

SPECIES IN DANGER

THE DECLINE OF THE BLACK RHINO IN ZIMBABWE

IMPLICATIONS FOR
FUTURE RHINO CONSERVATION

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TRAFFIC

— East/Southern Africa —

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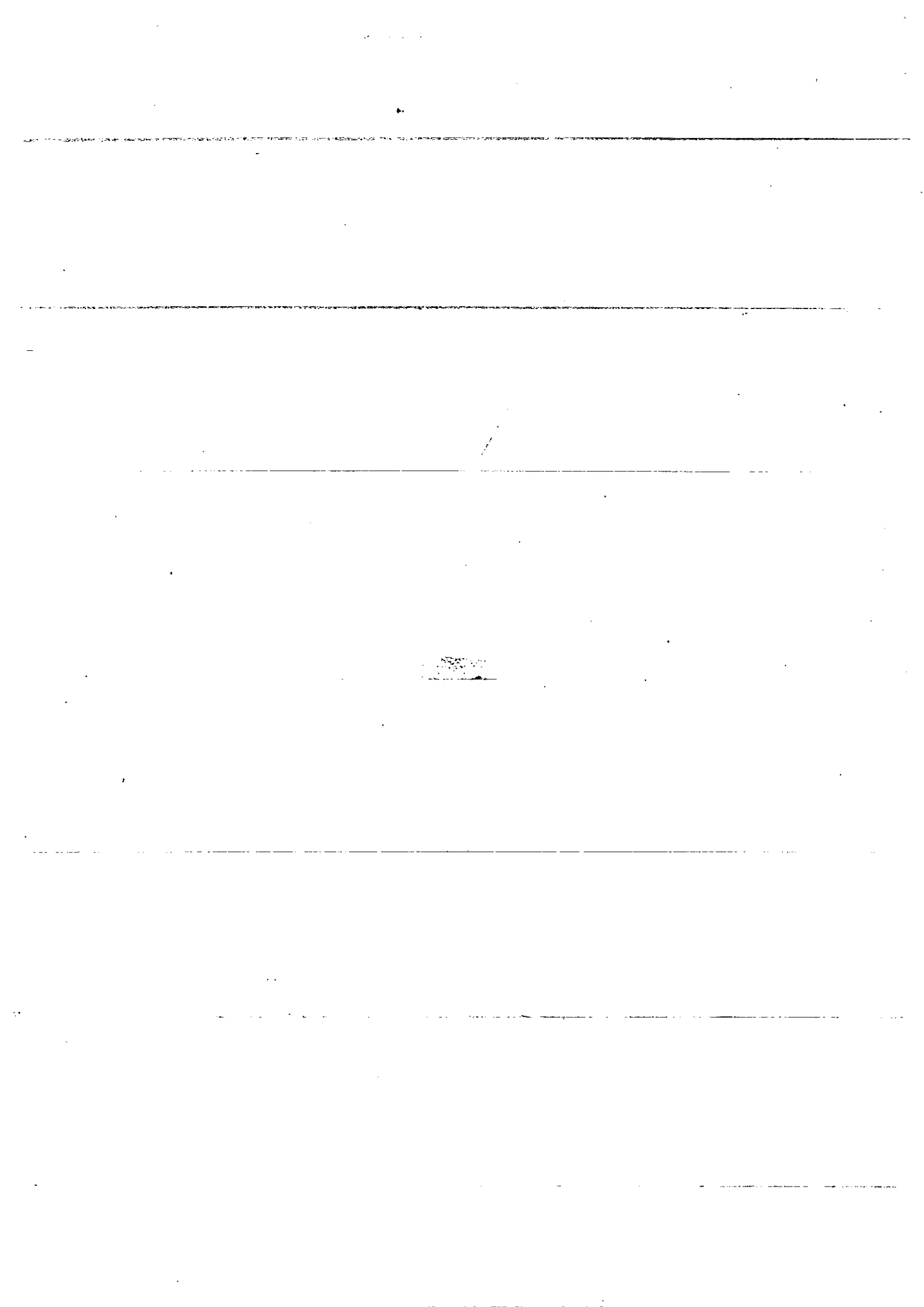


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INTRODUCTION

The black rhinoceros (*Diceros bicornis*) has declined at a faster rate than any other large land mammal in recent times, making a rapid transition from abundant to endangered. The estimated 65,000 black rhinos which roamed Africa's wildlands in 1970 have now been reduced by over 95% and the distribution of the species has been drastically altered. Fifteen years ago, Zimbabwe's black rhino population, estimated at 1,000 animals (Cumming, 1987), contributed less than two percent of the continental total. By mid-1991, the country's 1,400 black rhino stood as the largest population estimate in the world, making up about 40% of total remaining numbers (ARSG, 1991) and placing Zimbabwe in the forefront of the struggle to conserve the species in the wild. A year later, the official estimate was reduced to only 430 animals (ARSG, 1992), a tacit admission that previous population estimates were overly optimistic and had seriously failed to measure the full extent of attrition in rhino populations facing an unrelenting poaching crisis.

Although the five extant rhino species are far more endangered than the African elephant (*Loxodonta africana*), the latter species has captured the bulk of global sympathy — and funding — in recent years. If the 1989 international trade ban on ivory and other elephant products under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has indeed worked, the Convention's much longer-standing 1977 prohibition on rhino horn trading has been a failure in safeguarding the survival of the black rhino. The trade ban has not prevented the disappearance of black rhino from country after country, and the high prices which continue to be offered for horn in consumer markets guarantee that recurrent poaching will not abate. Until recently, CITES resolutions, which have attempted to reach beyond the specific scope of the Convention by calling for the imposition of domestic trade bans have been ignored in most consumer states, out of deference to legal, cultural and political considerations. When it is so evident that continuation of the status quo could lead to the ecological extinction of Africa's black rhinos, there is an urgent need to reassess the full range of options and respond with bold new conservation initiatives where appropriate.

In 1991, Zimbabwe's neighbours, South Africa and Namibia, harboured another 40% of Africa's black rhino population and over 90% of white rhino (*Ceratotherium simum*) numbers (ARSG, 1991). These three countries have come to question the prevailing belief that curtailing all consumptive uses of rhino products is the only method to ensure the survival of the species. In fact, they seriously question whether it is at all appropriate to continue with this strategy when the evidence of its failure is so compelling. In southern African countries, particularly Zimbabwe, there is a strong philosophical appreciation for the contribution consumptive utilization of wildlife can make to species conservation. As noted in Zimbabwe:

"In 1960, only 3.11% of Zimbabwe was set aside for wildlife conservation and utilisation. Today, 22.04% of land is in this category. If the sale of wildlife, or safari hunting or meat production from wildlife were to stop (in other words, if consumptive use were to stop), it is quite possible that up to half of the 22.04% could go from wildlife use to commercial and subsistence agriculture, with the inevitable loss of biological diversity associated with a change of land use" (Cumming, 1990).

The practical application of this viewpoint with respect to rhino conservation in Africa

directly challenges international resistance towards harnessing the species' economic value to ensure adequate levels of protection and management.

At the eighth meeting of the Conference of the Parties to CITES (Kyoto, 1992), both Zimbabwe and South Africa submitted proposals to initiate controlled legal exports of rhino horn from dehorned animals and present stockpiles (Anon, 1992f,g,h). It was proposed that any revenues generated would be used to augment national expenditure on rhino protection. Zimbabwe estimated that it requires double its current wildlife protection budget to conserve remaining populations effectively (Anon, 1992g). South Africa also argued that the initiative could have other significant benefits for rhino conservation, stating that:

"It is well-established that the legalisation of trade results in improved intelligence, as the legal entrepreneur informs on black market activities, and that a dependable supply of products depresses black market prices. In addition, private landowners will be encouraged to invest in rhinoceros populations and protect them as utilisable, economic assets" (Anon, 1992h).

While the TRAFFIC Network recommended that these proposals be rejected as premature, it urged broader consideration of the issue:

"The Parties should assess the full range of approaches needed to develop truly effective rhino conservation strategies. Options to be examined range from intensification of efforts to close consumer markets and promote the use of substitutes for rhino horn (as recommended in Resolution Conf. 6.10), to consideration of the merits and consequences of trophy hunting and re-opening of legal trade as advocated in these proposals. Such options should be investigated in light of the data that have been gathered on trade patterns in rhino horn, and increased effort should be directed toward gaining a more sophisticated understanding of the consumer demand and markets. A report evaluating the range of options should be prepared so that appropriate action can be taken at the next meeting of the Conference of the Parties to CITES" (TRAFFIC, 1992).

Indeed, Zimbabwe's and South Africa's proposals were rejected by majority vote at the meeting, but with little substantive discussion on their merits. Moreover, no direction was given for future action to enhance rhino conservation efforts. As these two countries, together with Namibia, a supportive neighbour, collectively hold the majority of Africa's rhinos, their viewpoint deserves far more consideration than it has been given to date.

During seven years of "rhino warfare", Zimbabwe's Department of National Parks and Wild Life Management (DNPWLM) has arguably sustained the most systematic and deadly anti-poaching effort any country in Africa has ever undertaken. Although the central government in Zimbabwe chronically under-funds the DNPWLM, in terms of its own budget, staff time and other resources, the Department's recurrent expenditure for rhino protection and conservation has been enormous. Moreover, over 170 lives, both the Department's men and poachers, have been lost. Regardless, the status of the black rhino in Zimbabwe is more precarious than ever before. Indeed, many rhino populations could be lost in the near future unless new initiatives are forthcoming and immediately implemented. Crisis management has led the Zimbabwe government to approve an unprecedented and extremely ambitious

programme to dehorn most of the remaining rhinos in the country. Such measures, however, are likely to have only temporary effect and are being undertaken at great cost.

Against this backdrop and with the conviction that the status of the country's black rhino demands immediate attention, a group of Zimbabwe conservation groups — the African Resources Trust, Zambezi Society, Wildlife Society of Zimbabwe, Zimbabwe Trust, and the Communal Areas Management Programme for Indigenous Resources Association (CAMPFIRE) — invited TRAFFIC to visit Zimbabwe and evaluate the severity of the rhino crisis and the merits of proposed solutions. TRAFFIC was selected because of its general expertise in wildlife trade research and monitoring, particularly its previous record of work on the rhino horn trade (Martin and Barzdo, 1984; Sheeline, 1987; Song and Milliken, 1990; Milliken, 1991; Milliken *et al*, 1991; Nowell *et al*, 1992a,b).

METHODOLOGY

In undertaking this project, TRAFFIC determined that its work in Zimbabwe should have four primary objectives: firstly, to evaluate Zimbabwe's black rhino conservation strategy in view of the ongoing poaching threat and illegal trade problems; secondly, to review the merits of maintaining the current international trade ban on rhino horn under CITES; thirdly, to assess the rhino's potential commercial value as an effective means of reducing poaching and illegal trade in rhino horn; and finally, to provide a thorough evaluation of rhino horn trade issues throughout the world.

The authors visited Zimbabwe from 11-17 May 1992 in order to witness Zimbabwe's anti-poaching efforts first-hand and directly interview field personnel defending the country's rhinos. Three field stations in the Sebungwe region, Tashinga in Matusadona National Park, the Chete Safari Area, and Sengwa, the research institute in the Chirisa Safari Area, were visited. To observe conservation efforts within the private sector, the authors also visited the Save Conservancy in the southeast of the country, one of the principal areas in Zimbabwe's programme for translocation and establishment of new rhino breeding nuclei on private land. One of the authors returned to Zimbabwe on another occasion, and another visited the country several times to complete this analysis.

BACKGROUND

Population Trends for Black Rhino

The black rhino is the sole survivor of a genus whose ancestry reaches back some ten million years in North and sub-Saharan Africa, southern Europe, and the Near and Middle East. A browser rather than a grazer like its cousin the white rhino, the black rhino retains the feeding habits of its ancestors. The species has developed a hooked mouth and prehensile lips, used for grasping leaves and twigs. Its primary habitat is woodland savanna and it generally is found close to permanent water sources. While the black rhino has adapted to habitats ranging from deserts in the southwest (and formerly the northwest) to montane forests in Kenya, it has never colonised the extensive rainforests of the Congo Basin.

Until the mid-19th century, the black rhinoceros had a more or less continuous distribution throughout sub-Saharan Africa, with the exception of the Congo Basin. The species ranged

from Mali, eastward to Ethiopia and Somalia, and southward through east Africa to southern Africa. Although seven subspecies were recognized originally (Groves, 1967), their validity is not accepted universally: recent genetic research found very little difference between black rhino populations in Kenya, Zimbabwe and South Africa (Ashley *et al.*, 1990). Currently, four subspecific groupings are recognized by the international zoo community and the IUCN/SSC African Rhino Specialist Group (ARSG)¹ for captive breeding and management purposes (Ansell, 1974; DNPWLM, 1992a). These include *D. b. michaeli* in the northeast, *D. b. longipes* in the northwest, *D. b. bicornis* in the extreme southwest, and the most common subspecies, *D. b. minor*, which has a broad distribution throughout southern and parts of eastern Africa.

By 1900, black rhino had disappeared from much of western and southern Africa, but were still well-distributed throughout the remainder of their range (Sydney, 1965; Tatham and Taylor, 1989). Progressive fragmentation of the species' distribution has occurred throughout the 1900s (Sydney, 1965; Western and Vigne, 1985; Cumming, 1987), leading to genetic isolation among individual populations. Only in southern Africa have black rhinos reclaimed some parts of their former range through deliberate translocation and management efforts (Herbert and Austen, 1972; Hall-Martin, 1979; Booth *et al.*, 1984).

While it must be acknowledged from the outset that all continental population estimates for black rhino, past and present, are imprecise and have no or very wide confidence limits, the general trend is unmistakable. For many years the black rhino was the most numerous of the five rhino species and possibly numbered 100,000 across the African continent in 1960 and 65,000 in 1970 (Martin and Martin, 1982). The first attempt at making scientific continental estimates for African rhinos was in 1980 (Hillman, 1981). Since then, black rhinos have declined precipitously in successive waves of poaching: down from an estimated 14,000-15,000 in 1980, 9,500 in 1984, 6,000 in 1985, 3,800 in 1987, 3,450 in 1991, to about 2,480 animals, the most recent continental estimate made in 1992 (ARSG, 1992; ARSG, 1991; Cumming *et al.*, 1990; Cumming and Jackson, 1984; Hillman, 1981). Table 1 presents a comparison of black rhino population estimates for individual African countries over the last ten years as compiled by ARSG. While the figures for most range states are not precise, the data do demonstrate the black rhino's most recent decade of decline. By 1991, the few large populations remaining in the wild were limited to Zimbabwe, South Africa and Namibia, but by the following year only the latter two countries could boast sizeable wild populations (Table 1).

Table 1
Black Rhino Population Estimates in African Range States

Country	1981	1987	1991	1992	Change (%)
Zimbabwe	1,400	1,754	1,400	430	-69
South Africa	625	577	771	819	+31
Namibia	345	440-458	479	489	+42
Kenya	1,028	>521	398	414	-60
Tanzania	3,795	265-285	185?	127	-97
Mozambique	150	VLN	50+	+50	-67
Angola	110+	N/D	+50	+50	-55
Cameroon	>100	30#	+50	35	-65
Zambia	3,000	>106	40?	40	-99
Botswana	10s	<10	10+	5	-50+?
Swaziland	—	—	6 @	6 @	@
Malawi	40	25	5	0?	-100 ?
CAR	1,500+-1,000	10	+5	0	-100
Uganda	<5	—	3	0	-100
Rwanda	30	15	*	15?	-50 ?
Somalia	<400	?	*	0	-100 ?
Sudan	<300	3	*	0?	-100 ?
Chad	?	#	0?	0?	-100 ?
Ethiopia	15	?	0?	0?	-100 ?
Zaire	—	0	0	0	?
Total	12,753	3,784	3,452	2,480	-81

Key:

VLN = Very low number

N/D = No data

— = No estimate given

? = Situation unknown

* = Population size unknown, but very small

= 1987 estimate of 30 for Cameroons includes the Chad population

@ = Animals introduced from Zimbabwe

Sources: 1981: Cumming and Jackson, 1984; 1987: Cumming *et al.* 1990; 1991: ARSG, 1991; 1992: ARSG, 1992

The list of countries which effectively have lost their black rhino in recent years is a long testimony to a failed conservation effort across Africa: Botswana, Central African Republic, Chad, Ethiopia, Malawi, Rwanda, Somalia, Sudan and Uganda. Other countries — Angola, Cameroon, Mozambique, Tanzania and Zambia — are very close to losing their rhinos unless concerted efforts are made soon to recover their numbers.

With Zimbabwe's current black rhino population dropping to 430 animals and other losses noted for Tanzania, Cameroon, Botswana, Malawi, Central Africa Republic and Uganda in 1992 (Table 1), the continental population shows a decline of 28% in a single year! In fact, more than an accelerated loss in Zimbabwe, the accuracy of previous estimates is at issue. In retrospect, it is poignant to note that in 1970, at least three protected area networks, Tsavo in Kenya, the Selous Game Reserve in Tanzania, and the Luangwa Valley in Zambia each were

estimated to hold more black rhinos than survived in the whole of Africa in 1991 (Goddard, 1969; Leader-Williams, 1985; Cumming, 1987).

The recovery of rhino populations from low numbers has been achieved in a few noteworthy rhino conservation success stories (reviewed in Leader-Williams, 1992b). The recovery of the southern white rhino from near extinction early this century has shown that the approach of providing secure protection and translocating animals to former habitats can work (Owen-Smith, 1981). The commencement of similar efforts for the black rhino in the 1960s and 1970s have met with success in parts of South Africa, Namibia and Zimbabwe (Herbert and Austen, 1972; Hall-Martin, 1979; Booth *et al.*, 1984). Indeed, South Africa has now set itself targets for recovery of its black rhino subspecies to population sizes that are based on the theory of conservation biology (Brooks, 1989). And Kenya, whose black rhino population plummeted from an estimated 20,000 in the 1960s to only 330 black rhino in the late 1980s, for the moment has reversed the decline under a national programme of rhino sanctuaries.

In attempts to focus conservation action for the black rhino on the most significant and viable populations, the ARSG periodically has conducted exercises to prioritize Africa's remaining wild rhinos according to population size, genetic rarity, and ecosystem diversity factors. At a meeting in Nyeri, Kenya in 1987, all but three of the top ten priority black rhino populations were located within three southern African countries: Zimbabwe (Zambezi Valley, Sebungwe complex, Chirisa Safari Area/Chizarira National Park², Hwange National Park); Namibia (Etosha National Park, Damaraland/Kaokoland); and South Africa (Kruger National Park). Kenya (Tsavo National Park), Tanzania (Selous Game Reserve) and the Cameroons/Chad population were also ranked within the top ten priorities for action.

By 1992, six of these designations had lost their status as priority black rhino populations of the highest order³, while Hluhluwe-Umfolozi Game Reserve Complex in South Africa's Natal Province was added to the list (ARSG, 1992). During the intervening five years, Kenya's Tsavo population had suffered significant poaching losses and at this stage numbers only some 30 animals, including recent translocations and births, with about half the animals in a fenced sanctuary (Brett, 1991). The only recent survey of Tanzania's Selous population resulted in the sighting of four rhinos over a four-month period even though the principal researcher walked or drove some 6,400 kilometres in areas which ten years earlier reputedly harboured several thousand animals (Laurie, 1992). Due to the cumulative effects of poaching, preliminary findings indicate that the range of the black rhino in the Selous may have fragmented into three sub-populations (J. Boshe, pers. comm.). While rhino in the Cameroons remain on the highest priority list as the last extant population of the subspecies *D. b. longipes*, numbers are very low and there is no knowledge of rhino trends although a major conservation effort is soon to be launched (S. Gartlan, pers. comm.). It is Zimbabwe's priority rhino populations, however, that have borne the brunt of Africa's poaching pressure in recent years and today none remain in the highest priority grouping. Moreover, given Zimbabwe's overwhelming losses, there is concern that the priority rhino populations in Namibia and South Africa could be next to face the poaching onslaught in southern Africa, while in east Africa the attention of poachers might re-focus on Kenya's recovering population.

Rhino Horn Uses and Trade Volumes

For centuries rhino horn has been a commercially valuable commodity, used primarily in countries of the Middle and Far East which never, or only marginally, have been part of the five rhino species' distribution in historical times. There are two aspects to the demand for rhinoceros products: in the Middle East and in parts of Asia, there are rhino horn carving traditions and, in the Far East, rhino horn and other parts are widely used as ingredients in traditional medicinal prescriptions. With the spread of Chinese cultural influences and the establishment of overseas communities in other parts of Asia and beyond, the use of rhino horn as medicine expanded, particularly to a number of countries in Southeast Asia with indigenous rhino populations. In contrast, there has been little domestic consumption of rhino horn in Africa, although it has featured as an export commodity for centuries (Martin and Ryan, 1990; Stiles, 1992).

African rhino horn is carved in the Middle East, in the small country of Yemen⁴. The lasting lustre of polished rhino horn makes it the preferred and most expensive substance for *jambia* handles, traditional daggers worn by men. Facilitated by the country's close proximity to Africa, rhino horn continues to be procured by Yemeni craftsmen. In spite of efforts to promote substitute substances and the ongoing process of modernization, Yemen's cultural heritage remains a potent force and rhino horn *jambia* handles remain popular (Varisco, 1987).

Asia's carving tradition, largely unique to China, also utilizes rhino horn as a substance for making decorative items. The earliest known Chinese examples date back to the Tang dynasty (618-907), but the art of carving cups, plates, bowls and figurines from rhino horn continued in an unbroken tradition through the Ching dynasty (1644-1912). Most of the earlier artifacts are believed to have been carved from Asian rhino horn, but from the Ming dynasty (1368-1643) onwards an increasing volume of African horn was brought to China over the Silk Road, the two thousand year-old trade route connecting the Middle Kingdom to the Middle East, as well as via sea routes which linked southern Chinese ports with distant Africa (Martin and Martin, 1982). To a much lesser extent, rhino horn carving traditions also have existed historically in Japan and parts of the Indian Subcontinent, Southeast Asia (notably Laos and Cambodia), and the Middle East. There is little evidence to suggest that rhino horn carving industries survive to any significant degree anywhere in Asia today, but Chinese appreciation for this unusual artistic tradition remains and antique Chinese rhino horn carvings, typically smuggled from Mainland China, are in vogue with affluent Taiwanese and Hong Kong collectors (Nowell *et al.*, 1992a; E. Martin, pers. comm.). Regardless, large pharmaceutical companies in Mainland China are pulverizing antique horn carvings for powder to use in the manufacture of medicines (Martin, 1990). While it is possible that small-scale, specialized rhino horn carving continues, in the final analysis, the use of rhino horn for this purpose in Asia can no longer be considered significant.

Without any doubt, the paramount threat to most rhino populations today is the continued use of rhino horn as an ordinary consumer good — medicine — in traditional markets throughout Asia. When combined with a variety of other natural medical materials, rhino horn is used to treat a wide range of ills (But *et al.*, 1988; Song and Milliken, 1990; Nowell *et al.*, 1992a). Such use has long been derided and misunderstood in the West. Traditional Oriental medicine

neither classify nor uses rhino horn as an aphrodisiac (Martin and Martin, 1982), although this fallacy continues to be published in the popular press. Similarly, rhino horn usage has been derided in the Western media as tantamount to chewing one's finger nails (both of which are made of keratin), but research on the pharmacological characteristics of rhino horn has shown evidence of anti-pyretic properties (But *et al.*, 1990). In fact, the traditional systems of medicine in the Far East accord rhino horn with cooling properties and the ability to lower sustained high fever.

Asian belief in these healing properties is deeply rooted: the oldest extant written description of rhino horn as a drug is found in the *Divine Peasant's Herbal* (*Shen Nong Ben Cao Jin*), the earliest Chinese *materia medica* dating to the first century B.C. Rhino horn is reported to have been in use long before that, possibly dating back to the time of the Ancient Emperor Huandi in 2,600 B.C. Korean and Japanese medical systems, which evolved from China's, also use rhino horn. Other rhino products — including blood, skin and urine — are also used medically by the Chinese, Indians, Nepalis, Burmese or Thais. Generally, rhino horn is sold to patients in prescriptions mixed with other natural materials, but on rare occasions it is dispensed in raw powdered form to be ingested directly or as a soup (Wei, 1992).

There are two distinct avenues of dispensation for rhino horn in the traditional medicine markets of Asia which have major implications for any attempt to control the trade. The first is a consumer/product relationship involving pre-packaged manufactured pills and powders. This type of trade is rather centralized at the production level with a relatively small number of manufacturers directly engaged in producing rhino horn medicines, and sometimes involves a significant degree of government control. The second avenue of trade is a doctor/patient dynamic whereby rhino horn medicines are produced and dispensed directly at traditional clinics and pharmacies. This type of rhino horn dispensation potentially involves thousands of retail dealers and private entrepreneurs who generally operate beyond any direct government control.

It needs to be appreciated that these two types of dispensation are not mutually exclusive, although one tradition or the other may predominate in individual countries. In South Korea and Taiwan, for example, direct dispensation is common, while in China rhino horn usage is focused mainly on the manufacture of proprietary medicines, both for local consumption and for export. Such products are commonly available in overseas Chinese communities in other parts of the world, including the United States where, in 1990, at least nine medicines purporting to include rhinoceros products were found for sale (J. Sordean, *in litt.*). In a comprehensive review of proprietary drugs manufactured in China, 31 different medicines were identified as containing rhino horn as an ingredient (But *et al.*, 1988). A similar review of traditional Korean medical literature found 16 rhino horn prescriptions in South Korea (Song and Milliken, 1990) and in Taiwan there are at least 15 different rhino horn medicines (Wei, 1992). Altogether, there could be as many as a hundred medical formulas in the Far East which incorporate rhino horn or other rhino products. However, doctors and pharmacists in Taiwan have emphasized that rhino horn is generally indicated for persistent high fever associated with serious illnesses, and is almost never prescribed as a fortifying health tonic or for minor ailments (Nowell *et al.*, 1992a,b; Nowell and Pei, *in prep.*).

The volume of rhino horn annually imported into Yemen, China, Taiwan and South Korea,

the world's leading consumers, and into lesser markets in North Korea⁵ and the overseas Chinese communities throughout Southeast Asia and other parts of the world is very difficult to quantify. Official Customs statistics based on declared imports give some indication of trends in recent years for the former North Yemen, which received an average of 3,235 kg of rhino horn annually from 1969 through 1977 (Martin, 1987; Leader-Williams, 1992a). Importation was banned in 1982, and although the trade progressively declined (Vigne and Martin, 1991b), it never ceased altogether. North Yemen's major trader continued to import small quantities of horn (Martin, 1987; Martin and Vigne, 1987). The latest assessment points to a resurgence in rhino horn trading since unification with South Yemen in May 1990; some 750 kg of rhino horn is believed to have entered Yemen during a 20-month period of time ending in March 1992 (Vigne and Martin, 1993). It is ironic that this development largely coincides with a serious downturn in Yemen's economy and is clear testament to the persistence of the country's rhino horn trade.

Data for the Far East are poor and official import statistics only really exist for three countries: Japan, Taiwan and South Korea. Comparative analysis of these data from 1970 to 1980 show an average of 800 kg, 580 kg and 200 kg of rhino horn a year entering Japan, Taiwan and South Korea, respectively, but these figures probably only reflect minimum levels of trade (Leader-Williams, 1992a). By the mid-1980s, rhino horn imports no longer appear in official statistics for these countries but, of the three, only Japan is believed to have curtailed internal trade substantially, as usage largely was restricted to the manufacture of government-regulated patented medicines. During the 1970s, there is very little import data for Hong Kong, both an entrepôt and end-use consumer, or China, a major importer, but, between 1970 and 1976, East African (Kenya, Uganda, Tanganyika/Tanzania) export statistics show that an annual average of 1,225 kg and 1,025 kg of rhino horn was exported to these destinations, respectively (Leader-Williams, 1992a). China's level of importation may be underestimated considerably given that Chinese import figures obtained from the World Bank for 1982 to 1986 showed an average of 2,124 kg of African horn (mostly chips and residue from Yemen's carving industry) and 87 kg of Asian horn were imported during these years (J. Barzdo, *in litt.*); however, Chinese officials have expressed scepticism about the validity of these data (E. Martin, pers. comm.). For North Korea, suspected to be another important consumer, and most other countries in Southeast Asia, there is a paucity of data and it is virtually impossible to estimate rhino horn trade volumes, past or present. Trade into Asian communities in North America and Europe is also difficult to measure, but from 1949 to 1974, East African exports of rhino horn show that at least 2,642 kg went to the United States and another 1,686 kg to the United Kingdom, (Leader-Williams, 1992a); both nations have large Chinese communities.

In spite of these shortcomings, various estimates of the annual volume of rhino horn in international trade have been made. Martin (1980) held that 8,000 kg of rhino horn — representing the horns of over 2,700 animals — was traded annually in the 1970s. While a reduction apparently occurred in the early to mid-1980s, the traffic still was estimated to average 3,000 kg per year — or some 1,000 black rhinos.⁶ Attempts to quantify volumes of rhino horn traded internationally inevitably stumble over lack of data as, by the mid-1980s, the majority of producing and consuming states officially had banned the trade (Table 2), resulting in the disappearance of international trade statistics altogether. Regardless, it is likely that overall rhino horn trade volumes peaked in the late 1970s and 1980s. The

economies of most of the principal rhino horn consuming countries in the Far East had been devastated after some 25 years of regional or civil warfare and political upheaval in the mid-1900s. During this period, the disruption to local economies meant that rhino horn importation virtually ceased and supplies became depleted or were lost altogether in many end-use markets, particularly Japan, the Koreas, and many parts of China. Only when political stability and economic recovery began to take shape, in the mid-1950s for Japan and about a decade later for many other countries, did large-scale importation resume (Leader-Williams, 1992a). For example, from 1951 to 1980, the total volume of Japan's rhino horn imports doubled each decade in spite of a major increase in price in the late 1970s (Leader-Williams, 1992a). During the years of scarcity, the few traditional medicine dealers who had rhino horn routinely provided shavings of horn to other local dealers as required for the production of medicines. From the 1970s onwards, as affluence within Asia's traditional medicine communities became widespread, an ever increasing number of retail dealers came into possession of their own horns. In 1988, in Seoul, South Korea, for example, 86% of the retail dealers were believed to possess rhino horn in one form or another (Song and Milliken, 1990), while in Taiwan, by 1991, almost 80% of the retail dealers appear to have had rhino horn in stock (Nowell *et al*, 1992a).

Attempts to measure internal demand also have shed light on the consumption of rhino horn in Asian markets, but, here again, the data are largely incomplete. In the most comprehensive market assessment to date, Taiwan's consumption of rhino horn was found to be between 186-397 kg per year, based on an annual mean dispensation of 42 grams by the island's retail dealers (Nowell and Pei, in prep.; Nowell *et al*, 1992a).⁷ This indicates that Taiwan's imports of rhino horn have outpaced annual consumption, giving rise to local stockpiles: Nowell and Pei (in prep.) estimate stocks held by retail pharmacies alone at 4,667 kg, with further, undocumented stockpiles possibly in the hands of wholesalers, clinics and importers. Martin (1990) found that the production of patented rhino horn medicines on the Chinese Mainland utilized between 600-700 kg of horn annually, but data on direct dispensation of rhino horn through retail medicine shops in China have not been collected. With larger populations, it is probable that annual rhino horn consumption in the Koreas is greater than that in Taiwan, but definitive data are not available for a clear assessment.

International Efforts to Close Down the Rhino Horn Trade

While every range state, except Laos, protects indigenous rhino species from unregulated exploitation under national wildlife legislation, in 1977, the entire family ostensibly gained protection from international trade with the listing of "Rhinocerotidae spp." on Appendix I of CITES. With the exception of North Korea, by 1987, all major consuming nations had enacted import, re-export, and export bans in conjunction with joining the Convention or, in the case of non-Parties, under national legislation (Table 2). In fact, these measures have done very little to stem poaching pressure on rhinos in range states.

Table 2
Rhino Horn Trade Controls in Consuming Countries

Country	CITES Mem- bership	External Trade Ban	Internal Trade Controls			
			Allowance of Internal Sales	Registra- tion of Stocks	Issuance of Possession Licence	Internal Monitor- ing System ¹
Brunei	1990	1978 ²	No ³	No	No	—
China *	1981	Import:yes Export:1988 ⁴	Yes, in reg. stock	Yes:1988	?	No
Hong Kong (UK)	1976	Import:1979 Export:1986	No:1989	Yes:1979	Yes	Yes
India	1976	Yes:1972	No:1984	No	? ⁵	—
Indonesia	1978	?	No	No	No	—
Japan	1980	No	Yes ⁶	No	No	No
Macau (Portugal)	1986 ⁷	Import:1986 Export:?	No:1988	No	No	—
North Korea *	No	?	?	?	?	?
Malaysia:	1977					
Peninsular		Yes:1972	No:1972 ⁸	No	No	—
Sabah		Yes:1963 ⁹	No:1963 ¹⁰	No	No	—
Sarawak		Yes:1990 ¹¹	No:1990 ¹²	No	No	—
Singapore	1986	Yes:1986	No:1992	? ¹³	?	?
South Korea *	No	Import:1986 Export:No	No:1983 ¹⁴	No	No	—
Taiwan *	No	Yes:1985	No:1992	Yes:1990	No	No
Thailand	1983	Yes:1972	Yes ¹⁵	No	No	No
Yemen	No	Import 1982 Export:1987 ¹⁶	Yes	No	No	No

* = Major consumer

¹The Internal monitoring system referred to is for registered stock or where internal sale is allowed.

²Sumatran rhinoceros only.

³Sumatran rhinoceros only.

⁴Export regulation pertains to manufactured products, which, since 1988, can only be exported legally subject to the issuance of an export permit.

⁵Under the Wildlife (Protection) Act – 1972 possession licence (ownership certificate) was required for anyone possessing rhino horn acquired prior to the enactment of the law. It is unknown whether any such certificates were issued.

⁶Pre-CITES only.

⁷Individual membership in 1986 is not acknowledged by the Depository Government of CITES, who acknowledges 1981 as the year Macau was covered by CITES under Portugal's membership.

⁸Sumatran rhinoceros only.

⁹Sumatran rhinoceros only.

¹⁰Sumatran rhinoceros only.

¹¹Sumatran rhinoceros only.

¹²Sumatran rhinoceros only.

¹³When Singapore joined CITES in 1986, the authorities carried out a multi-species registration programme, which was never made public. It is unknown whether stocks of rhino products were registered.

¹⁴Covers only rhino horn medicines.

¹⁵As of 1992, new laws are being implemented in Thailand. As written, the laws make internal possession and sale of rhino products prohibited. However, actual implementation of this prohibition is still pending.

¹⁶Refers to the former North Yemen.

One major consequence of the imposition of trade restrictions was that prices for rhino horn rose sharply in both producer and consumer nations in the late 1970s, in spite of the fact that trade volumes initially were not reduced by legal trade restrictions (Leader-Williams, 1992a). Martin (1980) gives the first reports of Asian dealers beginning to stockpile horn in 1977, in anticipation of the rhinos' increasing rarity and the horn's increasing price. A review of the rhino horn trade shows that many producing and entrepôt countries that became party to CITES continued to export rhino horn, as evidenced by their inclusion in the declared imports of consuming nations (Leader-Williams, 1992a). Once these consumers imposed external trade bans of their own, rhino horn trade figures disappeared from official statistical sources altogether, introducing an era where all international trading was illegal and underground.

At the same time, major problems remained with respect to internal trade issues. While the Convention prohibits international commercial trade in rhinoceros parts, derivatives, and products, CITES has had little impact on national trade. Consequently, most internal rhino horn markets continued and internal regulation remained poor. At the sixth meeting of the Conference of the Parties (Ottawa, 1987), it was recognized that CITES was failing to stem illegal trade in rhino horn and that many rhino populations were continuing to decline at an alarming rate. Resolution Conf. 6.10 (Trade in Rhinoceros Products) was adopted, urging all Parties to take exceptional measures to effect "a complete prohibition on all sales and trade, internal and international, of rhinoceros parts and derivatives, especially horn, whether whole or in any other form, including personal effects...". At the same time, the resolution called for "the destruction of all government and parastatal stocks of rhinoceros horn with supporting contributory funds from external aid sources...". The only exemption in the resolution concerned the "non-commercial movement of legitimate hunting trophies".

Notwithstanding Resolution Conf. 6.10, curbing internal trade in rhino horn or products has been fraught with legal pitfalls as well as resistance from the traditional medical community throughout Asia. Despite import bans and attempts to control internal trade, over the last five years, consumer market surveys in South Korea, China, Taiwan and Thailand show that rhino horn continues to be sold widely in these countries, and residual trades remain elsewhere such as in Yemen, Hong Kong, Macau and Japan (Martin, 1989; Song and Milliken, 1990; Martin, 1990; Milliken *et al*, 1991; Vigne and Martin, 1991b, 1992; Nowell *et al*, 1992a). Meanwhile, North Korean diplomats have been implicated in the purchase of illegal rhino horn in southern Africa (Anon, 1992a,b) and are believed to have approached officials in Tanzania for the same purpose (R. Tibanyenda, pers. comm.), but next to nothing is known about their domestic market or their international trade connections. While Hong Kong, a British Territory, provided the first and best example of a comprehensive legal package prohibiting all aspects of rhino trading, the legislative and administrative process took some 13 years to unfold and was not completed until 1989 (Milliken, 1991). Legal, political and cultural constraints necessitated the piecemeal approach taken by Hong Kong's administrators. Other consumer countries which have seriously attempted to address internal trade issues — China, Japan, South Korea, Taiwan and Yemen, for example — also have experienced legal difficulty in penalizing possession and sometimes even the sale of rhino horn which was acquired before restrictions on importation or internal usage came into effect. Unlike criminally-dangerous or socially-offensive items such as weapons, narcotics or pornography, government authorities have found very little latitude to confiscate local supplies of rhino horn based on retroactive possession prohibition.

Under many countries' legal systems, issues of possession and sale are often treated separately whereby future sale is prohibited but possession is not penalized retroactively. In reality, however, there are few examples where governments have taken this approach for commodities which have enjoyed a long-established legitimate place in local commerce.⁸ Consequently, while the scope may be narrowed, certain restricted possibilities for legal sale remain. Hong Kong authorities found it legally expedient to allow for registered stocks to be exported or dispensed locally for over seven years after importation was banned, and only when the official stock of rhino horn was completely exhausted was internal trade prohibited. Similarly, Japan allowed the manufacturers of patented rhino horn medicines an opportunity to use up their stocks before prohibiting future use (T. Milliken, *in litt.*), while Singapore allowed internal trade to continue for over six years to give local retailers a chance to deplete their stocks (Anon, 1992n). Even in the United States, where the black rhino has long been listed as "Endangered" under the ESA and enjoys strong public support for its conservation, federal controls apply only to import, export and interstate commerce; legally acquired horn that predates the ESA listing can still be sold between citizens of states which do not explicitly prohibit rhino horn sales.

Ex post facto legal measures are further complicated by the fact that, other than Hong Kong, none of the consuming countries instituted compulsory measures to identify and register existing rhino horn stockpiles at the time they prohibited importation. As a result, there is little scope for legally differentiating between pre-ban or post-ban rhino horn stocks. In the meantime, two major consumers, China and Taiwan, have attempted to rectify the situation with belated registration exercises.

China, which joined CITES in January 1981, is still in the process of registering rhino horn stocks held in the country, according to its delegation to the CITES Conference of the Parties in March 1992 (CITES, *in prep.*). As of 1990, 14 state-owned medical corporations and an undisclosed number of manufacturers had registered a total of 9,875 kg of rhino horn, according to data received from China's Forestry Department (Martin, 1990). By October 1992, these stocks had been reduced to about 8,500 kg as production of medicines continues (E. Martin, *pers. comm.*). This is believed to represent only part of China's stockpile as one TRAFFIC study indicated that rhino horn medicines were being manufactured in 121 different factories in 27 of the country's 28 administrative districts (Milliken, 1991). Until recently, Chinese authorities treated the registered stockpiles as "pre-Convention" material which technically are eligible for export. The issue is further compounded by the revelation that some of China's stockpile actually includes antique rhino horn carvings which could also be exempt from the provisions of the Convention. While China's CITES Management Authority has on several occasions claimed to have stopped issuing export permits for manufactured medicines derived from such stockpiles (Martin, 1990; Martin, 1991a), it is likely that a significant portion of the current production finds its way to overseas Chinese communities, as traditional medicine exports are an important source of foreign exchange for China (Martin, 1989; Martin, 1991a). For the moment, China officially prohibits export, but remains committed to allowing the use of existing rhino horn stockpiles in the manufacture of traditional medicines for local consumption (X. Wang, *pers. comm.*).

In the case of Taiwan, internal sale, exchange or display with intention to sell rhino horn was

prohibited under domestic wildlife legislation in June 1989, five years after the prohibition against importation came into effect. Registration of rhino horn held prior to the law's enactment was carried out from August to November 1990, and 1,465 kg were reported by 410 individuals and companies, although the amounts never were verified by government authorities. However, the registered rhino horn is estimated to represent only about 30% of actual stocks held by the private sector (Nowell and Pei, in prep.; Nowell *et al.*, 1992a), and flaws in Taiwan's conservation legislation have resulted in government authorities being unable to penalize non-registrants. Moreover, the government never made it clear to registrants whether they were exempt from the ban on internal sales. In order to rectify the situation, the government planned to amend the legislation, undertake a new registration, and introduce stricter controls for the internal sale of registered horn (Nowell *et al.*, 1992b). Subsequently, campaigns in the United States and United Kingdom to impose sanctions against Taiwan for continued rhino horn trading led the government to scrap these plans abruptly and introduce an immediate ban on all facets of domestic trading in November 1992. While rhino horn has disappeared from display in Taiwan's retail outlets (J. Loh, pers. comm.), the actual effect of this measure remains to be seen and some observers fear that it could drive the trade further underground and push black market prices up (W.-L. Chyi and C.-J. Pei, pers. comm.).

South Korea was first identified as a major rhino horn consumer in 1980 with most horn directly dispensed through the country's thousands of private clinics and pharmacies (Martin, 1983). Although South Korea has yet to become a member of CITES, rhino horn trade began to be regulated under domestic legislation in 1983 when a ban on the import of rhino horn for medical purposes was instigated and use as an ingredient in government-regulated patented medicines was prohibited (Song and Milliken, 1990). In 1986, importation for purposes other than medicinal use was prohibited; however, enforcement of these measures has been lax and no attempt has been made to identify and register local rhino horn stocks. In 1988, market surveys in Seoul demonstrated that more than eight out of ten retail dealers stocked rhino horn in one form or another and that the retail price had almost tripled since 1986 (Song and Milliken, 1990). In the face of international pressure, in January 1993, South Korea's Ministry of Trade and Industry published a Consolidated Public Notice which strictly prohibited import, processing, storage and display of rhino horn (Anon, 1993c). Although there has been only one prosecution to date (currently under way) (J. Mills, pers. comm.), government officials maintain that these measures have effectively curbed rhino horn usage in the country. Nonetheless, these claims have yet to be verified independently and a continuing underground trade remains a distinct possibility.

Thailand has also been identified as a major consumer of African and Asian rhino horn and as an entrepôt for Asian horn from the Indian subcontinent and other parts of Southeast Asia (Martin, 1989). In fact, in the recent past, more rhino products, including horn, hide, nails, dried blood, and penises, were available in Bangkok's Chinese medicine shops than any other city in Southeast Asia (E. Martin, pers. comm.). Until 1992, implementing legislation for CITES and enforcement of existing domestic wildlife measures, which have banned trade in certain Asian species of rhino since 1972, was non-existent. While the situation may have improved under the new legislation, the current state of the trade remains to be assessed.

In places where internal trade bans appear on the surface to have been successful — in particular Singapore, Hong Kong, Japan and a number of countries in Southeast Asia and the Indian sub-continent — the extent of the black market trade remains an important question mark (Leader-Williams, 1992a). Although a 1985 market survey in Singapore showed that only 7% of 30 pharmacies examined sold rhino horn (Anon, 1986), as late as 1988, another survey indicated that almost a quarter of some 43 retail outlets continued to have rhino horn (Martin, 1989). In 1992, the confiscation of 10 Sumatran rhino horns in Singapore (Anon, 1992c) at least indicates that the city-nation continues to function as a transit point, if not an entrepôt itself, for the trade. Moreover, the availability of manufactured Chinese medicines believed to contain rhino horn has never been surveyed and such trade could be a continuing feature. Regardless, from 20 November 1992, Singapore banned the sale or display of rhino horn or related products completely (Anon, 1992n).

Traders in Taiwan have consistently reported that Hong Kong middlemen play an important role in rhino horn trade involving Taiwan and China (Vigne and Martin, 1989; Nowell *et al.*, 1992a). Taiwan's confiscation in December 1992 of 22 rhino horns hidden in a consignment of New Zealand deer antlers, which apparently had been repacked in Hong Kong, further reinforces these reports (D. Callister, *in litt.*). Moreover, spot checks in Hong Kong indicate that patented Chinese medicines, which formerly identified rhino horn as an ingredient on the packaging, continue to be sold widely, but in new packaging which does not mention the substance (Milliken *et al.*, 1991). Some manufacturers in China have indicated that this reflects expedient labelling to comply with Hong Kong legislation rather than the actual use of substitutes (E. Martin, pers. comm.). In the absence of complex and costly forensic analysis of individual medicines, however, it is difficult to assess the degree to which substitutes are actually being used. And finally, there is evidence showing that Hong Kong consumers still readily obtain rhino horn medicines during weekend trips to Shenzhen, the most accessible Chinese border town, and that limited quantities of rhino horn continue to be possessed illegally by certain herbal shop owners within Hong Kong itself (Shaw and Chan, 1991; Milliken *et al.*, 1991; E. Martin, pers. comm.). It is conceivable that rhino horn consumption in Hong Kong remains significant, but industry and consumer response to the legal situation has all but rendered effective monitoring useless.

In Japan, where most rhino horn usage was for the manufacture of patented medicines, pharmaceutical manufacturers were obliged by the Ministry of Health in 1981 to remove rhino horn from their formulas or lose their licensing agreements with the government. The handful of manufacturers affected by this development are believed to have complied, but were allowed to exhaust existing stocks of rhino horn. While it is not known to what extent consumer demand has been satisfied by substitutes, there is little evidence to suggest that a significant illegal trade has developed. Nonetheless, rhino horn still is observed in traditional Japanese medicine shops where possession and dispensation remains legal, although it needs to be appreciated that over-the-counter dispensation has always accounted for very limited usage in Japan.⁹ At the same time, utilization of rhino horn among the millions of Koreans who hold permanent resident status in the country has never been assessed.

Where local availability of rhino horn is believed to have diminished, particularly India, Nepal, Brunei, Peninsular Malaysia, the Philippines and Indonesia (Redmond and Martin,

1992) and Sarawak (E. Martin, pers. comm.), illegal export to more lucrative markets elsewhere in Asia appears to be the principal operative factor in most cases (Leader-Williams, 1992a), not appreciation for the protective status of rhinos and support for their conservation. It is sophistic to argue that progress has been made in conservation terms where black market forces have usurped and transformed internal rhino horn traffic into an export trade.

Attempts to control the trade in rhino horn for carving purposes have also been slow in evolving and difficult to enforce. North Yemen first moved to ban rhino horn imports in 1982, but trade has continued until the present (Vigne and Martin, 1993). Attempts to impose internal trade controls within the unified Republic of Yemen began a decade after the import ban. With effect from 2 December 1992, the government issued a decree prohibiting the making of dagger handles from raw rhino horn and their sale (Vigne and Martin, 1993). At the same time, the government called for all unprocessed rhino horn to be registered by 2 February 1992 with the Ministry of Supply and Trade (Vigne and Martin, 1993), but apparently only 500 kg of rhino horn powder has been acknowledged (E. Martin, *in litt.*). In the meantime, the government plans to allow trade in previously made rhino horn *jambia*, so at least one avenue of legal trade remains for the time being.

Likewise, encouraging the use of substitute materials does not seem to have gained sway to the exclusion of rhino horn in most traditional markets. In Yemen, while other types of horn and plastic are used to fashion most dagger handles currently produced in the country, rhino horn still remains the substance which confers the greatest status and about 400 rhino horn handles were produced in 1992 (E. Martin, pers. comm.).¹⁰ As medicine, the horns of water buffalo (*Bubalus bubalis*), saiga antelope (*Saiga tatarica*), and cattle (*Bos taurus domesticus*), as well as a number of plant materials, including *Chrysanthemum meriflimum*, *Odontochilus inabai*, *Bupleurum fulcatum*, *Coptis chinensis*, sugar of the white gourd, and the aerial roots of the banyan tree, have all been suggested as possible substitutes for rhino horn (But *et al*, 1990; Nowell *et al*, 1992a). Saiga antelope horn was the substitute most often used by traditional pharmacists in Taiwan (Nowell *et al*, 1992a), and its efficacy in reducing fever (albeit in high dosages) has been demonstrated in comparative anti-pyretic experiments on rats (But *et al*, 1990).¹¹ Regardless, saiga antelope horn is regarded as unsuitable for treating certain kinds of fever by many practitioners (Teng, 1992) or is already used in combination with rhino horn in other common prescriptions (Song and Milliken, 1990). Moreover, reports from the saiga antelope's range in the former Soviet Union indicate that the species itself is now threatened with over-exploitation due to uncontrolled poaching in parts of its range (S. Edwards, pers. comm.), a development which makes its promotion as an alternative to rhino horn difficult to advocate until suitable management protocols and trade controls are all in place.

Although South Korea was believed to be moving away from rhino horn usage in favour of substitutes in the mid-1980s (Martin, 1986a), Song and Milliken (1990) subsequently found that this was not the case. In Taiwan, at least one prominent doctor has argued publicly that rhino horn is irreplaceable (Chen, 1991), and a recent survey of traditional medicine doctors showed that 35 out of 130 (27%) respondents felt that rhino horn was irreplaceable for certain illnesses (Nowell and Pei, *in prep.*) (even though a total of 79 (60%) respondents indicated they currently stocked rhino horn and presumably would continue to use it). And finally, one would expect a shift to substitutes on the part of low-income consumers given the expense of

rhino horn as an ingredient. There is limited data to support this view as Nowell and Pei (in prep.) found 16% of the doctors interviewed in Taiwan cited the high cost of rhino horn as a reason for driving either practitioners or patients to substitutes. In many instances, however, the small amount of rhino horn required in medicines may not increase the overall price to the extent that prescriptions become unaffordable to the majority of consumers. For example, the retail cost of rhino horn in a three-month supply of Chung Shim Won (100 balls), the most frequently dispensed rhino horn medicine in South Korea, was only US \$35 in 1988, while even smaller dosages in nine other common medicines added anywhere from US \$5-26 to retail prices (Song and Milliken, 1990).

In summary, Asian demand for rhino horn has ancient origins and in most places has resisted change (Song and Milliken, 1990; Nowell *et al.*, 1992a; Leader-Williams, 1992a). The trade now continues entirely unreported in official trade statistics, is increasingly difficult to monitor in end-use markets, and can be quantified only by estimating stockpiles and market availability in consumer countries, estimating rhino losses in range states and, in very rare instances (i.e. Yemen), acquiring data from importers. On the other hand, under-declaration and concealment of stockpiles and inherent difficulties in accurately censusing rhino numbers present major obstacles in any attempt to do so. National trade controls have been slow to evolve and remain difficult to enforce. In short, 15 years of efforts to prevent international trade in rhino horn undeniably have failed to halt the rapid population decline of the black rhino throughout Africa. While the international community is only beginning to make it a political priority to pressure consuming countries to comply with CITES trade restrictions, such developments come at a time when the trade is moving further underground in response to local restrictions.

BLACK RHINO CONSERVATION IN ZIMBABWE

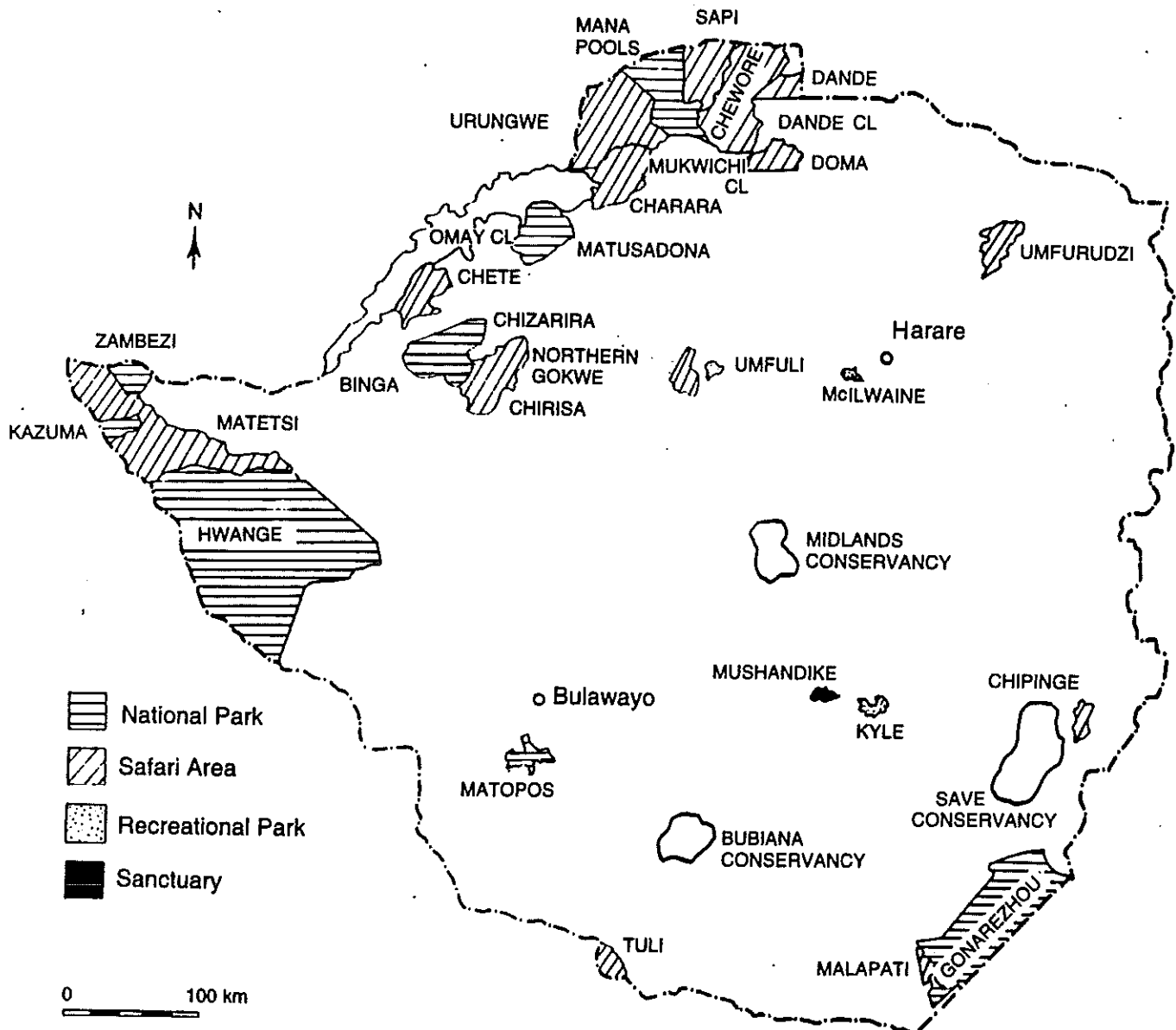
Population Trends

The majority of Zimbabwe's black rhino (*D. b. minor*) are found in the northern third of the country (Figure 1), and all major populations are located adjacent to border areas, a fact which indisputably has compromised their security. Ironically, Zimbabwe's largest black rhino population is now found in the Hwange National Park/Matetsi Safari Area Complex, a region where the species had once been extirpated. Following reintroductions in the 1960s and 1980s (Herbert and Austen, 1972; Booth *et al.*, 1984), black rhino numbers have built up to become the country's largest population today. In Hwange, black rhino were historically sympatric with white rhino, which also have been reintroduced. The second largest black rhino population is found south of Lake Kariba in the Sebungwe region. Here, protected areas are broken up by settled communal land so that rhinoceros populations are now discrete. Further east along the Zambezi Valley, black rhino formerly were distributed between Kariba and Kanyemba. Probably the largest contiguous wild population in all of Africa during the mid-1980s, today the species has been virtually lost in the Zambezi Valley. The Gonarezhou National Park population in the southeastern corner of the country was also established in 1971-1972 with black rhinos translocated from communal lands in the eastern Zambezi Valley and from Chipinge, where they had been threatened by poaching. Originally a success story, this population reached a peak of around 75 in 1987 (Cumming, 1987), but subsequently

was reduced to some ten animals during a major wave of poaching in the late 1980s. The few, if any, remaining black rhino are scheduled for translocation (G. Tatham, pers. comm.), and the Gonarezhou can no longer be considered an important area for rhino conservation in Zimbabwe at the present time.

Figure 1

Distribution of the Parks and Wildlife Estate, Communal Areas, and Rhino Conservancies in Zimbabwe



Accurate census of rhino numbers in the wild is extremely difficult as survey techniques remain to be refined.¹² Consequently, Zimbabwe's population estimates, which largely are based on aerial counts, have never been exact. A major benefit of the current nationwide dehorning exercise is that it will provide the most accurate figures to date on rhino numbers in Zimbabwe through a dramatic modification of the technique of individual recognition. With the benefit of hindsight, it is fairly safe to regard Zimbabwe's early population figures as underestimates, while the higher estimates given over the last two years have overstated numbers greatly by failing to measure the severity of poaching losses accurately and their impact on recruitment in surviving populations. In the absence of undisturbed populations, the results of population dynamics for black rhino must be calculated for each local or isolated population (Kingdon, 1979). After almost a decade of persistent poaching pressure, it is very difficult to generalize about mortality, recruitment and other variables when developing nationwide population models for Zimbabwe's rhinos.

Zimbabwe has almost 75,000 km² of rhino habitat, 43,531 km² (58%) of which is in National Parks and Wildlife Estate. According to DNPWLM calculations, which estimate carrying capacity at 0.2 rhino/km² for protected land and commercial farms and 0.1 rhino/km² for communal areas, the black rhino population in Zimbabwe has the potential to reach over 13,000 animals (Table 4). While some ecologists feel that this estimate may be over-optimistic, it should be noted that the AERSG used a figure of 0.33 rhino/km² when estimating potential rhino numbers in 1987. Regardless, Zimbabwe's black rhino population has never approached this number in recent history.

According to AERSG data, in 1981, there were an estimated 1,400 animals in the country (Table 1) and, unlike populations further north, poaching was not a serious threat in Zimbabwe. By 1987, numbers were estimated to have increased to at least 1,754 (Table 1), but Zimbabwe's most significant black rhino population, that in the Zambezi Valley, was already being hit by poachers from neighbouring Zambia. The DNPWLM's aerial census figures for the Zambezi Valley, when compared with reported rhino losses, reflect this trend with survey numbers showing an appreciable drop after 1984 (Table 3).

Table 3

Summary of Zambezi Valley Aerial Census Figures for Black Rhino 1980-1987
Compared with the Number of Found Rhino Carcasses

Year	1980	1981	1982	1983	1984	1985	1986	1987
No. of Strata								
Surveyed (n=14)	12	ns	13	10	11	ns	9	7
Census Totals	507	ns	1,171	784+	746+	ns	434+	359+
Rhino Carcasses	0	0	0	0	12	69	149	169

Key: ns = not surveyed

Sources: Rhino census figures from D.H.M. Cumming (unpublished data) in Du Toit, 1989b; rhino poaching data from Operation Stronghold statistics, Department of National Parks and Wild Life Management

Table 4
Population Trends for Black Rhino in Zimbabwe

	Area Sq. Km.	Carrying Capacity	Black Rhino Numbers		
			1989	1991	1992
Zambezi Valley					
NPs and Wildlife Estate					
Doma SA	945	189	50		25+
Dande SA	523	105	20		+
Chewore SA	3,390	678	300		+
Sapi SA	1,180	236	50		5
Mana Pools NP	2,196	439	100		10
Urungwe SA	2,870	574	150		10
Charara SA	1,694	339	200		15
Subtotal	12,798	2,560	870		65
Communal Lands					
Dande CL	3,000	300	30		+
Mukwichi CL	2,000	200	30		+
Subtotal	5,000	500	60		+
Total	17,798	3,060	930	957	65
Sebungwe Region					
NPs and Wildlife Estate					
Matusadona NP	1,407	281	150		20
Chizarira NP	1,910	382	300		30
Chirisa SA	1,713	343	200		10
Chete SA	1,081	216	70		0
Sijarira FA	200	40	20		0
Subtotal	6,311	1,262	740		60
Communal Lands					
Omay CL	2,700	270	40		0
Binga Dt	5,000	500	20		0
Northern Gokwe Dt	3,000	300	10		0
Subtotal	10,700	1,070	70		0
Total	17,011	2,332	810	767	60
Hwange NP/Deka SA	15,161	3,032	200#	205*	130*
Matetsi complex	4,407	881	20	*	*
Matobo NP	436	87	6	6	15
Gonarezhou NP	5,207	1,041	10	10	3
Commercial farms*	13,125	2,625	162	150	150
Chipinge SA	—	—	—	—	7
Zimbabwe Total	73,145	13,059	2,138	2,095	430

Key:

NP = National Parks SA = Safari Area Dt = District # = Original estimate of
CL = Communal Lands FA = Forest Area — = Not included 250 revised to 200

* = Estimate given for Matabeleland North includes Hwange NP, Deka SA, and Matetsi Complex

+ = Estimate for Doma SA includes Dande SA & CL, Chewore SA and Mukwichi CL

Sources: 1989 and 1991 data taken from DNPWLM, 1992a; 1992 data from ARSG, 1992

The last comprehensive air survey encompassing all protected areas with black rhino distributions was carried out in 1989.¹³ These data are presented in Table 4 and show a population of 2,138 animals. Until the recent dehorning exercise, no nationwide survey has been undertaken since 1989, but, in January 1992, based on an assumed annual growth rate of 5% less reported regional poaching losses, the DNPWLM offered an updated population estimate of 2,095 for 1991 (Table 4). Although this figure represents a net loss over the previous estimate, it was still believed to be far too optimistic by some observers. For example, although the 1991 estimate for the Zambezi Valley population officially was set at 930 (Table 4), WWF aerial survey data in 1988 estimated only 527 black rhino, while simultaneous subjective estimates (with a 63% confidence interval) placed numbers somewhere between 460 and 730 animals (Du Toit, 1989b). In August 1991, a substantially lower estimate of 1,400 was given for Zimbabwe's black rhino at the ARSG meeting (Table 1), while the country's black rhino proposal issued to the CITES Secretariat two months later gave a population estimate of approximately 2,000 animals. The CITES proposal acknowledged heavy poaching in Chizarira National Park and Chirisa Safari Area, however, and conceded that population figures for these areas may be "considerably reduced".

At the ARSG meeting in November 1992, the DNPWLM tabled a new population estimate indicating that only 430 black rhino remained in the country. This estimate, based on data obtained during the country's rhino dehorning exercise, represented a decline of 70-80% over other estimates made the previous year. Clearly, authorities in the DNPWLM had seriously failed to grasp the full impact of the country's poaching crisis. Zimbabwe's experience can only be viewed as a catastrophic set-back for black rhino conservation and the country, once admired as Africa's strongest example of rhino conservation, joins the ranks of African nations which have lost the majority of their rhinos to poachers. What happened?

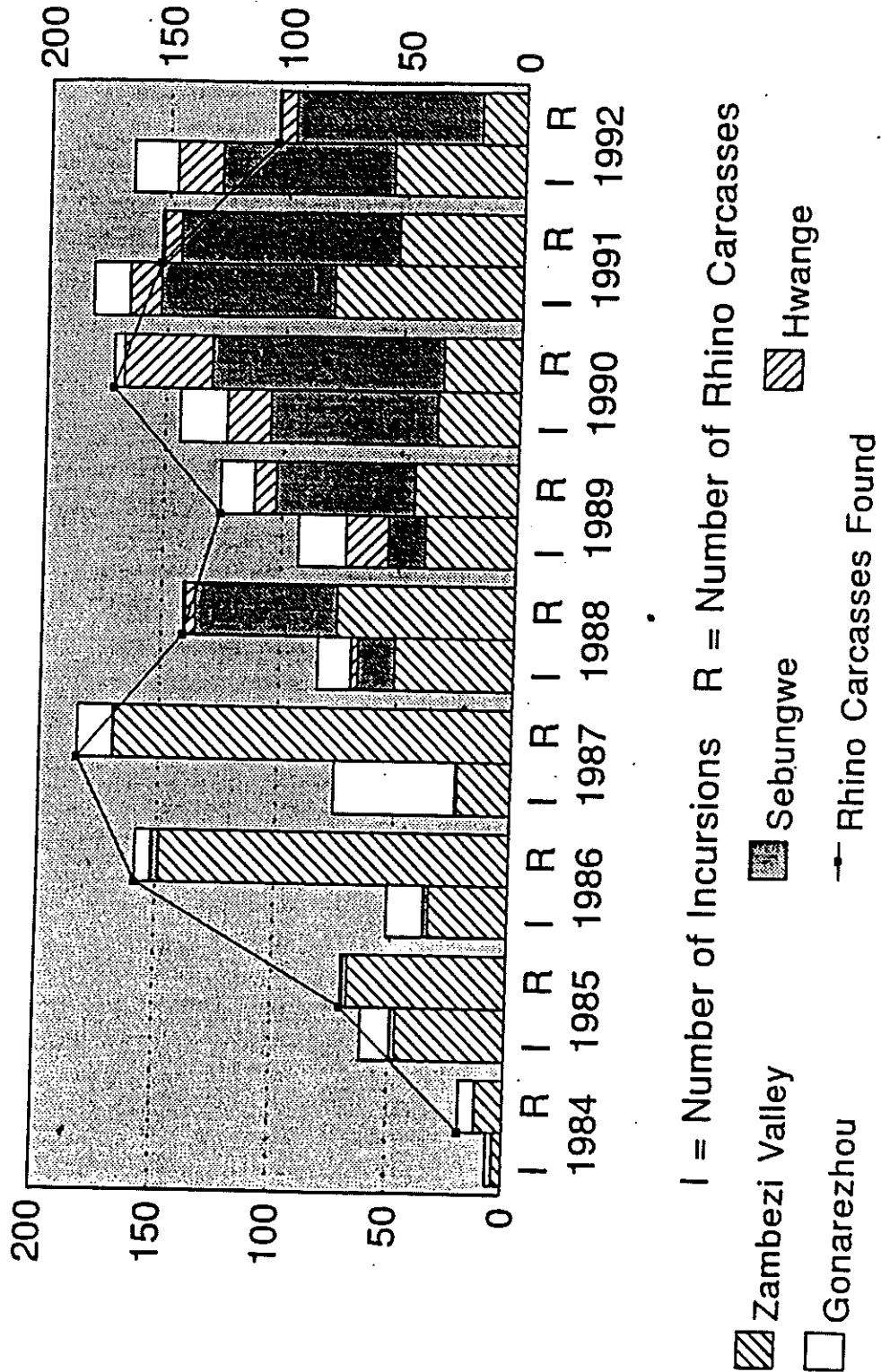
The Poaching Crisis

The poaching crisis, which successively eliminated or reduced black rhino numbers in country after country to the north, hit Zimbabwe in mid-1984. Since July of that year, when the first poaching incursions from Zambia occurred, over a thousand black rhino are known to have been killed nationwide (Table 5) and the killing continues unabated to this day in spite of Africa's most sustained and aggressive anti-poaching response to date.

Although rhino poaching was not unknown in the country, Zimbabwe's current crisis largely has its origins elsewhere. During the 1970s, Zambia's Luangwa Valley black rhino population, perhaps the largest in Africa at the time, suffered tremendous attrition due to poaching (Leader-Williams, 1988) and, by the early 1980s, aerial surveys confirmed that black rhinos on the Zambian side of the Zambezi Valley were also rapidly being hunted out (Tatham and Taylor, 1989). By then, Zambia's capital, Lusaka, was well-established as a major hub in the illicit international rhino horn trade and diminished prospects for meeting demand with local supply made it only a matter of time before Zambia's middlemen dealers directed their poaching gangs to neighbouring Zimbabwe. Predictably, the Zambezi Valley, where the river border is easiest to cross, was the first to suffer incursions from armed Zambian poachers (Tatham, 1988).

Figure 2

Number of Known Poaching Incursions by Region and Rhino Carcasses Found



Source: Department of National Parks and Wildlife Management

Based on the number of carcasses found, from the onset of serious poaching in July 1984 through January 1993, a minimum of 623 black rhino have been killed in the Zambezi Valley. Although the number of found carcasses peaked in 1987 at almost 170 animals and losses in the Zambezi Valley have declined since, there has been no respite in the crisis despite there being fewer animals to poach (Figure 2). At the same time, the poaching theatre has correspondingly widened to encompass the rhino's entire northern distribution in Zimbabwe. Beginning in 1988, Zambian poaching gangs began to turn their fire further west on rhinos in the Sebungwe region, south of Lake Kariba, and in Hwange National Park (Figure 2). During April of that year, for example, six gangs reportedly were operating at once in the Chete Safari Area and 54 rhino carcasses were found over a period of four months (N. English, pers. comm.); total known losses for the year reached 57 animals. The next year, poaching incursions expanded south of Chete to reach Chizarira National Park (where only a single rhino was known to have been poached in 1988), and by 1991, armed Zambians regularly were penetrating 140 km into Zimbabwe to hit rhinos in the Chirisa Safari Area and the adjoining Sengwa Wildlife Research Area. The country's first large-scale dehorning exercise was completed in Hwange National Park in late 1991 with the DNPWLM removing the horns from 54 white rhinos. Meanwhile, poaching in the Sebungwe region remained acute. In 1992, rhino poaching intensified in Matusadona National Park and Chete, possibly due to awareness that rhinos in these areas might be slated for either translocation to safer areas or for dehorning (N. English, A. Searle, pers. comm.). A total of 23 black rhino were known to have been killed in Matusadona in the first five months of 1992 and overall 34 carcasses were found for the year. In the wake of Zimbabwe's dehorning of rhino in vulnerable northern border areas, there is emerging evidence that Zambian poachers are moving further into the interior of the country. In December 1992, two Zambian men and a local woman were arrested while driving to Matopas National Park, over 450 kilometres from the Zambian border, on a mission to allegedly kill rhino (Anon, 1992p).

Table 5
Poaching Activity in Zimbabwe 1984 — January 1993

	No. of Rhino Carcasses	No. of Elephant Carcasses	No. of Horns Recovered	No. of Tusks Recovered
Zambezi Valley	623	222	149	58
Sebungwe Region	393	60	153	25
Hwange NP	63	31	30	18
Gonarezhou NP	51	186	5	256
Total	1,130	499	337	357

Source: Department of National Parks and Wild Life Management

Table 5 presents DNPWLM data on the number of rhino killed in the country based on actual carcass counts for each region; true losses, however, certainly are greater as the country's black rhino range cannot be adequately monitored due to under-staffing, and not all carcasses are found even in intensively patrolled areas. The Department itself recognizes this and, when the official count stood at about 1,000, conceded that "the number [of rhino killed] may be as

high as 1,500" (DNPWLM, 1992b), suggesting that one in three poached rhino carcasses goes undetected by DNPWLM personnel. Even this assessment may be overly optimistic. Rhino skull count data obtained during helicopter surveys in the Zambezi Valley's northern Chewore area during the 1988 dry season when compared with records of skulls located by anti-poaching patrols showed a carcass detection rate of only 55% (Du Toit, 1989a). Elsewhere coverage may be even worse: Matusadona National Park, an area of 1,407 km², has only nine scouts for patrol at any one time, and only one-fifth of the park can be covered effectively (A. Searle, pers. comm.); in Chete, anti-poaching coverage of the 1,081 km² area can drop to as low as six active game scouts (N. English, pers. comm.).

As incursions have penetrated deeper into Zimbabwe and rhinos have become increasingly rare and difficult to find, the composition and *modus operandi* of the poaching gangs has changed. While gangs formerly consisted of one to three people, including an older, experienced professional hunter, the current gang size is anywhere from four to six people, with the extra hands needed to carry supplies in and contraband out, which increasingly includes ivory. After crossing the Zambezi River or Lake Kariba in small dugouts, travel is generally on foot, although poachers have been known to jump the train which skirts Hwange National Park, and one poacher rather incredibly travelled on a public bus with his AK-47 through communal lands adjacent to Matusadona National Park with no interference (M. Murphree, pers. comm.). Poaching gangs have become better armed, with semi-automatic weapons largely replacing .375 hunting rifles. In some cases, ballistic tests on captured AK-47s have revealed that the weapons never had been used before, indicating significant capital investment in the poaching gangs by Lusaka's middlemen dealers (G. Tatham, pers. comm.). Other weapons have been traced to officials highly placed in former Zambian President Kenneth Kaunda's United National Independence Party, as well as to individuals holding office in the current Movement for Multiparty Democracy government (Anon, 1991e).

Experience and the increasing scarcity of rhinos have emboldened the poachers. Instead of only two or three days, poaching expeditions now last for up to two weeks. Analysis of data on poaching incursions between 1984-1988 found that where gangs went undetected, the maximum duration of a hunting foray averaged about nine days, the "limit being set by the amount of food they can carry and the need to return a load of rhino horns to the safety of their external base" (Martin, 1991b). Previously, poachers were known to move out of areas once rhino densities dropped to about one in 30 km²; now gangs continue to operate for long periods of time in areas where densities have fallen to only one animal per 70 km² (N. English, pers. comm.). Poaching gangs typically combine living off the land with provisions brought from their staging posts in Zambia; snares for bush meat as well as 45 kg sacks of maize meal have been recovered from poachers' camps inside Zimbabwe.

As rhinos became scarce, initially in the Zambezi Valley and later elsewhere, the DNPWLM has seen a small, but possibly significant, increase in elephant poaching. According to Department data, a minimum of 313 elephants have been poached in the Zambezi Valley, Sebungwe and Hwange areas since July 1984 (Table 5), over two-thirds of which occurred after January 1990 when the international ban on ivory came into effect. There are some indications that elephant poaching has intensified in recent months. On a single day in May 1992, two elephant groups, totalling seven animals, were poached and their tusks taken to Zambia, the largest single known kill in the Zambezi Valley since 1984 (G. Tatham, pers.

comm.). During the rhino dehorning operation in Matusadona, a total of ten new elephant carcasses were found (D. Pitman, pers. comm.), and contact with poachers carrying ivory in Chete has also surged (N. English, pers. comm.). Altogether, 30 poached elephant carcasses were found in Sebungwe in 1992, the greatest number in recent history. While reported losses certainly are sustainable for the moment, some observers have speculated that the rhino crisis may evolve into an elephant crisis as the country's rhino population hits rock bottom (Anon, 1992k; Anon, 1992l).

The factors underlying the poaching offensive coming out of Zambia are not difficult to define, but they will be very difficult to change. The primary cause is certainly purely economic (see Milner-Gulland and Leader-Williams, 1992). The most prosperous black-ruled country in sub-Saharan Africa at the time of independence, Zambia has seen its economy steadily deteriorate and today it is being completely restructured. With one of the world's highest per capita debts (nearly US \$1,000 for each of its eight million people), average annual income has dropped to less than US \$290 per person (Morrow, 1992). The resulting poverty and destitution ensures a steady stream of men willing to risk their lives to fill the ranks of the rhino poaching gangs. Recruitment is very cheap: porters and ferry men are known to work for as little as 2,500-5,000 Zambian kwacha (ZK) — or US \$12.50-25.00 — per trip plus expenses, while the gang leader/gunman earns considerably more, according to DNPWLM personnel and Zambian law enforcement officers (M. Murphree, N. Mumba, E. Sakala, pers. comm.). With Zambia's runaway inflation, cost of living increases and periodic currency devaluations, payments in ZK have increased over time, but economic gain is not always a certainty. Formerly, members of a poaching gang were paid a daily rate of 100 ZK, with an extra 1,000 ZK upon delivery of horn. Now, poachers are not paid for their time if they do not deliver the goods (W. Nduku, pers. comm.). Consequently, at considerable risk to themselves, they stay longer in Zimbabwean territory.

Poachers sell the horn for a relatively low price, considering its extreme value at the other end of the trade: prices in recent years range from US \$100-360 per horn¹⁴ depending on how the poaching mission was organized (M. Murphree, pers. comm.; E. Kanyama, on film; E. Sakala, pers. comm.). Where organizers are involved employing gunmen, porters and ferrymen, supplying weapons, ammunition and supplies, and paying transportation and other expenses, the price of the horn is cheap. Where gangs organize themselves, the price is higher in order to recoup the costs of the poaching mission.

While there is little doubt that most rhino losses in the northern arc of Zimbabwe's rhino distribution can be attributed to the work of armed Zambian gangs, there is growing evidence of logistical support from local people on communal lands inside Zimbabwe, particularly Binga (Anon, 1992e), Hurungwe, Kazangarare area, Kariba, Guruve, Kanyemba (Anon, 1991a), and Gokwe (I. Coulson, pers. comm.). More alarming yet, indigenous poaching is now an operative factor in the country's northern rhino wars and the risk of this becoming endemic increased as the local economic situation deteriorated with the region's crippling drought. The DNPWLM acknowledged this development in its April 1992 rhino action plan:

"Whereas until 1990 virtually all illegal hunting was carried out by nationals of neighbouring countries, during the past 18 months Zimbabwean locals have become significantly involved in both hunting and trafficking in horn....The current drought in the country is likely to lead to additional rhino mortality this year and involvement of

Zimbabweans in illegal hunting and trafficking will probably increase as a result of economic problems in rural communities" (DNPWLM, 1992b).

There are numerous indications of this trend, with politicians, government employees, military personnel and, on at least one occasion, a DNPWLM game scout appearing among the rhino horn traffickers or poachers. East of the Sebungwe region, the Karoi and Chinhoyi magistrate's courts convicted 13 Zimbabweans along with 15 Zambians for illegal rhino horn or ivory possession over eighteen months ending in July 1991 (Anon, 1991a), and most of the 64 people apprehended by the DNPWLM's Investigations Division in 1992 for dealing or illegally possessing rhino horns were Zimbabweans (Anon, 1993b). The MP from Zengeza, along with six others, was convicted in January 1993 for illegal possession of two rhino horns (Anon, 1993a). Another sensational case, which broke in the local press in July 1992, involved four members of the Central Intelligence Organisation (CIO) apprehended in Harare with two rhino horns, reportedly worth Z\$30,000 (US \$6,000), in their vehicle; the CIO is directly connected with the President's office (Anon, 1992j). At the same time, a clerk in the Criminal Court allegedly stole two rhino horns, evidence in a pending court case, and attempted to sell them in Mbare, a Harare suburb (Anon, 1992j). Members of the Zimbabwe National Army's Fifth Brigade were implicated in the removal of horns from a rhino which apparently died of natural causes in Inkosikazi Communal Land (Du Toit, 1990). And finally, in late 1990, an off-duty game scout from the Mana Pools area in the Zambezi Valley was arrested for alleged poaching in Chirisa Safari Area and later committed suicide in custody. As Zimbabweans themselves become more deeply involved, the rhino crisis takes on a new dimension, one which is likely to thwart attempts by the authorities to reestablish control.

Although local poaching is a relatively new development in the north, in the southeast of the country it has a longer history. The Gonarezhou rhino population suffered catastrophic losses during the two years, 1987-1988, when park administration was effectively under the control of the Zimbabwe military. While some rhinos were killed by Mozambican poachers on forays inside Zimbabwe and others possibly by local people from areas adjacent to the park, the largest number of rhinos were slaughtered for their horns by rogue elements in the Zimbabwe military command or their collaborators within the DNPWLM itself (Anon, 1991c). Events surrounding this serious lapse of authority still remain to be clarified and the affair stands as a serious blemish on the Department's credibility and integrity, both in international circles and at home. Official government comment on a report resulting from an internal inquiry on the Gonarezhou situation, chaired by Prof. Marshall Murphree, Chairman of the Parks and Wild Life Board, was not forthcoming for almost a year. When a public statement finally was issued, the government concluded that the probe failed to come up with conclusive evidence that there had been poaching by government employees or security forces (Chitsaka, 1992). However, the findings of the inquiry remain confidential, allegations of a cover-up have emerged and no disciplinary action has been taken against any alleged offenders either within the Department or the military (Chitsaka, 1992). As stated earlier, this spate of poaching all but eliminated the black rhino from Gonarezhou National Park and clearly is indicative of the possible consequences when indigenous poaching comes to the forefront. Since the stabilization of the Park's management at the end of 1989, most poaching incidents have involved Mozambicans crossing into the Gonarezhou to kill elephants, a situation which is more reflective of the external poaching threat in the north of the country.

Anti-Poaching and Law Enforcement

The response of Zimbabwe's wildlife authorities to the country's poaching crisis has not been passive. Code-named "Operation Stronghold", the DNPWLM's anti-poaching effort has been run along military lines since its inception in July 1984 to combat Zambian incursions into the Zambezi Valley (Tatham, 1988; Tatham and Taylor, 1989). As rhino poaching spread to other parts of the country, Operation Stronghold correspondingly expanded to meet the challenge. There has been little compunction about fighting fire with fire and, to date, 167 poachers have been killed (Table 6). What the media has popularly termed Zimbabwe's "shoot-to-kill" policy in fact represents basic self-defensive action on the part of DNPWLM anti-poaching personnel. While criticism has been raised both inside and outside of the country, particularly in Zambia, against the taking of human lives to protect wild animals, it is unrealistic to expect heavily armed poachers to drop their weapons and engage in dialogue when detected by game scouts in the field. In fact, since 1984, two DNPWLM game scouts and two investigations officers have been killed and six more severely wounded in skirmishes with poachers. One of the wounded was abducted from Gonarezhou and taken into Mozambique, and his fate remains unknown (Anon, 1991b).

Still, it has taken the authority of the country's highest political leaders to indemnify DNPWLM personnel from criminal liability for acts committed in the course of anti-poaching operations. In March 1985, the Department was granted the authority by the Ministry of Home Affairs to use their weapons against poachers, when then Prime Minister, now President, Robert Mugabe directly intervened in the case of a DNPWLM official formally charged with murder following the death of a suspected poacher (Pitman, 1991). In 1989, Zimbabwe's legislature firmly entrenched this principle with the formal passage of the *Indemnity (Protection of Wild Life) Act*. Under the Act, not only are DNPWLM personnel indemnified against prosecution for actions committed while fulfilling anti-poaching duties, but coverage also is extended to honorary officers and other persons assisting in any such operations.

Table 6
Anti-Poaching Statistics 1984 — January 1993

	No. of Incursions	No. of Contacts	No. of Poachers Killed	No. of Poachers Captured	No. of Poachers Wounded
Zambezi Valley	369	129	68	28	22
Sebungwe Region	252	70	51	32	7
Hwange NP	72	24	23	8	5
Gonarezhou NP	180	43	25	21	14
Total	873	266	167	89	48

Key: Hwange NP includes Deka Safari Area, Matetsi Complex

Source: Department of National Parks and Wild Life Management

Table 6 summarises the Department's anti-poaching record, based on nine years of Operation Stronghold data. The number of annual incursions has increased with time and, since 1988, there have been approximately 150 incursions a year — or one every two or three days. In

1992, however, there were indications that Zimbabwe was suffering almost daily incursions (DNPWLM, 1992b). Department game scouts have made contact in about 30% of the 873 recorded poaching incursions to date. Of the 167 poachers killed, all have been Zambian nationals with the exception of ten Mozambicans and three Zimbabweans. Another 89 poachers have been captured, tried and placed in Zimbabwe prisons, while another 48 were wounded. At the same time, the Department has recovered over 300 rhino horns in field operations, representing about 15% of the known rhino kills to date (Table 5).

Although there can be little doubt that the Department's anti-poaching record stands as one of the strongest in Africa, nonetheless the black rhino is declining. The DNPWLM consistently has argued for staff increases and more funds for such vital equipment as radios and helicopters, but large increases have not been allocated and certainly were not forthcoming during the drought crisis prevailing in 1992. Taking into account the costs of supporting staff, transport, subsistence, incidental expenses and funds for management, research and conservation, an analysis carried out by the Department holds that effective *in situ* black rhino conservation requires a funding commitment of close to US \$400/km² (DNPWLM, 1992a), a financial burden Zimbabwe has not been able to shoulder. The Department's total budget for all activities in 1991 was about US \$10 million, about half of the estimated US \$20 million annually needed to secure adequate protection for the country's black rhino alone.

The disparity between the Department's needs and actual means is critical. It can be forcefully argued that Zimbabwe's national revenue channelling priorities are in need of drastic revision. Currently, there is a disturbing lack of appreciation for the considerable contribution wildlife makes to the nation's economy among government policy makers. As a result, revenues from the country's tourism, which is largely based on the promotion of wildlife and wildlands, go to the Central Treasury. For example, the Zambezi Society has pointed out that Matusadona National Park (once one of the premier rhino-viewing spots in the country) grosses something on the order of Z\$2.5 million a month from tourist revenues, but, excluding salaries, the entire park budget allocated by government is less than Z\$80,000 a year (Anon, 1992d; M. Murphree, pers. comm.). Similarly, of the Z\$4 million raised through Zambezi Valley hunting auctions in 1993, only Z\$750,000 was channelled back to the DNPWLM for its operational budget for the entire Zambezi Valley (Anon, 1993d). On a national scale, foreign exchange earnings on tourism reached Z\$113 million in 1991 (Anon, 1991h), while the entire budget for the DNPWLM represents less than 10 percent of that amount. The disparity has only increased over the last two years.

Linked to the funding shortfall, deployment of staff also has been inadequate to protect the country's rhinos. Research in Zambia's Luangwa Valley indicates that a staff complement of at least 1 man/20 km² is required to check rhino and elephant poaching adequately (Bell and Clarke, 1986; Leader-Williams *et al.*, 1990). Following the forced retrenchment this year of 259 of the Department's game scouts (with possibly more to go in the future) under Zimbabwe's Economic Structural Adjustment Programme, there are now just 1,541 game scouts in the entire country, of which only about 800 are actively involved in anti-poaching. By comparison, the Department believes it needs 2,500 men to patrol rhino habitat in Zimbabwe adequately, but current game scout capacity translates into about 1 man/100 km² (DNPWLM, 1992b).

It is unlikely that current budgetary constraints can be overcome to even replace staff lost to retrenchment, much less create new positions. One solution to this impasse considered by the Department is to reinstate an honorary officer programme, a move which would effectively shift some of the costs of increased manpower to the private sector. Although discontinued in the mid-1980s, Zimbabwe once had a system of honorary officers to augment the government's anti-poaching forces in protected areas. Although a couple of isolated incidents surfaced to discredit the programme as a whole, in fact, honorary officers made a valuable contribution to Zimbabwe's overall law enforcement capability at the time. Anti-poaching efforts in the National Park and Wild Life Estate immediately would benefit from the reinstatement of such a programme. There also is scope to use honorary officers for the protection of rhinos in private conservancies and communal lands.

Scout salaries and field allowances in the Department remain at a very low level in comparison to military and police officers of equivalent rank (DNPWLM, unpubl. data). For example, a senior scout, with ten to 15 years of service and at the top of his pay scale, is still two steps below the pay rank of someone who has just joined the army as a private. Obviously, such discrepancies gnaw at the Department's morale. At the same time, incentive schemes for good performance in the field, which have been successfully employed elsewhere in parts of Africa, have not been a feature in the Department's pay matrix. This causes further hardship and stifles initiative in game scout ranks. Moreover, the logistical means to conduct effective anti-poaching operations — aircraft, watercraft, ground transport, weapons, radios and other field equipment — simply are not available in adequate quantities within the Department now.

Low morale, which stems from a perception of disunity within the Department's Directorate concerning the severity of the nation's poaching crisis, is another important issue affecting the performance of field personnel. For example, at an awards ceremony on 22 May 1992 honouring 31 game scouts for excelling in anti-poaching work, local newspapers quoted the Minister of Environment and Tourism, Dr. Herbert Murerwa, lamenting the fact that "killing the rhino for its horn has become more concerted in recent months" (Imbayago, 1992). Yet, in the same article, the DNPWLM's Assistant Director for Management at the time, told the press that Operation Stronghold had been very successful in that it had reduced poaching countrywide and that, although there had been increased incursions and contacts in recent months, there was "less loss to rhino" (Imbayago, 1992). In fact, the Assistant Director's contradictory statements are at odds with the facts at the time and only can be regarded as disturbing considering that they emanate from one of the Department's directorate. In the same vein, members of staff with alleged complicity in the previously mentioned Gonarezhou poaching episode, remain uncharged, uninvestigated, and in decision-making positions within the Department.

Bleak as this picture is for Zimbabwe, all of the negative variables mentioned above — understaffing, poor pay and conditions, inadequate budgets and scarcity of equipment — are the common experience of wildlife departments throughout Africa. Indeed, excluding South Africa, elsewhere on the continent the material needs are even more pronounced than Zimbabwe's. Although the contributions from external funding sources, both government aid agencies and non-government conservation bodies, help to mitigate the situation, they do not

alleviate basic funding problems over the long-term. To date, more than 20 private organizations have filled an important gap by donating funding, equipment and supplies. The World Wide Fund for Nature (WWF) alone has put over Z\$1 million into helicopter patrols and another Z\$5 million into other rhino conservation activities. Local conservation bodies have also contributed millions more for capital equipment (D. Pitman, pers. comm.), but these contributions do little to bridge the critical shortfall in the Department's recurrent expenditure.

The terms of aid agency contributions, particularly USAID, often are overly restrictive and do not allow sufficient scope for local wildlife authorities to deploy equipment and other resources expediently to areas where rhinos are under extreme pressure without violating written protocols. For example, in one case involving the pursuit of poachers, the Department's men would have been obliged to change vehicles four times as they moved through various districts if they had followed the letter of USAID's law. And administrative delays in procuring equipment are not unusual; a donated US \$300,000 Cessna 206 Aircraft sat on the tarmac for seven months before finally securing Customs clearance (G. Tatham, pers. comm.).

Penalties under Zimbabwe's national legislation for the unlawful killing of a rhino, or possession of, or trade in rhino parts have been among the most stringent in Africa and, under normal circumstances, should act as a sufficient deterrent. In 1985, the *Parks and Wildlife Act, 1975* was amended to increase penalties for first time offenders to a minimum fine of Z\$15,000 (US \$9,800) or a prison sentence of not less than five years, or both. For subsequent convictions, minimum penalties increased to a fine of not less than Z\$35,000 (US \$22,875), or a prison term of at least seven years, or both. Even these sanctions were later considered too lenient: further amendments to the Act in 1990 instituted mandatory prison sentences of anywhere from five to 15 years for first convictions, and seven to 15 years for repeat offenders.

To complement the work of anti-poaching forces in the field, the DNPWLM established an Investigations Division (ID) in Harare in 1980. At full capacity, operational plans call for some 30 staff positions and branches in Mutare, Bulawayo, Beitbridge, Hwange and Kariba. Staff levels, while increasing, are still not at full capacity: the Beitbridge office was only semi-operational, Hwange had just become so, and Kariba remained in the planning stages. Consequently, the ID's Harare, Bulawayo and Mutare offices account for most of the results to date. Arrests and convictions in connection with illicit rhino horn and elephant ivory dealings, and the number of horns and tusks recovered by the ID are shown in Table 7. These data indicate that about half of the 201 arrests for rhino horn infractions have not resulted in convictions. In many cases, however, verdicts are still pending in the courts, while in others, follow-up has been poor and ID records remain incomplete.

Table 7

Arrests and Convictions for Illegal Rhino Horn and Ivory Transactions in Zimbabwe

	Arrests		Convictions		Recoveries	
	RH	EI	RH	EI	RH	EI
1988	23	43	12	37	16	66
1989	21	10	15	10	19	18
1990	44	36	38	26	30	37
1991	49	39	23	26	36	49
1992	64	57	7*	12*	35	73
Total	201	185	95	111	136	243

Key: RH = Rhino Horn EI = Elephant Ivory * = Data through 6 June 1992

Sources: 1988-1991: DNPWLM's Investigations Branch Data for Harare, Bulawayo, and Mutare; 1992:

Anon. 1993b

Currently the ID has an annual budget of about Z\$1.1 million (about US \$220,000), including expenditure which is covered by other governmental budgets, while about twice as much is required to operate efficiently (G. Nott, pers. comm.). The lack of adequate budget inhibits the ID's performance, like other divisions within the DNPWLM, and results in an inability to investigate many potential leads, including well-publicized cases. For example, in April 1992, a prominent local magazine featured a major expose on the alleged rhino horn dealings of a local Member of Parliament from Chegutu, an area east of Harare (Chipangura, 1992); several months later there had been no follow-up investigation by the ID. Whether unfair or not, a perception exists among some quarters that the ID should be producing more results.

There clearly is a need to make the tremendous volume of information and data generated by the anti-poaching and investigative wings of the DNPWLM accessible and proactive elements in Zimbabwe's total law enforcement programme. Despite of numerous internal directives over the last ten years, neither the ID nor the Operations (Anti-Poaching) Division has developed a cohesive system of data reporting, collection, retrieval and analysis. Relevant information remains buried in files in various offices within the Department and statistical information is not compiled routinely for analytical or strategic review. There is a vital need to computerize the Department's daily field reports, radio logs and investigations diaries to establish data bases on poaching and trafficking. In an editorial on rhino poaching, Zimbabwe's Herald stated:

"This would point to the need for better intelligence of when, where and in what force the poachers intend to strike, the need to infiltrate the poachers' ranks and in particular get close to those who direct the poaching and reap the greatest benefits. Armed with information besides guns, our anti-poaching teams would be better placed to head off the butchers before the carnage starts" (Anon. 1991d).

While Zambia has been steadfast in opposing any kind of formal "hot pursuit" agreement which would allow Zimbabwe's anti-poaching forces access into Zambian territory when pursuing poachers, in recent years, there has been improved cooperation between the law enforcement bodies of both countries (Anon. 1991g). The Species Protection Department of

the Anti-Corruption Commission in Zambia, under the direction Mr. Paul Russell and Mr. Norbert Mumba, is now responding seriously — albeit within the limits of its capabilities — to intelligence reports from the DNPWLM's ID. In May 1992, Zambian forces picked up a gang of poachers on their side of Lake Kariba in response to intelligence reports received from Zimbabwe (G. Nott, pers. comm.). Earlier this year, staff in Zambia's Department of National Parks and Wildlife Service actually handed over to Zimbabwe authorities a poacher apprehended inside the country; although an *ad hoc* arrangement, nonetheless this act stands as the first instance of extradition to date. In fact, an extradition treaty exists between the two countries, but while Zimbabwe has formally designated Zambia, arrangements in Zambia to allow extradition to Zimbabwe remain to be formalized.

The involvement of Harare's diplomatic community in the illegal rhino horn traffic is perhaps the most unassailable aspect confounding effective law enforcement within Zimbabwe. Accredited diplomats are immune from arrest or criminal prosecution, their baggage and premises from inspection, and they have the ability to send small parcels through their country's 'diplomatic pouch' unhampered. While official representatives of other countries also may be involved in rhino horn trading, the Democratic People's Republic of Korea (North Korea) is the most infamous. To date, two diplomats have been declared *persona non grata* and deported from Zimbabwe (Anon, 1992a), virtually the only — albeit flaccid — response available to a host country. Mr. Pak Su Yong was expelled in 1990 after being apprehended with rhino horns in his possession; the North Korean government immediately reassigned him to their embassy in Lusaka, Zambia (Anon, 1992b), a gesture many regard as an expression of official approval for and complicity in his crimes. This was followed by a second case in November 1991 whereby North Korean diplomat, Mr. Han Dae Song, also was found to have purchased rhino horns illegally and smuggled them out of the country through diplomatic pouch. This man immediately was sent abroad by the embassy before he could be deported officially (Anon, 1992b).

ZIMBABWE'S BLACK RHINO CONSERVATION STRATEGY AND ACTION PLAN

Zimbabwe is one of the few African countries to have developed a comprehensive rhino conservation strategy.¹⁵ In 1987, the DNPWLM convened a workshop to assess all available options for the effective protection of the country's black rhino. The product which eventually evolved, the *Zimbabwe Black Rhino Conservation Strategy* (DNPWLM, 1992a), recognizes the necessity to concentrate both populations and anti-poaching efforts and to secure 'the full sequence of 'fall-back positions' before being forced to adopt them in a crisis situation'. The strategy, which sets out four prioritized objectives, represents heightened levels of organization and a growing awareness that the rhino war, as currently fought, may not be winnable.

The first objective is: to conserve viable populations of black rhino in the Parks and Wildlife Estate. The designation of eight separate areas as Intensive Protection Zones (IPZ) is key to the implementation of this objective. Each IPZ is to harbour one of the country's largest rhino populations, minimally 100 animals, and have at least 1,000 km² of rhino habitat. Zimbabwe's *in situ* conservation programme will be based on the eight IPZs, where research, monitoring and anti-poaching efforts will be concentrated. Plans call for increasing the IPZ

manpower complement to at least 1 man/25 km², while elsewhere in the rhinos range staff redeployment would be based on 1 man/50 km². Altogether, the designated IPZs encompassed a total of 10,000 km² and included Chewore North, Chewore South, Mana Pools Escarpment, Urungwe/Charara, Matusadona National Park (part), Chizarira National Park, Chirisa Safari Area (part), and Hwange National Park/Deka Safari Area (part).

The second objective is: to develop translocated breeding nuclei elsewhere in Zimbabwe and to maintain their genetic variability. Translocation of rhinos from vulnerable state or communal lands into private conservancies in the country's interior underpins the strategy for achieving this objective. To ensure genetic fitness and demographic viability for at least 100 years, founder stock for each breeding nucleus will number no less than 40 black rhino and all locations must have a carrying capacity of over 100 animals.

The third objective is: to develop one or more captive breeding centres in Zimbabwe. The envisioned captive breeding regime, based on a population of 24 black rhino, entails intensive breeding of captive animals, as well as studying the requirements for capture, confinement, translocation, reproduction, and the prevention of disease. The plan acknowledges that annual expenses will be about US \$10,000 per captive rhino and specifically calls for their dehorning in the interest of self-protection and the prospect of legal sales to help augment expenditure.

The fourth objective is: to continue to support the international *ex-situ* captive breeding programme. In making this an objective in the national strategy, Zimbabwe demonstrated formal support for the international breeding effort coordinated by the IUCN/SSC Captive Breeding Specialist Group and carried out under the auspices of reputable zoological and scientific institutions around the world. The country's participation in these international efforts is seen as the ultimate insurance against the loss of a species.

Impressive as the strategy is on paper and in spite of its approval by the Department's Director and the Parks and Wild Life Board in early 1990, the DNPWLM's document languished in the Ministry for almost two years before publication. This unfortunate delay created a climate of internal dissension and stifled implementation of key components, particularly the ambitious field programme and the creation of the IPZs. Nonetheless, despite of internal obstacles, the DNPWLM did manage to make some progress towards realizing three of the four objectives, including the capture and translocation of animals to establish breeding populations in three private conservancies, Midlands, Save and Bubiiana (West Nicholson/Beitbridge), the construction of the Boulton Atlantica Captive Breeding Centre outside of Harare, and the provision of ten black rhino each to the captive breeding programmes in the United States and Australia.¹⁶

By January 1992, when the strategy was finally officially published and publicly distributed, it was evident that the primary objective of conserving viable wild black rhino populations in Zimbabwe's protected areas was rapidly slipping away as an achievable goal. The crisis situation alluded to in the original strategy was clearly at hand and the preemptive range of 'fall-back' positions remained elusive goals, particularly the concentration of rhinos in the eight proposed IPZs. In fact, the failure of the Department to move the IPZ concept forward at an early stage is perhaps its single greatest failure in safeguarding the country's rhinos.

Even though most IPZs in Zimbabwe were slated for sensitive border areas, the plan had the potential of Kenya's sanctuary scheme to reverse the declining fortunes of the country's rhino population. Today, in the face of recent events, many aspects of the plan are largely obsolete.

On 22 April 1992, a one-day workshop of senior Departmental staff was held to reassess the situation. The Action Plan (*Zimbabwe Black Rhinoceros, Short Term and Medium Term Action Plans*) which was developed at the meeting did not mince words about the crisis in the field. Its opening paragraph made very grim predictions:

"The black rhino population in Zimbabwe is unlikely to survive in viable numbers beyond 1994 under present conditions. Levels of illegal hunting are increasing and now include Zimbabwean nationals. The capability for effective law enforcement is declining due to reduced budgets and manpower" (DNPWLM, 1992b).

The Action Plan examines progress towards implementation of the strategy's four principle objectives and recommends a series of short- and medium-term priority actions to secure the rhino's future in Zimbabwe. At the same time, the Department effectively added a fifth objective to Zimbabwe's rhino conservation strategy: to secure a high commercial value for rhino through such activities as trade in rhino horn stockpiles and farmed horn, sport hunting, and the sale of live animals.

Crisis management is clearly the focus of the Action Plan's seven short-term priorities, all of which are designed to jump-start the original strategy's stalled field initiatives within a period of six months. Foremost on the list is an immediate programme for dehorning all rhinos in vulnerable areas of the country. (This programme commenced in early June 1992 in Matusadona National Park, and is ongoing at the time of writing). Other key priorities address the Department's chronic manpower and equipment shortages and a number of critical personnel issues. Plans are presented for the immediate redistribution of staff, the introduction of an honorary officer system to augment existing anti-poaching forces, the provision of higher salaries for field staff, the adoption of an incentive scheme to encourage better performance in the field, the procurement of sufficient equipment, particularly weaponry and transport, and the provision of emergency budgets for more effective field operations. Other short-term priorities are the activation of a major research effort to determine remaining rhino numbers and distribution, and the enlistment of active support on the part of other law enforcement agencies to help curb cross-border incursions.

While the crisis in the field predominates the Action Plan's immediate agenda, the five medium-term activities address fundamental economic and international aspects of the issue and, in doing so, challenge orthodox rhino conservation strategies. Of first priority is the acquisition of adequate funding from the Central Treasury as well as from outside donors to secure the rhino's survival. At the same time, the inception of legal trade in rhino horn is called for to provide for the major part of the Department's rhino conservation budget in the future. Zimbabwe also intends to move forward to capture the full spectrum of the rhino's commercial value through other, perhaps less controversial, means such as the introduction of sport hunting and darting safaris. To promote understanding of the reasons behind these actions and to change public resistance, an international public relations campaign is envisaged. The strengthening of investigations into illegal trade in rhino products is among

the proposals, signalling a continuing commitment to basic law enforcement concerns. The final priority consists of gaining broader recognition within the Zimbabwe government itself to make the rhino crisis a national and international priority endowed with the resources commensurate with such standing. It seems ironic that gaining the understanding of the country's own policy makers is placed last in the prioritized scheme. The DNPWLM's timetable allows for six to 24 months to achieve these far-reaching objectives.

In the context of Zimbabwe's urgent rhino crisis, most of the short-term goals in the black rhino Action Plan involve material needs and issues of manpower, administration and research common to all wildlife departments in Africa. There is, however, one major innovation: the decision to dehorn the country's wild rhinos effectively elevates the concept of dehorning to new heights. As national policy, it moves beyond the realm of experimentation which characterized the earlier efforts in Namibia and Hwange National Park. As an essential component for the protection of rhinos in the wild, it stands as a tacit admission that traditional anti-poaching methods alone can not adequately prevent a state of constant attrition of rhino populations once the poaching threat reaches epidemic proportions. And finally, as a sustainable harvest activity akin to shearing sheep's wool (albeit with the aid of an anaesthetic), it opens the door on new avenues of thought for consumptive utilization of rhino horn.

Building on this, the medium-term goals in Zimbabwe's Action Plan clearly call for sweeping changes in conventional rhino conservation. The realization of consumptive use options for rhinoceros would involve a fundamental revision of current prescriptions under CITES and national legislation in both range states and consuming nations around the world. One alternative could be the development of new bilateral arrangements outside of the current institutional framework, but such moves would represent a radical departure from existing policy. Either way, there is little doubt that Zimbabwe's poaching crisis and its response to it may fundamentally alter rhino conservation as traditionally practised.

DISCUSSION

Current Strategies for Rhino Conservation

Since 1977, when the CITES ban on international trade in rhino horn from all rhino species was initiated, conservationists have single-mindedly pursued a two-pronged, strategy of protection for the world's rhinos. In range states, particularly in Africa, the strategy has relied upon beefing up anti-poaching and law enforcement operations, whereas in the consuming markets in Asia and the Middle East the focus has been on stamping out trade in rhino horn and other products.

While trophy hunting of white rhino has long been a feature in South Africa and to a more limited extent in Namibia, for black rhino it is non-consumptive strategies which have been followed by all range states. Governments across Africa with indigenous black rhino populations have refrained from consumptive uses of the species in favour of making hunting and trade illegal, even countries such as Zimbabwe and Namibia where black rhino numbers were then stable or increasing. Millions of dollars, generated from external funding sources as well as internal wildlife budget allocations, have been spent on *in situ* rhino conservation, particularly anti-poaching activities.

On the other side of the equation, researchers have identified the major consuming markets in Asia and the Middle East. Subsequent pressure from CITES and international conservation bodies has resulted in legal prohibitions against the import and export of rhinoceros products in virtually all countries with significant trade, as well as bans on internal sale and possession in several key ones (Table 2). For 15 years, there has been little deviation from this course of action, although one can question how diligently it has been implemented. The most recent IUCN/SSC action plan for rhino conservation, for example, advances this paradigm, by calling exclusively for increased law enforcement activities against rhino poaching and illegal trade in selected countries, and for initiatives to encourage the use of substitutes for rhino horn among consumers (Cumming *et al*, 1990).

A decade and a half after being listed on CITES Appendix I, the black rhino is more endangered than ever before, trade in rhino horn continues to flourish, and poaching pressure in Africa has reached critical levels for many of the few remaining large populations. The recurrent costs of rhino protection clearly outstrip available resources from all sources. Tourism, which essentially stands as the only revenue-earning option within the conventional conservation framework, in fact, does very little to secure black rhino futures in Africa beyond, perhaps, Kenya's Nairobi National Park, the Ngorongoro Conservation Area in Tanzania, the popular tourist destinations in Etosha National Park in Namibia and a couple of protected areas in South Africa where visitors have a very good chance to view rhinos in the wild. Elsewhere, chances of ever seeing wild rhino are very limited. Moreover, with the exception of certain protected areas in South Africa and Kenya, tourist revenues are not directed back into the hands of wildlife authorities. In Tanzania and Namibia, where wildlife authorities do not directly realize financial benefits from rhino tourism, it is possible that large numbers of tourists probably mitigate the occurrence of large-scale poaching. Regardless, for black rhinos time is running out and, at this juncture, it can be argued that this strategic framework has proven inadequate to stem the species' decline and has consistently suffered from insufficient funding.

Only in a handful of range states is rhino protection working, and then mainly because of extenuating circumstances that seem to defy duplication in any other context. Out of some 23 range states for the five rhino species, perhaps only three or four countries harbour large rhino populations that essentially have enjoyed security over the last 15 years. South Africa has successfully protected the world's largest population of white rhino and a major black rhino population in the Umfolozi/Hluhluwe Game Reserve Complex and another significant black rhino population in Kruger National Park. Nepal has maintained the world's second largest population of great one-horned rhino (*Rhinoceros unicornis*) in Chitwan National Park. Malaysia has demonstrated success in safeguarding two small but significant populations of the Sumatran rhino (*Dicerorhinus sumatrensis*) in Taman Negara and Endau Rompin National Parks in Peninsular Malaysia, while Indonesia continues to protect the world's largest population of Javan rhino (*Rhinoceros sondaicus*) in Ujung Kulon National Park on the island of Java.

All of these localities have unique factors which in the past have mitigated the kind of poaching pressure that has overwhelmed most African states during the last 20 years. South Africa has had the unparalleled ability of being able to commit more resources to general park

management and rhino protection than any other rhino range state in the world. Indeed, South African government bodies alone spend more on rhino conservation than the total combined expenditure of all other African governments (Hanks, 1987); without external funding, rhino protection elsewhere on the African continent would suffer, if not fall apart altogether. In Nepal, a large military presence has safeguarded Chitwan's population, which has built up from around 60 in the 1960s to some 400 rhinos 30 years later (Dinerstein and McCracken, 1990). Unfortunately, in African countries, including Zimbabwe, where military personnel have been implicated in serious rhino poaching, this solution is untenable. Furthermore, even without concerns about the effect of such action, military protection for all rhino enclaves in Africa is simply an impossibility. The Javan rhino clearly has benefitted from geographical factors which leave their dense tropical habitat on an isolated peninsula in western Java virtually intact and largely inaccessible. Similarly, habitats for Sumatran rhino in Peninsular Malaysia are difficult to penetrate, affording protection to the solitary species. Comparatively speaking, for the most part Africa's rhinos inhabit more open, accessible terrain.

While all of these populations have remained largely insulated from the large-scale poaching carnage known elsewhere, it must be acknowledged that most of these localities have recorded some poaching losses in recent years. At least 32 white rhino have been killed in Kruger National Park and Umfolozi/Hluhluwe Game Reserves in South Africa since 1991, with almost half of the losses occurring between November 1992 and March 1993 (P. Hitchins, *in litt.*). Chitwan's 700 military guards appear to be faltering in the face of Nepal's general breakdown in law and order: in the first seven months of 1990, five rhinos were poached, bringing the total since 1984 to 21 rhinos (Martin, 1992b), and the situation has continued to deteriorate since then (O. Menghi, pers. comm.). And on Java, "it is likely that poaching still occurs, although it is not reported as a result of inadequate surveillance of the park" (Santiapillai and MacKinnon, 1990).

Finally, it should be recognized that in the event of a sustained poaching crisis of the dimension Zimbabwe faces, it is unlikely that even these seemingly secure populations would be protected adequately in the long run. What is more relevant to the issue are the number of countries where numerical increases in rhino populations have rapidly eroded or been lost altogether during periods of political instability and economic deterioration. With a history of commitment to rhino conservation, Nepal's neighbour, India, with 80% of remaining great one-horned rhino numbers, has seen steady population gains impacted by poaching in Jaldapara and Manas National Parks during outbreaks of civil unrest in the states of West Bengal and Assam. In Kaziranga National Park, where almost 500 rhinos were poached between 1979 and 1989, serious poaching continues to this day (Martin *et al.*, 1987; Vigne and Martin, 1991a; A. Kumar, pers. comm.).

In Africa, similar tragedy already has destroyed rhino populations in Angola, Chad, Ethiopia, Mozambique, Rwanda, Somalia, Sudan and Uganda and the future prognosis for even the best success stories can not be viewed with unqualified optimism. Some of the small, concentrated populations of black rhino in Kenya, as well as the last vestige of the northern white rhino (*C. s. cottoni*) in Garamba National Park in Zaire, while increasing in number at the moment through painstaking investment in their survival, could be vulnerable to sudden setbacks if current political strife continues to build. Indeed, Zaire teeters on the verge of national

collapse and the recent influx of Sudanese refugees into areas adjacent to Garamba is further cause for concern (K. Hillman-Smith, pers. comm.). Similarly, in Kenya, civil unrest and lawlessness appears to be growing at the same time a major refugee problem takes shape in the wake of civil war in neighbouring Somalia.

Many observers are also concerned that Namibia's successful conservation record for black rhino could falter rapidly in the wake of the Angolan war settlement if demobilized, but armed, soldiers turn to cross-border rhino poaching as one way out of the chronic economic chaos and unemployment. It is worth recalling that a five-month spate of poaching in Kaokoland and Etosha National Park in 1989 resulted in the loss of seven percent of the country's rhino population (Lindeque, 1990; Kock, 1991). In 1991, a rhino bull was poached in Damaraland (Montgomery, 1991), and, although probably an isolated event involving wayward park personnel, four white rhino were shot in 1992 in Namibia's Waterberg National Park (E. Joubert, pers. comm.).

Even South Africa may not be immune to changes as the country charts a new, but uncertain political future. At the very least, wildlife department budgets can be expected to fall — probably sharply — as national budgetary priorities change to meet the basic human needs of the country's black population. Unless alternative revenue can be generated to support the high costs of rhino conservation, it is difficult to see how existing standards for wildlife management and protection will be maintained under such circumstances. Rhino poaching is already on the increase in South Africa where dense human population pressures reach the borders of most protected areas (P. Hitchins, pers. comm.).

And what about the other side of the equation for protecting the world's rhinos: stopping the demand of millions of potential rhino horn consumers in Asia and the Middle East? After ten years of research, the market dynamics of the rhino horn trade are just beginning to come into focus, although a number of questions remain outstanding. For example, investigation into potential production from live animals and existing stockpiles of rhino horn have just been initiated, but actual consumption in end-use markets has been quantified in only a few instances. The linkage between high prices, the speculative value of rhino horn, and actual consumption by sick patients has rarely been addressed, and only now are attempts being made to do so. In spite of all of the attention endangered large mammal species arouse, it is rather ironic that so much more is known about markets and demand for millions of other ordinary consumer items. Fifteen years after initiating the international trade ban, the Parties to CITES continue to recognize the need for a substantial increase in market knowledge. After the eighth Conference of the Parties (March 1992), the CITES Standing Committee continued to call for further intensive study to be undertaken before the next meeting in 1994 (Anon, 1992a).

The pronounced tendency to equate ivory trading with rhino horn traffic has long confused the issue. Many embrace the conviction that successes in curbing international demand for ivory can be duplicated for rhino horn. While the primary motive — economic gain — is the same for poachers of both rhinos and elephants and, in the field, anti-poaching operations are essentially the same for both species, the comparison largely ends there. With the exception of the situation in Yemen, the markets for rhino horn and ivory are totally dissimilar, with the two industries differing not only in target consumers but also in organization. Ivory is a

durable luxury item which is marketed most successfully to affluent publics through conspicuous display, whereas rhino horn is a disposable consumer commodity, the use of which is rarely a conscious decision on the part of the users themselves.

The drop in international demand for ivory can be directly attributed to general compliance with the trade ban by the major Japanese, Hong Kong and European ivory importers and their governments. Perhaps of even greater long-term significance is growing evidence that end-use consumers in Europe, North America and, to a lesser extent, Japan, the world's major consuming markets, are heeding the unprecedented "save-the-elephant" publicity campaigns and shunning ivory purchases. In contrast, public awareness efforts on the plight of the rhino appear to have had little appreciable impact on rhino horn consumption in Asia. At the same time, the importers and middlemen who profit from illegal rhino horn trading, with rare exception, remain faceless, mysterious entities to the outside world.

As noted, regulations banning import, export and various aspects of internal trade in rhino horn and other products largely are in place in Asia (Table 2); but still there are no examples where one can say with certainty that all aspects of rhino horn trading and consumption have ended. In Japan and Hong Kong, for example, Western conservationists have been able to promote their message through local conservation organizations and responsive media which function independently of government. Many of the other consuming countries where these needs are greatest today lie beyond the reach of conservation education efforts commonly practised in Western countries, such as those which met with success on the ivory issue. It seems likely that China, North Korea, and several other rhino horn consuming countries would remain impregnable bastions of rhino horn consumption into the next century.

It is questionable whether redoubled efforts in Asia to crack down on illegal internal trade and promote the use of substitutes would effect the behaviour of millions of potential Asian consumers in time to prevent the ecological extinction of some species of rhinos. There is evidence to suggest that consumers may remain ignorant of the fact that rhino horn is an ingredient in the medicines which they take. In South Korea, for example, some doctors have reported that few consumers actually ask for rhino horn themselves (J. Mills, pers. comm.). Where the sales dynamic is rooted in a personal doctor-patient relationship, as it is in South Korea and Taiwan, most consumers come to a doctor with an ailment and take away a prescription of medicine after diagnosis and consultation. In such instances, rhino horn usage results from a doctor's diagnosis, not a conscious demand on the part of consumers. Bearing in mind that rhino horn generally is only prescribed for serious illness, would an ill patient be likely to actually refuse a doctor's prescription, particularly in an Asian context? It is doubtful, and even if the patient were to refuse as a gesture of good faith towards rhinos in far-off lands, the doctor or pharmacist would probably argue persuasively that the horn had been in his possession for many years, as many have claimed in earlier surveys in Taiwan (Nowell *et al.*, 1992a).

Legal issues add a further complicating dimension to the issue. Given that large stocks of horn were acquired in many Asian countries before their importation was specifically prohibited by law, banning possession is not an immediate legal option, even in situations where internal sales are curbed. As is the case within the judicial systems of Western countries, there is no scope for the imposition of *ex post facto* penalties for possession of rhino

horn or other similar commodities in Asian countries. Such legal constraints dictate the instigation of administrative processes to identify and register rhino horn stocks, and, in some situations, establish limited avenues for their internal dispensation. In some cases, regulation of internal markets falls beyond the purview of national wildlife authorities.

In the face of these legal constraints, there is a limitation to the impact traditional law enforcement efforts can have on curbing illegal trade. As opposed to ivory tusks, the relative ease of moving smaller and lighter rhino horns or nondescript Asian medicines across international borders without detection clearly confounds administration and law enforcement efforts to put appropriate control systems in place. Furthermore, many Asian countries have laws against entrapment far stricter than those in the United States, for example, hampering the ability of officials to catch dealers in the act of actually selling rhino horn. With a wholesale value in Asia at least 20 times greater than that for raw ivory by equivalent weight, it is clear that black market economic factors will continue to govern the trade. In all likelihood, even under the best circumstances, rhino horn trading will continue into the next decade.

If the experience of Zimbabwe and other range states teaches anything, it is that, with the current level of investment, the ground war simply cannot be won in the face of sustained poaching pressure, and there can be little doubt that, in time, all remaining rhino populations of any consequence will face such pressure. In spite of the best intentions and efforts of government authorities and their supporters, targeted rhino populations face the spectre of constant attrition. There may be good years with fewer losses, but, under current strategies, ultimately the value of any black rhino bearing horn in the wild belongs not to its protectors, but to the poacher and the middlemen dealers and traffickers. And the message from Asia and the Middle East seems equally clear: the demand for rhino horn remains resilient, the dispensing and consuming publics remain uninformed or apathetic to the declining fortunes of the world's rhinos, and so far attempts to abolish the trade through political or legal measures have met with only limited success.

Future Options for Rhino Conservation

It is not surprising that it is the three African countries with the most rhinos to save and the greatest protection costs to bear — South Africa, Zimbabwe and Namibia — which have taken the lead in charting new ground in rhino conservation. In late 1991, consumptive use options were put on the table when South Africa and Zimbabwe submitted proposals to the eighth meeting of the Conference of the Parties to CITES (Kyoto, 1992) to secure international commercial trade opportunities for rhinos under the Convention; Namibia strongly supported the initiative. South Africa proposed to transfer only its white rhino population, the largest in the world, to Appendix II (Anon, 1992h). Zimbabwe ostensibly proposed to transfer both its white and black rhino populations to Appendix II (Anon, 1992f,g), but indicated a willingness to retain the two species in Appendix I if the Parties agreed to establish a quota for commercial exports of rhino horn and sport hunting trophies under a special resolution.¹⁷ While these proposals were not accepted, the fact that there was virtually no serious discussion of their merits was disappointing — if not irresponsible — given the desperate state of Africa's rhinos.

The motive of the three southern African states is based firmly on the belief that such action will ultimately secure the future of their rhinos. Most importantly, they seek badly-needed revenues to off-set the high costs of rhino conservation, including anti-poaching efforts, without establishing a dependency on the international donor community. Secondly, they hope to open a new economic front in the battle against illegal trade by providing Asian consumers with a stable, legal supply of rhino horn. And finally, outside of protected areas, they want to generate community support for rhinos by providing a legitimate commercial value to the species within the framework of community-based wildlife utilization schemes. These countries argue with reason that currently virtually the entire commercial value of the black rhino is being stolen by poachers.

South Africa, in particular, has been moving towards a strategy of utilizing the rhino's commercial value for some time through safari hunting of white rhino, the sale of live animals of both species to private game ranches, and game viewing ('t Sas-Rolfes, 1990). In the context of community wildlife utilization schemes in both Zimbabwe and Namibia, the rhino is the only large mammal with no legal commercial value. The philosophy of sustainable use underlying these programmes holds that, in order to conserve wildlife in communally-owned areas, local residents must derive economic benefits from wildlife as an incentive to deter, or even reverse, conversion of wildlands to other land uses, such as domestic stock production and agriculture (Martin, 1986b; Cumming, 1990). The decision for impoverished rural people to poach protected species is made according to economics rather than principle (Milner-Gulland and Leader-Williams, 1992). It has been demonstrated in Namibia that former poachers will cease their illegal activities when presented with the opportunity to earn money from wildlife in other ways, such as through employment as game guards or research assistants (Loutit and Owen-Smith, 1989). Zimbabwe's CAMPFIRE programme, in particular, is making progress in generating wildlife-derived income for whole communities located in areas where tourism is not a viable option for conservation. The only economic value rhinos have to local people at present is illegal, and, as mentioned, there is growing evidence of domestic poaching in Zimbabwe.

In the meantime, Kenya has clearly become identified as providing a non-consumptive model for protecting rhinos in the wild. With the hope of reversing the catastrophic decline of the last several decades, in 1984, Kenya began a formal programme of translocating black rhino into specially protected areas, otherwise known as sanctuaries. There is no question that in the context of crisis management, sanctuaries have filled the immediate void in Kenya's rhino conservation programme. In the long-term, however, the issue of how to generate required levels of funding beyond creating dependencies on external donors remains to be resolved. At the same time, other sanctuary-type models are being developed in Zimbabwe, South Africa and Namibia. With the passage of time, shifts in the current focus of rhino poaching in Africa are likely to put the sanctuary concept to test and each individual model will ultimately stand or fall on its own merits.

The plight of the black rhino certainly has reached the point where critical evaluation of all conservation options is warranted. Solutions that are wholly dependent upon external sources must be viewed with caution. Expanding legal commercial value beyond funds generated by tourists visiting the handful of national parks and private sanctuaries where rhino viewing is

more or less assured could, in a manner of speaking, help the rhinos to secure their own future by defraying the steep costs of protection and management. As mentioned, however, in most range states there is currently no mechanism in place to ensure that tourist revenues generated on state lands — much less funds arising from any new schemes — would benefit rhino conservation directly. The normal practice throughout the world is that wildlife revenues — be it sport hunting fees in government-controlled safari concessions or gate proceeds at national parks — fall to the Central Treasury with no tangible benefit to the conservation of wildlife species. Sustainable rhino conservation clearly demands that systemic changes in government practices be made to allow for rhinos to benefit directly from innovative measures designed to enhance their survival.

Rhino Sanctuaries and Conservancies

In recognition of the need to focus available resources, maximize security, and intensify the breeding potential of depleted populations, the idea of conserving rhinos by concentrating them into small, defensible units has been explored by wildlife authorities in a number of African range states. Various models for the development of rhino sanctuaries or conservancies are currently being implemented with varying degrees of success in Kenya, Zimbabwe, South Africa and Namibia. Efforts range from government-managed programmes in protected areas, to collaborative arrangements between wildlife authorities and the private sector, to overt privatisation schemes which shift rhino ownership and conservation responsibilities to private landowners.

Kenya is perhaps best identified as having a successful rhino recovery programme based on the creation of so-called "rhino sanctuaries". Although the translocation of black rhino to Nairobi National Park and Solio Ranch, two of the country's most successful sanctuaries, began as early as the 1960s and 1970s, Kenya's formal programme commenced in 1984. General management objectives call for maximizing breeding output and security to establish a genetically and demographically viable black rhino population of some 2000 animals. While the translocation of black rhino from vulnerable outlying areas into these specifically designated sanctuaries is a feature in the programme, in fact most of the founder stock for other sanctuaries has originated from Nairobi National Park and Solio Ranch. Today, about 70% of Kenya's black rhino population is directly managed under the programme and total rhino numbers in the country have increased by some 20% to 414 animals (Brett, 1991; KWS, 1992).

Defining what actually constitutes a rhino sanctuary in Kenya, however, has been problematic, much less isolating the factors which have made the programme successful. Originally, there were 11 sanctuaries, six of which were completely ring-fenced (four on private land), three more (including one on private land) were partially fenced, while the remaining two (Amboseli National Park and Masai Mara Game Reserve) were open protected areas falling along Kenya's international border with Tanzania. While Kenya's sanctuary programme originally stretched the gamut from artificially contained rhino groups in fenced enclosures to straightforward *in situ* conservation of naturally occurring black rhino in protected areas, in 1992 a decision was taken to re-define sanctuaries as wholly or partially fenced areas where rhino are subject to intensive manipulation. Consequently, Amboseli and Masai Mara are no longer regarded as official rhino sanctuaries.¹⁸

Currently, sanctuaries in Kenya vary in size from 55 km² to 390 km², and rhino numbers range anywhere from 11 to 70 animals (KWS, 1992). In comparison to Zimbabwe, for example, Kenyan habitats are able to support rhino at higher densities, thus small areas make viable sanctuaries. Currently, there are 290 rhino in the nine sanctuaries, which collectively have a carrying capacity of around 500-600 rhino (R. Brett, pers. comm.). Since 1986, the population growth of Kenya's black rhino has averaged about four per cent annually (ARSG, 1992), but breeding success has varied considerably among the various sanctuaries making it difficult to generalize about the best approach. Concentrating rhino numbers alone is not a sufficient guarantee that populations will increase, and one sanctuary has actually seen numbers drop. Laikipia Ranching, a partially fenced, private sanctuary with one of the larger resident black rhino populations, has recorded very few births to date. A biased sex ratio, the possibility of inbreeding depression, and overestimation of original numbers have generally been cited as the causes (H. Dublin, pers. comm.), but remedial manipulation of that population to promote breeding has yet to occur.

On the other hand, Lake Nakuru National Park has seen its rhino population increase by 50% since 1987 and two other sanctuaries, Nairobi National Park and Solio Ranch, have now exceeded their carrying capacities and surplus rhinos need to be removed to restock other areas (KWS, 1992).

Manipulation of rhino populations can lead to some degree of genetic mixing unless carefully managed. Although all of Kenya's black rhinos are of the northeastern subspecies *D.b. michaeli* and stock from other subspecies have not been introduced into the population, management for more subtle genetic traits has not been practised. Consequently, probably 60% of the black rhino in Kenyan sanctuaries are hybrid mixtures of upland and lowland types, the latter of which has adapted to living in tsetse-infested areas by developing resistance to trypanosome infection (KWS, 1992). Ongoing studies are examining the disease resistance of upland rhino introduced into lowland habitats. This work is enormously important as the two sanctuaries which have produced the majority of rhino for translocation (Nairobi National Park and Solio Ranch) are tsetse-free, while most areas to be restocked are lowland habitats.

Some sanctuaries, particularly Aberdares and Lake Nakuru, have benefitted from large-scale investment in the development of infrastructure, particularly fencing and anti-poaching equipment, while other areas have employed few additional inputs whatsoever. In terms of security, some of the private sanctuaries have specially equipped anti-poaching personnel for the exclusive purpose of protecting rhino, while others have no specific provisions of their own but are dependent upon the capacity of wildlife security units operating within the context of broader protected areas.

There has been little poaching of rhino in Kenya since the mid-1980s and inception of the sanctuary programme generally is credited with reversing the previous state of affairs. In fact, rhino poaching in Kenya already had waned largely because rhino densities had been reduced to such low levels that serious poaching had shifted elsewhere. By the early 1980s, most lowland rhinos had long since been devastated by a combination of well-organized Somali gangs and corrupt elements in the Wildlife Conservation and Management Department (WCMD). Subsequently, poaching in Kenya became largely an internal affair, with WCMD personnel making serious inroads on most remaining populations (KWS, 1992). In fact, Dr.

Richard Leakey, the current Director of the Kenya Wildlife Service (KWS) has suggested that 80% of the country's rhino losses directly involved wildlife department employees or officials (Anon, 1990a). Rhinos seemed to hold their own only on a handful of private ranches, which made a serious investment in their protection (some with the support of external funding sources), and a couple of protected areas which were major tourist attractions, particularly Nairobi National Park, one of the three most heavily visited wildlife parks in the country. Under new leadership in the wildlife department, a concerted effort to weed out departmental corruption commenced in 1987. This effort, which has continued within the new KWS, probably has done more to curtail rhino poaching in Kenya than any other single development.

It can be argued that Kenya's rhino sanctuaries have yet to be tested by an external poaching threat, and it is likely that some would not fare well if faced with a crisis of the dimension of Zimbabwe's. The sanctuary programme's coordinator has few illusions in this regard:

"With continuing high demand for horn, the fact that relatively few black rhino (20) are known to have been poached in Kenya in the last five years is hard to account for, though a complete cessation of poaching by staff of the wildlife authority (WCMD/KWS) is a significant factor. There has also been a substantial improvement in security in most National Parks and Reserves since 1989. However, standards of protection against poachers remain barely adequate even in the present rhino sanctuaries..." (Brett, 1992b).

In the event of resurgent poaching, concentrating rhinos into discreet units could make them especially vulnerable to large-scale slaughter. It is worth remembering that the six white rhino in Meru National Park were among the best protected in Kenya at the time: during the day they were attended by armed rangers and each night they were sequestered behind a wooden *boma* at the Park's headquarters. Regardless, in November 1988, all six animals, along with two other fenced black rhino, were killed in a daring raid by armed poachers.

Another issue is the extreme cost of constructing and maintaining sanctuaries. Much of the cost of Kenya's sanctuary programme has been met by external donors. Between 1984 and 1991, a total of 100 million Kenya shillings (approximately US \$5 million) has been provided by conservation groups, including WWF, IUCN, African Fund for Endangered Wildlife, African Wildlife Foundation, Friends of Conservation, East African Wildlife Society, Elsa World Animal Appeal, Zoological Society of London, Frankfurt Zoological Society, People's Trust for Endangered Species, Rhino Rescue Trust, Wildlife Conservation International, David Sheldrick Wildlife Trust, Rhino Ark, and Eden Trust (R. Brett, pers. comm.). Bilateral government donor agencies have made further donations, while the programme's expatriate coordinator is on secondment from the Zoological Society of London. Over half of this money has gone into creating the rhino sanctuaries at Lake Nakuru and Aberdares National Parks. Meanwhile, the private landowners themselves have made considerable contributions to the management and protection of rhinos on their lands, external funds also are needed to augment some of these efforts. Only Solio and Ol Pajeta Ranches appear to be wholly self-sufficient. The exceptional level of external assistance is probably not sustainable in the long-term and, in some cases, Kenya's sanctuary programme could falter if funding support were withdrawn.

While less publicised, South Africa and Zimbabwe also have established similar programmes. Between mid-1986 and early 1989, 174 black rhino were translocated to private properties in Zimbabwe (Du Toit, 1990) and today the country's three established rhino conservancies (others are being formed) and other private holdings now harbour about one-third of the remaining black rhino population. In South Africa about 670 white and 20 black rhino are found on over 80 privately-owned ranches. With over 8,000 game ranches in South Africa (Ricciuti, 1993), the potential for further introductions of rhino onto private lands is great. In Namibia, 55 white rhino, about 60% of the country's total population, also are in the hands of six private landowners. In the latter two countries, privatisation is the principle operative factor whereby rhinos become the exclusive property of individual landowners. In Kenya, black rhino on private ranches remain the property of the state, while in Zimbabwe rhinos are *res nullius*, but utilization options are controlled by the government as the species is designated as "Specially Protected" under the country's wildlife legislation. Some observers clearly believe that the private sector can ultimately play the most effective role in the protection of rhinos if economic incentives exist to make their investment worthwhile ('t Sas-Rolfes, 1990).

In terms of economic sustainability, the privately-owned Save and Bubiana (West Nicholson/Beitbridge) Conservancies in Zimbabwe are potentially the best models in Africa. These conservancies, the creation of like-minded, neighbouring ranchers pulling down cattle fences and collectively converting vast land holdings back to wildlife, combine tourism, sport hunting and other sustainable use options in order to secure a diversified, self-sustaining economic base. Save offers over 3,000 km² of habitat (about eight times the size of Kenya's largest sanctuary) and potentially has a carrying capacity of over 600 black rhino, while Bubiana is 1,300 km² in size and could hold about half as many rhino (DNPWLM, 1992). So far, conservancies have demonstrated a better capacity to protect rhinos from poaching than government authorities in charge of state land. Both Save and Bubiana have reward systems in place for informants who provide information on poachers. Moreover, these conservancies are striving to develop community-based conservation programmes around their borders, which include direct employment opportunities and indirect stimulation of secondary industries, in order to gain popular support from neighbouring communities (R. Du Toit, pers. comm.). Nonetheless, the prospect of wayward personnel poaching rhino cannot be discounted completely. The recent loss of one black rhino and two white rhinos in the Midlands Conservancy in Zimbabwe, for example, has been attributed to an inside poaching job (R. Du Toit, pers. comm.). Another 14 black rhino were poached on a private ranch in Karoi and local personnel are suspected of being responsible (R. Du Toit, pers. comm.), and white rhino have also been poached on private lands in Namibia (Montgomery, 1991).

Developments in Kenya, Zimbabwe and elsewhere show that sanctuaries and conservancies offer promise, but may not provide the ultimate solution to rhino conservation in all instances. In southern Africa, private enterprise has absorbed the bulk of the expense so far, while in Kenya external funding support continues to provide the major impetus. In certain instances, it ultimately may be far more cost effective to leave rhinos in the wild and employ other conservation strategies such as dehorning in combination with increased protection.

Dehorning

The two African rhino species use their horns in sparring and to defend calves against predators, particularly lion and spotted hyena (Leader-Williams, 1989). Namibia's decision in 1989 to dehorn wild rhinos threatened by poaching in the Kaokoland region was a controversial one, provoking alarm and concern in the conservation world over possible negative effects on the species' behaviour (Lindeque, 1990). Ongoing research in Kaokoland and later in Zimbabwe largely has dispelled these concerns. In Hwange, researchers have witnessed dehorned white rhinos successfully defend young from predators, including lion, and three females have given birth subsequent to their dehorning without any apparent complications (M. Kock, pers. comm.; Rachlow, 1993). A dehorned male black rhino was observed to prevail over a horned rival during dominance sparring in Chizarira National Park (R. Du Toit, pers. comm.). Researchers in Hwange have also witnessed a dehorned male white rhino initiate stub to horn contact with a horned rival and dominate the aggressive encounter (J. Rachlow, pers. comm.). Finally, dehorning does not appear to disrupt social organization as dehorned animals have not dispersed from resident areas subsequent to their dehorning (R. Du Toit, pers. comm.), while mother/calf pairs, which became separated during their mother's dehorning, successfully reunited (J. Rachlow, pers. comm.). In Namibia, where dehorned black rhinos have been monitored for about three years, no significant ill-effects have been observed (Berger, 1993).

While these results are promising, questions still remain concerning how dehorned rhino would fare in areas such as the Ngorongoro Conservation Area in Tanzania where predator densities are exceptionally high. While researchers examining this issue are reluctant to make definitive conclusions about the efficacy of dehorning (Berger, 1993; Rachlow, 1993), the tactic once branded as "a harebrained scheme... (of) more than one would-be conservationist" (Martin and Martin, 1982) has now gained legitimacy as a crisis management tool for some of the most significant wild rhino populations remaining on the African continent. Regardless, a number of organizations in the United States, including the Humane Society of the United States, Friends of Animals, the New York Zoological Society/The Wildlife Conservation Society, are on the public record as opposing dehorning.

Most importantly, evidence of dehorned rhinos being spared by poachers is beginning to emerge. In parts of Zimbabwe, where dehorning was accompanied by publicity efforts, there is clear evidence that poachers have temporarily ceased operations. For example, Matusadona National Park was experiencing at least one poaching incursion a week the first half of 1992, losing over 30 black rhino in the process (DNPWLM Operation Stronghold statistics). Once the dehorning exercise was completed in June 1992, for the next six months, not a single incursion is known to have occurred and field personnel directly attribute this to the fact that the rhinos had been dehorned (R. Du Toit, pers. comm.).

Much has been made of the fact that a small number of dehorned rhino have been killed by poachers in Zimbabwe (Begley, 1993) and some have suggested prematurely that this indicates that dehorning does not deter poaching effectively. Table 8 presents data for Zimbabwe on each individual poaching incident involving dehorned rhino as of April 1993. These data show that half of the 14 losses occurred within two months of dehorning. Given the intense poaching pressure in Zimbabwe since mid-1987, it is not surprising that poachers,

the majority of which originate from neighbouring Zambia, would continue to operate in these areas for a period of time without fully appreciating that dehorning had occurred. It is known, for example, that a Zambian poaching gang was actually in Matusadona National Park when the dehorning operation commenced, resulting in the loss of a rhino within days of the animal's dehorning. The first two poaching incidents, resulting in the deaths of three dehorned white rhino, occurred in Hwange National Park immediately following the first experimental dehorning in 1991. As mentioned, this operation was not comprehensive in scope nor was it widely publicized. Moreover, both of the gangs responsible for killing these animals had subsequent opportunities to pursue and kill other rhino, but refrained from doing so, suggesting that a conscious decision not to shoot dehorned rhino had been made (Rachlow, 1993).

It also is interesting to note that of the nine dehorned rhino killed in Zimbabwe for which we have specific details, two had both horn bases intact, two had only the posterior horn bases removed, and five had both horn bases removed (Table 8). If poachers believe that even horn stubs are valuable, then it is difficult to understand why six out of a possible 18 horn bases were not taken. Moreover, in all but two instances, the fact that poachers simultaneously removed ear tags and belting from the radio collars, which have no commercial value whatsoever, indicates a desire to prove to others that these individual rhinos had been "tampered with". In other words, it would appear that poachers were attempting to provide evidence for the expenditure of ammunition and other supplies to prevent accusations of a double-cross when they failed to produce whole horns to their organizers back home.

Regardless of its merits, it must be appreciated that dehorning itself is a costly, short-term crisis management solution, given the current scenario of intense poaching pressure and high black market prices for horn. The operational costs (exclusive of salaries) of Namibia's experimental dehorning of black rhino were US \$960 (2,400 Rand (RD)) per animal in 1989 (Milner-Gulland *et al.*, 1992); while the Kaokoland rhinos inhabit open, arid country offering wide visibility, they occur at very low densities, of the order of one per 200 km² (Lindeque, 1990). Zimbabwe's operation on white rhino in Hwange National Park in late 1991 was far less expensive, US \$426 (Z\$2,112) per rhino (exclusive of salaries) (Kock, 1991), but the park's higher rhino densities and the fact that white rhinos often aggregate worked to keep costs down. The current black rhino dehorning operation in Zimbabwe is expected to be far more expensive, possibly even more costly than Namibia's operation. The dehorning of 15 black rhino in Matusadona National Park cost over US \$1,100 (Z\$5,500) per animal. Where dehorning operations follow a sequential order of events with ground staff used to locate fresh spoor, fixed wing aircraft to locate individual animals, and helicopters employed only for the actual darting exercise itself, costs can be reduced considerably. For example, in December 1992, 19 widely dispersed black rhinos were dehorned in the Save Valley for about US \$600 per animal (R. Du Toit, pers. comm.). Nationwide, total expenditure could exceed US \$350,000 (D. Pitman, pers. comm.). The Department's own assessment indicates that costs per animal have varied between US \$350-1,800 and that there appears to be direct relationship between cost and the density of the rhino population and the experience of the dehorning team (Kock and Atkinson, 1993).

Table 8

Number of Dehorned Rhinos Poached in Zimbabwe as of April 1993

No. Killed	Species	Place	Dehorning (Mo/Yr)	Poaching (Mo/Yr)	Comments
1	White	Hwange	11/91	1/92	Removed both horn bases, ear tags. Later, wounded, but did not pursue 2 other rhino.
2	White	Hwange	11/91	1/92	Removed ear tags, meat, posterior horn bases, but not anterior bases. Later tracked an adult rhino to within 100 metres without shooting it.
1	White	Hwange	11/91	8/92	Removed both horn bases, ear tags and radio collar belt.
1	White	Hwange	11/91	2-3/93	Removed both horn bases, ear tags intact.
1	Black	Matusadona	6/92	6/92	Poaching gang in park at time of dehorning operation; horn bases not taken.
1	Black	Matusadona	6/92	1/93	Removed both horn bases and ear tags.
1	Black	Matusadona	6/92	1/93	Removed both horn bases, ear tags intact.
1	Black	Chizarira	9/92	10/92	Horn bases not taken.
2	Black	Chizarira	9/92	11/92	Details not available.
1	Black	Chizarira	9/92	4/93	Details not available.
1	Black	Hwange	8/92?	1/93	Details not available.
1	Black	Hwange	8/92?	2/93	Details not available.

Sources: Rachlow, 1993; R. Du Toit/G. Tatham, pers. comm.

Moreover, the exercise will have to be repeated periodically, possibly within two or three years time, given the regenerating growth rate of the horn. Adult black rhinos in Namibia annually regrow 9 cm of horn length (total for both horns) (Berger, 1993); data for the regrowth of Hwange's white rhino show growth rates of 6.8-7.0 cm/yr for anterior horns and 2.5-3.4 cm/yr for posterior horn (Rachlow, 1993) or approximately nine percent of the original horn mass (J. Rachlow, *in litt.*). No one has yet calculated what recurrent expenditure would be for the constant dehorning of wild rhinos across Africa, but the data at hand indicate that basic operational costs, excluding salaries and capital investment in aircraft, vehicles, and other equipment, could exceed US \$2 million. Realistically, there is no prospect for meeting these costs year after year.

Two recent studies have suggested prematurely that dehorning rhinos for the sole purpose of preventing poaching may not be a workable strategy. Berger (1993) statistically compared variation in horn size in sample wild populations with that of confiscated horns held by the Namibian government. He concluded that poachers do not target animals with larger horn size and thus would poach for shorter than average horn or even horn stubs. On the other hand, in spite of the variability in individual horn size, Berger's analysis is derived exclusively from examination of whole rhino horns. Consequently, one could argue that this only demonstrates that poachers target animals with whole horns. More importantly, evidence is emerging of instances where poachers have not taken horn stubs and have refrained from shooting rhinos presumed to have been dehorned (Table 8). Another problem in the study concerns Berger's use of end-use market prices to calculate the value of horn after a year of regrowth to demonstrate that there are significant financial incentives to poach dehorned animals. He argues that such horns would have a value of between US \$1,775-7,750 when, in fact, available data indicate that currently poachers only are receiving about US \$100 for whole horns in major black market entrepôts such as Lusaka (E. Sakala, pers. comm.). It is very unlikely that poachers could sell horn fragments at the current market price for whole rhino horns, much less earn profits on the order of Berger's estimation.

In another study using mathematical models, Milner-Gulland *et al* (1992) demonstrate that, given horn regrowth rates noted above, the time interval for which it would be economically advantageous for a poacher to harvest a regrowing horn would be shorter than that of a wildlife manager responsible for dehorning. In other words, poachers would be more inclined to kill rhino when the horns were still relatively short, while managers would want to wait and maximize profits by removing only larger horns. Clearly there is some critical threshold where dehorned rhino once again become attractive to poachers, but this does not invalidate the short-term deterrence dehorning holds for heavily poached rhino populations.

At the same time, the model indicates that regular dehorning may not be sustainable if rhino mortality during immobilization is over 3.7% (Milner-Gulland *et al*, 1992).¹⁹ Concerning this last point, techniques in Zimbabwe have been refined to the extent where mortality during capture and immobilization is now negligible. For example, although overall 7% of the 71 animals immobilised in Hwange in 1991 died, the five mortalities occurred within the first 34 rhinos darted (Kock, 1991). Thereafter, improvements in technique and drug combinations resulted in no further deaths in Hwange in 1991 and, as of April 1993, a further 165 black rhino and 84 white rhino have been immobilized with only one black rhino death specifically

related to dehorning (Kock and Atkinson, 1993). Consequently, overall mortality for both species has dropped to less than two percent, with a direct mortality of 1.6 percent for dehorning (Kock and Atkinson, 1993), and this figure continues to decrease as the dehorning operation progresses.

If dehorning becomes an institutionalized feature in future rhino management, a steady supply of horn will accrue to wildlife authorities in Africa. The dehorning of 59 white rhino in Hwange National Park yielded 240 kg of rhino horn (Kock, 1991) or, looked at another way, between 60-100% of Taiwan's estimated annual consumption. CITES Parties might consider trade options for such stocks, particularly in view of the fact that a somewhat similar solution was agreed by CITES for trade in vicuna (*Vicugna vicugna*) wool. Under strict management protocols, animals from two selected vicuna populations (Las Vicunas National Reserve in Chile and Pampa Galeras National Reserve in Peru) annually are rounded up, sheared of their soft, fibrous hair, then released again into the wild. These populations are listed under Appendix II of the Convention, but with an annotation which strictly limits the scope of commercial trade to finished wool products and nothing else (Torres, 1992). All other vicuna populations remain listed in Appendix I. While the situations are not completely analogous, dehorning exercises for rhino are in principle similar and possibilities for innovative solutions in the same vein should be carefully examined.

Darting Safaris

Dehorning rhino, costly as it is, offers at least one immediate revenue-earning opportunity: the darting/dehorning safari. Development of protocols establishing such options, however, need careful consideration to provide appropriate supervision and prevent serious injuries or mortalities to rhinos during immobilisation. In this regard, an assessment of the practicality of average trophy hunters successfully tracking and darting rhino from close range on the ground (between 15-30 meters depending on the habitat), as opposed to reliance on helicopters, should be a requirement. It is also important to assure that clients are fully competent in the use of a dart gun. So that revenues which accrue from darting safaris are used to benefit rhino conservation, mechanisms to ensure that funds are channelled into the budgets of wildlife departments or community-based wildlife conservation programmes should be formalized. And steps need to be taken to ensure that the primary purpose of dehorning, the deterrence of rhino poaching, is not inadvertently made a secondary priority to earning foreign exchange.

As national policy, there should be little delay in carrying out dehorning in high-risk areas to reach as many rhinos as possible. In other, more secure areas, if the considerations mentioned above can be satisfactorily resolved, darting safaris, under the supervision of an approved veterinary officer, could offer the attractive possibility of earning revenues while reducing the probability of individual animals being poached. Not only would the costs of dehorning the animal be shifted to the private sector, but significant funds also could be realized to meet dehorning costs elsewhere. In other words, a few darting safaris a year potentially could result in revenues sufficient to cover the costs of all or most government-conducted dehorning operations.

Interestingly, the most marketable feature of the darting safari from a general public relations standpoint is that the act of hunting essentially becomes a 'green' activity: the rhino remains

alive with the hunter playing the role of its immediate saviour. Moreover, the obligatory components of the traditional sport hunt, the photograph of the triumphant hunter with the downed animal, as well as the horn itself as a take-home trophy, all remain distinct possibilities within the context of a darting safari.

Currently, there is no legal sport hunting for black rhino anywhere in the world. Consequently, it remains one of the only large African mammals beyond the reach of even the most dedicated safari hunter. While market intelligence remains to determine what a realistic price could be, industry sources indicate that the trophy fee for a black rhino darting safari could be marketed for up to US \$30,000 in the United States if it were kept on a fairly exclusive basis (say about ten or so a year) and clients were able to receive a tax benefit by directing payment through an appropriate US-based conservation organization (J. Jackson III, pers. comm.). In fact, a similar concept for white rhino already is being promoted in Pilanesburg Game Reserve in Bophuthatswana, South Africa: hunters who pay US \$7,000 have been allowed to shoot selected rhinos with tranquillizing darts for the insertion of computer microchip tracking devices in the animal's horn by veterinary authorities or as part of translocation exercises (Anon, 1992i). In such cases, a horn trophy is not an option, but a photo opportunity is a certainty.

Regardless of the benefits darting safaris could offer for rhino conservation, national legislation in some countries where potential clients reside may prohibit the importation of black rhino horn trophies, even if they were obtained on a legal safari. Unless such legislation were amended to allow the acquisition of legitimate trophies, it is doubtful if darting safaris could be marketed successfully in several potential markets around the world. In the United States, with one of the largest constituencies of sport hunters, the black rhino is listed as 'Endangered' under the ESA, a designation which ostensibly precludes the non-commercial importation of hunting trophies. Under the black rhino's current listing, the only option is the use of the ESA's "enhancement" exemption, which effectively gives the Secretary of the Interior broad latitude in determining when an import may be in the best interest of a species' survival; i.e., that the import may "enhance the propagation or survival of the affected species...". In such instances, a determination would have to be made for each individual case and the permit would be subject to public notices and comment (which is standard procedure for all 'endangered' species under the ESA). Such an arrangement would not be without precedent: the importation of bontebok (*Damaliscus dorcas dorcas*) trophies from managed herds in South Africa has been deemed to constitute an "enhancement" for the species and routinely is allowed by the U.S. Fish and Wildlife Service (G. Hemley, *in litt.*).

Trophy Hunting

Apart from being one of the most profitable ways of using wildlife, many believe that trophy or safari hunting offers ecological advantages when compared to other consumptive or non-consumptive alternatives:

"Of all types of wildlife utilization, safari hunting probably has the least environmental impact. Hunters demand a truly natural landscape, they generally require and cause less modification of the habitat than do tourists and they are content with much lower animal population densities. They kill and remove a small proportion of animals from the population" (Kiss, 1990).

For black rhino this option has not been exercised in recent times. Currently, Namibia and South Africa are the only countries in the world which offer safari hunters a chance to shoot a white rhino. In Namibia, about one animal a year is taken on private ranches, while in South Africa, particularly in Bophuthatswana and Natal, a limited number of the country's white rhino are offered by both government agencies and private landowners to affluent local or international hunters able to pay the high fees. In 1989, the average price of a white rhino hunting safari in Bophuthatswana was around US \$23,000 ('t Sas-Rolfes, 1990); by 1992, the average price had increased to between US \$29,000-32,500, including a trophy fee of from US \$17,000-26,500 (depending on the size of the horn) and a minimum 10-day safari fee of US \$5,000 (plus US \$500 per day for extra time) (D. Paul pers. comm. to D. Newton, *in litt.*). Since 1990, 30% of the total cost of a rhino hunt goes to the professional hunter or safari outfitter, and 70% to the landowner, which in most instances is the Bophuthatswana Parks Board (BPB), although at least one tribal village which owns a game ranch has received income. In the case of the BPB, all income derived from rhino safari hunting is retained to cover park management expenses and rhino conservation costs. Surrounding communities in Bophuthatswana have benefitted both directly and indirectly from rhino safari hunting, particularly through the creation of jobs and meat sales.

In Natal the system is slightly different. All hunters must obtain a standard hunting licence from the provincial authorities for 60 RD (US \$22) per person, pay a licence fee of 700 RD (US \$260) to the Natal Parks Board, and a 15-day minimum safari fee of 7,200 RD (US \$2,670). As each rhino is auctioned individually through a tender bid system, there is no set price. It is a very competitive market, therefore offering more rhinos results in lower prices. Current package deals average around 60,000-70,000 RD (US \$22,225-25,925) a hunt, including a few other game species such as nyala (*Tragelaphus angasii*), red duiker (*Cephalophus natalensis*) and wildebeest (*Connochaetes taurinus*) (G. Davies pers. comm. to D. Newton, *in litt.*). Since 1989, the price of a white rhino hunt in Natal has dropped from an average of US \$36,669 ('t Sas-Rolfes, 1990) because of the increasing availability of white rhinos. With legally issued permits, trophies are eligible for international trade under CITES.

White rhino safari hunting in South Africa produces substantial revenues annually for the wildlife authorities and the owners of private concessions. In addition, safari hunters will pay US \$9,000 for a whole rhino mount (about 15-20% of the white rhino shot in Bophuthatswana are mounted in this way) and US \$1,000 for the more common shoulder mount. With small remnant rhino populations, most countries do not consider sport hunting as a possible management option. However, with respect to white rhinos, it has been demonstrated in South Africa that an offtake of about 3% — or one rhino for 33 animals — can be managed on a sustainable basis. Zimbabwe toys with the idea of offering a limited number of white and black rhino in the country's trophy hunting programme. If this becomes policy, Zimbabwe would become the only country in the world where black rhino could be hunted. Although a realistic price remains to be established, the Department has stated that potential trophy fees would be at least US \$100,000 (DNPWLM, 1992b) and possibly as high as US \$250,000 (DNPWLM, 1992a) per animal.

In Zimbabwe, sport hunting of rhino is viewed as a potential option in communal lands where tourism is not possible. One member of Zimbabwe's Parliament has called for the inclusion

of black rhino on the country's list of trophy animals with a trophy fee of Z\$1 million (US \$200,000) per animal split between local communities and an insurance fund for wildlife protection unit officers (Anon. 1991f). In fact, the country's CAMPFIRE Association has requested a small quota for certain areas with black rhino, but the DNPWLM has not taken any decision at the moment. For white rhino, however, the Department has authorised sport hunting on the Iwaba Ranch in the Midlands on a trial basis.

It is doubtful that sport hunting of black rhino would meet with public support in Zimbabwe at the present time. In some quarters, the argument already has been raised about the morality of allowing rich, overseas white hunters an opportunity to kill black rhino at the same time almost 170 black poachers have lost their lives in skirmishes to prevent rhino killing. Furthermore, apart from the public relations aspect of the issue, it is perhaps premature to consider the sport hunting option until a revised population assessment takes place in conjunction with the current dehorning operation. On balance, it has been argued that the removal of post-breeding males from even small populations would not impact on the reproductive capacity of the population (Adcock and Van Veldon, 1992), but conceivably could generate significant revenues and public support for rhino conservation. However, this assumes a knowledge of the existence of individual rhinos within discrete populations which would meet these conditions. Both the Bophuthatswana and Natal Parks Boards in South Africa believe they have such confidence and are moving cautiously towards future black rhino safari hunting options.

Sale of Live Animals

Privatisation schemes for rhino in South Africa are supported by annual rhino auctions under the auspices of the country's wildlife authorities. Since 1986, the Natal Parks Board has offered white rhinos through public auction to private farms and game reserves. Initially, fewer than ten animals were auctioned each year, but over the last four years, the number has increased to about 40 white rhinos annually. Although the average price more than tripled during the first three years and then remained fairly stable at high levels through 1991, the 1992 auction saw the average price for white rhino plummet to below the 1988 price (Table 9). Natal Parks Board officials attribute this to the general downturn in the South African economy, the current drought, and the recent wave of political unrest undermining the nation's confidence in its future (K. Meiklejohn, pers. comm.). However, the lower auction price for white rhino may make them more affordable to more people and the Natal Parks Board expects to maintain high revenues by increasing the number of white rhino in future auctions. Currently, in addition to the white rhino sold at auctions, each year at least another 60 animals are given away or translocated to other conservation authorities or programmes.

Table 9
Average Price Per Rhino Sold by Natal Parks Board

Year	White Rhino		Black Rhino	
	Average Price (RD)	Average Price (US\$)	Average Price (RD)	Average Price (US\$)
1986	10,167	4,459	—	—
1987	14,790	7,250	—	—
1988	4,714	15,293	—	—
1989	48,732	18,600	—	—
1990	48,524	18,735	440,000	169,884
1991	44,188	16,010	161,000 (T)	58,333 (T)
			225,000	81,522
1992	29,175	10,237	460,000	161,404

Key: RD = Rand — = No Sales T = Public Tender

Note: All sales at public auctions except where noted (T).

US \$ prices calculated at average exchange rate for year in question.

Source: Natal Parks Board.

Black rhino only became available to private buyers for the first time in June 1990 when the Natal Parks Board auctioned a founder population of five animals to a privately-owned nature reserve, Lapalala Wilderness, for 2.2 million RD (almost US \$850,000), or around US \$170,000 per head (Anon, 1990b). Since then another 10 animals have been auctioned and five more sold through public tender, although the latter animals were not in prime condition and consequently generated far less revenue. While the average price dropped in 1991 with the purchase of five black rhino by the Sable Ranch, in June 1992, the price per animal rebounded back to over US \$160,000 per animal, again purchased by the Lapalala Wilderness.

At present, the translocation of black rhino from state to private land in Zimbabwe does not involve live animal sales. In a legal sense, the rhinos remain *res nullius* or unowned either by the state or private individuals, but being protected species under Zimbabwe's wildlife legislation, there are restrictions on their exploitation; they only can be hunted, sold or otherwise exploited in terms of a permit issued by the Minister or his authorised designate. Over time, as this programme meets with success and rhino numbers increase, it is conceivable that live rhino sales will become a feature in Zimbabwe as well. While CITES has no authority over internal sales, as possibilities for selling black rhino for stocking private game ranches in other countries in the region grow, allowances for such trade under CITES might be considered.

Similarly, the provision of black rhinos to the international zoo community to enhance captive breeding programmes could also generate significant revenues for rhino conservation. The International Black Rhinoceros Foundation (IBRF)²⁰, which was established to interface with the Zimbabwe government on the provision of twenty black rhinos to zoos in the United States and Australia, subsequently provided the DNPWLM with a Bell Jet Ranger helicopter worth US \$500,000 plus spare parts and a pledge to cover operating expenses on the order of US \$300,000; significantly additional support will be forthcoming in the near future

(DNPWLM, 1992a,b; T. Foose, pers. comm.). While some have questioned whether such transactions constitute commercial trade under CITES, the fact that the breeding programmes are part of an internationally approved effort and that all revenues or material equipment provided by the IBRF are being used directly for rhino conservation activities in a range state should mitigate any such concerns. Future transactions of this order should continue to be treated as non-commercial trade under the Convention.

Trade in Rhino Horn

The reestablishment of legal trade in rhino horn has rarely been considered by conservationists as a solution to poaching in the field, but its efficacy as a legitimate tool to enhance rhino conservation deserves careful evaluation. As early as 1980, at an IUCN/SSC specialist group meeting, the late conservationist Leslie Brown proposed the commercial harvesting of black and white rhinos in South Africa. In his presentation, Brown argued the use of rhino horn supply to depress price in order to take some of the pressure off poaching (Martin and Martin, 1982). Others have reached similar conclusions:

"Theoretical economic models suggest that the sales of confiscated and harvested horn will alter the supply curve and depress the equilibrium price (see Bergstrom, 1990). Assuming that the number of animals killed by poachers is an increasing function of the price of horn (which it is in part, see Milner-Gulland and Leader-Williams, 1992), then legal sales should be a preferred option to destroying or stockpiling confiscated material, or not harvesting (Bergstrom, 1990). Clearly more empirical work is needed on the relationship between commodity prices and demand under legal and illegal trade regimes, but these theoretical models on the economics of crime and confiscation point the way forward" (Leader-Williams, 1992a).

The hypothesis that legal exports of horn could reduce demand for horn from poached rhino on the black market is a credible one and deserves objective evaluation. In considering this proposition, six major issues need to be examined carefully: the actual demand for rhino horn by end-use consumers, the degree to which demand is affected by the legality and cost of the supply, the supply of rhino horn in and available to end-use markets, the role of speculation in the illegal rhino horn trade, the influence both of these factors have on the price retail dealers pay for rhino horn, and the structure of black market trading channels. Few data illuminate all of these variables for individual consumer countries in Asia, including major players such as China and South Korea, but data for Taiwan are adequate to attempt a preliminary evaluation.

Table 10
Estimation of Annual Consumption and Stocks of Rhino Horn in Three Major Consuming Asian Countries

Country	Population	Annual Consumption	Stocks	Comments
Taiwan	22 million	186-397 kg	4,667 kg	Based on 1991 survey of retail outlets.
China	1.16 billion	600-700 kg	8,500 kg	Based on data for rhino horn usage in the manufacture of medicines.
S. Korea	44 million	372-794 kg	?	

Sources: Taiwan: Nowell and Pei, in prep.; China: Martin, 1991; UNEP, 1992; South Korea: estimate is an educated guess based on Taiwan data.

While demand by end-use consumers generally has been identified as the principal operative factor driving the rhino horn trade, where researchers have attempted to quantify actual use of rhino horn, volumes have been surprisingly low (Nowell *et al.*, 1992a; Martin, 1990). Table 10 presents a summary of the data for Taiwan and China as well as an educated guess of what annual consumption might be in South Korea. Estimates of annual consumption for Taiwan and China are based on published data, although the figure for China does not take into consideration direct dispensation of rhino horn through retail outlets, which accounts for some degree of additional consumption. Such trade, however, is believed to be far less significant than the usage of rhino horn by manufacturers of patented medicines, given that the free-dealing private retail pharmacies so characteristic of Taiwan and South Korea have been discouraged and, for the most part, were absent under the Chinese political system. While the situation may be changing, so far, there is evidence of direct dispensation of rhino horn for only three regions in China, parts of Guangdong Province adjacent to Hong Kong, in Chengdu, and very old stock in Xian (Low, 1991; Martin, 1989; Martin, 1991a.²¹ Few data exist to estimate annual consumption in South Korea, but in terms of market organization and sales dynamic the situation is very similar to Taiwan, with the dispensation of most rhino horn through private retail outlets. Estimates for South Korea in Table 10 are based on the untested assumption that Taiwanese rhino horn consumption variables can be applied to South Korea, a country whose population is twice as large as Taiwan's.

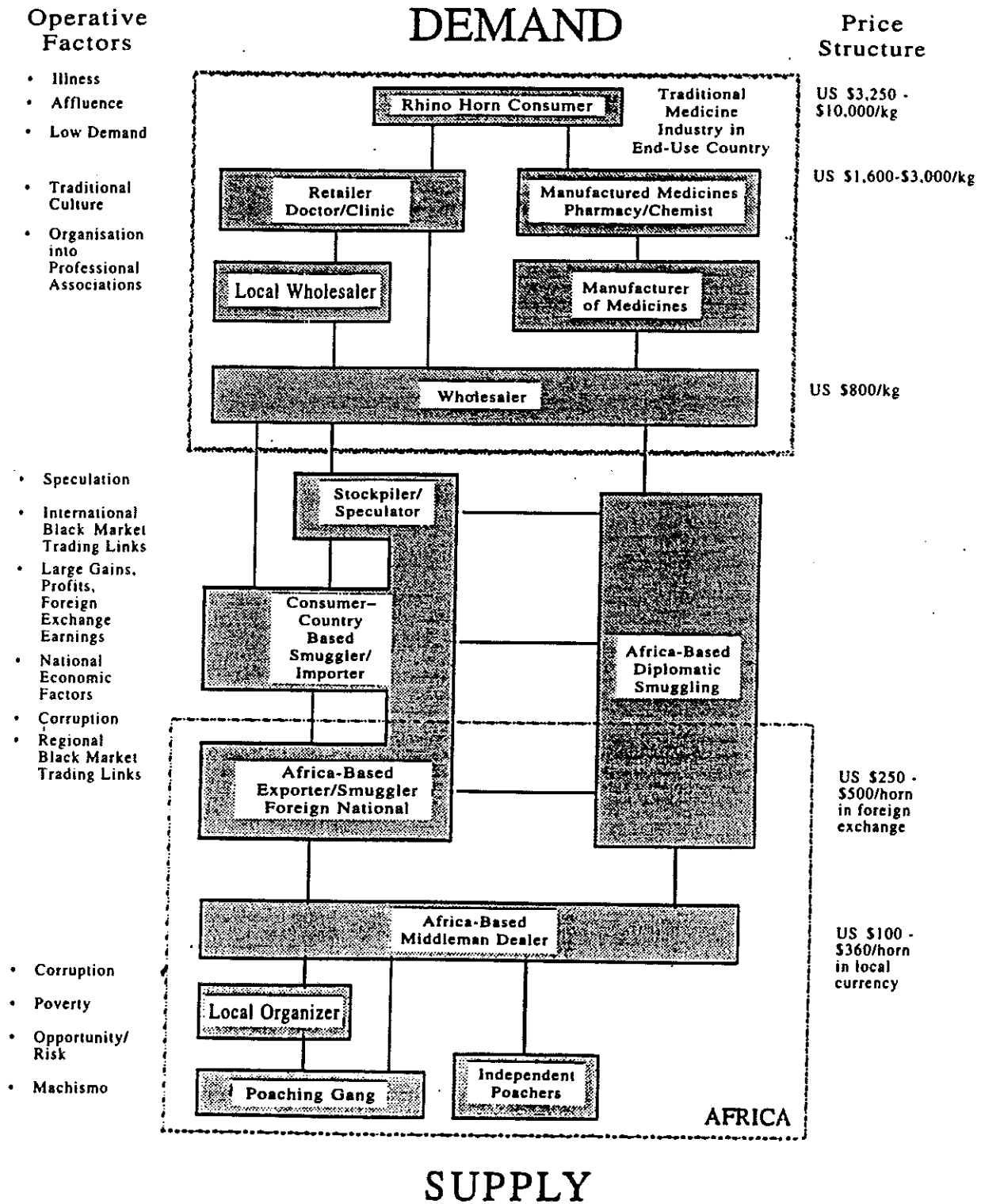
It is evident that rhino horn supply has outpaced actual consumption in some of the principal consuming countries in Asia. Researchers have documented the existence of large stocks in the hands of retail dealers in both Taiwan (Nowell *et al.*, 1992a; Nowell and Pei, in prep.) and manufacturers in China (Martin, 1990), which at present consumption rates are estimated conservatively to last 12-25 and 12-14 years, respectively (Table 10). The existence or extent of stockpiles in the hands of individuals outside of the traditional medicine industry remains unknown. Law enforcement activities in South Africa, where Taiwanese nationals have been apprehended with large consignments of rhino horn on several occasions (Lategan, 1992), and more recent confiscations of rhino horn in transit in the Netherlands and Hong Kong to Taipei, provide continuing evidence of rhino horn movement on to the island. In fact, 68% of the 282 rhino horns confiscated by South Africa's Endangered Species Protection Unit during a 12-

month period beginning in October 1990 were retrieved from Taiwanese operatives (Anon, 1992m). Unsubstantiated stories of huge rhino horn shipments, up to 6,000 kg, reaching Taiwan and the Chinese Mainland in recent years have been reported, but 'hard' evidence is lacking to confirm that these transactions actually took place (Vigne and Martin, 1989; Nowell *et al.*, 1992a).

Persistent stockpiling in the face of low consumer demand could be indicative of a strong role for speculation in the illicit rhino horn trade. While a number of studies have mentioned speculation as an operative force, none have addressed the issue directly. However, evaluation of retail level prices for rhino horn in Asian markets provides further evidence that speculation is far more significant than previously recognized. A number of studies have documented a rapidly increasing rise in the retail price of rhino horn in key Asian markets: in 1991, in Taipei the mean retail price had increased by 560% since the import of horn was banned officially in 1985 (Martin and Martin, 1991; Nowell *et al.*, 1992a). Similarly, the average retail price in South Korea almost tripled within two years after the import of rhino horn was prohibited in 1986 (Song and Milliken, 1990). The continued widespread availability of rhino horn in these two countries (Song and Milliken, 1990; Martin and Martin, 1991; Nowell *et al.*, 1992a) suggests that the price increase cannot be attributed with confidence to a major drop in supply. This is contrary to the situation found between 1980-1982, when, despite a sharp decline in the amount of new rhino horn believed to be entering world trade, retail prices increased only slightly, generally keeping pace with inflation (Martin, 1983).

Figure 3

Flow of Rhino Horn Through Black Market Channels to End-use Consumer in Asia



The illegal trading networks which connect Africa to Asia have been alluded to in many reports (Martin and Martin, 1991), but apart from information obtained in conjunction with law enforcement efforts most activity remains underground. Figure 3 attempts to present a visual conceptualization of the flow of rhino horn from impoverished African poachers to affluent Asian patients. The multi-tiered structure, shown in conjunction with rhino horn pricing indices and the operative forces driving the different trade levels, is a generic construction based on a range of law enforcement information and trade material. Generally speaking, the diagram illustrates Africa-based (primarily Zimbabwe/Zambia) and Asian end-use (primarily Taiwan) country components connected by middle-level international trading links; the diagram is not applicable to the end-use market trade in Yemen.

The structure of the traditional medicine industry in Asia, the last few links in the trade, is fairly well-documented in Taiwan (Nowell *et al.*, 1992a,b), and information concerning the dynamics of Zambian poaching gangs at the other end of the spectrum is beginning to emerge (N. Mumba, E. Sakala, M. Murphree, pers. comm.). Ultimately, these are the most important variables for establishing the economic parameters in the black market trade. At the same time, many of the specific details behind the flow of rhino horn through the many hands of African and foreign middlemen dealers and speculators in between remain largely unknown. In reality, a whole range of black market trading networks exist. On the one hand, some are probably far more complex and rhino horn conceivably exchanges hands more than one time at each generic level of trade depicted in Figure 3. On the other hand, well-established operations, including diplomatic smuggling, probably are able to move rhino horn from Africa to an end-use market circumventing most middleman connections altogether.

While many variables clearly are operative in the maze of black market rhino horn trading, it is evident that profit margins increase the further the horn moves away from the source (Table 11; Figure 4). One is struck by how cheaply rhino horn exchanges hands between a poacher and an African-based middleman dealer. As mentioned, available data in 1992 indicate that during the first round of exchanges between a poaching gang leader and a Lusaka middleman, for example, rhino horns are purchased for the equivalent of about US \$100-\$360 each in local currency (M. Murphree, E. Sakala, pers. comm.; E. Kanyama, on film). Moving along with a hypothetical sketch, a Taiwanese buyer based in South Africa may pay roughly double the original price of the horn but often in foreign currency, which provides an extra bonus for the Lusaka middleman when converted on the black market (N. Mumba, pers. comm.). Only at this level of trade does the concept of horn weight and price begin to emerge. Little is known about subsequent transactions until the horn enters the traditional end-use market. In 1993, Taiwanese importers were selling rhino horn to wholesalers for about US \$800 per kg (J. Loh, *in litt.*), while the wholesale price to retail dealers, the last link before dispensation to a consumer, in recent years has ranged from US \$3,000 per kg in 1991 to US \$1,600 per kg in late 1992 (Nowell *et al.*, 1992a; Manning, 1993). At the same time, a Taiwanese retailer purchasing a kilo of rhino horn at that price ultimately could expect to gain up to US \$10,000 at 1991 retail level price (Nowell *et al.*, 1992a), but the small sales volume (of roughly 50 grams annually in Taiwan) means that annual returns will be incremental and clear profit is realized only after seven years; the full value of the investment could take as much as 20 years to capture.

Table 11

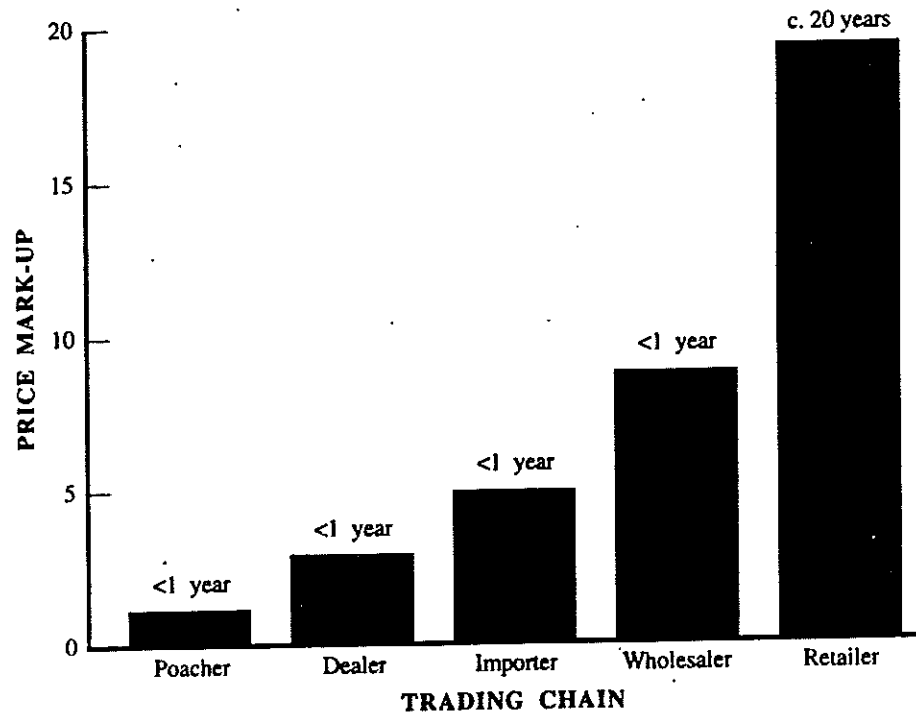
Rhino Horn Price Combinations per Kg in US Dollars as Cited in Published Reports

Year	Horn	Poacher	Dealer	Importer	Wholesaler	Retailer	Route	Source
1978	Af		300		675		Kenya-N. Yemen	Martin 1980
1978	Af		50	303			South Africa-Japan	" "
1979	Af		286	450			Tanzania	Martin & Martin 1982
1979	Af	135			341	1,478	Kenya-Japan	Martin 1980
1980	Af			383	1,190	1,620	Japan	Martin 1983
1982	Af			500	700	835	Sudan-N. Yemen	Martin 1984
1983	Af	370		700	870	1,190	Kenya-Sudan-N. Yemen	" "
1983	Af		460		750		South Africa-Taiwan	Martin & Martin 1989
1984	Af			450	705		Djibouti-N. Yemen	Martin 1985
1979	As				4,433	17,090	Taiwan	Martin 1983
1979	As				6,500	11,615	Hong Kong	" "
1979	As				2,200	11,782	Thailand	" "
1980	As				8,000	12,810	Myanmar	" "
1980	As	1,145			6-9,000		India-Far East	" "
1986	As	2,600	8,000	9,000		23,929	India-Singapore	Martin <i>et al</i> 1987
1987	As	8,000				40,558	India-Taiwan	Vigne & Martin 1991a
1989	As	6,250			45,000		India-Taiwan	Martin & Martin 1991
1989	As	7,300				40,558	Sabah-Taiwan	Martin & Martin 1989
1989	As	6,630			15,470		India-Singapore	Martin & Vigne 1990
1991	As	9,000				62,445	Nepal-Taiwan	Martin 1992b

Key: Af = African Rhino Horn As = Asian Rhino Horn

Figure 4

Price Mark-up as Multiples of Poacher's Price for Rhino Horn at Different Stages of the Trading Chain (bar labels indicate time taken to recover investment)



Comparison of the price paid for rhino horn during the various rounds of exchange indicates that the greatest short-term profits are had by the middle-tier players, the black market smugglers responsible for collecting the horn in Africa and moving it into the traditional market structure of an end-use country. That is to say, for example, an African-based Taiwanese syndicate with the capability to move rhino horn directly to wholesale dealers in Taiwan could turn an investment of as little as US \$200 per kg plus transport costs between Africa and Taiwan into something on the order of US \$2,000 per kg in a relatively short period of time. It is worth remembering that members of the traditional industry in end-use markets in Asia are rarely involved in the direct importation of rhino horn, so they are essentially a captive market forced to rely on black market importers and suppliers for the procurement of stocks at premium prices (Nowell *et al*, 1992b).

While data may be less precise for other countries, the situation in Taiwan in 1991 seems fairly clear: relatively low demand, abundant supply (and possibly increasing), and rising prices were coupled with aggressive, well-established black market trading links to African sources (Nowell *et al*, 1992a; Lategan, 1992). Under 'normal' supply/demand interactions, commodity prices decrease in the event of chronic oversupply. In fact, it can be argued that Taiwan's rhino horn trade has existed in a micro-economic bubble of its own making: speculative buying within the context of illegal trading keeps the value of rhino horn artificially — if not astronomically — high. The perceptions of the Taiwanese traditional medicine practitioners themselves lends further credence to this view. A number of retail pharmacists interviewed in Taiwan attributed the high price of rhino horn to growing

appreciation of its illegality and increasing rarity (Nowell and Pei, in prep.). Nowell *et al* (1992a) wrote: "because of both the perceived imminent extinction of the rhino and the fact that rhino horn may be stored for a long time without much risk of decomposition, traders see it as a solid investment". In fact, it appears that the 1991 survey results of Nowell *et al* (1992a) reflect the curve at its peak and that subsequently oversupply and low demand factors have led to a significant decrease in price. In late 1992, spot checks in Taipei's principal traditional medicine market found wholesale prices for rhino horn ranging from US \$1,600-2,308 per kg (Nowell and Pei, in prep.; Manning, 1993). This represents a 23-47% reduction in the 1991 price of US \$3,000 per kg (see Nowell *et al*, 1992a). Wholesale dealers attributed this development to an oversupply of rhino horn on the market, other more attractive investment opportunities, and capital flight factors (Nowell and Pei, in prep.). These survey results were obtained just prior to the international campaign against Taiwan's rhino horn trade and the subsequent imposition by the government of measures to ban internal use. Since then, at least one Taiwanese wholesaler has reported that rhino horn prices have increased, but trends are inconclusive at this point (J. Loh, *in litt.*).

In the face of low demand factors in Taiwan and possibly other markets, allowing speculators and black marketeers the unchallenged ability to monopolize the rhino horn trade entrenches the disturbing syndrome of rhino poaching in Africa and rhino horn stockpiling in Asia. In essence, the current arrangement lends itself to a classic rendition of the economics of extinction. Traditional medicine practitioners in Taiwan, for example, openly report that the price of rhino horn is very high because import is prohibited (Teng, 1992). It can be argued that only a loss of profitability for the middlemen dealers in the illegal rhino horn trade would engender a reluctance on their part to continue investing in poached horn. This suggests that the primary objective of any attempt to reestablish a legal rhino horn trade should not only be a reduction in demand for horn taken and traded illegally, but also a major reduction in the market price rhino horn currently commands in end-use markets.

Because the price structure of the black market's key middle tiers is poorly known, it is difficult to attempt to fix a strategic threshold price for legal horn if a low-value trade scenario were ever to be tested. However, it can be argued with reason that legal stocks of rhino horn should be marketed directly to end-use market wholesalers or retailers at prices comparable with or lower than the current African-based buyer's price in first level entrepôt states, (i.e. the "Lusaka price"). This reasoning stands in sharp contrast to the basic assumptions underlying proposals to resume a legal trade to date. Zimbabwe's DNPWLM, as well as the Natal Parks Board in South Africa, have measured the value of their rhino horn stockpiles against current Asian wholesale prices and, in the event of future sales, hope to capture the full market value. Published position statements generally use around US \$2,000 per kg when calculating potential revenue from rhino horn sales (Anon, 1992g). Even though this price represents a reduction by one-third of the 1991 wholesale price in Taiwan (Nowell *et al*, 1992a), it is still sufficiently high to allow for the continued profitability of rhino poaching and black market trading. (In the meantime, as noted, a marked decline in wholesale prices had occurred by October 1992 in Taiwan.) It is unlikely that the maintenance of current black market prices for rhino horn would work against the economic forces which drive poaching. Indeed, the introduction of a competitive legal trade under such circumstances may even cause poaching to intensify. It is also reasonable to assume that revenues generated for

wildlife departments from high-value legal sales would be lost to increased expenditure on anti-poaching and law enforcement efforts. And more fundamentally, in many countries at the present time such revenues would not even be retained by the competent wildlife authorities, but would be lost to the Central Treasury unless radical changes in current revenue channelling practices are implemented.

Although generating increased funding to support effective rhino conservation is a legitimate goal in and of itself, deeper economic analysis may show that the emphasis on selling rhino horn should shift from one of realizing maximum profits at current Asian prices to calibrated strategies designed to undermine the grossly inflated black market pricing structure in Asia and reduce the poaching threat in range states. It can not be over-emphasized that, like dehorning, the primary objective of any attempt to reestablish legal trade in rhino horn should be to reduce poaching. While dehorning decreases the likelihood that the poacher will meet with success in the field, reducing the value of rhino horn which continues to reach the black market further impacts on the profitability of the trade. Computer models have demonstrated that the poaching of rhinoceros and elephants will decline only when some critical threshold is reached whereby the risks begin to outweigh potential gains for poachers (Milner-Gulland and Leader-Williams, 1992) and, presumably, this also applies to other players in the black market trading structure.

While there is merit in pursuing law enforcement and consumer education initiatives in Asia, nonetheless it is difficult to conclude that such efforts will take effect in time to make a positive contribution to the conservation of rhinos in the field. Moreover, there is a strong probability that half-measures will only serve to enhance the black market cachet of rhino horn and fuel speculation. The proposition of a rhino horn trade in the context of a tightly controlled marketing system at prices well below current black market prices in Africa deserves close scrutiny. To prevent speculative buying by individuals either outside or inside the traditional medicine industry, exclusive purchase arrangements with *bona fide* wholesale or retail dealers would have to be a feature in the marketing system²², and limiting the sale of horn to powder, a form acceptable for usage in medicines by retail pharmacists but not conducive to high-value resale, could provide additional safeguards. A concerted effort to publicize the opening of a legal avenue for trade would be necessary to send a clear message to speculators, investors and middlemen that they no longer monopolize rhino horn supply and that range states are reasserting control. Under a low-value price scenario, it goes without saying that rhino horn sales would generate only marginal revenues (if any at all), and it is likely that marketing operations would have to enjoy government subsidies in order to function. One solution, however, could be to engage an international agency to subsidize a controlled rhino horn trade to allow for high-value purchase from legitimate authorities in range states and low-value sale to eligible dealers in end-use markets. In this way, the aspirations of certain southern African range states could be met, while simultaneously pursuing a strategy to undermine the price of rhino horn on the black market.

If legal trade in rhino horn were resumed, would legal supplies in Africa be able to meet demand? This issue is critical to the ability of any trading scenario to usurp the black market trade and lead to a reduction in rhino poaching in range states. The fact that there is a documented surplus of rhino horn among retailers and manufacturers in at least two major

markets, Taiwan and China, indicates that matching actual consumption levels would not be required until existing stockpiles have disappeared sufficiently, an event likely to take over a decade. Moreover, it is possible that the activation of a legal trade in rhino horn at prices well below the black market value would instigate a spate of panic selling by those outside of the traditional medicine industry speculatively holding rhino horn. Such action would release additional quantities of rhino horn into the system further limiting the need for the introduction of new horn. Currently, rhino horn stocks held by wildlife authorities in African range states are estimated to amount to over 6 tonnes, and these stocks continue to increase every year through the recovery of rhino horn from natural mortalities, law enforcement operations and dehorning. Additional rhino horns are in the hands of government authorities elsewhere around the world.

Another question which remains to be answered is whether demand for rhino horn would increase if avenues for legal trade were established. Currently, because of the high investment retailers must make to keep rhino horn in stock, economic logic dictates that it is in their interest to prescribe as much horn as possible in order to recapture their initial investment and generate profits quickly. As mentioned, however, average rates of dispensation remain very low in Taiwan, for example, indicating that most dealers are reluctant to dispense rhino horn gratuitously in situations for which it would not otherwise be prescribed. In other words, rhino horn only is used for specific ailments and available evidence suggests that most doctors remain true to their medical traditions. On the other hand, if price currently was an inhibiting factor, cheaper supplies could lead to increased consumption because rhino horn medicines would become more affordable. Clearly, routine monitoring in end-use markets would need to be an on-going feature of any legal trade equation so that adaptive management strategies could be affected in response to any worrying consumer trends.

The effect that legal exports of African rhino horn would have on demand for Asian rhino horn is unknown, but also deserving of careful consideration. It is possible, however, that the effect would be negligible. The medical community in Taiwan and possibly other countries distinguishes between Asian and African horn, and dealers pay much higher prices for the former as it is believed to be more powerful (Nowell *et al.*, 1992a; Leader-Williams, 1992a; E. Martin, pers. comm.). Should retail prices of African horn fall substantially, some medical dealers might attempt to boost sales of the more expensive Asian horn. On the other hand, Asian horn already commands a price which is up to 12 times more expensive (Nowell *et al.*, 1992a). It seems apparent that even now only the most wealthy patrons can afford it and opportunities for market expansion are limited.

CONCLUSION

There are no easy solutions to stem the decline of rhinos in Africa and prevent rhino horn trade in consuming markets around the world. In the absence of proven long-term successes, all available options, whether traditional strategies which have been practised over the last 15 years or alternative strategies currently being developed in a number of range states, have associated risks. Crisis management options for rhinos in the field, such as dehorning and the creation of rhino sanctuaries, while perhaps beneficial in the short-term, do not provide lasting solutions and will require high levels of recurrent expenditure. Political solutions which rely on stricter legislation and law enforcement practices may suppress poaching in range states

and demand in consuming countries, but neither will be eliminated. Equally, large-scale public awareness and consumer education efforts in end-use markets have never been attempted and would have to be viewed as experimental exercises in the initial stages. Treating rhino horn usage as a social issue raises the challenge of affecting large-scale social and cultural change in the behaviour of potentially millions of traditional medicine practitioners and their patients, hopefully within a single generation if rhinos are to benefit. And finally, the merit of radical economic solutions, which hope to harness basic market forces for the benefit of rhino conservation, ultimately will only be known if there is a will to test them. Any such move, however, would require an unprecedented measure of multi-national cooperation as well as fundamental changes in the way rhinos are currently treated under CITES and the national legislation of most range states and consuming countries.

Rhinos face a grave crisis and those who purport to hold the survival of the five species above everything else must be prepared to examine all available options with open minds and a will to seek lasting solutions. Zimbabwe's black rhino population, and probably those of most other countries, is likely to see the next century only through a massive regimen of dehorning, concentration into sanctuaries, conservancies or IPZs, and increased anti-poaching and law enforcement efforts in the field, supported by a concerted strategy to understand and impact rhino horn supply and price factors in consuming countries, including acceptance of the possibility that restricted avenues of trade may be part of the solution. As the rhinos enter perhaps their final hour, to let the dictates of dogma foreclose on any option before it has been thoroughly examined would be irresponsible and will certainly abet the rhinos' further slide into oblivion.

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ACRONYMS USED IN THIS REPORT

AERSG	African Elephant and Rhino Specialist Group
ARSG	African Rhino Specialist Group
BPB	Bophuthatswana Parks Board (South Africa)
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CIO	Central Intelligence Organization (Zimbabwe)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora in Commerce
DNPWLM	Department of National Parks and Wild Life Management (Zimbabwe)
ESA	United States Endangered Species Act
IBRF	International Black Rhino Foundation
ID	DNPWLM Investigations Division
IPZ	Intensive Protection Zone (concept in Zimbabwe Black Rhino Conservation Strategy)
IUCN	The World Conservation Union
KWS	Kenya Wildlife Service
ROC	Republic of China (Taiwan)
SSC	IUCN Species Survival Commission
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce
WCMD	Wildlife Conservation and Management Department (Kenya)
WWF	World Wide Fund for Nature

CURRENCIES USED IN THIS REPORT

RD	South African Rand
US \$	United States Dollars
ZK	Zambian Kwacha
Z\$	Zimbabwe Dollars

NOTES

1. During the 1970s, the IUCN/SSC specialist groups for African rhino and elephants were independently established. In 1981, these groups merged to become the IUCN/SSC African Elephant and Rhino Specialist Group (AERSG). In 1991, this group once again split into two parts, giving rise to the African Rhino Specialist Group (ARSG).
2. It should be noted that although the Chirisa Safari Area/Chizarira National Park are in fact part of the Sebungwe complex, in this prioritization scheme the AERSG choose to treat these two contiguous components separately from the other parts of the Sebungwe.
3. Due to the drastic decline in black rhino numbers, the ARSG found it expedient to devise a new prioritization scheme to identify key populations. Black rhino populations in the Cameroons, Damaraland and Etosha in Namibia, and Hluhluwe-Umfolozi and Kruger National Park in South Africa received the highest ranking. The criteria used were: population size was over 100 animals and the population trend was increasing or stable; or the population represented more than 50% of a black rhino subspecies (which was the case of the Cameroon population). The Selous and Hwange, along with Itala and Mkuzi Game Reserves in South Africa, Nairobi National Park in Kenya, and two private ranches, Midlands in Zimbabwe and Solio in Kenya, also were designated key populations, but with lesser rankings.
4. Oman has been cited as another country where rhino horn daggers are carved, but researchers have failed to substantiate such claims (E. Martin, pers. comm.).
5. North Korea's internal market remains a mystery and has never been properly surveyed due to the closed nature of the country. Nonetheless, traditional medicine remains a potent force and North Korean diplomats have been implicated in rhino horn smuggling in Africa (Anon, 1992a; Anon 1992b).
6. The later estimate is based on rhino mortalities in Africa rather than estimates of Asian imports, and assumes that only 50% of rhino deaths were the result of poaching and that the recovery of horn from natural mortality was 14% (Martin and Ryan, 1990). Others have questioned these premises, particularly the percentage of poached rhinos in overall mortality calculations, and feel that these figures underestimate true rhino horn trade volumes and rhino losses in Africa (Western, 1989; Leader-Williams, 1992a).
7. Nowell et al (1992a) surveyed 2,578 retail pharmacies throughout Taiwan and found rhino horn to be available in 77%, indicating that the number of retail shops actively trading in rhino horn number some 9,500 on the island (Nowell and Pei, in prep.). Based on an average annual dispensation volume reported by 50 pharmacies of 42.38 grams (with a Standard Deviation of 31.88 grams), Nowell and Pei (in prep.) estimate annual consumption at between 186 to 397 kg a year: the lower figure includes the percentage of shops surveyed by Nowell et al (1992a) which had whole rhino horns or pieces of horn in stock, while the higher figure adds those outlets only trading in pre-ground rhino horn powder, the authenticity of which cannot be verified visually.
8. This situation is as common in the West as it is in Asia. For example, in spite of overwhelming public support for whale conservation, the United States has experienced similar difficulties with respect to scrimshaw (sperm whale teeth) products. While the U.S. Endangered Species Act (ESA) prohibited commercial sale, in 1976, Congress allowed a three-year exemption in order to provide for the disposal of scrimshaw products held prior to the prohibition, regardless of their ownership. This exemption was extended in 1979 and again in 1982 because scrimshaw stocks were still in existence. In fact, in administering the exemption "not only those who held such products in December 1973, but all their subsequent purchasers were equally entitled to the exemption. To limit the administrative and enforcement difficulties inherent in an exemption for an ever-increasing population of beneficiaries, Congress in 1982 prohibited, as of January 31, 1984, the sale of scrimshaw products, except by persons who had been the original beneficiaries of the 1976 exemption and only if they held the products sold on the date of the 1982 Amendments [emphasis added]" to the ESA (Bean, 1983). Thus, although the scope of commercial trade has been limited and sales volumes have decreased, the sale of scrimshaw products continues to this day in the United States. Another good example are ivory products which continue to be sold legally in the United States and the United Kingdom, two nations which vehemently championed the ivory trade ban under CITES. While ivory dealers in those countries may have an extra legal burden to provide documentation certifying that their products were obtained before national legislation prohibited ivory imports, there has been no attempt to prevent commercial sales altogether and it is doubtful whether this could be done legally.
9. Whenever TRAFFIC Japan investigated the display of rhino horns in the show windows of traditional medicine shops, they were found to be old stock imported before the 1980 import ban. For example, one such establishment monitored in Tokyo since 1979 continuously displayed the same black rhino horn up until March 1992, the most recent occasion the shop was visited.
10. This represented only about one-third of one percent of the total number of dagger handles produced by Yemeni craftsmen in 1992 (E. Martin, pers. comm.). Nonetheless, even this reduced level of production would require about 200 kg of rhino horn or the horns of approximately 60-70 rhinos.

11. But et al (1990) examined the anti-pyretic effects of rhino, saiga antelope, water buffalo and domestic cow horn. Next to rhino horn, Saiga antelope horn was found to be the second most effective substance for reducing fever.
12. For large extensive areas the only practicable method used to date has been aerial census, however, aerial survey techniques produce very wide confidence limits due to the solitary habits and low density of the species (Goddard, 1967b). With wide confidence limits, repeat counts of black rhinos in large areas are of doubtful use in describing population trends (Borner, 1983). In addition, the lack of visibility of rhinos in woodland has produced an extensive debate on the extent that rhinos may be under-counted, and therefore on the size of any correction factor to be used. Crude estimates from counts have been corrected by factors varying from 1.5 to 7 (Goddard, 1967b; Western, 1982; Borner, 1983; Douglas-Hamilton et al 1979), so it is anyone's guess as to the actual size of a "corrected" aerial estimate. Where helicopters are used, rhino counts appear to be more accurate; under such circumstances, using fixed-wing aircraft correction factors does not seem to be appropriate at all (Du Toit, 1989b). The only really accurate method of counting rhinos used to date is that of individual recognition, but this is very time-consuming and can only be employed in relatively small areas (Klingel and Klingel, 1966; Goddard, 1967a; Hitchins, 1968; Hamilton and King, 1969; Mukinya, 1973; Western and Sindiyo, 1972; Leader-Williams, 1988).
13. During this survey, a number of variables were taken into consideration when analyzing the raw data: correction factors of 1.5 and 2 were used for helicopter and fixed wing aircraft counts respectively; the counts for some areas were reduced by 40% where ground knowledge was superior to the aerial survey data and where census extrapolations were believed to overestimate numbers; and all estimates were rounded off to the nearest 50 animals for numbers greater than 100 or to the nearest 10 for numbers under 100, except for black rhino populations in Matobo National Park or on commercial farms, where exact numbers were given.
14. The lowest price represents the most current data available and was obtained by Zambia's Species Protection Department in December 1992. The Department's undercover agents directly interacted with two poaching gangs based on the Zambian side of Lake Kariba and were told that rhino horns were selling for the equivalent of US\$ 100 per horn in Zambian kwacha (E. Sakala, pers. comm.).
15. In September 1985, the ARESG agreed that all countries should draft national conservation plans for the black rhino. Together with Zimbabwe, South Africa and Namibia (Brooks, 1989) and Kenya (Brett, 1992a) were among the first range states to do so. It is believed that most other range states will develop action plans for consideration at the United Nations Environment Programme (UNEP) meeting of donor countries, rhino range states and rhino horn consuming countries scheduled for June 1993.
16. In fact, the translocation of black rhino to ex situ breeding programmes has not been as successful as envisaged initially. Three of the ten rhino sent to the United States subsequently died apparently of marked biliary stasis in their livers (Miller, 1992). Of the ten animals designated for Australian zoos, three ultimately died of a syndrome frequent in black rhino characterized by toxic hepatotoxicity and haemolytic anaemia: one female while still in Harare, a male during quarantine in the Cocos Islands, and another female after arrival in Australia. The only other male died of head injuries and heat stress upon release in its holding pen, leaving six surviving females. Apparently, male black rhinos are being imported from the North American zoos to sustain the Australian breeding programme (D. Callister, *in litt.*; T. Foose, pers. comm.).
17. Since 1983, CITES has provided a special exemption to allow for the non-commercial export of African leopard (*Panthera pardus*) skins under a quota system for individual countries even though affected populations remain on Appendix I. This precedent was cited by Zimbabwe as an acceptable example of how CITES could accommodate rhinos in a future trading scenario, but the scope of the exemption would have to be broadened to include commercial exports of a specified nature.
18. The appropriateness of Amboseli National Park as a designated rhino sanctuary was becoming increasingly difficult to justify in view of the intensive habitat modification which has been caused by the Park's overpopulation of elephants, the poor breeding record of the resident rhino group, and the continuing loss of rhino to poaching. Once prime black rhino habitat, Amboseli may now be unsuitable for the species given that few woodlands remain and most other browsers, including Giraffe *Giraffa caelopardalis*, Impala *Aepyceros melampus*, and Lesser Kudu *Tragelaphus imberbis* have been reduced or totally eliminated as a consequence (Ricciuti, 1993). Moreover, the Amboseli population has continued to be plagued by rhino poaching, possibly as a consequence of the poor relations between the Park's management and the surrounding communities. In late 1991, three black rhino were speared and/or shot and today there may be only two rhinos left in Amboseli (although official Government data continue to note five) (Brett, 1991). On the other hand, the Masai Mara black rhino population continues to grow with one of the best breeding records in the country and clearly benefits from a surveillance programme funded by Friends of Conservation. In fact, the Masai Mara population probably stands as the most significant in situ rhino group left in Kenya.
19. The model assumed a 9% mortality associated with rhino dehorning, an outdated figure from a 1968 report on rhino mortality under anaesthetic (Roth and Child, 1968).

20. The IBRF has since expanded its scope to include all rhino species and consequently has changed its name to become the International Rhino Foundation (IRF).

21. For example, Martin (1989) reports that he failed to locate any rhino horn in medicine shops surveyed in the cities of Beijing, Guilin, Kunming, Nanjing, Shanghai, Suzhou, and Wuxi in 1985, and none in Tianjin in 1987. Other with broad experience in China report similar observations (Lau, *in litt.*).

22. In Taiwan, for example, most legitimate traditional medicine practitioners belong to trade associations which include the Republic of China (ROC) Chinese Medicine Commercial National Association, Taiwan Province Chinese Medicine Commercial Association, Taipei and Kaohsiung Chinese Medical Commercial Associations, Taiwan Drug Manufacturers Society, Taiwan Province Drug Manufacturers Association, ROC Chinese Medicine Doctors National Alliance, Taipei Chinese Medicine Doctors Society, Taiwan Province Pharmaceutical Product Manufacturers Society.

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