A RICH SEABIRD ASSEMBLAGE HIGHLIGHTS THE CONSERVATION VALUE OF THE NORFOLK BASIN

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ABSTRACT

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The Norfolk Basin is located between Aotearoa/New Zealand and Norfolk Island in the southwest of the South Pacific Ocean and is proximate to breeding areas of functionally important, unique, and threatened seabirds. Despite this region's potential importance for seabirds, the basin's seabird assemblage has never been quantified, although protections for part of the region exist within the framework of the Norfolk Marine Park. Here, we report on seabird surveys conducted while crossing the Norfolk Basin on 10 and 11 May 2025, as well as reporting on an exhaustive search for prior records of all seabirds recorded across this poorly surveyed area. We recorded 29 pelagic seabird species (32 taxa including subspecies) during our surveys, including three that had not previously been documented within the Norfolk Basin, highlighting the limited survey effort to date in the region. Gadfly petrels *Pterodroma* spp. exhibited exceptionally high species richness ($n = 11$) during our surveys. Additionally, almost 40% of the seabird species detected were listed as globally Near Threatened or higher under the IUCN Red List, and more than two-thirds were of conservation concern when also considering those listed as threatened in Australia and Aotearoa/New Zealand, underlining the region's importance for rich and threatened seabird assemblages. Our surveys, integrated with citizen science and historical data, provide foundational insights into the seabird assemblage of the Norfolk Basin. The species richness and counts of seabirds observed suggest that this region hosts a productive marine ecosystem. Continued and expanded surveys are needed to build the knowledge required to guide effective marine conservation in the Norfolk Basin region, both within and beyond protected areas.

Key words: Marine Protected Areas, Norfolk Marine Park, South Pacific Ocean, Tasman Sea, Coral Sea, shipboard survey, pelagic ecosystem

INTRODUCTION

Documentation of seabird occurrences at sea can provide important insights into ecosystem condition, ecological shifts, and emerging threats (Allen et al., 2025; Krüger et al., 2017). This is particularly true in pelagic environments, where direct monitoring of ecosystem health is logistically challenging (Thomson & Gerwing, 2023). Understanding the spatial ecology of seabirds at sea can inform marine conservation planning and contribute to the assessment of impacts of environmental change and evaluating the effectiveness of marine management actions.

The region where the Tasman and Coral Seas meet forms a biogeographically complex and ecologically significant region in the southwest portion of the South Pacific Ocean, supporting a diverse assemblage of breeding and non-breeding seabirds (Gorta et al., 2019; Priddel et al., 2010; Whitehead et al., 2019). These waters interact with multiple oceanographic features, including the eastern extension of the East Australian Current and the North Cape Eddy (Oke et al., 2019; Tilburg et al., 2001), and thus should sustain a high diversity of foraging seabirds (Bost et al., 2009). Included within the region are globally significant breeding colonies of many seabirds on remote islands such as Manawatāwhi/Three Kings Islands, Norfolk Island, Lord Howe Island, and Rangitāhua/Kermadec Islands (Gaskin, 2011; Hindwood, 1940; Priddel et al., 2010; Whitehead et al., 2019). In addition to breeding species, many other seabirds occur seasonally in the area, including trans-equatorial and circumpolar migrants (Marchant & Higgins, 1990). It is especially important to understand the contemporary seabird assemblage in this ecosystem in the context of limited current knowledge, regional shifts in seabird occupancy, and environmental change that can reshape seabird assemblages (Gorta et al., 2019; Phillips et al., 2023; Rodríguez et al., 2019). Effective conservation and management strategies are, therefore, critically dependent on high-resolution data on seabird distribution, abundance, and habitat use at sea (Ballance, 2007; Vaughan et al., 2024), yet systematic surveys in this region are sparse.

A variety of research approaches are available to study seabird occurrence and behaviour. Vessel-based surveys offer a viable approach for collecting systematic, spatially explicit data on seabird assemblages (Goyert et al., 2016). In particular, vessel-based observations are effective for assessing species composition, estimating relative abundance, and identifying spatial patterns in behaviour (Louzao et al., 2009; McQuaid, 2025; Ollus et al., 2023). Where pre-existing vessel movements can be leveraged for seabird research, some of the inherent challenges to vessel-based seabird surveys, including expense for charter and logistics of voyage planning, can be circumvented to provide useful data on seabird assemblages in under-surveyed areas (Viola et al., 2024). These surveys can be supplemented by other methods. Biologging offers high-resolution individual movement data, allowing for detailed inference about habitat preferences and foraging strategies, but is frequently limited by sample sizes, species accessibility, or logistical constraints associated with capturing and tagging birds (e.g., Rayner et al., 2020; Sequeira et al., 2019). Citizen science platforms and opportunistic sightings also contribute valuable occurrence (Gorta et al., 2019; Viola et al., 2022) and behavioural insights (Gorta et al., 2023; Vaughan & Viola, 2022) across varied spatial scales. Sea-watching and beach patrols can provide information on seabird movements nearshore and mortality events but provide largely inferential coverage of pelagic areas (e.g., Gorta, 2021).

We undertook a dedicated vessel-based survey of seabirds along a transect between the Manawatāwhi/Three Kings Islands and the Norfolk Island group in the Norfolk Basin, a relatively understudied marine corridor. Despite the complexity of its oceanography and proximity to important seabird breeding sites and designated Marine Protected Areas (MPAs), surveys of seabird occurrence and at-sea ecology in this region are scarce. This limited historical survey effort, coupled with the region's remoteness, have contributed to substantial knowledge gaps for seabird occurrence in the Norfolk Basin, including information about seabird use within MPAs, especially the Norfolk Marine Park (NMP) within Australia's Temperate East Marine Parks Network (Director of National Parks [DNP], 2018). Given these knowledge gaps and research priorities, we aimed to (1) identify and quantify the assemblage of seabirds in the Norfolk Basin through a contemporary survey and review of historical records, (2) associate survey records with known breeding colonies and marine management zones, and (3) identify knowledge gaps and future research and monitoring priorities.

METHODS

At-Sea Survey

We conducted vessel-based surveys within the Aotearoa/New Zealand (A/NZ) Exclusive Economic Zone (EEZ) on 10 May 2025 and in the NMP within the Australian EEZ on 11 May 2025 (Fig. 1). Surveys were within the Norfolk Basin, bounded by the Norfolk, Reinga, and Three Kings Ridges, lying broadly between Manawatāwhi/Three Kings Islands and the Norfolk Island group (Fig. 1).

Seabirds were recorded from the aft deck of the F/V *Manakai*, an open-backed converted fishing long-liner, with two observers collectively scanning a 270°-field of view. Both sides and the stern and a radius of within 500 m of the vessel were incorporated. The vessel lacked a suitable forward-facing observation point; therefore, management of attractant and observations of seabirds were conducted most effectively from the aft deck.

We used visual aids for distant identification and data recording: Swarovski EL 10×32 binoculars, a Nikon D500 DSLR camera with a Sigma 150- to 600-mm f/5–6.3 DG DN OS lens, and a Sony RX10 IV bridge camera. Surveys were conducted continuously from sunrise to sunset on both days, commencing at 07h20 and concluding at 17h50. Observers alternated between being on and

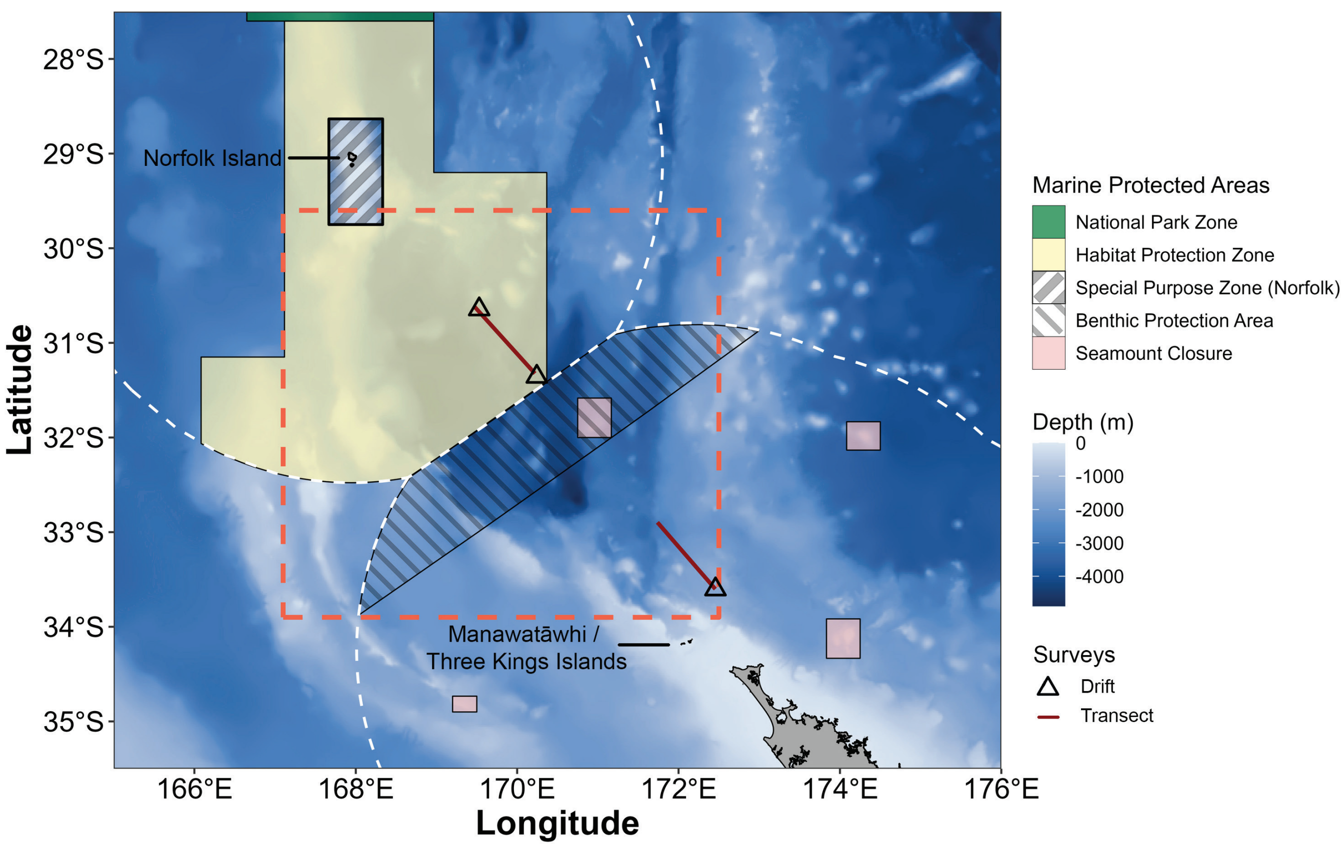

Fig. 1. Seabird survey effort across the Norfolk Basin from Aotearoa/New Zealand (grey landmass at bottom of map) to Norfolk Island on 10 and 11 May 2025. Transect and berley drift locations are indicated relative to bathymetry and Marine Protected Areas, and the region delineated by the orange dashed box indicates the bounds within which we searched for seabird records for the Norfolk Basin. White dashed lines delineate Exclusive Economic Zones.

off duty every 3 hr to maintain alertness, with the off-duty observer present to cross-reference observations when needed. Winds during surveys varied from Beaufort 4 to 6 across both days, but visibility was consistently good in overcast conditions. While the vessel was underway, speed was maintained at 8–10 knots, and we deployed tuna oil continuously at a rate of ~500 mL/hr via a drip mechanism from the stern.

Additionally, we undertook stationary surveys at three key sites (Fig. 1). Each was identified based on relatively complex bathymetry either on the edge or floor of the abyssal plain of the Norfolk Basin and within the NMP on the second survey day. For the stationary surveys, to enhance seabird attraction, the vessel drifted with the prevailing wind and current for 2 hr, while tuna oil was continuously deployed at a similar rate to that of underway surveys, and "berley bombs" (a mix of frozen fish that generates particulate matter on the sea surface while thawing) and raw chicken skin were deployed. As vessel-based surveys are fundamentally biased by attraction or avoidance effects (Borberg et al., 2005; Spear et al., 1992) and because our focus was on seabird species richness and counts rather than density, we used attractants to increase sensitivity and maximise detection. While olfactory attractants would favour procellariiform seabirds, visual foragers are also attracted to feeding flocks, slicks, and floating food (e.g., chicken skins), as well as vessels.

We collated species lists and counts every hour for underway surveys and individually for stationary surveys. These lists followed the AviList taxonomy (AviList Core Team, 2025). Observations of notable species (e.g., those that were locally uncommon or of notable conservation significance) were georeferenced, and we made specific notes of the number of birds involved and behaviour. We then summarised these data as species/subspecies lists for A/NZ and NMP waters. This summary included the total number of birds recorded per taxon across the two-day survey and maximum counts (highest hourly count per taxon) for each region. Birds were identified to subspecies level only in cases that field identification criteria were available in the literature (e.g., Gorta & Allen, 2026), with specific reference to locally relevant field guides (Howell & Zufelt, 2019; Menkhorst et al., 2019). For every individual observed sufficiently well to see necessary detail, birds were aged based on observations and photographs of plumage, condition, and moult. Because we used a continuous drip and berley and individuals could repeatedly follow or return to the boat, where possible, we tracked new arrivals and the retention of the same individuals by observation and photographs of distinctive details (e.g., plumage pattern or moult). In this way, we attempted to account for ship-following in our hourly estimates. Although stationary and transect surveys represent distinct methods, we report only summed counts, maximum counts, and species richness across survey days—metrics broad enough to remain meaningful when combining these approaches.

Data Review and Compilation

We conducted an exhaustive search of publicly available databases and literature up to 05 October 2025 to compile a dataset of seabird records from previous observer effort in the study region. For the purposes of this records search, the study area was a rectangle surrounding the Norfolk Basin itself, bounded by the coordinates 29.6°S, 167.1°E and 33.9°S, 172.5°E (Fig. 1). We selected this region because it included the general area where our active survey effort occurred and fell outside the relatively better-understood seabird communities immediately proximate to northern A/NZ and the Norfolk Island group (Whitehead et al., 2019). To capture pelagic seabird biologging information throughout the study region, the data sources we referred to for this search were citizen science databases eBird (Sullivan et al., 2009) and iNaturalist (iNaturalist, n.d.), local record assessment committees (i.e., the BirdLife Australia Rarities Committee [BirdLife Australia, n.d.] and Birds New Zealand Rare and Unusual Birds archive [Birds New Zealand, n.d.]), museum catalogues from local institutions (accessed via Online Zoological Collections of Australian Museums [n.d.]), historical expeditions by extra-regional organisations, and the scientific literature. For each source, we cross-referenced data to ensure no duplication, and each seabird observation that remained after this step constituted a record. To determine which species had breeding populations adjacent to the study region, we used information from Whitehead et al. (2019) and included breeding populations within this area as well as those from Norfolk Island group (including Norfolk Island, Phillip Island, and Nepean Island), with reference to Priddel et al. (2010) and our collective experience of seabird breeding activity on these islands.

Species with one or more populations in the regions described above were assigned a breeding status, while those with a strong seasonal signal or known migratory status from the literature (Williams et al., 2006) were identified as migratory. Vagrants were defined as species with < 10 records from the review that did not otherwise have a status assigned from the literature. Conservation status listings for all species captured in the review were extracted from the International Union for Conservation of Nature Red List (IUCN, 2025) as well as the Australian Environment Protection and Biodiversity Conservation Act 1999 (listings accessed via https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl) and the New Zealand Threat Classification System (Robertson et al., 2021).

RESULTS

Pelagic Survey

Across the entire survey, we recorded 29 species (32 taxa including subspecies) of pelagic seabirds (Table 1, Fig. 2). Most of these were tubenoses (order Procellariiformes), with Grey Noddy *Anous albivitta* and White-tailed Tropicbird *Phaethon lepturus*—both recorded in A/NZ waters—being the only exceptions (Table 1, Fig. 2). Species composition differed between survey days and regions. We recorded 24 species in A/NZ waters on 10 May and 22 species in the NMP on 11 May (Table 1, Fig. 2). Turnover in species composition between days was ~27%. Seven species and one subspecies (nominate Black-browed Albatross *Thalassarche melanophris melanophris*) were recorded only in the southern part of the survey region, and five species and one subspecies (the Australian taxon of White-faced Storm Petrel *Pelagodroma marina dulciae*) were recorded only in the northern part of the survey region (Table 1, Fig. 2).

Grey-faced Petrel *Pterodroma gouldi* and Black Petrel *Procellaria parkinsoni* were the most numerous species observed by a substantial margin, respectively representing 48.6% and 24.9% of all individual seabirds recorded (Table 1, Fig. 2). By contrast, we documented three species for the first time in the Norfolk Basin: White-tailed Tropicbird in A/NZ and, in the NMP, Soft-plumaged Petrel *Pterodroma mollis* and Juan Fernandez Petrel *Pterodroma*

TABLE 1
Seabird species/subspecies list for the vessel-based pelagic seabird surveys between Aotearoa/New Zealand and Norfolk Island in May 2025

Species	Scientific name	Aotearoa/New Zealand		Norfolk Marine Park		IUCN[c]	NZTCS[c]	EPBC[c]
		n (max)[a]	Age class[b]	*n* (max)[a]	Age class[b]			
Grey Noddy	*Anous albivitta albivitta*	1 (1)	Juv	–	–	LC	Rel	–
White-tailed Tropicbird	*Phaethon lepturus*	1 (1)	Ad	–	–	LC	–	–
Antipodean Albatross	*Diomedea antipodensis antipodensis*	8 (1)	Imm, Ad	3 (1)	Imm, Ad	EN	NC	VU
	Diomedea antipodensis gibsoni	2 (1)	Ad	1 (1)	Ad	EN	NC	VU
Black-browed Albatross	*Thalassarche melanophris melanophris*	1 (1)	Imm	–	–	LC	–	VU
	Thalassarche melanophris impavida[d]	10 (3)	Imm	5 (2)	Imm	LC	–	VU
Shy Albatross	*Thalassarche cauta steadi*	1 (1)	Ad	–	–	NT	Dec	VU
Wilson's Storm Petrel	*Oceanites oceanicus*	36 (6)	Ad	7 (2)	Ad	LC	–	–
White-faced Storm Petrel	*Pelagodroma marina dulciae*	–	–	2 (1)	Ad	LC	Rel	–
	Pelagodroma marina maoriana	3 (2)	Ad	14 (4)	Ad	LC	Rel	–
White-bellied Storm Petrel	*Fregetta grallaria*	2 (2)	Ad	5 (3)	Ad	LC	NE	VU
New Zealand Storm Petrel	*Fregetta maoriana*	1 (1)	Ad	–	–	CR	NV	–
Black-bellied Storm Petrel	*Fregetta tropica*	16 (6)	Ad	23 (4)	Ad	LC	–	–
Black Petrel	*Procellaria parkinsoni*	280 (120)	Juv, Ad	14 (3)	Juv, Ad	VU	NV	–
Buller's Shearwater	*Ardenna bulleri*	13 (4)	Ad	–	–	VU	Dec	–
Short-tailed Shearwater	*Ardenna tenuirostris*	3 (2)	Ad	1 (1)	Ad	LC	–	–
Sooty Shearwater	*Ardenna grisea*	1 (1)	Ad	1 (1)	Ad	NT	Dec	VU
Flesh-footed Shearwater	*Ardenna carneipes*	4 (3)	Ad	1 (1)	Ad	NT	Rel	–
Little Shearwater	*Puffinus assimilis*	–	Ad	2 (1)	Ad	LC	Rec	–
Fairy Prion	*Pachyptila turtur*	3 (2)	Ad	–	–	LC	Rel	–
Antarctic Prion	*Pachyptila desolata*	8 (3)	Juv	–	–	LC	Rel	–
Soft-plumaged Petrel	*Pterodroma mollis*	–	–	1 (1)	Juv	LC	–	VU
Grey-faced Petrel	*Pterodroma gouldi*	295 (90)	Ad	278 (90)	Ad	LC	–	–
Cook's Petrel	*Pterodroma cookii*	1 (1)	Ad	2 (1)	Ad	VU	Rel	–
Gould's Petrel	*Pterodroma leucoptera*	12 (4)	Ad	12 (6)	Ad	VU	–	EN
Collared Petrel	*Pterodroma brevipes*	–	–	2 (1)	Ad	VU	–	–
Black-winged Petrel	*Pterodroma nigripennis*	11 (2)	Juv, Ad	50 (10)	Juv, Ad	LC	–	–
Juan Fernandez Petrel	*Pterodroma externa*	–	–	1 (1)	Ad	VU	–	–
White-necked Petrel	*Pterodroma cervicalis cervicalis*	–	–	2 (1)	Ad	VU	Rel	–
Providence Petrel	*Pterodroma solandri*	2 (1)	Ad	2 (1)	Ad	LC	–	–
Mottled Petrel	*Pterodroma inexpectata*	1 (1)	Juv	1 (1)	Juv	NT	Rel	–
Kermadec Petrel	*Pterodroma neglecta*	9 (2)	Ad	24 (7)	Juv, Ad	LC	–	VU

[a] Summed counts within each of the two sampling regions (Aotearoa/New Zealand and Norfolk Marine Park) are listed under *n*, with the maximum count at any time recorded in parentheses (max).

[b] Age classes of the observed birds are juvenile (Juv), immature (Imm), or adult (Ad).

[c] Threatened species classifications are listed using the IUCN Red List—Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR)—as well as for the primary criteria of the New Zealand Threat Classification System (NZTCS)—Relict (Rel), Recovering (Rec), Declining (Dec), Nationally Vulnerable (NV), Nationally Endangered (NE), and Nationally Critical (NC)—and for the Australian Environment Protection and Biodiversity Conservation Act 1999 (EPBC)—Vulnerable (VU) and Endangered (EN).

[d] *Thalassarche melanophris impavida* is sometimes identified as a distinct species, Campbell Albatross *Thalassarche impavida*.

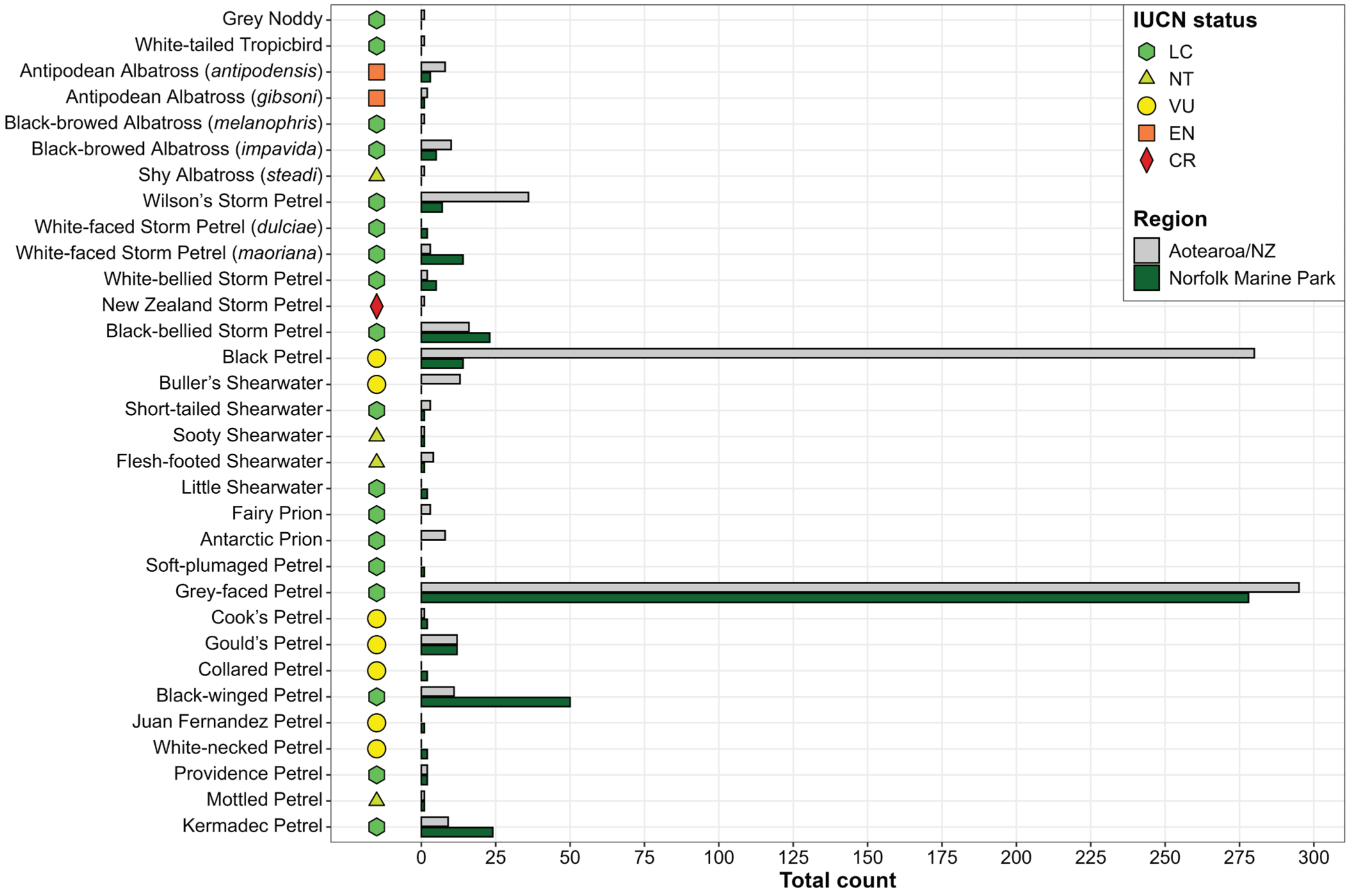

Fig. 2. Counts of seabird species/subspecies in taxonomic order, summed across survey regions of Aotearoa/New Zealand and Norfolk Marine Park in the Norfolk Basin on 10 and 11 May 2025. Coloured symbols represent the IUCN Red List status of each taxon: Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), or Critically Endangered (CR). Species listed: Grey Noddy *Anous albivitta albivitta*, White-tailed Tropicbird *Phaethon lepturus*, Antipodean Albatross *Diomedea antipodensis antipodensis* and *D. antipodensis gibsoni*, Black-browed Albatross *Thalassarche melanophris melanophris* and *T. melanophris impavida* (the latter is also known as Campbell Albatross *T. impavida*), Shy Albatross *T. cauta steadi*, Wilson's Storm Petrel *Oceanites oceanicus*, White-faced Storm Petrel *Pelagodroma marina dulciae* and *Pe. marina maoriana*, White-bellied Storm Petrel *Fregetta grallaria*, New Zealand Storm Petrel *F. maoriana*, Black-bellied Storm Petrel *F. tropica*, Black Petrel *Procellaria parkinsoni*, Buller's Shearwater *Ardenna bulleri*, Short-tailed Shearwater *Ar. tenuirostris*, Sooty Shearwater *Ar. grisea*, Flesh-footed Shearwater *Ar. carneipes*, Little Shearwater *Puffinus assimilis*, Fairy Prion *Pachyptila turtur*, Antarctic Prion *Pa. desolata*, Soft-plumaged Petrel *Pterodroma mollis*, Grey-faced Petrel *Pt. gouldi*, Cook's Petrel *Pt. cookii*, Gould's Petrel *Pt. leucoptera*, Collared Petrel *Pt. brevipes*, Black-winged Petrel *Pt. nigripennis*, Juan Fernandez Petrel *Pt. externa*, White-necked Petrel *Pt. cervicalis cervicalis*, Providence Petrel *Pt. solandri*, Mottled Petrel *Pt. inexpectata*, Kermadec Petrel *Pt. neglecta*.

externa. Gadfly petrels *Pterodroma* spp. formed the most species-rich group, with 11 species documented in total (Table 1, Fig. 2). All 11 species were recorded in the NMP on the second day, while seven were recorded in A/NZ (Table 1, Fig. 2). We could not find reference to higher richness of this genus in a single day of vessel-based survey, globally. A subset of the seabird species of particular interest recorded across the survey is illustrated in Fig. 3.

Thirteen species we recorded were listed as Near Threatened or higher on the IUCN Red List (IUCN, 2025; Table 1, Fig. 2). Groups with species of elevated conservation concern were albatrosses (two out of three species, 66%), shearwaters *Ardenna*/*Puffinus* spp. (three out of five, 60%), and gadfly petrels (six out of 11, 55%). One Critically Endangered species, a single New Zealand Storm Petrel *Fregetta maoriana*, was detected in A/NZ waters at the southern extent of the survey region (Table 1, Fig. 2). At least some resident, migratory, and vagrant species had elevated conservation statuses, including species where juveniles and immatures were detected, such as the globally Endangered Antipodean Albatross *Diomedea antipodensis antipodensis*/*gibsoni*. Additionally, more than two-thirds of all species (20/29) were listed as threatened nationally within Australian or A/NZ waters (Table 1, Fig. 2).

Record Review

From available literature and databases, we collated records of 56 species across the study region, and we encountered 52.7% of these during our survey. Three species that we saw had not previously been documented for the region (Table 2). Most records were collated from eBird (78%) and iNaturalist (10%), and many appeared to originate from near-annual seabird observation tours in March–April that sail between northern A/NZ and Norfolk Island as one leg of a larger itinerary (e.g.,

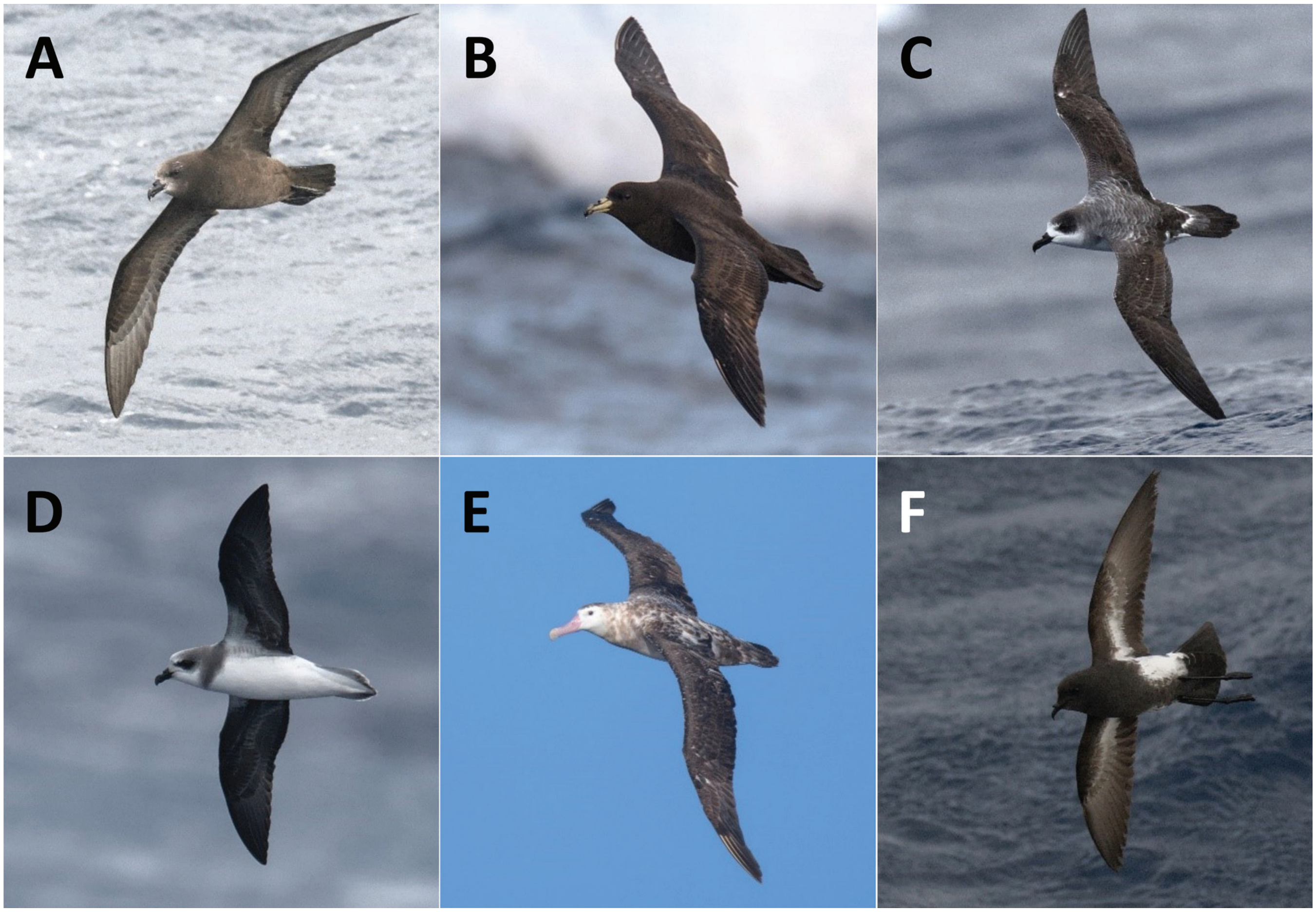

Fig. 3. Seabird species photographed on a pelagic survey across the Norfolk Basin from Aotearoa/New Zealand to Norfolk Island on 10 and 11 May 2025. Images are of the most numerous species: (A) Grey-faced Petrel *Pterodroma gouldi* and (B) Black Petrel *Procellaria parkinsoni*; species recorded in the Norfolk Basin for the first time: (C) Juan Fernandez Petrel *Pterodroma externa* and (D) Soft-plumaged Petrel *Pterodroma mollis*; a conservation-listed species: (E) Antipodean Albatross *Diomedea antipodensis gibsoni*; and a migratory species: (F) Black-bellied Storm Petrel *Fregetta tropica*. Photo credits: Peter Allen (A–F)

Heritage Expeditions, 2023). For an area with such high seabird richness, there were relatively low numbers of records for many species; for example, 40 species (71.4%) had fewer than 30 records captured in the review process, and 26 species (46.4%) had fewer than 10 records (Table 2). All species reviewed with > 50 records (*n* = 11) breed close to the Norfolk Basin. Another 14 species that breed close to the Norfolk Basin had fewer than 30 records (Table 2). These included species that are nominally present year-round, such as Masked Booby *Sula dactylatra*, and breeding migrants, such as White-bellied Storm Petrel *Fregetta grallaria* (presumed to breed in the Norfolk group) and Sooty Shearwater *Ardenna grisea*, indicating limited observational data across a range of breeding strategies (Table 2). Conservation-listed species were frequent in the reviewed records, and 21 species (37.5%) were found to be of conservation concern under the IUCN Red List (Table 2). This number increased to 38 (67.9%) when incorporating nationally threatened species in Australia and A/NZ (Table 2). There was a substantial lack of data for these threatened species, with 13 having fewer than 30 records in the study region (Table 2). Migratory species were particularly poorly represented, with examples including only six records of Mottled Petrel *Pterodroma inexpectata* and one record of Pomarine Jaeger *Stercorarius pomarinus*.

DISCUSSION

We highlight a rich assemblage of seabirds occurring within the Norfolk Basin, including populations of conservation significance. In particular, our snapshot survey within the Norfolk Basin indicates that much is still unknown about the region's seabird assemblage, and it provides information that could be useful in the identification of future conservation research priorities for this region.

The results of our survey and records search improve available information for seabirds in the Norfolk Basin. Although compilation of historical records alone highlights the region's rich seabird assemblage, our targeted survey effort revealed exceptionally high gadfly petrel richness. While we could not statistically demonstrate a rate of species accumulation per survey effort for the region, as prior observational effort was difficult to quantify, the fact that our two-day survey added three new species to the Norfolk Basin regional species list indicates that there might be other seabird species using the region that are yet to be detected (Ugland et al., 2003). Data gathered through the record review were concentrated in the austral autumn, and many data points were derived from incidental observations by birdwatchers transiting through the region on scheduled tours

TABLE 2

Records of pelagic seabirds compiled for the region between northern Aotearoa/New Zealand and the Norfolk Island group[a]

Species	Scientific name[b]	Records	Activity	Months	Breeding[c]	IUCN[d]	NZTCS[d]	EPBC[d]
Parasitic Jaeger	*Stercorarius parasiticus*	11	Migrant	Oct–Apr	–	LC	–	–
Long-tailed Jaeger	*Stercorarius longicaudus*	34	Migrant	Oct–Apr	–	LC	–	–
Pomarine Jaeger	*Stercorarius pomarinus*	1	Migrant	Oct–Apr	–	LC	–	–
Blue-billed White Tern	*Gygis candida candida*	> 50	Resident	Year-round	NF	LC	NC	–
Brown Noddy	*Anous stolidus pileatus*	8	Breeding migrant	Aug–May	NF	LC	–	–
Black Noddy	*Anous minutus minutus*	7	Resident	Year-round	NF	LC	NV	–
Grey Noddy	*Anous albivitta albivitta*	15	Resident	Year-round	NF, NZ	LC	Rel	–
Sooty Tern	*Onychoprion fuscatus serratus*	13	Breeding migrant	Aug–May	NF	LC	Rec	–
Red-tailed Tropicbird	*Phaethon rubricauda roseotinctus*	> 50	Resident	Year-round	NF	LC	–	–
White-tailed Tropicbird[e]	*Phaethon lepturus*	1	Vagrant	May	–	LC	–	–
Northern Royal Albatross	*Diomedea sanfordi*	4	Vagrant	Apr–Jun	–	EN	NV	EN
Antipodean Albatross	*Diomedea antipodensis antipodensis*	30	Migrant	Mar–Aug	–	EN	NC	VU
	Diomedea antipodensis gibsoni	24	Migrant	Mar–Aug	–	EN	NC	VU
Indian Yellow-nosed Albatross	*Thalassarche carteri*	1[f]	Vagrant	–	–	EN	–	VU
Black-browed Albatross	*Thalassarche melanophris melanophris*	3	Vagrant	May	–	LC	–	VU
	Thalassarche melanophris impavida[g]	22	Migrant	Apr–Sep	–	LC	NU	VU
Buller's Albatross	*Thalassarche bulleri*	21	Resident	Year-round	NZ	NT	Dec	VU
Shy Albatross	*Thalassarche cauta*	20	Foraging	Year-round	–	NT	Dec	VU
Salvin's Albatross	*Thalassarche salvini*	1[f]	Vagrant	–	–	VU	NC	VU
Wilson's Storm Petrel	*Oceanites oceanicus*	31	Migrant	Sep–May	–	LC	–	–
White-faced Storm Petrel	*Pelagodroma marina*	28	Resident	Year-round	NZ	LC	Rel	–
White-bellied Storm Petrel	*Fregetta grallaria*	9	Breeding migrant[h]	Oct–May	NF	LC	NE	VU
New Zealand Storm Petrel	*Fregetta maoriana*	4	Resident	Year-round	NZ	CR	NV	–
Black-bellied Storm Petrel	*Fregetta tropica*	19	Migrant	Nov–Apr	–	LC	–	–
Pintado Petrel	*Daption capense*	2	Vagrant	Sep	–	LC	NU	–
Southern Giant Petrel	*Macronectes giganteus*	1[f]	Vagrant	–	–	LC	–	EN
Northern Giant Petrel	*Macronectes halli*	1[f]	Vagrant	–	–	LC	Rec	VU
Tahiti Petrel	*Pseudobulweria rostrata*	6	Resident	Dec–May	–	NT	–	–
Westland Petrel	*Procellaria westlandica*	1[f]	Vagrant	–	–	EN	NU	–
White-chinned Petrel	*Procellaria aequinoctialis*	13	Resident	Year-round	–	VU	–	–
Black Petrel	*Procellaria parkinsoni*	> 50	Resident	Year-round	NZ	VU	NV	–
Wedge-tailed Shearwater	*Ardenna pacifica*	> 50	Breeding migrant	Aug–May	NF	LC	Rel	–
Buller's Shearwater	*Ardenna bulleri*	> 50	Breeding migrant	Sep–Jun	NZ	VU	Dec	–
Short-tailed Shearwater	*Ardenna tenuirostris*	8	Migrant	Oct–May	–	LC	–	–
Sooty Shearwater	*Ardenna grisea*	25	Breeding migrant	Sep–May	NZ	NT	Dec	VU
Flesh-footed Shearwater	*Ardenna carneipes*	37	Breeding migrant	Sep–May	NF, NZ	NT	Rel	–
Fluttering Shearwater	*Puffinus gavia*	3	Resident	Year-round	NZ	LC	Rel	–
Hutton's Shearwater	*Puffinus huttoni*	1	Vagrant	–	NZ	EN	NV	–
Little Shearwater	*Puffinus assimilis*	14	Resident	Year-round	NF, NZ	LC	Rec	–
Fairy Prion	*Pachyptila turtur*	> 50	Resident	Year-round	NZ	LC	Rel	–
Antarctic Prion	*Pachyptila desolata*	4	Vagrant	May–Jul	–	LC	Rel	–
Soft-plumaged Petrel[e]	*Pterodroma mollis*	1	Vagrant	May	–	LC	–	VU
Magenta Petrel	*Pterodroma magenta*	4[f]	Migrant	–	–	CR	NC	–
Grey-faced Petrel	*Pterodroma gouldi*	> 50	Resident	Year-round	NZ	LC	–	–
Cook's Petrel	*Pterodroma cookii*	31	Breeding migrant	Year-round	NZ	VU	Rel	–
Gould's Petrel	*Pterodroma leucoptera*	34	Migrant	Dec–May	–	VU	–	EN
Collared Petrel	*Pterodroma brevipes*	7	Migrant	Feb–Oct	–	VU	–	–
Black-winged Petrel	*Pterodroma nigripennis*	> 50	Breeding migrant	Sep–Jun	NF	LC	–	–
Juan Fernandez Petrel[e]	*Pterodroma externa*	1	Vagrant	May	–	VU	–	–
White-necked Petrel	*Pterodroma cervicalis cervicalis*	> 50	Breeding migrant	Oct–May	NF	VU	Rel	–
Providence Petrel	*Pterodroma solandri*	> 50	Breeding migrant	Sep–Jun	NF	LC	–	–
Mottled Petrel	*Pterodroma inexpectata*	6	Migrant	Oct–May	–	NT	Rel	–
Kermadec Petrel	*Pterodroma neglecta*	> 50	Resident	Year-round	NF	LC	–	VU
Great Frigatebird	*Fregata minor*	2	Migrant	Sep–Jun	–	LC	–	–
Australasian Gannet	*Morus serrator*	24	Resident	Year-round	NZ	LC	–	–
Red-footed Booby	*Sula sula*	6	Vagrant	Nov–May	–	LC	–	–
Brown Booby	*Sula leucogaster*	2	Vagrant	Sep–Jun	–	LC	–	–
Masked Booby	*Sula dactylatra tasmani*	11	Resident	Year-round	NF	LC	NE	–

[a] Compiled from citizen science databases, local rare bird assessment committees, museum catalogues, peer-reviewed literature, and the field observations reported in this study (see Methods).

[b] Subspecies information is provided where known, either from records documented to subspecies level or breeding colonies.

[c] Breeding species were compiled using the definitions from Priddel et al. (2010) and Whitehead et al. (2019) and from author experience in the Norfolk Island group. Breeding location is summarised as NZ (northern Aotearoa/New Zealand) and NF (Norfolk Island group).

[d] Threatened species classifications are listed using the IUCN Red List—Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR)—as well as for the primary criteria of the New Zealand Threat Classification System (NZTCS)—Relict (Rel), Recovering (Rec), Declining (Dec), Naturally Uncommon (NU), Nationally Vulnerable (NV), Nationally Endangered (NE), and Nationally Critical (NC)—and for the Australian Environment Protection and Biodiversity Conservation Act 1999 (EPBC)—Vulnerable (VU) and Endangered (EN).

[e] First records for the region observed during the surveys reported in this study.

[f] Number of individuals tracked into the region; no at-sea observations, so months of occurrence not available.

[g] *Thalassarche melanophris impavida* is sometimes identified as a separate species, Campbell Albatross *Thalassarche impavida*.

[h] White-bellied Storm-Petrel is presumed to breed in the Norfolk Island group.

(e.g., Western Pacific Odyssey, Heritage Expeditions, 2023). Temporally constrained observational coverage will miss migrants that occur outside limited time windows, and our survey was not far removed from prior records, being around four weeks later in the year than most tours. Future surveys in poorly surveyed periods like the austral winter and spring are likely to yield more species and taxa previously unrecorded in the region.

The rich assemblage of seabirds recorded in the Norfolk Basin is likely underpinned by the region's abiotic and oceanographic characteristics, which can create productive marine habitat for large numbers of foraging seabirds (Bost et al., 2009; Clay & Brooke, 2024). These abiotic drivers are important for the taxa detected during our surveys, many of which preferentially forage in high-productivity waters, driven by marine currents and bathymetry (Ainley et al., 2005; Scales et al., 2014). Such characteristics make the region an ecologically rich environment, comparable in species richness to other recognised seabird foraging hotspots (Santora & Sydeman, 2015).

Because of its physical and oceanographic drivers and geographic location, the Norfolk Basin supports seabirds during several critical phases of their annual cycles. Locally breeding taxa, including shearwaters and petrels, evidently use the basin for short-range foraging trips, linking breeding populations in the Norfolk group and in northern A/NZ directly to the Norfolk Basin (e.g., Fischer et al., 2024; Halpin et al., 2022). The basin also functions as an important migratory corridor, lying on the seasonal movement routes of many long-range migrants (Morten et al., 2025). Records of threatened species seen during our surveys, including gadfly petrels and albatrosses, demonstrate use of the area by species of conservation concern. Vagrant seabirds also contributed to the species richness we observed. Although species were classified as vagrants based on data-driven criteria in this study, we did not explore the drivers of vagrancy. Vagrant records can provide indications of range shifts and novel population establishment, especially given the proximity of large breeding colonies to the study region (Davis & Watson, 2018; Dufour et al., 2024; Gorta et al., 2026). In general, these processes illustrate the functional importance of the Norfolk Basin not only as a transit zone but also as a dynamic ecosystem worthy of protection, where multiple dimensions of seabird life histories intersect.

The Norfolk Basin is important for seabirds, including threatened taxa, which has clear implications for marine spatial planning and conservation policy. Although much of the northern basin falls within the boundaries of the NMP, the southern region is largely unprotected (Fig. 1). We detected threatened species inside and outside protected areas. This spatial mismatch between biodiversity values and MPA boundaries highlights the importance of the NMP while revealing a gap in conservation coverage for seabirds in the southern part of the basin. Ongoing threats, including reduced productivity with warming oceans and fisheries interactions, require coordinated, large-scale management within and beyond existing protected area boundaries (Dias et al., 2019; Oppel et al., 2018). Expanding protection in the southern Norfolk Basin would increase MPA connectivity and coverage of important foraging areas for seabirds (e.g., Dawson et al., 2006). This may benefit species such as the Black Petrel, which is particularly threatened by longline fishing (BirdLife International, 2018) and was detected in substantially higher numbers in A/NZ waters than within the NMP. Integrating seabird occurrence into regional marine management would also align with international obligations under agreements such as the Convention on Migratory Species and the Agreement on the Conservation of Albatrosses and Petrels, both recognised in the management plan for the NMP (DNP, 2018).

Given the mismatch between limited survey coverage and high counts and richness of seabirds of conservation significance in the Norfolk Basin, increased survey effort is a clear priority. Repeated seasonal surveys would permit assessment of temporal dynamics in species occurrence, migration, and foraging behaviour, particularly for poorly known and threatened taxa. Integrating vessel-based surveys with oceanographic monitoring would improve understanding of seabird–environment relationships and support proactive conservation planning (e.g., Dias et al., 2017). Targeted surveys at bathymetric features (e.g., Wanganella Bank) may further help to identify regions of importance to seabirds. Long-term monitoring could facilitate evaluation of climate-driven changes in temperature and ocean productivity on seabird assemblages (Grémillet & Boulinier, 2009). Ultimately, improving coverage of this ecologically important region will enhance conservation outcomes for seabirds and pelagic ecosystems in the South Pacific Ocean.

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DATA AVAILABILITY

The data that support this study will be shared upon reasonable request to the corresponding author.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualisation: PA, SBZG. Data curation: PA. Investigation: PA, SBZG. Methodology: PA, SBZG. Visualisation: PA, SBZG. Writing—original draft: PA. Writing—review & editing: PA, SBZG.

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