



Australian Government

Department of Climate Change, Energy,
the Environment and Water

Survey guidelines for four Grassland Earless Dragons (*Tympanocryptis* spp.) of Southeast Australia.



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Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.

Contents

Introduction.....	4
Survey guidelines	4
References	8

Tables

Table 1 The four grassland earless dragons of Southeast Australia.....	4
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Figures

Figure 1 Example of an artificial spider tube design used to mimic a natural arthropod burrow (Madani et al 2023).	6
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Introduction

These survey guidelines apply to four Grassland Earless Dragons of Southeast Australia listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), hereafter referred to as the listed GEDs.

Table 1 The four grassland earless dragons of Southeast Australia.

Common name	Scientific name	Jurisdiction	EPBC Act Listing status
Victorian grassland earless dragon	<i>Tympanocryptis pinguicollis</i>	Vic	Critically Endangered
Canberra grassland earless dragon	<i>Tympanocryptis lineata</i>	ACT, NSW	Critically Endangered
Bathurst grassland earless dragon	<i>Tympanocryptis mcartneyi</i>	NSW	Critically Endangered
Monaro grassland earless dragon	<i>Tympanocryptis osbornei</i>	NSW	Endangered

Survey guidelines

Survey methods and maximising detectability

This document presents best-practice methods for optimising detectability of the listed GEDs. New methods (e.g. detection dogs) and technologies may significantly improve detectability.

Surveys are essential to improve information on the occurrence and ecology of listed GEDs. Detection surveys and habitat assessments will help to improve knowledge about each listed GED and support more informed project planning.

The listed GEDs may occur undetected in an area despite extensive survey effort. An ecologist should be on-site during any clearing activities in areas where a listed GED may occur but has not been detected during surveys. This ensures any live individuals that are found during clearing operations can be collected and transferred to an ex situ program. It will also enable any deceased individuals to be salvaged for research programs (e.g. genetic analyses) and museum collections.

Survey design

Target areas vary considerably in relation to drivers of occupancy for the listed GED. Optimising detectability requires consideration of the characteristics of the target area. Survey effort must achieve comprehensive cover across the target area, including the full range of variation in habitat

composition, structure, slope, and aspect. Surveys must be implemented at a suitable time for each method, and with sufficient frequency and density, to maximise detectability.

The number of survey sites within a target area and minimum level of effort that is required to detect a listed GED will vary across the diversity of potential target area configurations and conditions. The survey design should be justified based on site configuration with reference to variation in likelihood of occurrence and conditions during survey periods.

Preparing for a rediscovery

All survey teams who are working in an area where a listed GED may be rediscovered, or a disparate population may be detected, must ensure they have appropriate equipment and facilities to safely house several individuals for several days (or more) while experts determine the most appropriate recovery action for these individuals. This may include transfer to an ex situ program to improve genetic resilience.

Survey methods

Three proven detection methods should always be applied concurrently at a site within a target area to maximise detectability of the listed GED:

1. Artificial arthropod burrows
2. Tiles
3. Endoscopic inspections.

In areas where cracks are abundant, mini pitfall traps should also be installed, and a greater emphasis placed on endoscopic inspections rather than large arrays of artificial arthropod burrows.

A **target area** is a general area where there is a possibility that a listed GED may occur. It is usually within the modelled distribution of a listed GED.

A **site** is an area where one or more survey methods are implemented within a target area. The number and arrangement of sites within a target area must optimise detectability while being proportional to the size of the target area and the survey method/s used.

Artificial arthropod burrows ('spider tubes')

Pre-installed artificial arthropod burrows ('spider tubes') is the optimal method for detecting two of the four listed GED at the time of publication (Canberra GED and Monaro GED).

Spider tubes consist of two lengths of PVC or clay tubing (an inner and an outer length) that is installed vertically in the ground with the upper part flush with the ground surface (Figure 1). Spider tubes should be installed with a shade roof above each tube.

Figure 1 Example of an artificial spider tube design used to mimic a natural arthropod burrow (Madani et al 2023).

Photographed and supplied by George Madani.



Radio tracking has demonstrated that the Canberra GED has an average core home range size of 170 m², i.e. approximately 13 × 13 m (Stevens et al. 2010). As such, spider tubes should be placed 5 m apart, and they will usually be positioned along linear transects to maximise coverage across a target area. The number of transects and density of spider tubes should maximise the potential to detect the listed GED across the entire target area. Spider tube transects must be accompanied by roof tile or mini pitfall trap, and endoscopic inspections.

Spider tubes must be pre-installed at least seven days prior to the first survey and be left undisturbed for this settling period. Each spider tube survey period must span a minimum of eight weeks after the initial installation. Spider tubes that are made from PVC must be closed or removed at the end of the survey period.

Spider tube surveys are best implemented between January and May as fidelity to winter burrows increases (Stevens et al. 2010) and juveniles are abundant. Alternatively, they can be implemented from September through to November when breeding activity is highest.

Spider tubes should be checked 2–3 times per week for surveys between January and May. They should be checked at least every second day from September to November to minimise the risk of GED eggs desiccating in the tubes (i.e. to detect and remove eggs for artificial incubation).

Tiles

Roof tiles (both concrete and terracotta) have proven to be an effective technique for detecting the listed GEDs in some circumstances. Detection probability increases with increasing ambient temperature (Madani et al. 2023). Tiles are best placed at 10 m intervals parallel to, and on either side of, a spider tube transect (see Madani et al. 2023). They can also be placed in independent grid arrays or transects. Tiles should be installed several weeks before surveys commence. Tile surveys should span the entire active period including summer/autumn. Apart from long-term monitoring and research programs, tiles must be removed at the end of the survey period to avoid increasing the risk of snake abundance and predation in a target area, and to reduce impacts to vegetation.

Endoscopic inspections

Invertebrate burrows and/or soil cracks can be examined with an endoscope to detect the listed GEDs (Banks et al. 2017). This can be an effective technique when used in combination with artificial spider tubes and tiles. Endoscopic inspections should occur several times per week concurrent with checks of spider tubes and tiles. The minimum recommended effort to optimise detectability is an hour of endoscopic inspections in the vicinity of each spider tubes and / or tile transect.

Mini pitfall traps

Mini pitfall traps are small, smooth-walled cylindrical containers that are installed in the ground with the top being flush with the soil surface. These traps should be shaded to prevent mortality from exposure.

Mini pitfall traps are particularly effective in areas with cracking soils, which have an abundance of potential shelter sites that are not invertebrate burrows. They target active GEDs. Mini pitfall trap surveys should occur at the same time as spider tube and tile surveys.

Mini pitfall traps should be installed along transects. Drift fences must be installed between traps to guide individuals into the trap. The number of pitfall transects should be proportional to the size of the target area, the variation in habitat attributes across this area, and align with the number of tile and or spider tube transects.

Detailed transect design and logistics of checking mini pitfall trap surveys may be subject to relevant state and territory guidelines and / or scientific and animal ethics permit requirements. Traps must be checked at least daily, and surveys must be mindful of extreme heat or heavy rain. To prevent mortality, traps should be closed and not operational during these conditions.

Remote cameras

Remote cameras can detect the listed GEDs, but they have low detection rates (McGrath et al. 2012; Banks et al. 2017). As technology improves, this technique may become more effective. In 2024, camera surveys are only recommended as a supplementary technique to concurrent arthropod tube, tile and endoscope inspection surveys (with or without mini pitfall traps – see above). Remote camera surveys target active GEDs and should occur at the same time as spider tube, tile and mini pitfall trap surveys.

Rock turning

Rock turning is not recommended because it can be destructive and ineffective (McGrath et al. 2015). Rock turning must not be used as a survey technique, but it may be used during a final pre-clearance survey the day before, or of, an action that will irreversibly remove habitat.

Detection dogs

The use of dogs to detect the listed GEDs was trialled by Zoos Victoria in 2023 and 2024. This method has the potential to greatly improve detectability of these cryptic species (Zoos Victoria 2024).

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