

RESEARCH AND REVIEW

Killing of black and white rhinoceroses by African elephants in Hluhluwe-Umfolozi Park, South Africa

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Abstract

Fifty-eight white rhinos and five black rhinos were killed by elephants in Hluhluwe-Umfolozi Park between 1991 and 2001. The culprits were probably young male elephants that are entering musth younger in the absence of older males. Rhino deaths were more frequent from July to December and were distributed throughout the reserve. Deaths were associated with rivers, with 76% of carcasses being within 1 km of a river. Deaths were predominantly adult rhinos (86%), with a ratio of about 0.76♀:1♂. Given the success of the introduction of older male elephants to Pilanesberg National Park, which stopped young bulls entering musth and ended rhinos, being killed by elephants, introducing older male elephants is supported as a solution for Hluhluwe-Umfolozi Park, and for all reserves that have this problem.

Résumé

Les éléphants du Parc de Hluhluwe-Umfolozi ont tué cinquante-huit rhinos blancs et cinq rhinos noirs entre 1991 et 2001. Les coupables sont probablement des jeunes mâles qui entrent en « musth » plus jeunes en l'absence de mâles plus âgés. Les morts de rhinos étaient plus fréquentes entre juillet et décembre et se répartissaient dans toute la réserve. Les morts étaient associées aux cours d'eau ; on a trouvé 76 % des carcasses à moins d'un kilomètre d'une rivière. Les morts touchaient surtout les rhinos adultes (86 %) dans un rapport de 0,76 femelle pour 1 mâle. Etant donné le succès qu'a connu la réintroduction d'éléphants mâles plus âgés dans le Parc National de Pilanesberg, qui a mis un terme à l'entrée en musth précoce des jeunes mâles et à l'exécution de rhinos par les éléphants, on encourage l'introduction d'éléphants mâles plus âgés dans le Parc de Hluhluwe-Umfolozi, ce qui serait sans doute une solution là et dans toutes les réserves qui connaissent ce problème.

Introduction

The black rhinoceros, *Diceros bicornis* Linnaeus, 1758, is 'Threatened: Critically Endangered' and the white rhinoceros, *Ceratotherium simum* Burchell, 1817, is

'Lower Risk: Conservation Dependent' and will become 'Near Threatened' in the 2001 IUCN reclassification (Hilton-Taylor 2000). Hluhluwe-Umfolozi Park (HUP) is world famous as the reserve where the last

population of the southern white rhino exists, and all current populations of the southern white rhino are derived from animals exported from this park. HUP is also one of two reserves in South Africa that had naturally occurring black rhinos, and most other black rhino populations in South Africa are derived from animals exported from HUP. The conservation of these two species by the then Natal Parks Board (now KwaZulu-Natal Wildlife) is one of the success stories of modern conservation. HUP today is one of two parks that conserve Key 1 black and Key 1 white rhino populations, as rated by the African Rhino Specialist Group. It includes 37% of South Africa's black rhinos and 17% of its white rhinos (as of 1999).

Despite the success of rhino conservation in South Africa, each individual still represents a valuable resource, both for direct conservation and for sale to raise additional funds for conservation purposes. Auction prices in June 2001 for the white rhino were USD 20,000 and USD 33,000 for males and females respectively and for the black rhino were over USD 65,000 each (KwaZulu-Natal Wildlife unpublished auction prices).

An unusual, but not unique, situation has arisen in HUP. African elephants, *Loxodonta africana* Blumenbach, 1797, have been killing both



Park officials removed the horns of this rhino, killed by an elephant.



Elephant tusk holes are clearly evident on the carcass of this rhino.

black ($n = 5$) and white rhinos ($n = 58$), mainly through tusk wounds made to the shoulder and chest area. This abnormal behaviour has been described from a number of reserves but has mainly occurred in Pilanesberg National Park (PNP), where between 1992 and 1997 elephants killed up to 50 white rhinos (Slotow and van Dyk 2001). The culprit elephants were young males (17–25 years old) who were entering a state of musth (heightened aggression from elevated hormones associated with reproductive competition—Poole and Moss 1981) well ahead of schedule—from 18 years of age as opposed to a normal age of 28 years (Poole 1987)—and were doing so because of the absence of an older male hierarchy (Slotow et al. 2000). These young males remained from culled family groups in Kruger National Park (KNP) and matured in the absence of dominant bulls. The problem in PNP



Evidence! This action shot, although blurred, shows an elephant attacking a rhino and goring it from behind and above with its tusks.

was solved by introducing six older male elephants, up to 35 years of age, from KNP in early 1998. The older introduced bulls suppressed the musth of the young males, and elephants in PNP have caused no subsequent rhino deaths (Slotow et al. 2000).

Elephants were previously extirpated from HUP and were introduced back into it from KNP starting in 1983 (detailed in Dominy et al. 1998). The HUP elephant population was thus founded in 1983, with all founders being young animals orphaned from culling. As a result, there was no structured age hierarchy, as the oldest males were about 25 years of age by 2000. After the success of the PNP project, 10 older male elephants were introduced from KNP to HUP in May 2000. The results of that introduction are currently being monitored. This paper documents patterns of mortality of black and white rhinos in HUP caused by elephants.

Methods

All records are from rhino carcasses that field scouts found in the reserve. Field scouts patrol the entire reserve, regularly covering each part of it. On finding a carcass, scouts noted if elephant was the cause of mortality. This would apply to carcasses found within seven days of death, when such determinations could be made. With carcasses older than this, the cause of death was noted as unknown, and those carcasses are not included in this analysis. The information provided in this paper is thus a minimum assessment of the mortality from

elephants. However, as the patrols were regular, most carcasses were detected within a week. Death was attributed to elephant by observing the injuries that resulted in death (based on autopsy by a veterinarian or assessment by the section ranger), or interpreting the tracks in the area (by experienced scouts), or both. For each carcass, the date; the location of the carcass; the age, as determined by trained and experienced scouts and section rangers; and the sex, where possible, were noted. Data were collated and stored at the central database at Hluhluwe Research Centre.

Data were spatially referenced using GPS locations or estimations from 1:50,000 maps (point accuracy = ± 500 m). Maps were produced in Arcview (ESRI). Distance from rivers was calculated using the buffer function, with 100-m buffers being created, and the number of deaths within each buffered distance being extracted.

Results

Five black rhinos and 58 white rhinos have been killed in Hluhluwe-Umfolozi Park up to October 2001. The first death, of an adult female black rhino, occurred on 20 September 1991, and two white rhinos were killed shortly after this, on 8 October 1991 (unsexed adult) and 11 October 1991 (adult male). The next death was of an adult female white rhino in May 1995. From June 1996 to the end of 1998, deaths occurred sporadically in clusters of one to three months (fig. 1). In June 1999, the frequency of deaths increased markedly, with 21

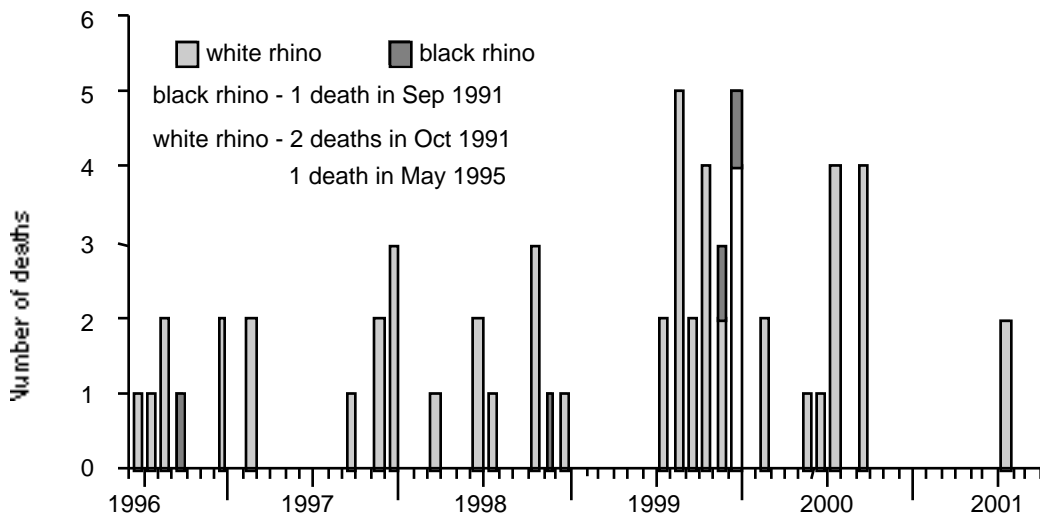


Figure 1. Sequence of deaths caused by elephants in Hluhluwe-Umfolozi Park on a monthly basis (gaps indicate months, with long tick at year-end and medium tick between June and July). To increase clarity, the first four deaths are not shown at the beginning of the sequence.

deaths (including 4 black rhinos) by the end of 1999. Ten older male elephants, up to 45 years of age, were introduced to HUP from Kruger National Park in May 2000. The number of deaths in 2000 decreased, and there were no rhino deaths from elephant between September 2000 and May 2001, two deaths in June 2001, and no deaths from then to October 2001.

Deaths were not limited to one age or sex class for either species (fig. 5). However, the majority of deaths were of adult animals (84.5% for white rhinos, 80% for black rhinos—fig. 5). The bias was towards males over females for both species: white rhino: 0.77♀:1♂ (24♀:31♂ individuals); black rhino: 0.67♀:1♂ (2♀:3♂ individuals) (fig. 5).

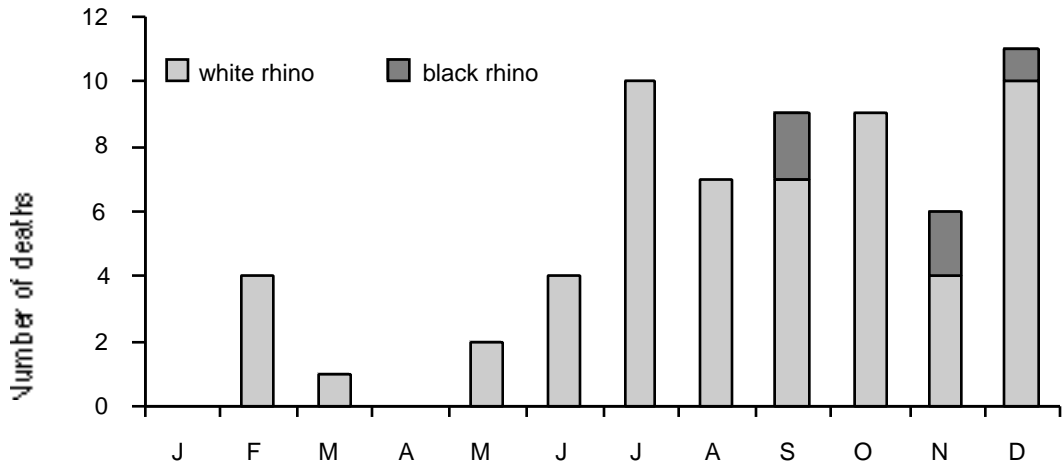


Figure 2. Summary of deaths per month caused by elephants in Hluhluwe-Umfolozi Park over the period from 1991 to October 2001.

Deaths were spread throughout the year, but there were no deaths in January or April. The majority of deaths occurred from July through December (83%), with the four highest months being December, July, September and October (fig. 2).

The deaths were scattered throughout the reserve (fig. 3). The early deaths were all in Hluhluwe, but they spread south to Umfolozi in 1996. The elephants were initially concentrated in Hluhluwe and ventured into Umfolozi only in 1995–1996. Deaths were associated with river systems, with 76.2% deaths occurring within 1000 m of a river (fig. 4).

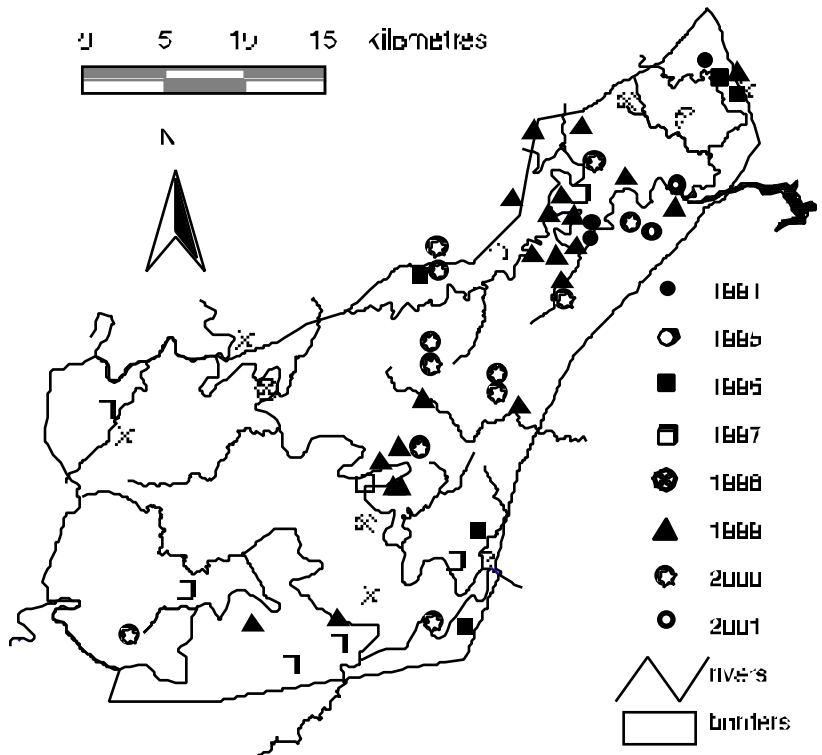


Figure 3. Distribution and timing of rhino deaths from elephants in Hluhluwe-Umfolozi Park.

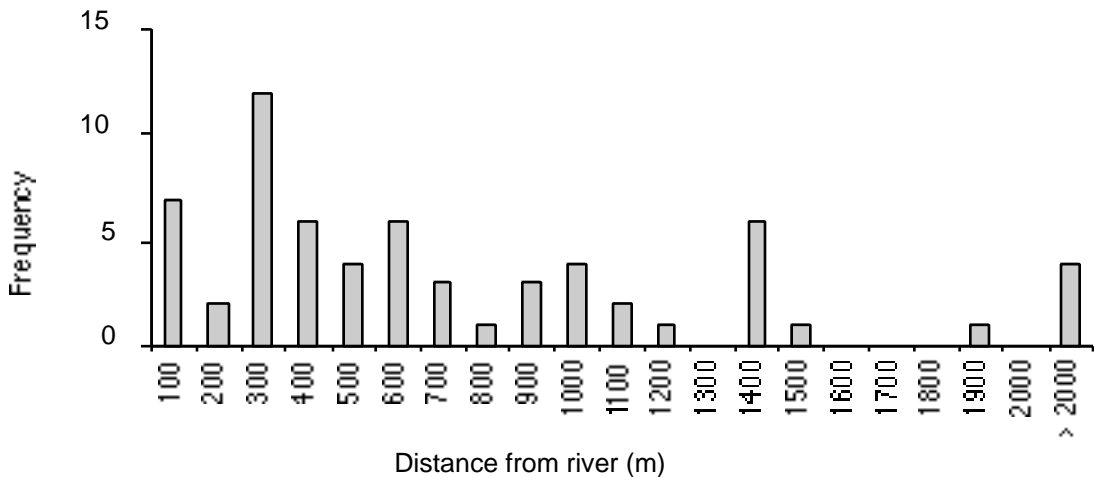


Figure 4. The relationship between the location of water and rhino deaths in Hluhluwe-Umfolozi Park. Deaths tended to be associated with rivers, with 76.2% of deaths within 1000 m of a river.

Discussion

Elephants killing rhinos is clearly not a phenomenon restricted to HUP. This behaviour, however, is uncommon in populations with normal age structures. In PNP, the problem first occurred with any substance in 1992 and 1994; in HUP, 1996 was the year the problem first became common.

The problem increased rapidly in HUP, and the number of deaths in HUP has exceeded those in PNP. One reason for this may be that PNP management staff worked to control the problem through culling male elephants located nearest to the rhino deaths. The culling stopped rhino deaths until the next elephant matured and came into musth.

Most deaths were in the latter half of the year. We estimate elsewhere (Slotow et al., unpublished data 2001) that at least four elephants were responsible for the deaths, one active in February–March, one in June–August, one in September–October, and the last in November–December. The musth males appear to be spreading their musth through the year, without overlapping cycles, which is what occurs in natural populations (Poole 1987).

The rhinos being killed are predominantly adults, and slightly more males than females. A similar pattern was observed in PNP, where all ages and both sexes of rhinos were killed (Slotow and van Dyk 2001). There is no indication that deaths are related to rhino territorial behaviour. Deaths occur along river valleys, and

our interpretation is that clashes occur at shared water access points but are random in other aspects.

Implications from the events in PNP and HUP are that other parks that received orphan elephants from KNP culls will encounter similar problems, and management should be proactive to prevent further loss of these valuable rhino species. Given the large number of rhinos killed by elephants in PNP and HUP, the success of introducing big adult male elephants into PNP (Slotow and van Dyk 2000), and the apparent success of their introduction into HUP (Slotow et al., unpublished data 2001), we recommend introducing a limited number of older elephant males from KNP into each of the populations that lack older males. However, the number of older males needs to be carefully considered and should be on the conservative side. The reason for this is that older male elephants have a major adverse impact on large aesthetic trees such as marula *Sclerocarya birrea* (A. Rich.) Hochst. (personal observations in both PNP and HUP), and the impact will increase with the number of males that are introduced. Given that the purpose of introducing older males is to regulate the musth of younger males, we recommend two or four males be introduced to small elephant populations (< 75 animals), and six males be introduced to larger populations. Close study should be made on the effects of the introduced males on musth in the resident young males, and additional males could be introduced if necessary.

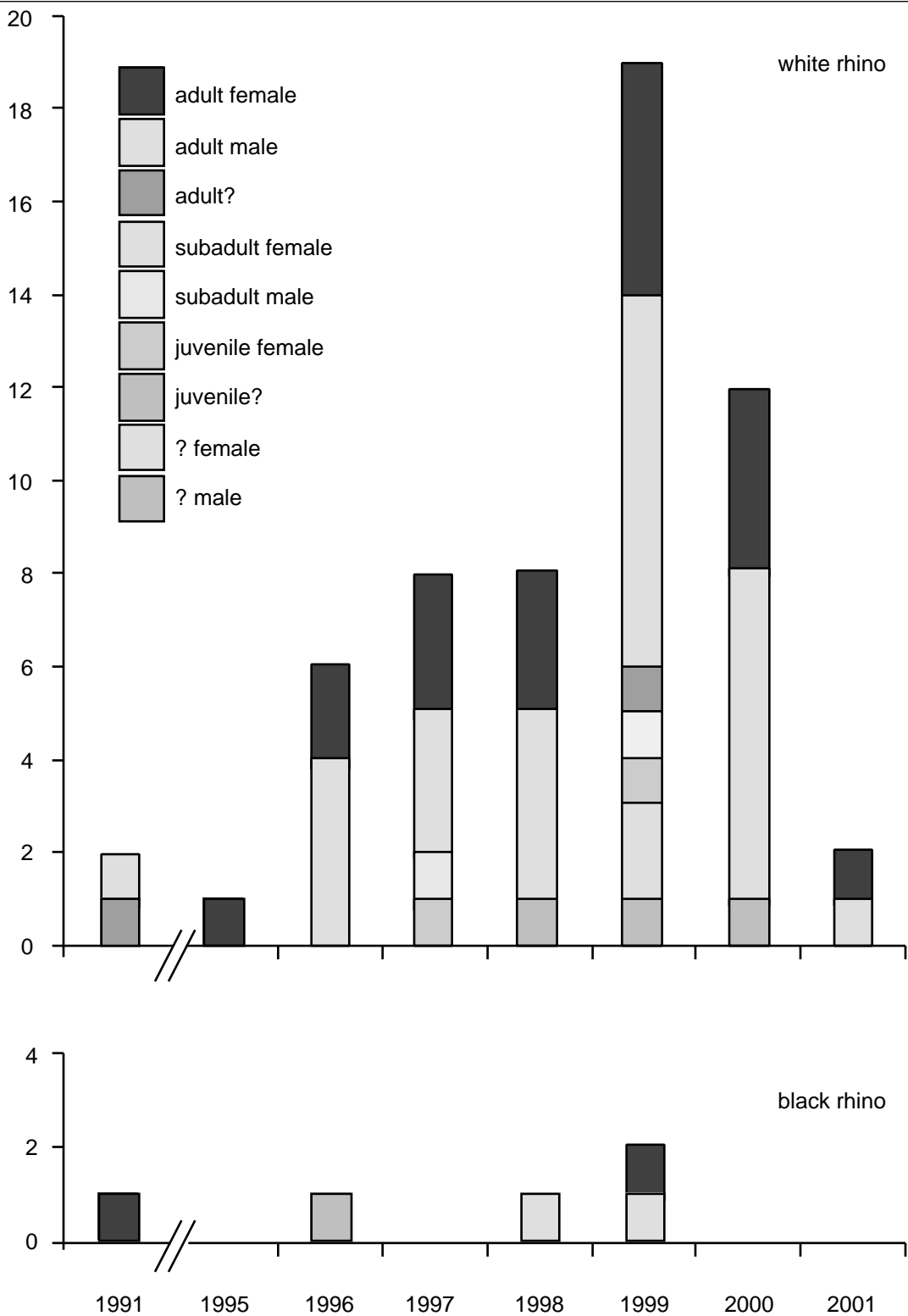


Figure 5. Breakdown by age and sex of rhinos killed by elephants in Hluhluwe-Umfolozi Park. ? = either age or sex was indeterminate.

Acknowledgements

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