

Predation on king penguins by Antarctic fur seals

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Adult male Antarctic fur seals, Arctocephalus gazella, were observed pursuing, killing and eating adult king penguins, Aptenodytes patagonicus, on Marion Island. The majority of the king penguins were pursued on land. This is the first time that members of the Otariidae have been reported to take seabirds as large as king penguins, and the first time fur seals have been reported to take penguins ashore.

Volwasse Antarktiese pelsrobmannetjies, Arctocephalus gazella, is waargeneem om volwasse koningspikkewyne, Aptenodytes patagonicus, by Marion-eiland te agtervolg, te dood en te verorber. Die meerderheid van koningspikkewyne is op land gevang. Dit is die eerste vermelding dat lede van die Otariidae seevoëls so groot soos koningspikkewyne vang, en die eerste keer dat pelsrobbe pikkewyne op land vang.

Introduction

A number of otariid seals catch and kill penguins. Penguins form a considerable part of the diet of the New Zealand fur seal, *Arctocephalus forsteri*, population at Macquarie Island (Csordas & Ingham 1965, Green *et al* 1990). Subantarctic fur seals, *A. tropicalis* (Paulian 1964, Tollu 1974), and South African (Cape) fur seals, *A. pusillus pusillus* (Cooper 1974, Shaughnessy 1978), also take penguins, as do all three species of southern sea lions: Hooker's sea lion, *Phocartos hookeri* (Gwynn 1953), the Australian sea lion, *Neophoca cinerea* (King 1983), and the South American sea lion, *Otaria byronia* (Lanting 1988).

All penguins taken by otariids are of small size, such as the macaroni penguin, *Eudyptes chrysolophus* (Bonner & Hunter 1982), jackass penguin, *Spheniscus demersus* (Cooper 1974), rockhopper penguin, *E. chrysocome* (Tollu 1974), magellanic penguin, *S. magellanica* (Lanting 1988), gentoo penguin, *Pygoscelis papua* (Bonner 1968), and the little penguin, *Eudyptula minor* (King 1983). Penguins taken by fur seals are taken at sea (Bonner & Hunter 1982), although Hooker's sea lion and the South American sea lion have been recorded to pursue penguins ashore (Gwynn 1953, Lanting 1988).

The Antarctic fur seal, *A. gazella*, takes macaroni and gentoo penguins on occasion at Heard Island (Green *et al* 1989), Macquarie Island (Green *et al* 1990) and

South Georgia (Bonner 1968, Bonner & Hunter 1982, Laws 1985). Bonner & Hunter (1982) also reported wounded king penguins from sites at South Georgia and suggested that these penguins may also be victims of fur seals. Laws (1985) stated that fur seals kill and eat numerous macaroni penguins at South Georgia, but that the larger king penguin is more than a match for them.

At Marion Island (46° 54'S, 37° 45'E) Antarctic fur seals have been observed to either kill and eat, or attempt to kill king penguins on at least 15 occasions. In the majority of cases the penguin was pursued and killed ashore. This paper describes these observations and discusses their importance with respect to diet and behaviour. The *A. gazella* population numbered in excess of 335 individuals in 1988/89 (Wilkinson & Bester 1990). They show a summer (breeding) and autumn (moulting) peak in numbers ashore, and are largely absent from the island from May to September (Kerley 1983). In the 1990/91 season there were about 210 000 adult king penguins on Marion Island with fewest birds present in August and September (JC Cooper pers comm).

Methods

Observations were recorded opportunistically by a number of observers. In all but four of the 19 incidents the observers were interviewed by the authors who filled in a standard questionnaire. Four cases were taken from written accounts requested by the authors. Questions were asked concerning the age class, sex and apparent health of both the predator and the prey, the time of year and day of the incident, the site of the incident and site characteristics, and the method of pursuit, killing and feeding. In addition a short description of the events was recorded. Some of the observations were recorded a considerable time after the event had taken place. However, the observers were, in some cases, aided by an account written at the time of the incident. In all cases only that information of which the observers were absolutely certain was recorded.

Results

Fifteen predatory interactions between king penguins and Antarctic fur seals were described for the period August 1986 to August 1993.

The predator and its prey

In all but three cases, where the age, sex and apparent health of the seal were not known, the predators were adult males in good condition ($n = 12$). When recorded, the penguins were judged adult ($n = 11$) and in good condition ($n = 7$).

In addition to the attacks on king penguins, two attacks on macaroni penguins and one attack on a rockhopper penguin were recorded, but are not commented on here.

Site, date and time of capture

Capture of king penguins took place at two sites only: Good Hope Bay East, a smooth and relatively flat (10° slope) shingle beach, and Kildalkey Bay, a rough and steep (40° at the water's edge) boulder beach. Thirteen incidents were recorded at Good Hope Bay East and only two at Kildalkey Bay. Antarctic fur seals breed at neither of these two beaches.

Most events (12 of 15) occurred during August and September, that is at the end of winter. There is one record from May, the beginning of winter, and two for October, the onset of spring.

Pursuit

In both incidents that took place at Kildalkey Bay the seal was seen swimming with the penguin carcass. None of these pursuits was observed. On the one occasion the seal carried the penguin carcass out onto the land, possibly to feed from it. However, the seal dropped the carcass between large boulders and was unable to retrieve it. Thirteen incidents took place at the flat shingle beach in Good Hope Bay East. On one occasion a seal was seen with the carcass at sea but may not have caught the penguin there. The pursuit was seen in 11 of the other 12 incidents, all of which occurred on land.

The conclusion of ten of the observed pursuits is known. In seven of these the pursuit was successful. All but one pursuit took place over a distance of ten metres or less, one penguin being unsuccessfully pursued for about 25 metres. Only two pursuits lasted in excess of five minutes. During both of these pursuits the penguin and the seal at times remained stationary and faced each other over a distance of less than a metre. These periods of inactivity ended only when the penguin attempted to move away, or the seal attempted to capture the penguin. The penguin managed to escape on one of these occasions. The conclusion of the remaining pursuit is not known.

In all cases penguins were pursued within seconds of their hauling out. In six of the seven successful pursuits the penguin was finally taken while fleeing. The exception was when the penguin was taken while walking past

a stationary seal. On one occasion the seal appeared to wait for the penguins to move a few metres from the water line before charging at them, while in another the seal emerged from the water to cut off the penguin's advance inland, forcing it back to the water. The charge of the seals almost always resulted in the penguins fleeing, their backs being exposed to the seal. In one instance the penguin made no attempt to escape, but did so after the seal had released it subsequent to tearing a strip of skin from its neck. On seven occasions the penguins attempted to escape into the sea. Twice they fled inland. On one occasion the seal moved to the seaward side of the penguin, in what appeared to be an attempt to prevent the penguin from escaping.

Only one seal was seen to pursue penguins on more than one occasion. The first attempt was unsuccessful. It then waited fifteen minutes for another group of penguins to emerge from the sea, and succeeded in catching and killing one of these.

Killing and feeding

Seals were observed with a captured penguin in ten cases, in four of which it is unknown whether the carcass was fed upon. On one occasion the seal was prevented from feeding on the carcass as it was irretrievably lost between a few large boulders, and in one instance only one bite was taken, wounding the penguin. In three of the remaining four cases the seal clearly consumed most of the carcass. In all instances the seal would start to consume the penguin immediately upon capture (Fig 1).

Figure 1

A male Antarctic fur seal feeding on a live king penguin that it had caught on the beach at Good Hope Bay, Marion Island



Where the penguin was consumed, the seal spent between four and fifteen minutes at the carcass.

In eight cases the seal held its prey by the neck or back, and once took it by the chest. The penguin was then violently flailed through the air. This resulted in chunks of flesh being torn out, which were swallowed by the seal. This action was then repeated. The penguin was killed by the flailing action, but only after it had been partially eaten.

Discussion

The present study suggests that only adult male Antarctic fur seals at Marion Island prey on king penguins. They capture the birds as they haul out on the two beaches that support the two king penguin breeding colonies closest to the major breeding site of the Antarctic fur seal at Watertunnel Stream (Wilkinson & Bester 1990). King penguins were captured primarily during the two months preceding the breeding season haul out that commences in October (Kerley 1983). Attacks may be launched from either the sea or the land and are facilitated by the shallow bottom gradient and smooth nature of the beach in Good Hope Bay East. Conversely, pursuit on land is less likely in Kildalkey Bay due to the rough nature and steep gradient of the beach.

As Good Hope Bay East has been visited regularly (at least once every seven to ten days) from August to March each year since 1983 (and Kildalkey Bay throughout the year) with virtually no records of this behaviour outside of August and September, it suggests that the taking of king penguins is largely confined to the short pre-breeding season. Furthermore, scat collections ($n = 260$) throughout three consecutive years at the nearby breeding colony site at Watertunnel Stream rarely produced penguin remains (MRI unpublished results) that would readily show up if penguins were taken (*vide* Green *et al* 1990). It is also unlikely that the relatively few visits by observers to the beaches between March and August may have precluded further sightings of king penguins being taken as *A. gazella* are largely absent from the island during winter (Kerley 1983).

Predation on macaroni penguins by Antarctic fur seals at South Georgia is a probable extension of play behaviour (Bonner & Hunter 1982). Attacks were made by subadult males and took place in the water during summer, but carcasses were seldom fed upon, and wounded and dead penguins were often abandoned in favour of play with other seals. In the present study, however, only two of the five males that held penguins in the water appeared to be playing with them. Where king penguins were captured ashore no play behaviour was evident. Some of the males were persistent in their attempts to catch the penguins, with no delay between the capture and eating of the penguin. It is therefore likely that the adult males deliberately take the king pen-

guins on land as part of their diet. Attention is focussed on the large king penguins as they leave the water, presumably a time when they are most vulnerable to attack, while adults and chicks in the nearby rookery are ignored. However, the eating of penguins seems to be of minor importance compared with the non-breeding, summer population of *A. forsteri* males at Macquarie Island (Shaughnessy & Fletcher 1987) where penguins form a large part of their diet (Green *et al* 1990).

On Marion Island only one individual attempted attacks on king penguins on more than one occasion. The difficulty in identifying individuals precluded the identification of others which might have taken king penguins on more than one occasion. The skill shown by the fur seals in dealing with the penguins may be indicative of considerable experience on their part. Some individuals are therefore likely to have hunted king penguins on more than one occasion over the seven years since this behaviour was first recorded for adult males at this site. Bonner & Hunter (1982) also thought it likely that only a few individual Antarctic fur seals were catching macaroni penguins at South Georgia.

It therefore seems that penguins are regularly taken by non-breeding male fur seals during the breeding season (South Georgia), within non-breeding populations during summer (Macquarie Island), or in advance of the breeding season (Marion Island) after a winter at sea (present study). While smaller-sized seabirds such as macaroni penguins are taken by *A. gazella* (Bonner 1968, Bonner & Hunter 1982, this study), at least some adult males at Marion Island have taken the large king penguins which they catch onshore as they arrive from the sea, apparently for the purpose of feeding on them. With the continued expansion of the Antarctic fur seal population at Marion Island (Wilkinson & Bester 1990) predation on king penguins is likely to increase.

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