REPRODUCTIVE BIOLOGY OF CAPTIVE POLAR BEARS

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Abstract: Observations on the breeding activity of captive polar bears (*Ursus maritimus*) at the St. Petersburg Zoo were collected by 2 technicians and other zoo employees. Between 1932 and 1988, data on 50 litters and 88 cubs were recorded. Most copulations (70%) occurred during March–April and were independent of weather conditions and ambient temperature. Coitus lasted from 10 to 40 minutes (n = 18). Mean duration of pregnancy was 224 days (range = 164–294 days). Duration of pregnancy was mainly influenced by the date of copulation, because there was little variation in timing of parturition. Mean litter size was 1.8 cubs (n = 50 litters). Most litters were composed of one 1 or 2 cubs; there were 2 sets of triplets. The sex ratio at birth was close to 1:1, with slightly more males (52.3%; 46 males and 42 females).

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Many aspects of the reproductive biology of the polar bear cannot be studied under free-ranging conditions. Further, many questions related to their reproductive ecology are of great interest for captive breeding and for developing conservation strategies for natural populations. In the wild, polar bears mate between March and May, depending on geographic location (Parovshchikov 1964, Harington 1968, Lønø 1970, Lentfer et al. 1980, Ramsay and Stirling 1986, Belikov 1993). However, data on the timing of copulation, parturition, and reproductive behavior are scarce in wild populations and difficult to obtain. According to the few published reports, males persistently follow estrous females, rubbing against them during the breeding season (Wiig et al. 1992). Intense competition and fighting among 2 or more males may occur for access to a female (Ramsay and Stirling 1986). Most of these data are based on interpretation of tracks in the field and on the histological investigation of male reproductive organs.

In the last 10–15 years new insights into the reproductive ecology of polar bears have occurred (Ramsay and Stirling 1986, 1988; Derocher and Stirling 1994; Derocher 1999). However, many aspects of life history can only be documented by constant observation, which is only possible in captive situations. The objective of the present work was to examine the influence of the timing of mating on pregnancy duration and the span of the breeding period in captive polar bears.

METHODS

Observations on the breeding activities of captive polar bears were collected by technicians and other employees at the St. Petersburg Zoo between 1932 and 1988. Animals were maintained within an observation field of 150 m^2 within the enclosure. In all years, the group of adult animals comprised 1 male and 1 or 2 females; some had lived in the zoo >10 years. Ages of the females were not known. The bears were kept together after breeding, but the females were moved 1 month before parturition to a separate enclosure with a den. Over the duration of the entire observation period, 8 females were studied. According to the observation schedule, the zoo technician and other zoo employees conducted morning and evening observations. Duration of pregnancy was defined as the time from the first day of copulation to parturition. Pregnancy was considered to begin on the first day after copulation.

RESULTS AND DISCUSSION

Most copulations (70%) occurred in March–April (Table 1) and were independent of weather conditions and ambient temperature. Coitus lasted from 10 to 40 minutes (n = 18). Mean pregnancy duration was 224 days and (range = 164–294 days, n = 50).

Variation in the timing of breeding was greater than that of parturition, which occurred in November or December

Table 1. Relationship between dates of copulation and parturition and duration of pregnancy for polar bears at the St. Petersburg Zoo, Russia, 1932–88.

Dates of copulation	Dates of parturition	Litters	Mean (S.E.) pregnancy duration (days)	Cubs	Mean (S.E.) cubs per female	Males (%)
11–28 Feb	19 Nov–6 Dec	9	281 (2.74)	14	1.55 (0.10)	50.0
2–31 Mar	10 Nov–22 Dec	15	254 (2.93)	27	1.80 (0.08)	51.9
1–30 Apr	10 Nov–30 Dec	20	237 (1.60	35	1.75 (0.12)	54.3
8–16 May	2–7 Dec	4	207 (3.09)	9	2.25 (0.28)	55.6
5–13 Jun	21–24 Dec	2	166	3	1.50	33.3

regardless of when mating occurred. Given that polar bears and other ursids have delayed implantation (Wimsatt 1974, Ferguson et al. 1996), this relatively narrow window of parturition is expected.

Data on 50 litters and 88 cubs were recorded. Mean litter size was 1.76 cubs (n = 50). These data were obtained within 2–3 weeks of parturition. Two-cub litters were most common (68%), followed by single (28%) and triplet (4%) litters. Although based on small sample size for some months, there was a tendency for females that bred early (February) or late (June) to have fewer cubs per litter than those that bred in March–May (Table 1). Duration of pregnancy and litter size appeared to be related (Table 2), because shorter pregnancies, within the limits typical for the species, resulted in larger litters. Conversely, longer pregnancies resulted in smaller litters. Apparently, the increased pregnancy period of polar bears that bred in February resulted in greater embryo resorbtion, perhaps due to external factors. In the wild, such factors can influence polar bear reproduction. For example, on Wrangel Island, Russia, in years with low snow cover over dens, body weight of females and cubs appeared to be significantly lower than in favorable years (Belikov 1993). When snow depths are low, it is possible that lower air temperature in the den result in increased energy expenses.

Table 2. Pregnancy duration and litter size of female polar bears at the St. Petersburg Zoo, Russia, 1932–88.

Pregnancy duration (days)	Number of litters	Mean (S.E.) cubs per litter
164–233	16	1.88 (0.13)
239–256	17	1.76 (0.07)
260–294	17	1.64 (0.07)

The sex ratio of cubs at the St. Petersburg Zoo was close to 1:1, with a slight preponderance of males (52.3%; 46 males and 42 females, Table 1). An equal sex ratio at birth is typical among carnivores when conditions are favorable. Factors such as physiological state and climate can influence the sex ratio of offspring, and therefore, population dynamics.

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