

The development of white rhino social organisation at Ziwa Rhino Sanctuary, Uganda

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The last wild rhino in Uganda was killed in 1983 (Emslie and Brooks, 1999). The extermination of the rhino population in the country was the result of heavy poaching associated with the civil unrest that rocked the country in the 1970s and early 1980s.

Following several years of political stability, a group of Ugandan citizens decided to reintroduce rhinos back into Uganda and in 1997 formed the NGO Rhino Fund Uganda. In 2001, two white rhinos were imported for educational purposes from Kenya and located at Entebbe Zoo, later renamed the Uganda Wildlife Education Centre. By 2004, the NGO had raised funds for the establishment of a sanctuary specifically for rhinos and, in 2005, the Ziwa Rhino Sanctuary in Nakasongola received its first four rhinos from Solio Ranch, Kenya. Two more were received from Disney Animal Kingdom, USA in 2006. Since then ten calves have been born and one sub-adult has died. At the start of 2016, the rhino population at the sanctuary stood at 15 individuals (Table 1).

In June 2010, in order to better understand the behaviour and movements of the rhinos, the sanctuary initiated a monitoring programme. Since then, monitors attached to each rhino have kept an hourly record of their location. This paper presents an analysis of the rhino monitoring data and charts the development of the social organisation among rhinos at the sanctuary. The analysis is based on the number of twenty-four

hour periods that an individual was either (a) alone or (b) in an association with one or more other individuals. An association was defined as occurring when two or more animals were within 10 metres of each other for more than 24 hours.

Overall, the results of the study show that adult males lead a mainly solitary existence. Adult females associate with their calves; and chase away the older sibling when a new calf is born but may subsequently allow the older sibling to return and/or associate with juvenile offspring of other females. Juvenile and sub-adult individuals demonstrated the most dynamic patterns of association, which are described in detail below.

The development of associations

At the time that the rhino monitoring programme began in June 2010, the three females had each had their first calf and were mostly found separately across the sanctuary, in places where the quality of the grazing was best. New grass after burning was especially sought after and the three females with their calves were often recorded in the same area, sometimes in close proximity, but never in an association which lasted more than 24 hours.

On the occasion of the birth of her second calf, the female Nandi chased away her former calf Obama, then aged 24 months, who immediately joined up with female Kori and her calf Justus.

Seven months later, females Bella and Kori had their second calves within five days of each other, having chased away their former calves. The three first calves, i.e. Obama, Augustu and Justus, joined together in an association at 31, 26 and 24 months of age respectively.

Six months later Justus (by then 30 months old) left the group and rejoined his mother Kori and her new calf Laloyo. Obama and

Table 1. The population structure of rhinos at the Ziwa Rhino Sanctuary on 1 January 2106

Adult males (3)	Taleo 16 years	Moja 16 years	Hassani 14 years 6 months
Adult females (3)	Nandi 16 years 5 months	Bella 16 years	Kori 16 years
Sub-adult males (2)	Obama 6 years 6 months	Augustu 6 years 3 months	[†Justus, died 12 Apr'15, aged 5 years 3 months]
Sub-adult females (3)	Malaika 4 years 7 months	Donna 4 years	Laloyo 4 years
Independent juvenile (1)	Female: Uhuru 31 months		
Calves (3)	Male: [unnamed] 4 months	Female: Lunar 20 months	Female: Waribe 24 months

Augustu remained together for a further 5 months, when they joined up with Bella, the mother of Augustu, and Bella's new calf Donna, then 11 months old. At this point, Obama and Augustu were 42 and 37 months old respectively.

During this time, Justus joined either Obama and Augustu, or Bella and her calf Donna, for one month only and then returned to Kori and Laloyo. The following month Nandi chased away Malaika when she had her new calf Uhuru. Malaika (24 months) joined Justus (41) with Kori and Laloyo.

Six months later, Malaika (30 months) left Justus (47) and Laloyo (23) and joined Obama (54) and Augustu (49), who were still with Bella and her calf Donna.

Two months later, Justus and Laloyo left Kori and her new calf Waribe. When Bella had a new calf in April 2014, her former calf Donna (27 months) joined Obama (58), Augustu (53) and Malaika (34). Malaika left the group two months later in June 2014 and returned to Justus and Laloyo.

Thus at this point there were two groups of sub-adult animals: one group consisted of Obama (60 months), Augustu (55) and Donna (29), and the other of Justus (53), Malaika (36) and Laloyo (29).

When Obama was 5 years and 3 months old, he left his group for one month. During this period he was found on his own or with the adult male Hassani, who was 13 years and 3 months old. He then rejoined Augustu and Donna, but thereafter tended to stay a few metres away from them. From around 6 years old Obama started to spend up to half his time alone and the rest of the time with Augustu and Donna.

The other group was disrupted by the death of Justus in April 2015, then 5 years and 3 months old, after a fight with Taleo. Malaika and Laloyo had used the older Justus as protection from the mating interests of the adult males. Within a month, Taleo was showing interest in Malaika, now 47 months old, but he was superseded the next month by Moja, who was often with the two young females over the following months. Although the two had lost their 'protector' they did not choose to join any of the females or the other sub-adult group.

Following the death of Justus, the three adult males, Taleo, Moja and Hassani, were dehorned in June 2015. This measure was taken to give the remaining sub-adult males, Obama and Augustu, and developing females Malaika, Donna and Laloyo, some protection from injury when the adult males were aggressive towards them. It is possible that the dehorning has

resulted, or may in the future result in changed patterns of association, compared to those that might have evolved had the measure not been taken.

In September 2015, female Nandi had a new calf and chased away her 27 month old former calf Uhuru. Two hours later, Uhuru joined up with female Kori and her 21 month old calf Waribe, with whom she has remained to date.

Overview of results of the monitoring program

Over 56 months of monitoring, the three males did not form any lasting associations. On average, males stayed with adult females for between one to three 24-hour periods in a month. Moja and Hassani formed such temporary associations equally with each of the three females. However, the female Kori allowed the male Taleo to form associations that lasted about twice as long as those he formed with Bella and Nandi. Males also stayed with sub-adult males for, on average, between one and two 24-hour periods per month. Moja associated with the three sub-adult males some 20% less than Taleo and 41% less than Hassani.

Of the three adult females, Bella and Kori (with their calves) have accepted associations with juvenile and sub-adult individuals while Nandi has preferred to remain alone with her current calf. All seven rhinos born at the sanctuary that have younger siblings were chased away by their mothers immediately prior the birth of the new calf. In each case, the juvenile that had been chased away formed an association within as little as two hours with another group, either a female and calf or a group of sub-adults.

Sub-adult rhinos formed lasting associations, i.e. between Obama and Augustu (49 months to date), Malaika and Laloyo (25 months to date), and Malaika and Justus (22 months until the death of Justus). By contrast the four associations between an adult female with calf and a sub-adult male were shorter, lasting for 6, 8, 10 and 17 months.

The social organisation of the white rhinos in Ziwa Rhino Sanctuary is set to develop further as sub-adult males mature. The oldest surviving sub-adult male started to show signs of wanting to become solitary at 6 years of age. Moreover two further births are expected in 2016.

Emslie RH, Brooks M. 1999. African rhino: status survey and conservation action plan. IUCN/SSC African Rhino Specialist Group, Gland and Cambridge; p. 57.