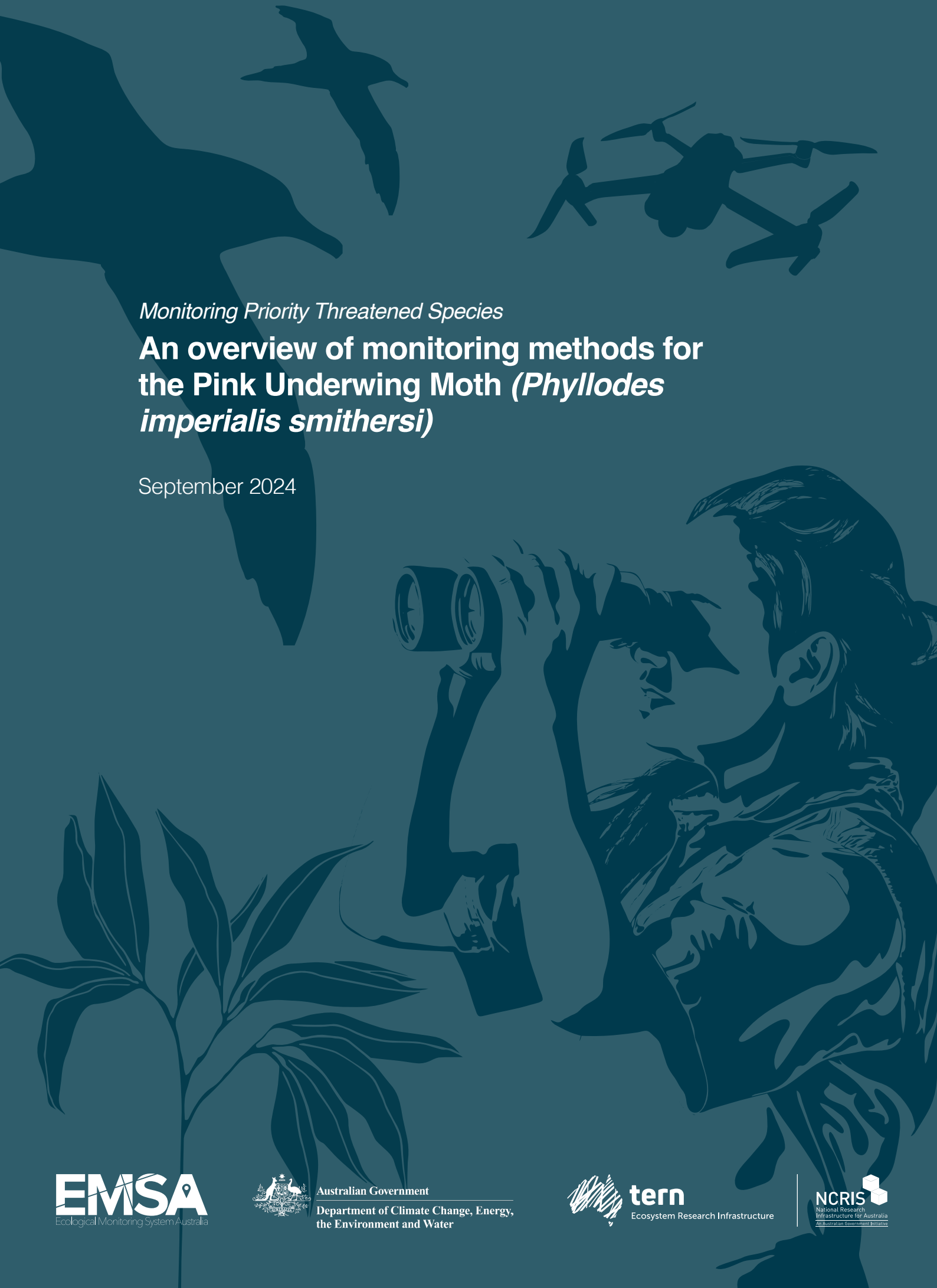

Monitoring Priority Threatened Species

An overview of monitoring methods for the Pink Underwing Moth *(Phyllodes imperialis smithersi)*

September 2024

EMSA
Ecological Monitoring System Australia

Australian Government
Department of Climate Change, Energy, the Environment and Water

tern
Ecosystem Research Infrastructure

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

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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

- Endangered (but likely to be down-listed after the work of Andren *et al.* 2021)

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 Pink Underwing Moth. 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 Pink Underwing Moth *(Phyllodes imperialis smithersi)* is a sub-tropical species occurring in south-eastern Queensland and in north-eastern New South Wales, in two disjunct regions, the Northern Rivers and Bellinger-Orara (Sands 2012).
- In south-eastern Queensland, the species is known to occur southeast from Gympie to the NSW-Qld Border Ranges; it has been observed at Kin Kin Creek, Conondale, Conondale Range and Witta, Maleny, Blackall Range, Bellthorpe, Mount Mee, Lamington (AM) and Springbrook' (Sands 2012).
- The distribution of the Pink Underwing Moth is linked to its larval food plant, the endemic and uncommon subtropical vine *Carronia multisepalea*. This vine is mostly restricted to 'old growth' subtropical rainforests on the coast and ranges (< ca 1,000 m), from Kin Kin Creek, Qld to the Bellinger River, NSW (Sands 2012).
- Pink Underwing Moth Pink Underwing Moth s were recorded in major tracts of forest of the Wollumbin caldera. Furthermore, of the 222 specific locations of records of *P. i. smithersi* in NSW (NSW BioNet), 89 are from monitoring at Coolgardie, conducted for the Pacific Highway Upgrade (Lloyd *et al.* 2019). The relatively large number of locations resulting from an increased survey intensity at Coolgardie suggests that Pink Underwing Moths, while patchily distributed, is a widespread and relatively common species in the Northern Rivers (Andren *et al.* 2021).

1.3 Habitat

- The NSW rainforest habitat of *P. i. smithersi* is dominated by the White Booyong *Argyrodendron trifoliolatum* lowland subtropical rainforest alliance, with three sub-alliances predominate: White Booyong, Pepperberry-Giant Stinger-Fig-Hoop Pine, and Black Bean-Rosewood (Andren *et al.* 2021).
  - At higher elevations, while the habitat is still related to these three suballiances, it is also characterised by the presence of 'cool' subtropical species such as Black Booyong *Argyrodendron actinophyllum*.
  - Under normal environmental conditions, it is considered these rainforest communities

should provide enough fruit resources for the highly mobile adult moths.

- *Carronia multisepalea* was found to be a common species in the rainforests of the Northern Rivers and was often locally abundant (Andren *et al.* 2021).

1.4 Ecology

- The larval food plant, *Carronia multisepalea* upon which *P. i. smithersi* depends, is confined to notophyll vine forest, growing on rich volcanic slopes and riparian or alluvial soils (Sands 2012).
- Adult Pink Underwing Moths have been observed feeding on the damaged fruit of *Ficus* spp. and a *Syzygium* sp. (Sands 2012).
- Andren *et al.* (2021) found Pink Underwing Moths larvae along drainage lines (e.g. Booyong Reserve), on ridges (e.g. Limpinwood Nature Reserve (NR)), steep slopes (e.g. Mt Thunberrigan), flat land (e.g. Davis Scrub NR) and from 5 m above sea level at Coolgardie to the highest known occurrence of 790 m at Mt Nardi.There are also relatively high elevation records along the McPherson Range in Limpinwood NR (510 m), Numinbah NR (400 m) and Mt Thunberrigan (350 m), plus a Queensland record less than 6 km north of the border at Binna Burra at 780 m (Lachlan 2014)" (Andren *et al.* 2021).
- The larval host plant *Carronia multisepalea* and Pink Underwing Moths are less common in the Bellinger-Orara region. However, there are local concentrations, such as the lower Rosewood River in Dorrigo NP, Bellingen Island, Pine Creek, and the upper Orara River catchment. Pink Underwing Moths were found in most areas containing significant numbers of *C. multisepalea*, although there appeared to be a greater focus on riparian habitat than on the Northern Rivers. *C. multisepalea* appears to be absent from the high elevation rainforests in the region, although both species were recorded at an elevation of 470 m in Dorrigo NP (Andren *et al.* 2021).

1.5 Threats

- The primary threats to the Pink Underwing Moth according to (OEH 2017) are:
  - Clearing or disturbance of remnant rainforest habitat
  - Restricted distribution and low numbers
  - Weed invasion
  - Use of rainforest remnants by domestic stock
  - Insufficient understanding of taxonomy.

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 (tracks, scats, hair-tubes) (includes opportune and sand plots)
- Signs – DNA/eDNA/eRNA
- Camera trapping
- Trapping – pitfall
- Trapping – Elliott/cage/or similar (ground)
- Trapping – Elliott/cage/or similar (in canopy)
- Refuge checks (burrows, dens, nests, caves, etc)
- Aerial surveys
- Invertebrate techniques
- Active searching/opportune (for its food plant, the rainforest vine *Carronia multisepalea*)
- Plots
- Quadrats/transects

2.2 Existing survey requirements

- Optimal time of year/season/climate conditions (timing with resource availability etc)
  - Pink Underwing Moths larvae have been found from late October to early April (spanning 171 days), which aligns with the species having two generations per year, with a lifespan of around 80 days (Andren *et al.* 2021).
- Optimal location of surveys
  - To monitor known populations the optimal location is within the distribution of *C. multisepalea* vines and *P. i. smithersi* described in Andren *et al*. (2021).
- Minimum survey effort
  - Andren *et al.* (2021) noted that searching for *C. multisepalea* vines for larvae was a labour-intensive technique, requiring an average search time of 64 minutes to locate a larva at a site. Despite the survey effort, they concluded that it can be implemented successfully to survey *P. i. smithersi*. Size of sites was not specified by Andren *et al.* (2021).
- Survey personnel
  - 1-2 people
- Other factors:
  - Occurrence tied to its food plant *Carronia multisepalea*.
  - RLP project application ERFIP000080 (see below) states "survey for Southern Pink Underwing Moth larva will be undertaken between November 2022 and February 2023 at known locations of host plant, *Carronia multisepalea*. This will build on surveys of the distribution and ecology of the larva and larval food plant which occurred from 2016 to 2021 by M Andren, P. G. Richards and D.P.A, Sands"

2.3 Existing protocols

- Andren et al. (2021) produced a protocol, "Timed search for *P. i. smithersi* larvae and eggs on *C. multisepalea*". The protocol can be used for surveying known populations and surveying for new records.
- There are no national protocols or guidelines avaliable for surveying threatened invertebrates.
- NSW have general guidelines for surveying threatened invertebrate species which are included within the DEC (2004) "Threatened Biodiversity and Assessment: Guidelines for Developments and Activities" document.

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

- Direct visual search for larva on vines. Additional methods
- None have been identified to date.

2.4.2 Methods to rule out

- All survey methods typical for invertebrates are considered suitable (no specific methods ruled out).
- None have been identified to date.

2.4.3 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 Pink Underwing Moth:

- Invertebrate fauna
- Opportune
- Floristics (food plant)
- Cover (food plant)

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.

2.4.4 Other 110 priority species with potential links

- None have been identified to date.

3 Considerations for survey guidelines development

Key considerations should a full literature review and/or survey guidelines be developed for the Pink Underwing Moth are highlighted below.

- Special equipment required
  - No specialised field equipment is required.
- Estimated time and surveyor effort
  - Expected to be labour-intensive based on results of Andren *et al.* (2021) being over one hour for two people per site, Andren *et al.* (2021) did not specifiy site size but states that there were an average of 22 vines per site.
- Vegetation communities or landscapes of the species' preferred habitat not suitable for the optimal survey methods
  - None have been identified to date.

3.1 Key documents for further review

- Protocols
  - Timed search for *P. i. smithersi* larvae and eggs on *C. multisepalea* (Andren *et al.* 2021).
- Scientific papers and reports
  - Andren, M., Richards, P.G. and D.P.A. Sands (2021). The distribution and ecology of the southern pink underwing moth *Phyllodes imperialis smithersi* Sands (Lepidoptera: Erebidae) in New South Wales. Australian Entomologist, 48(3) 133-148.

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

- Mick Andren, NSW Biodiversity Conservation and Science
- Don Sands, CSIRO Ecosciences Precinct

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EMSA
Ecological Monitoring System Australia

emsa.tern.org.au