

REPRODUCTIVE CHARACTERISTICS OF CAPTIVE EUROPEAN BROWN BEARS AND GROWTH RATES OF THEIR CUBS IN RUSSIA

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Abstract: European brown bears (*Ursus arctos*) are common in captivity in Russia. I used data from 52 litters of captive European brown bears in the St. Petersburg and Moscow zoos during 1952–94 to examine the reproductive and growth characteristics of the species in captivity in Russia. Copulation was observed during May–July but almost all births occurred in January. Sex ratio of newborn cubs was nearly equal, but cubs born to females who copulated in July were more likely to be females. Daily weight gain was greatest for cubs 3.5–4.0 months of age.

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Key words: captive European brown bears, cub growth, reproductive characteristics, *Ursus arctos*.

Several reproductive features of European brown bears (*Ursus arctos*) are poorly documented. Data documenting the reproductive potential of brown bears are important for at least 2 practical purposes: (1) successful breeding of brown bears in captivity, and (2) development of conservation strategies for natural brown bear populations.

METHODS

I collected and analyzed information on breeding period, gestation period, and growth of cubs of European brown bears in the St. Petersburg and Moscow zoos between 1952–94. The period between the first observed copulation and parturition was considered the length of gestation. The second day after observed copulation was considered the first day of pregnancy.

RESULTS AND DISCUSSION

An analysis of 52 records of brown bears born in captivity indicated that most litters were comprised of 2–3 cubs. Records of 1 or 4 cubs in a litter were rare: only 1 female gave birth to 4 cubs and only 3 females gave birth to 1 cub. Similar litter sizes have been documented for female brown bears in forests throughout European Russia. Pazhetnov (1990) reported that brown bears inhabiting the Tver forests also gave birth to 2–3 cubs, and Danilov et al. (1979) reported occasional litters of 4–5 cubs for wild brown bears in Karelia and other parts of European Russia. In Estonia, wild young female bears gave birth to 1–2 cubs, while older females gave birth to 2–3 cubs (Kaal 1972).

Among 154 records of wild litters of newborns in Estonia, 19% of the females had 1 cub, 62% had 2 cubs, 17% had 3 cubs, and only 2% had 4–5 cubs/litter (Kaal 1972). Potential fecundity of European brown bears is

low, but actual fecundity in brown bear is higher than in the polar bears (*Ursus maritimus*). In comparable conditions in captivity, the average litter size was 2.5 (SD = 0.09) in brown bears (52 litters) and 1.8 (SD = 0.06) in polar bears (50 litters), for many years of observations.

Pregnancy in bears began with a long delay between coitus and the implantation of the blastocysts. Of 15 records of observed copulation in captivity with known dates of the first day of coitus and parturition, the average gestation period in brown bears was 221 days (range 174–257). Among captive polar bears (50 litters), the gestation period averaged 244 days (164–294).

Observations of captive brown bears revealed other reproductive features. Captive brown bears copulated over a long period. However, a limited period for parturition appeared common for this species. In 52 observed matings, copulation was observed in May, June, and the beginning of July. However, parturition almost always occurred in January, with only 4 cases (7.7%) during the second half of December. Parturition appeared independent of dates of copulation and of environmental temperature in summer–autumn. Thus, the gestation period was determined by dates of copulation of females: it was shorter for later dates of copulation and longer for early dates (Table 1). Copulation near the end of the breeding period in July also tended to result in smaller litters (Table 2). This observation did not appear to be related to the age of adult female bears. Apparently, follicular activity of the ovaries declined in July, and copulation during this month was accompanied with a decrease of fecundity.

Litter size and sex ratio on newborn cubs are major components of the demographic structure of natural populations and the dynamics of their populations. Our data indicated that among newborn cubs in dens, the average sex ratio is nearly 1:1. Among 83 newborn brown bear cubs from 33 litters, 43 were males and 40 were females. The sex ratio was similar for 12 litters reported from the

Table 1. Relationship between gestation period of 15 captive brown bear females in Russia and dates of their copulation ($n = 15$).

Dates		Number of litters	Average gestation period in days (SD)
Copulation	Parturition		
5–31 May	2–25 Jan	7	240 (1.05)
10–23 Jun	18–22 Jan	3	218 (3.78)
3–7 Jul	25 Dec–31 Jan	5	195 (6.12)

Table 2. Relationship between fecundity, sex ratios of litters, and date of copulation for captive female brown bears in Russia.

Month of copulation	Number of litters	Total cubs	Mean litter size (SD)	Males (%)
May	7	19	2.7 (0.2)	57.9
Jun	3	9	3.0 (0.0)	55.6
Jul	5	11	2.2 (0.2)	18.2
Total	15	39	2.6 (0.15)	46.2

Kiev Zoo, with 16 males and 18 females among 34 newborn cubs (T.G. Kachan, as cited in Pazhetnov [1990]), Similarly, of 322 newborn cubs at the Leipzig Zoo, 163 (50.6%) were males (Pulliainen 1972).

The copulation period, which is determined by the bear's physiological state and by climatic factors, apparently influenced the sex ratio of newborn cubs (Table 2). In both captive brown and polar bears, copulation at the end of the breeding period resulted not only in decreased fecundity, but also favored females in the sex ratio in litters (Tumanov 1991).

Brown bear cubs born in captivity weighed 397–520 g. They were born blind, with closed ears, and were covered by thin whitish hair 2–3 mm long. By 10 days of age, pigment was noticeable in claws and hair, which was

light brown, dense, and soft. A white throat spot was often strongly pronounced by this period, although it disappeared after juvenile molt, which began at 2.0–2.5 months and ended by 5.0–5.5 months of age.

Eyes of brown bear cubs opened in 30–35 days, and ears opened 2 weeks earlier. At the age of 1 month, young bears could barely stand on their feet, and they defecated only when the mother promoted the release of feces by licking the abdomen and anus. Cubs defecated without help when 1.5 months old.

Canine teeth also appeared in cubs at 1.5 months of age, when active tooth formation began. By 3.0–3.5 months of age, young bears had a complete set of juvenile teeth. In June these juvenile teeth began to be replaced by permanent teeth.

Two-month old bear cubs were very playful and active. By the age of 3 months they left the natal den with their mother. At this age, cubs could rapidly run, climb, and dig and readily ate new grass, berries, carrots, and plant roots. However, after they left the den, the young bears still continued to suckle their mother for another 2.5–3 months. Lactation usually ended in August, following a nursing period of 5–6 months.

After leaving the den, the young bears grew rapidly. This rapid growth was apparently connected with their transition to additional sources of food. Their body weight increased nearly 1.5 times between the age of 3 and 4 months. During these months the rate of daily weight gain was highest (Table 3).

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Table 3. Average body weight (kg), daily weight gain (g), and length (cm) for 4 brown bear cubs born in captivity in Russia.

Age months	2 Males			2 Females		
	Body weight	Daily weight gain	Body length	Body weight	Daily weight gain	Body length
Births	0.49	–	24	0.47	–	23
1.0	1.8	44	39	1.6	38	37
1.5	2.6	53	47	2.2	40	42
2.0	3.5	60	51	3.1	60	47
2.5	5.0	100	59	4.2	73	52
3.0	6.6	107	64	5.8	107	58
3.5	9.2	173	70	7.8	133	62
4.0	11.3	140	75	10.0	147	68
4.5	12.9	107	81	11.5	100	73
5.0	14.2	87	90	12.8	87	82

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