



Monitoring Priority Threatened Species

An overview of monitoring methods for the Margaret River Burrowing Crayfish (*Engaewa pseudoreducta*)

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

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About

This literature overview collates information on one of the 110 priority threatened species identified in the *Threatened Species Action Plan 2022-2032* and has been reviewed by invited practitioners experienced in monitoring the species.

The *Survey Guidelines for Monitoring Threatened Species* project, a collaboration of the Department of Climate Change, Energy, the Environment, and Water (DCCEEW) and the Terrestrial Ecosystem Research Network (TERN), aims to improve our knowledge of threatened species by enhancing accessibility and sharing of quality scientific threatened species data. By developing best practice field survey guidelines and recommendations, practitioners will be better equipped to conduct standardised, repeatable surveys.

By identifying the monitoring methods typically implemented by practitioners, documenting and assessing the techniques known to work, and identifying opportunities to standardise the methods, we can move towards ensuring all monitoring is species-appropriate, comparable between practitioners and populations, and repeatable over time. Further, together with consistent terminology, guidelines, instructions, and data collection, we can refine efforts and resources to measure and share information. Data collected using robust, standardised methods will improve our knowledge of threatened species and underpin threatened species recovery at scale. This project is essential to establishing monitoring protocols and data repositories to enhance the accessibility and sharing of threatened species data.

TERN has prepared the literature overviews for the Department of Climate Change, Energy, the Environment, and Water. For further information, please visit the [EMSA Threatened Species Survey Guidelines](#) website. Additional information, particularly monitoring methods and techniques not included that should be considered, can be brought to the author's attention by emailing tern@adelaide.edu.au for consideration for future updates.



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1 Background

1.1 Conservation status and species trajectory

1.1.1 Current EPBC Act status

- Critically endangered

1.1.2 Summary of data held in the Threatened Species Index

The Threatened Species Index (TSX) provides reliable and robust measures of change in the relative abundance of Australia's threatened and near-threatened species at national, state and regional levels. Understanding these changes in species populations is crucial for monitoring Australia's conservation progress and allows users to measure and report on the benefits of conservation investments, and to justify and design targeted management responses. Currently, the index is restricted to birds, plants and mammals, with new groups to be added in the near future.

The TSX does not hold data on the Margaret River Burrowing Crayfish. More information on the TSX, including how to contribute threatened species monitoring data to the index, can be found at tsx.org.au

1.2 Distribution

- The Margaret River Burrowing Crayfish (*Engaewa pseudoreducta*) occupies a distribution throughout the high rainfall zone of south-west Western Australia, aligning with the Warren Bioregion (Thackway and Cresswell 1995; Burnham 2014).
- The species is found within the Mediterranean forests, woodlands and shrubs ecoregion.
- The species only live in narrow creek tributaries of the Margaret River and Carburnup River (DOE 2022) and has been described as terrestrial or near terrestrial (e.g. Riek 1972; Horwitz and Richardson 1986; Burnham 2014).
- Known populations of the species are primarily disjunct (Horwitz and Adams 2000; Burnham 2014), and the species occurs in two known subpopulations at Treeton and Payne Road (DOE 2022).
- Margaret River Burrowing Crayfish occurs across an extent of 60 km² and has an area of occupancy of 2.5 km², but may also occur in areas of inaccessible vegetation that have not been surveyed (DOE 2022).

1.3 Habitat

- The species occupies swamp systems in coastal south-west Western Australia. These systems are relatively continuous in the far south-western corner but are increasingly fragmented further north (Horwitz and Adams 2000; Burnham 2014).
- Suitable habitat for the species is often associated with impenetrable vegetation (DOE 2022).
- They can be found in seasonally inundated basins (sumplands), channels (creeks) and flats (floodplains) and seasonally waterlogged basins (damplands), channels (troughs), flats (palusplains) and slopes (paluslopes) (sensu Semeniuk and Semeniuk 1997).
- They will utilise considerable variation in the habitat (Horwitz and Adams 2000).
- At Treeton, the species has been collected in heavy grey-yellow clays (TSSC 2009) in areas of narrow, sloping depressions (Burnham 2014), with a dense shrub strata and more burrows on a southerly aspect (Burnham 2014).

- In the other population (Payne Road), the species was found on a flat site (Burnham *et al.* 2012) with coarse white sand and open, low shrub strata (Burnham 2014).

1.4 Ecology

- The Margaret River Burrowing Crayfish is a small crayfish that can grow up to 50 mm in length (DOE 2022).
- The species has purplish-blue claws with a pale brown-coloured body (DOE 2022).
- Little information is available, but the species is thought to be long-lived with a slow maturation (DOE 2022).
- The species spend nearly their entire life below ground (Burnham 2014).
- The crayfish generally dig their burrows in sandy or loamy soils in heathlands dominated by myrtaceous shrubs (Horwitz and Adams 2000).
- Burrow depth varies from just below the surface to over two metres and can also branch repeatedly and be acutely slanted (Horwitz and Adams 2000; pers. obs.; Burnham 2014).
- A complex burrow system is often constructed that can extend several metres to reach freshwater water tables in drier months (TSSC 2009).
- A chimney of soil pellets often indicates burrow systems and these are generally seen in wetter periods (TSSC 2009).
- Patches of different-coloured soil or holes in the ground may indicate the entrance to a burrow when chimneys are not present (Burnham *et al.* 2012).
- The presence of chimneys is not definitive evidence of inhabitation by *Engaewa* species because members of the freshwater crayfish genus *Cherax* also can construct chimneys (DOE 2022).
- Once a potential *Engaewa* species burrow has been identified, excavation may be required to identify the species (Burnham *et al.* 2012; DOE 2022).

1.5 Threats

- Land clearing for forestry and agriculture removes habitat and may cause increased salinity in wetlands (Burnham *et al.* 2007).
- Construction of farm dams impacts surface water and groundwater and may cause salinisation, flooding and waterlogging (Burnham *et al.* 2007).
- Livestock cause soil compaction and erosion (Burnham *et al.* 2007).



2 Existing monitoring methods

2.1 Summary of existing methods used

- Direct observation
- Direct observation: special techniques (specify) (e.g. spotlighting, burrow scopes, drone with camera)
- Signs (pellet chimneys)
- Signs – DNA/eDNA/eRNA
- Camera trapping
- Trapping – pitfall
- Trapping – Elliott/cage/or similar (ground)
- Trapping – Elliott/cage/or similar (in canopy)
- Refuge checks (digging out burrows to collect resident crayfish)
- Aerial surveys
- Invertebrate techniques

2.2 Existing survey requirements

- Optimal time of year/season/climate conditions (timing with resource availability etc)
 - Individuals are assumed to be closest to the soil surface during the wet season, but this can also limit track access to sites (Burnham 2014).
- Optimal location of surveys
 - Creek tributaries of the Margaret and Carburnup Rivers in south-west Western Australia (DOE 2022).
- Minimum survey effort
 - Multiple hours to survey a site by digging out burrows, locating *Engaewa*, restoring the dug-out area, and then identifying *Engaewa*.
 - 1-2 hrs per site to locate *Engaewa* burrows and collect a soil or water sample from within a burrow, or *Engaewa* body parts, for eDNA analysis.
 - Surveys should target both subpopulations (Treeton and Payne Road).
- Survey personnel
 - At least 2 people.
- Other factors:
 - Sampling is intensive and destructive, which limits large-scale or repeated sampling (Burnham 2014).
 - Inaccessible vegetation may limit access.
 - All digging equipment, boots and car tyres may need to be sterilised after exiting a possible dieback-infected area to prevent the spread of *Phytophthora* (Burnham 2014).

2.3 Existing protocols

Existing protocols identified are identified in Table 1.

Table 1. Survey guidelines, protocols, and key resources that identify Margaret River Burrowing Crayfish monitoring methods

Protocol	Comments	Reference
Locating and digging out burrows	Details provided on site selection from analysis of imagery, timing of surveys, characteristic features of soil chimneys, digging out of burrows to locate crayfish for identification (by microscope), site rehabilitation, and associated issues (die back prevention).	Burnham (2014)

2.4 Methods to consider further

The methods listed below have been identified as potential methods and techniques to survey for the species, either to identify presence or absence, or to assist determining population size and status. Further review of the literature and consultation with experts is required, particularly to identify and assess specific techniques for examining population ecology factors.

2.4.1 Available methods

- Locating and digging burrows

2.4.2 Additional methods

- eDNA (see project application NHT-MU38-P1 'Using eDNA to Improve Management of the Margaret River Burrowing Crayfish')
 - Loose crayfish body parts (claws, moults) can be used for analysis.
 - DNA markers are described in Burnham (2014).

2.4.3 Methods to rule out

- All survey methods typical for invertebrates are considered suitable (no specific methods ruled out)

2.4.4 Relevant Ecological Monitoring Standards Australia (EMSA) modules

- The following Ecological Monitoring System Australia (EMSA) modules developed by TERN for the Australian Government should be considered for surveying the Margaret River Burrowing Crayfish:
 - Invertebrate fauna (active search)
 - Targeted surveys

In addition, the Plot description, Floristics, Cover, Soils, Condition and Vegetation mapping modules may be beneficial for assessing the suitability of a location against the species' habitat preferences.

2.4.5 Other 110 priority species with potential links

- Tasmanian Giant Freshwater Crayfish (*Astacopsis gouldi*) may have similar survey protocols.
- Also in the south-west Western Australia region:
 - Carnaby's Cockatoo (*Zanda latirostris*)
 - Western Ground Parrot, Kyloring (*Pezoporus flaviventris*)
 - Chuditch, Western Quoll (*Dasyurus geoffroyi*)
 - Gilbert's Potoroo, Ngilkat (*Potorous gilbertii*)

- Numbat (*Myrmecobius fasciatus*)
- Quokka (*Setonix brachyurus*)
- Western Ringtail Possum (*Pseudocheirus occidentalis*)

3 Considerations for survey guidelines development

Key considerations should a full literature review and/or survey guidelines be developed for the Margaret River Burrowing Crayfish are highlighted below.

- Special equipment required
 - eDNA equipment
- Estimated time and surveyor effort
 - Hours to survey a site and days to survey the dense vegetated, wet habitats.
- Vegetation communities landscapes of the species' preferred habitat not suitable for the optimal survey methods
 - Surveys may be limited in areas with dense or inaccessible vegetation

3.1 Key documents for further review

The documents listed below have been identified as key documents to review should a full literature review and/or survey guidelines be developed for the Margaret River Burrowing Crayfish.

- Protocols
 - None have been identified to date.
- Scientific papers and reports
 - Burnham, Q. (2014). Systematics and biogeography of the Australian burrowing freshwater crayfish genus *Engaewa* Riek (Decapoda: Parastacidae). Ph.D. Thesis. School of Natural Sciences, Edith Cowan University.

3.2 Key agencies and organisations involved in the species research and recovery

- Quinton Burnham. Centre for Ecosystem Management, Edith Cowan University, Perth, WA
- RLP South West Catchments Council.

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