

MANAGING BLACK RHINOS

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INTRODUCTION

This paper in part summarises the main findings relating to managing black rhino to emerge from the Black Rhino 2000 project we undertook in Hluhluwe-Umfolozi Park (For full details see BR2000 final report - Chapter 2, Volume 1 (1993); Chapters 14-23, Volumes 4 (1993), 5 (1994) and 6 (in prep.) It also seeks to summarise the collective experience of other colleagues such as Pete Hitchins, Martin Brooks, Mike Knight, Trevor Sandwith, Athol Marchant, Alf Wills, Raoul du Toit, Peter Erb, Rob Brett, Bruce Brockett, Bob Lacy, Willem Ferguson, Derek Potter, Rusty Hustler, Bob Keffen, Pete Goodman, Blythe and Rudi Loutit, and Brad Fike to name but a few.

METHODS AND ANALYSES

Once again as the primary target audience of this symposium are game farmers and other practical conservationists we have concentrated on presenting and discussing the main results in this paper. For a brief overview of the research and analytical methods used see the paper on feeding ecology by Emslie & Adcock in this volume. Interested technical readers can consult Chapters 3,4 and 5 in Volume 2 of the BR2000 final report (Emslie & Adcock 1993) for full details of the methods and analyses used.

BEFORE BUYING BLACK RHINOS

While the Natal Parks Board (NPB) Assessment Team will give you a quick rough and ready estimate of maximum productivity carrying capacity, it is highly recommended that before spending such a large amount of money you seek a more thorough professional opinion on whether you should buy any black rhino, and what your maximum founder number should be.

One of the major problems to emerge to date is that non-experts and especially land-owners invariably tend to over-estimate black rhino carrying capacities. This has occurred in South Africa, Swaziland and Zimbabwe, with the result that in all three countries black rhinos have died on private land as a result of overstocking. Ensuring you do not overstock is of critical importance if you are going to contribute to helping meet regional conservation goals for the species.

In seeking a professional opinion on the potential carrying capacity of your farm you should engage the services of one, or better still a small team, of black rhino habitat/feeding ecology experts. This is not to say such a team will always be correct - but experience has shown that other non-rhino researchers, managers or game capture experts can come up with wildly inflated estimates of carrying capacities with disastrous results.

Just because you are a security expert, rhino capture fundi or experienced in rhino ID does not make you a rhino habitat expert. In an attempt to improve the situation the Rhino Management Group (RMG) held a workshop to review property assessment procedures. In time the RMG hopes

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to be able to synthesise the views of the various habitat experts in Southern Africa and come up with a transparent computer-based carrying capacity estimation expert system which any extension officer or ranger can use. Unfortunately, this is not yet available.

When estimating carrying capacities it is also essential that founder stocking and estimated carrying capacity densities are ALWAYS calculated and compared with figures for other areas.

It is also important to determine whether your farm is likely to be dry or wet season limited. For this it is important to have someone with local knowledge of the area.

If the total estimated carrying capacity for your farm is small (<20), you should be aware that the chance of bad luck reducing population growth (eg by getting more males than average) increases.

You should also work out how much black rhinos are going to cost you in extra management expenses such as increased security, population monitoring, and improving fencing etc. It is a fallacy to think you can just dump black rhinos in a park and leave them. Hands-on intensive management is the recipe for success in smaller populations.

You must also set carrying capacity according to crunch times. One cannot have the attitude that "the last years of drought were exceptional - I want to manage for average years". If you do this, when bad droughts come, you may lose a few rhino. It is no good doing well for 7 years and then losing all your gains in a couple of bad years.

You also need to be aware that browsers like black rhino are perhaps harder to manage successfully than grazers. This is because less is known about browsers than grazers and the food resource is perhaps more dynamic. Browsers also seem to be more prone to die-offs. As a result one needs to take a slightly more conservative approach when setting your estimated maximum productivity carrying capacity.

Rhino are water-dependent and need to drink at least every third day, but preferably every day. Rhino set up their territories based on the water distribution, and male territories and numbers will be limited by available water. Increases in rhino social, territorial pressure because of changes in water distribution can result in fighting. You may need to put in an artificial water-hole in part of your property before you release your rhinos.

Deep, sticky mud around waterholes should be avoided if possible; rhinos can get stuck in mud and die.

If you have steep cliffs on your property you should be aware that one of your precious beasts may frustrate your ambitions by killing itself by falling down the cliff (a surprisingly common cause of black rhino deaths). Therefore all else being equal a flatter farm is better. If possible you may even be able to fence off potentially dangerous cliffs.

TRANSLOCATION AND INTRODUCTION OF BLACK RHINOS

Translocation

ALWAYS use an experienced game capture crew and vet. Take their advice. It would be a good idea to speak to as many colleagues as possible who have introduced black rhinos to learn from their experiences.

Boma construction and holding prior to release

If you buy black rhinos from the Natal Parks Board you will be required to hold your rhinos in bomas, before releasing them into an adjoining electrified fenced camp. In time you will eventually release them onto the rest of the property. Your perimeter fence must be up to scratch before

releasing your rhinos on the rest of your property. Consult your supplier for specifications of how to build a boma.

Release

If possible avoid press circuses and razzmatazz at the time of release, and instead try to opt for a quiet release. It may also be a good idea to spread some of the rhinos' dung around outside before releasing the animals to make them feel at home.

Social factors

If there are already established black rhino on your property it will be important to try to minimise the risk of fighting post release. Consult your supplier or Private Land-owners Representative to get advice. See paper by Adcock in this volume.

Boma feeding

An adult black rhino's average daily consumption in a boma is 28-30kg, while a sub-adult consumes about 20kg/day. Remember that there appears to be a limit to the amount of any one species that a black rhino will eat; and so its diet needs to be made up of a number of species.

It appears that *Dichrostachys cinerea* may not be a good cut-browse food - it loses its leaves quickly and can injure animals with its strong spines.

Watch and adjust the amounts of lucerne and cubes put in each day to 1) reduce wastage levels, which can be high; 2) keep a greater proportion of the food fresher; and 3) reduce costs.

Most cut browse, eg. *Spirostachys africana*, is predisposed to drying out and dropping leaves, but lasts longer if sprayed with water. If logistically possible cut and feed browse twice a day, rather than in one big lot once a day.

Make sure you feed the rhino palatable spizes (see paper on feeding by Emslie & Adcock in this volume).

Your supplier can give you advice on boma feeding.

DIRECT MANAGEMENT ACTIONS

Managing other animal numbers

Grazer stocking densities

The paper on feeding in this volume discusses how excessive grass interference can reduce habitat quality. The role of grazers in black rhino habitat management is that together with rainfall they influence the grass layer:

They affect fuel loads for burning, and thus influence bush encroachment/control.

They influence grass height and thus grass interference on rhino food plants.

Managing black rhino habitat will entail managing grazer numbers to permit a desired burning regimen, whilst limiting grass interference of rhino food.

Elephants

Elephants interact with fire and bush clearing and are a force in themselves in reducing vegetation height and reversing succession. This will benefit black rhino. Elephant impact is cumulative, and may take 10-20 years to be fully manifest in introduced population. Elephants feed at different heights to black rhino and also graze; so in normal circumstances there is minimal competition for

food. It is more likely that elephant will facilitate for black rhino by their feeding. Elephants can reduce rhino food but only when they are at high densities and after years of cumulative elephant impact (eg. as happened in Tsavo). The down side is that elephant can be aggressive to rhino and even kill them. This seems to be more of a problem with introduced elephant where "delinquent" behaviour is more prevalent.

Stocking densities of other browsers

Unless other browsers are at exceptionally high densities, eland are the one browser species which could potentially seriously compete with black rhino. They feed in a similar height range to black rhino and break off branches and remove quite thick twigs, compared to other browsers.

The impact of browsers on the condition of browse plants should be monitored to detect possible competition, and when severe, eland numbers may need to be reduced.

Field staff on the ground should however still keep a close watch on small "Acacias" and other key favoured black rhino spizes to see they are not being too heavily browsed. For example if impala densities are very high these might start competing with black rhino.

Nyala and kudu competition with black rhino is limited as they feed more selectively, and have different species preferences. The negative correlation between densities of nyala and black rhino appear largely to reflect habitat changes rather than being a function of nyala out-competing black rhino.

Predation

All else being equal not having lions and spotted hyaenas is an advantage. However, although large predators may kill the odd rhino, on balance they appear not to pose as serious a threat as sometimes alleged. Large predators may instead be beneficial by bringing in increase tourism revenue which in turn can help justify conservation as a form of land use.

The incidence of lion and spotted hyaena predation will depend on the relative densities of the predators, black rhino and other prey species, but at worst, Keryn Adcock estimates that one rhino in a big park may be lost every three or four years to predators at average densities. Reducing or removing predators is an option if such losses are deemed unacceptable to management.

FIRE MANAGEMENT

Fire is one of the most important influences on black rhino habitat (see paper on feeding ecology by Emslie & Adcock in this volume). In most bushveld areas the judicious use of fire is essential for maintaining favourable habitat conditions. For this, a good understanding of the principles of burning, and fire effects on rhino food species, is needed.

A manager's ability to use fire successfully depends in part on the degree of understanding of the impacts different fires have on woody vegetation dynamics. Armed with this information a manager can also predict the short and longer term impacts of different fire regimes on black rhino habitat quality. To do this requires data on vegetation responses to be linked to specific fire behaviour. Unfortunately, our current ability to do this is limited, as we have only a basic understanding of the influence of different fire behaviours on vegetation responses. This hampers the successful use of fire in conservation management in southern Africa.

For example, the literature on the effects of different fires and fire return periods on key Savanna spize mortality rates is very scanty and contradictory. This is a serious gap in our knowledge. One fact to emerge however, is that mortality of "Acacias" is very low after fire. If we are going to improve our ability to use fire as a management tool (either to produce open grasslands or manage habitat for black rhinos) increasing research attention is going to have to focus in future on determining the effects of different fire behaviour and regimes on the population biology of key

"encroaching" species. Such research would be of great practical value to managers. Future sound management requires that we increase our understanding of the effects of different fire types and fire return periods on the germination, establishment, topkill rates, and mortality rates of key woody species.

However, from limited research undertaken, we at least have a basic understanding of the characteristics, and some of the effects of different fires.

It appears that if increased attention is given to meteorology, and BEHAVE fire prediction software was used more often, managers should be able to produce more effective burns (eg in terms of producing high topkill rates) when fuel loads are not at peak levels.

Given the current information gaps about the effects of burning on woody plant dynamics, rhino managers should adopt an adaptive management learning attitude to burning; and closely monitor its effects on topkill, plant kill and seedling recruitment rates in vegetation stands of different kinds.

To summarise ...

Short term effects of fire:

Black rhino actually favour burnt areas, as this:

- removes grass interference,
- removes thorn from twigs,
- alters the taste/smell of the food (like toast),

However, before coppicing occurs, burnt/late winter food will include normally unpalatable species, and is nutritionally sub-optimal.

Never burn large percentages of the property at once. It is better to stagger burning over a longer period.

Further benefits of burning are that the coppice is highly nutritious and favoured by rhino. Plants are knocked back to rhino feeding height, and forbs (ground flowers) are promoted and made available with grass removal.

Severely burnt areas are less favourable than moderately or lightly burnt areas for feeding in, especially in Tambothi thickets. Severe burns can penetrate bush clumps and termitaria, where many palatable but fire-sensitive species reside. If this occurs too frequently, these valuable food species may decline. The occasional severe burn in bush clumps and thickets may aid rhino, though, in knocking back these plants to rhino feeding height.

Provided densities of small/medium "Acacias" are not reduced to low levels by very frequent fires, topkill following burning is clearly beneficial to black rhinos by keeping trees in the most preferred size classes for longer. This should be aimed for.

If bush encroachment is at an early stage and trees are generally <1m, then based on current literature, cooler fires seem to be effective in producing good topkill rates. Frequent cool fires should keep the bush low in short scrub, and managers need not wait years for big fuel loads to build up.

However, once trees increase in size around 2m+, intense fires and high flame heights will be required to produce significant topkill rates. Unless grazer biomass is low, or burning during very dry, windy conditions can be risked, there may need to be a few years between fires, during which time the trees will grow even taller. A good fire with high flame height will kill these, but rhino will have been disadvantaged.

Long-term effects of fire:

A period of a few years without adequate fire can result in a vegetation trend which is difficult to reverse: toward tall woodland, with rhino food out of reach; and/or toward later successional species which are unpalatable.

However, too frequent fires may be detrimental in the longer term by reducing densities of some food species while promoting others. E.g. Frequent hot fires may also promote the spread of palatable *A.caffra* and some less palatable species e.g. *L.javanica*, at the expense of the highly preferred "Acacias" eg. *A.nilotica*, *A borleii*, *A.senegal*; and the important *A.karoo*.

Chance of animals being burnt to death

Only one black rhino was recorded as having been burnt to death in the RMG region during 1989-92 out of a total sample of 2 667 rhino years (Source: RMG Status Reports). If fire was going to be a major mortality factor we could have expected the fire risk to be substantially higher than the recorded 0.037% risk per rhino per year. Given that every black rhino is precious, managers could probably minimise the risk of burning rhinos by applying the more frequent spot-burning policy advocated by Alf Wills. The retention of aspects of the old fire management policy, and especially putting in long fire fronts along roads probably increases mortality risks (albeit slightly).

In conclusion, we must reject the hypothesis that control burning negatively impacts on black rhino in the short term by reducing habitat quality during the immediate post burn period; and that many black rhino may be burnt to death. Rather we must conclude the opposite. On the whole burning benefits black rhino in the short term.

Non burning on the other hand will in the short term largely be negative for black rhino by 1) allowing "Acacias" to grow into taller less preferred size classes; 2) allowing emerging seedlings of unpalatable fire sensitive later successional evergreen species to establish and grow; 3) not removing grass interference in wet years; and 4) not creating conditions conducive to the early season growth of palatable ground herbs.

As cool undercanopy fires in closed woodland remove seedlings of unpalatable evergreen species that otherwise grow up to become canopy dominants, the proposal by Alf Wills that fire policy should aim towards more frequent cooler fires may therefore be beneficial to black rhino in the longer as well as shorter term.

In the longer term the interactive effect of elephants and fire can benefit black rhino by retarding or preventing the development of closed woodlands/forests. For example, it is without doubt that Hluhluwe's current carrying black rhino carrying capacity would have been higher had elephants not been hunted out of the area and had fire frequencies been higher thirty five years ago.

BUSH CLEARING

Only short-lived herbicides that are safe for browsers should be used for chemical bush clearing.

To benefit black rhino, bush clearing should try to reverse successional trends by removing tall unpalatable/out-of reach species, allowing recruitment of woody seedlings of food species. After this careful fire management is essential to keep the bush at favoured heights and densities.

Thinning of dense thickets of food species to increase rhino access will also be beneficial.

Like fire, clearing so that food density is markedly reduced will be detrimental to rhino, although this may be difficult to achieve in practice. Managers generally have the aim of increasing grazer habitat with such clearing, and the opening up of bush plus grazing pressure could create short grass area with scattered short scrub favourable to black rhino. Regrowth of unpalatable species (eg *Maytenus*

senegalensis, *Euclea* spp.) or undesirables such as *D.cinerea*, *A.mellifera* should be especially targeted in follow-up treatments.

Immediately after clearing of "Acacia" thickets, black rhino habitat suitability temporarily declines. However, experience has shown that without repeated follow-up treatments, the "Acacias" quickly grow back. The removal of canopy cover by clearing, combined with an apparent stimulation of germination following burning appears to promote rapid re-establishment of "Acacias" on bush cleared sites. Thus any decline in carrying capacity as a result of clearing "Acacia's" is temporary.

Of all the species *D.cinerea* is particularly resistant to clearing.

However, bush clearing is very expensive and unlikely to be a viable long term proposition. Rather you should try to control bush thickening by controlling grazer numbers, and using fire (and possibly elephants).

MONITORING

Successful biological management requires good information. This means that you should routinely and regularly monitor your population's size, the reproductive performance of individual females, population age and sex structure, mortalities, time it takes to pick up carcasses, recording what you did when introducing and releasing animals (so any lessons learnt become available to the wider community).

You may also want to monitor feeding behaviour with a view to detecting if your rhinos are increasingly being forced to eat unpalatable species in summer.

You are strongly urged to fill in an annual RMG status report. You will then be able to compare the performance of your population with others in the region. This should allow you to be a bit more pre-emptive in future when the time comes to decide whether you are nearing your estimated maximum productivity and need to take animals off.

The RMG can also help give you advice on monitoring from details of the standardised population age classes in use to how to estimate population sizes better in larger thick bushed areas. The RMG can also put you in touch with someone experienced in the use of ID methods; and he/she may be able to help train up your staff.

GENETICS

Current research shows that genetics is not a critical issue in black rhino management. The populations in Southern Africa are genetically healthy and diverse. Introducing new blood into the populations need be done only every 20-30 years at the most.

SECURITY

This is very important. You will be required to meet minimum standards before being allowed to bid for black rhino by the Natal Parks Board. NPB will require you to have three suitably trained and armed staff. To this should be added, depending on the security situation, at least one staff member for each additional 1 500ha up to 6 000ha, and for each 3 000ha thereafter. For example, this translates to six staff if your property is between 6 000 and 9 000ha.

The RMG security committee should also be able to help you get advice.

NEIGHBOURS - COMMUNITY COOPERATION

The better the neighbour relations and the more wildlife uplifts and empowers local communities, the better.

CONCLUSIONS

Probably the most important decision you have to make is to estimate your maximum productivity carrying capacity. When your population density reaches this figure, remove some of your rhino in an attempt to prevent density-dependent limiting factors from reducing your performance. Regular monitoring and comparison with other areas is the key to continuously refining this estimate as you go along. There is a bit of art involved, but the more your decision is based on good data, the more likely you are to get it right.

Remember the golden rule - if in doubt err on the side of a conservative stocking rate.

WHERE TO GET ADVICE

Contact your RMG private land-owners representative, conservation department or one of the specialist rhino ecologists and specialist security boffins in your country. If in doubt ask for help from the relevant source. You may have to pay. The proposed formation of an African Private Rhino Owners' Society will also help facilitate you getting access to appropriate help.

Above all, good luck! Here's hoping the private land-owner can contribute as much to black rhino conservation in Southern Africa as private owners have in Kenya.