



Threatened
Species
Recovery
Hub

National Environmental Science Programme



A Threatened Species Index for Australia: Interim Report Part 1 – Birds

Executive Summary

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Front cover: The Hooded Plover, one of the Australian Government's 20 priority threatened birds. Photo: Ed Dunens Flickr CC BY 2.0

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Electronic supplementary material

Supplementary material is available electronically from the TSR Hub project webpage:
www.nespthreatenedspecies.edu.au/projects/threatened-species-index

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Executive Summary

The Goal

The overall goal of the NESP TSR Hub Threatened Species Index Project is to develop, test and deliver an index that provides reliable and robust measures of changes in the relative abundance of Australia's threatened and Near Threatened species at a national scale, and that can readily be interrogated and interpreted at a range of other scales and for individual groups of species. The index will eventually be freely available to anyone interested in learning about the trajectories of threatened and Near Threatened species, and their interpretation.

The NESP TSR Hub Threatened Species Index Project has seven associated/subsidiary aims:

1. To develop a collaborative network among agencies and groups that collect monitoring data on threatened species, and involve them in the development of a coordinated index.
2. To collect, vet, process, and collate existing annual time series data (e.g. counts, abundance estimates or proxies) on threatened and Near Threatened species' populations from any reliable sources.
3. To critically evaluate, and thence refine, the robustness of the index depending on the credibility and representativeness of available data for threatened and Near Threatened species.
4. To provide reliable and robust measures of changes in the abundance of subsets of Australia's threatened and Near Threatened species (e.g. by state or territory, broad ecosystem type, threatening process, conservation status etc.).
5. To work with stakeholders on the development of a roadmap for continuation of the index as a legacy product beyond the life of the hub.
6. To provide a platform for a national 'conversation' about threatened and Near Threatened species, and thereby to increase community awareness and appreciation of our threatened biodiversity and create a mandate for investment in its protection.
7. To improve the quality and extent of threatened biodiversity monitoring in Australia by providing impetus in the form of a highly visible national index.

This interim report delivers on a project milestone – to complete a test case using Australia's threatened and Near Threatened birds. It also provides background information for a workshop to be held in Canberra in late January 2018 with the Department of the Environment and Energy to explore the workings and applicability of the index, and help refine the future direction of the project as a whole.

Why do it?

A credible Threatened Species Index is vital for understanding and reporting on overall biodiversity changes, for supporting the evaluation of large scale programs such as the Australian Government's first Threatened Species Strategy as well as threatened species programs in other jurisdictions, and for identifying priorities for ongoing investment. Repeatedly over several decades, government agencies and others have requested such an index.



Photo of Far Eastern Curlew kindly provided by G. Ehmke, BirdLife Australia.

What we did

Our initial focus has been on threatened and Near Threatened birds, selected to provide a proof-of-concept for the methodology and to explore reporting capabilities. The project team developed a collaborative network with all potential stakeholders undertaking monitoring of threatened and Near Threatened bird species, identified standards for acceptable monitoring programs and datasets, and developed collaborative contracts with custodians for the immediate use of those datasets. We explored the applicability and performance of a global range of comparable indices, and selected the Living Planet Index as a suitable approach.

The project team formed a research partners group of 42 representatives of government agencies and other groups (quarterly phone hook-ups), a *Friends of the Index* group of >95 people (regular emails), four workshops and three conference presentations, and leveraged \$150,000 in cash co-funding from the Terrestrial Ecosystem Research Network (\$30,000) and an Ian Potter Foundation grant to BirdLife Australia (\$120,000). The NESP contribution has been \$369,000 to date and we estimate the additional in-kind support to be \$791,000 (see section A2.12 in the supplementary material for more information on the in-kind estimate).

To calculate a Threatened Bird Index for Australia, an aggregated database of 122,686 population time series (i.e. data from repeated monitoring at the same place over time) was collated from 66 data sources for 100 threatened or Near Threatened taxa (out of 236 possible species or subspecies assessed by BirdLife Australia/Threatened Species Committee and/or 130 bird taxa listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999). When criteria for the suitability of data for trend analyses were applied, the database was culled to 72 taxa with at least one suitable time series, resulting in 11,772 time series for use in the index. Of these time series, 48% were for Near Threatened, 11% for Vulnerable, 18% for Endangered and 22% for Critically Endangered bird taxa. Data were accepted up until December 15th 2017, so the analyses presented here are indicative rather than comprehensive.

The analytical approach we used, based on the Living Planet Index, shows the relative change in abundance (across many species/subspecies) from one year to the next using an initial reference year. The index is cumulative and is always in reference to the baseline, as are the 95% confidence intervals around the index value (Figure 1 shows a snapshot based on the present data available). The index is highly dynamic, and both the trend and the confidence intervals may change after inclusion of new data.

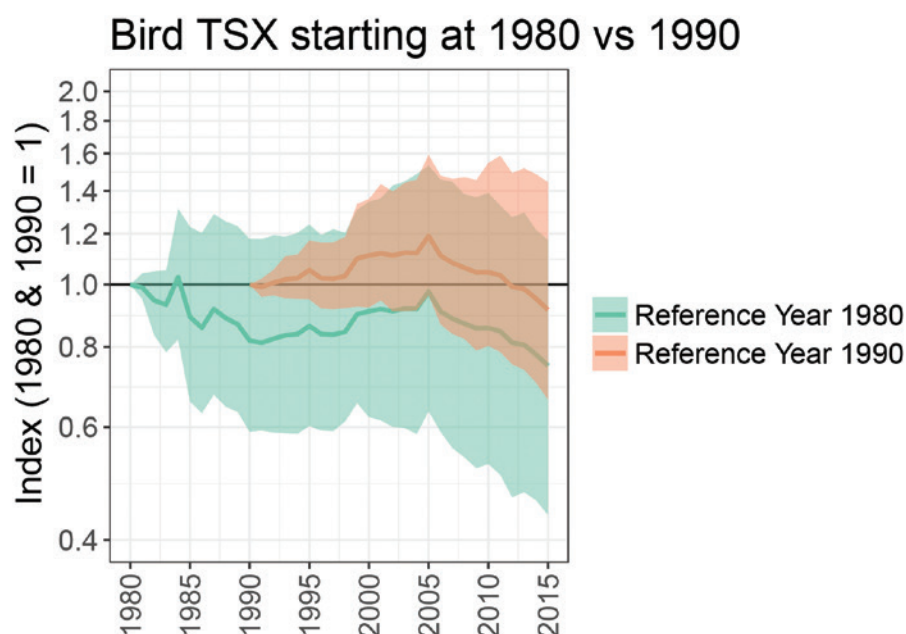


Figure 1: A Threatened Species Index (TSX) for threatened and Near Threatened Australian birds (72 taxa out of 236 taxa listed under BirdLife Australia/Threatened Species Committee - 2016 and/or EPBC Act - 2017). Here, the index value is set to 1.0 at a reference year of 1980 (green) vs 1990 (orange). Note that the pattern from a later reference is the same, but estimated decrease in the index value is linked to the reference year.

A novel aspect of the method has been to develop and utilise an automated workflow of processes to handle large volumes of data (many millions of data points such as those generated from big data citizen science monitoring programs) and apply the complex array of data processing and quality control tasks required to generate the index in a consistent and reproducible way. The distributed computing approaches are used to expedite the computing processes. The automated workflow system was developed using entirely open-source programming frameworks and web-applications. Applicable to any taxonomic group, the automated workflow allows for seamless incorporation of data as they are made available.

What we discovered

The 11,772 time series used to inform the index had an average length of 18.0 ± 8.8 years (mean \pm SD) and an average number of sample years of 12.0 ± 7.0 (mean \pm SD). The primary reason for rejecting 91% of the candidate data was because we accepted only time series that had at least five data points (Figure 2, green trend) and data collection was consistent from year to year in terms of method and surveying effort. Based on our acceptance criteria we will be able to identify species for which monitoring data are absent or inadequate. This will help guide the development of more suitable and applicable monitoring approaches to expand the scope of the index into the future.

Initial sensitivity analyses have been carried out to test the robustness of the index to varying data quantity or quality. For example, we tested the behaviour of the index using different reference (i.e. baseline) years (Figure 1) and minimum sample sizes of years with surveys per time series (Figure 2). These analyses will be complemented with more in-depth examination of data suitability for trend analyses after initial stakeholder feedback.

Based on these analyses we find that there are sufficient data to make robust and credible statements about aggregated trends in the abundance of Australia's threatened and Near Threatened birds.

Further, the Threatened Species Index is a feasible and transparent reporting tool toward the 5-year target of improving the trajectories of 20 priority birds (data on 12 taxa are available but vary in their suitability for trends), 20 mammals and 30 plants as delineated in the Australian Government's Threatened Species Strategy.

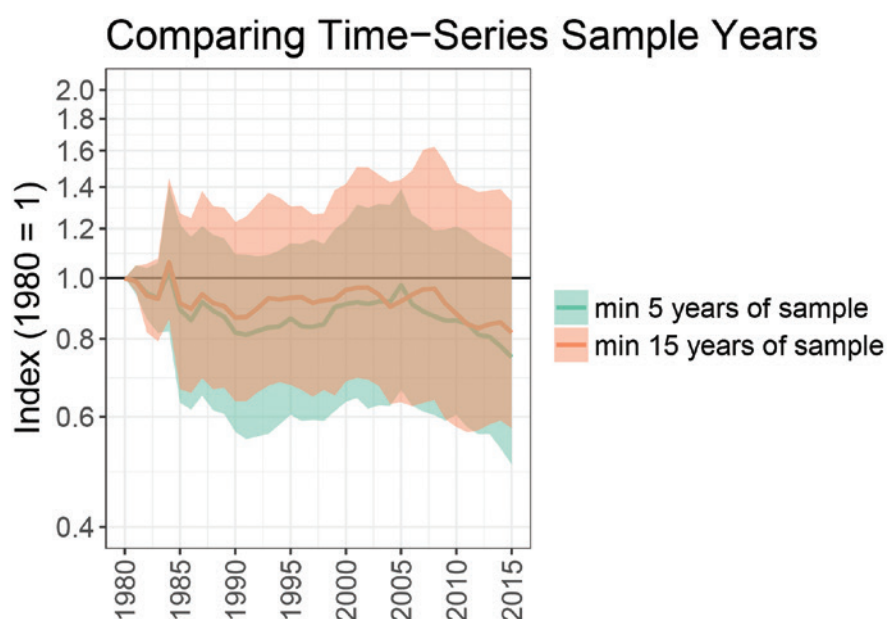


Figure 2: A Threatened Species Index (TSX) for threatened and Near Threatened Australian birds for which different number of survey years were used (minimum of 5 years of sample in green vs 15 years in orange). The index value is set to 1.0 at a reference year of 1980.

The Threatened Species Index estimates a decrease from 100% to 75% (with confidence limits of 122% at best and 53% at worst) relative to a baseline set to 1.0 in 1980 (Figure 1, in green). This means that our best estimate is that there may have been a 25% reduction in the abundance of threatened and Near Threatened birds in Australia since 1980 (for sampled taxa with the data available). Inspection of changes in specific geographic regions and groups is broadly consistent with other published literature and expert opinion.

The index can be used as a national headline indicator to report on overall changes in threatened species' populations, and can be an enduring tool for reporting on overall changes in populations of groups of threatened species in different regions over time. The aggregated datasets and code will all be freely available to the public, and the index can be readily updated by those with more monitoring data on trends of species, including through an automated data uploading portal, providing a foundational data processing service that saves agencies time and money. Users will be able to select the baseline, region and species groups of interest. The index, data and the automated workflow system have wide-ranging applicability, informing state of the environment reporting at national and sub-national scales, assessing national or state/territory threatened species strategies, reporting on international biodiversity commitments, or collating data that can support the development of environmental accounts.

What's next?

The project team plans to finalise the Threatened Bird Index by consulting intensively with the data custodians with respect to the observed trends, carrying out further sensitivity analyses and creating a prototype web-visualisation tool to allow interrogation. The next phase of the project, for which further funding is sought, will be to expand the approach to threatened and Near Threatened plants and mammals, and create a user-friendly web-visualisation tool for interrogation.

Thanks

Collating the database was only possible because of the generosity of more than 130 single data custodians, including research institutions, non-government organisations, state and territory agencies, recovery groups, citizen science projects, and private individuals. The effort in collecting high quality, scientifically planned data over many decades is inestimable but doubtlessly has involved thousands of volunteers, many of whom have self-funded travelling long distances to harsh environments to collect the data. The large in-kind contribution to this project greatly amplifies the resources committed by NESP and is a testimony to the broad interest in and support for the project.



Image: Malleefowl Photo: Butupa Wikimedia Commons CC2.0



Further information:

<http://www.nespthreatenedspecies.edu.au/>

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