

FIDELITY OF FEMALE POLAR BEARS TO WINTER-DEN SITES

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Most Holarctic bears of the genus *Ursus* enter a metabolically dormant state each winter during which they undertake an extended fast (Nelson, 1980). For most of the dormant period, individual bears ensconce themselves in a sheltered den, the construction of which varies greatly depending on the species, habitat, and general winter conditions (Johnson and Pelton, 1980; Lentz et al., 1983). Although over-winter dens are critical for bears, reuse of individual dens is rare, at least in the American black bear (*U. americanus*), suggesting that suitable sites for dens are not limiting (Alt, 1984; Tietje and Ruff, 1980).

Polar bears (*U. maritimus*) differ from other ursids in that only pregnant females enter over-winter dens. Bears of all other age and reproductive classes remain active throughout the year except perhaps during brief periods of inclement weather (Harington, 1968). Polar bears also differ from the terrestrial ursids in that they do not maintain defended home ranges, probably because of the labile nature of the sea ice on which they spend much of each year (Ramsay and Stirling, 1986a). Over most of the Arctic, maternity dens are found at low densities and within a few kilometres of the coast of the mainland or offshore islands, although they have also been recorded on drifting sea ice off Alaska (Lentfer, 1975). In three regions (Wrangel Island, USSR; Kong Karlsland, Svalbard; and northeastern Manitoba, Canada) however, localized areas on land support relatively large numbers of pregnant polar bears in over-winter dens (Hansson and Thomassen, 1983; Harington, 1968; Larsen, 1985; Stirling et al., 1977; Uspenski and Kistchinski, 1972).

As part of our ongoing studies on the ecology of polar bears, we made a preliminary assessment of the degree of fidelity shown by adult females to specific den sites on land in northeastern Manitoba, south and east of the town of Churchill. This region of discontinuous permafrost lies at the boreal forest-tundra ecotone. By about late July each year, the annual ice on Hudson Bay melts completely forcing all polar bears onto land until early November when freeze-up occurs. During the period most adult females, with or without cubs, move away from the coast whereas, in general, males remain along the coastal regions. During summer and autumn, pregnant females rest in earth dens dug in banks along edges of lakes and streams (Jonkel et al., 1972). In late autumn, when the remainder of the population returns to the sea ice, pregnant female polar bears remain in earth dens, approximately 20–100 km inland from Hudson Bay (Stirling and Ramsay, 1986; Stirling et al., 1977). The presence of hundreds of earth dens in the region indicates a long tradition of use. Hearne (1795) observed polar bears to den in the study region >200 years ago.

In late February and March of each year, approximately 100–150 adult female polar bears with their new-born cubs emerge from their over-winter dens and walk to the sea ice of Hudson Bay (Ramsay and Andriashek, 1986). We searched for and captured bears from a helicopter during 8–19 March 1980, 26 February–25 March 1981, 13 February–29 March 1982, 2–23 March 1983, and 29 February–24 March 1984. We flew at altitudes <150 m and at ground speeds of 10–200 km/h and searched completely, two or more times each year, the entire region of den-site locations documented by Stirling et al. (1977). Each river bank, major creek, and lake shore in the region was investigated.

We located 67 over-winter maternity dens in spring, usually in snow drifts along relict and extant stream beds and along lake shores. All were situated in south or east facing drifts, in the lee of prevailing winds and all were excavated entirely in snow except for two dens dug into soil with a tunnel through the snow connecting to the surface.

Maternity dens dug in snow appeared to be located near earth dens only visible in summer and autumn after the snow had melted. We marked trees near 11 snow dens in spring and investigated the sites the following summer or autumn when the snow was gone. At each site, an earth den was found. Two pregnant females captured in autumn at earth dens were recaptured with cubs the following spring in snow dens within a few metres of the autumn sites. Pregnant females appeared to initiate their over-winter hibernation

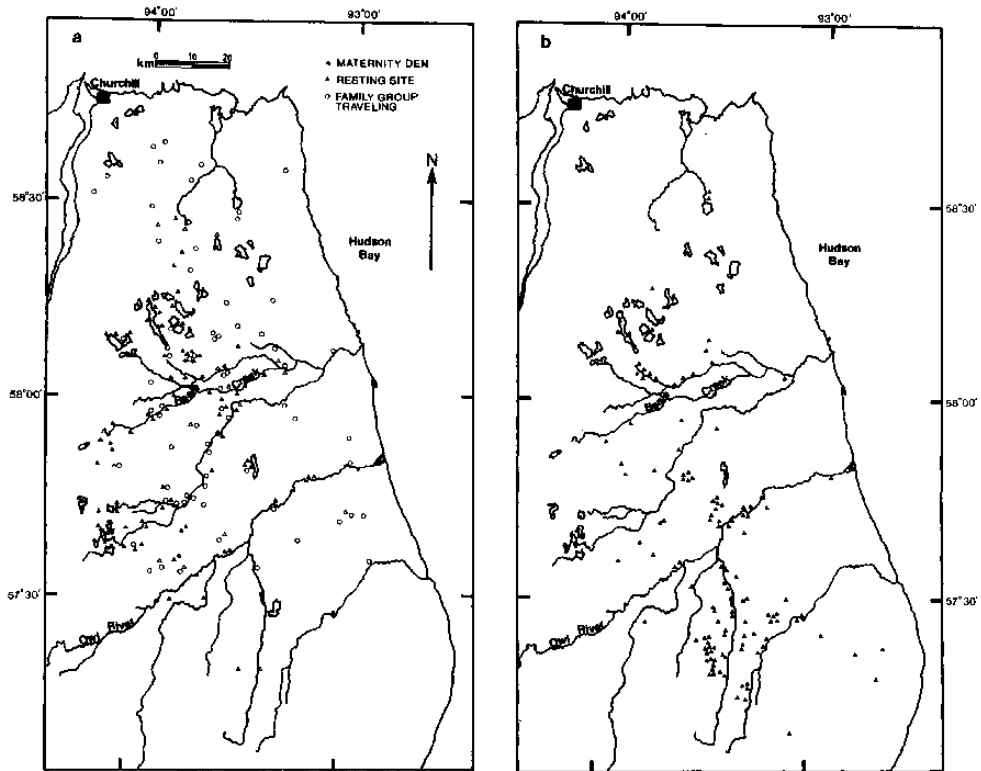


FIG. 1.—Map of polar bear maternity-denning region in northeastern Manitoba showing the location of known maternity dens, resting sites, and traveling polar bear family groups sighted in February and March: a, 1980–1984; b, 1970–1976. Latter map after Stirling et al. (1977).

in an earth den then, during winter, burrowed into snow drifts (Watts and Hansen, 1987), possibly to maintain adequate gas exchange through the snow. In three instances, dens were reused in different years but no individual bear was observed to use the same den twice.

Twelve adult females were captured in each of 2 separate years in spring, and one female was caught in 3 separate years. Five of these bears were captured at maternity den sites on two occasions, with a mean distance between sites of 27 km and a median distance of 24 km (range, 4–52 km). The remaining females were captured as they traveled to the sea ice, after leaving their dens, on at least 1 of the years. The mean and median distance between successive spring captures for all 13 bears, including those at dens, was approximately 34 km (range, 3–57 km). The region in the study area in which maternity dens were found encompasses approximately 6,000 km² (Fig. 1a).

We recorded the location of each bear and den site found during spring (Fig. 1a). Because we used a helicopter, it was possible to land and inspect each site closely to determine whether it was an over-winter maternity den or a temporary resting site dug by a family enroute to the sea ice. Fewer than 15% (nine of 67) of the known maternity dens we recorded were located south of or on the Owl River and almost 50% (32 of 67) were north of Beale Creek (Table 1). The distribution of resting sites we found was similar to that of over-winter den sites (Table 1).

We compared the location of maternity dens that we observed with those recorded a decade earlier (Fig. 1b) by personnel of the Department of Natural Resources, Government of Manitoba (Stirling et al., 1977). In February and March 1970–1976 inclusive, their observers used fixed-wing aircraft to search the study region for polar bears, tracks, and possible maternity dens. Because they could not land, they could not determine whether a particular snow structure was a den used over winter by a parturient female or simply a temporary rest site dug by a family returning to the sea. Sixty-three percent (75 of 119) of the snow structures they saw in spring were located south of or on the Owl River and only 17% (20 of 119) were north of Beale Creek (Table 1).

TABLE 1.—Number of potential polar bear maternity-den sites (1970–1976 and 1980–1984) and captured females (1980–1984) located in spring in northeastern Manitoba.

Years and sites	Whole study region n	Locations					
		South of or on Owl River		Between Beale Creek and Owl River		North of or on Beale Creek	
		n	%	n	%	n	%
1980-1984							
Known maternity sites	67	9	13	26	39	32	48
Resting sites	23	2	9	12	52	9	39
Total all sites	90	11	12	38	42	41	46
Females traveling	73	8	11	26	36	39	53
1970-1976*							
Possible maternity sites	119	75	63	24	20	20	17

* From Stirling et al. (1977).

Clearly, the center of distribution of over-winter den sites in Manitoba shifted northward between the surveys of 1970–1976 and those conducted from 1980–1984. Polar bears appear to possess the requisite navigational skills to allow them to return to specific regions in the same season each year (Lentfer, 1983; Ramsay and Andriashek, 1986; Schweinsburg et al., 1982). Therefore, the reason for the northward shift in the location of maternity den sites is not clear.

Although polar bears may abandon occupied dens if displaced by a helicopter during capture and tagging operations (Ramsay and Stirling, 1986b), our research activities did not appear to be the proximal cause for the spatial shift in distribution of occupied dens because the shift occurred either at onset or before our current studies.

For polar bears, maternity dens may serve primarily as thermal refugia where the tiny, undeveloped cubs can survive until they have grown sufficiently to be able to withstand the arctic winter (Blix and Lentfer, 1979). Because the insulative quality of dens built in snow probably varies little between locations, most sites at which sufficiently deep snowdrifts form may be suitable for maternity dens. Polar bears on land, therefore, might choose locations for their dens in the closest suitable habitat to desired resources on the sea ice. Ramsay and Andriashek (1986) suggested that the orientation of routes that polar bear families adopt when leaving the region of denning in northeastern Manitoba ensures that they reach desirable regions of the sea ice. Harington (1968), Larsen (1985), and Lønø (1970) speculated that variation in the local pattern of sea-ice movements during the preceding summer and autumn accounts for interannual changes in the number of winter dens at other regions of concentration. Significant changes in sea-ice conditions on Hudson Bay between 1970–1976 and 1980–1984 survey periods possibly resulted in the observed latitudinal shift in the distribution of maternity dens.

We thank S. E. Hatfield, F. Messier, and J. O. Murie for comments on earlier drafts of the manuscript. D. Andriashek, L. Hill, K. John, S. Miller, D. Seip, and I. Thorleifson kindly assisted us in the field. Support for our work was received from the Canadian National Sportsmen's Fund, Canadian Wildlife Service, Churchill Northern Studies Centre, Manitoba Department of Natural Resources, Natural Sciences and Engineering Research Council of Canada, Polar Continental Shelf Project, and World Wildlife Fund (Canada).

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Submitted 12 December 1988. Accepted 8 July 1989.

J. Mamm., 71(2):236-237, 1990

SUPERNUMERARY MAMMAE AND NIPPLES IN THE POLAR BEAR (*URSUS MARITIMUS*)

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Supernumerary mammae (hypermastia) and supernumerary nipples (hyperthelia) have been reported in humans, apes (Pongidae), domestic bovids (*Bos taurus*), and several other mammals (Anderson, 1978). Herein, I report cases of supernumerary mammae and nipples in polar bears (*Ursus maritimus*). Normally, polar bears have four mammae, two positioned about 4 cm either side of the ventral midline immediately posterior to the axillae, and a second pair approximately 15 cm further posterior (DeMaster and Stirling, 1981).

In western Hudson Bay, near Churchill, Manitoba, I caught two females, aged 15 and 22 years at capture, each with five functional mammae. The anterior four mammae were positioned normally, whereas the fifth was located posteriorly, in the anterior abdominal region, approximately 4 cm from the midline, on the right side in one female and on the left in the other. Both females were lactating from all five mammae and were accompanied by cubs. An adult female with cubs near Devon Island in the Canadian Arctic had six functional mammae, four pectoral and two inguinal (W. Calvert, pers. comm.).

A case of supernumerary nipples was found in a 14-year-old female with cubs captured in western Hudson Bay; it had four functional mammae positioned normally and two additional nipples in the inguinal region (15 cm anterior to the vaginal orifice) and in line with the anterior mammae. This female was lactating from the four anterior mammae, but the two additional nipples did not appear to be associated with functional mammary glands; milk could not be expressed and there were no signs that they had been suckled. One