Aerial Survey of Wetland Birds in Eastern Australia - October 2020 Annual Summary Report

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2020 Aerial Survey of Wetland Birds in Eastern Australia Summary

1. Average to above average rainfall in most of eastern Australia from January to April 2020 has enabled partial recovery of some of the rainfall deficiencies, but significant further rain is required for a substantial recovery in Murray−Darling Basin water bodies after record breaking drought during 2016-2019.[1]

2. There has been limited recovery in water storage levels in the Murray-Darling Basin with the rain since January 2020 [1]. Water storages in the northern Basin reached the record low of 5.4% of combined capacity in mid-January, 7.5% lower than at any point during the Millennium Drought.

3. At December 2020, around 67% of Queensland was in drought or drought affected [3]; in NSW 10% of the state is in drought or drought affected [2]. Around 70% of South Australia is drought affected [4]. Most of Victoria has received average rainfall during 2020, but long term (4 year) deficiencies persist in the north west and south east [1].

4. Four major indices for waterbirds (total abundance, breeding index, number of species breeding and wetland area index) continue to show significant declines over time. If 1983 & 1984 peak years are omitted then 3 of the 4 major indices still show significant decline (OLS regression at p=0.05; variables 4th root or log transformed where appropriate; Fig. 1; Table 1). Long term trends are more informative for predicting population status than year to year fluctuations.

5. Total waterbird abundance in 2020 (n=162,824) decreased from 2019 and remains well below average: the 6th lowest in 38 years. Waterbirds were most abundant in bands 5 and 10 (Figs 1, 2 & 5).

6. Breeding species' richness and breeding abundance, decreased considerably compared to the previous year; breeding was widely distributed across most survey bands (Fig. 6) and comprised mostly of black swans.

7. Species functional response groups (feeding guilds) all showed significant long term declines (OLS regression at p=0.05; variables 4th root or log transformed where appropriate. 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).

8. Wetland area index (104,014 ha) was the fifth lowest since surveys began, well below the long term average. Some rivers and wetlands in the northern Lake Eyre Basin including the Diamantina and Georgina rivers, held small amounts of water and supported low numbers of waterbirds. Lakes Torquinnie, Mumbleberry and Galilee were dry; The largest concentrations of waterbirds were located in the Paroo overflow Lakes, the Macquarie Marshes and Goorganga Creek floodplain and Lake Moondarra in the north (Fig. 5).

9. The Macquarie Marshes had moderate levels of water augmented by environmental flows, provided by the NSW Government and Commonwealth managed environmental water and supported considerable numbers and diversity of waterbirds. The Lowbidgee wetlands had low to moderate inundation, and they supported moderate numbers of waterbirds with no breeding recorded. The southern-most wetlands in the Menindee Lakes system were mostly dry, while outside the survey band to the north Copi Hollow and Lakes Wetherell, Pamamaroo, Bijiji and Balaka held water. Overall, there were few waterbirds and no breeding activity. The Tallywalka lakes system was also dry (Fig. 7).

2020 Aerial Survey of Wetland Birds in Eastern Australia
Summary (continued)

10. Waterbirds were more widely dispersed than in the previous year; 5 wetlands supported more than 5,000 waterbirds representing 35% of the total abundance – three of these occurred in the Murray-Darling Basin (Fig. 5). These areas were distributed in bands 10 and 5 and generally supported high species diversity (Figs 2 & 7). More than 48% of surveyed wetlands supported no waterbirds (includes wetlands that were dry).

11. Total breeding index (nests + broods) was 364 (all species combined), a considerable decrease from the previous year (1,987) and well below the long term average (Figs. 1 & 6). Breeding species' richness was extremely low, with only 3 species recorded breeding, the sixth lowest on record. Black swans comprised most of the breeding recorded (296), 81% of the total.

12. All game species abundances were well below long term averages, in some cases by an order of magnitude; five out of eight species continue to show significant long term declines (OLS regression at p=0.05; variables 4th root or log transformed where appropriate. Table 3). Grey teal declined significantly from the previous year (Fig. 13).

13. Waterbird indices across river basins generally reflected low levels of available of habitat and drought intensity in the preceding 4 years; 2020 abundance and wetland area rose sharply in the Murray-Darling Basin compared to the previous year. Conversely abundance in the Lake Eyre basin decreased strongly after available habitat declined (Fig. 8).

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

15. Selected species distribution and abundances are shown in figures 10-19; Freckled duck and Plumed whistling-duck are included for comparison with game species. Map plots in these figures show 2020 distribution and trend plots show changes in abundance over time (1983-2020). Horizontal lines in trend plots indicate the long term average.

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We thank Sharon Ryall for logistics and Shannon Dundas (NSW DPI) and Paul Wainwright (SA Government) for acting as expert observers during the survey; thanks also to James Barkell of NSW National Parks and Wildlife, for piloting the aircraft. We also thank Ada Sanchez, Kaytlyn Davis, Zoe Ford, Matt Davis and Daniel Simpson for support, data management, graphics and quality assurance. Thanks are also due to our trainee observers: Sam Hardy, Karl Hillyard, and Jody O'Connor. Cover Picture: Main Richard Kingsford; Inset John Porter

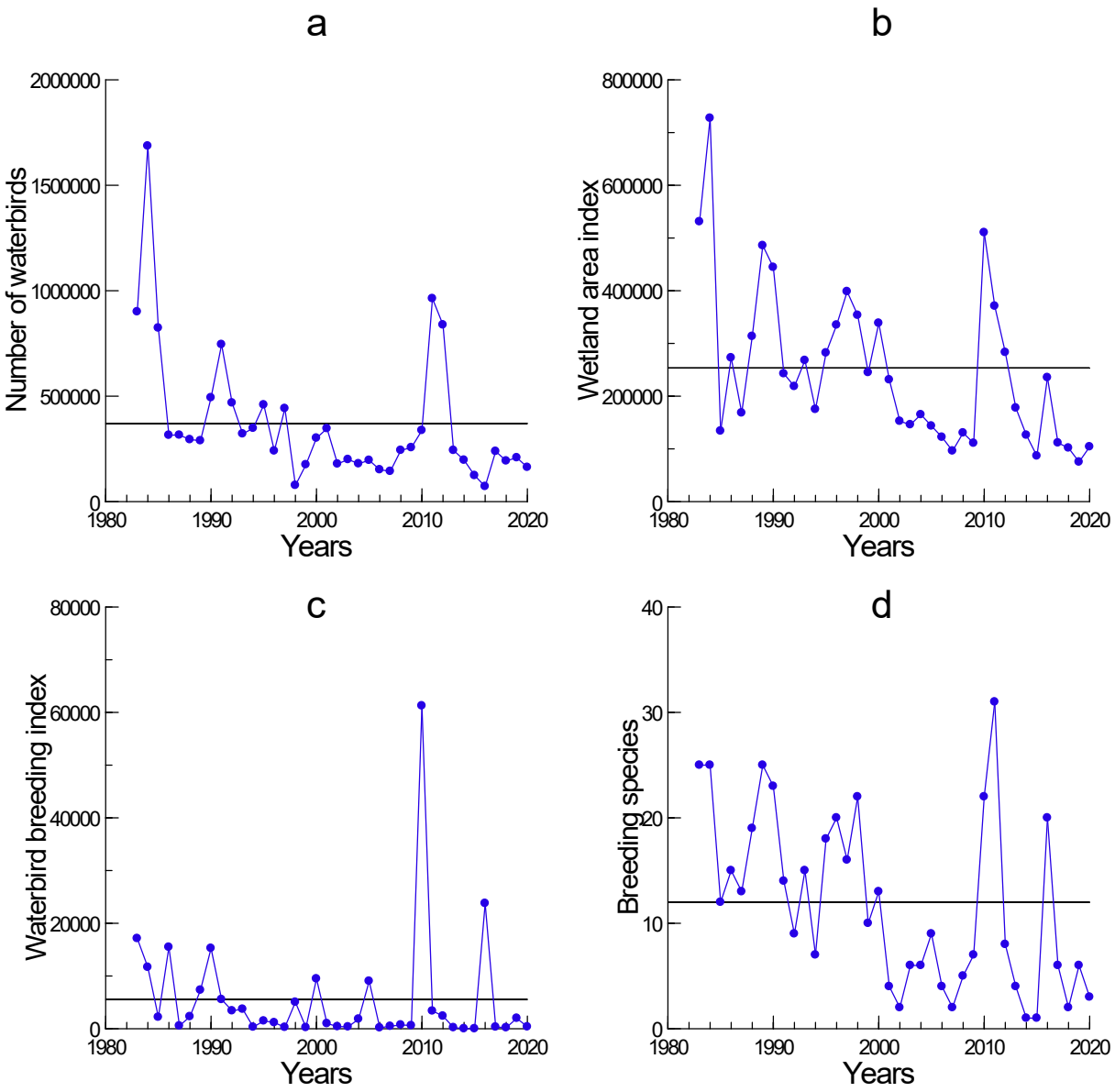

Figure 1. Changes over time in a) total abundance, b) wetland area, c) breeding and d) number of breeding species in the Eastern Australian Waterbird Survey (1983-2020); horizontal lines show long-term averages.

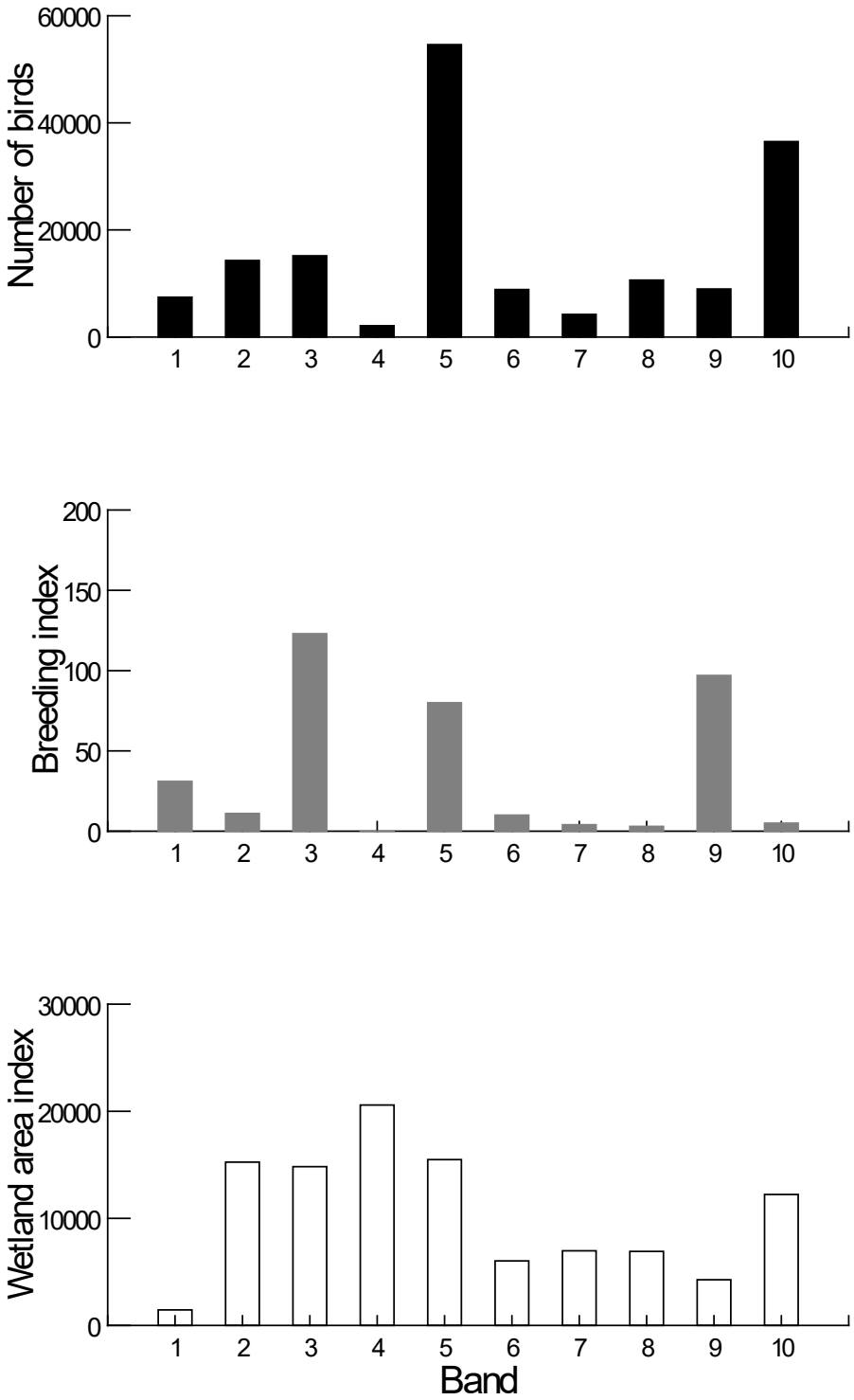

Figure 2. Distribution of waterbird abundance, breeding index and wetland area index in 10 survey bands of the Eastern Australian Waterbird Survey in 2020.

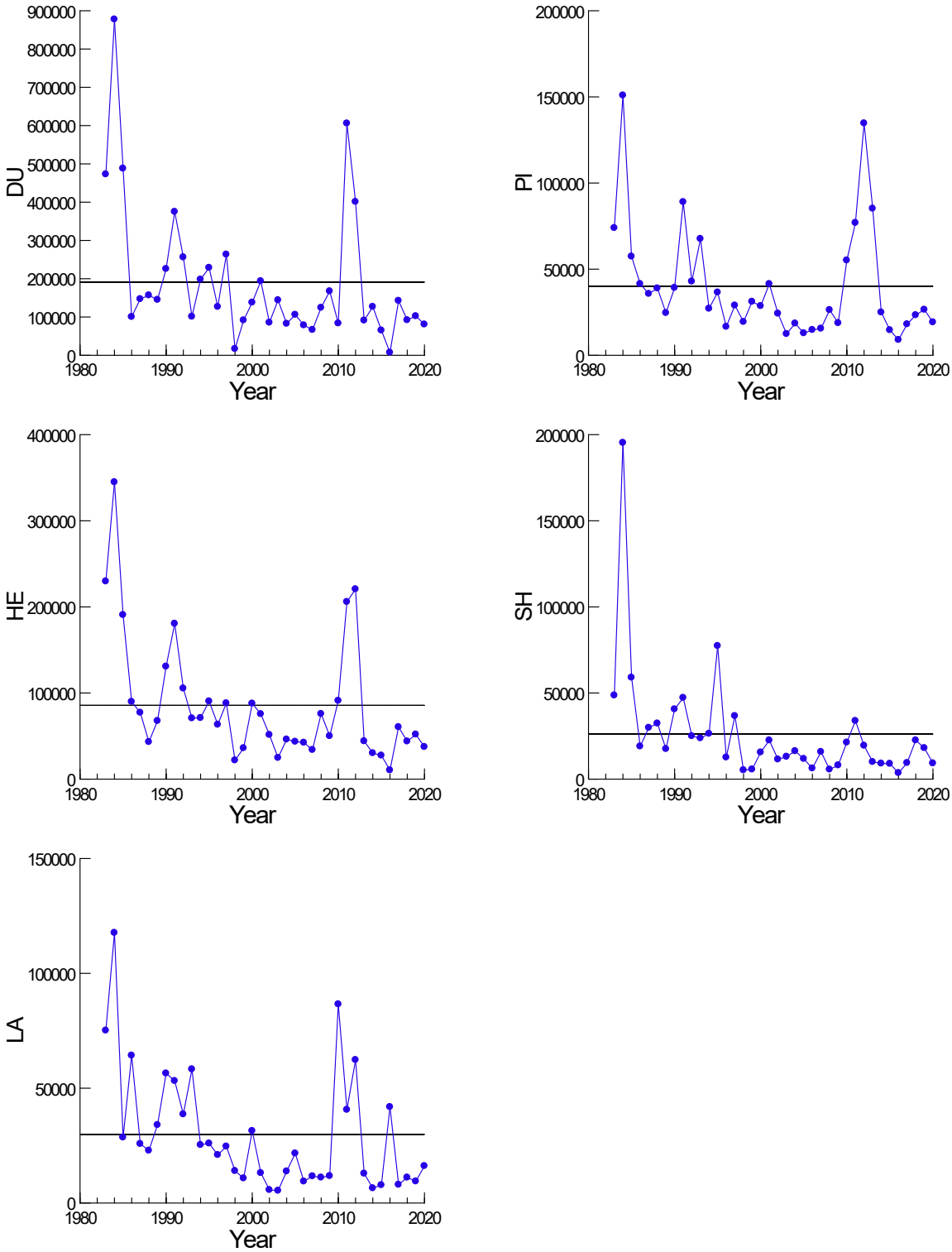

Figure 3. Changes in abundances of waterbird functional response groups (Du=ducks; Pi=piscivores; He=herbivores; Sh=shorebirds; La=large wading birds) over time in the Eastern Australian Waterbird Survey (1983-2020).

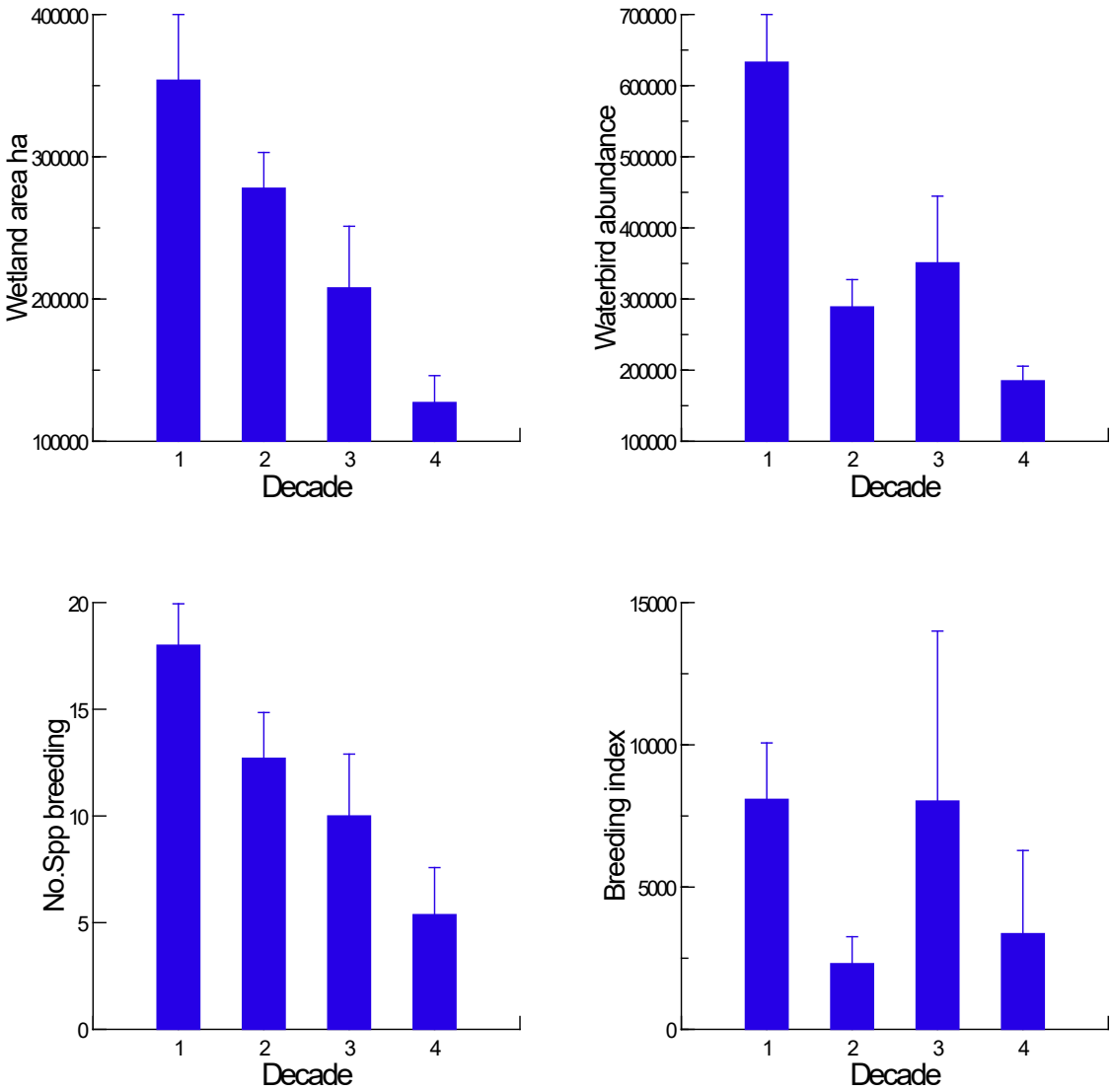

Figure 4. Decadal changes in indices including total abundance, wetland area, number of breeding species and breeding in the Eastern Australian Waterbird Survey (1983-2020).

Table 1. Trends in total waterbird abundance, wetland area index, breeding index and breeding species richness in the Eastern Australian Waterbird Survey (1983-2020).

Variable	Trend	Regression all years	Trend	Regression 1983-84 omitted
Total waterbird abundance	decline	r2=0.26, p=0.001	decline	r2=0.16, p=0.017
Wetland area index	decline	r2=0.35, p<0.001	decline	r2=0.25, p=0.002
Breeding index	decline	r2=0.12, p=0.031	no trend	r2=0.067, p=0.127
Breeding species richness	decline	r2=0.26, p=0.001	decline	r2=0.20, p=0.006

Table 2. Trends in abundances of functional response (Fx) groups, in the Eastern Australian Waterbird Survey (1983-2020).

Fx group code	name	Trend	Regression all years	Trend	Regression 1983-84 omitted
Du	Ducks	decline	r^2=0.25, p=0.001	decline	r^2=0.16, p=0.015
He	Herbivores	decline	r^2=0.26, p=0.001	decline	r^2=0.15, p=0.019
La	Large wading birds	decline	r^2=0.28, p=0.001	decline	r^2=0.18, p=0.010
Pi	Piscivores	decline	r^2=0.14, p=0.019	no trend	r^2=0.06, p=0.141
Sh	Shorebirds	decline	r^2=0.37, p<0.001	decline	r^2=0.30, p<0.001

Table 3. Trends in abundances of game species from the Eastern Australian Waterbird Survey (1983-2020).

Species	Trend	Regression all years	Trend	Regression 1983-84 omitted
Pacific black duck	decline	r^2=0.31, p<0.001	decline	r^2=0.19, p<0.007
Australasian shoveler	decline	r^2=0.54, p<0.001	decline	r^2=0.48, p<0.001
Chestnut teal	no trend	r^2=0.09, p=0.064	no trend	r^2=0.06, p=0.148
Grey teal	decline	r^2=0.21, p=0.004	decline	r^2=0.11, p=0.045
Hardhead	no trend	r^2=0.03, p=0.344	no trend	r^2=0.01, p=0.687
Mountain duck	decline	r^2=0.41, p<0.001	decline	r^2=0.35, p<0.001
Pink-eared duck	no trend	r^2=0.06, p=0.157	no trend	r^2=0.03, p=0.299
Australian Wood duck	decline	r^2=0.22, p=0.003	no trend	r^2=0.10, p=0.056

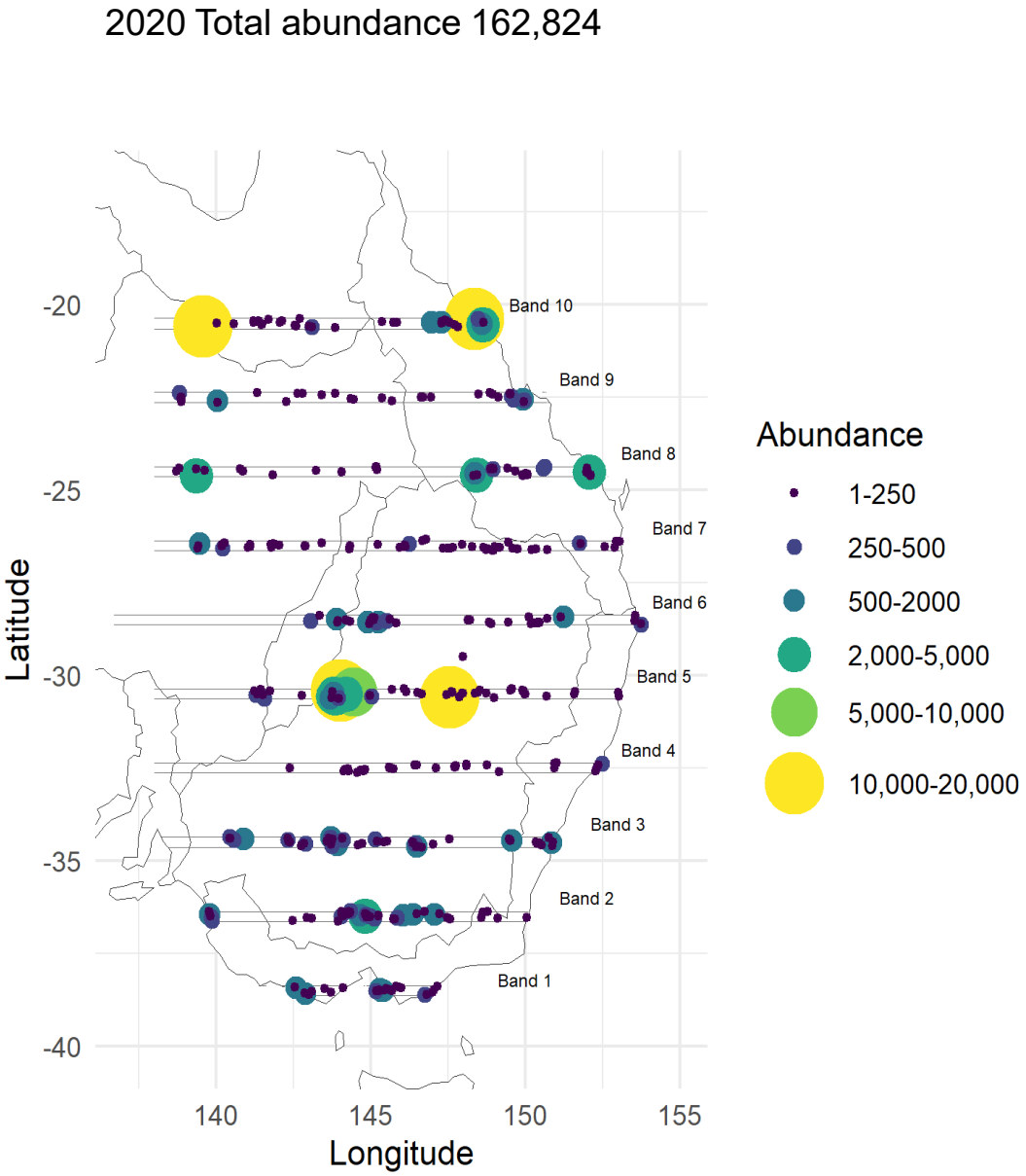

Figure 5. Distribution and abundance of waterbirds in the 2020 Eastern Australian Waterbird Survey. Dry wetlands and those with zero waterbirds not plotted.

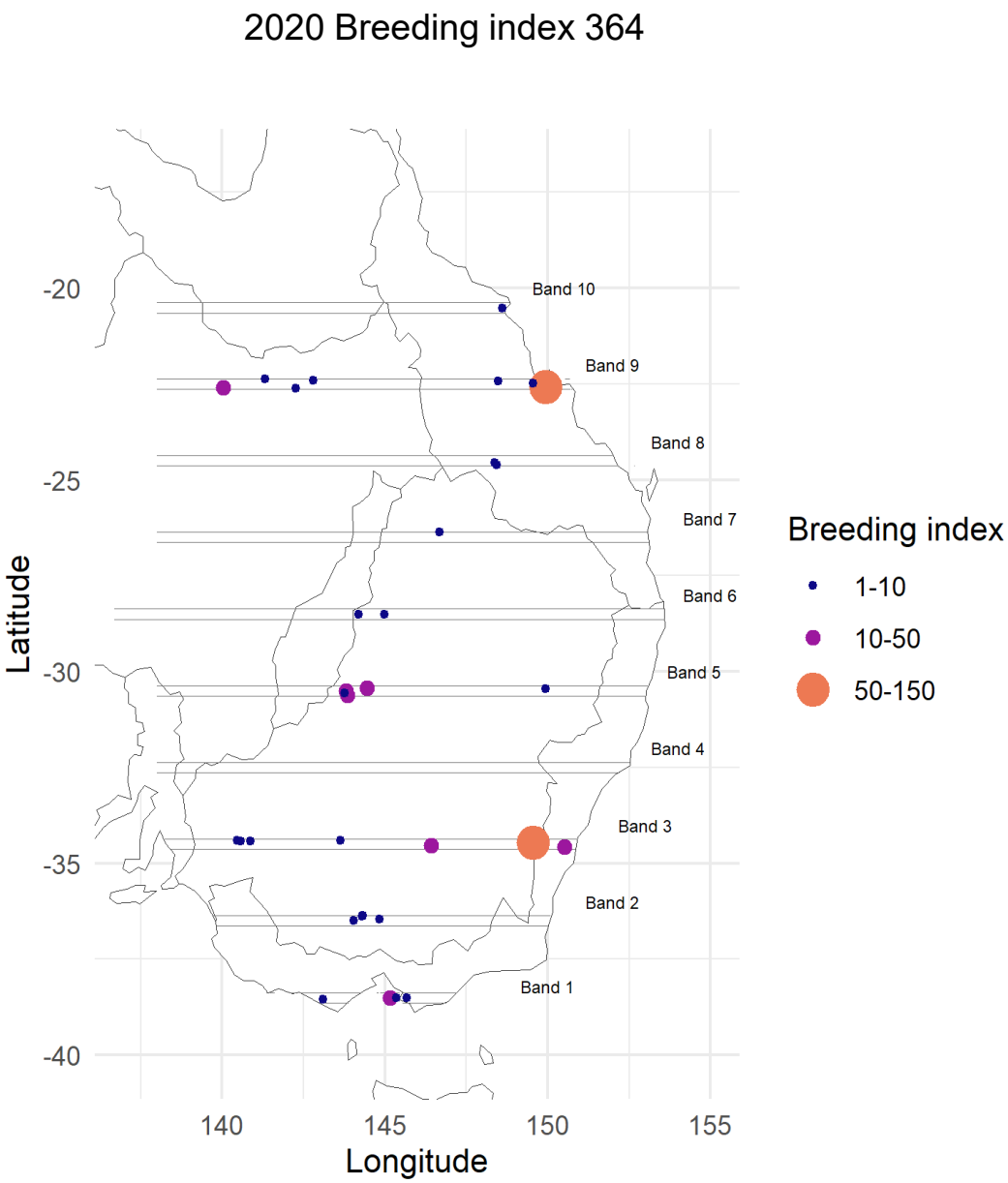

Figure 6. Distribution of waterbird breeding in the 2020 Eastern Australian Waterbird Survey. Only wetlands with breeding recorded are plotted.

2020 Wetland area index 104,015 ha

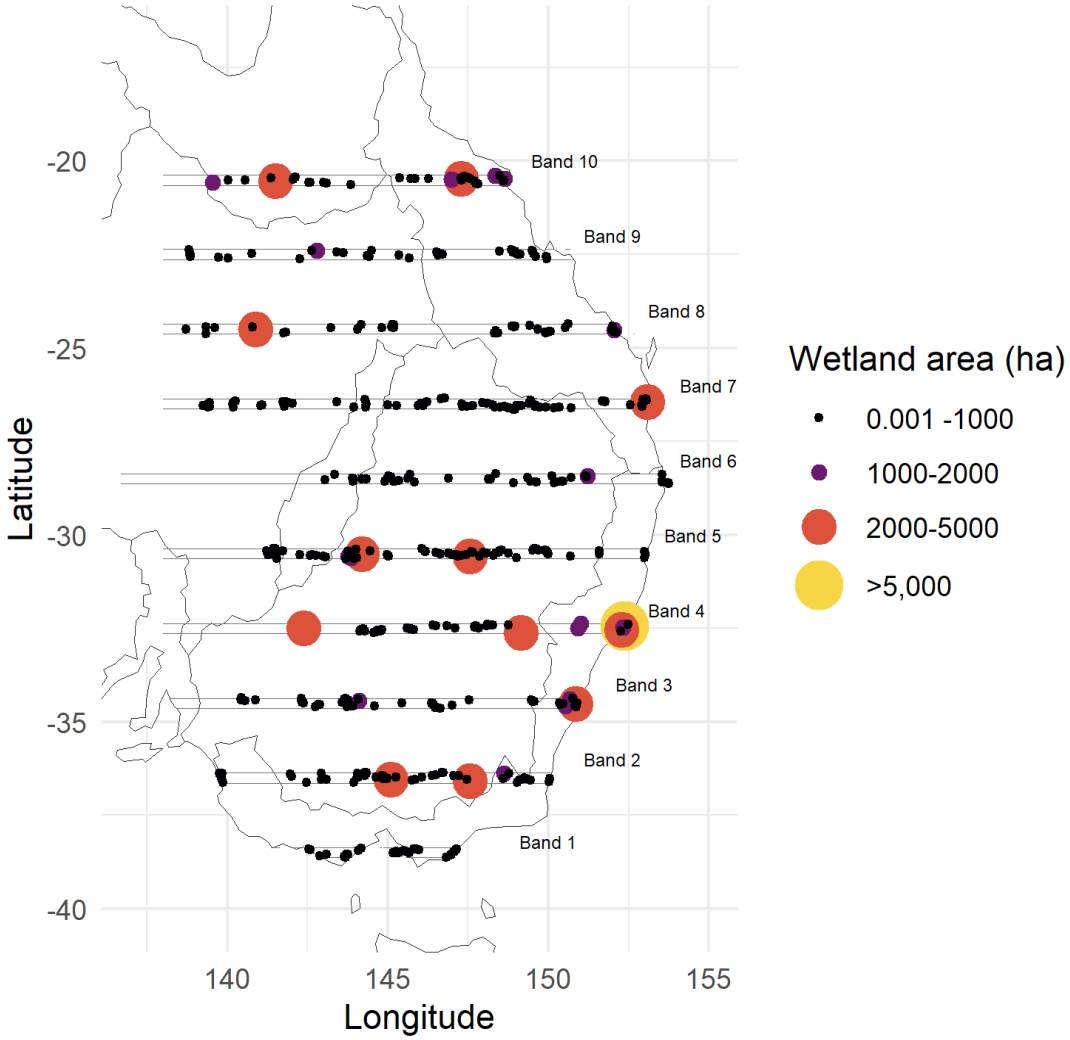

Figure 7. Distribution of wetland area in the 2020 Eastern Australian Waterbird Survey. All surveyed wetlands with surface water present are plotted; dry wetlands not plotted.

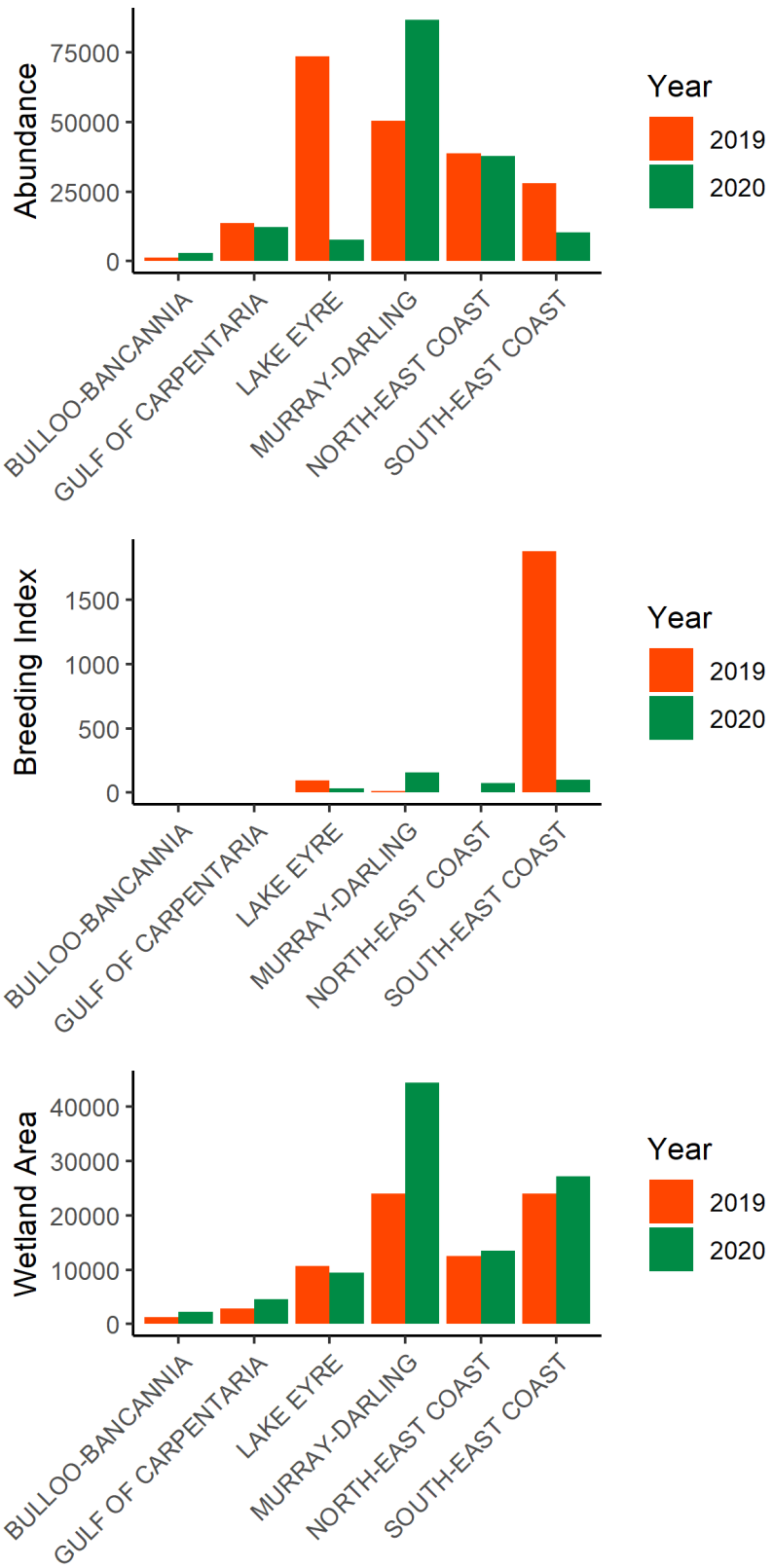

Figure 8. Comparison of waterbird abundance, breeding index and wetland area in major river basins in 2019 to 2020.

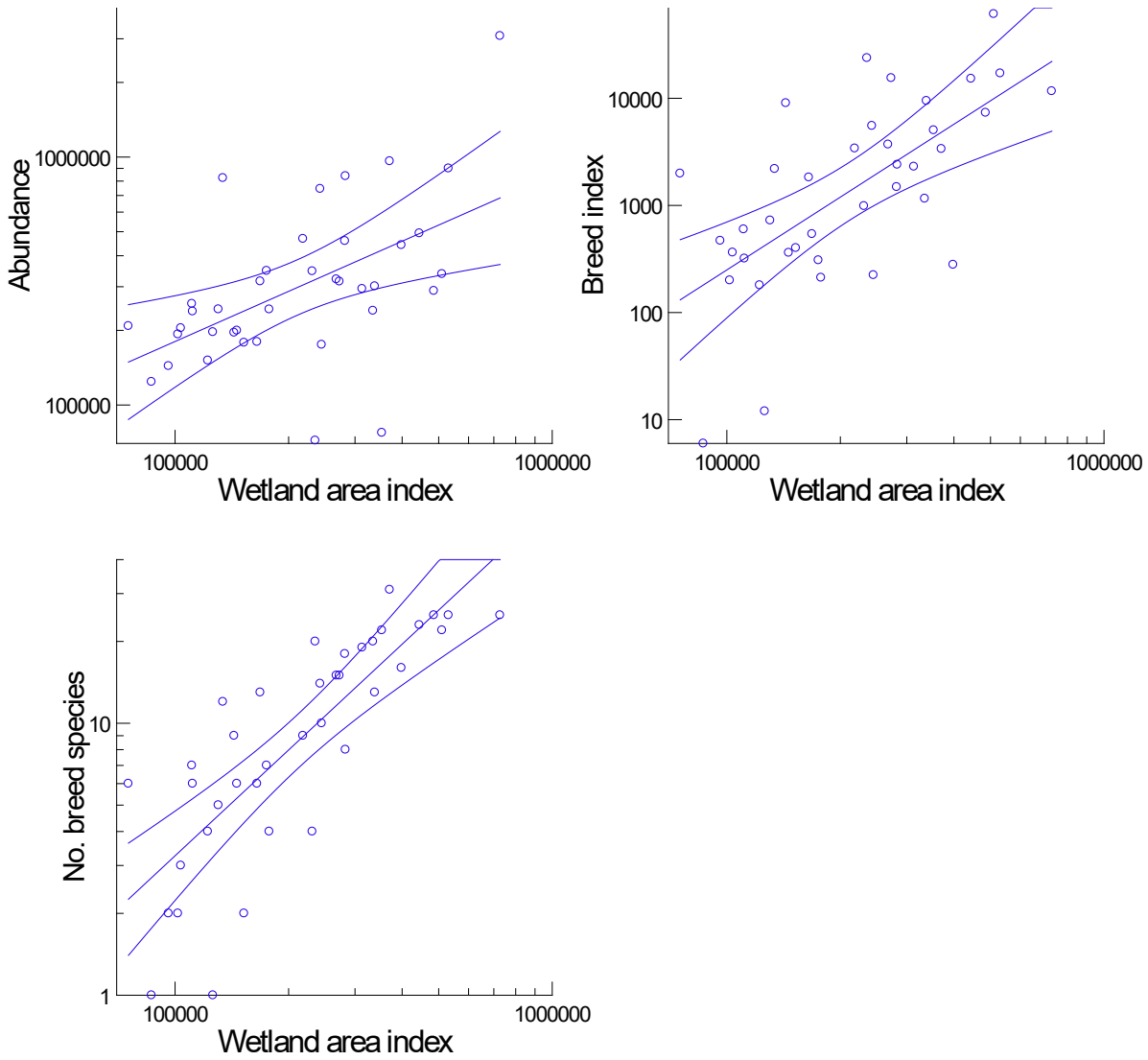

Figure 9. Interactions – mean abundance, breeding and number of breeding species with wetland area index (ha) for the Eastern Australian Waterbird Survey (1983-2020).

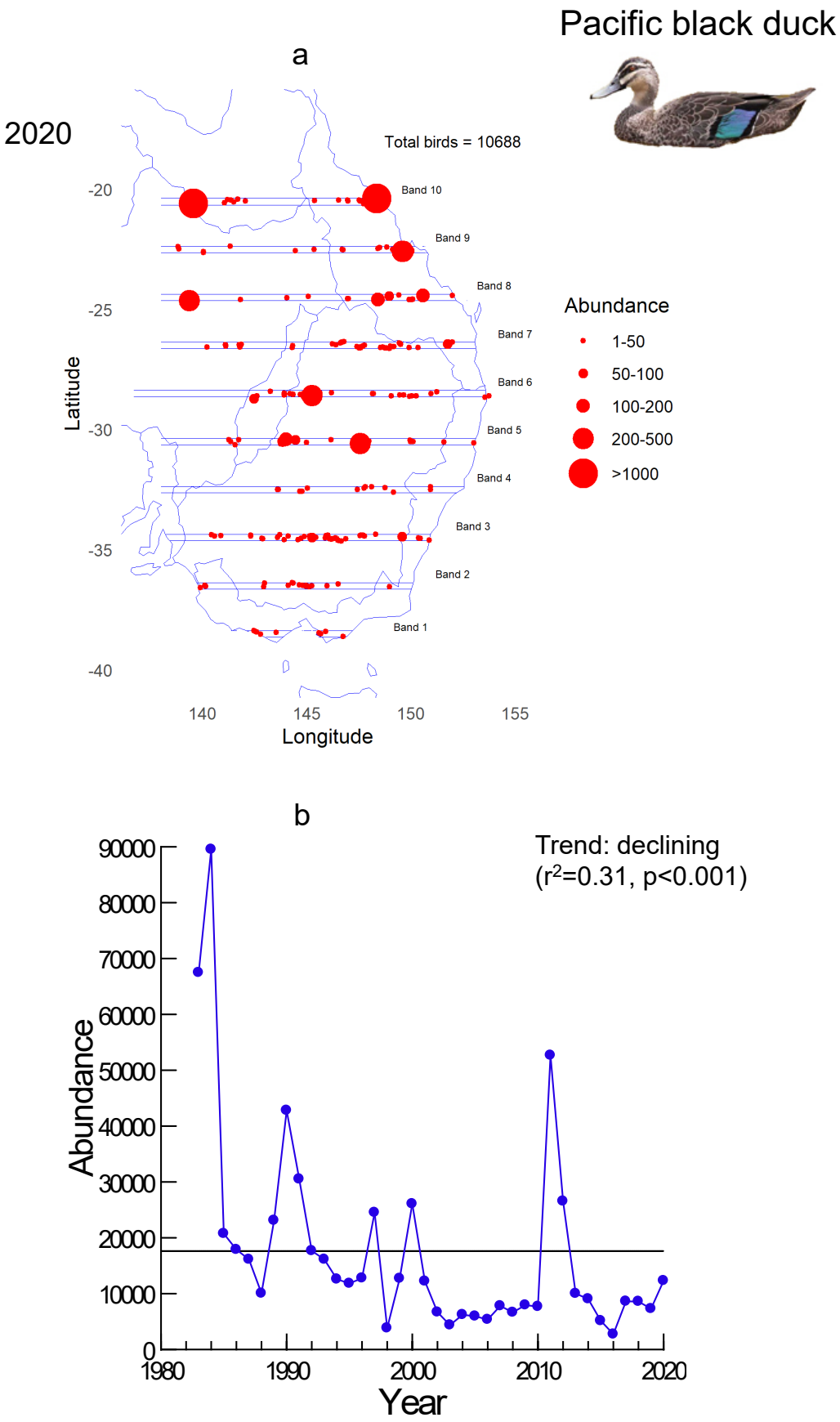

Figure 10. a. Distribution and abundance of Pacific black duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

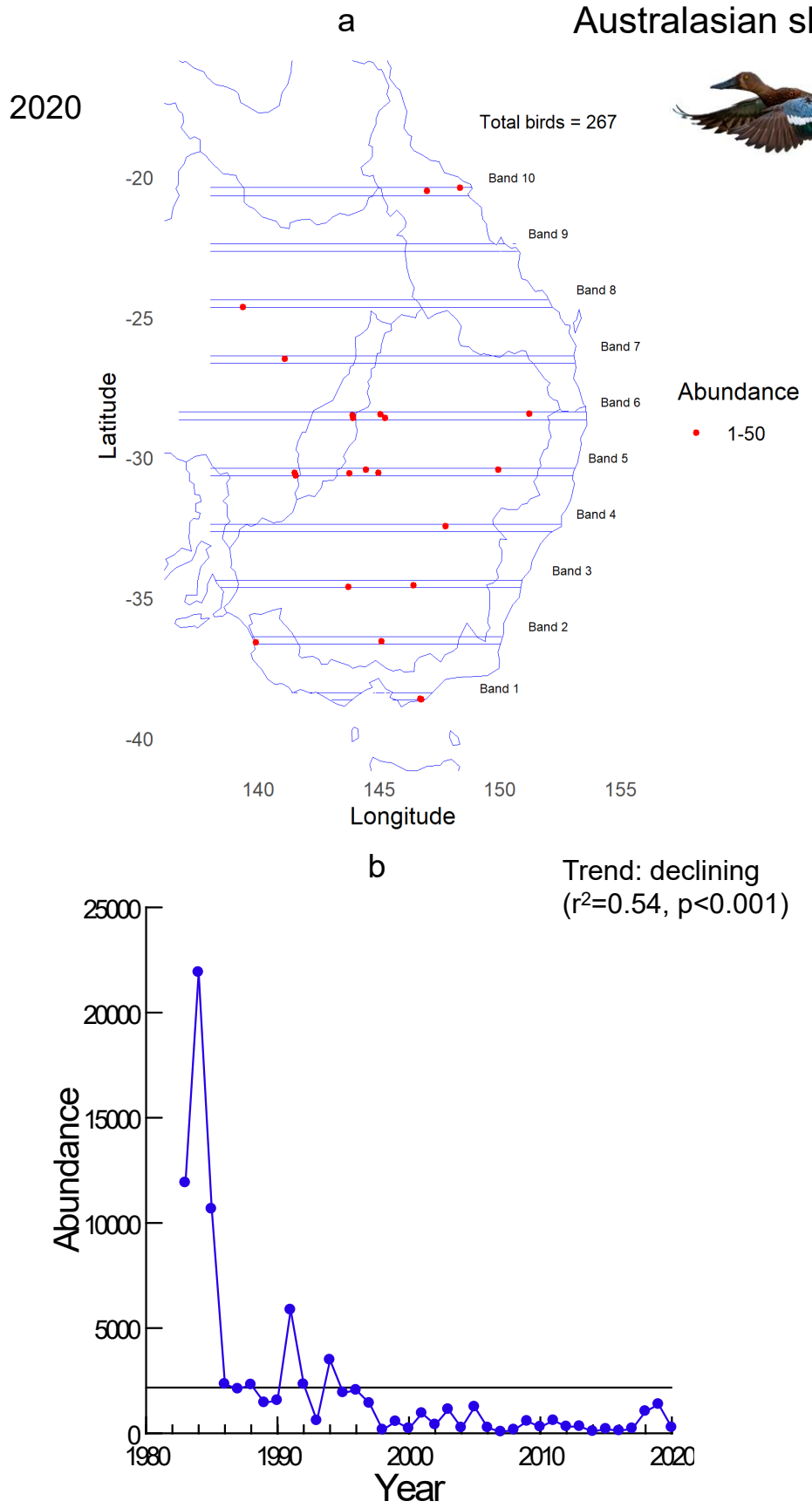

Figure 11. a. Distribution and abundance of Australasian shoveler during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

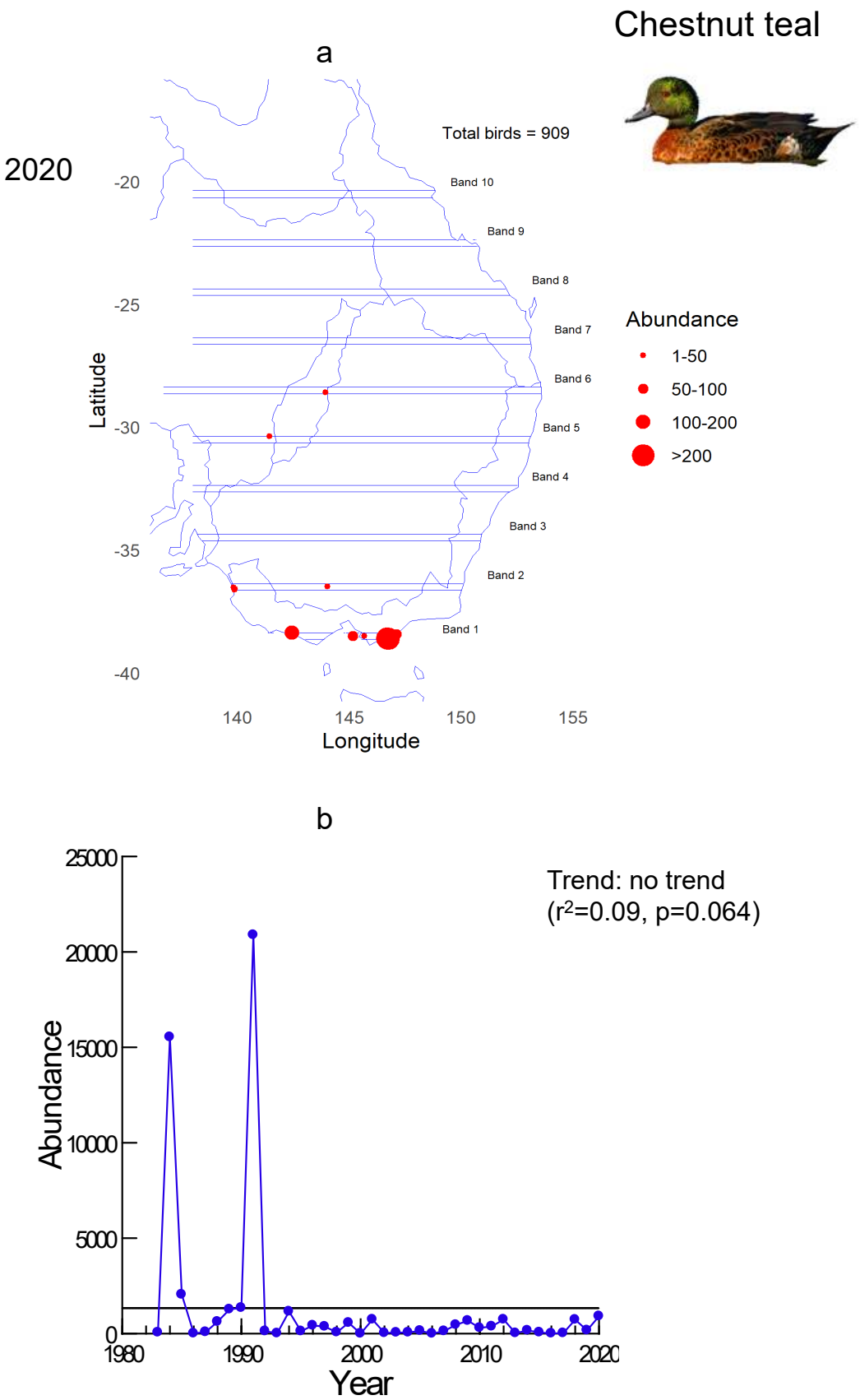

Figure 12. a. Distribution and abundance of Chestnut teal during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

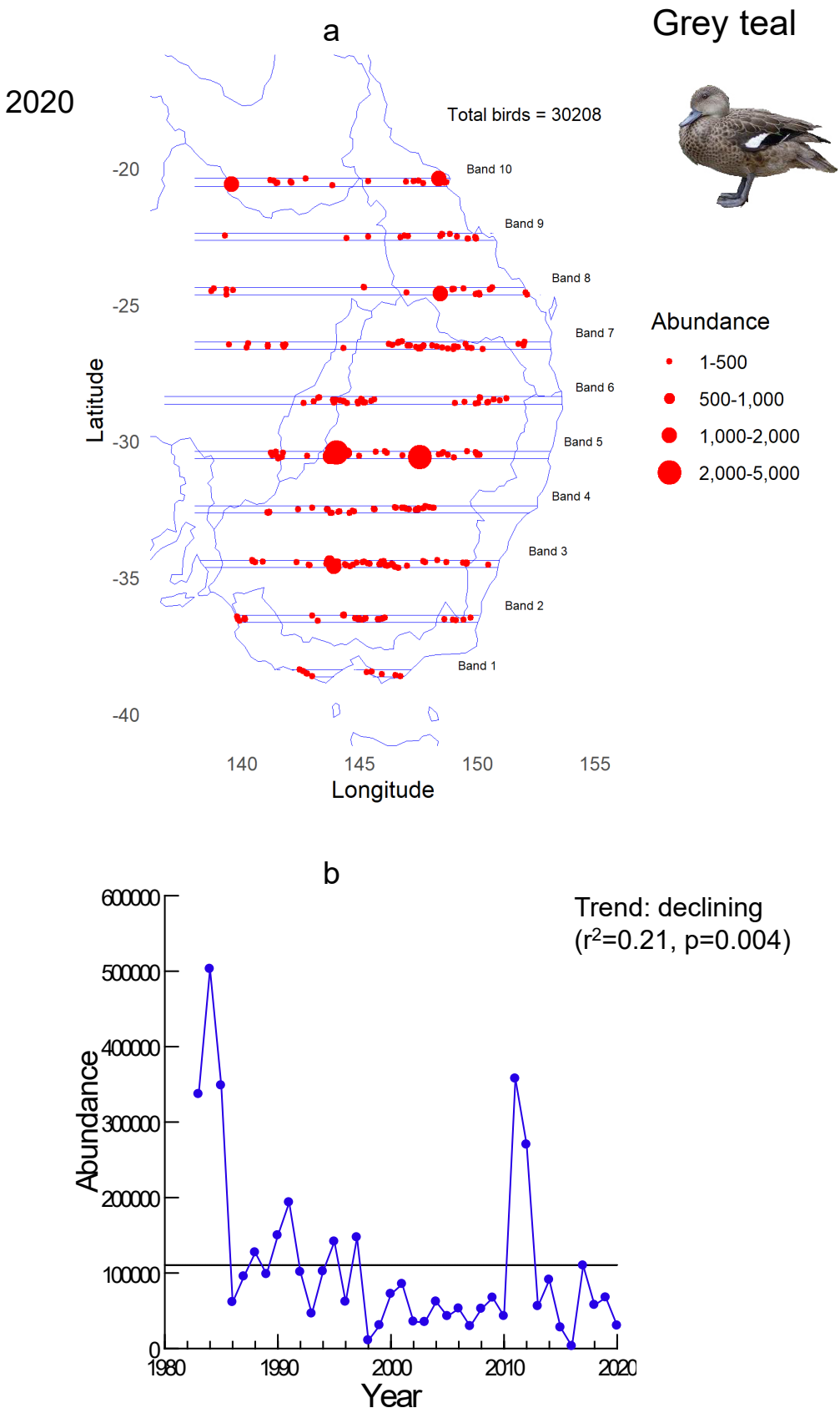

Figure 13. a. Distribution and abundance of Grey teal during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

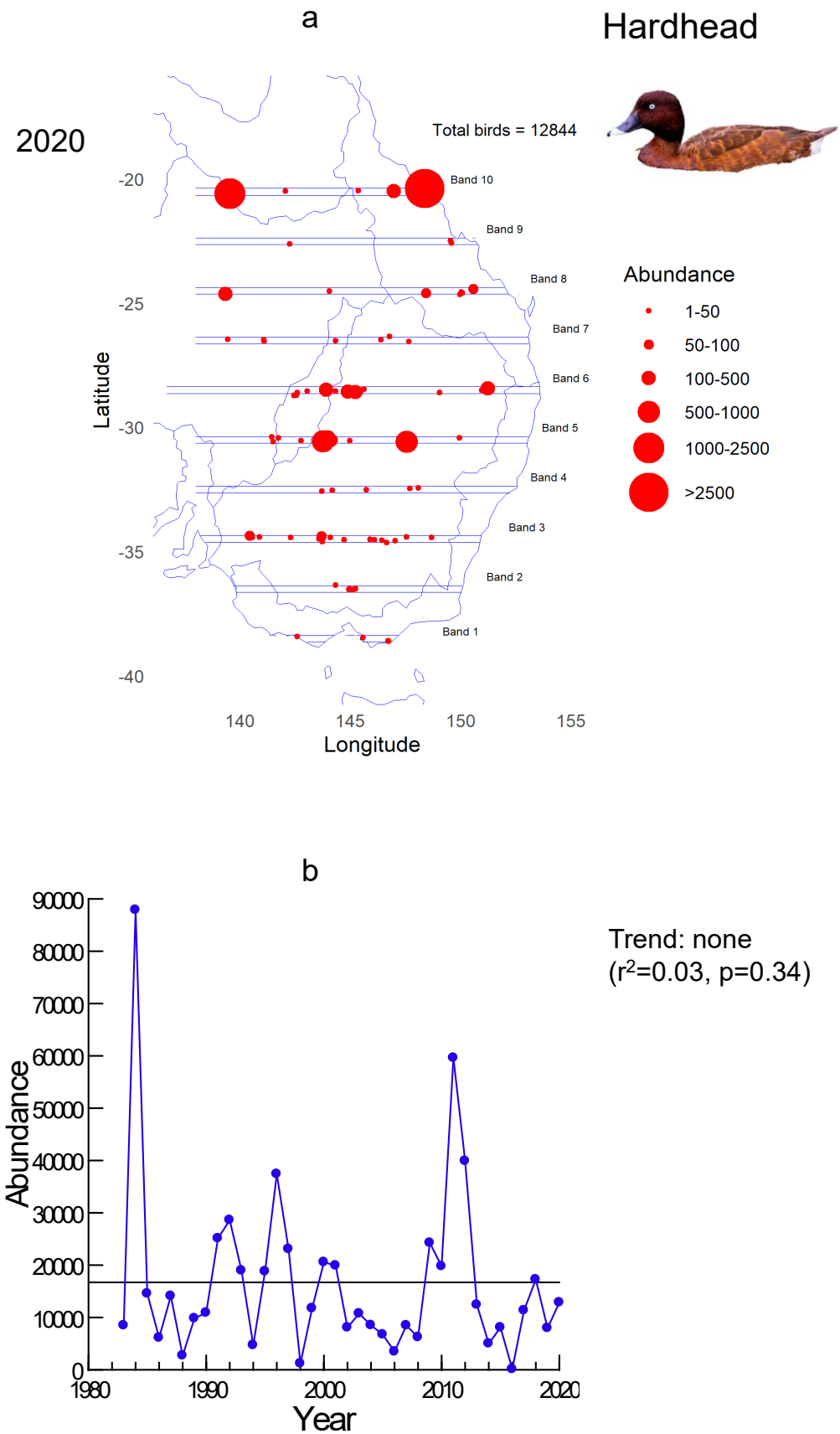

Figure 14. a. Distribution and abundance of Hardhead during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

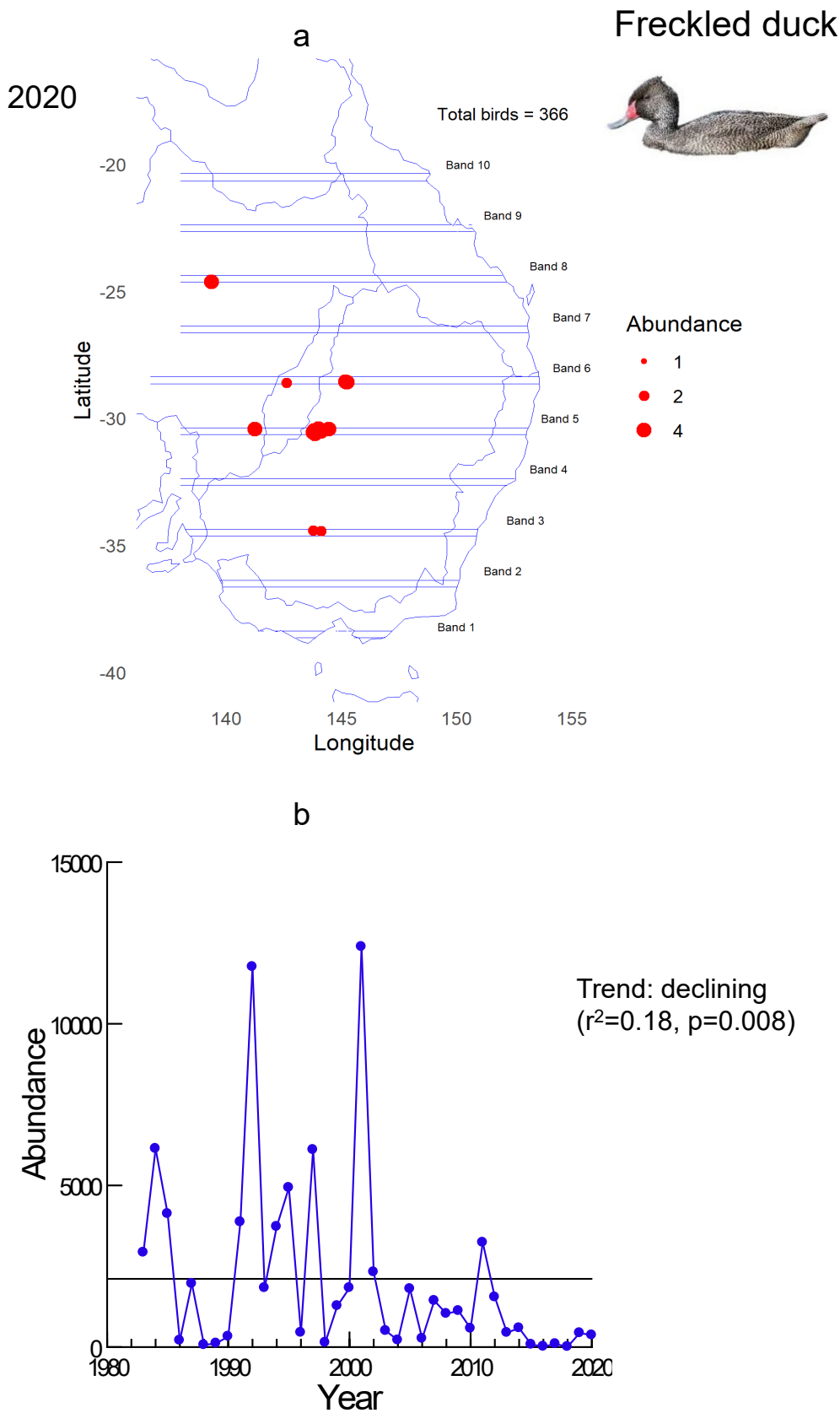

Figure 15. a. Distribution and abundance of Freckled duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

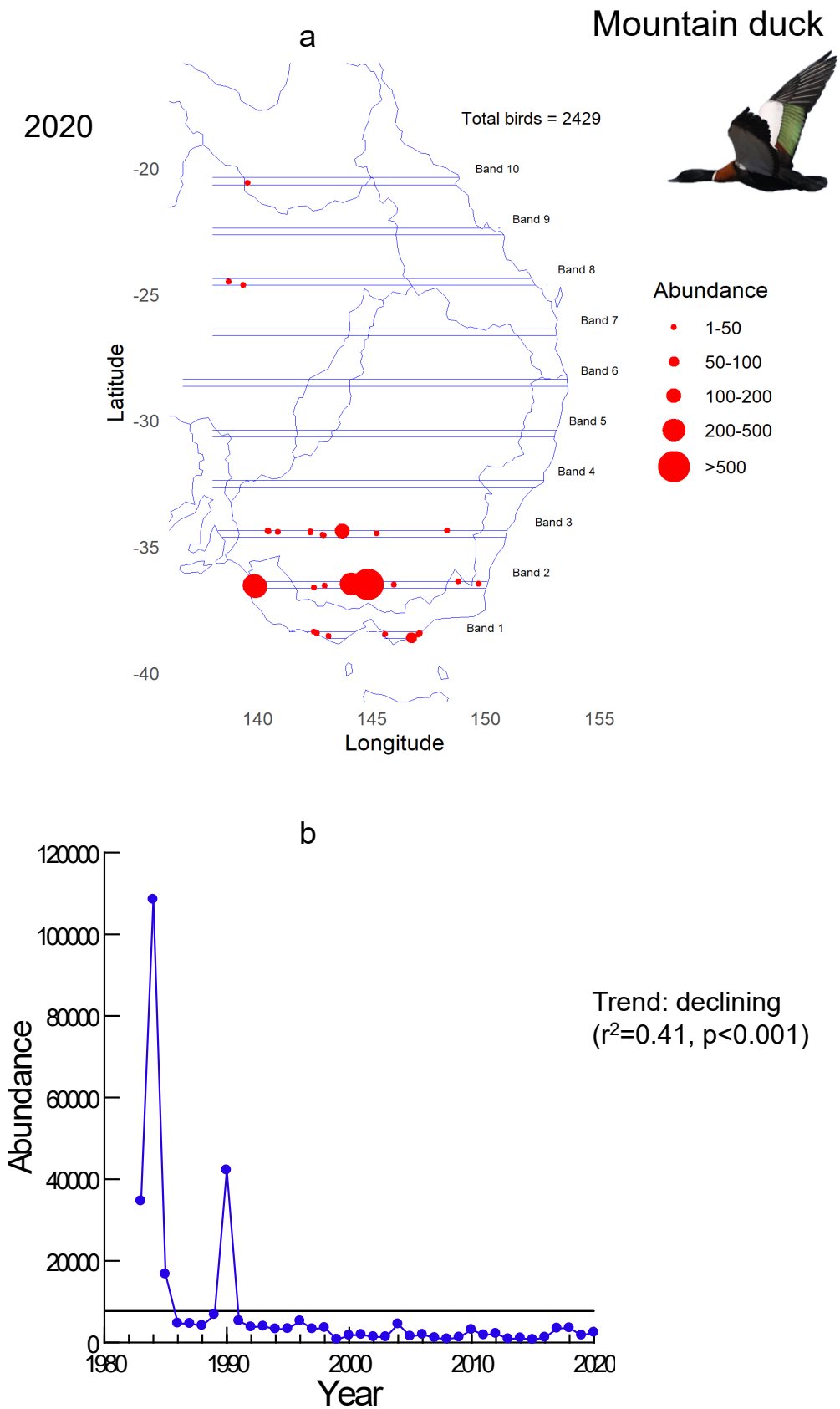

Figure 16. a. Distribution and abundance of Mountain duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

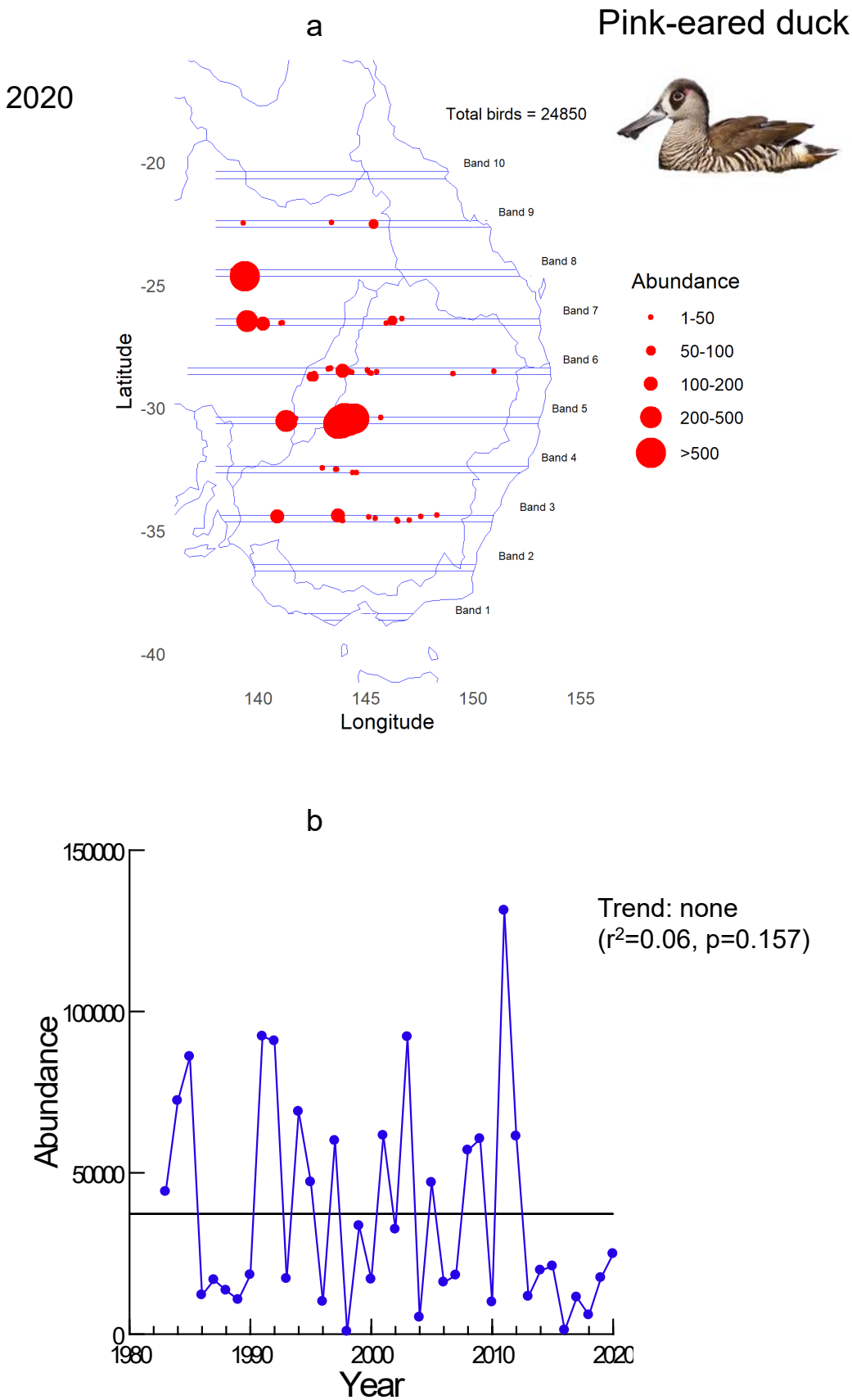

Figure 17. a. Distribution and abundance of Pink-eared duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

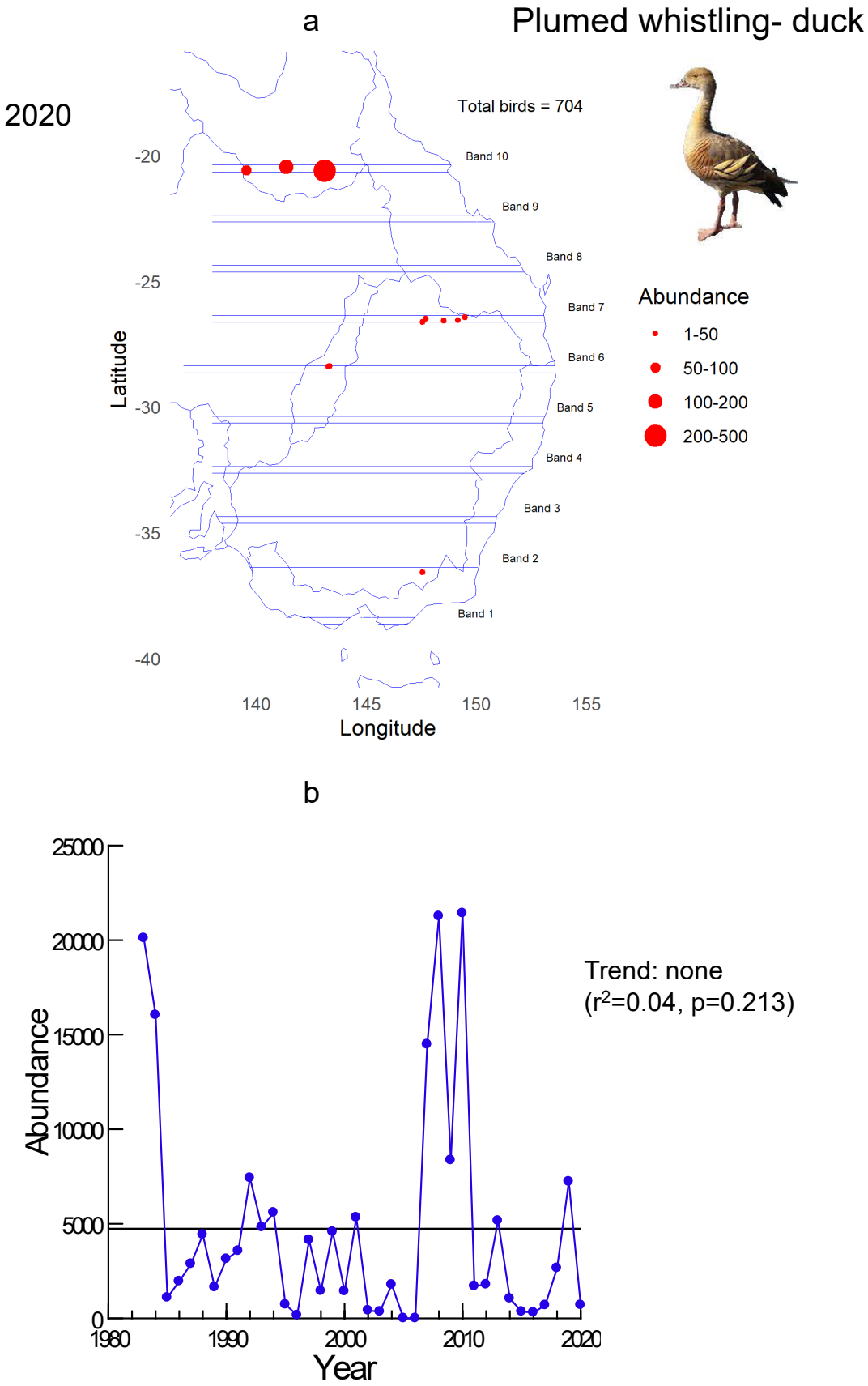

Figure 18. a. Distribution and abundance of Plumed whistling-duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

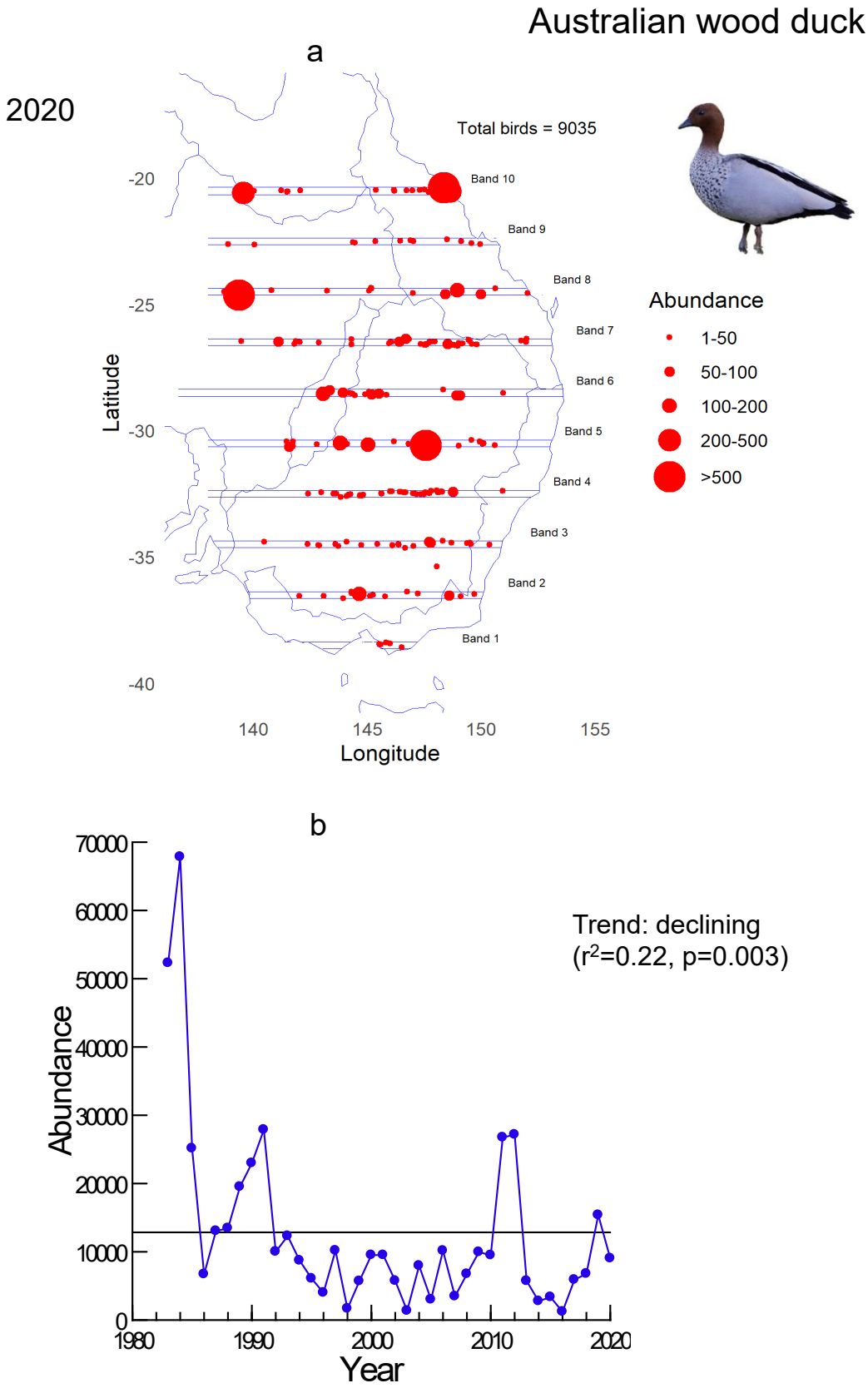

Figure 19. a. Distribution and abundance of Australian wood duck during the 2020 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2020). Horizontal line indicates long term average.

References

1. Bureau of Meteorology (BOM) 2020 Drought Knowledge Centre. Australian Government. Accessed 10/12/2020 http://www.bom.gov.au/climate/drought/
2. Department of Primary Industries (DPI) 2020. Accessed 10/12/2020 https://edis.dpi.nsw.gov.au/
3. Queensland Government 2020 Drought declarations (Department of Agriculture and Fisheries). Accessed 10/12/2020 https://www.longpaddock.qld.gov.au/drought/drought-declarations/
4. Primary Industries and Regions SA 2020. Accessed 10/12/2020 https://www.pir.sa.gov.au/__data/assets/pdf_file/0007/339469/Drought_affected_areas_20200811.pdf