

Breeding of Bactrian Camels in 1997–2007

The domesticated form of Bactrian camel (*Camelus ferus f. bactrianus*) belongs among the most frequently bred and in zoos favourite animals. Visitors could see them in our zoo, in fact, for the whole period of its existence. In 1997–2007, thirteen young Bactrian camels were born at the Brno Zoo, of which three died. Three females were involved in the reproduction process. I have participated in all the above-mentioned breeds and I would like to point out in this article that specific breeding principles must be followed for successful development of a new individual of this species. Even if it is often contrary to traditional opinions of endurance of Bactrian camels and of the fact that they are creatures which withstand everything, actually, care of them is not easy at all in the wet climate of Central Europe and often in other parts of the world either.

Sexual Maturity

Bactrian camels sexually mature quite early. Females usually mature between the second and the fourth year – males in Brno never began to be interested in females before their fourth year of age. The first male rut occurs at the age of three and the full sexual activity starts from 6 to 8 years of age and the full bodily maturity comes even later. Females sexually mature at the age of 4 or 5 and they attain full bodily maturity around the age of 8.



Mother lifts the young one



Birth of Bactrian camel

Generally, if camels are engaged in reproduction too early, growth of females stops and viability of young ones decreases. An example of early engagement of a female in reproduction is female Sulika. It delivered the young at the age of three for the first time and its young (small female Sára) was too weak and had to be artificially bred. In nature, the engagement of young males is prevented by a dominant male, in captivity, a male must first gain recognition, only then it is allowed to mate. Sexual dimorphism of camels is less obvious. Males are usually bigger, their constitution is mostly stronger and their skeleton more robust than that of females.

Rutting and Mating

Mating season proceeds from January to June in the southern hemisphere, where people brought camels at the end of the local winter and at the beginning of spring, i.e. from June to September. It is markedly seasonal. A female's mating invokes a male's mating. If one male starts mating, it stimulates its start at the other males. If we separate the first male, the manifestation of mating stops in the others as well.

Females tend to mutually synchronize their mating and to whelp at the same period. Sexual cycle takes from 2 to 4 weeks and the period of rutting ranges from 2 to 8 days and its intensity is changeable. Younger and well fed female camels have usually a shorter and more intensive rutting; old females have a long and non-distinct one. Rutting is more clear-cut in colder weather and it stops in hot days. After delivery, females began to rut in 2 or 3 days, but our male mostly couples with them immediately after giving birth to the young ones (without fertilizing them). Similar phenomenon can be observed with llamas.

Strong female rutting shows with a higher irritability, unrest, mutual smelling and congestion of outer vulva. Females prepared for mating lie down

on the ground next to the male. Male rutting is more dramatic. An animal calm for most of the year becomes irritated and hard to be controlled. Some males become strongly aggressive and must be separated from the herd and people. A rutting male often waters standing with its legs widely apart and swishing with its tail to its foreskin to be able to spray urine over the body and its surrounding. The occipital gland is active during this period and secretes plenty of a smelling secretion, which is spread on the hump and surrounding objects. Testicles enlarge their volume. Males often slaver and grit their teeth, show part of velum from the mouth cavity in the form of inflates vesicle and produce rattling sounds. Otherwise quiet creature may also often groan or weep. In nature, fights that may end in death of an opponent occur. Males try to mutually bite their front parts of the body and legs and they often kneel on the ground half suffocated. If a male has no opponent in another camel, it may turn aggressively against a different animal or a person. A slow camel may become dead fast in rutting. According to witness of my colleagues, our previous male killed a hare which strayed to the exhibit. Even cases of killing people, whose skulls were bitten through by an aggressive camel, are known.

Camels copulate lying. A male chases a female and forces it to lie down by biting. Our male chases only young females to control their behaviour according to its ideas – but it never copulates with them. Copulation is always carried out in quiet with an experienced female. It lies down voluntarily and a male straddles on it during the act, which usually lasts from 4 to 20 minutes. Male rutting takes from one to four months and in nature it often ends in full physical exhaustion. A male in rutting reduces intake of food and fully concentrates on guarding the herd. In captivity, it only eats a little of hard fodder and it lies down while gritting its teeth.



Other members of the herd smell the new arrival

Gestation, Delivery, Fertility

The duration of gestation is given differently by different authors and it ranges from 12 to 14.5 months. Female camels always have a single young; twins were not observed.

The first indication of a coming delivery is usually the enlargement of the mammary gland. It is obvious on our females several weeks before delivery. Another indication is usually an enlarged vulva. But this symptom is not completely reliable with camels. The most reliable symptom for the keeper, who knows animals well, is abdomen which markedly subsides two or three days before delivery as ligaments release. On the day of delivery, the female does not eat and keeps away of the herd. Opening of vulva may take several hours and the female camel restlessly walks, alternatively lies down or stays on one place. Expulsive stadium usually takes 10 to 35 minutes. Front legs appear in the opening of the birth canal. At this stage the female nervously walks around the exhibit and groans. Gradually, further parts of front legs come out, they break foetal membranes and a head appears and the young takes a breath for the first time. A female lies down now and then, but when a keeper approaches, it stands up and goes to a different place. In the end, it stays lying and starts pushing. At this moment a keeper can come to it and help her take the young out. When it is all out, we have about a minute before the mother stands up and approaches the young. During this minute we can clean the young off foetal membranes (a female has never actively cleaned the young). At the same time, we may determine sex of the new individual. At the moment when the mother is standing up and approaching the young, it is better to give away, let mother be alone with its young and not increase its nervousness. The born young weigh from 30 to 45 kg.

In an ordinary cycle, female camels deliver one young every second year. The reason for the long generation interval may be the start of the

lactation period (the absence of rutting), which enables to extend the period of lactation to 18 months. Despite this fact, a male couples with the female immediately after delivery. This phenomenon is characteristic of all family of Camels. If the young dies or abortion incurs, the female becomes pregnant again and another small camel is born next year.

Camel Milk Composition

Mammary gland is situated in the pubic area. Milk is clear white, dense, sweet and salty and by one third fatter than cow milk. Data on its composition differ according to the breeding areas. In the Czech Republic it contains from 3.5 to 4.6 % of proteins, from 3.6 to 6 % of fat, 5 % of lactose, 0.8 % of ash. There are vitamins A, C, B1, B2 and B12. The level of acidity (pH) remains stable during the first three days after delivery, which is attributed to a higher bactericidal power of milk.

Natural Breeding

The goal of every keeper should be the natural breeding, when mother itself takes care of the young since its birth to the weaning.

A female camel stands up immediately after delivery, approaches the young and thoroughly smells it. The mother does not clean or lick the young. It stands above the young and waits until it stands up by itself. If this period takes too long, it may try to stand it up by trying to catch it for the head or back by its mouth. From outside it seems as if it bites it. The same activity may be done by the male. It is stated that the young gets up approximately after 20 minutes, but this period differs a lot. Only really strong young will get up in the given term and only in an ideal weather and suitable ground surface. In other cases, this period takes longer, often even half of a day, and depends on factors such as the young's sex (young males stand up faster), cur-

rent weather, the ground surface, the female's experience or stress. When the young stands up, it tries to find the udder. The search may take many hours and is usually accompanied with many falls. Its duration is governed by the same factors as in case of standing up, however, mainly by the female's experience. The first drinking may thus incur not before several days. It is ideal if the female delivers separated from the herd under a shelter with dry bedding. It eliminates most complications during the development of the young.

Female camels are usually careful mothers for several first days or weeks. A mother lets the young to be smelled by the other members of the herd, which, by doing so, accepts it to the group, but its alertness does not weaken and it watches over the young all the time. If we want to perform any treatment on the young during this period, at least three people must participate in it. The first person keeps the young, the second carries out the treatment and the third one drives off the female. The other members of the herd do not protect the young. After several days, the mother's alertness usually weakens and it allows the young to be manipulated with. Intensity of the mother's behaviour is individual. Sulika lets the young to be handled with mostly without problems; Izis took away its young even after a year.

Frequent and differentiated voice communication is developed between the mother and the young one. Since the first moments, the mother emits growling sounds which are answered by the young. It uses them, e.g. when it wants the young to drink and the young is lying or is interested in a different activity. It also calls it in a similar way or takes it away. If we catch the young, it starts emitting loud bleating sounds by which it quickly calls its mother. When we separate the mother from its young, they both emit loud guttural lowing spreading to the distance. Voice communication between the mother and its young is the most intensive in the morning and before suckling. If



Mating immediately after the delivery

a mother wants to take the young somewhere or direct it, it uses its body: it tries to push the young in the demarcated direction.

During delivery in the middle of the herd, the mother is not usually disturbed. Young females are sometimes curiously watched by males. When the young is born and stands up or it is released to the others for the first time, the entire herd comes to curiously smell it. The acceptance to the herd usually goes smoothly, only some young females hustle the young ones of other mothers. A male takes a protective attitude towards the young. It stays close to the mother and the young and it often softly smells it. Young camels in the herd like playing with one another.

The young should drink foremilk as soon as possible, as it is the source of necessary antibodies. The period from the first suckling differs a lot. Only a strong young of an experienced mother drinks within 30 minutes after birth. This period is usually much longer and corrective measures are necessary. Young ones in some zoos automatically get an injection of antibodies preventing the occurrence of an infection. The young then stands up much faster and starts drinking. In most cases the young „joins“ after two days and starts suckling. The frequency of suckling is the highest in the morning. The female camel calls the young to drink because milk pinches it. Lactation takes to the 18th month when the young camels are naturally weaned before the next delivery. As maturing young camels have always been weaned in our zoo in time, suckling of more young ones from one female has not been observed. But it is quite frequent phenomenon in other zoos. For example, the Prague Zoo experienced the case of suckling of three weaned young camels from the female which had another new young. Cases of drinking of adult females from lactating females are known as well. We have not observed this phenomenon in Brno.

Breeding with Additional Feeding

Although our primary task is to breed young camels naturally, the keeper's intervention may be sometimes necessary. Young camels are in the beginning often unable to accept mother's milk due to various reasons. In such case we can either separate the young and feed it artificially, or we start giving it additional feeding directly in the herd and wait until it „joins“ and gradually starts accepting the mother's milk.

Young camels quite often do not drink the foremilk at all for the first twelve hours, therefore they miss protective antibodies. Energy resources the young is born with are sufficient for it to survive for three days. Natural breeding is always preferred and the young mostly starts drinking within two days. But if it is necessary to give the young additional feeding or breed it artificially, the sooner we start the better. Making a decision, whether to intervene in the breeding or not is very difficult.

Despite this fact there were situations, when we decided to start with additional feeding. It is the first step to follow in case that the young either



Izsis with her daughter April (April 2006)

does not drink or drinks little and is weak, or other health complications incurred. We tried to use the option of artificial breeding only as the third step, when the condition of the young started getting worse. Unfortunately, it is the general truth that if the young exceeds certain threshold in its weak state or exhaustion, a correction is very difficult, or even impossible. It is very difficult to state this threshold. Therefore the decision to take the young born on 6th April 2004 from its mother was made too late and we did not manage to rescue the young camel. If it is necessary to intervene in the natural breeding, it is more suitable for additional feeding to place the mother with the young outside the exhibit in a calm and dry shelter. Additional feeding of the young one in the exhibit is suitable only in favourable and especially dry weather. Unless these conditions can be met, it is better to separate the young from its mother, bring it to a dry place and start artificial breeding.

Depending on the type of problems, we encounter breeding with additional feeding may be carried out in three ways: 1) additional feeding from the mother after its fixation, 2) additional feeding from a bottle directly in the exhibit in the herd, 3) additional feeding from a bottle outside the exhibit – the mother and its young are separated from the herd. The first method is used, when the mother is inexperienced and is not able to give the young drink, although it has enough milk. This was the case of Izsis, who had to be fixed and the young had to be brought to her to learn to drink. It started drinking alone after three fixations. The second method, which we used twice, is suitable only when we have no possibility to separate or fix the mother with its young. Disadvantage is that the

mother and the young are disturbed by the other members of the herd. Disturbing influences may come from the surrounding and both of them must withstand unfavourable weather. The third method is of course suitable for most situations. A shelter with dry bedding separated from the exhibit prevents the occurrence of most complications and helps the mother to establish necessary contact with the young.

During additional feeding with fixation of the mother, the female must be strongly tied up, preferably in a small space (a fixation box). We had only a widespread exhibit without a separated yard and a separating device. We forced the mother to the corner of the exhibit and enlaced it with a band in the area of connection of legs to the body and pulled it to the fence. Then we attracted the young. To calm the mother down it is suitable to pull a non-transparent breathable bag over its head. As the udder is usually very full and sensitive of touching, it is suitable to milk the female first. Two keepers keep the young camel during attaching. When the procedure is repeated, the female camel adopts and resists less. At least two people are necessary also for additional feeding by warm milk from a bottle in the exhibit – someone must watch or drive back the mother, which usually does not like handling with its young one. The young camel learns to accept milk from a bottle and it comes to the fence alone to drink. Bigger plastic vessels with a rubber mouthpiece used in calf sheds are suitable for feeding the young one. Additional feeding outside the exhibit, when the mother and its young are separated from the herd, is the most suitable and the least hazardous and stressful for the mother. The probability that the

young will start suckling alone is the highest. Reasons for additional feeding of the young are as follows:

1. The young is born weak and is not able to drink alone. The mother has enough milk and wants to suckle the young.
2. The young has a health handicap which does not allow it to suckle milk. (It is usually the bruised gums after the mother's attempts to lift the young.
3. The mother has little milk and the weak young needs to be supported before it starts eating coarse fodder.

In practice, combinations of these reasons often incur.

During additional feeding, when the ability of the young to accept mother's milk is temporarily blocked, we offer only such amount of milk which does not cover the total need. Otherwise the young would lose the stimulus to search milk at its mother. We perform additional feeding in long intervals (three to four times a day) and with a limited amount of milk. If the young can not suckle from the female alone or if the female camel has no milk, we start artificial breeding.

Artificial Breeding

Artificial breeding is a very serious intervention in the life of the mother and its young one. A person usually takes the young from its mother and suckles it by himself. Artificial breeding may be carried out in the presence of the mother but because it does not participate in its feeding, relationships between the mother and its young are interrupted and the young starts to fix on the person feeding it. This phenomenon is often used in circuses or at private keepers. A zoo should use this method only in a rare case.

During my work in the zoo, we have not carried out artificial breeding, or it failed, because we started late with it (the below given case of Sara female camel had happened before I came to the zoo). Despite this fact, we could use it in justified cases, because practice has proved that the ar-

tificially bred young ones are able to join the herd and successfully participate in reproduction.

If we omit the effort to have a fully contact animal used to the presence of a person, reasons for artificial breeding are as follows:

1. The mother has no milk.
2. The mother has milk but refuses to suckle the young or attacks it.
3. The young can not suckle from certain reason, it can not stand up and it is ill or injured. (In case of a health handicap, its seriousness must be evaluated and only temporarily handicapped young ones shall be taken for artificial breeding. Permanently handicapped young ones should be excluded from breeding.)

We fully replace the mother to the young during artificial breeding. The young camel must be placed in a dry and warm place. The quantity of the given milk must fully cover the need, its composition must correspond with the given species and it can not be changed during breeding. If artificial breeding starts immediately after birth, we have to supplement foremilk to the young as well. It can be gained by milking the female camel; cow foremilk can be used as a replacement. Immunoglobulin can be administered by injection. Milk shall be delivered heated to the body temperature. The young should have coarse fodder available from one week of age, preferably hay, which it gradually starts eating. Artificial breeding takes at least three months (so that pre-stomach is sufficiently developed) and hygiene and cleanliness must be strictly followed for the whole period. As soon as the young learns to drink well and by itself, it should return to the herd so as not to interrupt its relationship with its members.

Artificial Breeding of Sára, the Female Camel

Breeding of the female Sára, which was born to Sulika on 15th February 1995, was successful. Sulika was only three years old at that time and its weak young one confirmed the experience that if the pregnant female is too young, it decreases

viability of the young. In addition, Sergej, the male, was father of Sulika and small Sára, which means a close family breeding incurred. At the same time, the one-year younger Fatima, the sister of Sulika, also delivered the young at the Brno Zoo, but it succeeded in its breeding. Sára had to be bred artificially. From 15th February to 19th February nobody saw that the young would drink and it got weaker for four days – which proved the high endurance of young camels. Artificial breeding started on 19th February: the young got milk five times a day in average: in three-hour intervals between 7.00 a.m. and 7.00 p.m. More sensitive animal species should be fed even at night in the beginning. It is not necessary for small camels. On the first day, the young drank 1550 ml of milk, on the second day it drank 2320 ml. Then the consumption increased every day up to the 37th day, when the daily consumption reached maximum – 9150 ml of milk. The stagnation followed and gradual decrease of consumption. Additional feeding was terminated on 19th May, i.e. after three months of breeding.

Conclusion

The Brno Zoo practices all three described kinds of breeding of camels, but it prefers breeding by mothers and in the herd. Keepers used to fix mothers and breed by additional feeding in the past. Artificial breeding as a border case was used, except for Sára, unfortunately too late and therefore it was not successful. This experience leads to my opinion that if we sometimes in future decide on artificial breeding, we must not hesitate and start as soon as possible. Artificially bred individuals are little bit less resistant, but can be used in zoos in all respects, they are suitable especially as contact and riding animals.

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Review of Bactrian Camel Breeding at the Brno Zoo in 1997–2007

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
♂ Abdul * 5. 4. 1992 Russia											
♀ Fatima* * 17. 5. 1990 Brno Zoo	2 nd young one* 28. 3. 1997 ♂ Udaj successful natural breeding		3 rd young one 25. 6. 1999 abortion	4 th young one 2. 3. 2000 ♂ Mrcousek successful breeding with ad- ditional feeding		5 th young one 29. 3. 2002 ♂ Mulisák successful natural breeding		Removal of a female to the Ostrava Zoo			
♀ Sulika** * 6. 3. 1992 Brno Zoo	2 nd young one** 5. 4. 1997 ♂ Omar unsuccessful artificial breeding	3 rd young one 2. 6. 1998 ♀ Lee successful natural breeding		4 th young one 7. 3. 2000 ♂ Holmes successful natural breeding		5 th young one 5. 3. 2002 ♂ Fénix successful natural breeding		6 th young one 6. 3. 2004 unsuccessful breeding with ad- ditional feeding, attempted artificial breeding † 11. 3. 2004	7 th young one 18. 4. 2005 ♀ Gája successful natural breeding		8 th young one 10. 3. 2007 ♀ Poly successful natural breeding
♀ Izis * 2. 6. 1998 Prague Zoo						1 st young one 26. 3. 2002 ♀ Anuket successful breeding with ad- ditional feeding		2 nd young one 22. 4. 2004 ♂ † 22. 4. 2004 death		3 rd young one 2. 4. 2006 ♀ April successful natural breeding	Tragic death of female after an injury

* 1st young one (♂ Harun) in 1994 with male Sergej – successful natural breeding

** 1st young one (♀ Sára) in 1995 with male Sergej – successful artificial breeding