

Science for Saving Species

Research findings factsheet

Project 7.7



National Environmental Science Programme

An updated national-scale dataset for threats affecting Australia's imperilled flora and fauna

In brief

Australia's biodiversity is facing ongoing declines since European arrival. The threats causing this decline and their relative impacts on our nation's threatened species have not been assembled in a consistent and up-to-date dataset to inform decision-making.

In this research, we compiled the first complete, validated, and consistent species-specific threat and threat impact dataset for all

1,796 nationally listed threatened plants and animals in Australia on November 2019. The dataset uses IUCN approaches to estimate the relative impacts of each threat on each species, and defines eight consistent broad-level threats and 48 subcategory threats to help inform conservation actions needed within Australia.

We found that the threats affecting most species are *Habitat loss*,

fragmentation, and degradation then *Invasive species and disease* and *Adverse fire regimes*. Different groups of species are threatened by different threats, with birds, frogs, mammals and reptiles most severely affected by *Invasive species and disease*. The ranking of threats also changes when the impact of the broad-level threat is considered, with *Invasive species and disease* impacting the most species at a high impact.

Background

The main threats to Australia's threatened species are:

- the introduction of invasive species (e.g., woody and herbaceous weeds, camels, cattle, horses, goats, cane toads, cats, foxes)
- widespread clearing of native vegetation for intensive agriculture and urban development
- grazing of the landscape by livestock
- the spread of introduced disease (e.g., Chytrid fungus, Phytophthora, myrtle rust)
- altered fire regimes

Our research advances this knowledge by identifying the relative impact of each major threat to each threatened species, using information that differentiates between less severe threats and those that are causing significant or catastrophic declines. The threat impact dataset can inform policy-makers, decision-makers and practitioners to determine the optimal responses to the processes impacting Australia's threatened species.

Main aim of the research

We aimed to compile the first complete, validated, and consistent data about species-specific threats and their impacts on 1,796 nationally listed threatened plants and animals in Australia (as of 2019). The purpose of compiling this data was to help inform the conservation actions needed to help the nation's threatened species persist and recover in the future.











What we did

We collated known information about threats to threatened species in Australia, in collaboration with experts from each taxon. Threats were classified and ranked in 2019–20, consistently applying the IUCN Threat Classification Scheme and Threat Impact Scoring System. The experts estimated the scope (e.g., affecting the whole population or a majority or minority of it), severity (overall declines caused by a threat) and timing (continuing, short-term, long-term) of the threats, and impact scores were calculated for each one. This produced a comprehensive species–threat–impact dataset for all threatening processes affecting nationally listed threatened species and subspecies.

The dataset also defined eight broad-level threats (e.g., *Disrupted ecosystem and population processes*) and 48 sub-category threats (e.g., *Lack of recruitment*) for all 1,796 terrestrial and aquatic threatened species and subspecies. These categories were co-designed with independent experts from the Australian Government’s Threatened Species Scientific Committee and their collaborators to capture the unique Australian situation. This included adding some threat categories not specifically addressed by the IUCN system, such as *Habitat loss, fragmentation and degradation* and *Disrupted ecosystem and population processes*.

The dataset consists of a total of 4,946 species–threat combinations, which includes information about the timing, scope and severity of those combinations, where it is available.

Table 1. The eight broad-level threat categories and 48 sub-category threats used in the Australia-wide analysis.

Broad-level threats	Symbol	Sub-category threats
Adverse fire regimes		Increase in fire frequency/intensity Suppression in fire frequency/intensity Other change in fire regime/trend unspecified
Changed surface and groundwater regimes		Alteration to groundwater levels Alteration to surface water flows and infiltration Dams and altered flow regimes
Climate change and severe weather		Climate change and severe weather-Unspecified Habitat shifting and alteration Increased frequency/severity of droughts Sea-level rise Storms and flooding Temperature extremes
Disrupted ecosystem and population processes		Genetic introgression/hybridisation Lack of recruitment Problematic native species Small, restricted and reduced population
Habitat loss, fragmentation and degradation		Agriculture and aquaculture Energy production and mining Fisheries Forestry Geological events Military development Transportation and service corridors Other natural system modifications
Invasive species and diseases		Disease Invasive amphibian Invasive bird Invasive fish Invasive invertebrate Invasive predator Invasive rabbit Invasive reptile Invasive rodent Invasive ungulate Invasive weed
Overexploitation and other direct harm from human activities		Collision Direct harvest Human intrusion Persecution Unintentional poison Unintentional hunting Entanglement
Pollution		Effluent and wastewater Garbage and solid waste Herbicides and pesticides Light pollution Nutrient loads Oil spills Seepage from mining

The species–threat–impact dataset is available as CSV file through Figshare:
<https://figshare.com/s/b2359dbd89748adaec3a>

Key findings

We found that the most frequently listed broad-level threats (see Figure 1) were:

- *Habitat loss, fragmentation, and degradation* (affecting 1,212 species)
- *Invasive species and disease* (affecting 965 species)
- *Adverse fire regimes* (affecting 685 species).

However, different groups of species are threatened by different pressures. For example, while *Habitat loss, fragmentation, and degradation* is the key threatening process for invertebrates, fish and plants, *Invasive species and disease* threaten the most birds, frogs, mammals and reptiles.

Looking at the sub-category threats can help understanding of the main causes of each broad-level threat it is nested in. The most frequently listed sub-category level threats were:

- *Invasive weeds* (nested within *Invasive species and disease* and affecting 566 species)
- *Agriculture and aquaculture* (nested within *Habitat loss, fragmentation, and degradation* and affecting 413 species)
- Other natural system modifications (also nested within *Habitat loss, fragmentation, and degradation* and affecting 402 species).

The ranking of the threat prevalence changes when the impact of the broad-level threat is considered. See Figure 2 overleaf. When all threats are considered regardless of impact, *Habitat loss, fragmentation, and degradation* is the major threat category (affecting 1,212 species). Yet when only high-

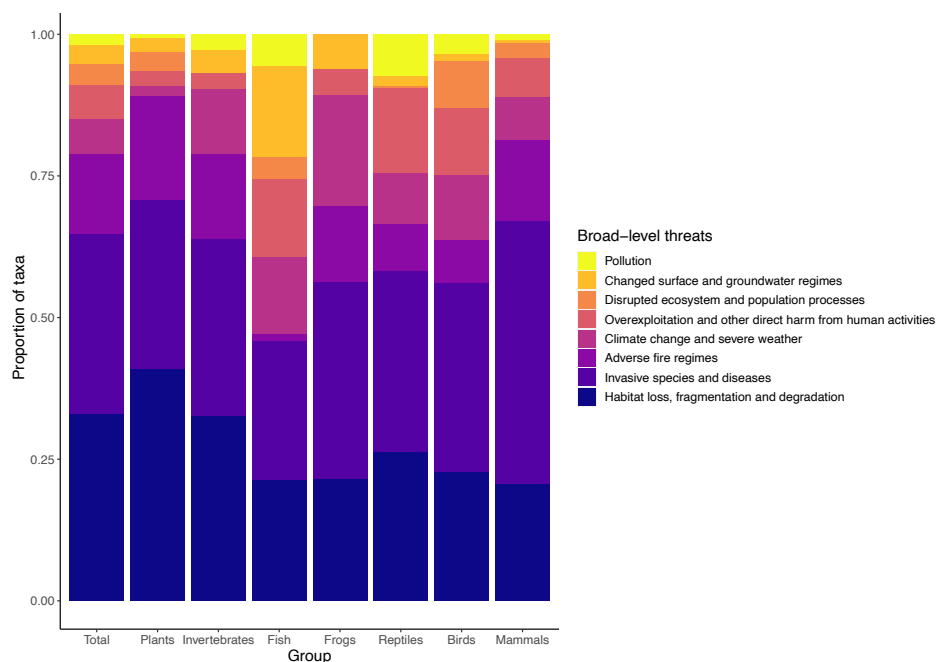


Figure 1. Proportion of Australian threatened species impacted by broad-level threats for all species and categorised by group. Threats are ordered based on the relative number of total species impacted, from the highest in blue (*Habitat loss, fragmentation and degradation*) to lowest in yellow (*Pollution*). The broad-level threats were determined by independent experts from the Australian Threatened Species Scientific Committee.

impact threats or medium-impact threats are considered, *Invasive species and diseases* (affecting 167 and 603 species, respectively) become the key threats compared to *Habitat loss, fragmentation, and degradation* (affecting 70 and 454 species, respectively).

For 11.2% of species–threat combinations, we could not calculate impact scores due to insufficient data, which appears to indicate a lack of understanding of the level of impact that habitat modifications have on threatened species. This outcome reflects the reality of complex threatening processes, and critical knowledge gaps concerning threats to Australia’s imperilled biodiversity, where experts were able to identify a possible threat but could not confidently evaluate the impact it has on a particular species.

Our analysis shows that, in Australia, the greatest number of species would benefit from reducing the threat of *Habitat loss, fragmentation and degradation*. A habitat is a species’ most fundamental need, and its continued loss will result in continued declines regardless of how well other threats are managed. Since 2000, an area of habitat equating to 7.7 million hectares has been lost to land clearing primarily for agriculture and urban development, impacting over 85% of EPBC Act-listed species. This contrasts with overall global trends, with over-exploitation being the most dominant threatening process worldwide. Our work highlights the unique challenge that we face in seeking to protect and recover Australia’s threatened species.

Cited material

Ward, M., Carwardine, J., Yong, C.J., Watson, J.E.M., Silcock, J., Taylor, G.S., Lintermans, M., Gillespie, G.R., Garnett, S.T., Woinarski, J., Tingley, R., Fensham, R., Hoskin, C.J., Hines, H.B., Roberts, J.D., Kennard, M. J., Harvey, M.S., Chapple, D.G., and Reside, A. A national-scale dataset for threats affecting Australia's imperiled flora and fauna. In review. *Ecology and Evolution*. In press.

Further Information

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Key findings (continued)

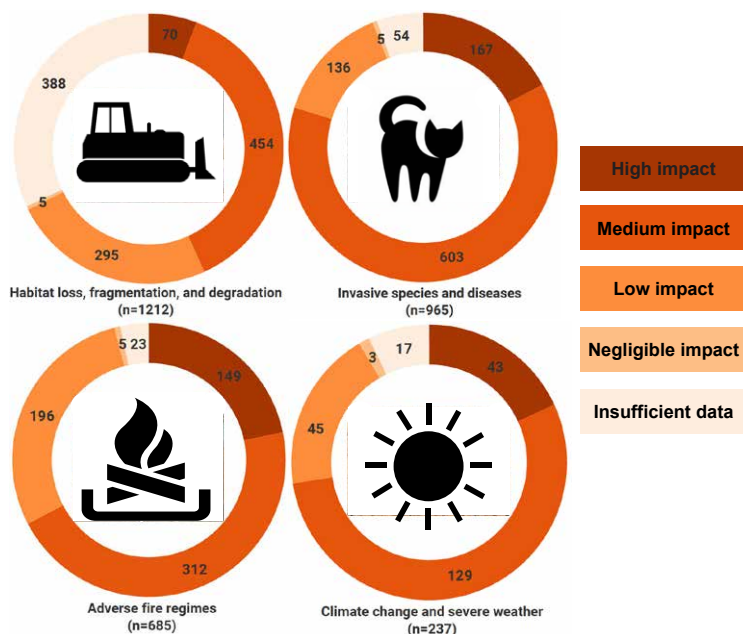


Figure 2. The most important threats to threatened Australian plants and animals change when impact is considered. Impact was determined by evaluating timing, severity and scope for each threat per species. Where a species was threatened by multiple sub-categories within a broad threat, we used the maximum impacting level.

Limitations

The dataset integrates historic and recent threat information up to the present, so it can't assess the effect of changes in exposure to threats and to their impact over time, although future revisions may enable this. As it is national in scale, the dataset cannot account for local differences in threat impacts. Interactions between threats are not specifically considered. The dataset focuses on EPBC Act-listed species as of 2019, and many other species and subspecies that are potentially eligible for listing as threatened under national legislation are not included. Finally, threats emerging after the expert consultation could not be considered, with a key example the extensive, intense wildfires that burned much of south-eastern Australia in 2019–20.

Implications and recommendations

This dataset provides critical information that can inform the prioritisation and management of Australia's threatened species and threatening processes at a range of scales, such as:

- national-, state- and territory-level conservation strategies
- conservation action and recovery planning at local, regional, state and national scales
- informing national legislation (e.g., the EPBC Act)
- assessing the vulnerability of

species to impacts (e.g., post-disaster planning, determining significant impacts)

- prioritising investments in threatened species management and recovery.

As part of these processes, threat impact data can also be used to estimate the relative importance of, or the benefit of, managing a particular threat. For example, the Endangered south-eastern subspecies of the spotted-tailed quoll (*Dasyurus maculatus maculatus*) has 13 recorded threats,

one of which is considered to be of high impact, three of medium impact, and nine of low impact. This indicates that while the one high-impacting threat, invasive foxes, must be mitigated, lower impacting threats such as cane toads and death from road traffic must also be recognised and managed.

It is our vision that the threat impact dataset will be periodically updated, improved and integrated with additional relevant information to better inform conservation decisions and outcomes.