Survey guidelines and recommendations for priority threatened species

Literature overview documents – note to the reader

About the project

The *Survey guidelines and recommendations for priority threatened species* project aims to develop best practice field survey guidelines and recommendations to assist practitioners working in threatened species conservation and recovery. The intended outcome of the project is to enable targeted efforts and resources to measure, share and achieve tangible outcomes for conservation. Data collected using robust, standardised methods will improve our knowledge of threatened species and drive threatened species recovery at scale. This project is an important step towards establishing monitoring protocols and data repositories to improve accessibility and sharing of threatened species data.

Project deliverables

The first phase of the project involves preparation of literature overviews for 65 of the 110 priority threatened species. The second phase prepares more in-depth literature reviews of selected species, and based on existing best-practice, produces general survey guidelines and recommendations. Phase three of the project produces species-specific survey guidelines and recommendations for selected species. Phase three species were selected on the basis for the most urgent need for standardised surveys.

Literature overviews

The literature overviews are intended to provide a summary of the species under review, identifying known distributions, key resources and ecological requirements, as well as an overview of the known survey techniques used for monitoring.

The literature overviews were compiled in March 2023, and are intended to be updated over time as new information becomes available.

For more information

The literature overviews have been prepared by TERN for the Department of Climate Change, Energy, the Environment, and Water. For further information, please visit: www.tern.org.au/threatened-species-surveys or email tern@adelaide.edu.au

Citation: TERN Australia (2023) Survey guidelines and recommendations for priority threatened species: project phase 1. Literature overview **Christmas Island Goshawk (*Accipiter hiogaster natalis*)**. Literature overview for the Department of Climate Change, Energy, the Environment and Water. TERN Adelaide.

110 Priority Threatened Species Literature Overview

Christmas Island Goshawk (*Accipiter hiogaster natalis*)

Taxa

☐ Plant ☐ Mammal ☐ Frog ☐ Invertebrate
☒ Bird ☐ Reptile ☐ Fish

Current EPBC Act status

☐ Critically Endangered
☒ Endangered
☐ Vulnerable

General background

Distribution

- Reflecting its namesake, data suggests that the Christmas Island goshawk is confined to the Australian territory of Christmas Island (Peters 1931; Marchant and Higgins 1993).
- The Christmas Island goshawk is widespread on Christmas Island (Corbett *et al.* 2003; Hill 2004; Hurley 2005; James and Retallick 2007) but uncommon (Hill 2004).
- The extent of occurrence of the Christmas Island goshawk is estimated, with high reliability, to be 160 km^2 (Flakus *et al.* 2021).
- The number of mature individuals is estimated at 250. The population is considered probably stable, with four sets of surveys providing no indication of decline (Flakus *et al.* 2021).
- Data on site occupancy collected in 2011, 2013 and 2015 are not yet publicly available (Flakus *et al.* 2021).

Habitat

- The Christmas Island goshawk occurs in all major habitat groups (Corbett *et al.* 2003; Hill 2004; Hurley 2005; James and Retallick 2007) including all forest types on Christmas Island (Hill 2004).
- The Christmas Island goshawk prefers secondary forest, settlements or rehabilitated habitat (Hill 2004), often occurring in sparser vegetation growth at edges or in clearings in the forest (Gibson-Hill 1947).
- Cleared land provides improved visibility and resource access (Hill 2004).
- The goshawk is capable of foraging in most available habitats, but requires suitable tall trees in native rainforest for nesting (Hill 2004).
- The species of trees, the density and height of trees, and the amount of understorey vegetation are not important in habitat choice (Marchant and Higgins 1993).

Ecology

- The Christmas Island goshawk is territorial and does not migrate, unlike the closely-related subspecies on the Australian mainland (Stokes 1988; Marchant and Higgins 1993).
- The life expectancy of the Christmas Island goshawk has not been documented (Aumann 1988).

Version dated: April 2023

- It is assumed that breeding season and behaviour of the Christmas Island goshawk are like those of the mainland goshawk populations of northern Australia:
    - These populations breed from early September to early December (Hollands 1991). They make a rough nest of sticks with leaves throughout, lined with green leaves (Cupper and Cupper 1981).
    - Mainland goshawks are considered to be monogamous, but there have been no long-term studies of marked birds (Marchant and Higgins 1993).
    - Mainland goshawks apparently pair for at least one season, but replace their mate if lost (Aumann 1988).
    - Female goshawks may breed successfully in their first or second year, but males typically breed only in full adult plumage (Ashton 1987; Aumann 1988; Hollands 1991).
    - The clutch size of Australian mainland goshawks is usually three, but is sometimes two or four (Baker-Gabb 1984). Eggs are incubated and chicks brooded by both sexes, but mostly by the female. The incubation period is 30–33 days (Olsen *et al.* 1982), and the fledging period is 28–40 days, with males usually fledging before females (Hobbs 1971; Hollands 1991).
- The Christmas Island goshawk feeds on large insects, such as grasshoppers, beetles and mantids, centipedes and small birds, mammals and reptiles (Gibson-Hill 1947; Hill 2004; Hurley 2005).
- The Christmas Island goshawk searches for prey mainly from concealed perches within foliage, but also from low unconcealed perches or actively on the wing. It is not usually active on the ground, but may stalk and take prey there (Marchant and Higgins 1993).

Threats

- The critical habitat of the Christmas Island goshawk, primary rainforest, has been fragmented by clearing, and is dissected by roads and 'grid lines' cleared for historic phosphate exploration (Hill 2004).
- Historically, the removal of native rainforest on Christmas Island to establish human settlements, phosphate mining operations and associated infrastructure (Stokes 1988; Hutchings and Brown 2014) removed 25% of the goshawk's habitat. Since 1988, clearing of the primary vegetation has no longer been permitted. Future removal of vegetation could threaten the species (Flakus *et al.* 2021).
- Care must be taken in control of Black rats (*Rattus rattus*) to ensure the rodenticide does not cause secondary mortality of goshawks (Flakus *et al.* 2021).

Common survey methods used

Terrestrial fauna

☒ Direct observation
☐ Direct observation: special techniques, eg. spotlighting, burrow scopes, drone with camera
☐ Signs - tracks, scats, hair-tubes, including 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)
☒ Trapping – other
☒ Refuge checks (nests)
☐ Aerial surveys
☐ Invertebrate techniques: (specify)
☒ Call surveys

Existing survey requirements

☒ Optimal time of year/season/climate conditions (timing with resource availability etc)

- Breeding season

☒ Optimal location of surveys

- Christmas Island – secondary forest, settlements or rehabilitated habitat

☒ Minimum survey effort

- Area surveys 20 hours/4 days (in areas less than 50 ha)
- Broadcast surveys 2 hours/2 days (DEWHA 2010)

☐ Survey personnel

- N/A

☐ Other factors:

- None have been identified to date.

Existing protocols

Protocol	Comments	Reference
Survey guidelines for Australia's threatened birds	Recommends area searches for sightings or calls, and watches for courting pairs soaring above the canopy from vantage points. Daytime broadcast (playback) surveys may be effective before and during the breeding season, although the timing of breeding is currently unknown.	(DEWHA 2010)

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.

Available methods

- Area search (for sightings and calls)
- Visual survey from vantage points
- Trapping for mark-recapture
- Nest surveys
- Opportunistic observation
- Daytime broadcast (playback) surveys

Additional methods

- Pellet analysis for determining prey items
- Trawling (lures on fishing line) to assist with capture

Methods to rule out

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

Existing TERN ecological monitoring modules with direct links

The following TERN ecological monitoring modules should be considered for surveying the Christmas Island goshawk:

- Opportune
- Vertebrate fauna
- Targeted

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

Other 110 priority species with potential links

- Similar monitoring methods:
  - Red goshawk (*Erythrotriorchis radiatus*)

Considerations for module/protocols development

Key considerations should a full literature review and/or survey guidelines be developed for the Christmas Island goshawk are highlighted below.

Special equipment required

- Acoustic recorder

Estimated time and surveyor effort

- In 2005–2006, the species was detected from 6 of 527 survey sites specifically for birds, representing a reporting rate of 1.1% (10 min at 128 sites generally repeated four times; James and Retallick 2007). In more general island-wide surveys, the species was detected at 5% of 933 sites in 2011 and 9% and 11% of 1106 sites surveyed in 2013 and 2015, respectively. Differences in methods mean the results are not comparable (Flakus et al. 2021).

Vegetation communities or landscapes of the species' preferred habitat not suitable for the optimal survey methods

- Only applicable to Christmas Island where the species is present

Key documents for further review

Protocols

- No protocol with specific requirements are available

Scientific papers and reports

- National Recovery Plan for the Christmas Island goskawk (Hill 2004).
- Action Plan for Australian Birds (Flakus *et al.* 2021) – refers to unpublished data, could contact to obtain access.
- Generation lengths of the world's birds and their implications for extinction risk (Bird *et al.* 2020).
- Christmas Island Biodiversity Monitoring Programme: Summary Report (James and Retallick 2008).
- Forest Birds of Christmas Island: A Baseline Survey of Abundance (James and Retallick 2007) – mentioned in the Action plan but cannot find document online.

Key agencies and organisations involved in the species research and recovery

- BirdLife Australia

Projects funded by the Australian Government

There are no Australian Government funded projects listed on MERIT.

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