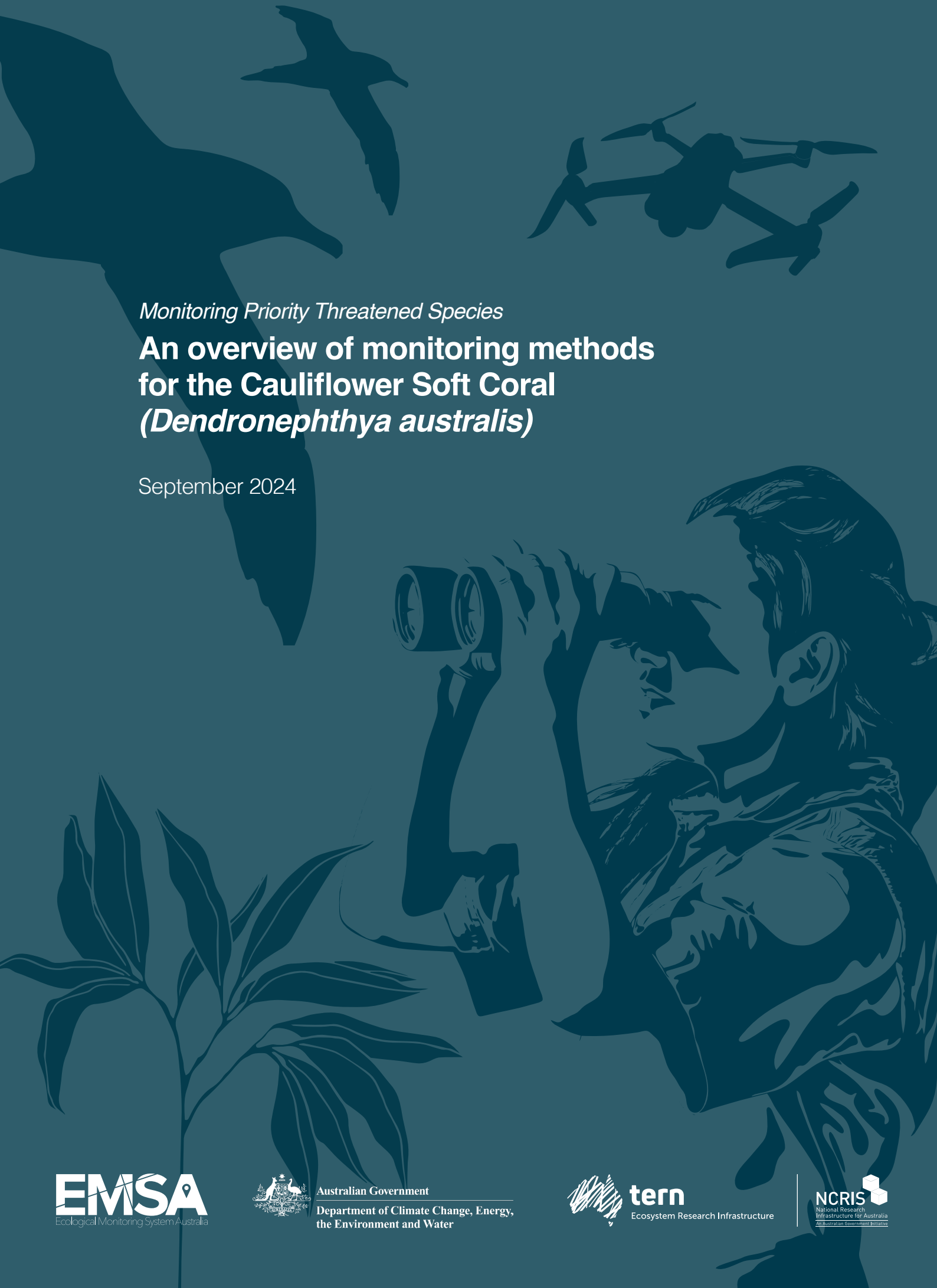


Monitoring Priority Threatened Species

An overview of monitoring methods for the Cauliflower Soft Coral *(Dendronephthya australis)*

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Ecological Monitoring System Australia

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tern
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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

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 Cauliflower Soft Coral. 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

- Cauliflower Soft Coral *(Dendronephthya australis)* occurs intermittently at sites spanning approximately 400 km of the eastern Australian coastline (Williamson *et al.* 2022).
- Key locations of the species include Port Stephens, Brisbane Water, Bowen Island at the mouth of Jervis Bay, HMAS Adelaide shipwreck off Terrigal, and Botany Bay (Williamson *et al.* 2022).

1.3 Habitat

- Cauliflower Soft Coral occurs on the sand, seagrass and rocky reef substrates (Williamson *et al.* 2022).
- Cauliflower Soft Coral occurs in protected estuary environments in areas of high current flow, on sandy substrates in depths of 1 to 18 m (TSSC 2020).

1.4 Ecology

- Cauliflower Soft Coral are important habitat for a diverse range of marine species (TSSC 2020).
- The soft coral and sponges are a preferred habitat for White's seahorse (Harasti *et al.* 2014), and both are declining in distribution and abundance within Port Stephens (Harasti 2016).
- No information is available regarding the species biology, reproduction and maturity status (TSSC 2020).

1.5 Threats

- Identified threats include sand inundation, localised damage from boat anchoring and moorings, and seasonal natural predation by the sea slug (TSSC 2020).
- The coral has experienced large declines in abundance over the past three years, with the March 2021 flood detrimentally impacting the Port Stephens population.

- Recent mapping by NSW DPI estimates that the Port Stephens population is now only approximately one per cent of the recorded abundance mapped in 2011 (Poulos *et al.* 2016).
- The soft coral has also declined from Sydney Harbour, a location where it was previously considered abundant in the 1970s and 80s (Poulos 2011).

2 Existing monitoring methods

2.1 Summary of existing methods used

- Active searching/opportune
- Plots
- Quadrats/transects
- Camera trapping (towed diver + GPS + video)

2.2 Existing survey requirements

- Optimal time of year/season/climate conditions (timing with resource availability etc)
  - Limited information available
- Optimal location of surveys
  - Port Stephens and Botany Bay, NSW.
  - Formerly two of the largest aggregations of *D. australis* were the Pipeline and Seahorse Gardens in Port Stephens.
  - See sites identified in Larkin *et al.* (2021).
- Minimum survey effort
  - A survey in Port Stephens estuary includes 20 scuba dives to map the distribution of the species. The average dive time was 44 mins, with an average distance of 797 m covered on each dive (Poulos *et al.* 2016).
  - Lack of information regarding surveys for monitoring known populations and minimum survey effort.
- Survey personnel
  - Towed diver and boat driver (+ spotter?).
- Other factors:
  - Occurrence tied to known sympatric species, White's Seahorse *(Hippocampus whitei*).
  - Investigations needed to determine if towed video footage also enables survey of sympatric *Hippocampus whitei*
  - Port Stephens estuary populations have been mapped in detail via towed video at four-year intervals since 2011 (Larkin *et al.* 2021).

2.3 Existing protocols

Existing protocols identified are identified in Table 1.

Table 1. Survey guidelines, protocols, and key resources that identify Cauliflower Soft Coral monitoring methods

Protocol	Comments	Reference
Towed diver + GPS + video	"towed GPS system, where a video camera … in [an] … underwater housing … was carried by a SCUBA diver towing a GPS unit … attached to a float at the surface"	Poulos et al. (2016) p. 257
	"Transects were run at depths of 1–10 m … at speeds of 1 to 2 kn. A SpotX dropcam with a GoPro™ Hero 5 Black (Full HD, 12 mega pixels, wide-angle setting) was towed ~1 m above the substrate. This provided a live full HD video feed to an iPad mini. Underwater video footage was analysed as the presence or absence of data using GPS waypoints recorded on the GPS unit of the vessel."	Williamson et al. (2022) p. 3

2.4 Methods to consider (for further literature review)

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

- Underwater active search
- Camera trapping

2.4.2 Additional methods

- None have been identified to date.

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

No Ecological Monitoring System Australia (EMSA) modules developed by TERN for the Australian Government have been identified for consideration in surveying the Cauliflower Soft Coral. EMSA protocols to date have only focussed on terrestrial ecosystems and have not been tested in marine/freshwater environments.

2.4.5 Other 110 priority species with potential links

- White's Seahorse (*Hippocampus whitei*)
  - The Cauliflower Soft Coral is an important habitat for the White's Seahorse to live on (see Harasti *et al.* 2014; Harasti 2016) with the soft coral providing a habitat refuge for the seahorse.
- Grey Nurse Shark (eastern) *Carcharias taurus* occurs in same region

3 Considerations for survey guidelines development

Key considerations should a full literature review and/or survey guidelines be developed for the Cauliflower Soft Coral are highlighted below.

- Special equipment required
  - SCUBA gear, boat, etc.
  - Video recording equipment – e.g. towed GPS system, where a video camera (Sony Handycam, HDR-XR550VE Full HD, 12 mega pixels, see http://www.sony. com) in a Light & Motion STINGRAY G2+ underwater housing (http://www.lightandmotion.com/bluefin-housing) was carried by a SCUBA diver towing a GPS unit (Garmin Map60, see http://www.garmin.com) attached to a float at the surface (Poulos *et al.* 2016).
  - Williamson *et al.* (2022) used a SpotX dropcam with a GoPro™ Hero 5 Black (Full HD, 12 mega pixels, wide-angle setting), which was towed ~1 m above the substrate. This set up provided a live full HD video feed to an iPad and underwater video footage was analysed as the presence or absence of data using GPS waypoints recorded on the GPS unit of the vessel.
- Estimated time and surveyor effort
  - 20 scuba dives were undertaken to map the distribution of the species within targeted sections of the Port Stephens estuary, with each dive lasting for 44 mins on average (Poulos *et al.* 2016).
- 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

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 Cauliflower Soft Coral.

- Protocols
  - Towed diver + GPS + video: the two equipment setups described in Williamson *et al*. (2022) p. 3.
- Scientific papers and reports
  - Poulos, D.E., Harasti, D., Gallen, C., Davis, T., & Booth, D.J. (2016). Distribution and spatial modelling of a soft coral habitat in the Port Stephens-Great Lakes Marine Park: implications for management. Marine and Freshwater Research, 67(2): 256–265.

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

- Davina E. Poulos, College of Marine & Environmental Sciences, James Cook University, Townsville, Qld
  - Dr David Harasti; Senior Marine Scientist, Fisheries Research, NSW Department of Primary Industries, Nelson Bay, NSW

  - Involved in a long-term *Hippocampus whitei* monitoring programme from 2005 to 2021 (associated with *D. australis*).
- Sydney Aquarium
- Gamay Botany Bay Rangers

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