

Polar bear Cora has reared her second set of twins

Brno Zoo's female polar bear, Cora, has successfully brought two sets of viable twins into the world, and has carefully raised them. The first twins were born in 2007, the second in 2012. One male from the first litter now lives at Prague Zoo, and the other at Gelsenkirchen Zoo in Germany. From the second litter, the female left Brno in April 2014 for Rostov-on-Don Zoo, and the male will be leaving in the summer of 2014 at the latest, though no home has been found for him yet. The natural rearing of four polar bears can be said to be the greatest success Brno Zoo has achieved in recent years.

Any attempt to breed polar bears in captivity places increased demands on animal keepers. The desired result – the successful raising of young bears – happens a lot less than one would like. European and worldwide statistics show that, on average, fewer than 8% of bears born in zoos live to one year of age. In the history of Czech and Slovak zoological gardens, 132 polar bear births have been recorded from which only 15 cubs lived to be one year old, so approximately 11%. The real percentage is probably lower because, for example, it seems that several still-born young were not recorded. We believe that the breeding success of polar bears is not markedly higher even in the wild.

The difficulty of raising polar bears in captivity arises from the high cub mortality rate in the period just after birth. Cubs are often still-born. Others are not capable of looking after themselves, lacking the strength to find their mother's teats and therefore failing to drink the colostrum-containing substances which give them bacterial immunity. The situation can be worsened by the inexperience or illness of primiparous females during milk production. Once a cub has been accepted by its mother and has started drinking milk, its chances of survival are far greater. During the monitoring of world zoo populations from 1980 to 2011, success in raising such cubs usually ranged from 20-35%, only exceeding 50% very occasionally. For two years, the success rate climbed to 75%, but these were isolated events.



Cora, the female of polar bear, with her twins in March 2013

A brief look at the biology of the species

Polar bears are endemic to the coast of the Arctic Ocean and adjacent frozen areas upon the ocean surface. The southernmost place where they reproduce is James Bay, at the south-eastern end of Hudson's Bay in Can-

ada. The species is found on the territory of five countries: Denmark (Greenland), Norway (Spitsbergen), Russia, the United States (Alaska), and Canada. The current wild population is estimated at 25,000 individuals.

Reproduction is a very idiosyncratic process in polar bears. Young bears are born at the end of November or in December in dens

built by their mothers under thick layers of snow. They wait until March or April to leave their winter shelter. Male polar bears and females with young adult cubs or without cubs are active and hunt even in the winter. However, after giving birth, females with young cubs devote themselves to nursing their offspring, spending the whole winter without eating. Before giving birth, the females have only a couple of months in which they can sufficiently feed themselves to create a fat supply within their body that then serves them as enough of an energy source to survive the winter, and bear and rear their young. Before they retreat into their winter shelter, they increase their average body weight by about 40% (around 200 kg), and then live off this energy supply in their den for three or four months while they nurse the cubs.

When breeding polar bears in zoos, it is necessary to reproduce as closely as possible the strongly ingrained habits of bears in the wild. It is crucial to enable the female to eat as much as she needs in order to reach a high body weight in the prenatal period. This extra feeding starts at the end of May and finishes at the beginning of September. The female is unable to add weight later.

Our polar bears, which we keep together except during the final stages of pregnancy and subsequent nursing, are fed during this period *ad libitum*. In other words, they are given more food than they consume. The majority of their diet is made up of some type of flesh (most often beef, horse meat, or fish) and fish fat, which our bears prefer above all else. This is supplemented by fruit, vegetables, yoghurt,

and bread. This does not represent their natural diet, however, which can only be partially provided to them here in the Czech Republic. In the wild, polar bears mainly hunt seals. They eat the fat, skin, and internal organs first. The females leave the meat for their cubs. During the summer, polar bears get by on carrion from walruses, whales, and other animals. They also eat seaweed and, in tundra regions, various roots and berries. Sometimes they catch land mammals for food.

A female must have a sufficient store of subcutaneous fat before retreating to her den. At that time she is no longer taking food: Remnants of undigested food would have a toxic effect upon her, as her physiological processes are suppressed while she is nursing in her den. An empty digestive tract is also a guarantee that the area where the female will nurse her young will not threaten the cubs with infection from her waste. The change in feeding regime must not be sudden, and so the zoo begins lowering the amount of food provided to pregnant females from the beginning of autumn, when perhaps two months still remain before the birth. Unfortunately, though, heavy feeding is not enough to guarantee successful breeding.

The breeding pair

The parents of the four successfully raised polar bear cubs arrived at Brno Zoo at the dawn of the new millennium to found a new breeding line. The female, Cora, was born in 1998 at the zoo in Saint Petersburg (previously Petrograd and later Leningrad), where she was reared naturally. Her mother, Usladi, came from Moscow

Zoo, which is famous for successfully raising polar bear cubs born to parents caught in the wild. Cora's father, Meshnikov, was born in the wild.

Cora's partner in Brno, Umca, was born in Almaty Zoo (previously Alma-Ata) in Kazakhstan in the same year as Cora. He was nursed partly artificially: At the age of three months, his keepers took him away from his mother and fed him themselves. Many experts reject this artificial feeding of polar bears and other zoo animals. It must be said, then, that Umca is an example of how even an artificially reared male can breed successfully.

Although even animals living in the wild, including polar bears, can in rare cases display fixed stereotypical movement behaviour, it seems that artificial nursing can contribute to its development. A mother bear would normally feed, play with, and look after her young almost round the clock. A young animal without a mother is more likely to develop stereotypical behaviour. Umca was unable to rid himself of this completely even after his arrival in Brno as a ten-month-old cub, when keeper Jaroslav Jasinek devoted a great deal of time to him in the enclosure, playing with him and keeping him busy.

The first Czech twins

Umca and Cora mated for the first time in 2003, and again in 2004. The first mating to bear fruit took place in 2005, when Cora gave birth to two cubs which died shortly afterwards. The same occurred in 2006. However, at that time an important event occurred in the lives of our polar bears: They were moved from



Cora, the female of polar bear, with her twins in May 2013



Polar bears twins in May 2013

a cramped, small enclosure next to the veterinary hospital to a larger, natural enclosure which had originally been designed for our polar bears but which until then had been inhabited by brown bears. On 23rd November 2007, Cora gave birth for the third time, bringing two female cubs into the world. These became the first successfully reared polar bear twins in a Czech zoo.

After this, the zoo lived in hope of further babies, but it became apparent that the breeding of polar bears really is beset by numerous obstacles, and the experienced mother suffered a series of setbacks. Her twins left for another zoo in January 2009, and Cora didn't get pregnant again that year. A year later, in 2010, she gave birth to one cub, but it only lived for two and a half days. She looked after it the whole time until it died, after which she ate it, which is what normally occurs in the wild. In 2011, she had two cubs, but one was stillborn and the other died several hours after birth. The mother tried to look after them for half a day longer, and then ate them both. Our keepers discussed the reasons for the apparently mysterious lack of success, and searched for a way out of this blind alley.

The end of long-range immobilisation for the male

In the years following the departure of the first successfully reared twins, Cora also began displaying stereotypical behaviour. It started at the end of the summer and mainly involved her spending most of the time in the pool, where she repeatedly performed the same movement,



Cora, the female of polar bear, with her twins in August 2013

something like a backwards roll. This caused her to scrape her body on the pool bottom again and again until a small bald spot appeared on her back. Various means were employed to distract and entertain her, but they only had a short-term effect. We believe that a feeling of monotony negatively influenced her feeding, and at the start of winter it was even possible to see that she had lost weight.

One of the reasons for this unnatural behaviour may have been the presence of Umca. In the wild, males and females only meet during the mating period. When autumn arrived, Cora may also have remembered that when she was heavily pregnant we shut her in her sleeping facilities (den). We always used to shut the female in the birthing room before an expected birth as, in the wild, female bears spend the winter in a space formed underneath a layer of snow and connected with the surface only by a narrow breathing passage. They maintain a comfortable temperature in this chamber through their body heat and breath. Even though the temperature outside may be way below freezing, it rarely dips below zero inside the den. Cora really didn't like being locked in and, both at the beginning and the end of her stays there, she tried hard to get out.

Before shutting Cora in her den, we had always moved Umca to a separate animal-keeping facility. He didn't benefit from being regularly moved away and back, partly because it was necessary to use long-range immobilisation to put him to sleep. The zoo therefore decided in 2011 to invest a relatively large sum of money in building a separate enclosure where Umca is away from zoo visitors. During Cora's pregnancies in 2011 and 2012 and the subsequent nursing of her cubs in 2012, Umca was in the separate enclosure. Each time, a drop in his

stereotypical behaviour was noticeable, and Cora's stereotypical behaviour also disappeared: Instead of spending almost all day doing rolls in the pool, she lay on the ground, relaxing.

Cora's resistance to total isolation in her den during the winter came to a head in November 2012 when she was preparing for her second successful birthing of twins. She resolutely refused to enter her den. All tries at tempting her inside ended in failure. We therefore decided to leave the door leading from the enclosure to her den open, even at the cost of later falls in temperature inside. In November 2012, the average temperature in the den fluctuated around 5.5°C, while air humidity was around 80%, varying only slightly. During nursing, we were unable to measure the temperature and humidity within the den, and could only monitor the development of the young bears via a web camera. The temperature in the den only noticeably fell below freezing in the area close to the exit leading to the enclosure, making it clear that the female bear is able to create sufficient thermal comfort for her young with her own body heat and breath. During the first phase of nursing, the camera showed that Cora was lying on her side with her back turned towards the exit in order to protect the cubs she was holding on her breast from draughts.

For monitoring the development of the young bears, the pictures and sound transmitted from the birthing room via a web camera capable of filming in the dark proved to be indispensable. Although the camera can't capture the nursing of newborn cubs (the mother covers her babies with her front legs), it can transmit the voices of the infant bears during the early phase of nursing. Cubs emit a typical sound while suckling which reminds some listeners of pumping, and others of a running motor. We

can determine the number of feeds and their intensity from these sounds, and also ascertain the cubs' degree of satiation from their voices after feeding.

Another successfully raised set of twins

On 24th November 2012, Cora gave birth to her second viable set of twins. Her first cub came into the world in the outdoor run. The mother bit through the umbilical cord, ate the placenta, and, at 14:36, brought the cub into the birthing room in her mouth. The second cub was born in the birthing room an hour and a half later. (Of course, the mother bit through the umbilical cord and ate the placenta this time as well.) At the beginning, the baby bears gave out cries almost continuously, and their mother looked after them very intensively right from the start.

Female bears have two pairs of functioning teats. One pair is on the breast, so the mother can use her forelimbs to keep the cubs warm while feeding; and the second pair is at the lower part of the rib cage. At the start of nursing, females prefer to use the breast teats because they can provide greater thermal comfort to their young. After several weeks, it is more common to see one cub at each pair of teats while their mother lies on her side. Later still, the female starts to nurse while sitting, hugging her young with her back resting against the walls in a corner of the birthing room. Like that of marine mammals, polar bear milk contains an unusually high amount of fat (33%). It thus has amazing nutritional value even when drunk in small quantities, and requires less water for its

production. This is very important, as the female hardly drinks during nursing: She has minimal water requirements and, on average, drinks only once every several days. (Cora didn't drink until the third day after giving birth.) However, it is crucial for polar bears to have access to water even during winter. In the wild, the female gets water from the walls of her den. (In February, we often saw Cora leaving her den to lick up snow.)

Young bear cubs spend the first weeks of life at their mother's breast. She lies on her side and they are able to drink milk in small doses with breaks between feedings. While suckling, they emit a characteristic sound, as mentioned previously. The period during which they drink ranges from only a few minutes to an hour, but generally lasts from 30 to 60 minutes. During this period, sometimes the cubs drink together and sometimes they take turns. Determining which of the cubs is drinking, and for how long, isn't possible. Suckling is followed by breaks of varying lengths during which the cubs sleep or move around their mother's body. These rest intervals between feed times last from approximately one to four hours. The number of feeding times varies from 8 to 17 per day, averaging 13, with the most regular intake of milk usually occurring around midnight. The cubs suckle even when their mother is asleep. The female often moves during nursing, causing the cub to fall from the teat. It then expends great effort in regaining its lost position, emitting disgruntled shrieks all the while.

The nursing female massages her babies' stomachs by licking them, and does this more and more thoroughly as they grow. For the first month of their lives, bear cubs are blind and deaf. We first saw open eyes in the fifth week

after birth, though it is possible they may have opened their eyes earlier. The uncertainty is due to the low resolution of the portable camera system. After a month and a half, cubs are able to find their way around and follow their mother. The more they grow, the more of a handful they become. They are almost constantly active, and their mother needs the patience of a saint.

After two months spent in the den, Cora started to appear in the open exit to the enclosure and to view the surroundings. She was fed for the first time on 14th February, when we threw two apples, two carrots, and a mackerel into her den through the ventilation shaft. At the beginning of March, she was already taking her cubs for short walks around the enclosure. (In the wild, young polar bears also crawl out of the den onto the surface for short periods to get used to the light and outdoor temperature.) Zoo keepers first entered the den with a vet in order to vaccinate the cubs on 4th April after removing Cora to a neighbouring sleeping area. It was then that they discovered the sex of the twins.

The parents will be together once again

After the young female has left for Rostov, Cora will remain in the enclosure with the male twin until it is also time for him to leave for another zoo. After that, we will close the exit from the sleeping quarters to the separate enclosure. Umca, who has never seen the twins he fathered, will return to Cora's enclosure to be reunited with her and continue fulfilling his duties as a partner.

Ing. Miloslav Walter,
Keeper



Polar bear twins was in April 2014 almost as big as their mother (middle on the photo)