

# Terrestrial Maternity Denning of Polar Bears in the Eastern Beaufort Sea Area

IAN STIRLING<sup>1</sup> and DENNIS ANDRIASHEK<sup>1</sup>

(Received 9 January 1992; accepted in revised form 23 April 1992)

**ABSTRACT.** Observations on the location of polar bear (*Ursus maritimus*) maternity dens, the locations of females with young cubs on the sea ice just after leaving their dens, and observations of Inuvialuit hunters were recorded in the eastern Beaufort Sea area from late March to mid-May 1971-79 and 1985-87. Maternity denning occurs annually on the west and south coasts of Banks Island but it has been recorded less frequently along the mainland coast of the southern Beaufort Sea. This distribution pattern could have been influenced by the pattern of sea ice formation in the fall and anthropogenic factors. Denning females and females accompanied by young cubs have been protected for almost 20 years, and maternity denning along the mainland coast appears to be increasing as a result.

**Key words:** polar bear, denning, Beaufort Sea, Banks Island

**RÉSUMÉ.** Des observations faites sur l'emplacement des tanières de mise bas d'ours polaires (*Ursus maritimus*), l'emplacement des femelles avec leurs oursons sur la banquise juste après l'abandon de la tanière ainsi que des observations faites par des chasseurs Inuvialuit ont été enregistrées dans la mer de Beaufort de la fin mars à la mi-mai de 1971 à 1979 et de 1985 à 1987. La mise bas dans les tanières a lieu chaque année sur la côte occidentale et méridionale de l'île Banks mais on l'a rapportée moins fréquemment le long du rivage continental du sud de la mer de Beaufort. Il se peut que ce schéma de distribution ait été influencé par le schéma de formation de la banquise à l'automne et par des facteurs anthropiques. Les femelles qui mettent bas et celles accompagnées de leurs oursons sont protégées depuis au moins 20 ans, ce qui semblerait résulter en une augmentation de la mise bas dans des tanières le long du rivage continental.

**Mots clés:** ours polaire, tanière de mise bas, mer de Beaufort, île Banks

Traduit pour le journal par Nésida Loyer.

## INTRODUCTION

In 1970, about 60 polar bears were reported killed each year in the eastern Beaufort Sea and Amundsen Gulf area by Inuvialuit hunters. Between 1961 and 1970, trophy hunters in Alaska killed 30-133 polar bears in the Alaskan Beaufort Sea area each year (Amstrup *et al.*, 1986). Trophy hunting ceased in Alaska in 1972 but hunting by indigenous people continued on both sides of the border. Maternity denning of polar bears was known to be common on the west coast of Banks Island (Harington, 1964) but not elsewhere in the Canadian Beaufort Sea area. Because no significant denning areas had been found in Alaska, many Inuvialuit hunters in the western Canadian Arctic believed the sport hunt in Alaska was largely being sustained by polar bears produced in Canada. The southern Beaufort Sea is also the focus of much exploration for hydrocarbons, both onshore and offshore. Hunting and other human activities can influence polar bears in maternity denning areas (Lef-fingwell, 1919; Belikov, 1976; Lentfer and Hensel, 1980), but little was known about denning in the Beaufort Sea region. It is possible these programs may have a negative impact on polar bear habitat. For all these reasons, it is important to identify the most important areas for polar bear maternity denning in the western Canadian Arctic so it can receive adequate protection, as stipulated by Article II of the International Agreement on the Conservation of Polar Bears (Stirling, 1988: Appendix I).

## METHODS

Our observations of dens were incidental to population studies that required the capture and tagging of polar bears throughout the eastern Beaufort Sea and Amundsen Gulf east of 141°W and south of 75°N (Fig. 1) (Stirling *et al.*, 1975, 1988;

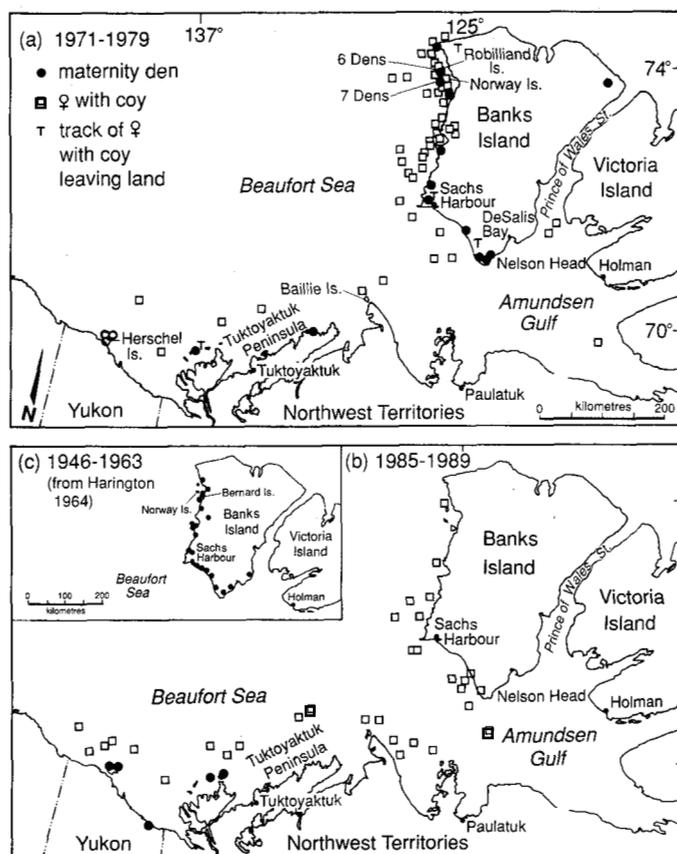


FIG. 1. Locations where polar bear maternity dens were found or reported, female polar bears with cubs of the year were seen on the sea ice in early spring, and tracks of family groups leaving maternity dens on land in spring were seen or reported in: a) 1971-79, b) 1985-89, and c) 1946-1963.

<sup>1</sup>Canadian Wildlife Service, 5320 - 122 Street, Edmonton, Alberta, Canada T6H 3S5

DeMaster *et al.*, 1980). We gathered data on the distribution of polar bear maternity dens by direct observation and by interviewing Inuvialuit polar bear hunters. We recorded the locations of all captures and sightings of females accompanied by cubs-of-the-year (COY) on the sea ice, because in the spring they indicate the general proximity of maternity denning areas. We also recorded the locations of tracks of females with COY leaving inland areas for the sea ice in the spring. Although it is possible that a female with COY may have been recorded more than once, we took care in assimilating the data to minimize the chance of duplication.

We searched for polar bears using a Bell 206B helicopter between late March and mid-May from 1971 through 1979 and 1985 through 1987. Between 1971 and 1979, we flew about 550 h of helicopter survey over 75 000 km of polar bear habitat on the sea ice and examined potential denning areas on adjacent shorelines on an opportunistic basis (Stirling *et al.*, 1993). The search effort on the sea ice was subdivided fairly evenly between the mainland coast from the Alaska border to 50 km east of Baillie Islands, Amundsen Gulf, and the west coast of Banks Island. Between 1985 and 1987, we flew about 550 h of survey on the mainland coast, western Amundsen Gulf, and the west coast of Banks Island (Stirling *et al.*, 1988). (We did not calculate the number of kilometres flown over potential habitat.) Inuvialuit hunters were guiding non-resident polar bear hunters on the west coast of Banks Island in late March and April, particularly north of Sachs Harbour. Because they were concerned the helicopter would frighten the bears, we were unable to survey there until after family groups had left their dens.

#### RESULTS AND DISCUSSION

Between 1971 and 1979, six family groups were captured on the sea ice adjacent to the mainland coast, one terrestrial den was found, and four dens were reported by Inuvialuit hunters (Fig. 1a). In 1985-87, we captured 18 adult females with COY along the mainland coast, three times the number caught from 1971 through 1979 (Fig. 1b). During those three years, two dens were reported to us and two dens were located on Herschel Island by Amstrup (1986) using radio telemetry. In 1989, a female polar bear and her two cubs were found dead in a collapsed maternity den on the southeast Yukon coast (Clarkson and Irish, 1991) (Fig. 1b).

From 1971 through 1979, we found 21 maternity dens on the west and south coasts of Banks Island and one set of tracks made by a family group leaving the land. Three dens and two sets of tracks of family groups leaving the land were reported by Inuvialuit hunters, and we captured or sighted 36 family groups (Fig. 1a). From 1985 through 1987, we saw no dens because our survey was too late in the season, but we captured or sighted 15 family groups (Fig. 1b).

From 1971 through 1979, we surveyed over 13 500 km of habitat in eastern Amundsen Gulf (Stirling *et al.*, 1993) but found no dens and sighted only 3 females with COY (Fig. 1a). We did not survey this area in 1985-87.

Inuvialuit hunters with long-term experience in hunting and travelling along the mainland coast were unanimous in their opinion that maternity denning is uncommon from east of Paulatuk to east of Herschel Island. There was similar consensus among hunters that considerable polar bear denning occurs annually on the southern end of Banks Island near Nelson

Head and along the northwest coast, particularly in the vicinity of Norway Island. With the exception of southwestern Banks Island, hunters stated that maternity denning occurred infrequently on the coastline of Amundsen Gulf. On the basis of personal observations and interviews with Inuit hunters, Harington (1964) also reported that the west coast of Banks Island was an important maternity denning area (Fig. 1c). It is important to note that Inuvialuit hunters have travelled extensively along all the coastal areas of the eastern Beaufort Sea and Amundsen Gulf trapping and hunting in the spring for many years. Thus, if there were areas other than the west coast of Banks Island on which maternity denning occurred regularly, we are certain they would be known.

The data recorded in the different sample periods (Fig. 1) cannot be compared quantitatively because they were collected incidentally to other studies; there were differences in timing of search on the west coast of Banks Island; and there was unknown variability in the number of Inuvialuit hunters travelling in potential denning areas in different years. However, we suggest the much larger number of females with cubs that were found along the mainland coast in the 1980s, compared to the 1970s, may indicate that the amount of maternity denning is increasing there.

In terms of the identification of the most important polar bear maternity denning habitat in the western Canadian Arctic, several points are clear. The greatest amount of maternity denning in the western Canadian Arctic occurs along the western and southern coasts of Banks Island (Fig. 1). In particular, maternity denning appears to occur most frequently on the small islands along the northwestern coast of Banks Island (Norway, Bernard, and Robilliard). Along the mainland coast, Herschel Island appears to be the most important area, followed by the Yukon coast and the small offshore islands west of Tuktoyaktuk.

On first inspection, it seems surprising that so little maternity denning was recorded along the mainland coast in the 1970s and earlier (Lentfer and Hensel, 1980; Amstrup, 1986). Suitable snow banks are abundant along the coastline close to where the females can hunt seals after leaving their dens. Potential denning habitat along the mainland coast appears similar to that used by polar bears on the western coast of Banks Island and elsewhere in the High Arctic (Stirling *et al.*, 1984). Maternity denning also occurs regularly along the mainland coast in eastern Siberia (Stishov, 1991).

The low frequency of maternity denning along the mainland coast may be the product of different ecological pressures, both natural and anthropogenic. One factor influencing the distribution of maternity dens on land may be the timing of freeze-up and the distribution of pack ice adjacent to the coast in late October and early November, when most pregnant females enter their dens (Harington, 1968). Shorefast ice first connects the coast with the pack ice in the vicinity of Herschel Island and then progresses east (Lindsay, 1975, 1977). The Cape Bathurst polynya, to the northeast of the Tuktoyaktuk Peninsula, is the last area to consolidate and, in some years, large areas of open water may persist until late in the winter (Smith and Rigby, 1981). Consequently, the pattern of freeze-up facilitates pregnant female polar bears reaching the Yukon coast or the small offshore islands west of the Tuktoyaktuk Peninsula, while open water may make their access to the land farther east more difficult in some years. In contrast, the drifting pack ice lies close to the west coast of Banks Island almost

every fall (Lindsay, 1975, 1977), so that under normal conditions, pregnant females have no difficulty reaching the land to den. Lentfer and Hensel (1980) reported that the first shorefast ice along the mainland coast of Alaska forms between the Colville River and the Canadian border. They suggested this facilitates pregnant female polar bears reaching the land from the drifting pack and explains the greater prevalence of maternity dens there than elsewhere in Alaska. They further speculated that in years when the pack ice does not reach the coast until later in the winter, female polar bears may not be able to reach the coast or offshore islands and could be forced to den on the drifting pack instead.

A second factor that may contribute to the low observed numbers of denning female polar bears along the mainland coast of the southern Beaufort Sea is that the area from the Tuktoyaktuk Peninsula to eastern Alaska has been inhabited by whalers and native hunters equipped with firearms for over 80 years. Because adult female polar bears appear to show fidelity to maternity denning areas (Ramsay and Stirling, 1990), those that regularly returned to the mainland coast to dig maternity dens would have been more vulnerable to hunters and could have been eliminated as the use of firearms became widespread. This hypothesis is supported by Leffingwell's (1919:63) report that "The natives in the vicinity [Canning River in the Alaskan sector of the Beaufort Sea] shot perhaps a dozen [polar bears] each year, mostly females that were giving birth to young in snow caves under high banks of the land." However, in more recent years, despite extensive surveys, few maternity dens have been found along the Alaskan coast of the western Beaufort Sea (Lentfer and Hensel, 1980; Amstrup, 1986). Although the hunting of polar bears in the Canadian Beaufort Sea area prior to about 20 years ago is not well documented, from discussion with older hunters it appears that hunting bears in their dens was a common practice throughout the region, including the west coast of Banks Island, up to about the late 1960s. Possibly because there were far fewer hunters on Banks Island than there were on the mainland coast during that period (Abrahamson, 1968; Usher, 1971), Harington (1964) still found a substantial amount of maternity denning there in the early 1960s.

Although killing of polar bears at their dens no longer occurs, two adult females that denned along the mainland coast in the study area were shot (possibly in error) while accompanied by COY soon after leaving their maternity dens during the period of our studies (unpubl. data). A small number of similar instances also occurred in Alaska during the same period. Such practices, even if they continue at a low frequency, will be detrimental to the occurrence of maternity denning along the mainland coast.

Lentfer (1975) first confirmed that maternity denning occurred, albeit to an unknown extent, in the multi-year pack ice of the Beaufort Sea. One Inuvialuit hunter reported finding a female with cubs in a maternity den on a multi-year ice floe south of Nelson Head in the early 1970s. Amstrup (1986) and Amstrup and Gardner (pers. comm. 1992) subsequently reported that 53% of 90 polar bear maternity dens found using telemetry along the mainland coast of northern Alaska and Canada were in the multi-year pack ice up to about 300 km offshore. Although there is no way of knowing if female polar bears have always denned offshore in the southern Beaufort Sea, it is clear they do now. Until the late 1960s or early 1970s, when females in dens were either protected or at least were

hunted less frequently, denning in the pack ice was probably selected for because females doing so had a higher rate of survival than those that denned along the mainland coast. We suggest that, because bears in dens along the mainland coast have largely been protected for almost 20 years, the frequency of maternity denning there may be increasing. However, because freeze-up occurs later along the mainland coast, especially from Mackenzie Bay east, this may inhibit access of pregnant females to the shoreline in the eastern Beaufort Sea and Amundsen Gulf, so that maternity denning on land there will probably never occur as frequently as it does on the west coast of Banks Island.

#### ACKNOWLEDGEMENTS

We are particularly grateful to the Canadian Wildlife Service and the Polar Continental Shelf Project for their continued support of our research. We thank the following for their assistance in the field: A. Derocher, W. Hoffmann, D. Larsen, C. Spencer, and T.G. Smith. We received much advice, information, and assistance from the following Inuvialuit hunters: Andy Carpenter, the late Fred Carpenter, Pat Ekpakoak, Albert Elias, Peter Esau, Nelson Green, Billie Jacobson, John Lucas, the late Wallace Lucas, Bob MacKenzie, Jimmy Memorana, David Nasogaluak, David Ruben, Vince Steen, Fred Wolkie, Geddes Wolkie, and the late Jim Wolkie. Steven C. Amstrup and an anonymous reviewer made constructive suggestions for improvement of an earlier draft.

#### REFERENCES

- ABRAHAMSON, G. 1968. Tuktoyaktuk - Cape Parry area economic survey. Ottawa: Department of Indian Affairs and Northern Development. 83 p.
- AMSTRUP, S.C. 1986. Research on polar bears in Alaska, 1983-85. In: Proceedings of the Ninth Working Meeting of the IUCN Polar Bear Specialist Group, 9-11 August 1985, Edmonton, Alberta. Gland, Switzerland: International Union for the Conservation of Nature and Natural Resources. Publication 1196. 85-112.
- AMSTRUP, S.C., STIRLING, I., and LENTFER, J.W. 1986. Past and present status of polar bears in Alaska. *Wildlife Society Bulletin* 14:241-254.
- BELIKOV, S.E. 1976. Behavioral aspects of the polar bear, *Ursus maritimus*. International Conference on Bear Research and Management 3:37-40.
- CLARKSON, P.L., and IRISH, D. 1991. Den collapse kills female polar bear and two newborn cubs. *Arctic* 44:83-84.
- DeMASTER, D., KINGSLEY, M.C.S., and STIRLING, I. 1980. A multiple mark and recapture estimate applied to polar bears. *Canadian Journal of Zoology* 58:633-638.
- HARINGTON, C.R. 1964. Polar bear study - Banks Island, Northwest Territories. Unpubl. Canadian Wildlife Service Report. 33 p. Available at Canadian Wildlife Service, Department of Environment, Ottawa, Ontario K1A 0H3.
- \_\_\_\_\_. 1968. Denning habits of the polar bear (*Ursus maritimus* Phipps). *Canadian Wildlife Service Report Series No. 5*. 30 p.
- LEFFINGWELL, E.deK. 1919. The Canning River region, northern Alaska. U.S. Geological Survey Professional Paper 109. Washington, D.C.: U.S. Government Printing Office. 247 p.
- LENTFER, J.W. 1975. Polar bear denning on drifting sea ice. *Journal of Mammalogy* 56:716.
- LENTFER, J.W., and HENSEL, R.J. 1980. Alaskan polar bear denning. International Conference on Bear Research and Management 4:101-108.
- LINDSAY, D.G. 1975. Sea ice atlas of arctic Canada, 1961-1968. Ottawa: Department of Energy, Mines and Resources. 213 p.
- \_\_\_\_\_. 1977. Sea ice atlas of arctic Canada, 1969-1974. Ottawa: Department of Energy, Mines and Resources. 219 p.
- RAMSAY, M.A., and STIRLING, I. 1990. Fidelity of female polar bears to winter den sites. *Journal of Mammalogy* 71:233-236.
- SMITH, M., and RIGBY, B. 1981. Distribution of polynyas in the Canadian Arctic. In: Stirling, I., and Cleator, H., eds. Polynyas in the Canadian Arctic. *Canadian Wildlife Service Occasional Paper No. 45*. 7-28.
- STIRLING, I. 1988. Polar bears. Ann Arbor: University of Michigan Press. 220 p.

- STIRLING, I., ANDRIASHEK, D., and CALVERT, W. 1993. Habitat preferences and distribution of polar bears in the western Canadian Arctic in late winter and spring. *Polar Record* 29:in press.
- STIRLING, I., ANDRIASHEK, D., LATOUR, P., and CALVERT, W. 1975. The distribution and abundance of polar bears in the eastern Beaufort Sea. Final report to the Beaufort Sea Project. Fisheries and Marine Service, Department of the Environment, Victoria, B.C. 59 p. Available at Canadian Wildlife Service, Room 230, 4999 - 98th Avenue, Edmonton, Alberta T6B 2X3.
- STIRLING, I., ANDRIASHEK, D., SPENCER, C., and DEROCHE, A. 1988. Assessment of the polar bear population in the eastern Beaufort Sea. Final report to NOGAP. Unpubl. 81 p. Available at Canadian Wildlife Service, 5320 - 122 Street, Edmonton, Alberta T6H 3S5.
- STIRLING, I., CALVERT, W., and ANDRIASHEK, D. 1984. Polar bear (*Ursus maritimus*) ecology and environmental considerations in the Canadian High Arctic. In: Olson, R., Hastings, R., and Geddes, F., eds. Northern ecology and resource management. Edmonton: University of Alberta Press. 201-222.
- STISHOV, M.S. 1991. Results of aerial counts of the polar bear dens on the arctic coasts of the extreme northeast Asia. In: Proceedings of the Tenth Working Meeting of the IUCN Polar Bear Specialist Group, October 25-29, 1988, Sochi, U.S.S.R. Occasional Paper, IUCN Species Survival Commission, No. 7. 90-92.
- USHER, P.J. 1971. The Bankslanders: Economy and ecology of a frontier trapping community. Ottawa: Department of Indian Affairs and Northern Development. 88 p.