Science for Saving Species
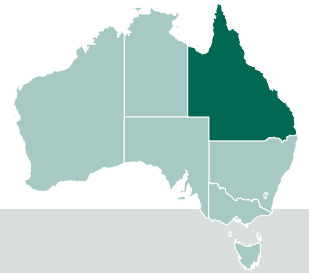
Research findings factsheet

Project 3.1

Threatened Species Recovery Hub

National **Environmental Science** Programme

Factsheet: A Threatened Mammal Index for Queensland

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.
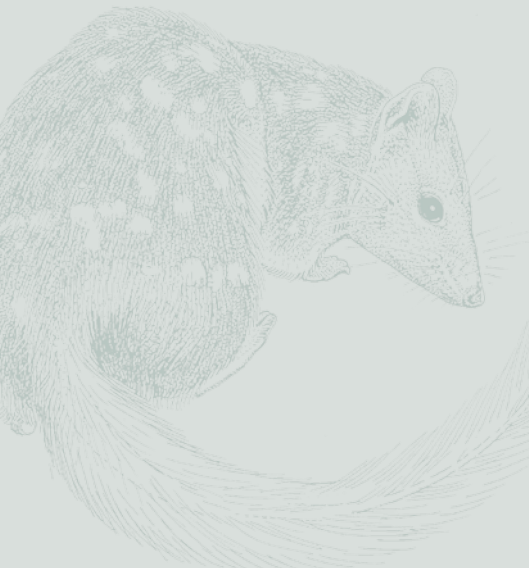
How can the index be used?

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 Queensland

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 Queensland (Figure 1A). In its first iteration, this index incorporates data from 16 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 (143 taxa, which counts both species and subspecies).

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:

A Threatened Species Index for mammals in Queensland (continued)

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

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

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

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 Queensland where threatened and near-threatened mammals were monitored, the TMX value in 2016 based on the current data is 1.07. This suggests that the relative abundance of threatened and near-threatened mammals for which we have information has increased by 7% between 1995 and 2016. While the overall index value in 2016 is 1.07, individual taxa have TMX values between 0.20 (an 80% decrease) and 5.31 (a 431% 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 Queensland data?

This overall index on all monitored sites is based on 88 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 16 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 Queensland (Figure 1B). The number of sites monitored that met the TMX criteria (Figure 1C) has substantially increased since around 1995, while the number of taxa monitored increased from two in 1995 to 12 in 2011 (Figure 1D). In combination, this has resulted in a large increase in the time series available: from seven in 1995 to 73 in 2011.

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 16 time series with data on eight mammal taxa. This index has a 2016 value of 1.85, which corresponds to an increase of 85% between 2000 and 2016 (Figure 2).

The index corresponding to sites with no (known) targeted management contains 72 time series and eight mammal taxa. The TMX value in 2016 is 0.21 which indicates a 79% decrease on average in relative mammal abundance between 1995 and 2016 (Figure 3).

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 overall Queensland trend is only based on 15 taxa while 46 are on the EPBC list. 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 overall trend is largely influenced by decreasing population trends for Hastings River mouse and koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).

- 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).
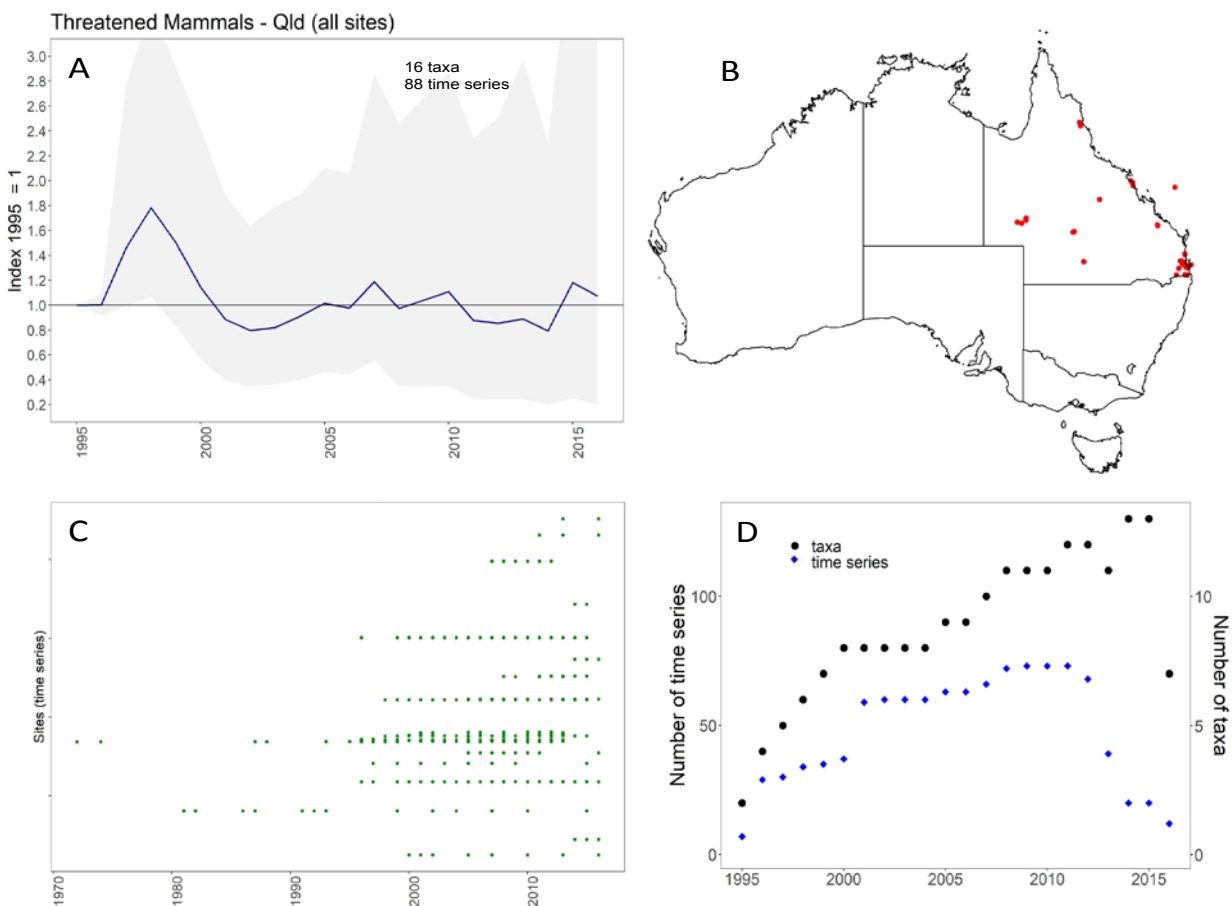

Figure 1: A) The Threatened Mammal Index (TMX) for Queensland, including data from all sites where threatened and near-threatened mammal taxa were provided. The blue line shows the change in mammal abundance relative to the baseline year of 1995, where the index is set to 1.0. The grey cloud shows the 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 Queensland. 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.
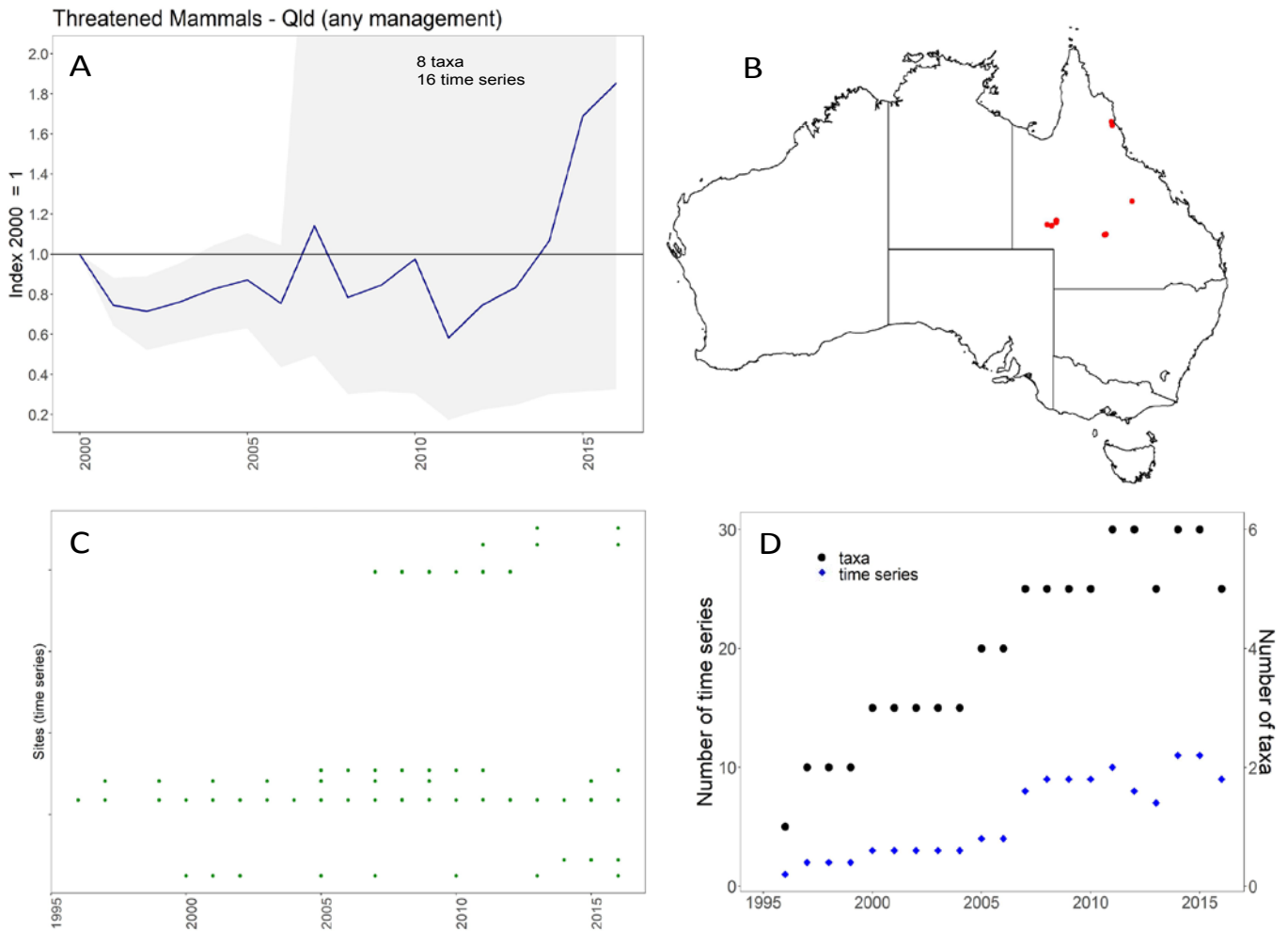
Figure 2: *A) The Threatened Mammal Index (TMX) for Queensland based only on data from managed sites (introduced predator-free havens/ islands and other dedicated conservation management). Taxa included in this trend are: bilby, bridled nailtail wallaby, kowari, northern hairy-nosed wombat, northern quoll, yellow-bellied glider (wet tropics) and yellow-footed rock-wallaby (central-western Queensland).*

B) A map showing where threatened and near-threatened mammal data on sites subject to any conservation 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.

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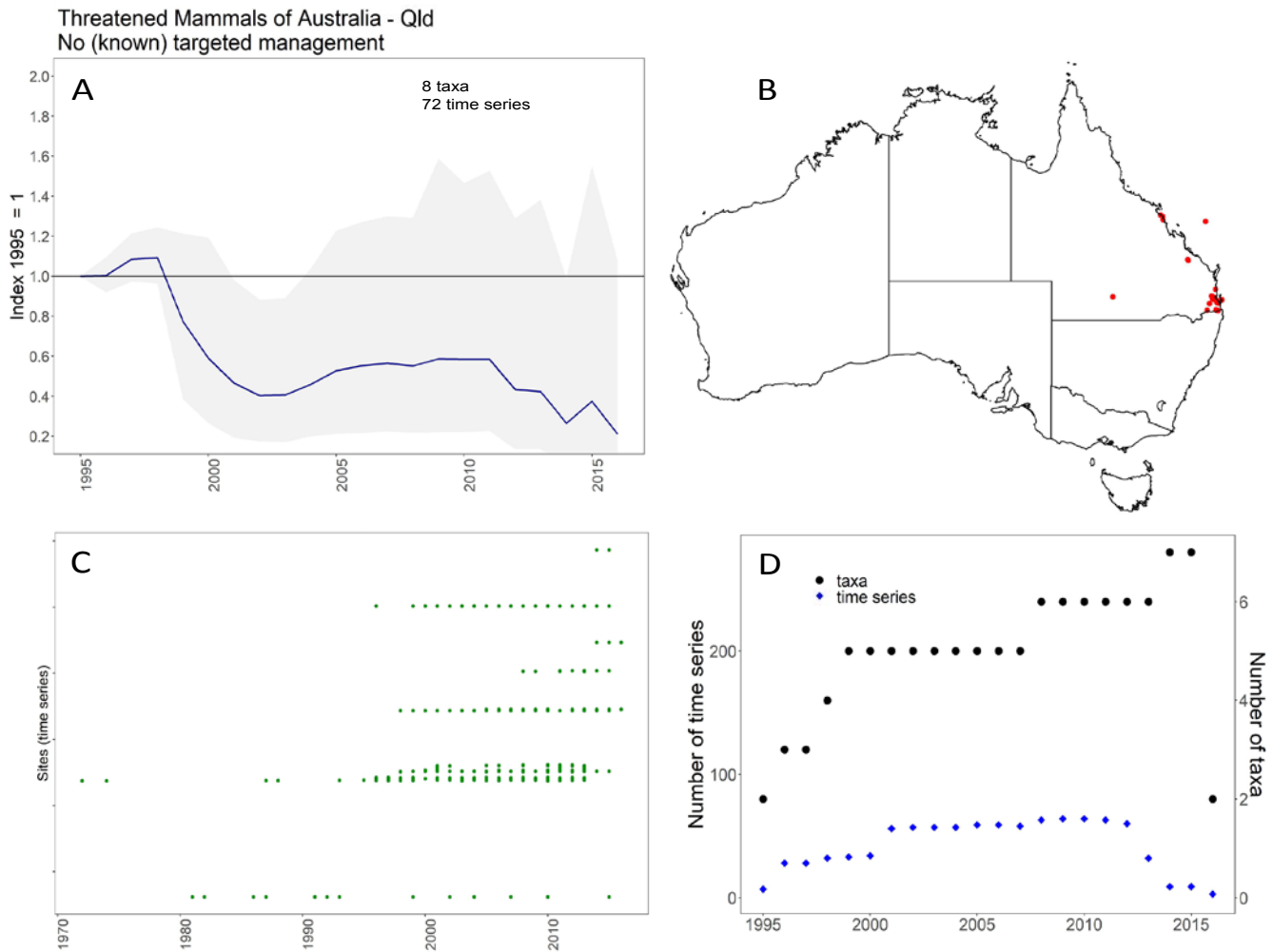No (known) targeted management

A 8 taxa
72 time series

Figure 3: *A) The subindex of The Threatened Mammal Index (TMX) for Queensland 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: black-tailed antechinus, Hastings River mouse, humpback whale, koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), large-eared pied bat, long-nosed potoroo (south-eastern Queensland, north-eastern New South Wales), silver-headed antechinus and water mouse.*

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 Queensland.*

Times-series length (mean ± SD): 12.9 ± 7.2
Number of samples (year) per time series (mean ± SD): 5.6 ± 4.3
Number of data sources in index: 19
Number of data taxa in index: 16

Taxon common name	Taxon scientific name	Functional Group	IUCN Status	EPBC Status	# data sources	# time series	Mean time-series length
Bilby	*Macrotis lagotis*	Terrestrial:50-5000g	Vulnerable	Vulnerable	1	4	3.0
Black-tailed antechinus	*Antechinus arktos*	Terrestrial:50-5000g		Endangered	1	1	2.0
Bridled nailtail wallaby	*Onychogalea fraenata*	Terrestrial:50-5000g	Endangered	Endangered	2	2	14.5
Carpentarian antechinus	*Pseudantechinus mimulus*	Terrestrial:<50g	Endangered		1	1	4.0
Hastings River mouse	*Pseudomys oralis*	Terrestrial:50-5000g	Vulnerable	Endangered	1	2	15.0
Humpback whale	*Megaptera novaeangliae*	Marine:>5000g	Least Concern	Vulnerable	1	1	35.0
Koala (combined populations of Qld, NSW and the ACT)	*Phascolarctos cinereus*	Terrestrial:Arboreal:>5000g	Vulnerable	Vulnerable	3	59	14.9
Kowari	*Dasyuroides byrnei*	Terrestrial:50-5000g	Vulnerable	Vulnerable	1	4	5.5
Large-eared pied bat	*Chalinolobus dwyeri*	Terrestrial:Volant:<50g	Near Threatened	Vulnerable	1	1	20.0
Long-nosed potoroo (south-eastern Queensland, north-eastern New South Wales)	*Potorous tridactylus tridactylus*	Terrestrial:50-5000g	Near Threatened	Vulnerable	1	1	17.0
Northern hairy-nosed wombat	*Lasiorhinus krefftii*	Terrestrial:>5000g	Critically Endangered	Critically Endangered	1	1	17.0
Northern quoll	*Dasyurus hallucatus*	Terrestrial:50-5000g	Endangered	Endangered	1	2	5.0
Silver-headed antechinus	*Antechinus argentus*	Terrestrial:<50g		Endangered	1	2	3.0
Water mouse	*Xeromys myoides*	Terrestrial:<50g	Vulnerable	Vulnerable	2	5	4.0
Yellow-bellied glider (Wet Tropics)	*Petaurus australis (Wet Tropics)*	Terrestrial:Volant:50-5000g	Near Threatened	Vulnerable	1	1	19.0
Yellow-footed rock-wallaby (central-western Queensland)	*Petrogale xanthopus celeris*	Terrestrial:>5000g	Near Threatened	Vulnerable	1	1	12.0

Yellow-bellied glider.
Image: Jasmine Zeleny

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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