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Population status of little penguins (*Eudyptula minor*) on Kangaroo Island in 2024

Comino, A., Lashmar, K., Berris, K., Byrne-Willey, H., Leigh, S., and Rogers, P.



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Postal Address: 35 Dauncey Street, Kingscote, SA, 5223.

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Primary author contact: Alexandra Comino

Manager approver name: Karleah Berris

Signed:



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ACKNOWLEDGEMENT OF COUNTRY AND SEA COUNTRY

The Kangaroo Island Landscape Board acknowledges and respects the traditional custodians of the Kangaroo Island region, and we also pay our respects to their Elders past, present and emerging. We acknowledge and respect the deep spiritual attachment and the relationship that Aboriginal and Torres Strait Islander people have to Country.

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Over 50 community volunteers and students assisted with the annual little penguin surveys between 2006 and 2014.

SUMMARY

- The Kangaroo Island Landscape Board Biodiversity Unit (KILB) completed a whole-of-island little penguin (*Eudyptula minor*) census in autumn and spring 2024. Outcomes of the surveys in 2024 were compared to the survey findings for spring 2023, and those of the 2011-2013 baseline population assessment ($\beta_p = 960$) calculated from surveys between 2011 and 2013.
- One of the main impetuses behind the data reanalyses, and the resumption of the modern survey, was the imminent risk of high pathogenicity avian influenza and the potential impact on the little penguin population that breeds on Kangaroo Island.
- A total of nine colonies were surveyed for little penguin breeding activity across Kangaroo Island in autumn and spring of 2024. Active burrows were counted at each colony when little penguins were in the process of rearing their first and second seasonal clutches of chicks respectively. The autumn survey was the first survey undertaken by the KILB during the start of the little penguin breeding season.
- A total of 260 and 265 active burrows were identified across nine colonies on Kangaroo Island in autumn and spring 2024 respectively. Based on the assumption of two breeding adult penguins per active burrow, the population estimate for the nine Kangaroo Island colonies was 520 (autumn) and 530 (spring) breeding adult little penguins. Combined colony estimates for 2024 dropped by 7% and 5%, respectively since the estimate of 558 in 2023 and declined by 61% since 2011 (1,348).
- Kangaroo Island's six largest colonies were surveyed during every whole-of-island census. Small colonies were excluded from some years due to low activity and local extinctions. The latest average population assessment across these sites in 2023 and 2024 estimates an average of 536 adult little penguins, a drop of 41% compared to the 2011-2013 baseline average of 910 across the same sites.
- Individual colonies have generally declined across surveyed sites since 2011-2013, with the exception of Emu Bay, where the population has increased to a record high of 278 estimated little penguins in autumn 2024.
- Priority conservation actions for little penguins on Kangaroo Island identified in 2023 that have been actioned during 2024 included:
 - Two censuses in autumn and spring 2024.

- A site assessment and survey of the Sealink development area in Penneshaw and provision of management advice to mitigate potential threats during the build process at the new ferry wharf;
- Targeted predator control in the island's larger colonies, Penneshaw and Emu Bay;
- Cleaning up of old fencing materials and other rubbish in the Emu Bay and Kingscote colonies.

INTRODUCTION

Background

Kangaroo Island was identified by the Australian Commonwealth Government as one of 20 priority places of importance under the *Threatened Species Action Plan 2022-2032*. This recognises the national importance of the island as an area with a significant number of threatened species.

Little penguins are seabirds in the family Spheniscidae which contains 18 species of penguin globally (Paleczny et al., 2015). The range of the little penguin *Eudyptula minor* extends through coastal regions of southern Australia, from Western Australia to New South Wales, and around New Zealand (Marchant and Higgins, 1990). While some colonies have increased in size in recent decades (e.g., Sutherland and Dann, 2014) others, including colonies in every state across their range, have declined (Norman et al., 1992; Stevenson and Woehler, 2007; Cannell et al. 2012, 2023; Colombelli-Négrel, 2015a, 2016, 2017; Vardeh, 2016; Comino et al., 2024). Within South Australia (SA), little penguin colonies have been recorded at approximately 100 sites, mostly in small populations (<100 nests) on near-shore islands (Copley, 1996; Wiebkin, 2011). Colombelli-Négrel et al. (2020) found that colonies on eight islands in SA were connected by moderate levels of gene flow, possibly due to migration from the Kangaroo Island colonies. Little penguin colonies on Kangaroo Island are mostly distributed along the northern coastline in Investigator Strait and Backstairs Passage (Kinloch and Brock, 2007).

The little penguin population on Kangaroo Island was monitored between 2006 and 2014 by Natural Resource Management (NRM) Board staff, other researchers, students and volunteers (Kinloch & Brock, 2007; Wiebkin, 2011; Colombelli-Négrel & Kleindorfer, 2014; Colombelli-Négrel 2015a, 2015b, 2016, 2017; Gibbons, unpubl. data). Research by the NRM Board (now Kangaroo Island Landscape Board) included: an annual survey at Kingscote from 2006 to 2014; island-wide penguin censuses from 2011 to 2013; and a penguin burrow activity study conducted at the Kingscote colony from 2008 to 2013. Prior to the report by Comino et al. (2024), results from region-wide population surveys of little penguins on Kangaroo Island had not been published for almost two decades (Kinloch and Brock, 2007). As outlined in Comino et al. (2024), the annual censuses were conducted during spring to coincide with peaks in the breeding activity of little penguin. During 2011, 2012 and 2013, the census was expanded from Kingscote to include eight additional colonies located around Kangaroo Island (Fig. 1). The penguin population at Kingscote peaked at 868 breeding adults during 2007, but then declined significantly to 154 breeding adults in 2013 and 128 breeding adults in 2014. During the island-wide censuses in 2011-2013, the mean population estimates for other major penguin colonies on Kangaroo Island (Antechamber Bay, Emu Bay, Penneshaw, and Vivonne Bay) ranged between 108 and 188 breeding penguins. The 2023 island-wide census

identified declines in population size at all resurveyed sites, with the exception of Emu Bay which increased by 36% compared with the 2011-2013 average (Comino et al., 2024). All surveys used counts of active burrows to estimate numbers of little penguins, with the key assumption being that each active burrow supported a pair of breeding adults.

High pathogenic avian influenza (HPAI) is a highly contagious disease that has had global impacts on at least 60 mammal and 500 bird species (FAO, 2025). This includes several penguin species confirmed with infections of the rapidly spreading H5N1 clade 2.3.3.4b (Muñoz et al., 2024; Clessin et al., 2025). Seabirds are globally one of the most vulnerable species groups. Reasons for this include the highly migratory and gregarious behaviours of some species and their breeding in high density colonies. The data in this report provides a baseline to aid in assessment of the future potential impacts of HPAI on the little penguin population.

Objectives

The objectives of this report were:

1. To report on the autumn and spring surveys of the little penguin breeding population in 2024 at all active sites on Kangaroo Island and compare the findings with historical data.
2. To report on threat management and habitat restoration activities in little penguin colonies that were completed by the KILB in 2023 and 2024.

METHODS

Survey location

Eight little penguin colonies were surveyed between 17 and 28 May (autumn) and nine colonies between 14 and 25 Oct (spring) 2024 to assess the status of the population on Kangaroo Island. Colonies included those surveyed in 2011, at Antechamber Bay, Penneshaw, Kingscote, Emu Bay, Stokes Bay and Vivonne Bay. As Cape Cassini and Western River Cove colonies had no activity in 2023, they were excluded from the 2024 surveys. Snellings Beach, with one active burrow in 2023 was surveyed in spring 2024 only. These colonies with no or very low activity will be revisited every five years to assess recolonisation. Three locations were added to the survey in 2023, including Seal Bay, Cape Willoughby and Brown Beach (Fig. 1). As Brown Beach had no sign of activity in 2023, this site was excluded in autumn 2024.

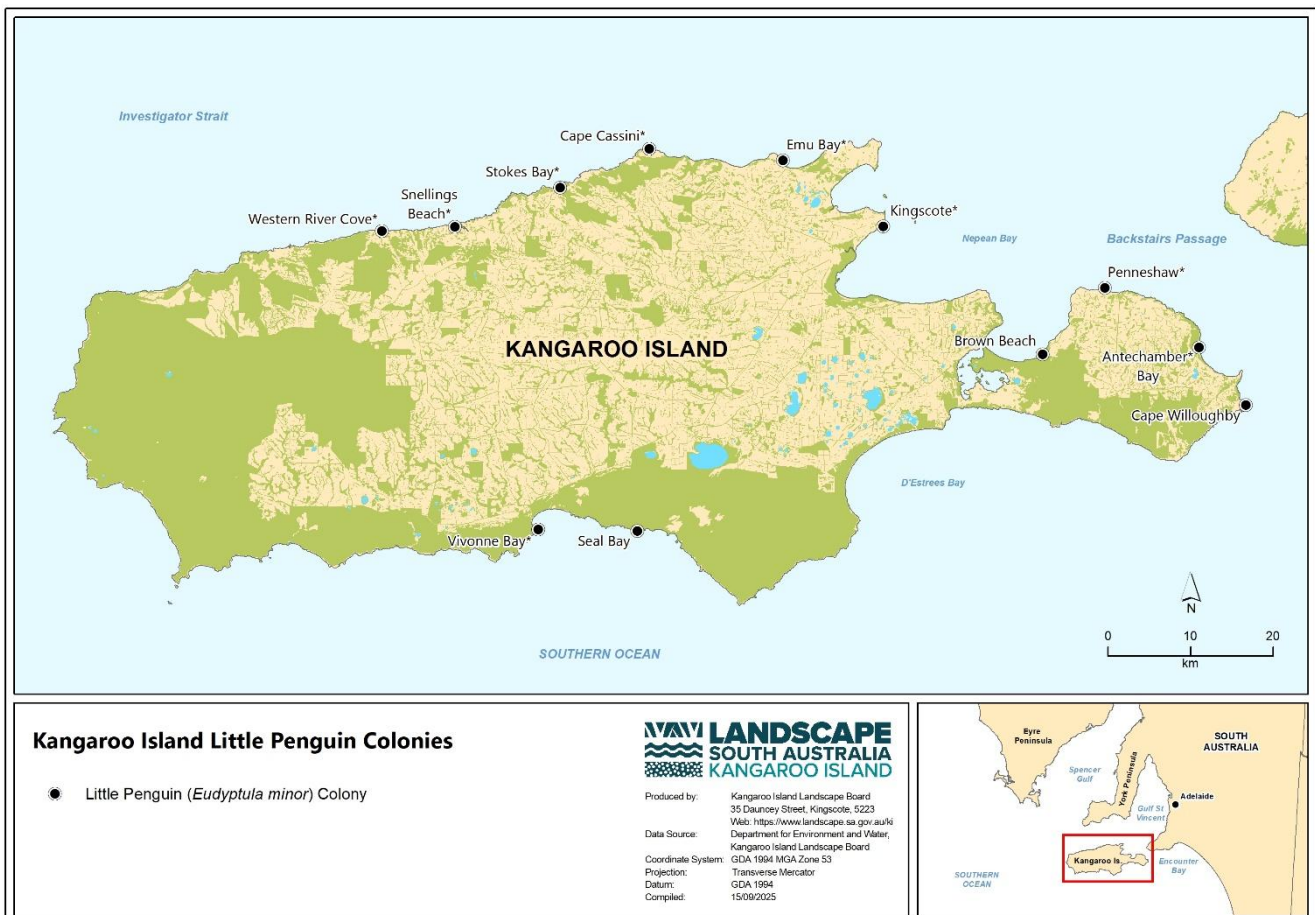


Figure 1: Map of little penguin colonies on Kangaroo Island surveyed in 2023 and 2024. Colonies with an asterisk (*) were surveyed in 2011-2013 as well.

Burrow counts

Burrows were counted at each colony during a period of high breeding activity when little penguins were in the process of rearing their first and second seasonal clutch of chicks. Surveys were undertaken during daylight hours, with the lower ends of the tides favoured to allow ease of access and facilitate little penguin tracks to be recognised in sandy supratidal areas.

Burrow status was recorded as either active or inactive. Burrows were considered active if birds were present, or if there was evidence of recent or current occupation, including presence of eggs or egg fragments, fresh feathers, tracks, calls or the sound of movement in burrows, nesting material, fresh guano, or a strong smell. Signs used to classify inactive burrows included collapsed entrances, spider webs covering entrances, old guano or moulted feathers. The spatial locations of all burrows were recorded using a hand-held GPS with an accuracy of ± 3 metres.

Spatial patterns of active burrows

Active habitat area for each colony was calculated using GPS point data. Total active habitat area for each site was calculated using ArcGIS software (Version 10.6.1) by generating a polygon buffer of 10 metres around the centroid of each active burrow. Where individual burrows were closely clustered, the buffers were dissolved together into a single feature to remove any overlap. The total active habitat area was then summed by colony in square metres (m²).

Spatial patterns of active burrows were interpolated using ArcGIS and the Kernel Density tool to generate a raster layer of active burrow density. MEAN spatial distributions of active burrow density for 2011/2013 and 2023/2024 were calculated for each colony using the ArcGIS Cell Statistics tool.

RESULTS

Total active burrow count

A total of 260 (autumn) and 265 (spring) active burrows were identified in 2024, across eight colonies surveyed on Kangaroo Island. This represented a decrease of 7% (autumn) and 5% (spring) since the previous count of 278 during spring 2023.

Based on the assumption of two breeding adults per active burrow, the breeding population estimate for little penguins in the Kangaroo Island region was 520 in autumn 2024 and 530 in spring 2024 (c.f. 556 in spring 2023).

Only Kangaroo Island's six largest colonies were surveyed during every whole-of-island census between 2011 and 2024. The latest mean population assessment across these sites in 2023 and 2024 estimated 511 adult little penguins, a decline of 44% compared to the 2011-2013 baseline mean of 910 across the same sites (Table 1).

The estimated population for all surveyed colonies during the whole-of-island censuses also dropped 44%, from the 2011-2013 baseline mean of 960 (nine colonies) to 536 adult little penguins in the 2023-2024 mean (nine colonies).

Colony-specific trends in burrow counts

Kingscote had 34 little penguins in autumn 2024 and 38 in spring 2024, down from a total of 74 in spring 2023 and the historical peak of 868 in 2007. The 2023 and 2024 counts mean (49) was the equivalent of 18% of the baseline at the colony level ($\beta_c=278$).

Penneshaw had 112 little penguins in autumn 2024 and 150 in spring 2024, similar to the spring 2023 result of 148. The 2023 and 2024 counts mean (137) was the equivalent of 73% of the 2011-2013 baseline at the colony level ($\beta_c = 188$). Notably, the colony counts of 148 and 112 in 2023 and 2024, respectively, were the same as the counts in 2012 and 2013, showing the colony is variable yet consistently in the 100-150 individual range since the historical peak of 304 in 2011.

Emu Bay increased to a record high of 278 little penguins in autumn 2024 and 244 in spring 2024, up from a total of 222 in spring 2023. The previous historical peak was 228 penguins in 2011. The 2023 and 2024 counts mean (248) was the equivalent of 85 more birds than the 2011-2013 baseline at the colony level ($\beta_c=163$).

Table 1: Population estimates for little penguin at twelve colonies on Kangaroo Island between 2011 and 2024. *Brown Beach, Cape Willoughby and Seal Bay were first surveyed by the KI Landscape Board in 2023.

Colony	2011	2012	2013	2011-13	2023	Autumn 2024	Spring 2024	2023-24	% change from 2011-2013 baseline at six largest colonies
Antechamber Bay	190	152	106	149	26	22	30	26	-82.6
Brown Beach					0*				
Cape Cassini	52	46	12	37	0				
Cape Willoughby					12*	18	12	14	
Emu Bay	228	160	102	163	222	278	244	248	51.8
Kingscote	380	300	154	278	74	34	38	49	-82.5
Penneshaw	304	148	112	188	148	112	150	137	-27.3
Seal Bay					12*	14	8	11	
Snellings Beach	18	4	4	9	2		0		
Stokes Bay	38	26	8	24	8	6	8	7	-69.4
Vivonne Bay	126	130	68	108	54	36	40	43	-59.9
Western River Cove	12	0	0	4	0				
KI Region combined	1,348	966	566	960	534	520	530	536	-44

Spatial patterns of active burrows

The total active habitat area averaged across the 2023 and 2024 surveys shows a decline for four of the five largest colonies, with the exception being Emu Bay, and across the whole region combined compared with the active habitat area from the 2011-2013 surveys (Table 2). A reduction in overall activity, and changes in density at some colonies (see Appendix), aligned with observed trends in habitat area.

Table 2: Active habitat area used by little penguins across Kangaroo Island's colonies between 2011 and 2024.

Year	Habitat area (m ²)					
	All Colonies	Antechamber Bay	Emu Bay	Kingscote	Penneshaw	Vivonne Bay
2011	100,414	8,448	20,234	36,422	24,616	10,695
2012	88,808	9,398	19,261	32,186	15,535	12,867
2013	60,239	8,080	13,040	18,546	12,804	7,768
2011-2013 MEAN	83,153	8,642	17,511	29,051	17,651	10,297
2023	51,930	2,991	21,722	8,671	12,908	5,638
2024-A	46,344	3,041	23,928	4,468	10,516	4,390
2024-S	49,297	3,416	24,050	5,661	11,384	4,786
2023-2024 MEAN	49,190	3,149	23,233	6,267	11,603	4,938

Comparison of active burrow density between 2011-2013 and 2023-2024 showed changes in distribution for each of the five largest colonies (see Appendix). Activity has increased in most of the Emu Bay colony and spread southward towards the main beach and high traffic areas. Activity and density in Kingscote and Vivonne Bay have generally shifted away from areas with high disturbance. Activity at Penneshaw has mostly clustered into two areas to the west of the ferry terminal. Hog Bay beach had no activity, while

density at the North Shore section, where the Penneshaw Penguin Centre currently run evening tours, has increased.

DISCUSSION

The population estimate from the Kangaroo Island little penguin census was 520 in autumn 2024 and 530 in spring 2024, compared with 558 breeding adults in 2023. These estimates show a decline of 44% compared with the baseline of 960 calculated from census surveys between 2011 and 2013.

The 2024 surveys confirm trends identified in the 2023 census, including some stabilisation and recovery recorded in the Penneshaw and Emu Bay colonies, with similar estimates for 2012, 2013, 2023 and 2024 recorded for Penneshaw and a 52% increase at Emu Bay compared with the 2011-2013 baseline. Further observed declines at Kingscote, now 83% lower than the 2011-2013 baseline, is coupled with a spatial contraction away from areas of high human disturbance. Three local colonies have become extinct since the 2011-2013 baseline, with significant drops in population of over 80% recorded at three additional colonies, and of 60% or more for two smaller colonies when compared to the 2011-2013 average.

The 2023 and 2024 census results may indicate potential recovery for, or movement between, sections of the colonies at Emu, Vivonne and Antechamber Bays with lower estimated populations compared to partial burrow counts undertaken in 2015 and 2016 (Colombelli-Négrel, 2016, 2017). The 2023 and 2024 censuses show activity density has changed across the five largest colonies, both towards (Emu Bay and Penneshaw) and away (Kingscote, Emu Bay and Penneshaw) from areas of higher disturbance.

The 2011-2024 census results indicated there is considerable variation in counts year to year at many colonies. The high number of surveyors, including volunteers, may have resulted in inconsistencies in counts, despite training and oversight from researchers in 2011-2013. Additionally, the 2023 census took place in November rather than October, when the 2011, 2012, 2013 and 2024 surveys were conducted. Additionally, an autumn count was included in 2024 during the first seasonal clutch for the first time with similar results to the spring 2024 census. Annual counts in future years will form a long-term dataset and clarify population trends across the Kangaroo Island region.

As in 2023, inactive burrows, both natural and artificial, were found at all sites (Comino et al., 2024). There is little need for additional artificial burrows on Kangaroo Island at present, with the exception of the outer margin of Emu Bay's growing colony. Native revegetation and weed control is being prioritised in

this colony but supplementary timber burrows translocated from Kingscote could provide additional breeding habitat while the vegetation matures.

Other land-based management activities include continued control of feral cats adjacent to colonies, with colonies on the Dudley Peninsula benefitting from eradication efforts undertaken by KILB. There have been a number of dead penguins found with suspected dog attack related injuries on Kangaroo Island in recent years, a feature not uncommon in other little penguin colonies, where small colonies are at the greatest risk (Blamey et al., 2024). The presence of domestic dogs has been found to alter little penguin behaviour (Costello and Colombelli-Négre, 2023). Community education is recommended to increase awareness of the impact domestic dogs have on seabirds.

It is not known how little penguin survival and breeding success will be impacted by both High Pathogenic Avian Influenza H5N1 (clade 4.3.3.1) reaching Australian shores (Ryding et al., 2025), and the harmful algal bloom dominated by dinoflagellate *Karenia* species (SARDI, 2025), active in Kangaroo Island's inshore waters since March 2025 to present. It is recommended that monitoring of the population across Kangaroo Island continue through annual censuses to document any impacts. Future data will be key to guiding management of Kangaroo Island's population and may be used to verify state-wide trends (Wiebkin, 2011). Colonies and sub-colonies which appear to be extinct should also be surveyed periodically (e.g., every five years) to identify recolonisation as part of an on-going census program.

NEXT STEPS AND FUTURE DIRECTIONS

- Continuation of census surveys to monitor the long-term fluctuations in Kangaroo Island's little penguin population is particularly important in the coming years given the potential impacts of the Harmful Algal Bloom and HPAI H5N1, evidence of declines in little penguin populations in Gulf St Vincent, and the many data deficient island colonies in South Australia.
- Relocation and minor repairs to damaged artificial burrows from Kingscote to the Emu Bay colony.
- Improving vegetation through planting native coastal species and control of invasive weeds, particularly kikuyu grass, where they are encroaching on the two largest colonies; Penneshaw and Emu Bay (Comino et al., 2024).
- Undertaking feral cat control activities near active colonies during peak breeding periods. The Penneshaw, Antechamber Bay and Cape Willoughby colonies are ideally located to benefit from the feral cat eradication program on the Dudley Peninsula.

- Continue to collaborate and share management, census and threat information with local stakeholders who interact with, or work near Kangaroo Island's colonies, including KI Council, tourism agencies and members of the public.

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APPENDIX

Little penguin activity density at Kangaroo Island's largest colonies

