



Submission

Threatened Species Strategy Action Plan 2021 - 2026 (consultation paper)

Summary

The Australian Citizen Science Association (ACSA) generally supports the actions laid out in the consultation paper.

Our overall observation and recommendation is that the increased use and effectiveness of citizen science warrants it being included throughout the action plan in a way that “professional” science, Indigenous knowledge and citizen science are complementary.

We have made a number of recommendations that enable citizen science to continue to make a significant contribution to threatened species initiatives in Australia.

Our key recommendations are as follows:

- *That citizen science be included throughout the action plan.*
- *That agencies and other organisations develop citizen science strategies.*
- *Develop an integrated knowledge framework for threatened species that leverages the strengths of professional science, Indigenous knowledge and citizen science.*
- *Develop initiatives and tools that are inclusive and suitable for use by a wide range of contributors.*
- *Include citizen science organisations in the threatened species partner network.*
- *Include citizen science in any activities to improve data sharing mechanisms and technology development.*

Additional recommendations are included in the main document.

Introduction

The Australian Citizen Science Association ([ACSA](#)) is Australia’s representative membership association for citizen science. We support citizen science as an exciting and innovative way to encourage broad and meaningful participation in science. Since its inception six years ago, ACSA has grown to include 26 organisational members, over 260 individual members, 5 regional chapters and a social media and newsletter reach of over 2,000 and social media reach of over 5,000 across major platforms.

ACSA works closely with its sister associations: the United States Citizen Science Association, the European Citizen Science Association, CitSciAsia, and African Citizen Science Association to advance citizen science globally, including through the [Global Citizen Science Partnership](#). ACSA has been collaborating to help advance citizen science for a sustainable world and is working with the United Nations to advise on how citizen science can be used to address the UN’s Sustainable Development Goals, and with UNESCO on its Recommendation on Open Science. In an Australian context, citizen science has been recognised as a key action and contributor for biodiversity monitoring and engagement in [Australia’s Strategy for Nature](#) and State of the Environment reporting at both the [national](#) and [state/territory](#) level.

In response to increased interest and use of citizen science ACSA has also recently started offering consulting services to help government agencies and other organisations develop citizen science strategies and undertake projects involving citizen science.

Current State of Citizen Science

Role of Citizen Science

There is increasing recognition of the critical national role of citizen science, especially its ability to increase community participation in science, improve awareness, form partnerships and ultimately support the generation of research-ready data to complement traditional researcher-led programs. Indeed, in some domains such as biodiversity sciences and meteorology, citizen science has played an operational role for decades. There is also recognition that science can be significantly enhanced by increasing the diversity of people involved in science and the tremendous capacity to scale efforts spatially and temporally.

Recent international research and analysis has shown that:

- 65% of biodiversity occurrence data in the Global Biodiversity Information Facility (GBIF) is now sourced from citizen science (a rise from 11% in 2007) (Heberling et al 2021).
- Australia ranks third (behind US and UK) in science publications incorporating citizen science (Pelacho et al 2021).
- Australia is the top contributing nation in the southern hemisphere to the citizen science app iNaturalist, and in the top four contributing nations globally, with over 1.6 million observations of over 36,000 identified species contributed by almost 27,000 users (Mesaglio & Callaghan 2021)
- In 2015 it was estimated that globally 1.3 – 2.3 million volunteers contributed \$667 - \$2.5 billion in-kind annually to biodiversity citizen science (Theobald et al 2015).

Citizen science is about more than community engagement - it is also a valuable way to collect data to inform policy and monitoring activities. Indeed, the United Nations Environment Program has identified citizen science as a valuable tool to collect data to fill gaps in both local initiatives and national level reporting (e.g.: for Sustainable Development Goals).

Alternative Data Sources

Professional research can survey deeply or broadly but not both. Research has shown that traditional data sources alone are insufficient, and that citizen science data is an important alternative data source to incorporate into research, planning and policy. The value of citizen science has been demonstrated in Australia through analysis of citizen science bird observations that found that citizen science can serve as a complementary source to professional data (Callaghan et al. 2021). The widely used FrogID Project has verified almost 400,000 frog observations and led to increased data on frog persistence post bushfire as well as increased data on vulnerable species such as Sloane's froglet. Citizen science represents a way for professional research to harness the citizen science "crowd", not only in data collection but also data analysis, providing local "on the ground" insight and direct conservation actions.

Citizen Science and Government

Government organisations are starting to recognise the value of citizen science and are developing citizen science strategies that see citizen science as not only supporting their community engagement and outreach activities, but also inform their scientific programs. Geoscience Australia and the NSW Biodiversity Conservation Trust are two examples where ACSA has provided assistance in the development of organisation-wide citizen science strategies.

Citizen science and threatened species

A review of citizen science programs in Australia has found over 130 different programs with relevance for more than 1,700 threatened species in Australia (NESP Threatened Species Hub; Steven 2019, Lloyd et al 2020). This work was part of the [NESP Threatened Species Recovery Hub](#), and found four broad categories of activities that citizen scientists undertake:

1. Targeted direct observation of species
2. General monitoring in habitat (with the potential for direct observation)
3. Habitat restoration activities
4. Monitoring or managing the agent of decline for a threatened species.

There are numerous organisations or citizen science groups that pursue citizen science in the context of threatened and/or endangered species, operating at both local, regional and national levels, with different periods of monitoring (including a number of long term projects of at least 40 years), with the majority coordinated through NGOs (see Steven 2019) - a few examples include:

- Wildlife of the Central Highland (Vic) - <https://www.wotch.org.au/>
- Gilbert's Potoroo Action Group (WA) - <https://www.potoroo.org/>
- Eastern Bristlebird Recovery Team (Qld) - (Oliver et al 2019)
- Threatened Bird Network (BirdLife) (National) - see [here](#).
- Carnaby's Black Cockatoo (WA) and [CockyWatch](#) - (Williams et al 2016)

General Feedback on Action Plan 2021-2026

In general we agree with the actions described in the draft action plan, and provide the following comments and recommendations.

Citizen Science as Cross Cutting Theme

Although citizen science is referred to in the action plan it is primarily with respect to community engagement. We would like to ensure that citizen science is seen as a cross cutting "theme" or capability within each action area. We feel it is important to acknowledge the importance of open and accessible science to assist people in making choices and for mitigation/adaptation - noting "science" is one of the key elements of the Strategy.

- *We recommend that citizen science be included throughout the action plan particularly with respect to initiatives relating to:*
 - *Mitigating new and established threats*
 - *Data collection, baselining and monitoring and reporting*
 - *Scientific research activities*
 - *Community engagement*

Organisational Capability

In our experience organisations considering citizen science are unsure how to include citizen science in their strategies and planning in ways that complement their established practices.

To enable organisations to use citizen science and engage with citizen scientists we recommend that:

- *All agencies and organisations active in threatened species action areas develop a citizen science strategy that supports their science, operational and community engagement objectives towards improved threatened species outcomes.*

Feedback on Action Areas

Action Area 1 - Mitigating new and established threats

Include the following actions to ensure that a quantitative approach is adopted for planning and monitoring mitigation activities:

- *Establish baseline measurement and monitoring of feral and invasive species.*
- *Develop methodologies, best practices and tools for measurement and monitoring that can be used by communities and citizen scientists on behalf of, and in collaboration with, conservation agencies.*

Action Area 2 - Conserving, restoring and improving habitat

Citizen science empowers communities around their local landscapes and habitats to support its stewardship. Citizen science is a tool not only for land managers (e.g. farmers, private conservation) but can connect those managers with other interested stakeholders to support conservation efforts.

- *Publicly promote and support the stewardship of threatened species and ecological communities by a range of managers and citizen science groups. (2.2)*

Action Area 3 - Emergency preparedness and response

ACSA in partnership with CSIRO and the Atlas of Living Australia produced the [Citizen Science Bushfire Project Finder](#). Continuing support and contribution to this type of integration platform will provide a useful resource for stakeholders (e.g. land managers, government agencies, researchers) to connect and engage with the community not only as a way for people to help with and respond to an emergency (e.g. ongoing monitoring of impact) but also as a resource for data, information and tools.

ACSA's collaboration with Minderoo Foundation's Fire and Flood Resilience Initiative, is an example of the need to support existing citizen science projects or platforms to scale or adapt into a natural disaster response context - both at the local and national scale.

Another collaborative example is The Bushfire Recovery Project <https://www.bushfirefacts.org/> (Fenner School of Environment and Society, ANU, Climate Change Response Program, Griffith University, and the Great Eastern Ranges Initiative) which brings together key research findings, information and data.

We would therefore recommend an additional action:

- *Support citizen science platforms, tools and methods that enable members of the public to contribute to and co-design research projects that will increase disaster resilience for landscapes[habitats] and species.*

Action Area 5 - Effective planning for conservation

Citizen science as a method and citizen science data should be included in relevant conservation planning documents and plans as well as best practice guidelines. Citizen scientists and citizen science groups and coordinators should be recognised and supported to be part of relevant conservation partnerships and partner networks.

For this action area our recommendation is to include Citizen Science in the activity relating to development of a partner network:

- *Develop a partner network to implement conservation planning actions for priority species and places, to improve collaboration and participation with other government agencies, citizen science groups and the private sector. (5.1)*

Action Area 6 - Knowledge and Tools

The strategy includes traditional sources and data and recognises the complementary nature of Indigenous knowledge to address gaps and provide additional perspectives. Given the increasing use and capability of citizen science we recommend that citizen science be recognised as a third source of data and knowledge available to threatened species policy, research and initiatives.

As with the other two sources it is important to understand the strengths and limitations of each and how to extract the most value from them. This understanding enables organisations to make informed decisions about how different types of data and knowledge are gathered, shared and analysed.

The quality of citizen science data is sometimes cited as an issue that precludes its use. Recent advances in the sophistication of tools, processes, training and data analysis for citizen science negates many of these concerns. Having said that, there is active work underway in Australia and the global science community to continue to improve citizen science data and the tools and platforms used to collect and manage citizen science data.

Our primary recommendation for this action area is:

- *Develop a data, knowledge and tools framework that enables organisations to incorporate traditional, Indigenous and citizen science data to threatened species initiatives in an integrated manner.*

6.1 Monitoring Standards

We recommend that monitoring standards be defined in ways that enable a wide range of organisations and potentially individuals to contribute to monitoring. If there are multiple ways to monitor a species or place then approaches that do not require investment in expensive equipment and training should be preferred so as not to exclude organisations such as community organisations who could contribute to monitoring.

These standards should also include data standards including FAIR principles, CARE Principles (for Indigenous data - Carroll et al 2020) and Public Participation in Scientific Research-Core ([PPSR-Core](#)) standards (at citizen science project level) (see Bowser et al 2020).

Our recommendations with respect to monitoring standards are therefore:

- *Define monitoring standards that consider monitoring costs and the capabilities of those that will undertake the monitoring*
- *Establish monitoring standards for priority species and places, including appropriate data standards.*

6.2 Baseline data for priority species and places

Our recommendations with respect to baseline data is:

- *consider components of Essential Biodiversity Variables (EBVs) as part of collecting baseline data and monitoring for change, noting most EBVs are monitored by citizens and communities (Chandler et al 2017, Jetz et al 2019).*

Note a number of citizen science projects include long term monitoring data (Steven 2019).

6.3 Mechanisms for improved data sharing

Data sharing is of course crucial to policy, research and direct initiatives. We know that there are multiple data sharing platforms and initiatives available but no single platform for threatened species and places data. We are supportive of the ARDC collaborative [Sensitive Data Pathways](#) project involving the Atlas of Living Australia which is bringing together state and commonwealth jurisdictions, and research infrastructures and data repositories around the sharing of threatened and sensitive species data.

An inventory of existing data sharing platforms and mechanisms would serve as a starting point to understand how to effectively make the wide range of data available to those who require it. From the citizen science perspective we recommend:

- *Include citizen science data in the terms of reference of any activity to define improved data sharing and data sharing infrastructures/platforms for threatened species.*

6.4 Tackling knowledge gaps

As described in our general comment for Action Area 6, citizen science and Indigenous knowledge already play important roles in addressing knowledge gaps. Our recommendations for 6.4 therefore are:

- *Support citizen science initiatives that create knowledge to fill knowledge gaps.*
- *Incorporate Indigenous knowledge in ways that enable it to be used with other knowledge.*

It should also be noted that knowledge gaps can be identified and filled by innovative modelling techniques and technologies - noting the work of Simon Ferrier and Andrew Hoskins from CSIRO (via a [GEOBON/Microsoft collaboration](#)) to extract value (e.g. signal change) from unstructured species occurrence data including citizen science data, and help identify where to invest effort in collecting additional data.

6.5 Developing and deploying new tools and technology

Citizen science data can be either a primary data source or used to “ground truth” or supplement other data sources. We note existing developments in new tools for data collection (drones, remote sensing of various sorts, low cost sensors) and data analysis (artificial intelligence-based image analysis, data fusion and predictive analytics). Access to many of these technologies is well within the reach of the average citizen and we see an effective use of all of these technologies by citizen scientists. The paper by Ceccaroni et al (2019) provides an excellent overview of the use of AI and ML in a citizen science context, including suggested good practices.

Our recommendations with respect to tools and technology are :

- *Inventory existing tools and their usage to determine whether they can be used more widely or effectively.*
- *Develop tools and technologies in ways that are suitable for deployment via partner organisations such as Indigenous, community, educational and citizen science focused organisations.*
- *Evaluate whether tools and technology can be developed to support Indigenous conservation activities or collect data for inclusion in the baseline data.*
- *Ensure that commercially available tools do not put unreasonable technical or licensing restrictions on access to data collected for the public good.*

Action Area 7 - Forging stronger partnerships

We support the actions (7.1) to strengthen partnerships with Aboriginal and Torres Strait Islander peoples and suggest review of the recent paper by Tengo et al (2021) which talks to the synergies between citizen science and Indigenous science and engaging with complementary knowledge systems using a multiple evidence based approach to contribute to better stewardship of ecosystems.

Recognising different market-based solutions, including crowdfunding (Gall-Cajiao et al 2018), eco-tourism and citizen-science based tourism (e.g. Earthwatch - <https://www.earthwatch.org.au/>) and how these can generate data and information, we recommend the following additional actions:

- *Engage with the tourism sector to identify the value of threatened species to tourism and innovative models to enable tourism to contribute to threatened species initiatives. (7.2)*
- *Incorporate data collection and monitoring activities into partnerships with landholders. (7.3)*

Action Area 8 - Community leadership and engagement

As Australia's citizen science peak body we are very supportive of any initiatives to increase the use, participation and impact of citizen science. We refer here to our general recommendation that all participating agencies and organisations develop citizen science strategies to support not only engagement but also to support their science and operational data collection objectives.

We agree with the activity:

- *Work with Citizen Science partners to increase the number of citizen science initiatives engaging participants in threatened species management, monitoring and recovery for priority species and places. (8.1)*

We would suggest the following additional actions

- *Work with citizen science groups to develop capability building materials, tools and resources that community organisations can use to increase their participation in threatened species initiatives. (8.2)*

Conclusion

We hope you give this submission full consideration for its potential impact not only in helping to improve threatened species outcomes but also enabling a significant shift in being able to effectively and collaboratively extract value from citizen science.

ACSA would also welcome the opportunity to participate in your targeted online Action Area workshops to further develop specific actions. We are also happy to share any Departmental communications related to the Strategy / Action plan outcomes with our membership and through our communication/social media channels.

Regards

Australian Citizen Science Association

Erin Roger - Chair

Stephanie von Gavel - Vice Chair

Peter Runcie - Treasurer

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Resources and References

Additional resources or information about citizen science can be accessed here:

- ACSA website - <https://citizenscience.org.au/>
- ACSA Youtube channel <https://www.youtube.com/channel/UCETzSdrExLMkQiF6bDfQ6GQ>
- Our publications listings - <https://citizenscience.org.au/acsa-publication-listings/>
- Citizen Science - Theory and Practice Journal - <https://theoryandpractice.citizenscienceassociation.org/>
- Citizen Science Project Finder - for an understanding of the breadth and scope of existing projects - <https://citizenscience.org.au/ala-project-finder/>
- See subset of projects contributing to bushfire knowledge - <https://citizenscience.org.au/bushfire-project-finder/>

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