

**Paper 18**

## **Polar Bear Den Surveys in Svalbard, 1972 and 1973**

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### **DEN SURVEY IN 1972**

An effort to estimate the abundance of polar bear (*Ursus maritimus*) dens in Svalbard was made in 1972. Because most polar bear females with cubs leave their dens over a relatively short period of time (Uspenski and Kistshchinski 1972), large areas must be surveyed simultaneously. The purpose of the pilot study in 1972 was primarily to define the relative importance of various regions as denning areas rather than to try to determine the absolute number of dens. Studies from other parts of the Arctic have demonstrated the feasibility of fixed wing aircraft in polar bear den surveys (Uspenski and Kistshchinski 1972). Fixed wing aircraft were used in Svalbard in 1972, both for den surveys and for transport of field groups and supplies. With fuel depots established in Tjuvfjorden, Freemansundet and Sorgfjorden, and with bases in Longyearbyen and in Ny-Ålesund, the aircraft were able to survey the entire archipelago (Fig. 1). Two Cessna 185's with ski/wheels and cargopacks were used in the surveys. The cruising speed was between 130 and 150 km per hour. Observations were made from altitudes between 70 and 100 meters. On most surveys, the planes worked together; they either searched one side of a fjord each, or a mountain at different altitudes, or one surveyed a shoreline while the other checked islands, riverbanks, etc.

Some areas of particular importance were patrolled repeatedly, while others were surveyed only once, due to great distances or bad weather conditions. About 200 hours were flown on surveys between 25 March and 13 May. Field parties simultaneously searched possible denning localities on foot or on skis frequently using binoculars and spotting scopes. If dens were discovered, efforts were made to determine whether it was a maternity den or temporary den, mainly on the basis of tracks around the den. During aerial surveys it was often difficult to classify dens. Tracks and other signs were studied through binoculars, and they were photographed whenever possible. Pictures were then examined afterwards. The islands Edgeøya and Bartentsøya were surveyed several times during late March and throughout April. Not until 27 and 28 April did the aircraft find a group of eight and one single den in the eastern and northern part of Edgeøya. The northern coast of Nordaustlandet was surveyed from the air 8, 15 and 16 April. Prior to the last two surveys, there had been more than a week of very calm weather on Nordaustlandet (E. Nyholm. pers. comm.). One could assume, therefore, that dens which had been opened during the first week of April, would still be visible on the surveys. Twenty-six dens were located during 30 hours of effective flying (Fig. 1). On Kong Karls Land, ground surveys were made between 31 March and 18 April by two field parties. The western massif of Kongsøya was surveyed by a three man group between 31 March and 10 April. Thirteen dens were found in four effective days, and an additional nine were discovered during a three hour aerial survey on 10 April. On Svenskøya, a two man field party found 21 dens between 12 and 18 April, in six effective days. Another six dens were found during a two hours aerial survey on 18 April (Figs. 2 and 3).

The northern and eastern coast of Spitsbergen were surveyed repeatedly, but no dens or evidence of denning was found. There was, however, a relatively high degree of bear activity in some areas.

Of a total of 84 polar bear dens found in Svalbard in 1972, 54 were spotted from the air, while 30 were found by the field groups. Air observations could not be

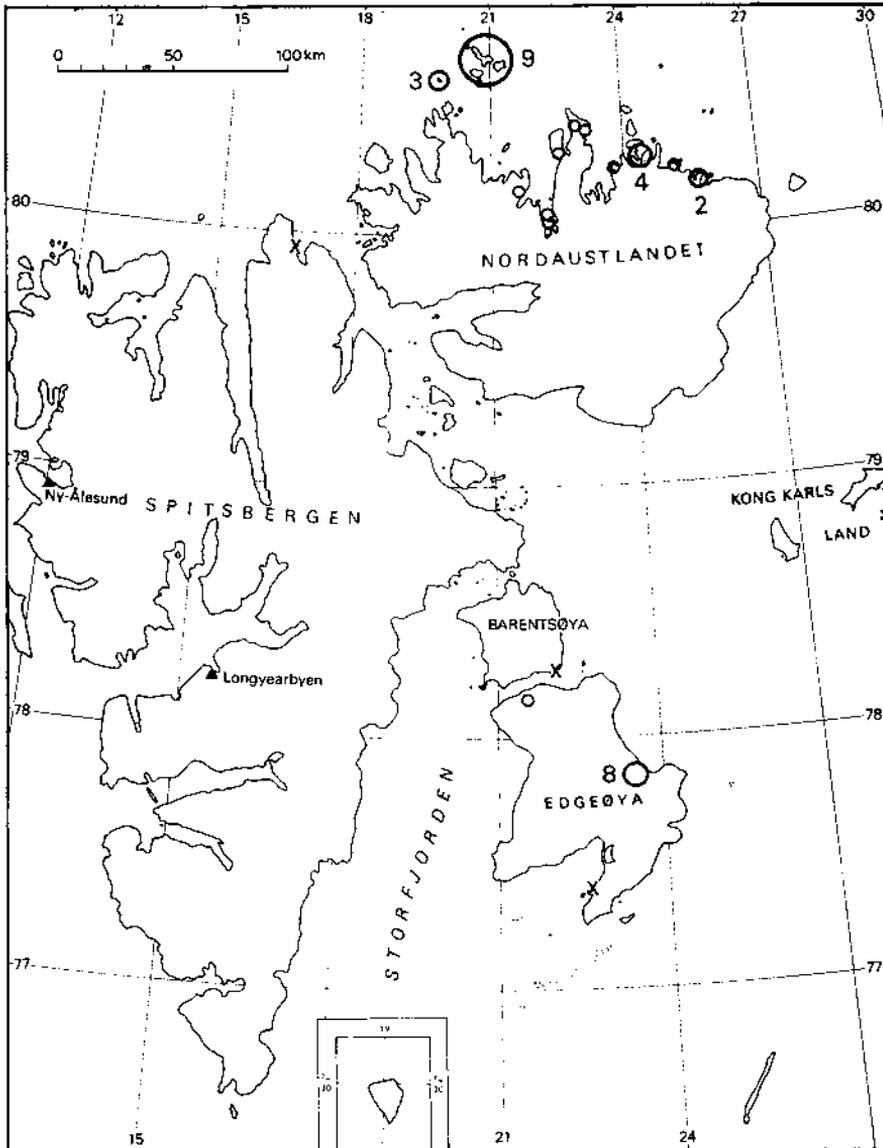


Fig. 1. Polar bear dens recorded on Nordaustlandet and Edgeøya during aerial surveys in April and May 1972. X: Fuel depots. O: Single dens. Concentration of dens are given by bigger circles and a number.

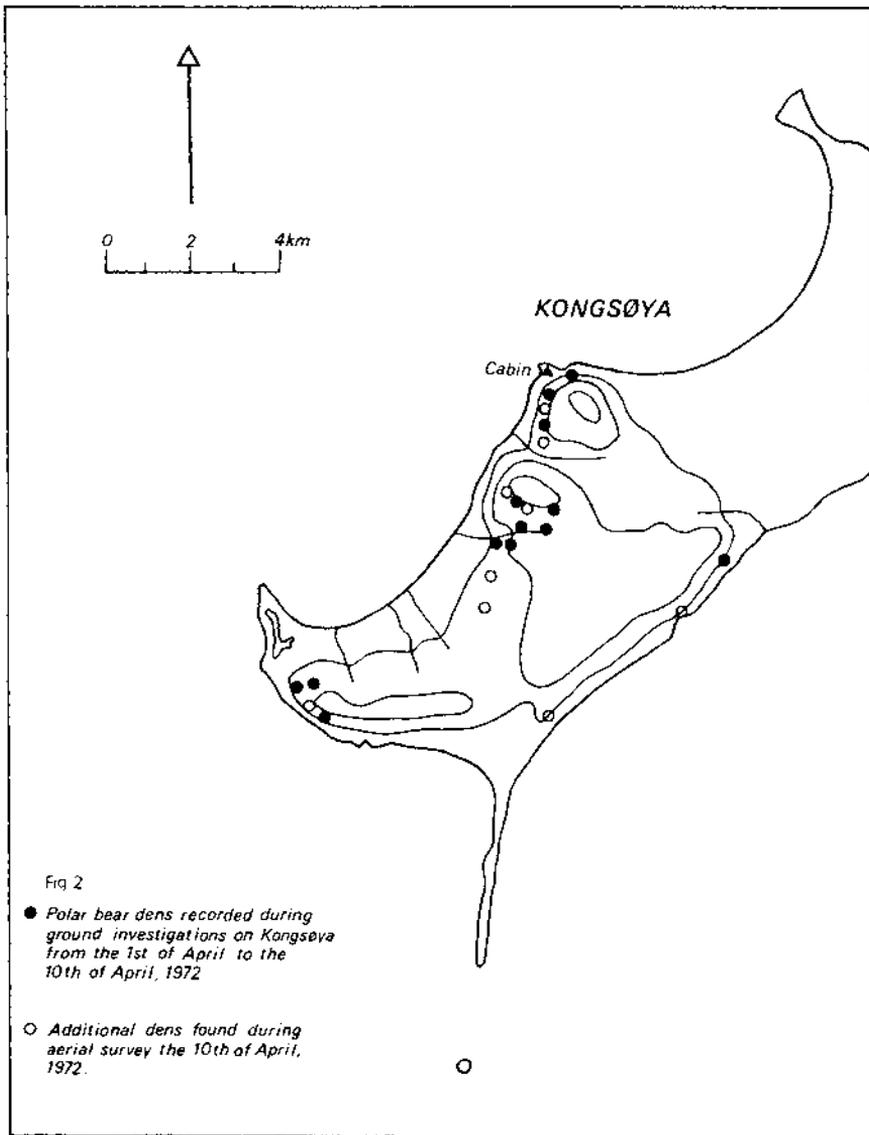


Fig. 2. Polar bear dens recorded during ground and aerial surveys on Kongsøya, Svalbard, April 1972.

proved to be more effective than ground surveys, or vice versa. Ground observation success depended upon topography, weather and light conditions. Drifting snow might fill up and cover dens shortly after they were abandoned. By the use of aircraft, observation success was dependent upon cruising speed and altitude, light conditions and the observer's skill and experience. The comparative air and ground counts on Kong Karls Land indicated that about 50 percent of the dens present in an area may be seen from the planes. Track observations and other signs indicated that about half the number of dens were maternity dens.

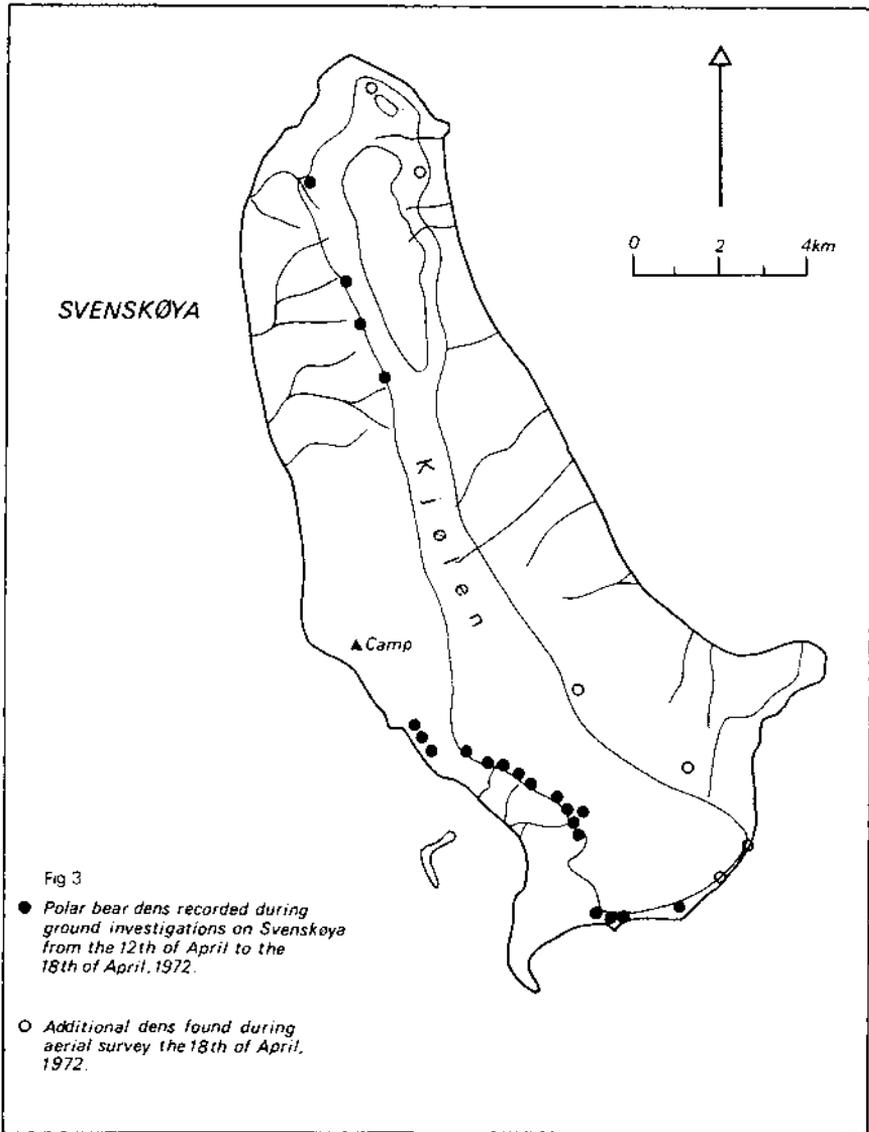


Fig. 3. Polar bear dens recorded during ground and aerial surveys on Svenskøya, Svalbard, April 1972.

### DEN SURVEY IN 1973.

Studies of polar bear dens in 1973 were concentrated on Kong Karls Land. The purpose was to try and determine the absolute number of dens on the islands, to distinguish between den types whenever possible, and to describe den sites and den construction. Two field groups, each consisting of two men, carried out ground surveys on Kongsøya and Svenskøya between 15 March and 29 April and between 17 March and 28 April respectively. Each group surveyed the islands as often as possible in an effort to make absolute den counts. Each den found

was marked with bamboo sticks and monitored repeatedly. Efforts were made to distinguish between maternity and temporary dens. When abandoned, dens were in some cases dug out and described. The field groups also made observations of single bears and family groups and their activities. Bad weather conditions hampered the work for both groups. On Kongsøya, 26 days were considered effective days for observations, during which time 49 dens were found. Forty-six dens were found between 16 and 26 March. Nineteen dens were classified as maternity dens, six as temporary dens, while in 24 cases, the den type could not be determined. Of the unclassified dens, some were in accessible, while others were filled and covered by snow during storms, so that they could not be located afterwards. Five maternity dens and one temporary den were dug out and described. In most of the maternity dens, the observers found that changes had taken place during the winter. In many cases, the female had repeatedly dug out snow from the roof, and packed it under her on the floor. Thus, tunnels and chambers could be drastically changed and elevated half a meter or more, sometimes necessitating a new tunnel to be dug out when the family emerged in the spring. When the floor of the dens was excavated, several layers of urine and much feces were often found; in some cases, two kilos or more of feces were found. In many cases, urine and faeces were found in the vicinity of the den after it had been opened. Some dens were elaborately constructed, with two or more tunnels and several chambers or caves. Sometimes, digging had evidently been done by the cubs. A few maternity dens were rather simple, consisting of a tunnel and a chamber only. Most temporary dens consisted of a short tunnel, and in some cases also a chamber.

On Kongsøya, the majority of dens were oriented southwards, between west and southeast. Altitudes varied between 30 and 250 meters above sea level, and the angle of the den site varied between 20 and 65 degrees. The majority of the dens were located less than one km from the coast. Most of the dens were abandoned shortly after they had been opened, and the female bear and her cubs headed straight out into the pack. Only in three cases did the families stay in their dens for 12, 17 and 17 days, probably because the weather became bad shortly after they opened the dens for the first time.

Thirteen single bears were observed on Kongsøya, in addition to five females each with one cub, three females each with two cubs, and two females, each with one yearling.

On Svenskøya, 23 days were considered effective days for observation, during which time 16 dens were found. Ten dens were found between March 18 and 26 March. Two dens were assumed to be maternity dens, six to be temporary dens, while in eight cases, the den type could not be determined. Eight dens were dug out and described. The changes which had taken place in some of the Kongsøya dens were also observed in some on Svenskøya. The majority of the dens were facing southwest, on the lee side of a ridge running northwest to southwest along the island. Altitudes varied between 40 and 150 meters, and the angle of the den site varied between 20 and 40 degrees. Nineteen single bears were observed on Svenskøya, in addition to two females, each with one yearling. The locations of the dens on Kongsøya and Svenskøya are shown in Figs. 4 and 5.

## DISCUSSION

The polar bear den surveys in Svalbard in 1972 and 1973 show that Nordaustlandet and Kong Karls Land must be considered as particularly important

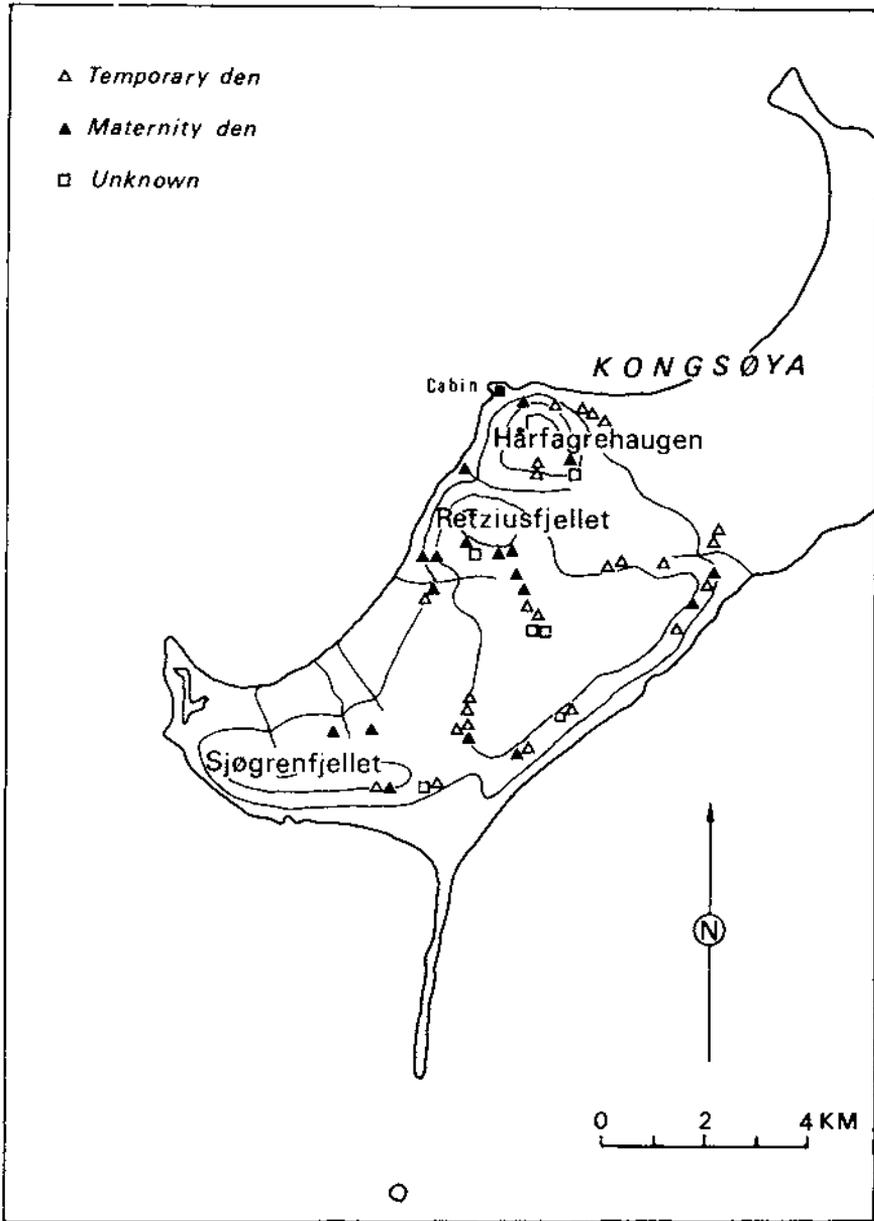


Fig. 4. Polar bear dens recorded during ground surveys on Kongsøya, March and April 1973.

denning areas. In Kong Karls Land there were 0.3 and 0.4 dens per square km in 1972 and 1973 respectively. On Kongsøya alone, there were 1.5 dens per square km of habitat suitable for denning, in 1973. There is a marked difference in climate, temperatures and ice conditions between northern and eastern Svalbard and the rest of the archipelago, which may explain the choices for den sites. There are also noticeable differences in the topography.

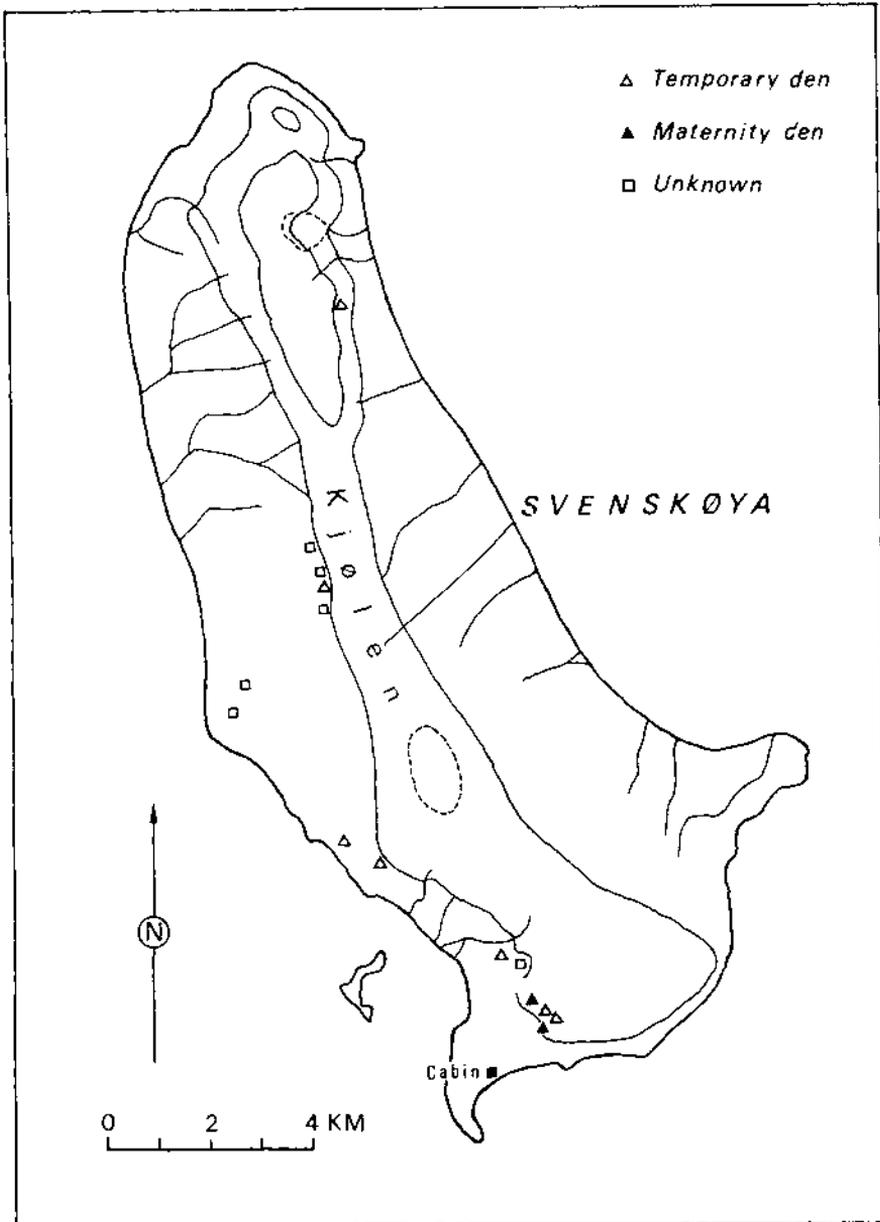


Fig. 5. Polar bear dens recorded during ground and aerial surveys on Svenskøya, March and April 1973.

The location of den sites in 1972 and 1973 seemed to coincide with the amount of snow which had accumulated in various areas throughout the year. Most dens were found on slopes where they were protected from prevailing winds from the north and northeast, and the den openings were normally facing away from the wind. Polar bear dens in the Hudson Bay area are sometimes dug out in the earth as well as in the snow (Jonkel *et al.* 1972). In Svalbard, earth

dens were not found, which coincides with observations from other parts of the high Arctic (Harington 1968; Uspenski and Kistshchinski 1972).

Only ten den sites occupied in 1972 on Kong Karls Land were used again in 1973. Even in these cases, the site may have been moved 100 meters or more, which however, could not be controlled. Uspenski and Kistshchinski (1972) state that the same den sites are not necessarily used again every year in Wrangel Island. It is reasonable to assume that wind and precipitation may alter denning conditions in an area from one year to another, thus affecting the bears' choice of den sites.

In Wrangel Island and in the Canadian high Arctic, most dens are found within 8 km from the coast, but some are located as much as 25 km inland (Harington 1968; Uspenski and Kistshchinski 1972). In the Hudson Bay area, two major den sites are located 20 and 70 km inland (Jonkel *et al.* 1972). Most of the dens in Svalbard have been found less than one km inland. This is partly due to the small sizes of the islands and peninsulas which may be suitable for denning.

Harington (1968) and Lønø (1972) state that polar bears depend upon the drift ice to get ashore and den. According to Vibe (1967), the drift ice is the major factor which determines where and when polar bears will appear along the coast of east Greenland. Lentfer (1972) states that unfavorable ice conditions may prevent the female bears from coming ashore, so that they are sometimes forced to den on the sea ice. On Wrangel Island, female polar bears will come ashore to den from mid September onwards, and in years with normal ice conditions, the majority will den up during October (Uspenski and Chernyavski 1965). According to Parovshchikov (1964), polar bears on Franz Josef Land will den up during October and November. In 1971, northern Svalbard and Kong Karls Land were embraced by the ice by early October. The ice edge probably reached Barentsøya and Edgeøya by the end of October (Vinje 1973 and pers. comm.). Compared with information from other parts of the Arctic, the ice conditions should therefore not have prevented the female bears from going ashore in any of these areas to dig their dens. In 1968, the ice was surrounding Edheøya and Barentsøya even earlier in the autumn (Larsen 1971). But very few signs of the denning were found on those two islands both in 1969 and 1972, in spite of relatively intense surveys both springs. It is unlikely therefore, that the ice conditions account for the lack of dens on Barentsøya and Edgeøya. In 1972, the edge of the loose ice (i.e. about 3/10 ice cover) was found at Kvitøya, 200 km north of Kong Karls Land, by late October. By 4 November, the loose ice had reached Kong Karls Land, while the more consolidated ice did not reach the islands before mid November (Vinje 1974 and pers. comm.). Polar bear dens were as abundant on Kong Karls Land in 1973 as they had been in 1972. If we assume that the drift ice determines when polar bears may come ashore, they could not have reached Kong Karls Land before the first week of November at best, in 1972.

Lønø (1970) states that most polar bear family groups leave their dens in Svalbard between 10 and 25 April. But the observations from Nordaustlandet and Kong Karls Land in 1972, indicated that most of the dens had been opened and abandoned before 1 April. Some females with cubs stay in their dens well after that date. When our data disagree with Lønø's findings, it may be explained by the fact that most of his information was based upon observations of family groups which were already out and may have abandoned their dens some time before the records were made.

The den surveys in Kong Karls Land in 1973 were quite extensive, and probably few dens were overlooked by the field parties. Almost four-fifths of the dens

found on Kongsøya, which were monitored, were maternity dens. But probably only one-fourth of the monitored dens on Svenskøya were maternity dens. The data from 1972 and 1973 indicate that about 40 maternity dens can be found on Kong Karls Land in a normal year. The comparative air and ground counts from Kong Karls Land in 1972 indicate that about 50 per cent of the dens were overlooked from the air. Thus, an evaluation of the observations from Nordaustlandet indicate that an estimated 20 to 30 maternity dens may be found there every winter. It is most probable that the total number of maternity dens in Svalbard in a normal year is well below 100.

It is questionable whether den counts can serve as a basis for accurate population estimates of polar bears. The accuracy of both ground and air surveys is limited by several factors. Ground surveys require a massive effort over a relatively short period of time. Data collected by different observers cannot immediately be compared, as observation techniques and efficiency vary. The ratio between maternity and temporary dens require close examination of almost every den found, which is impossible because some of them are inaccessible and because such inspection is time consuming. But information about the relative abundance of dens can be obtained through repeated counts over several years, and this may reveal changes in polar bear abundance and population composition. Combined air and ground surveys will probably give the best results, and the use of helicopters will probably be more effective than fixed wing aircraft. Surveys must be extensive during the period when the majority of polar bear females with cubs leave their dens. In Svalbard, surveys and den counts may be more easy than in many other areas, because so many of the dens are concentrated close to the coast.

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