

RHINO/FIELD NOTES

Ziwa Rhino Sanctuary—the first 10 years

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Introduction

Once there were hundreds of eastern black and northern white rhinos in Uganda, but through legal over-hunting and illegal poaching they became officially extinct in 1983. In 1997, a group of conservationists created the NGO Rhino Fund Uganda to raise funds to reintroduce rhinos to the country. So it was that the first fence posthole for the new Ziwa Rhino Sanctuary (ZRS) was dug in October 2013.

The sanctuary covered 64.2 km² in Nagasongola District in central Uganda. While this was outside of the historic range of the northern white rhino, it was only 120 kilometres further south of the area in Murchison Falls National Park to where white rhinos had been moved and bred successfully in the early 1960s.

The sanctuary area is divided between raised areas, ridges or interfluges with alluvial sandy soils and shallow drainage lines with clay loams or 'black cotton'. The soils of the area are classified as Ferralsols and Fluvisols. The dominant vegetation types are *Combretum* woodland mosaic, wooded grassland, open and swamp grassland, and riverine swamp along the Lugogo River. There are only small areas of dense bushland or thicket. Approximately 30% of the area becomes seasonally inundated or waterlogged, including much of the grassland on the drainage lines and adjoining the swamp. Average annual rainfall between 2004 and 2012 was 1,046 mm (range 708–1,345 mm).

Before Ziwa was accepted as a rhino sanctuary, an expert evaluation of its carrying capacity suggested the habitat could maintain 1 rhino per 1.5 km² (Brett

1998), meaning a maximum today of 47 white rhinos. The fully fenced area received its first four white rhinos, two subadult males and two subadult females, in July 2005. By this time, the northern white rhino was almost extinct in the last confirmed wild population in the Democratic Republic of Congo (DRC), and those individuals remaining were of the highest conservation value. The DRC government authorities ultimately were unwilling to translocate any of the remaining rhinos to a more secure reserve in another country and would have been especially unwilling to do so to a new and untried reserve like Ziwa. Although the southern white rhino was not indigenous to Uganda, given the unavailability of indigenous northern white rhino IUCN supported the introduction of the more numerous southern white rhino into Ziwa, recognizing that this re-established the species in Uganda (Emslie et al. 2009). In September 2006, an adult female and immature male were added to form the founder population.

At the end of 2013, the white rhino population of ZRS consisted of 13 individuals: 3 adult males—Taleo, Moja and Hassani—and 3 adult females with calves—Nandi and female calf Uhuru, Bella and female calf Donna, Kori and female calf Laloyo, and 4 subadults, the males Obama, Augustu and Justus, and the female Malaika (Table 1).

The rhinos at Ziwa are held under heavy 24-hour security by armed guards and monitoring rangers, who follow the animals on foot from a distance but keep them in sight as much as possible. During the hours of darkness, the rangers have torches, which they use to observe the rhinos whenever they hear any sound of activity, and at least at 15-minute intervals to check

Table 1. Estimated age categories for the Ziwa rhino population at December 2013

Age categories (years)		
10–15	3.5–7	< 3.5
Nandi ♀	Obama ♂	Malaika ♀
Taleo ♂	Augustu ♂	Donna ♀
Bella ♀	Justus ♂	Laloyo ♀
Moja ♂		Uhuru ♀
Kori ♀		
Hassani ♂		

on the rhinos. During full moon periods the rhinos are easily observed without the need for torches.

Rangers monitoring the rhinos initially reported any incident that was thought significant such as mating and calf birth. Since June 2010, to better understand the behaviour and movements of the rhinos, the monitors have kept an hourly record of the location, key activities of each rhino and their associations with conspecifics (for more details see Patton et al. 2011). The rangers complete a 24-hour sighting form for each hour of each day, recording the location, type of habitat, main activities—feeding, resting, moving—and secondary activities—drinking, wallowing, mating or fighting (conspecific aggression)—that have occurred. To standardize location information, the reserve is split into sectors and blocks, as shown in Figure 1.

The daily data are not always complete as there are occasions when a particular rhino is out of sight, especially in thick bush habitat, or has run off and has to be found again, especially after a disturbance at night. Microsoft Excel macros were used to consolidate and analyse the data.

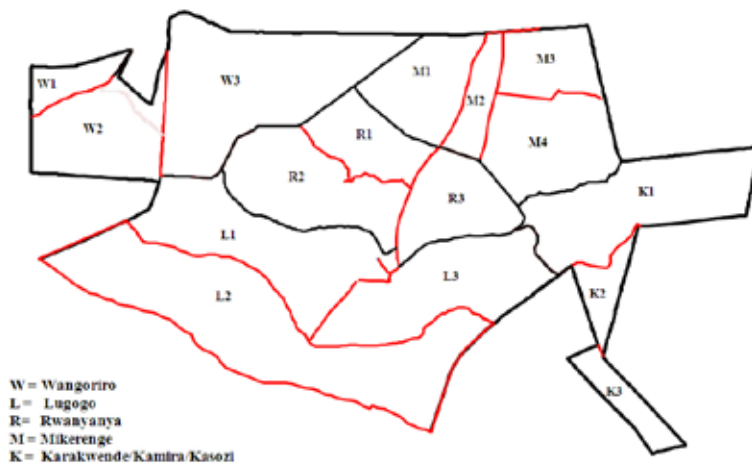


Figure 1. The sectors and blocks of Ziwa Rhino Sanctuary.

Summary of the 3-year data collected between June 2010 and May 2013

Main activity

The daily pattern of main activity was consistent among each of the three 12-month periods:

midnight to 1 a.m.	feeding or resting
1 a.m. to 5 a.m.	resting
5 a.m. to 6 a.m.	feeding or resting
6 a.m. to 11 a.m.	feeding
11 a.m. to 4 p.m.	resting
4 p.m. to midnight	feeding

Feeding was carried out on average for 13 hours per day (54%), resting for 9 hours per day (38%), feeding or resting for 2 hours per day (8%). Rhinos were most likely to go to water to drink between 3 p.m. and 6 p.m.

During the night-time period of 7 p.m. to 7 a.m., where few detailed observations have been reported by other rhino areas, the rhinos spent 6 hours feeding (50%), 4 hours resting (33%) and 2 hours feeding or resting (17%).

Main location

The rhinos most-preferred location in each of the 3 years has been sector L block 2 (39% of the time); next was sector R blocks 2 and 3 combined (28% of the time). L2, R2 and R3 are areas where the grass was kept short by annual burning and that constitute pockets of relatively open ground where movement for rhinos is easy when grazing.

W block 2 (15% of the time) was important in wet months; it was higher, therefore drier, ground. In this block, cattle grazing maintained short grass.

Breeding performance

The aim of the reintroduction project is to produce as many new individuals as quickly as possible in order to boost rhino numbers in the country, and to in future provide animals to create and build a metapopulation of white rhinos. Rapid breeding of rhinos also minimizes loss of genetic heterozygosity, and this is especially important given the

current small founder number of this population. The data collected indicate the level of breeding performance of the population. Analyses undertaken include the interval between the new birth date and the apparent conception date (known here as the mating interval), the interval between the apparent conception date and the new birth date (the gestation period) and the interval between births of calves from the same female (the calving interval).

Table 2 summarizes the available reproduction data for the three females at ZRS.

Mating

Taleo accompanied both Bella and Kori throughout August, September and October 2010. Mating was observed in early September with Bella and mid-September with Kori; Moja was also present at times in the same period. Taleo accompanied Nandi from the end of December 2011 to the end of February 2012 with mating observed in mid-February. Taleo accompanied Kori on two short 7-day periods in August and September 2012 with mating observed during the August period; Moja was absent throughout. Bella was accompanied by Taleo from mid-October through to 14 November 2012 with mating observed on 10 November. Taleo returned to Bella from 20 November to 9 December while Moja was absent throughout the period.

Mating observations by rangers showed Nandi mated four times in daylight hours on 11 January 2012 with mating lengths of 40, 21, 45 and 50 minutes and mated twice two days later for 28 and 10 minutes. Bella mated with Taleo on 7 September 2010 between 6 a.m. and 10 a.m. and between 12 p.m. and 2 p.m. Bella also mated with Moja between 6 a.m. and 7 a.m. on the same day. Kori mated with Taleo between 11 a.m. and 12 p.m. and between 3 p.m. and 4 p.m. on 19 September 2010. For the second calf, Kori and Taleo mated at 4.15 p.m. on 8 August 2012.

The ZRS data showed that the two mature adult males, Taleo and Moja, were continually interacting with the three breeding females and at times were in the same area at the same time. The sighting and mating

Table 2. Reproduction data for the three female white rhinos at Ziwa Rhino Sanctuary

Reproduction	Nandi	Bella	Kori
First calf	Obama	Augustu	Justus
Birth date	25 Jun 09	07 Sept 09	02 Jan 10
Conception date ¹	05 Feb 10	07 Sept 10	19 Sept 10
Mating interval ² (days)	224	365	259
Gestation period ³ (days)	423	488	483
Second calf	Malaika	Donna	Laloyo
Birth date	04 Jun 11	10 Jan 12	15 Jan 12
Intercalving interval	1.9 years	2.3 years	2.0 years
Conception date	13 Feb 12	10 Nov 12	08 Aug 12
Mating interval (days)	253	283	210
Gestation period	477 days	n.a.	n.a.
Third calf	Uhuru	n.a.	n.a.
Birth date	01 Jun 13	n.a.	n.a.
Intercalving interval	2.0 years	n.a.	n.a.

¹ Conception date shown was the last date when a mating was observed

² Mating interval represents the period between the birth of a calf and the conception date

³ Gestation period is the time between the conception date and the birth date of the subsequent calf

data indicate that Taleo was the dominant male who was observed mating with all females. Mating with both males in a short time period was recorded only once when Taleo and Moja both mated Bella between 6 a.m. and 7 a.m. However, there were daylight-hour periods when the females were out of view when mating could have occurred; there are no records of night-time mating.

Both Bella and Kori were observed mating on only one day while Nandi mated on two days with a 48-hour gap. This observation suggests that conception was easily achieved.

Copulations recorded at ZRS were only available for the mating of the female Nandi with the male Taleo where it was recorded six times, four of which occurred in a 7-hour period and two in a 4-hour period. The length of each mating varied between 10 and 50 minutes, averaging 32 minutes. Although all females were accompanied by a male after mating, on only one occasion could a consort period be isolated—Taleo remained with Kori for three days after mating.

Birth

The four gestation periods recorded in ZRS averaged 468 days (range 423–488). Five of six births occurred in January and June, two of the driest months of the year. The average intercalving interval for the three females was 2.1 years (range 1.9–2.3 years).

Fighting

Monitoring rangers record any aggressive behaviour from serious (as opposed to play-like) behaviour, from pushing and shoving through to fierce assaults resulting in injuries (see table 3).

Taleo was observed to be the dominant male, most often fighting with Moja, his same-age rival. The intensity of the fights developed over time and resulted in Moja trying to escape from the sanctuary by smashing through the fence. Since October 2012, Moja has made its main range (perhaps territory) in the rarely used sector K, away from the danger Taleo poses.

Hassani, when a 9-year-old male, was initially tolerated by Taleo but fought with Moja, but within a year, at 10 years of age, he was more of a breeding threat. From this time, Taleo started fighting him while Moja avoided any association.

Analysis of the fighting data between the males and females shows that most fights were in the months between the birth of a calf and first subsequent mating. For Nandi, data are available only for the second birth, when fighting with Taleo occurred in seven out of eight months leading up to mating. On some occasions, fighting between Nandi and Taleo was recorded as ‘Nandi defended the new calf’ from Taleo. Both Taleo and Moja fought with Bella in the four months before her first calf was conceived, after which fighting all but ceased, even in the months preceding the conception of the second calf. For Kori, fighting was spread across all months but at a much reduced level compared with the other two females, and she is considered the most placid of the three.

In summary, no fighting mortality occurred during the period and only once was veterinary intervention necessary, when Taleo injured Moja near his eye. Also the 24-hour protection has allowed staff to protect the vulnerable young animals from being injured or killed by bulls after they have left their mother but before they have joined the other animals.

Population performance

It is of conservation importance to increase the white rhinoceros population in East Africa in order to establish an additional out-of-range metapopulation

Table 3. Number of fights recorded involving the six adult rhinos at Ziwa Rhino Sanctuary

Rhino	Taleo	Moja	Hassani	Total	%
Taleo ♂	—	79	26	105	39
Moja ♂	79	—	30	109	40
Hassani ♂	26	30	—	56	21
Total ♂	105	109	56	270	100
Nandi ♀	13	15	17	45	30
Bella ♀	34	33	4	71	48
Kori ♀	9	15	8	32	22
Total ♀	56	63	29	148	100
All, ♂ & ♀	161	172	85	418	100

in case of a catastrophe in the southern African range States. Optimum breeding performance is essential in establishing self-sustaining populations (Hermes et al. 2007) so it is vital to understand the reproductive status and factors that influence the fecundity of these animals.

Emslie and du Toit (2006) published indicators that can be used to determine population performance. In small populations such as ZRS, estimates are usually analysed over periods of three or five years as calving rates are variable year to year.

Indicator 1. Overall annual population growth rates

Over the period from the first birth in 2008 to 2013, seven births

- > 7.5%, indicates good to excellent performance
- 5–7.5%, indicates moderate to good performance
- 2.5–4.9%, indicates poor to moderate performance
- < 2.5%, indicates poor to very poor performance (population may even be declining).



New calf Uhuru meets subadult male Justus for the first time.

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Even though the founder population had a 1:1 sex structure and two of the three founder females were introduced as subadults, the population has achieved a net average growth rate of 14.9% per annum, which is an excellent performance.

Indicator 2. Observed intercalving interval

- > 3.5 years, poor to very poor fecundity
- 3.1–3.5 years, moderately poor to poor fecundity
- 2.5–3.0 years, good to moderate fecundity
- < 2.5 years, good to excellent fecundity.

At ZRS, the four recorded birth intervals averaged 2.1 years, which is excellent fecundity.

The future

The data presented are clear evidence that ZRS has so far proven to have an excellent habitat and a secure environment for breeding southern white rhinos. Habitat preferences and breeding performance to date support management burning and use of cattle grazing to help create and maintain favoured open, short grass areas. However, challenges still need to be addressed. The small number of 6 founders is well below the 15–20 individuals recommended as a founder group in a new reserve, which might ultimately lead to a slower than desired increase in the population and reduced genetic heterozygosity. More females of breeding age are needed to redress this situation, especially as Ziwa was established to be the engine that produces surplus founder rhinos to set up additional populations in the country. In addition, the three female founders are under stress from both the competing three males of breeding age and from the rapidly increasing number of tourists. The females with their calves are often accompanied by one or more of the four subadults and are more consistent in their range than are the males. This makes them easier to monitor and take visitors to see. On any one day, only one of the females may be accessible, so at the height of the season, the presence of a constant stream of groups can create stress pressure on the individual rhino.



Ziwa rhinos will find any wet hole in which to cool down even alongside the main road.

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By 2008 ZRS was receiving a mere 2,223 visitors, but a concerted campaign to persuade safari operators to call into the reserve on their way to or from Murchison Falls has resulted in 11,051 visitors in 2012, increasing to 12,629 in 2013. As visitor numbers continue to rise, which is necessary to obtain the income required to maintain the reserve, the problem may affect breeding performance unless the population of females is increased to make more individuals accessible. It is hoped that a suitable rhino range State will donate as many as six females to ZRS, and sooner rather than later.

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