Factsheet: A Threatened Mammal Index for South Australia
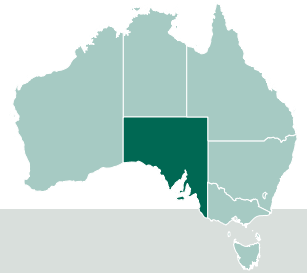
Research in brief

This project is developing a Threatened Species Index (TSX) for Australia which can assist policy-makers, conservation managers and the public to understand how some of the population trends across Australia's threatened species are changing over time. It will inform policy and investment decisions, and enable coherent and transparent reporting on relative changes in threatened species numbers at national, state and regional levels. Australia's TSX is based on the Living Planet Index (www.livingplanetindex.org), a method developed by World Wildlife Fund and the Zoological Society of London. The TSX has been designed to be a dynamic tool to which new monitoring data are added and examined annually.
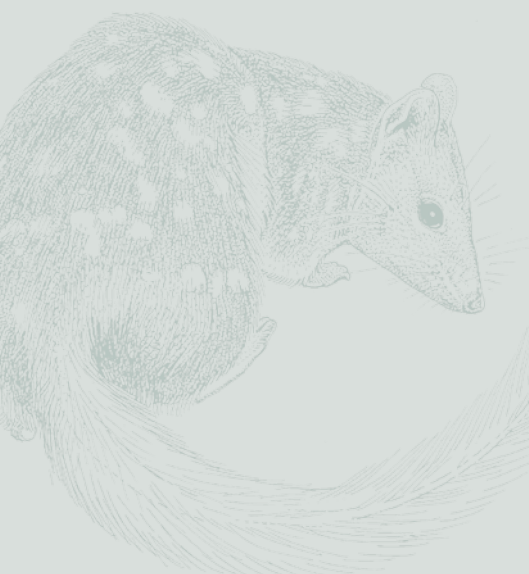
How can the index be used?

For the first time in Australia, an index has been developed that can provide reliable and rigorous measures of trends across Australia's threatened species, or at least a subset of them. In addition to communicating overall trends, the indices can be interrogated and the data downloaded via a web-app to allow trends for different taxonomic groups or regions to be explored and compared. So far, the index has been populated with data for some threatened and near-threatened birds and mammals, and monitoring data for threatened plants are currently being assembled.

These indices will allow Australian governments, non-government organisations, stakeholders and the community to better understand and report on which groups of threatened species are in decline by bringing together monitoring data. It will potentially enable us to better understand the performance of high-level strategies and the return on investment in threatened species recovery, and inform our priorities for investment.

A Threatened Species Index for mammals in South Australia

Different taxonomic groups can be explored individually in the Threatened Species Index. And we can also look at trends produced for Australian states and territories. Here, we present a report from the national Threatened Mammal Index (TMX) on trends for threatened and near-threatened mammals for South Australia (Figure 1A). In its first iteration, this index incorporates data from 12 threatened and near-threatened mammal taxa (Near Threatened, Vulnerable, Endangered or Critically Endangered under the EPBC Act and/or IUCN – see Table 1). We used information from the Australian Species Profile and Threats Database and the international IUCN Red List as of July 2019 to make a decision about the currently listed taxa.

Data on these mammal taxa come from fixed sites where they have been repeatedly monitored in a systematic and standardised way. For some of the terrestrial sites, the data custodians provided information on whether they have been intensively managed and how. This information allowed us to look at the trend across all monitored sites which is the overall Threatened Mammal Index (Figure 1) but also to drill down to look at the trends for:

1. Sites subject to any management (e.g., introduced predator-free havens/islands and other dedicated conservation management) (Figure 2),

A Threatened Species Index for mammals in South Australia (continued)

2. Sites without introduced predators (islands and fenced exclosures) (Figure 3), and

3. Sites with no (known) targeted management (Figure 4).

The division of sites/populations has been made solely on information provided by the custodians. This separation into subindices based on the type of intensive management is important especially for mammals monitored after being reintroduced into fenced or predator-free island areas. These areas are often more intensively monitored than extant populations, have fewer threats, and have the potential to significantly bias the population trends in the overall index. The reintroduced population trends may skew the overall result for a taxon and show the population as stable or increasing while in fact the extant population outside of the predator-free safe havens continues to decline, and thus needs to be examined carefully.

The index shows the estimated yearly change in relative abundance of threatened and near-threatened mammal taxa in relation to a baseline year, for which 1995 was chosen, where the index is set to 1.0. This baseline year was chosen because very few of the ongoing monitoring programs originated before 1995. However, later baseline years are also available to support the specific needs of conservation managers and can be selected via the web-app. Changes in the index are proportional – a value of 0.5 indicates the multi-taxon relative abundance is 50% below the baseline value; a value of 1.5 indicates 50% above baseline.

For the index on all sites in South Australia where threatened and near-threatened mammals were monitored, the TMX value in 2016 based on the current data is 2.12. This suggests that the relative abundance of threatened and near-threatened mammals for which we have information has increased by 112% between 2000 and 2016. While the overall index value in 2016 is 2.12, individual taxa have TMX values between 0.47 (a 53% decrease) and 7.01 (a 601% increase) (Figure 1A). It is expected that more data (and taxa) will be added as they become available each year, allowing the index to grow.

What should we know about the South Australian data?

This overall index on all monitored sites is based on 108 time series (defined as sites where data on a taxon are recorded using the same methodology and a consistent monitoring effort though time) across these 12 taxa. Data quality was maximised by: 1) checking whether each dataset had been produced by standardised monitoring; and 2) by sending surveys on 127 eligible datasets to custodians and requesting them to assess the trends produced for their datasets. Feedback was received for 74% of the datasets. Only time series that had been produced by standardised monitoring and with a minimum length of two years, collected between 1995 and 2016 inclusive, were used for index calculation. Sub-trends of the overall trend can be calculated if data on at least three taxa are available.

The data underlying the index mostly derive from monitoring programs in coastal South Australia and from the arid zone (Figure 1B).

The number of sites monitored that met the TMX criteria (Figure 1C) has substantially increased since around 2000, while the number of taxa monitored increased from seven in 2000 to 11 in 2013 (Figure 1D). In combination, this has resulted in a large increase in the time series available: from 12 in 2000 to 100 in 2013.

The index containing data on sites that were subject to any management such as introduced predator-free havens/islands and other dedicated conservation management (i.e., sustained predator baiting and ecological fire management) has 13 time series with data on 10 mammal taxa. This index has a 2016 value of 3.65 which corresponds to an increase of 265% between 2000 and 2016 (Figure 2).

The index which includes only island and other predator-free sites is based on nine time series and eight mammal taxa. Most of the sites included in this sub-trend are from the 123 km² predator-free, fenced wildlife reserve managed by the independent not-for-profit Arid Recovery. With a TMX value of 6.96, it shows an average increase of 596% between 2000 and 2016 (Figure 3).

The index corresponding to sites with no (known) targeted management is based on 95 time series and three mammal taxa. The TMX value in 2016 is 0.49, which indicates a 51% decrease on average in relative mammal abundance between 2000 and 2016 (Figure 4).

As more high-quality data become available they can be added, making the index more powerful, meaningful and representative. Increasing the number of taxa, regions and functional groups monitored would strengthen the value of the index. Ongoing long-term monitoring programs allow for continuing capability to track changes in the relative abundance of threatened and near-threatened mammal taxa.

Interpretational issues and constraints

- This composite index only includes data for threatened and near-threatened mammal taxa provided by the custodians endeavouring to meet the TMX criteria supplied. Inspection of these data indicate they are biased to the coastal areas of most states and are sparse for the arid zone. The index can be useful for also identifying strategic monitoring opportunities to increase the comprehensiveness of representation of threatened and near-threatened mammal taxa (see Table 1).

- There were limited appropriate monitoring data for remote areas available for inclusion in the index to 2016.

- Some mammal subgroups, such as bats and rodents, are still underrepresented.

- The proportional representation of threatened and near-threatened mammal taxa, and spatial coverage, is low in comparison to data on threatened and near-threatened birds (Threatened Bird Index).
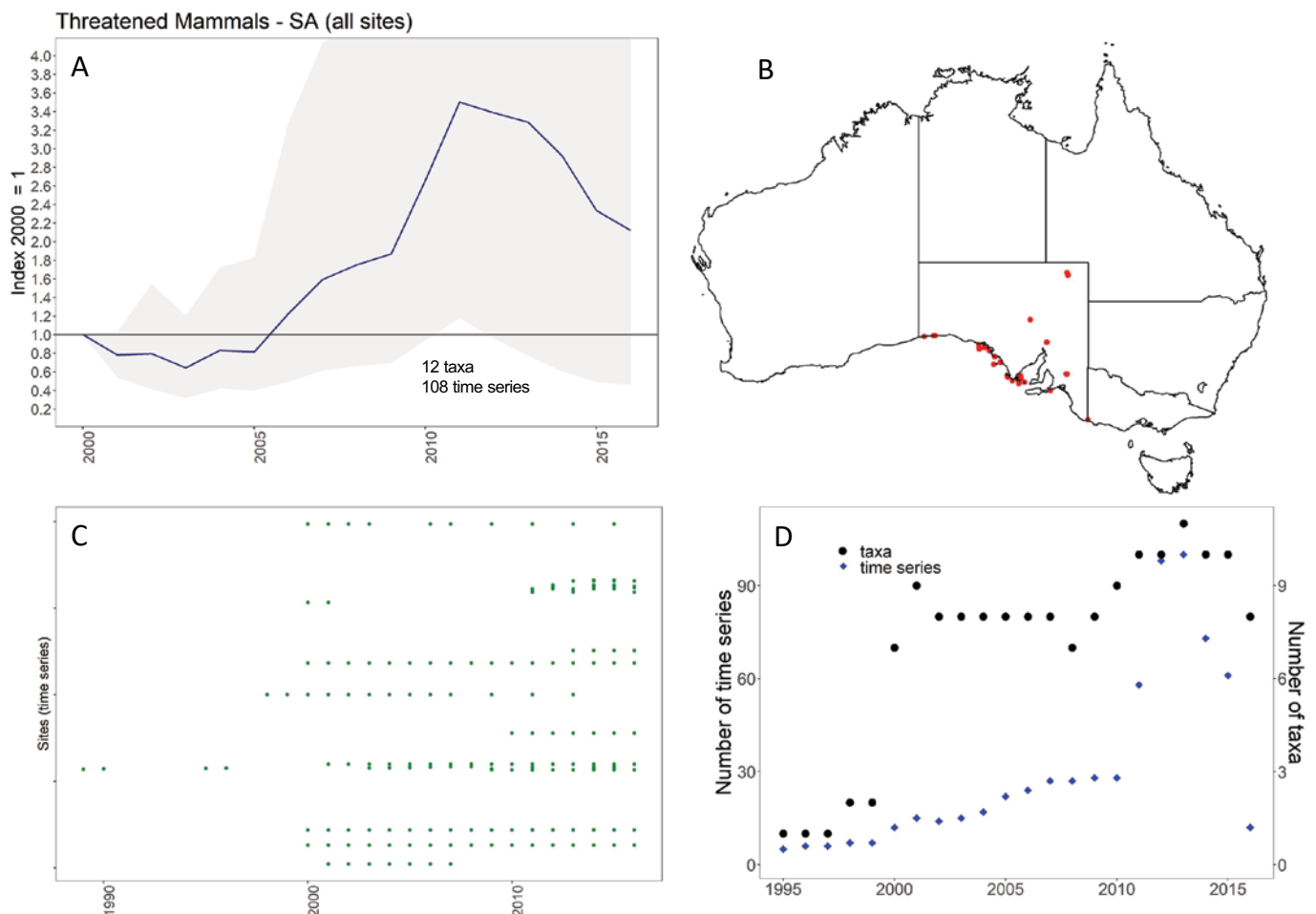

Figure 1: A) The Threatened Mammal Index (TMX) for South Australia, including data from all sites where threatened and near-threatened mammal taxa were provided. The blue line shows the change in mammal abundance relative to the baseline year of 2000, where the index is set to 1.0. The grey cloud shows the range of trends for the individual taxa that make up the overall multi-taxon index. It can be seen as the variability between single-taxon trends that contribute to the composite (i.e., it is not statistical confidence).

B) A map showing where threatened and near-threatened mammal data were recorded in South Australia. The red dots indicate repeatedly monitored fixed sites.

C) This dot plot shows the particular 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.

D) The number of taxa (in black circles) and number of time series (in blue diamonds) used to calculate the index for each year.
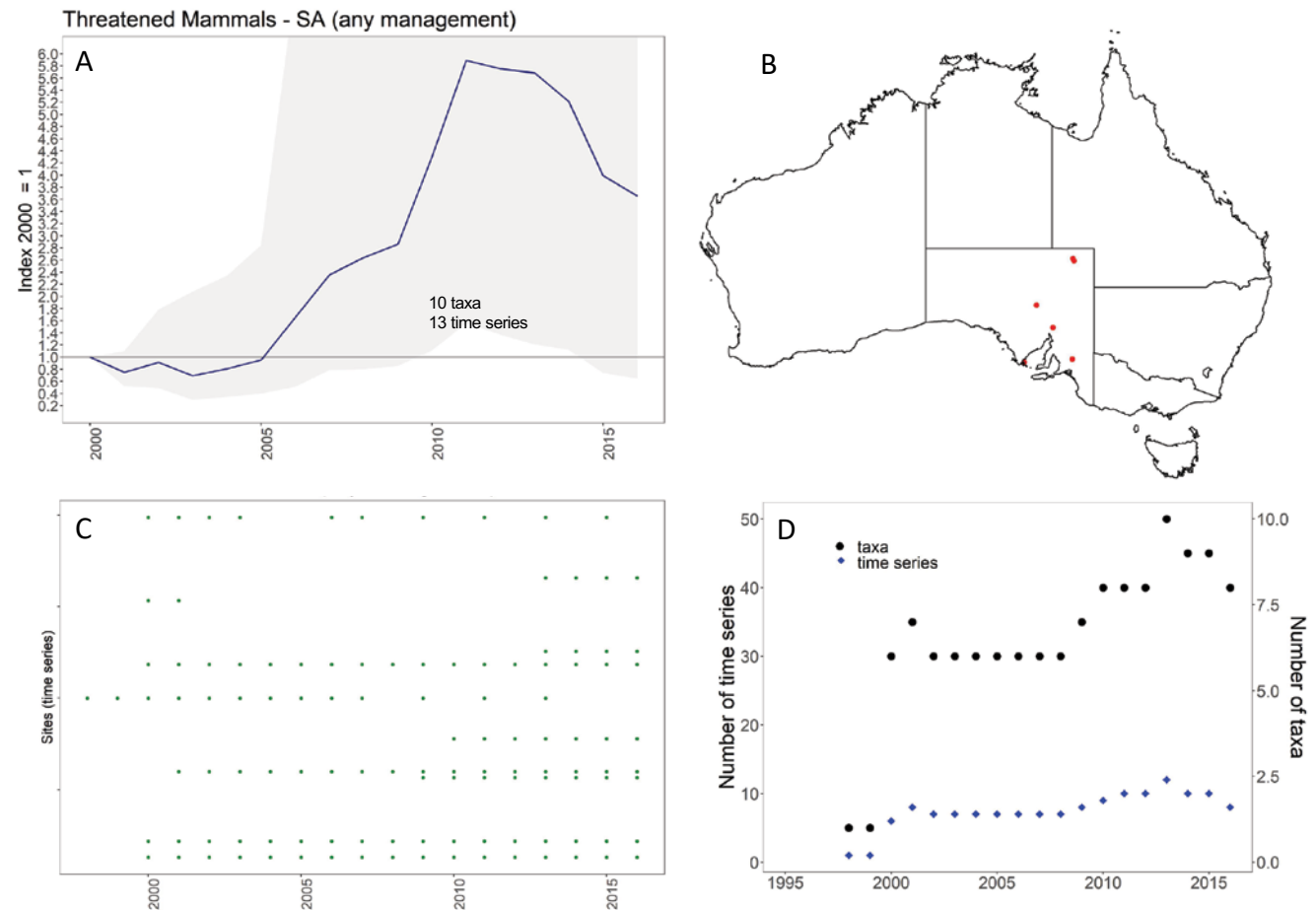
Figure 2: A) The Threatened Mammal Index (TMX) for South Australia based only on data from managed sites (introduced predator-free havens/islands and other dedicated conservation management). Taxa included in this trend are: bilby, boodie, boodie (Shark Bay), greater stick-nest rat, kowari, numbat, plains mouse, western barred bandicoot, woylie and yellow-footed rock-wallaby (South Australia, New South Wales).

B) A map showing where threatened and near-threatened mammal data on island and other predator-free sites were recorded.

C) This dot plot shows the particular 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.

D) The number of taxa (in black circles) and number of time series (in blue diamonds) used to calculate the index for each year.
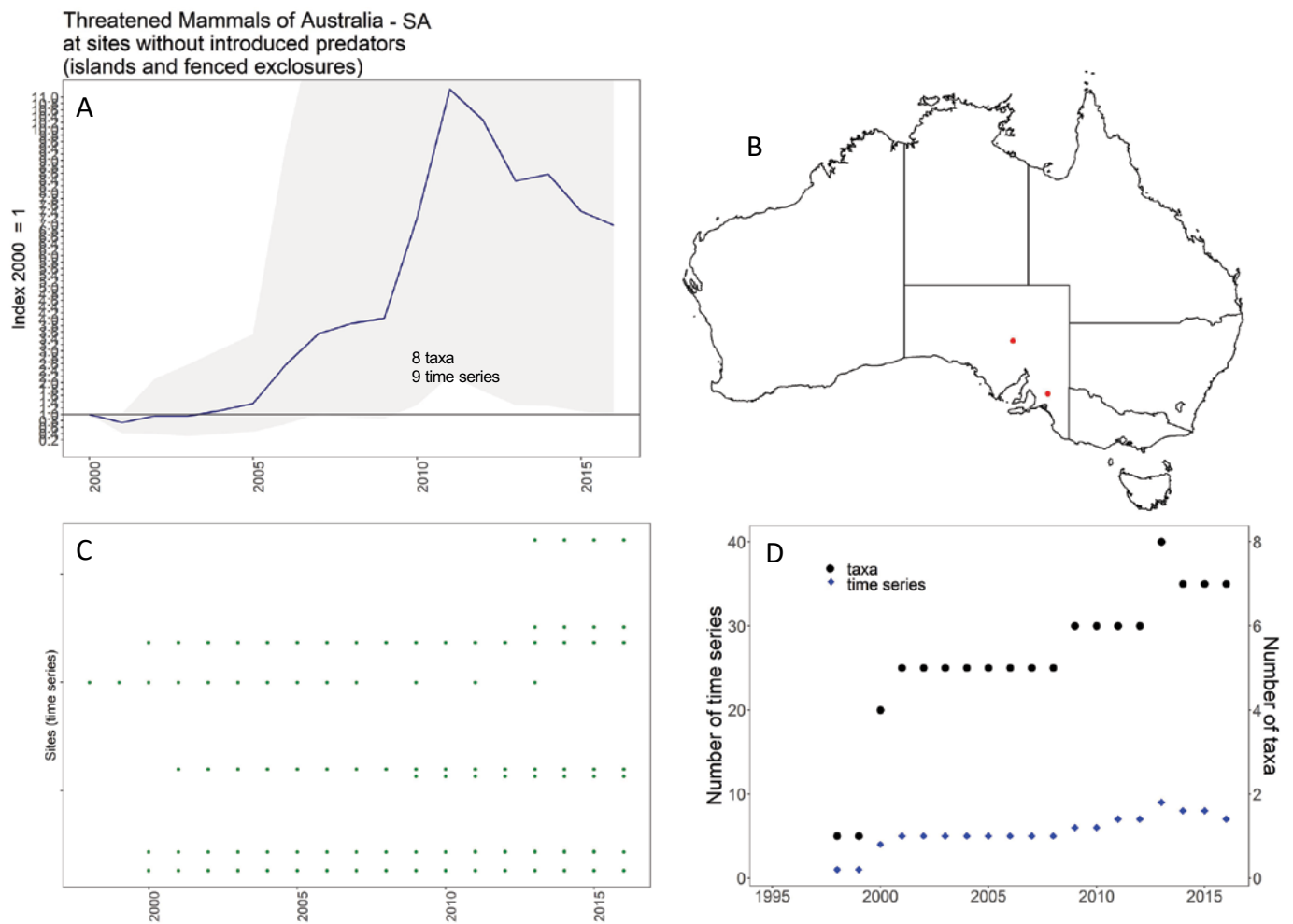
Figure 3: *A) The subindex of the Threatened Mammal Index (TMX) for South Australia that includes only data from feral predator-free islands and fenced sites. Note that where one of these species also occurs elsewhere, data from those sites (which are not feral predator-free) is not included in this subindex. Taxa included in this trend are: bilby, boodie, boodie (Shark Bay), greater stick-nest rat, numbat, plains mouse, western barred bandicoot and woylie.*

B) A map showing where threatened and near-threatened mammal data on island and other predator-free sites were recorded.

C) This dot plot shows the particular 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.

D) The number of taxa (in black circles) and number of time series (in blue diamonds) used to calculate the index for each year.

Greater stick-nest rat. Image: Australian Wildlife Conservancy

Threatened Mammals of Australia - SA
No (known) targeted management

A — 3 taxa, 95 time series
Index 2000 = 1

B

C — Sites (time series)

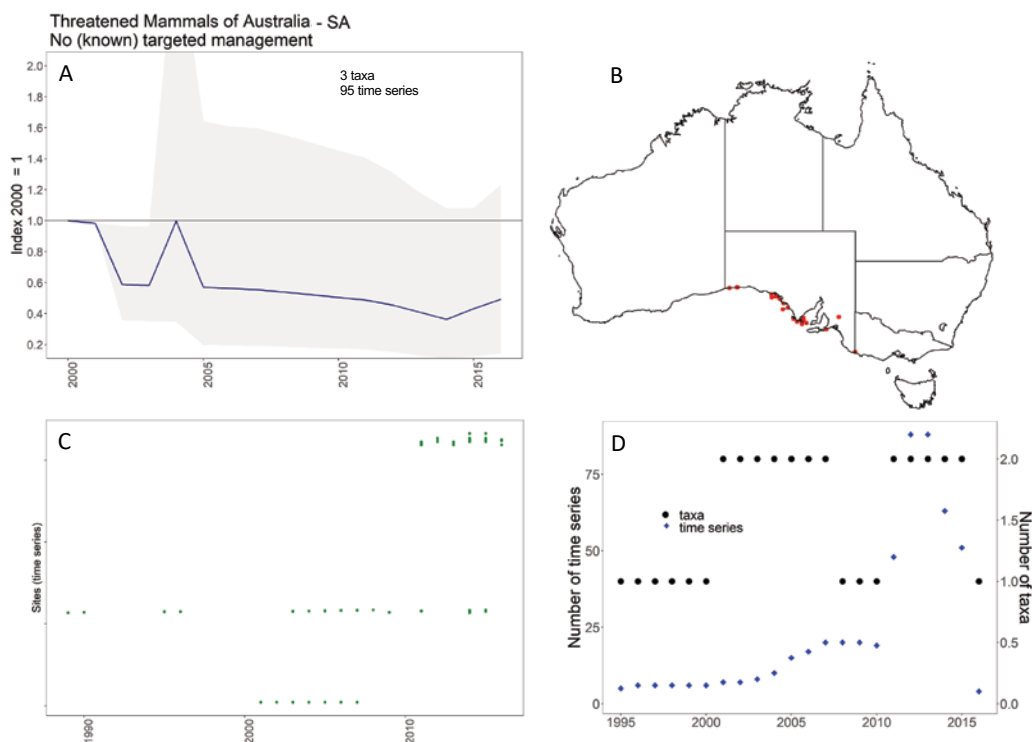D — Number of time series / Number of taxa — taxa, time series

Figure 4: A) The subindex of the Threatened Mammal Index (TMX) for South Australia that includes monitoring data on sites without targeted management of threatened and near-threatened mammal taxa or for which no information on management was provided by the custodians. Taxa included in this trend are: Australian sea-lion, southern brown bandicoot (south-eastern Australia) and woylie.

B) A map showing where threatened and near-threatened mammal data with no (known) targeted management were recorded.

C) This dot plot shows the particular 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.

D) The number of taxa (in black circles) and number of time series (in blue diamonds) used to calculate the index for each year.

Table 1: : Data on threatened and near-threatened mammal taxa included in the TMX for South Australia.

Times-series length (mean ± SD): 6.2 ± 5.1
Number of samples (year) per time series (mean ± SD): 3.3 ± 3.1
Number of data sources in index: 9
Number of data taxa in index: 12

Taxon common name	Taxon scientific name	Functional Group	IUCN Status	EPBC Status	# data sources	# time series	Mean time-series length
Australian sea-lion	*Neophoca cinerea*	Marine:>5000g	Endangered	Vulnerable	1	20	13.0
Bilby	*Macrotis lagotis*	Terrestrial:50-5000g	Vulnerable	Vulnerable	2	2	11.0
Boodie	*Bettongia lesueur*	Terrestrial:50-5000g	Near Threatened	Vulnerable	1	1	17.0
Boodie (Shark Bay)	*Bettongia lesueur lesueur*	Terrestrial:50-5000g	Near Threatened	Vulnerable	1	1	4.0
Greater stick-nest rat	*Leporillus conditor*	Terrestrial:50-5000g	Near Threatened	Vulnerable	1	1	17.0
Kowari	*Dasyuroides byrnei*	Terrestrial:50-5000g	Vulnerable	Vulnerable	1	2	14.5
Numbat	*Myrmecobius fasciatus*	Terrestrial:50-5000g	Endangered	Endangered	1	1	8.0
Plains mouse	*Pseudomys australis*	Terrestrial:<50g	Vulnerable	Vulnerable	1	1	16.0
Southern brown bandicoot (south-eastern Australia)	*Isoodon obesulus obesulus*	Terrestrial:50-5000g		Endangered	1	1	7.0
Western barred bandicoot	*Perameles bougainville*	Terrestrial:50-5000g	Vulnerable		1	1	16.0
Woylie	*Bettongia penicillata*	Terrestrial:50-5000g	Critically Endangered	Endangered	2	76	3.6
Yellow-footed rock-wallaby (South Australia, New South Wales)	*Petrogale xanthopus xanthopus*	Terrestrial:>5000g	Near Threatened	Vulnerable	1	1	7.0

Further Information

For more information or to become a *Friend of the Index* and receive updates on the progress of the project please contact the TSX Team at tsx@uq.edu.au

The data underpinning the index were contributed by many different individuals and organisations, including Commonwealth, state and territory agencies, research institutions and environmental non-government organisations (e.g., Australian Wildlife Conservancy and Arid Recovery) and consultants. Visit this web page for more information: tsx.org.au

Go to the web-app to access and explore the data behind the TMX and to produce reports tailored to your particular needs.

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