Eastern Australian Waterbird Aerial Survey - October 2025 Annual Summary Report

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2025 Eastern Australian Waterbird Aerial Survey

Executive Summary

- The annual Eastern Australian Waterbird Aerial Survey (EAWS) began in 1983 to monitor annual continental scale changes in the distribution and abundance of waterbirds and their breeding, as well as change in the extent of wetland habitat over time. It tracks trends in more than 70 species of waterbirds. The 43rd annual survey was completed in 2025.

- The weather was more volatile and unpredictable in 2025 (compared to previous years) due to climate change, leading to more frequent and intense extreme weather events, a key aspect of the Australian summer. This year is on track to be one of the hottest on record, and the global mean temperatures are expected to continue increasing, leading to a rise in heatwaves and other severe weather, according to the World Meteorological Organization (WMO 2024).

- In 2025 Australia experienced significant river flow and flooding events, with extreme rainfall in southwestern and western Queensland causing major floods that reached Lake Eyre and a severe flooding event (1 in 500 years) on the Mid North Coast of New South Wales. At the same time drier conditions continued across parts of southeastern Australia (August-October).

- Overall wetland area increased considerably in 2025 compared to 2024, to well above the long-term average. Some rivers and wetlands in the north or west including Kati Thanda-Lake Eyre, Lakes Mumbleberry and Torquinie and Lake Galilee filled or retained water and some supported large numbers of waterbirds. The Cuttaburra Channels and Menindee Lakes, Talyawalka Lakes and Fivebough and Tuckerbill Swamps supported high numbers of waterbirds.

- Most game species of ducks had abundances below their long-term averages; two of these (Grey Teal, Hardhead) were close to their long-term averages. Five out of eight game species continued to show significant long-term declines. Total waterbird abundance (all species combined) increased slightly in 2025 compared to 2024.

- Breeding species richness and breeding abundance, increased in 2025 compared to the previous year; breeding abundance remained well below the long-term average and significant long-term decline is evident in breeding species richness.

- Availability of wetland habitat is a major driver of waterbird abundance, breeding and diversity. Reductions in habitat area and persistence due to climate change, river regulation and water extraction have resulted in ongoing long-term declines particularly in the Murray-Darling Basin. Purchases and timed releases of environmental water to support breeding or habitat retention have offset some the ongoing impacts of regulation and climate change.

- There were no occurrences of any mass mortality of waterbirds (a potential indicator of avian influenza).

Results

1. Global warming continues to influence Australian and global climates. Record high global surface temperatures were recorded for 15 consecutive months from June 2023 to July 2024 (NOAA 2024). Australia's weather and climate continues to change with an increase in extreme heat events, longer fire seasons, more intense heavy rainfall and sea level rise (CSIRO 2024).

2. There has been a shift towards drier conditions across southern Australia, especially from April to October (BOM 2025a). While some areas have had above average rainfall for southern Australia as a whole, April to October rainfall has been below the historical (1961–1990) average in 26 of the last 32 years between 1994 and 2025.

3. River and stream flow conditions in 2025 varied significantly across eastern Australia with increased variability due to climate change (MDBA 2025). Intense flooding in western Queensland and north-eastern NSW contrasted with drier conditions and reduced flows in western Victoria and South Australia (BOM 2025). Streamflows were below average at many sites across southern and eastern Australia (BOM 2025b).

4. The combined storages in the Murray–Darling Basin were 66% full. This is down from 73% at the end of October last year. Menindee Lakes storages are around 77% full, up from 44% at this time last year (MDBA 2025). The Lachlan catchment storages are at 89% down from 101% in 2024.

5. Queensland was free from drought (as of November 2025); 46% of NSW was in drought or drought affected (QLD 2025; DPI 2025). South Australian and Victorian drought maps are not currently available.

6. Despite recent flood years, three major condition indices for waterbirds (total abundance, number of species breeding and wetland area) continue to show significant declines over time. If 1983 and 1984 peak years are omitted then three of four major indices still showed significant declines (OLS regression at p=0.05; variables 4th root or log transformed where appropriate and autocorrelation plots examined for serial autocorrelation; Fig. 1; Table 1). Long-term trends are more informative for predicting population status than year to year fluctuations.

7. Total waterbird abundance in 2025 (n=375,419) increased significantly from 2024 to slightly above the long-term average; this was the 12th highest total in 43 years. Waterbirds were most abundant in survey bands 9 and 8 (Figs 2 and 5). Temporary saline desert wetlands - Lakes Mumbleberry and Torquinie in Band 8 and Lake Galilee in Band 9, supported large numbers, with more than 99,000 waterbirds combined (26% of total abundance). In Band 5, the Cuttaburra Channels and Paroo Overflow lakes supported large numbers of waterbirds (>29,000).

Results (continued)

8. Total breeding index (nests + broods) was 1,270 (all species combined), an order of magnitude increase from the previous year but well below the long-term average (Figs 1 and 6). Breeding species' richness also increased considerably with 16 species recorded breeding. However this was comprised mainly of five species (Magpie Goose, Little Black Cormorant, Straw-necked Ibis, Black Swan and Caspian Tern), accounting for 82% of the total breeding recorded. Breeding was predominantly limited to a few locations in survey band 9 (Figs 1 and 6) and comprised mostly Magpie Goose, Little Black Cormorants and Pelicans.

9. Most functional response groups (species feeding guilds) showed significant long-term declines (OLS regression at p=0.05; variables 4th root or log transformed where appropriate and autocorrelation plots examined for serial autocorrelation. (Fig. 3; Table 2). Long-term changes were also observed in decadal averages of total abundance, wetland area index, breeding index and breeding species' richness (Fig. 4).

10. Wetland area index (334,324 ha), increased considerably from the previous year, well above the long-term average. Most of the wetland habitat was located in Survey bands 6 (43%) and 7 (17%) (Figs 2 and 7). Four wetlands (Kati Thanda-Lake Eyre, Cooper Creek, Lake Yamma Yamma and the Diamantina floodplain) created significant habitat (51% total) but supported disproportionately low numbers of waterbirds with around 3.8% of the survey total (Fig. 5). Bands 4 and 5 also contained important areas of habitat – together comprising 17% of the inundated wetland area sampled (Fig. 2).

11. The northern Macquarie Marshes (within survey band 5) had a moderate level of inundation and supported c. 3,200 waterbirds with no breeding rookeries active. The Lowbidgee wetlands also had low inundation extent and supported low numbers of waterbirds with no recorded breeding. Most wetlands in the regulated Menindee Lakes system contained high levels of water with around 7,900 waterbirds. Other important wetlands included: Lake Cooper (Band 2), Lake Barambah and the Diamantina floodplain (Band 7), Burdekin River and Proserpine Reservoir (Band 10) and Tuckerbill and Fivebough Swamp Ramsar site (Band 3) (Fig. 5).

12. Waterbirds had 59% of their total abundance distributed across 10 wetlands (Fig. 5), making them more spatially concentrated and less evenly spread than in 2024. Around 44% of surveyed wetlands supported no waterbirds (this includes wetlands that were dry).

13. Five game species of ducks (Australasian Shoveller, Chestnut Teal, Mountain Duck, Pink-eared Duck and Wood Duck) had abundances well below their long-term averages; two game species (Hardhead and Grey Teal) were close to their long-term averages (Figs 11-20). The remaining species (Black Duck) was above it's long-term average. Five out of eight game species continued to show significant long-term declines (OLS regression at p=0.05; variables 4^{th} root or log transformed where appropriate; Table 3).

Results (continued)

14. Waterbird indices (abundance, breeding species richness) across river basins responded to widespread flooding (Feb-Apr 2025) with increases in wetland area. Wetland areas increased considerably in the Lake Eyre, Cooper Creek Basin also in the Murray-Darling Basin compared to the previous year (Fig. 8). Species relative abundances were more evenly spread compared to previous year; 10 species comprised 79% of total abundance. These species/groups were, in order of decreasing abundance: Grey Teal, Eurasian Coot, Black Duck, Little Black Cormorant, Black Swan, Magpie Goose, Hardhead, Australian Pelican, Pink-eared Duck and egrets.

15. Selected species distributions and abundances are shown in Figures 11-21; Freckled Duck, Plumed Whistling Duck and Australian Pelicans are included for comparison with game species. Map plots in these figures show 2025 distribution and trend plots show changes in abundance over time (1983-2025). Horizontal lines in trend plots indicate the long-term average.

16. Across Eastern Australia overall abundance, breeding index and breeding species richness were positively related to available habitat (wetland area index). Equally, declines in wetland area are likely to result in declines in waterbird abundance, breeding and breeding species richness (Fig. 9).

17. Several game species (Black Duck, Mountain Duck and Australasian Shoveler) showed significant long-term declines in the number of wetland sites they occupied, indicating a change in spatial distribution and potential contractions in range. This was examined by plotting the number of wetland sites each species was observed at as a proportion of the total number surveyed that year; wetlands with zero birds were excluded. Raw (naïve) occurrence data was then examined for trends (OLS regression at p=0.05; variables 4th root or log transformed where appropriate) and autocorrelation plots examined for serial autocorrelation (Fig.10).

18. There were no observations of any mass mortalities of waterbirds that might indicate impacts of avian influenza.

Methods

Methods are described in detail in Braithwaite et al. (1985) and Kingsford et al. (2020) – a short description follows here. All waterbirds (including nests and broods) were counted from high-winged aircraft (e.g. Cessna 206 or 208) at 167–204 km hr−1 and a height of 30–46 m, within 150 m of the wetland's shoreline where waterbirds concentrated. A front-right observer (navigator) and a back-left observer independently record counts on digital audio recorders, with their combined counts making up a completed count. Counts are attributed on the recorder to a unique number for each wetland, and a geolocation (longitude, latitude), as well as the exact time of day the count commenced. All timing is synchronised to GPS time – this enables audio counts to be linked to location via a GPS track log of the flight path. The percent fullness (inundated area) of each wetland is also estimated, relative to the mapped high-water mark. Inundated areas (ha) are also estimated for wetlands which are not mapped.

Methods (continued)

An area of 2,697,000 km^2 is systematically sampled with ten survey bands 30 km in width, spaced every 2° of latitude from 38°30'S to 20°30'S. Waterbirds are counted on all waterbodies (rivers and wetlands) larger than 1 ha within survey bands; additional counts are made on an ad-hoc basis of wetlands smaller than 1 ha. This ensures information is collected across a representative sample of waterbodies (wetlands, dams, lakes, estuaries and rivers).

All waterbirds are identified to species, except those few that cannot be consistently identified to species level from the air and were grouped: small grebes (Australasian Little Grebe, Hoary Headed Grebe), small egrets (Cattle Egret, Little Egret and Intermediate Egret), terns and small and large migratory wading birds (Charadriformes). Counts of no birds are also recorded, as are dry wetlands. Waterbirds are counted singly and in groups, progressively increasing up to 1,000 individuals. Waterbird nomenclature and classification follows the IOC World Bird List (Gill et al. 2023; Appendix 1).

Three counting techniques are used: total counts, proportion counts and transect counts. For total counts, all birds are counted during a circumnavigation of the wetland, the preferred method for wetlands with large concentrations of waterbirds. For proportion counts, a proportion (usually >50%) of a large wetland with few waterbirds (e.g. large dam) is surveyed, with counts extrapolated to give total counts. For the final transect method, waterbirds are counted within 200 m-wide transects (100 m on each side of the aircraft, delineated by tape markers on each aircraft wing strut), a technique only used for braided or spatially complex large wetlands. Total estimates are formed from the relative area of the transects, compared to total area flooded. Most counts are total counts or proportion counts greater than 50%.

Acknowledgements

This survey is managed by the Centre for Ecosystem Science, School of Biological, Earth and Environmental Sciences, UNSW Sydney and the Department of Climate Change, Energy the Environment and Water (NSW), with additional resourcing from the South Australian Department for Environment and Water, the Queensland Department of Environment, Tourism, Science, and Innovation, the Victorian Department of Energy, Environment and Climate Action and the Victorian Game Management Authority. The Murray-Darling Basin Authority funds complementary surveys in the Murray-Darling Basin.

We thank Sharon Ryall for help with logistics, along with staff from our collaborative agencies. We also thank Thomas Clark and Tom Martin (Pay's Air Service), for piloting the aircraft and Chris Sanderson, Jody O'Connor (MDBA), Shelley Thompson (MDBA), Heath Dunstan (VIC GMA) and Paul Wainwright (Landscape SA) for acting as aerial observers. Thanks to our trainee observer Kevin Lintern (SA DEW). For data collation and quality assurance we thank: Courtney Adams, Sarah Cordell, Alexander Dibnah, Evangaline Faught, Emily Gardner-Brandis, Sophie Hewitt, Amelia Jeffrey, Bradley Newman, Bina Phuyal, Louis Price and Matt Smith.

Cover Picture: The Narrows, Curtis Island - John Porter

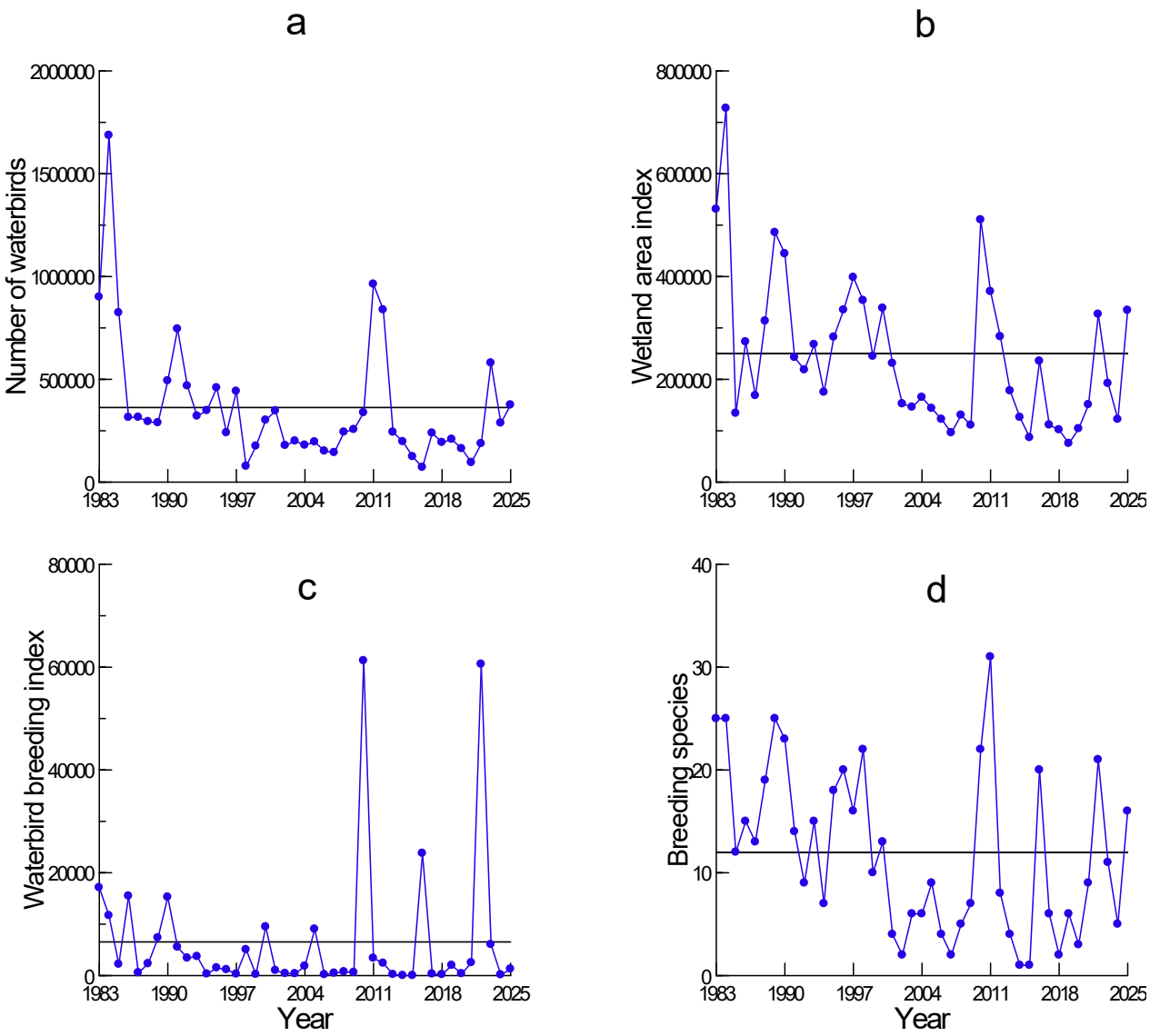


Figure 1. Changes over time in a) total abundance, b) wetland area, c) breeding and d) number of breeding species in the Eastern Australian Waterbird Aerial Survey (1983-2025); horizontal lines show long-term averages.

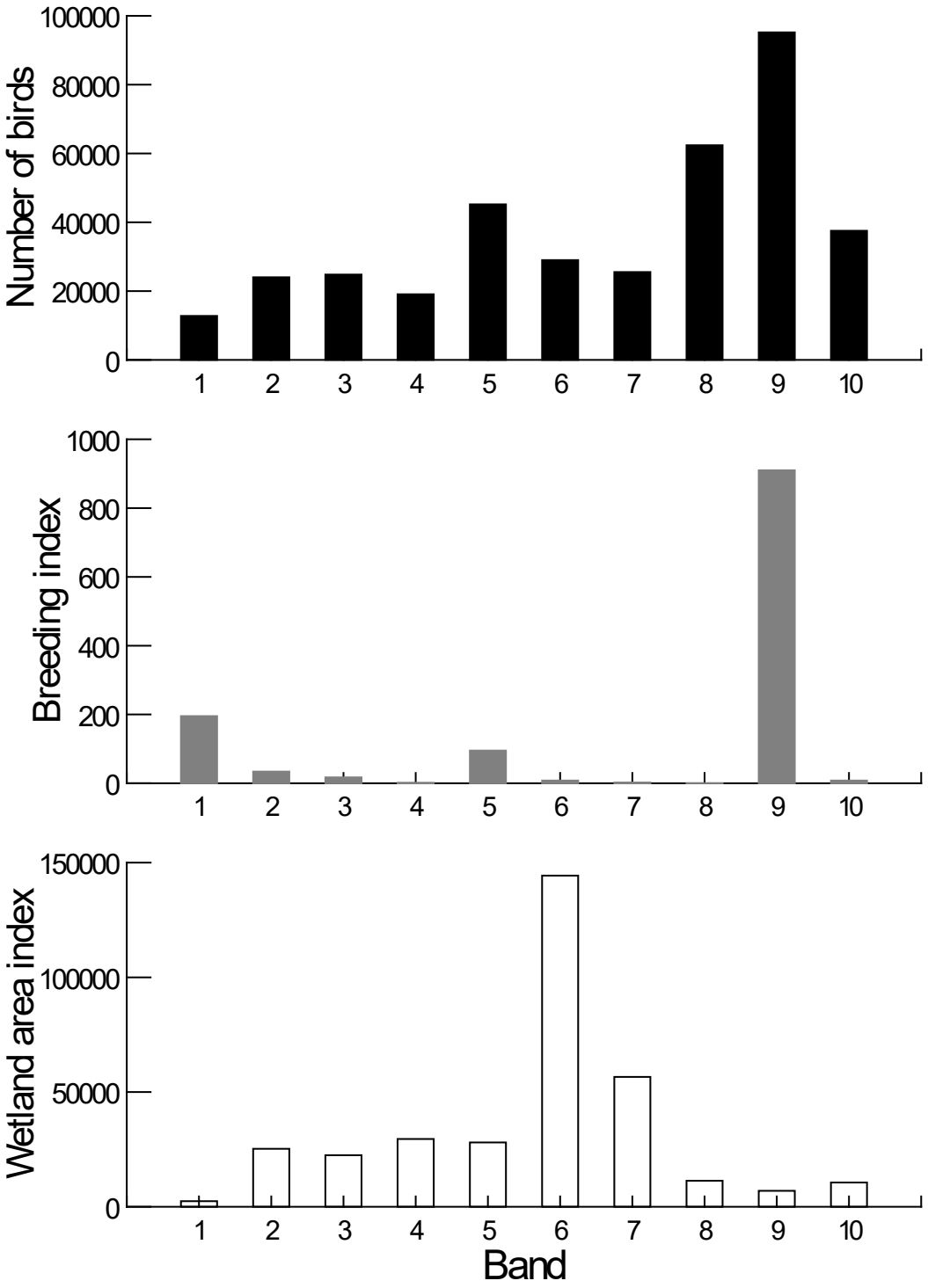


Figure 2. Distribution of waterbird abundance, breeding index and wetland area index in survey bands 1-10 (south to north respectively) of the Eastern Australian Waterbird Aerial Survey in 2025.

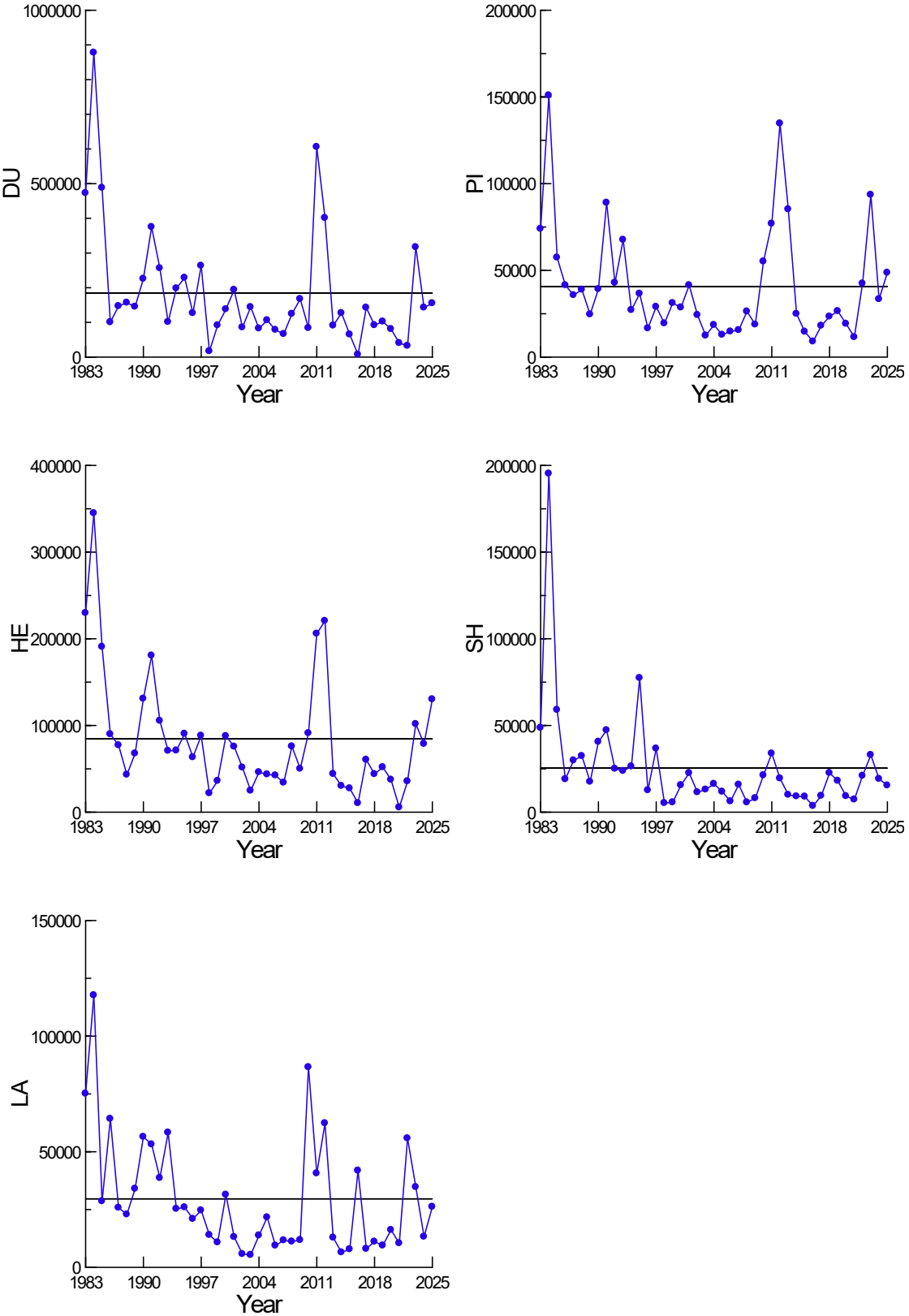


Figure 3. Changes in abundances of waterbird functional response groups (Du=ducks; Pi=piscivores; He=herbivores; Sh=shorebirds; La=large wading birds) over time in the Eastern Australian Waterbird Aerial Survey bands (1983-2025); horizontal lines show long-term averages.

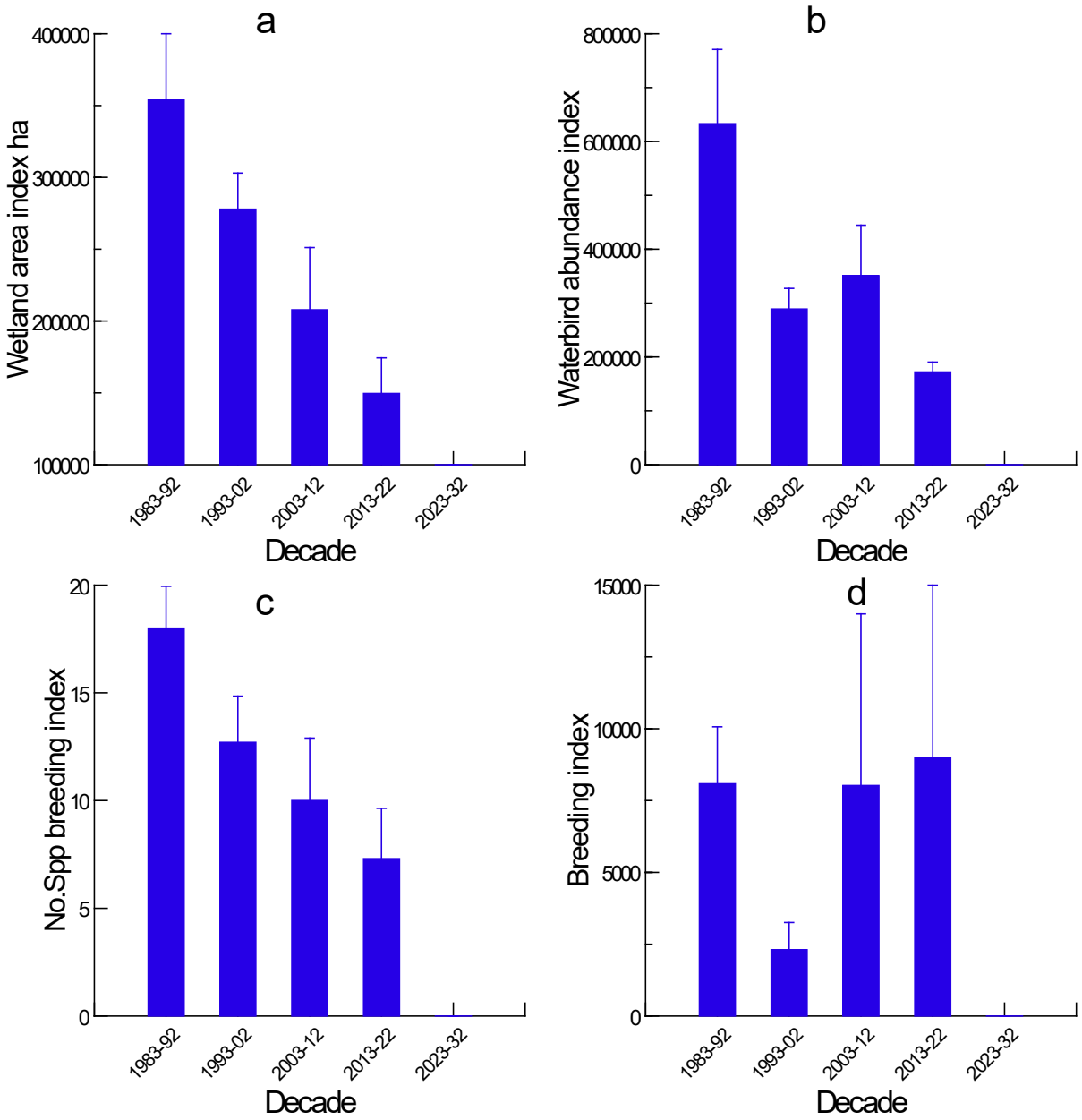


Figure 4. Decadal means of a) wetland area index, b) total abundance index, c) number of breeding species and d) breeding index in the Eastern Australian Waterbird Aerial Survey (1983-2025). Error bars are SE. The most recent decade with only three years data (2023-25) is not shown.

Table 1. Trends in total waterbird abundance index, wetland area index, breeding index and breeding species richness in the Eastern Australian Waterbird Aerial Survey (1983-2025).

Variable	Trend	Variance and significance (all years)	Trend	Variance and significance (1983-84 omitted)
Total waterbird abundance	decline	r^2=0.25, p=0.001	decline	r^2=0.15, p=0.012
Wetland area index	decline	r^2=0.24, p=0.001	decline	r^2=0.15, p=0.011
Breeding index	no trend	r^2=0.04, p=0.227	no trend	r^2=0.01, p=0.538
Breeding species richness	decline	r^2=0.17, p=0.006	decline	r^2=0.11, p=0.038

Table 2. Trends in abundances of functional response (Fx) groups, in the Eastern Australian Waterbird Aerial Survey (1983-2025).

Fx group code	name	Trend	Variance and significance (all years)	Trend	Variance and significance (1983-84 omitted)
Du	Ducks	decline	r^2=0.17, p=0.005	no trend	r^2=0.09, p=0.058
He	Herbivores	decline	r^2=0.17, p=0.006	no trend	r^2=0.08, p=0.075
La	Large wading birds	decline	r^2=0.17, p=0.006	no trend	r^2=0.09, p=0.061
Pi	Piscivores	no trend	r^2=0.06, p=0.116	no trend	r^2=0.01, p=0.504
Sh	Shorebirds	decline	r^2=0.26, p<0.001	decline	r^2=0.18, p=0.005

Table 3. Trends in abundances of game species from the Eastern Australian Waterbird Aerial Survey (1983-2025).

Species	Trend	Variance and significance (all years)	Trend	Variance and significance (1983-84 omitted)
Pacific Black Duck	decline	r^2=0.22, p=0.002	decline	r^2=0.11, p=0.036
Australasian Shoveler	decline	r^2=0.42, p<0.001	decline	r^2=0.34, p<0.001
Chestnut Teal	no trend	r^2=0.01, p=0.465	no trend	r^2=0.001, p=0.816
Grey Teal	decline	r^2=0.22, p=0.002	decline	r^2=0.13, p=0.023
Hardhead	no trend	r^2=0.06, p=0.124	no trend	r^2=0.03, p=0.325
Mountain Duck	decline	r^2=0.31, p<0.001	decline	r^2=0.23, p=0.002
Pink-eared Duck	no trend	r^2=0.06, p=0.111	no trend	r^2=0.06, p=0.114
Australian Wood Duck	decline	r^2=0.12, p=0.026	no trend	r^2=0.03, p=0.298

2025 Total abundance index - 375,419

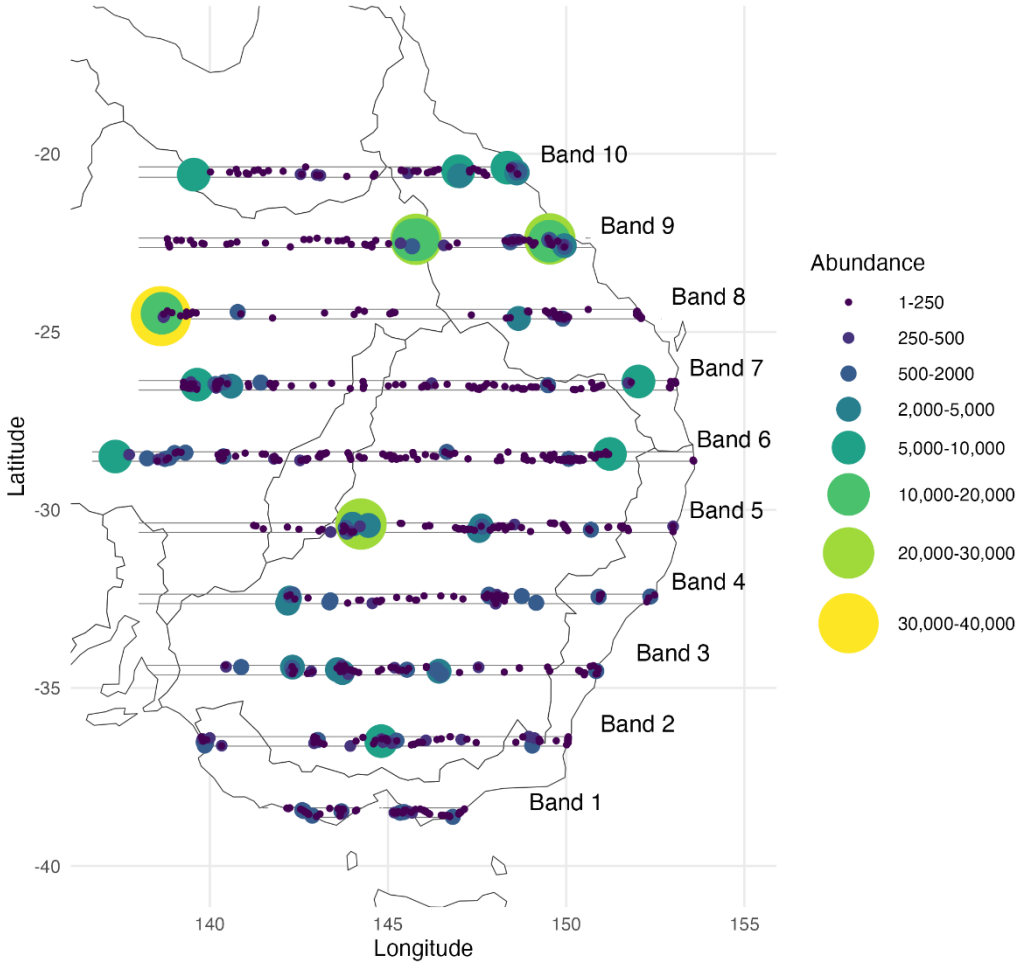


Figure 5. Distribution and abundance of waterbirds in the 2025 Eastern Australian Waterbird Aerial Survey bands. Dry wetlands and those with zero waterbirds or outside survey bands are not plotted.

2025 Total breeding index – 1,270

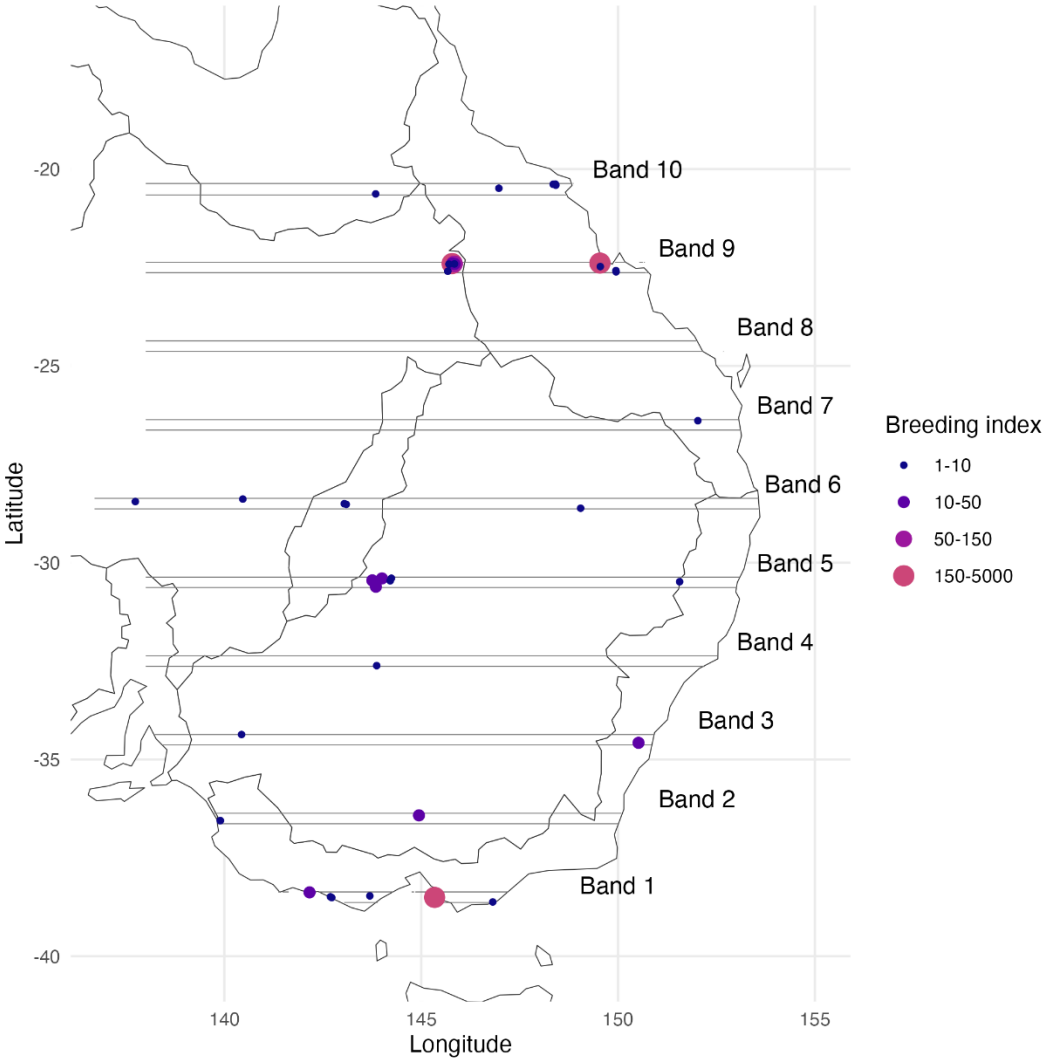


Figure 6. Distribution of waterbird breeding (nests and broods) in the 2025 Eastern Australian Waterbird Aerial Survey bands. Only wetlands with breeding recorded within survey bands are plotted.

2025 Total wetland area index – 334,325 ha

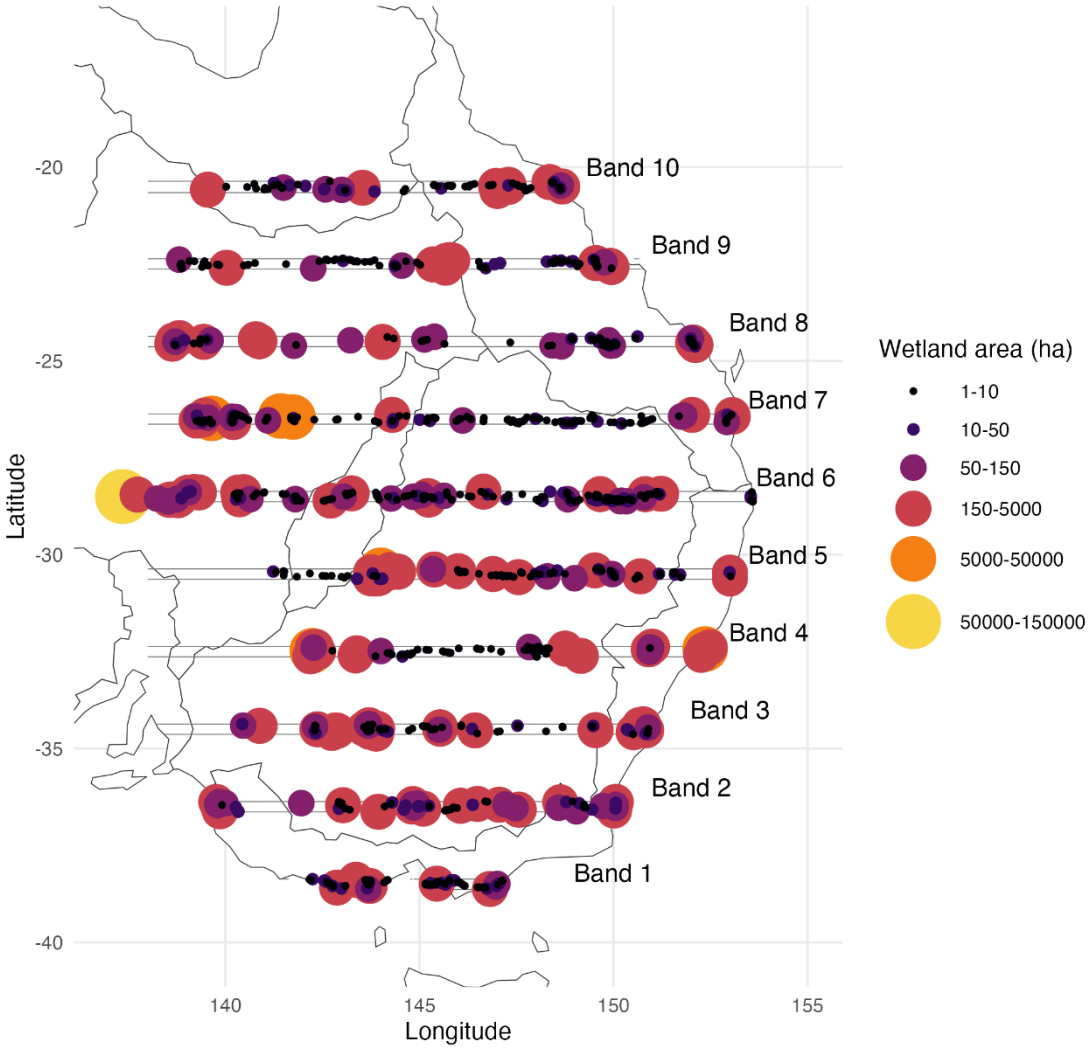


Figure 7. Distribution of wetland area in the 2025 Eastern Australian Waterbird Aerial Survey bands. All surveyed wetlands with surface water present are plotted; dry wetlands (and areas outside of the survey bands) are not shown.

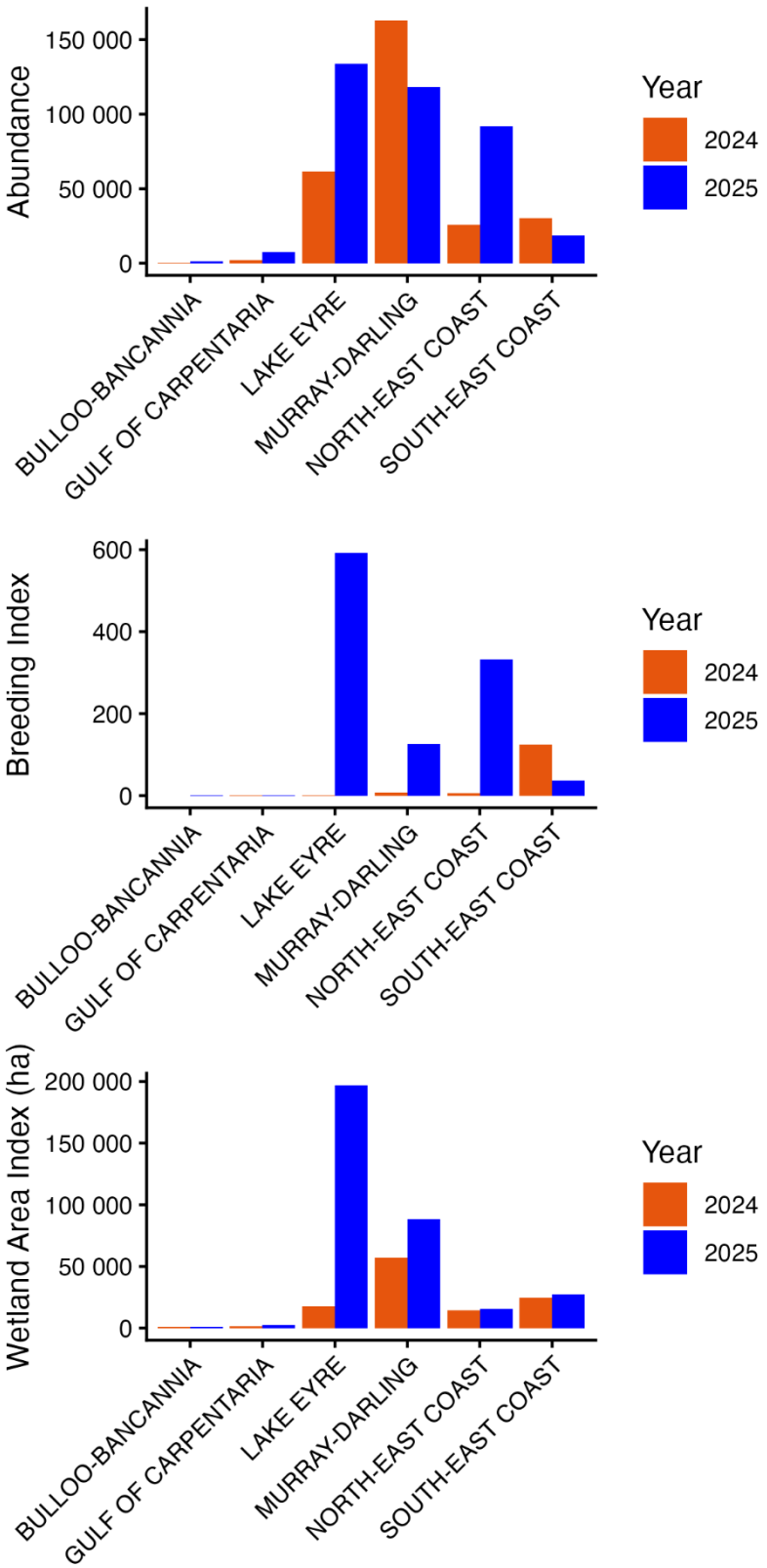


Figure 8. Comparison of waterbird abundance, breeding and wetland area indices in major river basins 2024-2025.

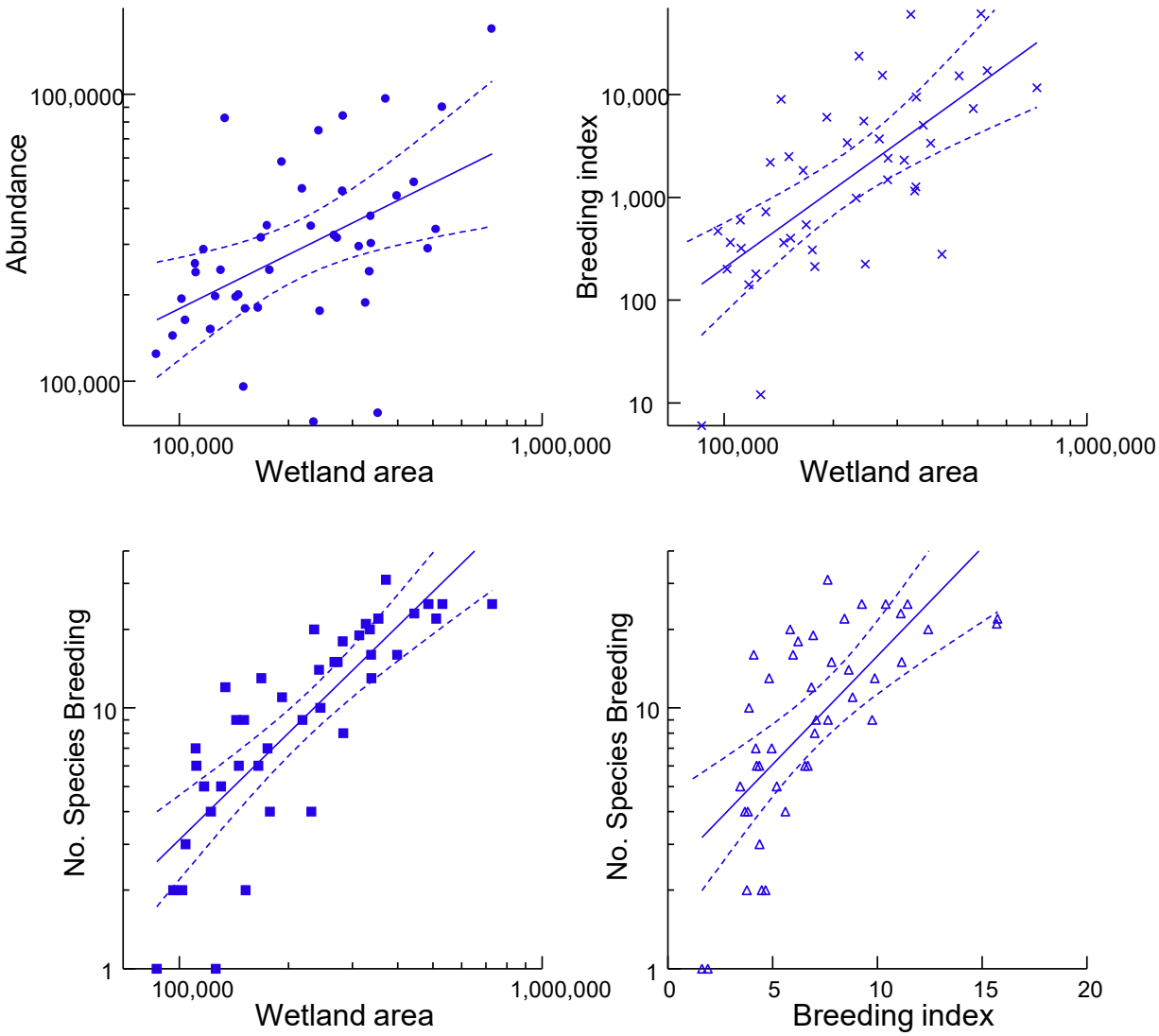


Figure 9. Significant positive interactions between abundance index, breeding index and number of breeding species with wetland area index (ha) for the Eastern Australian Waterbird Aerial Survey (1983-2025). Also shown is the relationship between number of breeding species and breeding index (abundance). Dashed lines are 95% confidence limits.

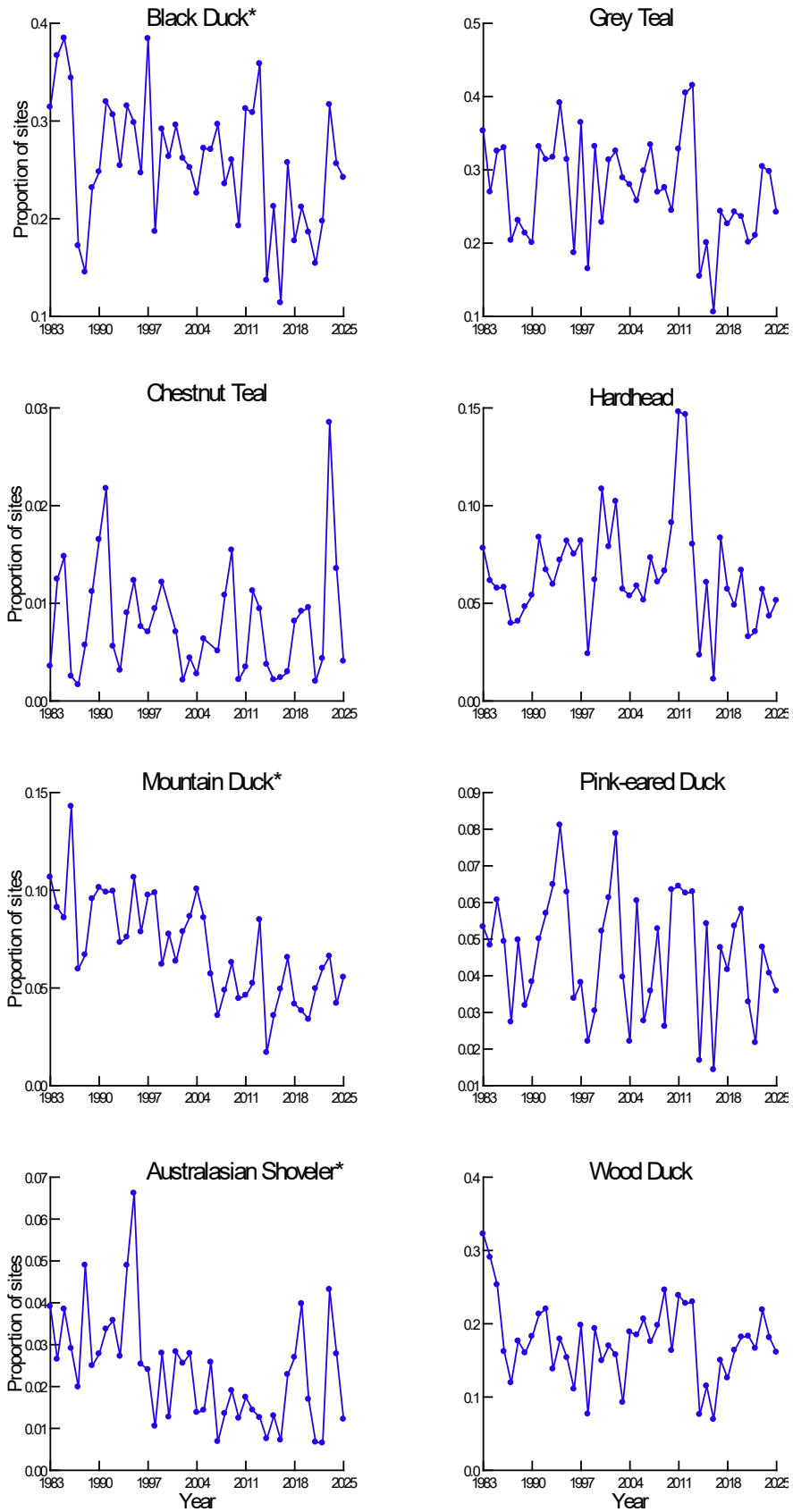


Figure 10. Proportion of wetland sites occupied for eight game species (1983-2025); asterisk indicates species with significant decline over time. Nil (zero) count wetlands were excluded from analysis.

Pacific Black Duck

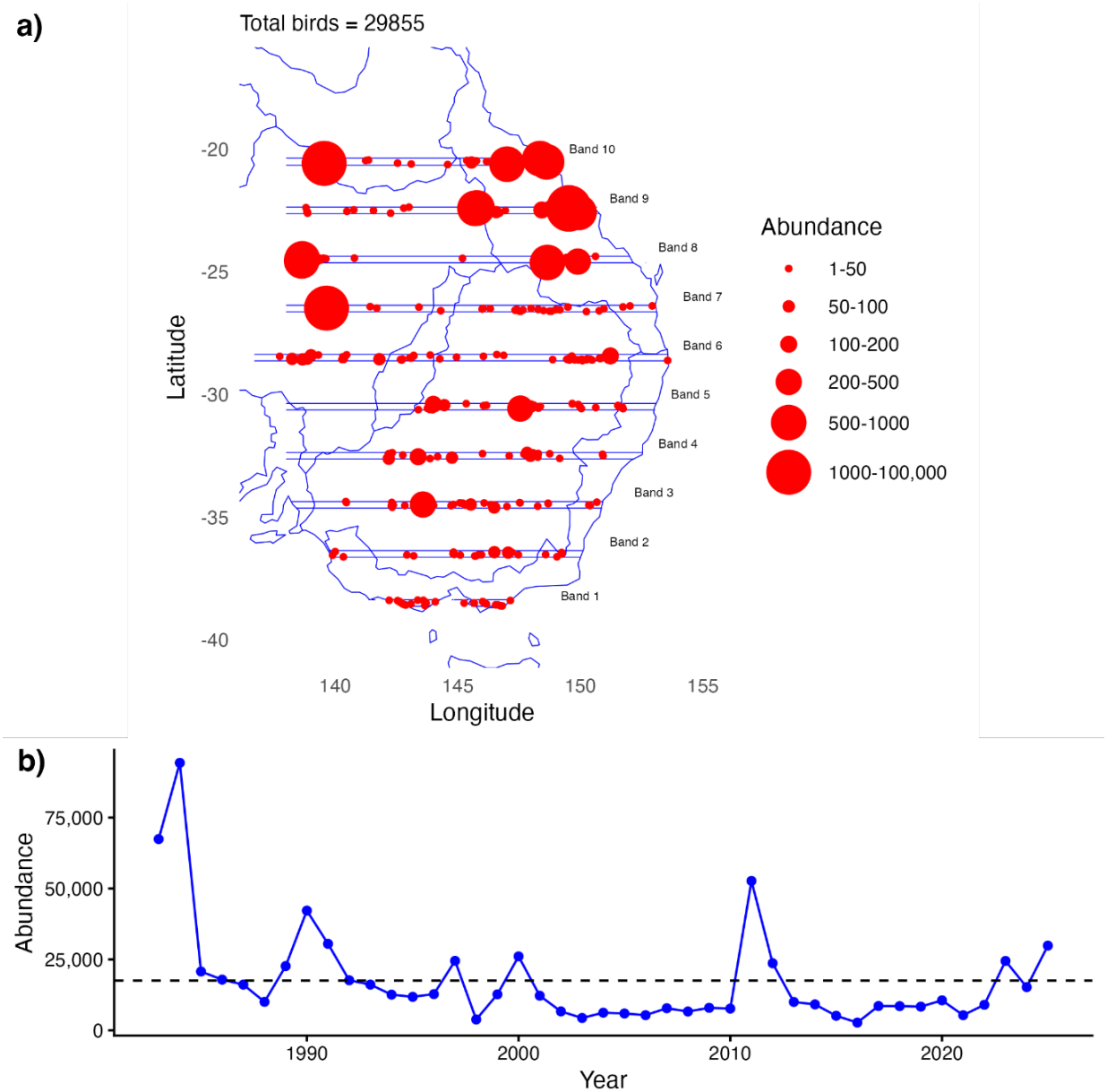


Figure 11. a) Distribution and abundance of Pacific Black Duck during the 2025 Eastern Australian Waterbird Aerial Survey. B) Changes in abundance (1983-2025); horizontal line show long-term average.

Australasian Shoveler

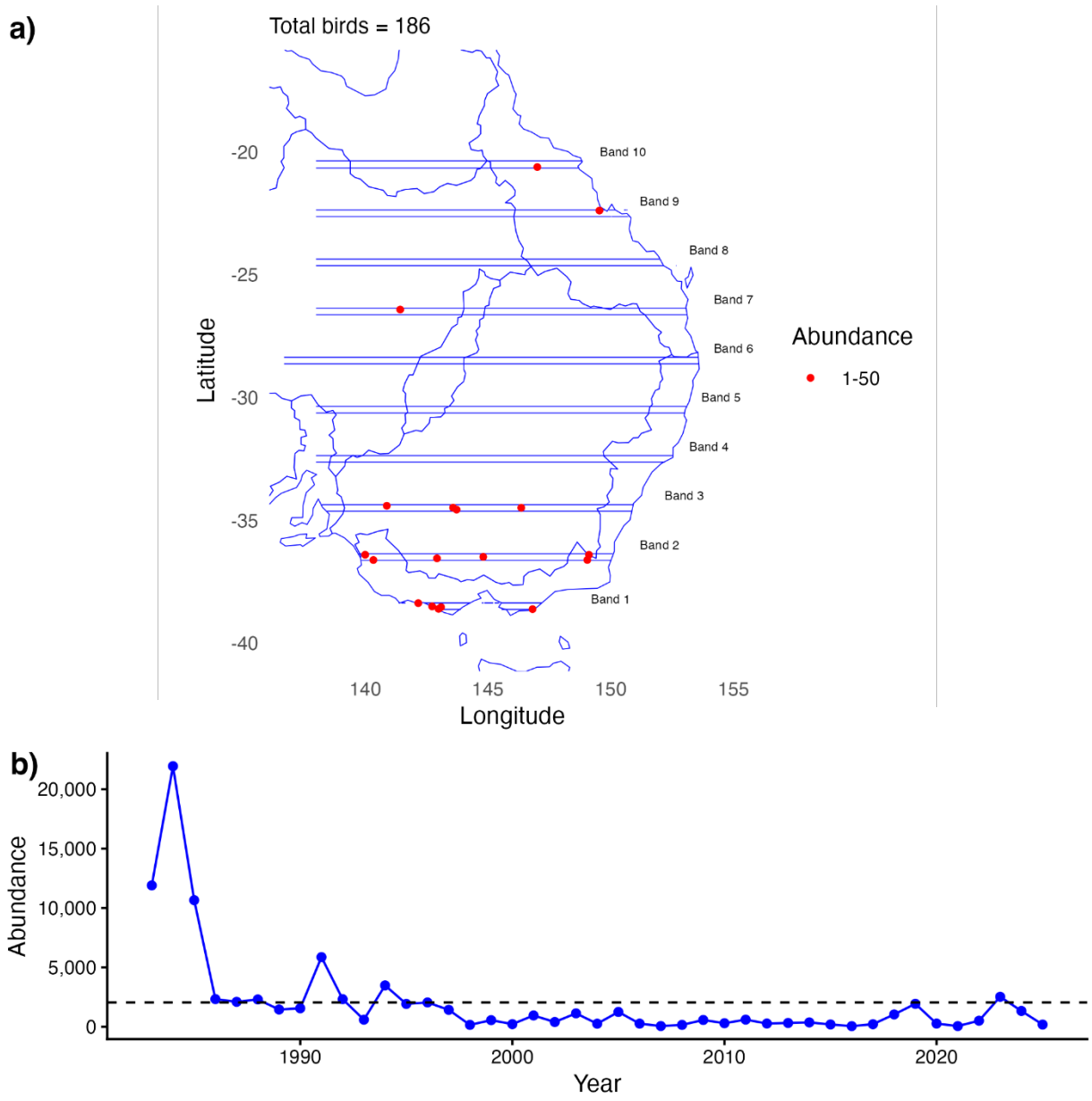


Figure 12. a) Distribution and abundance of Australasian Shoveler during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Chestnut Teal

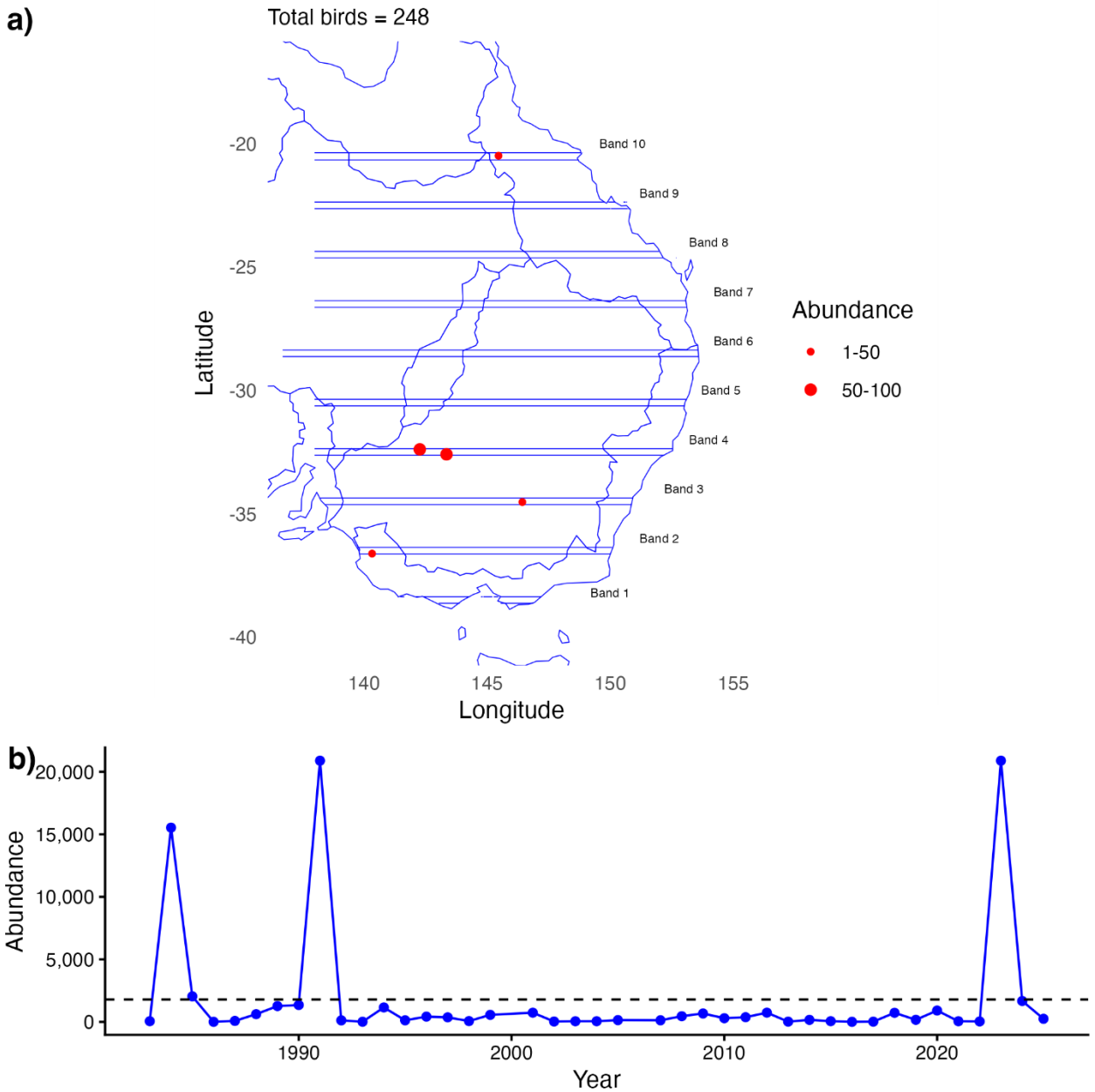


Figure 13. a) Distribution and abundance of Chestnut Teal during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Grey Teal

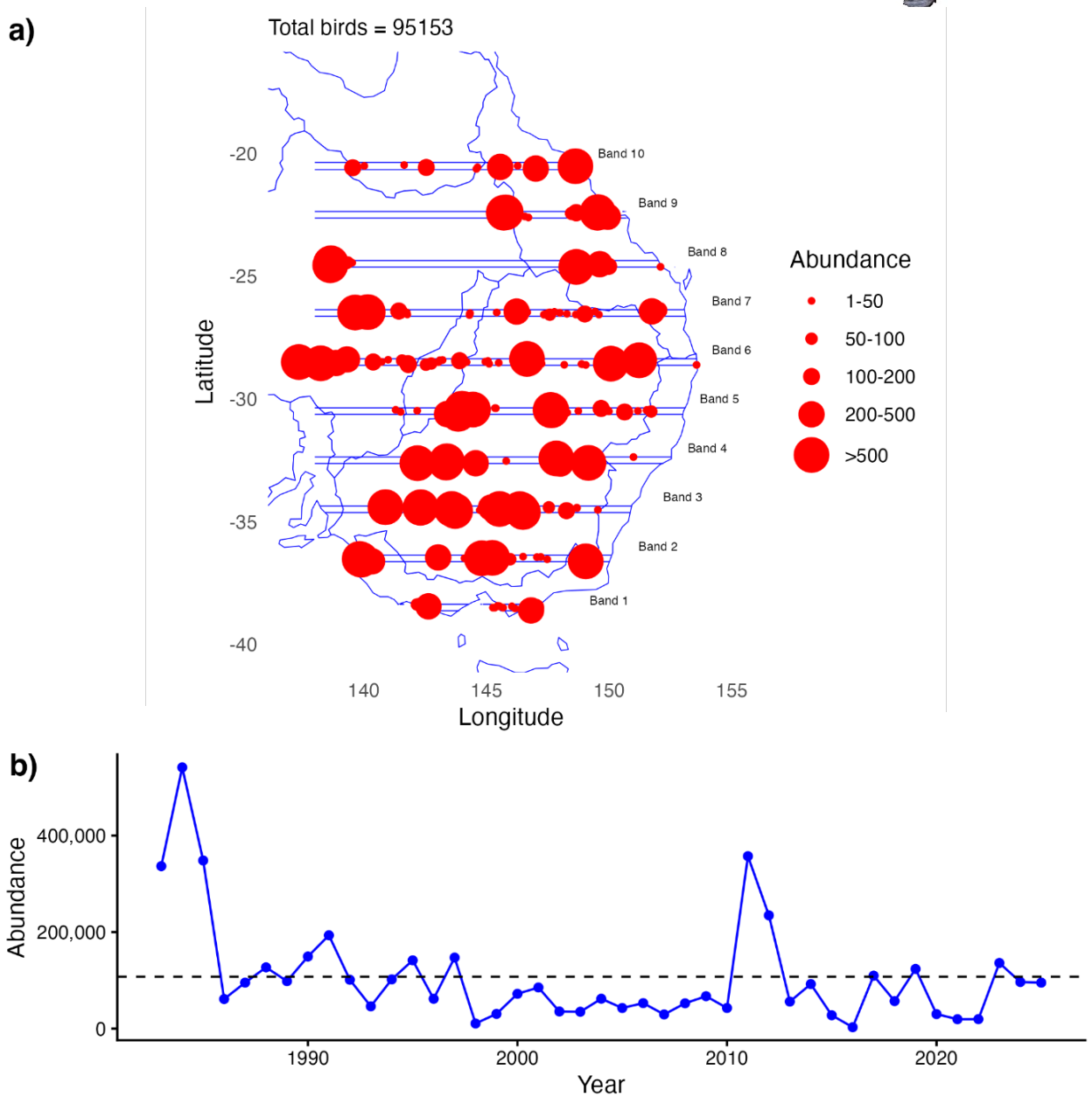


Figure 14. a) Distribution and abundance of Grey Teal during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Hardhead

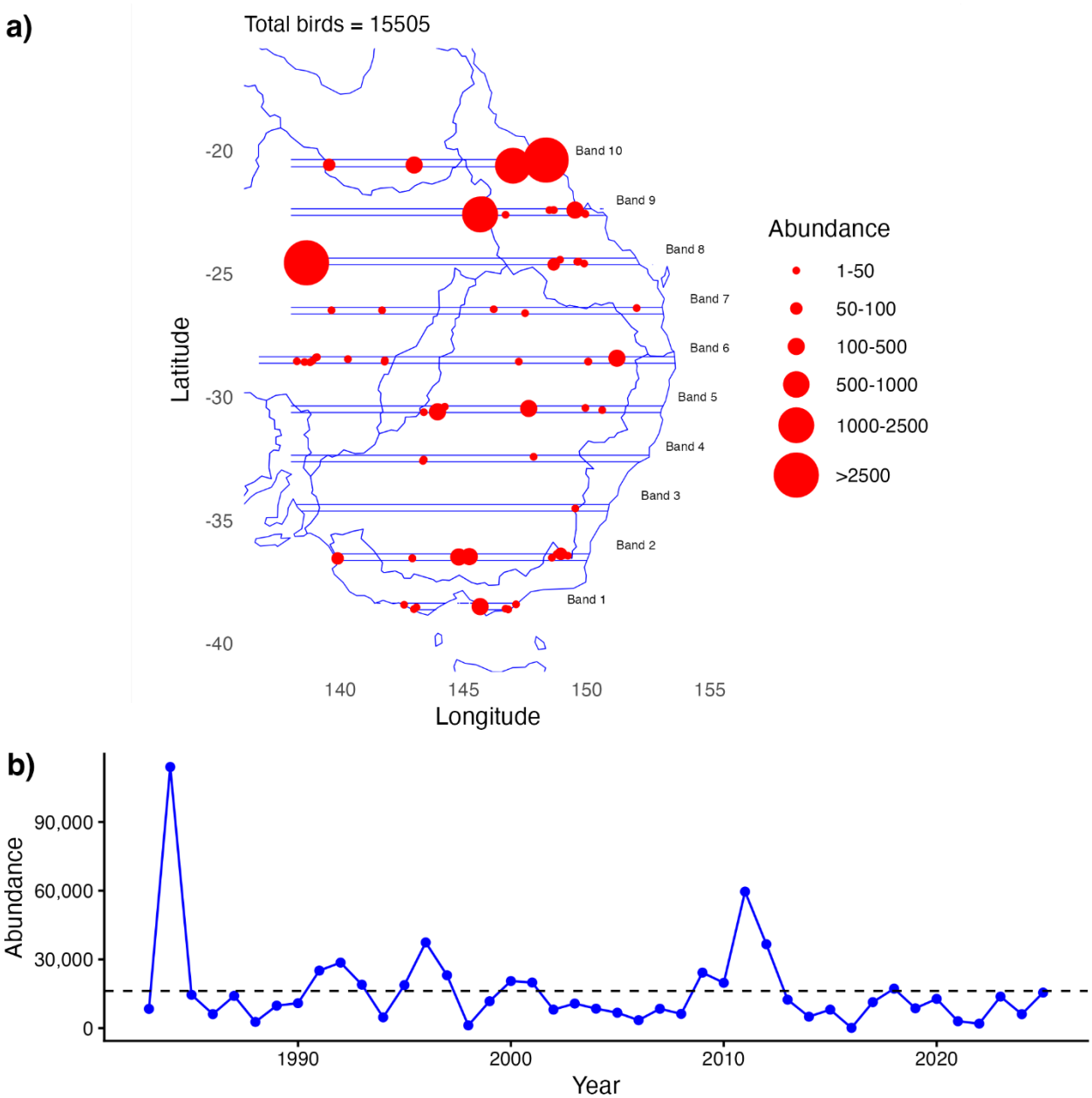


Figure 15. a) Distribution and abundance of Hardhead during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Freckled Duck

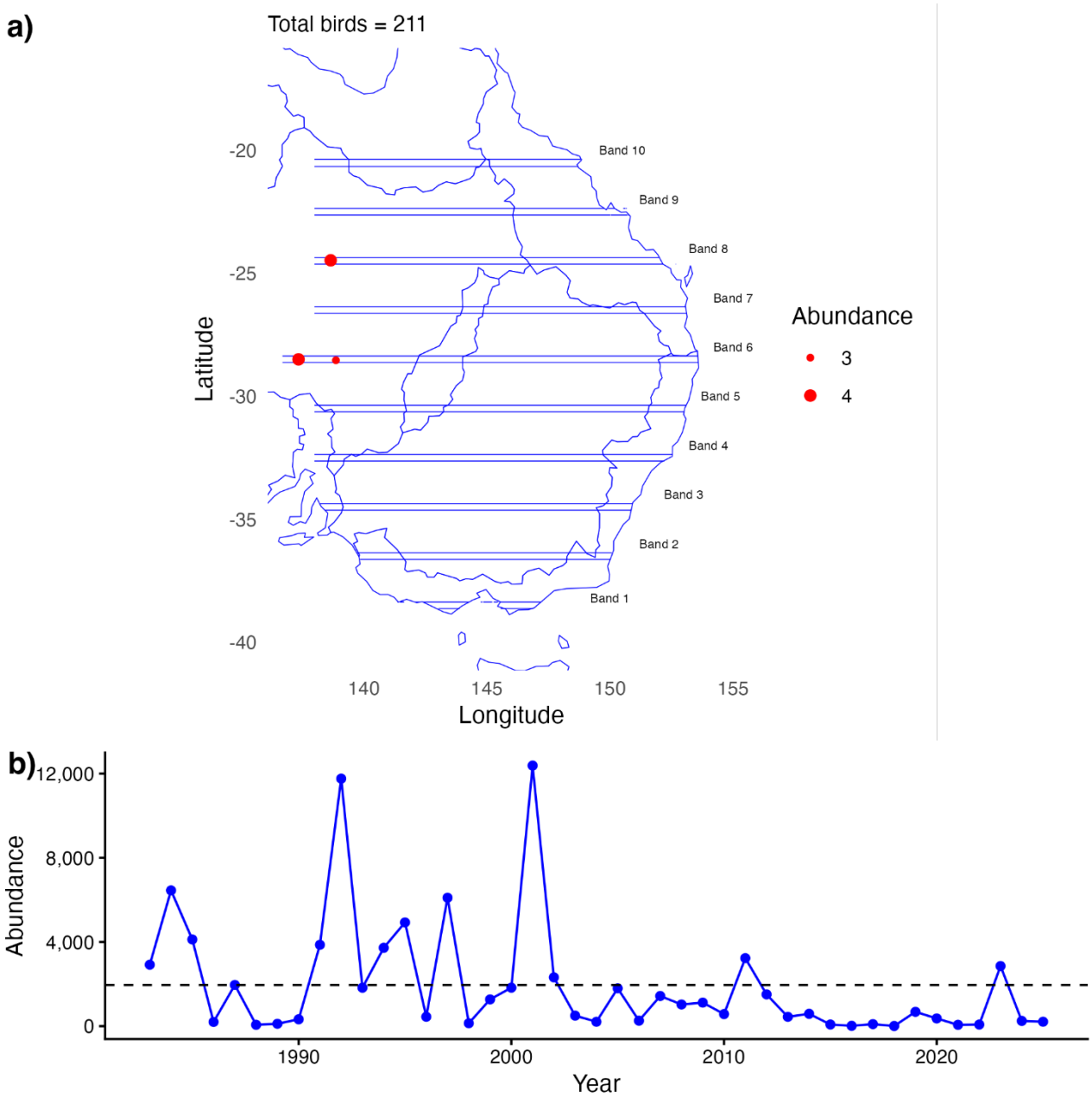


Figure 16. a) Distribution and abundance of Freckled Duck during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Australian Shelduck

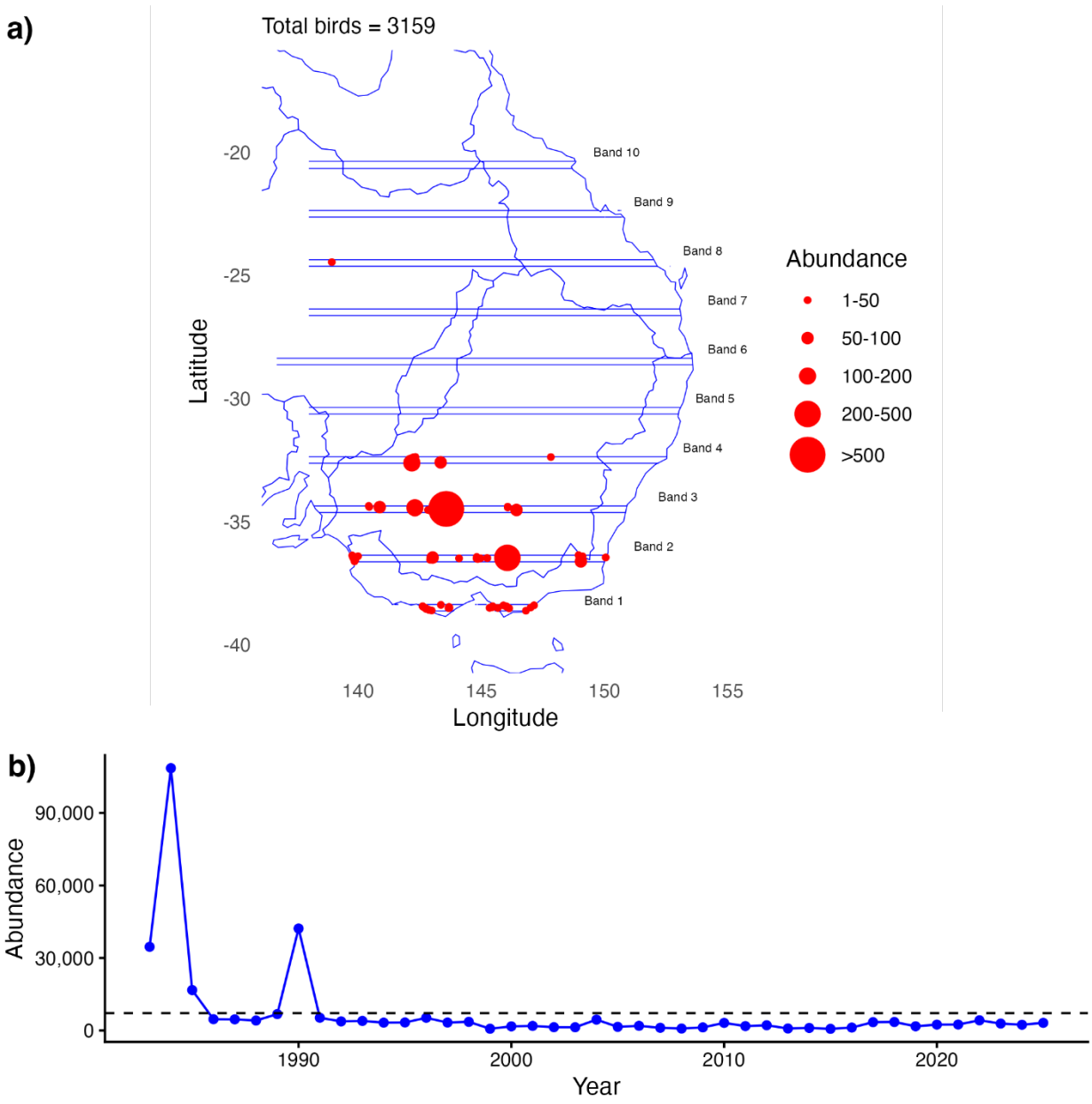


Figure 17. a) Distribution and abundance of Australian Shelduck during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Pink-eared Duck

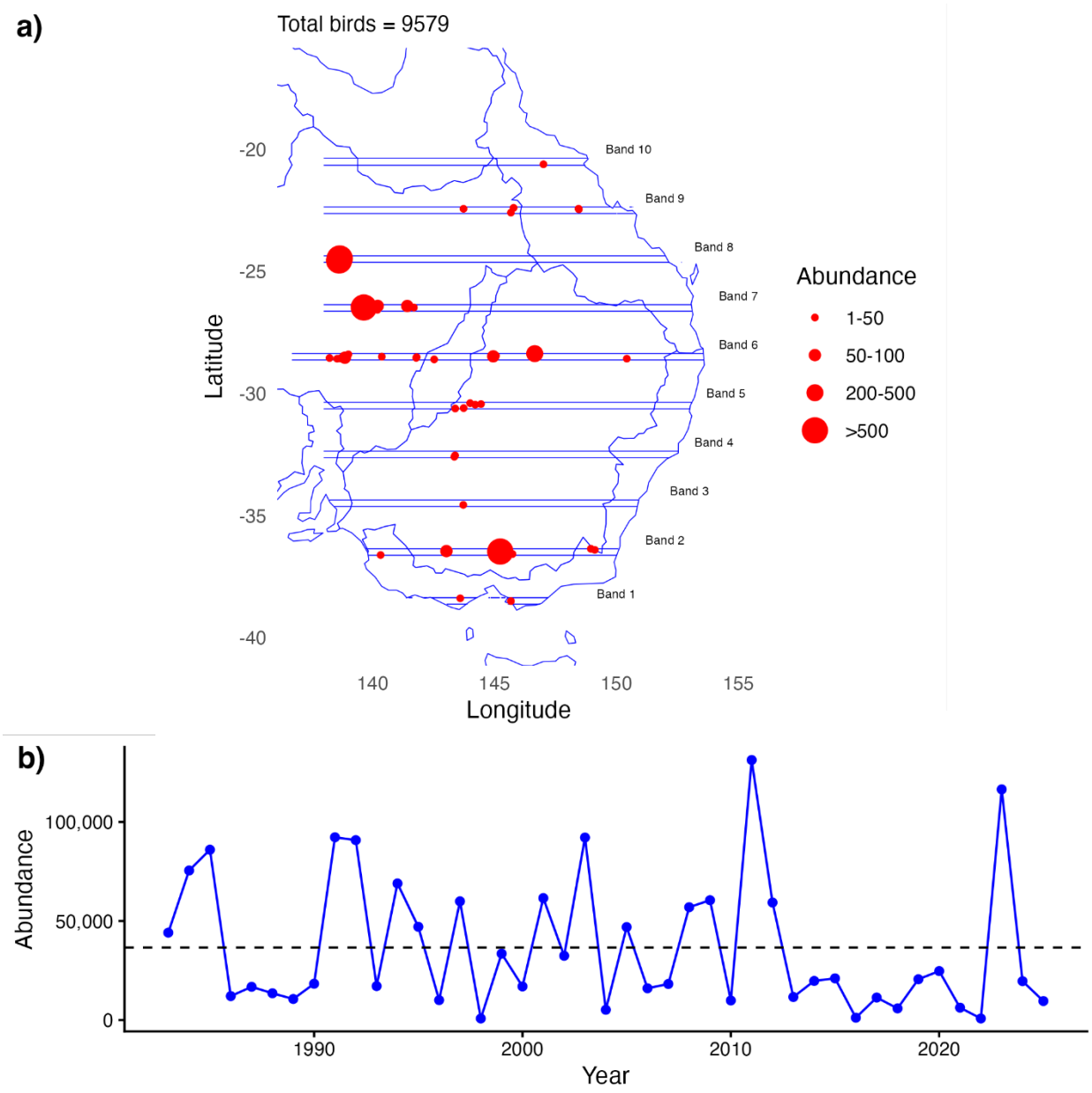
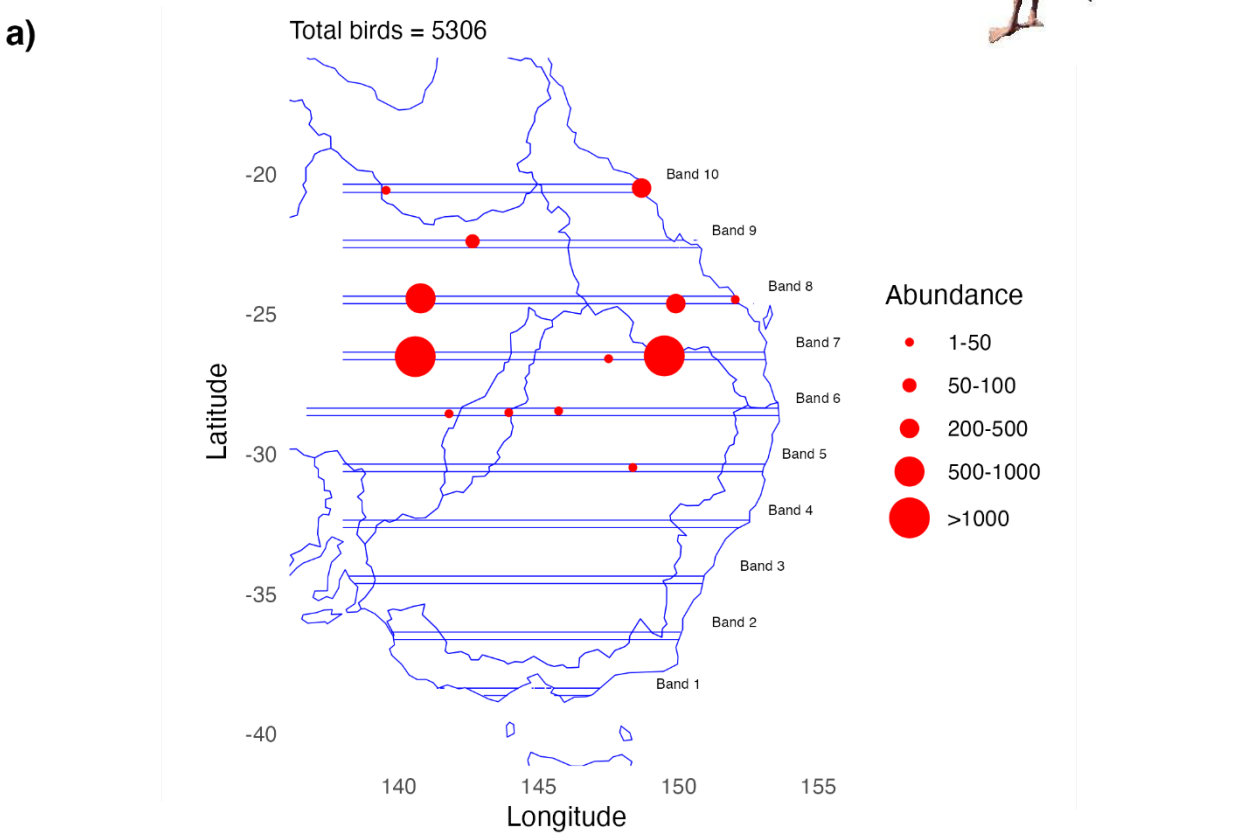


Figure 18. a) Distribution and abundance of Pink-eared Duck during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Plumed Whistling Duck



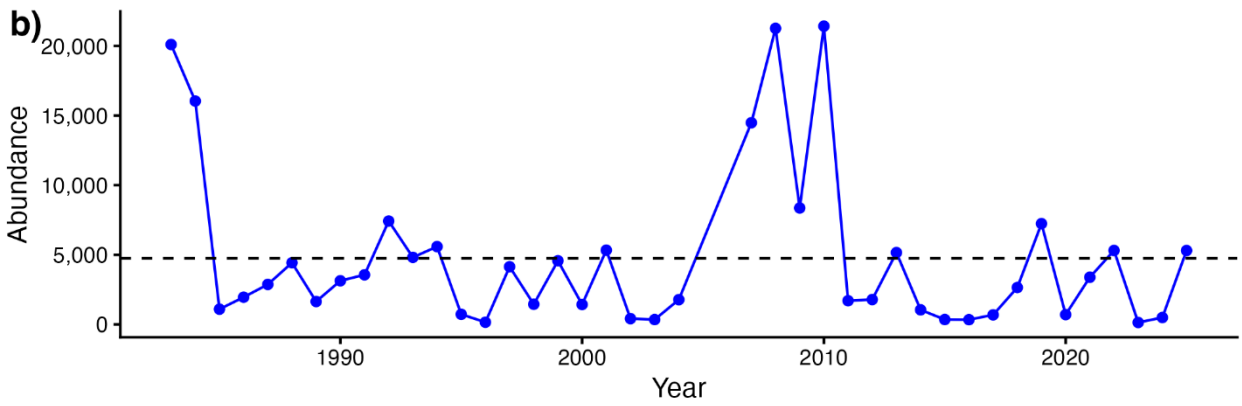


Figure 19. a) Distribution and abundance of Plumed Whistling Duck during the 2025 Eastern Australian Waterbird Aerial Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

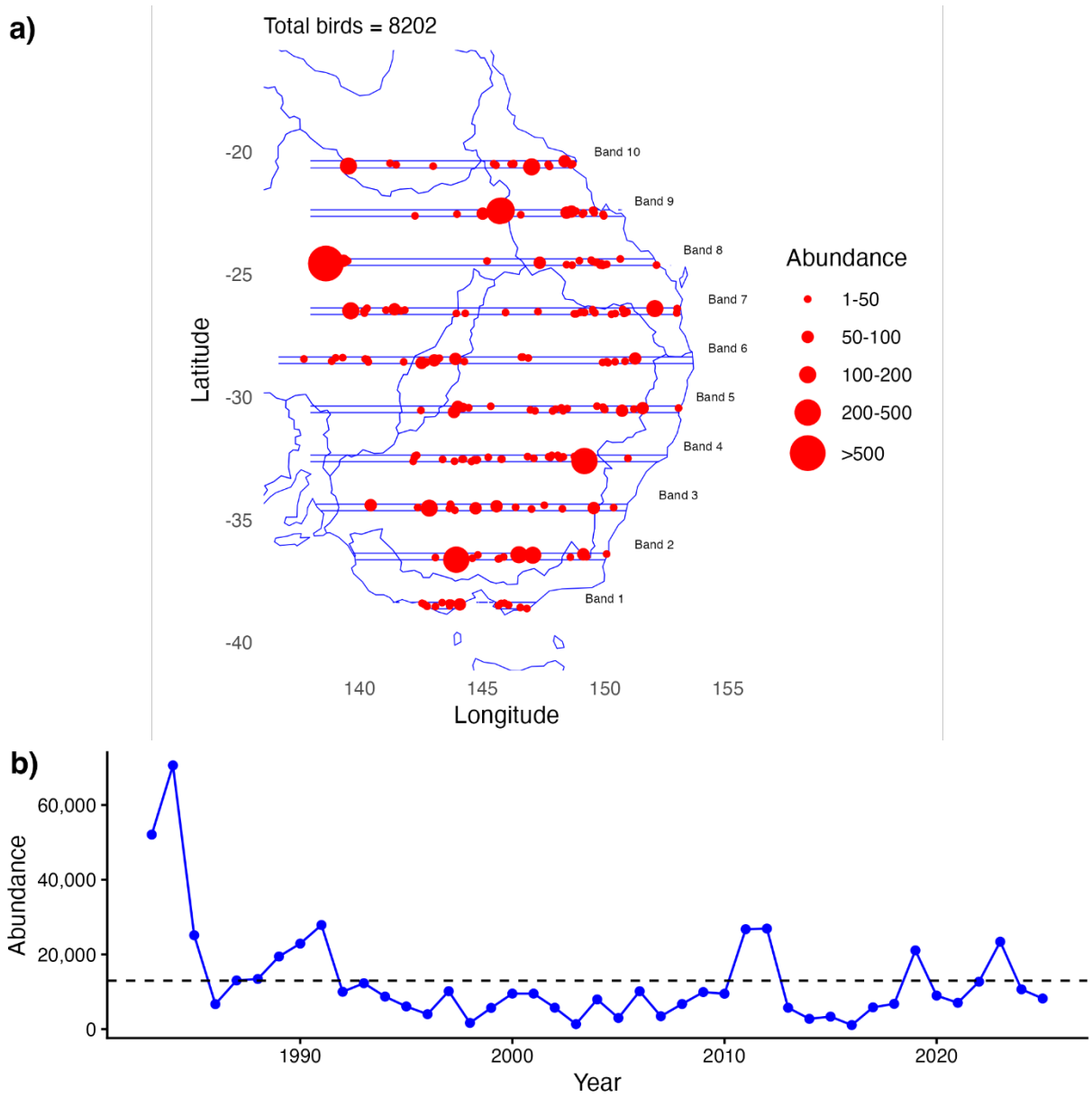


Figure 20. a) Distribution and abundance of Australian Wood Duck during the 2025 Eastern Australian Waterbird Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

Australian Pelican

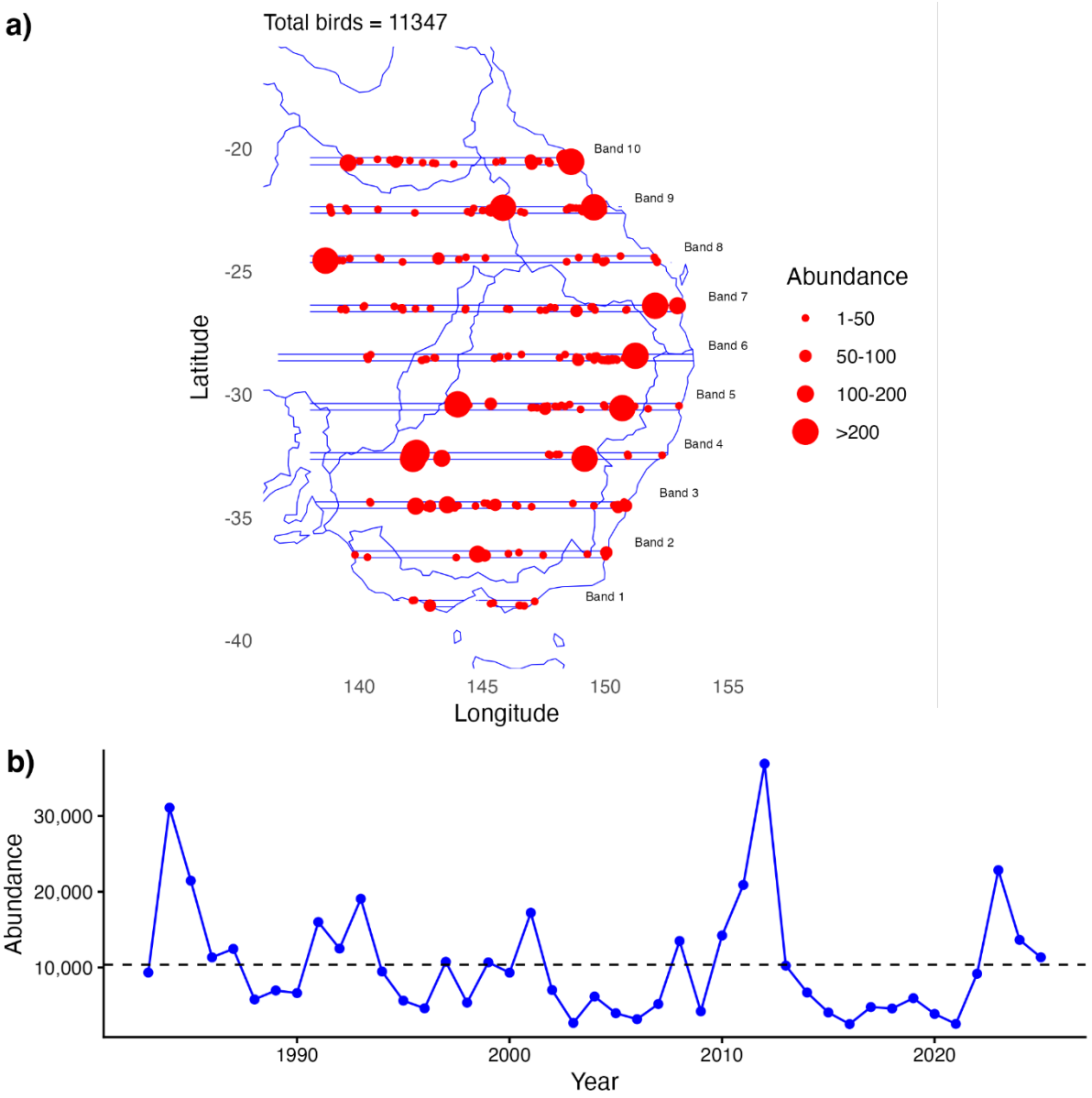


Figure 21. a) Distribution and abundance of Australian Pelican during the 2025 Eastern Australian Waterbird Survey. b) Changes in abundance (1983-2025); horizontal line show long-term average.

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Appendix 1. Waterbird species, common names and functional (Fx) groups identified during aerial survey (Gill et al. 2023).

Common Name	Fx_Group	SppCode	ScientificName
Australasian Darter	Pi	DAR	*Anhinga novaehollandiae*
Australasian Grebe	Du	ALG	*Tachybaptus novaehollandiae*
Australasian Shoveler	Du	BWS	*Spatula rhynchotis*
Australasian Swamphen	He	SHE	*Porphyrio melanotus melanotus*
Australian Pelican	Pi	PEL	*Pelecanus conspicillatus*
Australian Pied Cormorant	Pi	PCO	*Phalacrocorax varius*
Australian Pratincole	Sh	APR	*Stiltia isabella*
Australian Shelduck (Mountain Duck)	He	MNU	*Tadorna tadornoides*
Australian White Ibis	La	WHI	*Threskiornis molucca*
Banded Lapwing	Sh	BDP	*Vanellus tricolor*
Banded Stilt	Sh	BST	*Cladorhynchus leucocephalus*
Black Bittern	La	BBN	*Ixobrychus flavicollis*
Black Swan	He	BSW	*Cygnus atratus*
Black-fronted Dotterel	Sh	BFP	*Elseyornis melanops*
Black-necked Stork	La	JAB	*Ephippiorhynchus asiaticus*
Black-tailed Native-hen	He	BTN	*Tribonyx ventralis*
Brolga	La	BRL	*Antigone rubicunda*
Cape Barren Goose	He	CBG	*Cereopsis novaehollandiae*
Caspian Plover	Sh	CAP	*Charadrius asiaticus*
Caspian Tern	Pi	CST	*Hydroprogne caspia*
Chestnut Teal	Du	CTL	*Anas castanea*
Common Greenshank	Sh	GNK	*Tringa nebularia*
Cotton Pygmy Goose	Du	WPG	*Nettapus coromandelianus*
Curlew Sandpiper	Sh	CSP	*Calidris ferruginea*
Dusky Moorhen	He	MHE	*Gallinula tenebrosa*
Egrets	La	EGR	*Ardea/Egretta sp.*
Eurasian Coot	He	COT	*Fulica atra*
Freckled Duck	Du	FDU	*Stictonetta naevosa*
Glossy Ibis	La	GLI	*Plegadis falcinellus*
Great Cormorant	Pi	GRC	*Phalacrocorax carbo*
Great Crested Grebe	Pi	GCG	*Podiceps cristatus*
Great Egret	La	LGE	*Ardea alba*
Greater Crested Tern	Pi	CTN	*Thalasseus bergii*
Green Pygmy-goose	Du	GPG	*Nettapus pulchellus*
Grey Teal	Du	GTL	*Anas gracilis*
Gull-billed Tern	Pi	GBT	*Gelochelidon nilotica*
Hardhead	Du	HHD	*Aythya australis*
Intermediate Egret	La	PLE	*Ardea intermedia*
Kelp Gull	Pi	KGU	*Larus dominicanus*

Appendix 1. (Continued) Waterbird species, common names and functional (Fx) groups identified during aerial survey (Gill et al. 2023).

Common Name	Fx_Group	SppCode	ScientificName
Large Waders	Sh	LGW	*large wader sp.*
Little Black Cormorant	Pi	LBC	*Phalacrocorax sulcirostris*
Little Egret	La	LTE	*Egretta garzetta*
Little Pied Cormorant	Pi	LPC	*Microcarbo melanoleucos*
Magpie Goose	He	MPG	*Anseranas semipalmata*
Masked Lapwing	Sh	MLW	*Vanellus miles*
Nankeen Night Heron	La	NKE	*Nycticorax caledonicus*
Pacific Black Duck	Du	BDU	*Anas superciliosa*
Pied Heron	La	PIH	*Egretta picata*
Pied Stilt	Sh	WHS	*Himantopus luecocephalus*
Pink-eared Duck	Du	PED	*Malacorhynchus membranaceus*
Plumed Whistling Duck	He	GWD	*Dendrocygna eytoni*
Radjah Shelduck	Du	BKU	*Radjah radjah*
Red-necked Avocet	Sh	AVO	*Recurvirostra novaehollandiae*
Royal Spoonbill	La	RSB	*Platalea regia*
Silver Gull	Pi	SGU	*Chroicocephalus novaehollandiae*
Small Grebes	Du	GRE	*small grebe sp.*
Small Waders	Sh	SMW	*small wader sp.*
Sooty Oystercatcher	La	SOC	*Haematopus fuliginosus*
Spotted Whistling Duck	Du	SWD	*Dendrocygna guttata*
Stilt Sandpiper	Sh	LSP	*Calidris himantopus*
Straw-necked Ibis	La	SNI	*Threskiornis spinicollis*
Unidentified Godwit	Sh	GOD	*Godwit sp.*
Unidentified Tern	Pi	TRN	*Tern sp.*
Wandering Whistling Duck	Du	WWD	*Dendrocygna arcuata*
Western Cattle Egret	La	CEG	*Bubulcus ibis*
Whiskered Tern	Pi	MST	*Chlidonias hybrida*
White-faced Heron	La	WFH	*Egretta novaehollandiae*
White-necked Heron	La	WNH	*Ardea pacifica*
Wood (Maned) Duck	He	WDU	*Chenonetta jubata*
Yellow-billed Spoonbill	La	YSB	*Platalea flavipes*
Zero Count	Ze	NIL	