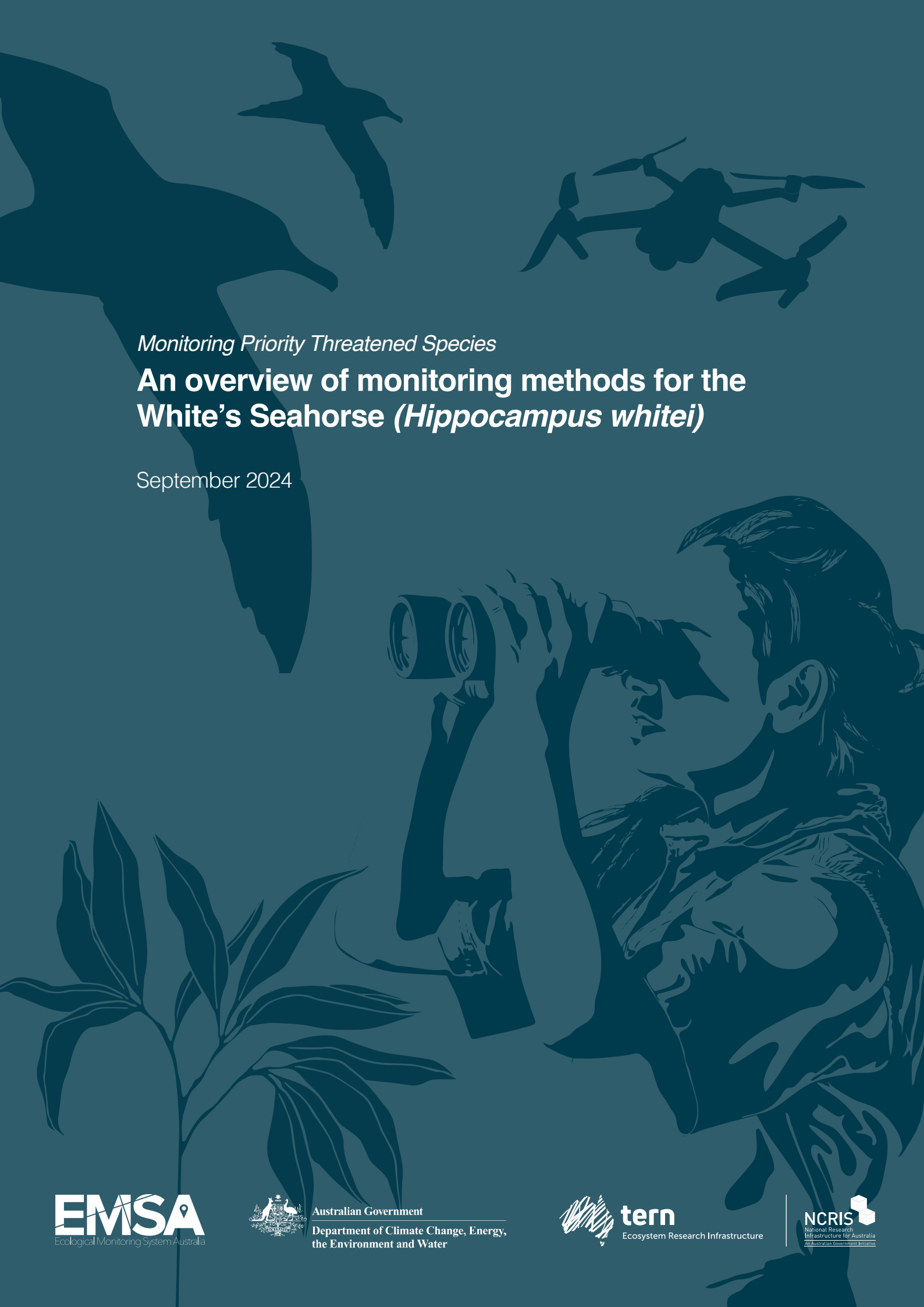




Monitoring Priority Threatened Species

An overview of monitoring methods for the White's Seahorse (*Hippocampus whitei*)

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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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This document is designed to be an information resource. It is not a statutory document or policy statement. If information diverges, the information in the statutory document(s) and policy statement(s) take precedence over this document. This document should be used in parallel with relevant survey guidance, conservation advice, and recovery plans.

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 White's Seahorse. 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

- White's Seahorse (*Hippocampus whitei*) has been found in estuaries between St Georges Basin, New South Wales, and Hervey Bay, Queensland (Kuitert 2009; Harasti *et al.* 2012)
- Port Stephens and Sydney Harbour are the only locations where large populations (more than 10 individuals) have been found to occur (Harasti *et al.* 2012).
- The species has been confirmed as occurring in eight estuaries between Forster and Port Hacking (Sydney) and in the Tweed River. These estuaries are Wallis Lake (Forster), Port Stephens, Lake Macquarie, Tuggerah Lake, Hawkesbury River (including locations such as Brisbane Water and Pittwater), Port Jackson (Sydney Harbour), Botany Bay and Port Hacking (Lintermans 2019).

1.3 Habitat

- White's Seahorse occurs at depths between 1 and 15 metres (Harasti 2016; Simpson *et al.* 2019).
- The species utilise a range of natural and artificial habitat types (Harasti 2016; Simpson *et al.* 2019).
- In Port Stephens, Harasti *et al.* (2014) found that juveniles prefer gorgonian coral habitats (*Euplexaura* sp.), whilst adults prefer both sponges and soft coral (*Dendronephthya australis*) habitats. Adults have also been found to occur in *Posidonia australis* seagrass and juveniles within *Sargassum* sp. macroalgal and soft coral habitats (*Carijoa* sp. and *D. australis*) (Harasti *et al.* 2014).
- White's Seahorse prefers complex habitats, providing protection and more available food resources (Harasti *et al.* 2010; Hellyer *et al.* 2011).
- Habitat selection by the species can be influenced by prey type and the occurrence of predators (Manning *et al.* 2018).
- White's Seahorse will choose artificial over natural habitats (Simpson *et al.* 2019) and utilise artificial 'seahorse hotels' (Simpson *et al.* 2020).

- Individuals show strong fidelity to holdfasts (the holdfast is the habitat that the seahorse holds onto with its prehensile tail) such as sponges, with some individuals being recorded on the same holdfast for up to 17 months (Harasti *et al.* 2014).

1.4 Ecology

- White's Seahorse displays rapid growth, early maturity and reproduction. Age at sexual maturity is approximately 7 months (mean total length = 106.7 mm), and life expectancy is up to 7 years (Harasti 2021).
- As with others in the Syngnathid family, males give birth (Harasti *et al.* 2012).
- The generation length is three years (Vincent and Giles 2003).
- Litter size is ~ 150 (Vincent and Giles 2003). In a breeding season, a large male can reproduce up to eight times. However, litter size is considered to decrease following each reproduction within a season (Vincent and Giles 2003).
- These growth and reproductive traits indicate that the species can develop large populations if conditions are appropriate (Harasti 2015). However, the species has minimal dispersal ability given that there is no pelagic stage for juveniles (Kuitert 2009), with newborns generally settling in the area of birth and not travelling far (Harasti *et al.* 2014).
- The species displays strong site fidelity, and individuals are not known to move far (less than 100 m) (Harasti *et al.* 2014).
- White's Seahorse is not associated with 'rafting' (whereby juvenile seahorses attach themselves to floating debris to disperse and recruit to new areas) as observed in other seahorse species.

1.5 Threats

- Both soft coral and sponges (principal habitat) are declining in distribution and abundance within Port Stephens (Harasti 2016). There have been large declines in soft coral and sponge abundance over the past three years due to severe impacts following La Niña floods, with the March 2021 flood detrimentally impacting Port Stephens populations (Poulos *et al.* 2016).
- The TSSC (2020) identify the following as being threatening processes for White's Seahorse:
 - Habitat loss
 - Ocean clean-up where artificial habitat is removed



2 Existing monitoring methods

2.1 Summary of existing methods used

- Electrofishing
- Gillnets
- Fyke nets
- Direct observation
- Camera trapping
- Capture-mark-recapture using PIT or FIFE
- Other

2.2 Existing survey requirements

- Optimal time of year/season/climate conditions (timing with resource availability etc)
 - Breeding season September – March.
- Optimal location of surveys
 - Port Stephens and Botany Bay, NSW are ideal for surveys of known populations, particularly the formerly two largest known aggregation sites were the Pipeline and Seahorse Gardens in Port Stephens (Harasti *et al.* 2012).
- Minimum survey effort
 - At least three daily surveys per site (D. Harasti unpub. data) (Fisheries Scientific Committee 2019).
- Survey personnel
 - Divers should always dive with another diver for safety.
- Other factors:
 - Occurrence tied to known sympatric species, Cauliflower Soft Coral (*Dendronephthya australis*) (Harasti *et al.* 2014)

2.3 Existing protocols

Existing protocols identified are identified in Table 1.

Table 1. Survey guidelines, protocols, and key resources that identify White's Seahorse (*Hippocampus whitei*) monitoring methods

Protocol	Comments	Reference
Capture-mark-recapture; dispersal; longevity	Visible implant fluorescent elastomer (VIFE: https://www.nmt.us/) is used to mark individuals with each seahorse receiving three small (1–2 mm) elastomer tags so that each animal could be uniquely identified. See Figure 1 in Harasti (2021).	Woods and Martin-Smith (2004)
Survey guidelines for Australia's threatened fish	White's Seahorse is not included	DSEWPC (2011)

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

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

2.4.2 Additional methods

- Camera traps for fish monitoring (Bilodeau *et al.* 2022; <https://www.spotx.com.au/underwater-camera-trap/underwater-camera-trap>), such as using video recording conducted with GoPro Hero 5 session cameras, or associated with a fish trap (Bachelier *et al.* 2014).
- Visible implant fluorescent elastomer (VIFE) which allows for individual identification (Harasti 2021)

2.4.3 Methods to rule out

- None have been identified to date.

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 White's Seahorse. EMSA protocols to date have only focussed on terrestrial ecosystems.

2.4.5 Other 110 priority species with potential links

- Symbiotic relationship:
 - Cauliflower Soft Coral (*Dendronephthya australis*): The Cauliflower soft coral is an important habitat for the White's Seahorse to live on (Harasti *et al.* 2014; Harasti 2016) with the soft coral providing a habitat refuge for the seahorse.

3 Considerations for survey guidelines development

Key considerations should a full literature review and/or survey guidelines be developed for White's Seahorse are highlighted below.

Special equipment required

- SCUBA gear, boat, etc.

Estimated time and surveyor effort

- Information not available.

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 White's Seahorse.

Protocols

- Woods, C. M. C. & Martin-Smith, K. M. (2004). Visible implant fluorescent elastomer tagging of the big-bellied seahorse, *Hippocampus abdominalis*. Fisheries Research 66: 363–371.
- White's Seahorse is not included in the Survey guidelines for Australia's threatened fish (DSEWPC 2011) document.

Scientific papers and reports

- Harasti, D., Martin-Smith, K., & Gladstone, W. (2012). Population dynamics and life history of a geographically restricted seahorse, *Hippocampus whitei*. Journal of Fish Biology 81: 1297–1314

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

- Dr David Harasti; Senior Marine Scientist, Fisheries Research, NSW Department of Primary Industries, Fisheries
- Involved in a long-term *Hippocampus whitei* monitoring programme from 2005 to 2021.
- Michael Simpson, Marine Ecology Laboratories, The University of Sydney
- Sea Life Sydney Aquarium
- Gamay Botany Bay Rangers

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