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The Sumatran Rhinoceros – A Living Fossil near Extinction

Sumatran rhinoceros in the Cincinnati Zoo, 2000 *Photo by: Bohumil Král*

The nature of Southeast Asia stands out in high species diversity of both the plants and animals, with high percentage of endemic species. But the fast economical development in the last decades caused the broad part of the original ecosystems to be highly threatened. That may lead to a destabilization and depletion of the populations that are unique worldwide. It is not for nothing we classify the Southeast Asia as so-called "hot places", i.e. localities with high number of species that are immediately endangered by human activities and that do not occur in any other place of the world. Even despite the serious threat – thanks to strict protection – some states of this region as yet managed to preserve even such species in wild, which have already disappeared from other places of the original area. One of them is one of the rarest and oldest big mammals of the world – the Sumatran rhinoceros.

For a common man, it's hardly possible to see this animal in its natural environment, whether because of low number of specimens or because the rhinos live in a covert way of living. We can see little of them even at zoos. Except the Cincinnati Zoo, where they keep one male and two females, the Melaka Zoo in Malaysia with one female and the Bronx Zoo in USA with one male, we can't find them in any other zoo of the world! For those, who would like to see this rhino in its natural environment anyway and would not to like to rely on an accidental meeting in wild, there is a possibility of visiting some of the rescue centres, either in Malaysia or Indonesia.

Sumatran rhinoceros in the rescue station Sungai Dusun, 2001 *Photo by: Josef Suchomel*

The Sumatran rhinoceros *(Dicerorhinus sumatrensis)* is the smallest of five kinds of living rhinos. The length of their body is around 280 cm, the height around 110-140 cm and the weight varies between 800-1000 kg, even though we can find a female weighing 2000 kg in the literature. On the front part of their skull, the rhinos have one or two outgrowths that we call the horns. The Sumatran rhinos have two such horns and that's what differs them from the other two Asian rhinos, the Indian *(Rhinoceros unicornis)* and the Javan rhinoceros *(Rhinoceros sondaicus)*, who are monocerous. A typical front horn of the Sumatran rhinoceros is 15-25 cm long, but there is a front horn of the lenght 80 cm in the British Museum in London. The back horn is smaller; sometimes it is developed as a smooth rise. Another feature is a visible body hair, due to which the Sumatran rhinoceros may look like the Woolly rhinoceros, which is already extinct nowadays. The hair covers particularly the inner sides of auricles, back and legs. The measure of hairiness depends on individual variability. This kind is also phylogenetically the oldest one of all living rhinos. According to the newest research, it is the last living member of the ancient *Dicerorhinus* family, which appeared on Earth already in the end of early Tertiary, in the Oligocene, i.e. about 30 millions years ago. According to this, the Sumatran rhinoceros is often called a living fossil.

The Last Three Hundreds

Originally, this species was much more widespread than today and several of its subspecies inhabited the whole Southeast Asia, from Asam in India and North Vietnam all the way South to Sumatra and Borneo. Today, there are only few isolated populations left. The biggest of them can be found on the Malayan peninsula and on Sumatra, where 250 specimens of the nominotypical sub-species *Dicerorhinus s. sumatrensis* live. Therefrom about 100-150 specimens live on Sumatra, mostly in large national parks of Gunung Leuser (9000 km^2), Kerinci Seblat (15000 km^2) or Bukit Barisan Selatan (3300 km^2) and about 75-100 specimens live on the Malayan peninsula; the biggest population is in a unique national park of Taman Negara (4343 km^2). In Northeast Borneo, in the Malayan state of Sabah, there lives a smaller subspecies *D. s. harrissoni*, which is much rarer and its total number in wild is being estimated to only 30-50 specimens. Most probably, it is already extinct in the other parts of Borneo, i.e. in the Malayan state of Sarawak and Indonesian Kalimantan. Today, the last Borneo rhinos are centred mostly in the vanishing lowland forests around the Kinabatangan river and in the Tabin National Park (1200 km^2), which is isolated from the main forest parts by plantations of oil palms. Lately (May 2006), the scientists discovered tracks of thirteen specimens in the remaining continuous forest block in central Sabah; they even took a photo of one of them by a photographical trap. It was the first time ever on Borneo that this animal has been photographed in wild after many years of efforts, which is a proof of the very covered way of

living of the Sumatran rhinoceros. The central Sabah with an adjoining part of Indonesia is called the "Heart of Borneo" and it has an irreplaceable importance in preserving of the local ecosystem.

Except the populations mentioned, perhaps there even live some last specimens in India, Bangladesh and Burma. These are sometimes being classified in literature as members of a special subspecies *Dicerorhinus s. lasiotus*. According to the last estimates of the International Union for the Conservation of Nature (IUCN) and the International Rhino Foundation (IRF) from February 2005, there are not more than 300 specimens in wild.

The Sumatran rhinoceros lives lonely in both the lowland and mountain tropical rain forests, often near water. It can swim very well and it likes to seek for muddy places, where it covers itself with mud to be protected from bothersome insects. Each single animal has its own paths, which it regularly walks through. The male always controls territories of several females. The animals in the forest environment communicate by various loud noises and also by scent signals. Both the sexes mature at the age of about 7-8, when they firstly can join the reproduction process. The pregnancy lasts about 17 months and the females may have young ones only once in 3 or 4 years. The life length may reach even more than 32 years.

The Preservation Started Twenty Years Ago

The Sumatran rhinoceros is critically endangered for at least almost 30 years; it's the most endangered kind of rhino, together with the Javan rhinoceros. Destruction of their original habitats and illegal hunt for skin and especially for horns used in traditional Chinese medicine caused a drastic decrease of its population. We experience a very rapid decrease in the last decade, when the number of specimens fell by about 60%! Therefore the protection of the Sumatran rhinos has developed since the half of the eighties; all the states with still living populations in wild and also institutions breeding these rhinos participate in it.

Right from the beginning, the international cooperation outlined two main directions of the protection. The first is preservation of the species in wild, also called "in situ", using armed anti-poacher groups, so-called Rhino protection units (RPUs), established in 1995. The second direction is breeding and reproduction of the species in captivity, or "ex situ".

Optimal is the protection of the species in its original habitat, of course. The so-called RPUs programme is, and has always been, the most important part of the Sumatran rhino protection strategy. Most of the annual investments that are earmarked for this species protection (total about one million USD) are donated for this programme. Organisations dealing with the Sumatran rhino protection provide for its saving in wild five times as many funds than for the projects in captivity.

But many factors make the Sumatran rhino protection in wild very hard and problematic. As one of the examples may be mentioned the fate of the population in the beginning of 80's, i.e. in the beginning of the international protectionist cooperation; at that time, there still lived about 800-1000 Sumatran rhinos in wild. But at least 25% of them were doomed to die, because it was impossible to prevent their environment from destruction and there also were not enough means for protection from poachers. The unremitting increase of problems was caused by the rapid increase of the human population, same as the periodicity of the economical and political instability both in the countries, where the rhinos live, and also in other parts of the world.

Sumatran rhinoceros in the rescue station Sungai Dusun, 2001 *Photo by: Josef Suchomel*

From the beginning, the preservation strategy put stress also on the breeding in captivity programme, target of which was creating a reserve population that would serve as a policy in case of complete extinction of the quickly decreasing species. The saving programmes oriented on breeding in captivity often appeared as successful tools of protection for many other species. These are the shining examples: the Przewalski horse *(Equus przewalskii)*, the Arabian oryx *(Oryx leucoryx)*, the California condor *(Gymnogyps californianus)*, the Black-footed ferret *(Mustela nigripes)* and many other animals that escaped the complete extinction this way. Unfortunately, compared with the African black rhino *(Diceros bicornis)*, the White rhino *(Ceratotherium simum)* and the Indian rhino *(Rhinoceros unicornis)*, which are managed to be bred quite successfully today, the reproduction of the Sumatran rhino has still been mostly unsuccessful. Birth of a young one in Calcutta in 1889 became the only exception. At that time, it was the second birth of a rhinoceros in captivity ever! Now we may ask, if our ancestors knew the way of reproducing this animal (and they later lost this skill), or it was a mere chance; finally, the female could already be pregnant, when she got into the zoo.

The international programme of breeding in captivity practically started in 1984, when the first specimens, who had only small chances to survive in wild, were captured. They either couldn't be protected by available tools from actual threats of extinction (e.g. the total destruction of their forest habitats), or they weren't members of enough big and viable population (e.g. lonely specimens isolated in remaining fragments of forests). Until 1994, there were 40 rhinos caught on various places of Malaysia and Indonesia and then brought to zoos either in these countries or in England and USA, where they were significantly successful in breeding other kinds of rhinos.

Probably the Most Difficult Big Mammal to Breed

Unfortunately, the Sumatran rhinoceros proved to be probably the most difficult big mammal to breed in captivity. 23 of the total number of the caught rhinos died of various reasons, e.g. due to wrong feeding. Some females managed to get pregnant, but they have always miscarried. The only exception is a female that was born in the Melaka Zoo in 1987, but her mother was caught already pregnant. In 2001, only 17 animals, including the female from Melaka, of the 40 caught specimens were alive. Therefore the zoos

intensify their efforts of reproduction of this species and also increased the care of the animals to prevent them from further dying. E.g. they didn't hesitate, even despite high expenses, to transport suitable feeding from long distances. They were engaged in detailed and intensive research that provided information on a row of factors that retarded the successful breeding in the end.

The reason for the difficult breeding may be deduced from the species' biology laws. Strong and sometimes even fatal aggression of the males towards the females that disappears only during the mating season is only one of many difficulties of the Sumatran rhino reproduction. But it is very hard to recognize the suitable time to put a pair together. The thing is that the rut by the females doesn't show itself in any considerable way. In addition to that, the females have a provoked ovulation, i.e. it doesn't occur until the mating. Thus, it is impossible to use it for the rut diagnostics. In practise, the rut is controlled by the sex hormones measuring and also by monitoring the size of ovaries by the ultrasound scan. When the ovaries reach the maximum size and the hormones reach a certain level, the male is let over the female. But it is very important to exactly hit the right time. At the Cincinnati Zoo, female Emi and male Ipuka were put together one day earlier and they started to attack each other. But if the female ruts, both the specimens are usually able to hold back the aggression.

The reproduction complications are also caused by the specimen's health condition. A lot of females in captivity often have pathological changes on their sex organs and related reproduction defects. That's what Dr. Nan Schaffer, president of the SOS-Rhino organisation and a member of the Asian Rhino Specialist Group (AsRSG), was closely engaged in; she is a considerable expert in diagnostics of the pathological changes on sex organs of the Sumatran rhinoceros. She was the first to start using the ultrasonography for diagnostics in the beginning of the nineties. On the basis of the ultrasonography and the autopsy findings of the dead specimens, she found out, e.g. that at least a half of 15 females (of 22 caught in 1984) had pathological changes on their uterus. Schaffer registered that the defects start to occur by about ten years old females and dominate by animals older than 15 years. According to her, that's exactly one of the difficulties of the breeding: most of the remaining females in captivity represent an older group. Only 7 of the 12 monitored females in captivity have been mating lately and only three of them did not have any pathological changes. The changes occurred in various stages by other four of them. In addition to that, Schaffer expects that the condition of these females will probably continue to worsen. Thus the important aim is to correct the health condition of all the animals, which will be quite difficult. Schaffer sees a certain hope in the same research of completely different animals, namely domestic horses. It was established that the mares with slight pathological changes of the uterus are able to rut and consequently even reproduce, if the other important conditions are optimal.

Sumatran rhinoceros in the rescue station Sungai Dusun, 2001 *Photo by: Josef Suchomel*

Reproduction defects affect also the males in captivity. Dr. Schaffer, who is carefully observing their productivity, says the main defects are a low quality of sperm and an aversion to mate. She has also found a permanent aggressiveness towards females by one of the males (i.e. including during the mating season), which is reportedly caused by a long-standing stay in captivity. Schaffer thinks many problems could be solved by increased possibilities to mate.

After many unsuccessful attempts to rear a lineage in traditional conditions of classic zoos, the experts came to the conclusion that it is necessary to change the basis of the preserving programme in captivity.

Transition from Zoos to Rescue Centres

The changes aimed to enlargement of the animal's living space and return to wild conditions. That's why they moved most of the remaining animals from zoos back to the countries of their original habitat, where they have placed them into bigger controlled reproduction centres in the original surroundings. The centres of controlled breeding were built in the preserves of Way Kambas in South Indonesia, Sungai Dusun on the Malayan peninsula and Sepilok in Sabah, i.e. in the Malayan part of Borneo. These centres cooperate with the zoos and with each other, too. In the past, especially Sungai Dusun and Way Kambas cooperated, because both the facilities kept the same nominotypical form. The centre in Way Kambas keeps one male and three females today, but two of the females arrived in the second half of 2005 – they were moved from the endangered areas in the Bukit Barisan Selatan National Park. The centre in Sepilok keeps one male and one female today; it's the only breeding pair of the Sumatran rhinoceros in the world.

The End of the Biggest Breeding Group

The priceless Sungai Dusun centre was affected by an unexpected disaster in 2002 and 2003. By then, the centre was known for the biggest breeding group of the Sumatran rhinos in the world – originally two males and five females of the *Dicerorhinus s. sumatrensis* subspecies. But the rescue station in Sungai Dusun came to an end, because all the animals have died.

The male Shah was the first to die in the beginning of 2002. However, 2003 was disastrous. Everything started in April, when Rima, one of the females, suddenly died. The most probable cause of death was the tetanus. Rima was the mother of Minah, the youngest female of the group. The breeders caught already pregnant Rima in wild in the half of the eighties, but she spent most of the pregnancy in captivity. The worst came half a year later. At that time, between 28th October and 16th November, i.e. during only seventeen days, died all the five remaining animals! This loss is irreparable if only for the reason that all the animals were essentially healthy and suitable for the reproduction process. The females Minah (lately, she had the reproduction cycle restored), Panjang, Seputih and Mas Metan and the second male Ara have all died.

It still is not known, what exactly caused the tragedy. It could be either a virulent virus infection or some kind of natural toxin. The centre in Sungai Dusun had been breeding its rhinos in essentially good state of health for more than fifteen years without any similar incident ever. But it seems that the animals lately lived in unhygienic conditions after all, which the breeders and the vets might have underestimated.

An experts' team tried to avoid the deaths in every possible way. Dr. Mohd Aidi, curator of the centre, participated on the saving efforts together with a team of vets led by Dr. Wellayan from the Negara National Zoo in Malaysia. They discussed the strategy with, e.g. Dr. Robin Radcliff from the Fossil Rim Wildlife Center and Dr. Terri Roth from the Cincinnati Zoo. The rescue activities were coordinated by Dr. Mohd Khan, chairman of the IUCN/SSC Asian Rhino Specialist Group and chief of the Malaysian Rhino Foundation. Unfortunately, they did not manage to reverse the course of the disaster. Whatever has caused it, the end of the breeding group is a classic example of how vulnerable the small and isolated populations are. One and only disturbation in the shape of natural disaster or infectious disease is enough and an animal form or even a whole species may die out completely.

„Our knowledge have improved in many ways and started to bring certain successes during twenty years of studying and breeding this species in captivity" summarizes Dr. Thomas J. Foose, director of the IRF saving programme and he adds: „Unfortunately, it's true that the animals in captivity gradually grew older without taking part in the reproduction successfully in a way we expected. Growing older, they were getting less resistant to various diseases, pathological changes of their sex organs appeared more often, which is usual by this species. If a female doesn't take part in the reproduction for a longer time, there appears increased occurrence of tumoral diseases and other pathological changes on the reproduction organs. This may lead to a total infertility." In addition to these circumstances, small populations, either in wild or in captivity, are much more inclinable to accidental disruptions that may then lead as far as to their complete extinction, just as it happened in Sungai Dusun.

First Young Ones – Hope for Future

Despite the disaster that met the biggest breeding group, many experts are convinced that the breeding programme in captivity must continue in developing. It is necessary to try to create a viable reserve population that would be an addition to the main course of the preservation of this species in wild, because the hope for a successful reproduction has risen due to present knowledge. Therefore the breeding programme of the western subspecies of the Sumatran rhinoceros *(Dicerorhinus s. sumatrensis)* will continue at the Cincinnati Zoo and in the breeding centre of the Way Kambas National Park on Sumatra.

Despite the intensive efforts of many organisations, the Sumatran rhino's fate is still very insecure. The hope can be brought only by conservation of adequate number of preserves for viable populations in wild, their strict protection and also successful reproduction of this species in captivity. It is only to be hoped that this is going to happen despite the tragic events that happened lately. The breeding successes that the Cincinnati Zoo achieved after twenty years of concentrated efforts may be called a hope thanks to present experience and advanced knowledge of the reproduction biology. The breeding female Emi has given birth to two young ones in Cincinnati. Firstly, she dropped a little male on 13th September 2001 and the second time a female on 30th July 2004. These are the first young ones born in captivity since 1889. Let's stoutly hope they weren't the last ones.

Ing. Josef Suchomel, Ph.D.

Taman Negara National Park *Photo by: Josef Suchomel*