



Weddell seal feeds on Adélie Penguins in the Ross Sea, Antarctica

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Abstract

In the Antarctic ecosystem, leopard seals are known to be a main predator of penguins, while Weddell seals typically feed on fish and small crustaceans. In this study, we describe the observation of a Weddell seal that hunted juvenile Adélie Penguins on Inexpressible Island in the Ross Sea, Antarctica. The Weddell seal remained in the water near the edge of the sea ice and attacked young individuals. The penguins were in the late phase of molting and appeared to just venture into the water, which indicates that the individuals were unfamiliar with the water and had lower swimming ability than adults. To the best of our knowledge, this is the first video recording of Weddell seal predation on penguins and the first record on Adélie Penguins being attacked by the Weddell seals. Here, we discuss the possibility that Weddell seals could be an opportunistic predator of juvenile penguins when they are highly vulnerable.

Keywords Weddell seal · Adélie penguin · Foraging behavior · Predation

Introduction

Pinnipeds are well-known predators of penguins at various southern latitudes, both at sea and ashore (Bonner and Hunter 1982; Hofmeyr and Bester 1993; Crawford and Cooper 1996; Casaux et al. 1998; du Toit et al. 2004; Moore et al. 2008; Charbonnier et al. 2010; Rey et al. 2012). Among the Antarctic pinniped species, the leopard seal (*Hydrurga leptonyx*) is well known as a main predator of penguins (Ainley 2002; Hall-Aspland and Rogers 2004; Ainley et al. 2005), and Weddell seals (*Leptonychotes weddellii*) are thought to feed mainly on fish and small crustaceans (Lake et al. 2003; Casaux et al. 2006; Ainley and Siniff 2009; Goetz et al. 2017). It was previously assumed that Weddell

seals do not typically feed on penguins due to the seals' low swimming speed (Todd 1988). However, there have been a few records of Weddell seal predation on penguins. Predation on Chinstrap Penguins (*Pygoscelis antarcticus*) was initially reported in the South Shetland Islands, with the Weddell seal smashing the penguin on the water surface like leopard seals (Todd 1988). More recently Cogley and Bell (1998) and Bombosch and Solovyev (2017) observed Weddell seals hunting Gentoo penguins (*Pygoscelis papua*) on the Antarctic Peninsula. This behavior has rarely been observed, and it is still unclear whether this predation occurs in other penguin species as well and is widespread in other regions of the Antarctic continent.

To the best of our knowledge, the Adélie Penguin (*Pygoscelis adeliae*) has not yet been reported to be preyed upon by Weddell seals. The main predators of Adélie Penguins are regarded to be killer whales and leopard seals (Ainley 2002). In this study, we describe an observation of Weddell seal predation on Adélie Penguins in the Ross Sea and present a video recording of the Weddell seals' hunting.

Won Young Lee and Jin-Woo Jung equally contributed to this work.

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Methods

During the Antarctic summer in 2017–2018, we conducted a field survey in Seaview Bay (Fig. 1; 163°43'E, 74°54'S), Inexpressible Island, Victoria Land, Antarctica, to monitor

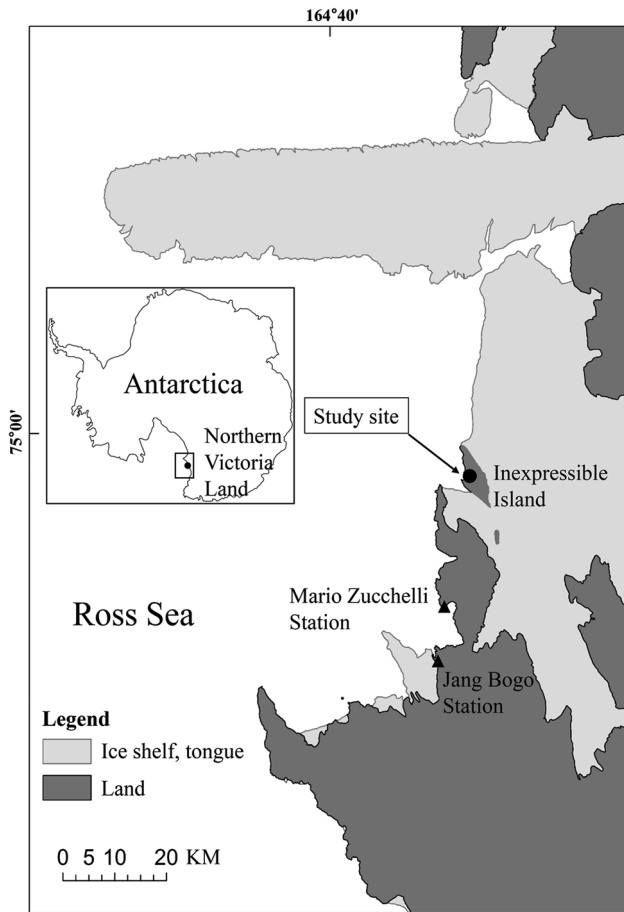


Fig. 1 A map of our study site and the surrounding area

the breeding status of Adélie Penguins, of which there were approximately 24,450 breeding pairs in 2012 at this site (Lyver et al. 2014). We visited the penguin colony three times during incubation (4, 6, and 7 Dec), four times during chick guarding (12, 13, and 14 Dec and 2 Jan), two times during crèche (7–10 and 28–29 Jan) and once during the late molting and migration period (11 Feb). During each visit, 4–5 researchers performed field observations near the penguin colonies and checked for the presence of pinnipeds near the sea shore. Weddell seals were continuously recorded resting on the sea ice near the penguin colony, and a leopard seal was occasionally observed.

On 28 January 2018, two Weddell seals were frequently found near the sea shore. No hunting behaviors were observed, but the seals appeared to be searching this area. On 11 February 2018, we investigated the diving behavior of fledgling Adélie Penguins. Juvenile penguins were in the late molting period, and they gathered at the shore to jump into the water with adult penguins. We observed their behavior at the sea ice edge for approximately seven hours, from 10.00 to 17.00 h. Two Weddell seals and one leopard seal were observed during the survey. This study was conducted



Fig. 2 A Weddell seal killed two Adélie Penguins and other penguins escape the area onto the sea ice

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Results and discussion

We found that two Weddell seals attacked juvenile Adélie Penguins near the sea shore, independently from each other. During the seven-hour observation, at least two attacks were recorded by each Weddell seal and both attacks were successful, i.e. the penguins were killed. A total of four penguins were observed to be attacked and killed by the two Weddell seals. From the video recordings, we observed that one Weddell seal attacked one Adélie Penguins and ate its body (Online Resource 1). The feeding event took approximately 30 min. Following the initial attack, the Weddell seal repeatedly smacked the water surface with the penguin and dismembered the body in a manner similar to that used by leopard seals when hunting. Simultaneously, one leopard seal was also observed performing a typical penguin feeding behavior with chasing and smacking the juvenile individual as Weddell seals did, in an area far away from the shore. One penguin was observed to be consumed by the leopard seal. The Weddell seals and leopard seals did not seem to interfere with each other. After the Weddell seal finished eating the first penguin, it attacked a second one at the same site. When the penguins were attacked, other penguins escaped the area and jumped onto the sea ice (Fig. 2). Both adult and juvenile penguins were alerted to the Weddell seal's attack and seemed to hesitate to get into the water in the presence of a Weddell seal.

In addition to three previous publications on Weddell seal attacking Chinstrap and Gentoo Penguins (Todd 1988; Cogley and Bell 1998; Bombosch and Solovyev 2017), Bombosch and Solovyev (2017) collected more anecdotal observations of Weddell seal attacks on emperor penguins at McMurdo Sound, in the Ross Sea, and on Adélie Penguins at Hukuro Cove, in Lützow-Holm Bay. Interestingly, although no leopard seal has been observed in Hukuro Cove, it was previously reported that these Adélie Penguins performed synchronized diving and surfacing, possibly as a defensive strategy against possible predators such as Weddell seals (Takahashi et al. 2004). Considering the previous observations, Weddell seal attacks on penguins may be a rather widespread albeit poorly reported behavior around Antarctica.

An interesting aspect of our observations is that several Weddell seals were observed during incubation and chick rearing period of Adélie Penguins, and the penguins did not seem to show any defensive behavior, such as beak-bites and head up displays in response to their presence. This indicates that adult penguins may not regard Weddell seals as potential predators during these periods. During molting, however, both adult and juvenile penguins showed cautious and careful behavior in response to the presence of Weddell seals, and predation events occurred at the end of the sea ice, where the penguins dive into the water. It seems that penguins may have adjusted their behavior after witnessing the attacks. Thus, we discuss the possibility that penguin hunting by Weddell seals could primarily be aimed at fledglings at a certain vulnerable period of their life. It is, however, also possible that researchers could mistakenly take Weddell seal attacks on penguins for leopard seal attacks because the Weddell seals' feeding behavior is very similar to that of leopard seals (Cogley and Bell 1998; Bombosch and Solovyev 2017).

Although penguins form a known part of pinniped species diets, here, we report the rare observation of Adélie Penguins being preyed upon by Weddell seals. This relationship between Adélie Penguins and Weddell seals can shed light on potential implications in modeling the Antarctic ecosystem network. In future studies, it will be interesting to investigate Weddell seal feeding behavior in detail throughout the seasons and to record how the penguins respond to their approaches.

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Compliance with ethical standards

Conflict of interest The authors declare no conflicts of interest.

Research involving human participants and/or animals This article does not contain any studies with human participants performed by any of the authors. All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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