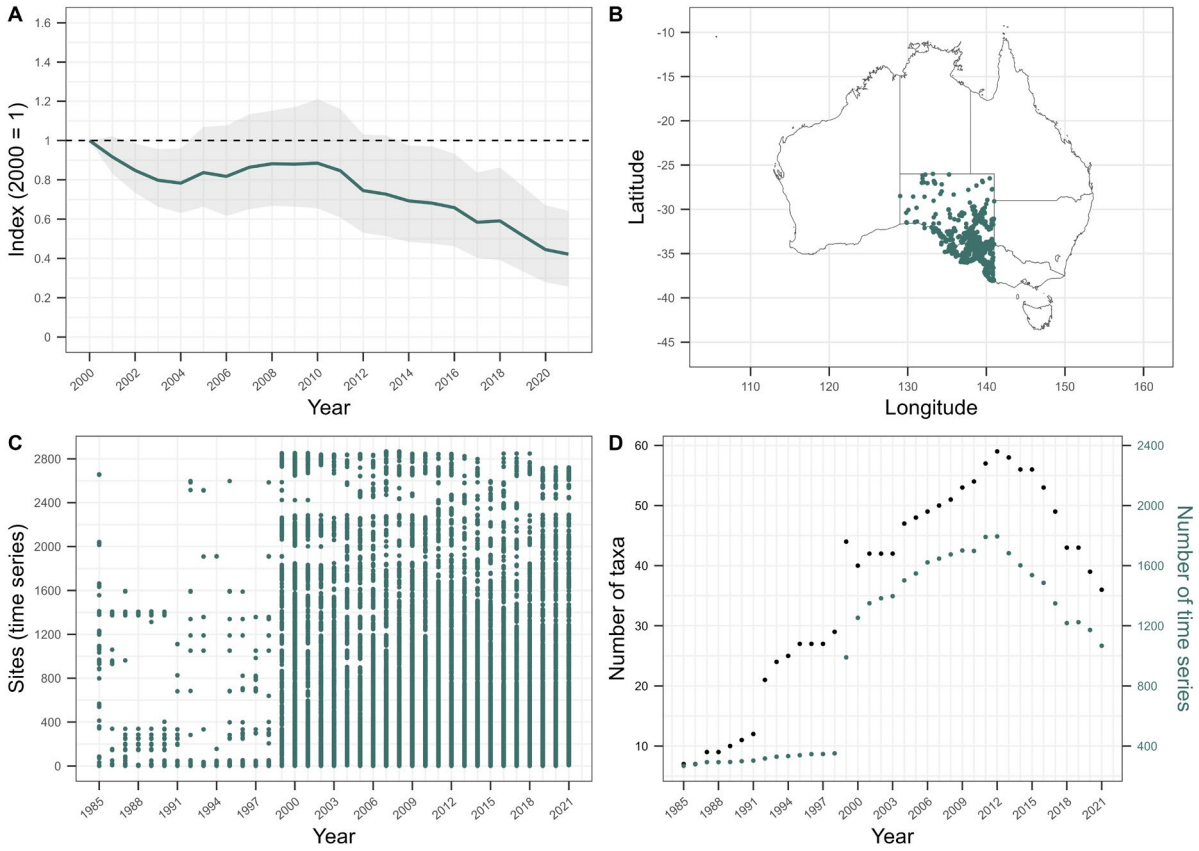

Figure 15. A) The Threatened Species Index 2024 for South Australia. The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in South Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in South Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the South Australia index for each year.

Data for Western Australia

Unsurprisingly for such a large state, there are limited monitoring data for some regions in WA. The data underlying the WA index have good coverage for the Perth area, Kimberley, and south-central and south-west coastal areas (**Figure 16B**). Both the number of sites and the number of taxa being monitored in WA has substantially increased since around 1999, peaking at around 2016 (**Figure 16C and 16D**).

WA Index - Quick Facts

Reference year	2000
2021 index value	0.509
% change from 2000	*-49.1%*
Time series	3137
Taxa	81
Av. time-series length	13.5
Data sources	53

You can find a summary of the taxa included in the Western Australia index, and explore additional trends, on the TSX visualisation tool.

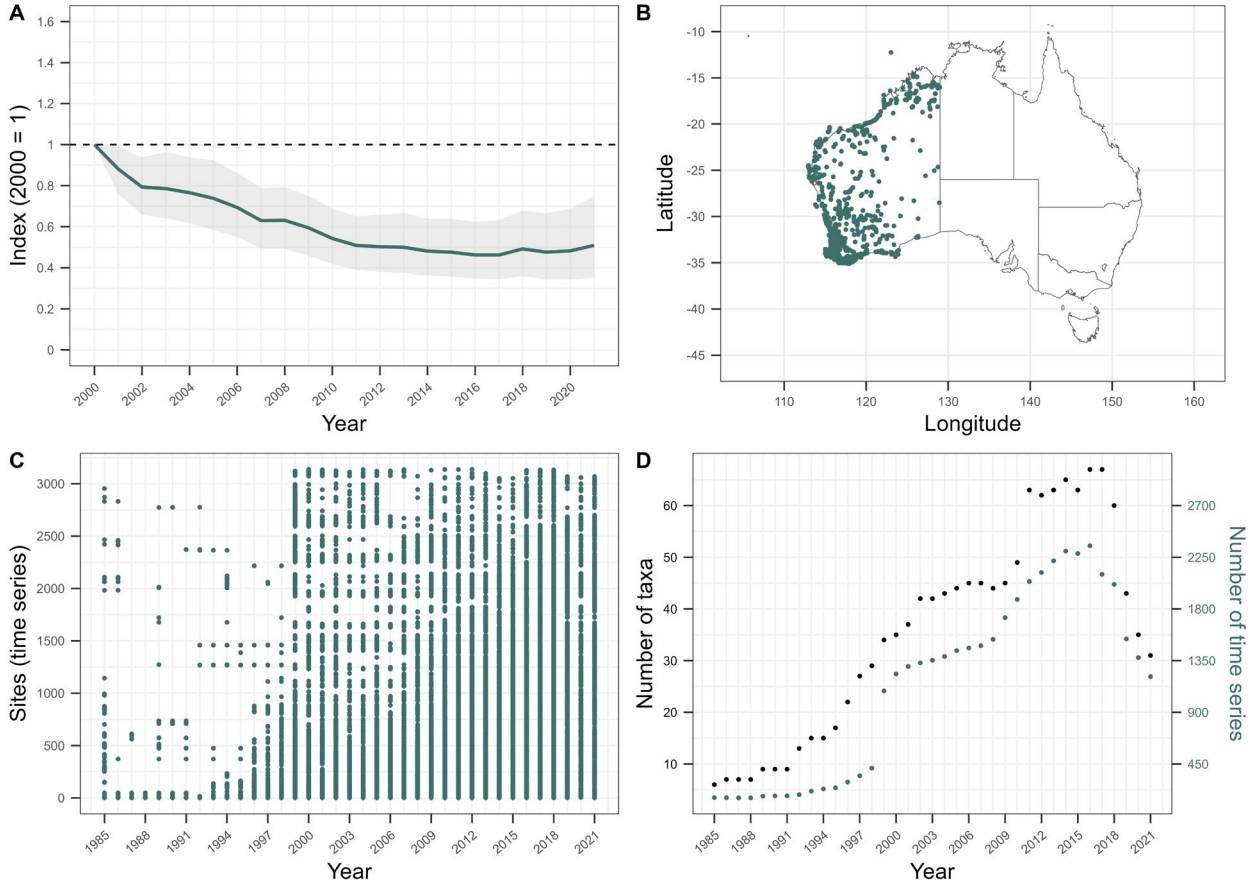

Figure 16. A) The Threatened Species Index 2024 for Western Australia. The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in Western Australia. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Western Australia. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Western Australia index for each year.

Data for the Northern Territory

The data underlying the NT index have higher coverage in the north and south of the territory but are limited for central regions of the semi-arid and arid zones (**Figure 17B**). For all groups, both the number of time series and the number of taxa being monitored in the NT has substantially increased since the early 1990's, peaking in 2010 and 2001 respectively, and have since declined (**Figure 17C and 17D**).

NT Index - Quick Facts

Reference year	2000
2021 index value	0.482
% change from 2000	***-51.8%***
Time series	644
Taxa	29
Av. time-series length	14.7
Data sources	13

You can find a summary of the taxa included in the Northern Territory index, and explore additional trends, on the TSX visualisation tool.

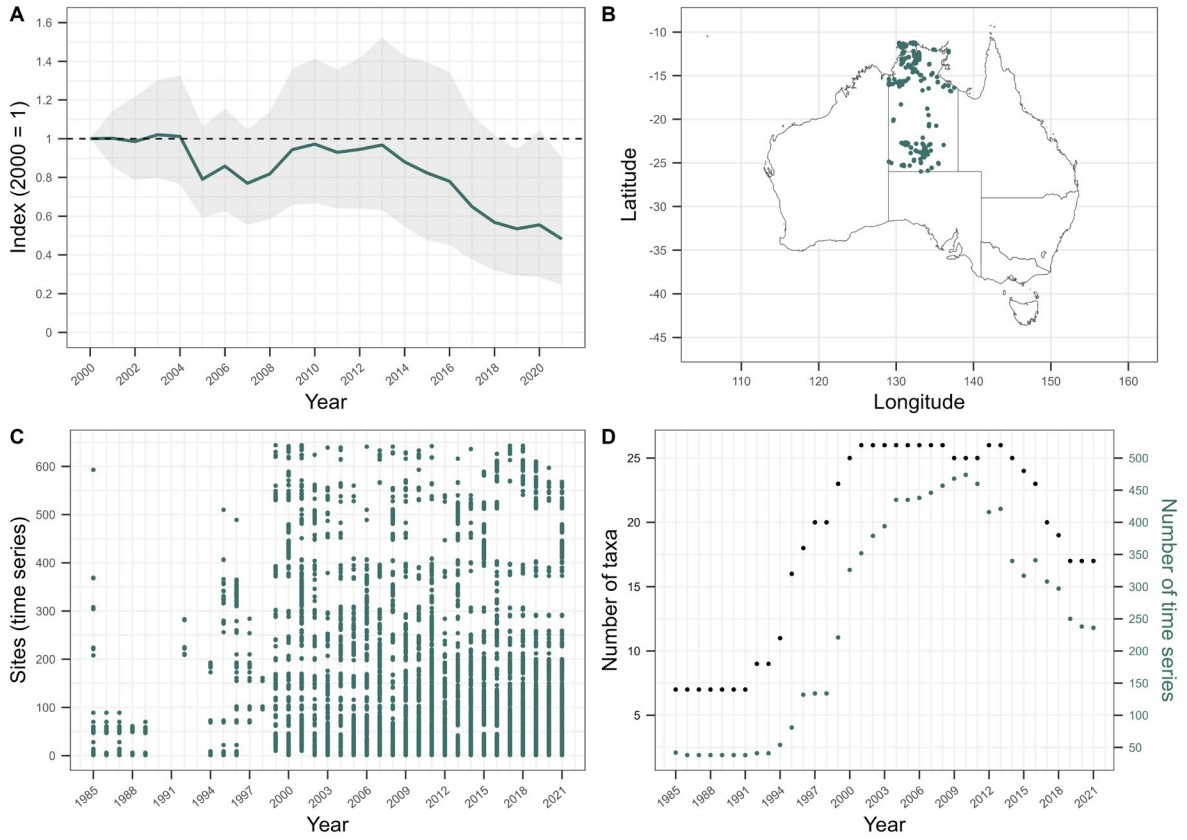

Figure 17. A) The Threatened Species Index 2024 for the Northern Territory. The green line shows the average change in relative abundance compared to the baseline year of 2000 where the index value is set to 1. The shaded areas show the confidence limits. **B)** A map showing where the threatened monitoring data, submitted to the index, were recorded in the Northern Territory. The green dots indicate repeatedly monitored sites. **C)** A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in the Northern Territory. **D)** The number of taxa (in black circles) and number of time series (in green circles) used to calculate the Northern Territory index for each year.

Glossary

The TSX is created using multiple time series of population abundance, brought together to reveal changes in threatened species abundances over time. To interpret the results of the TSX correctly, refer to the following definitions of some commonly used terms.

Taxon: A taxonomic unit, specifically including both species and subspecies in this context.

Taxa: Plural of *taxon*.

Time series: Repeated surveys of a single taxon, conducted at a single site using the same method over at least two years.

Population: A group of organisms from the same taxon, living in a distinct area of habitat at a particular time. A single taxon can have multiple populations, depending on its range and habitat distribution.

Abundance: The number of individuals recorded at a survey site. This count provides an estimate of a species' local population size.

Relative abundance: The rate of change in population abundance over time. Rather than measuring the absolute number of individuals, this focuses on how populations increase or decrease relative to their starting abundance.

Confidence limits: Ranges that show the level of uncertainty in an index calculation. These are produced using a statistical method called "bootstrapping," which resamples trends to estimate upper and lower bounds. Wider limits indicate greater variation in the underlying trends.

Appendix

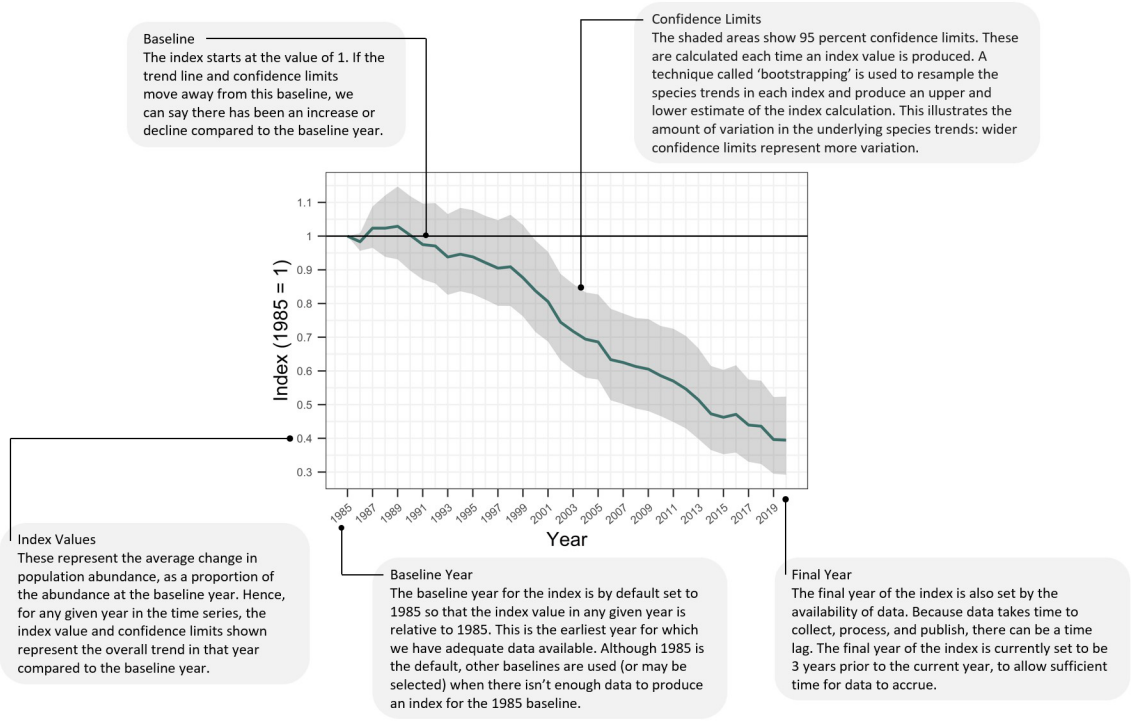

Figure A1. This illustration explains how to interpret the Threatened Species Index trend graphs. It briefly explains the time period displayed and what the confidence limits and index values show.

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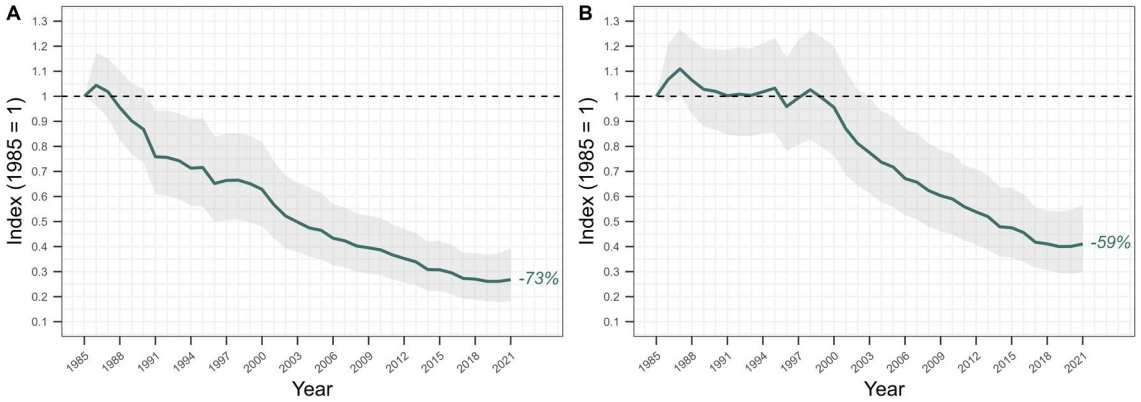

Figure A2. The Threatened Species Index 2024, showing trends up to 2021 across all taxa **(A)** and excluding amphibian taxa **(B)**. The green lines show the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits.

Table A1. Upper and lower confidence interval (CI) values for the 2021 index value of the Threatened Species Index 2024, presented for the overall index (all groups) and separately for birds, mammals, plants, and amphibians.

Trend	2021 trend value	2021 Lower CI value	2021 Upper CI value
All groups	0.268	0.182	0.391
Birds	0.410	0.308	0.564
Mammal	0.547	0.267	1.175
Plants	0.323	0.174	0.566
Amphibians	0.028	0.007	0.108

Table A2. All taxa currently included in the Threatened Species Index 2024 as listed according to EPBC Act, IUCN Red List, and The Action Plan for Australian Birds 2020. The proportion of all listed taxa represented in the index is also provided. Values in parentheses exclude duplicates for subspecies where only the parent taxa (species) are explicitly listed.

	EPBC Act	IUCN Red List	The Action Plan for Australian Birds 2020	All listings
Total number of taxa	299 (292)	179 (155)	59	335 (327)
Proportion of all listed taxa represented	17%	11%	27%	12%

Table A3. All National Priority Species currently included in the Threatened Species Index 2024.

Group	Species	EPBC Act Status	Number of time series	Av. time-series length
Birds	Australasian Bittern *Botaurus poiciloptilus*	Endangered	2	4
Birds	Black-eared Miner *Manorina melanotis*	Endangered	103	14.4
Birds	Carnaby's Black-Cockatoo *Zanda latirostris*	Endangered	219	8.6
Birds	Christmas Island Goshawk *Accipiter fasciatus natalis*	Endangered	225	5.6
Birds	Far Eastern Curlew *Numenius madagascariensis*	Critically Endangered	698	16.3

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Table A3 (continued). All National Priority Species currently included in the Threatened Species Index 2024.

Group	Species	EPBC Act Status	Number of time series	Av. time-series length
Birds	Malleefowl *Leipoa ocellata*	Vulnerable	175	16.5
Birds	Orange-bellied Parrot *Neophema chrysogaster*	Critically Endangered	7	28.3
Birds	Plains-wanderer *Pedionomus torquatus*	Critically Endangered	4	12.5
Birds	Western Ground Parrot *Pezoporus wallicus flaviventris*	Critically Endangered	2	9
Mammals	Australian Sea-lion *Neophoca cinerea*	Endangered	40	17.8
Mammals	Bilby *Macrotis lagotis*	Vulnerable	9	8.6
Mammals	Chuditch, Western Quoll *Dasyurus geoffroii*	Vulnerable	30	18.5
Mammals	Eastern Quoll *Dasyurus viverrinus*	Endangered	2	11
Mammals	Koala Qld, NSW + ACT *Phascolarctos cinereus*	Endangered	115	15.1
Mammals	Leadbeater's Possum *Gymnobelideus leadbeateri*	Critically Endangered	19	19.8
Mammals	Mountain Pygmy-possum *Burramys parvus*	Endangered	7	34.4
Mammals	New Holland Mouse *Pseudomys novaehollandiae*	Vulnerable	8	22.4
Mammals	Northern Hairy-nosed Wombat *Lasiorhinus krefftii*	Critically Endangered	1	17
Mammals	Northern Quoll *Dasyurus hallucatus*	Endangered	102	10.6
Mammals	Numbat *Myrmecobius fasciatus*	Endangered	5	11.2
Mammals	Spectacled Flying-fox *Pteropus conspicillatus*	Endangered	1	15
Mammals	Western Ringtail Possum *Pseudocheirus occidentalis*	Critically Endangered	4	20.2
Plants	Angle-stemmed Myrtle *Gossia gonoclada*	Endangered	7	16
Plants	Davies' Waxflower *Phebalium daviesii*	Critically Endangered	2	27.5
Plants	Foote's Grevillea *Grevillea calliantha*	Endangered	7	10.9
Plants	Forked Spyridium *Spyridium furculentum*	Endangered	5	12.2
Plants	Giant Andersonia *Andersonia axilliflora*	Critically Endangered	1	9
Plants	*Pimelea cremnophila*	Critically Endangered	1	2
Plants	Small-flowered Snottygobble *Persoonia micranthera*	Critically Endangered	2	15.5

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Table A3 (continued). All National Priority Species currently included in the Threatened Species Index 2024.

Group	Species	EPBC Act Status	Number of time series	Av. time-series length
Plants	Stiff Groundsel *Senecio behrianus*	Endangered	4	3.8
Plants	Stirling Range Dryandra *Banksia montana*	Critically Endangered	1	23
Plants	Waddy *Acacia peuce*	Vulnerable	1	29
Plants	Wollemi Pine *Wollemia nobilis*	Critically Endangered	1	25
Amphibians	Kroombit Tinker Frog *Taudactylus pleione*	Critically Endangered	1	31
Amphibians	Red and Yellow Mountain Frog *Philoria kundagungan*	Endangered	1	5
Amphibians	Southern Bell Frog *Litoria raniformis*	Vulnerable	143	13.5
Amphibians	Southern Corroboree Frog *Pseudophryne corroboree*	Critically Endangered	24	12.1
Amphibians	White-bellied Frog *Anstisia alba*	Critically Endangered	3	6.3

References:

Garnett ST & Baker GB (2022). The Action Plan for Australian Birds 2020 (1st ed.) CSIRO Publishing.