

Differences in haul-out pattern in two nursing ringed seal *Phoca hispida* pups

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This paper describes activity of two nursing ringed seal *Phoca hispida* pups from Svalbard based on 35 days of continuous recordings from VHF-transmitters glued to the fur of the pups. While still whitecoated the pups spent respectively 10.4% and 63.7% of the recorded time in the water, and were captured or observed at respectively 6 and 7 different breathing holes. The fact that the pups spend much time in the water while still nursing will result in skilled divers at an extremely early age. This, and the high number of breathing holes used by the individual pups, are considered to be adaptations to avoid surface predators.

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INTRODUCTION

Nursing pups in phocid seals where the pups don't moult *in utero*, are generally sedentary and spend most of their time hauled out on land or on ice (Bowen 1991). One exception is pups of Weddel seal (*Leptonychotes weddellii*), which are reported to enter water with their mothers before they are two weeks old and to spend an increasing portion of their time in the water as lactation progresses (Tedman and Bryden 1979). While studying milk intake in free-living ringed seal (*Phoca hispida*) pups (Lydersen et al. 1992), we often captured the whitecoats in a breathing hole as they surfaced to breathe. Since the pups were often in the water prior to our arrival and were often captured at different breathing holes, we considered the swimming a natural part of the activity of pups of this species. Here we report on the activity of two ringed seal pups, and document that nursing whitecoats of this species can spend a considerable portion of their time in the water.

MATERIAL AND METHODS

The study was conducted in Kongsfjorden, Svalbard (78°55'N, 12°30'E), from April 18 to May 14, 1991. Two whitecoat ringed seal pups, a male (E2020) and a female (E2030),

were captured as described in Lydersen et al. (1992). After weighing and tagging, a VHF transmitter was glued to the lanugo on the back of each pup before it was released. On an island about 2 km away from the capturing site, an automatic receiving station was established. Signals from the VHF-transmitters were continuously monitored on a strip chart recorder. If no signal was received it was assumed that the antennae and thus the pups were in the water. The pups were recaptured and weighed at various occasions during the study period. Capture or observations of the pup at a different location than the previous capture was noted.

RESULTS AND DISCUSSION

Nineteen days of recordings were obtained from pup E2020 and 16 days from pup E2030.

Signals were received from pup E2020 for 6 more days, but they are not included here. We assumed that the pup was weaned 19 days after the first capture. At this time it has completely moulted, it was not observed with its mother anymore, and it has started to lose weight. Pup E2020 was very easy to capture and rarely tried to enter the breathing hole when approached. It was recaptured 12 ti-

Table. 1. Mass gain and time spent hauled out versus in water for two ringed seal pups from Svalbard spring 1991.

Pup no	First capture	Last capture	Initial body mass, kg	Final body mass, kg	Daily mass gain, g day ⁻¹	Percent of total time hauled out	Percent of total time spent in water
E2020	18. April	7. May	10.35	14.6	223	89.6	10.4
E2030	28. April	14. May	16.8	17.0	12.5	36.3	63.7

mes, including 3 times after weaning. It was observed or recaptured at 7 different breathing holes or lairs, with a maximum distance between the structures of 900 m.

Pup E2030 was only recaptured once during the whole period. It was observed or captured at 6 different breathing holes or lairs with a maximum distance between the structures of 600 m. When E2030 was recaptured it was hauled out at the same breathing hole as E2020, so both pups were captured simultaneously.

Our observation suggests that although ringed seals appear to occupy a specific home range, the number of holes visited by pups exceed the average 3.5 holes per adult seal found by Hammill and Smith (1990). Adult ringed seals are thought to be territorial during the breeding season (Stirling 1977) and females are supposed to defend a certain number of breathing holes within their territory. The observations described above could indicate more plasticity in the territorial defence than previously thought, or simply that the pups are more free to move around, even into a neighbouring female's territory.

Pup E2030 spent 63.7% of the total recorded time in the water (Table 1) and had an average mass gain of only 12.5 g day⁻¹. Corresponding figures for pup E2020 was 10.4% and 223 g day⁻¹. For pup E2020 we found a significant increase in number of hours hauled out or decrease in number of hours spent in the water, with increasing age ($r=0.52$, $N=19$). No correlation between these parameters was found for pup E2030. We do not know if pup E2030 was still suckling or if it had been weaned prior to its recapture and thus had a higher body mass within the study period and was recaptured during the post-weaning fast. During the last 3 days of recordings from this pup, it spent 98.1% of the time in water with the longest period without hau-

ling out lasting 32.5h. Since the pups nurse on ice, this indicates that lactation had finished.

Both mass at weaning and daily mass gain for these two pups is very low compared to previously reported (Hammill et al. 1991, Smith et al. 1991, Lydersen et al. 1992). Based on a cross sectional sample, the average weaning mass and daily mass gain for ringed seal pups was found to be 22.1 kg and 0.43 kg respectively (Hammill et al. 1991), and based on a longitudinal sample, the average daily mass gain of the nursing pups was 0.386 kg (Lydersen et al. 1992). This great difference in mass gain may partly be explained by differences in activity. Both pups in the present study were occupying the same general area, and the impact from snowmobile disturbance and surface predators, mainly arctic foxes (*Alopex lagopus*), would have been similar. Pup E2020 which was recaptured 12 times had the highest growth rate of the two, indicating that handling had little effect on growth rate.

There is obviously a conflict between mass gain and activity. A pup that spends more time hauled out on the ice is likely to gain mass faster than a more active pup spending a considerable time in the water. However, spending more time in water may permit a pup to develop diving skills that would enable it to escape surface predators. Without drawing any firm conclusions on which strategy is the best, we would like to mention that the pup that «chose» the haul-out strategy, pup E2020, was killed by a polar bear (*Ursus maritimus*) 6 days after weaning.

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SAMMENDRAG

Diende kvitunger av andre selarter holder seg vanligvis på land eller oppe på isen til dieperioden er over. Deretter følger en periode hvor de starter å utforske det våte element. Basert på 35 døgnkontinuerlige registreringer av signaler fra VHF-sendere pålimt to diende ungene går i vannet på et svært tidlig stadium. De tilbrakte henholdsvis 10.4% og 63.7% av den registrerte tiden i vannet, og ble fanget eller observert på henholdsvis 6 og 7 forskjellige pustehull. Ved å tilbringe så mye tid i vannet utvikler de seg til dyktige dykkere ved en ekstremt lav alder. Dette, samt det høye antall pustehull som ble benyttet av de enkelte ungene, sees på som tilpasninger til å unngå predasjon fra polarrev og isbjørn.

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