

Infanticide and Cannibalism of Juvenile Polar Bears (*Ursus maritimus*) in Svalbard

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ABSTRACT. Two instances of infanticide and cannibalism in polar bears (*Ursus maritimus*) were observed in SE Svalbard, at Hopen Island. In the first, an adult male killed three young cubs at a den site and consumed one of them. In the second, an adult male actively pursued, killed, and consumed a dependent yearling. Infanticide of dependent polar bear offspring by adult males may be more common in Svalbard than in other populations because the population is close to carrying capacity or because geographic features reduce spatial segregation of age and sex classes.

Key words: Barents Sea, cannibalism, infanticide, polar bear, *Ursus maritimus*, Svalbard

RÉSUMÉ. On a observé deux cas d'infanticide et de cannibalisme chez l'ours polaire (*Ursus maritimus*) à l'île Hopen, dans le sud-est du Svalbard. Dans le premier cas, un mâle adulte a tué trois oursons dans leur tanière et en a dévoré un. Dans le second, un mâle adulte a pourchassé, tué et dévoré un ourson d'un an non autonome. Il se peut que, chez l'ours polaire, l'infanticide des petits non autonomes par des mâles adultes soit plus commun au Svalbard que dans d'autres populations en raison de la taille de la population qui est proche de la capacité biogénique ou parce que les caractéristiques géographiques réduisent la ségrégation spatiale des catégories d'âges et de sexes.

Mots clés: mer de Barents, cannibalisme, infanticide, ours polaire, *Ursus maritimus*, Svalbard

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Factors affecting the survival of polar bear cubs (*Ursus maritimus*) are poorly understood (Derocher and Stirling, 1996). Low food availability and accidents on the sea ice may be the main sources of cub mortality (Uspenski and Kistchinski, 1972; Larsen, 1986; Derocher and Stirling, 1996). Intraspecific predation, infanticide, and cannibalism have been reported in polar bears (Belikov et al., 1977; Hansson and Thomassen, 1983; Larsen, 1985; Lunn and Stenhouse, 1985; Taylor et al., 1985). However, some of the instances have followed human activities such as harvest or immobilization (Taylor et al., 1985). Regardless, intraspecific predation has been suggested as a regulating feature of ursid populations (e.g., McCullough, 1981; Young and Ruff, 1982; Larsen and Kjos-Hanssen, 1983; Stringham, 1983; Taylor et al., 1985).

In this paper, we report on two observations of infanticide and cannibalism in polar bears at Hopen Island, Svalbard.

On 23 March 1996, as part of a study on the ecology of polar bears in Svalbard, Norway, we were conducting a helicopter survey for maternity dens on Hopen Island (76.5°N, 25.2°E) on the western edge of the Barents Sea. We located a maternity den with two cubs-of-the-year at the den mouth, but the mother was not present. The den site was shallow and dirt was visible on the floor, which was atypical of normal maternity dens (e.g., Harington, 1968).

The den was located approximately 25 m above sea level at the foot of a steep, rocky cliff, about 20 m from the edge of the landfast sea ice. In comparison, we have typically found maternity dens from 100 to 300 m above sea level on Hopen Island.

On the same day and again on 24 March, we observed an adult female near the weather station on Hopen Island, approximately 3 km from the den site. The female had enlarged, highly visible mammae, which suggested that she was lactating and had recently nursed. Patches of dirty fur on the mother were consistent with the dirt seen at the den site. The female appeared to be in medium-to-poor condition for a mother with cubs in spring. The same female had been observed before our arrival at Hopen Island and was observed several times near the station after 24 March. Backtracking of the female suggested that she had likely come from the den site, but since the tracks were obscured by fresh snow, we could not confirm that she was the mother of the cubs at the den site. On 30 March, we arrived at the den site and found three dead cubs lying outside the den. Large tracks in the snow indicated that an adult male (> 5 years old) had approached the den from the south, climbed up, excavated the den, and killed the cubs. However, we did not observe the bear that killed the cubs.

All three cubs (two males and one female) were found below the den site, 30–50 m away from the den. Two of

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the cubs (one male and one female) were intact, while approximately one-third of the remaining cub had been consumed. The cubs were collected and necropsied at the Veterinary Institute in Oslo. The body weights of the intact cubs were 4.0 kg for the female and 5.1 kg for the male. The partially consumed cub weighed 4.1 kg, but we believe it was the largest cub in the litter. All three cubs revealed extensive bruising and puncture wounds to the chest, back, and head; cranial damage was consistent with a bite. Death was attributed to predation by a polar bear. Presence of milk in the stomachs and intestinal tracts of the cubs indicated they had fed recently, which suggested that the mother had not abandoned them.

Both authors viewed video film of one other instance of cannibalism on Hopen Island. On 4 June 1995, an adult female with one yearling (ca. 18 months, unknown sex) was observed being pursued by an adult male. The male, in normal physical condition, was estimated (on the basis of its size relative to the adult female and its scarring patterns) to be more than 8 years of age. The male was persistent in his pursuit, and the female and yearling attempted to escape by swimming among broken ice floes in the sea. The yearling followed its mother until they both left the water, with the male still in pursuit. On land, the mother attempted to go between the yearling and the male, but she was not observed to directly challenge the male. The female and yearling ran up a rocky slope towards the base of a steep, unclimbable cliff. The killing of the yearling was not seen because of topography, but it occurred about 50 m from the water. The male dragged the yearling's carcass down the slope, where he fed on it. The mother left the area immediately and travelled north along the coast, away from the male. After feeding briefly on the carcass at the bottom of the slope, the male took the yearling to an ice floe 200 m offshore, where he continued to feed on it for about two days. Little remained of the carcass when the male left.

Five main reasons for infanticide have been proposed: exploitation of young as an energy source, competition for resources, sexual selection, parental manipulation of progeny, and social pathology (Hrady and Hausfater, 1984). We cannot assess the possible role of competition for resources or social pathology. In neither observation was the mother responsible for the infanticide; therefore, maternal manipulation of the offspring was not involved.

Polar bear cubs weighing a few kilograms are a very small energy source for an adult polar bear that normally feeds on ringed seals (*Phoca hispida*) weighing up to 60 kg and bearded seals (*Erignathus barbatus*) weighing up to several hundred kilograms (Stirling and Archibald, 1977). However, nutritional intake is a possible motivation, given that one cub was eaten. The cubs were small relative to the normal mass of triplet cubs (5.6–11.9 kg) (Derocher and Stirling, 1998), and the killed cubs had little or no subcutaneous fat. Polar bears sometimes do not eat ringed seal pups they have killed if the pups have little or no fat (Stirling and McEwan, 1975). Similarly, the bear may not

have eaten the cubs because of their low energy content. We have often seen adult males on Hopen Island during the spring, when females with cubs are emerging from dens. It is possible that close proximity to the sea ice and a movement corridor along the landfast ice made the den more vulnerable to detection by a passing male, which became curious about the den and decided to investigate.

Female polar bears give birth to cubs in dens largely for thermal protection but also for protection from predation (Harington, 1968; Jonkel et al., 1972). However, predation at the den site is highly unusual. We believe that the proximity of the den to the coast and the possible absence of the mother from the den were contributing factors to the infanticide. We have not observed other mothers to leave offspring unattended at dens. Further, triplet litters are rare in Svalbard (Wiig, 1998). Therefore, nutritional stress may have caused the mother to wander in search of food before her cubs were ready to leave the den. The smell of food and burned garbage from the Hopen Island Weather Station may have prolonged the periods that the mother was away from the den.

There is speculation that adult males may obtain a breeding opportunity with adult females if they kill their dependent offspring and the female becomes available for breeding (Hayssen, 1984; Hrady and Hausfater, 1984). This adult male likely arrived at the den site when the female was absent, because there was no sign of an interaction between the adults. Therefore, the adult male had a low-risk opportunity to kill the cubs, but no direct opportunity to breed with the mother. However, as neither the male nor the mother of the cubs was seen after the infanticide, we do not know whether the male had a subsequent opportunity to breed with the mother.

Breeding pairs of polar bears have been observed up to June 20 in Svalbard (Lønø, 1970). Thus the yearling was killed at the end of the normal breeding season. However, a mating opportunity was not the motivation for the event: the male showed no interest in the adult female, which left the area shortly after the cub was killed. Therefore, we believe the yearling was killed simply for food. Little other food is available in late June at Hopen Island. We have weighed yearlings in May that range from 50 to 120 kg in body mass, so intraspecific predation may present a viable nutritional source for some bears. Infanticide of yearling polar bears is a rare occurrence, and the lower mobility of adult males relative to yearlings has been proposed to explain the scarcity of predation (Stirling 1988). The mother's failure to defend the cub may relate to the risk of injury or death to herself. Adult female polar bears have been killed by males while defending their young (Stirling, 1988).

Hopen Island is situated on a migratory route for polar bears in the Barents Sea and is also commonly used for maternity dens (Derocher and Wiig, unpubl. data). Spatial and temporal segregation of age and sex classes has been recorded in polar bears and has been postulated to result from the risk of intraspecific predation of juveniles by

adult males (Latour, 1981; Derocher and Stirling, 1990; Stirling et al., 1993; Ferguson et al., 1997). However, the narrowness of Hopen Island (maximum width 2 km, length 33 km) may reduce the potential for spatial segregation, increasing the vulnerability of juveniles to predation.

The impact of cannibalism on polar bear populations is difficult to quantify. However, cannibalism may regulate population size in a density-dependent manner (Van den Bosch and Gabriel, 1997). The survival rate of polar bear cubs at Svalbard is low (Wiig, 1998). Infanticide contributes to mortality, but its importance relative to other causes of death is unknown. The Barents Sea polar bear population, shared between Norway and Russia, has not been harvested since 1956 in Russia and since 1973 in Norway (Prestrud and Stirling, 1994). Therefore, the Barents Sea population may be near carrying capacity (Derocher and Taylor, 1994; Wiig, 1998). Infanticide has been reported more frequently in the Svalbard-Barents Sea area (Taylor et al., 1985) despite much greater research activity in Canada and Alaska, where multiple searches have occurred over some areas in a single season. All intensively studied polar bear populations, other than the Barents Sea population, undergo some level of harvest (IUCN/SSC Polar Bear Specialist Group, 1998) and are likely maintained below carrying capacity. We speculate that infanticide may be a density-dependent parameter in polar bear populations and may occur more frequently in the Barents Sea. However, geographic features may also play a role in the occurrence of infanticide.

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