Aerial Survey of Waterbirds in Eastern Australia - October 2021 Annual Summary Report

J.L. Porter[1,2], R.T. Kingsford[2] , R. Francis[2] and K. Brandis[2]

Department of Planning Industry & Environment-
Environment, Energy and Science Group[1], Centre for Ecosystem Science,
School of Biological,
Earth and Environmental Sciences, UNSW Sydney[2]

2021 Aerial Survey of Wetland Birds in Eastern Australia Summary

1. Late November at the end of the survey period was one of the wettest on record for many places in central and south eastern Queensland. Monthly rainfall records were broken with some places recording the wettest November in more than 100 years.

2. Central and eastern NSW and Victoria have also experienced significant rainfall in November. Water storages in much of the Murray-Darling have continued to fill, with Hume Dam at its highest level in 5 years. Menindee Lakes water storage levels reached their highest levels in 9 years.

3. Multi-year rainfall deficiencies, which originated during the 2017–2019 drought, still remain over some parts of the study area due to the extremely low accumulated rainfall totals experienced over this extended period. Further periods of above average rainfall are needed to continue the recovery, especially in parts of western Queensland, parts of South Australia and far west New South Wales, and some parts of Victoria, especially in the north west[1].

4. In August 2021 (the most recent drought mapping available), around 65% of Queensland was in drought or drought affected [3]; in December in NSW 4% of the state was in drought or drought affected[2]. South Australian drought maps are no longer available.

5. Four major indices for waterbirds (total abundance, breeding index, number of species breeding and wetland area index, Fig. 1) continue to show significant declines since 1983. 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; Table 1). Long term trends are more informative for predicting population status than year to year fluctuations.

6. Total waterbird abundance in 2021 (n=95,306) decreased from 2020 and remains well below average: the 3rd lowest in 39 years. Waterbirds were most abundant in bands 3 and 5 (Figs 2 & 5).

7. Breeding species' richness and breeding abundance, increased considerably compared to the previous year; breeding largely occurred in bands 1 and 3 (Fig. 6) and comprised mostly of Australian white ibis and straw-necked ibis.

8. 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, Table 1).

9. Wetland area index (150,803 ha) increased slightly from the previous year, but remains well below the long term average (Fig. 1). Some rivers and wetlands in the northern Lake Eyre Basin including the Diamantina and Georgina rivers, held moderate amounts of water and supported low numbers of waterbirds. Lakes Torquinnie, Mumbleberry and Galilee held some water and moderate numbers of waterbirds; the largest concentrations of waterbirds were located in the Paroo overflow Lakes, the Macquarie Marshes and Lake Moondarra in the north (Fig. 5).

10. The Macquarie Marshes (Band 5) 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 moderate inundation (Band 3), and they supported moderate numbers of waterbirds with a breeding colony of straw-necked ibis recorded. Most wetlands in the regulated Menindee Lakes system were full, including outside the survey band to the north - Copi Hollow and Lakes Wetherell, Pamamaroo, Bijiji and Balaka were also full (Band 4). Overall, there were moderate waterbird numbers and breeding activity. The Tallywalka lakes system was dry (Band 4, Fig. 7).

2021 Aerial Survey of Waterbirds in Eastern Australia Summary (continued)

11. Waterbirds were again widely dispersed (similar to the previous year); only 2 wetlands (Green Lake on the Paroo River (Band 5) and Prosperpine Dam (Band 10)) supported more than 5,000 waterbirds representing 13% of the total abundance – Green Lake was in the Murray-Darling Basin (Fig. 5). More than 48% of surveyed wetlands supported no waterbirds (includes wetlands that were dry).

12. Total breeding index (nests + broods) was 2,494 (all species combined), a considerable increase from the previous year (364) but still well below the long term average (Figs. 1 & 6). Breeding species' richness also increased with 9 species recorded breeding but this is below the long term average and the ninth lowest on record (Fig. 1). Ibis comprised most of the breeding recorded (white ibis: 1071, straw-necked ibis: 1000), 83% of the total.

13. All game species abundances were well below long term averages, in some cases by an order of magnitude; six 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 from the previous year (Fig. 13).

14. Waterbird indices across river basins had not yet responded to recent rainfall and flooding and generally reflected low levels of available of habitat and drought intensity in the preceding 4 years; 2021 abundance decreased, but wetland area rose in the Murray-Darling Basin compared to the previous year (Fig. 8).

15. 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).

16. 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 2021 distribution and trend plots show changes in abundance over time (1983-2021).

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We thank Sharon Ryall and Anne Ahern for help with logistics, along with staff from our collaborative agencies. We also thank James Barkell and Tim Dugan of NSW National Parks and Wildlife, for piloting the aircraft. We also thank Anne Ahern, Fred Dadzie, Matt Davis, Skye Davis, Victoria Inman, Ada Sanchez, Daniel Simpson, Jana Stewart and Amy Walburn for support, data entry and management, graphics and quality assurance. Cover Picture – Fitzroy River near Rockhampton: Richard Kingsford.

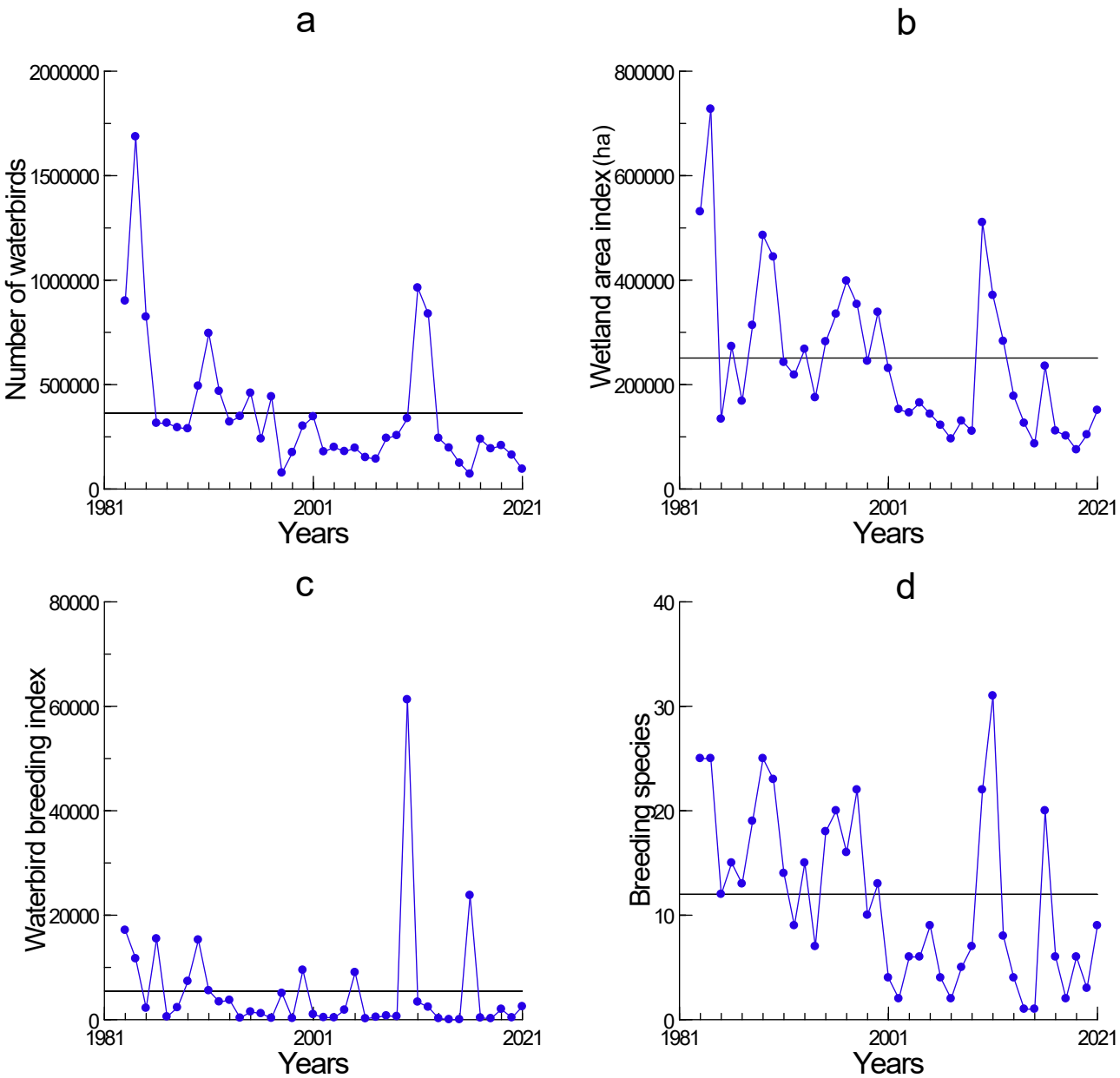


Figure 1. Changes over time in a) total abundance, b) wetland area index, c) waterbird breeding index and d) number of breeding species in the Eastern Australian Waterbird Aerial Survey (1983-2021); horizontal lines show long term averages.

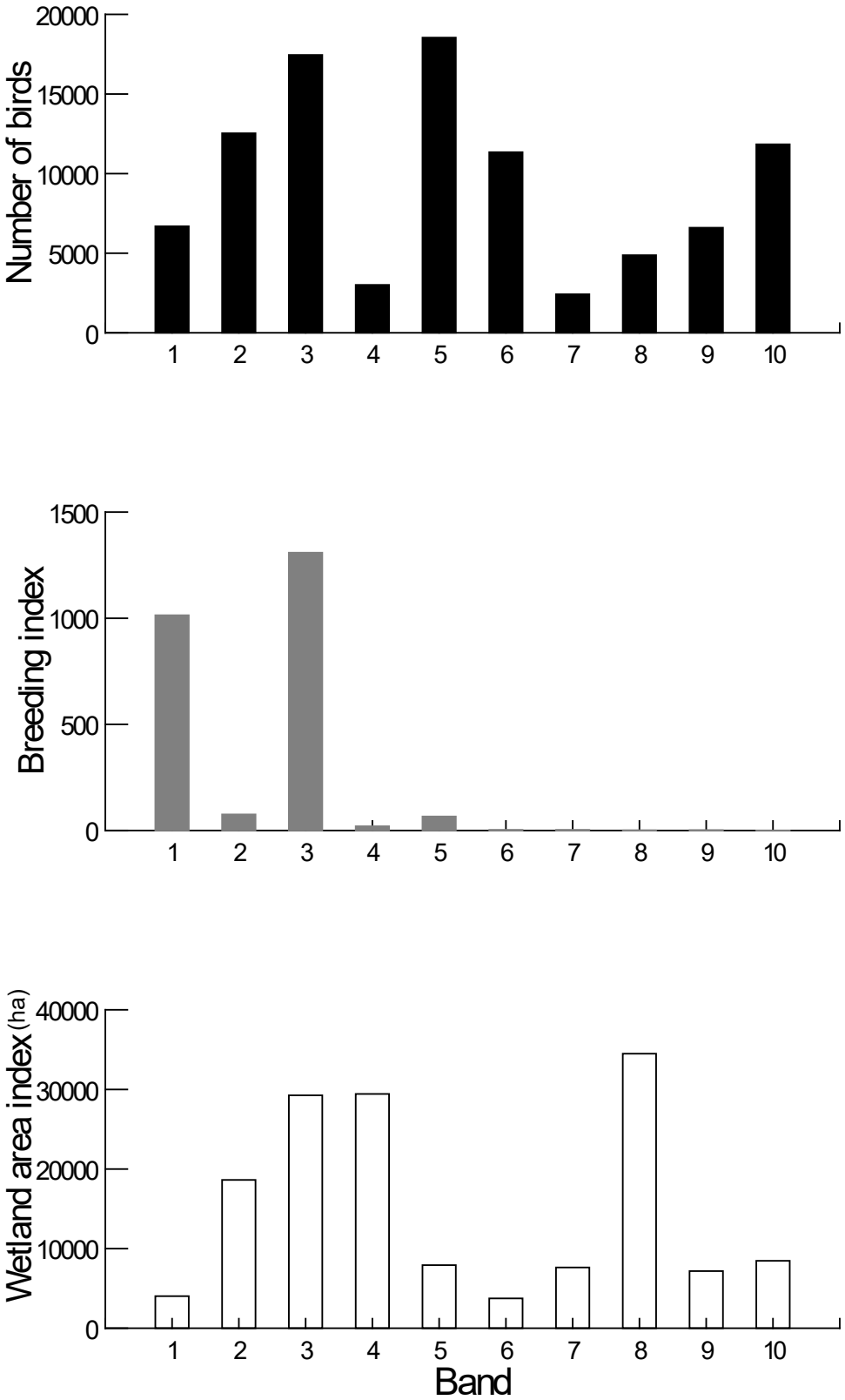


Figure 2. Distribution of waterbird abundance, breeding index and wetland area index in 10 survey bands of the Eastern Australian Waterbird Survey in 2021.

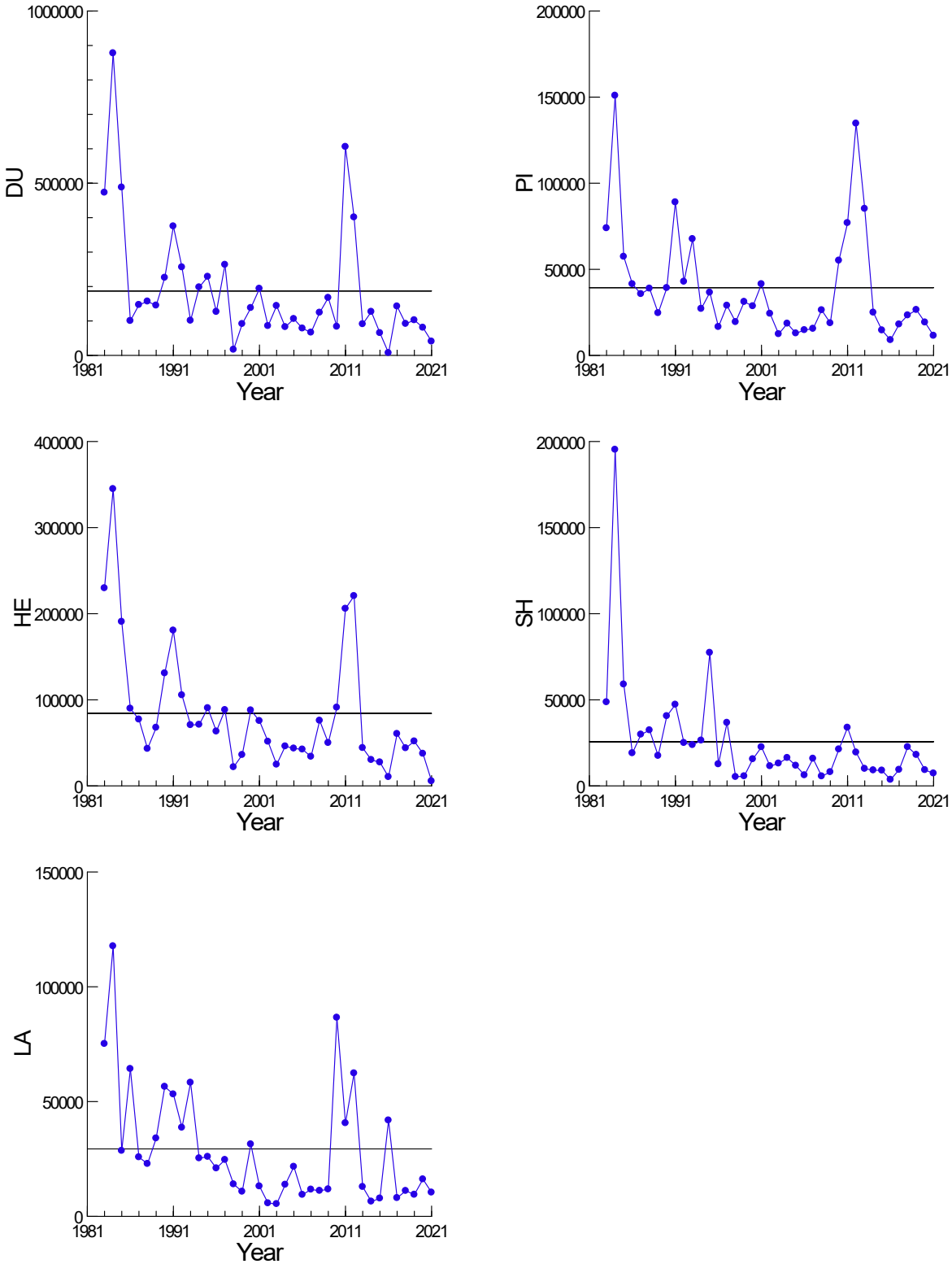


Figure 3. Changes in abundances of waterbird functional response groups (Du=ducks; Pi=piscivores; He=herbivores; Sh=shorebirds; La=large wading birds) over time in the Eastern Australian Waterbird Survey (1983-2021).

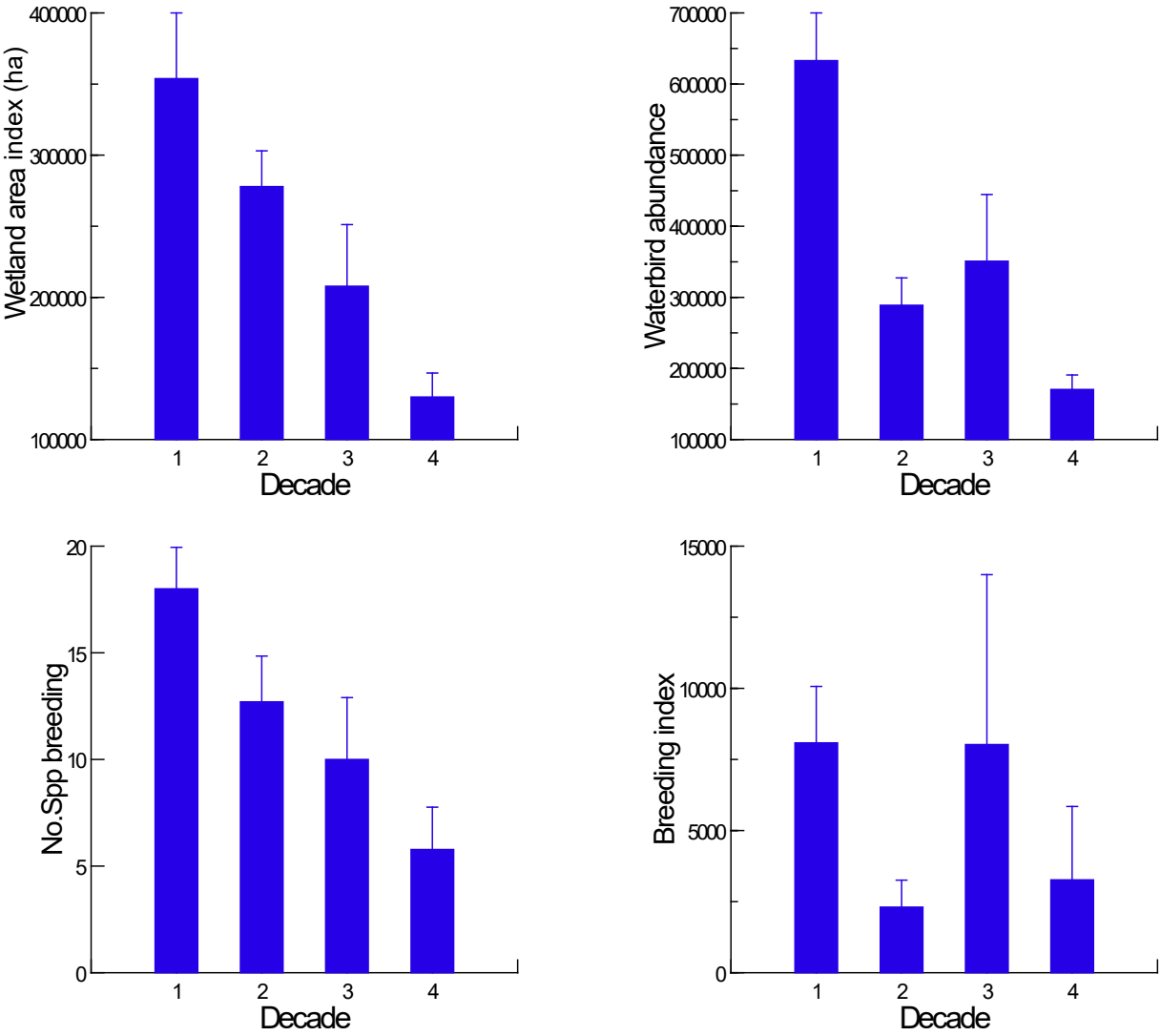


Figure 4. Mean (±SE) decadal changes in indices including total abundance, wetland area, number of breeding species of waterbirds and waterbird breeding index in the Eastern Australian Waterbird Aerial Survey (1983-2021).

Table 1. Trends in total waterbird abundance, wetland area index, breeding index and breeding species richness in the Eastern Australian Waterbird Survey (1983-2021).

Variable	Trend	Regression all years	Trend	Regression 1983-84 omitted
Total waterbird abundance	decline	r2=0.29, p<0.001	decline	r^2=0.19, p=0.007
Wetland area index	decline	r2=0.36, p<0.001	decline	r^2=0.27, p=0.001
Breeding index	decline	r2=0.11, p=0.039	no trend	r^2=0.06, p=0.152
Breeding species richness	decline	r2=0.27, p=0.001	decline	r^2=0.20, p=0.006

Table 2. Trends in abundances of functional response (Fx) groups, in the Eastern Australian Waterbird Survey (1983-2021).

Fx group code	name	Trend	Regression all years	Trend	Regression 1983-84 omitted
Du	Ducks	decline	r^2=0.27, p=0.001	decline	r^2=0.18, p=0.008
He	Herbivores	decline	r^2=0.28, p=0.001	decline	r^2=0.18, p=0.009
La	Large wading birds	decline	r^2=0.29, p<0.001	decline	r^2=0.20, p=0.006
Pi	Piscivores	decline	r^2=0.17, p=0.009	no trend	r^2=0.09, p=0.075
Sh	Shorebirds	decline	r^2=0.39, p<0.001	decline	r^2=0.32, p<0.001

Table 3. Trends in abundances of game species from the Eastern Australian Waterbird Survey (1983-2021).

Species	Trend	Regression all years	Trend	Regression 1983-84 omitted
Pacific black duck	decline	r^2=0.33, p<0.001	decline	r^2=0.21, p<0.002
Australasian shoveler	decline	r^2=0.56, p<0.001	decline	r^2=0.51, p<0.001
Chestnut teal	no trend	r^2=0.10, p=0.042	no trend	r^2=0.07, p=0.114
Grey teal	decline	r^2=0.24, p=0.002	decline	r^2=0.14, p=0.025
Hardhead	no trend	r^2=0.04, p=0.220	no trend	r^2=0.02, p=0.473
Mountain duck	decline	r^2=0.39, p<0.001	decline	r^2=0.33, p<0.001
Pink-eared duck	no trend	r^2=0.07, p=0.093	no trend	r^2=0.05, p=0.192
Australian Wood duck	decline	r^2=0.22, p=0.003	no trend	r^2=0.10, p=0.055

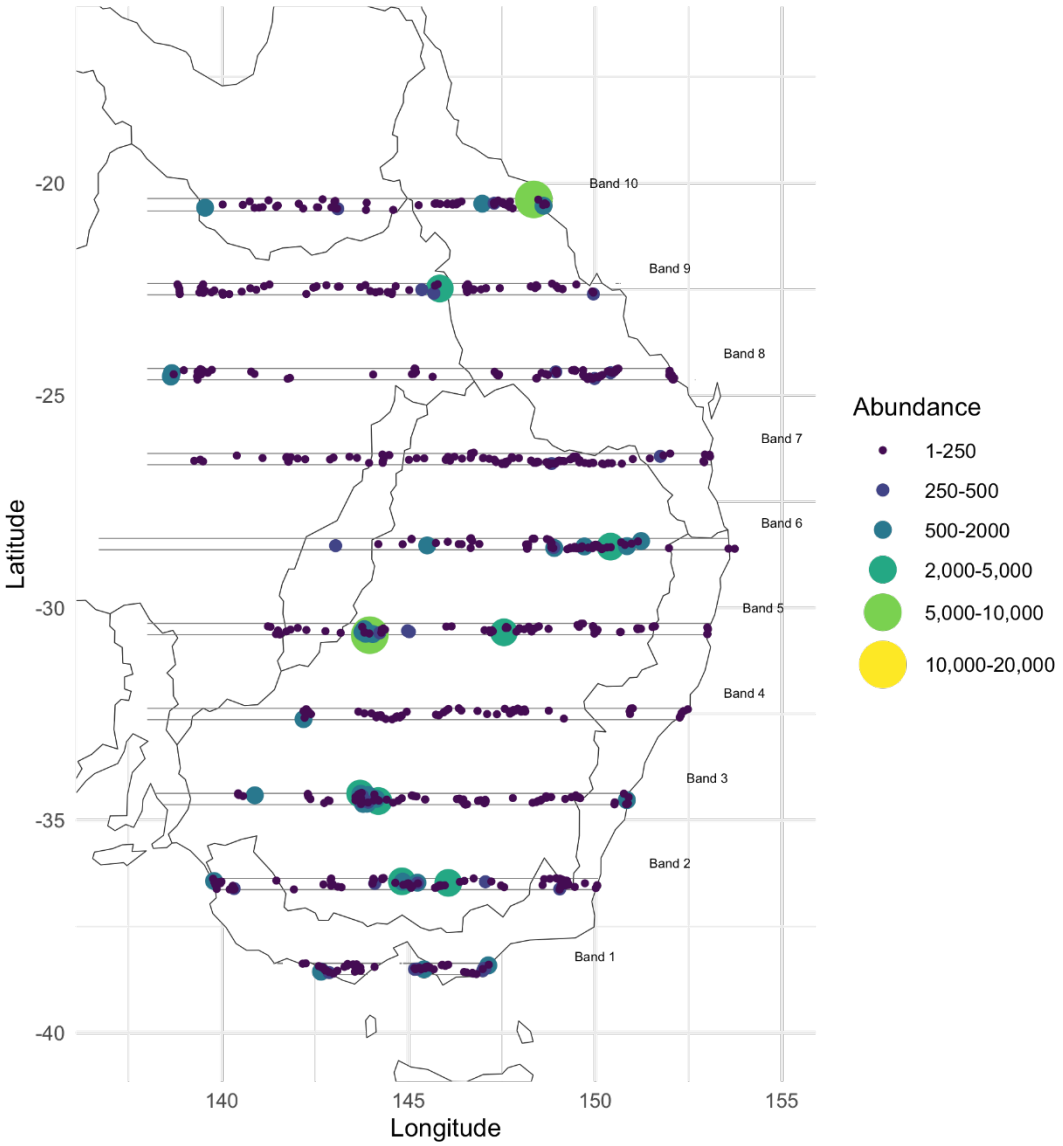


Figure 5. Distribution and abundance of waterbirds in the 2021 Eastern Australian Waterbird Survey. Dry wetlands and those with zero waterbirds not plotted.

2021 Breeding index – 2,494

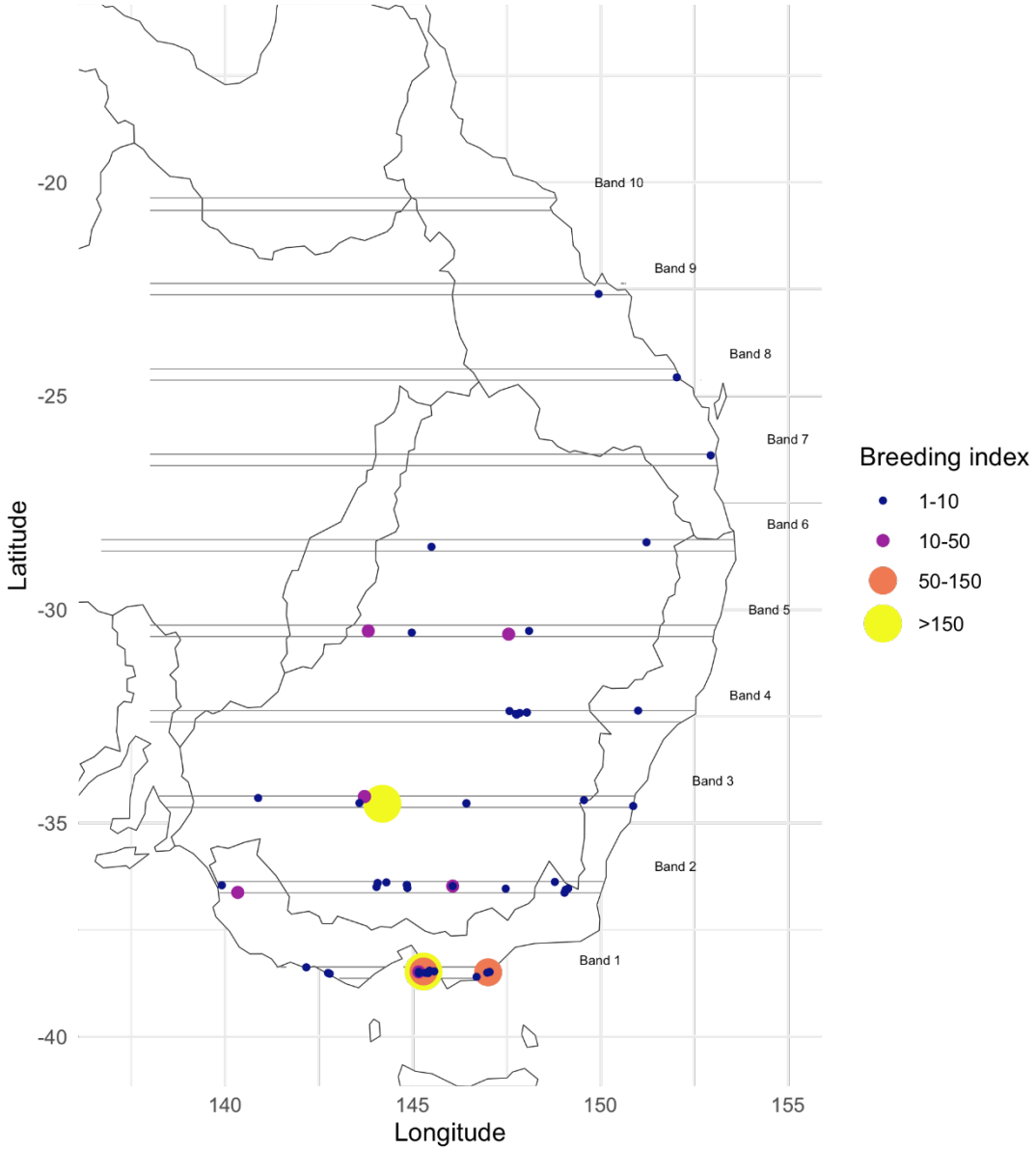


Figure 6. Distribution of waterbird breeding in the 2021 Eastern Australian Waterbird Survey. Only wetlands with breeding recorded are plotted.

2021 Wetland area index – 150,803 ha

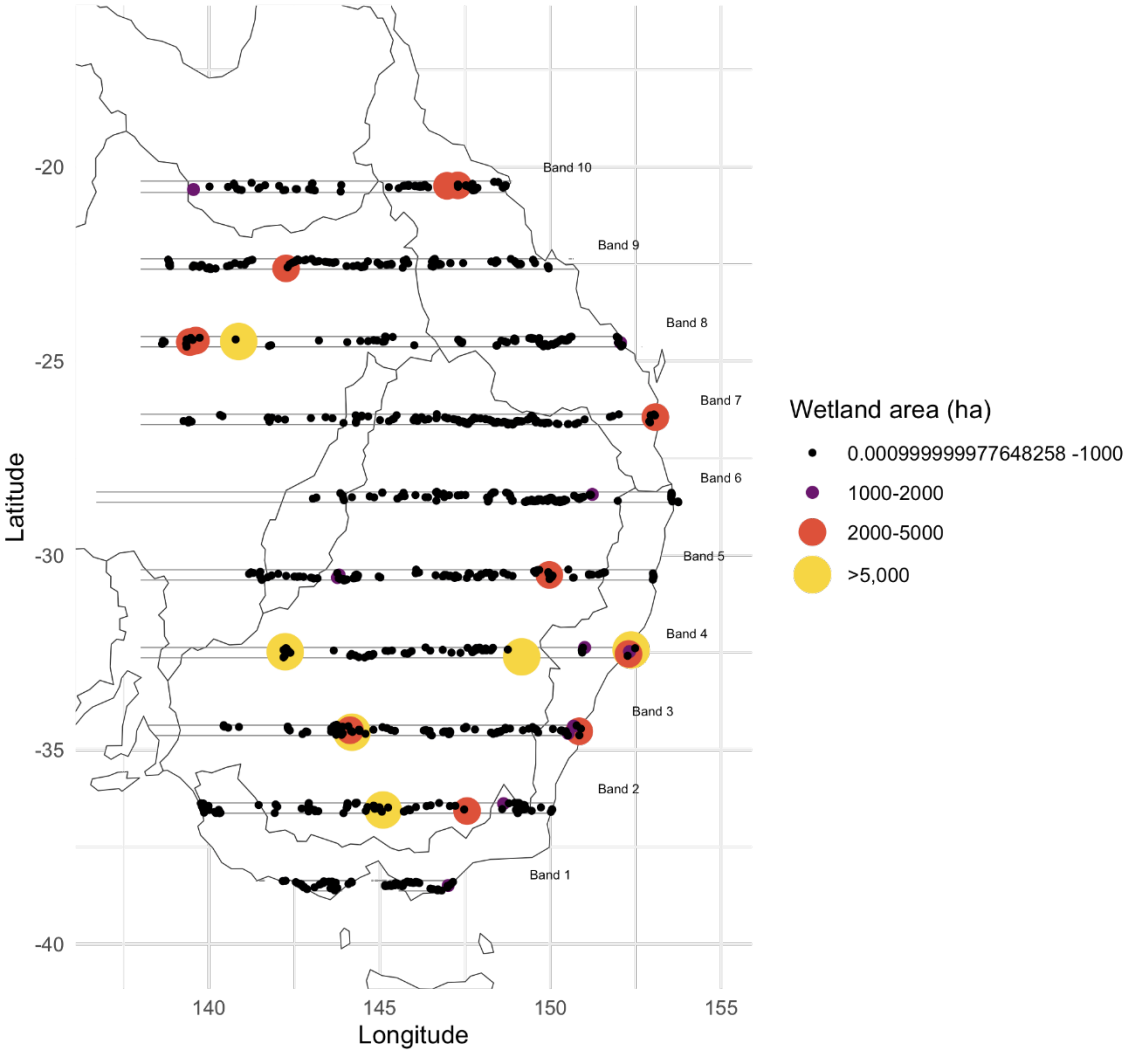


Figure 7. Distribution of wetland area in the 2021 Eastern Australian Waterbird Survey. All surveyed wetlands with surface water present are plotted; dry wetlands not plotted.

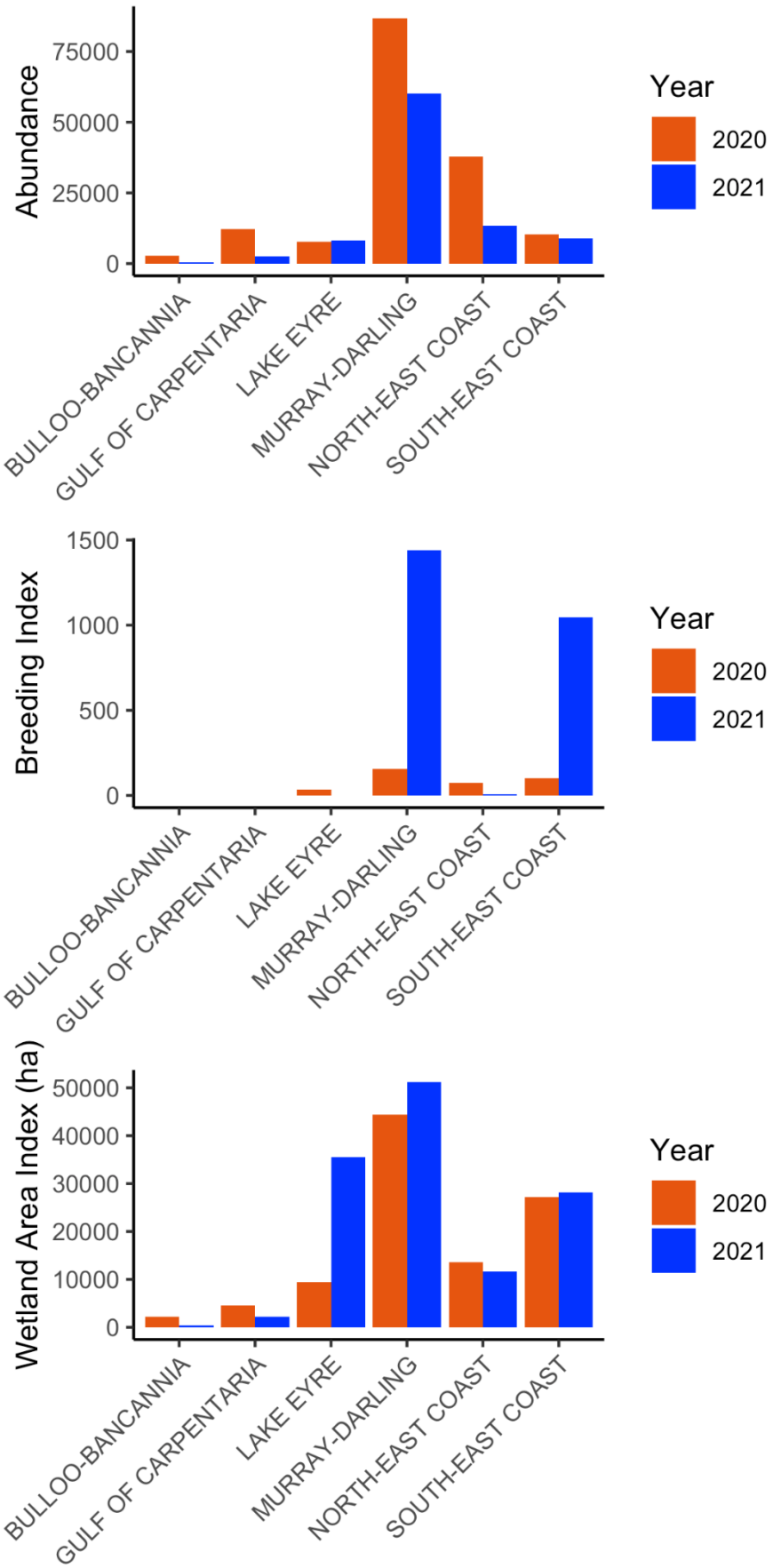


Figure 8. Comparison of waterbird abundance, waterbird breeding index and wetland area index in major river basins in 2020 to 2021.

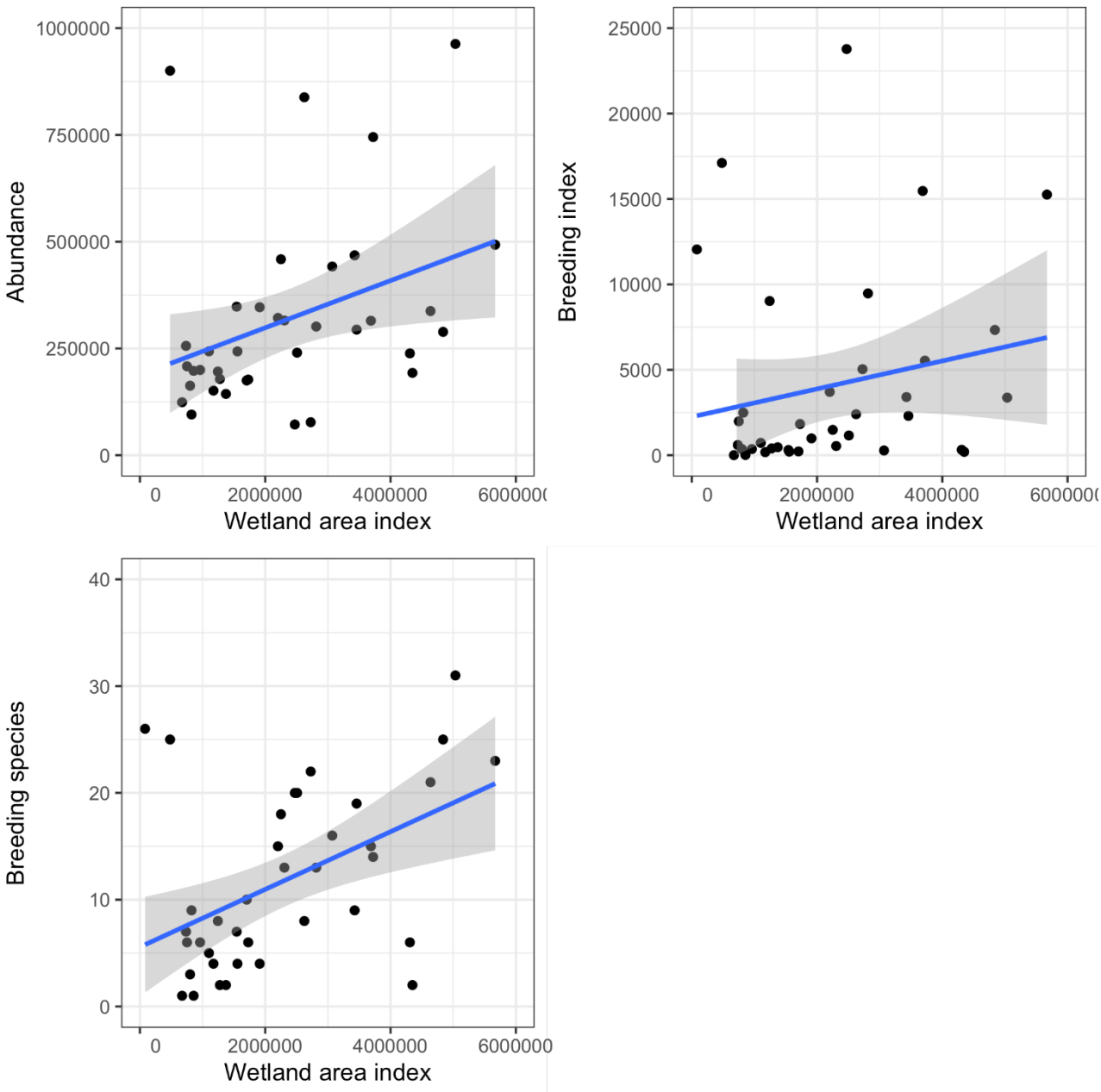
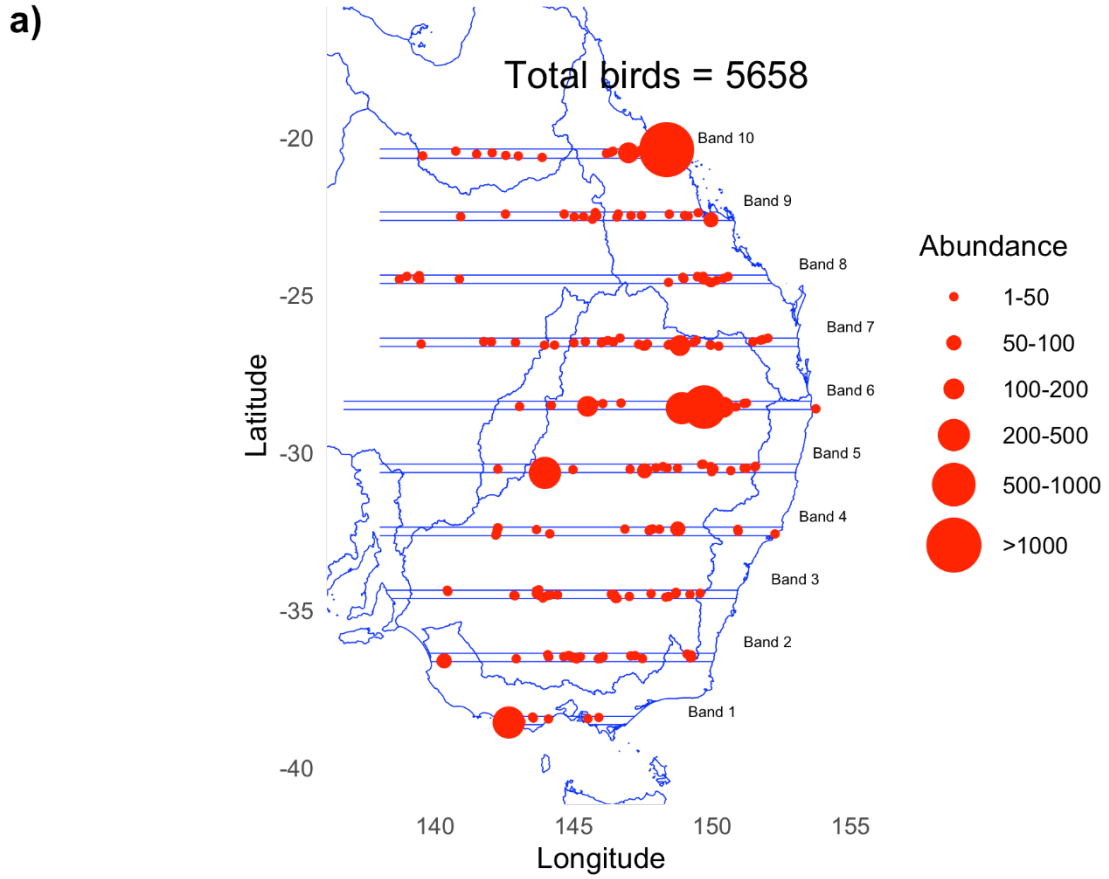


Figure 9. Interactions – mean abundance, breeding and number of breeding species with wetland area index (ha) for the Eastern Australian Waterbird Survey (1983-2021).

Pacific black duck



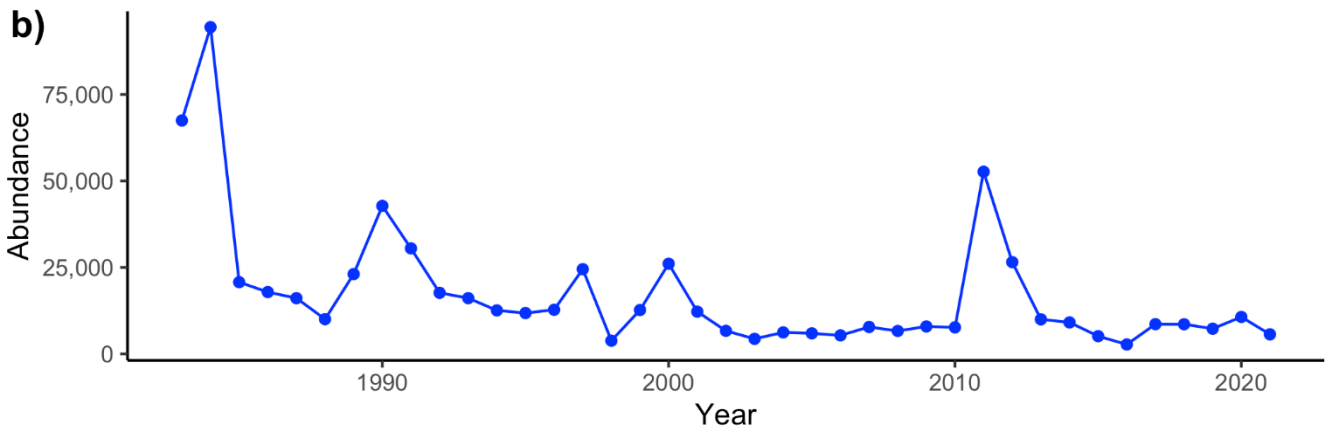


Figure 10. a. Distribution and abundance of Pacific black duck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Australasian shoveler

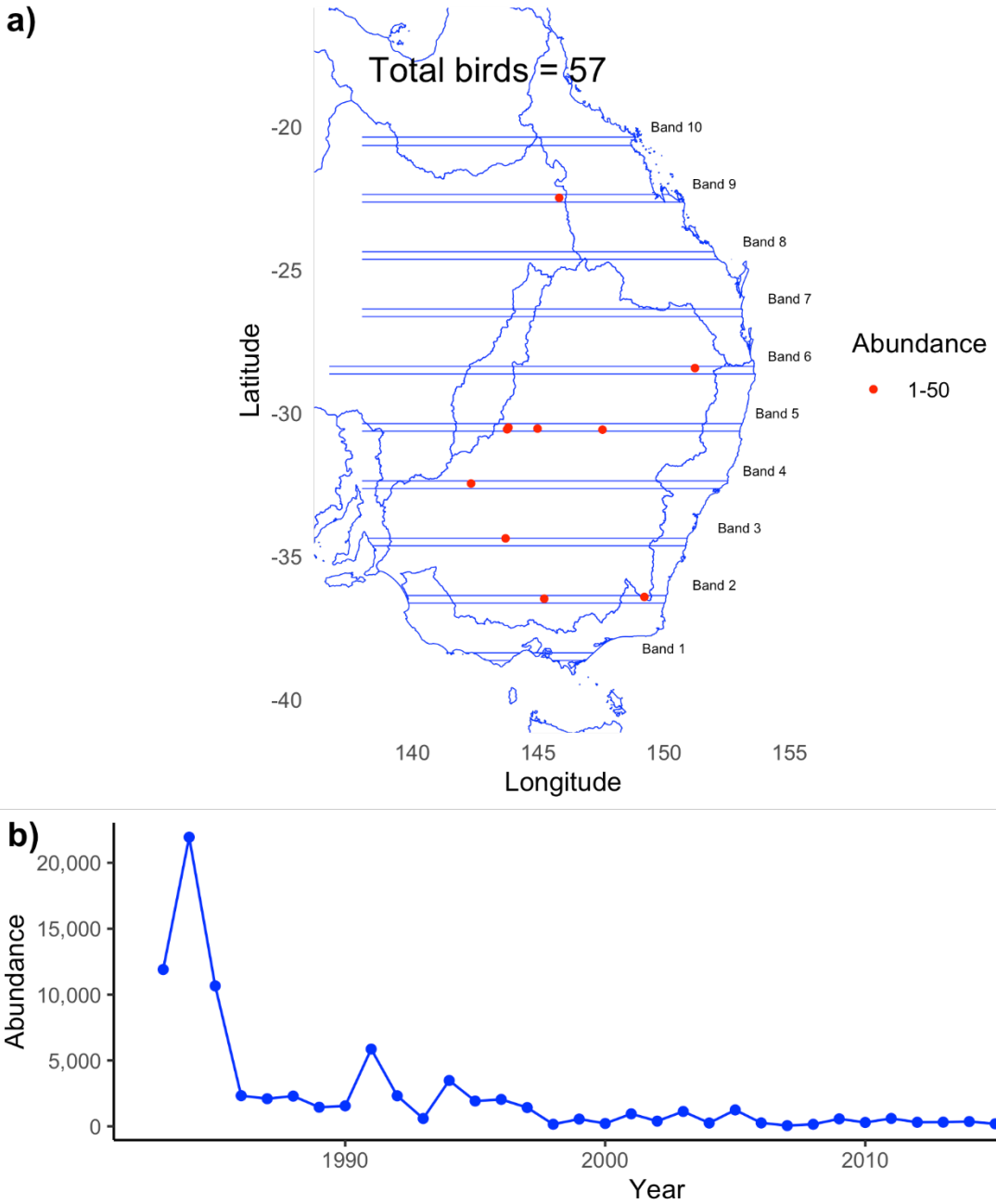
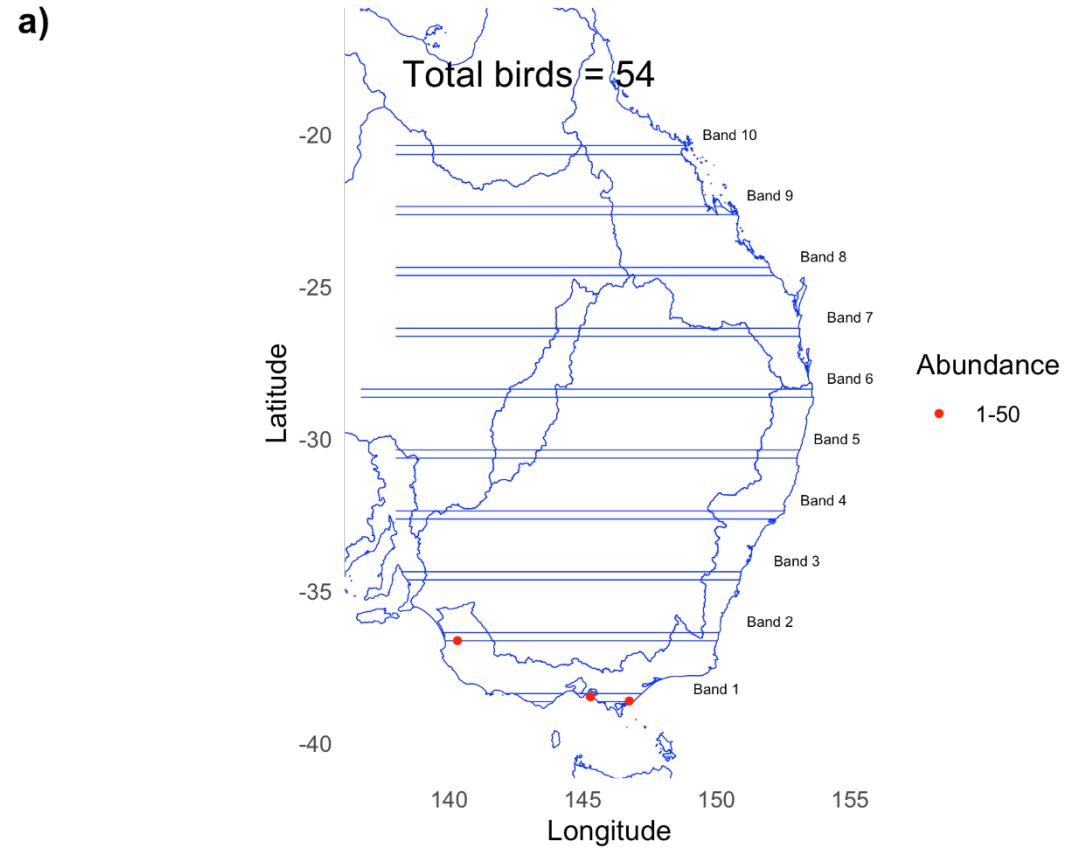


Figure 11. a. Distribution and abundance of Australasian shoveler during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Chestnut teal



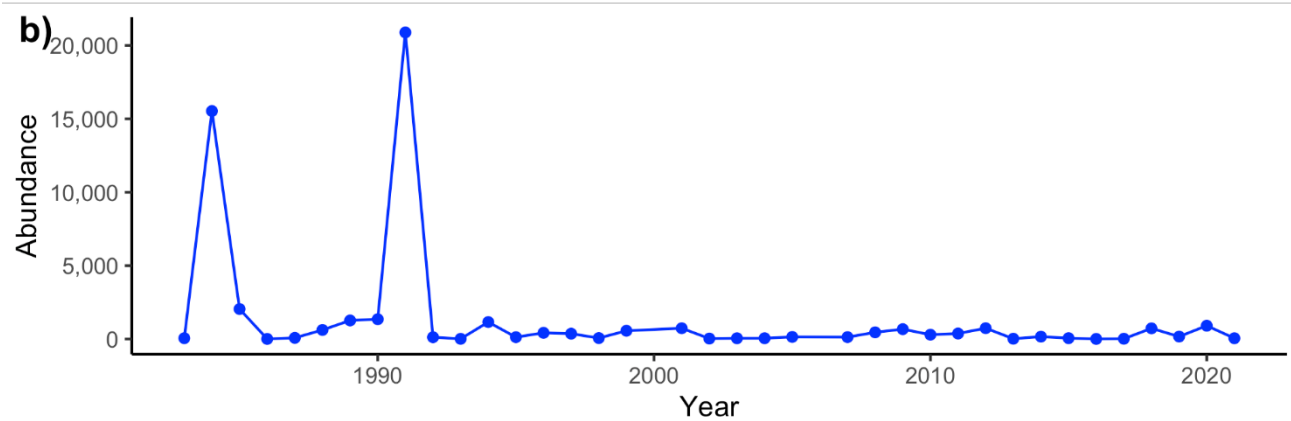
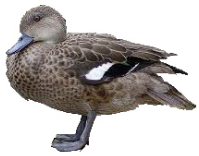


Figure 12. a. Distribution and abundance of chestnut teal during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Grey teal



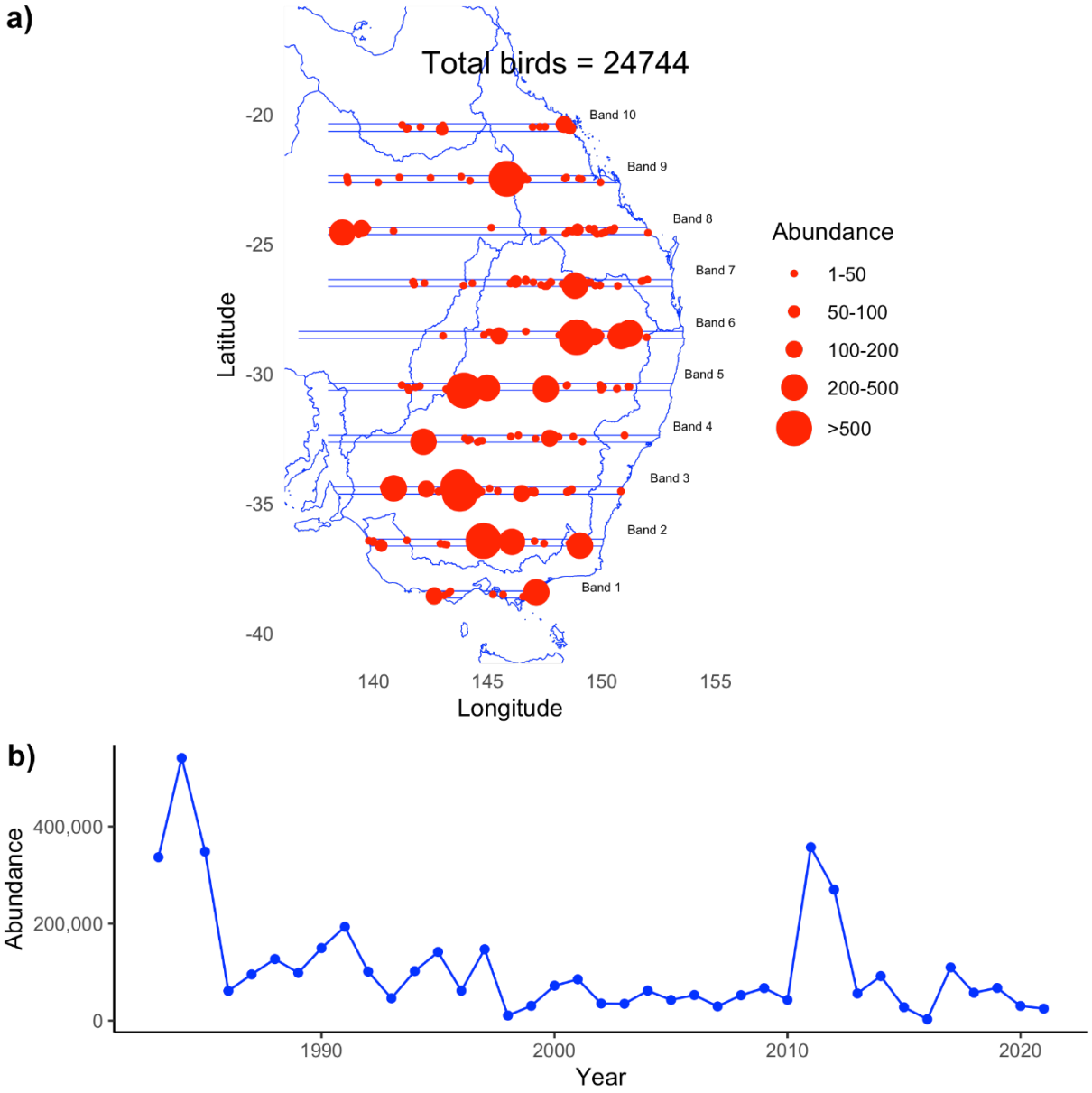


Figure 13. a. Distribution and abundance of grey teal during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Hardhead

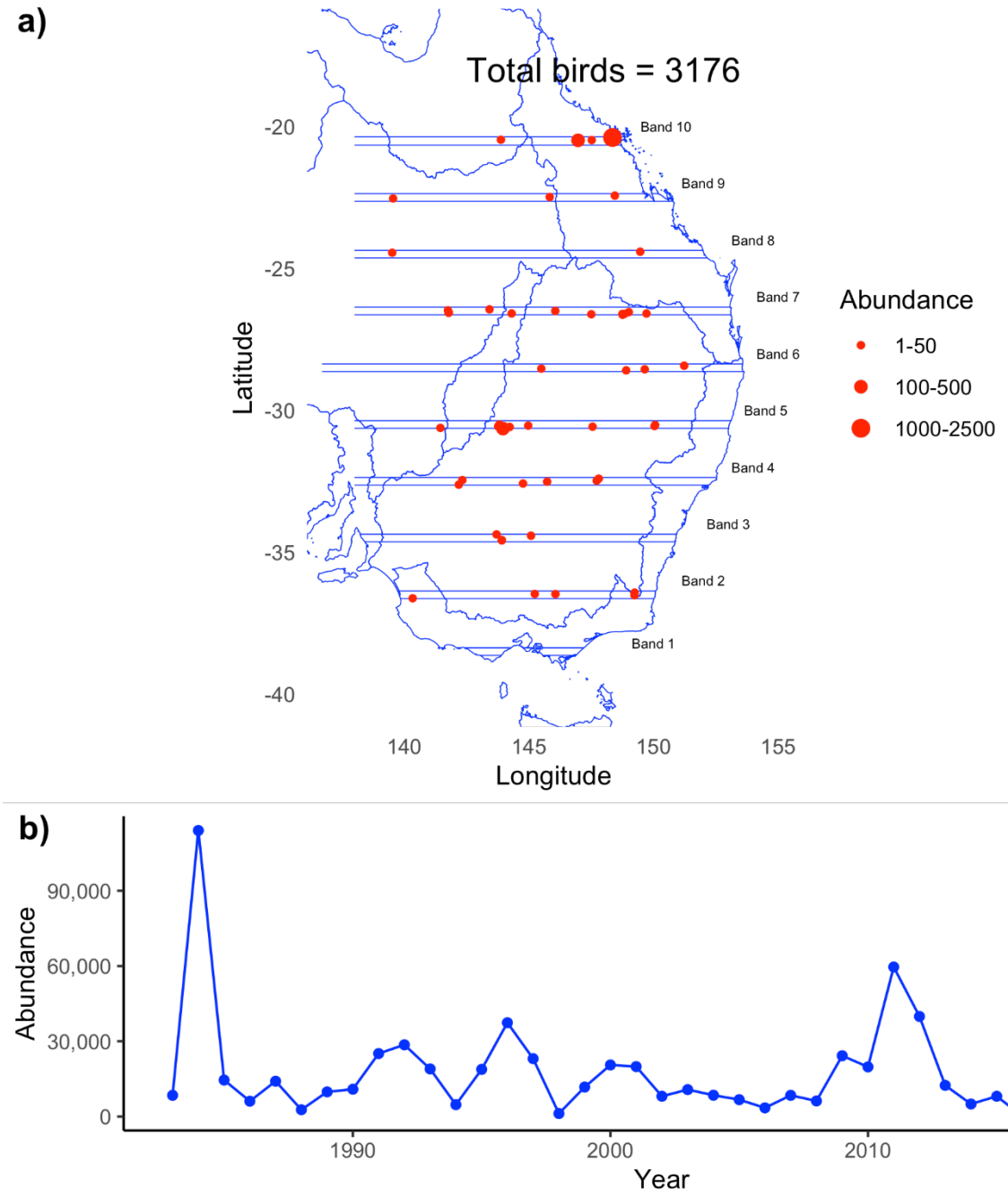
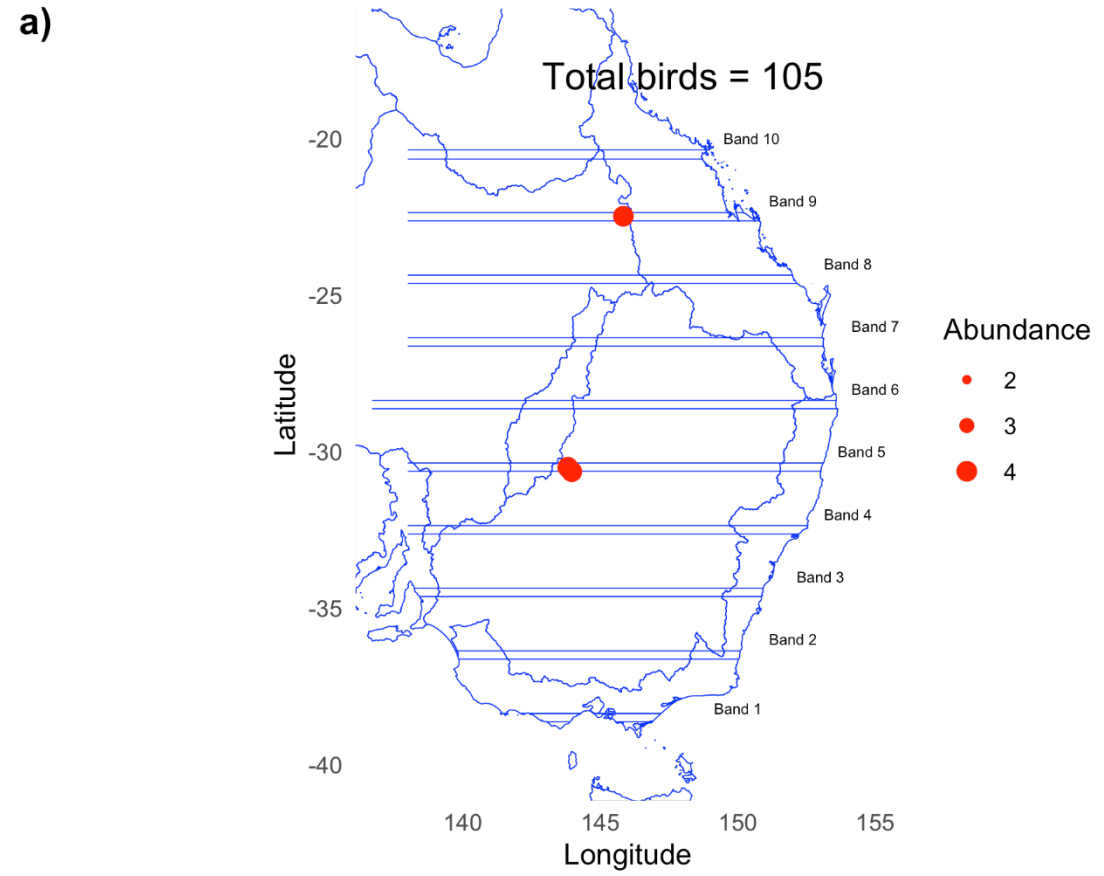


Figure 14. a. Distribution and abundance of hardhead during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Freckled duck



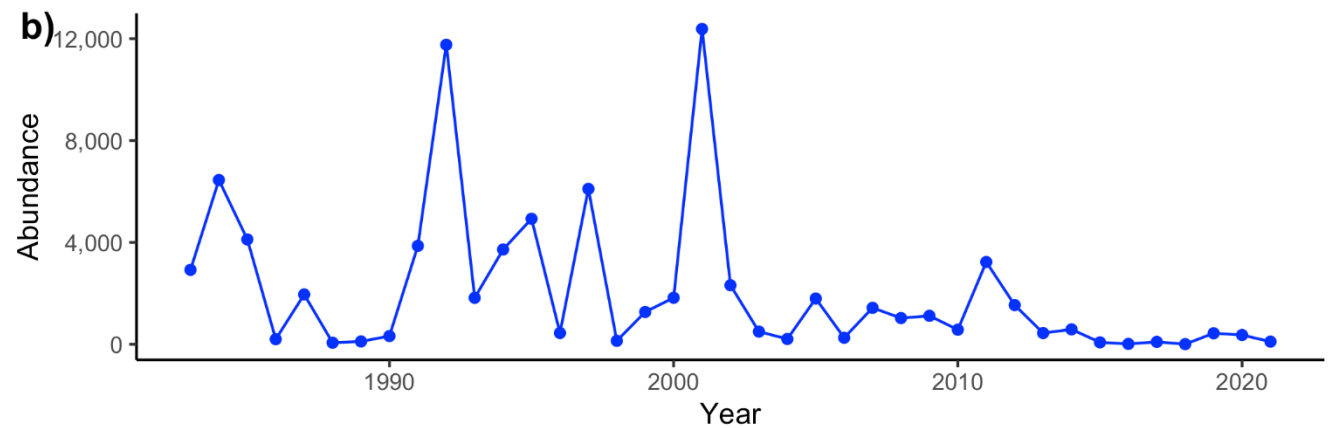


Figure 15. a. Distribution and abundance of freckled duck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Australian shelduck

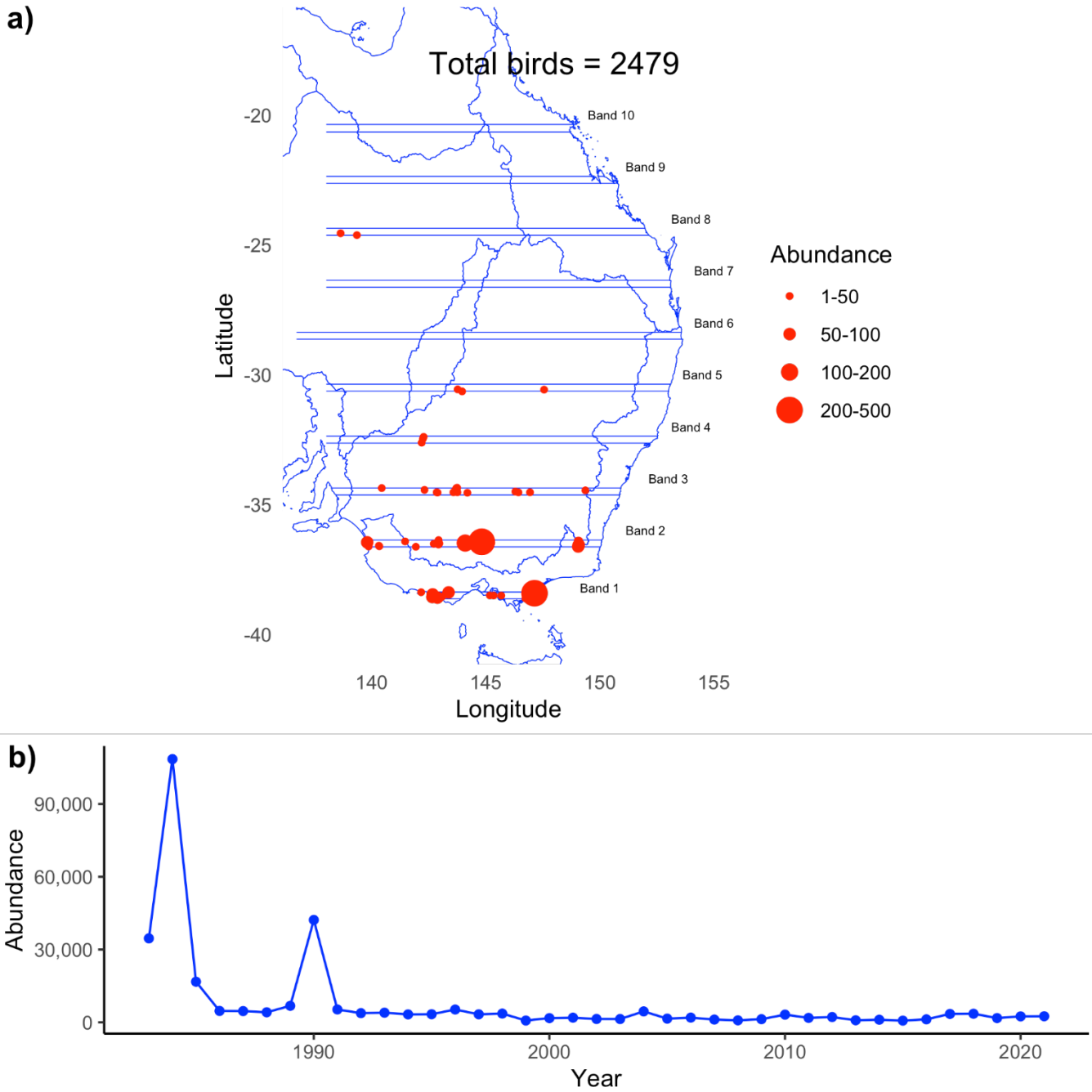
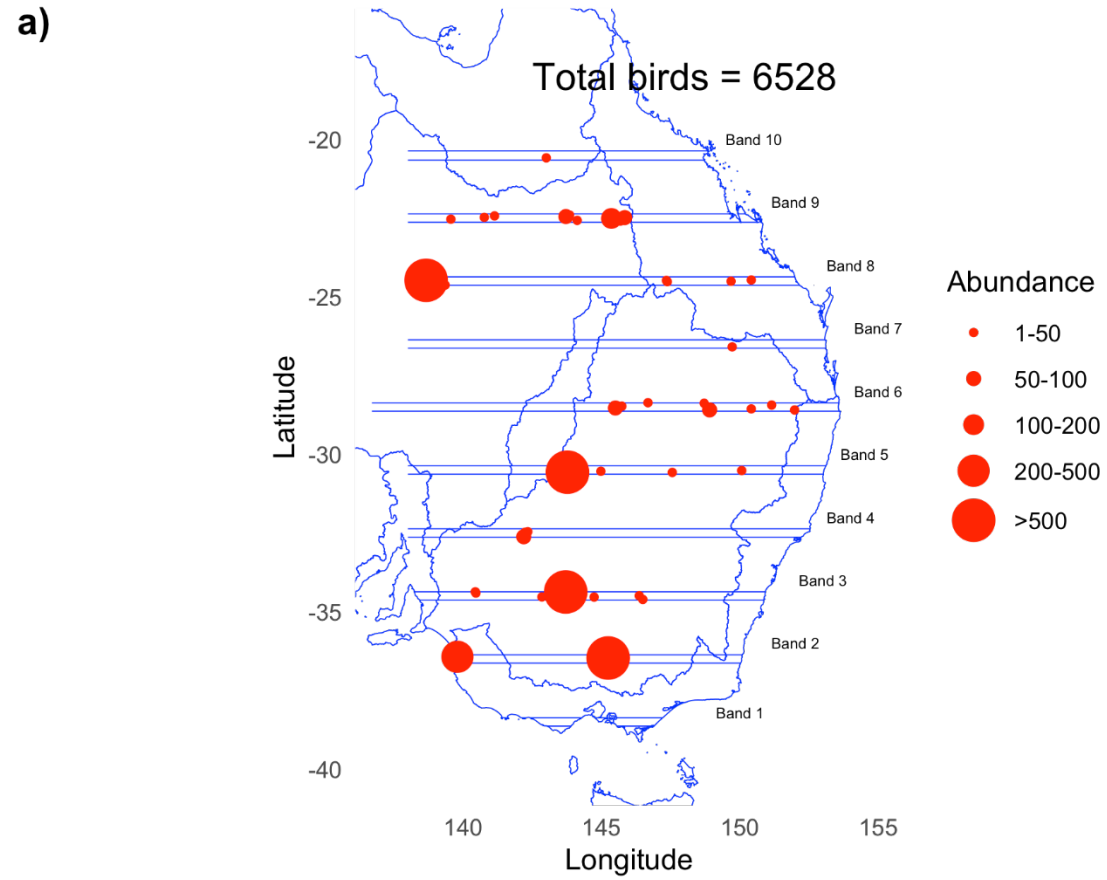


Figure 16. a. Distribution and abundance of Australian shelduck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Pink-eared duck



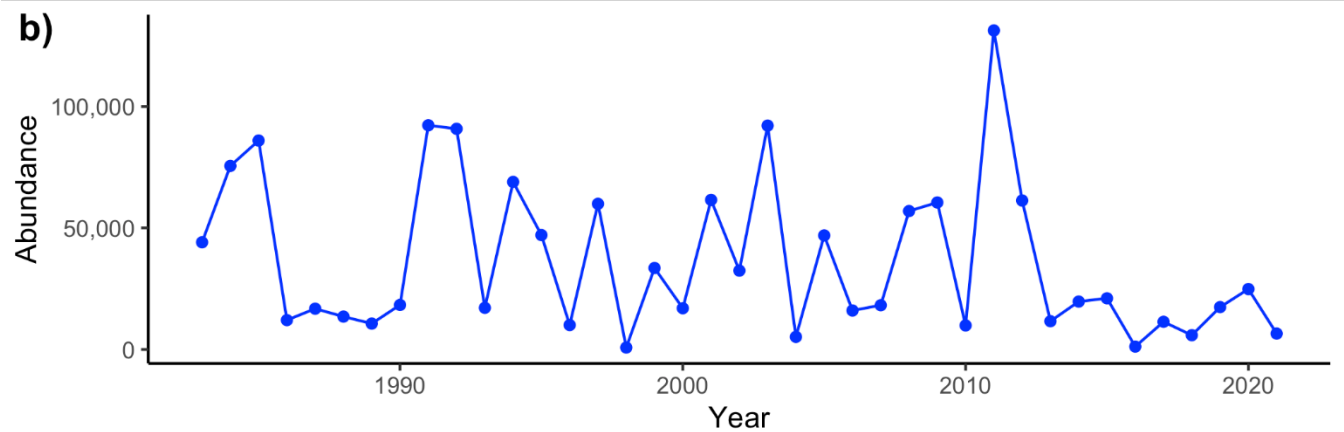


Figure 17. a. Distribution and abundance of pink-eared duck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Plumed whistling- duck

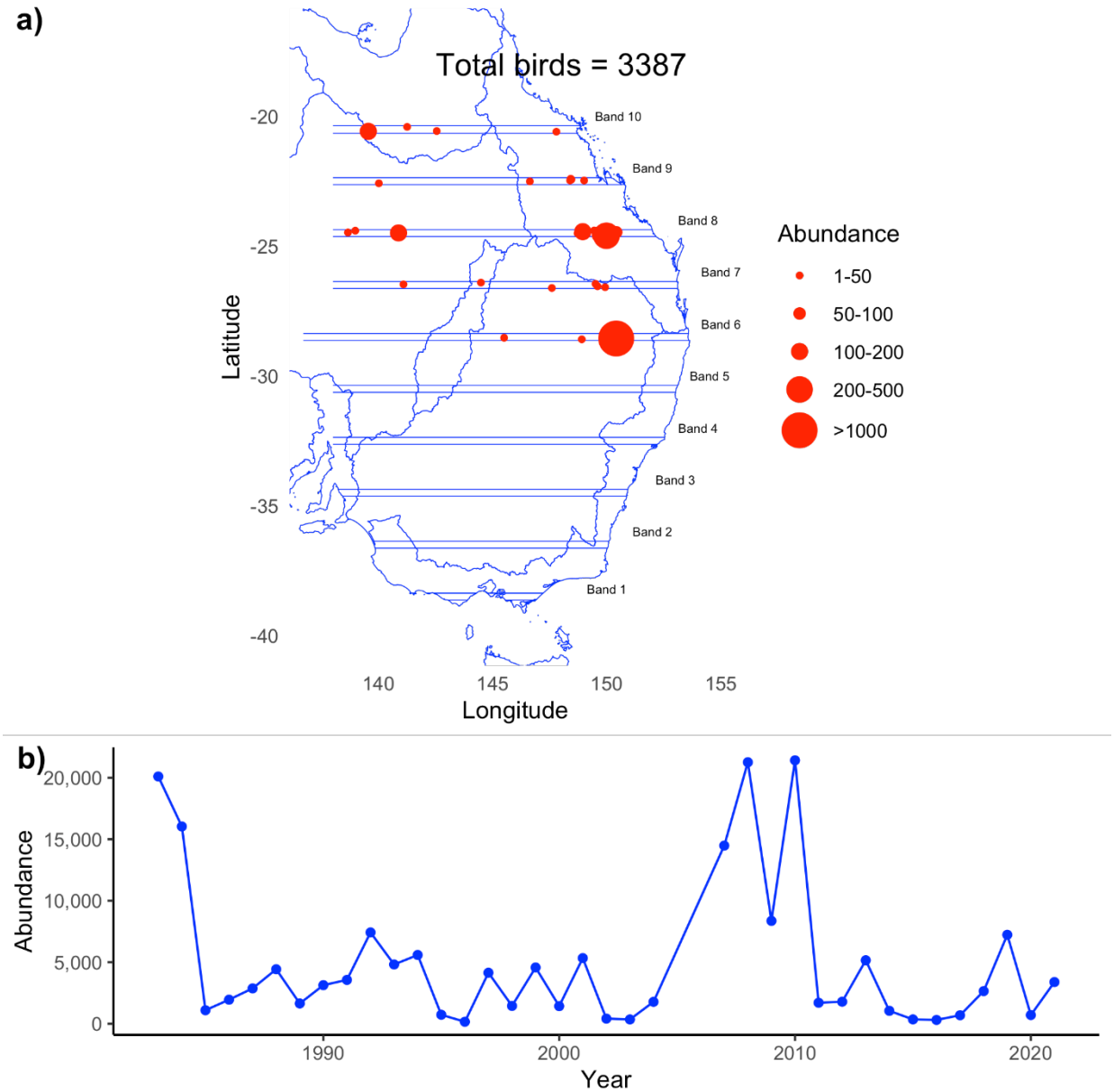
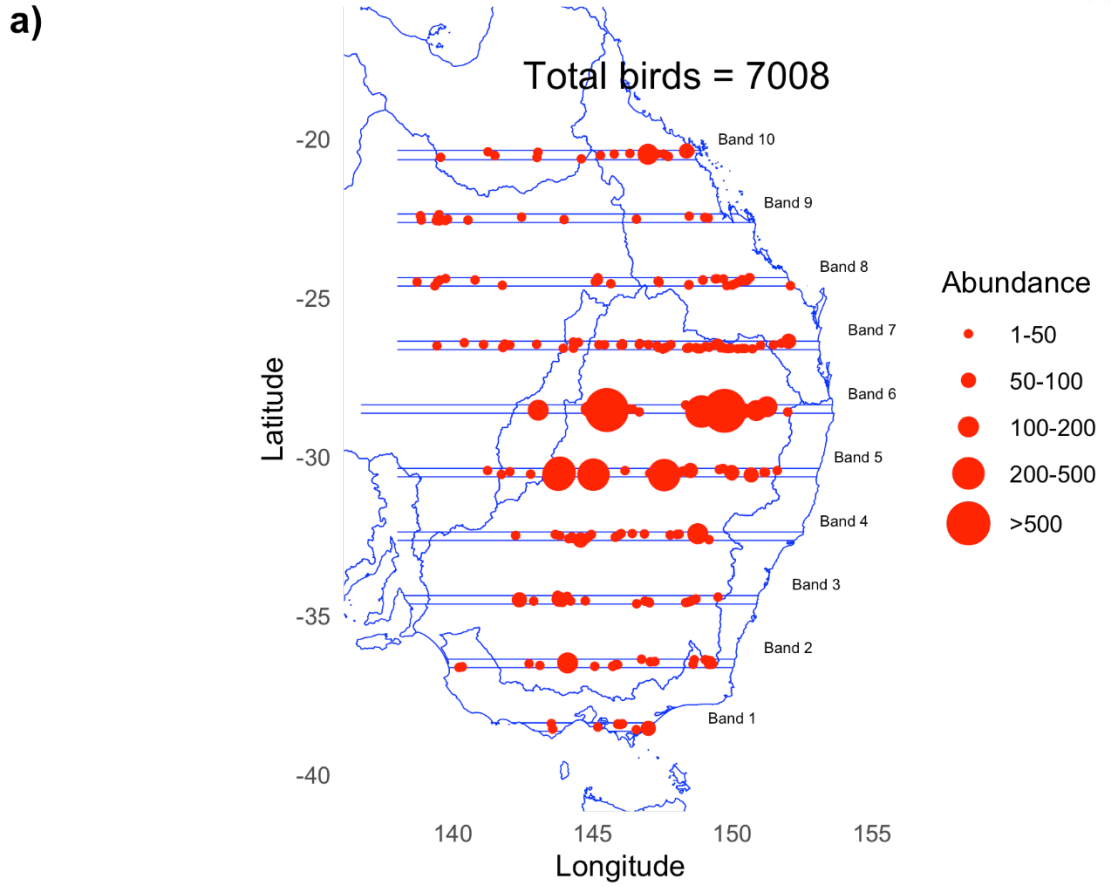


Figure 18. a. Distribution and abundance of plumed whistling-duck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

Australian wood duck



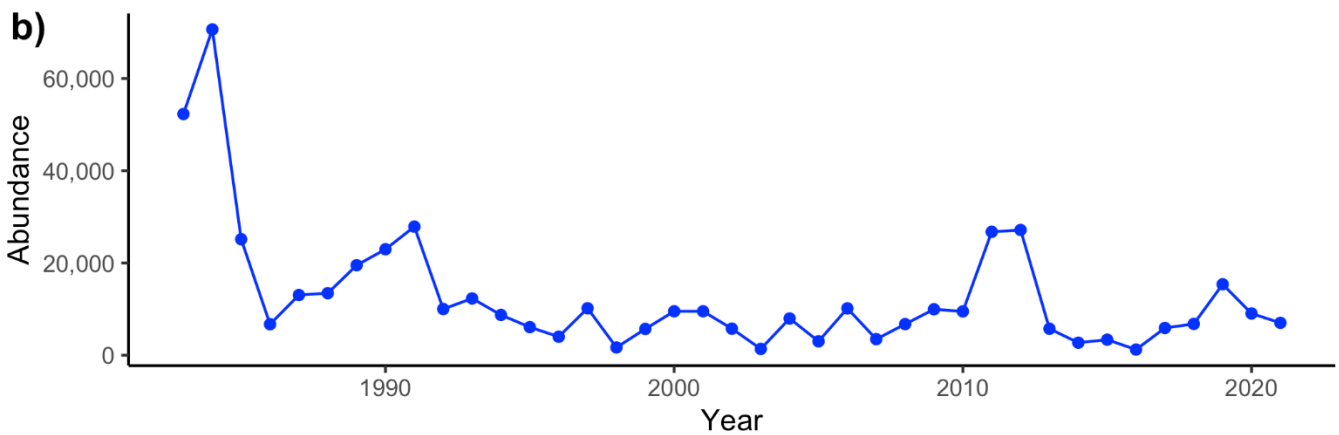


Figure 19. a. Distribution and abundance of Australian wood duck during the 2021 Eastern Australian Waterbird Survey. b. Changes in abundance (1983-2021).

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2. Department of Primary Industries (DPI) 2021. Accessed 05/12/2021 https://edis.dpi.nsw.gov.au/
3. Queensland Government 2021 Drought declarations (Department of Agriculture and Fisheries). Accessed 05/12/2021 https://www.longpaddock.qld.gov.au/drought/drought-declarations/