

Status Survey and Conservation Action Plan

New Edition

Asian Rhinos

Edited by Thomas J. Foose, Ph.D.
and Nico van Strien, Ph.D., Program Officers
on behalf of Mohd Khan bin Momin Khan, Chairman,
S.C. Dey, Deputy Chairman, Effendy Sumardja, Deputy Chairman



IUCN/SSC Asian Rhino Specialist Group

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Much of the work was completed at action plan workshops at the two AsRSG Meetings: Jaldapara Wildlife Sanctuary, West Bengal, India in December 1993 and Sandakan, Sabah, Malaysia in December 1995.

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Executive Summary

There are three species of Asian rhino: the Indian or greater one-horned Asian rhino (*Rhinoceros unicornis*); the Javan or lesser one-horned Asian rhino (*Rhinoceros sondaicus*); and the Sumatran or Asian two-horned rhino (*Dicerorhinus sumatrensis*). The Indian rhino is, along with the African white rhino, the second largest living species of land mammal and inhabits riverine grasslands in India and Nepal. The Javan rhino is in the same genus as the Indian rhino but is a smaller species and inhabits tropical forests but particularly along water courses. The Sumatran rhino is the smallest of all rhino species and inhabits the most dense habitat in tropical forests. Both the Indian and Javan rhinos are one-horned while the Sumatran rhino has two horns, similar to the African rhino species. The Sumatran rhino is also known as the hairy rhinoceros and is closely related to the woolly rhino that inhabited Eurasia during the Ice Ages. The Indian rhino is a grazer similar to the African white rhino. The Sumatran rhino is a browser similar to the African black rhino. The Javan rhino is a mixed feeder.

Historically, all three species were abundant and rather widely distributed in Asia through at least the middle of the 19th century. The Indian occurred all along the Indus, Ganges, and Brahmaputra River Basins; earlier it was even more broadly distributed even into southern India. The Javan occurred from eastern India throughout the rest of mainland South East Asia and on the islands of Sumatra and Java. The Sumatran rhino also extended from eastern India through mainland South East Asia and on the islands of Sumatra and Borneo.

Currently, all three species are threatened with extinction, two critically so, as assessed by the new IUCN Red List Categories.

- The Sumatran rhino is the most critically endangered of all rhino species with a population of 250–400 distributed fragmentarily in Sumatra, Peninsula Malaysia, and Sabah. Remnants may survive in Sarawak, Thailand, Myanmar, and Laos but their existence is unconfirmed and the viability of any populations unlikely.
- The Javan rhino is the rarest of all rhino species with fewer than 100 individuals estimated to survive, most in a single protected area in Indonesia; a few in an unprotected area in Vietnam.
- The Indian rhino is the success story in Asian rhino conservation with over 2000 individuals in India and Nepal. This population has recovered from very low numbers comparable to the current situation for the Sumatran and even Javan. However, threats to this species are significant and only continued and increased protection will enable survival.

The critical situation for Asian rhinos is emphasized by the fact that the number of all three Asian species combined is approximately equal to or perhaps slightly fewer than the rarer of the two African rhino species, the black rhino, which has received much more publicity over the last decade.

As in Africa, poaching for the horn is the major threat to Asian rhinos. Poaching is significant for all three species and is still rampant on the Sumatran rhino. The primary demand for the horn is its use in traditional Chinese medicine throughout the Far East. Asian rhino horn also appears to be a speculator's commodity in several consumer states.

Habitat degradation is also a significant threat, more so than for the African rhinos since two of the Asian species are denizens of tropical rainforest which continues to decrease in extent. Forest habitat is being destroyed through unsustainable exploitation of timber and conversion of land to agriculture and other human uses.

Immediately, the major requirement for Asian rhino conservation is increased protection *in situ* through core areas similar to the intensive protection zones and sanctuaries that have been successful in Africa.

Managed breeding remains a potential tool for Asian rhino conservation and is successful for the Indian rhino. However, traditional captive propagation methods have not succeeded for Sumatran rhino and have not been tried for Javan rhino. Attempts are under development to establish managed breeding centers in native habitat at least for the Sumatran and perhaps for the Javan rhino to assist in their protection and conservation.

Ultimately, major requirements for rhino conservation are:

- cessation of the illegal trade in rhino horn and products
- stabilization, extension, and improvement of rhino habitat
- recovery of rhino populations to viable levels
- support of local communities for and hence benefit to local communities from rhino conservation.

Significant funds are required both from governmental and nongovernmental sources, both inside and outside range states, if Asian rhinos are to be conserved from extinction. A rigorously defined set of projects with estimated costs has been prepared to indicate the actions and support required. The total cost of these projects is approximately US\$ 33 Million for the period 1996–2000.

Ideally, rhino conservation would become financially sustainable and self-sufficient obviating dependence on the vagaries of donor support. At least one program is in progress and others are under discussion to try to generate such self-sustaining income.

1. Introduction

1.1 Background of the Asian Rhino Specialist Group (AsRSG) and its Action Plan

This Action Plan is an update of the 1989 version of Asian Rhinos: An Action Plan for Their Conservation edited by AsRSG Chairman Mohd Khan bin Momin Khan who has led the Asian Rhino Specialist Group since 1984.

The foundation for the earlier action plan was prepared by Professor Ruedi Schenkel, and his wife Lotte, at the Bangkok meeting of the IUCN/SSC Asian Rhino Specialist Group (AsRSG) in 1979. As the first AsRSG Chairman, Dr. Schenkel was instrumental in creating the interest for the intensive surveys, studies, and conservation activities that have since been carried out.

The AsRSG conducted its second meeting in Frazer's Hills, Malaysia, in 1982, where, for the first time, a critical analysis of Asian rhino distribution, numbers and conservation requirements was conducted.

In October 1984, a further meeting convened in Singapore under auspices of the Species Survival Commission of the IUCN. Its major purpose was to formulate a plan to develop captive breeding of Sumatran rhino as a component of the conservation strategy for this species. As a result, three separate projects were initiated in Peninsular Malaysia, Sabah, and Indonesia.

The need still existed to develop a comprehensive conservation action plan for all three species of Asian rhino, in which captive breeding could be placed within

the overall conservation objectives for each species. This need was emphasized by controversies over the aspects of the proposed captive breeding plans, especially protests from Malaysia over export of their rhino to non-range states.

The AsRSG therefore convened again in Jakarta in 1986 and then in Kuala Lumpur in 1987. The 1989 version of the Asian Rhino Action Plan was the result.

A number of regional workshops have also been conducted under AsRSG auspices to assess conservation status and to develop action plans: Javan Rhino in Indonesia in July 1989; Rhino Conservation Strategy and Action Plan in Indonesia in September 1991; Rhino Conservation Action Plan in Malaysia in May 1993; Indonesian Sumatran Rhino Population and Habitat Viability and Analysis Workshop in Indonesia in November 1993, Population and Habitat Viability Analysis Workshop for Indian Rhino in India December 1993; Malaysian Rhino population and Habitat Viability Analysis Workshop in Malaysia in November 1995.

Among significant developments from these regional workshops were:

- 1 the revelation that numbers of Sumatran rhino had declined significantly by 50% or more during the 1980s and 1990s, and
- 2 the realization that the traditional captive programs for Sumatran rhino were not succeeding.



Sumatran rhino consuming a water plant.

Alain Compost

Since then, there have been efforts:

1. to intensify *in situ* protection particularly through a major grant from the Global Environment Facility (G.E.F.) through the United Nations Development Programme (UNDP) with the support of the United Nations Environment Programme (UNEP) and the facilitation and coordination of the AsRSG
2. to reorient this program toward managed breeding centers located in natural habitat, i.e. Sumatran rhino sanctuaries.

The AsRSG as well as many representatives of Asian rhino range states participated in the two UNEP Conferences Between Rhinoceros Ranges States, Consumer States, and Donor Nations on Financing Rhinoceros Conservation in December 1992 and June–July 1993.

Another full meeting of the AsRSG was conducted at Jaldapara Wildlife Sanctuary in December 1993. This meeting was the first AsRSG session to occur on the Indian Subcontinent. One important development at this meeting was a change in the orientation of the Group. In general, it was observed that until that time the AsRSG, like other Specialist Groups traditionally, had concentrated on technical information and advice. There was agreement that in the future the AsRSG needs to assume a more active role in advocacy and fund-raising for Asian rhino conservation. It was also determined that facilitating development of a long-term funding strategy emphasizing self-sufficiency was of paramount importance. The GEF/UNDP (Global Environment Facility/United Nations Development Programme) Project for Rhino in South East Asia that the AsRSG has facilitated and is now coordinating is a prime example of this kind of activity.

A draft revision of the Action Plan was formulated at the December 1993 Jaldapara Meeting. However a number of factors delayed publication of the Action Plan. Nevertheless, there has been much AsRSG activity in the last two years. Hence, it was decided that another full review of the draft revision by the AsRSG membership in an interactive session was required. Moreover, there has recently been indication that the UNEP Elephant and Rhino Conservation facility would assume a more active role in recruiting resources for Asian rhino conservation. Toward this end they have requested preparation of a continent-wide strategy for Asian rhinos. This need again seemed to necessitate an interactive formation by the AsRSG membership. Hence, finalization of the Action Plan was achieved at the AsRSG Meeting conducted in Sandakan, Sabah, Malaysia 29 November – 1 December 1995.

Finally, it should be recognized that all the Asian rhino range states have developed their own rhino conservation strategies and action plans since 1989. These country plans have been guided by the Asian Rhino Action Plan. Reciprocally, this revision of the Asian Rhino Action Plan reflects much feedback from these national plans and the experience acquired in their implementation. It is envisioned that the Asian Rhino and range state action plans will continue to be iteratively, interactively and adaptively revised in response to the changing situation for Asian rhinos.

1.2 Strategic foundations of the Asian Rhino Action Plan

This Action Plan is intended to recommend both general strategies and specific measures to protect and manage the



Poached Sumatran rhino without horn in Malaysia.

Mohd Khan bin Momin Khan

three species of Asian rhinos: the Indian; the Javan; and the Sumatran.

Basically, as discussed in detail in Chapter 2, all three species of Asian rhinoceros are in a demographic crisis caused:

- 1 primarily by over-exploitation through poaching for rhino horn and other products and
- 2 secondarily by loss of habitat due to expanding and developing human populations

As a consequence, the paramount and immediate goal of Asian rhino conservation is to assess and reverse the decline of rhino numbers due to poaching. This goal will require much more intensive protection of rhino *in situ*. Moreover, the protection must entail surveillance and patrols specifically related to rhino protection not just general maintenance of the protected areas the rhino inhabit. Rhinos are spectacular examples of species that are disappearing much more rapidly than their habitat. The recent cost-effectiveness study of rhino conservation (Leader-Williams 1996) has demonstrated that development of intensive protection zones or sanctuaries has proven one of the, perhaps the, most successful method of conserving rhinos. Hence, the identification and defense of such core areas has become the goal of Asian rhino conservation strategies and action plans. The objectives and recommendations of the Action Plan concentrate on development of such improved and intensified protection.

The cost-effectiveness overview analysis (Leader-Williams 1996) also indicates that the amount of funds allocated to these intensive protection areas is also a critical factor in determining success or failure. As of 1995, it appears that at least US\$ 1,000/sqkm may be required for success. Of perhaps equal importance is the density of active and effective rhino protection staff/sqkm. In the protected areas of India and Nepal that have been successful in conserving rhinos this staff density is on the order of one person/sqkm. It may not be feasible or necessary to achieve these densities in tropical forest areas. However, a higher density of guards than has previously occurred is needed.

As a consequence of these considerations, implementation of the various recommendations in this Action Plan and in the related range state action plans will require greater efforts and significant funds.

Protection of both animals and their habitat is necessary, indeed imperative, for conservation programs for Asian rhino. However, over the long-term such protection is unlikely to be sufficient. The combined pressures of habitat destruction and poacher activity are both reducing and fragmenting rhino populations in the wild. When populations become small and fragmented, they become vulnerable to extinction for genetic and

demographic reasons, in addition to the direct threats of habitat disturbance and poaching. Moreover, the smaller the population, the greater these genetic and demographic threats become.

Therefore, it becomes essential to maintain or recover some target population size or sizes that will be viable in terms of demographic, genetic, and catastrophic challenges. Target numbers of rhino also imply minimum areas necessary to accommodate populations of the specified sizes. Determination of what population sizes and habitat areas are required for viability is a central problem for the emerging science of conservation biology.

This action plan for Asian rhino has been formulated with reference to the principles of conservation biology and especially through the process of population and habitat viability analysis (PHVA) (Lacy *et al.* 1995). Thus, many of the goals, objectives and recommendations are oriented to the maintenance or attainment of genetically and demographically viable populations of rhino.

Details of the conservation biology considerations and PHVA analysis are provided in the reports from the various PHVA workshops that have been conducted on rhino: Seal and Foose 1989; Foose *et al.* 1993; Soemarna *et al.* 1994; Molure *et al.* 1995.

Some of the major and common conclusions of the PHVA process for various rhino species are:

- 1 Any rhino population under 10 individuals is at high risk of extinction even under ideal conditions;
- 2 To maximize probability of survival under all kinds of identifiable risks, populations of 100 or populations that can be rapidly expanded to 100 or more individuals, seems advisable;
- 3 To avoid the risks of having "all the eggs in one basket", at least five or more populations of 100 or more individuals are recommended for each regional variety of rhino considered distinct enough to be conserved as a separate taxon.
- 4 For long-term viability a total population of at least 2,000 to 3,000 rhino of each taxon seems highly desirable.

The 1989 version of the Asian Rhino Action Plan had placed great emphasis and expectation on *ex situ* programs for Asian rhinos. The captive program for the Indian rhino has indeed been very successful and provides an important back-up for the wild populations. (Foose 1992; Foose & Reece 1996). However, traditional captive methods and programs have proven unsuccessful for the Sumatran rhino despite investment of considerable time and effort. (Foose 1996). A major part of the problem has been attributed to the unnatural

conditions: e.g. diet; size and complexity of enclosures; social configuration of the sexes; climate including protection from excessive sunlight, especially ultraviolet. Despite these problems, managed breeding under intensively protected conditions still seems an important component of the conservation strategy for the Sumatran and ultimately for the Javan rhino because of the difficulties and uncertainties of conserving these species in the wild. However, there are now efforts to reorient the captive programs for these species toward managed breeding centers in natural habitat. These centers are being described as sanctuaries. The usage of this term differs from how it has been used in African rhino conservation in that the Sumatran rhino centers will initially be somewhat smaller and the rhino more intensively managed than in the African sanctuaries. However the ultimate goal with the Sumatran rhino sanctuaries is to evolve into the African model with the rhino being in larger areas under less management albeit still inside fences and under intensive protection.

Ultimately, major requirements for rhino conservation are:

- cessation of the illegal trade in rhino horn and products
- stabilization, extension, and improvement of rhino habitat
- support of local communities for and hence benefit to local communities from rhino conservation.

Hence, efforts in all three of these areas are integral to the Asian Rhino Action Plan and to the range state action plans.

1.3 The continental (Asian) strategy

Considering the strategic foundations, a continental strategy for rhinoceros in Asia has been formulated by the range states through the AsRSG.

1. Concentrate efforts and funds on the five major range states of India, Nepal, Indonesia, Malaysia, and Vietnam (until or unless new information indicates significant rhino populations still survive elsewhere.)
2. Arrest further decline in the Sumatran and Javan rhinos in Indonesia, Malaysia, and Vietnam as the most critical need in Asian rhinoceros conservation.
 - Provide intensive protection of *insitu* nuclei as the paramount action required at this time.
 - Develop managed breeding centers in native habitat. In Asia, these managed breeding centers are being designated "sanctuaries", a slightly different

definition than pertains in Africa although the goal of the Asian sanctuaries will be to expand in size and diminish in management until they converge on the African "sanctuary" concept, i.e. an intensively protected area of native habitat delimited by a fence.

3. Reinforce the continuing recovery of populations of Indian rhinoceros in India and Nepal.
4. In the major range states, accord priority to populations with the highest probability for recovery to viability.
5. Establish as scheduled objectives for each of the species:

5 Year Objectives

Sumatran	No further decline in numbers.
Javan	Increase of 25% in numbers in Indonesia. No further decline in Vietnam.
Indian	Achievement of target numbers.

10 Year Objectives

Sumatran	Increase of 20 % in numbers.
Javan	Increase of 50% in numbers in Indonesia. Increase of 25% in Vietnam.
Indian	Stabilization at target numbers.

1.4 Taxonomic approach of the strategy

Much interest and investigation continues on the taxonomy, classification, and conservation units of Asian rhinos (Groves 1967; Amato *et al.* 1995; Melnick and Morales 1996). Currently the AsRSG strategy and all of the range state action plans continue to recognize three species and within these species three conservation units for the Sumatran (*Dicerorhinus sumatrensis sumatrensis* in Sumatra, Peninsular Malaysia, and Thailand; *Dicerorhinus sumatrensis harrissoni* on Borneo; and *Dicerorhinus sumatrensis lasiotis* in Myanmar) and two for the Javan (*Rhinoceros sondaicus sondaicus* in Java and *Rhinoceros sondaicus annamiticus* in Vietnam). Recently it has also been suggested that there are possibly two conservation units justifiable for the Indian rhino, i.e. a western population in Nepal and an eastern population in West Bengal and Assam. The captive programs are respecting these units for the Sumatran rhino but not for the Indian; there are no Javan rhino in captivity. There have been recent arguments that the demographic crisis for Sumatran rhino argues for managing all populations as a single conservation unit. At this time, the AsRSG and range states do not believe there is an imperative to merge. However, the principle is acknowledged and this proposal will continue to be an option if the demographic crisis in the managed breeding population deteriorates.

2. The Asian Rhinos: Three Species on the Brink of Extinction

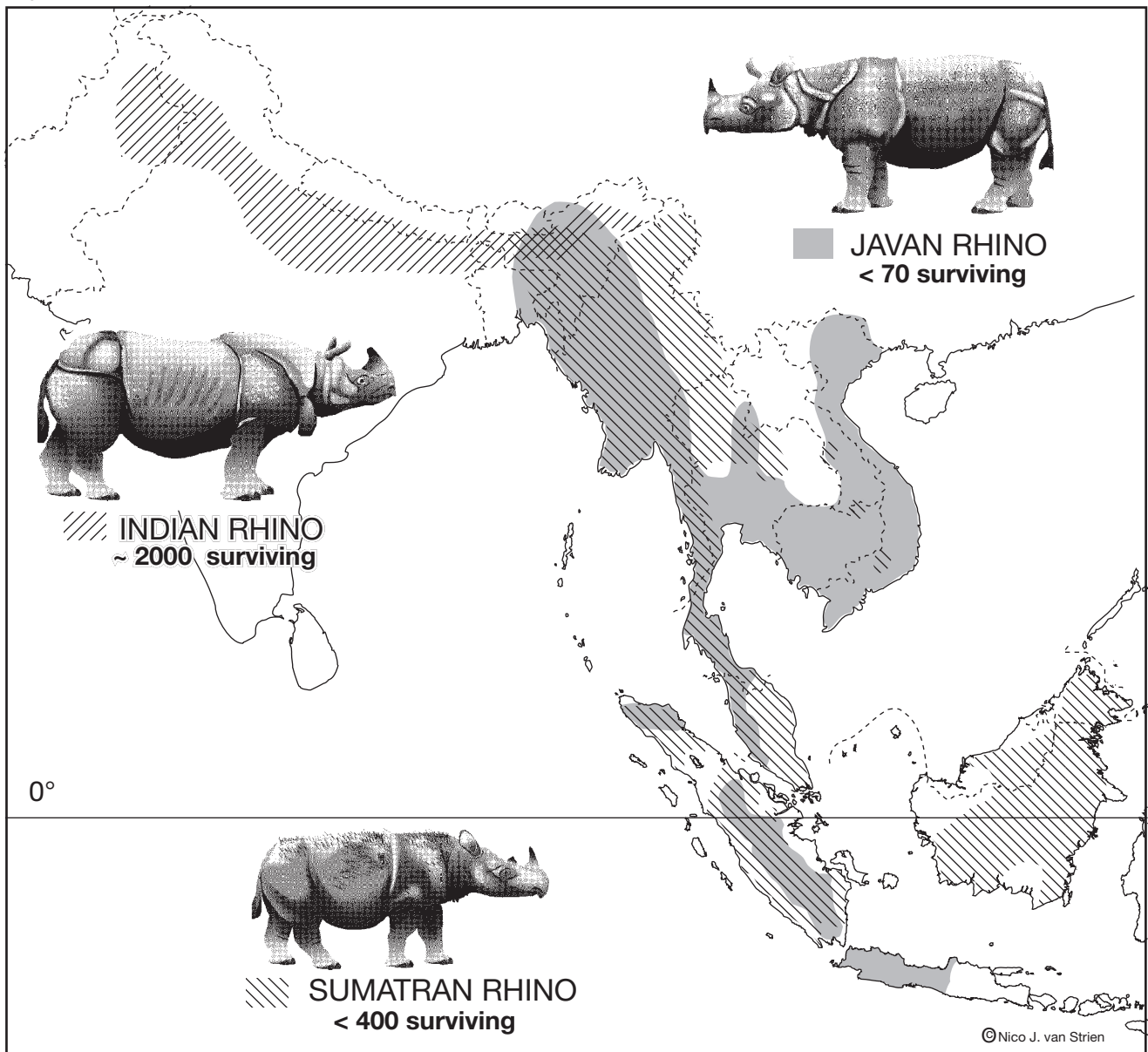
2.1 Overview

The three species of rhino in Asia are among the most remarkable animals on earth and are of great cultural importance in Asia. Two of the species, the Indian and Javan are closely related to each other, being placed in the same genus. However, the Sumatran rhino is quite distinct and may be more closely related to the African than to the two one-horned Asian species. The Sumatran

is related to the woolly rhino and the rather unicorn-like elasmotheres of the Pleistocene. The Indian rhino inhabits riverine grasslands of the Terai and Brahmaputra Basins. The Javan and Sumatran are denizens of the tropical rainforest, although the Javan like its relative the Indian, prefers proximity to watercourses.

The three species of Asian rhinos once ranged widely across southern and southeastern Asia (Figure 2.1).

Figure 2.1 Historic distribution and current numbers of Asian rhino



Through the middle of the 19th century, and in some cases beyond, they were quite abundant.

For example, during the last century the greater one-horned or **Indian rhinoceros** was killed for sport. The Maharajah of Cooch Bihar alone killed 207 rhinos between 1871 and 1907. This provides an idea of the former abundance of the species. Similarly, the Sumatran rhino was so abundant that it was described as a garden pest in the journals of some of the 19th century residents of the area.

Tragically, today all three species of Asian rhinoceros are among the rarest and most endangered species of animal in the world, reduced to small pockets across their former range.

- The Javan rhino is the rarest of all rhino species with fewer than 100 individuals estimated to survive, most in a single protected area in Indonesia; a few in an unprotected area in Vietnam.
- The Sumatran rhino is the most critically endangered of all rhino species with a population of 250–400 distributed fragmentarily in Sumatra, Peninsular Malaysia, and Sabah. Remnants may survive in Sarawak, Thailand, Myanmar, and Laos but their existence is unconfirmed and the viability of any populations unlikely.
- The Indian rhinoceros is the success story in Asian rhino conservation with over 2000 in India and Nepal. This population has recovered from very low numbers comparable to the current situation for Sumatran and Javan rhino. However, the threats to this species are significant. Only continued and increased protection will enable their survival.

An overview of the current numbers and target populations of Asian rhino species by country is

presented in Table 2.1. More detailed estimates of numbers by area are presented in Tables 2.3. to 2.5. In the detailed tables, two sets of estimates are presented for each species: the numbers presented at the 1993 AsRSG meeting in Jaldapara, India and the numbers reported at the 1995 AsRSG meeting in Sandakan, Sabah, Malaysia. For the Indian rhino, the difference in numbers is believed to represent real changes in the numbers of rhino. For Javan rhino, the 1993 numbers represent the results of a photographic population estimation method; the 1995 figures represent a more traditional ground survey methodology. For Sumatran rhino, the difference in the population estimates from the two reporting years is greater than for the other two species. It is not clear to what extent, these differences represent real changes (i.e. further decline) in numbers and how much represents improved information (in the case of Indonesia) or different methodology in population estimation (in the case of Peninsular Malaysia). Further surveys are in progress in Peninsular Malaysia to clarify if methodology is causing a significant change in the population estimates for various areas.

The newly published IUCN Red List Categories (IUCN 1994) have been applied to Asian rhino taxa. The results appear in Table 2.2. and indicate that of the seven taxa maximally recognized: one is probably extinct, four are critically endangered, and two are endangered. In terms of the three species, two are critically endangered and one is endangered. The IUCN Red List Categories are explained in Appendix 2.

The decline of Asian rhinos is in part related to habitat destruction and fragmentation, more so than for the African rhino species. However, all these species have been declining for several centuries due to over-exploitation for both sport-hunting and horn-trade.

Country	Indian Rhino <i>Rhinoceros unicornis</i>				Javan Rhino <i>Rhinoceros sondaicus</i>				Sumatran Rhino <i>Dicerorhinus sumatrensis</i>			
	Current Pop.	Target Pop.	Current Number/ Size km ² Areas	Target Number/ Size km ² Areas	Current Pop.	Target Pop.	Current Number/ Size km ² Areas	Target Number/ Size km ² Areas	Current Pop.	Target Pop.	Current Number/ Size km ² Areas	Target Number/ Size km ² Areas
Indonesia					-60	500	1/300	3/1,500	<200	2,000	5/22,000	5/30,000
Malaysia												
Peninsula					0	100	0	2/500	<100	400	4/8,000	4/10,000
Sabah									<75	200	2/2,000	4/4,000
Sarawak										100	1/600	1/1,000
Vietnam					<15							
Thailand										200	2/	2/2,000
Myanmar										200	2/	2/2,000
Laos										200	2/	2/2,000
India	-1,600	2,200+	9/2,000	10/2,500								
Nepal	-500	800+	2/1,000	2+/1,000								
Pakistan												
ASIA	-2,100	3,000+	10/3,000	12/3,500	<75	2,100			<400	3,300	10/37,000	20/50,000

Table 2.2 Assessment of Asian rhino species by IUCN Red List Criteria

IUCN Criteria*	Javan Rhino		Sumatran Rhino			Indian Rhino	
	<i>Rhinoceros sondaicus sondaicus</i> JAVA	<i>Rhinoceros sondaicus annamiticus</i> VIETNAM	<i>Dicerorhinus sumatrensis sumatrensis</i> SUMATRA, MALAYSIA	<i>Dicerorhinus sumatrensis harrissoni</i> BORNEO	<i>Dicerorhinus sumatrensis lasiotis</i> MYANMAR, THAILAND	<i>Rhinoceros unicornis</i> Eastern pop. ASSAM, W. BENGAL	<i>Rhinoceros unicornis</i> Western pop. NEPAL
A. Population reduction	VU	CR?	CR	CR	-	VU	VU
B. Extent of occurrence	EN	EN	EN	EN	-	EN	EN
C & D. Population estimate	CR	CR	CR	CR	-	VU	VU
E. Probability of extinction	EN?	CR?	EN?	CR	-	VU	VU
Overall rating	CR	CR	CR	CR	EX?	EN	EN

* Revised IUCN Categories and Criteria, approved by the 40th Meeting of the IUCN Council, 30 November 1994
EX = Extinct CR = Critically Endangered EN = Endangered VU = Vulnerable

The rhino represents a case of one of the least sustainable uses of a resource in human history. Poaching continues at a high level.

In the particular case of the **Indian rhino** the over-hunting combined with agricultural conversion, teak plantations and other developments in response to the needs of the rapidly expanding human population resulted in extensive losses of rhino habitat. These pressures on the species brought it to the brink of extinction. By 1908 there were only a handful of animals remaining, mainly in Kaziranga in Assam, India. The Chitwan Valley in Nepal was facing similar situation in 1960s. In order to save the species, Kaziranga was established as a forest reserve in 1908 and a wildlife sanctuary eight years later, and was essentially closed to the public until 1938.

As a result of these and other similar conservation activities in rhino areas, supported by proper legislation, the Indian rhinoceros is now considered to be the least threatened of the Asian rhinos. Numbers have increased and the species has been translocated successfully to establish new populations within its former range (though additional translocations would be most desirable). The total population is estimated to be more than 2,000 animals, and the Indian and Nepalese authorities deserve much credit for bringing the situation under control, though continuing strict conservation measures will be needed for some time.

The **Javan rhinoceros** formerly occurred through most of South East Asia, but has disappeared from almost all of its former range in Assam, Myanmar, Thailand, Indochina, Malaysia, Sumatra, and Java. Only two populations are known to survive, one in Java and the other in Vietnam. The animals on Java are restricted to the Ujung Kulon National Park, where, as a result of strict protection, the population increased from about 25 animals in 1967 to an estimated 54-60

animals in 1984. There are an estimated 8-15 rhino in the Dong Nai area of Vietnam; the rhino are reported to be in the Cat Loc Nature reserve but this area is not effectively protected. The status in Laos is unknown; the species is presumed extinct in Cambodia. The cause of decline is mainly attributable to the excessive demand for rhino horn and other products for Chinese and allied medicine systems.

The **Sumatran rhinoceros** occurs more widely than the other two species in highly scattered and fragmented populations. The total population is estimated at fewer than 400. All known animals occur in Peninsular Malaysia, Sabah and Sumatra. On Sumatra there are perhaps 100-250 rhino (197-274 estimated at 1993 PHVA and AsRSG Workshops; 103-151 estimated at the 1995 AsRSG Meeting). The largest populations are located in Gunung Leuser, Way Kambas Barisan Selatan, North Aceh (Gunung Abongabong and Lokop) and Kerinci Seblat. In Malaysia, the latest estimates are 125-150 rhino distributed more or less equally between Peninsula and Sabah. The main populations in Peninsular Malaysia are in Endau Rompin State Park(s) (the portion in the State of Johore gazetted; the part in the State of Pahang not), Belum Wildlife Reserve, the Selama area, and Taman Negara National Park. The main populations in Sabah are in the Yayasan Sabah Forest Concession Area (which includes Danum Valley), the Tabin Wildlife reserve and the Lower Kinabatangan area. Rhinos had been reported from Sarawak in the 1980s but their continued survival has not been recently confirmed. The possibility of a few survivors in Kalimantan is being explored.

Recent surveys suggest that the species scarcely survives in Thailand. The latest surveys in Myanmar, especially in the northern part of the country where the possibility of survival was considered most probable, have indicated no recent evidence of rhino.

2.2 The great one-horned or Indian rhinoceros (*Rhinoceros unicornis*)

The great one-horned or Indian rhinoceros once existed across the entire northern part of the Indian subcontinent from Pakistan to the Indian-Burmese border, and including parts of Nepal and Bhutan. It may have also existed in Myanmar, southern China and Indochina. The species now exists in a few small population units generally situated in north-eastern India and in Nepal.

The latest estimates of population numbers for Indian rhino by country and locality are presented in Table 2.3. The past and present distributions are displayed in Figures 2.1. and 2.2.

The Indian rhino is the least threatened of the Asian species. Populations have increased and rhino have been successfully translocated to re-establish populations in areas where the species had been exterminated. The total estimated number is about 2,000 animals. There are about 135 in captivity in the world.

The species has been intensely protected by the Indian and Nepalese wildlife authorities. However, poaching pressure has been substantial with some areas

in India particularly impacted, e.g. Laokhowa (where the rhino has become extinct) and Manas (where the population has become reduced to no more than 20% of its previous levels in the 1980s). The number of rhinos lost to poachers from 1986 to 1995 has been reported as about 450 in India and about 50 in Nepal (Martin 1995; Menon 1996). The numbers of rhino poached in both India and Nepal have declined in 1994 and 1995 compared to 1990–1993. The decline in poaching is attributed to: higher budgets for protected areas from government sources; greater NGO (especially local) support; better intelligence networks; improvements in staff morale, resources, and performance; better cooperation with police (India) and/or army (Nepal).

In both these countries the programs of protection and translocation must be continued and further increased. This is particularly so in India where there remain many areas (Laokhowa, Manas, Orang) which in recent history have had rhino populations and are capable of accommodating populations of viable size if properly protected. These areas should be protected and new populations established or remnant ones reinforced through translocations from areas where populations now exist in sufficient numbers to be unaffected by removals.

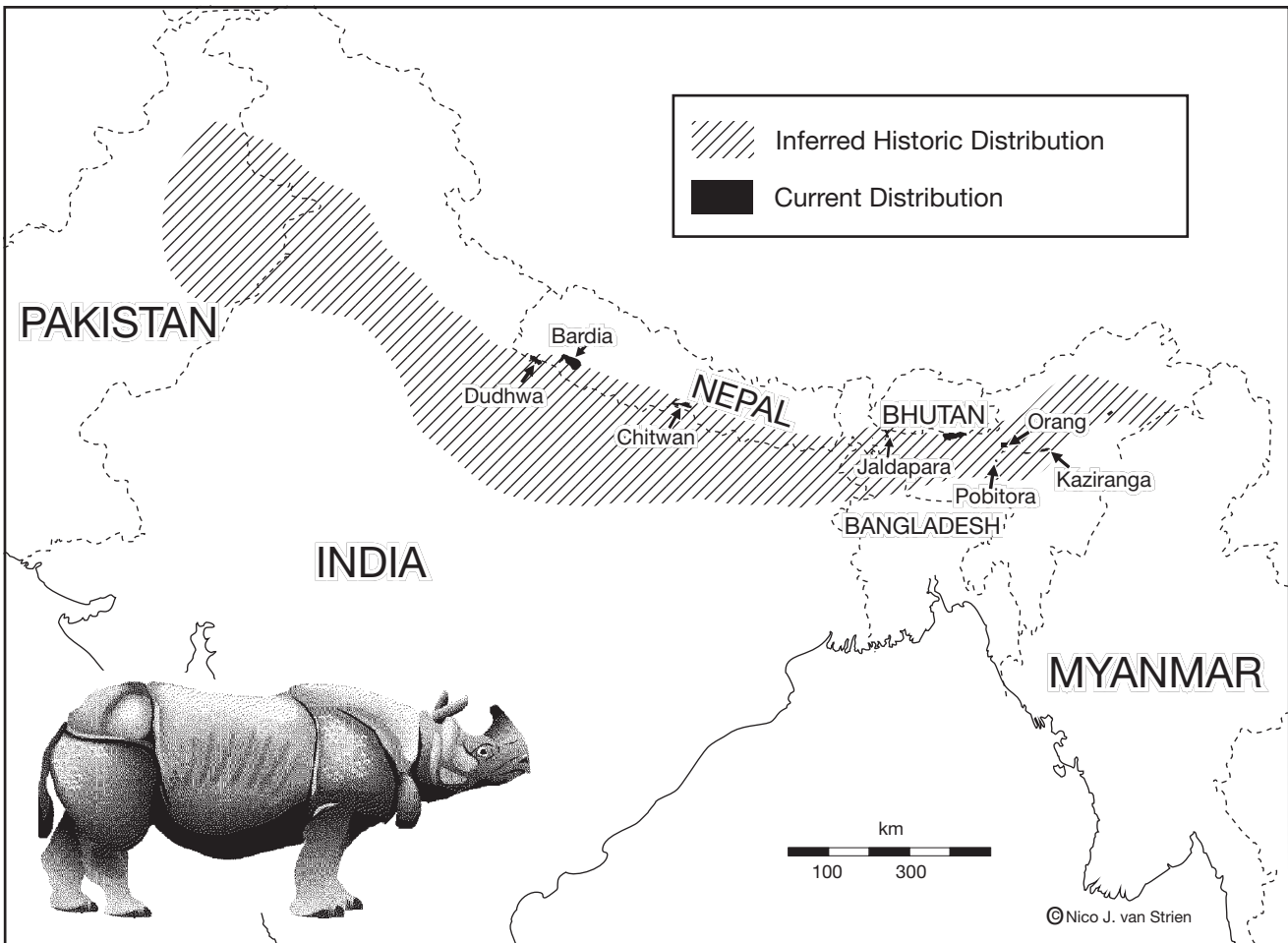
Indian rhino in Kaziranga.



T. J. Foote

Location	Estimated Number of Rhino		Habitat Availability (sq km)		Protection Status	Potential Carrying Capacity
	AsRSG Meeting 12/1993	AsRSG Meeting 12/1995 Known/Probable/Possible	Presently	Potentially		
India						
Manas	60+	4/16/?	500	500	National Park	>100
Dudhwa	11	13/0/0	490	490	World Heritage Site	>100
Karteniaghat	4	4/0/0	20	20	National Park	10
Kaziranga	1164±134	1200/50/50	430	900	Wildlife Sanctuary	1500
Laokhowa	0	0	70	70	National Park	50+
Orang	90+	90/10/0	76	76	Wildlife Sanctuary	>150
Pabitora	56	68/8/0	18	40	Wildlife Sanctuary	70+
Pockets-Assam	25	20/0/0	508	508	Insecure	100+
Jaldapara	33+	35/0/0	216	225	Wildlife Sanctuary	150+
Gorumara	13	18/0/0	79	100	National Park	50+
Nepal						
Royal Bardia	40+	40/5/0	968	968	National Park	300+
Royal Chitwan	375-400	460/6/0	932	1,200	National Park	500
Pakistan						
Lal Sohanra	2	0/0/2	?	?	National Park	?
Total	1870-1895 ±134	1948/95/52 = 2095				2600+

Figure 2.2 Indian rhino - historic and present distribution



2.3 The Javan rhinoceros (*Rhinoceros sondaicus*)

The principle surviving population of the Javan rhinoceros is located on the Ujung Kulon peninsula, which forms the westernmost extremity of the island of Java. An estimated 54–60 animals now live in the area. Another, smaller, and ineffectively protected population occurs in and around the Cat Loc Nature Reserve in the Dong Nai region of Vietnam.

The species was once widespread throughout the Oriental Realm from Bengal eastward to include Myanmar, Thailand, Cambodia, Laos, Vietnam and southwards to the Malay Peninsula and the islands of Sumatra and Java. About 150 years ago the species occurred as three discrete populations. The first, belonging to the subspecies *inermis*

(now almost certainly extinct) was found from Bengal to Assam and eastwards to Myanmar. The second subspecies *annamiticus* occurred in Vietnam, Laos, Cambodia, and the easternmost part of Thailand. The third subspecies, the nominate form, was found from Tenasserim, through the Kra Isthmus into the Peninsula and Sumatra and in the western half of Java. All these populations have disappeared, except for in Ujung Kulon and some scattered remnants surviving in Indochina. The Javan rhino has the distinction of being the rarest large mammal in the world.

The latest estimates of populations numbers for Javan rhino by country and locality are presented in Table 2.4. The past and present distributions are illustrated in Figures 2.1. and 2.3.

The 54–60 Javan rhinos in Ujung Kulon are in a national park and the population size is probably limited

Table 2.4 Population estimates of the wild Javan rhinoceros

Location	Estimated Number of Rhino		Habitat Availability (sq km)		Protection Status	Potential Carrying Capacity
	AsRSG Meeting 12/1993	AsRSG Meeting 12/1995 Known/Probable/Possible	Presently	Potentially		
Indonesia Ujung Kulon	47-60	23/31/6	761	761	National Park	100+
Cambodia Various	?	0	?	?	Not known	?
Laos Various	?	0	?	?	Not known	?
Viet Nam Dong Nai near Nam Cat Tien	Small (<10)	8/4/3	350	?	National Park	?
Total	<100	31/35/9 = 75				



Javan rhino in Ujung Kulon.

Alain Compost

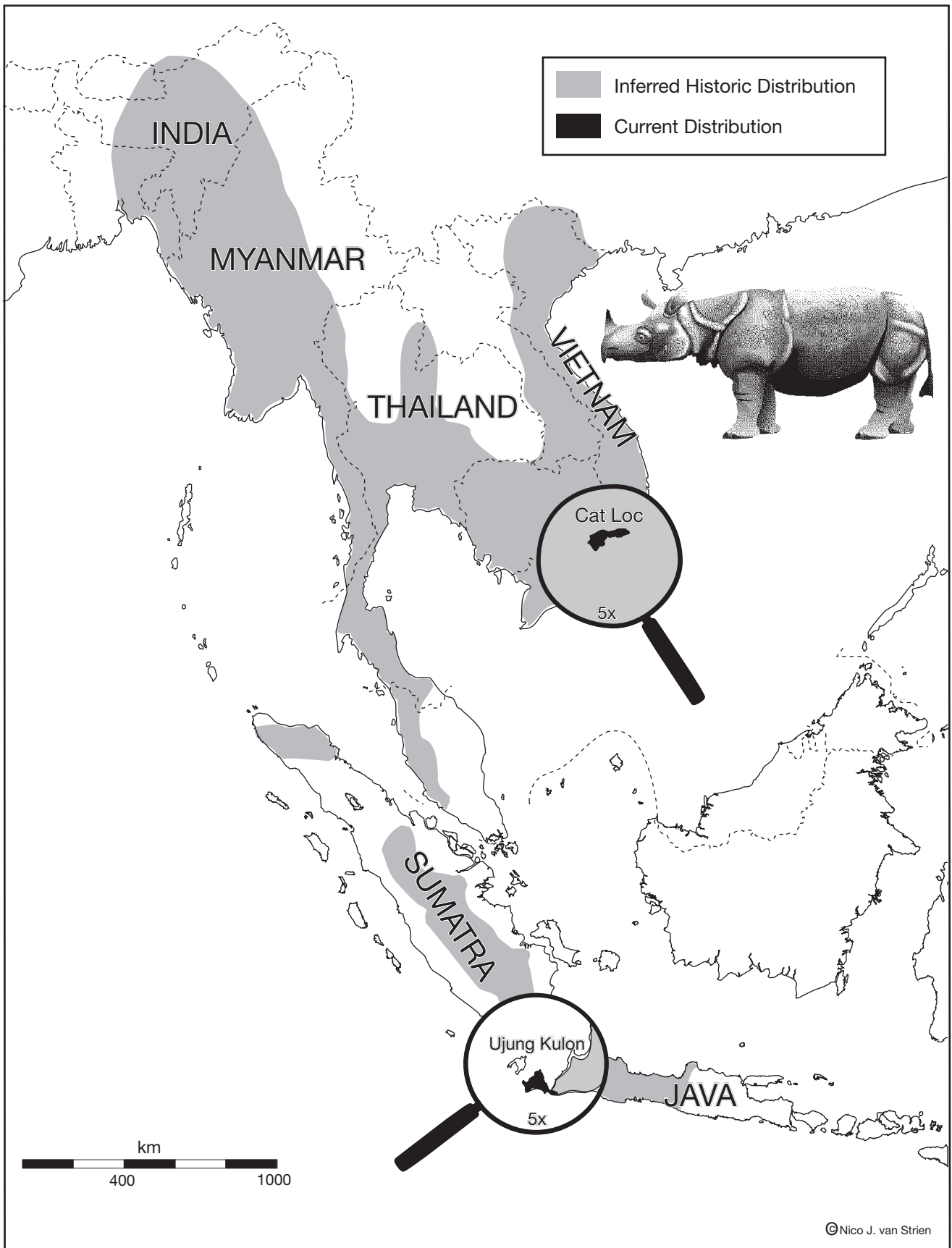


Figure 2.3 Javan rhino - historic and present distribution

to the effective carrying capacity of the area. One danger to these animals comes from disease, which could potentially wipe out the entire population. In 1981-1982, this threat became a reality when an unknown disease actually killed at least five animals in Ujung Kulon. In addition, any such small population of rhinos faces a permanent threat from poachers. There are no Javan rhinos in captivity.

It is suggested that the situation facing this species be looked at very closely to see if recommendations to translocate some animals into other areas, such as Way Kambas or southern part of Bukit Barisan Selatan National Park in Sumatra should not be seriously considered. A single small population is always extremely vulnerable. It must be kept in mind that the Ujung Kulon peninsula is on the Sundaic edge volcanic line and that during the Krakatau eruption in 1883, the entire peninsula was affected by tidal waves and ash rains which destroyed much of its terrestrial life.

A second approach is that the Indonesian authorities should also consider bringing some animals into a "sanctuary" situation, i.e. managed breeding center located in natural habitat.

The Javan rhino in Vietnam are in a nature reserve but this area does not receive effective protection. The rhino area is close to the Cat Tien National Park and inclusion of the Javan rhino area in this protected area has been strongly recommended as imperative to survival of the species in this country.

Better exploration of the situation in Vietnam, Laos and Cambodia also needs to take place, with the option of a "sanctuary" again being considered. Such information might become available as fieldwork on the kouprey *Bos sauveli* conservation program get underway.

2.4 The Sumatran rhinoceros (*Dicerorhinus sumatrensis*)

The Sumatran rhinoceros once occurred from the foothills of the Himalayas in Bhutan and eastern India, through Myanmar, Thailand, and the Malay Peninsula, and on the islands of Sumatra and Borneo. There have also been unconfirmed reports of the species in Cambodia, Laos and Vietnam.

The latest estimates of populations numbers for Sumatran rhino by country and locality are presented in Table 2.5. The past and present distributions are displayed in Figures 2.1. and 2.4.

In general until recently this species had survived much better in its native habitats than the Javan rhino. This may be partly because it mainly inhabits the mountains and forests of higher elevations which were not so subject to development and logging. In contrast the Javan rhino is a species of the coastal plains and river valleys.

At present the species survives mainly in the Malay Peninsula, on Sumatra and on Borneo. Little is known of its status in Myanmar which if it survives is the last refuge of the subspecies *lasiotis*. The nominate subspecies *sumatrensis* is now represented by animals in Peninsular Malaysia and in Sumatra with perhaps a few in Thailand. The subspecies *harrissoni* once widespread over Borneo is now confirmed to exist only in Sabah but a few may survive in Sarawak and in Kalimantan. In all areas, Sumatran rhino numbers have continued to decline at a rapid rate with loss of 50% or more of the population over the last decade.

Perhaps the largest number of the subspecies *sumatrensis* now survives on the island of Sumatra. However, only 100-200 rhino are estimated to survive.



Sumatran rhino in Peninsular Malaysia.

John Lukas

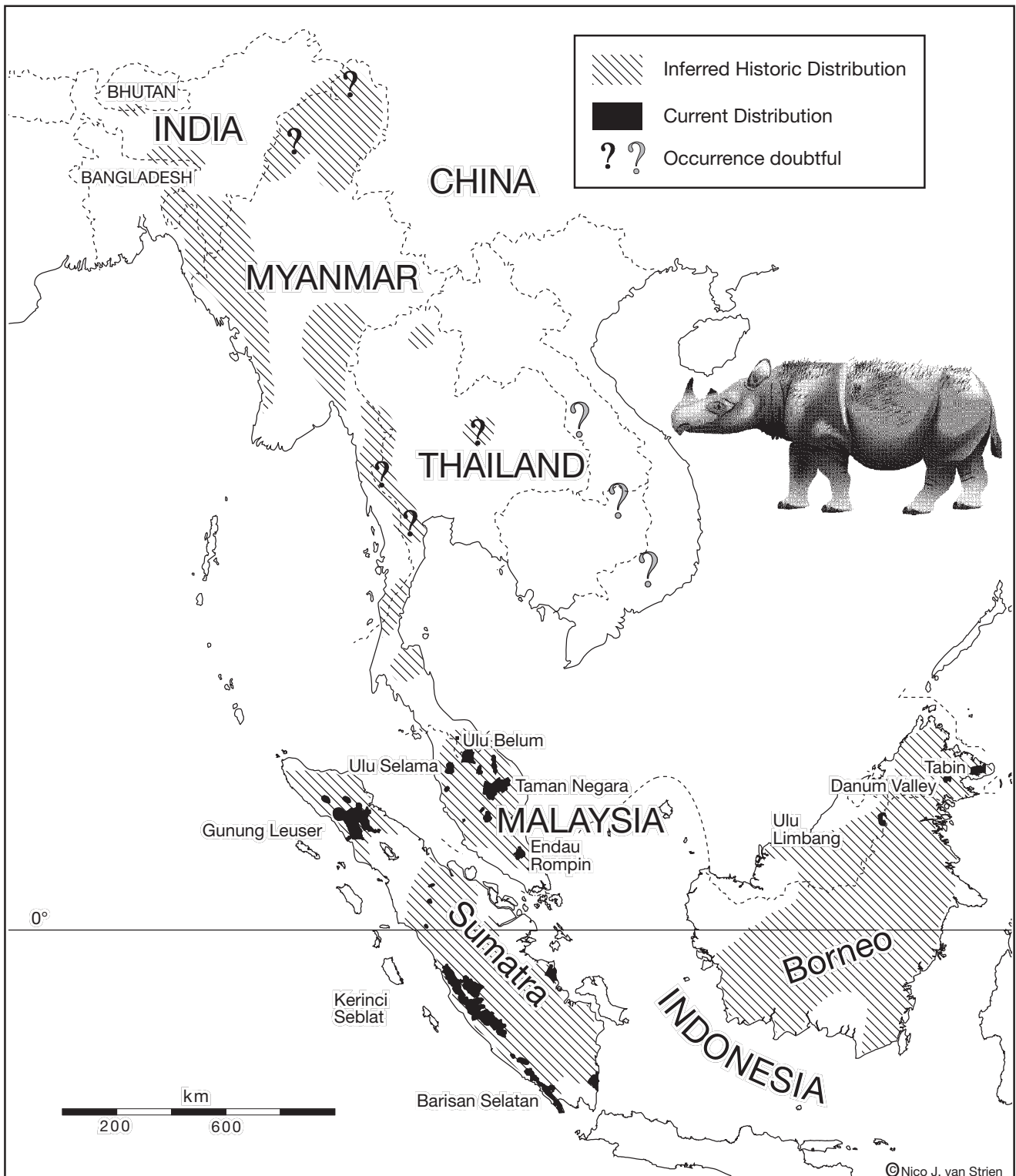


Figure 2.4 Sumatran rhino - historic and present distribution

Moreover, the island is now in a phase of intense development resulting from Indonesia's transmigration program and the habitat available to the species is being rapidly reduced. In addition the sheer size of the island, compared to the available staff for protecting the species,

renders adequate protection almost impossible. Even in areas where there is a strong presence of protection staff, poaching is active. This fact is indicated by the presence of fresh snare wounds on the legs of rhinos captured for captive breeding programs in areas where numerous

Table 2.5 Population estimates of the wild Sumatran rhinoceros

Location	Estimated Number of Rhino		Habitat Availability (sq km)		Protection Status	Potential Carrying Capacity
	AsRSG Meeting 12/1993	AsRSG Meeting 12/1995 Known/Probable/Possible	Presently (% Surveyed)	Potentially		
Myanmar						
Schwe-u-daung	Small	0 / 0 / ?	207	?	Game Sanctuary	?
Tamanthi	Small	0 / ? / ?	2150	?	Game Sanctuary	?
Lassai tract	6-7	0 / 0 / ?	?	?	Unknown	?
Sub-total	6-7+					
Laos						
Nam Theun-Nakai		0 / ? / ?				
Sub-total						
Thailand						
Hala-Bala	4+	0 / ? / ?	?	?	Wildlife Reserve	?
Khao Soi Dao Reserve	2+	0 / ? / ?	745	745	Wildlife Sanctuary	35
Phu Khieo	4+	1 / ? / ?	1,560	1,560	Wildlife Sanctuary	75
Sub-total	10+	1 / ? / ? = 1				110 ?
Indonesia						
Kalimantan						
Kayan Mentarang		0 / ? / ?			National Park	
Sabah Border	Small	0 / ? / ?			Unprotected	
Gunung Belayon P.F.		0 / 0 / ?			Protection Forest	
Bentuang Karimun		0 / 0 / ?			Nature Reserve	
Gunung Meratus		0 / 0 / ?	?	?	Unknown	?
Sumatra						
Gunung Leuser	60	20/20/20	1,400	8,000	National Park	140-800
Gunung Patah	10-15	0/8/4	400	500	Production Forest	40-50
Kerinci Seblat	64-77	9/9/10	5,000	10,000	National Park	500-1000
Gunung Abongabong	5-10	0 / ? / ?	?	?	Unprotected	?
Lokop	3-5					
Serbojadi	15-25					
Berbak	1-2	2/1/1	?	?	National Park	?
Torgamba	3-5	0/3/1	?	?	Production Forest & Oil Palm Plantation	?
Barisan Selatan	25-60	5/10/7	700	3,600	National Park	70-360
Bukit Hitam	3-5	0/3/2	?	?	Production Forest	?
Bukit Tapan	5		?	?	National Park	?
Rokan Hilir	Small	0/0/?				
Way Kambas	3-5	3/10/3	?	?	National Park	?
Sub-total	197-274	39/64/48=151				750-2210
Malaysia						
Peninsula						
Endau Rompin	20-25	5/4/?	900 (70%)	1,000-1,600	State Park(s)	110-160
Taman Negara	22-36	15/29/?	4,400 (25%)	4,400	National Park	220+
Sungai Dusun	1-2	1/0/0	40	140	Wldlf Rsrvt/Distrbd Forest	15
Gunung Belumut	3-4	1/0/0	230	230	Forest land	23
Mersing coast	3-5	1/0/0	?	100	Secondary forest	0
Sungai Depak	2-4	?	?	?	Secondary forest	0
Sungai Yong	3-5	?	?	?	Secondary forest	0
Kuala Balah	2-4	0/0/?	?	?	Secondary forest	0
Bukit Gebok	1-2	0/0/0	?	?	Secondary forest	0
Sungai Ara		1/0/0				
Krau	1-2	0/0/0	500	500	Wildlife Reserve	50
Selama	10-15	6/1/1	1200 (80%)	?	Primary & secondary forest	?
Gunung Inas	2-4	? / ? / ?				
Belum	10+	10/0/?	2400 (100%)	?	Primary & secondary forest	?
Bubu	2-3	0/0/3	?	?	Primary & secondary forest	?
Besut	3-5	1/0/0	?	?	Secondary forest	?
Sub-total	85-126+	41/34/4+ = 79+				418-468

Table 2.5 ... continued. Population estimates of the wild Sumatran rhinoceros

Location	Estimated Number of Rhino		Habitat Availability (sq km)		Protection Status	Potential Carrying Capacity
	AsRSG Meeting 12/1993	AsRSG Meeting 12/1995 Known/Probable/Possible	Presently (% Surveyed)	Potentially		
Malaysia						
Sabah						
Tabin Wildlife Reserve (+ Kulama W.R. & Lower Segama)	20+	13/2/5	1,200 (100%)	1,200	Wildlife Reserve	120
Kretam	18-28	1/0/0	1,000	0	Protected Forest Reserve	80
Yayasan Sabah Forest Concession	10-20					
A) Danum Valley		6/2/3			Protection Forest	200
B) Maliau Basin		1/2/1				
C) Kuamat River		2/2/2				
D) Ulu Segama & Malua FR		2/4/2	438 (80%)	2,000 ?		
Damarakot-Tangkulap		1/0/2				
Lower Kinabatangan		3/2/3				
Lamag		1/0/2				
Other		0/6/0				
Sub-total	48-68+	30/20/20=70				200
Sarawak						
Limbang	10+	0/?/?	600	600	Prmry/secndry forest	60
Sub-total	10+	0/?/?				60
Total Malaysia	143-204	71/54/24+=149+				678-728
Total	356-495	110/118/72+=300+				1538-3048

wildlife staff are positioned. The rhinos in Sumatra are too widespread and in too many pockets for all of them to be protected adequately in the ranges where they still survive. As a result, they are subject to heavy poaching pressure both from hunters with firearms and from trappers using wire snares and other traps.

An extensive international cooperative program for the conservation of this species is already being implemented within *situ* activities being conducted with the aid of a Global Environment Facility (GEF)/United Nations Development Programme (UNDP) Project in Indonesia and Malaysia. The primary objectives are to develop and deploy effective anti-poaching teams and to provide the coordination capacity to manage and sustain, financially as well as organizationally, the program.



There are also ongoing but reoriented efforts to develop managed breeding centers for the species in Indonesia and in Malaysia (both the Peninsula and in Sabah) as an adaptive modification of the captive programs. Traditional captive methods have proven unsuccessful for this species (Table 2.6) (Foose 1996). A total of 40 rhino have been captured for the captive program 1984-1995. Of these 20 survive. Mortality has been 50%. No reproduction has occurred although one calf was born in captivity to a female pregnant when captured. Attempts at captive breeding continue with the three animals in the United States. Plans are under way to repatriate the rhino of Indonesian origin in a British zoo to a Sumatran Rhino Sanctuary (i.e. a managed breeding center in native habitat, being developed in Indonesia). The captive program in Peninsular Malaysian is also being adaptively modified into a "sanctuary" or "gene pool" concept with the enlargement of the facility at Sungai Dusun. These efforts are components of a global captive propagation program initiated for this species under the general guidelines of the Singapore Proposals adopted by the AsRSG and IUCN in 1984, modified at meetings in Indonesia in 1991 and since then adaptively adjusted based on the experience with captivity.



The one calf born, but not bred, in captivity.

T.J. Foose

Table 2.6 Summary of captive programs for Sumatran rhino 1984-1996

Country	Captured	Born	Imported	Exported	Released	Died	Alive
Peninsular Malaysia	3/9	0/1 *	1/0	0/2	0/0	2/2	2/6
Sabah	8/2	0/0	0/0	0/0	1/0	4/0	3/2
Indonesia	7/11	0/0	0/1	4/7	0/0	2/3	1/2
Thailand	0/0	0/0	0/1	0/0	0/0	0/1	0/0
United Kingdom	0/0	0/0	1/2	0/0	0/0	0/2	1/0
United States	0/0	0/0	2/5	0/0	0/0	1/3	1/2
Total	18/22	0/1 *	4/9	4/9	1/0	9/11	8/12

* Conception occurred in wild but most of gestation and parturition transpired in captivity.

2.5 Conclusion

Finally, it should be emphasized that members of the IUCN/SSC Asian Rhino Specialist Group should work together for the maximum benefit of all these species, and should carry out their tasks and agreements in a manner that will encourage and engender future and long-term cooperation. The importance of respecting absolutely the authority in each country that is responsible for the

conservation of wildlife in general, and the rhino species in particular, cannot be over-emphasized.

This action plan is intended to recommend both general strategies and specific measures to protect and preserve the three species of Asian rhino: the great one-horned or Indian rhino, *Rhinoceros unicornis*; the lesser one-horned or Javan rhino, *Rhinoceros sondaicus*; and the Asian two-horned or Sumatran rhino, *Dicerorhinus sumatrensis*.

3. Indian (Great One-Horned) Rhinoceros Action Plan

3.1 Introduction

The past and present status of this species is summarized in Chapter 2. The total estimated number is around 2,000 animals. The species has been well protected by the Indian and Nepalese wildlife authorities and the situation seems generally to be under control. However, the increasing human population pressure and the poverty of the villagers who surround these protected areas, coupled with the great value of its horn, have resulted in significant losses to poachers in India and this still poses a threat to rhinos in Nepal. Limited resources for protected area managers is a critical problem for continued control of poaching.

The emphasis of this action plan is to consider what needs to be done to preserve the species in perpetuity. Thus, the main objectives that should govern immediate conservation actions are detailed along with specific recommendations derived from these objectives. Application of these recommendations is considered separately for Nepal and India.

3.2 Objectives

- 1 To develop and maintain a total wild population of at least 3,000 rhinos.
- 2 To maintain these rhinos in the following major protected areas in the current range of the species: Kaziranga, Manas, Rajiv Gandhi Wildlife Sanctuary, Pobitora, Jaldapara and Dudhwa in India; Chitwan and Bardia in Nepal.
- 3 To expand the number of rhinos in other protected areas also when and where possible.
- 4 To respond to threats to viable populations in the wild adequately.
- 5 To maintain a captive population capable of long-term viability to guard against any unforeseen extinction of the wild population.
- 6 To continue efforts to close down the trade in rhino products.
- 7 To develop public support for conservation through eco-development and awareness programs.

3.3 General recommendations

- 1 Concentrate efforts on areas in which reasonably viable wild populations (>100 rhinos) in the wild can be developed and maintained:

India: Kaziranga
Manas
Rajiv Gandhi Wildlife Sanctuary
Pobitora
Jaldapara
Dudhwa
Nepal: Chitwan
Bardia

Such efforts should include habitat improvement, area extension, anti-poaching measures, training of staff, public education campaigns, research and eco-development.

- 2 Calculate the financial resources currently available and those additionally required to provide adequate protection for these populations. Develop project proposals for submission to donors for additional financial support.
- 3 Assess the value to the conservation of the species of the small remnant populations of rhinos, e.g. Gorumara, through better information on current status and cost-benefit analyses of increased protection and management in such areas.
- 4 Continue efforts to establish other wild populations elsewhere in India and Nepal through translocations. But such translocations should be limited to sanctuaries where the carrying capacity exceeds 100 rhinos. It is recommended that there be follow-up surveillance to measure the success of the translocations.
- 5 Expand the captive population mainly through propagation of rhinos already in zoos by transfer of animals, where required, from western zoos.
- 6 Encourage wildlife officials and their governments in India and Nepal to participate more fully in the activities of the IUCN/SSC Asian Rhino Specialist Group (AsRSG).

7. Continue measures to prevent illegal trade in rhino products from leaving India and Nepal for markets abroad.

3.4 Nepal: specific recommendations

The conservation of the Indian rhino in Nepal represents a conservation success story. In around 1960, the Chitwan population had plummeted to around 60 rhinos. In 1994 the Chitwan population was estimated at between 446–466 animals. At present, the population is increasing at a rate of about 3.7% per year. With the control of both poaching and habitat destruction, recruitment has been so strong that translocations of rhinos to other protected areas have already begun. In this manner Nepal has led the way for other Asian nations in its efforts to preserve an important constituent of the regional megafauna. Nevertheless, the conservation effort for the Indian rhino in Nepal is far from over. This section of the action plan delineates and prioritizes what must be done to ensure the long-term viability of the species in Nepal and in the region.

The action plan for Nepal emphasizes continued efforts to protect rhinos from poaching, population monitoring, and habitat maintenance. Recommendations as they apply to the situation in Nepal are as follows (each recommendation below is in the same order and numbering as the General Recommendations earlier in this chapter):

- 1. Concentrate efforts on areas in which reasonably viable wild populations (>100 rhinos) in the wild can be developed and maintained.**

In Nepal, these areas are Chitwan and Bardia. In 1975 the Chitwan rhino population was 270–310 animals. This number was estimated using a combination of photo registration and indirect count techniques. By 1988, the minimum estimate was 358 rhinos. Monitoring the second largest population of the Indian rhino proved invaluable. In particular, these have greatly improved the translocation efforts by providing data on the structure of the Chitwan population, and the sex, relative age, and home range of animals considered suitable for translocation. Thus, a real benefit from intensive monitoring is obvious.

The continuation of the ongoing ecological studies in Chitwan also augments efforts to monitor rhino numbers. Research in Chitwan has demonstrated that the accurate way to census rhinos is to register all individuals encountered and prepare a database based on composite morphological characteristics of each animal. Clearly, there is no substitute for being out in the field in order to monitor the population, and such research projects conducted by Nepali and expatriate collaborators are providing for close surveillance of the rhino populations.

In association with the reintroduction of the species to the Royal Bardia Reserve National Park, park employees should be assigned to carry out rhino census every three years. In addition, serious thought should be given to supporting Nepali graduate students with appropriate background to monitor and study relocated animals.

In and around both Chitwan and Bardia, more anti-poaching units must be established and supported with equipment. Training of staff in wildlife and protected area management should be continued. Public awareness programs need to be developed around both these areas, together with the investigation of methods that allow local human populations to derive economic benefits from the existence of the rhinos.

- 2. Calculate the financial resources currently available and those additionally required to provide adequate protection for these populations.**

Current financial resources appear to be insufficient to ensure the conservation of the rhinos at Chitwan. A rhino action plan was prepared in 1993 and updated now, including Bardia.

- 3. Continue efforts to establish new wild populations through translocations.**

Reintroductions should be limited to sanctuaries capable of supporting rhino populations in excess of 100 animals. A follow-up surveillance should be initiated to measure the success of such reintroductions. Nepal has attracted world-wide attention with its bold and highly successful reintroduction effort in Bardia. However, the analysis of data from the genetic management of endangered species at the previous ASRSG Meeting suggests that this effort is only about one-third complete. To maintain 90% of the genetic variability of the Bardia population for the next 200 years requires a founder group of at least 30 and preferably 40 animals. Because of the small number of founders reintroduced, the Bardia population faces a high probability of rapid extinction due to demographic or random events. At present, if no more rhinos are added to Bardia, the best available evidence indicates that the population might not last longer than 75 years before the deleterious effects of inbreeding start to threaten its continued existence. A greater investment now will return real conservation dividends if the founder group is substantially increased. This is especially true if only a percentage of the rhinos relocated to Bardia actually breed and produce offspring.

An important caveat in the relocation effort is that animals should be shifted only to those reserves which can ultimately support more than 100 individuals as recommended by the several population and habitat

viability analyses conducted for rhino (Foose *et al.* 1993; Seal and Foose 1989; Soemarna *et al.* 1994; Moluret *et al.* 1995). In this light, the potential of Sukla Phanta Wildlife Reserve as a future rhino reserve must be considered.

4 Expand the captive population mainly through propagation of rhinos already in zoos by transfer as needed from western zoos.

Eventually, all the Indian rhino in captivity must be managed as one population. In order to maintain an MVP of Indian rhino in captivity, the numbers must be increased.

5 Encourage wildlife officials and the government in Nepal to participate more fully in the activities of the IUCN/SSC Asian Rhino Specialist Group.

In this regard, the proposal from the 1986 Jakarta ASRSG meeting that a future meeting be held in Nepal should be implemented.

3.5 India: specific recommendations

Because of the large size of Kaziranga, the Indian rhino population, and the extensive network of reserves across northern India, great opportunities exist for future translocation efforts. This effort has already begun in Dudhwa National Park. The ultimate objective that the Indian rhino conservation program in India should address and consider is the issue of reestablishing the species in as many reserves as possible where the potential carrying capacity for the species exceeds 100 animals. Additional

protection will need to be afforded the species in its relocation sites.

Recommendations as they apply to the species in India ensue in the same order and numbering as the General Recommendations earlier in this chapter:

1 Concentrate efforts on areas in which reasonably viable wild populations (>100 rhinos) in the wild can be developed and maintained.

In India, these are: Kaziranga, possibly Manas, Rajiv Gandhi Wildlife Sanctuary, Pobitora, Jaldapara, and Dudhwa (though others might be created through further translocations).

In addition, it would be useful to harmonize the population census techniques used in India in some areas with the photo-registry technique currently used in Nepal. Exchange visits between rhino researchers and managers in Chitwan, Kaziranga, Manas and Jaldapara should be arranged.

The human pressures around the actual and potential rhino reserves in India are extremely severe, and are likely to become worse. For the long-term security of the rhinos, a number of actions are required:

- maintenance and improvement of ongoing anti-poaching measures, and the implementation of such measures for newly established populations (e.g. Dudhwa);
- habitat improvement program and extension of areas in Kaziranga and elsewhere.
- public awareness and education programs around all rhino reserves;
- eco-development activities for fringe villages;



Indian rhinos mating in Kaziranga.

T. J. Foose

- maintenance and improvement of wildlife management and protected areas including training programs for staff at all levels;
- research on managerial, biological, ecological and sociological issues;
- continuous monitoring and periodic evaluation.

2 Calculate the financial resources currently available and those additionally required to provide adequate protection for these populations.

An action plan was prepared during 1993 by the Indian Government for support by donor agencies. This plan has now been improved and updated at current prices for external funding.

3 Assess the value to the conservation of the species of the small remnant populations of rhinos (e.g. Gorumara), through better information on current status and cost-benefit analyses of increased protection and management.

In particular, investigations are needed of the various small populations in Assam and West Bengal, to determine the strategy for their future management.

4 Continue efforts to establish other wild populations elsewhere in India and Nepal through translocations.

Much deserved credit has been given to the Indian Government for its successful reintroduction of rhinos to Dudhwa National Park. However, with a founder stock of only seven animals, which has increased to 13 currently, the operation cannot yet be considered complete. To avoid the problems of inbreeding, it would be advisable to introduce more animals. Other sites for reintroduction should also be considered.

Reintroductions should be limited to sanctuaries capable of supporting rhino populations in excess of 100 animals, and follow-up surveillance should be initiated to measure the success of such reintroductions.

5 Expand the captive population mainly through propagation of rhinos already in zoos and by transfer as needed from western zoos.

6 Encourage wildlife officials and the government in India to participate more fully in the activities of the IUCN/SSC Asian Rhino Specialist Group.

The government should also provide some support for such participation.

7 Continue measures to prevent rhino parts and products from leaving India for markets abroad.

Continued instances of poaching in India suggest that the government cannot afford to ease off in its attempts to close down the illegal exports of rhino parts and products from the country.

3.6 Conclusion

Of the three Asian species of rhino, the Indian rhinoceros seems to be in the best situation at this time. However, significant threats, such as problems of habitat disturbance and poacher activity still exist. The species can be monitored with relative ease, in comparison with the other two species, because of the habitats it favors. It occurs at its highest densities in the early successional habitats, which regenerate, often within 1–2 years of a major natural disturbance. This contrasts with the habitat requirements of the Sumatran and Javan rhinos which are more heavily dependent on primary rain forest. However, since the anthropogenic pressures on the habitat of the Indian rhinoceros are rather high and rapidly growing, to consolidate the conservation success, extension and improvement of habitat coupled with continued vigilance, support from local people, capacity building of wildlife staff, appropriate research, monitoring and evaluation will be required.

4. Javan (Lesser One-Horned) Rhinoceros Action Plan

4.1 Introduction

The only easily accessible and well known population of the Javan rhinoceros occurs in the Ujung Kulon National Park in West Java where an estimated 54–60 occur according to the latest census. A small population estimated at 8–15 rhino was discovered in the Dong Nai area of Vietnam, in the Cat Loc Nature reserve, near to, but not included in, Nam Cat Tien National Park. The situation in Laos and Cambodia is unclear, but the probability of survival is considered higher in Laos than in Cambodia where all rhino are presumed extinct.

This species probably has the distinction of being the rarest large mammal in the world. The greatest threat to the species is poaching. In Indochina, there might also be the threat of habitat destruction (it being an inhabitant of tropical lowland forest).

In Indonesia, the Javan rhino has been legally protected since 1931. Ujung Kulon National Park was set aside for the conservation of the species. The area is managed by PHPA (Perindungan Hutan dan Pelestarian Alam) a Directorate General within the Ministry of Forestry.

In Vietnam, the rhino are not currently in an effectively protected area although there are proposals to gazette the area and create a corridor to the nearby Nam Cat Tien National Park.

4.2 Objectives

- 1 To preserve the remnant populations in the wild.
- 2 To locate and/or establish other populations in the wild.
- 3 To develop a managed breeding or "sanctuary" program to reinforce this species in the wild, but in a way that minimizes the demands on the tiny wild population.
- 4 To continue efforts to close down the trade in rhino products.

4.3 General recommendations

- 1 Continue and intensify the surveys in Ujung Kulon National Park, Java, to determine more precisely the size and composition of the population surviving there. The intensive surveys should be guided by competent ecologists and can be conducted as part of the activities of the rhino protection units proposed for the Park. Highly recommended are: standardized surveys and estimates; training for and implementation of intensive patrols; provision of additional equipment and facilities



Javan rhino in Ujung Kulon.

Alain Compost

for the Rhino Conservation Units; and concerted research and monitoring.

- 2 Determine what resources are currently available, and what are additionally required, to provide adequate protection for the population in Ujung Kulon. This should include a consideration of human needs in the buffer-zone outside the park.
- 3 Investigate further the status of Javan rhino in Vietnam and Laos (and perhaps) Cambodia. This investigation might be conducted in conjunction with the Kouprey Conservation Programme.
- 4 Develop as soon as possible managed breeding or "sanctuary" programs, based on information obtained by intensive survey of Ujung Kulon and the explorations in Vietnam.
- 5 Formulate guidelines, and perhaps conduct a search, for a site to establish additional wild populations in South East Asia. Animals should be generated for reintroduction from the managed breeding or "sanctuary" programs.
- 6 Introduce and enforce strict measures to ban the use of Javan rhino products in all countries, especially in Laos, where internal consumption is still permitted. More severe measures against poachers and traders are needed.

4.4 Indonesia (Java): specific recommendations

The situation of the Javan rhino is an emergency, and only abroad, integrative conservation program is likely to save it from extinction. Because of the uncertainty of the situation in Indochina, initial efforts must be directed to the animals in Ujung Kulon National Park. With such a small population, and continuing incidences of poaching, the following actions are necessary

1 **Conduct an intensive survey of the species in Ujung Kulon National Park.**

This is an essential pre-requisite to recommending further conservation action. The survey is of such importance that it should be led by top quality ecologists and the proposed rhino protection units. The survey should concentrate on the size, composition and habitat preferences of the population occurring there, and should assess the principal threats to its continued survival. Standardized surveys should be conducted annually thereafter.

2 **Determine what resources are currently available, and those that are additionally required, to provide adequate protection in Ujung Kulon.**

This should lead to a comprehensive management plan for the entire area, which should include:

- strong anti-poaching measures, including the establishment of a Javan rhino protection unit.
- training of PHPA staff at all levels in wildlife and protected area management;
- an extensive public education and awareness program among local people as to the unique importance of Ujung Kulon National Park and its rhinos;
- initiation of appropriate forms of development in a buffer-zone outside the park to enable local people to derive tangible economic benefits from the park.

3 **A specific application of this recommendation is not relevant to Indonesia as there is no evidence to justify investment of resources in search for further remnant populations.**

4 **Develop as soon as possible a Javan Rhino "Sanctuary", i.e. an intensive protection zone and perhaps managed breeding center in native habitat.**

Such a development is essential to improve protection and conservation of the Javan rhino in Ujung Kulon National Park where poaching does continue with loss of rhino as recently as 1994. A "sanctuary" program could also facilitate production of rhino for possible expansion of the Ujung Kulon population in areas of the Park not currently utilized as well as translocation to new sites. The population in Ujung Kulon is not large enough, and perhaps never could be under current conditions, to be viable in genetic and demographic terms. The best possibility to facilitate rapid expansion of the population, and thereby reduce the risks of demographic failures and arrest the continuing loss of genetic variation, is to develop a managed breeding or "sanctuary" program. Such a program should be developed as a collaboration between the Indonesian Government and international organizations/institutions. The program will need to consider where the initial "sanctuary" should be located and how to expand the population as quickly as possible, and yet minimize demands on the wild population.

5 **Formulate guidelines, and perhaps conduct a search, for a site in which to establish additional wild populations in South East Asia.**

This project is a longer-term development, which should emanate from the managed breeding program. The area to be selected should be within the historical range of the

species, with suitable habitat for the animals to survive at a relatively high density, of sufficient size to support a viable population, and with good security against poachers.

- 6 **Enforce strict measures to prohibit the use of Javan rhino products in Indonesia. This is to include the application of the strongest possible penalties against poachers and traders.**

4.5 Vietnam: specific recommendations

Implement immediate measures to improve protection of the remnant population in the Cat Loc Nature Reserve in the Dong Nai area near Nam Cat Tien National Park including:

- more intensive anti-poaching patrols and surveys;
- incorporation of the Don Nai area into Nam Cat Tien National Park;

- possible development of a managed breeding center in native habitat ("sanctuary") at or near Dong Nai or Nam Cat Tien.

4.6 Laos and Cambodia: specific recommendations

Because of the very uncertain situation of this species in Indochina, only recommendations number 4.3.3 (i.e. investigating status) and 4.3.6 (i.e. ban on Javan rhino products) apply at this stage. Surveys should be coupled with the Kouprey Conservation Programme.

4.7 Conclusion

An international recovery program for the Javan rhinoceros is one of the most pressing species conservation priorities in the world. The loss of this species would be a supreme act of negligence by the conservation community.

5. Sumatran (Asian Two-Horned) Rhinoceros Action Plan

5.1 Introduction

The Sumatran rhinoceros is a species of rainforest in hilly and mountainous areas. It is much more widely scattered, often in tiny non-viable populations, than the other two species. As a result, it is more difficult to make decisions as to the most appropriate priorities for its conservation, especially since a number of national and state governments are involved. Although not yet as critically threatened as the Javan rhinoceros, this species is probably experiencing the most serious level of poaching for its horn of all the Asian rhinos. In some areas it is also threatened by habitat destruction. In view of these complexities, it has been felt best to handle the specific recommendations for each country in a slightly different way from the previous two species.

A major Global Environment Facility (GEF) Project is in progress in both Indonesia and Malaysia to develop more effective anti-poaching and community outreach activities.

The 1989 Action Plan placed great hopes and importance on captive propagation programs for this species. However, the captive program using rather traditional methods has not succeeded in developing propagation of this species or even maintaining the species within acceptable limits of mortality. Fifty percent of the 40 rhino that have been captured as part of this program from 1984 through 1996 have died. (Table 2.6).

Nevertheless, considering the intense, even intensifying threat, to this species caused by continued poaching as well as the difficulties of protecting this species because of its large ranges and dense forest habitat, managed breeding is still considered an essential part of the strategy. However, emphasis is now being placed on the development of managed breeding centers in natural habitat or sanctuaries.

5.2 Objectives

- 1 To develop populations of at least 700–1,000 rhinos in each of the major regions of its range: Sumatra; Borneo; Peninsular Malaysia and adjacent mainland; and perhaps northern Myanmar if appropriate stock is available.
- 2 To preserve, manage and where appropriate expand all populations that have the potential to increase to 100 animals or more.
- 3 To determine if the populations in each major part of its range (listed under objective 5.2.1) constitute valid subspecies or evolutionary significant units (ESUs), justifying preservation as separate entities by conservation programs.



Sumatran rhino browsing from a tree.

Francesco Nardelli

- 4 To locate or establish additional viable populations, especially on the mainland and Borneo.
- 5 To develop a managed breeding population of 50 rhinos distributed in sanctuaries in South East Asia: notably Way Kambas in Indonesia; Sungai Dusun in Peninsular Malaysia; and Sepilok and Tabin in Sabah.
- 6 To continue efforts to close down the trade in rhino products.

5.3 General recommendations

- 1 Concentrate initial *in situ* conservation efforts on the 10 populations considered to be reasonably viable according to current information and analysis.
- 2 Develop more effective anti-poaching teams and programs.
- 3 Calculate the resources currently available and additionally required to provide adequate protection for these populations.
- 4 Ensure improved legal protection status of all areas with viable, or potentially viable, populations (particular attention to be given to Kerinci-Seblat in Sumatra and Endau Rompin in Peninsular Malaysia).
- 5 Conduct biochemical genetic studies, initially using blood and tissue from captive animals, to investigate if there is more than one ESU in this species.
- 6 Organize surveys as soon as possible in Kalimantan (highest priority), Thailand, and northern Myanmar to ascertain whether appreciable populations of rhino survive there.
- 7 Continue the capture of isolated animals outside reasonably viable or feasibly protectable areas for translocation to managed breeding centers or intensive protection zones, i.e. sanctuaries.
- 8 Improve the effectiveness of law enforcement throughout the species' range with respect to anti-poaching measures and trading in Sumatran rhinoceros products. The strictest possible penalties should be applied to offenders.

5.4 Indonesia: specific recommendations

The total population of the Sumatran rhinoceros in Indonesia has recently been estimated to be: 185–259

(1993 PHVA Workshop (Soemarna *et al.* 1994); 197–274 (1993 AsRSG Meeting) and 103–151 (1995 AsRSG Meeting)). These estimates represent about a quarter to a half of what was estimated in the 1989 Action Plan and the 1991 Indonesian Rhino Conservation Strategy. The reduction represents both improved information but also much real decline in numbers due to continued poaching.

All known Sumatran rhino in Indonesia are in Sumatra, with the possibility of a few existing in Kalimantan (Table 2.5).

In Indonesia this species has been legally protected since 1931. A number of reserves have been set aside for the conservation of wildlife, including this species, notably the Gunung Leuser, Kerinci-Seblat, Bukit Barisan Selatan and Way Kambas National Parks in Sumatra. These are all managed by the PHPA (Perlindungan Hutan dan Pelestarian Alam), a Directorate General within the Ministry of Forestry. The goal is to ensure the survival of viable populations of the Sumatran rhino in Indonesia in its natural habitat. *In situ* protection has the highest priority. The captive program is currently being reoriented to establish a managed breeding center (Sumatran Rhino Sanctuary or SRS) in Way Kambas National Park.

1. *In situ* protection

Better protection is needed of the known possible rhino populations in Gunung Leuser, Kerinci-Seblat, Bukit Barisan Selatan and Way Kambas National Parks in Sumatra as well as in other locations where nuclei of rhino are confirmed. Such improved protection should include the following aspects:

- a massive increase in anti-poaching efforts;
- appropriate forms of sustainable development in the buffer-zones around these parks, to enable people to derive economic benefits from the protected areas;
- a public education and awareness program on the importance of these national parks and their rhinos;
- a training program for all levels of staff working in wildlife and protected area management. This should include training in captive management of rhino;

2. Monitoring

Monitoring should be conducted on as many rhino populations as possible on a regular basis to assess the trends, distribution, threats, movement and habitat preferences of the species. Population estimation should preferably be conducted annually by teams of people employing standardized methods. Surveys should be conducted to assess the distribution and abundance of the species outside the protected areas. In particular, surveys should be conducted to assess the status of rhino, if any,

in Gunung Patah, Gunung Abongabong, Lokop, and in several areas in Kalimantan which are suspected to have rhino populations, e.g. Kayan Mentarang National Park; Ulu Sembakaung/Sungai Sebuku; Gunung Belayan/Sungai Boh/Sungai Kayaniut; Sungai Irun; Gunung Meratus; Bentuang Karimun Nature Reserve.

3. Capture and translocation

It is important to identify areas that are destined to be converted to other land uses incompatible with wildlife conservation, and hence determine whether it is necessary to translocate rhinos to another, safer area or into the "sanctuary" population. The target area must have adequate habitat to sustain a viable population of rhino which the various PHVAs conducted for rhinoceros recommend as at least 100 individuals.

4. Research

Research on rhino should be directly applicable to the problems of conservation biology and management of the populations. Research on rhino populations in the national parks and other protected areas should be conducted with a view to determining their number, breeding performance and habitat requirements. Research is also necessary in order to determine the threats to the animals in each area and to devise appropriate conservation action.

5. Trade

Limited information exists on the illegal trade in rhino horn on and from Sumatra. Investigations are urgently required to collect information on prices, trade routes and specific dealers. This information can then be used for law enforcement activities to close down the trade both unilaterally on the part of the government of Indonesia and bilaterally with those countries discovered to be importing Sumatran rhino products.

5.5 Malaysia: specific recommendations

The management of wildlife in Malaysia is governed by three different legislative measures. In the Peninsula, the Wildlife Protection Act of 1972 provides wildlife protection for the 11 states. In Sabah and Sarawak, the Fauna Conservation Ordinance and the Wildlife Protection Ordinance make necessary provisions for wildlife administration respectively. The Sumatran rhino is protected by law throughout Malaysia. Of 20 known populations in Malaysia, 14 are considered non-viable and only six (Taman Negara, Endau Rompin, Belum, and Ulu Selama in Peninsula; Tabin and Danum Valley in

Sabah) are considered reasonably viable for long-term genetic management. Habitat destruction through logging, agricultural development, human settlement, and shifting cultivation are the main causes of the population decline. Poaching remains a serious problem in both Peninsular Malaysia and Sabah.

The goal is to maintain or recover viable populations of the Sumatran rhinoceros in the wild in Malaysia. The objectives of the action plan for Malaysia are:

- to protect and manage the rhino and its habitat;
- to gather information on the viability of the populations and exact habitat requirements for rhinos;
- to promote scientific research and dissemination of information on captive individuals;
- to increase the "sanctuary" population to produce rhino available for reintroduction.

Sabah

1. As of January 1988, the Sabah Wildlife Department has been upgraded to full departmental status within the Ministry of Tourism (previously Wildlife had been a division within Ministry of Forestry). However, the current strength of the Division is inadequate for effective protection and research to be conducted for the rhino in particular and wildlife in general. As a long-term measure, the Wildlife Department should be strengthened in terms of staffing, funding and logistical support.
2. The Fauna Conservation Ordinance 1963 has been the wildlife legislation for the state of Sabah. Penalties under the Ordinance for poaching of rhinos and relevant provisions have been considered inadequate to deter poaching or to ensure that offenders are brought to book. The 1989 Asian Rhino Action Plan recommended that the ordinance be reviewed to provide for heavier penalties for poaching of rhinos, and the powers of wildlife officers be reviewed to enable them to carry out their duties effectively. The Ordinance is currently undergoing a major revision and will be replaced by the Wildlife Conservation Enactment.
3. Currently, there are four rhino areas in Sabah: Tabin Wildlife Reserve, Yayasan Sabah Forest Concession (which includes Danum Valley), Lower Kinabatangan, and Damarakot-Tangkalap. Tabin and the Yayasan Concession are the two most important. Tabin Wildlife Reserve will be extended to incorporate an area of adjacent forest in the north, connecting Tabin to Kulamba Wildlife reserve. In addition, sufficient manpower and facilities should be and are being assigned to these areas, especially Tabin and Yayasan Forest Concession. Public education programs should

be instigated around these areas, and appropriate forms of buffer-zone development should be considered.

- 4 At least two of the known populations are considered to be reasonably viable for long-term genetic management (Tabin has approximately 20, and Danum about 10 individuals). It is recommended that surveys be conducted to locate further breeding populations as well as other isolated individuals.
- 5 It is recommended that the capture of isolated or threatened rhinos be continued for the "sanctuary" or translocation purposes. Breeding between individuals from different geographical regions (e.g. Peninsular Malaysia and Sabah) should be avoided unless further studies show that there are no appreciable genetic differences between these areas or until a demographic imperative argues for subordination of genetic considerations in favor of maximizing breeding.

Sarawak

- 1 A detailed study of the rhino population is needed in order to demonstrate that the area should be declared a national park or a rhino reserve.
- 2 Constant monitoring of the Ulu Limbang population is needed to determine its true extent, and its protection requirements.

Peninsular Malaysia

- 1 There are believed to be four viable (actually or potentially) populations in Peninsular Malaysia: Taman Negara, Endau Rompin, Selama, Belum. Constant surveillance should be carried out on these populations. Now that the State of Johor has established their part of Endau Rompin as a State Park, the highest priority is to encourage the State of Pahang also to designate its part of Endau Rompin as a State Park.
- 2 Extensive habitat evaluation should be carried out to determine the carrying capacity of the areas. This information is important to determine whether these are suitable sites for the future release of animals translocated from doomed populations.

- 3 Sungai Dusun Wildlife Reserve (Peninsular Malaysia): A managed breeding center in natural habitat (or "sanctuary") will be developed here by expanding the existing captive facility through extension of the yards into the adjacent forest. This "sanctuary" will thus evolve into the "gene pool" concept discussed in the 1989 Asian Rhino Action Plan. Management of rhinos in a semi-wild state should be implemented at this site. The founder population will consist of the current captive population of six females and two males.
- 4 Other areas in Peninsular Malaysia, especially along the main range of mountains extending down the peninsula, should be surveyed for rhino populations.

5.6 Thailand

The current status of the species in Thailand is obscure, and requires investigation. If any animals survive, it is most unlikely that they do so in viable populations. As such, any animals would best be captured for a "sanctuary" or managed breeding program (perhaps in conjunction with Peninsular Malaysia), pending reintroduction to a suitable site at a later date. Rhino products, almost entirely of imported origin, are still available in Thailand. Although rhinos are strictly protected in Thailand, there is currently insufficient legal capacity to control the importation of rhino products. The government of Thailand is strongly urged to take action on this.

5.7 Myanmar

Survival of the isolated subspecies *lasiotis* in northern Myanmar is confirmed by the continuing appearance of rhino products of Burmese origin in northern Thailand. As the situation permits, the status of the species in northern Myanmar should be investigated to determine the necessary *in situ* and *ex situ* conservation requirements.

5.8 Conclusion

The Sumatran rhino is probably the most critically endangered of all rhino species. Only immediate and drastic action can prevent its extinction in the next decade.

6. Summary of Country Action Plans

(Verbatim reports submitted by the Range States)

6.1 India

Rhinoceros unicornis – the Indian rhinoceros now occurs in fragmented habitats and is restricted to West Bengal, Assam and Uttar Pradesh. Such rhino habitats are a part of Brahmaputra basin in Assam whereas in West Bengal the Protected Areas are confined within the limits of the catchments of the rivers Teesta and Torsa, and in Uttar Pradesh in the Terai. Currently, the population of rhino is estimated at approximately 1550, distributed in nine Protected Areas, five of which are located in Assam, two in West Bengal and two in Uttar Pradesh. Of these populations, the one in Kaziranga National Park represents a great success story of conservation. Numbers in Kaziranga have increased from fewer than 50 (perhaps as few as 12) to 1250+ in a span of 90 years. Other populations can at best be described as small populations or potentially a metapopulation.

Legal status of protected areas

Of the nine protected areas, four (namely Kaziranga and Manas, Gorumara and Dudhwa) have the status of National Park. In addition, Manas has also been recognized as a World Heritage Site. Three other rhino areas of Assam have been declared as Wildlife Sanctuaries.

Jaldapara in West Bengal and Kartiniaghat in Uttar Pradesh are Wildlife Sanctuaries.

Legal protection of the Indian rhino

Rhinoceros unicornis was accorded special status both in Assam and West Bengal through special legislation like the Assam Rhinoceros Preservation Act of 1954 and the Bengal Rhinoceros Preservation Act of 1932. The Indian rhino also occupies a distinctive status currently as it has been included in the Schedule I of the Wildlife (Protection) Act, 1972, which was amended in 1991 to provide stricter protection.

Conservation problems

1. The Indian rhino has been subjected to very bad episodes of poaching in its protected areas as this particular animal carries a horn worth its weight in gold. This poaching has caused an annual loss of 50 animals over the last 12 years. The poaching problem can be attributed to the decreasing number of African black rhino, and the problem is compounded because of the increasing value of the Indian rhino horn believed to be superior in medicinal properties. Apprehension of a very high dignitary in Taipei with a haul of 22 rhino



Indian rhino in water.

Peter Jackson

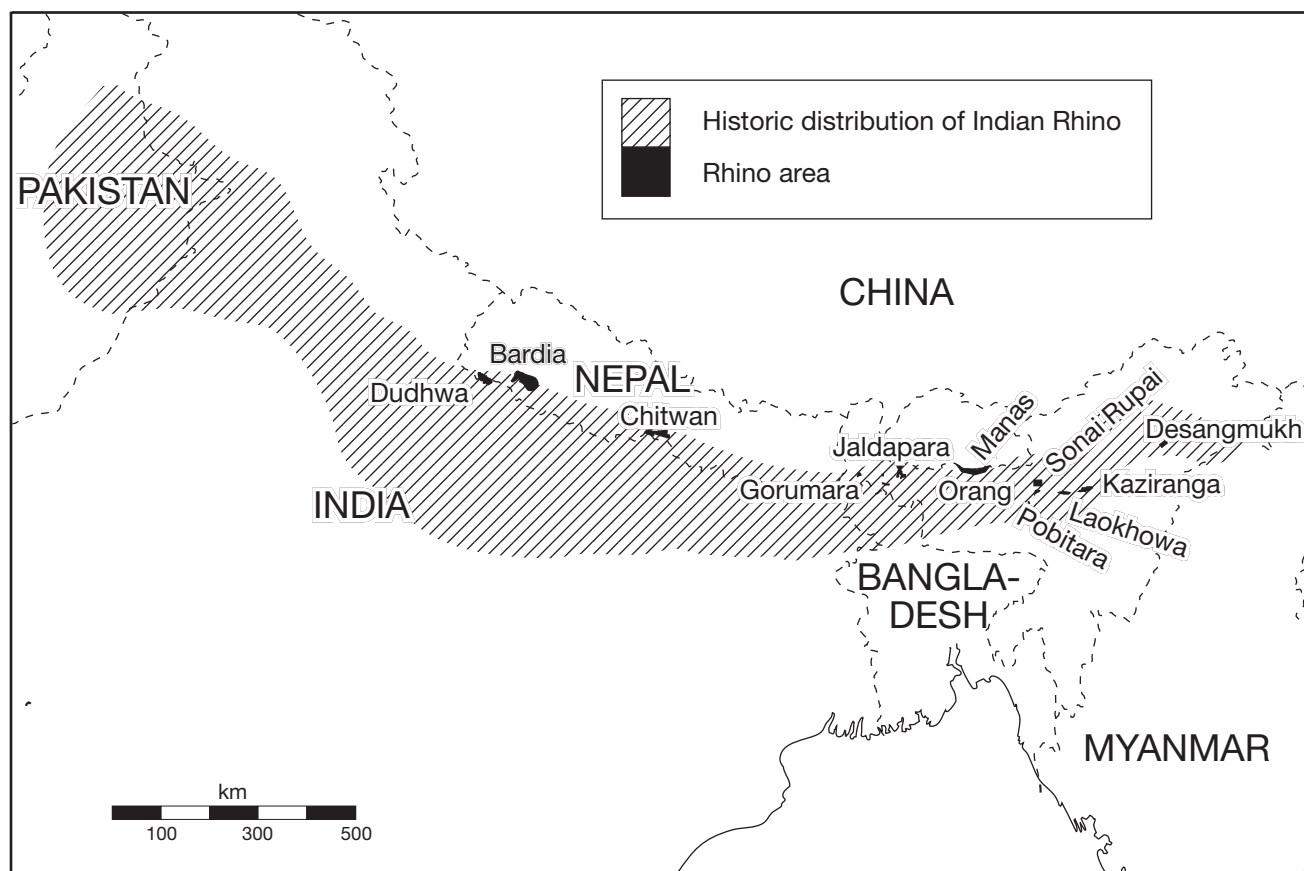


Figure 6.1 Closer view of rhino distribution and areas in India and Nepal

horns weighing 14kg, is indicative of the pressure of poaching on the Indian rhino population.

- 2 Rhino areas are located in the catchment of flood-prone rivers. Hence the threat of losing substantial numbers during high floods, particularly in the Brahmaputra basin, are real. But such areas can recover very rapidly during the periods of remission of floods. The changing courses of rivers in some rhino areas have also caused serious incursions into rhino habitat. During the last four decades the frequency of floods, on average, has been two in a decade, one of which in each decade was very severe.
- 3 Wood infestation and colonization of weeds: Weed infestation, particularly by weeds like *Mikania* sp., *Lea* sp., *Eupatorium* sp., *Mimosapudica* etc, in many cases has resulted in shrinkage of grasslands. Similarly, the progression of succession in riverine areas has led to colonization of grasslands by tree-lands.
- 4 There has also been shrinkage in water bodies, particularly in Kaziranga National Park through siltation of beels (i.e. small lakes or ponds) and

invasion of such water bodies by undesirable aquatic vegetation. All rhino protected areas have a high density of fringe human populations which, in many cases, have to draw sustenance from the resources of the protected areas. Such fringe people usually keep a high livestock population, which is often free ranging. Grazing by domestic cattle is, thus, a big factor in managing such protected areas, resulting quite frequently in conflict between the game managers and the local people.

- 5 The dearth of infrastructure, equipment, habitat improvements, area extension and eco-development programs due to paucity of funds has been a major constraint in managing rhino population in some of the protected areas.

The Rhino Action Plan

The Action Plan for Indian rhino relies primarily on *in situ* conservation with the specific objective of preserving existing biodiversity and interspersing of habitat with emphasis on maintenance and attainment of ecologically viable populations of Indian rhino. The major components included in the Action Plan are:

1. Intensification of anti-poaching drive through rationalizing existing organizational infrastructure and providing sufficient resources in the form of personnel, equipment, vehicles, arms, and radio stations.
2. Extension of protected areas for accommodating of straying rhinos and for providing safe corridors for them.
3. Habitat improvement through weed elimination followed by close planting with indigenous grasses and overwood removal in areas colonized by woodlands in serial stages. There is also need for improvement of water bodies through desiltation and removal of water hyacinth.
4. Translocation of breeding stock of Indian rhino into some small populations to ensure recovery to viable levels and survival through generations in the wild; and reintroduction of Indian rhinoceros into some areas of Assam, Uttar Pradesh and West Bengal in its former range.
5. Reduction of grazing pressure through erection of barriers and development of silvo-pastoral plantations on community lands.
6. Provision of suitable highlands for providing shelter to marooned individuals in flood-prone areas.
7. Provision for diversion of controlled discharge of existing perennial streams into abandoned river courses in the park for rejuvenation of former prime grasslands.
8. Development of an *in situ* orphanage center for rehabilitation of rescued animals from the wild.
9. Economic rehabilitation of fringe human populations through provision of adequate investment in beneficiary oriented and community development items in consultation with the local village level institutions like eco-development committees, panchyats, etc.
10. Provision of social facilities for park personnel and adequate compensation for disablement.
11. Development of appropriate site-specific interpretation facilities and raising of awareness through an intensive campaign.
12. Relocation of enclave villages from protected areas on mutual understanding.
13. Provision of veterinary care for the Indian rhino through establishment of a properly equipped veterinary unit in all protected areas.
14. Training of personnel on issues related to management of habitat and desired level of intensive protection.
15. Developing research capabilities of local institutions for undertaking research on identified items like reproduction biology in small pockets, grassland ecology, habitat utilization, etc.
16. Monitoring of rhino habitat and its population through use of satellite imagery at periodic intervals and undertaking censuses at two-year intervals.
17. Rational utilization of stock at different managed breeding centers for breeding to achieve the desired level of heterozygosity and subsequent release in the wild.

The projects and costs

A total of 20 projects for rhino conservation have been delineated by India.

These projects entail both increased protection against anti-poaching as well as population and habitat management in Assam, West Bengal and Uttar Pradesh.

The total cost of these projects is estimated to be US\$ 16,239,000 over the period 1996–2000.

6.2 Nepal

The rhino and its protected areas

The rhino is of special conservation interest because of its role in the maintenance of Terai biodiversity in Nepal. The rhino population in Chitwan is the second largest remaining population of Indian rhino in the Indian sub-continent. As a result of habitat destruction and poaching for the much valued horn, the Chitwan rhino population declined to minimum of 60–80 individuals in 1962. After 20 years of vigorous protection and habitat maintenance, now the Royal Chitwan National Park supports a viable population of more than 466 rhinos and over 40 individuals in the Royal Bardia National Park.

Conservation problems

The recent success and hence surge in the smuggling of rhino horns out of the country has intensified rhino poaching in Nepal's protected areas. Authorities have increased the surveillance of the rhino areas by establishing anti-poaching units despite the lack of resources and logistics. However, authorities are poorly equipped with transportation, communication means and field gear. The level of floods and extent of erosion in the plains are increasing every year, directly affecting the floodplain

grasslands, the prime habitat of rhinoceros. Maintenance and long-term monitoring of both rhino populations and critical rhino habitats are vital. In addition, scientific analyses (i.e. population and habitat viability assessment) (Seal and Foose 1989; Foose *et al.* 1993; Soemarna *et al.* 1994; Moluret *et al.* 1995) have indicated that populations smaller than 50–100 are at appreciable risk of extinction due to genetic and demographic problems.

The Rhino Action Plan

The Rhino Action Plan consists of *in situ* conservation. Major programs are:

- 1 Environmental monitoring of floodplain grasslands.
- 2 Strengthening anti-poaching measures.
- 3 Maintenance and monitoring of critical rhino habitats and rhino population.
- 4 Additional translocation of Chitwan rhinos to Bardia rhino population.

The projects and costs

A total of seven projects for rhino conservation have been delineated by Nepal.

Immediate and intensive action are required to arrest the decline due to poaching and enhance the population growth. This action will require both increased commitment from governments and financial support from the international donor community. Specifically, these projects include: development of monitoring systems for rhinos and their habitat; extension of rhino habitat in Chitwan; translocation of more rhino to Bardia N.P.; and additional equipment and training for guards.

The total cost of these projects is estimated to be US\$ 3,022,000 over the period 1996–2000.

6.3 Malaysia

The rhino and its protected areas

The Sumatran rhino in Malaysia is under serious threat of extinction by the end of this century, due to poacher pressure and habitat degradation. Numbers of rhino have declined to very low levels in both the Peninsula and on the island of Borneo. Based on recent surveys of 40% of the previously known rhino areas, the tentative estimates of the population are: 40–80+ in Peninsular Malaysia; 30–70 in Sabah; an unknown but doubtful number in Sarawak. Distribution is fragmentary but there are nine major areas where rhino occur: four in Peninsular Malaysia;



Edwin Bost

Sumatran rhinos mating at "sanctuary" in Sepilok, Sabah, Malaysia.



John Lukas

Overview of Rhino Conservation Center at Sungai Dusun, Peninsular Malaysia.

four in Sabah; one in Sarawak. Protection and management efforts are being concentrated in these areas.

Conservation problems

The fragmented distribution of rhino is impeding reproduction and impairing long-term genetic and demographic viability. The decline in numbers is due to poaching and habitat loss. Moreover, many rhino occur in inadequately protected areas. Scientific analyses have indicated that populations smaller than 50–100 are at appreciable risk of extinction due to genetic and demographic problems (Seal and Foose 1989; Foose *et al.* 1993; Soemarna *et al.* 1994; Moluret *et al.* 1995).

The Rhino Action Plan

The Rhino Action Plan consists of both *in situ* and *ex situ* components. More specifically, the major components are:

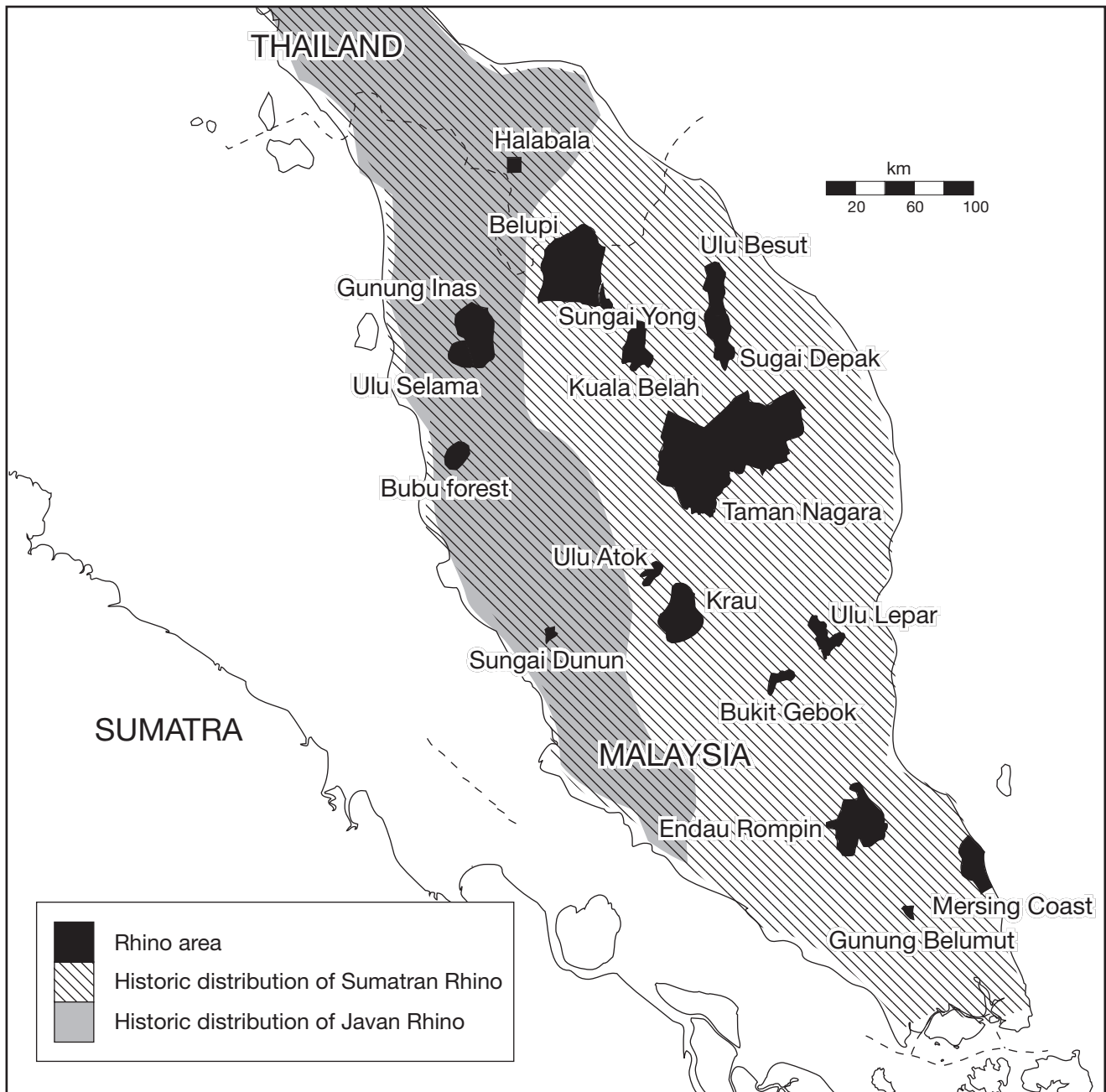


Figure 6.2 Closer view of rhino distribution in Peninsular Malaysia

1. *in situ* protection and management to enable survival and recovery of viable populations in the wild.
2. Translocation of rhino in non-viable situations into viable wild populations, intensive protection zones, or intensive management facilities.
3. Intensive management programs for propagation and research, including creation of "gene pools" or "sanctuaries" for managed breeding *insitu*.

The projects and costs

A total of 12 projects has been delineated for Malaysia, both Peninsula and Sabah.

Immediate and intensive action is required to reverse the present decline, so as to permit recovery of viable populations of rhino. This action will require both increased commitment of governments and more investment from the international donor community.

The total cost of these projects is estimated to be US\$ 5,704,000 over the period 1996–2000.

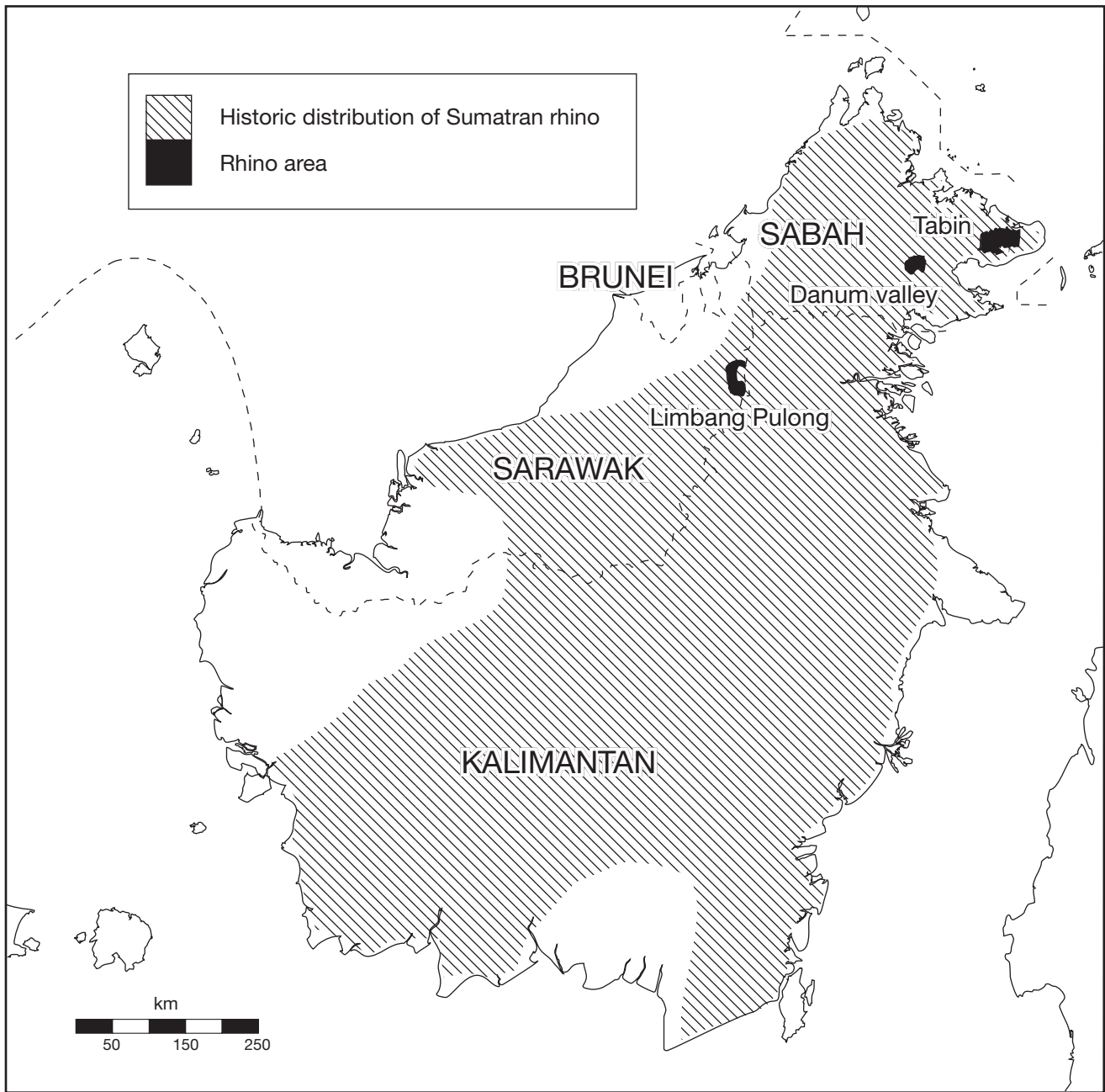


Figure 6.3 Closer view of rhino distribution in Borneo

6.4 Indonesia

The rhinos and their protected areas

Indonesia is the only country in the world to retain populations of both the Sumatran (*Dicerorhinus sumatrensis*) and Javan rhino (*Rhinoceros sondaicus*). Over 50% of the surviving world populations of Sumatran rhino and over 80% of the Javan rhino known to survive on the planet reside in Indonesia.

Both the Javan rhino and the Sumatran rhino are threatened with extinction, in Indonesia and world

wide. The current populations are small, scattered and most are threatened by illegal hunting and loss of habitat. Even without any further losses, the present populations are so small that they are vulnerable to environmental catastrophes, demographic fluctuations and genetic problems typical of small populations.

The Javan rhino formerly occurred through most of South East Asia, but has disappeared from almost all of its former range in Myanmar, Thailand, Malaysia and Sumatra, and is currently restricted to Java, with scattered populations still surviving in Cambodia, Laos and Vietnam. The cause of decline is

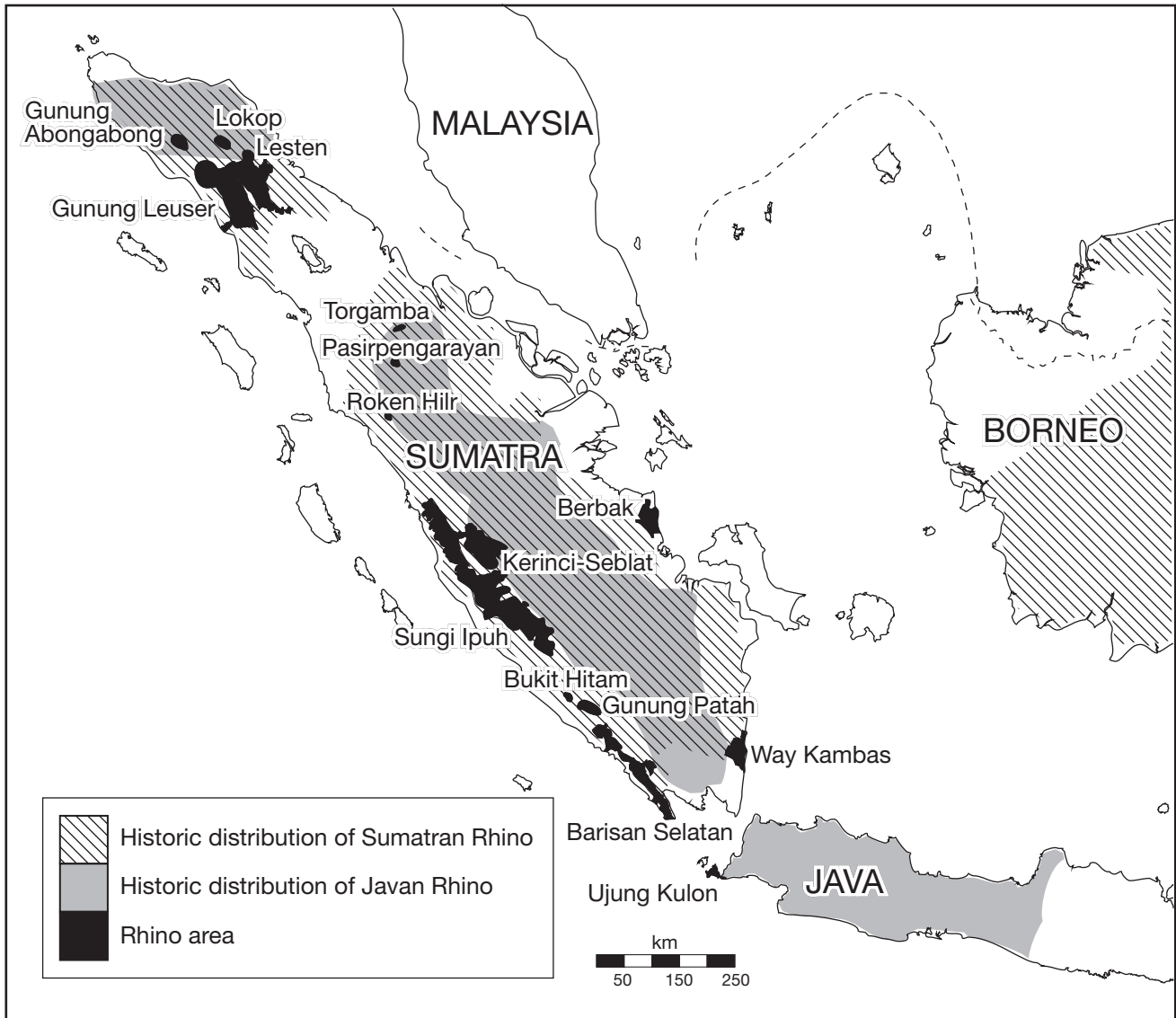


Figure 6.4 Closer view of rhino distribution and areas in Indonesia



Graduating class of guards from first GEF Project training session in Indonesia.

John Lukas

mainly attributable to the excessive demand for rhino horn and other rhino products for Chinese and allied medicinal practices.

The animals on Java are restricted to the Ujung Kulon National Park, where, as a result of strict protection, the population increased from about 25 animals in 1967 to about 55 in 1993. The most recent and perhaps reliable estimates for the Javan rhino are 47–60 (Griffiths 1993) by a photographic population estimation method and 54–60 by the most recent ground population estimate survey conducted by PHPA (Sriyanto 1995, unpublished report).

The Sumatran rhino occurs more widely than the Javan rhino, in highly scattered and fragmented populations. The recent estimates of the Sumatran rhino population in five major and several smaller areas in Indonesia are: 185–259 (1993 PHVA Workshop) (Soemarna *et al.* 1994); 197–274 (1993 AsRSG Meeting); 103–151 (1995 AsRSG Meeting). All known populations occur on Sumatra. Populations with the possibility of recovering to viability occur in Gunung Leuser, Kerinci Seblat, Bukit Barisan Selatan and Way Kambas National Parks as well as in North Aceh (Gunung Abongabong and Lesten/Serbojadi). The status of Sumatran rhino in several areas of Kalimantan where rhino populations are suspected (e.g., Kayan Mentarang National Park and Ulu Sembakung) is not yet known but will be explored further.

The Rhino Conservation Strategy and Action Plan

The objective of the strategy is to create conditions conducive to the long-term survival of viable wild populations of the Javan rhino and the Sumatran rhino in Indonesia. The aim is to establish and maintain secure populations of both species throughout their natural range.

To establish such populations, a number of actions are needed:

1. Rigorous protection of existing wild rhino populations and their natural habitat;
2. Expansion of existing wild populations, by natural population growth and, where appropriate, with animals translocated from elsewhere;
3. Re-establishing rhino populations in suitable areas within the natural range with animals derived from the wild or from captive or "sanctuary" stocks;
4. Strengthening of managed breeding programs to develop into a significant source of animals for re-introductions;
5. Reinforcement of the general conservation base through public awareness and education in combination with

good legislation and strict enforcement by a dedicated force;

6. Acquisition of additional knowledge needed for management and preservation of rhino populations and their habitat;
7. Provision of training and capacity building for those involved in development and implementation of the programs;
8. Investigation of the trade of rhino products in Indonesia.

Javan Rhino Action Plan

Conservation of the Javan rhino in Ujung Kulon National Park

1. Park protection and intensive patrolling.

The park management and administration unit should be strengthened to further improve the security of the park and the rhino population through effective law enforcement. In particular, a total of 10 persons should be trained to work in two rhino units that should be formed.

2. Education and Awareness Program.
3. Research Program.
4. Wildlife Tourism.
5. Development of Gunung Honje as Javan rhino habitat extension.
6. Possible development of a Javan rhino sanctuary area within the park.

Sumatran Rhino Action Plan

In situ conservation of Sumatran rhino

1. Rhino protection and law enforcement.

The efforts of rhino protection should be concentrated on the large wild populations in Sumatra by the creation of:

- Rhino Protection (Anti-Poaching) Units (RPUs).
- Mobile Units.
- Research and monitoring of the rhino in key areas for on-going population assessment.
- A Rhino Conservation Officer within the Ministry of Forestry.



Sign for Sumatran rhino sanctuary in Way Kambas National Park.

These should be supported initially by external technical support.

- 2 Improved management structures for key areas.
- 3 Education and awareness program.
- 4 Rapid population assessment

Rapid assessment of suspected rhino populations in Sumatra and Kalimantan. PHVAs should be conducted on each confirmed population to determine whether it is viable or "doomed".

- 5 Population concentration

The requirements and protocols for possible concentration of populations of widely dispersed rhino into intensive protection zones within their present forest areas should be investigated. In this regard, Kerinci Seblat National Park should be the highest priority.

Conservation options for "doomed" Sumatran rhino

Based on the rapid assessments and PHVAs, various conservation options for rhinos classified as "doomed" should be considered. Options include: concentration into intensive protection zones in their current locations; translocation into intensive protection zones in other areas; incorporation into the Sumatran rhino "sanctuary" program.

Sumatran rhino managed breeding program

- 1 The implementation of management plans for managed breeding.
- 2 Research and study on managed Sumatran rhinos.
- 3 Implementation of *in situ* management systems.

An extensive national Rhino Conservation Strategy has been prepared (1993) through an extended collaborative process that involved many rhino experts, managers, and researchers inside and outside Indonesia. Indonesian Rhino Conservation Plan Priorities are intended to be implemented by the Indonesian Rhino Conservation Strategy.

The projects and costs

A total of 14 projects for rhino conservation have been delineated by Indonesia.

The total cost of these projects is estimated to be US\$ 7,192,000.

6.5 Vietnam

No range state action plan specifically for the Javan rhino has been provided to or obtained by AsRSG from Vietnam. No representative from Vietnam was able to participate in either of the Asian Rhino Action Plan workshops.

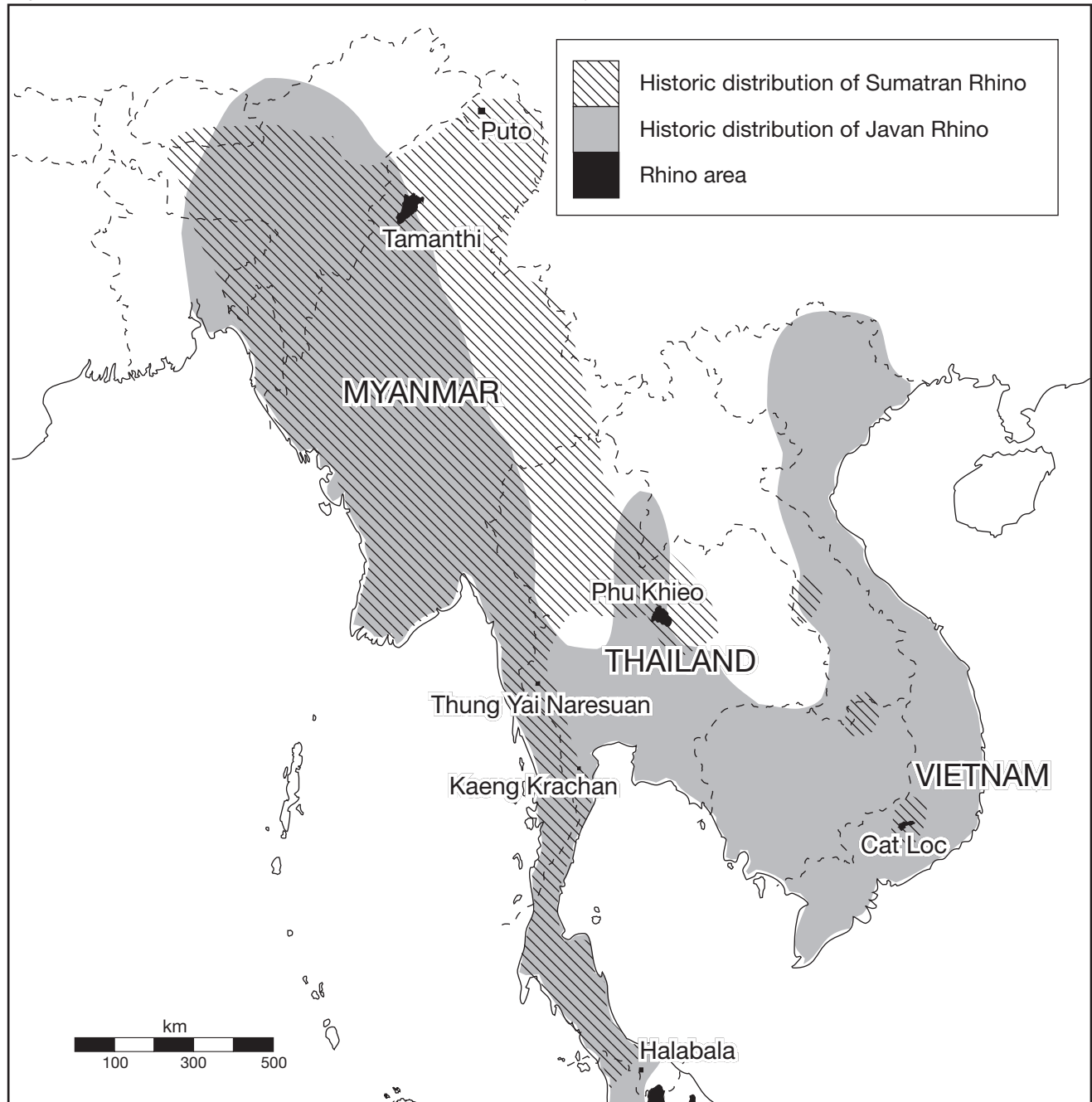
However, The Biodiversity Action Plan for Vietnam formulated by the Government of the Socialist Republic of Vietnam and the Global Environment Facility (GEF) Project VIE/91/G31 provides for a long-term management plan for Cat Tien National Park that includes:

- 1 Enlargement of Cat Tien National Park to include the Cat Loc Nature Reserve where the Javan rhino live;
- 2 Improvement of infrastructure and staff capacity in the enlarged National Park;

- 3 Formulation and implementation of a field program to monitor the Javan rhino population in Cat Loc.
- 4 Design and development of buffer zones in collaboration with relevant authorities and local communities.

It has also been recommendation that a sanctuary project be developed for the Javan rhino. This sanctuary program could resemble either the existing African models (where an area of native habitat is enclosed but mate choice is not managed) or the Indonesian/Malaysian model (where the

Figure 6.5 Closer view of rhino distribution and areas in Myanmar, Thailand, Indochina



initial sanctuary is a managed breeding center in native habitat with the objective of eventual expansion to emulate the African model, when the situation permits).

The projects and costs

Two projects for rhino conservation have been delineated in Vietnam. These projects emphasize intensive protection specifically for the rhino in Cat Loc.

The cost of these projects is estimated to be \$ 244,000. If a sanctuary program does proceed, these costs could be higher by an order of magnitude.

6.6 Thailand

Occurrences of Sumatran rhino in Thailand were reported in Hala-Bala Wildlife Sanctuary (1986), Phukhio Wildlife Sanctuary (1988) and Khao Soi Dao Wildlife Sanctuary (1990). After the 1993 AsRSG Meeting in the Jaldapara Wildlife Sanctuary, the Royal Forest Department of Thailand organized a survey team to conduct a large scale inventory in potential rhino areas to determine its status.

A Sumatran rhino surveying techniques training course was conducted in Thailand in November 1993 jointly organized by the Royal Forest Department and the Department of Wildlife and National Parks, Malaysia. The purpose of the course was to train the Thai RFD personnel to be able to conduct the large scale inventory in protected areas mentioned above and other potential rhinoceros areas, and to determine the presence and distribution of the Sumatran rhinoceros in Thailand.

The first survey in Phukhio Wildlife Sanctuary (1994 to 1995) indicates the continued presence of Sumatran rhino. The Royal Forest department will continue the large scale surveys in Phukio, Hala-Bala Wildlife Sanctuary (adjacent to the Malaysia border), Phukhio Wildlife Sanctuary (1988) Khao Soi Dao Wildlife Sanctuary (adjacent to the Cambodian border), Thung Yai Neresuan Sanctuary (adjacent to the Myanmar border) and Kaeng Krachan National Park (also adjacent to the Myanmar border).

Technical assistance from the AsRSG and experts from Malaysia and Indonesia are needed. Funding for large scale surveys in potential rhinoceros areas through the country is also required.

The projects and costs

Only one project for rhino conservation has been delineated by Thailand at this time. The project is to confirm if rhinos do still survive in this country.

The cost of this project is estimated to be US\$ 130,000.

6.7 Myanmar

No current range state action plan from Myanmar has been provided to or obtained by AsRSG. No representative from Myanmar was able to participate in either of the Asian Rhino Action Plan workshops. However, the AsRSG is currently attempting to arrange a mission to Myanmar to confer with wildlife officials there.

A summary of the action plan submitted to the 1993 UNEP Conference on Financing Rhinoceros Conservation is provided as interim information:

The rhinoceros conservation plan aims to safeguard the remaining number of rhinoceros in Myanmar, in general, and in Tamanthi Wildlife Sanctuary, in particular. Short term objectives include training and continued and improved security. Long term objectives are improved park management, public awareness, and research. Although a considerable amount of investment and support are required to implement this plan, it is believed that success is possible. The plan represents nine small and medium projects at the concept stage and totals for each main activity are shown below.

Main Activity	Number of Projects	Funds Needed (US \$)
Park Management	4	\$ 240,000
Public Awareness	1	42,000
Security	2	50,000
Research	1	56,000
Training	1	10,000
TOTAL	9	\$ 398,500

The projects and costs

Based on the limited information available, only one project for rhino conservation is delineated for Myanmar at this time. This project is intended to confirm the presence of rhino in various parts of the country.

The cost of this project is estimated to be US\$ 164,000.

6.8 Laos

No range state action plan from Laos has been provided to or obtained by AsRSG.

6.9 Cambodia

No range state action plan from Cambodia has been provided to or obtained by AsRSG.

7. Summary of Asian Rhino Action Plan

This Chapter summarizes the goals presented in Chapters 3, 4, and 5 on the Indian, Javan, and Sumatran rhinoceros and Chapter 6 on the individual range state action plans.

- 1 Preserve and manage the Indian, Javan, and Sumatran rhino as species and as components of their ecosystems.
- 2 Maintain viable populations *insitu* of all evolutionarily significant units of the three species against the pressures of poacher exploitation and habitat degradation.
- 3 To achieve this goal, arrest any further decline of existing populations. To this end, the highest priority is effective anti-poaching efforts. Sanctuaries representing intensive protection, and in the case of the Javan and Sumatran rhinos, intensive management (and indeed managed breeding) zones, are recommended.
- 4 Almost as high a priority, is to prevent any further loss of habitat.
- 5 Once stabilization of populations is accomplished, commence recovery of the species. The recovery goal is to develop secure populations of 2,000 to 3,000 of each species distributed over at least five separate protected areas, each of which should be capable of accommodating a minimum of 100 rhino, preferably more. (A population of 100 has been determined by population simulations on all five rhino species to represent a population viable in terms of demographic and genetic stochasticity with a minimum of management.) It is highly desirable to have two or more protected areas that can accommodate at least 400–500 rhino each.
- 6 For Javan and Sumatran rhino in particular, Goal 5 will entail substantially expanding existing populations and establishing additional sanctuaries. For all three species, a total population larger than the minimum (i.e., 2,000) and more than five protected areas capable of accommodating viable populations (>100 rhino) are highly desirable.
- 7 Isolated rhino outside of populations of reasonable viability or areas of feasible protectability (i.e., what were defined as “doomed” in the 1989 action plan) should be translocated to sanctuaries or managed breeding centers.
- 8 Develop managed breeding populations of at least 150 for the Indian rhino and 50 each for the Sumatran and Javan rhino. For the Indian rhino, traditional captive programs seem to be successful. For Sumatran and presumably for Javan, emphasis should be on managed breeding centers in native habitat.
- 9 Encourage and assist efforts to further reduce the trade in rhino horn. Specifically:
 - There needs to be more enforcement of laws against internal trade in rhino horn and products. Poachers need to be swiftly prosecuted and severely penalized.



Sumatran rhino in pool.

John Lukas

- Actions to prevent international commerce in rhino horn. Export of horn from Sumatra, India, and probably Borneo needs particular attention.
10. Implement public awareness and education campaigns in the vicinity of *in situ* rhino populations to direct attention of local communities to the value of rhino and therefore to mobilize public opinion in support of their conservation.
 11. Continue training programs in wildlife training and management with a particular emphasis on developing a capacity in the range states to monitor and manage wild rhino populations.
 12. Continue, and intensify, protected area management.
 13. Develop long-term funding strategies that emphasize self-sufficiency especially through eco-tourism.
 14. Continue efforts to investigate status of rhino in less well known areas such as Indochina, Kalimantan, Sarawak, Thailand, and Myanmar.

8. Program Costs, Fund Needs, Project Priority and Description

8.1 Overview

Table 8.1 presents an overview of the costs and fund needs for Asian rhino conservation 1996–2000.

Table 8.2 presents a categorized summary of the priority projects and programs by the range states and by the AsRSG.

Proposals of the individual projects and programs are then presented in a standardized format in section 8.3. The proposals are organized by range state in an approximate west to east order: India, Nepal, Myanmar, Thailand, Vietnam, Malaysia, Indonesia. Costs are described as "investment" to designate start-up or capital expenses and "recurrent" to designate ongoing or operational expenses.

- geographic distribution
- range country priorities
- current population size
- potential carrying capacity of the area
- rhino taxon involved
- size of budget
- initiating character of project

Initially each project was scored for the criteria above and the sum of the scores was used as a crude measure of priority. Subsequently the list was reviewed by the range state meeting and modified where the meeting felt that the initial scoring was not truly representing the importance of the project.

Projects were classed in three categories:

8.2 Prioritization of Asian range states rhino conservation projects

This prioritization of projects originally occurred at a range state meeting during the UNEP Conference Between Rhinoceros Ranges States, Consumer States, and Donor Nations on Financing Rhinoceros Conservation in June and July 1993.

Prioritization was based on criteria of:

A1 - **Projects of immediate priority**. Such projects are vital for the immediate survival of the species or subspecies and involve known populations.

A2 - **Projects of high priority**, but not immediately needed for the survival of the species, subspecies, or population.

A3 - **Priority projects**, that could be deferred or phased if funding is not immediately available.

Range State	Highest/ Immediate Priority	High Priority	Priority	Total (US\$)
India	8,590,000	3,109,000	4,540,000	16,239,000
Nepal	697,000	2,200,000	125,000	3,022,000
Indonesia	2,519,000	4,673,000		7,192,000
Malaysia	1,592,000	4,002,000		5,594,000
Vietnam	194,000	50,000		244,000
Thailand			130,000	130,000
Myanmar		164,000		164,000
Laos				?
Cambodia				?
Asia	13,592,000	14,198,000	4,795,000	32,585,000

Table 8.2 Asian rhino conservation project priorities

Country	Project Title	Costs
A1 - Projects with Immediate Priority		
India	Habitat Extension Kaziranga	900,000
	Creation of Artificial High Ground in Kaziranga	500,000
	Habitat Improvement & Management	1,070,000
	Communications Equipment & Network	2,450,000
	Anti-Poaching Equipment & Supplies	720,000
	Intelligence Network	200,000
	Ecodevelopment Program	2,000,000
Nepal	Research & Monitoring (Partial)	750,000
	Environmental Monitoring	258,000
	Habitat Monitoring System for Chitwan	150,000
	Anti-poaching Measures	189,000
Vietnam	Monitoring & Protection of Rhino in Chitwan	100,000
	Intensive Protection Units for Cat Loc	194,000
Malaysia	Establishment of Anti-Poaching Units/Sumatran Rhino <i>(covered by GEF Project)</i>	950,000
Peninsular Malaysia	Intensive Protection - Taman Negara	90,000
	Intensive Protection - Endau Rompin	98,000
	Intensive Protection - Belum	98,000
	Intensive Protection - Selama	100,000
Sabah	Intensive Protection - Tabin	98,000
	Intensive Protection - Danum Valley	98,000
	Intensive Protection - Yayasan Sabah F.C.	60,000
Indonesia	Rhino Trade Study	33,000
Java	Ujung Kulon Intensive Protection	204,000
	Coastal Monitoring System in Ujung Kulon	390,000
	Gun Control & Law Enforcement	11,000
Sumatra	Establishment of Anti-Poaching Units/Sumatran Rhino <i>(covered by GEF Project)</i>	950,000
	Expansion/Supplementation of GEF Project	128,000
	Extension of GEF Project for 2 Additional Years	338,000
	Development of Sumatran Rhino Sanctuary - Biological Program <i>(covered by IRF)</i>	465,000
Total of A1 projects		13,592,000
A2 - High Priority Projects		
India	Improvement of Staff Capabilities & Performance	229,000
	Desiltation/Water Channel Maintenance/Weed Control	630,000
	Mobile Rhino Teams	500,000
	Veterinary Units & Cattle Immunization	560,000
	Nature Education and Awareness Development	1,190,000
Nepal	Habitat Extension/Village Resettlement	2,000,000
	Translocation of 50+ More Rhino to Bardia	200,000
Myanmar	Intensive Survey for Rhino/Guard Training	164,000
Vietnam	Sanctuary Feasibility Study	50,000
Peninsular Malaysia	Intensive Survey & Protection in New Areas	110,000
	Intensive Re-surveying of Taman Negara	52,000
	Development of Sumatran Rhino Sanctuary, Sungai Dusun	650,000
	Development of Sumatran Rhino Sanctuary, Krau Wildlife Reserve	3,300,000
Indonesia		
	Java	Javan Rhino Sanctuary
Sumatra	Javan Rhino Protection & Conservation Unit	922,000
	Gunung Leuser Anti-Poaching Units, <i>(covered by European Union Project)</i>	1,300,000
	Development of Sumatran Rhino Sanctuary - Eco-Tourism Program	710,000
Kalimantan	Rapid Assessment of Potential Sumatran Rhino Populations	300,000
	Survey for Sumatran Rhino in Kalimantan	152,000
Total of A2 projects		14,308,000

Table 8.2 ... continued. Asian rhino conservation project priorities		
Country	Project Title	Costs
A3 - Priority Projects		
India	Boundary Fencing of Rhino Areas	770,000
	Relocation of Enclave Villages	650,000
	Rhino Rescue & Rehabilitation Centers	70,000
	Captive Breeding for Translocation	60,000
	Translocation of Rhino	240,000
	Staff Facilities	2,000,000
	Research & Monitoring (Partial)	750,000
	Equipment & Training for Guards	125,000
	Intensive Survey for Rhino	130,000
Total of A3 projects		4,795,000
Grand Total		32,695,000

8.3 Individual rhinoceros conservation project proposals

Species	Country	Area
Indian Rhino	India	Kaziranga - Assam
Title		
Habitat Expansion for Main Rhino Population in Kaziranga N.P.		
Duration		Budget
4 years		US\$ 900,000

RATIONALE

Kaziranga contains 1,200 to 1,300 rhino, i.e. at least 60% of the known population of this species. Moreover, Kaziranga, along with Chitwan in Nepal, has consistently been one of the two most secure areas for the Indian rhino. However, there is need to expand the habitat for the rhino in Kaziranga. Much of the original area of the Park has been lost due to erosion along the Brahmaputra (northern) side and to human encroachment and development along the southern border. Particularly needed are extensions into higher areas not affected by the annual floods.

INPUTS

Acquisition of additional land; various indemnifications and reparations.

OUTPUTS

Greatly expanded and improved habitat for Indian rhino in its main area.

BUDGET (In US\$)

Extension of Habitat		900,000
TOTALS	Investment	900,000
	Recurrent	
	TOTAL	900,000

Species	Country	Area
Indian Rhino	India	Kaziranga - Assam
Title		
Creation of Artificial Highlands for Flood Refuge for Rhino		
Duration		Budget
4 years		US\$ 500,000

RATIONALE

The severe floods each year during the monsoon in Kaziranga (home to 60% of all Indian rhino) displace many animals every year. Indeed for weeks to months, much of the habitat in Kaziranga is unusable. Moreover, human activities along the Brahmaputra have increased the severity of the floods. Historically, the rhino moved to higher ground in the adjacent hills during this period. However, increasing human settlement and development have reduced or eliminated access to these higher areas. Some artificial highlands in Kaziranga have already been tried with considerable success. However, the size of the Park, the severity of the floods, and the large number of rhino require much more extensive development of artificial highlands as refugia.

INPUTS

Creation of artificial highlands.

OUTPUTS

Decreased loss of rhino to the annual floods.

BUDGET (In US\$)

Assam - Kaziranga

Artificial highlands		500,000
TOTALS	Investment	500,000
	Recurrent	
	TOTAL	500,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Habitat Improvement and Management		
Duration		Budget
4 years		US\$ 1,070,000

RATIONALE

Ecological changes and processes have reduced the quality of the habitat for rhino in many areas. Habitat management is needed to restore, improve and manage habitat for rhino without detriment to other endangered and integral species in these ecosystems.

INPUTS

Habitat modification and management.

OUTPUTS

Improved quality of habitat and increased carrying capacity for rhino.

BUDGET (In US\$)

Assam - Kaziranga		600,000
West Bengal		170,000
Uttar Pradesh		300,000
TOTALS	Investment	
	Recurrent	1,070,000
	TOTAL	1,070,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Communications and Wireless Network		
Duration		Budget
2 years		US\$ 2,450,000

RATIONALE

The effectiveness of the anti-poaching staff in the rhino areas will be greatly facilitated by wireless radio communication. Although the number of guards per sq km is high in the rhino areas of India, environmental and especially climatic conditions impedes effective patrol and pursuit of poachers. Field radio communication is essential to improve this situation.

INPUTS

Field radio networks for all rhino areas.

OUTPUTS

Improved capability to interdict and pursue poachers.

BUDGET

Assam		2,350,000
West Bengal		40,000
Uttar Pradesh		60,000
TOTALS	Investment	2,450,000
	Recurrent	
	TOTAL	2,450,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Anti-Poaching and Area Protection Equipment and Supplies		
Duration		Budget
2 years		US\$ 720,000

RATIONALE

Government sources although substantial in the level of support provided for many of the rhino areas, have been inadequate to provide certain equipment needed for the effective operation of the anti-poaching staff. In particular, needs include: firearms, binoculars, night-vision equipment, and watch-towers.

INPUTS

Equipment and facilities: firearms, binoculars, night-vision equipment, and watch-towers.

OUTPUTS

More effective operation of rhino staff in anti-poaching and other protection activities.

BUDGET (In US\$)

Assam		
Arms and ammunition		80,000
Watchtowers, night vision equipment, binoculars		500,000
West Bengal		
Arms and ammunition		30,000
Watchtowers, night vision equipment, binoculars		70,000
Uttar Pradesh		
Arms and ammunition		10,000
Watchtowers, night vision equipment, binoculars		30,000
TOTALS	Investment	720,000
	Recurrent	
	TOTAL	720,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Establishment of an Intelligence Network		
Duration		Budget
4 years		US\$ 200,000

RATIONALE

Money expended on information from local citizens about poachers and middlemen has proven to be a very effective method for the reduction of poaching (in India, in Nepal, and in Africa). An increase in the funds expended on this activity at Kaziranga has corresponded to a significant decrease in the number of rhino poached in 1994 and 1995 compared to the 1991–1993 period. However, an even higher level of expenditure is required to maximize the effectiveness of this method which needs to be extended to all rhino areas in India.

INPUTS

Rewards for information leading to apprehension and conviction of poachers and middlemen.

OUTPUTS

Increased apprehension and conviction of poachers and middlemen. Overall, an increasingly inhospitable and hopefully nonviable environment for poachers and middlemen in the human communities around the rhino areas.

BUDGET (In US\$)

Assam		
Intelligence network		100,000
West Bengal		
Intelligence network		70,000
Uttar Pradesh		
Intelligence network		30,000
TOTALS	Investment	
	Recurrent	200,000
	TOTAL	200,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Development of Eco-Tourism		
Duration		Budget
4 years		US\$ 3,490,000

RATIONALE

Further development of eco-tourism provides the potential to greatly increase funds available for rhino conservation and to generate these monies in a self-sufficient and sustaining way.

INPUTS

Development of better facilities and programs for tourists.

OUTPUTS

Great and more self-sufficient and secure funds for rhino conservation.

BUDGET (In US\$)

Assam		2,630,000
West Bengal		710,000
Uttar Pradesh		420,000
TOTALS	Investment	3,760,000
	Recurrent	
	TOTAL	3,760,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Improvement of Staff Capabilities and Performance		
Duration		Budget
4 years		US\$ 229,000

RATIONALE

Rhino area staff in India have experienced considerable success and shown great fortitude, under difficult conditions. Unfortunately, government funds have been inadequate to provide many basic necessities such as clothing, boots, etc. Additional training would also be beneficial.

INPUTS

Provision of basic necessities and equipment.

OUTPUTS

Improved morale and performance of rhino area staff.

BUDGET (In US\$)

Assam		
Staff amenities		20,000
Training of staff		19,000
West Bengal		
Staff amenities		70,000
Training of staff		80,000
Uttar Pradesh		
Staff amenities		20,000
Training of staff		20,000
TOTALS	Investment	119,000
	Recurrent	110,000
	TOTAL	229,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Desiltation/Waterchannel Maintenance/Weed Control		
Duration		Budget
4 years		US\$ 630,000

RATIONALE

There is need to redress habitat detriment caused by siltation, weed proliferation, and water channel obstruction and reorientation that is a result of the flood dynamics in the riverine ecosystems in Assam and West Bengal.

INPUTS

Desiltation, waterchannel maintenance, weed control.

OUTPUTS

Improved quality of habitat for rhino and maintenance of waterways for protection activities.

BUDGET (In US\$)

Assam – Kaziranga		350,000
West Bengal		280,000
TOTALS	Investment	
	Recurrent	630,000
	TOTAL	630,000

Species	Country	Area
Indian Rhino	India	All main rhino areas
Title		
Establishment of Mobile Rhino Protection Teams		
Duration		Budget
4 years		US\$ 500,000

RATIONALE

The current anti-poaching staff and system consist mostly of resident units. There is a need for mobile units that rapidly move around trouble spots and a need to more effectively coordinate the resident staff.

INPUTS

Equipment and field allowances.

OUTPUTS

More effective operation of anti-poaching staff; better response to hot spots of trouble.

BUDGET (In US\$)

Assam		
Mobile teams		450,000
West Bengal		
Mobile teams		50,000
Uttar Pradesh		
Mobile teams		50,000
TOTALS	Investment	
	Recurrent	500,000
	TOTAL	500,000

Species	Country	Area
Indian Rhino	India	All main rhino areas
Title		
Establishment of Veterinary Services and Immunization Programs		
Duration		Budget
4 years		US\$ 560,000

RATIONALE

The presence of large numbers of domestic livestock around and often in the rhino areas presents a disease risk to the rhinos and other wildlife. Improved veterinary services, especially immunization programs, are needed to mitigate these risks.

INPUTS

Veterinary immunization programs for domestic livestock and selected wildlife. Other veterinary care and support programs for rhino.

OUTPUTS

Improved health of rhino populations.

BUDGET (In US\$)

Assam		
Establishment of veterinary unit		250,000
Cattle immunization		120,000
West Bengal		
Establishment of veterinary unit		70,000
Cattle immunization		50,000
Uttar Pradesh		
Establishment of veterinary unit		50,000
Cattle immunization		20,000
TOTALS	Investment	370,000
	Recurrent	190,000
	TOTAL	560,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Nature Education and Awareness Development		
Duration		Budget
4 years		US\$ 1,190,000

RATIONALE

Long-term viability of conservation programs depends upon public support and hence awareness and appreciation of rhino and other wildlife.

INPUTS

Development and dissemination of nature education and awareness materials and programs.

OUTPUTS

Greater public support for rhino conservation.

BUDGET (In US\$)

Assam		320,000
West Bengal		910,000
Uttar Pradesh		50,000
TOTALS	Investment	
	Recurrent	1,190,000
	TOTAL	1,190,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Boundary Fencing of Rhino Areas		
Duration		Budget
4 years		US\$ 670,000

RATIONALE

The use of fencing to create rhino sanctuaries in Africa has proven to be one of the most effective methods of protecting rhinos against poachers. Some fences have been erected already at Dudhwa in India but more are needed in selected areas, especially in West Bengal.

INPUTS

Selective use of fences to facilitate creation of rhino sanctuaries.

OUTPUTS

Improved protection of rhino against poachers.

BUDGET (In US\$)

Assam		
Boundary wall/Electric fence		50,000
West Bengal		
Electric fence		650,000
Uttar Pradesh		
Electric fence		70,000
TOTALS	Investment	770,000
	Recurrent	
	TOTAL	770,000

Species	Country	Area
Indian Rhino	India	Assam, West Bengal
Title		
Relocation of Enclave Villagers		
Duration		Budget
4 years		US\$ 650,000

RATIONALE

There has been encroachment of human settlement and activities into a number of the rhino areas. There is a need for resettlement to reduce human/rhino/wildlife competition and activities without depriving the human communities of an acceptable quality of life.

INPUTS

Resettlement of villages and indemnifications of lost assets.

OUTPUTS

Improved habitat and security for rhinos.

BUDGET (In US\$)

Assam		
Relocation of enclave villagers		350,000
West Bengal		
Relocation of enclave villagers		300,000
TOTALS	Investment	650,000
	Recurrent	
	TOTAL	650,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Rhino Rescue and Rehabilitation Centers		
Duration		Budget
4 years		US\$ 70,000

RATIONALE

The severe floods characterizing the riverine ecosystems occupied by rhino cause a number of displaced and debilitated rhino every year. Other climatic and ecological problems, such as tiger predation, also produce rhinos needing rescue or rehabilitation.

INPUTS

Improved facilities and capabilities to rescue and rehabilitate rhino victims of floods and other problems.

OUTPUTS

Fewer lost rhino.

BUDGET (In US\$)

Assam		
Rescue and rehabilitation centers		30,000
West Bengal		
Rescue and rehabilitation centers		20,000
Uttar Pradesh		
Rescue and rehabilitation centers		20,000
TOTALS	Investment	70,000
	Recurrent	
	TOTAL	70,000

Species	Country	Area
Indian Rhino	India	Assam, West Bengal
Title		
Captive Breeding for Translocation and Population Enhancement		
Duration		Budget
4 years		US\$ 60,000

RATIONALE

Intensive management of Indian rhino both *in situ* to correct demographic and genetic imbalances caused by the small size of many populations and *ex situ* as a back-up to wild populations are considered integral parts of the conservation strategy for this species.

INPUTS

Facilities and operating funds to intensively manage rhinos.

OUTPUTS

BUDGET (In US\$)

Assam		
Captive breeding		30,000
West Bengal		
Captive breeding		30,000
TOTALS	Investment	
	Recurrent	60,000
	TOTAL	60,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Translocation for Rhino for Establishment of New Populations		
Duration		Budget
4 years		US\$ 240,000

RATIONALE

Intensive management of Indian rhino, both *in situ*, to correct demographic and genetic imbalances caused by the small size of many populations, and *ex situ*, as a back-up to wild populations are considered integral parts of the conservation strategy for this species. Of particular note, is the need to establish or enhance some new populations of rhino in areas the species formerly occupied, e.g. in Uttar Pradesh, Bihar.

INPUTS

Funds to translocate, monitor and manage rhinos.

OUTPUTS

More viably distributed populations of rhino, reducing the risks of all the eggs in a few baskets.

BUDGET (In US\$)

Assam		
Translocation of rhino		80,000
West Bengal		
Translocation of rhino		80,000
Uttar Pradesh		
Translocation of rhino		80,000
TOTALS	Investment	
	Recurrent	240,000
	TOTAL	240,000

Species	Country	Area
Indian Rhino	India	All rhino areas
Title		
Research, Monitoring and Evaluation		
Duration		Budget
4 years		US\$ 1,500,000

RATIONALE

Effective protection and management of rhino and their habitat requires research, monitoring and evaluation.

INPUTS

Equipment, personnel, projects.

OUTPUTS

Improved information for rhino conservation programs.

BUDGET (In US\$)

Assam		1,050,000
West Bengal		290,000
Uttar Pradesh		160,000
TOTALS	Investment	
	Recurrent	1,500,000
	TOTAL	1,500,000

Species	Country	Area
Indian Rhino	Nepal	Chitwan and Bardia N.P.
Title		
Environmental Monitoring		
Duration		Budget
3 years		US\$ 258,000

RATIONALE

This monitoring will be conducted in a larger context with a coarse filter approach and apply to all rhino areas, i.e. Chitwan and Bardia. Monitoring will be done on: flood level in various river systems necessary for the maintenance of the floodplain and oxbow lakes; climatic variables and change including rainfall and temperature; vegetation change; land use change; irrigation systems; the effect of dams on the Rapti River (Chitwan N.P.) and Babai River (Bardia N.P.) floodplain management; human population pressure, settlement, and encroachment; livestock population and grazing; and wildlife disease related to rhino.

INPUTS

Personnel, equipment, data-base compilation and model-building.

OUTPUTS

A database and model to better comprehend and manage the riverine ecosystems that provide the habitat for rhino in Nepal.

BUDGET (In US\$)

TOTALS	Investment	158,000
	Recurrent	100,000
	TOTAL	258,000

Species	Country	Area
Indian Rhino	Nepal	Royal Chitwan N.P.
Title		
Development of Habitat Monitoring System for Chitwan National Park		
Duration		Budget
3 years		US\$ 150,000

RATIONALE

This monitoring will concentrate only on Chitwan N.P. Monitoring activity will include the floodplain, riverine forest, grassland, grass harvesting by humans, and availability of palatable species for rhino. It will also entail rhino habitat management that promotes an increase in suitable habitat for rhino—in terms of availability of palatable grass species, maintenance of oxbow lakes and reservoirs, and breeding arenas.

INPUTS

Personnel, equipment, data-base compilation and model-building, habitat management plans and experiments.

OUTPUTS

Expanded and improved habitat for rhino within Chitwan N.P.

BUDGET (In US\$)

TOTALS	Investment	150,000
	Recurrent	
	TOTAL	150,000

Species	Country	Area
Indian Rhino	Nepal	Chitwan and Bardia N.P.
Title		
Strengthening of Anti-Poaching Measures		
Duration		Budget
3 years		US\$ 189,000

RATIONALE

For effective anti-poaching measures, the existing anti-poaching units (APUs) need to be well equipped with vehicles, walkie-talkies, field gear, etc. It is also important to strengthen the existing reward system and involvement of the local people in the activities of the APUs.

INPUTS

Equipment, information network and incentives, community outreach and development.

OUTPUTS

A much improved system of anti-poaching especially with regard to local community relations, awareness and involvement.

BUDGET (In US\$)

TOTALS	Investment	89,000
	Recurrent	100,000
	TOTAL	189,000

Species	Country	Area
Indian Rhino	Nepal	Royal Chitwan N.P.
Title		
Monitoring and Protection of Rhino in Chitwan National Park		
Duration		Budget
3 years		US\$ 100,000

RATIONALE

There is need for large-scale and intensive surveillance and protection activities beyond the routine currently provided by the government. Activities include: more organized, frequent, and effective patrolling by park and army personnel; comprehensive census of rhino (e.g. similar to "Count Rhino 1994") every three years; regular monitoring of rhino through transects; more specialized and intensive studies such as reproductive behavior and population recruitment; in particular blocks as identified by the "Count Rhino 1994".

INPUTS

Personnel and their support.

OUTPUTS

Increased information, improved management, better performance assessment.

BUDGET (In US\$)

TOTALS	Investment	
	Recurrent	100,000
	TOTAL	100,000

Species	Country	Area
Indian Rhino	Nepal	Royal Chitwan N.P.
Title		
Habitat Expansion with Resettlement of Padampur Village in Chitwan N.P.		
Duration		Budget
3 years		US\$ 2,000,000

RATIONALE

Resettlement of Padampur Village (comprising 1657 households) will create about 1,500 ha. of additional rhino habitat which is likely to sustain about 30 resident rhino. In addition, this resettlement will render 1,589 ha. of sal forest, 158 ha. of riverine forest, and 627 ha. of savannah grassland, free of human related activities such as grazing, resource collection and other incursions. This will increase the capacity of Chitwan National Park to sustain more rhino. Moreover, poaching pressure on the rhino and other wildlife will be significantly and dramatically reduced. Because of the public interest in the Padampur Village, His Majesty's Government of Nepal (HMG/N) has already initiated this project of resettlement and therefore, HMG/N will arrange matching funds. The public interest in the relocation is derived from the flood risks in the area as well as the degradation to crops and livestock by the wildlife. Overall, the resettlement project will neutralize the people-Park conflict to a great extent. A small part of the village has already been relocated elsewhere at a cost of US\$ 365,000 plus considerable contribution in kind by the HMG/N. Rhino sightings in the area vacated by the resettlement have increased remarkably. Support of this project by external donors will greatly accelerate the process.

INPUTS

Various costs related to resettlement of human inhabitants from habitat needed for rhino.

OUTPUTS

Increased and more secure habitat for rhino.

BUDGET (In US\$)

TOTALS	Investment	100,000
	Recurrent	
	TOTAL	100,000

Species	Country	Area
Indian Rhino	Nepal	Bardia N.P.
Title		
Translocation and Monitoring of 50+ More Rhino to Bardia		
Duration		Budget
3 years		US\$ 200,000

RATIONALE

At present, Bardia National Park contains a rhino population of 45+ which was established in the early 1990s by translocation of 38 rhino from Chitwan National Park. The breeding rate of the translocated rhino in Bardia is encouraging and the habitat available is estimated sufficient enough to accommodate a population of 100 or more rhino. Therefore, translocation of an additional 50+ rhino from Chitwan is recommended to rapidly achieve demographic and genetic viability in Bardia as well as establish a second viable population to reduce single-population risks (all the eggs in one basket) at Chitwan.

INPUTS

Transport costs for translocation and monitoring of rhino.

OUTPUTS

Establishment of a second population with a genetic and demographic foundation that should provide almost immediate viability, assuming protection is adequate.

BUDGET (In US\$)

TOTALS	Investment	150,000
	Recurrent	50,000
	TOTAL	200,000

Species	Country	Area
Indian Rhino	Nepal	All rhino areas
Title		
Equipment and Training for All Rhino Guards		
Duration		Budget
3 years		US\$ 125,000

RATIONALE

For effective control of the present rate of poaching, it is urgent to train park personnel in rhino monitoring and protection methods for use both in and around the Parks. Provision of more equipment is also imperative, including: four wheel-drive vehicles, motorcycles, bicycles; rafts, life jackets, and other accessories for river transport; radios and walkie-talkies.

INPUTS

Training and equipment.

OUTPUTS

Improved monitoring and protection by rhino staff.

BUDGET (In US\$)

TOTALS	Investment	125,000
	Recurrent	
	TOTAL	125,000

Species	Country	Area
Sumatran Rhino	Myanmar	Major conservation areas
Title		
Intensive Survey for Rhinoceros in Myanmar/Preliminary Training for Rhino Protection Staff		
Duration		Budget
4 years (1997-2000)		US\$ 164,000

RATIONALE

Thoroughly survey the potential areas for, and determine the status of, Sumatran rhinoceros and other endangered species (tapir, kouprey etc). The survey will be conducted for six months per year with the following schedule:

- i. 1997-1998 Tamanthi Wildlife Sanctuary
- ii. 1998-1999 Lay Nhyar and other areas in Tenasserim Division
- iii. 1999-2000 Other areas as determined by preliminary surveys

INPUTS

Equipment, training, personnel.

OUTPUTS

A report and hopefully a GIS database on any rhino located in Myanmar.

BUDGET (In US\$)

Preliminary Reconnaissance		
(Myanmar Forest Dept & AsRSG Advisers)		20,000
Training of four teams (5 members) of anti-poaching staff		10,000
Operational costs for four teams for three years		104,000
One 4-Wheel Drive Vehicle		30,000
TOTALS	Investment	60,000
	Recurrent	104,000
	TOTAL	164,000

Species	Country	Area
Sumatran Rhino	Thailand	Major conservation areas
Title		
Intensive Survey for Rhinoceros in Thailand		
Duration		Budget
4 years (1997-2000)		US\$ 130,000

RATIONALE

Thoroughly survey potential areas for, and ascertain the status of, Sumatran rhinoceros and other endangered species (tapir, kouprey etc). The survey will be conducted for six months per year with the following schedule:

- i. 1997 Phukio Wildlife Sanctuary
- ii. 1997-1998 Halabala
- iii. 1998-1999 Khao Soi Dao
- iv. 1999 Kaeng Krachan
- v. 1999-2000 Thung Yai Naresuan

INPUTS

Equipment and personnel.

OUTPUTS

A report and hopefully a GIS database on any rhino located in Thailand.

BUDGET (In US\$)

GPS (4 sets)		8,000
Video camera (1 set)		3,000
Camera (2 sets)		2,000
One 4-Wheel Drive Vehicle		30,000
10 workers, 180 working days (USD 10.00/day)		72,000
Miscellaneous		15,000
TOTALS	Investment	43,000
	Recurrent	87,000
	TOTAL	130,500

Species	Country	Area
Javan Rhino	Vietnam	Cat Loc Nature Reserve
Title		
Intensive Protection for Javan Rhino Against Poaching in Cat Loc		
Duration		Budget
5 years		US\$ 194,000

RATIONALE

The small number (estimated at 8-15) of Javan rhino in Cat Loc Nature Reserve is one of the last two known populations of this species to survive on the planet. Currently this population is inadequately protected. The Cat Loc Reserve is near to, but not included in, the Cat Tien National Park for which a major Biodiversity Program is under development. This Program recommends the inclusion of Cat Loc into Cat Tien. However, there is urgent need to immediately train and deploy intensive rhino protection units while this larger project develops.

INPUTS

Recruitment and training of three teams (5 members each) to patrol Cat Loc Nature Reserve. Equipment and operational costs for four years.

OUTPUTS

Interim intensive protection of the rhino while plans to develop an enlarged and effective Cat Tien National Park that will include Cat Loc is implemented.

BUDGET (In US\$)

Training of three teams of five members		10,000
Operational Costs for three teams for four years		144,000
Equipment		40,000
TOTALS	Investment	50,000
	Recurrent	144,000
	TOTAL	194,000

Species	Country	Area
Javan Rhino	Vietnam	Cat Loc Nature Reserve
Title		
Feasibility Study for Establishment of Javan Rhino Sanctuary		
Duration		Budget
1 year		US\$ 50,000

RATIONALE

The small number (estimated at 8–15) of Javan rhino in Cat Loc Nature Reserve is one of the last of two known populations of this species to survive on the planet. Currently this population is inadequately protected. The Cat Loc Reserve is near, but not included in, the Cat Tien National Park for which a major Biodiversity Program is under development. This Program recommends the inclusion of Cat Loc into Cat Tien. However, there is a need to protect this population while plans for the larger program and project develop. The most immediate need is to deploy anti-poaching units which are described in a separate project. There would also be value in considering development of a sanctuary for the rhino to enhance the efforts at *in situ* protection. This sanctuary would attempt to enclose a part of Cat Loc within an electric fence to facilitate protection. It might either immediately be a sanctuary on the African model or initially on the Sumatran rhino models being developed in Malaysia and Indonesia. A feasibility study is needed to provide the basis for more detailed plans.

INPUTS

An intensive assessment of the situation for and formulation of plans for a Javan rhino sanctuary.

OUTPUTS

A detailed plan and recommendations for a Javan rhino sanctuary in Cat Loc Nature Reserve.

BUDGET (In US\$)

Feasibility Study		50,000
TOTALS	Investment	50,000
	Recurrent	
	TOTAL	50,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Taman Negara
Title		
Monitoring and Protection of Rhino Areas		
Duration		Budget
3 years		US\$ 90,000

RATIONALE

- Protection of remaining population of Sumatran rhinoceros.
- Identifying isolated populations for translocation.
- Increasing the number of Rhino Protection Units (RPUs) to offset the decline in rhino numbers. Employment of guards to complement the present RPUs.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (@ 8,000)		8,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Costs for eight guards (3 years, @19,200/y)		58,000
Equipment - firearm (2 units @ 2,000)		4,000
TOTALS	Investment	32,000
	Recurrent	58,000
	TOTAL	90,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Endau Rompin
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 98,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPUs) needs to be increased to offset the decline in rhino numbers.
Employment of guards to complement the present RPUs.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (2 units @ 8,000)		16,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Costs for eight guards (3 years, @19,200/y)		58,000
Equipment – firearm (2 units @ 2,000)		4,000
TOTALS	Investment	40,000
	Recurrent	58,000
	TOTAL	98,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Belum
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 98,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPU) needs to be increased to offset the decline in rhino numbers. Employment of guards to complement the present RPU.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (2 units @ 8,000)		16,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Cost for eight guards (3 years @ 19,200/y)		58,000
Equipment - firearms (2 units @ 2,000)		4,000
TOTALS	Investment	40,000
	Recurrent	58,000
	TOTAL	98,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Selama
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 100,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPU) needs to be increased to offset the decline in rhino numbers.
Employment of guards to complement the present RPUs.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.

Improved survival and reduced poaching of rhino.

Recommendations for possible translocation of specific rhino.

BUDGET

Radio Communication System (2 units @ 8,000)		16,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Cost for eight guards (3 years @ 19,200/y)		58,000
Equipment - firearms (3 units @ 2,000)		6,000
TOTALS	Investment	42,000
	Recurrent	58,000
	TOTAL	100,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Isolated areas
Title		
Monitoring and Protection of New Rhino Areas (e.g. Main Range Mountains)		
Duration		Budget
3 years		US\$ 110,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPU) needs to be increased to offset the decline in rhino numbers.
Employment of guards to complement the present RPU.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (1 unit @ 8,000)		8,000
Four Wheel Drive Vehicle (2 units @ 20,000)		40,000
Operational Cost for eight guards (3 years @ 19,200/y)		58,000
Equipment – firearms (2 units @ 2,000)		4,000
TOTALS	Investment	52,000
	Recurrent	58,000
	TOTAL	110,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Taman Negara
Title		
Intensive Survey of the National Park		
Duration		Budget
1 year		US\$ 52,000

RATIONALE

Identify the Sumatran rhino population within the Park. Supplement the existing personnel in the Department of Wildlife and National Parks.

INPUTS

Equipment and personnel.

OUTPUTS

A database in GIS format of the rhino located in the Park.

BUDGET (In US\$)

Camping Equipment (20 sets @ 200)		4,000
Contract Worker for Surveys (20 @ 4,000/y)		48,000
TOTALS	Investment	4,000
	Recurrent	48,000
	TOTAL	52,000

Species	Country	Area
Sumatran Rhino	Malaysia - Peninsula	Sungai Dusun
Title		
Development of a Sumatran Rhino Sanctuary in Sungai Dusun Wildlife Reserve		
Duration		Budget
5 years		US\$ 650,000

RATIONALE

The Sumatran rhino remain in great peril *in situ*. The free-ranging populations have declined perhaps 50% in the last five to seven years. While efforts to protect rhinos in the wild have intensified and will hopefully succeed, there is a strong belief that more intensive protection and management of rhino is a vital part of the conservation strategy. Such a belief motivated the attempt at a captive propagation program for Sumatran rhino commencing in 1984. Rhinos located outside potentially viable or feasibly protectable populations were captured for this program. Unfortunately, traditional methods of captivity have not succeeded with this species: mortality has been high and no reproduction has occurred. In adaptive adjustment, there are now attempts in progress to develop managed breeding centers in native habitat. The centers are being designated Sumatran Rhino Sanctuaries (SRS). This use of the term sanctuary differs from the definition applied in Africa (i.e. an enclosed area of native habitat which is intensively protected but within which mate selection or breeding activity is not managed). It is the goal of the Sumatran rhino sanctuaries to gradually expand in size and diminish in management, to emulate and converge on the African model. The first one of these sanctuaries in Malaysia will be in Sungai Dusun Wildlife Reserve (40–60 sq km). The Reserve has had a resident population of rhino, most of which were moved into the captive program which has been largely located at a rather traditional captive facility in the Reserve. Rhinos for the sanctuary will derive from individuals already in captivity in Malaysia. This facility has already been somewhat expanded by funds provided by and through the IRF. However, the ultimate goal is to enclose the entire Reserve toward emulation of an African-type sanctuary.

INPUTS

Facilities and operations costs.

OUTPUTS

An effective managed breeding center in native habitat for Sumatran rhino. The ultimate objective will be to expand the size of the enclosed areas, increase numbers of rhino, and eventually reduce level of management so that the sanctuary converges on the African model of a rhino sanctuary.

BUDGET (In US\$)

Facilities/Equipment		500,000
Operation for Initial three Years		150,000
TOTALS	Investment	500,000
	Recurrent	150,000
	TOTAL	650,000

Species	Country	Area
Sumatran Rhino	Malaysia	Krau W.R.
Title		
Development of a Sumatran Rhino Sanctuary in Krau Wildlife Reserve		
Duration		Budget
5 years		US\$ 3,300,000

RATIONALE

The Sumatran rhino remain in great peril *in situ*. The free-ranging populations have declined perhaps 50% in the last five to seven years. While efforts to protect rhinos in the wild have intensified and will hopefully succeed, there is a strong belief that more intensive protection and management of rhino is a vital part of the conservation strategy. Such a belief motivated the attempt at a captive propagation program for Sumatran rhino commencing in 1984. Rhinos located outside potentially viable or feasibly protectable populations were captured for this program. Unfortunately, traditional methods of captivity have not succeeded with this species: mortality has been high and no reproduction has occurred. In adaptive adjustment, there are now attempts in progress to develop managed breeding centers in native habitat. The centers are being designated Sumatran Rhino Sanctuaries (SRS). This use of the term sanctuary differs from the definition applied in Africa, i.e. an enclosed area of native habitat which is intensively protected but within which mate selection or breeding activity is not managed. It is the goal of the Sumatran rhino sanctuaries to gradually expand in size and diminish in management, to emulate and converge on the African model. The first one of these sanctuaries in Malaysia will be in Sungai Dusun Wildlife Reserve; a second is proposed for Krau Wildlife Reserve (500 sq. km.) The Reserve had a resident population of rhino until probably the 1970s when the last were lost to poachers. The sanctuary at Krau would be populated by rhino translocated from nonviable situations elsewhere in Peninsular Malaysia, e.g. along the Main Range. Unlike the sanctuaries at Sungai Dusun in Peninsular Malaysia and Way Kambas in Indonesia, the Krau sanctuary would emulate the African model immediately.

INPUTS

Facilities and operations costs; translocation of rhino from nonviable situations.

OUTPUTS

An African-type rhino sanctuary for Sumatran rhino.

BUDGET (In US\$)

Facilities/Equipment (Fence Construction)		3,000,000
Operation		200,000
Translocation of Rhino		100,000
TOTALS	Investment	3,000,000
	Recurrent	300,000
	TOTAL	3,300,000

Species	Country	Area
Sumatran Rhino	Malaysia - Sabah	Tabin
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 98,000

RATIONALE

- Protection of remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- Increasing urgently the number of Rhino Protection Units (RPU) to offset the decline in rhino numbers. Employment of guards to complement the present RPU.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (2 units @ 8,000)		16,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Cost for eight guards (3 years @ 19,200/y)		58,000
Equipment - firearms (2 units @ 2,000)		4,000
TOTALS	Investment	40,000
	Recurrent	57,600
	TOTAL	98,000

Species	Country	Area
Sumatran Rhino	Malaysia - Sabah	Danum Valley
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 98,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPUs) needs to be increased to offset the decline in rhino numbers.
Employment of guards to complement the present RPUs.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.

Improved survival and reduced poaching of rhino.

Recommendations for possible translocation of specific rhino.

BUDGET (In US\$)

Radio Communication System (2 units @ 8,000)	16,000	
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Cost for eight guards (3 years @ 19,200/y)		58,000
Equipment - firearms (2 units @ 2,000)		4,000
TOTALS		
	Investment	40,000
	Recurrent	57,600
	TOTAL	98,000

Species	Country	Area
Sumatran Rhino	Malaysia - Sabah	Yayasan Sabah F.C.
Title		
Monitoring and Protection of Rhino Area		
Duration		Budget
3 years		US\$ 60,000

RATIONALE

- Protection of the remaining population of Sumatran rhinoceros.
- Identifying the isolated population for translocation.
- The number of Rhino Protection Units (RPUs) needs to be increased to offset the decline in rhino numbers. Employment of guards to complement the present RPUs.

INPUTS

Equipment and personnel.

OUTPUTS

Establishment of more rhino protection units.
Improved survival and reduced poaching of rhino.
Recommendations for possible translocation of specific rhino.

BUDGET

Radio Communication System (1 unit @ 8,000)		8,000
Four Wheel Drive Vehicle (@ 20,000)		20,000
Operational Cost for four guards (3 years @ 9,600/y)		30,000
Equipment - firearms (1 unit @ 2,000)		2,000
TOTALS	Investment	30,000
	Recurrent	30,000
	TOTAL	60,000

Species	Country	Area
Sumatran Rhino, Javan Rhino	Indonesia	Java, Sumatra, Kalimantan
Title		
Investigation of the Trade in Javan and Sumatran Rhino Products in Indonesia		
Duration		Budget
2 years		US\$ 33,000

RATIONALE

The two species of rhino in Indonesia, the Javan and the Sumatran, have declined drastically in the past 10 years due primarily to poaching for the horn. About 50% of Sumatran rhinos have been poached in this time period. Significant trade in horn is suspected to have occurred since the early 1960s and has involved the communities adjacent to the rhino habitat as well as an illegal network of traders within the Asian region. The trade in horn, if not stopped, will highly accelerate the species' rate of decline to extinction. Hence, investigation into the nature and extent of the trade in rhino horn is urgently needed. The ultimate goal of this project is to delineate the dynamics of the rhino horn trade in Indonesia.

INPUTS

Personnel and equipment.

OUTPUTS

Comprehensive report on Sumatran and Javan rhino horn trade networks in Indonesia in particular and Asia in general.

BUDGET (In US\$)

Salaries and travel costs (@11,000/y)		22,000
Report Production		1,000
Equipment (Computer, stationery)		6,000
Miscellaneous		4,000
TOTALS	Investment	7,000
	Recurrent	26,000
	TOTAL	33,000

Species	Country	Area
Javan Rhino	Indonesia	Ujung Kulon N.P.
Title		
Intensive Protection for Javan Rhino Against Poaching in Ujung Kulon		
Duration		Budget
5 years		US\$ 204,000

RATIONALE

Access to the area most vulnerable to poaching, the southeastern quarter of UKNP between Cigenter and Cibandawoh, for preventive patrols is limited, because there is no patrol trail through this area. Therefore guards seldom, if ever, patrol the area, allowing poachers free play. To increase the frequency of patrols in the Intensive Protection = Patrol Zone (IPZ), and to allow guards to move swiftly to all parts of the IPZ, establishment of a permanent patrol trail between Cigenter and Cibandawoh, roughly along the Cibandawoh, is highly recommended. With regular patrols in the area, and increased vigilance on the entrance areas, there is no danger that the new trail will in fact benefit the poachers. Patrolling of the IPZ will mainly be the task of personnel of the Resorts of Karangranjang and Cigenter, but it may be beneficial to establish a special patrol core-team of three experienced forest surveyors, working full time in the IPZ, with assistance of the Resort guards. The patrol(s) should have GPS units, hand radios, cameras and firearms. The patrol leader should be fully qualified to arrest intruders. The Mobile Team and the Rhino Conservation Officer will provide technical assistance. Besides patrolling, IPZ teams should also conduct continuous monitoring of rhinos in the area, using standardized techniques. Team members need to be trained in monitoring.

INPUTS

Assignment of sufficient staff for continuous patrolling, in the form of Rhino Protection Units.

Provision of equipment.

Design of patrol system, rhino monitoring protocol and work rosters.

Supervision of teams and evaluation of effectiveness.

OUTPUTS

Elimination of poaching of rhino and illegal entry into Ujung Kulon NP. Better monitoring of rhino population in areas covered by Rhino Protection Units.

BUDGET (In US\$)

Clearing patrol trail (~10 km)		750
Regular field equipment		250
GPS, radio, camera, gun		3,000
Operational (5 years)		200,000
TOTALS		
	Investment	4,000
	Recurrent	200,000
	TOTAL	204,000

Species	Country	Area
Javan Rhino	Indonesia	Ujung Kulon N.P.
Title		
Coastal Zone Monitoring System in Ujung Kulon N.P.		
Duration		Budget
5 years		US\$ 390,000

RATIONALE

The three guard posts on the Selamat Datang Bay side of the UKNP need to be better equipped to monitor traffic across the sea boundary of the Park, especially during night time. There is still illegal fishing inside the park boundaries and rhino poachers can sail across the bay at night. In all three posts a tall watchtower needs to be constructed that offers a good view over the bay. There should be a 24-hour watch, with binoculars during daylight and night vision equipment during the night. All vessels observed to cross the sea boundary, that is clearly marked with buoys, should be stopped and instructed to leave by guards with a fast patrol boat. The patrol boats and crew need to be on 24-hour stand-by. All posts will need a fast patrol boat and sufficient personnel for a 24-hour roster.

INPUTS

Assignment of sufficient personnel to allow a 24-hour roster for the manning of watchtowers and patrol boats.
 Building of facilities and provision of equipment.
 Development of alarm protocols and workplans.
 Supervision of teams, including alertness tests.

OUTPUTS

Elimination of illegal entry into Park area for fishing and poaching.

BUDGET (In US\$)

Watchtowers (3)		27,000
Binoculars, night vision, radios (3X)		21,000
Patrol boats (3)		42,000
Operational (5 years)		300,000
TOTALS	Investment	90,000
	Recurrent	300,000
	TOTAL	390,000

Species	Country	Area
Javan Rhino	Indonesia	Ujung Kulon N.P.
Title		
Gun Control and Law Enforcement		
Duration		Budget
1 year		US\$ 11,000

RATIONALE

Rhino and game poaching is usually done with locally made front-loader guns. These guns are widely available and are made in a village called Situpotong, near Binuangun. It is recommended to liaise with the internal security agencies at a high level, to develop a cooperative effort to stop the production of guns, and to conduct a program for the confiscation of guns available in the villages around UKNP. A small compensation for those that voluntarily hand in their guns during a grace period, could be considered. After the grace period PHPA should work together with the security agencies to collect the remaining guns and to prosecute holders of illegal firearms.

INPUTS

Establishing a joint operation force with police and security agencies.
 Closure of illegal fire-arm factory.
 Collection of fire-arms from public.
 Maintaining intelligence network to monitor gun possession.

OUTPUTS

Reduced availability of guns and reduced poaching of rhino and illegal game hunting.

BUDGET (In US\$)

Operational		9,000
Compensation		2,000
TOTAL	Investment	
	Recurrent	11,000
	TOTAL	11,000

Species	Country	Area
Javan Rhino	Indonesia	Ujung Kulon N.P.
Title		
Establishment of Javan Rhino Sanctuary (Phase 1)		
Duration		Budget
5 years		US\$ 1,289,000

RATIONALE

The establishment of a fenced-in area in the area east of the Karangrandjang is part of a comprehensive effort to provide optimal protection to the Javan rhino population in Ujung Kulon. Secondly it would allow for the establishment of other Javan rhino populations elsewhere in the historic range of the species. The Javan Rhino Sanctuary concept would provide excellent protection of the rhinos in UKNP, with a double electric fence, and would allow the establishment of other Javan rhino populations, with minimal influence on the existing population. A large area of under-utilized rhino habitat in the Gunung Honje area would be enclosed by electric fences: one across the Isthmus, the other further east between the bay and Indian Ocean beach, with a four-wheel-drive patrol track. Unobserved entry into Ujung Kulon over land would be almost impossible, but the rhinos confined inside the Sanctuary would be easier prey for poachers. Therefore the outside fence needs to be patrolled and the rhinos inside need to be monitored closely. The precise location of the eastern fence must be determined in relation to the habitat condition, especially since in some parts fields have been established.

Rhinos occasionally still move over the Isthmus. The Isthmus fence and capture yards are meant to confine rhinos that move naturally towards the Gunung Honje area. The funnel shaped fence will force rhinos to enter the capture yard. The capture yard needs to be monitored by night-vision video. Once a rhino is inside the capture yards, the outside gate closes and the rhino, if wanted for the Sanctuary, is allowed to move into the habituation and observation yards (ca 30 ha each).

To allow monitoring of the rhinos it is important to habituate them to the presence of humans. This can occur while in the observation yard. During that period it can be decided whether the rhino has the right age, sex and character to be allowed into the Sanctuary proper.

Initially a small number of rhinos (2-4 females, 1-2 males) would be allowed into the Sanctuary to breed. Offspring can, depending on the circumstances and needs, be kept in the Sanctuary, released back into Ujung Kulon, or be used for a translocation program. After some time the founders could be released back into Ujung Kulon and other animals taken into the Sanctuary, to increase the genetic basis of the sub-population. Currently only few (1-2) rhinos use the Kalejetan area, and it may be that a balanced population cannot be formed from the rhinos that enter the Sanctuary 'naturally'. In that case action can be considered to move animals in through capture and release, but this will increase the costs and risks. It would be prudent to start the construction with the capture and habituation yards, and only commence with the construction of the large fence once the method is found to be successful. The Sanctuary concept would allow the staged establishment of new populations, without draining the gene pool of the founder population, and with minimal risks and stress for the founder animals. No animals will be captured and no animals will be taken out permanently from the UKNP population. Once established with habituated rhinos the Sanctuary, or parts of it, could be used for viewing of Javan rhinos in natural habitat. This would form a major tourist attraction and will increase the potential of UKNP for sustainable development of ecotourism.

The establishment and running of the Sanctuary will require substantial financial input for at least 20 years, and therefore it is recommended to establish the Sanctuary in the same fashion as the Sumatran Rhino Sanctuary in Way Kambas NP. Ecotourism with a direct link, also financially, to the Sanctuary would ensure the long-term sustainability of the Javan Rhino conservation program.

INPUTS

Detailed feasibility study and preliminary design.

Workshop to discuss feasibility study and to make recommendations for further action.

Cooperative agreement for further development.

Mapping and final design.

Animal management plan.

Staged development of construction and intake of rhinos (3 years).

Expansion of population (5 years).

Gradual transfer of offspring to establish new populations in safe habitats (10 years).

OUTPUTS

Barrier against unauthorized intrusion into Ujung Kulon.

A managed breeding facility for Javan rhino, to strengthen the Ujung Kulon population and to provide founder animals for additional populations.

An integrated wildlife management and ecotourism development project to maintain long-term sustainability.

BUDGET (In US\$)

Fence and gates - Isthmus		273,000
Fence and track - outside		159,000
Video equipment		4,500
Telemetry		7,000
Management facilities		45,500
Operational (5 years)		800,000
TOTALS	Investment	489,000
	Recurrent	800,000
	TOTAL	1,289,000

Species	Country	Area
Javan Rhino	Indonesia	Ujung Kulon N.P.
Title		
The Establishment of a Javan Rhino Protection and Conservation Unit		
Duration		Budget
3 years		US\$ 922,500

RATIONALE

Ujung Kulon NP is the only place where a viable population of Javan rhino survives. The UKNP peninsula was established as a conservation area long ago, and its topography makes protection comparatively easy. The area is too small for a large population of the Javan rhino and it cannot be expanded substantially. Since it is the only source of animals for the establishment of other populations, protection of this unique resource has the highest priority in Indonesia. Immediate action should be directed towards achieving the best possible protection for this population. A single population of rhino concentrated in one location such as Ujung Kulon is at great risk from natural disaster and human pressure, disease, problems of inbreeding, and over-crowding and competition for the limited space, as well as natural catastrophes such as flood, drought, and volcanic activities. Poaching of the Javan rhino in UKNP has occurred over the past several years. A recent case occurred in 1994: at least one rhino was killed and its horn was removed, and there have been numerous cases of illegal entry into the Park. Rhino bones were found in an area vulnerable to poaching during a routine patrol. Several suspected poachers from the districts of Pandeglang, Lebak, and Sukabumi, were apprehended and interrogated, but so far no conclusive evidence has been found.

The program aims at:

1. Improvement and strengthening of the protection and conservation of Javan rhino in UKNP through:
 - Establishment of the Javan Rhino Protection Unit.
 - Training and strengthening the capability of guards in the Javan Rhino Protection Unit.
 - Provision of the equipment to the Javan Rhino Protection Unit.
 - Strengthening the capability of the Javan Rhino Protection field operations.
 - Development of more effective anti-poaching measures.
2. Implementation of public education and awareness program on the importance of UKNP and its Javan rhino.

INPUTS

Construction of residential and operational facilities for Rhino Protection Unit team.

Facilities for operation for rhino protection and community relation and development.

Training and morale improvement for other UKNP staff.

Construction of a base of operation for protection, management, and community development activities in rhino conservation and their ecosystem.

Funds for further development, implementation and coordination of the Javan rhino conservation strategy.

OUTPUTS

More effective protection of the Javan rhino in Ujung Kulon.

BUDGET (In US\$)

Base station (Camp and field equipment)		122,000
Mobile Unit (Speedboat, motorbikes, etc)		117,000
Media and signposts		14,000
Base station Staff (72 mm)		72,000
Technical assistance (6 mm)		36,000
Mobile Unit Staff (150 mm)		112,500
Technical assistance (6 mm)		36,000
Community outreach Staff (40 mm)		40,000
Technical assistance (6 mm)		36,000
Research/Monitoring Staff (40 mm)		40,000
Technical assistance (6 mm)		36,000
TOTAL	Investment	253,000
	Recurrent	669,500
	TOTAL	922,500

Species	Country	Area
Sumatran Rhino	Indonesia	Bukit Barisan Selatan
Title		
Expansion/Supplementation of GEF Anti-Poaching Program for Sumatran Rhino		
Duration		Budget
3 years		US\$ 128,000

RATIONALE

The GEF Project is providing substantial funds to initiate and catalyze an intensive anti-poaching and community outreach program for the Sumatran rhinoceros in three of the four major areas for this species in Sumatra: Bukit Barisan Selatan National Park; Kerinci Seblat National Park; and Way Kambas National Park. (The other major rhino area in Sumatra, Gunung Leuser National Park, is being protected through a major project supported by the European Union). One mobile unit and nine resident rhino protection units have been recruited, trained, and deployed. However, surveys in the course of the project have revealed somewhat different distributions and more intense poaching of rhinos than believed at the outset of the project. Hence there is need to add at least three additional rhino protection units.

INPUTS

Personnel, training, equipment.

OUTPUTS

More frequent and effective patrolling and more comprehensive coverage of rhino areas.

BUDGET (In US\$)

Operational Costs: Field Allowances		121,000
Equipment		5,000
Training		2,000
TOTALS	Investment	7,000
	Recurrent	121,000
	TOTAL	128,000

Species	Country	Area
Sumatran Rhino	Indonesia	Bukit Barisan Selatan, Kerinci Seblat, Way Kambas NPs
Title		
Extension of GEF Anti-Poaching Program for Sumatran Rhino		
Duration		Budget
2 years		US\$ 338,000

RATIONALE

The GEF Project is providing substantial funds to initiate and catalyze an intensive anti-poaching and community outreach program for the Sumatran rhinoceros in three of the four major areas for this species in Sumatra: Bukit Barisan Selatan National Park; Kerinci Seblat National Park; and Way Kambas National Park. One mobile unit and nine resident rhino protection units (RPUs) have been recruited, trained, and deployed. Another three RPUs are proposed. However, the GEF Project will expire in mid-1998. Efforts are in progress to recruit funds to sustain the anti-poaching program until at least the year 2000 while more self-sustaining and internal sources of support are located. Approximately, US\$ 13,000 is required to support each team/year.

INPUTS

Operational expenses.

OUTPUTS

Extension of the anti-poaching program initiated by the GEF for an additional two years while internal and self-sustaining sources of funds are developed.

BUDGET (In US\$)

Operational Costs for teams @US\$ 13,000/team/year		338,000
TOTALS	Investment	
	Recurrent	338,000
	TOTAL	338,000

Species	Country	Area
Sumatran Rhino	Indonesia	Way Kambas, Sumatra
Title		
Further Development of a Sumatran Rhino Sanctuary in Way Kambas N.P.		
Duration		Budget
5 years		US\$ 710,000

RATIONALE

The Sumatran rhino remain in great peril *in situ*. The free-ranging populations have declined perhaps 50% in the last five to seven years. While efforts to protect rhinos in the wild have intensified and will hopefully succeed, there is strong belief that more intensive protection and management of rhino is a vital part of the conservation strategy. Such belief motivated the attempt at a captive propagation program for Sumatran rhino commencing in 1984. Rhinos located outside potentially viable or feasibly protectable populations were captured for this program. Unfortunately, traditional methods in captivity have not succeeded with this species: mortality has been high and no reproduction has occurred. In adaptive adjustment, there are now attempts in progress to develop managed breeding centers in native habitat. The center is being designated a Sumatran Rhino Sanctuary (SRS). This use of the term sanctuary differs from the definition applied in Africa, i.e. an enclosed area of native habitat which is intensively protected but within which mate selection or breeding activity is not managed. It is the goal of the Sumatran rhino sanctuaries to gradually expand in size, and diminish in management, to emulate and converge on the African model. The first one of these sanctuaries in Indonesia will be in Way Kambas National Park. The Park has a resident population of rhino and the SRS will serve to augment the protective presence in the area. Rhino for the SRS will derive from individuals repatriated to native habitat from captivity. An important part of the SRS program will be to develop an eco-tourism component to generate funds for operation of the sanctuary as well as other rhino conservation projects. This eco-tourism program will attempt to encompass other rhino areas in Indonesia and South East Asia (e.g. Ujung Kulon, Sungai Dusun, Sepilok, and Tabin). The SRS in Way Kambas will be a joint venture of PHPA, Taman Safari Indonesia, and the International Rhino Foundation (IRF). Much of the initial capital for development of the rhino facilities is already being provided by the International Rhino Foundation. However, more funds are needed to develop the eco-tourism facilities and programs for start-up costs and operations for three years, until the projected profits materialize.

INPUTS

Facilities, equipment, personnel, program development.

OUTPUTS

An effective managed breeding center in native habitat for Sumatran rhino. The ultimate objective will be to expand size of the enclosed areas, increase numbers of rhino, and eventually reduce level of management so that the sanctuary converges on the African model of a rhino sanctuary. A model eco-tourism program to generate income and hopefully self-sufficiency for the SRS and other rhino conservation programs in Indonesia.

BUDGET (In US\$)

Facilities/Equipment		560,000
Operation for Initial three Years		150,000
TOTALS	Investment	560,000
	Recurrent	150,000
	TOTAL	710,000

Species	Country	Area
Sumatran Rhino	Indonesia	Sumatra
Title		
Rapid Assessment of Suspected and Potential Rhino Populations in Sumatra		
Duration		Budget
1 year		US\$ 300,000

RATIONALE

A number of suspected or known rhino populations have had no surveys conducted in recent years. Furthermore, there are a number of large forest blocks for which no information exists. The project will aim to survey all those areas mentioned above to establish:

1. Presence and absence of rhinos.
2. Distribution maps.
3. Best estimates of rhinos number.
4. Short and long term threats to the population and habitat.

INPUTS

Personnel support. Equipment.

OUTPUTS

The information gathered will be used to conduct PHVAs on each of the separate populations found, with the aim of providing recommendations for conservation actions required.

BUDGET (In US\$)

TOTALS

Investment	65,000
Recurrent	235,000
TOTAL	300,000

Species	Country	Area
Sumatran Rhino	Indonesia	Kalimantan
Title		
An Assessment of the Present Population of Sumatran Rhinoceros in Kalimantan		
Duration		Budget
2 years		US\$ 152,000

RATIONALE

Recent reported sightings indicate that the Sumatran rhinoceros is still present in Kalimantan, although hard evidence is lacking. The reported sightings imply that the animals are spread out over the most mountainous and remote areas of Kalimantan. Considering the critical global status of the species, it is thought essential to gather information on the distribution and limiting factors of this subspecies, as soon as possible. The output of the survey will be used to prepare a conservation action plan for the remaining rhinos in Kalimantan. As the distribution range may overlap with the one in Sabah and Sarawak, co-operation with these states will be sought in the execution of the work.

Areas to be covered:

- 1 Kayan-Mentarang National Park
 - upper Sungai Bahau
 - upper reaches of the Sungai Kat, Sungai Punjungan and Sungai Iwan
- 2 Ulu Sembakung/Sungai Sebuk (Kalimantan-Sabah border)
- 3 Gunung Belayan / Sungai Boh / Sungai Kayaniut
- 4 Sungai Irun
- 5 Gunung Meratus
- 6 Bentuang Karimun Nature Reserve

INPUTS

Personnel and equipment.

OUTPUTS

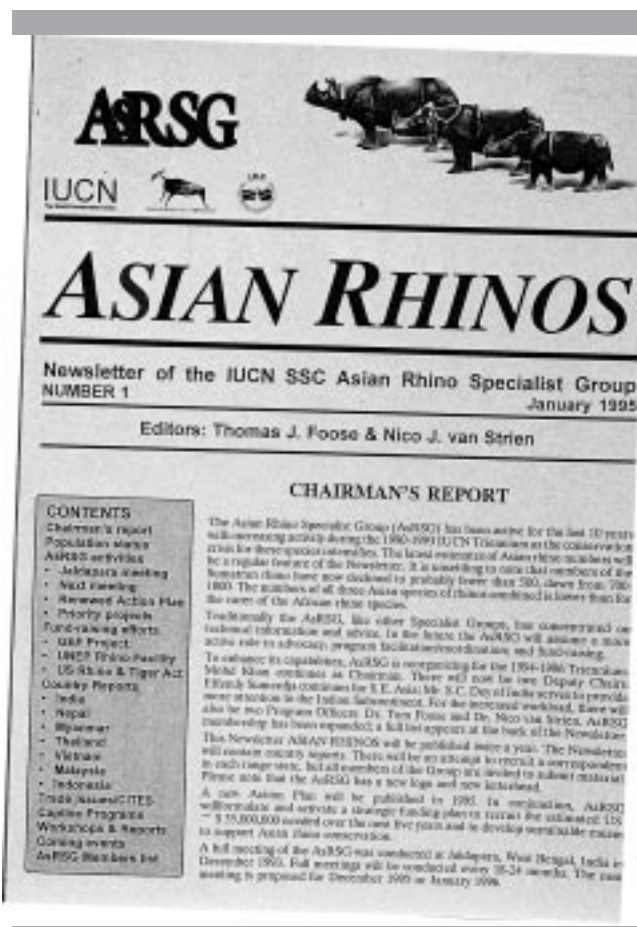
A database in GIS format of any rhino located in Kalimantan.

BUDGET (In US\$)

Equipment		12,000
Transport (@25,000/y)		50,000
Salaries and wages (@34,000/y)		60,000
Personal Expenses (@4,000/y)		8,000
Others		10,000
TOTALS	Investment	12,000
	Recurrent	140,000
	TOTAL	152,000

9. Work Plan for AsRSG 1996-1998

- Adaptive Revisions of Asian Rhino Action Plan
- Oversight of GEF Project on Conservation of Rhinoceros in South East Asia
- Recruitment of Additional Funds for Asian Rhino Conservation:
 - Grant Proposals:
 - U.S. Rhinoceros and Tiger Conservation Act
 - MacArthur Foundation
 - Geraldine Dodge Foundation
 - European Union
 - Additional GEF Projects
 - WWF Netherlands
 - Taiwan Government
 - Selected Corporations
 - Revenue Generation Programs
- Catalysis/Facilitation of Additional Projects
 - Reconnaissance to India & Nepal
 - Sumatran Rhino Sanctuary Project in Way Kambas
 - Reconnaissance in Myanmar/Thailand/Laos/Vietnam
 - Javan Rhino Sanctuary
- Production of Newsletter ASIAN RHINOS
 - Two Issues/Year
- Organization of AsRSG Meetings



AsRSG Newsletter Cover.

Tentative Operating Budget for AsRSG 1996-1998				
Item/Activity	Total Need		Already Obtained	Needed
	Per Year	3-Year Total		
	US\$	US\$		
Travel:				
2 Trips/Year North America-Asia @ \$ 3,500	\$ 7,000	\$ 21,000	\$ 11,000	\$ 10,000
2 Trips/Year Europe-Asia @ \$ 3,000	\$ 6,000	\$ 18,000	\$ 9,000	\$ 9,000
4 Trips/Year Indian Subcontinent-South East Asia @ \$ 2,000	\$ 8,000	\$ 24,000		\$ 24,000
8 Trips/Year Within S.E. Asia or Indian Subcont. @ \$ 1,000	\$ 8,000	\$ 24,000	\$ 12,000	\$ 12,000
Communications @ \$ 1,500/month	\$ 18,000	\$ 54,000	\$ 18,000	\$ 36,000
Production & Distribution of Action Plan, Newsletters, etc.	\$ 6,000	\$ 18,000		\$ 18,000
Secretarial Support				
Half-time persons for Program Officers @ \$ 30,000/year	\$ 30,000	\$ 90,000		\$ 90,000
Compensation for Program Officer				
40% time each 2 Program Officers @ \$ 30,000 each/year	\$ 60,000	\$ 180,000	\$ 90,000	\$ 90,000
Office Supplies @ \$ 500/month.	\$ 6,000	\$ 18,000	\$ 9,000	\$ 9,000
Total	\$ 149,000	\$ 447,000	\$ 149,000	\$ 298,000

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APPENDIX 2

IUCN Red List Categories

Prepared by the IUCN Species Survival Commission
As approved by the 40th Meeting of the IUCN Council, Gland, Switzerland
30 November 1994

1) Introduction

1 The threatened species categories now used in Red Data Books and Red Lists have been in place, with some modification, for almost 30 years. Since their introduction these categories have become widely recognised internationally, and they are now used in a whole range of publications and listings, produced by IUCN as well as by numerous governmental and non-governmental organisations. The Red Data Book categories provide an easily and widely understood method for highlighting those species under higher extinction risk, so as to focus attention on conservation measures designed to protect them.

2 The need to revise the categories has been recognised for some time. In 1984, the SSC held a symposium, 'The Road to Extinction' (Fitter & Fitter 1987), which examined the issues in some detail, and at which a number of options were considered for the revised system. However, no single proposal resulted. The current phase of development began in 1989 with a request from the SSC Steering Committee to develop a new approach that would provide the conservation community with useful information for action planning.

In this document, proposals for new definitions for Red List categories are presented. The general aim of the new system is to provide an explicit, objective framework for the classification of species according to their extinction risk.

The revision has several specific aims:

- to provide a system that can be applied consistently by different people;
- to improve the objectivity by providing those using the criteria with clear guidance on how to evaluate different factors which affect risk of extinction;
- to provide a system which will facilitate comparisons across widely different taxa;
- to give people using threatened species lists a better understanding of how individual species were classified.

3 The proposals presented in this document result from a continuing process of drafting, consultation and validation. It was clear that the production of a large number of draft proposals led to some confusion, especially as each draft has been used for classifying some set of species for conservation purposes. To clarify matters, and to open the way for modifications as and when they became necessary, a system for version numbering was applied as follows:

Version 1.0: Mace & Lande (1991)

The first paper discussing a new basis for the categories, and presenting numerical criteria especially relevant for large vertebrates.

Version 2.0: Mace *et al.* (1992)

A major revision of Version 1.0, including numerical criteria appropriate to all organisms and introducing the non-threatened categories.

Version 2.1: IUCN (1993)

Following an extensive consultation process within SSC, a number of changes were made to the details of the criteria, and fuller explanation of basic principles was included. A more explicit structure clarified the significance of the non-threatened categories.

Version 2.2: Mace & Stuart (1994)

Following further comments received and additional validation exercises, some minor changes to the criteria were made. In addition, the Susceptible category present in Versions 2.0 and 2.1 was subsumed into the Vulnerable category. A precautionary application of the system was emphasised.

Final Version

This final document, which incorporates changes as a result of comments from IUCN members, was adopted by the IUCN Council in December 1994.

All future taxon lists including categorisations should be based on this version, and not the previous ones.

4 In the rest of this document the proposed system is outlined in several sections. The Preamble presents some

basic information about the context and structure of the proposal, and the procedures that are to be followed in applying the definitions to species. This is followed by a section giving definitions of terms used. Finally the definitions are presented, followed by the quantitative criteria used for classification within the threatened categories. It is important for the effective functioning of the new system that all sections are read and understood, and the guidelines followed.

References:

Fitter, R., and M. Fitter, ed. (1987) *The Road to Extinction*. Gland, Switzerland: IUCN.

IUCN. (1993) *Draft IUCN Red List Categories*. Gland, Switzerland: IUCN.

Mace, G. M. et al. (1992) "The development of new criteria for listing species on the IUCN Red List." *Species* 19: 16-22.

Mace, G. M., and R. Lande. (1991) "Assessing extinction threats: toward a reevaluation of IUCN threatened species categories." *Conserv. Biol.* 5.2: 148-157.

Mace, G. M. & S. N. Stuart. (1994) "Draft IUCN Red List Categories, Version 2.2" *Species* 21-22: 13-24.

II) Preamble

The following points present important information on the use and interpretation of the categories (= Critically Endangered, Endangered, etc.), criteria (= A to E), and sub-criteria (= a, b, etc., i, ii, etc.):

1 Taxonomic level and scope of the categorisation process

The criteria can be applied to any taxonomic unit at or below the species level. The term 'taxon' in the following notes, definitions and criteria is used for convenience, and may represent species or lower taxonomic levels, including forms that are not yet formally described. There is a sufficient range among the different criteria to enable the appropriate listing of taxa from the complete taxonomic spectrum, with the exception of micro-organisms. The criteria may also be applied within any specified geographical or political area although in such cases special notice should be taken of point 11 below. In presenting the results of applying the criteria, the taxonomic unit and area under consideration should be made explicit. The categorisation process should only be applied to wild populations inside their natural range, and to populations resulting from benign introductions (defined in the draft

IUCN Guidelines for Re-introductions as ". . . an attempt to establish a species, for the purpose of conservation, outside its recorded distribution, but within an appropriate habitat and eco-geographical area").

2 Nature of the categories

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as 'threatened'. The threatened species categories form a part of the overall scheme. It will be possible to place all taxa into one of the categories (see Figure 1).

3 Role of the different criteria

For listing as Critically Endangered, Endangered or Vulnerable there is a range of quantitative criteria; meeting any one of these criteria qualifies a taxon for listing at that level of threat. Each species should be evaluated against all the criteria. The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. Even though some criteria will be inappropriate for certain taxa (some taxa will never qualify under these however close to extinction they come), there should be criteria appropriate for assessing threat levels for any taxon (other than micro-organisms). The relevant factor is whether any one criterion is met, not whether all are appropriate or all are met. Because it will never be clear which criteria are appropriate for a particular species in advance, each species should be evaluated against all the criteria, and any criterion met should be listed.

4 Derivation of quantitative criteria

The quantitative values presented in the various criteria associated with threatened categories were developed through wide consultation and they are set at what are generally judged to be appropriate levels, even if no formal justification for these values exists. The levels for different criteria within categories were set independently but against a common standard. Some broad consistency between them was sought. However, a given taxon should not be expected to meet all criteria (A-E) in a category; meeting any one criterion is sufficient for listing.

5 Implications of listing

Listing in the categories of Not Evaluated and Data Deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time as an assessment is made, species listed in these categories should not be treated as if they were non-threatened, and it may be appropriate (especially for Data Deficient forms) to give them the same degree of protection as threatened taxa, at least until their status can be evaluated.

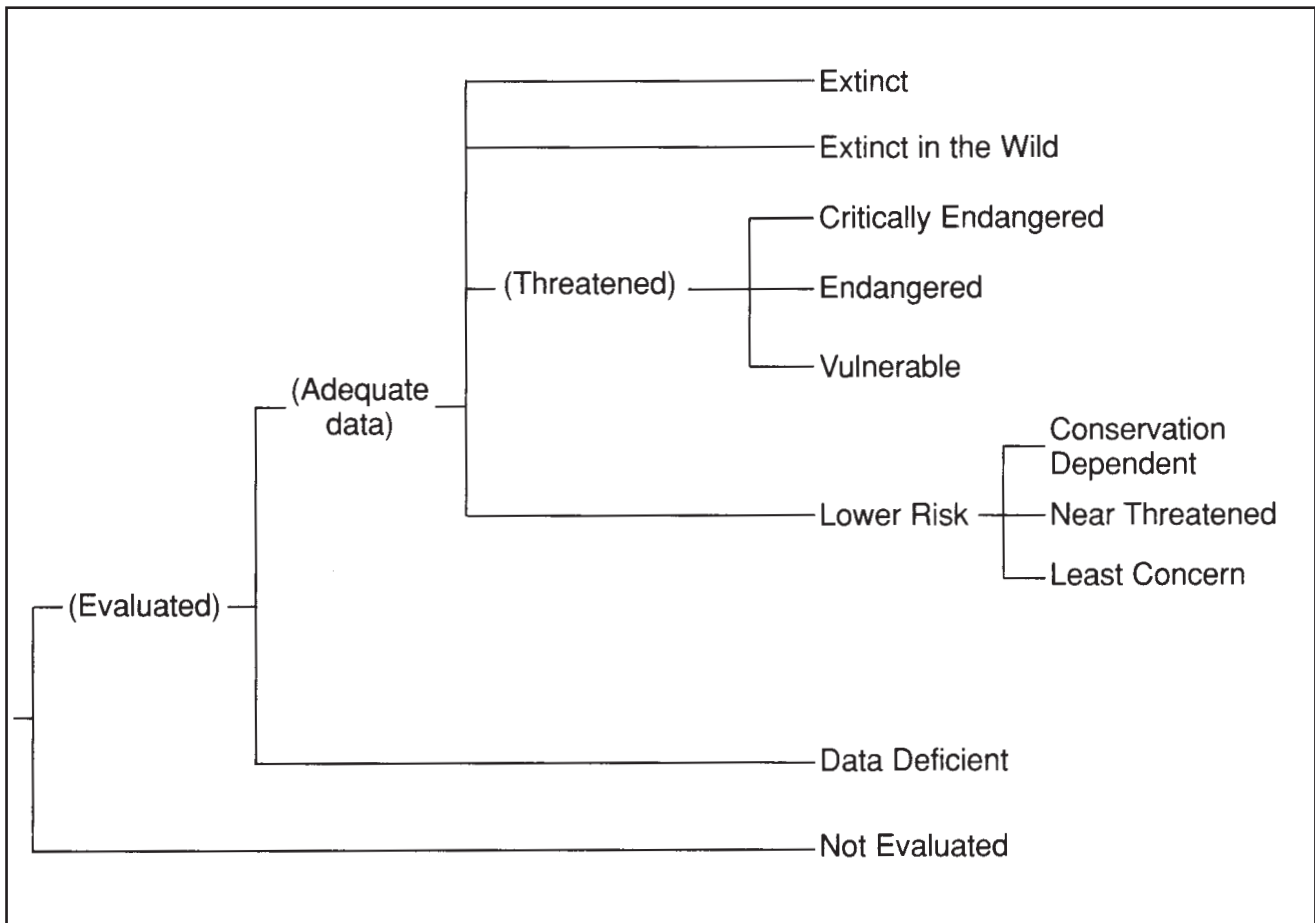


Figure 1: Structure of the Categories

Extinction is assumed here to be a chance process. Thus, a listing in a higher extinction risk category implies a higher expectation of extinction, and over the time-frames specified more taxa listed in a higher category are expected to go extinct than in a lower one (without effective conservation action). However, the persistence of some taxa in high risk categories does not necessarily mean their initial assessment was inaccurate.

6 Data quality and the importance of inference and projection

The criteria are clearly quantitative in nature. However, the absence of high quality data should not deter attempts at applying the criteria, as methods involving estimation, inference and projection are emphasised to be acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonably be supported. Suspected or inferred patterns in either the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified.

Taxa at risk from threats posed by future events of low probability but with severe consequences (catastrophes) should be identified by the criteria (e.g. small distributions, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible, or nearly so (pathogens, invasive organisms, hybridization).

7 Uncertainty

The criteria should be applied on the basis of the available evidence on taxon numbers, trend and distribution, making due allowance for statistical and other uncertainties. Given that data are rarely available for the whole range or population of a taxon, it may often be appropriate to use the information that is available to make intelligent inferences about the overall status of the taxon in question. In cases where a wide variation in estimates is found, it is legitimate to apply the precautionary principle and use the estimate (providing it is credible) that leads to listing in the category of highest risk.

Where data are insufficient to assign a category (including Lower Risk), the category of 'Data Deficient' may be assigned. However, it is important to recognise that this category indicates that data are inadequate to determine

the degree of threat faced by a taxon, not necessarily that the taxon is poorly known. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, it is important to attempt threatened listing, even though there may be little direct information on the biological status of the taxon itself. The category 'Data Deficient' is not a threatened category, although it indicates a need to obtain more information on a taxon to determine the appropriate listing.

8 Conservation actions in the listing process

The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action affecting it. In cases where it is only conservation action that prevents the taxon from meeting the threatened criteria, the designation of 'Conservation Dependent' is appropriate. It is important to emphasise here that a taxon requires conservation action even if it is not listed as threatened.

9 Documentation

All taxon lists including categorisation resulting from these criteria should state the criteria and sub-criteria that were met. No listing can be accepted as valid unless at least one criterion is given. If more than one criterion or sub-criterion was met, then each should be listed. However, failure to mention a criterion should not necessarily imply that it was not met. Therefore, if a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic down-listing. Instead, the taxon should be re-evaluated with respect to all criteria to indicate its status. The factors responsible for triggering the criteria, especially where inference and projection are used, should at least be logged by the evaluator, even if they cannot be included in published lists.

10. Threats and priorities

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the likelihood of extinction under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and even perhaps the taxonomic distinctiveness of the subject.

11. Use at regional level

The criteria are most appropriately applied to whole taxa at a global scale, rather than to those units defined by regional or national boundaries. Regionally or nationally based threat categories, which are aimed at including taxa that are threatened at regional or national levels (but not necessarily throughout their global ranges), are best used with two key pieces of information: the global status category for the taxon, and the proportion of the global

population or range that occurs within the region or nation. However, if applied at regional or national level it must be recognised that a global category of threat may not be the same as a regional or national category for a particular taxon. For example, taxa classified as Vulnerable on the basis of their global declines in numbers or range might be Lower Risk within a particular region where their populations are stable. Conversely, taxa classified as Lower Risk globally might be Critically Endangered within a particular region where numbers are very small or declining, perhaps only because they are at the margins of their global range. IUCN is still in the process of developing guidelines for the use of national red list categories.

12. Re-evaluation

Evaluation of taxa against the criteria should be carried out at appropriate intervals. This is especially important for taxa listed under Near Threatened, or Conservation Dependent, and for threatened species whose status is known or suspected to be deteriorating.

13. Transfer between categories

There are rules to govern the movement of taxa between categories. These are as follows: (A) A taxon may be moved from a category of higher threat to a category of lower threat if none of the criteria of the higher category has been met for five years or more. (B) If the original classification is found to have been erroneous, the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay (but see Section 9). (C) Transfer from categories of lower to higher risk should be made without delay.

14. Problems of scale

Classification based on the sizes of geographic ranges or the patterns of habitat occupancy is complicated by problems of spatial scale. The finer the scale at which the distributions or habitats of taxa are mapped, the smaller the area will be that they are found to occupy. Mapping at finer scales reveals more areas in which the taxon is unrecorded. It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxa in question, and the origin and comprehensiveness of the distributional data. However, the thresholds for some criteria (e.g. Critically Endangered) necessitate mapping at a fine scale.

III) Definitions

1 Population

Population is defined as the total number of individuals of the taxon. For functional reasons, primarily owing to

differences between life-forms, population numbers are expressed as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used.

2 Subpopulations

Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little exchange (typically one successful migrant individual or gamete per year or less).

3 Mature individuals

The number of mature individuals is defined as the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity the following points should be borne in mind:

- Where the population is characterised by natural fluctuations the minimum number should be used.
- This measure is intended to count individuals capable of reproduction and should therefore exclude individuals that are environmentally, behaviourally or otherwise reproductively suppressed in the wild.
- In the case of populations with biased adult or breeding sex ratios it is appropriate to use lower estimates for the number of mature individuals which take this into account (e.g. the estimated effective population size).
- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals).
- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.

4 Generation

Generation may be measured as the average age of parents in the population. This is greater than the age at first breeding, except in taxa where individuals breed only once.

5 Continuing decline

A continuing decline is a recent, current or projected future decline whose causes are not known or not adequately controlled and so is liable to continue unless remedial measures are taken. Natural fluctuations will not normally count as a continuing decline, but an observed decline should not be considered to be part of a natural fluctuation unless there is evidence for this.

6 Reduction

A reduction (criterion A) is a decline in the number of mature individuals of at least the amount (%) stated over the time period (years) specified, although the decline need not still be continuing. A reduction should not be interpreted as part of a natural fluctuation unless there is good evidence for this. Downward trends that are part of natural fluctuations will not normally count as a reduction.

7 Extreme fluctuations

Extreme fluctuations occur in a number of taxa where population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e., a tenfold increase or decrease).

8 Severely fragmented

Severely fragmented refers to the situation where increased extinction risks to the taxon result from the fact that most individuals within a taxon are found in small and relatively isolated subpopulations. These small subpopulations may go extinct, with a reduced probability of recolonisation.

9 Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

10. Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. colonial nesting sites, feeding sites for migratory taxa). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon. The criteria include values in km², and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small (see Figure 2).

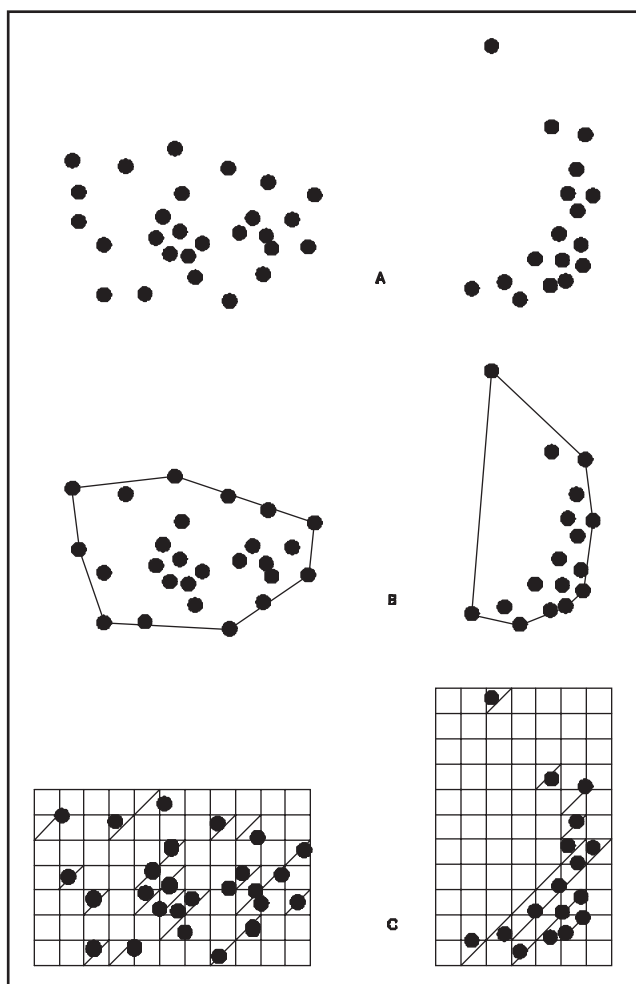


Figure 2: Two examples of the distinction between extent of occurrence and area of occupancy. (a) is the spatial distribution of known, inferred or projected sites of occurrence. (b) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (c) shows one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

11. Location

Location defines a geographically or ecologically distinct area in which a single event (e.g. pollution) will soon affect all individuals of the taxon present. A location usually, but not always, contains all or part of a subpopulation of the taxon, and is typically a small proportion of the taxon's total distribution.

12. Quantitative analysis

A quantitative analysis is defined here as the technique of population viability analysis (PVA), or any other quantitative form of analysis, which estimates the extinction probability of a taxon or population based on the known life history and specified management or non-management options. In presenting the results of quantitative analyses the structural equations and the data should be explicit.

IV) The categories ¹

EXTINCT (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW)

A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E) on page 110.

ENDANGERED (EN)

A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E) on pages 110 and 111.

VULNERABLE (VU)

A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to D) on pages 111 and 112.

LOWER RISK (LR)

A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (cd)**. Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (nt)**. Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
3. **Least Concern (lc)**. Taxa which do not qualify for Conservation Dependent or Near Threatened.

DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)

A taxon is Not Evaluated when it is has not yet been assessed against the criteria.

¹ Note: As in previous IUCN categories, the abbreviation of each category (in parenthesis) follows the English denominations when translated into other languages.

V) The Criteria for Critically Endangered, Endangered and Vulnerable

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

- 1) An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
 - a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

- 2) A reduction of at least 80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 100 km² or area of occupancy estimated to be less than 10 km², and estimates indicating any two of the following:

- 1) Severely fragmented or known to exist at only a single location.
- 2) Continuing decline, observed, inferred or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals.
- 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) number of locations or subpopulations
 - d) number of mature individuals.

C) Population estimated to number less than 250 mature individuals and either:

- 1) An estimated continuing decline of at least 25% within three years or one generation, whichever is longer or
- 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 50 mature individuals)
 - b) all individuals are in a single subpopulation.

D) Population estimated to number less than 50 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer.

ENDANGERED (EN)

A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

- 1) An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:

- a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
- 2) A reduction of at least 50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d), or (e) above.
- B) Extent of occurrence estimated to be less than 5000 km² or area of occupancy estimated to be less than 500 km², and estimates indicating any two of the following:
- 1) Severely fragmented or known to exist at no more than five locations.
 - 2) Continuing decline, inferred, observed or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals.
 - 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) number of locations or subpopulations
 - d) number of mature individuals.
- C) Population estimated to number less than 2500 mature individuals and either:
- 1) An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, or
 - 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals)
 - b) all individuals are in a single subpopulation.
- D) Population estimated to number less than 250 mature individuals.
- E) Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

VULNERABLE (VU)

A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

- A) Population reduction in the form of either of the following:
- 1) An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
 - a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
 - 2) A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.
- B) Extent of occurrence estimated to be less than 20,000 km² or area of occupancy estimated to be less than 2000 km², and estimates indicating any two of the following:
- 1) Severely fragmented or known to exist at no more than ten locations.
 - 2) Continuing decline, inferred, observed or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals
 - 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) number of locations or subpopulations
 - d) number of mature individuals
- C) Population estimated to number less than 10,000 mature individuals and either:
- 1) An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, or

- 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
 - b) all individuals are in a single subpopulation

- D) Population very small or restricted in the form of either of the following:
 - 1) Population estimated to number less than 1000 mature individuals.

- 2) Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than five). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

- E) Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

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- Action Plan for Asian Primate Conservation: 1987-1991.** Compiled by A.A. Eudey and the IUCN/SSC Primate Specialist Group, 1987, 65 pp. (Out of print.)
- Antelopes. Global Survey and Regional Action Plans. Part 1. East and Northeast Africa.** Compiled by R. East and the IUCN/SSC Antelope Specialist Group, 1988, 96 pp. (Out of print.)
- Dolphins, Porpoises and Whales. An Action Plan for the Conservation of Biological Diversity: 1988-1992.** Second Edition. Compiled by W.F. Perrin and the IUCN/SSC Cetacean Specialist Group, 1989, 27 pp. (Out of print.)
- The Kouprey. An Action Plan for its Conservation.** Compiled by J.R. MacKinnon, S.N. Stuart and the IUCN/SSC Asian Wild Cattle Specialist Group, 1988, 19 pp. (Out of print.)
- Weasels, Civets, Mongooses and their Relatives. An Action Plan for the Conservation of Mustelids and Viverrids.** Compiled by A. Schreiber, R. Wirth, M. Riffel, H. van Rompaey and the IUCN/SSC Mustelid and Viverrid Specialist Group, 1989, 99 pp. (Out of Print.)
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- The Red Panda, Olingos, Coatis, Raccoons, and their Relatives. Status Survey and Conservation Action Plan for Procyonids and Ailurids.** (In English and Spanish) Compiled by Angela R Glatston and the IUCN/SSC Mustelid, Viverrid, and Procyonid Specialist Group, 1994, 103 pp.
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- Partridges, Quails, Francolins, Snowcocks and Guineafowl. Status survey and Conservation Action Plan 1995-1999.** Compiled by Philip J.K. McGowan, Simon D. Dowell, John P. Carroll and Nicholas J.A. Aebischer and the WPA/BirdLife/SSC Partridge, Quail and Francolin Specialist Group, 1995, 102 pp.
- Pheasants: Status Survey and Conservation Action Plan 1995-1999.** Compiled by Philip J.K. McGowan and Pater J. Garson on behalf of the WPA/BirdLife/SSC Pheasant Specialist Group, 1995, 116 pp.
- The Wild Cats: Status Survey and Conservation Action Plan.** Compiled and edited by Kristin Nowell and Peter Jackson and the IUCN/SSC Cat Specialist Group, 1996, 406 pp.
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- African Primates: Status Survey and Conservation Action Plan (Revised edition).** Compiled by John F. Oates and the IUCN/SSC Primate Specialist Group, 1996.
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- Orchids: Status Survey and Conservation Action Plan.** Edited by Eric Hagsater and Vinciane Dumont, and compiled by Alec M. Pridgeon on behalf of the IUCN/SSC Orchid Specialist Group, 1996, 153 pp.
- Palms: their conservation and sustained utilization. Status Survey and Conservation Action Plan.** Edited by Dennis Johnson and the IUCN/SSC Palm Specialist Group, 1996, 116 pp.
- Conservation of Mediterranean Island Plants. 1. Strategy for Action.** Compiled by O. Delanoë, B. de Montmollin, L. Olivier and the IUCN/SSC Mediterranean Islands Plant Specialist Group, 1996, 106 pp.

IUCN/Species Survival Commission

The Species Survival Commission (SSC) is one of six volunteer commissions of IUCN – The World Conservation Union, a union of sovereign states, government agencies and non-governmental organizations. IUCN has three basic conservation objectives: to secure the conservation of nature, and especially of biological diversity, as an essential foundation for the future; to ensure that where the earth's natural resources are used this is done in a wise, equitable and sustainable way; and to guide the development of human communities towards ways of life that are both of good quality and in enduring harmony with other components of the biosphere.

The SSC's mission is to conserve biological diversity by developing and executing programs to save, restore and wisely manage species and their habitats. A volunteer network comprised of nearly 7,000 scientists, field researchers, government officials and conservation leaders from 188 countries, the SSC membership is an unmatched source of information about biological diversity and its conservation. As such, SSC members provide technical and scientific counsel for conservation projects throughout the world and serve as resources to governments, international conventions and conservation organizations.

The IUCN/SSC Action Plan series assesses the conservation status of species and their habitats, and specifies conservation priorities. The series is one of the world's most authoritative sources of species conservation information available to nature resource managers, conservationists and government officials around the world.

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