



FINAL REPORT

June 2023 – June 2024

Fairy Tern census in south-eastern Australia in 2023/2024

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Fairy Terns, Clonmel Islands, Victoria. Photo: Mark Lethlean

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Cover photo: Fairy Tern adults, Glenn Ehmke

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Executive summary

The Australian Fairy Tern (*Sternula nereis nereis*) is a small, threatened, beach-nesting seabird endemic to western and southern Australian coastal habitats, and is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are two subpopulations in Australia, Western Australia (c. 5,000 – 6,000 individuals) and eastern Australia (c. 1,500 individuals). The eastern subpopulation has experienced rapid declines over the last 30 years, which have been identified in well-monitored areas like the Coorong in South Australia. However, a population census across the entire eastern range of the species has never been conducted, and so there is a lack of baseline data to assess population trends over the entire eastern range and to understand site occupancy over time. In this project, we aimed to conduct the first ever census of the Fairy Tern breeding population in eastern Australia to provide the best possible estimate of the current breeding population size and breeding activity distribution.

After analysing historical Fairy Tern records and consulting with regional stakeholders and volunteers, 134 sites were selected for the Fairy Tern census across South Australia, Victoria, southern New South Wales and Tasmania. Surveys took place in three occasions within the breeding season, in the months of October, December and February. Over 200 volunteers and staff participated in these surveys.

Fairy Terns were recorded in all regions but the Fleurieu Peninsula (Encounter Bay islands) and Western Victoria. In October, a total of 793 adults were recorded across eastern Australia, 919 in December and 1,146 in February. South Australia consistently recorded the highest abundance, accounting for 56 to 73% of the total adults recorded in each of the three months. Within South Australia, the highest abundance of Fairy Terns was detected in the western Eyre Peninsula.

Breeding was also detected in all regions but Kangaroo Island, Fleurieu Peninsula, and Western Victoria. We recorded 25 breeding colonies at 23 different sites. The number of adults per colony ranged from 3 to 200. The largest colonies were recorded on King Island, Tasmania (200 adults) and the South Lagoon of the Coorong (160 adults).

Our highest count (1,146 adults) may be an accurate estimate of the population size within our survey coverage, but the next census needs to ensure the extent of Tasmanian habitat is included. In order to evaluate future population trends of the eastern population of Australian Fairy Terns, we recommend this census is repeated every two to four years and key barriers overcome to include the full extent of the Tasmanian range. The guidelines, sites and procedures developed in this project can be replicated in the future. Given Australian Fairy Terns are highly mobile, and we do not have a good understanding of their movement patterns, our best attempt at a reliable and accurate eastern population size estimate to assess trends needs to be achieved from a structured and coordinated census across the entire eastern range.

1. Introduction

The Australian Fairy Tern (*Sternula nereis nereis*) is one of Australia's smallest (20-24 cm) and most threatened seabirds, listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) since March 2011. The species range extends along the southern Australian coast, from south of the Dampier archipelago in Western Australia and east to Botany Bay in New South Wales, including Tasmania. The Great Australian Bight divides the species distribution between western and eastern populations. In 2020, the population was estimated to be between 6,800 and 8,100 mature individuals (Greenwell et al., 2021a). Whereas the western population is considered to be stable, the eastern population is experiencing a continuing decline (Greenwell et al., 2021a; Paton et al., 2009). The National Recovery Plan for the Australian Fairy Tern Recover Plan (hereafter the Recovery Plan) aims to increase the population size of the species and sustain a positive population trend by 2030 (Commonwealth of Australia 2020).

The current eastern population is estimated to be around 1,500 mature individuals (range 1,300 – 1,700) based on state-based estimates (Commonwealth of Australia 2020). These state-based estimates include 900-1,150 mature individuals in South Australia (DENR 2012), 100 – 120 breeding pairs in Tasmania (Commonwealth of Australia 2020), 100 – 150 breeding pairs in Victoria (Adams et al., 2019) and less than 50 breeding pairs in New South Wales (Greenwell et al., 2021a). Nonetheless, a coordinated state population census has only been conducted in South Australia in 2011/2012 (DENR 2012). The other state-based estimates are from smaller scale (e.g., regional, colony sites) counts of breeding colonies, whose purpose was not to estimate population size but to monitor breeding success. While dedicated monitoring of breeding effort and success is necessary and should continue to detect potential causes of low breeding success and address these through evidence-based management, intensive breeding monitoring is not possible at many Fairy Tern breeding sites due to remoteness or lack of human resources in some regions. For example, DENR (2012) found that about 50% of the South Australian Fairy Tern population was in the Eyre Peninsula, including colonies on offshore islands, a region where intensive breeding monitoring of most sites is not feasible. Furthermore, in regions where most sites can be regularly monitored, if efforts are focused on active colonies, double counting individuals is likely as adults may re-attempt nesting at different sites within a season. Hence, a coordinated, simultaneous and ongoing census across the entire eastern range is needed to obtain the best possible estimate of the Fairy Tern breeding population size and reliable population trends.

BirdLife Australia identifies a Fairy Tern census of the eastern population as a priority for advancing the recovery of the Fairy Tern, and this project's planned actions align with the recovery actions identified within the Recovery Plan. This project spans the range of the eastern subpopulation of Fairy Tern, with a particular focus in South Australia and Victoria, where most of the eastern Australian individuals occur. This project was coordinated by BirdLife Australia's Beach-nesting Birds team with expertise in species and population ecology, as well as working with citizen scientists and on-ground practitioners. The activities within this project build the foundations of future works and the establishment of an active and skilled network of land managers and volunteers to monitor long-term trends of the Fairy Tern eastern population and improve the conservation outlook for the species.

1.1. Aims

In alignment with the Recovery Plan's goal and strategy, Birdlife Australia aims to:

1. Establish a biennial south-eastern census for Fairy Tern following the general methods employed in the 2011 South Australian Fairy Tern census (three surveys throughout the breeding season) to provide an accurate estimate of population size and distribution.
2. Achieve a minimum extent of count to include all historical, current and potential fairy tern breeding habitat sites across South Australia, Victoria, southern New South Wales and Tasmania.
3. Develop national monitoring guidelines to ensure standardised counts are performed including emphasis on collection of threat data at each site to opportunistically gather information on the range and extent of threats present at breeding sites.
4. Supply an estimate of the eastern population of mature individuals and mapping layers of the census to support future recovery work and trend assessments.

2. Methods

2.1. Census site selection

South-east Australia, including South Australia, Victoria, Tasmania and southern New South Wales, has more than 10,000 km of coastline. Because it would not be possible to survey all coastline, prioritising and selecting the most appropriate sites to include in the census was a key task before conducting any surveys. We prioritised and selected the final sites following two main steps:

1. Identify all sites where Fairy Terns had been recorded since 1980 and prioritise sites based on historical and recent use by Fairy Terns.
2. Consult with relevant regional stakeholders, local groups, and volunteers to consolidate the list of census sites based on their local knowledge.

Historical Fairy Tern occurrence records

To identify all historical and current Fairy Tern habitat sites in south-eastern Australia, we collated all Fairy Tern occurrence records in South Australia, Victoria, Tasmania and New South Wales available in Birddata (BirdLife Australia 2023), eBird (eBird 2024), the Biodiversity Database of South Australia (BDBSA), the Victorian Biodiversity Atlas (VBA) and Natural Values Atlas (NVA) since 1980. This data set includes BirdLife Australia's standardised monitoring surveys, the 2011 South Australia Fairy Tern census and records from citizen scientists and recreational birders. In total, we gathered 17,678 Fairy Tern occurrence records along the south-eastern Fairy Tern population range. To identify potential census sites and their priority level (i.e., Low, Medium, Medium/High, High and Very High), we conducted the following steps with R (R Core Team 2021), RStudio (Posit Team 2024) and QGIS 3.22.10 (QGIS.org 2024):

1. Merge records from all databases keeping breeding information where available. Note that the level of detail regarding breeding activity depends on the data base and the protocol used by the person who submitted the record, so we grouped all breeding activity (e.g., eggs observed, chicks observed, breeding behaviour observed) as 'Breeding confirmed', and all sightings recorded as no breeding or without breeding information were grouped as 'No breeding/Unknown'.
2. Spatially intersected the coordinates of the sightings with polygons of existent Birddata's Beach-nesting Birds and Migratory Shorebirds shared sites' polygons with the R package *sf* (Pebesma 2018).
3. We identified clusters of sightings outside of polygons overlapping all geometric features on top of a satellite base map in QGIS. We then draw more polygons on suitable habitat areas (e.g., sand spits, islands shown on the satellite map) that had at least two Fairy Tern records. We created a shapefile with all existent and new polygons that constituted our Fairy Tern sites (628 polygons that represented 543 distinct sites – 239 sites in South Australia, 157 sites in Victoria, 103 sites in Tasmania and 44 sites in New South Wales). Figure 1 shows the extent of the sites along the Australian south-eastern coast.
4. We repeated the spatial intersection in step 2, this time with a buffer of 5km to ensure sightings outside a polygon were assigned to the nearest site within 5km.
5. We discarded sightings outside polygons and the 5km buffer (329 records) from further analysis and removed duplicates keeping only one sighting per breeding status (i.e. 'Breeding confirmed', 'No breeding/Unknown') within the same site and day. For sites with more than one sighting within the same day, we kept the sighting with the highest count if count information was available. Keeping only one sighting per day and site, reduces to some extent the biased effort of popular birding. After this, 13,226 records of Fairy Tern remained to identify priority sites.
6. For each site, we counted: number of records since 1980, number of unique years with records since 1980 and highest count since 1980. To have a better understanding of recent site use, we also counted the number of unique years with records since 2018.
7. We used the above variables to identify the priority level of each polygon. At a state level, we defined lower (50th percentile for number of records, 25th percentile for all other variables) and upper (90th percentile for number of records, 75th percentile for all other variables). Thresholds were defined at a state level to ensure that sites were representative of both south-eastern population and states' species distribution. Nonetheless, since most individuals occur within South Australia and Victoria, the focus of the census remained on these two states. Sites with less records than the lower threshold were classified as **low priority**; sites with a number of records equal or higher than the upper threshold for records and a number of years with records equal or higher than the upper threshold for years were classified as **high priority**; all other sites were classified as **medium priority**. Further, sites of high priority with highest counts equal or higher than the upper threshold for counts and with records over at least 4 years since 2018 were upgraded to **very high priority**. Because there were too many Medium priority sites (200), we upgraded to **Medium/High priority** those Medium sites with records over at least 4 years since 2018.

8. We created an interactive map with the R package *leaflet* (Cheng et al., 2022) to map the location of the Fairy Tern sites and their priority level. This map is a HTML file that the user can open in their computers without the need of any GIS tools, they can zoom in and out and click on any geometric feature (polygon or sighting) to see more information. We shared this map with our key stakeholders, together with a list of the sites with the highest priority according to our analysis, to seek their feedback on the priority levels and local knowledge about sites.

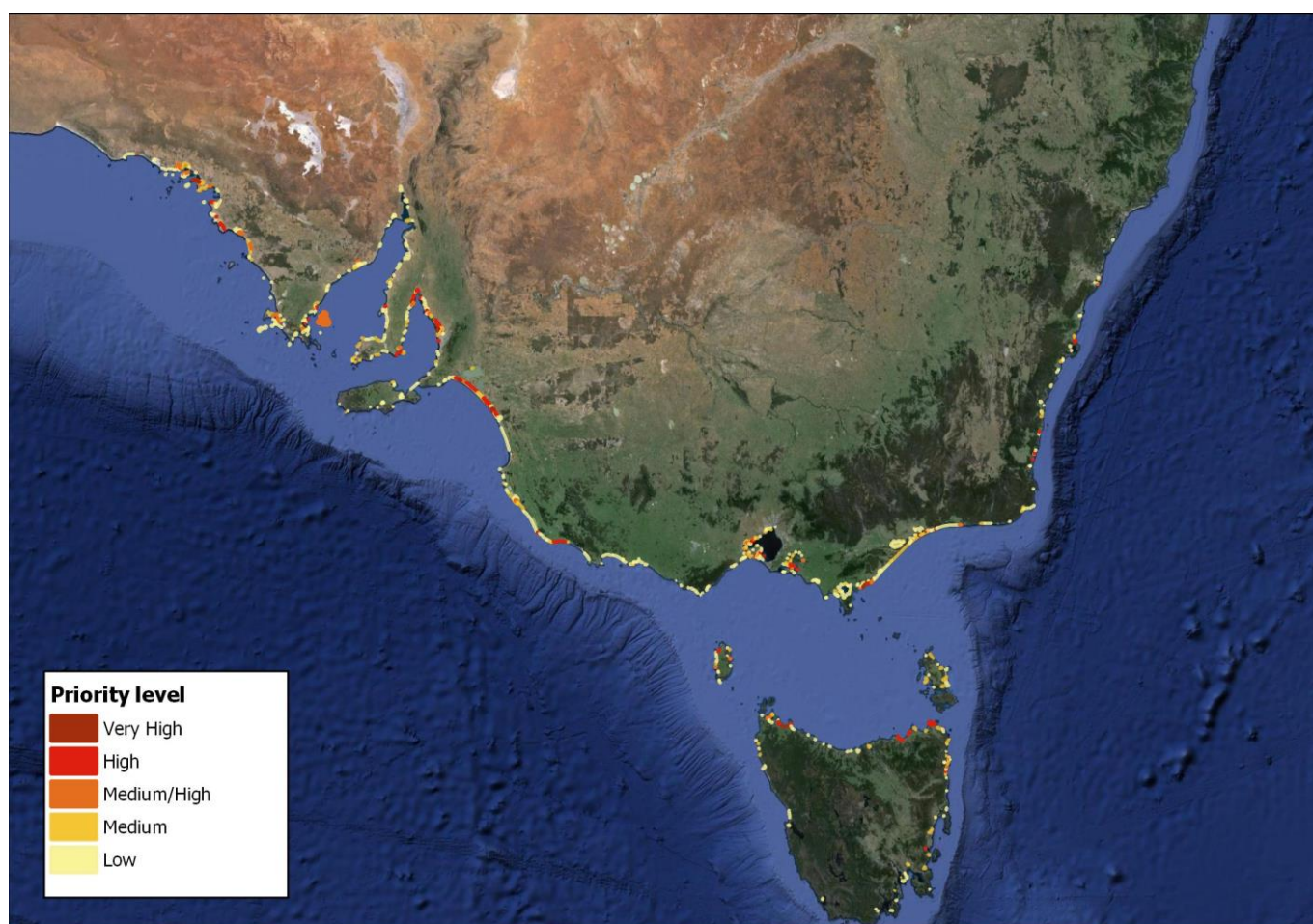


Figure 1. Extent and priority level of the 543 Fairy Tern sites across South Australia, Victoria, Tasmania and New South Wales identified using occurrence Fairy Tern data since 1980 available in Birddata. eBird, Biodiversity Database of South Australia, Victorian Biodiversity Atlas and Natural Value Atlas.

Consultation to select census sites

To seek feedback from relevant stakeholders, community groups and local volunteers, we divided the 543 sites into regions. These regions were: (1) Eyre Peninsula West Coast, (2) Eyre Peninsula South and East Coast, (3) Yorke Peninsula and St Vincent Gulf, (4) Fleurieu Peninsula, (5) the Coorong, (6) South East South Australia, (7) Kangaroo Island, (8) Western Victoria, (9) Port Phillip and Western Port Bay, (10) South Gippsland, (11) East Gippsland, (12) New South Wales South Coast, (13) North West Tasmania, (14) North East Tasmania, (15) East Tasmania.

We sought feedback from over 20 regional stakeholders and community groups across South Australia, Victoria, New South Wales and Tasmania, and from our Beach-nesting Birds and Migratory Shorebirds local

volunteers. The key groups included National Parks and Wildlife Service, Department for Environment and Water, Eyre Peninsula Landscape Board, Southern Eyre Bird Club, Indigenous Protected Areas, Limestone Coast Landscape Board, Fleurieu Hills Landscape Board, University of Adelaide, Friends of Shorebirds South East, Parks Victoria, Geelong Field Naturalists Club, Friends of French Island, Phillip Island Nature Parks, NSW National Parks and Wildlife Service, BirdLife Shoalhaven, BirdLife Southern NSW, BirdLife Tasmania, Tasmania Parks and Wildlife Services, Department of Natural Resources and Environment Tasmania, Friends of Orford Bird Sanctuary, and North East Bioregional Network.

The feedback from these key groups was focused on: (1) assessing the accuracy of our priority levels as identified by our analysis, (2) suggesting new sites we might have overlooked due to lack of survey effort or submission of data to historical data sets, and (3) evaluating feasibility of repeated surveys at key sites based on accessibility and remoteness. These key groups also provided details of land holders for sites with private access (e.g., Horse Peninsula in the Eyre Peninsula) to seek permission to survey.

Final census sites

Based on the feedback received during the consultation process and surveyors' capacity at time of census, a total of 134 sites across South Australia, Victoria, New South Wales and Tasmania were included in the census. This included five sites in South Australia that were overlooked in the historical dataset due to lack of survey effort or records: Clare Bay, Walkers Rock, Tumby Island, Paisley Inlet and Cowrie Island. For coordination purposes, the 134 sites were split into 14 regions: Eyre Peninsula West Coast, Lower Eyre Peninsula, Yorke Peninsula and St Vincent Gulf, Fleurieu Peninsula, the Coorong, South East South Australia, Kangaroo Island, Western Victoria, Port Phillip and Western Port Bay, South Gippsland, East Gippsland, New South Wales South Coast, King Island, and East Tasmania. Figure 2 shows the location and extent of the selected sites, and Table 1 has the number of sites and coverage per state and region, and a complete list of all sites can be found in Appendix 1.

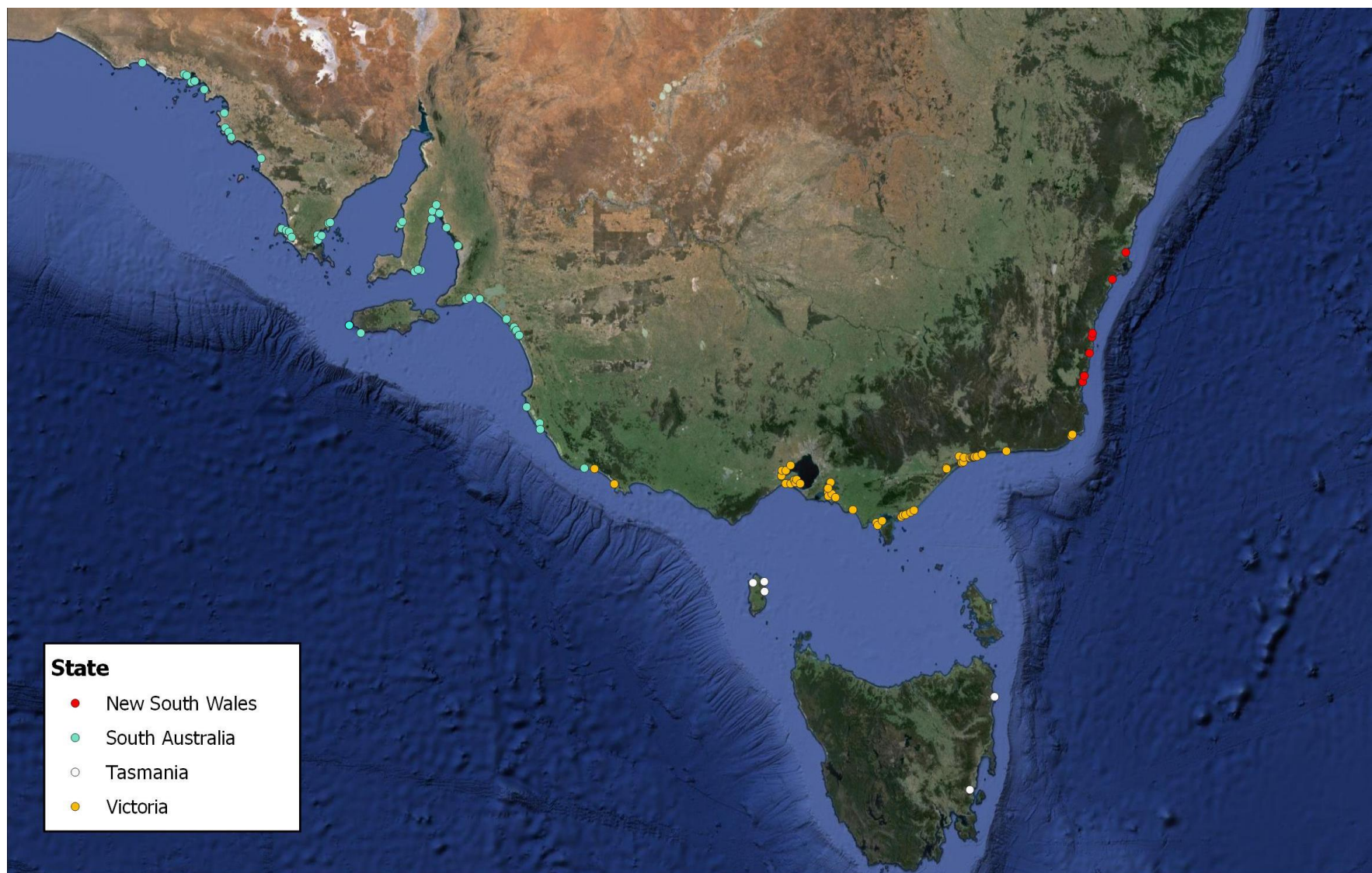


Figure 2. Extent and location of the 134 selected sites for the Fairy Tern Census in the 2023/2024 season.

Table 1. Number of sites and coverage per region and state included in the Fairy Tern Census in the 2023/2024 season.

State	Region	Number of sites	Coverage
South Australia	Eyre Peninsula - West Coast	23	Coastline with suitable breeding habitat from Clare Bay to Lake Newland, including St Peter Island, Eyre Island; Streaky Bay, Seagull Lake and Baird Bay.
	Lower Eyre Peninsula	16	Coastline with suitable breeding habitat in Coffin Bay, and coastline with suitable breeding habitat between Port Lincoln and Tumby Bay.
	Yorke Peninsula and St Vincent Gulf	20	Coastline with suitable breeding and roosting habitat, including Point Pearce, St Vincent Gulf coastline and Bird Island (Outer Harbor).
	Fleurieu Peninsula	5	Boat surveys of islands in Encounter Bay
	Coorong	3	Murray River mouth, and islands with suitable breeding habitat in the Coorong South and North Lagoon
	South East	5	Known previous breeding sites between Robe and Danger Point, including Robe Obelisk, Lake George, Cowrie Island and Danger Point.
	Kangaroo Island	2	Known previous breeding sites off the south-west coast, including Casuarina Islets and Paisley Islet
Victoria	Western Victoria	2	Coastline with suitable breeding habitat between Glenelg River Mouth and Cape Bridgewater.
	Port Phillip and Western Port Bay	20	Coastline with suitable breeding, roosting and foraging habitat along the western side of Port Phillip Bay, French Island and Phillip Island.
	South Gippsland	10	Coastline with suitable breeding habitat between Inverloch and Corner Inlet.
	East Gippsland	14	Coastline with suitable breeding habitat between Gippsland Lake and Mallacoota
New South Wales	South Coast	8	Known small tern breeding sites between Wallagoot Lake and Shoalhaven Heads.
Tasmania	King Island	3	Known small tern breeding sites on the east and west coast of King Island
	East Tasmania	3	Known breeding sites in north-east Tasmania and Orford Beach

2.2. Census methods: frequency and survey techniques

Following the methodology of the 2011 South Australian Fairy Tern census (DENR 2012), we conducted three surveys within the breeding season to target three critical stages: 1) site selection and colony establishment; 2) colonies in early stages, i.e. adults still incubating; 3) colonies in late stages, i.e., colonies with chicks of different ages, or failed colonies reattempting breeding at alternative sites. We aimed to conduct the counts within a narrow time window across all sites to minimise the chances of double counting individuals and to obtain an accurate representation of south-eastern Fairy Tern population distribution at one point in time. We conducted each of the 3 surveys over 2 different days, with a 1-week buffer either side of the survey dates to allow for some flexibility, including surveyors' availability, site accessibility (particularly to islands) and weather. The survey dates were:

- 1st survey: 24th – 25th October 2023
- 2nd survey: 5th – 6th December 2023
- 3rd survey: 1st – 2nd February 2024

In some instances, some regions or sites were surveyed outside of the 2-week time window due to unsuitable weather or tides and in cases where we joined the Fairy Tern Census effort with other coordinated bird surveys taking place at the same sites close to our census time windows (e.g., shorebird counts). This was the case for:

- First round of surveys in the Yorke Peninsula and St Vincent Gulf region were conducted on the 16th October as a recurrent shorebird count was planned at the same census sites on that day.
- Third round of surveys on the Eyre Peninsula was conducted in late February (tides were also unsuitable during the main Fairy Tern Census time window), when coordinated annual shorebird counts were being conducted at all Fairy Tern Census sites within the region (plus extra sites that were not included in the first two surveys due to lack of resources).
- Western Port Bay sites, except Observation Point, Rams Island, Chilcott Rocks, Fairhaven Campground and Reef Island, were surveyed as part of the annual Western Port Water Bird Surveys.

Within each region, smaller count areas (i.e., sites) were allocated to pairs of surveyors (staff or volunteers). Surveyors were provided with detailed maps of their site/s. The surveyor was also provided with detailed guidelines to ensure all surveys were conducted in a standardised manner and birds were not disturbed. If an observer encountered an active colony, they stayed at a minimum distance of 80 metres and never entered the colony area, unless trained to do so.

Each count area was walked (ground survey) or motored/kayaked (boat survey) or surveyors stopped at predefined spots and made observations over a 20-minute period. The data collected included individual count of adults and plumage status (i.e., breeding, non-breeding), chicks and juveniles (if present and visible), breeding activity (e.g., incubating adults, colony with chicks), and threats. Binoculars and spotting scopes were used to count individual birds. Data was collected using either the Birddata app in a smartphone or using census data sheets. All data were entered in Birddata's Colonial Nesting Birds Program. Figure 3 shows the census data sheets with all the variables recorded in the field at each survey.

Active colony areas were not entered to avoid disturbance, the number of adults that appeared to be incubating (incubating adults) was used as a proxy of number of nests - it is important to note that the goal of the census was to determine the population size and distribution of breeding colonies across eastern Australia, but not to monitor the breeding success of each colony¹. Besides number of adult individuals, surveyors also aimed to record the number of individuals of other age stages, including chicks, juveniles and immatures. All adult individuals in breeding (i.e., a solid black head cap and a bright yellow/orange bill and legs) and non-breeding plumage (i.e., mottled fore-cap merges into white forehead, dark brown bill with irregular patches of dull yellow) were assumed to be sexually mature (mature individuals) as not all adults acquire breeding plumage at the same time (Greenwell et al., 2021b), although some mature adults in the population may not breed every year. Chick stage included the period between hatching and fledgling, during which individuals are flightless (approx. 3 weeks; Greenwell et al., 2021b). Juveniles referred to recently fledged young, i.e., fledglings from the 2023/2024 season, which were distinguished from immature and adults by their heavily mottled greyish brown to brown upperparts and light brown to rufous foreheads and crowns (DENR 2012; Dunlop 2018; Greenwell et al., 2021c). Immature birds were individuals that had not reached age of first breeding (~2 years; Dunlop 2018) and were identified by an extensive dull white forehead, pale grey crown and black or nearly black bill, lacking the dull yellow patches in non-breeding adults (DENR 2012; Dunlop 2018). Surveyors had access to our 'My Fairy Tern: A Pocket Guide to Ageing Fairy Terns in Australia' to identify the different ages stages.

2.3. Participant registration and training

All participants in Fairy Tern Census were registered as volunteers or professionals in BirdLife Australia's Beach-nesting Birds Hub (<https://beachvol.birdlife.org.au>) and completed the 'Fairy Tern Census' online induction. The online induction includes the 'Fairy Tern Census guidelines', instructions to enter the data in Birddata using the App or the website (<https://birddata.birdlife.org.au>), identification booklets, the video recording of an identification and monitoring workshop, and a final quiz that needs to be completed with a minimum score of 80% to successfully complete the online induction. Once the online induction was completed, the Project Coordinator gave participants access to the Birddata's Colonial Nesting Birds Program to record their census surveys.

2.4. Data analysis

For each survey, participants recorded the total number of adult Fairy Terns in breeding and non-breeding plumage at each site, including zeros when no Fairy Terns were present. The sum of the counts across all sites provided a total abundance for the survey. The maximum count of the three surveys was considered to provide the best estimate of mature Fairy Terns in eastern Australia, as we assumed the lower counts may have missed sites hosting additional individuals as it was unlikely that the eastern population had experienced an actual significant change in size during the 2023/2024 breeding season. Regional and state estimates are also

¹ BirdLife Australia's Beach-nesting Birds team monitored the breeding success of six Fairy Tern sites in South Australia and 12 in Victoria. For details on the breeding monitoring please check Furbank et al. (2024) and Sanchez et al. (2024).

provided following the same process within each state and region. Abundance and breeding activity at each site was mapped for each survey to assess the breeding population distribution over the season across eastern Australia. Extra breeding monitoring surveys at some sites (see Sanchez et al., 2024 and Furbank et al., 2024), and personal communications to the Census Coordinator were used to complement the census surveys. It is indicated in the Results and Discussion sections where this type of data was used.

All data analysis were performed with R (R Core Team 2021), RStudio (Posit Team 2024) and the R package *dplyr* (Wickham et al., 2023). All maps presented in this report have Google Satellite imagery as the base layer and were created with QGIS 3.22.10 (QGIS.org 2024) or RStudio (Posit Team 2024) and R packages *ggmap* (Kahle and Wickham, 2013) and *ggplot2* (Wickham 2016).

FAIRY TERN CENSUS DATA SHEET

PAGE 1 OF ____

Please ensure surveys with zero Fairy Terns are also submitted. Please complete separate entries if birds are seen at multiple locations within your site.

SURVEY DETAILS

Observer name/s (record everyone):			
Site name (from map provided):			State:
Latitude/Longitude of count location (can be determined by Google maps):			
Date:	Time started: AM / PM	Survey duration (mins):	
Temperature:		Tide (circle): high / rising / falling / low	
Wind speed (circle): calm / light / breeze / windy		Survey conducted by (circle): foot / boat / vehicle	

THREATS ASSESSED? ☐ Yes ☐ No

Access & visitors	<input type="checkbox"/> Access within view	<input type="checkbox"/> Dune use	<input type="checkbox"/> Human prints above high tide mark	# people:
Vehicles	<input type="checkbox"/> 4WDs	<input type="checkbox"/> Trail bikes	<input type="checkbox"/> Quad bikes	Other:
Dogs	# Dogs on leads:	# Dogs off leads:	<input type="checkbox"/> Dog prints	
Predators	<input type="checkbox"/> Foxes	<input type="checkbox"/> Cats	<input type="checkbox"/> Rats	<input type="checkbox"/> Stock
	<input type="checkbox"/> Horses	<input type="checkbox"/> Pigs	# Magpies:	# Ravens:
	# Silver Gulls:	# Pacific/Kelp Gulls:	# Raptors:	
Vegetation	<input type="checkbox"/> Weeds present	Weed species (if known):		
Comments:				

SIGHTINGS (You can record all species you see if you'd like but you only need to complete colony and behaviour information for tern species)

Species:			
Lat/Lon of birds (can be determined by Google maps):			
Number of adults:		Number of juveniles:	
Bands?			
Habitat (where birds or colony are located)	<input type="checkbox"/> Beach	<input type="checkbox"/> Dune	<input type="checkbox"/> Rocks
	<input type="checkbox"/> Mangroves	<input type="checkbox"/> Wetland	<input type="checkbox"/> Salt lake
Colony stage	<input type="checkbox"/> No breeding	<input type="checkbox"/> Colony establishing	<input type="checkbox"/> Suspect nesting
	<input type="checkbox"/> Colony with nests	<input type="checkbox"/> Colony with nests/chicks/juveniles	<input type="checkbox"/> Colony with chicks/juveniles
	# incubating adults:	# chicks:	Description of chick ages:
Colony Behaviour (tick all that apply)	<input type="checkbox"/> Aerial displays	<input type="checkbox"/> Nest scrape making	<input type="checkbox"/> Incubating
	<input type="checkbox"/> Courtship feeding	<input type="checkbox"/> Fish wiping	<input type="checkbox"/> Dive bombing
	<input type="checkbox"/> Brooding	<input type="checkbox"/> Feeding chicks	<input type="checkbox"/> Roosting
Colony failure	<input type="checkbox"/> No failure	<input type="checkbox"/> Partial failure	<input type="checkbox"/> Complete failure
Suspected cause of partial/complete failure	Cause details:		
	# dead chicks:	# unattended eggs:	
Site management	<input type="checkbox"/> None	<input type="checkbox"/> Permanent sign	<input type="checkbox"/> Temporary sign
	<input type="checkbox"/> Cameras	<input type="checkbox"/> Fox control	Other:
Comments:			

Please enter your data into Birddata Colonial Nesting Birds and/or e-mail completed data sheets to Sonia Sanchez - sonia.sanchez@birdlife.org.au Thanks!

Figure 3. Standardised Fairy Tern census data sheet showing all variables recorded during each census survey.

3. Results

3.1. Surveys and coverage

Surveys were conducted on the 24th – 25th October 2023, 4th – 5th December 2024 and 1st – 2nd February 2024, including a 1-week window at either side of these dates. A total of 134 sites were surveyed between Fowler Bay on the western Eyre Peninsula and Shoalhaven Heads in the New South Wales South Coast (including some offshore islands), and the coastline of King Island and eastern Tasmania. Over 200 volunteers, 20 regional staff (e.g., Landscapes Board SA) and eight BirdLife Australia staff undertook ground and boat surveys. Due to logistics and lack of human resources, sites on the lower Eyre Peninsula and Tasmania were not included in the first survey, and Kangaroo Island sites were only possible to be surveyed in mid-November, outside the main census time windows (Table A1). The third survey in February had the largest coverage as we were able to include extra sites on the Eyre Peninsula in South Australia and Western Port Bay in Victoria that were being surveyed as part of annual shorebird and waterbird counts, respectively (Table A1). Hence, in the first survey we covered 57% (or 77 sites) of the 134 sites, 71% (95 sites) in the second survey and 87% (117 sites) in the third survey.

3.2. Counts of adult and immature Fairy Terns in eastern Australia

In October 2023, a total of 793 adult Fairy Terns were recorded (Table 2). South Australia accounted for 57% (or 451 individuals), with the Eyre Peninsula West Coast recording the highest abundance in eastern Australia (35% of the total number of adults) (Table 2). Seventeen immature individuals were also sighted on the Eyre Peninsula West Coast (Table 2). The region with the second highest abundance was South Gippsland in Victoria, with 24% of the total number of adults (Table 2). Only one Fairy Tern adult was recorded in the New South Wales South Coast (Table 2), at the Shoalhaven River mouth with a group of 49 Little Terns that seemed to be establishing a breeding colony (S. Leonards 2023, *pers. comm.*). Note that Kangaroo Island and Tasmania were not surveyed in October, and only Long Beach in Coffin Bay was surveyed in the Eyre Peninsula South Coast (Table A1). It is to be noted however, that Fairy Terns were present in Tasmania in October and their arrival and breeding onset this season was earlier than average (E. Woehler 2024, *pers. comm.*).

In December 2023, the total number of adult Fairy Terns was 919, and South Australia accounted again for more than half of the abundance (56% or 514 adults) (Table 2). The Eyre Peninsula West Coast was the region that recorded the highest number of adults, 323 or 35% of total number of adults, and 14 immature individuals were also recorded in this region (Table 2). All other South Australian regions also recorded Fairy Tern adults, except the Fleurieu Peninsula. A single Fairy Tern was recorded on Kangaroo Island on November 19th flying over the south coast of the island (P Jennings 2023, *pers. comm.*). King Island was the second region with the highest adult count, 209 individuals (Table 2). The numbers in Victoria, 155 adult individuals, decreased compared to the October survey, whereas the number of adults in New South Wales South Coast increased to 20 individuals (Table 2).

The last survey in February 2024 recorded the highest number of adults out of the three surveys, 1,146 individuals (Table 2). Most of them, 74%, were recorded in South Australia, with two regions accounting for 25% of the total counts each, Eyre Peninsula West Coast (293 adults, 16 immatures) and the Yorke Peninsula and St Vincent Gulf (281 adults, 10 immatures) (Table 2). The Coorong also recorded relatively high numbers, with 198 adults (Table 2). In Victoria, adult and immature Fairy Terns were sighted in Port Phillip and Western Port Bay (141 adults, 18 immatures) and South Gippsland (90 adults, 10 immatures). Large mixed flocks of Fairy and Little Terns in different plumage stages were recorded in both regions. In a single count on Sand Island (Port Phillip Bay) on the 4th February 2024, a mixed flock of 180 individuals contained 85 adult Fairy Tern in breeding plumage (identified from images), whereas we were not able to identify 88 individuals that were a mix of non-breeding Little Terns and immature Fairy Terns (G Appleby 2024, *pers. comm.*). BirdLife staff surveyed this site 3 days earlier, on 1st February, and there were no Fairy or Little Terns present (S. Sanchez 2024, *pers. comm.*). On the 6th February, a flying flock of 140 small terns was recorded at Moolap Saltworks (Port Phillip Bay) during the census survey, but it was not possible to identify species composition other than the genus *Sternula* (J. Newman 2024, *pers. comm.*). Two mixed flocks of 90 and 80 *Sternula* sp. were recorded on Clonmel Island and Boxbank Island, respectively (South Gippsland) on the 3rd February 2024. The Boxbank flock was mainly composed of non-breeding Little Terns and no adult Fairy Terns were observed. The Clonmel Island flock had 50 adults Fairy Terns and 10 immature Fairy Terns.

Table 2. Total Fairy Tern counts summarised by regions in eastern Australia for each of the three census surveys: October 2023, December 2023 and February 2024. ‘# total adults’ includes all adult Fairy Terns in breeding and non-breeding plumage; immature individuals are birds of 1+ years of age (i.e., fledged in 2022/2023 or earlier), but not sexually matured; juvenile individuals include recently fledged young from the current season (i.e., 2023/2024); active colonies include colonies with confirmed incubating adults, nests or chicks. Suspected colonies (in brackets) include colonies with suspected incubating adults or scrapes without eggs observed.

Survey 1 – October 2023

State	Region	# total adults	# immatures	# juveniles	# active colonies (suspected)	# incubating adults	# chicks
SA	Eyre Peninsula – West Coast	278	17	0	2 (1)	35	0
SA	Lower Eyre Peninsula	4	0	0	0	0	0
SA	Yorke Peninsula and St Vincent Gulf	109	6	0	0	0	0
SA	Fleurieu Peninsula	0	0	0	0	0	0
SA	Coorong	60	0	0	0	0	0
SA	South East	0	0	0	0	0	0
SA	Kangaroo Island	Not surveyed					
VIC	Western Victoria	0	0	0	0	0	0
VIC	Port Phillip and Western Port	76	0	0	0	0	0
VIC	South Gippsland	188	0	0	0 (1)	0	0
VIC	East Gippsland	77	0	0	2* (1*)	6	0
TAS	King Island	Not surveyed					
TAS	East Tasmania	Not surveyed					
NSW	South Coast	1	0	0	0	0	0
TOTAL		793	22	0	4 (3)	41	0

*At least 1 Little Tern also present in at least 1 Fairy Tern breeding colony

Table 2. (cont). Total Fairy Tern counts summarised by regions in eastern Australia for each of the three census surveys: October 2023, December 2023 and February 2024. ‘# total adults’ includes all adult Fairy Terns in breeding and non-breeding plumage; immature individuals are birds of 1+ years of age (i.e., fledged in 2022/2023 or earlier), but not sexually matured; juvenile individuals include recently fledged young from the current season (i.e., 2023/2024); active colonies include colonies with confirmed incubating adults, nests or chicks. Suspected colonies (in brackets) include colonies with suspected incubating adults or scrapes without eggs observed.

Survey 2 – December 2023

State	Region	# total adults	# immatures	# juveniles	# active colonies (suspected)	# incubating adults	# chicks
SA	Eyre Peninsula – West Coast	323	14	2	4 (1)	59	7
	Lower Eyre Peninsula	15	0	0	0	0	0
	Yorke Peninsula and St Vincent Gulf	119	0	0	0	0	0
	Fleurieu Peninsula	0	0	0	0	0	0
	Coorong	36	0	0	1*	1	0
	South East	20	0	0	0 (1)	0	0
	**Kangaroo Island	1	0	0	0	0	0
VIC	Western Victoria	0	0	0	0	0	0
	Port Phillip and Western Port	49	0	1	2*	3	0
	South Gippsland	101	0	0	3 (1*)	13	0
	East Gippsland	5	0	0	0	0	0
TAS	King Island	208	0	0	2	<i>Not counted</i>	0
	East Tasmania	22	0	0	1	0	0
NSW	South Coast	20	0	0	2* (1*)	9	0
TOTAL		919	14	3	15 (4)	85	7

*At least 1 Little Tern also present in at least 1 Fairy Tern breeding colony

** Surveys conducted in mid-November due to participants availability

Survey 3– February 2024

State	Region	# total adults	# immatures	# juveniles	# active colonies (suspected)	# incubating adults	# chicks
SA	Eyre Peninsula – West Coast	293	16	4	1	3	2
	Lower Eyre Peninsula	69	0	1	0	0	0
	Yorke Peninsula and St Vincent Gulf	281	10	8	2	70	2
	Fleurieu Peninsula	0	0	0	0	0	0
	Coorong	198	0	0	2*	68	0
	South East	2	0	0	0	0	0
	Kangaroo Island	<i>Not surveyed</i>					
VIC	Western Victoria	0	0	0	0	0	0
	Port Phillip and Western Port	141	18	2	0	0	0
	South Gippsland	90	10	1	2	15	0
	East Gippsland	0	0	0	0	0	0
TAS	King Island	38	0	0	1	4	2
	East Tasmania	32	0	14	1	0	2
NSW	South Coast	2	0	0	0	0	0
TOTAL		1146	54	30	9	160	8

*At least 1 Little Tern also present in at least 1 Fairy Tern breeding colony

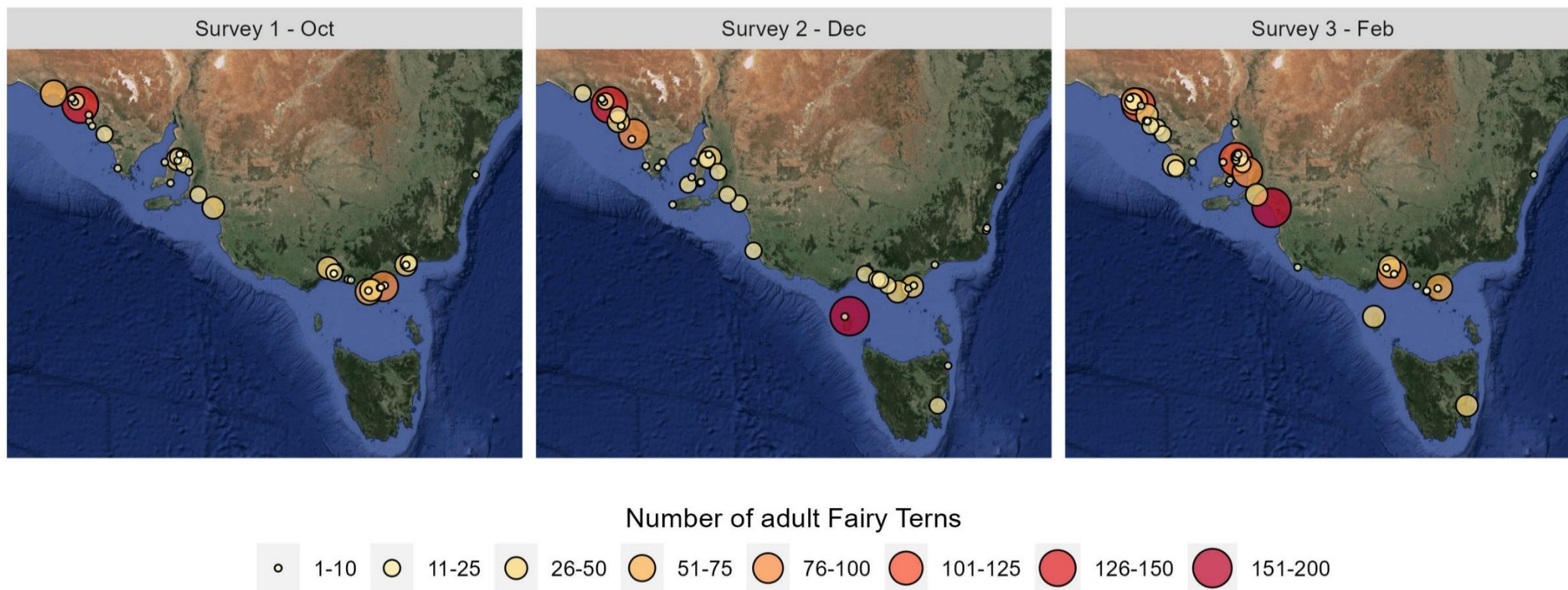


Figure 4. Distribution and abundance of the Fairy Tern adult counts during the three census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right).

3.3. Distribution of Fairy Terns in eastern Australia

From east of Fowlers Bay the Eyre Peninsula (South Australia) to Shoalhaven Heads (New South Wales), including Tasmania, Fairy Terns were recorded in all regions across eastern Australia, except the Fleurieu Peninsula and Western Victoria (Table 2). Noting the survey gaps in Tasmania, the Fairy Tern hotspots across eastern Australia were the far west Eyre Peninsula, northern side of St Vincent Gulf, the Coorong, and South Gippsland (Figure 4). Appendix 2 – 5 have details of the counts at each site and region distribution maps.

In South Australia, more than half of the Fairy Tern adults were localised in the west coast of the Eyre Peninsula in October and December, a decreasing to one third in February (Figure 5A). The Yorke Peninsula and St Vincent Gulf was the South Australian region with the second highest abundance in the state, accounting for 25-35% of the total number of adults (Figure 5A). The percentage of total South Australia abundance recorded in the Coorong varied between 7% in December and 25% in February (Figure 5A), when the highest count of 198 adults was recorded in this region (Table 2). Nonetheless, water levels were very low in the South Lagoon of the Coorong from December, making it difficult to access the small islands where Fairy Terns usually breed (C. Thompson 2024, *pers. comm.*) (see *section 3.4* for more information on breeding colonies in the Coorong). Within the Eyre Peninsula's west coast, Fairy Terns were more abundant just east of Fowlers Bay and Smoky Bay (Figure 4), with Eyre Island recording the highest counts in the region in the three surveys (October: 147 adults; December: 126 adults; February: 103 adults) (Appendix 2). In the same area, St Peter Island had a lower abundance of adults in October and December compared to Eyre Island, but 15 immature individuals were observed in October and 14 in December (Appendix 2). In the lower Eyre Peninsula, the highest counts of adults were recorded in the Coffin Bay area, with 42 adults observed at Point Longnose (Coffin Bay National Park) and 25 adults at Long Beach (Coffin Bay township) in February (Figure 4, Appendix 2). Within the Yorke Peninsula and St Vincent Gulf region, the highest abundance was concentrated in the northern side of the Gulf, particularly at Price Saltfields, Bald Hill and Bird Island sites (Figure 4, Appendix 2). The Coorong South Lagoon recorded the highest counts within the Coorong region, particularly in February (162 adults) (Figure 4, Appendix 2). Only two sites in the South East South Australia recorded Fairy Terns: Cowrie Island, a small rocky island off Beachport (20 adults in December) and Hutt Bay, west of Port Macdonnell (2 adults in February) (Figure 4, Appendix 2).

The distribution of adult Fairy Terns in Victoria varied between surveys, with the abundance being higher in the eastern part of the state (i.e., from Inverloch east to the New South Wales border) in October (75% of state adults), but in February, more than half of the Fairy Tern adults observed in the state were within Port Phillip and Western Port Bay region (Figure 4, Figure 5B). In East Gippsland, all Fairy Terns were recorded within the Gippsland Lakes Ramsar site, on four islands: Crescent Island, Pelican Island, Albifrons Island and Waddy Island (Appendix 3). Crescent and Pelican Islands recorded the highest counts in the region with 47 and 23 adults in October, respectively, when breeding colonies were established at these sites (see *section 3.4*), but by December, only 5 adults were observed in East Gippsland and none in February (Table 2, Figure 4). In South Gippsland, Fairy Terns were recorded in three main areas in all surveys and established breeding colonies (see *section 3.4*), from east to west: Anderson Inlet, Shallow Inlet and Corner Inlet Ramsar site (Figure 4, Appendix 3). In Port Phillip Bay, Fairy Terns were recorded in the western side, within the Port Phillip

(Western Shoreline) and Bellarine Peninsula Ramsar site, mainly at two sites, Mud Islands and Sand Island, where breeding was attempted (Figure 4, Appendix 3).

In New South Wales, Fairy Terns were recorded in four sites (from south to north: Wallagoot Lake, Mogareeka Inlet, Lake Conjola, Shoalhaven River Mouth) out of the eight we surveyed in the south coast (Figure 4, Appendix 4). At these sites, Fairy Terns were always observed in mixed breeding colonies with Little Terns (see section 3.4) and the highest abundance was recorded in December, when 10 adults were observed at Lake Conjola and eight at Wallagoot Lake.

Fairy Tern abundance in Tasmania was the highest in December on the east coast of King Island, when 200 adults were counted at Lavinia Point (Figure 4, Appendix 5). Yellow Rock Beach, on the west coast of King

Island, also hosted a breeding colony of Fairy Terns (see section 3.4). On the east coast of mainland Tasmania, the highest abundance of Fairy Terns was localised at Orford Beach, within the Orford Bird Sanctuary (Figure 4, Appendix 5). Nonetheless, earlier in the season, Fairy Tern breeding colonies were established in the north-east coast in October – November and these numbers were not captured in our census (E. Woehler 2024, *pers. comm.*).

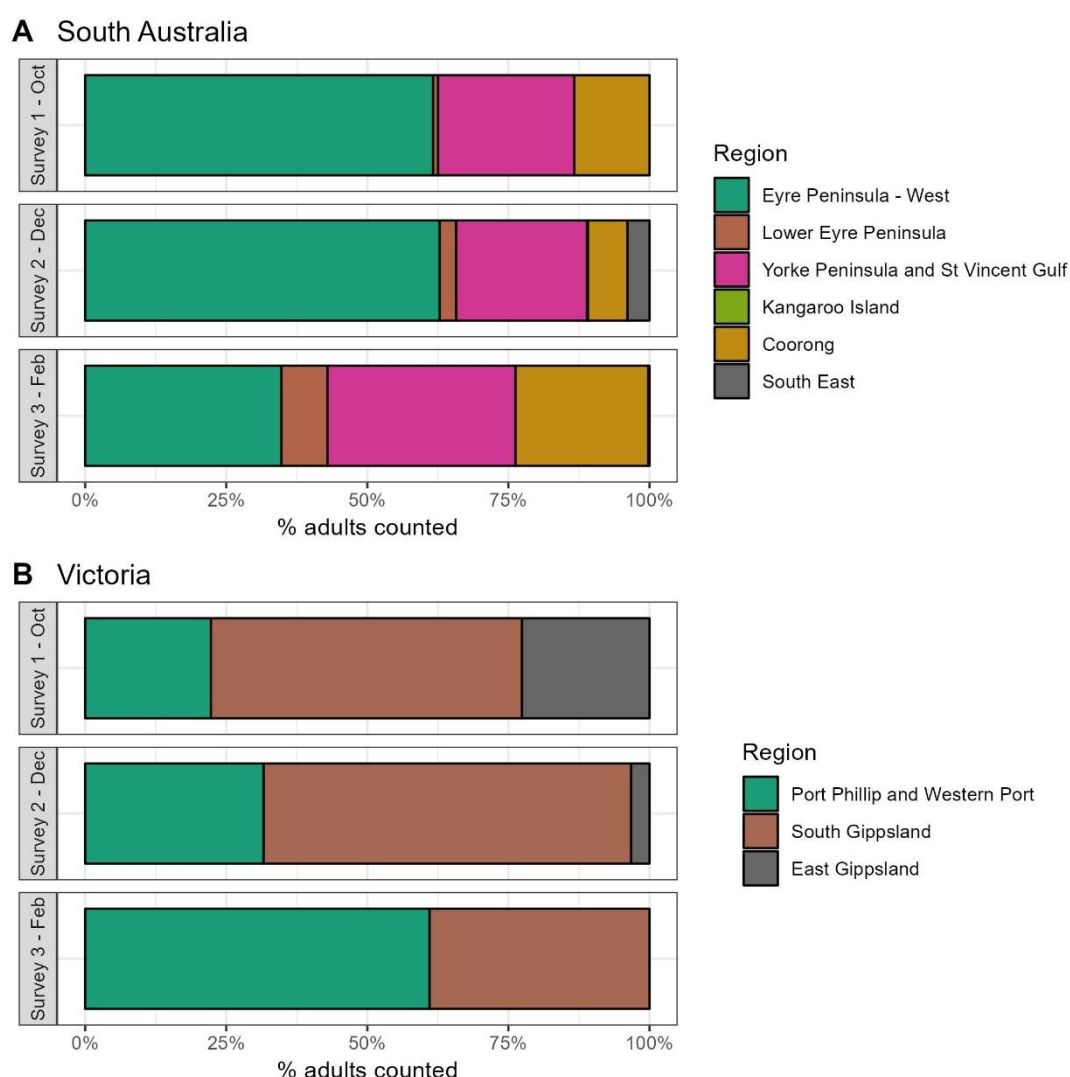


Figure 5. Distribution of (A) South Australia and (B) Victoria state Fairy Tern adults represented as the percentage of the total state adults counted within each region. Regions are ordered west to east.

3.4. Fairy Tern breeding colonies in eastern Australia

Breeding colonies were recorded in all regions, except the lower Eyre Peninsula, Kangaroo Island, the Fleurieu Peninsula, Western Victoria, and in all survey periods. A total of 25 confirmed breeding colonies (i.e., eggs or chicks overserved) were recorded across eastern Australia, plus two sites with suspected breeding and three sites with scrapes observed. All breeding colonies were located near shallow and calm waters like tidal inlets (e.g., Shallow Inlet), estuaries (e.g., Lake Conjola), and bays (e.g., Eyre Island), and 11 of these colonies were located within wetlands of international importance (i.e., Ramsar sites): the Coorong, Lake Alexandrina & Albert Wetland, Port Phillip (Western Shoreline) and Bellarine Peninsula, Corner Inlet, Western Port, Corner Inlet, Gippsland Lakes and Lavinia. Table 3 presents a summary of the breeding activity found during the census surveys, and Figure 6 shows the location and fate of the breeding colonies and the suspected breeding and scrapes. Note the purpose of the census was not to follow through the fates of colonies, and most data on fates came from alternate monitoring projects. Some sites in South Australia and Victoria were monitored by BirdLife staff and volunteers as part of other projects focusing on breeding monitoring (see Table 3), and we used the information from these surveys here. Breeding colonies in South Australia recorded an average (\pm standard deviation) of 73 ± 42 adults, 31 ± 26 in Victoria, 90 ± 95 in Tasmania, and 9 ± 1 in New South Wales.

Table 3. Fairy Tern breeding activity recorded during any of the three census surveys in 2023/2024 and during surveys outside the census surveys that were part of the broader Fairy Tern monitoring efforts by BirdLife Australia, including fate of confirmed colonies (Success = fledglings produced, Failure = no fledglings produced, Unknown = not confirmed fledglings), and sites with only scrapes or suspected breeding recorded. Adults, incubating adults, chicks and fledglings refer to the maximum number recorded in a single survey. EP = Eyre Peninsula, YP = Yorke Peninsula, SVG = St Vincent Gulf, PP = Port Phillip, WP = Western Port, *Unk* = *Unknown*. Sites are ordered west to east.

State	Region	Colony site	Month first recorded	Fate /other activity	# adults	# incubating adults	# chicks	# fledglings	Notes
SA	EP- West	*CLARE BAY	Oct	Unknown	70	58	13	1	Suspect partial failure due to storm surge and heavy rainfall, 1 likely fledgling (Furbank et al., 2024)
		*EYRE ISLAND	Oct	Success	136	65	4	15	2 colonies (Furbank et al., 2024)
		THE SPIT (Streaky Bay)	Dec	Failed	16	6	<i>Unk</i>	0	Suspect failure due to 4WD and human disturbance
		*SEAGULL LAKE	Nov	Success	34	9	3	3	Furbank et al., 2024
		**WALKERS ROCK	Nov	Unknown	50	4	<i>Unk</i>	<i>Unk</i>	Surveyed on 26/12 by volunteer, incubating adults and chicks present. Found Fairy Tern eggshells in last census survey. December count not included in census.
	Lower EP	**HOME BAY - REEVESBY ISLAND	Dec	Scrapes	5	<i>Unk</i>	<i>Unk</i>	<i>Unk</i>	Surveyed on 29/12 by BirdLife volunteer, found Fairy Tern scrapes. Count not included in census.
	YP and SVG	*PRICE SALTFIELDS	Jan	Unknown	112	3	0	0	Unknown failure cause (Furbank et al., 2024)
		*BIRD ISLAND	Nov	Success	103	68	49	22	K. Bartley 2024, <i>pers. comm.</i>
	Coorong	MURRAY MOUTH	Nov	Success	48	19	9		Little Terns also nested successfully at the site (Furbank et al., 2024)

State	Region	Colony site	Month first recorded	Fate /other activity	# adults	# incubating adults	# chicks	# fledglings	Notes
		COORONG SOUTH LAGOON	Dec	Success	160	50	<i>Not counted</i>	<i>Not counted</i>	Two more colonies not recorded during the census (D. Paton 2024, <i>pers. comm.</i>)
	South East	COWRIE ISLAND	Dec	Suspected breeding	20	<i>Unk</i>	<i>Unk</i>	0	Adults appeared to be incubating in the second census survey, but site was not accessible to confirm
VIC	PP and WP	*SAND ISLAND	Nov	Failed	3	1	0	0	Unknown failure cause, site with vegetation encroachment (Sanchez et al., 2024)
		*MUD ISLANDS	Dec	Failed	28	8	0	0	Swamp Harrier predation (Sanchez et al., 2024)
		*OBSERVATION POINT	Nov	Failed	12	3	0	0	Tidal inundation (Sanchez et al. 2024)
	South Gip	*PT SMYTHE	Nov	Success	85	69	10	10	Sanchez et al., 2024
		*SANDY POINT SPIT	Nov	Failed	30	10	0	0	Partial failure due to tidal inundation and unknown cause (Sanchez et al., 2024)
		*SNAKE ISLAND	Dec	Failed	3	1	0	0	Suspect tidal inundation (Sanchez et al., 2024)
		*CLONMEL ISLAND	Oct	Scrapes and Unknown	48	16	7	1	Scrapes recorded in October 2023. Second breeding attempt in February 2024 - suspect at least 1 fledgling (Sanchez et al., 2024)
		*BOXBANK ISLAND	Dec	Scrapes	50	<i>Unk</i>	<i>Unk</i>	<i>Unk</i>	Mixed establishing colony with 15 Little Terns in December census survey (Sanchez et al., 2024)
	East Gip	*CRESCENT ISLAND	Oct	Failed	61	34	0	0	2 mixed colonies with 25 and 6 Little Terns, 1 x inundation after heavy rainfalls, 1 x unknown cause (D. Sullivan 2024, <i>pers. comm.</i>)
		*PELICAN ISLAND	Oct	Failed	26	4	0	0	Mixed colony with 3 incubating Little Terns, inundation after heavy rainfalls (D. Sullivan 2024, <i>pers. comm.</i>)
TAS	King Island	YELLOW ROCK BEACH	Dec	Success	38	4	2	<i>Unk</i>	Unknown number of fledglings, but confirmed success (Graham 2024, <i>pers. comm.</i>)
		LAVINIA POINT	Dec	Failed	200	<i>Not counted</i>	<i>Unk</i>	0	S. Graham 2024, <i>pers. comm.</i>
	East Tasmania	ORFORD BEACH	Dec	Success	32	6	12	14	G. Whisson 2024, <i>pers. comm.</i>
NSW	South Coast	WALLAGOOT LAKE	Dec	Failed	8	4	0	0	Mixed colony with 25 incubating Little Terns. Site inundation (L. Berzins 2023, <i>pers. comm.</i>)
		MOGAREEKA INLET	Dec	Suspected breeding	2	0	0	0	Mixed colony with 20 Little Terns, 2 Little Tern fledglings and Silver Gull predation (L. Berzins 2024, <i>pers. comm.</i>)
		LAKE CONJOLA	Dec	Unknown	10	5	0	0	Mixed colony with 20 incubating Little Terns, 3 Little Tern fledglings (P. Hendry 2024, <i>pers. comm.</i>)

*Sites that were regularly monitored by BirdLife Australia staff and volunteers / ** Sites that were opportunistically visited outside the census periods.

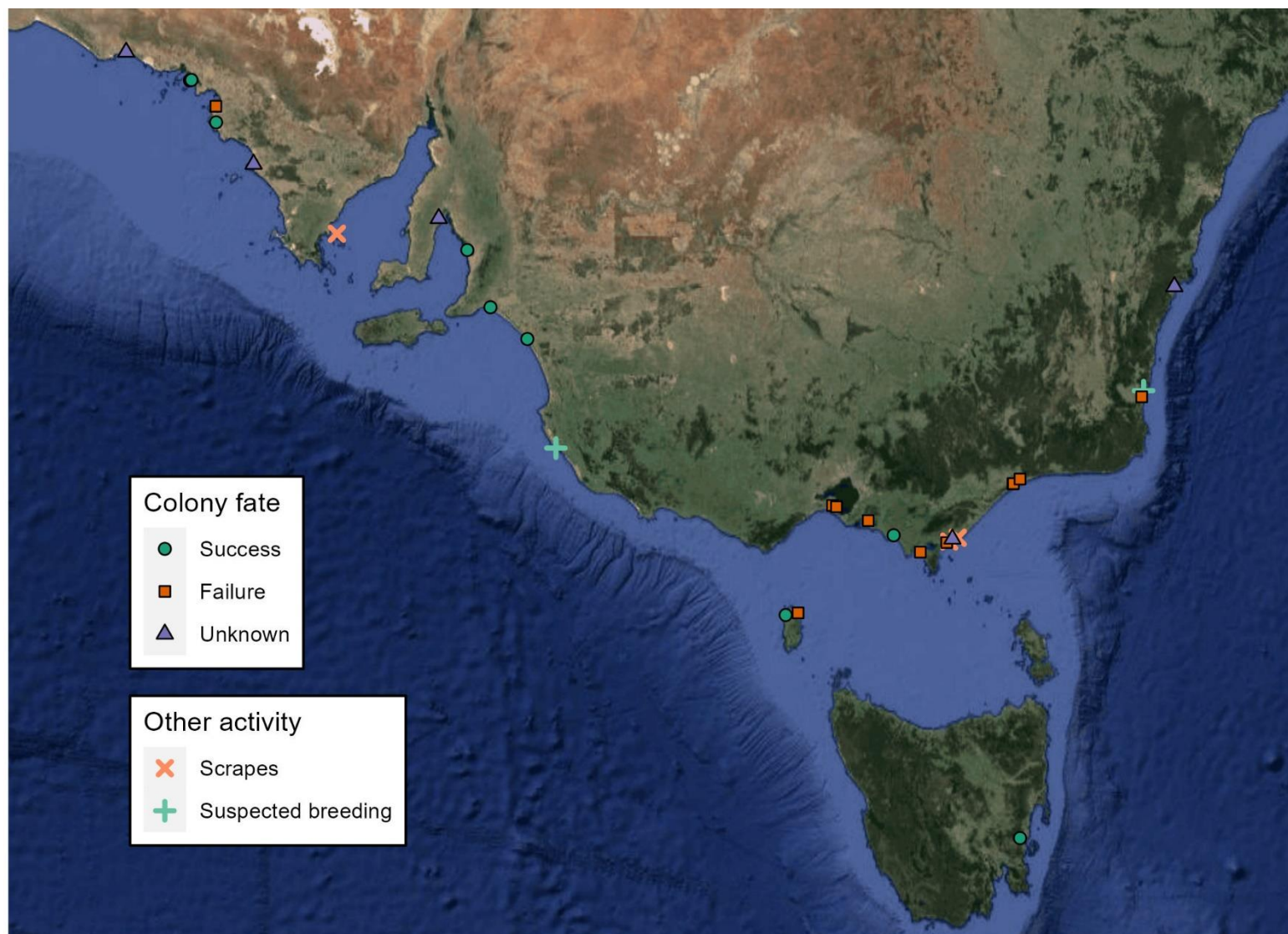


Figure 6. Distribution and fate (Success = fledglings produced, Failure = no fledglings produced, Unknown = not confirmed fledglings) of the Fairy Tern breeding colonies found during any of the three census surveys in 2023/2024 and during surveys outside the census surveys that were part of the broader Fairy Tern monitoring efforts by BirdLife Australia, and location of scrapes and suspected breeding recorded during these surveys.

In South Australia, we recorded 10 Fairy Tern colonies, of which nine were found during the census surveys (Clare Bay, two on Eyre Island, the Spit, Seagull Lake, Price Saltfields, Bird Island, Murray Mouth and the Coorong South Lagoon), and one (Walkers Rock) was found incidentally by a BirdLife volunteer in late December (Table 3). Six out of the 10 confirmed colonies (including a mixed colony with Little Terns at the Murray Mouth) produced fledglings and one failed (The Spit) likely due to human disturbance and four-wheel drives (Table 3). A suspected colony was also recorded on Cowrie Island, in South East South Australia, during the December census survey, but high tide and waves made access to the island difficult and breeding was not confirmed then. The site was visited a month later and no Fairy Terns were recorded (J. Campbell 2024, *pers. comm*) (Table 3, Figure 6). Scrapes were observed on Reevesby Island, a remote island off the south-east coast of the Eyre Peninsula which could only be visited once in late December (Table 3, Figure 6). The Coorong South Lagoon had two additional colonies in December and late January that we did not record in our census surveys (D. Paton 2024, *pers. comm*). Please refer to Furbank et al., (2024) for more details on the breeding colonies that we monitored.

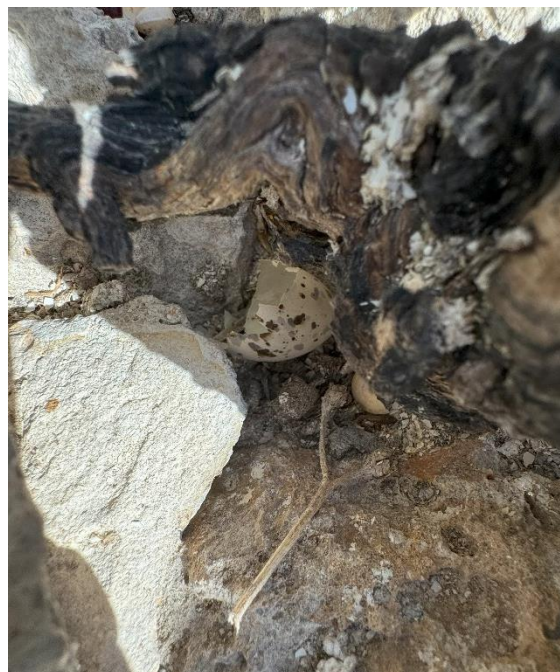


Figure 7. Fairy Tern eggshell found at Walkers Rock (Eyre Peninsula, SA) in February 2024. Photo: Deb Furbank.

All the Victorian colony sites were part of our breeding monitoring efforts beyond the census. We recorded 11 Fairy Tern colonies in Victoria, and only one had confirmed breeding success (Point Smythe, within Anderson Inlet in South Gippsland) (Table 3, Figure 6). Tidal inundation and flooding were causes of failure of at least four colonies. Please refer to Sanchez et al., (2024) for more details on the breeding colonies that we monitored.

In Tasmania, two breeding colonies were recorded on King Island, Lavinia Point and Yellow Rock Beach, and one in the east coast, Orford Beach (Table 3, Figure 6). The Lavinia Point colony failed, and Yellow Rock fledged 30 nests (S. Graham 2024, *pers. comm.*). Orford Beach was recorded in December and produced at least 14 fledglings (G. Whisson and Friends of Orford Bird Sanctuary 2024, *pers. comm*). Outside of our census surveys, several Fairy Tern colony sites were in October/November (earlier than usual) and lost to coastal erosion and high tides (E. Woehler 2023, *pers. comm.*).

The South Coast of New South Wales also recorded Fairy Tern breeding colonies at two locations, Wallagoot Lake and Conjola Lake, and suspected breeding was recorded at Mogareeka Inlet (Table 3, Figure 6). These colonies also had Little Terns nesting, which were much more abundant than Fairy Terns (Table 3). None of the New South Wales colonies produced Fairy Tern fledglings. Wallagoot Lake was inundated after heavy rainfalls in December, but Mogareeka Inlet and Lake Conjola fledged at least two and three Little Terns, respectively and the fate of the nesting Fairy Terns was unknown, although failure was suspected (Table 3).

During the last census survey, Fairy Tern juveniles (i.e., fledglings from the 2023/2024 season) were observed at sites where no breeding activity or success were recorded. In South Australia, a total of six juveniles were

recorded across Price Saltfields, Clinton Coastal Park and Bald Hill (northern St Vincent Gulf) on the 1st February 2024. This area recorded some juveniles in mid-January as well (T. Jack and P. Taylor 2024, *pers. comm.*), and Price Saltfields continued to record Fairy Tern juveniles during February and March, with a maximum of 30 (Figure 8) (Furbank et al., 2024). Other records of one to two juveniles in the February census survey included sites on the western Eyre Peninsula (St Peter Island, Baird Bay), on the lower Eyre Peninsula (Point Longnose) and the Yorke Peninsula (Goldsmith Beach, Giles Point). In Victoria, two Fairy Tern juveniles were recorded on Sand Island (Port Phillip Bay) with a large flock of 180 small terns, including 85 Fairy Terns, during the February census survey. Eight juveniles were observed at Barry Beach (Corner Inlet, South Gippsland) with 28 adults on the 20th January 2024 (S. Leonard 2024, *pers. comm.*)



Figure 8. Left: Fairy Tern adult (left) and juvenile (right) at Bald Hill (northern St Vincent Gulf, SA) on 15th January 2024. Photo: Paul Taylor. Yorke Peninsula, SA) on 25th March 2024. **Right:** Fairy Tern juveniles at Price Saltfields (northern St Vincent Gulf, SA) on 25th March 2024. Photo: Teresa Jack.

3.5. Threat assessments

Threat assessments were conducted for 69% of visits, that is 264 of 382 site visits to known Fairy Tern habitat: 134 threat assessments were conducted in South Australia across 47 sites, 114 in Victoria across 44 sites, 11 in New South Wales across 6 sites and 5 in Tasmania across 4 sites.

Across eastern Australia, the two most common threats were the presence of Silver Gulls (62.1 % of threat assessments), and that of people, detected by both human prints (28.8 %) and observations of people present during a site visit (17.8 %) (Table 4). Other common threats were dogs, vehicles and foxes, all detected by the presence of prints/tracks. No evidence of horses or rats were recorded at any site (Table 4).

Evidence of people (including observations and prints) were most common in Tasmania (40 and 60 %) and New South Wales (45.5 and 54.5 %), although the number of threat assessments was low in these two states (Figure 9).

Nonetheless, the total number of people recorded varied across sites and the three sites with the highest people counts were Duck Point in South Gippsland Victoria (42 people across 3 assessments), Lake Conjola in New South Wales (32 people across 2 assessments) and Foster Islands in South East SA (25 people across 3 assessments). Vehicle tracks occurred in ~20 % of the threat assessments in all states but Victoria (where beach driving is illegal and only authorised vehicles are present), where vehicle tracks were observed in only

4.4 % of the assessments (Figure 9). In Tasmania, 4WD tracks were only observed at Lavinia Point on King Island. In New South Wales, all vehicle tracks (4WD and trail bikes) were observed along the edge of Brou Lake, and New South Wales Parks Service was working on addressing this threat (L. O'Brien 2024, *pers. comm.*). In South Australia, vehicle tracks were more widespread and recorded in 15 sites across the Eyre Peninsula, the Yorke Peninsula and St Vincent Gulf, the Coorong and the South East regions. 4WD were observed to drive through the Fairy and Little Tern colony area at the Murray Mouth, displacing the breeding adults (Furbank et al., 2024). Vehicle tracks observed in Victoria belonged to either management vehicles at Observation Point (Western Port Bay) or trail bikes along dirt tracks in Avalon Saltworks (Port Phillip Bay).

Table 4. Percentage of threat assessments in which each threat type considered was recorded in eastern Australia during the Fairy Tern Census surveys in 2023/2024. Threat types are ordered from highest to lowest percentage of occurrence.

Threat Type	% assessments
Silver Gulls	62.1
Human prints	28.8
People	17.8
Dog prints	14
Vehicle tracks (quad, four-wheel drive and/or trail bike)	12.9
Fox prints	12.5
Ravens	11
Dogs (on and/or off leash)	7.2
Raptors	6.8
Magpies	3
Cat prints	2.7
Stock prints	0.4
Horse prints	0
Rat prints	0

Silver Gulls were the most commonly occurring potential predator in all states (Figure 9). There were only 18 sites across eastern Australia (10 in South Australia, 6 in Victoria, 1 in New South Wales and 1 in Tasmania) where Silver Gulls were not recorded. In New South Wales, Silver Gull predation on a Little Tern colony was recorded at Mogareeka Inlet and it is unknown if the gulls also preyed on the few Fairy Terns nesting there (L. Berzins 2024, *pers. comm.*). Silver Gull predation is also the suspected cause of Little Tern breeding failure in Brou Lake. In Victoria, Silver Gull colonies co-occur with Fairy Tern colonies on Mud Islands, Boxbank Island and Clonmel Island. In South Australia, Fairy Terns attempted breeding at Price Saltfields after the Silver Gull finished

breeding. Other potential avian predators observed included ravens and raptors, whose occurrence ranged between 5 and 28 % across the four states (Figure 9).

Amongst mammalian predators, dogs (and their prints) and foxes (recorded by presence of prints) were recorded in all states except Tasmania (Figure 9). The occurrence of dogs (and their prints) was higher in New South Wales and were concentrated primarily at Lake Conjola. In South Australia, dogs and/or dog prints were recorded at 15 sites, including two Fairy Tern colony sites, Clare Bay on the western Eyre Peninsula and Bird Island (Outer Harbor) on the northern St Vincent Gulf. In Victoria, dogs and/or dog prints were recorded at 12 sites, two of which, Lake Tyers in East Gippsland and Point Smythe in South Gippsland had Little and Fairy Tern colonies, respectively. Fox prints were recorded in 10.4 % of assessments in South Australia, 14.9 % in Victoria and 18.2 % in New South Wales. In New South Wales, sites with fox baiting (Brou Lake and Tuross Heads) did not have fox prints detected (K. O'Brien 2024, *pers. comm.*), whereas fox prints were recorded at Lake Conjola and Shoalhaven River mouth, but we do not know if fox baiting was undertaken at these sites. Evidence of foxes in Victoria was observed in all regions at nine sites, including Point Smythe, Sandy Point Spit and Snake Island, which all had Fairy Tern breeding attempts. In South Australia, fox prints were observed at

8 sites in the western and lower Eyre Peninsula and the Yorke Peninsula and St Vincent Gulf. Cat prints were observed at three sites in South Australia, including the breeding colony site at the Murray Mouth, and at one site in Tasmania, the breeding colony site at Orford Beach.

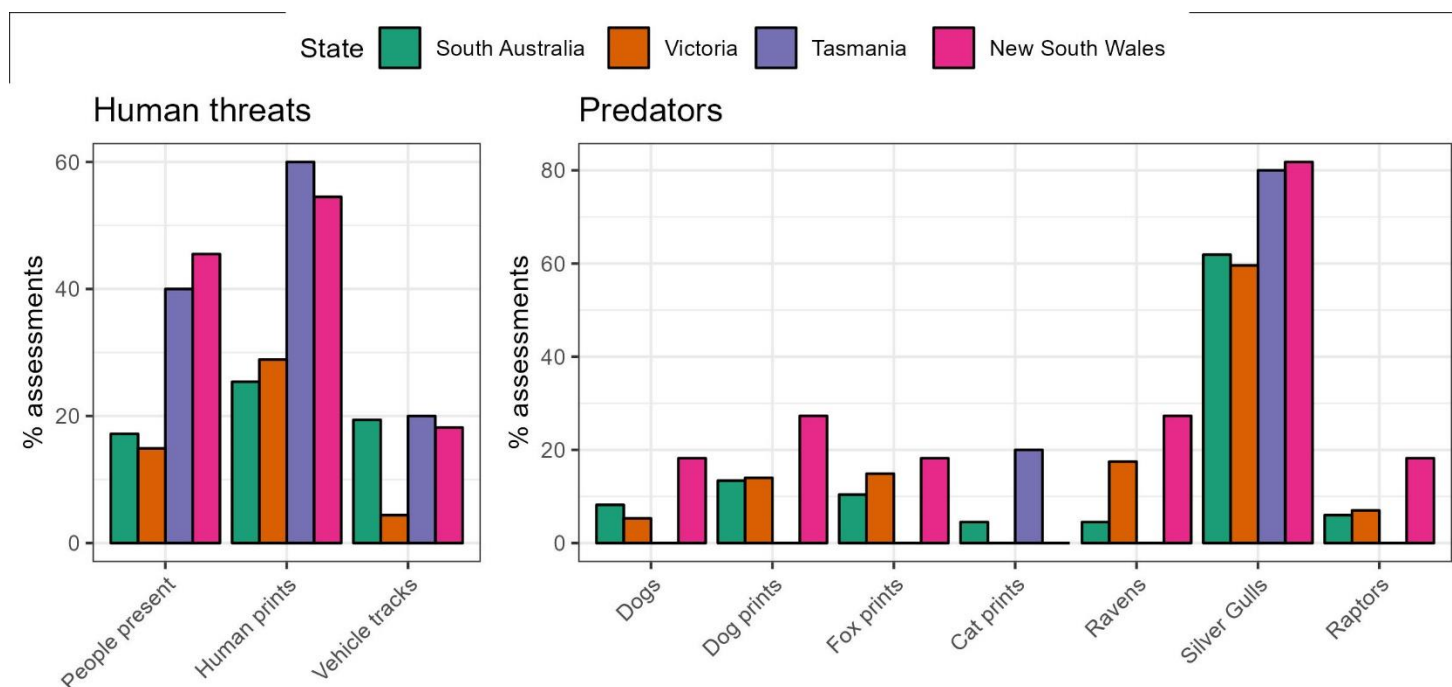


Figure 9. Percentage of threat assessments at state level in which each human and predator threat type was recorded during the Fairy Tern Census surveys in 2023/2024. South Australia: 134 threat assessments in 47 sites, Victoria: 114 threat assessments in 44 sites, New South Wales: 11 threat assessments in 6 sites, Tasmania: 5 threat assessments in 4 sites.

Threat assessments in South Australia and Victoria included a range of mainland and island sites. Figure 10 shows a comparison of the occurrence of the main threat types between mainland and island sites in western Eyre Peninsula (mainland: 37 threat assessments, island: 33), Port Phillip and Western Port Bay (mainland: 24, island: 18), South Gippsland (mainland 16, island: 15), and East Gippsland (mainland: 12, island: 26). All human threats and mammalian predators are much less common on islands than in mainland sites, particularly on the western Eyre Peninsula, whereas avian predators like Silver Gulls, have similar occurrences.

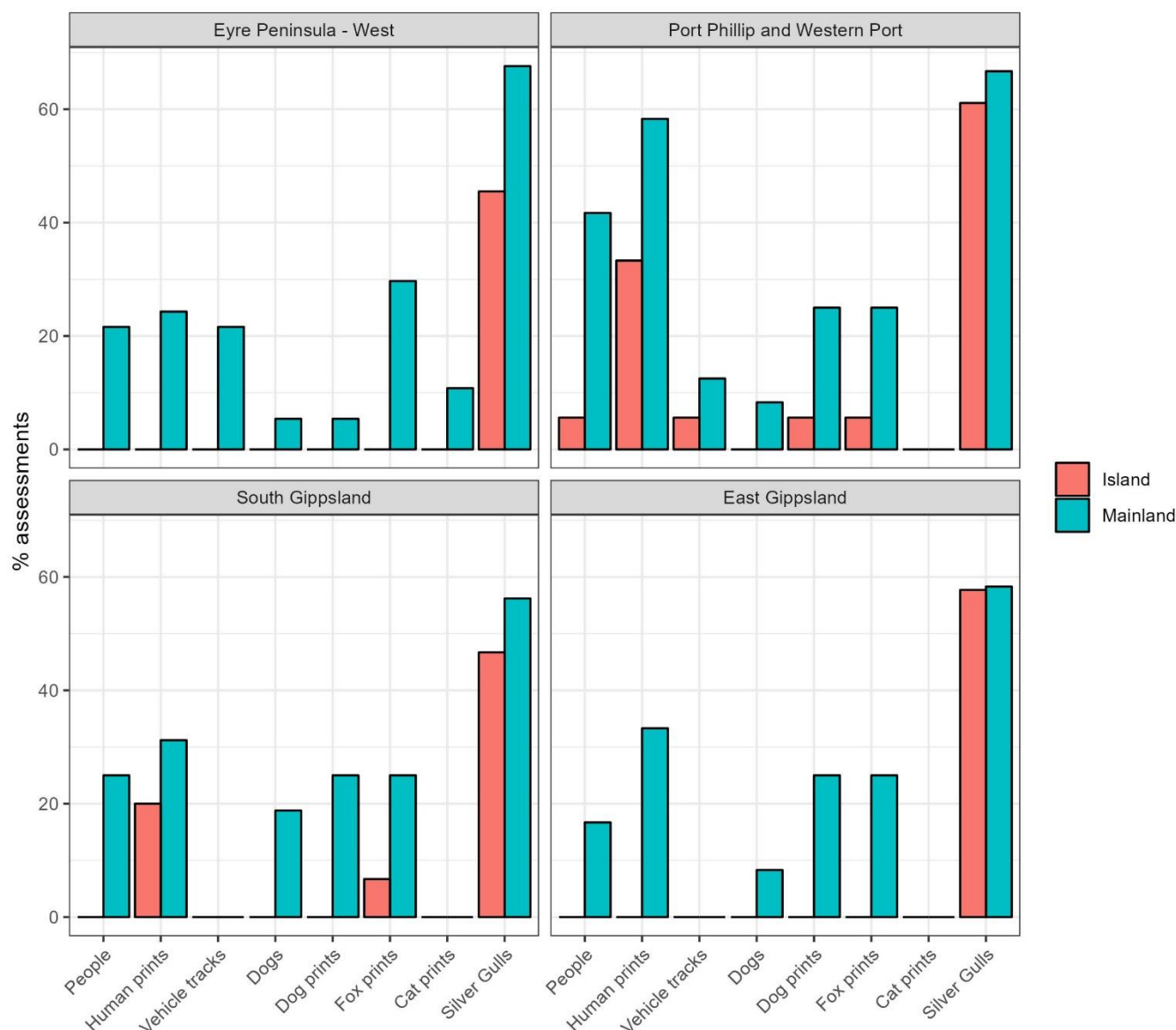


Figure 10. Comparison of the occurrence of the main threat type (% assessments) between island and mainland sites surveyed during the Fairy Tern census in 2023/2024 on the Eyre Peninsula – West in South Australia, Port Phillip and Western Port Bay, South Gippsland and East Gippsland in Victoria.

4. Discussion

4.1. Distribution and abundance

Fairy Terns were observed in all surveyed regions in eastern Australia, except Encounter Bay on the Fleurieu Peninsula and within Western Victoria. South Australia accounted for more than half of the Fairy Tern adults counted in October 2023, December 2023 and February 2024, and individuals were primarily located in the west coast of the Eyre Peninsula, particularly in October and December. This is in line with the previous South

Australian census in 2011/2012 (DENR 2012) and the estimated South Australian proportion of current eastern population estimates (Commonwealth of Australia 2020). Other regions with relatively high abundance in our census were South Gippsland in Victoria (October and December), Port Phillip Bay (February), and King Island (December).

The highest count across the three surveys was 1,146 adults, which may be an accurate estimate of the number of adults within our survey coverage, but likely underestimates the real population size in eastern Australia as we did not survey most of Tasmania. A less conservative approach can be considered if we assume that there are no interstate movements of adults during the breeding season; then, the sum of the highest counts within states (i.e., SA = 843 adults, VIC = 341, TAS = 230, NSW = 20) would provide the best population size estimate of the area our surveys covered (i.e., 1,434 adults). While we did not achieve to survey the entire eastern range, our census provided valuable insights about the relative importance of sites and regions, which can inform future census efforts to learn about the variation in site use over time and gain an insight into population trends.

Regional variation in counts between census surveys (e.g., decrease of adults in the western Eyre Peninsula in February, absence of adults in East Gippsland after October) suggests movements at regional scale during the breeding season. This variation between months in our regional counts could be due to movements during prospecting of breeding sites and dispersion after breeding (e.g., record of 85 adults and 3 juveniles in Port Phillip Bay in February 2024). Long movements while adults are breeding seem much less likely as suggested by the re-sighting of about 10 banded adult Fairy Terns breeding at two nearby locations in the Coorong South Lagoon this season (D. Paton 2024, *pers. comm.*). There is evidence of some long adult movements (>300 km), and it is thought that the Tasmanian population migrates to mainland Australia in winter (Higgins & Davies 1996). For example, a bird banded in the Coorong in February 2010 was recovered ~1.5 years later at Port Phillip Bay having travelled 510 km (Baker-Gabb and Manning 2011), and a colour-marked adult seen at Burrill Lake (southern NSW) in January 2013 was re-sighted at Port Phillip Bay in April 2016, having travelled at least 607 km, one of the longest documented distances (Driessen et al., 2016). In contrast, band recoveries of birds banded in Victoria suggest that Fairy Terns move within the state (e.g., Port Phillip Bay to Gippsland Lakes) but do not leave the state. Recoveries and re-sightings of individuals banded as chicks have provided valuable information on juvenile recruitments in the Coorong (e.g., Paton and Rogers 2009). Despite information from band recoveries and re-sightings, understanding intra- and inter-annual movement patterns between regions and states remains a critical knowledge gap, so coordinated colour-marked banding efforts (e.g., different colours per region) across the entire eastern Australia range would improve our knowledge about Fairy Tern movement patterns.

The states with best survey coverage were South Australia and Victoria. Our highest adult count in South Australia was 843 in February 2024. This is 305 less individuals (or a 26.5 % decrease) than the highest count during the 2011/2012 South Australian Fairy Tern Census (DENR 2012). Nonetheless, this decrease does not necessarily represent a negative trend in the South Australian population since the last census as more counts over several years would be required to identify a reliable trend sign (i.e., positive, negative or stable) and magnitude of change (Wauchope et al., 2019). What seems clear from our census and the previous South Australian census, is that the Eyre Peninsula, particularly the west coast, holds the highest abundance of Fairy

Terns in South Australia and across the eastern Australian range (from our counts: ~50% of South Australia counts and 25-35% of the total eastern Australia abundance). The western Eyre Peninsula was also an important hub of breeding activity, hosting 6 out of the 25 breeding colonies we recorded across eastern Australia. Our counts in the lower Eyre Peninsula were lower than in the 2011/2012 SA census – our maximum count was 69, and maximum count in 2011/212 was 353. In 2011/2012, Fairy Terns were recorded on several offshore islands of the lower Eyre Peninsula that we could not survey (e.g., Sir Joseph Banks, Rocky North, Four Hammocks), and so our census may have underestimated abundance in the region. Nonetheless, we managed to visit Boston Island, Waldegrave Islands and Rabbit Island in February and no Fairy Terns were found, but there were reports of Fairy Terns prospecting Point Maria on Boston Island in October 2023 (D. Storey 2023, *pers. comm.*). Documented historical records and standardised survey effort are lower on the Eyre Peninsula compared to other regions like the Coorong. Given the relative high abundance of Fairy Terns on the Eyre Peninsula, more regular survey effort of the region will be needed to obtain reliable size estimates and trends of the eastern Fairy Tern population.

The Coorong was another important South Australian region in our census. We recorded 48 adult Fairy Terns breeding at the Murray Mouth and a colony of 160 birds on an island in the South Lagoon in February. It is however likely that our census underestimated the abundance in the Coorong this season as two other colonies were established in the South Lagoon that were not detected in our census due to low water levels challenging boat access: one on Pelican Island established in December and another one near Cattle Island, with some banded adults being detected at more than one colony (D. Paton 2024, *pers. comm.*). Monitoring efforts localised in the Coorong by other researchers estimated approximately 500 Fairy Terns using the Coorong this season (D. Paton 2024, *pers. comm.*). This number of adults is higher than the 2000-2015 Coorong median abundance of 337 Fairy Terns and the highest abundance of Fairy Terns recorded in the Coorong since 2001 (Paton et al., 2022). Although it is estimated that Fairy Tern abundance in the Coorong has declined an 80% since 1985 (Paton and Rogers 2009), the Coorong continues to be a stronghold of the eastern Australian population. Elsewhere in South Australia, Fairy Terns were abundant in the northern St Vincent Gulf, particularly in Price Saltfields and Bird Island.

In Victoria, the highest abundance of Fairy Terns was recorded in South Gippsland in October and February, and then in Port Philip Bay in February. Our highest count in Victoria was 341 adults, which is similar to the current state population estimate of 100 – 150 breeding pairs (Adams et al., 2019). The Victorian population has however experienced a reduction of its breeding habitat range and population size since the 1980s. Corner Inlet in South Gippsland has regularly hosted breeding colonies of Fairy Terns, but the stronghold of the state had been in East Gippsland. This season, only 77 Fairy Terns were recorded in East Gippsland, all within the Gippsland Lakes Ramsar site where they established breeding colonies on Crescent and Pelican Islands early in the season, but only five Fairy Terns were counted in the region in December and none in February. South Gippsland instead, accounted for 40 to 55 % of the Victorian population, concentrated in breeding colonies in Corner Inlet, Shallow Inlet and Anderson Inlet. Although Fairy Terns had not bred in Anderson Inlet since 2010/2011 (Minton et al., 2011), this is the second consecutive year that they bred in Shallow Inlet. It is therefore critical to monitor the range of the species over time, as regions appear to shift in their importance for the species. Fairy Terns may be expanding their breeding range and numbers in South Gippsland and reducing in East Gippsland, and the triggers for this shift in occupancy of breeding sites should be explored. In

Port Phillip and Western Port Bay region, most Fairy Terns were recorded in the western side of Port Phillip Bay. In accordance with the steep declines in number of colonies and breeding pairs in the region since the 1980s (Adams et al., 2019), only approximately 40 adults bred within the region.

Within Tasmania, we had limited survey coverage, so that we cannot speculate on the size of the Tasmanian population nor make comparisons to historical knowledge of site distribution. Tasmanian sites were not surveyed in October as the assumption had been made that Fairy Terns do not usually start establishing at breeding sites this early (E. Whoeler 2023, *pers. comm.*). However, this year Fairy Terns had already started establishing colonies in the state in October and breeding monitoring efforts by Dr Eric Whoeler recorded higher than usual breeding pair numbers in the state (E. Whoeler 2024, *pers. comm.*). Despite our survey coverage gaps, the highest count at a single site during our census was recorded at Lavinia Point, on the east coast of King Island (200 adults). King Island is the stronghold of the Tasmanian population, with two thirds of the birds breeding on the island at three main locations: Lavinia Point, the coast between Sea Elephant River and Cowper Point and Yellow Rock Beach (Woehler 2009). This season, colonies at both Lavinia Point and Yellow Rock were established, but none at Sea Elephant. On the east coast of mainland Tasmania, we recorded another breeding colony at Orford Beach, which receives a high monitoring effort due to its ease of access on the mainland.

New South Wales has an estimated Fairy Tern population of less than 50 breeding pairs, the lowest abundance in eastern Australia (Greenwell et al., 2021a), being at the edge of the species range and perhaps related to competition with the Little Tern, which is more dominant in NSW and along the East coast of Australia. We surveyed eight main small tern breeding sites in the south coast of NSW, between Wallagoot Lake and Shoalhaven Heads. Our highest count in the state was 20 adults in December 2023 that were breeding at three sites, Wallagoot Lake, Mogareeka Inlet and Lake Conjola, in mixed colonies with higher numbers of Little Terns. Shoalhaven Heads had a large Little Tern colony (~200 adults) and it is possible that some Fairy Terns nested in this colony as well, but it was not confirmed (S. Leonards 2024, *pers. comm.*). Hybrid pairs of Fairy and Little Terns have been reported in the south coast of NSW (e.g., Lake Conjola in 2008, Minton and Jessop 2010). Hybridisation with Little Terns may pose a threat to the genetic diversity of Fairy Terns and it may be more common than current reporting rates suggest, given the low numbers of Fairy Terns in New South Wales almost always nesting in mixed colonies with Little Terns.

4.2. Breeding colonies

We recorded 25 breeding colonies across eastern Australia, most of them in Victoria (11) and South Australia (10). In South Australia, two of the colony sites (Clare Bay and Walkers Rock) had not been officially documented before, but Clare Bay is a known breeding site by the locals (A. Brooks 2023, *pers. comm.*). Note however that as the aim of this census was not monitoring outcomes of breeding colonies, the number of adults reported here may not represent the actual colony sizes and breeding phenology. It is also possible that we missed breeding attempts between census surveys. Hence, we will only briefly discuss breeding colonies in South Australia and Victoria, where an alternate BirdLife Australia project monitored some breeding colonies (see Sanchez et al., 2024 and Furbank et al., 2024 for more details on breeding monitoring).

Breeding colonies were smaller in Victoria (mean \pm standard: 31 ± 26 adults) than in South Australia (73 ± 42 adults). Minton et al. (2001) already reported a reduction in the breeding range, colony sites and colony sizes in Victoria since the 1980s. We recorded the smallest colonies in Victoria within Port Phillip and Western Port Bay (i.e., 3 adults on Sand Island, 28 on Mud Islands, and 12 at Observation Point), which supports evidence that steep declines in colony sites and colony sizes have occurred in this region in the last 40 years (Adams et al. 2019). Breeding success was also lower in Victoria than in South Australia, with only one confirmed colony producing fledglings (Point Smythe in Anderson Inlet). Tidal inundation, storm surge and flooding were common failure causes reported in Victoria. These are not new threats. Corner Inlet has regularly reported low breeding success due to extreme weather conditions (e.g., VWSG 1994, Minton et al., 2011; Sanchez and Mead 2023). However, we expect that the frequency of extreme weather events, storm surges and king tides will increase with climate change.

4.3. Threats

Besides extreme weather events and tidal inundation briefly discussed above, human disturbance and introduced predators are known threats to Fairy Terns and contribute to their decline (Commonwealth of Australia 2020). Whereas human disturbance and introduced predators are present across the entire Fairy Tern range, the occurrence rates of these threats may be different across sites (e.g., fox-free islands, remote sites with low human disturbance). Our census provided us with a snapshot of the distribution of human disturbance and introduced and native predators that can be used to inform further management efforts. There are other known threats that are more site specific, such as water management and high salinity affecting the Coorong that we did not address. As the number of threat assessments and sites were low in New South Wales (11 assessments in 6 sites) and Tasmania (5 assessments in 4 sites), we will focus the discussion on South Australia and Victoria, where our data provides a better representation of threats across the landscape of the two states.

There were no major differences between South Australia and Victoria regarding introduced or native predators, with Silver Gulls being the most common threat across all regions, and dog and fox evidence recorded in ~15 % of occasions. Cat evidence was however recorded in South Australia, but not in Victoria. Foxes and cats may roam over large areas, so the absence of prints at a site should not be interpreted as the lack of the threat, however this difference is similar to data from the repeated visits at breeding Hooded Plover sites across the coast of Victoria and South Australia (BirdLife Australia annual reports). The main difference in human disturbance between the two states was the evidence of vehicles in Fairy Tern sites. Whereas 20% of the threat assessments in South Australia recorded vehicle tracks, only 4.4% were recorded in Victoria, which came from a management vehicle at Observation Point on Phillip Island and trail bikes along dirt road in Avalon Saltworks. This is not surprising as vehicles are allowed on most South Australian beaches but are illegal on Victorian beaches. Evidence of vehicle use was widespread in South Australia across the Eyre Peninsula, the Yorke Peninsula, St Vincent Gulf, the Coorong and the South East. Disturbance from 4WDs was of particular concern at the Murray Mouth, where tracks were observed through the colony area and, in response, BirdLife Australia staff installed large banners around the colony perimeter to protect the nests (Furbank et al., 2024). Vehicles in South Australia are a key threat to address in the state, and education and

raising awareness amongst beach users may be the best approach to help Fairy Terns, given many colony sites are in remote areas with low resources to enforce compliance.

We also compared threats between mainland and island sites in four regions: the western Coast of the Eyre Peninsula, Port Phillip and Western Port Bay, South Gippsland and East Gippsland. Not surprisingly, the rates of human disturbance and introduced predators were much higher on mainland sites than on islands. Nonetheless, it is important to note that on some islands (e.g., Eyre Island), it was not always possible to check thoroughly for prints. The difference between threats on islands and mainland was particularly great in the Eyre Peninsula, where islands on the west coast did not record any human or introduced predator threats, highlighting the importance of these islands as refuges for Fairy Terns.

4.4. Challenges and limitations

Like other terns, Fairy Terns are a challenging species to census due to their mobility and low site fidelity. Furthermore, the range of the eastern population expands over more than 9,000 km of coastline and many key sites are remote and require boat access. Even with perfect coverage, detectability at some sites may be low due to the landscape geography (e.g. large, undulating dune systems), weather conditions or misidentification with the similar Little Tern. Overall, the main challenges and limitations of our study were:

- The lack of a complete and centralised inventory of historical records of observations and breeding events made site selection difficult and time consuming.
- Short amount of time to design and coordinate survey efforts, including selection of sites, recruiting volunteers, developing guidelines and training resources to ensure standardised data collection.
- Coverage gaps due to the lack of human resources and funding for accessing difficult sites.
- Low detectability at some sites (e.g., rocky islands with many crevices, low water levels in the Coorong South Lagoon making boat access difficult or impossible).

Despite the above challenges and limitations, we believe the census was useful and warranted as the current monitoring efforts overlook key regions like the Eyre Peninsula, which appears to account for ~25-30% of the eastern Australia Fairy Tern population. And given we do not know the regional and larger scale movements of the birds within a year, a coordinated and simultaneous census effort across the eastern range is needed.

5. Recommendations

Based on the learning from coordinating the Fairy Tern Census and its results, combined with knowledge from the historical data set, our recommendations are:

1. Conduct a census in eastern Australia every two to four years to obtain the best possible estimates of population size and trends. The census conducted in this project is the first step to inform future effort and design of more rigorous surveys and geographic coverage, with higher time and funding

investment, to learn about site use over time and gain more robust knowledge of population size and trends to measure conservation targets.

2. Use protocols and procedures developed in this project for future census
3. Future census should ensure that the entire eastern range is surveyed within a short period of time, aiming to survey entire regions within a week maximum. Nearby sites (i.e., within a 10 km radius) should, ideally, be surveyed simultaneously by multiple teams or on the same day.
4. Priority sites for future census should be the offshore islands of the Eyre Peninsula and Tasmania, including Flinders Island, to overcome geographic knowledge gaps.
5. Researchers, groups and organisations conducting Fairy Tern monitoring or recovery actions should communicate, coordinate and share data where possible to ensure efficient use of resources and minimize disturbance to nesting sites during future census surveys.
6. Allow at least six months to plan and coordinate future census so there is time to recruit more volunteer and regional staff to participate, and communicate census dates as soon as possible even if sites are not all locked in. Investing in a longer term project would allow for continued investment in training and upskilling to build a knowledgeable base of participants.
7. Establish state (but ideally national) protocols for Fairy Tern colour banding and establish a banding program. Combining a banding program with census efforts would provide better understanding of Fairy Tern movements and population exchanges beyond the colony sites that are regularly monitored.
8. Explore the logistics and capacity to conduct a winter census or utilise data from current groups undertaking shorebird winter counts to identify potential important roosting and foraging sites during winter.
9. Refine our work collating all historical data available in Birddata, eBird and state biodiversity databases to include records that are documented in other sources such as Victorian Wader Study Group Bulletins and Friends of Shorebirds South East articles. Currently, the lack of a complete database will hinders our ability to use historical data in future population trend analysis that are required to assess conservation targets.

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Thank-you to the many individual volunteers, community groups and organisations which dedicated their time to help monitor breeding sites and complete remedial management actions including BirdLife Australia volunteers and staff, Eyre Peninsula Landscape Board, National Parks and Wildlife Service, Southern Eyre Bird Club, the Wardang Island Indigenous Protected Area rangers, Limestone Coast Landscape Board, Department for Environment and Water, Fleurieu Hills Landscape Board, Friends of Shorebirds South East, Birds SA, Ngarrindjeri Aboriginal Corporation, Parks Victoria, PINP, Bunurong Land Council, Friends of French Island, Geelong Field Naturalists Club, VWSG, Friends of Orford Bird Sanctuary, Tasmania Parks and Wildlife Service, Department of Natural Resources and Environment Tasmania, NRM North, BirdLife Shoalhaven, NSW National Parks. We also thank the observers who reported incidental Fairy Tern sightings.

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All work was carried out under Department of Environment, Land, Water and Planning Wildlife Act and National Parks Act Research Permit No. **10010399**, and Department for Environment and Water, and National Parks and Wildlife Research Permit No. **E26037-15**.

Appendix 1 – List of census sites

Table A1. Complete list of the sites surveyed during the Fairy Tern Census in the 2023/2024 season. GPS coordinates are longitude and latitude of the site centroid. An X indicates the site was included in that survey and a blank indicates that sites was not included in that survey. In some instances, due to lack of counters, weather, or other unforeseen circumstances, not all sites were included in the three surveys. *Extra added on the Eyre Peninsula in the last survey in as part of the annua shorebird counts; **Sites added to one of the surveys where there was capacity to assess site habitat and use by Fairy Terns. EP = Eyre Peninsula, YP = Yorke Peninsula, SVG = St Vincent Gulf, Fleurieu Peninsula = FP, PP = Port Phillip, WP = Western Port, SG = South Gippsland, EG = East Gippsland.

State	Region	Site Name	GPS Coordinates	Survey 1	Survey 2	Survey 3
SA	EP - West Coast	CLARE BAY	-31.953, 132.691	X	X	X
SA	EP - West Coast	*CACTUS BEACH	-32.076, 132.989			X
SA	EP - West Coast	TOURVILLE BAY WEST	-32.127, 133.46	X	X	X
SA	EP - West Coast	TOURVILLE BAY EAST	-32.15, 133.509	X	X	X
SA	EP - West Coast	ST PETER ISLAND - BOB BAY	-32.253, 133.594	X	X	X
SA	EP - West Coast	*ST PETER ISLAND SOUTH	-32.271, 133.637			X
SA	EP - West Coast	ST PETER ISLAND - MOUNT YOUNGHUSBAND SPIT	-32.238, 133.653	X	X	X
SA	EP - West Coast	EYRE ISLAND	-32.369, 133.828	X	X	X
SA	EP - West Coast	THE SPIT	-32.728, 134.195	X	X	X
SA	EP - West Coast	SEAGULL LAKE	-32.96, 134.214	X	X	X
SA	EP - West Coast	**LITTLE ISLANDS	-32.74, 134.26	X		
SA	EP - West Coast	**PIGFACE ISLAND	-32.695, 134.278	X		
SA	EP - West Coast	BAIRD BAY	-33.128, 134.337	X	X	X
SA	EP - West Coast	*ANXIOUS BAY BOAT RAMP TO SOUTH WALKERS	-33.6, 134.843			X
SA	EP - West Coast	*WALKERS ROCK	-33.554, 134.856			X
SA	EP - West Coast	LAKE NEWLAND	-33.432, 134.873	X	X	X
SA	EP - West Coast	*WATERLOO BAY	-33.642, 134.878			X
SA	Lower EP	7 MILE BEACH	-34.502, 135.251		X	X
SA	Lower EP	POINT LONGNOSE	-34.528, 135.334		X	X
SA	Lower EP	HORSE PENINSULA	-34.549, 135.389		X	X
SA	Lower EP	*KELLIDIE BAY	-36.600, 135.510			X
SA	Lower EP	LONG BEACH	-34.631, 135.434	X	X	X
SA	Lower EP	PORT LINCOLN YACHT CLUB TO AXEL STENROSS	-34.715, 135.857		X	X
SA	Lower EP	*POINT MARIA (BOSTON ISLAND)	-34.674, 135.917			X
SA	Lower EP	*RABBIT ISLAND	-34.607, 135.984			X
SA	Lower EP	TOD RIVER MOUTH	-34.597, 135.909		X	X
SA	Lower EP	SECOND CREEK	-34.418, 136.108		X	X
SA	Lower EP	*TUMBY ISLAND	-34.408, 136.14			X
SA	YP and SVG	**FOUL BAY	-35.202, 137.198		X	
SA	YP and SVG	**PT TURTON	-34.942, 137.356		X	
SA	YP and SVG	POINT PEARCE	-34.414, 137.449	X	X	X

State	Region	Site Name	GPS Coordinates	Survey 1	Survey 2	Survey 3
SA	YP and SVG	**POINT PEARCE – NTH PORT VICTORIA	-34.471, 137.485			X
SA	YP and SVG	GOLDSMITH BEACH	-35.149, 137.692	X	X	X
SA	YP and SVG	**GILES POINT, COOBOWIE	-35.044, 137.747			X
SA	YP and SVG	SULTANA POINT	-35.117, 137.755	X	X	X
SA	YP and SVG	**TROUBRIDGE ISLAND	-35.13, 137.807		X	
SA	YP and SVG	**PINE PT	-34.571, 137.88			X
SA	YP and SVG	**PORT JULIA NORTH	-34.637, 137.897			X
SA	YP and SVG	MACS BEACH	-34.357, 138.002	X	X	X
SA	YP and SVG	PRICE SALTFIELDS	-34.316, 137.998	X	X	X
SA	YP and SVG	PORT CLINTON	-34.234, 138.017	X	X	X
SA	YP and SVG	CLINTON CP	-34.14, 138.089	X	X	X
SA	YP and SVG	BALD HILL	-34.258, 138.152	X	X	X
SA	YP and SVG	THOMPSON BEACH NORTH	-34.485, 138.277	X	X	X
SA	YP and SVG	BIRD ISLAND	-34.758, 138.486	X	X	X
SA	FP	WEST ISLAND	-35.61, 138.59	X	X	X
SA	FP	WRIGHT ISLAND	-35.58, 138.61	X	X	X
SA	FP	GRANITE ISLAND	-35.56, 138.63	X	X	X
SA	FP	SEAL ROCK	-35.58, 138.64	X	X	X
SA	FP	PULLEN ISLAND	-35.54, 138.69	X	X	X
SA	Kangaroo Island	INNER CASUARINA ISLET	-35.901, 136.536		X	
SA	Kangaroo Island	PAISLEY ISLET	-36.067, 136.702		X	
SA	Coorong	MURRAY MOUTH	-35.559, 138.883	X	X	X
SA	Coorong	COORONG - NORTH LAGOON	-35.863, 139.375		X	
SA	Coorong	COORONG - SOUTH LAGOON	-36.046, 139.56	X	X	X
SA	South East	ROBE OBELISK	-37.158, 139.747	X	X	X
SA	South East	FOSTER ISLANDS (LAKE GEORGE)	-37.414, 139.991	X	X	X
SA	South East	COWRIE ISLAND	-37.481, 139.996	X	X	X
SA	South East	HUTT BAY	-38.042, 140.638			X
SA	South East	DANGER POINT	-38.048, 140.806	X	X	X
VIC	Western Victoria	GLENELG ESTUARY	-38.06, 140.99	X	X	X
VIC	Western Victoria	DISCOVERY BAY VIC	-38.28, 141.35		X	X
VIC	PP and WP	MOOLAP SALTWORKS	-38.15, 144.42	X	X	X
VIC	PP and WP	AVALON SALTWORKS	-38.06, 144.44	X	X	X
VIC	PP and WP	**BARWON ESTUARY	-38.27, 144.5	X		X
VIC	PP and WP	WESTERN TREATMENT PLANT	-38.01, 144.57	X		X
VIC	PP and WP	**LAKE VICTORIA	-38.27, 144.59	X		
VIC	PP and WP	SWAN BAY WEST - JETTY	-38.22, 144.66	X		X
VIC	PP and WP	**QUEENSCLIFF BOAT RAMP	-38.26, 144.67			X
VIC	PP and WP	SAND ISLAND (RESTRICTED ACCESS)	-38.26, 144.68	X	X	X
VIC	PP and WP	EDWARDS POINT	-38.21, 144.7	X	X	X

State	Region	Site Name	GPS Coordinates	Survey 1	Survey 2	Survey 3
VIC	PP and WP	MUD ISLANDS	-38.27, 144.77	X	X	X
VIC	PP and WP	*LONG ISLAND WP	-38.31, 145.22		X	X
VIC	PP and WP	CHILCOTT ROCKS & SCOTTS BEACH	-38.36, 145.27	X	X	X
VIC	PP and WP	TORTOISE HEAD	-38.4, 145.28		X	X
VIC	PP and WP	FAIRHAVEN CAMPGROUND	-38.34, 145.28	X	X	X
VIC	PP and WP	OBSERVATION POINT	-38.45, 145.28	X	X	X
VIC	PP and WP	*BARRALLIER ISLAND	-38.28, 145.31		X	X
VIC	PP and WP	*LONG REEF WP	-38.25, 145.33		X	
VIC	PP and WP	RAMS ISLAND	-38.42, 145.35	X	X	X
VIC	PP and WP	REEF ISLAND - BASS BAY	-38.47, 145.42	X	X	X
VIC	PP and WP	*STOCKYARD POINT	-38.34, 145.53		X	X
VIC	SG	PT SMYTHE	-38.65, 145.73		X	X
VIC	SG	SHALLOW INLET	-38.83, 146.16	X	X	X
VIC	SG	SANDY POINT SPIT	-38.86, 146.17	X	X	X
VIC	SG	DUCK POINT	-38.81, 146.27	X	X	X
VIC	SG	**TOORA BIRDHIDE	-38.69, 146.33			X
VIC	SG	SNAKE ISLAND EASTERN SPIT	-38.75, 146.63	X	X	X
VIC	SG	SUNDAY ISLAND	-38.73, 146.66	X		X
VIC	SG	CLONMEL ISLAND	-38.72, 146.7	X	X	X
VIC	SG	BOXBANK ISLAND	-38.68, 146.79	X	X	X
VIC	SG	DREAM ISLAND	-38.66, 146.86	X	X	
VIC	EG	VICTORIA LAGOON	-38.04, 147.45	X	X	X
VIC	EG	HOLLANDS LANDING	-38.06, 147.46	X	X	X
VIC	EG	BARTON ISLAND	-37.96, 147.75	X	X	X
VIC	EG	WADDY ISLAND	-37.96, 147.76	X	X	X
VIC	EG	CRESCENT ISLAND	-37.96, 147.76	X	X	X
VIC	EG	ALBIFRONS ISLAND	-37.96, 147.77	X	X	X
VIC	EG	PELICAN ISLAND	-37.9, 147.88	X	X	X
VIC	EG	FLANNAGANS ISLAND	-37.88, 147.92	X	X	X
VIC	EG	RIGBY ISLAND EAST	-37.89, 147.96		X	X
VIC	EG	LAKE TYERS	-37.86, 148.08			X
VIC	EG	SNOWY RIVER MOUTH	-37.8, 148.55	X		X
VIC	EG	KARBEETHONG JETTIES	-37.54, 149.74	X		X
VIC	EG	BETKA ESTUARY AND BEACH	-37.58, 149.75	X	X	X
VIC	EG	MALLACOOTA INLET ENTRANCE	-37.56, 149.76	X	X	X
NSW	Southern NSW	WALLAGOOT LAKE	-36.79, 149.95	X	X	X
NSW	Southern NSW	BAY DRIVE FLATS	-36.7, 149.98	X	X	X
NSW	Southern NSW	MOGAREEKA INLET	-36.7, 149.98	X	X	X
NSW	Southern NSW	WALLAGA LAKE	-36.36, 150.08	X	X	X
NSW	Southern NSW	BROU LAKE	-36.13, 150.12	X	X	X
NSW	Southern NSW	TUROSS LAKE	-36.07, 150.13	X	X	X



State	Region	Site Name	GPS Coordinates	Survey 1	Survey 2	Survey 3
NSW	Southern NSW	LAKE CONJOLA	-35.27, 150.5		X	X
NSW	Southern NSW	SHOALHAVEN HEADS – RIVER MOUTH	-34.86, 150.75	X	X	X
TAS	King Island	YELLOW ROCK ESTUARY	-39.688, 143.901		X	X
TAS	King Island	SEA ELEPHANT	-39.811, 144.113		X	
TAS	King Island	LAVINIA POINT	-39.672, 144.108		X	
TAS	East Tasmania	ORFORD BEACH	-42.55, 147.88		X	X
TAS	East Tasmania	HORSESHOE SANDS	-41.28, 148.32		X	
TAS	East Tasmania	BLANCH BEACH	-41.28, 148.34		X	X

Appendix 2 – Counts in South Australia

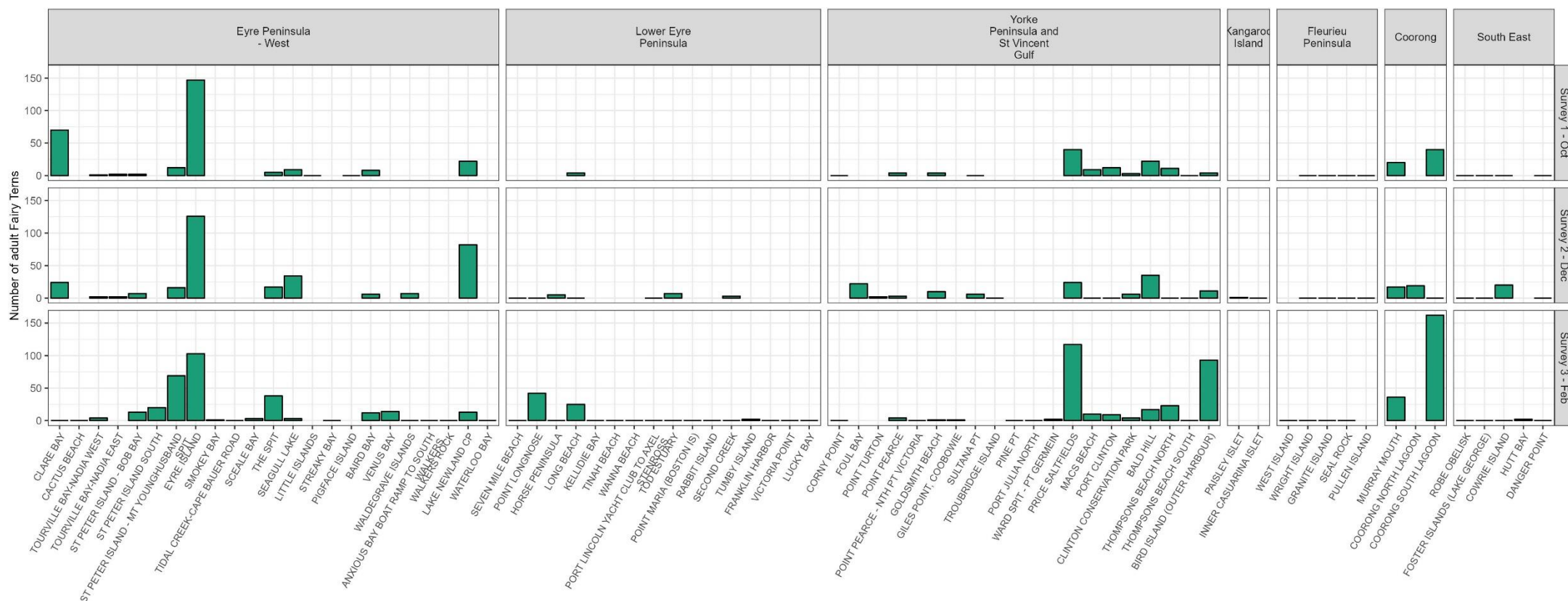


Figure A2.1. Counts of adult Fairy Tern at all surveyed South Australia sites in each of the three survey periods (rows) of the Fairy Tern Census in 2023/2024. Sites are grouped by region and ordered from west to east along the x-axis. Zeros are included, and sites with blanks mean the site was not counted in that survey period.

Eyre Peninsula - West

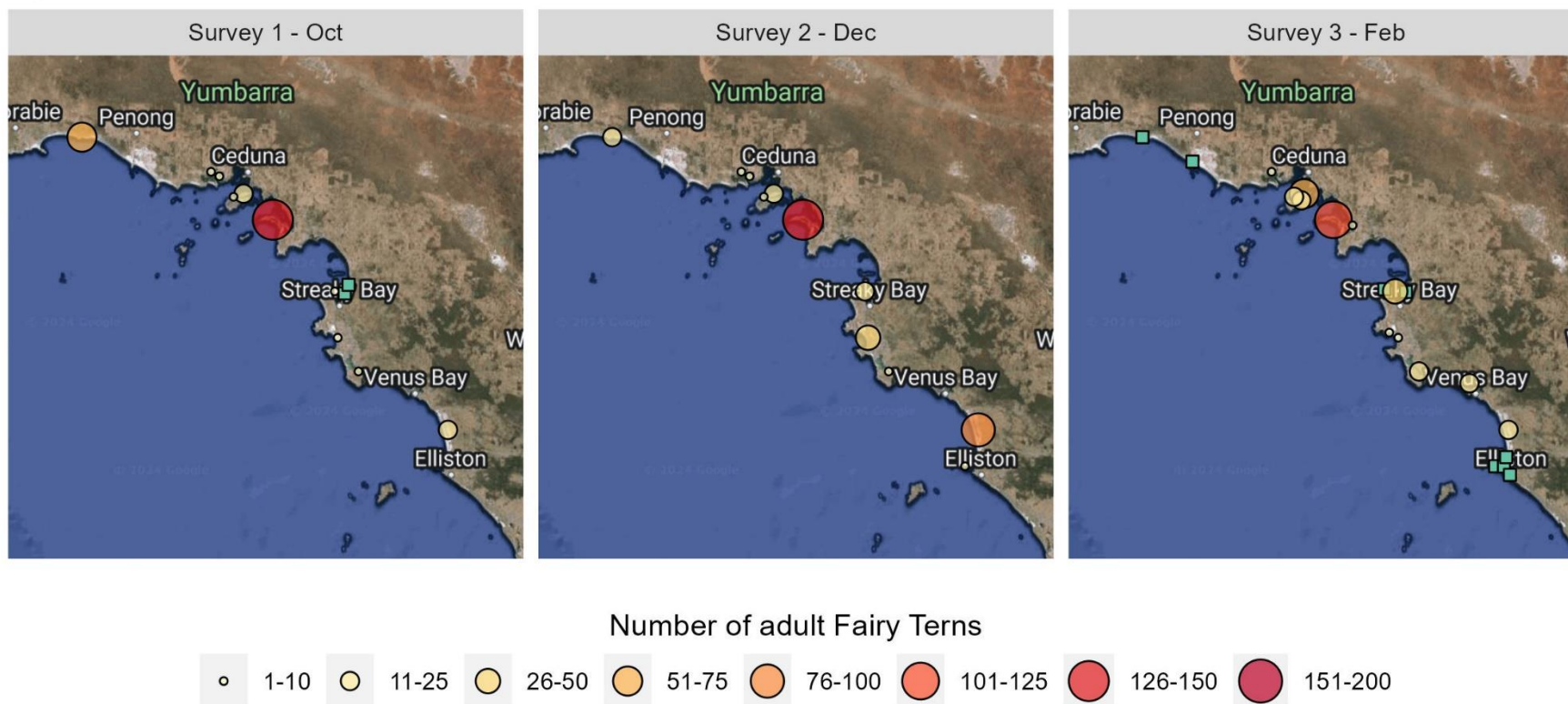


Figure A2 2. Distribution and abundance of the counts of adult Fairy Terns in the west coast of the Eyre Peninsula during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

Lower Eyre Peninsula

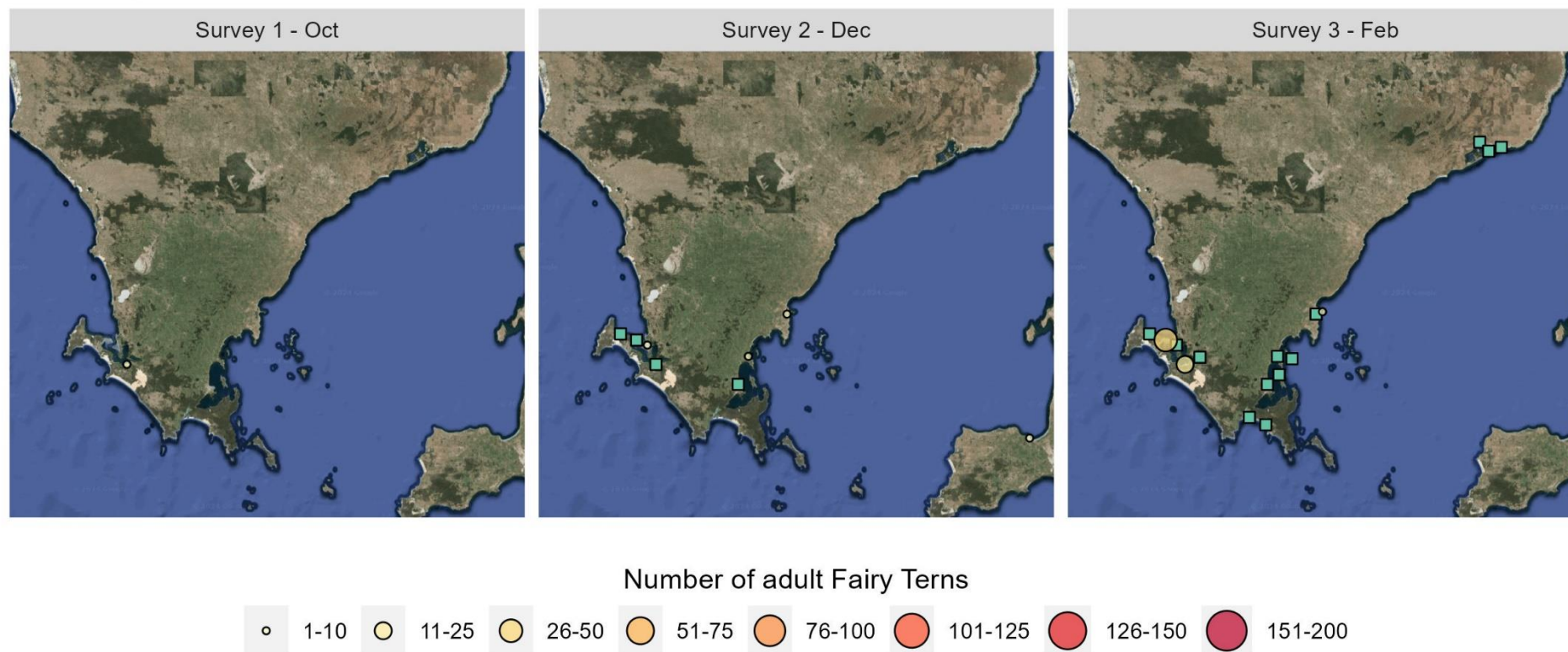


Figure A2 3. Distribution and abundance of the counts of adult Fairy Terns in the Lower Eyre Peninsula during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

Yorke Peninsula and St Vincent Gulf

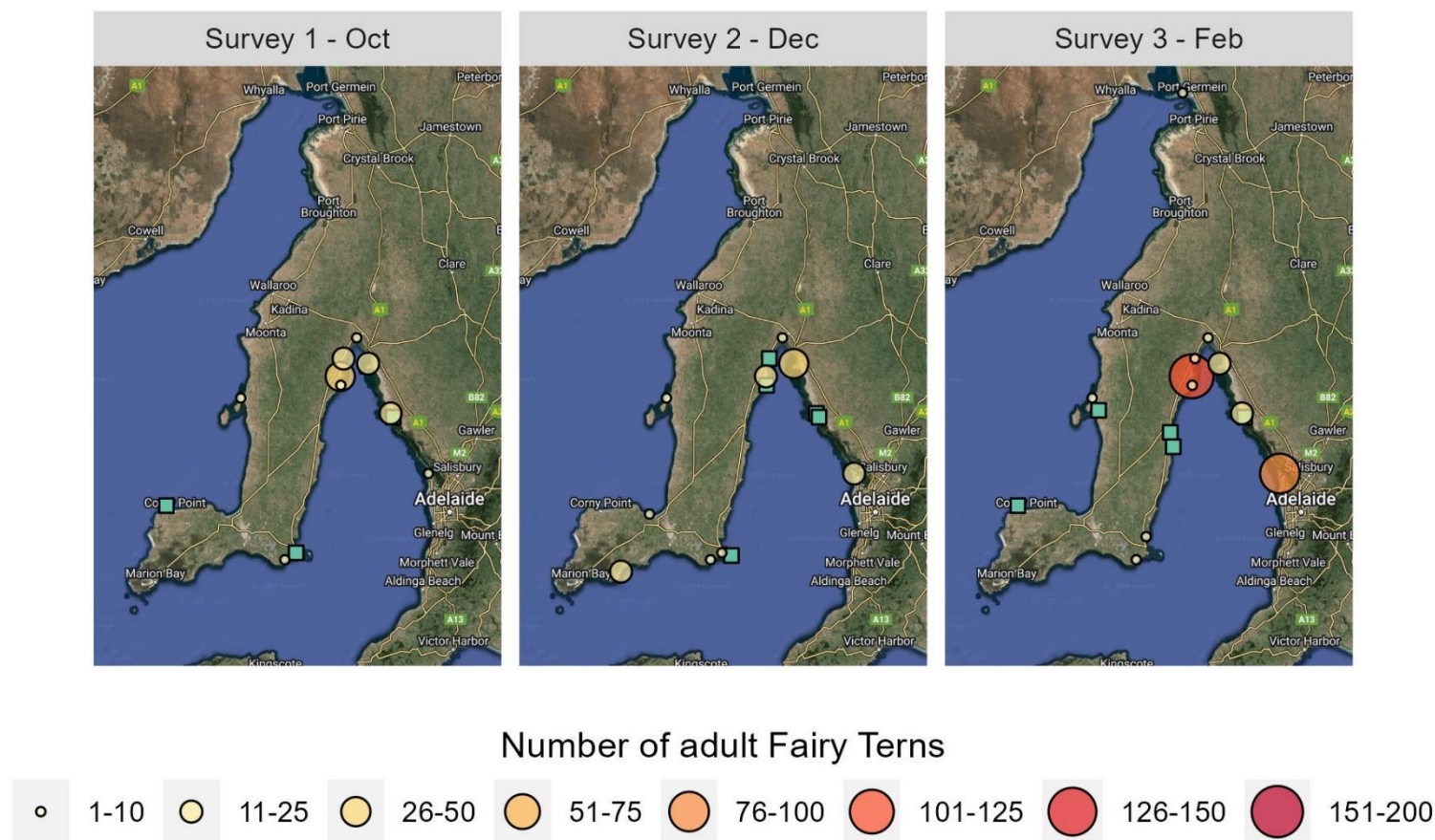


Figure A2 4. Distribution and abundance of the counts of adult Fairy Terns in the Yorke Peninsula and St Vincent Gulf during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

Coorong

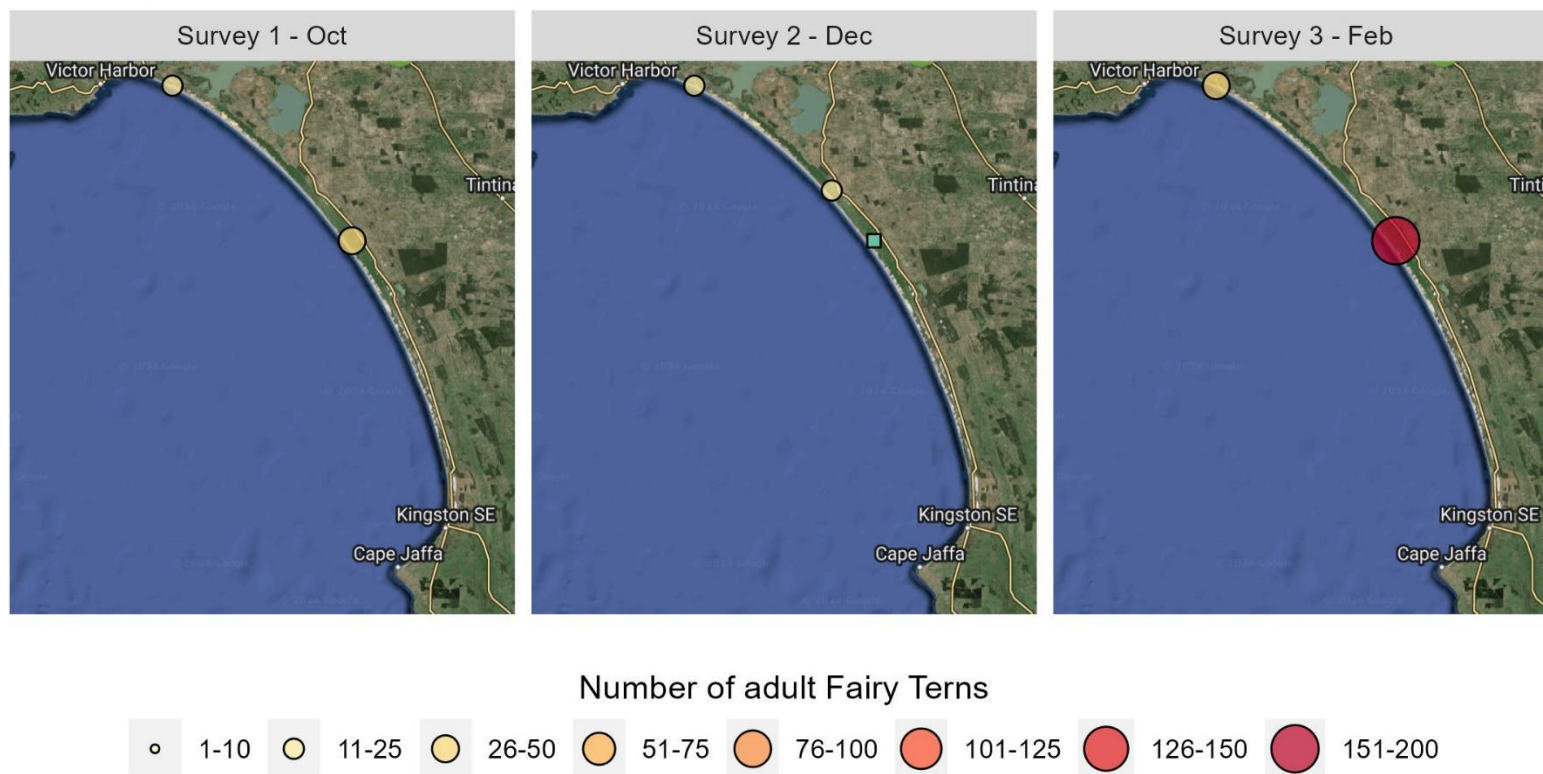


Figure A2 5. Distribution and abundance of the counts of adult Fairy Terns in the Coorong during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts. Note that the map does not show exact location of sightings within the North and South Lagoons as we have grouped their abundances, but several nearby locations were surveyed.

South East

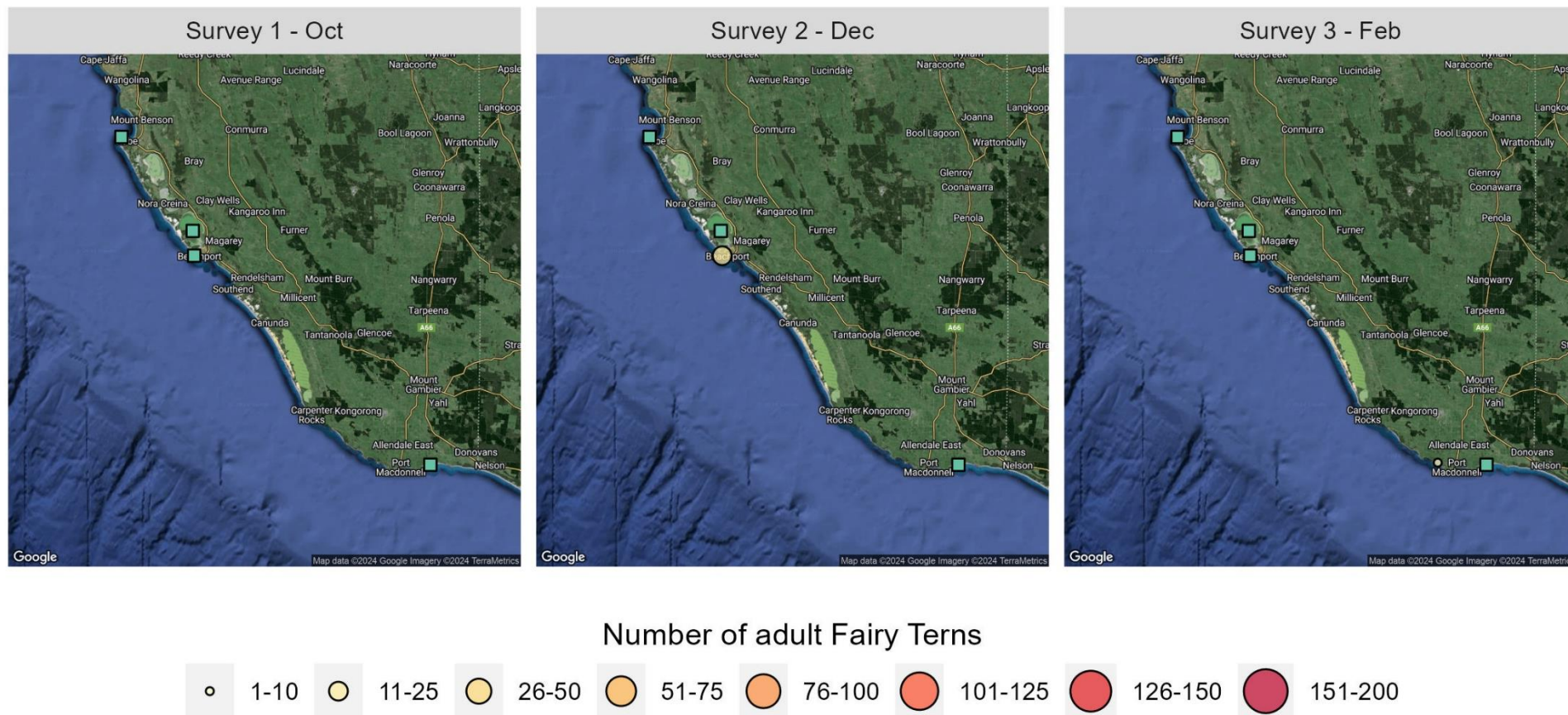


Figure A2 6. Distribution and abundance of the counts of adult Fairy Terns in South East South Australia during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

Appendix 3 – Counts in Victoria

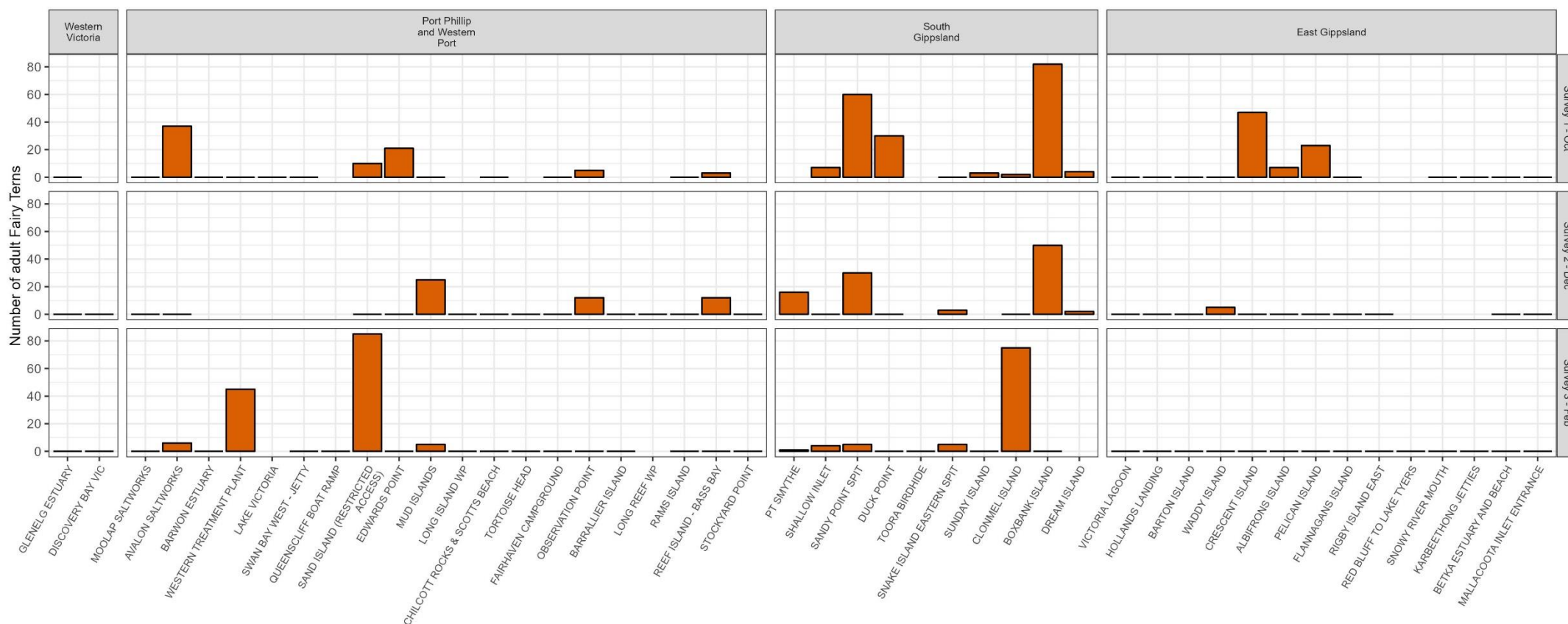


Figure A3 1. Counts of adult Fairy Tern at all surveyed Victoria sites in each of the three survey periods (rows) of the Fairy Tern Census in 2023/2024. Sites are grouped by region and ordered from west to east along the x-axis. Zeros are included, and sites with blanks mean the site was not counted in that survey period.

Port Phillip and Western Port

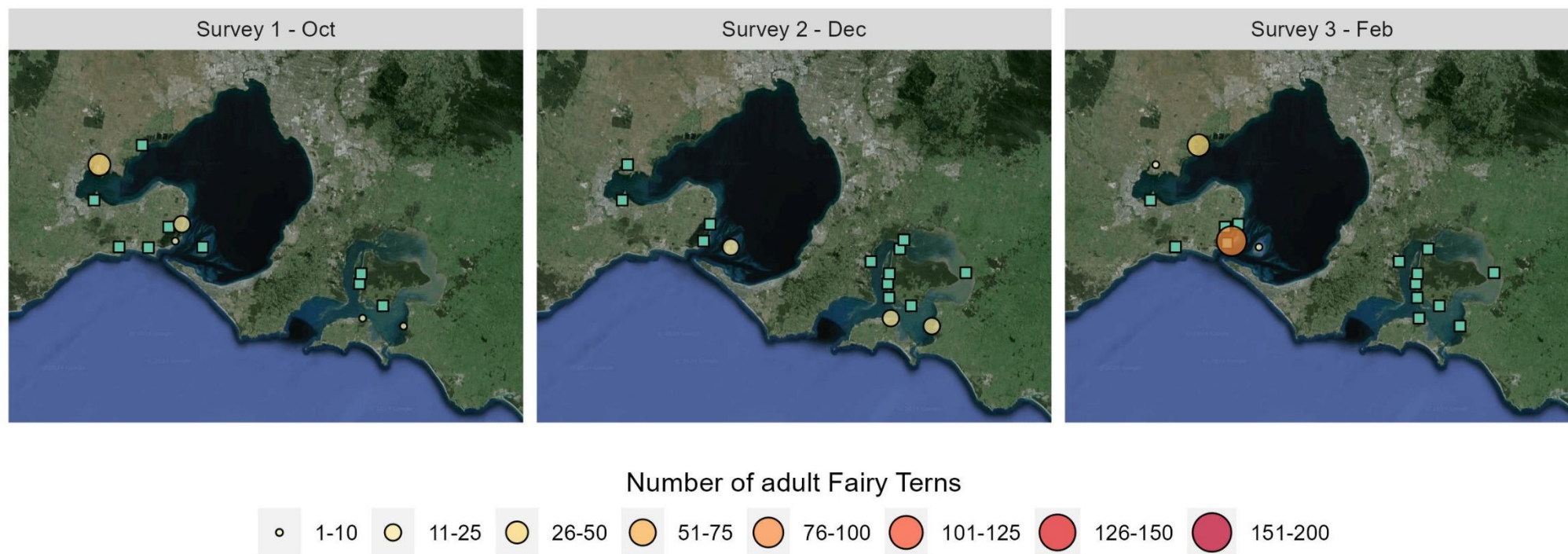


Figure A3 2. Distribution and abundance of the counts of adult Fairy Terns in Port Phillip and Western Port Bays during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

South Gippsland

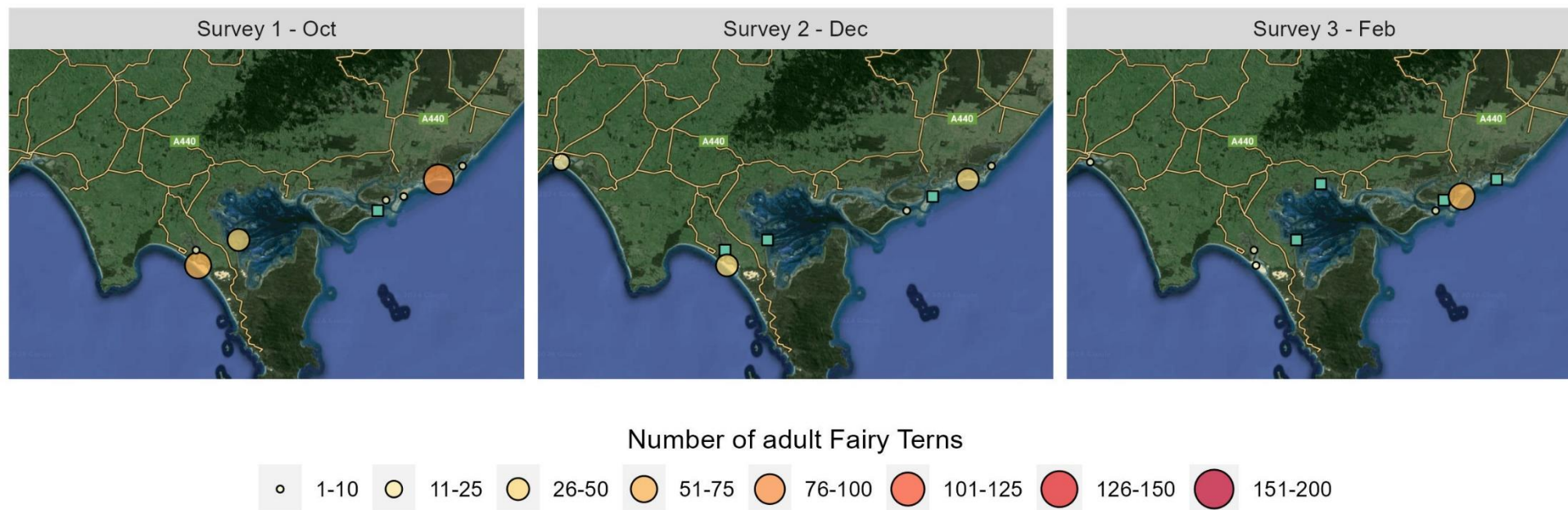


Figure A4 3. Distribution and abundance of the counts of adult Fairy Terns in South Gippsland during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue points squares indicate sites with nil counts.

East Gippsland



Figure A3 4. Distribution and abundance of the counts of adult Fairy Terns in East Gippsland during the three Fairy Tern Census surveys in October 2023 (top), December 2023 (centre) and February 2024 (bottom). Blue squares indicate sites with nil counts.

Appendix 4 – Counts in New South Wales

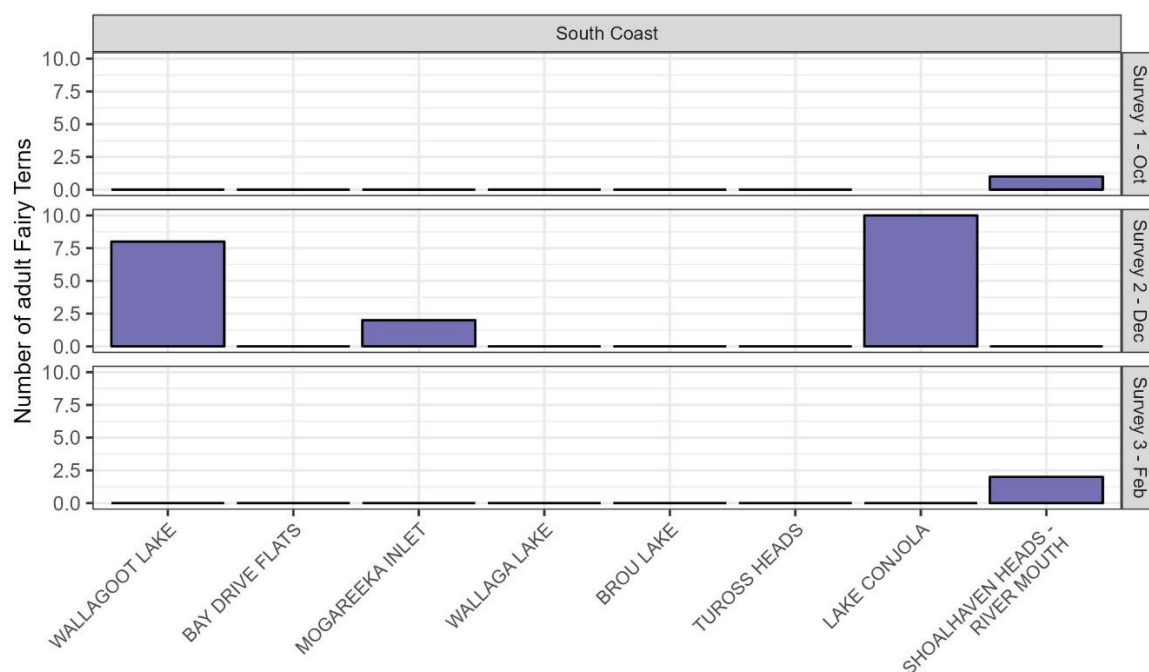
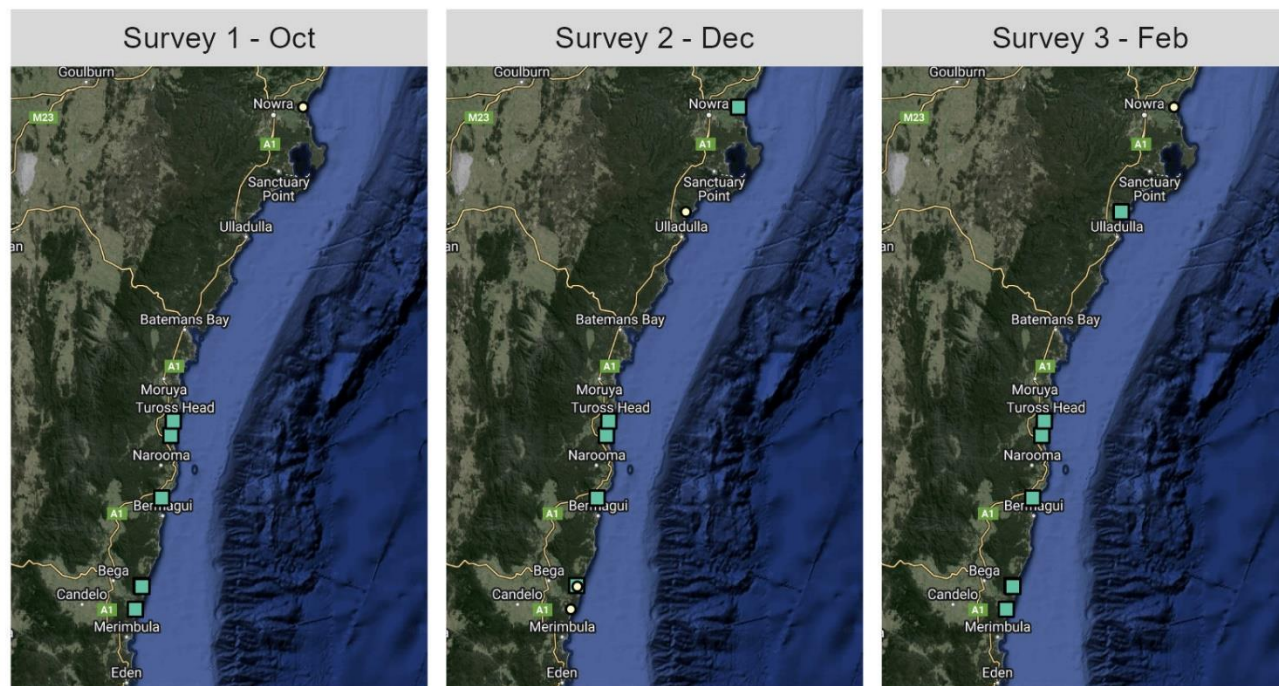


Figure A4 1. Counts of adult Fairy Tern at all surveyed New South Wales sites in each of the three survey periods (rows) of the Fairy Tern Census in 2023/2024. Sites are grouped by region and ordered from west to east along the x-axis. Zeros are included, and sites with blanks mean the site was not counted in that survey period.

South East NSW



Number of adult Fairy Terns



Figure A4 2. Distribution and abundance of the counts of adult Fairy Terns in the South Coast of New South Wales during the three Fairy Tern Census surveys in October 2023 (left), December 2023 (centre) and February 2024 (right). Blue squares indicate sites with nil counts.

Appendix 5 - Counts in Tasmania

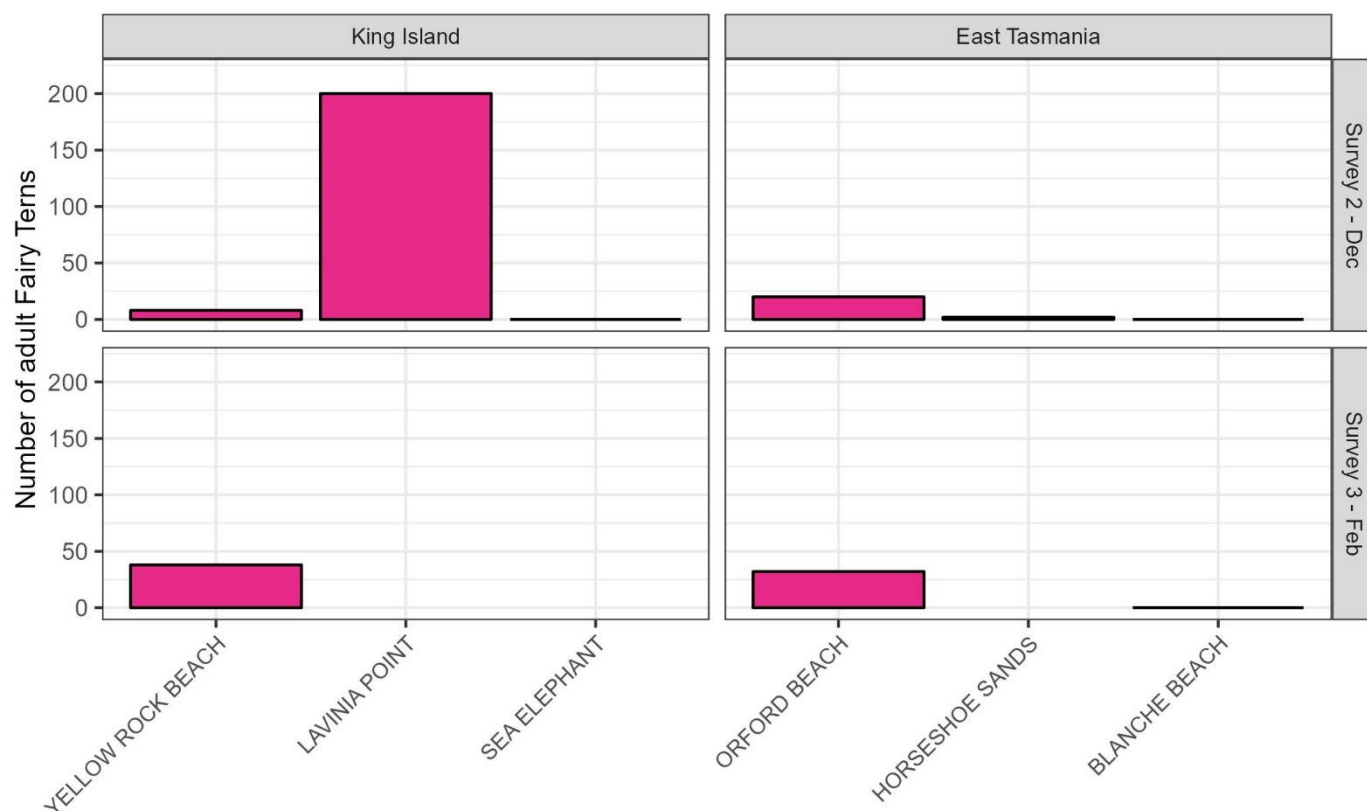


Figure A5 1. Counts of adult Fairy Tern at all surveyed Tasmania sites in each of the three survey periods (rows) of the Fairy Tern Census in 2023/2024. Sites are grouped by region and ordered from west to east along the x-axis. Zeros are included, and sites with blanks mean the site was not counted in that survey period.

King Island

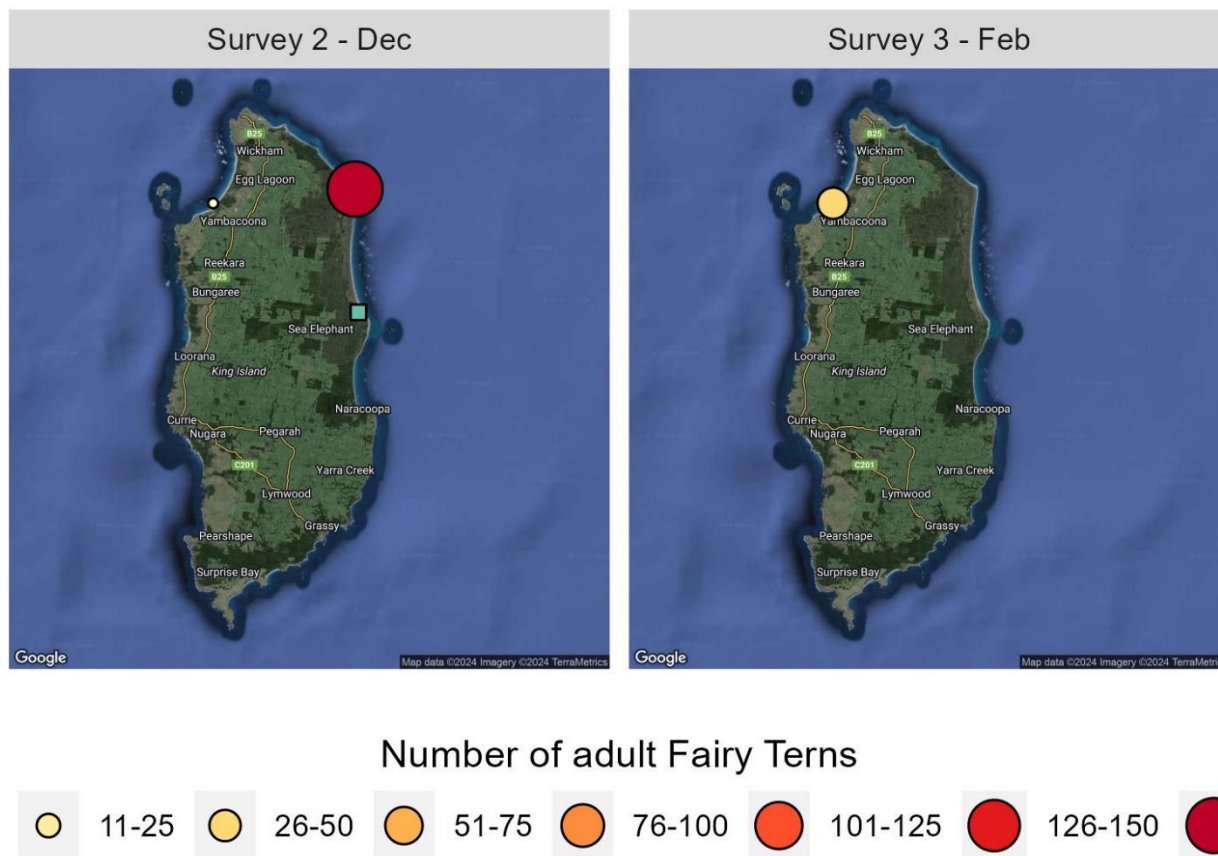


Figure A5 2. Distribution and abundance of the counts of adult Fairy Terns on King Island during the three Fairy Tern Census surveys in December 2023 (left) and February 2024 (right). Blue squares indicate sites with nil counts.

East Tasmania

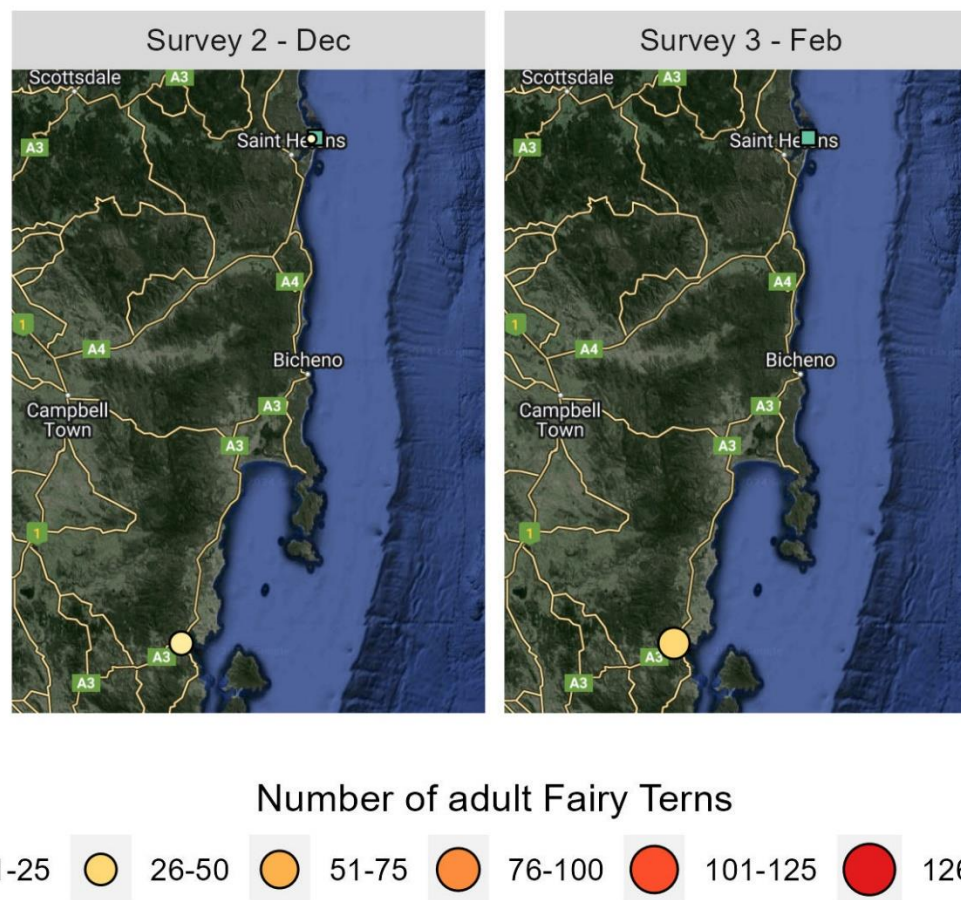


Figure A5 3. Distribution and abundance of the counts of adult Fairy Terns in East Tasmania during the three Fairy Tern Census surveys in December 2023 (left) and February 2024 (right). Blue squares indicate sites with nil counts.