
RESEARCH ON THE EFFECTS OF TEMPORARY HORN REMOVAL ON BLACK RHINOS IN NAMIBIA

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in equal measure although no data were presented (Berger & Cunningham 1994a). The 1993 drought did and

INTRODUCTION

In July 1993, Berger and Cunningham (1993) concluded in an unpublished progress report to the Namibian Ministry of Environment and Tourism (MET) that three black rhinoceros (*Diceros bicornis*) calves had died in the only part of their study area in the Kunene region of Namibia where rhinos were dehorned and where large predators occurred. They claimed that two black rhino calves born in 1992 could not be found in 1993, nor could they find a third calf, never seen, but which was assumed to have been born to a dehorned female which had a swollen udder. All three alleged calf deaths were attributed to predation by spotted hyaenas and lions. This report acknowledged, however, the possibility that only two calves had died and that other factors such as drought could have accounted for their deaths. MET was concerned over several aspects of the report, but officially regarded it as an interim progress report and nothing more.

In February 1994, concern turned to disappointment when it became evident that these preliminary data had been submitted as solid fact in a paper to the policy forum section of *Science* (Berger & Cunningham, 1994a), and were cited as the basis for speculation about the relative efficiency of alternative *in situ* rhino conservation strategies. The conclusion that dehorning might not be an effective strategy was considered by MET to be premature, not supported by adequate data, and not in the best interests of rhino conservation. The authors furthermore chose not to provide clarification on some research methods and the scope of their planned work in 1994 as requested, but terminated their study (even before MET had considered not extending their research permit on the basis of their article in *Science*). They have subsequently gained support for their position from their home base in the USA, for example, in Berger & Cunningham (1994b), Brussard (1994) and Macilwain (1994).

In this paper, we examine the calf mortality data and interpretations presented by Berger & Cunningham (1993, 1994a) and Berger *et al.* (1993). We have

foregone the temptation of taking issue with the various allegations and speculations concerning the Namibian wildlife management authority and its policies, or indeed the respective roles of science in wildlife management and foreign scientists in developing countries.

A chronology and summary of the circumstances surrounding the three rhino deaths assumed to have occurred by Berger & Cunningham (1993, 1994a) are presented (see Table), based on Berger & Cunningham (1993), Berger *et al.* (1993), Berger & Cunningham (1994a), and the unpublished data of MET Kunene Region staff and B. Loutit of the locally-based "Save the Rhino Trust" (SRT). The essence of the argument that temporary horn removal increases the risk of spotted hyaena (*Crocuta cmcuta*) predation on calves is given in Berger & Cunningham (1994a). Several points of dispute are highlighted below.

EXPERIMENTAL DESIGN

Berger & Cunningham (1994a) contrasted calf survival in three areas (known as SR, DC and NYF) of hyperarid broken terrain in the Kunene region of Namibia, previously known as Damaraland. Two areas larger than 1,000km² (SR and DC) each contained fewer than 20 rhinos which had all been dehorned once since 1989 (See Table). Large predators allegedly occurred only in area SR and in the third region where no rhinos were dehorned (NVF). Apart from our concern over extremely small sample sizes as well as a different conclusion reached by Martin (in press) using the same statistical procedure as Berger & Cunningham (1994a), flaws in the experimental design are obvious to those familiar with the region and the environmental conditions over the past few years. It is our belief that other important differences affecting rhino survival occurred between areas SR, DC and NVF, unrelated to predators or dehorning. The alleged rhino calf deaths coincided with the worst drought in human memory in Namibia. Berger & Cunningham (1993) presented photographic evidence of emaciated adult rhinos in areas DC and SR in 1993, but later claimed that the drought had affected their entire study areas

affect a large part of the Kunene region, but Normalized Difference Vegetation Indices derived from NOAA satellites indicate substantially more actively growing vegetation, and thus biomass, in parts of area NVF than in either DC or SR (unpublished MET data).

Apart from being located in a vegetation zone completely different from the other two areas (Geiss, 1971), area NVF is managed as a tourism concession and *de facto* conservation area with negligible presence of livestock, and is partly fenced by a stock-proof veterinary cordon fence. Areas DC and SR are unfenced communal lands used by semi-nomadic livestock farmers. Surface water is scarce throughout

the region, but more so in DC and SR than in NVF. Some 500 small stock (goats and sheep) and cattle were moved into the SR rhino concentration area during the 1993 drought, which severely depleted water supplies and displaced black rhinos from their usual watering points (Loutit & Montgomery, in press; B. Loutit, pers. comm.) A lesser influx of people and livestock occurred over a shorter period in DC but nothing comparable occurred in NVF. Berger and Cunningham must have been aware of this, and indeed have cited the increased pastoral use of areas DC and SR during the drought as probable causes of rhino population decline (Berger & Cunningham, 1993). The experimental design presented by Berger & Cunningham (1993, 1994a) thus represents an artificial

Table. A chronology of black rhino conservation problems and management intervention in areas SR, DC and NVF of the Kunene region of Namibia.

Year	Rhino security risks, management intervention and environment conditions ¹	Average adult female anterior horn length (cm) ² in SR	Births from dehorned mothers in SR	Recorded black rhino deaths in the SR part of the Kunene region of Namibia
1989	High risk in SR, 20 dehorned in SR, 3 translocated from SR	0	(1) ³	
1990	No poaching in SR or DC, 1 killed in NVF area	6.4	-	
1991	High risk in DC, 8 dehorned in DC	12.8	-	
1992	No illegal hunting in SR or DC, onset of drought, influx of livestock in SR	19.2	2 seen ⁴ 1 inferred ⁵	1 sub-adult (starvation) 1 calf inferred ⁶ (unknown causes)
1993	No illegal hunting in SR or DC, serious drought; SR adults in emaciated condition ³	25.6	inferred ⁴	3 calves inferred ⁴
1994	No illegal hunting, but security risk growing, drought conditions persist in parts of NVF, SR and DC	32.0	1 ⁷	1 adult (from <i>Staphylococcus</i> sp. infection)

¹ Summarised assessment from unpublished reports and data of MET and B. Loutit.

² Average female anterior horn lengths calculated from Berger et al. (1993).

³ This calf was less than three months o/d when his mother was dehorned He has survived (B. Loutit, SRT, and unpublished MET data).

⁴ Two calves were recorded in 1992, and a third was never seen, only inferred from photos of a female with a swollen udder (Berger & Cunningham, 1993).

⁵ Results of a 1992 photographic census of rhinos by SRT and MET

⁶ Calf positively recorded but with no subsequent appearances (B. Loutit, SRT and unpublished MET data).

⁷ B. Loutit, SRT, pers. comm.

oversimplified experiment (with no control, see Martin, in press) not taking account of other environmental factors, and therefore cannot reveal anything about rhino calf survival as a consequence of dehorning or any other mortality factor.

PREDATOR AND PREY DENSITIES IN THE KUNENE REGION

A contrast in the experimental design of Berger & Cunningham (1994a) is the presence and absence of large carnivores in three parts of a large study area in northwestern Namibia, variously described as ca. 7,000km² (Berger & Cunningham, 1994a) or 10,000km² (Berger & Cunningham, in press) or 4,500km² (Berger, in press). There are enormous logistical and methodological problems in determining large mammal densities in large areas of broken terrain, especially if an aircraft is not used, as, for example in the study of Berger and Cunningham. The two researchers have not explained their methods of monitoring mammal densities, but these could not have been more than sightings of animals and their tracks at waterholes and along the few roads in the region. Such methods may yield valid estimates of ungulate densities under controlled conditions, but we know of no situation in arid savanna or desert regions where such methods have been considered useful for estimating densities of large African carnivores. Experienced MET ranger and research staff consider it most unlikely that more than 30 spotted hyaenas or more than 10 lions occur in the entire 40,000km² of the "Damaraland" part of the Kunene region, as also suggested by the low reported incidence of predation on livestock in this region (unpublished data, MET). Berger (in press), concedes an estimate of 10 hyaenas in 4,500km² in "central Kaokoveld".

The brown hyaena *Hyena brunnea* (which almost never preys on large mammals [Mills, 1990; Skinner & Smithers, 1990]), occurs throughout the Kunene region of Namibia, and partly overlaps in track dimensions with spotted hyaenas *Crocuta crocuta*. Much of the region has coarse substrates not suitable for accurate distinction between the tracks of related species. Intriguingly, Berger & Cunningham (1993, 1994a) report no hyaena presence from area DC at all, while both species have regularly been recorded there (Skinner & Smithers, 1990; unpublished MET records; pers.obs.) Spotted hyaenas were found at the carcass of the sub-adult rhino which died in 1992 (Table 1) in the DC area which, according to Berger & Cunningham, had no large predators at all. In a later manuscript, Berger and Cunningham (in press) mention that the number of

spotted hyaenas had not been determined in their study area, and yet they state elsewhere with conviction that some parts of their huge study area had no hyaenas while other parts did.

We conclude that their survey methods were inadequate, given the importance attached to apparent differences in predator density as a factor in rhino calf survival. There is, in fact, no evidence for predation on rhino calves in area DC, where both species of hyaena occur sympatrically with rhinos which were dehorned in 1991.

PREDATION ON RHINOS

By accepting that black rhino calves are vulnerable to spotted hyaena and lion predation, one cannot simply conclude that any missing black rhino calves in the Kunene region are therefore killed by predators. No carcasses of any calf born in 1992 or later have been located. There is no evidence to suggest that either predation was the cause of death of three rhino calves when their carcasses were never recovered, or that calf predation was related to a horn reduction exercise three years earlier!

Interesting questions may nevertheless be asked about predation on rhinos, such as "How much horn does a rhino mother need to deal with a predator?", or "Is there an optimal size or shape for a rhino mother's horn?". As evident from the table, Berger (1993a) and Berger *et al.* (1993), the anterior horns of the three dehorned mothers had already regrown to between 19 and 26cm by the time their calves had allegedly disappeared. This length of horn overlaps with the natural distribution of adult horn lengths (Berger *et al.*, 1993). Rhino horn shapes and lengths show extreme variation under natural conditions and the horns are the main features used in individual recognition of rhinos by researchers in southern Africa. This suggests that horn dimensions *per se* are not that important for the protection of calves. It seems likely that if maternal horn length and shape are important for the protection of the calf, these parameters would have evolved towards an optimum shape and length rather than varying to the degree seen in all populations.

TEMPORARY DISASSOCIATIONS BETWEEN RHINO MOTHERS AND CALVES

The fact that black rhino cows hide their small calves has been reported *inter alia* by Joubert & Eloff (1971), Hall-Martin & Penzhorn (1977) and Owen-Smith (1988), and not for the first time as claimed by Berger

(1993b). Berger & Cunningham (1994a) alleged that all three calves disappeared within one year after birth, during the interval that calves are most often hidden (Berger, 1993b). Berger & Cunningham (in press) also recorded spatial displacement by females of several kilometres in one day in response to human presence. No more extreme than their predation theory is the speculation that Berger and Cunningham's activities and presence might have also affected the period of separation between cow and calf, especially in situations compounded by drought, poor body condition and displacement from watering points.

No data have been published comparing the vulnerability of hidden calves versus those accompanied by their mothers, or the proportion of time spent in hiding at various age intervals. If calves are preyed on whilst in hiding, maternal horn length is of no consequence. This possibility should have been discussed in any paper dealing with predation on rhino calves.

CONCLUSIONS

Considering that rhino cows hide their small calves; that horn shape and length show tremendous natural variation, indicating the lack of any strong evolutionary selection towards an optimum defensive utility; and considering the adverse habitat conditions experienced by the SR rhinos at the time when they seem to have lost their calves; we have to conclude that there is no support for any claim that a prior dehorning exercise had affected calf survival. No evidence exists that any calf died from predation or any other cause such as being abandoned during extreme drought conditions. Until unambiguous proof exists that the same females which were said to have lost calves, have indeed lost their calves, any conclusion about the effects of dehorning on calf survival is irresponsible speculation.

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