



Jiddah with Dzanty, 8 months old, born 26 July 2008 (dh)

Breeding the black rhinoceros at Dvur Kralove Zoo

Dana Holeckova

Black rhinoceros

Diceros bicornis
(Linnaeus, 1758)

Taxonomy:

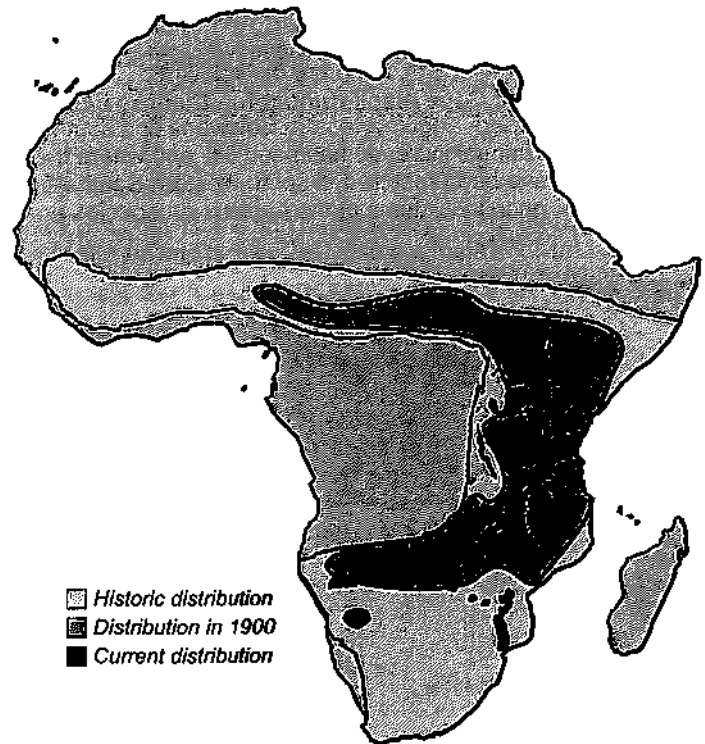
Class: Mammals (*Mammalia*)
Order: Odd-toed ungulates (*Perissodactyla*)
Family: Rhinoceroses (*Rhinocerotidae*)



(dh)

Distribution

Originally, the black rhino inhabited most of Africa south of the Sahara with the exception of the Congo Basin and the equatorial forests of Western Africa. The range extended in the territory of 33 current African countries; however, the black rhino became extinct in some areas by 1900, especially those of Western and Southern Africa, and occurred in only 23 states (PENNY 1988). After 1900, this rhino was completely driven to extinction in additional eighteen countries, namely Chad, the Central African Republic, Nigeria, the Democratic Republic of Congo, Angola, Ethiopia, Mozambique, Swaziland, Cameroon, Somalia, Sudan, Burundi, Ivory Coast, Uganda, Malawi, Zambia, Botswana and Rwanda. Unfortunately, this tendency continued so they now only exist in isolated patches in 10 countries; in fact, natural populations have only survived in five of these, namely Kenya, Namibia, Zimbabwe, South Africa and Tanzania. Over 1,000 individuals still live in South Africa and Namibia, more than 500 in Kenya and Zimbabwe, and above 100 in Tanzania. In other countries (Swaziland, Malawi, Zambia, Botswana and Rwanda), there is a few dozen animals or only solitary animals at the most (EMSLIE *et al.* 2007), 2007). At the same time, Swaziland, Malawi, Zambia and Botswana are the countries where the species had become extinct and subsequently reintroduced (EMSLIE *et al.* 2009). Reintroduction schemes are also underway in countries where the species has not been exterminated in full, as in Tanzania (HOLECKOVA 2009).



Black rhinoceros - distribution map
(according to the International Rhino Foundation - IRF, and PENNY 1988)

Biological data (www.wikipedia.org, www.rhinos-irf.org, www.rhinoresourcecenter.com, www.arkive.org, www.animalinfo.org, GOLTENBOTH et al. 1995)

Weight:	800 - 1,400 kg (a 1,820kg animal was the maximum on record); males are usually larger and weighing more than females
Wither height:	132-180 cm
Horn length:	Longer anterior horn 42-140 (usually 50 cm), posterior horn 20-55 cm; quite rarely, a small third horn may occur
Record sizes:	Anterior horn 291.5 cm, posterior horn 227 cm (TRENSE 1989).
Body length incl. head:	3-3.8 m
Oestrus cycle:	21-28 days (25 days - SCHWARZENBERGER 1995b)
Gestation period:	440-470 days (SCHWARZENBERGER 1995b), or also 419-479 days
Number of young:	1
Birth weight:	25-50 kg
Eyes opening:	At birth
Nursing period:	Up to 2 years
Sexual maturity:	Males 4-8 (10) years (up to 10 years in the wild if territory is available), females 3.5-7 years
Reproductive age:	Females in the wild 30-35 years, males 35-40 years
Longevity:	Usually 35-40; rarely up to 49 years in captivity

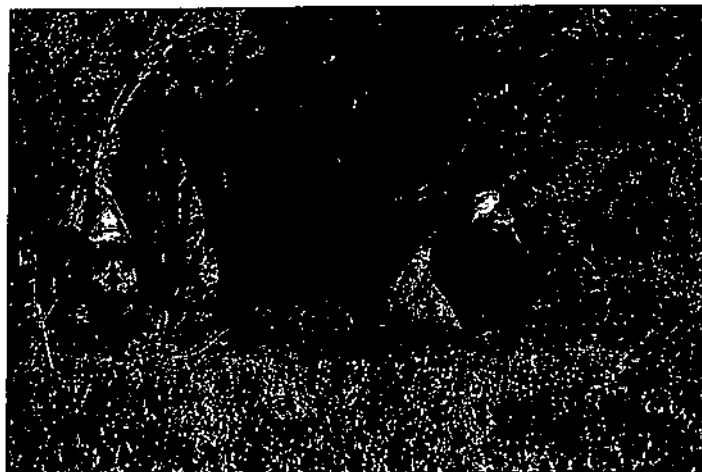
Subspecies

Four subspecies of the black rhino are distinguished (www.rhinos-irf.org, www.arkive.org, www.iucn.org, www.panda.org):

South-western or Cape black rhinoceros *Diceros bicornis bicornis* (Linnaeus, 1758) is an arid-adapted subspecies native to Namibia, southern Angola, western Botswana and south-west of South Africa. The largest current population is found in Namibia, where the annual increase has been 5% and where the killing of rhinos was last recorded in 1853 (www.panda.org); minor populations have been restored in south-western South Africa. It is planned to reintroduce this subspecies in the Addo Park in South Africa, once individuals of the eastern subspecies are displaced (EMSLIE and BROOKS 1999).



A south-central black rhinoceros (*Diceros bicornis minor*) in Kruger National Park, 1997 (dh)



An eastern black rhinoceros (*Diceros bicornis michaeli*) in Ol Pejeta, Kenya, 2009 (dh)

South-central black rhinoceros *Diceros bicornis minor* (Drummond, 1976) is currently the largest subspecies, with historical distribution from western and southern Tanzania to the south through Zambia, Zimbabwe and Mozambique to the northern and eastern part of South Africa. It also probably occurred in southern Democratic Republic of the Congo, northern Angola, and eastern Botswana. Today, its stronghold is South Africa and to a lesser extent Zimbabwe, with smaller numbers remaining in southern Tanzania (EMSLIE and BROOKS 1999). Reintroduction activities take place in Botswana, Swaziland, Malawi, Botswana and Zambia.

Eastern black rhinoceros *Diceros bicornis michaeli* Zukowsky, 1964, has longer, more slender and more curved horns than the other subspecies, and is reputedly more aggressive. Some eastern black rhinos have distinctive skin ridges on their sides giving them a 'corrugated' appearance. Historically, this subspecies was distributed from southern Sudan, Ethiopia, and Somalia towards the south through Uganda, Rwanda and Kenya into northern-central Tanzania. Its current stronghold is Kenya, with small numbers still found in Tanzania and one non-native population in South Africa. In 1961, 4 (2.2) individuals were relocated from the Kiboko territory, Kenya, outside the historical range to the national park of Addo Elephant in South Africa (FITZJOHN 1993), making up a population of about 40 animals by the end of the century. The animals were moved to private game reserves within the historical range in South Africa and into a protected sanctuary in Tanzania (Mkomazi). Today, this subspecies occurs in South Africa, where there is the largest population, in Tanzania, and Rwanda where probably one animal has survived (EMSLIE *et al.* 2009). This subspecies was given its scientific name from Michael Grzimek (ROBINSON 2000).

Western black rhinoceros *Diceros bicornis longipes* Zukowsky, 1949 was once ranging through the major part of savannah zones of Western and Central Africa, but recently only a small last population now remains in northern Cameroon and a few western black rhinos remain in Chad (EMSLIE and BROOKS 1999). In 2002, 10 to 12 animals lived in Cameroon, but since 2006, this rhino is considered extinct (EMSLIE *et al.* 2007).

Habitat

The black rhino inhabits a variety of habitats, ranging from the deserts of Namibia to rather moist mountain forest areas of Kenya. They primarily range in wooded grasslands and acacia savannahs, forest steppes, bush and broadleaved woodlands. The abundance of animals depends on the carrying capacity of habitats, this being the highest in the savannahs and succulent valleys of lowland areas (www.rhinos-irf.org, www.arkive.org).

Diet

Black rhinoceroses feed on the leaves and twigs stripped from a variety of woody plants and herbs using their prehensile finger-like upper lip. This adaptation is designed to grazing on leaves and twigs of shrubs and trees. They also eat fruits and various plants of the savannah, with grasses being last on the menu if choice is poor (MILLS and HES 1997). Their diet consists of up to 220 different plant species, especially small acacias, various spurge, succulents and many ever-green woody plants. Black rhinos can live up to 5 days without water (www.rhinos-irf.org, www.arkive.org, www.iucn.org).

Ecology

Territorial and semi-social animals to some extent, they tend to be less social and more aggressive than the white rhinoceros (WALKER *et al.* 1968). Home ranges of individuals overlap. Bulls lead a solitary life once adult, being not as social as cows, although they can tolerate other rhinos from time to time. Females and juveniles live social life. Sometimes, satellite males may reside within one another's territories. Ranges of adult females overlap; female black rhinos are actually not as solitary as often reported. The size of the home range depends on the habitat, season and availability of food and water, and increases depending on sex and age. Generally, there are smaller home districts and greater density of animals in habitats where there is a large quantity of food and water available. In Serengeti, home ranges are around 43 and 133 km², while in Ngorongoro it is between 2.6 to 44 kilometres. The black rhino likes to rest on specific points, which are usually elevated places.

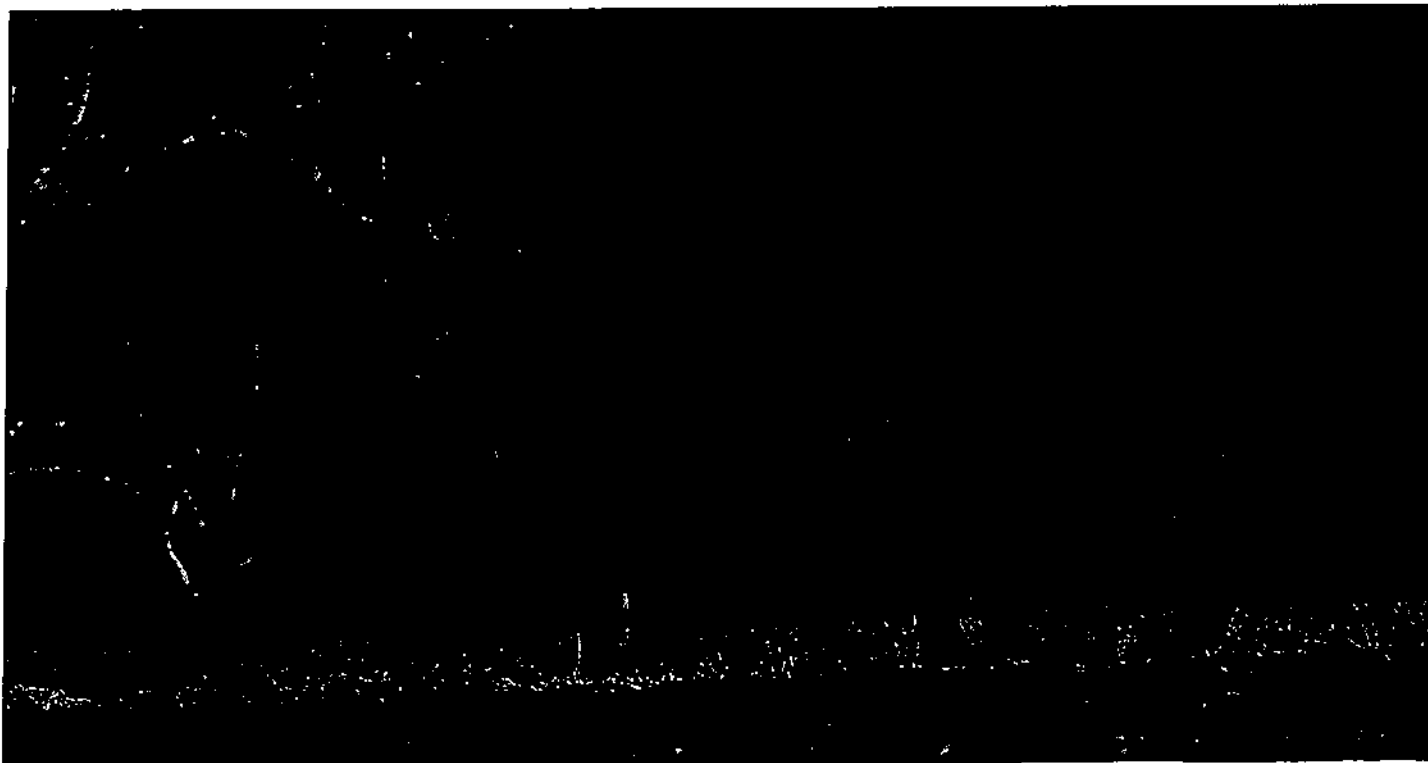
Very fast runners, they can reach speeds of up to 56 km/h (VOELKER 1986). Walking through the vegetated area to reach water resources, they use the same paths as elephants. When grazing, they also use narrow tracks. They emerge to graze in the morning and at dusk, because at the hottest time of the day they are most inactive, resting and sleeping in the shade or wallowing in the mud. Mud bathing is an important part of their biology because it helps them to cool the body temperature and protects against parasites. If mud is not available, they wallow in the dust. Watering places are usually visited in the late afternoon.

Despite excellent hearing and sense of smell, they are short-sighted and only able to see some six metres. Certainly, they cannot make out objects more than 20 metres away; however, they are capable of sensing a human standing down wind from 750 m (VOELKER 1986). They are curious and often aggressive towards other animals and humans. The black rhino has a reputation for being extremely aggressive; they attack out of fear, confusion, and panic, with the cause being their poor eyesight when sensing danger. They have even been observed in charging tree trunks and termite mounds. The sharp assaults are pretended rather than being a real aggression, as rhinos will drive against everything suspected; once satisfied that there is no danger to them, they soon calm down afterwards. They can even attack cars of tourists.

They display no aggression to other species and any provocation is feigned. Bulls sometimes fight heads and horns against each other, but usually avoid each other if at all possible. Females are not aggressive to each other. Despite their aggressiveness, they have no natural enemies, perhaps with the exception of Nile crocodiles, where attacks were not confirmed. A young black rhino may fall foul of spotted hyenas or lions (MILLS *et al.* 2003).

Black rhinos are a long-lived species. Females reach sexual maturity at the ages of 4-7, while in males this takes place at 7-10. Reproduction occurs throughout the year but births tend to be mostly towards the end of the rainy season in more arid environments. Maximum number of births falls in Kenya into the period from September to November, while in South Africa birth mainly takes place in April to July. Every 23 to 28 days females enter heat (SCHWARZENBERGER *et al.* 1993a). Rhinos are used to pile their dung. Once a male finds faeces of an oestrous female, he is scraping and spreading the pile of dung, thereby hampering the other adult males to pick up the female's scent trail; then he follows the female. Adult males and females live together only during the mating season.

Courtship behaviour before mating includes snorting and sparring with the horns. Typical courtship behaviour is called bluff and bluster, where the rhino will snort and swing its head from side to side aggressively before running away repeatedly. Breeding pairs



A black rhino female with a five-month-old calf, Mkomazi, Tanzania - 2009 (dh)

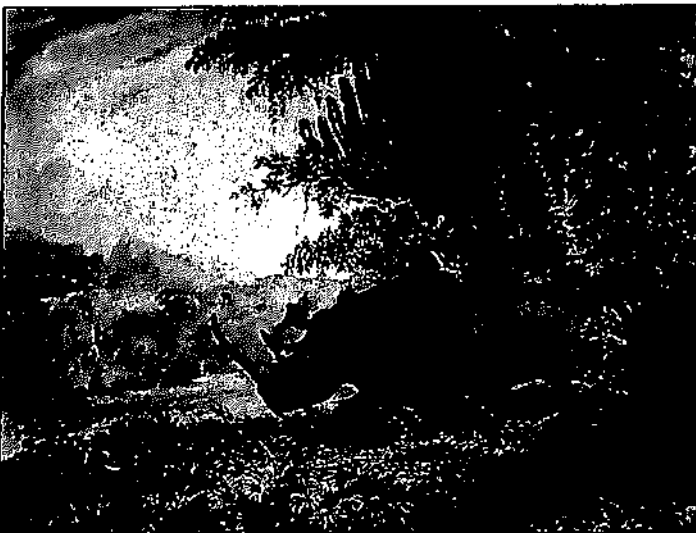
stay together for 2-3 days and sometimes even a week. They mate several times a day over this time and copulation may last more than a half an hour. A single calf is born fully developed and can follow its mother around after just three days, with whom it stay together for 2-3 years until the next calf is born. The calf starts to take solid food as early as the age of several weeks. Mothers mostly guide the young following her from behind. The calf is nursed by the cow for 18 months (SCHENKEL and GRZIMEK 1990); the cow comes into oestrus again and is mated by the male while still accompanied by the calf. Female calves may remain with its mother after the birth of another rhino, forming small groups. Male calves are driven off by mothers after the birth. Cows may have at least 7 and a maximum of 12 calves if the reproductive age ends when the cow is 30-35 years, but even up to 18 calves (14 on average), if the cow is capable of reproducing until 40 years (SMITH and READ 1992). The life expectancy in natural conditions (without poaching pressure) is from 35-50 years (www.wikipedia.org, www.rhinos-irf.org, www.arkive.org, www.iucn.org).

Population status and development

In the year 1900, probably 2-3 million black rhinos lived in Africa (WEINBERGER 2007), this species being world's most numerous rhinoceros, but was however rare or locally extirpated in the western part of Africa at that time due to intense uncontrolled hunting by white hunters (PENNY 1988). Killing rhinos for their horn was common in many countries in the late 1950s (GRZIMEK 1966); at the same time, there were still 100,000 black rhinos around 1960 (EMSLIE *et al.* 2009). As a result of poaching and loss of habitat, these numbers declined to around 70,000 and 65,000 animals in the late 1960s and 1970, respectively; at that time, the Kenyan population still totalled 18,000 black rhinos (EMSLIE and BROOKS 1999). In the 1970s and 1980s, a number of African countries turned politically and economically unstable, leading to an increase in poaching and militarization. As the three Asian rhino species neared extinction and the sources of rhino horn for the local markets became exhausted, focus was shifted onto the African rhinoceros. The main reason of the commercial interest in rhino horn was its use in traditional Asian medicine, especially in China, plus as handles for ritual daggers in the Middle East, chiefly in Yemen. The horn price exceeded in the second half of the 1980s \$ 500 per 28.35 grams (1 oz) (VOELKER 1986).

By the end of the '80s, the population in the wild had dwindled to less than 15,000, with numbers of black rhinos being estimated at just 2,300 in 1993 (www.iucn.org). The period between 1970 and 1993 saw 96% of them disappear from the wild (EMSLIE and BROOKS 1999).

In 1980, the largest populations, each numbering more than a thousand animals, ranged only in five states, with the largest of them being the one in Tanzania, with 3,795 individuals, from which a mere of 32 animals were left by 1995. In 1980, 1,500 rhinos still



A black rhino on an oil picture by Thomas Baines dated 1874 (the art collection of Sanlam - ROOKMAKER 2008)



An illustration of a black rhino by Roualeyn Gorgon Cumming from 1850 published in *The Life of Hunter* (ROOKMAKER 2008)

roamed Kenya, which in four years was only 550 animals and in 1987 even a mere 381 individuals. In the Central African Republic, there were still 3,000 animals in 1980; about 11 years later, only 5 were left and since 1992, the black rhino is extinct in this country. In Zambia, the rhino population in 1980 was estimated at 2,750 animals and Zimbabwe was probably still home to 2,500 individuals (however, official figures were lower than that). While in Zambia, the species was in all probability extinct in 1995, in Zimbabwe 315 animals left in 1995. In 1987, last three black rhinos were recorded in Sudan and they are now extinct in that country since that time. Simultaneously, two countries - South Africa and Namibia - avoided a decline in their black rhino population in the years 1980-1997 thanks to the working wildlife protection and law enforcement, with virtual zero level of poaching. In 1980, a total of 930 individuals were roaming these two countries, representing only 6% of the worldwide stock. Increase in the numbers can be seen from the IUCN data, according to which in 1996 1,024 and 598 black rhinos lived in South Africa and Namibia, respectively, making a total of 1,622 animals (HES Mills, 1997), while in 1997 the numbers of South African and Namibian black rhinos totalled 1,750 animals, representing 67% of wild populations (EMSLIE and BROOKS 1999).

Applying the strictest level of protection to the remaining population brought a gradual increase in the numbers, so in 2001 there were 3,100 black rhinos in the wild. According to the latest IUCN data from June 2008 (IUCN 2009), the population increased from 3,750 individuals in 2005 to 4,200 in 2008. Over these 3 years, the stock grown by 450 individuals, while several new populations emerged or were founded/relocated, such as in North Luangwa National Park, Zambia. The main population constituting 98% of all wild black rhinos ranges in four countries - Zimbabwe, South Africa, Namibia and Kenya (www.panda.org). The numbers have also increased in other states with reproducing populations with the exception of Zimbabwe, where there was a slight decline due to illegal hunting.

In Zimbabwe, problems started to emerge in the late 1980s and early 1990s, when poachers began to penetrate across the border, killing 75% of the south-central black rhino population (*D. b. minor*). Zimbabwe was then home to 2,000 individuals, which was one of the largest populations in the world. Poaching however continued and in 1993, only 370 black rhinos remained in Zimbabwe, with even just 315 in 1996 (HES and MILLS 1997). Afterwards, a national conservation strategy was developed, under which zones with high-intense protection were set up inside national parks and private game reserves. This successfully increased the stock to 500 individuals, which was the third largest population of black rhinos in Africa, of which 25% are kept inside national parks and the remaining 75% are held in commercial farms and game reserves. However, many national parks are under-equipped to face the well-armed poachers coming from Zambia, Angola and Botswana (www.rhinos-irf.org).

It was during the period 2000-2005 when they recorded a total of 136 illegal cases of killing of black rhinos, with 90% of the cases taking place in three countries - Zimbabwe, South Africa and Kenya. It should be mentioned that in 2003-2005, the Democratic Republic of Congo accounted for 59.1% of poaching recorded in both rhino species, Zimbabwe's portion and that of Kenya was 12% and 3.3%, respectively, Botswana accounted for 2.8% and South Africa for 0.4%, while in Namibia, Tanzania and Swaziland did not record any case of poaching (MILLEDGE 2007).

Since then the situation has worsened in South Africa, where poaching had virtually never existed in the past, in particular after the abolition of the fence on the north of Kruger National Park. In late 2008, about 40 white rhino were killed in this park by militarily armed poachers from Vietnam (CURRIE pers. comm.).

The worst situation today exists in Zimbabwe, where in 2008, poachers killed a total of 88 rhinos (southern white and south-central subspecies), this representing more than 10% of the local population counting 800 animals. By May 2009, additional 18 black rhinos had been killed, when the animals were hunted by well-organised and armed gangs of poachers equipped with cars and radios, plus superb legal assistance. Poachers were not only massacring the rhino, but even seeking to shoot those protecting the animals. These gangs are involved in illegal smuggling of rhinoceros horns as well as diamond and gold across the Zimbabwe border (IRF, 2009). The situation in Zimbabwe was termed "Zimbabwe rhino crisis," and thus rescue operations began, aiming to raise funds and to relocate rhinos to safer areas. In addition, three poachers from the five-member gang of rhino poachers were hunted down and shot in Lowveld, Zimbabwe, in May 2009, after they had fired at police and rangers (IRF 2009).

In cooperation with Zimbabwe conservation representatives, the International Rhino Foundation (IRF) has developed a scheme to protect the black rhino in South Africa, which includes the following:

- Protecting rhinos in private conservancies and national park intensive protection zones;
- Re-establishing populations in protected wild habitat in places, especially Botswana, where the species had previously been extirpated but which now seems secure for reintroduction;

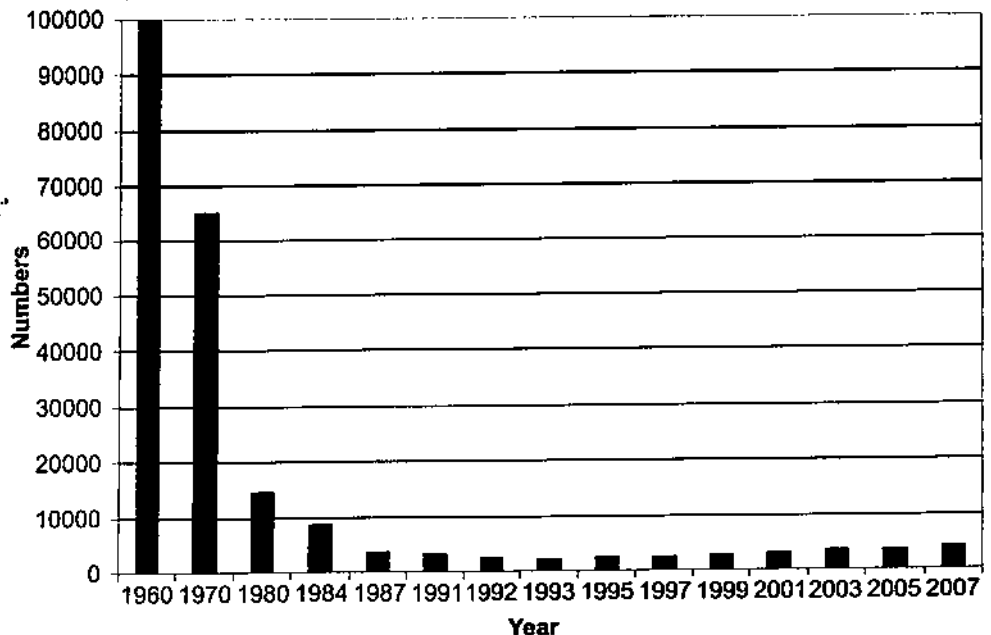
- Translocation of rhinos from zoo collections to free-range facilities to hold them in semi-wild situations to produce additional rhinos for the reintroduction programmes. This way, a male black rhino from White Oak Conservation Center, Florida, along with a female from the Frankfurt Zoo have already been successfully introduced to the wild into Marakele National Park in South Africa where they have produced several calves.

To save the rhinos, IRF announced a fundraising campaign and organised a petition calling for stopping the illegal trade in black rhino horn for traditional Chinese medicine (www.13point7billion.org), with less than 460 south-central black rhinos remaining in Zimbabwe according to the May 2009 report (IRF, 2009). The governments of Zimbabwe, Botswana and South Africa signed the memorandum of understanding under which a cross-border protected area should be established for the rhino, formed in South Africa by the Venetia-Limpopo Nature Reserve with an area of 340 km² and Mapungubwe National Park with an area of 220 km², both stretched over land owned by De Beers, the South African company. Fences between these areas will be dismantled to allow for interconnecting. The Northern Tuli Game Reserve and 36 ranches with a total area of 700 km² will be appended on the Botswana part. On the Zimbabwe part, the territory of Tuli Safari and adjacent wildlife ranches with a total area about 500 km² will be added. A fundraising campaign has been underway to support this International Rhino Foundation's project (www.rhinos-irf.org). By early August 2009, IRF had raised over 120,000 USD, which was used to pay for a move of 46 black rhinos; in addition, eight poachers were killed from May to August 2009 (IRF 2009).



Oi Pejeta, Kenya (dh)

Development of the wild black rhino population since 1970



Development of the black rhino population in the wild

(MILLS *et al.* 2003, EMSLIE 2005 and 2007, EMSLIE *et al.* 2009, www.iucn.org, www.rhinos-irf.org)

Year	1880	1900	1960	1970	1980	1984	1987	1991	1992	1993	1995	1997	1999	2001	2003	2005	2007
Num.	Over 1 million	Several hundred thousands	Over 100 000	65 000	14,785	8,800	3,665	3,450	2,475	2,300	2,410	2,600	2,700	3,100	3,610	3,750	4,230

The abundance of the black rhino per African country in the period 1980-2005 (according to EMSLIE and BROOKS 1999, EMSLIE *et al.* 2007, EMSLIE 2009)

Country	1980	1984	1987	1991	1992	1993/4	1995	1997	1999	2001	2003	2005	2007
Angola	300	90	?	50	50	10	?	0?	0	0	0	0	0
Botswana	30	10	<10	<10	5	4	0?	0?	0	0	5	5	7
Cameroon	110	110	30?	50	35	27	7	10	10	8	5	0?	0
Central African Rep.	3,000	170	10	5	0	?	?	?	0	0	0	0	0
Chad	25	5	3	0?	0	?	?	?	0	?	0	0	0
Ethiopia	20	10	?	0?	0?	5	1	0?	?	4	0	0	0
Kenya	1,500	550	381	398	414	417	420	424	420	430	439	540	577
Malawi	40	20	25	5	0?	2	2	3	7	7	8	10	16
Mozambique	250	130	?	50	50	45	?	13	?	0	0?	0?	0?
Namibia	300	400	449	479	489	583	598	707	695	893	1,238	1,141	1,435
Rwanda	30	15	15	?	15	10	4	4	6	0	1	1	1
Somalia	300	90	?	0?	0	?	?	?	0	0	0	0	0
SA	630	640	677	771	819	897	1,024	1,043	1,074	1,179	1,284	1,379	1,488
Sudan	300	100	3	?	?	0	?	?	0	0	0	0	0
Swaziland	0	0	6	4	6	4	9	10	10	10	15	16	18
Tanzania	3,795	3,130	275	185?	127	132	32	46	47	49	66	101	123
Uganda	5	0?	0	3	0	0	0	?	0	0	0	0	0
Zambia	2,750	1,650	>106	40?	40	33	0?	0?	0	0	5	6	16
Zimbabwe	>1,400	>1,680	>1,775	1,400	425	381	315	339	435	524	536	527	558
DRC	0	0	0	0	0	0	0	0	?	0	0	0	0
Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	14,785	8,800	3,665	3,450	2,475	2,560	2,410	2,600	2,704	3,100	3,610	3,726	4,240
Total countries	18	17	14	14	12	14	9	9	9	8	10	10	10

Natural populations have survived in Kenya, Namibia, South Africa, Zimbabwe and Tanzania. Reintroduced populations exist in Malawi, where the black rhino had become extinct (1992), Rwanda (prior to 1957), Swaziland (in the late 19 century), Botswana (1995) and Zambia (1995). The species is declared extinct in Uganda (1983), the Democratic Republic of the Congo (1986), Somalia (1987), Sudan (1991-1993), Angola (1995), the Central African Republic (1992), Chad (1991), Mozambique (2002), Côte d'Ivoire (after 1960), Ethiopia (about 1997) and Cameroon (2006) (EMSLIE and BROOKS 1999, EMSLIE *et al.* 2007). There are sporadic and unverified reports of individual animals from Mozambique, Rwanda, Sudan and Ethiopia (EMSLIE *et al.* 2007). In late 2007, Africa had 131 populations of the three surviving black rhino subspecies with a total of 4,230 animals (EMSLIE 2009).

Conservation

Since 1977, the black rhino has been listed in the Annex I (A) of CITES, which prohibits any international trade in live animals and their derivatives, i.e. horn in particular, as well as products thereof. In the IUCN's 2007 Red List (IUCN Red List 2009), the species is categorised as "critically endangered", the south-western subspecies (*D. b. bicornis*) being classified as vulnerable (VU) and the three remaining subspecies are listed as critically endangered (CR). Additionally, the International Union for Conservation of Nature (IUCN) announced on 7 July 2006 that the western subspecies (*D. b. longipes*) had been extirpated, with some last 10 to 13 animals remaining in 2002 (EMSLIE *et al.* 2007).

To reduce illegal hunting, the CITES regulations were implemented into the rules and legislation of a number of African countries during the 1990s. An effective direct protection became crucial to preserving the remaining rhino population. Many surviving rhinos are now concentrated in fenced territories, protected areas and intensive protection zones, where they can be effectively guarded. Constant overseeing and checks of the animals provided data allowing for the management of the rhino population with the aim of rapid growth. This resulted in surplus animals being relocated to establish new populations in the native range areas of the species, as well as outside them, with subsequent reducing the numbers produced in certain areas and increasing the efforts to increase biological control with a view of increasing the growth rate within the metapopulation. In addition, the increasing efforts also led to the integration of local communities in a common conservation struggle. In many countries, black rhinos are now managed by a variety of stakeholders, such as private sector and governments, which increases the long-term security of the species. Pro-active conservation associated with stock breeding control is expensive and costs USD 1000-1200 per km²/year (MILLS and HES 1997, EMSLIE *et al.* 2007). Unlike the southern white rhino, black rhinos held by private landowners are mostly managed under the custody of the government. There are a number of African regional conservation initiatives such as SADC (South African Development Community) regional scheme for the protection of rhinos, the SADC Rhino Management Group, etc. The IUCN SSC African Rhino Specialist Group is coordinating the continental rhino conservation in Africa (www.iucn.org, www.wikipedia.org, www.rhinos-irf.org, www.arkive.org).

The protection of rhinos is related to the political stability of countries. A successful protection strategy was recommended by the IUCN SSC AfrSG. National rhino strategies and policies have been adopted by Botswana, Kenya, Namibia, South Africa, Tanzania, Zambia and Zimbabwe; the one of Swaziland was under development in 2007 (EMSLIE *et al.* 2007). To set out procedures for re-introduction and relocation of rhinos, an IUCN guide was developed (EMSLIE, AMIN and KOCK 2009).

Targeted protection is necessary for stabilisation and growth of the black rhino population. The strict protection in fenced facilities - often a product of cooperation between the government and the private sector - together with heavily protected unfenced zones as part of large areas has met the greatest success. In some states, dehorning was also used to reduce the interest of poachers. In 1997, Yemen joined the Washington Treaty (CITES) that prohibits trade in rhinoceros horn, which caused the demand for rhino horn greatly reduced in the Middle East. Therefore, the population of black rhinos increased in 2001 to 3,100 animals in six out of the eight range states. These animals are mostly kept in strictly protected areas. The African Rhino Specialist Group to the International Union for Conservation of Nature (IUCN) provides guidance on the protection of African rhinos; it created a detailed Action Plan including extensive information and strategic recommendations for rhino conservation (www.rhinos-irf.org, www.iucn.org).

Development of the black rhino population in the wild, 1984-2007

(Foose 1993, Penny 1988, IRF, Emslie 2000, 2007, Potter and Emslie 2002, Dollinger and Geser 2008, Emslie *et al.* 2009, Emslie 2009)

Species (subspecies) / Wild population	1984	1993	1997	1999	2001	2003	2005	2007
South-western (<i>D. b. bicornis</i>)	737	560	740	740	943	1,310	1,221	1,550
Eastern (<i>D. b. michaeli</i>)	490	500	485	485	498	520	639	700
South-central (<i>D. b. minor</i>)	1,467	1,300	1,365	1,365	1,651	1,770	1,866	1,995
Western (<i>D. b. longipes</i>)	About 10	40	10	About 10	8	5	0 ?	0
Black rhinoceros (<i>Diceros bicornis</i>)	2,704	2,400	2,600	2,700	3,100	3,610	3,726	4,240

Conservation activities

Generally, rhinos came to the brink of extinction due to illegal hunting for their horn and loss of habitat. Black rhinos have been particularly threatened by poaching for international trade in their horns that are demanded for two reasons. The first is traditional Chinese medicine, which uses a powder made from the horn for the resurrection (recovery) of patients treated for fever and coma. The efficacy of the rhino horn to treat the diseases has not been confirmed by medical science. The second of the reasons is the one of using horn for ornamental purposes in certain Middle Eastern countries, where it is a highly prized material for the manufacture of jambiya, a hand-carved Yemeni ceremonial dagger with rich decoration. In June 2007, the first case of the sale of a black rhino horn for medical purposes was documented in the U.S., confirmed through genetic testing of a specimen confiscated in a traditional Chinese medicine shop in Portland, Oregon.

Civil unrest and guns freely available in Africa had a negative impact on the protection of African rhinos. Black rhino populations in Angola, the Central African Republic, Chad, Mozambique, Rwanda, Somalia, Sudan and Uganda diminished as a result of war and civil unrest since the 1960s. Trading in arms obtained in exchange for rhino horn and ivory that resulted in increased poaching determined by the growth of poverty in times of civil wars, as well as reduced levels of protection of the rhino population by redirecting financial resources outside the area of wildlife had a detrimental effect. Changes in the natural environment were another cause for the decline in the rhino stock. The reasons listed above caused the wild population of black rhinos to decrease by 96% between 1970 and 1992 (www.wikipedia.org, www.rhinos-irf.org, www.arkive.org, www.iucn.org).



Black rhinos - a cow with its calf, Ol Pejeta, Kenya - 2009 (dh)

Recent development of the black rhino population in the wild (according to EMSLIE *et al.* 2007, EMSLIE 2009)

No.	Country	Number of subspecies	South-western subspecies 2005 / 2007	Eastern subspecies 2005 / 2007	South-central 2005 / 2007	Total 2006	Total 2007	Balance
1	SA	3 - South-central, south-western, eastern	80 / 113	41 / 54	1,258 / 1 321	1,379	1,488	+ 109
2	Namibia	1 - South-western	1,141 / 1,435	-	-	1,141	1,435	+ 294
3	Kenya	1 - Eastern	-	540 / 577	-	540	577	+ 37
4	Zimbabwe	1 - South-central	-	-	527 / 558	527	558	+ 31
5	Tanzania	2 - Eastern and south-central	-	57 / 67	44 / 56	101	123	+ 22
6	Swaziland	1 - South-central (after reintroduction)	-	-	16 / 18	16	18	+ 2
7	Malawi	1 - South-central (after reintroduction)	-	-	10 / 16	10	16	+ 6
8	Zambia	1 - South-central	-	-	6 / 16	6	16	+ 10
9	Botswana	1 - South-central	-	-	5 / 7	5	7	+ 2
10	Rwanda	1 - Eastern (after reintroduction)	-	1 / 1	-	1	1	-
	Total	3 subspecies	1,221 / 1,550	639 / 700	1,865	3,726	4,240	+ 514

1. The Republic of South Africa (SA)

In 1930, South Africa had only two natural populations of the south-central subspecies of the black rhino (*D. b. minor*) kept in the iMfolozi and uMkhuze reserves. From 1962 to 1970, 180 animals were moved into the KwaZulu Natal protected areas. In 1971, 10 pairs of black rhinos were donated to Kruger National Park, followed by additional 47 pairs, whose founders came from Zimbabwe. The population established this way grown to become the world's second largest population of the black rhino (EMSLIE *et al.* 2009). Cross-border translocation of animals helped to restore the population of the south-western subspecies (*D. b. bicornis*) as well (EMSLIE *et al.* 2009).

In 1962, an out-of-range population of the eastern subspecies (*D. b. michaeli*) was set up in South Africa, in Addo National Park, with seven individuals imported from the territory of Makueni, Kenya. Of these, only four animals became founders of the new population. By the end of 2007, there were 54 rhinos in the Addo Park. This stock is moved to sites within the native range of the subspecies in Tanzania - Mkomazi and Ngorongoro (EMSLIE *et al.* 2009).

In 2005 (EMSLIE *et al.* 2007), South Africa was home to 80 individuals of the south-western subspecies (*D. b. bicornis*), 41 animals of the eastern subspecies (*D. b. michaeli*) and 1,258 south-central black rhinos (*D. b. minor*). In 2007, it was already 113 south-western, 54 eastern and 1,321 south-central black rhinos (EMSLIE 2009). South Africa is the most important range state of the black rhino, as on 31 December 2007, nearly 1,488 individuals representing 35% of global wild population lived in the country, with an annual increase of almost 4%.

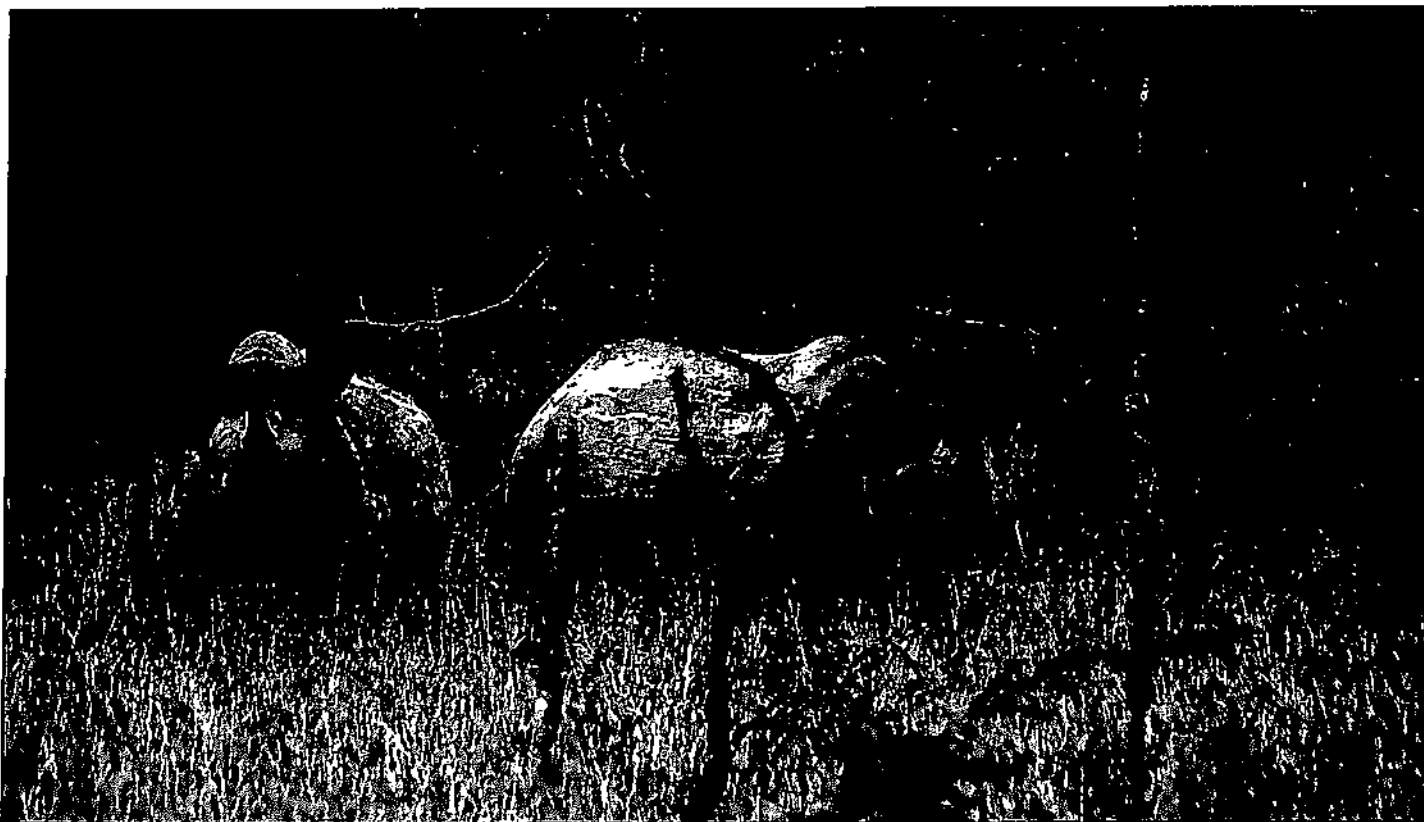
2. Namibia

In 2005 (EMSLIE *et al.* 2007), 1,141 individuals of the south-western subspecies (*D. b. bicornis*) lived in South Africa, while in 2007 the numbers reached even 1,435 animals (EMSLIE 2009). Namibia is the most important range country for the south-west (Cape) subspecies of the black rhinoceros, with enduring stability and protection of wildlife. As per 31 December 2007, there lived 1,435 animals representing almost 34% of global wild population, with an annual population increase of nearly 13%.

3. Kenya

Kenya is home to only a single form of a rhino, the eastern black rhinoceros subspecies (*D. b. michaeli*). In the early 20 century, 1000 rhinos were shot in Kibwezi because of agricultural development. In the 1970s and 1980s, the rhino population declined from 20,000 to less than 400 remaining animals due to poaching. The chief strategy preventing the numbers further decline was relocation of the rhinos into fenced sanctuaries, with the first established in 1980. Lewa Wildlife Conservancy, where they achieved an annual increase of the population over 13% in 2004, became one of the most successful of these. By the end of 2007, the population had increased to 577 animals (EMSLIE *et al.* 2009).

In Kenya, a governmental programme of rhino protection and population growth has been developed and underway (OKITA-OUMA 2007), owing to which the numbers have successfully increased. The reason for implementing the scheme above was that Kenya still had 20,000 rhinos by 1970, from which 98% was extirpated as a result of poaching to less than 350 animals in the 1980s. In 2008, Kenya had already 609 black rhinos, which represents 87% of the world's free-ranging population of the eastern subspecies. The aim is to increase the number to 700 individuals by 2011 and to 2,000 animals in the future. Rhinos are kept in protected areas and their protection is implemented through an effective security system, including armed patrols monitoring every individual rhino, where each animal is on average seen every 3rd day (Ol Pejeta/Lewa Conservancy). Any missing animal is traced using telemetry, aerial search and specially trained tracking dogs (CRAIG pers. comm.). Kenya is holding the third-largest population of the black rhino and at the same time the largest population of the eastern subspecies. On 31 December 2007, there lived 577 animals, representing 13.6% of the global free-ranging population of the species and more than 82% of the eastern subspecies. The population's annual increase in 2005-2007 and 2007-2008 was almost 3.5% and 5.5%, respectively.

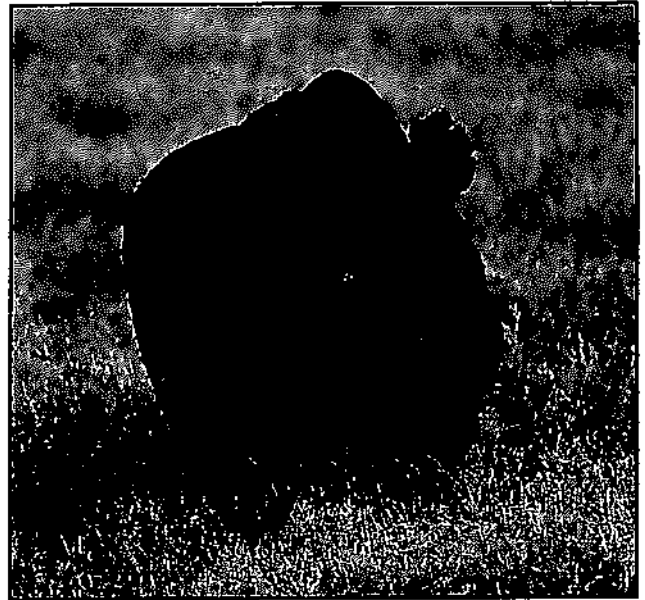
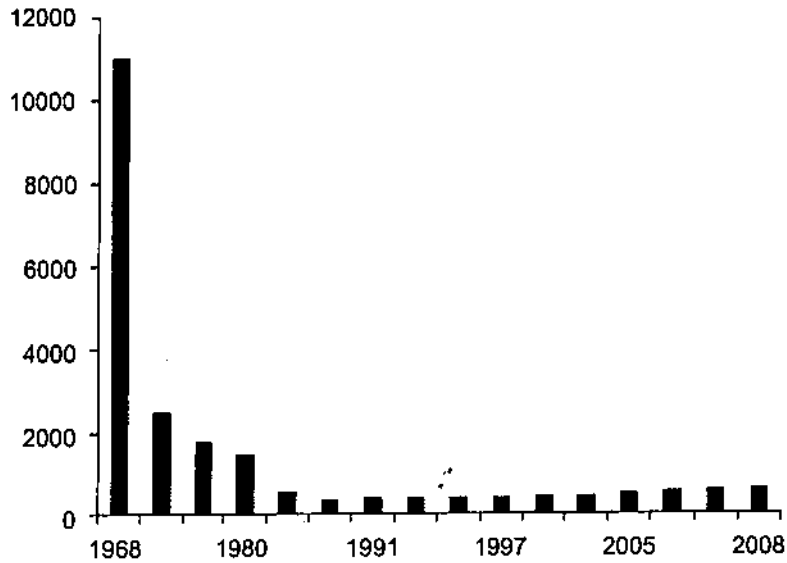


Eastern black rhinos, Ol Pejeta, Kenya (dh)

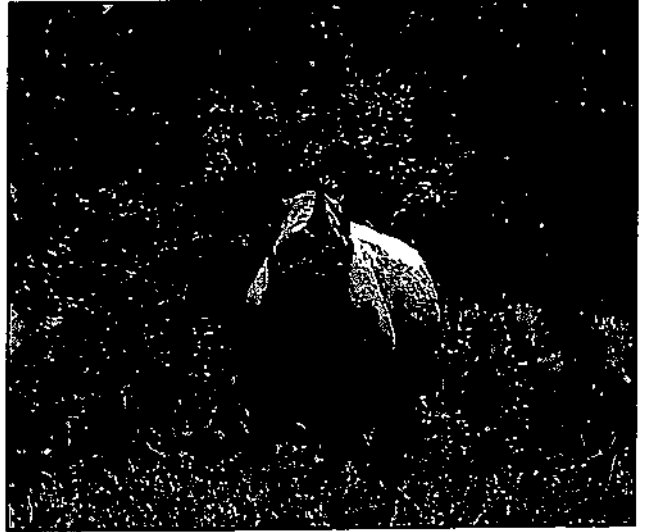
Development of the black rhino abundance in Kenya since 1968

Year	1968	1970	1977	1980	1984	1987	1991	1992	1995	1997	2002	2003	2005	2007	2008
Numbers	11,000	2,500	1,800	1,500	550	381	398	414	420	424	430	437	539	577	609

Development of the black rhino abundance in Kenya since 1968



An eastern black rhino (*D. b. michaeli*) in Kenya - Lewa Wildlife Conservancy, 2009 (dh)



A young black rhino (*D. b. michaeli*) in its typical habitat - Ol Pejeta Conservancy, Kenya, 2009 (dh)

4. Zimbabwe

In the beginning of 1990s, poaching around the Zambezi River increased and therefore a number of rhinos were relocated to safer locations of the country (EMSLIE *et al.* 2009).

In 1998, 28 rhinos were moved from KZN to the SE Zimbabwe private game sanctuary, and thus established a growing population, which is soon to become a source of animals for further re-introduction projects (EMSLIE *et al.* 2009). In 2005, there lived 527 individuals of the southern subspecies (*D. b. minor*). In Zimbabwe, a private sanctuary was founded with 71 rhinos imported into the area of 3000 km² (EMSLIE *et al.* 2007).

Zimbabwe is the place of survival for the fourth-largest wild population of the black rhino with poaching being the biggest threat. In 2007, the total numbers were formed of 558 individuals, representing more than 13% of global wild population, while nearly 30% of the southern subspecies. The small annual increase of 2.9% is due to loss of animals by poaching (EMSLIE 2009). The situation in Zimbabwe deteriorated in 2008 and 2009, when poachers killed dozens of animals (for more details, see Zimbabwe rhino crisis on page 18).

5. Tanzania

In Tanzania, there are two subspecies of the black rhinoceros: the south-central black rhino (*D. b. minor*) in the south and the eastern black rhino (*D. b. michaeli*) in the north of the country. The local situation as regards the black rhino was even worse than in Kenya, as in 1980, the country had 3,795 individuals, while in 1987 it was a mere 275 and in 1995 only 32 black rhinos were remaining (EMSLIE and BROOKS 1999). By 2005, the number had increased to 101 (EMSLIE *et al.* 2007), from which 57 individuals were those of the eastern and 44 of the south-central subspecies. In 2007, there were 123 rhinos in Tanzania, which consisted of 67 eastern and 56 south-central black rhinos (EMSLIE 2009).

From 1974 to 1978, there were about 700 eastern black rhinos (*D. b. michaeli*) in Serengeti National Park covering an area of 12,920 km², where the population density was one rhino per 19 km². In contrast, a much denser population lived in the Ngorongoro Crater, with one rhino per 3.1 km², which corresponded to the habitat carrying capacity of both sites. At that time, this involved a single population that inhabited both Serengeti National Park and the Ngorongoro Conservation Area including Olduvai Gorge, extending to the territory of Maasai Mara in Kenya in the north. Presumably, this population expanded to the Kenyan national parks Amboseli and Tsavo. Intense poaching led to the mutual isolation of the rhino populations of these national parks. In the national parks of northern Tanzania, poaching became a serious problem after 1975, resulting in a dramatic decrease in the numbers of rhinoceroses in the country. This left a mere 50-100 animals in Serengeti by 1980, of which about 20 occurred in Moru Kopjes, southern Serengeti (ROBINSON 2000).

In the Olduvai Gorge, they recorded 69 rhinos in 1966 of which however none had remained by 1980. In the Ngorongoro Conservation Area established in 1959, poaching began in the early 1970s and culminated in the late 1980s. In the years 1964-1966, there were 108 individuals in the crater, while subsequently only 14 permanent and 7 migrant animals were recorded in the period from 1980 to 1988. Despite significantly reduced by anti-poaching patrols in the area of Serengeti and Ngorongoro since that time, poaching did not stop completely. In 1993, the only Tanzania's viable population of the eastern subspecies remained in the Ngorongoro Crater, comprising 14 to 18 individuals. Isolated rhinos remained in Serengeti, with five animals being a maximum. Several animals might have survived in one to two parks of northern Tanzania. In November 1993, a joint project of the Ngorongoro Conservation Area Headquarters and the Frankfurt Zoological Society was launched, where the crater was confirmed to have had only 13 remaining rhinos, which involved two adult males, 6 adult females and 5 subadult animals, with probably still a few rhinos staying along the crater walls. In January 1993, a subadult male left the crater and appeared in the Serengeti's Moru region in 1995, encountering two adult females. From 1988 to August 1995, no cases of poaching were recorded in Ngorongoro until Amina, a rhino female, was killed, leaving a calf, an 8 months old male Richard. However, the Ngorongoro population was not on increase. After the death of Amina, Richard was kept in a boma until 2 December 1997, when he was sent as a 2.5-year-old animal to Addo National Park, South Africa, since returning the male into the crater would be running the risk of the male being killed by another male. At the same time, the Frankfurt Zoological Society donated the Serengeti Ecosystem a female named Akuru; born at Frankfurt Zoo, this animal belonged to the southern subspecies, and therefore went to Marakele National Park in South Africa. In exchange for Richard and Akuru, two individuals born in Addo National Park were imported to Tanzania at the end of 1997 (CHAUSI 1998). In the years 1997-2000, three rhinos died of natural causes in the crater, and the population increased to 17 animals. In the same year, seven rhinos stayed in Muru Kopjes, Serengeti (ROBINSON 2000). Each of the animals has a radio installed in the horn and is constantly monitored (MORKELE pers. comm.). Since the beginning of the Ngorongoro project, there has been a single case of a rhino killed by poachers in 1995. Currently, Ngorongoro is home to 24 rhinos.



A male eastern black rhino (D. b. michaeli) in Ngorongoro, Tanzania, 2007 (dh)



The Ngorongoro Crater, Tanzania, is the place where a single population of the black rhino has survived, the picture shows an old male, 2009. (dh)



A skull of a young black rhino snarled by poachers, Arusha National Park, Tanzania - 2009 (dh)



A reintroduced eastern black rhino (D. b. michaeli) in Mkomazi National Park, Tanzania - 2009 (dh)

In Tanzania, there is even the third population of the eastern subspecies, which was established through reintroduction from Addo National Park, South Africa (4 pairs) and Dvur Kralove Zoo (3 animals) into Mkomazi National Park in 1997, 2001 and 2009. This involves a group of 13 rhinos kept in a fenced holding area of several tens of km² (HOLECKOVA 2009).

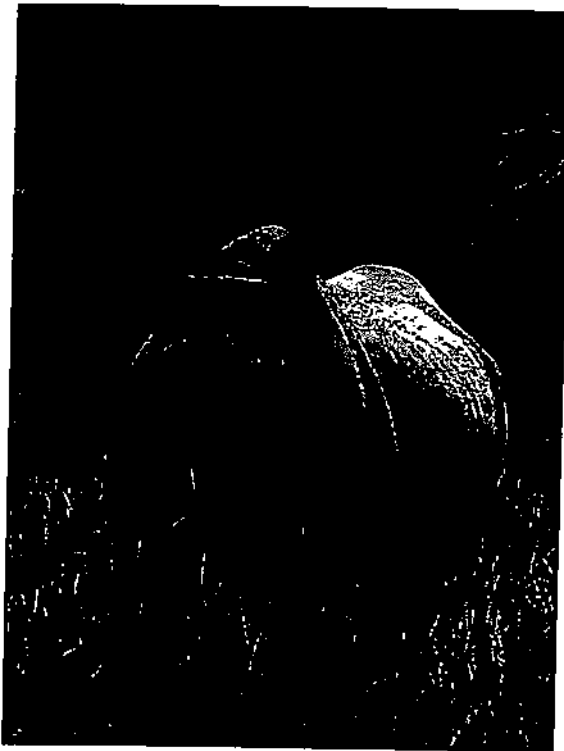
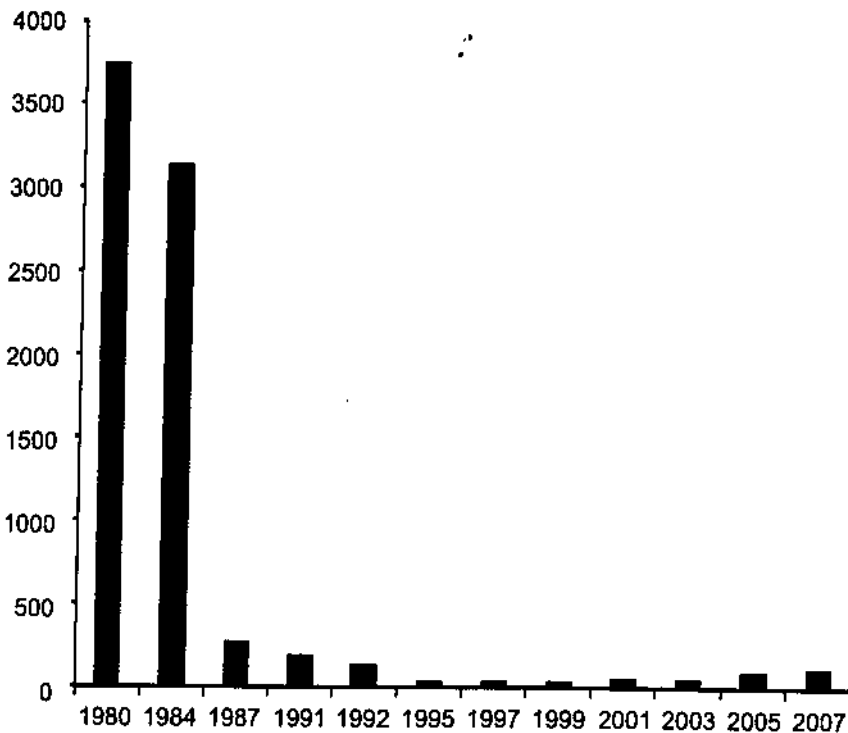
Reintroduction of rhinos into the Grumeti Game Area, which is a territory of over 416 km² adjoining Serengeti National Park and integrated within a larger migration ecosystem of Serengeti-Mara, presents another Tanzanian project. Within the project above, they fenced a hill with an observatory point designed for holding black rhinos. The first couple - five years old - was imported from Port Lympne Zoo, UK, to the Sasakwa-Grumeti Reserve on 12 June 2007. It should be noted that male Limpopo is a son of female Etna born in Dvur Kralove (DK 13). As early as 2008, female Laikipia got pregnant. The reason for the project was the fact that poachers nearly wiped out the entire natural population as the Serengeti-Mara Ecosystem had contained about 1,000 black rhinos and in 2007, fewer than 100 individuals were left across northern Tanzania. As a result of protection measures, the population began to increase; nonetheless, it exists in the form of isolated patches. The goal of the reintroduction efforts is setting up a new group and increasing genetic diversity. The entire area is protected against the tsetse fly using a special system of traps (SMRCEK and HOLECKOVA 2008).

Tanzania had 123 black rhinos on 31 December 2007, which represents less than 3% of the global free-ranging population. The annual increase was nearly 11%, which was influenced by reintroductions.

Development of the black rhino abundance in Tanzania since 1970

Year	1970	1980	1984	1987	1991	1992	1995	1997	1999	2001	2003	2005	2007
Numbers	10,000	3,795	3,130	275	185 ?	127	32	46	47	49	66	101	123

Development of the black rhino abundance in Tanzania since 1980



Oi Pejeta, Kenya, 2009 (dh)

Reintroduction of black rhinos (*D. b. michaeli*) into the Grumeti Reserve, Tanzania, in September 2007



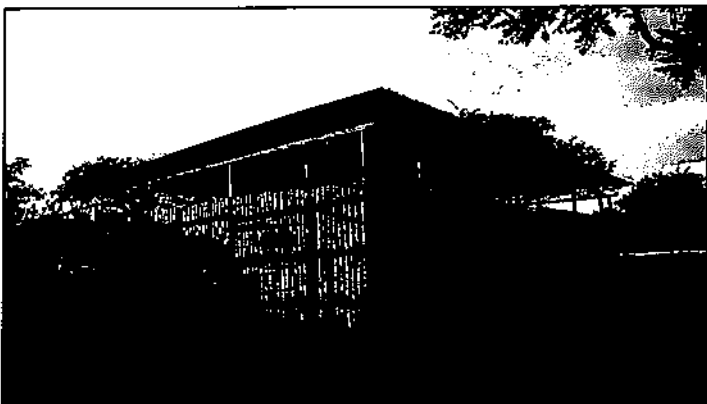
Tanzanian Grumeti Reserve - the mound in the back of the elephants was assigned to keeping the black rhino. (dh)



Male Limpopo in Grumeti, Tanzania, is son of Etna (DK 13). (dh)



The territory as such is protected to prevent entry of elephants, with a boma placed inside it. (dh)



Limpopo inside the enclosure three months upon the male's arrival in Tanzania (left) and the boma (right) (dh)

6. Swaziland

In Swaziland, the black rhinos were exterminated as a result of poaching. In the late 20th century, reintroduction projects began concerning both black and white rhinos. In 1996 (MILLS and HES 1997), nine individuals of the southern black rhino subspecies (*D. b. minor*) ranged in the country. By the end of 2005, the numbers had grown to 16 (EMSLIE *et al.* 2007). The founders were imported from Zimbabwe and South Africa (EMSLIE *et al.* 2009). In the late 2007, the population had reached 18 (EMSLIE 2009).

7. Malawi

In 2005 (EMSLIE *et al.* 2007), 10 individuals of the south-western subspecies (*D. b. bicornis*) lived in South Africa, while in 2007 the numbers reached even 16 animals (EMSLIE 2009).

8. Zambia

Zambia was a stronghold for the south-central black rhino (*D. b. minor*), of which a population lived in the Luangwa Valley, but was wiped out by poaching in the 1970s (KAMPAMBA 2003). In collaboration with IUCN SSC's AfRSG, a reintroduction programme was implemented in North Luangwa National Park, where six individuals of the south-central form ranged in 2005; over the two subsequent years, additional 10 animals were moved in. In the early 2007, the founder population had already 15 animals. Parties involved in this reintroduction project, in addition to Zambia Wildlife Authority, included the Frankfurt Zoological Society, South Africa National Parks and the Namibian Ministry of Environment and Tourism. These organisations provided rhinoceroses (EMSLIE *et al.* 2007).

9. Botswana

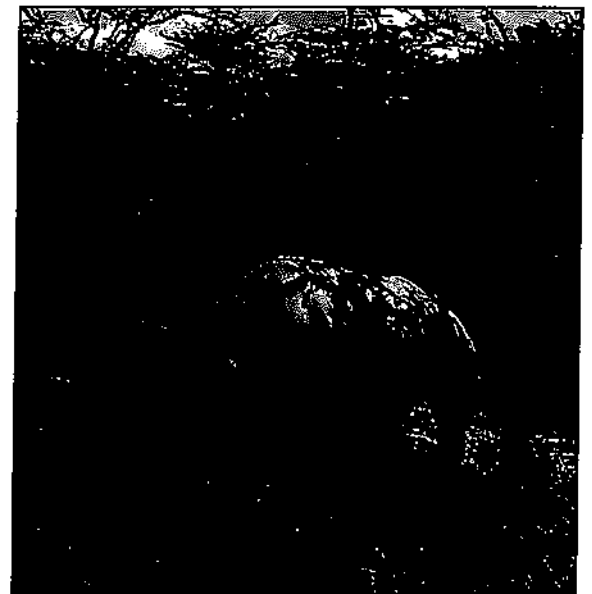
In 2005 (EMSLIE *et al.* 2007), five individuals of the south-western subspecies (*D. b. bicornis*) lived in South Africa, while in 2007 the numbers reached even seven animals (EMSLIE 2009).

10. Rwanda

In 2005 (EMSLIE *et al.* 2007), there lived a single individual of the eastern form (*D. b. michaeli*) that died in 2006. According to official but unconfirmed sources, another animal is believed to have been ranging here (EMSLIE 2009).



In Swaziland, both rhino species became extinct through poaching. Following adoption of a law punishing poaching by death, the country has become a safe place for reintroduction of rhinos. (dh)



A young eastern black rhino, Ol Pejeta Conservancy, Kenya, 2009 (dh)

CAPTIVE BREEDING

First zoo animal: 1868 London, the UK

First animal born and reared in the zoo situation: 1941 Brookfield Zoo, Chicago, the USA

The first animal in captivity, i.e. in Europe since Roman times, was male Theodore imported by the legendary German animal dealer Carl Hagenbeck to London Zoo, England, on 11 September 1868 (BERTRAM 1983, EDWARDS 1996). On arrival, Theodore was as big as a large pig. Caught in Eastern Sudan in February 1868, this animal died on 12 April 1891 of stomach cancer when it was 24 years old (EDWARDS 1996). The oldest animals as listed by the International Studbook are two individuals (a pair) imported into Bronx Zoo, New York, the USA. Both animals were captured in Uganda in 1906. The female named Victoria (Stdbk #699) was supplied by Ruhe, a German animal dealer, while the male named Spoke (Stdbk #700) was imported by Bourne, an English company. While Victoria stayed in New York until 1931 and lived to be 26 years old - a great age for that time, the male died already in 1910 before reaching his adult age (GOLTENBOTH and OCHS 1999). That was probably the reason that the animals never reproduced.

The first individual born in captivity - male Georgie-Joe - was born in 1941 in Brookfield Zoo, Chicago, the USA, to female Mary belonging to the south-central subspecies (*D. b. minor*). In Europe, the first black rhino was born on 12 October 1958 in Frankfurt a/M. This was female Lemuta who later gave birth twice and reared one calf. This rhino lived for 13 years and died in 1971.

The act of foundation of the International studbook was initiated by the International Union of Directors of Zoological Gardens (IUDZG) in 1966. It was managed jointly for both species of African rhinos (International Studbook for African Rhinoceros *Diceros bicornis* / *Ceratotherium simum*) by Berlin Zoo, Germany, with Professor Heinz-Georg Klos, then director of Berlin Zoo, being the first studbook keeper. Since that time, data were collected throughout the stock of zoo-based African rhinos and summarised by Prof Klos in 1976, when the first edition of the studbook was released (FRESE 1993). As of 2001, the studbook has been split and published as two parts, one of which has been attending to the black rhino, while the other concerns the white rhino (FRADRICH and OCHS 2001). Currently, the Black Rhino International Studbook is kept by Dipl Biol Reinhard Frese and Berlin Zoo. The latest edition was published in 2009 (FRESE 2009); according to this release, the studbook historically registered 1,021 (485,497.22) black rhinos prior to 2 December 2009, of which the living population consisted of 299 (131,146.22) animals.

The chief issue of breeding black rhinos in captivity is not reproduction of this species - they breed quite well already in the fifth generation. Rather, their insufficient longevity is the case, as they suffer from various health problems including haemolytic anaemia (breakdown of red blood cells) and die relatively young, which relates to the fact they are dietary specialists and rather nervous animals.

This has also been evidenced by the gradual increase in population in captivity, when the annual increase in a period of 35 years (1969-2004) was 2.64%, as is apparent from the data of international studbooks (KLOS and FRESE 1981, 1983, 1987, 1991 and



Theodore at London Zoo in 1885 (M J Fortune Nott)



Theodore at London Zoo in 1890 (L Medland), from: EDWARDS 1996.

1993, GOLTENBOTH and OCHS 1995, 1997 and 1999, OCHS 2001, OCHS and LANGE 2005) and the table on page 32 and 33. While captive collections held in 1969 a total of 144 (73.71) black rhinos, in 2004 it was by 92% more, i.e. 277 (125.146.6) animals.

The abundance of the black rhino in captivity, 1969-2009 (according to the International Studbook)

Year	Num. as per 1 Jan	Total born	Year	Num. as per 1 Jan	Total born	Year	Num. as per 1 Jan	Total born
1969	144 (73.71)	6 (4.2)	1978	187 (84.103)	7 (5.2)	1990	204 (91.113)	13 (6.7)
1970	143 (72.71)	11 (2.9)	1979	181 (83.98)	10 (6.4)	1992	208 (92.116)	11 (8.3)
1971	143 (69.74)	5 (2.3)	1980	179 (82.97)	5 (4.1)	1994	206 (94.112)	15 (7.7.1)
1972	156 (77.79)	8 (3.5)	1981	172 (78.94)	8 (4.4)	1996	238 (109.129)	14 (7.7)
1973	161 (76.85)	4 (1.3)	1982	174 (82.92)	7 (2.5)	1998	235 (105.130)	11 (1.9.1)
1974	170 (76.94)	4 (1.3)	1983	180 (83.97)	8 (4.4)	2001	275 (125.144.6)	18 (9.9)
1975	171 (76.95)	8 (4.4)	1984	182 (86.96)	4 (3.1)	2004	277 (125.146.6)	11 (5.4.2)
1976	183 (81.102)	5 (2.3)	1985	180 (85.95)	7 (2.5)	2009	299 (131.146.22)	12 (1.4.7)
1977	186 (82.104)	11 (8.3)	1986	181 (82.99)	6 (3.3)			

According to the 1993 International Studbook (FRADRICH and FRESE 1993), 105 (48.57) black rhinos, i.e. 46% out of 228 (111.117) animals imported reproduced in captivity, while the same was achieved in a total of 54 (27.27) individuals, i.e. 23.4%, out of 231 (112.119) captive-born rhinos.

The International Studbook (GOLTENBOTH and OCHS 1995) reports that 223 captive black rhinoceroses lived in 1994, of which 58 individuals, i.e. 26%, were animals more than 20 years old, while the rest of the captive stock (74%) were younger animals, with 99 individuals (44.4%) under 10, and the remainder counting 66 animals (29.6%) between 10 and 20 years. At the same time, 20 births were registered in the course of 2 years (1993-1994), which is 10% as regards the entire population and 5% per year. This is in contrast with the situation in the southern white rhino, where in the same year 694 animals were held, with those over 20 years numbering 374 individuals, i.e. 53.9% of the population. In addition, only 23 births were recorded over the two preceding years (3.3% as regards the entire population, while the annual birth rate was a mere 1.66%). In the Indian rhino, the total population in captivity in 1994 consisted of 134 individuals, and 11 births were registered in the 1993-1994 period (8.2% with respect to the entire population and 4.1% annually). The comparison of all three species makes clear that the best breeding performance in captivity is that of the black rhino (5% per year). The latest issue of the International Studbook (FRESE 2009) shows that between 2005 and 2009 (prior to 2 December 2009), 67 (25.25.17) calves were born and 30 (11.19) individuals died.

The data in the International Studbook (OCHS 2005) show that in 2004, a total of 930 black rhinos were registered in two subspecies (eastern and south-central), while the current population consisted of 277 individuals, which is by 55 animals more than in 1995 (an increase of almost 25% in 9 years). More details on the 1995, 2004 and 2009 breeding performance are summarised in the following table, which shows an increase in the eastern subspecies numbers of 15.2% in 5 years and reduced numbers of the south-central subspecies by 15%. The total population of black rhinos in captivity increased since 2004 by almost 8%.

Analysis of black rhino stock development in captivity, 1995-2009 (HOLECKOVA 1996, LANGE and OCHS 2005b)

Subspecies in captivity	Total registered stock 1995	Imported from the wild 1995	Total born in captivity 1995	Breeding animals 1995	Total living animals 1995	Total living animals 2004	Total living animals 2009
Eastern ssp. <i>D. b. michaeli</i>	460 (222.233.5)	201 (93.108)	259 (129.125.5)	78 (29.49)	173 (78.92.3)	210 (91.114.5) + 21.4%	242 (99.121.22) + 15.2%
South-central ssp. <i>D. b. minor</i>	82 (40.42)	61 (28.33)	21 (12.9)	14 (6.8)	49 (20.29)	67 (34.32.1) + 36.7%	57 (32.25) -15%
Total	542 (262.265.3)	262 (121.141)	280 (141.134.5) i.e. 51.7%	i.e. 41.4%	222 (98.121.3)	277 (125.146.6) + 24.8%	299 (131.146.22) + 7.9%



An indoor exhibit at Brookfield Zoo, Chicago, 2009. In the house that dates back to 1929, the first captive black rhino was born in 1941. The picture from 2009 is showing a female of the south-central subspecies (*D. b. minor*). (dh)



Black rhino (*D. b. minor*) enclosure, Brookfield Zoo, Chicago, the USA; the picture is showing a stud male, 2009. (dh)

Analysing the black rhino breeding performance in captivity by region reveals that the population increased by 79 individuals, i.e. 39.9% (2.85% per year) in 14 years (from 1990 to 2004). Although the majority of animals were still kept in North American zoos, the number of animals kept in Europe increased, while that in Asia declined. The largest increase of the stock was observed in Africa - for insight, see the following table.

The abundance of the black rhino in captivity per region (according to the International Studbook)

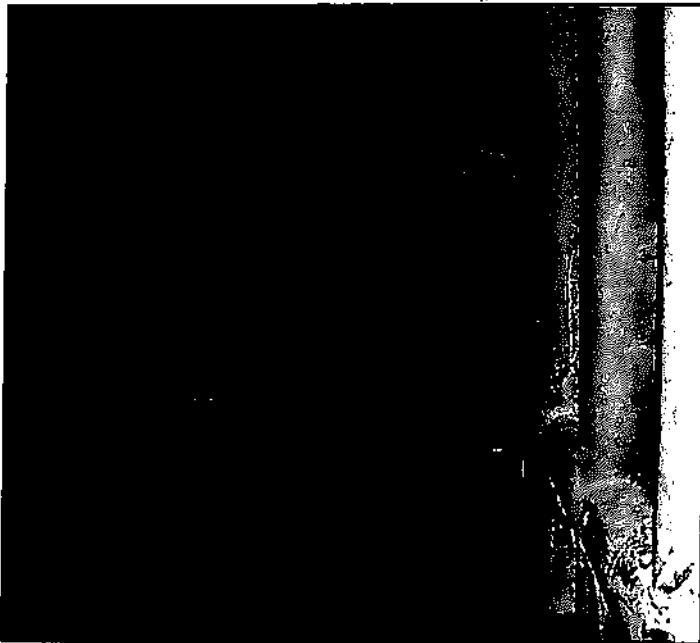
Region	1990 (no. of individuals/ %)	1994 (no. of individuals/ %)	1998 (no. of individuals/ %)	2000 (no. of individuals/ %)	2004 (no. of individuals/ %)
North America	85-42.9%	92-41.3%	102-43.4%	109-39.6%	110-39.7%
Europe	55-27.8%	62-27.8%	73-31.1%	74-26.9%	75-27.1%
Asia	41-20.7%	41-18.4%	28-11.9%	33-12%	28-10.1%
Africa	9-4.5%	12-5.4%	16-6.8%	46-16.7%	52-18.8%
South and Central America	6-3%	4-1.8%	4-1.7%	1-0.4%	0-0%
Australia	2-1%	12-5.4%	12-5.1%	12-4.4%	12-4.3%
Total (increase in %)	198	223 (99.121.3) (+12.6%)	235 (106.130) (+5.4%)	275 (125.144.6) (+23.9%)	277 (125.146.6) (+24.2%)

The following table summarising the data per region with respect to the eastern black rhinoceros shows that in 2004 there were no breeders in Australia and South/Central America. The most numerous stock was that of Europe where 15 zoos held 73 animals, i.e. almost five individuals on average per holder. In North America (which in fact concerns the USA), 71 animals were held by 28 different collections (2.5 animal per institution). The only African holder is the Lewa Wildlife Conservancy with their 40 animals, where animals are managed under fully natural conditions.

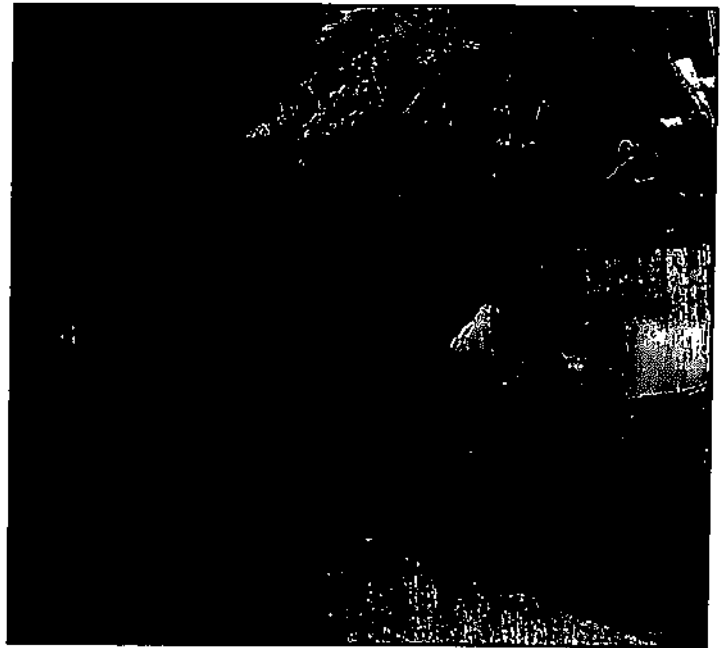
Eastern black rhino (*D. b. michaeli*) stock in captivity per region (according to the International Studbook)

Region	1992	2000	2004
North America	69 (36.33) - 24 collections	67 (40.60) - 28 collections	71 (40.31) - 28 collections
Europe	57 (21.36) - 11 collections	72 (24.48) - 15 collections	73 (26.47) - 15 collections
Asia	24 (13.11) - 13 collections	27 (11.16) - 9 collections	26 (11.15) - 9 collections
Africa	6 (3.3) - 5 collections	33 (11.18.4) - 4 collections	40 (14.21.5) - 1 collection
South and Central America	5 (2.3) - 3 collections	1 (1.0) - 1 collection	0
Australia	1 (0.1) - 1 collection	1 (1.0) - 1 collection	0
Total	162 (75.87) - 57 collections	201 (88.109.4) - 57 collections	210 (91.114.5) - 53 collections

Summary information on the world's largest breeders of the eastern black rhinoceros is provided under the table on page 35, which shows that Dvur Kralove Zoo has been the most important black rhino holder since 1982, which as of 2000 applies to England's Port Lympne for Europe and Lewa Wildlife Conservancy globally, where the latter is not a zoological park, but a nature reserve in Kenya with reintroduced (restored) population.



An indoor exhibit for the black rhino (*D. b. michaeli*) equipped with a scale at Lincoln Park Zoo, Chicago - the picture is showing male Nakili, 2009 (dh)



Black rhino (*D. b. michaeli*) house at Zurich Zoo, Switzerland; 2007 (dh)

The world's major holders of the eastern black rhino (*D. b. michaeli*) - according to the International Studbook

Institution	1982	1994	2000	2004
Dvur Kralove	9 (3.6)	14 (5.9)	14 (4.10)	15 (5.10)
Berlin Zoo, Germany	6 (1.5)	9 (7.2)	6 (1.5)	7 (1.6)
Cincinnati, USA	6 (3.3)	3 (2.1)	3 (2.1)	2 (1.1)
Tehran, Iran	8 (3.3)	5 (2.3)	0	0
Hiroshima, Japan	5 (3.2)	5 (1.4)	7 (3.4)	8 (4.4)
Nagoya, Japan	5 (2.3)	1 (1.0)	2 (1.1)	2 (1.1)
Denver, USA	5 (2.3)	3 (2.1)	3 (2.1)	3 (2.1)
Zurich, Switzerland	5 (2.3)	5 (2.3)	4 (1.3)	4 (1.3)
Port Lympne, UK	4 (2.2)	10 (6.4)	19 (7.12)	19 (7.12)
Chicago Brookfield, USA	3 (1.2)	5 (3.2)	5 (2.3)	5 (3.2)
Chester, UK	2 (1.1)	3 (1.2)	5 (1.4)	7 (3.4)
Lewa Wildlife Conservancy, Kenya	-	-	29 (10.15.4)	40 (14.21.5)
Kansas City, USA	-	0	4 (2.2)	5 (2.3)
Colombo, Sri Lanka	4 (2.2)	0	0	0
Detroit, USA	4 (2.2)	1 (1.0)	1 (1.0)	1 (1.0)
Lisbon, Portugal	4 (2.2)	0	0	0
Magdeburg, Germany	4 (2.2)	2 (0.2)	4 (1.3)	4 (1.3)
Mysore, India	4 (2.2)	4 (0.1.3)	2 (1.1)	2 (1.1)
Beijing, China	4 (1.3)	3 (1.2)	0	0
Sydney, Australia	4 (2.2)	0	0	0
Whipsnade, UK	4 (2.2)	2 (1.1)	2 (1.1)	2 (1.1)

Historically, only two of the four black rhino subspecies have been held in captivity. The comparison between 2004 and 1995 shows that there was a reduction in the number of collections from 75 to 68, while the number of animals increased by 55 (24.8%) up to 277 individuals in 9 years. Of these, 210 (75.8%) belong to the eastern subspecies, and 67 (24.2%) are those of the south-central form.

The abundance of the black rhino in captivity per subspecies (according to the International Studbook)

Year	Num. of collections	Num. of individuals	Eastern ssp. <i>D. b. michaeli</i>	South-central ssp. (<i>D. b. minor</i>)
1995	75	222 (98.191.3)	173 (78.92.3)	49 (20.29)
2004	68	277 (125.146.6)	210 (91.114.5)	67 (34.32.1)
Balance 2004-1995	- 7 (90.1%)	+ 55 (124.8%)	+ 37 (121.4%)	+ 18 (136.7%)

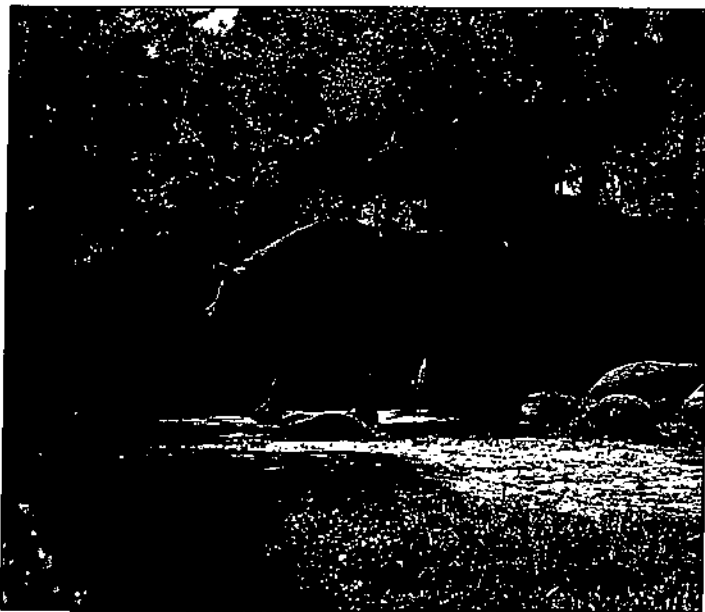
Eastern black rhino holders



*Black rhinos (*D. b. michaeli*) - a hand-reared four-year-old female Lola and her two-year-old brother Elvis with their keeper in Lewa Wildlife Conservancy, Kenya, 2009 (dh)*



*The youngest sibling of the black rhinos (*D. b. michaeli*) hand-reared in Lewa, Kenya, 2009. All the young were born to a blind female mated by a free-ranging male; they were abandoned by their mother when only a few weeks old. (dh)*



*A black rhino (*D. b. michaeli*) in a new enclosure at the zoo in Saint Louis, USA, in 2009 (dh)*



Overall view of the black rhino enclosure at Saint Louis Zoo, USA, 2009 (dh)

European black rhino holders



Black rhino enclosure (D. b. michaeli) - male Vungu with females Salome (DK 23) and Rufiji, Howletts, England, 2008 (dh)



In Europe, the south-central black rhino (Diceros bicornis minor) is held only at Frankfurt Zoo, Germany - 2008. (dh)



The only stock of the south-central black rhino (Diceros bicornis minor), a female with a calf, Frankfurt Zoo, Germany, 15 June 1994 (lh)



Breeding facilities for the black rhino (D. b. michaeli) in Port Lympne, England, 1998 (dh)



Little Mweru with its mother Nakuru at Port Lympne Zoo, England (az)

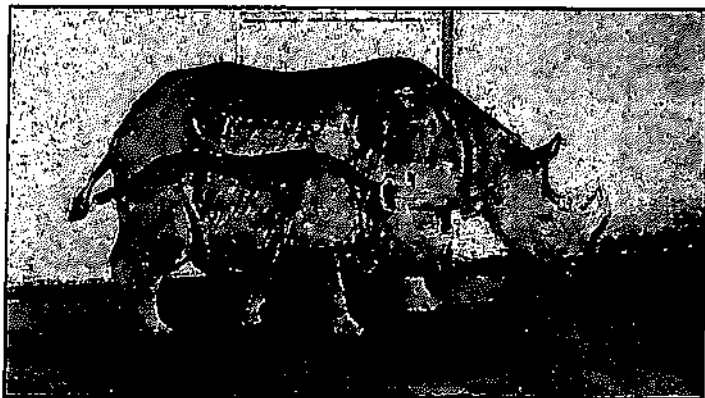
European eastern black rhino holders



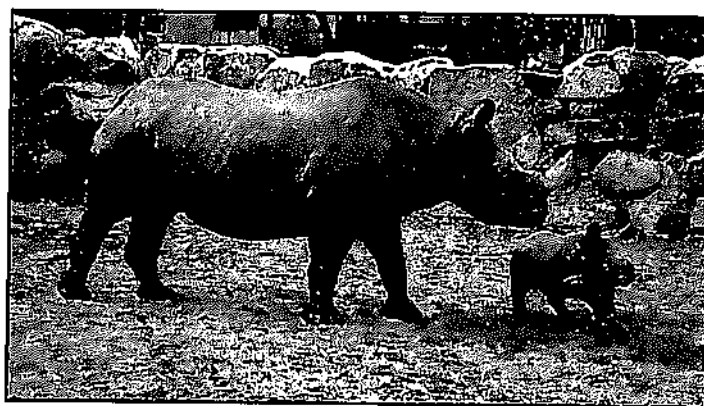
Hannover, 6 July 1995 (lh)



Leipzig, 11 June 2002 (lh)



Osnabruck, 23 June 1998 (lh)



Berlin Zoo, 8 May 1991 (lh)



Berlin Zoo, 2 October 2009 (lh)



Zurich Zoo, 13 June 1992 (lh)

EEP

The European black rhino conservation breeding programme (EEP) was established at German Berlin Zoo in 1990 that managed the programme until 2006. Since 2007, this EEP has been under the management of Chester Zoo, the UK. At the beginning, the EEP was coordinated by Dr Reinhard Goltenboth who was then replaced by Dr Andreas Ochs. In 2007, Mark Pilgrim of UK-based Chester Zoo took over. As per 1 January 1993, 55 (21.34) black rhinos were held by 12 collections, 3 (2.1) calves were born during the year on 31 and December 1993, the stock consisted of 54 (21.33) individuals (GOLTENBOTH 1994). In the same year, only three animals older than 30 years lived in Europe.

On 1 January 1998, 16 zoos associated within the EEP held 69 (24.45) individuals belonging to the eastern subspecies (*D. b. michaeli*) except 3 (1.2) individuals of the south-central subspecies (*D. b. minor*) at Frankfurt Zoo. Throughout the year 1997, 8 (1.7) calves were born, from which 6 (0.6) were reared. It should be noted that 2 calves were born and reared at Dvur Kralove Zoo alone (GOLTENBOTH 1997). Upon 1 January 1999, 72 (23.49) animals were held in 15 zoos within the EEP. In 1998, 5 (1.4) calves were born and reared, representing 6.9% of the stock. By comparison, the EEP population consisted of 77 (27.50) black rhinos in 18 collections as per 31 December 2006 (PILGRIM 2007), with 5 (3.2) calves born in 2006, which represents 6.7% of the stock as per 1 January 2006 numbering 75 (25.50) animals. According to the most recent figures, a total of 78 (29.49) black rhinos were held in 16 zoos on 1 January 2009, of which 2 (1.1) belonged to the south-central subspecies (Frankfurt) and the remainder, i.e. 76 (28.48) animals, to the eastern form (PILGRIM 2009). Over 11 years, the black rhino EEP population increased from 61 (24.37) individuals in 1995 to 77 (27.50) and 78 in 2008, respectively, representing an absolute increase of more than 26% (GOLTENBOTH 1996, PILGRIM 2008 and 2009). At the same time, there was a decline in the population as a result of the reintroductions to Africa over the same period (OCHS 2005, SMRCEK and HOLECKOVA 2009) carried out by the zoos in Frankfurt (two females in 2000 and 2004, respectively) and Howletts (a pair in 2007).

Development of EEP black rhino population

Year (source)	Status as per 1 Jan	Status as per 31 Dec	Number of zoos	Total born	Total reared
1995 (Goltenboth 1996)	61 (24.37)	61 (22.39)	15	5 (2.3)	5 (2.3)
2006 (Pilgrim 2008)	75 (25.50)	77 (27.50)	17	5 (3.2)	3 (1.2)
2008 (Pilgrim 2009)	76 (26.50)	78 (29.49)	16	3 (3.0)	3 (3.0)



Davu chasing Etosha DK 30 (dh)

Analysis of black rhino stocks in the zoos within the EEP (GOLTENBOTH 1995, PILGRIM 2007 and 2009)

* South-central subspecies - *D. b. minor*, the remainder are holders of the eastern subspecies, *D. b. michaeli*

No.	Zoo	Numbers as per 31 Dec 1993	Numbers as per 6 Sep 2007	Numbers as per 1 Jan 2009
1	Berlin Zoo, Germany	6 (1.5)	7 (1.6)	8 (2.6)
2	Chester, UK	4 (2.2)	7 (3.4)	8 (3.5)
3	Dvur Kralove, CZ	14 (5.9)	14 (5.9)	17 (7.10)
4	Frankfurt, Germany*	2 (1.1)	2 (1.1)	2 (1.1)
5	Hannover, Germany	2 (1.1)	3 (1.2)	3 (1.2)
6	Leipzig, Germany	2 (1.1)	3 (1.2)	3 (1.2)
7	London, UK	3 (2.1)	0	0
8	Magdeburg, Germany	4 (2.2)	5 (1.4)	4 (1.3)
9	Port Lympne, UK	9 (4.5)	15 (4.11)	15 (4.11)
10	Rome, Italy	1 (0.1)	0	0
11	Tallinn, Estonia	2 (1.1)	1 (1.0)	1 (1.0)
12	Zurich, Switzerland	5 (1.4)	4 (1.3)	2 (0.2)
13	Howletts, UK	0	3 (1.2)	3 (1.2)
14	Doué-la-Fontaine, France	0	3 (2.1)	4 (2)
15	Cologne, Germany	-	2 (1.1)	1 (1.0)
16	Krefeld, Germany	0	3 (2.1)	3 (2.1)
17	Paignton, UK	0	3 (1.2)	2 (0.2)
18	Pont-Scorff, France	0	2 (1.1)	2 (1.1)
	Total	94 (21.33)	77 (27.50)	78 (29.49)

Breeding in Czech and Slovak zoological parks

The first live black rhino in Czechoslovakia was, according to the studbook, male Max (Stdbk #650), which was acquired by the circus of Kludsky family in 1932 and sold by the same holder to Prague Zoo in 1933. Max was wild-caught somewhere in East Africa and died in 1940 from pneumonia when he was 10 years old. The second Prague's black rhinoceros was male Max 2 (Stdbk #42), who arrived in 1954, but its origin is veiled in mystery. Max 2 died in 1969 and lived for 17 years. Female Isis (Stdbk #43) was imported in 1959 to join Max 2; the female never reproduced and was sold to Brink, the Dutch company, in 1972; Brink sent this animal to Rio de Janeiro where Isis, however, died of stress soon after arrival. All of these three Prague's individuals belonged to the eastern subspecies and died without offspring (GOLTENBOTH and OCHS 1999).

The subsequent stock history relates to the wild-caught animals from imports organised by Dvur Kralove in the early 1970s, where a pair of black rhinos was supplied to Lesna Zoo (1976). Because male Addo died in Lesna after two years, female Satara returned to Dvur Kralove in 1979, where she however died as well in 1981 without offspring. The only successful black rhino holder amongst Czech and Slovak zoos is Dvur Kralove, who has been holding the species continuously since 1972, successfully producing offspring for 32 years.

Black rhino stock in Czech zoos - overview prior to 1 January 2009

Zoo	Holding period	Import	1st birth	Most recent birth	Total born	Total reared	Status as per 1 Jan 2009
Dvur Kralove	1972-2008	19 (11.8)	1977	2007	33 (13.20)	29 (11.18)	17 (7.10)
Lesna	1976-1981	2 (1.1)	-	-	0	-	0
Prague	1933-1972	3 (2.1)	-	-	0	-	0
TOTAL	1972-2008	24 (13.10)	1977	2007	33 (13.20)	29 (11.18)	17 (7.10)



Female Etna (DK 13) with its first calf at Port Lympne Zoo, UK (az)

BLACK RHINO AT DVUR KRALOVE ZOO

Black rhino imports

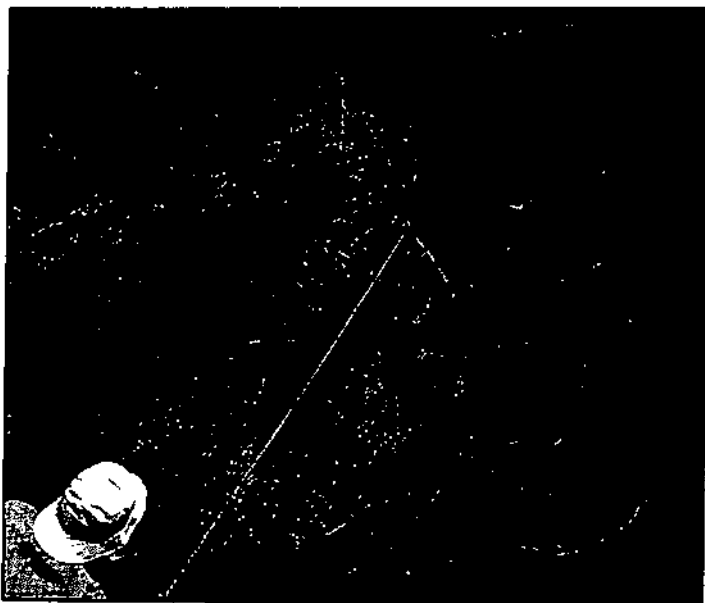
Dvur Kralove acquired eastern black rhinoceroses (*Diceros bicornis michaeli*) from the wild in Kenya; this action was carried out by the zoo alone in 1972, when 10 (4.6) juveniles about one year old caught in Tsavo National Park were imported, with additional 3 (1.2) animals one to three years old, of which female Sabi was caught in the Isiolo region, while the origin of male Addo and female Satara is not known exactly.

Of the animals above, a pair (Lord and Lenka) was supplied in 1972 to Jacksonville Zoo in the U.S. Male Murray left to Wroclaw in 1974, from where he returned to Dvur Kralove in 1980; this animal was eventually supplied together with female Sabi to Zurich Zoo, Switzerland, in 1983. The pair, Addo and Satara, was sold in 1976 to the Moravia-based Lesna Zoo, Zlin, from where the female however returned in 1979 to Dvur Kralove following the death of the male. From all rhinos imported to Dvur Kralove from Africa, male Murray held in Tallinn Zoo, Estonia, died in 2009 when 39 years old; female Jimmi lived over 39 years in Dvur Kralove and female Sabi lived 36 years in Zurich.

From 1978 to 2008, six males were gradually introduced into the collection: one-year-old Isis (F2) from Cincinnati Zoo, the USA (1978), thirteen-year-old Mabou (F1) from Magdeburg and seventeen-year-old Cody (F2, born in Australia) from Berlin, Germany (both males arrived in 1992), a five-year-old Mweru (F2) from Port Lympne, England (2001), and, finally, two-year Davu (F3) from the German Krefeld Zoo and sixteen-year-old Baringo II (F3) from England's Port Lympne in 2008.

In 2007, male Jimm (DK 3) reared in Dvur Kralove returned from the Swiss Zurich Zoo, to which he was loaned a year before within the breeding cooperation.

A total of 20 (12.8) individual eastern black rhinos were imported to Dvur Kralove, of which 13 (5.8) were wild-caught in Kenya. Two of the animals above (1.1 - Murray and Satara) were imported two times. 5 (3.2) animals left for good to other zoos and 10 (4.6) individuals died in Dvur Kralove. Out of the animals imported, 5 (5.0) still live in Dvur Kralove. For more details, refer to the table on page 43-44.



Black rhino capture in Kenya (az)



A young black rhino in the boma, Kenya (az)

Imports of black rhinos to Dvur Kralove Zoo prior to 31 December 2009

(Stdbk # - animal number within the International Studbook; M - male, F - female. Names in brackets were used in other zoos.)

No.	Sex	Name	Stdbk #	Arrival	Birth	Departure/Death (†)	Comments
1	M	Lord	169	22 Aug 1971 Kenya	January 1970 Kenya, Tsavo NP	22 Jun (3 Aug) 1972 Jacksonville, USA 22 Apr 1978 San Antonio, USA † 22 Jun 1978 San Antonio, USA	Lived 29 years
2	M	Ken	170	22 Aug 1971 Kenya	January 1970 Kenya, Tsavo NP	† 8 Nov 1979 Dvur Kralove	Lived 9 years
3	M	Murray (Murry)	171	22 Aug 1971 Kenya 2 Oct 1980 Wroclaw, Poland	February 1970 Kenya, Tsavo NP	29 Oct 1974, Wroclaw, Poland 23 Apr 1983 Zurich, Switzerland 12 Sep 1988 Tallinn, Estonia	Lived 39 years
4	M	King	172	22 Aug 1971 Kenya	1970 Kenya, Tsavo NP	† 22 Apr 1978 Dvur Kralove	Lived 8 years
5	F	Zina	173	22 Aug 1971 Kenya	1969 Kenya, Tsavo NP	† 26 Jun 1978 Dvur Kralove	Lived 8 years
6	F	Elsa	174	22 Aug 1971 Kenya	1970 Kenya, Tsavo NP	† 7 Apr 1978 Dvur Kralove	Lived 8 years
7	F	Jimmi	175	22 Aug 1971 Kenya	February 1970 Kenya, Tsavo NP	† 21 Aug 2009 Dvur Kralove	Lived 39 years
8	F	Lenka (Bonnie)	176	22 Aug 1971 Kenya	1970 Kenya, Tsavo NP	22 Jun 1972 Jacksonville, USA 14 May 1978 Columbus, USA † 17 Apr 1982 Columbus, USA	Lived 12 years
9	F	Tuty	177	22 Aug 1971 Kenya	1970 Kenya, Tsavo NP	† 24 May 1978 Dvur Kralove	Lived 8 years
10	F	Jarca	178	22 Aug 1971 Kenya	February 1970 Kenya, Tsavo NP	† 8 Sep 1996 Dvur Kralove	Lived 26 years
11	F	Sabi	217	26 Jun 1974 Kenya	1972 Kenya, Isiolo Region	23 Apr 1983 Zurich, Switzerland † 13 Apr 2008 Zurich, Switzerland	Lived 36 years
12	M	Addo	216	2 Jul 1974 Kenya	1971 Kenya	20 Apr 1976 Lesna, CR † 31 Jan 1978 Lesna, Czechoslovakia	Lived 7 years
13	F	Satara	218	2 Jul 1974 Kenya 14 Jul 1978 Lesna, Czechoslovakia	1973 Kenya	20. Apr 1976 Lesna, Czechoslovakia † 24 Apr 1981 Dvur Kralove	Lived 8 years
14	M	Isis/Bub- ba	268	17 Nov 1978 Cincinnati, USA	3 Nov 1977 Cincinnati, USA		
15	M	Mabu	277	1 Oct 1992 Magde- burg, Germany	23 Jan 1992 Magdeburg, Germany	† 15 Oct 1996 Dvur Kralove	Lived 17 years
16	M	Cody	260	10 Dec 1992 Berlin, Germany	20 May 1975 Sydney, Australia	† 19 May 1999 Dvur Kralove	Lived 24 years
17	M	Mweru	659	29 Nov 2001 Port Lympe, UK	12 Sep 1996 Port Lympe, UK		
18	M	Davu	970	3 Apr 2008 Krefeld, Germany	19 Feb 2008 Krefeld, Germany		

No.	Sex	Name	Stdbk #	Arrival	Birth	Departure/Death (†)	Comments
19	M	Jimn	283	16 May 2008 Zurich, Switzerland	18 Mar 1979 Dvur Kralove		
20	M	Baringo II	483	6 Jun 2008 Port Lympe, UK	3 Dec 1992 Port Lympe, UK		
Total individuals imported: 20 (12.8), of which male Jimn returned to Dvur Kralove after having been loaned to Zurich Zoo.							

Stock founders

The information obtained from the studbook (OCHS 2005) and others (TOMASOVA 2005) shows that there are 27 (14.13) founders represented in the Dvur Kralove stock, of which 22 (10.12) comes from Kenya (born between 1941-1973), 2 (2.0) from Tanzania (born 1944 and 1970), 2 (1.1) from an unspecified site of East Africa (born about 1953) and 1 (1.0) from Addo National Park, South Africa (born 1975). The exact origin is unknown in 12 (7.5) founders, of which 6 (5.3) were caught in Tsavo National Park, Kenya, 1 (0.1) in Isiolo, Kenya, 1 (0.1) in the territory of the Tana River, Kenya and 1 (1.0) in Arusha National Park in Tanzania. The male imported from Addo National Park in South Africa is a descendant of four individuals introduced into South Africa from the Makueni region, Kenya, in 1961. A brief overview of the founders is provided in the table on page 44, covering all black rhinos imported from the wild directly to Dvur Kralove that reproduced further. This involves a total of 8 (4.4) founders, of which 6 (2.4) bred in Dvur Kralove, while two (2.0) reproduced in other collections (the USA and Switzerland). In addition to the proven breeders, the table further includes two potential studs - Davu, a male imported to Dvur Kralove in 2008, still not fully mature, and female Bashira, a yearling loaned to Chester Zoo, England.

Founders represented in the Dvur Kralove stock (according to the International Studbook, LANGE and OCHS 2005b)

No.	Stdbk #	Sex	Name	Birth	Zoo	Relationships to Dvur Kralove/Breeding individuals *
1	9	M	Kibo	1969 Kenya, Tsavo NP	Gelsenkirchen, Germany Hannover, Germany Magdeburg, Germany Hannover, Germany	Father of Mabu
2	18	M	Bwana Mkubwa	1962 Kenya	Whipsnade, UK London, UK Port Lympe, UK	Grandfather of Mweru
3	20	M	Willie	1949 Kenya	Bristol, UK	Great-grandfather of Baringo II
4	21	F	Stephanie	1949 Kenya	Bristol, UK	Great-grandmother of Baringo II
5	56	M	Johnny/Freeman	1953? East Africa	Cincinnati, USA Oklahoma, USA	Grandfather of Isis
6	57	F	Opal	1953? East Africa	Cincinnati, USA	Grandmother of Isis
7	99	M	Ferdinand	1944 Tanzania, Arusha NP	Sydney, Australia	Grandfather and father of Cody
8	100	F	Peggy	1941 Kenya	Sydney, Australia	Grandmother of Cody
9	120	M	Boyle	1961 Kenya	St. Louis, USA	Grandfather of Davu

No.	Stdbk #	Sex	Name	Birth	Zoo	Relationships to Dvur Kralove breeding individuals *
10	121	F	Ollve	1962 Kenya	St. Louis, USA Oklahoma, USA	Grandmother of Davu
11	153	F	Kenia	1966 Kenya	Magdeburg, Germany	Father of Mabu
12	166	M	Klaus	1970 Tanzania	Leipzig, Germany Berlin, Germany	Grandfather of Davu (father of Nane)
13	169	M	<i>Lord</i>	<i>1970 Kenya, Tsavo NP</i>	<i>Dvur Kralove</i>	<i>Had 4 descendants in the USA</i>
14	170	M	Ken	1970 Kenya, Tsavo NP	Dvur Kralove	Father of Sali, possible father of Elvira
15	171	M	<i>Murray</i>	<i>1970 Kenya, Tsavo NP</i>	<i>Dvur Kralove</i>	<i>Had a single descendant in Zurich</i>
16	172	M	King	1970 Kenya, Tsavo NP	Dvur Kralove	Father of Jimm, possible father of Elvira
17	174	F	Elsa	1970 Kenya, Tsavo NP	Dvur Kralove	Mother of Elvira
18	175	F	Jimmi	1970 Kenya, Tsavo NP	Dvur Kralove	Mother of Jimm, Jessi a Jane Lee
19	178	F	Jarca	1970 Kenya, Tsavo NP	Dvur Kralove	Mother of Jaga
20	194	F	Naivasha	1970 Kenya	Howletts, UK Port Lympne, UK	Grandmother of Bashira
21	195	F	Rukwa	1970 Kenya	Howletts, UK Port Lympne, UK	Grandmother of Mweru, mother of Baringo II
22	217	F	Sabi	1972 Kenya, Isiolo Region	Dvur Kralove	Mother of Sali, grandmother of Davu
23	240	F	Mzima	1973 Kenya, Tana River District	Del Garda Zoo Berlin, Germany	Grandfather of Davu (father of Nane)
24	247	M	Ralph-Embu	1970 Kenya	Hannover, Germany Cincinnati, USA	Father of Isis
25	534	M	Gareth Edwards	1975, Addo NP, SA	Port Lympne, UK	Father of Mweru
26	582	M	Peter-Meru	1951 Kenya	Rotterdam	Great-grandfather of Baringo II
27	583	F	Sonny	1949 Kenya	Rotterdam, Netherlands Amhem, Netherlands	Great-grandmother of Baringo II

Bold: animals imported to Dvur Kralove from the wild

Italics: animals imported to Dvur Kralove from the wild with descendants in other zoos

Blue: includes potential breeders - male Davu and female Bashira

Stdbk # - animal number in the International Studbook

RHINO HOUSING FACILITIES

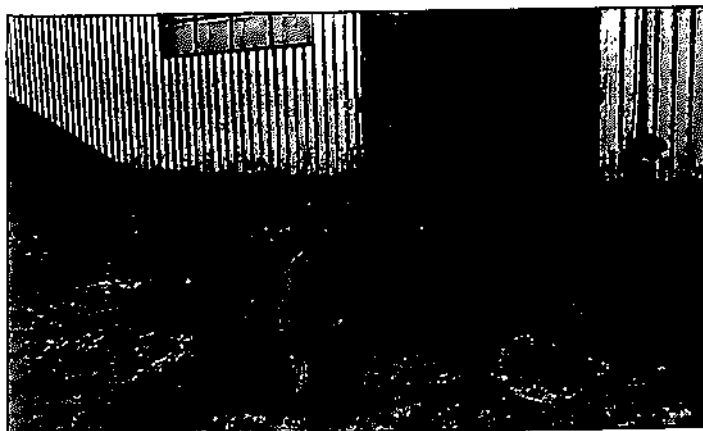
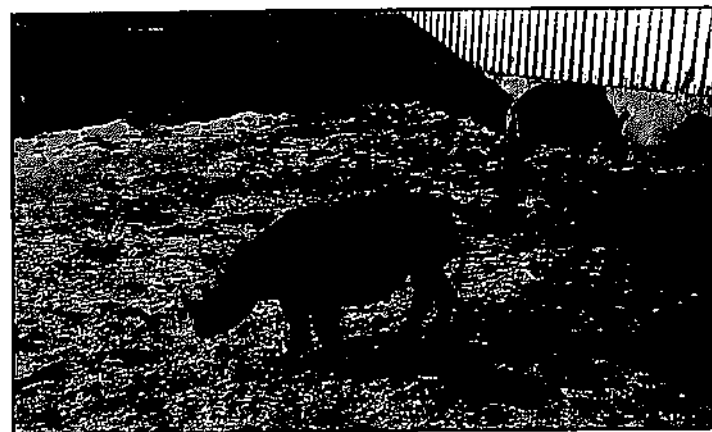
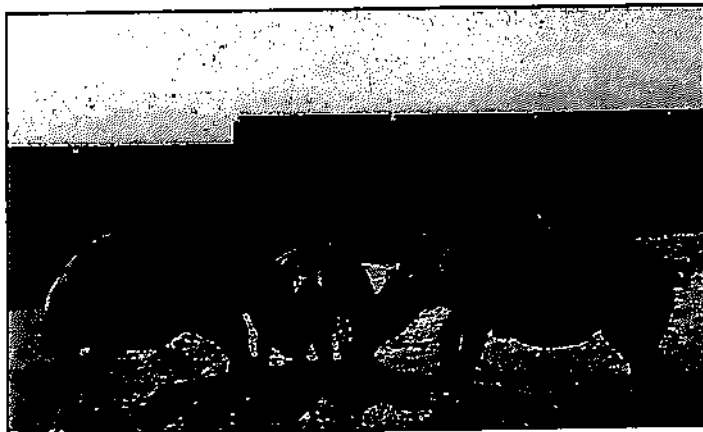
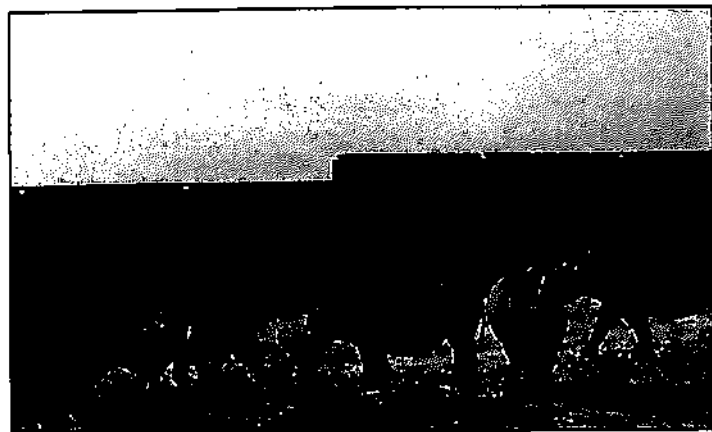
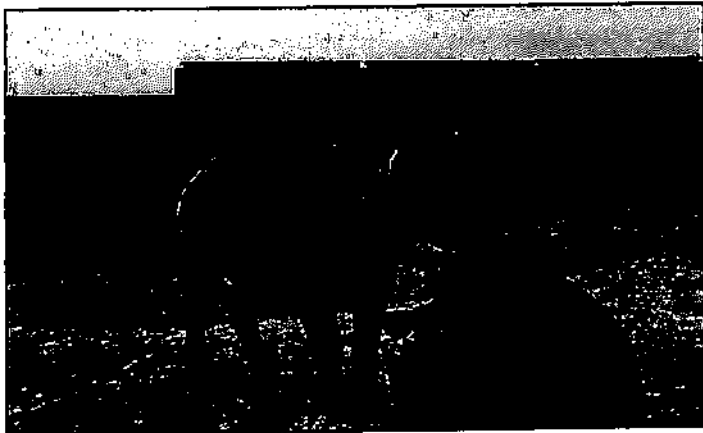
Quarantine and wintering facilities

Following the import from Africa in the early 1970s, black rhinos were first placed in the quarantine, which was a steel heat-insulated barn with indoor wood-fenced boxes. For white rhinos, a similar simple barn made of bricks that served as the first wintering facility for giraffes, white rhinos and other species and subsequently as a central store was used over the first two winters. This building has in part been accommodating giraffe housing needs since 2000.



A black rhinoceros after arrival in the quarantine facility, 1971 (jv)

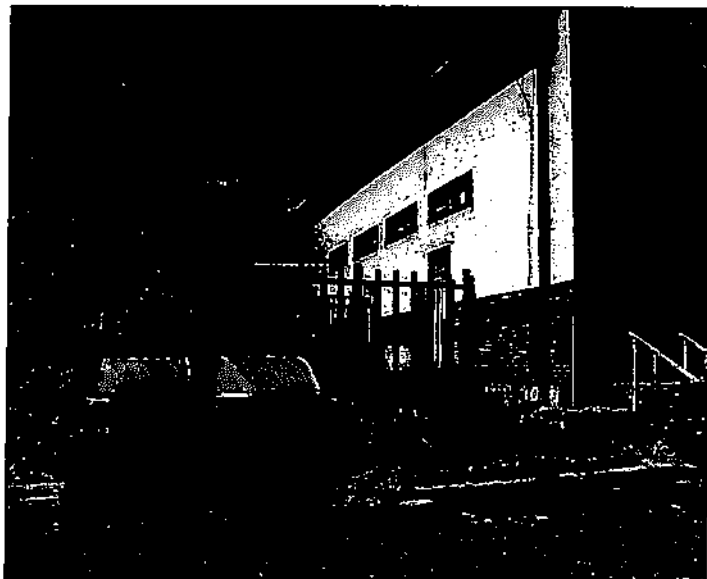
Black rhinos in the enclosure by the quarantine facility



Black rhinos in the quarantine facility enclosure, the 1971/1972 winter (pb)



Aerial view of the zoo grounds with facilities used for housing rhinos (dh)
 A - Rhino house No. 1, B - Rhino house No. 2, Enclosures by the block of old rhino houses: C, D & E - enclosure #1, 2 & 3
 F - Rhino house No. 3, Enclosures by the new rhino house: G, H, I & J - enclosure #1, 2, 3 & 4
 1 - Black rhino quarantine facility
 2 - Southern white rhino quarantine facility



Enclosures by the quarantine facility serving for black rhinos from 1986 to 1990 (dh)

The African Camp Exhibit

In summer, the rhinos - more specifically, the southern whites and black rhinos - were housed from 1970 up to autumn 1972 in the African Camp Exhibit designed as the bomas where the animals were held back in Africa in the period of capture. Unlike the wintering grounds and the quarantine, the exhibit was available to the zoo visitors. In this African Camp Exhibit, rhinos were first held from June to November 1970. This involved 4 white rhinos (1.3) that were placed in this area immediately upon their arrival from Africa and spent the subsequent winter in the building used later as a store. In 1971 and 1972, the African Camp already housed in summer both white and black rhinos. Afterwards, the rhino enclosures were removed to provide a space for a giraffe house built later, while all rhinos were spending the 1972 winter in the rhinoceros house.



Southern white rhinos in the African Camp (jh)



Southern white rhinos in the African Camp, 1971 (jov)



Black rhinos in the African Camp, 1972 (az)

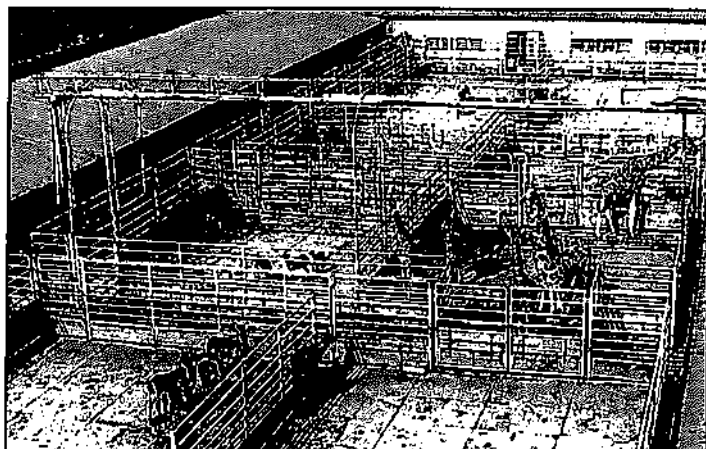


Central wintering facility

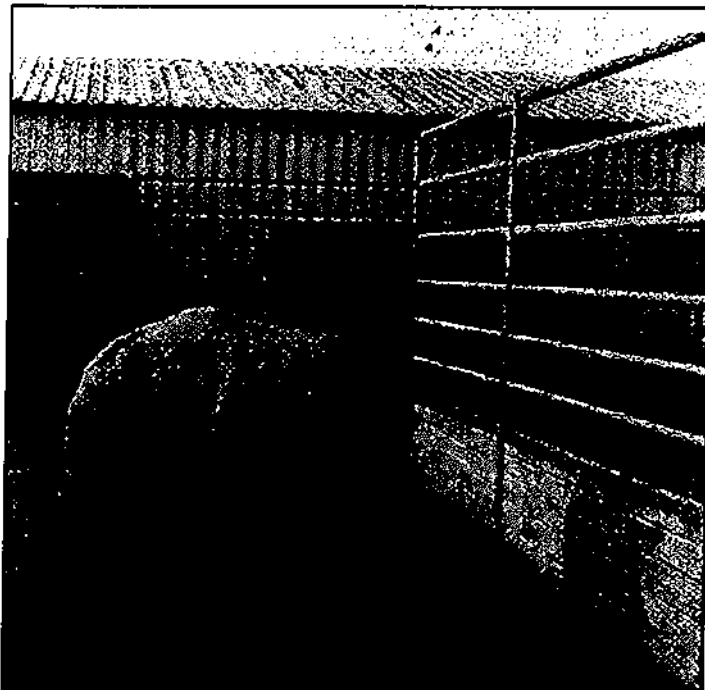
Throughout the black rhino management history, more specifically from 1974 to 1981, the central wintering facility was used for keeping the species. In addition, it was used for northern white rhinos from September 1975 to May 1977. The block consisted of heat-insulated steel barns with indoor stalls constructed from timbered metal fence sections, with each barn opening into a system of pens with surfaces covered by concrete panels, where each pen served as an outdoor enclosure.



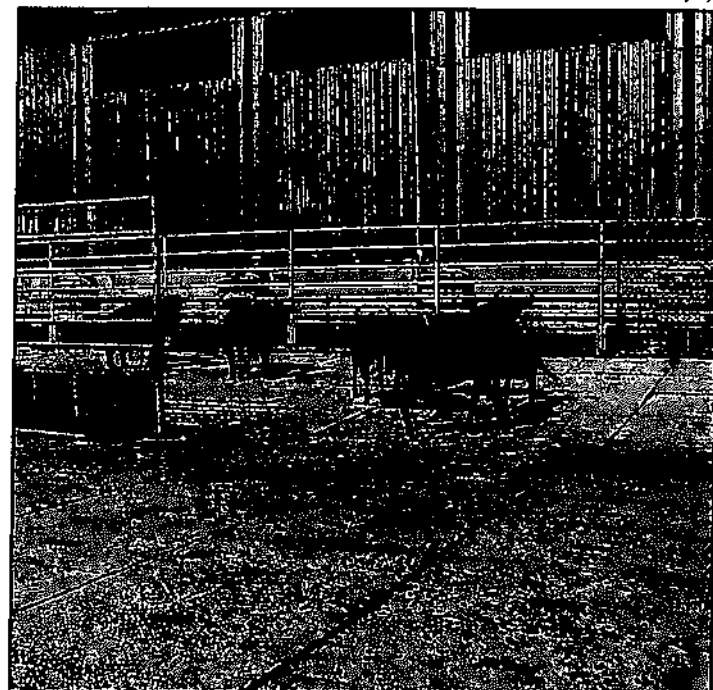
A northern white rhino in the pen by the central winter house, 1975 (pb)



The central wintering facility with pens used as outdoor enclosures for the rhinos (az)



A northern white rhino in the pen by the central winter house, 1975 (pb)

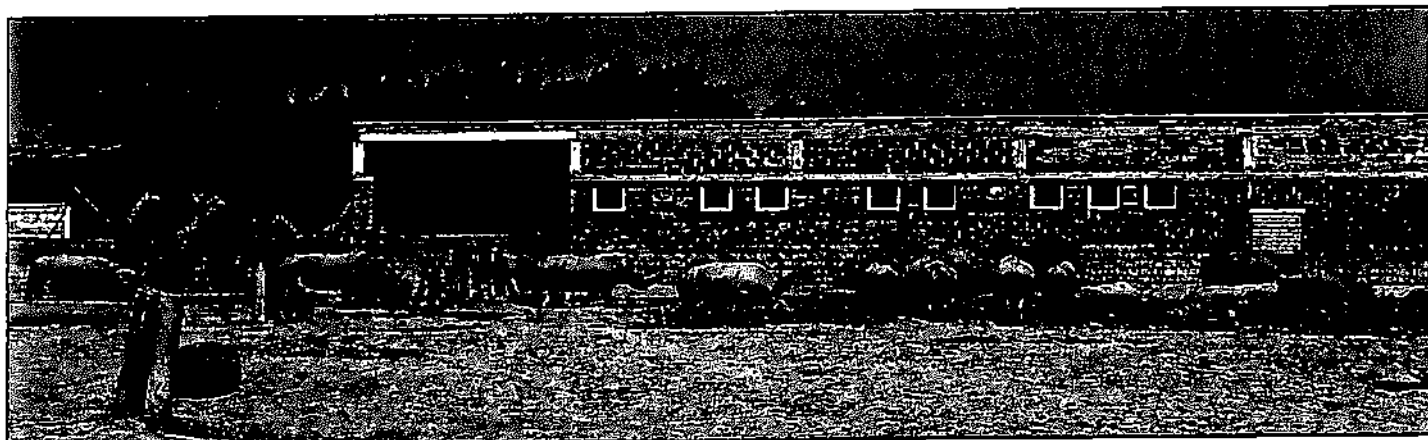


The former rhino pen and barn in 2004 (dh)

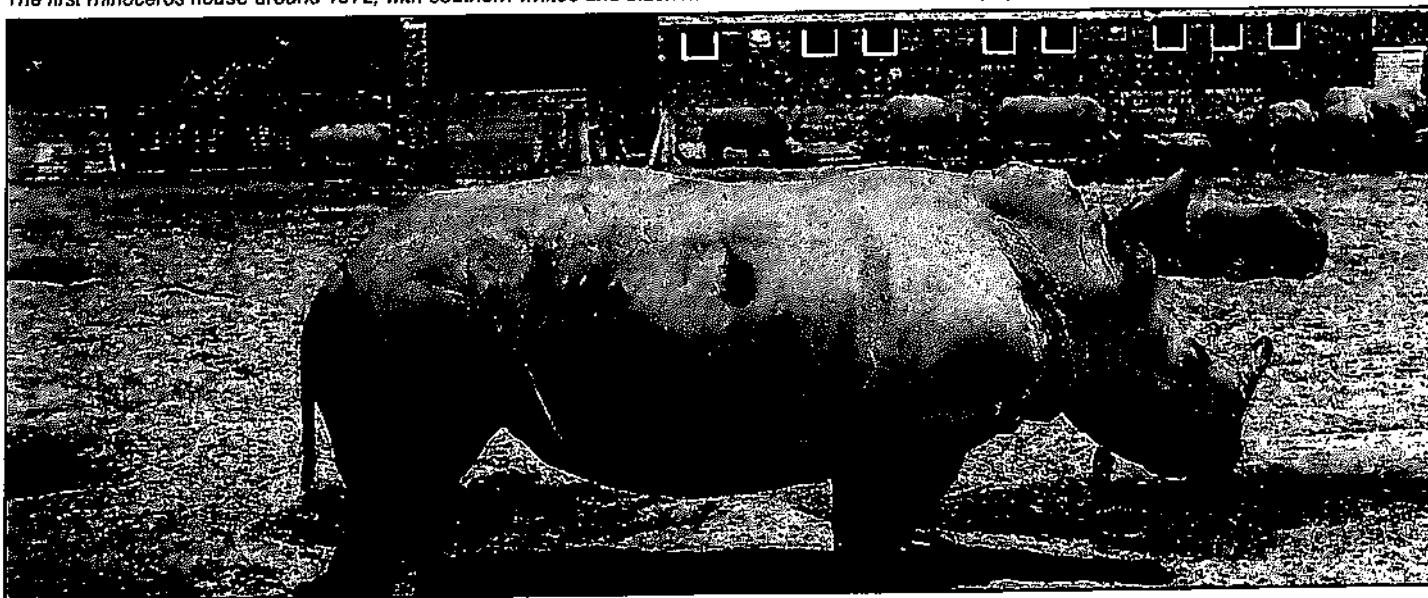
Rhino house 1 used for black rhinos since 1990

From the 1972 winter on, rhinos already used to spend colder periods of the year in the rhino house No. 1, though the house was still not finished, while in summer all used to go out into the adjoining enclosure.

Used from the late 1972, the rhino house 1 still had only four stalls in service in 1973 and was fully completed in 1974. Sized 59m x 9m and 4.5 m high, this facility neighbours with two outdoor enclosures about 1,235 m² each and a 221m² pen. The indoor area is heated to 18 °C; each indoor stall has an area 5.1m - 6.4m per 4.9 m (VAHALA *et al.* 1993, JIRICKA *pers. comm.*). The total surface area of the facility is 545 m², where the indoor part covers 253 m², split in nine breeding stalls, two of which are most frequently used as maternity boxes. The housing capacity is up to nine adults in summer when the animals can go out, while in winter eight adults is the maximum, as at least one stall must be available to allow for handling when cleaning takes place.

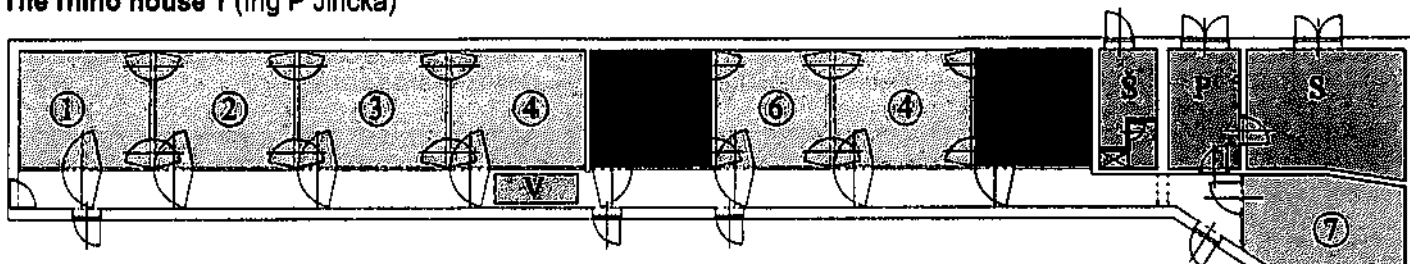


The first rhinoceros house around 1972, with southern whites and black rhinos in the outdoor enclosure (vd)



In 2009, the facility housed two adult males (Jimm DK 3 and Baringo II) and three adult females (Jessi DK 5, Elba DK 19 and Jiddah DK 17) plus their calves (Dzanty DK 33, Eva DK 34 and Jasmina DK 35), of which two youngest animals lived there together with their respective mothers. There is a pen neighbouring with the house and separated from the enclosures by gates made of metal tubing and a planted area lined with brickwork. In 2008, a scale was installed in the indoor corridor of the house; up to this time, weighing the housed rhinos was not possible.

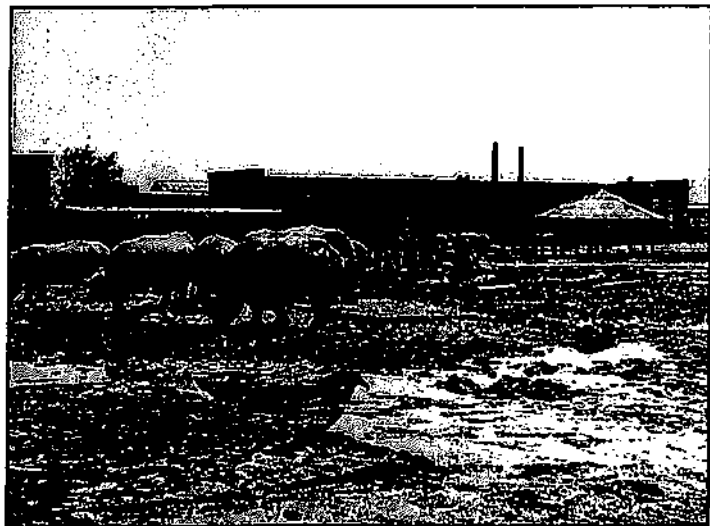
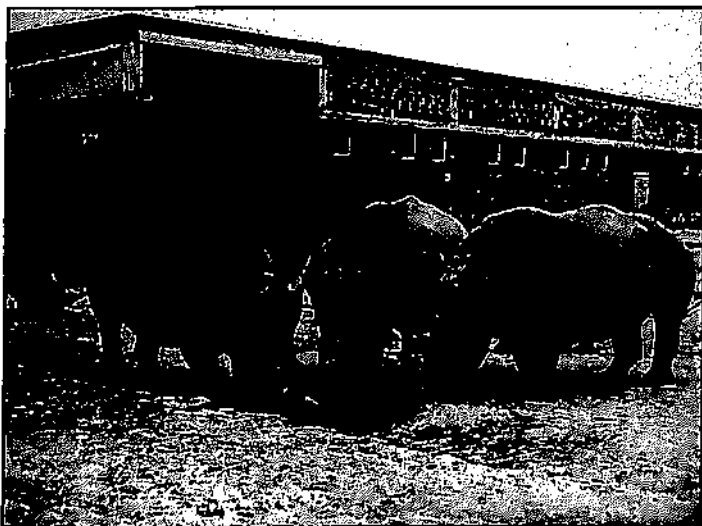
The rhino house 1 (Ing P Jiricka)



Key

- | | | | |
|---|--|---|--|
| ① | Box - size: 5.6 x 4.9 m, surface area: 27.4 m ² | Š | Changing room - area: 12.2 m ² - monitor CCTV |
| ② | Box - size: 6.1 x 4.9 m, surface area: 29.9 m ² | P | Food preparation room - area: 15.2 m ² |
| ③ | Box - size: 6.4 x 4.9 m, surface area: 31.4 m ² | S | Hay store - area: 33.9 m ² |
| ④ | Box - size: 5.8 x 4.9 m, surface area: 28.4 m ² | ■ | Calving boxes |
| ⑤ | Box - size: 5.1 x 4.9 m, surface area: 25.0 m ² | V | Scale |
| ⑥ | Box - size: 4.8 x 4.9 m, surface area: 23.5 m ² | | |
| ⑦ | Box - extension, surface area: 35.6 m ² | | |

Total area of boxes for rhinos 253.1 m²



Southern white rhinos inside the enclosure in front of the rhino house 1 in the early 1970s (az)

The rhino house 1 in 2009



The first rhino house indoors, 2009 (dh)



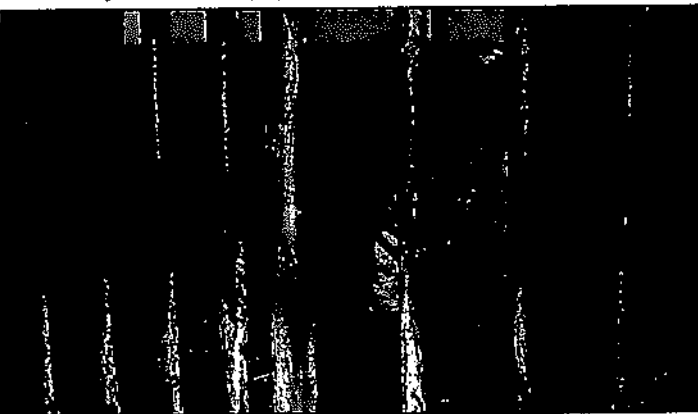
A corridor for rhinos (dh)



Male Dzanty in the box #3 (dh)



Female Jessi in the calving box #5 (dh)



Male Jimm in the box #7 (dh)

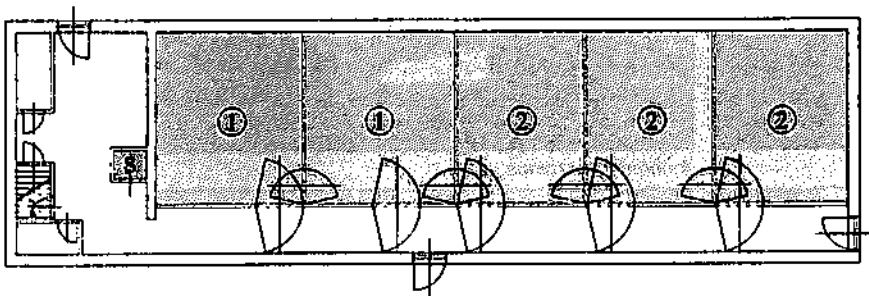


Monitoring activities indoors via CCTV, the picture shows Bc J Hruby. (dh)

Rhino house 2, used for black rhinos from 1973 to 1990

The rhino house 2 was constructed in 1973 and 1974. Originally, it was designed for zebras, but due to space issues concerning housing of subadult rhinos, it was used for housing of black rhinos that continued to stay here until 1990. A brick two-storey building with a total area of 260 m², the house has sizes 30 m x 9 m x 5.3 m and a hay-loft. As ceiling of the indoor stalls is significantly lower (2.7 m) than in the rhino house 1, this building was used for black rhino breeding. Since finishing the new rhino house in 1990, the building above was operated as a rhino house only occasionally. There is an enclosure with an area of over 1420 m² adjoining the house, which can be entered by rhinos kept in the house No 1 as well. With 5 stalls 4.5-6 m large and a total housing surface area of 143 m², the building can accommodate up to 5 adult animals or up to five groups of subadults.

The rhino house 2 (Ing P Jiricka)



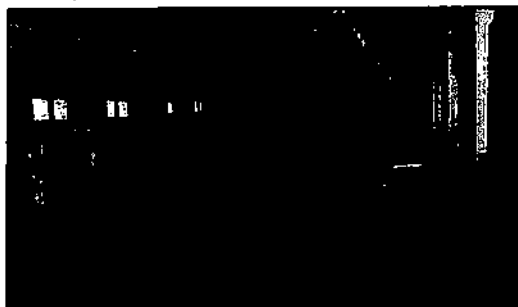
Key

- ① Box - size: 5.2 x 6.0 m, surface area: 31.2 m²
- ② Box - size: 4.5 x 6.0 m, surface area: 27.0 m²
- S Hay supply chute

Total area boxes for rhinos 253.1 m²



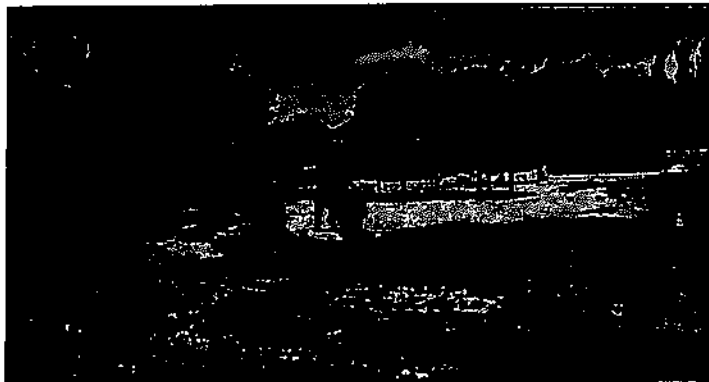
One of the stalls at the rhino house 2 - female Elsa with its daughter Eivira, 1977 (lh)



The rhino house 2 indoors in 2009 (dh)



Rhino house 2 and the adjoining enclosure with black rhinos, 1977 (az)

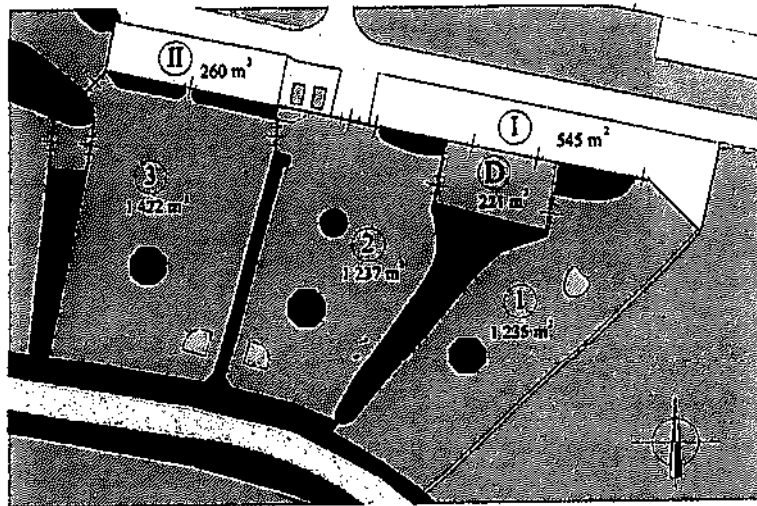


The same enclosure in 2009 (dh)

Enclosures by the block of two original rhino houses

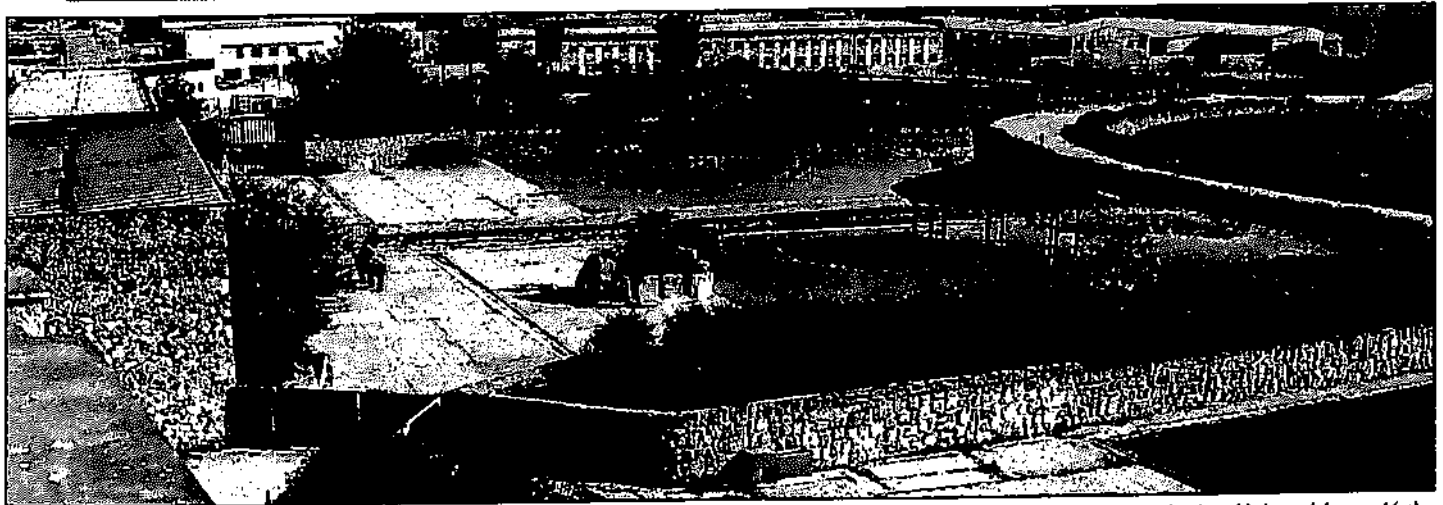
From autumn 1972 up to 1975, rhinos used to go outdoors into a single large enclosure in front of the rhino houses, where they were staying together. In 1976, this area was split to form three enclosures and a pen. The walls separating the enclosures were later partly replaced by U-shaped ditches and partly by vegetation planted in the area enclosed by two backfilled brick walls 200 cm high. The enclosures adjoining both houses are separated from each other by either a U-shaped ditch or an elevated area of a drop-like platform covered by vegetation and lined by brickwork. The animals are separated from visitors by a ditch, which originally was of a U-shaped form, but in 2000, it was gradually sloped along the enclosure 3. Additionally, the U-shaped ditch along the eastern side of the enclosure adjoining the giraffe paddock (formerly a one of zebras) was removed, with now a gradually sloped ditch and a brick wall about 1.2 m high from the side of giraffes and rhinos, respectively, separating both enclosures. Each of these outdoor exhibits contains a shelter providing shade and protecting from rain, and a mud bath filled in summer with water. For more details, see the plan and photographs.

The block of original rhino houses (Ing P Jiricka)



Key

- | | |
|-------------------|------------------|
| Ⓘ House 1 | ☉ Mud bath |
| Ⓜ House 2 | ● Shelter |
| Ⓛ - ③ Enclosures | ■ Dry moat |
| Ⓓ Enclosure (pen) | ☒ Dung container |
| | ● Greenery |



Enclosures in front of the rhino house 1 and 2, isolated by areas with a drop-like platform containing still immature greenery and separated from each other by a U-shaped dry moat (zc)

Enclosures in front of the original black rhino block



The gate into the enclosure with grass spread to avoid damage by overheating and a plank to prevent any young to go through (dh)



Viewing the enclosure #2 through the gate (dh)



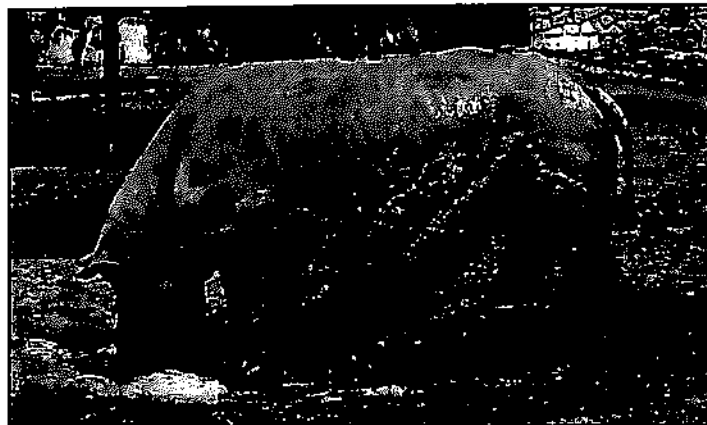
The enclosure #2 in 2000, when a U-shape ditch was replaced by a gradually sloped dry moat and a brick wall was built between the giraffe and rhino enclosures (mp)



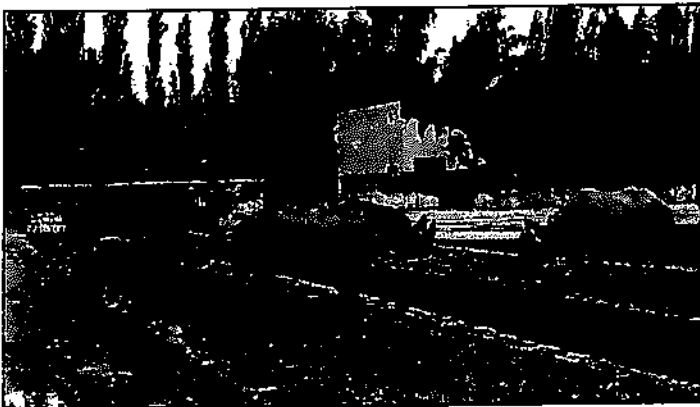
The pen by the house 1 with a surface area of 221 m² includes gates from both sides that open into the enclosures (dh)



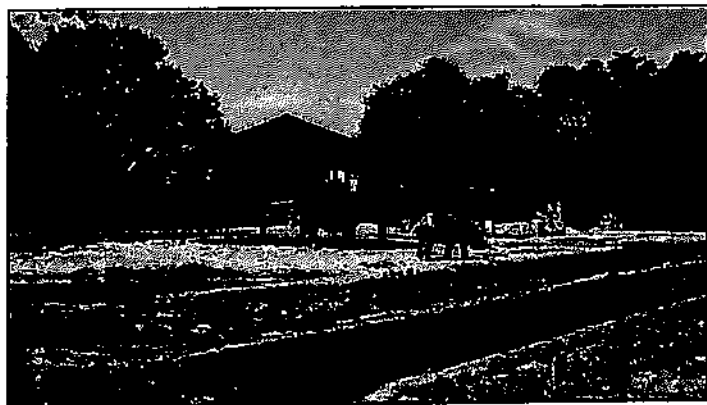
The enclosure #3 with Jiddah and Dzanty inside (dh)



Ema Elsa DK 26 in the mud bath of the enclosure #2, 2002 (dh)



The enclosure #3 and the U-shaped dry moat between the enclosure 2 and 3 by the old rhino house block (dh)



The enclosure #3 by the rhino house 2 (dh)

Enclosures in front of the original black rhino block



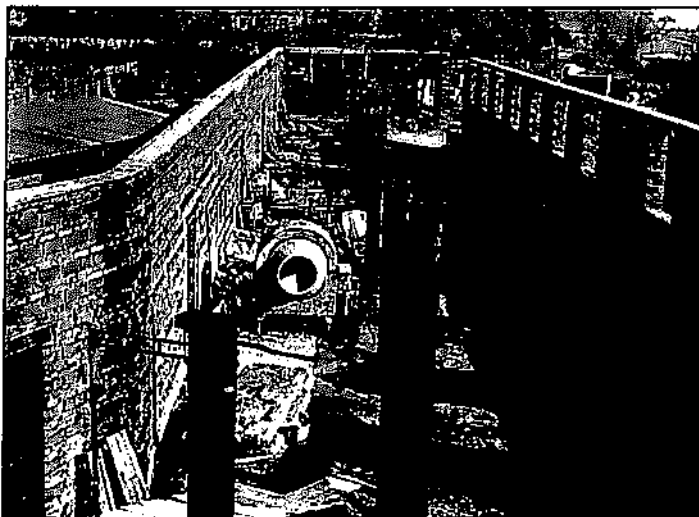
The enclosure #3 with a mud bath; the house is masked by vegetation (dh)



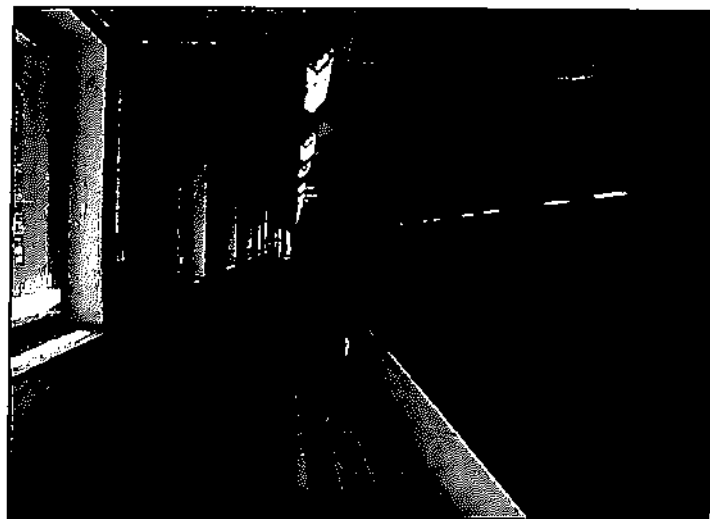
Enclosure #3 and #2 in front of the original rhino houses (dh)

Rhino house 3 (the new house) used for keeping white and Indian rhinos, and a part of black rhinos

In 1986-1990, a new rhino house was built, providing housing for white rhinos, Indian rhinos and several black rhinos. There are five enclosures adjoining the house with a surface area ranging from 830 to 2,978 m², of which black rhinos normally used those three lesser paddocks. In 1997, the outside transfer corridor of the house 3 was supplied with a scale. Each of those enclosures contains a shelter and a mud bath that in the enclosure 4 was converted to form a naturalistic pool for Indian rhinos in the early 1990s. The house as such, with sizes 126 m x 10 m x 6.3 m, has two wings with 10 stalls each and a loft including a hay-loft. The building can house up to 18 adult rhinos. Each stall as such is 5-6 m by 5.9 m in area. In each wing, three stalls make together a triple box which suit for keeping a pair, which was the case of Indian rhinos or a group of juveniles, e.g. black rhino nurseries.



Construction of the rhino house 3, 1988 (left, zc) and 1989 (right, pch)



The new rhino house in the construction period prior 1990 (pch)

The rhino house indoors, with an inspection corridor and stalls, 2009 (dh)