

High-latitude occurrence of *Phoebetria palpebrata* in the Weddell Sea: new distribution limits and ecological implications

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Abstract

The Light-mantled Albatross (*Phoebastria palpebrata*) is a pelagic seabird widely distributed throughout the Southern Ocean, foraging primarily in subantarctic and Antarctic waters associated with major oceanographic fronts. Outside the breeding season, individuals disperse widely, but records from high Antarctic latitudes in the Weddell Sea remain extremely scarce. During ship-based seabird surveys conducted aboard the Argentine icebreaker ARA Almirante Irizar in February 2024, 24 sightings comprising 37 individuals were recorded between 56°S and 71°S. Nine sightings occurred south of 69°S, including a single individual observed at 71°01'54"S, 20°10'33"W. Based on published literature and global biodiversity databases, this represents the southernmost documented occurrence of *P. palpebrata* in the Weddell Sea. Together with the species' southernmost breeding record at King George Island (62°S), this record highlights the seasonal exploitation of high-latitude marine habitats during the austral summer sea-ice minimum and underscores the importance of ship-based monitoring for tracking shifts in predator distributions in remote polar ecosystems.

Introduction

The Light-mantled Albatross [*Phoebastria palpebrata* (Forster, 1785)] is a circumpolar pelagic seabird breeding primarily on subantarctic islands, including South Georgia, Crozet, Kerguelen, Prince Edward, Heard, and Macquarie Islands (Brooke 2004; Phillips et al. 2005). However, it also breeds in the maritime Antarctic, with a breeding colony documented at Fildes Peninsula, King George Island, South Shetland Islands (62.2°S, 59.01°W), which represents the southernmost breeding place of any albatross species (Lisovski et al. 2009). Highly adapted to dynamic soaring flight, this species travels vast distances across ocean basins to forage (Weimerskirch et al. 2000). During both the breeding and non-breeding seasons, its distribution is closely linked to major oceanographic fronts (Bost et al. 2009) and productive pelagic zones south of the Antarctic Polar Front (Phillips et al. 2005; Cherel et al. 2023). Although it is typically associated with subantarctic and cold-temperate waters, *P. palpebrata* is known to forage at high Antarctic latitudes, occasionally associating with marginal ice zones and sea-ice-influenced habitats (Wakefield et al. 2025).

The Weddell Sea is a remote marine region characterized by complex oceanographic circulation (the cyclonic Weddell Gyre) and extensive seasonal sea-ice cover (Teschke et al. 2021). These conditions sustain highly productive food webs that support top predators, yet logistical constraints have historically limited systematic seabird surveys in the southern Weddell Sea (Teschke et al. 2021). Consequently, occurrence records of pelagic seabirds like albatrosses at high latitudes in this sector remain scarce compared to other areas like the Ross Sea, where *P. palpebrata* routinely reaches 77°S–78°S in open-water polynyas (OBIS 2026; GBIF 2026). While long-term at-sea surveys in Prydz Bay (Woehler 1996) and the Indian Ocean (Peron et al. 2010) show regional declines in the at-sea abundance of *P. palpebrata*, multi-decadal surveys in the southwest Pacific Ocean indicate stable abundance over the last 50 years (Sojitra et al. 2022). Historical data from global databases and literature show that prior records of this species in the Weddell Sea were concentrated north of 65°S, with only sporadic sightings

reported further south (eBird 2026; OBIS 2026). In this note, we report new at-sea observations of *P. palpebrata* in the Weddell Sea during the austral summer of 2024, including the southernmost occurrence documented for this region, and discuss the environmental factors facilitating these high-latitude incursions.

Materials and Methods

Ship-based seabird surveys were conducted during the austral summer of 2024 (8–28 February) aboard the Argentine icebreaker ARA Almirante Irizar along southbound and northbound transects spanning 56°S to 77°S in the Weddell Sea. Visual observations were carried out from the vessel's bridge (15 m above sea level) during daylight hours under standard navigation conditions.

Survey effort followed the standardized protocol of Tasker et al. (1984), consisting of consecutive 10-min observation periods alternated with 10-min non-survey intervals throughout daylight hours. Albatrosses were detected visually and identified using 10 × 42 binoculars, following standard identification guides for Antarctic seabirds (Orgeira 2014; Savigny 2021). For each sighting, we identified the species and estimated group size. When two or three observers made independent counts, group size was calculated as the mean of those counts. We maintained at least two observers on continuous watch, each covering approximately 90° forward (combined forward coverage ≈ 180°); when more than two observers were present, two remained actively observing while the others rotated through 2–3 h shifts to ensure continuous observation.

Geographic coordinates, dates, times, and abundance were georeferenced using the vessel's onboard GPS. Visibility by presence of fog was continuously monitored; surveys were only stopped under heavy fog severely limiting visibility. Spatial distribution was mapped using QGIS version 3.16.2 (QGIS Development Team 2020) with Antarctic coastline layers from the Quantarctica 3.0 dataset (Norwegian Polar Institute 2019). To evaluate the latitudinal novelty of our sightings, we compared them against published literature and occurrence records from global biodiversity databases, including the Ocean Biodiversity Information System (OBIS 2026), the Global Biodiversity Information Facility (GBIF 2026), and eBird (eBird 2026).

Results and Discussion

A total of 24 sightings comprising 37 individuals of *P. palpebrata* were recorded in the Weddell Sea between 8 and 28 February 2024 (Fig. 1). Sightings ranged from 56°53'S to 71°01'S. During the southbound transect, 7 sightings were recorded, culminating in the southernmost record on 13 February 2024 at 71°01'54"S; 20°10'33"W, where a single individual was observed and photographed (Fig. 2; Table 1). The northbound transect yielded 17 sightings (30 individuals) between 60°57'S and 70°49'S. Nine sightings of 21 individuals were documented south of 69°S (Table 1), representing a significant concentration of birds at high latitudes.

Table 1
Records of *Phoebastria palpebrata* obtained south of 69°S during ship-based surveys conducted in the Weddell Sea in February 2024.

Date	Time (UTC)	Latitude (S)	Longitude (W)	Individuals
13/02/2024	10:00	71°01'54"	20°10'33"	1
26/02/2024	04:00	70°29'37"	24°10'32"	1
26/02/2024	04:40	70°24'40"	24°19'30"	1
26/02/2024	05:00	70°21'51"	24°19'30"	2
26/02/2024	06:40	70°10'18"	25°15'38"	2
26/02/2024	08:40	69°29'39"	26°01'49"	5
26/02/2024	09:40	69°21'41"	26°13'18"	1
26/02/2024	11:00	69°10'31"	26°27'48"	4
26/02/2024	11:40	69°05'27"	27°00'38"	4

The observation at 71°01'54"S represents the southernmost documented record of *P. palpebrata* in the Weddell Sea. While satellite-tracking studies and historical surveys have shown that the species can forage near the pack-ice edge, previous Weddell Sea records were largely restricted to northern and eastern sectors, with southernmost reports around 64°54'S (ACAP 2026) and sporadic ship observations near 69° 30'S. The occurrence of multiple individuals south of 69°S (Table 1) suggests that high-latitude waters in the southern Weddell Sea are regularly exploited by this species during late summer. This is consistent with satellite tracking of *P. palpebrata* from Bird Island, South Georgia, during the chick-rearing period, which demonstrated that although the majority of trips are to shelf and shelf-slope areas along the southern Scotia Arc or oceanic waters in the mid-Scotia Sea, some foraging trips (11% of tracked routes) extend into the marginal ice zone in the Weddell Sea (Phillips et al. 2005). Adults from South Georgia commuted up to a maximum range of 921 ± 447 km (traveling a cumulative distance of $3,795 \pm 2,432$ km per trip) over 115 ± 86 hours, maintaining high travel speeds during the night (mean 27.6 km h⁻¹) by spending 46.3% of darkness in flight (Phillips et al. 2005). These extensive flight capacities and high nocturnal activity facilitate rapid commuting to high-latitude foraging zones in the Weddell Sea.

This high-latitude incursion is further supported by the species' trophic ecology and dietary flexibility. Whole blood stable isotope signatures during the chick-rearing period (mean $\delta^{13}\text{C}$: $-23.08 \pm 0.84\text{‰}$, $\delta^{15}\text{N}$: $11.64 \pm 0.98\text{‰}$) confirm that *P. palpebrata* relies on prey from cold Antarctic waters south of the Polar Front (Connan et al. 2014), where they feed on psychroteuthid squid (*Psychroteuthis glacialis*), other cephalopods, and Antarctic krill (*Euphausia superba*) (Xavier & Croxall 2007; Cherel et al. 2023). Furthermore, stable isotopes from body feathers grown during the moult (non-breeding season) show high isotopic niche plasticity: while some feathers are moulted in subantarctic waters near the Subtropical Front ($-20.3\text{‰} < \delta^{13}\text{C} < -17.3\text{‰}$, where they feed on fish and squid), others are grown in

high-Antarctic waters ($\delta^{13}\text{C} < -24.0\text{‰}$) with low $\delta^{15}\text{N}$ values (7.3–8.6‰) that reflect direct feeding on krill (Connan et al. 2014). This trophic adaptability allows *P. palpebrata* to exploit seasonal resources in high-latitude environments, such as the southern Weddell Sea, as pack ice retreats.

The differences between the Weddell Sea and other sectors of the Southern Ocean further illustrate this pattern. In the Ross Sea, *P. palpebrata* is regularly recorded south of 75°S (OBIS 2026). The Ross Sea features a large, wind-driven coastal polynya that maintains open water throughout the summer, providing reliable foraging access. Conversely, the cyclonic Weddell Gyre retains dense pack ice and thick multi-year ice throughout much of the year, restricting pelagic seabird access to the southern continental shelf until the late-summer melt. Thus, the sightings reported here, matching the mid-February sea-ice minimum, represent a transient but ecologically important exploitation of high-latitude Weddell Sea resources. Recent modeling confirms that the at-sea distribution and occurrence of *P. palpebrata* are strongly driven by sea surface temperature (SST) and sea surface height (SSH) anomalies, showing a significant preference for colder waters and negative SSH values (Sojitra et al. 2022). Negative SSH anomalies are characteristic of cold-core cyclonic eddies and upwelling systems along fronts and continental slope breaks, which act as productivity hotspots (Bost et al. 2009) by concentrating mesopelagic fish and krill. These oceanographic features likely drive the latitudinal clustering of *P. palpebrata* along the southern Weddell Sea continental slope observed in our surveys.

These findings highlight the value of long-term ship-based monitoring programs, such as the “Relevamiento de Aves y Mamíferos Marinos Antárticos” project of the “Instituto Antártico Argentino”. Standardized surveys from vessels of opportunity and icebreakers remain essential for documenting baseline predator distributions, detecting climate-induced range shifts, and understanding the ecological dynamics of remote Antarctic ecosystems under rapid environmental change. Although long-term breeding trends are sparse, the population at Possession Island (Crozet) decreased at 1.7% per annum between 1966 and 1995 according to the Scientific Committee on Antarctic Research (SCAR 1997) and significant declines in at-sea abundance have been reported in Prydz Bay (1981–1993; Woehler 1996) and the Southern Indian Ocean (Peron et al. 2010). In contrast, at-sea abundance has remained stable in the southwest Pacific (Sojitra et al. 2022). In this context of regional variability, documenting concentrations of *P. palpebrata* in the southern Weddell Sea during the late-summer sea-ice minimum provides crucial baseline data to assess how top predators respond to changing polar marine environments.

Declarations

Competing interests:

The authors have no conflicts of interest to declare.

Financial interests

The authors declare they have no financial interests.

Ethis approval

Human ethics and consent to participate

Not applicable.

Consent to participate:

Not applicable. No human participants were involved in this study.

Consent for publication:

Not applicable. This manuscript does not contain any individual person's data in any form.

Animals

Field observations were conducted as part of the "Relevamiento de Aves y Mamíferos Marinos Antárticos (RAMMA)" coordinated by the Instituto Antártico Argentino (IAA). No animals were captured, handled or experimentally manipulated during this study; therefore, formal approval by an Institutional Animal Care and Use Committee was not required.

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Author Contribution

MLA, ASV, and FA, conceived and designed the investigation. Fieldwork and data collection were carried out by MLA, FA and ASV. FA contributed materials, and analysis tools. All authors participated in writing the manuscript and approved the final version.

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Data Availability

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Figures

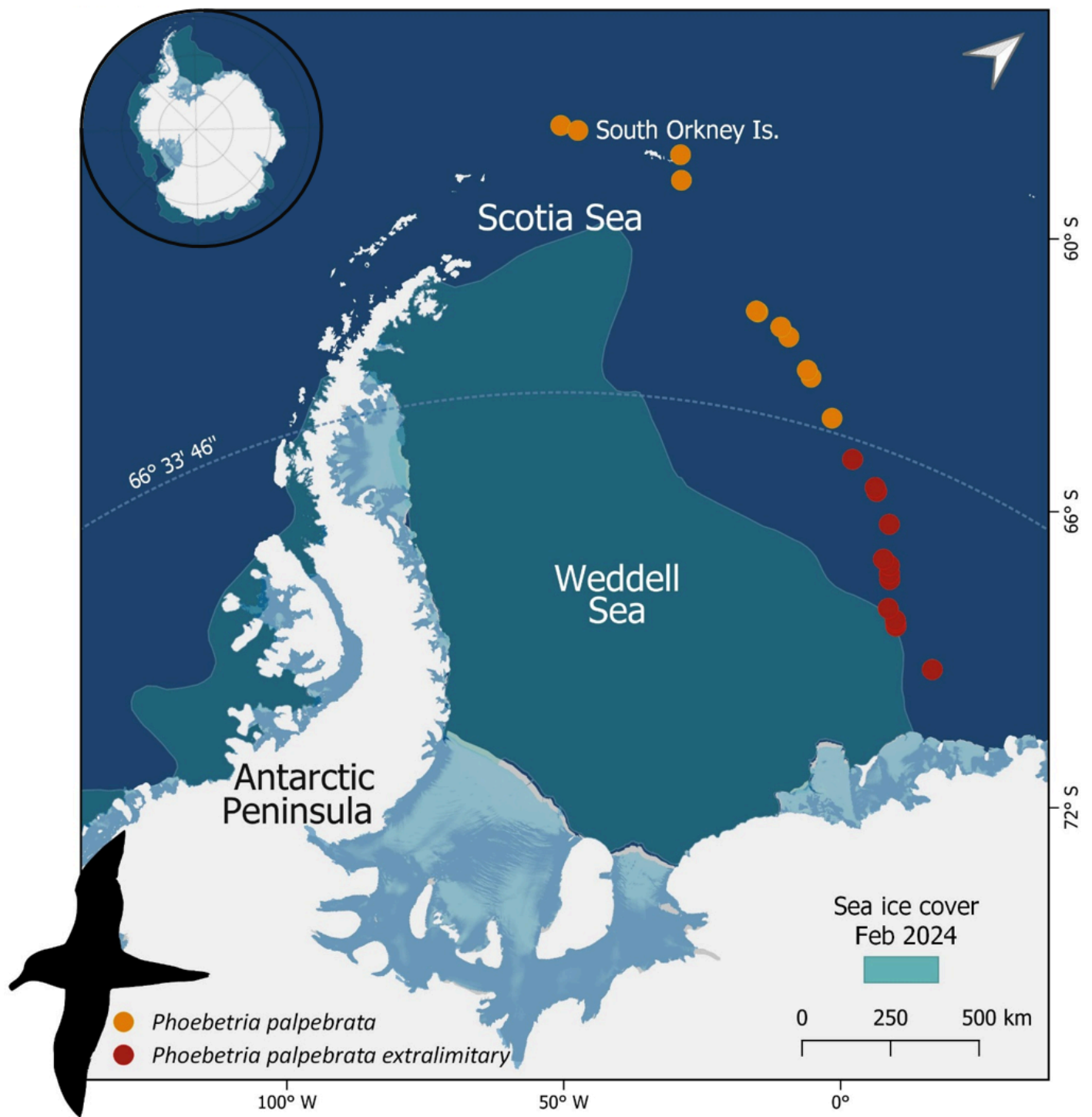


Figure 1

Georeferenced occurrences of the light-mantled albatross *Phoebetria palpebrata* recorded during ship-based surveys conducted aboard the icebreaker *ARA Almirante Irizar* in the Weddell Sea between 8 and 28 February 2024. Occurrences were recorded along north–south and south–north transects and ranged from 56°S to 71°S.



Figure 2

Light-mantled Albatross (*Phoebastria palpebrata*) photographed in the southern Weddell Sea on 13 February 2024.