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Research Note

Observation of the Emperor penguins *Aptenodytes forsteri* in the Prince Gustav Channel related with unusual sea-ice decline in north-western Weddell Sea

Observación de los pingüinos emperadores *Aptenodytes forsteri* en el canal Príncipe Gustavo relacionada con la disminución excepcional del hielo marino en el noroeste del Mar de Weddell

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Abstract.- A pair of juvenile emperor penguins (*Aptenodytes forsteri*) was observed in the northern coast of James Ross Island, the north-western sector of the Weddell Sea, Antarctica, in January 2017. The penguins originated from the colony located on Snow Hill Island, 120-130 km far from the observation area. Despite the emperor penguin´s ability to migrate over long distances, when they are well-known from different areas in Antarctica, this was the first observation of this species in the north of James Ross Island. In this short paper we discuss the environmental factors which allowed the penguins to reach James Ross Island northern coast, especially significant sea ice variability in this area during last decade.

Key words: Emperor penguin, James Ross Island, Antarctica, sea ice

Introduction

Emperor penguin (*Aptenodytes forsteri*, Gray, 1844) colony near Snow Hill Island is one of the most recently discovered colonies of this species (Coria & Moltalti 2000, Todd *et al.* 2004). The colony was located in the north-eastern sector of the Antarctic Peninsula in the northern Weddell Sea (57°44′W; 64°52′S) and it is the northernmost and the most remote colony of emperor penguins in Antarctica (Fretwell *et al.* 2012, Ancel *et al.* 2017). The colony counts about 2100 breeding pairs on area of *ca.,* 2,500 m^2 (Fretwell *et al.* 2012, Jenouvrier *et al.* 2014). The observations of the emperor penguins in the north-east Antarctic Peninsula region are scarce and usually limited to several individuals during a decade. The emperor penguins from Snow Hill Island colony were observed on Seymour Island and Cockburn Island (*ca.*, 40 km from the colony) in late 1980s and early 1990s and even at Esperanza Station (*ca*., 140 km from the colony) (Coria & Montalti 2000). There were also a few observations of emperor penguin individuals on South Georgia (Clark 1986), which could originate from the colony near Snow Hill Island. The Czech research activities in the northern part of James Ross Island begun in 2004 and have continued since then every Antarctic summer. In general, the appearance of penguins along the James Ross Island northern coast was limited to several to dozens individuals, from which Adélie and Gentoo penguins prevail. However, the emperor penguins observation in January 2017 was the first in this area.

In this research note was analyzed the recent environmental situation in the area of the James Ross archipelago that allowed the first record of emperor penguins on the north coast of James Ross Island since at least 2004.

Materials and methods

A pair of juvenile emperor penguins was observed on the northern coast of James Ross Island about 1 km west of the Czech research Station of Johann Gregor Mendel (63°48′S; 57°52′W) on 22 January 2017, walking along the beach of the Prince Gustav Channel. Although the expedition members stayed on the island until the beginning of March, no emperor penguins were further observed. The area of observation is *ca.*, 120-130 km far from the Snow Hill Island colony and particularly only two migration paths, through Herbert Sound and the Prince Gustav Channel, respectively, were available to reach the northern part of James Ross Island (Fig. 1).

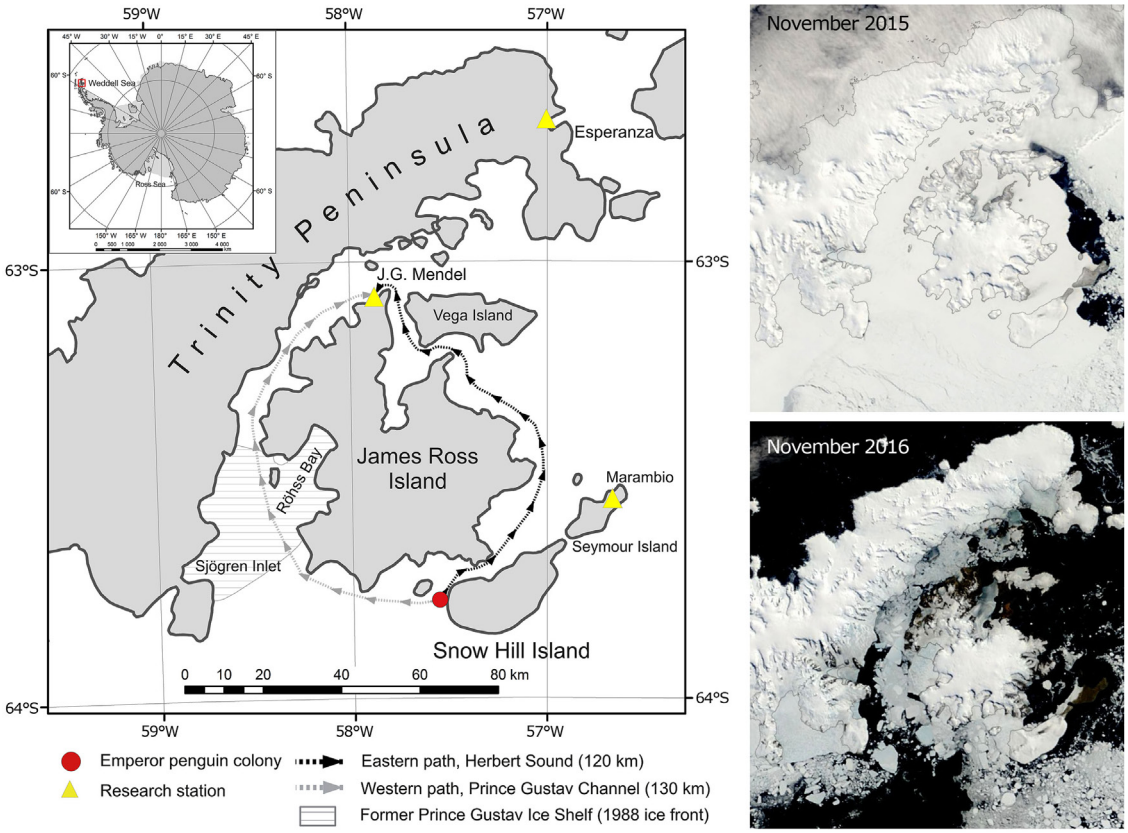

Figure 1. Map of the north-eastern Antarctic Peninsula Region indicating two potential migration paths of emperor Penguins between the Snow Hill Island colony and the northern coast of James Ross Island and the sea-ice situation in the mid-November 2015 and the mid-November 2016 / Mapa de la la región nordeste de la Península Antártica que indica dos posibles rutas de migración de pingüinos emperadores entre la colonia Isla Snow Hill y la costa norte de la Isla James Ross y las condiciones del hielo marino a mediados de noviembre 2015 y 2016

Results and discussion

The potential migration path of emperor penguins from the Snow Hill Island colony along the eastern coast of Antarctic Peninsula was prevented by Prince Gustav Ice Shelf, which was located between Sjogren Inlet (Trinity Peninsula) and Röhss Bay (James Ross Island) and filled the southern entrance of the Prince Gustav Chanel (Fig. 1). This barrier collapsed in 1995 (Cooper 1997) and so opened this part of the Weddell Sea for migration. According to satellite and visual observation, the fast ice in the channel of James Ross Island northern coast usually disintegrated between mid-November to mid-December (Fig. 1), while in 2013-2015 the fast ice remained compact to mid-February (Nývlt *et al.* 2016), which was connected with a local climate cooling in the northeast Antarctic Peninsula (Oliva *et al.* 2017). However, a very warm austral spring in 2016 (READER database)[1] caused the start of the sea ice breaking-up in the northern Weddell Sea already in late September and the Prince Gustav Channel was ice free in mid-November. According to satellite images from the beginning of January 2017 (NASA Worldview)[2], the sea ice was completely disintegrated in the area north of Jason Peninsula (approx. 66°S) which divides Larsen B and Larsen C ice shelves. To the date of 1st March, the area of sea ice around Antarctica even dropped to historical minimum since 1979 (Turner *et al.* 2017). Such significant sea ice retreat resulted in complete disappearance of the ice around the nesting area near Snow Hill Island. It is very probable that these conditions were the main impulse for emperor penguin migration to the areas far from the colony.

[1]READER. 2016. Reference Antarctic Data for Environmental Research Project. Scientific Committee on Antarctic Research. <https://legacy.bas.ac.uk/met/READER/surface/stationpt.html>
[2]NASA Worldview 2017. <https://worldview.earthdata.nasa.gov/>

The emperor penguins can travel for hundreds, even thousands of kilometres between their colony and ice-free sea (*e.g.*, Gearheart *et al.* 2014). It is also common that juvenile emperor penguins can travel hundreds of kilometres on the open sea during their first journey out of the colony (Kooyman & Ponganis 2007). However, in the Weddell Sea the knowledge about the migration and breeding cycle of the emperor penguins is very scarce, which is caused by a poor accessibility of the colony near Snow Hill Island and by the fact that the colony has been discovered very recently.

Our observation suggests that the individuals of emperor penguins had to overcome the distance of at least ≈250 km, considering they would return to the colony. It also shows future increasing mobility potential of the emperor penguins from Snow Hill Island colony in case of a progressive sea ice disintegration in the Weddell Sea region in the future. Reduction of the sea ice extent is considered an important trigger causing potential decline of the emperor penguin population until the end of 21st century (Jenouvrier *et al.* 2014). The monitoring of penguin mobility in the wider region around the colony is therefore important from the perspective of understanding their capability of adaptation on sea ice changes in the northern part of Weddell Sea region (Jenouvrier *et al.* 2017) and finding new habitats for their breeding like was observed in case of king penguins *Aptenodytes patagonicus* on South Shetland Islands (Petry *et al.* 2013, Juáres *et al.* 2017).

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