Active Intervention and Conservation: Africa's Pachyderm Problem

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Since 1900 the world's population has increased from about 1.6 to over 5 billion; the U.S. population has kept pace, growing from nearly 75 to 260 million. While the expansion of humans and environmental alterations go hand in hand, it remains uncertain whether conservation programs will slow our biotic losses. Current strategies focus on solutions to problems associated with diminishing and less continuous habitats, but in the past, when habitat loss was not the issue, active intervention prevented extirpation. Here we briefly summarize intervention measures and focus on tactics for species with economically valuable body parts, particularly on the merits and pitfalls of biological strategies tried for Africa's most endangered pachyderms, rhinoceroses.

Rescue efforts, this century and last, are credited with preserving two ungulates, Przewalski horses (*Equus przewalskii*) and Pere David's deer (*Elaphurus davidiensus*), both currently extinct in the wild but surviving in small captive populations. Active intervention is most common today when other tactics fail. The handful of remaining black-footed ferrets (*Mustela nigripes*) and California condors (*Gymnogyps californianus*) were seized from the wild, propagated in captivity, and then returned to former ranges; whether these populations will persist is unclear.

Few measures have effectively halted the illegal killing of species for lucrative body parts. Just as last century's bison (*Bison bison*) were shot for tongues and hides, the present victims include tigers (*Panthera tigris*), bears (*Ursus* spp.), and rhinos. Jimbu, the consumption of specialized animal parts, as well as the use of rhino horn in traditional Asian medicines and in the jambiyyas (dagger handles) of Yemeni men have precipitated the declines. Interventive solutions have had their place. When few plains bison remained, an 1880s Smithsonian expedition captured a small group in Montana, bred them on the East Coast, and later reestablished ancillary populations in South Dakota and Oklahoma (*1*). But what has worked for one species has not for another. In 1988, an African elephant was killed for its ivory every 8 minutes (*2*). Economic and political intervention facilitated recovery. The sale of ivory was banned at the 1989 Convention of International Trade in Endangered Species (CITES) meeting, although the result was much dissension between African countries. Those countries with abundant elephants supported continued utilization to pay for conservation programs; those with dwindling populations supported the ban. Elephant populations declined from over 1 million to less than half that before the CITES decision was reached, and the ban is credited for today's rebounding populations (*3*).

Neither conventional nor radical interventive measures are helping Africa's black rhinos (*Diceros bicornis*) (*4*). CITES enacted protective legislation 18 years ago, but populations have plummeted; in 25 years, 65,000 rhinos were reduced to less than 2,500, a loss of 97%. Prohibitions against the horn trade have been so ineffective that, in all of Africa today, only one unfenced population numbering more than 100 animals exists—that in the northern Namib Desert of Namibia. Like international legislation, national protective decrees have done little. Even Zimbabwe's hard-line shoot-to-kill (poacher) policy, enforced by paramilitary units, has not worked despite the deaths of more than 150 poachers and numerous rangers (*5*). Not unexpectedly, failures stem from inadequate funding and, in countries like Ethiopia, Sudan, Uganda, Angola, and Mozambique, political instability (*6*).

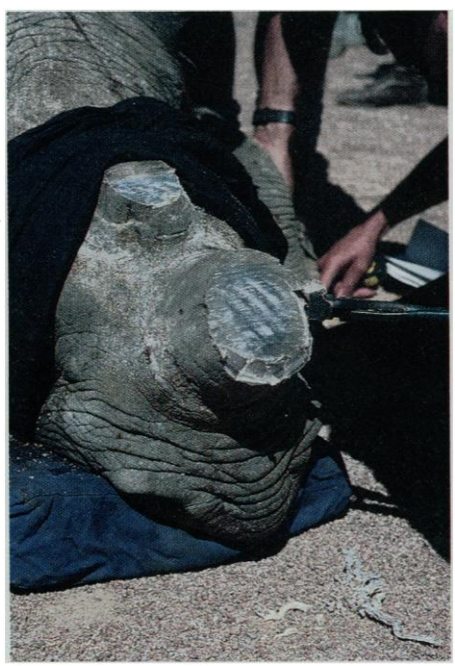

Fig. 1. A black rhino being dehorned in the northern Namib Desert in 1991.

Given the inadequacies of protective legislation and enforcement, Namibia, Zimbabwe, and Swaziland are using a controversial preemptive measure, dehorning (Fig. 1), with the hope that complete devaluation will buy time for implementing other protective measures (*7*). In Namibia and Zimbabwe, two species, black and white rhinos (*Ceratotherium simum*), are dehorned, a tactic resulting in sociological and biological uncertainty: Is poaching deterred? Can hornless mothers defend calves from dangerous predators?

On the basis of our work in Namibia during the last 3 years (*8*) and comparative information from Zimbabwe, some data are available. Horns regenerate rapidly, about 8.7 cm per animal per year, so that 1 year after dehorning the regrown mass exceeds 0.5 kg. Because poachers apparently do not prefer animals with more massive horns (*8*), frequent and costly horn removal may be required (*9*). In Zimbabwe, a population of 100 white rhinos, with at least 80 dehorned, was reduced to less than 5 animals in 18 months (*10*). These discouraging results suggest that intervention by itself is unlikely to eliminate the incentive for poaching. Nevertheless, some benefits accrue when governments, rather than poachers, practice horn harvesting, since less horn enters the black market. Whether horn stockpiles may be used to enhance conservation remains controversial, but mortality risks associated with anesthesia during dehorning are low (*5*).

Biologically, there have also been problems. Despite media attention and a bevy of allegations about the soundness of dehorning (*11*), serious attempts to determine whether dehorning is harmful have been remiss. A lack of negative effects has been suggested because (i) horned and dehorned individuals have interacted without subsequent injury; (ii) dehorned animals have thwarted the advance of dangerous predators; (iii) feeding is normal; and (iv) dehorned mothers have given birth (*12*). However, most claims are anecdotal and mean little without attendant data on demographic effects. For instance, while some dehorned females give birth, it may be that these females were pregnant when first immobilized. Perhaps others have not conceived or have lost calves after birth. Without knowing more about the frequency of mortality, it seems premature to argue that dehorning is effective.

We gathered data on more than 40

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known horned and hornless black rhinos in the presence and absence of dangerous carnivores in a 7,000 km^2 area of the northern Namib Desert and on 60 horned animals in the 22,000 km^2 Etosha National Park. On the basis of over 200 witnessed interactions between horned rhinos and spotted hyenas (*Crocuta crocuta*) and lions (*Panthera leo*), we saw no cases of predation, although mothers charged predators in about 45% of the cases. Serious interspecific aggression is not uncommon elsewhere in Africa, and calves missing ears and tails have been observed from South Africa, Kenya, Tanzania, and Namibia (*13*).

To evaluate the vulnerability of dehorned rhinos to potential predators, we developed an experimental design using three regions: Area A had horned animals with spotted hyenas and occasional lions, area B had dehorned animals lacking dangerous predators, and area C consisted of dehorned animals that were sympatric with hyenas only. Populations were discrete and inhabited similar xeric landscapes that averaged less than 125 mm of precipitation annually. Area A occurred north of a country-long veterinary cordon fence, whereas animals from areas B and C occurred to the south or east, and no individuals moved between regions. The differences in calf survivorship were remarkable. All three calves in area C died within 1 year of birth, whereas all calves survived for both dehorned females living without dangerous predators (area B; $n = 3$) and for horned mothers in area A ($n = 4$). Despite admittedly restricted samples, the differences are striking [Fisher's (3×2) exact test, $P = 0.017$; area B versus C, $P = 0.05$; area A versus C, $P = 0.029$]. The data offer a first assessment of an empirically derived relation between horns and recruitment.

Our results imply that hyena predation was responsible for calf deaths, but other explanations are possible. If drought affected one area to a larger extent than the others, then calves might be more susceptible to early mortality. This possibility appears unlikely because all of western Namibia has been experiencing drought and, on average, the desert rhinos in one area were in no poorer bodily condition than those in another. Also, the mothers who lost calves were between 15 to 25 years old, suggesting that they were not first time, inexperienced mothers (*14*). What seems more likely is that the drought-induced migration of more than 85% of the large herbivore biomass (kudu, springbok, zebra, gemsbok, giraffe, and ostrich) resulted in hyenas preying on an alternative food, rhino neonates, when mothers with regenerating horns could not protect them.

Clearly, unpredictable events, including drought, may not be anticipated on a short-term basis. Similarly, it may not be possible to predict when governments can no longer fund antipoaching measures, an event that may have led to the collapse of Zimbabwe's dehorned white rhinos. Nevertheless, any effective conservation actions must account for uncertainty. In the case of dehorning, additional precautions must be taken.

From an interventionist perspective, the tactic that seems to work best has been the transfer of animals to small, guarded sanctuaries. In Kenya, the 1990s have seen births finally exceed deaths (*15*). Population recovery has been progressing for more than 30 years in South Africa with the successful establishment of numerous satellite populations (*4*). Nevertheless, problems involving horns still exist. Fight-related mortality in both sexes is uncharacteristically high in black rhinos. If interventive management is to improve in situ recovery, two tactics might help—removal of both hyenas and horns. Dehorning should reduce female fight-related mortality, which may account for up to 30% of adult and subadult female deaths (*14*) once sanctuary populations are safe from poachers. But where the aim is to improve population viability by juvenile recruitment, dehorning appears imprudent unless dangerous carnivores are removed. Once the interventionist track begins, an increasing cascade of distasteful ecosystem manipulations will become inevitable.

It may never be possible to develop a truly comprehensive framework of proactive management across species, but translocation to protected areas has proved successful for Arabian oryx (*Oryx leucoryx*) and North American bison, and it may be the last recourse for Africa's two rhino species. Many biologists would claim that diffusing the risk of failure by the establishment of satellite groups is modern conservation at its best. As early as 1906, Hornaday believed in interventive management: "to provide against local failures, and possible outbreaks of contagious disease, it seems desirable that . . . several herds should be established in widely separated localities" (*16*). What we still don't know is how widely this tactic should be applied; we do know that for black rhinos it must be soon.

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