RESEARCH NOTE

First observations of emperor penguins on Horseshoe Island, Antarctica

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Abstract

This note reports observations of two moulting emperor penguins (*Aptenodytes forsteri)* on Horseshoe Island, West Antarctica, during the Seventh Turkish Antarctic Expedition in February 2023. This is the first time this species has been documented on this island. Emperor penguins largely depend on fast-ice to breed and moult. The Antarctic Peninsula hosts few emperor penguin colonies. Horseshoe Island has become one of the northernmost points along the western Antarctic Peninsula where emperor penguins are documented to moult.

Keywords

Aptenodytes forsteri; sea ice; Antarctic Peninsula; Marguerite Island; moult; ice-dependent species

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Abbreviations

GNSS: global navigation satellite system
TAE VII: Seventh Turkish Antarctic Expedition

Introduction

The emperor penguin (*Aptenodytes forsteri*) is the heaviest and tallest penguin species (Stonehouse 1953) and is listed as Near Threatened (BirdLife International 2020). Emperor penguins may have been seen during James Cook's second voyage in the 18th century (Cook & Furneaux 1777), and the first colony was discovered in 1902 by members of the British National Antarctic Expedition (Discovery Expedition), under the leadership of Robert Falcon Scott (Wienecke 2010).

Requiring fast ice to breed and raise their young (Barbraud & Weimerskirch 2001; Jenouvrier et al. 2009) and rarely observed on land (Kooyman et al. 2000), emperor penguin colonies are located around the perimeter of the Antarctic continent (Trathan et al. 2011; Fig. 1), including the western and eastern coasts of the Antarctic Peninsula (Fig. 1). The northernmost colony, discovered in 1997, is on Snow Hill Island (57.46°S, 64.52°W), on the eastern side of the peninsula. It numbered about 4000 pairs when its population was at its highest documented level in November 2004 (Coria & Montalti 2000; Wienecke 2010), but comprised only 2700 pairs in December 2018 (Schiel et al. 2019). Jason Peninsula (66.01°S, 60.67°W) also in the eastern part of the Antarctic Peninsula, is home to a second colony (Fretwell et al. 2014). On the western side of the peninsula, a colony established itself north of Rothschild Island (69.52°S, 72.23°W). On Emperor Island, one of the Dion Islands, in Marguerite Bay, the small colony (ca. 150 pairs) discovered in 1948 (Stonehouse 1953) had disappeared by 2009, likely because of climate change (Trathan et al. 2011). According to a recent remote sensing study, 62 emperor penguin colonies are still active in Antarctica and four no longer exist (Fretwell & Trathan 2021).

This note reports the first documented observations of emperor penguins on Horseshoe Island, about 60 km east of Emperor Island, in Marguerite Bay, western Antarctic Peninsula. Two adults were observed to moult there in February 2023 by members of the TAE VII.

Study area

Horseshoe Island lies about 3.5 km west of the Antarctic Peninsula, in Marguerite Bay (Figs. 1, 2). It hosts Base Y Station, a former British research station, built in 1955 and since 2019, the Turkish Scientific Research Camp (Yirmibesoglu et al. 2022). Tourist cruise ships pass through the area; three were observed during TAE VII. Also observed on Horseshoe Island during the expedition were Adélie penguins (*Pygoscelis adeliae*), chinstrap penguins (*P. antarcticus*), south polar skuas (*Stercorarius maccormicki*), crabeater seals (*Lobodon carcinophaga*), fur seals (*Arctocephalus pusillus*) and Antarctic terns (*Sterna vittata*).

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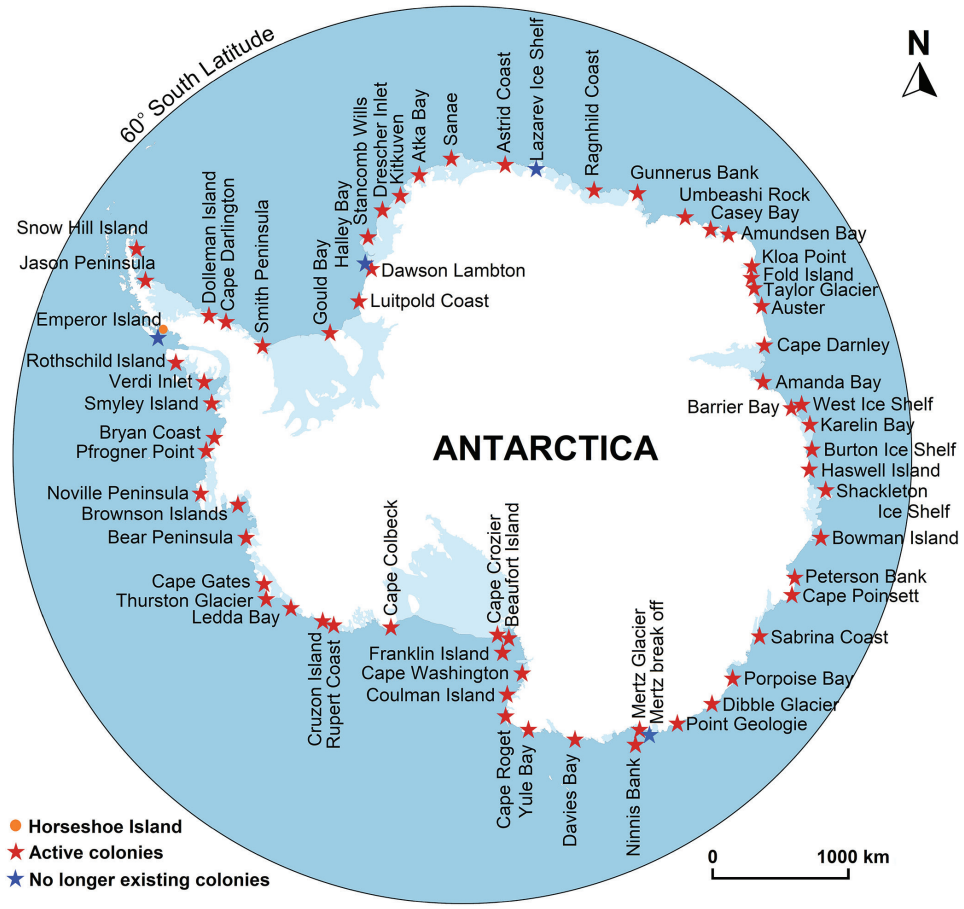

Fig. 1 Locations of emperor penguin colonies on Antarctica, compiled from Fretwell & Trathan (2009); Trathan et al. (2011); Younger et al. (2017) and Fretwell & Trathan (2021), using a base map from the Quantarctica Geographical Information System software programme (Matsuoka et al. 2021).

Horseshoe Island is surrounded by first-year sea ice in the winter (Fig. 2a; Table 1). There was no sea ice around Horseshoe Island on 18 February 2023. Lystad Bay, where the emperor penguins were observed, Gaul Cove and Sally Cove were free of sea ice, apart from a few small icebergs (Fig. 3).

Observations

On 18 February, a moulting emperor penguin (Figs. 4, 5a) was observed standing on a cliff overlooking Lystad Bay (67.83°S, 67.24°W) at what is marked as Observation Area 1 in Fig. 2. The cliff is stair-like, with rock 'steps' that are 1–2 m high (Fig. 4). The penguin stood at least 15 m a.s.l., about 50 m from the GNSS station solar panels and 250 m south of the Turkish Scientific Research Camp.

The bird was photographed and videotaped with a professional Canon camera equipped with a 300 mm telephoto lens, while a distance of at least 15 m was maintained to avoid disturbance, because they are easily stressed (see Burger & Gochfeld 2007). The bird was approached from the leeward side and large rocks were used for cover. Research-related drone usage was cautious. With all these precautions, the bird appeared not to be disturbed. It had progressed about halfway through its moult. Its flippers were fully moulted, while its breast, upper back, head and lowest body parts still had old feathers. Fallen feathers were on the ground in the area.

At least five adult south polar skuas were seen within 50 m of the penguin on the first observation day. Skuas are the main predators of penguin chicks in Antarctica on land but are not a threat to adults (Pacoureau et al. 2019).

Two days later, the penguin had moved 40 m to the north. Moulting had advanced on the neck and head.

On 22 February, four days after the first bird was observed, a second emperor penguin (Fig. 5b) was spotted, about 250 m away from the first one in the upper part of the cliff, at the location labelled Observation Area 2 in Fig. 2. This spot is subject to strong winds on account of the lack of natural obstructions. During the observation, the penguin

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walked around, and a few skuas and Antarctic terns seemed to watch it. This second penguin was also moulting, in a slightly more advanced state than the first one.

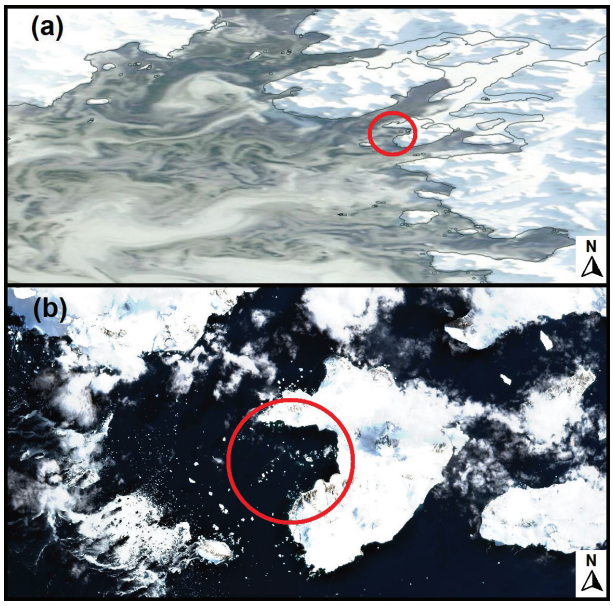

Fig. 2 (a) Image taken from NASA's Terra satellite MODIS (Moderate Resolution Imaging Spectroradiometer) instrument, showing almost full sea-ice coverage in the bays of Horseshoe Island (circled) on 27 August 2022 (NASA 2022). (b) Sentinel 2 satellite image showing the sea ice remaining in Lystad Bay (circled) on 17 November 2022.

Table 1 Monthly sea-ice coverage in Lystad Bay and the approaching side from the west to Horseshoe Island from open water from January 2022 to February 2023. The sea-ice coverage was interpreted from Terra/MODIS and Sentinel 2 satellite images (NASA Worldview 2022; Copernicus Open Access Hub 2023).

Months	Sea-ice coverage (average %) Lystad Bay	Sea-ice coverage (average %) approach to Horseshoe Island
Jan 2022	0	0
Feb 2022	0	0
Mar 2022	0	2
Apr 2022	0	5
May–Jul[a]	up to 100	up to 100
Aug 2022	55	72
Sep 2022	45	57
Oct 2022	30	70
Nov 2022	0	6
Dec 2022	0	0
Jan 2023	0	0
Feb 2023	0	0

[a]Winter months.

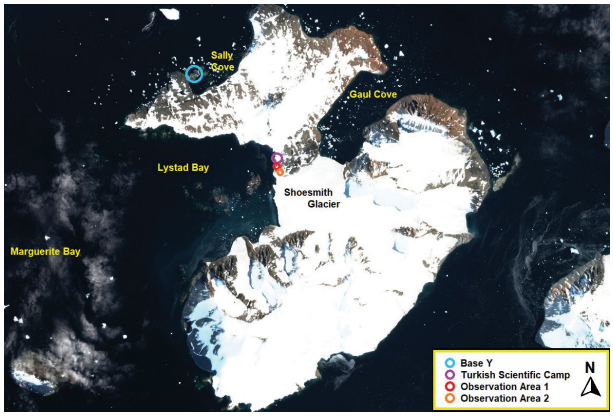

Fig. 3 Sentinel-2 satellite image of Horseshoe Island, on 18 February 2023, the day of the first emperor penguin observation reported herein. White dots in the water are icebergs.

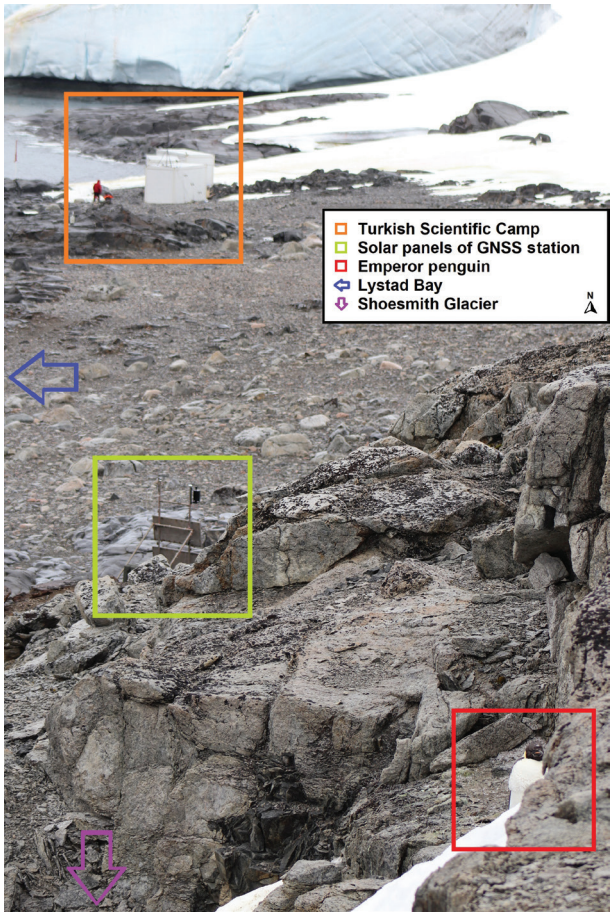

Fig. 4 The location of the first emperor penguin in relation to infrastructure on the island. (Photo: Captain Sinan Yirmibesoglu.)

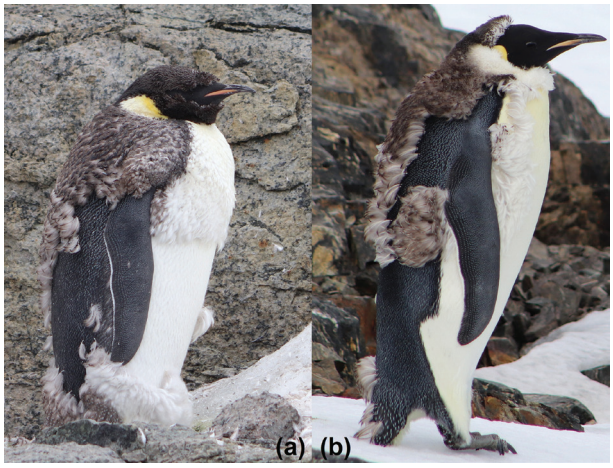

Fig. 5 The (a) first and (b) second emperor penguins observed. (Photo: Captain Sinan Yirmibesoglu.)

Discussion

Consistent with our observations, adult emperor penguins generally moult in February (Fretwell & Trathan 2021). However, our observations provide an example of emperor penguins moulting on land, whereas this species usually moults on fast ice or pack ice, selecting ice platforms that stay intact throughout the month-long moult so that the birds do not have to enter the water (Kooyman et al. 2000; Kooyman et al. 2004). Satellite images showed that Horseshoe Island was completely surrounded by sea ice in the winter of 2022 (Fig. 2), giving penguins easy access to the island. Lystad Bay had been ice-free since November 2022, as was the approach to the island from the west. Perhaps the penguins came to the area to moult. The emperor penguins probably came to Horseshoe Island from the colonies south of the island rather than those on the eastern side of the Antarctic Peninsula (Fig. 1). The penguins may have come from Rothschild Island, 400 km away, which is the active colony closest to Horseshoe Island. Emperor penguins can travel hundreds of kilometres (Croxall & Davis 1999; Thiebot et al. 2013; Schiel et al. 2019) and juveniles are known to migrate even greater distances (Thiebot et al. 2013). Diverse sea-ice related studies have demonstrated that sea ice is being affected by climate change (Newman et al. 2019; Lavergne et al. 2022), which threatens penguin habitat (Younger et al. 2017).

Our observations add to the few sightings of emperor penguins on dry land (see Kooyman et al. 2000) and make Horseshoe Island one of the northernmost places along the western Antarctic Peninsula where emperor penguins have been seen during moulting. The Turkish Antarctic expeditions will continue to monitor Horseshoe Island for more penguins. We recommend that environmental protocols for tourists on Horseshoe Island, particularly around Base Y, which is a site of historic significance, should take into account the possible presence of moulting emperor penguins. Emperor penguins have been shown to change their movements when they notice people within 22.8 m (Burger & Gochfeld 2007), so keeping a distance of at least 30 m is advisable.

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Disclosure statement

The authors report no conflict of interest.

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