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PREFACE

Captive breeding and, especially, the role of the world's zoological institutions in the conservation of endangered wildlife, continues to be debated. It was in this spirit of self-examination that the 5th World Conference on Breeding Endangered Species in Captivity was held in Cincinnati, Ohio on October 9-12, 1988. The conference was co-sponsored by The Fauna and Flora Preservation Society, The Cincinnati Zoo and Botanical Garden Center for Reproduction of Endangered Wildlife, and Kings Island Wild Animal Habitat.

While the presentations and discussions of previous conferences have centered primarily on specific captive breeding programs, the organizers of the Cincinnati conference attempted to develop a number of related themes. As a result, the presentations were divided into four categories - rescue and status, management and reintroduction, restoration, and recovery. The fact that 30 of the 56 papers were presented during sessions devoted to rescue and status is somewhat indicative of our current position with respect to the conservation of the world's wildlife. Perhaps by the time of the next conference, the number of presentations involving reintroduction, recovery and restoration projects will be on a par with those dealing with specific breeding programs.

The presentations by field biologists from conservation organizations, government agencies, and academia provide a special perspective and their participation underscores the fact that conservation programs involving captive propagation must be interdisciplinary to be successful.

It has been five years since the last conference was held in the Netherlands. We hope that the information presented and discussed throughout this conference will contribute in many different ways to the future success of the captive propagation of endangered wildlife. And, hopefully, this will be evaluated positively when this Conference is organized again at least four years from now.

Poster Sessions

Abstracts and/or poster text were submitted for publication.

Workshops

Workshops were organized for discussions on rhinos, bonobos, okapi, Arabian and scimitar-horned oryx, drills and exotic cats. Only the proceedings of the exotic cat workshop were submitted for publication.

Acknowledgements

The Program Committee wishes to thank all of the staff, volunteers, exhibitors and sponsors who made this Conference possible as well as Vickie Stidham who typed all of the manuscripts, and the participants and delegates who shared very many valuable thoughts and comments.

B. L. Dresser, R. W. Reece and E. J. Maruska, Editors

CONSERVATION OF ASIAN RHINOS: PROBLEMS AND CHALLENGES

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PAST AND PRESENT DISTRIBUTION

The Greater One-horned Rhinoceros

The greater one-horned rhinoceros (Rhinoceros unicornis) was formerly found across the entire northern part of the Indian subcontinent from Pakistan on the west to Nepal, Bhutan and the Indian-Burmese border. The species now survives in a few small population units on the northern border of eastern India and Nepal (Figure 2).

The animal was so common in the old days that it was killed for sport. According to Martin (1983), a hunter by the name of Colonel F.T. Pollack killed 47 Indian rhinos and the Maharajah of Cooch Bihar killed 207 between 1871 and 1907. Development, mainly tea plantations and agriculture for an expanding human population, reduced rhino habitat, resulting in countless animals being killed to prevent crop depredation. This loss of habitat combined with the uncontrolled killing of the rhinos drove the animals to the brink of extinction. By 1908 there were only about a dozen animals left in Kaziranga and a few scattered animals in other places. Kaziranga was made a forest reserve in 1908 and a wildlife sanctuary eight years later and was essentially closed to the public until 1938.

Today it is the least threatened of the three Asiatic species. Populations have increased and the species has been successfully translocated to re-establish populations in its former ranges (please see Table 1). The estimated population is 1724 individuals.

Conservation Problem

The species has been intensely protected by the Nepalese and Indian wildlife authorities and the situation appears to be under control. However, the expanding human population pressure adjacent to these rhino habitats and the high commercial value of its horn have resulted in significant losses to poachers.

Maintenance and expansion of existing populations in major sanctuaries such as Kaziranga, Manas and Orang in India and Chitawan and Bardia in Nepal are of top priority. As far as possible, these major sanctuaries should be expanded. Translocation of rhinos should be continued in India and Nepal with a view to establishing more wild populations in areas which historically had rhino populations. These areas should be protected with the reintroduced populations.

The Lesser One-horned Rhinoceros

The lesser one-horned rhinoceros formerly widespread was found in Java, Sumatra, Malaya, Burma, Eastern India, Bangladesh, Thailand and Indo China (Rookmaaker, 1980). It occurred as three discrete subspecies:

i) Rhinoceros sondaicus sondaicus - was found from Tennaserim, through the Kra Ithmus into the Malay Peninsular, Sumatra and on the western island of Java,
ii) Rhinoceros sondaicus annamiticus - occurred in Vietnam, Loas, Kampuchea and the eastern most part of Thailand,
iii) Rhinoceros sondaicus enermis - was found around the deltas of the Ganges river, from Bengal to Assam and eastwards to Burma.

In Indonesia, it occurred from Acheh in the north to Lampung in the south Sumatra, and in the west and central parts of Java. Presently, it is only found in Udjung Kulon, Indonesia and Indochina.

In Indonesia, it was given protection in 1910 and Udjung Kulon was made a sanctuary in 1921 which was later upgraded to the status of a National Park. Poaching still exists today.

Also known as the Javan rhinoceros, only about 25 individuals remained in the Udjung Kulon in 1937. By 1958, there were about 12 to 24 animals. With the rigid protection in Udjung Kulon, the Javan rhino population increased to 21 to 28 animals in 1967 (Schenkel and Schenkel, 1969). The population increased to 40 to 45 rhinos in 1975, 53 to 59 in 1981 and 54 to 60 in 1983-84 (Sajudin, 1984).

Sajudin (1984) suggested that the population would continue to increase further but doubted whether the present habitat and size of the Udjung Kulon National Park can accommodate additional rhinos. The 1982 report of the task force to save the Javan rhino stated that the optimum carrying capacity for the Javan rhino in Udjung Kulon was 53 animals.

The Udjung Kulon National Park is located at the western most end of Java, comprising an area of 78,619 ha. The National Park encompasses Udjung Kulon, Pulau Pahaitan, Pulau Peucang, Pulau Krakatau and Gunong Honje. In Udjung Kulon, the Javan rhinos are found in the coastal and lowland forest up to 1,000 m altitude. It feeds in the thick bushes and dense forest but shys away from the open areas.

The lesser one-horned rhinoceros still exists in Indochina but its population and distribution are as yet not adequately known. It is important to know the population and distribution to initiate plans for its conservation in Indochina.

The Sumatran Rhinoceros

The lesser two-horned or more commonly known as the Sumatran rhinoceros (Dicerorhinus sumatrensis) was formerly found from India, Burma, Thailand, the Malay Peninsular, Sumatra, and Borneo. The population in India is now extinct.

There is little information on the status of the subspecies D. s. lasiotus found in Burma. The subspecies D. s. sumatrensis are found mostly in Thailand, the Malay Peninsular and Sumatra. There is little or no information on the Thai population. The populations in Peninsular Malaysia are found in 23 localities. From the estimated 100 individuals, only Taman Negara and Endau-Rompin contain viable numbers of between 25-36 rhinos in each area. In other sites, the low population level of between 1-6 individuals may not be viable in the long term.

Sumatra holds the largest population of about 420-785 individuals of this species. Four viable populations of the species in Gunung Leuser, Kerinci Sebelat, Barisan Selatan and Central Acheh are reasonably protected.

D. s. harrisoni is the most endangered subspecies which exists in rapidly dwindling forest islands in Eastern Sabah and in Limbang, Sarawak. The populations in Sabah and Sarawak are approximately between 30-40 and 10-12 individuals respectively.

Conservation Problem

The existing population of this species survived mainly because it inhabits the inaccessible forests and mountains or because it has adapted to modified environment (secondary forest and old logged over forest). However, the surviving populations are constantly subjected to disturbances and harassment.

Habitat loss can be singled out as the main problem causing populations to be isolated. The solitary behavior of this species requires large forested land to be set aside for conservation. Such prime lands especially the lowlands are also suitable for agricultural plantations. Economic growth and rural development take precedence in all developing nations. Clear-felling for agriculture and logging for timber are responsible for the heavy mortalities of the rhinos.

Rhinos poached for their horns are known to occur in Sumatra and Malaysia. In Sumatra, four rhinoceroses were caught by wire-snares over the last few years. The steel-wire snares were used rampantly by wild boar trappers. In Sabah, two animals that died were found with home made lead slug embedded in their bodies. A conservative estimate of at least two animals were poached yearly in Sabah. In Peninsular Malaysia, two animals were known to be poached and the horns were taken by the poachers. The causes of two other mortalities in the wild were not known.

TRADE AND USES OF RHINO HORN IN ASIA

Early Chinese record of trade and uses of Asian rhino horn dated back to the 13th century. The horns were used for traditional medicine. Overseas Chinese who have made their homes in countries like Indonesia, Malaysia, Singapore and Burma made use of rhino horns in much the same way as they are used in China. Japanese and Koreans acquired their knowledge of the use of rhino horns in traditional medicines from China.

Studies carried out (Martin, 1979) in Hong Kong, Macao, Singapore, Taiwan and Thailand revealed that it was the Chinese in these countries who import and consume rhino products. The horn is used as a fever reducing drug and the hide is used for skin disorders. The preparation of these products are essentially

similar in procedures as laid down by Li Shih Chen the famous Chinese pharmacist, who wrote the Pen Ts'ao Kang Mu in the 10th century.

India

In India, rhino horns are used by the Gujarati Muslims as an aphrodisiac in the traditional Unani medicine. The horns are either scraped or grounded into powder and taken in a mixture of herbs. A dose of the medicine costs about $2 which is the equivalent of the take home salary of the average Indian. This rather expensive cost of the medicine limits the sale to the more well to do people who prefer and have access to western medicine. The horn is also used for lumbago, arthritis and hemorrhoids.

The high commercial value of the rhino horn is due to its scarcity and difficulty to obtain it in India. The species is endangered and protected. A license, which is quite impossible to obtain, is required to possess a rhino horn. The Indian government abolished rhino hunting in 1910 and later declared the rhino horn illegal for anyone to possess but allowed those already in possession to be used. Over the years these rhino horns were used up and were seldom replaced. As a result, the internal trade of Indian rhino horns is now minimal.

The Forest Department in Assam auctioned rhino horns confiscated or collected from dead animals. A kilo of good quality rhino horn can fetch as high as $9,000 in South East Asia and the Far East (Martin, 1983). In the years 1965/1966 to 1979/1980, a total of 318.57 kilos of rhino horns were sold by tender. These horns were taken to Calcutta and exported (or smuggled) to Singapore or Hong Kong.

With such high prices for rhino horns, poaching became extremely serious. Between 1967 and 1972 a total of 37 rhinos were killed by poachers. The average for five years between 1967 and 1972 was seven animals per year. A total of 238 animals were poached between 1982 and 1985.

Malaysia

Chinese came to the state of Malacca, Malaya in the 1500s. Only after 1957 was there restriction on travels between China and Malaysia. The period was certainly a long one spanning a few hundred years. Trade included rhino horns.

Rhino horns are used for reducing fever. Scrappings are soaked in warm water and then drunk. Other parts of the rhino which are used included skin and teeth.

The current price of rhino horns in Peninsular Malaysia is about $12,000 a kilo. The population of the Sumatran rhino is about one hundred animals found in the most difficult and inaccessible terrain of the country.

The Javan rhino once existed in Peninsular Malaysia but became extinct in 1932.

Wildlife law enforcement is effective in Peninsular Malaysia. Only two rhinos were killed in the last nine years. Medicine shops were raided from time

to time and only one case of violation was detected in 1984. Two African rhino horns were confiscated.

In the East Malaysian states of Sabah and Sarawak there are about 30-40 and 10-15 rhinos respectively. About 2-4 animals are poached each year in Sabah and the horns are smuggled to Singapore. The poachers are locals who track the animals for months and only come out after they have successfully killed an animal.

No poaching is known to have taken place in Sarawak. The whereabouts of the rhinos are not known to people except in the Forest Department.

Indonesia

Indonesia has the largest number of about 420-785 Sumatran rhinos. Trade in rhino horns with China took place as early as the 13th century and continued into the 20th century. Between 1919 to 1927, Dammerman noted 344 kilos of rhino horns were exported from Sumatra to mainly Singapore but also to mainland China. From 1919 to 1922, an additional 210 kilos of Sumatran rhino horns left Borneo.

About ten Javan rhinos were poached in Udjung Kulon nature reserve in 1963 and 1964. The current population is about 50 animals.

Rhino horn is used for reducing fever in Indonesia by the Chinese. They have also traditionally used rhino horns for typhus and to clear the body of poisons. Asian horns are said to be superior to African horns, the smaller sizes are said to be more concentrated and have more curative properties. Javan rhino horns are said to be better than Sumatran rhino horns. A more logical explanation may be that the species is the rarest of all the other species and are therefore almost impossible to obtain.

The shavings or scrappings are boiled and the water taken by the patient. The same shavings may be boiled a second time.

Rhino hide is prepared in the same way as the horn and taken for skin diseases. Similarly, rhino hooves are used by people who cannot afford to buy rhino horn as a fever reducing drug. Hooves, however, are rarely used.

Burma

In Burma, rhino products have traditionally been consumed by both the Chinese and the Burmese themselves. The horn, hide and hooves are preferred by the Chinese while the Burmese use rhino blood, urine, heart and meat. Rhino horns are scarce in Burma because of the situation in the country. A rhino horn was sold in 1980 for the equivalent of $12,810. Dried rhino blood is often sold in Chinese Medical Halls. It is prescribed for people suffering from "weak blood," vitamin deficiencies or general lethargy. There are also tonics made from rhino dried blood that are taken for tiredness, the effect of over exhaustion and listlessness.

The horn may be obtained free from the hill state. Hunters, who still occasionally kill rhinos in parts of Arakan, Kachin and Karen, supply the horns to doctors in return for professional services to their families. The rhino population in Burma is about 100 animals or may be as little as 25.

Japan and Korea

Japanese and Korean beliefs in the curative properties of rhino horns were developed as a result of early contact with mainland China. There are differences in the preparation of the drug in these two countries.

Japan imported an annual average of 1,283 kilos mostly of Sumatran and Javan rhino horns between 1882 to 1887. On the average, the price was $11.29 per kilo of rhino horn. When rhino horns diminished in Indonesia, the Japanese turned to India for their needs.

After World War II, Japan's economy suffered severely resulting in relative low imports of rhino horns compared to the years prior to 1940. Imports of rhino horns rose sharply in the 1960s, the annual average of 404 kilos almost doubled that of the previous decade. An annual average of 806 kilos of rhino horns were imported into Japan between 1970 to 1979. This was a period when there were relatively no restrictions on the importation of rhino horns into Japan. In November, 1980, the Japanese government ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Traders stopped importing rhino horn into Japan as of September, 1980.

In Japan, rhino horns are available in both tablets and traditional forms. Japanese appear to prefer slices of rhino horns which are boiled and drinking the liquid before meals. The drug is used primarily for reducing fever but it may also be used in the same manner for measles, nose bleeds and blood poisoning. There is also a powdered form of rhino horn which according to the label of the medicine called "Usaikakusan" is a reliable cure for measles, influenza, whooping cough, pleurisy and high fever.

In 1970, Korea imported 52 kilos of rhino horns. Between 1972 and 1980, an annual average of 233 kilos were imported making Korea one of the major rhino horn consuming nations in Asia. There appear to be discrepancies between the official figures and the amount that was actually imported. It is likely that most of these horns were from African rhinos.

Korean medicine developed on its own for many centuries, from that of the Chinese. In Korea, rhino horn is used to lower fever and high blood pressure, to stop bleeding and cure snakebite. Rhino horn is also considered a relaxant which prevents hallucinations, nightmares and infantile convulsions and also a cure for shock, paralysis, and dysentery.

Conservation Measures Needed to Save the Rhinos

The diverse uses of rhino horns and the strong belief that they possess medicinal and aphrodisiac properties have resulted in great demands for them in Asia. The prices for them are extremely high in the various countries which use them. The penalties against poachers are inadequate. Added to this is the problem of middlemen who buy the horns from the poachers at good prices. These middlemen are part of a syndicate who provide funds for the poachers to carry out their illegal activities. In India, the poachers and their families are protected and supported by the syndicates should they be sent to prison. Experienced lawyers are hired to defend them.

To succeed there must be adequate trained law enforcement personnel, the provision of good salaries and allowances, vehicles and equipment.

To protect the wildlife species, officers must know where the rhinos are and surveys are needed to find this out. In India and Nepal, most rhino areas are either wildlife sanctuaries or national parks. Nepal has an excellent record of rhino conservation. In Malaysia, Taman Negara and Endau-Rompin are national and state parks, respectively, holding most of the rhinos in Peninsular Malaysia while Tabin Wildlife reserve in the State of Sabah has a fairly good population. In Indonesia, Gunong Lenser holds the most number of rhinos while the others have good populations.

Despite the fact that these are protected areas, poaching still takes place in most of them. Law enforcement is not an easy task. It must be extended to the cities where Chinese or Unani traditional medicine shops are found. Raids from time to time would be necessary to catch law breakers.

CITES has been effective in the control of trade in rhino horns. With the exception of Indochina and Burma all other countries holding rhinos are parties to CITES. There is a drop in the illegal trade of Asian rhino horns. Important consuming countries like Japan, Hong Kong, Singapore and Korea which have ratified the Convention have strictly enforced the Convention. This is a big step forward in stopping illegal trade.

An active extension program in all consuming countries as well as rhino producing countries would greatly assist conservation work. The precarious position and the plight of the rhinos, causes leading to the situation and why the species should be conserved should be included in the program. Adequate funds are needed for the program to reach the people for an awareness to be created.

Recommendations and Conclusions

The greater one-horned rhinoceros has been successfully bred in captivity and a captive population of at least 150 rhinos, mainly through propagation of rhinos already in captivity should be established. Founder animals from the wild may be needed to improve the stock.

Training of personnel is needed for trained staff to maintain ongoing anti-poaching measures and the management of protected areas. The same people can carry out education and public awareness programs. Efforts have to be made to prevent rhino horns from leaving their country of origin.

Preservation of the remnant population of the lesser one-horned rhinoceros is of utmost importance. This, in itself, is a difficult task because the areas where the rhinos are located is remote. The problems have to be carefully studied and overcome. Manpower requirement has to be looked into and increased if necessary. Training is essential for the staff to carry out their duties efficiently.

A survey has to be carried out by competent ecologists to determine the size and composition of the population of the Javan rhinos in Udjung Kulon, Indonesia. This survey will reveal the number of animals in existence and if a viable captive population can be established.

The status of the species in Indochina needs to be investigated in conjunction with the Kouprey conservation program. A captive breeding program has to be developed as soon as possible.

An extension program among local people as to the importance of Udjung Kulon is urgently needed.

The greater one-horned rhinoceros appears to be in the best position at this time. Poaching and habitat disturbance is still a serious threat to the species. In comparison with the other two species, monitoring can be done with relative ease because of the habitat it favors. The Javan and Sumatran rhinoceroses are dependent on primary forest which makes monitoring more difficult. What is needed for the great one-horned rhinoceros is rigid protection and courage on the part of wildlife managers and conservationists to expand the already successful translocation program.

A recovery plan is urgently needed for the Javan rhino while the Sumatran rhino is in a better situation where action must be taken to avoid a similar crisis situation that is faced by the Javan rhino.

ACKNOWLEDGEMENTS

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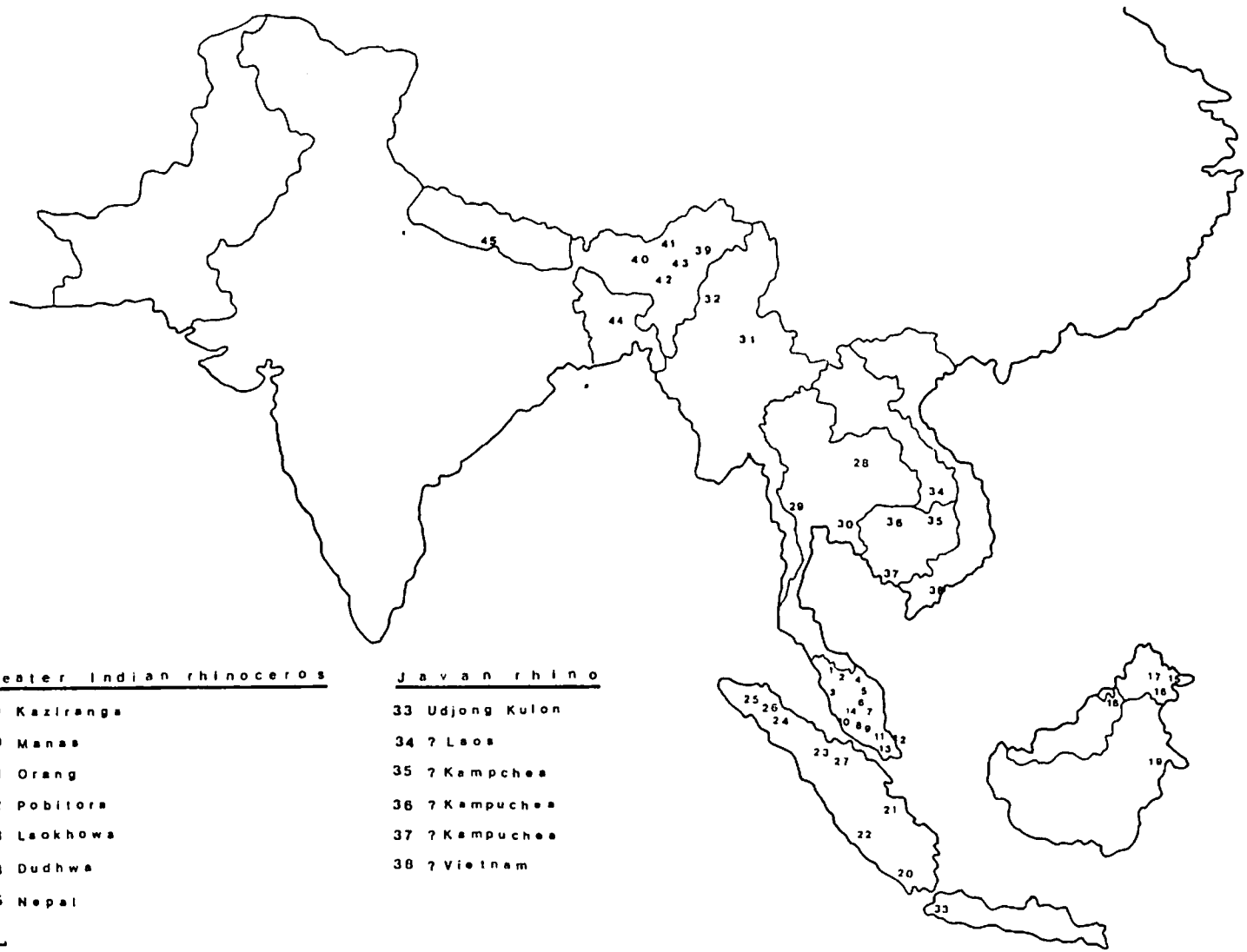
FIGURE 1: DISTRIBUTION OF THE ASIAN RHINO



Greater Indian rhinoceros

39 Kaziranga
40 Manas
41 Orang
42 Pobitora
43 Laokhowa
44 Dudhwa
45 Nepal

Javan rhino

33 Udjong Kulon
34 ? Laos
35 ? Kampchea
36 ? Kampuchea
37 ? Kampuchea
38 ? Vietnam

Sumatran rhino

1 Kedah Border
2 Ulu selama
3 Ulu Belum
4 Kuala Balah
5 Sungai Depak
6 Taman Negara
7 Sungai Leper
8 Krau Reserve
9 Bukit Gebuk
10 Sungai Dusun
11 Endau Rompin
12 Mersing Coast
13 Gunung Belumut
14 Ulu Atok
15 Silabukan
16 Danum Valley
17 Kretam
18 Limbang
19 Barumuda
20 Barisan Selatan Game Reserve
21 Berbak Game Reserve
22 Proposed Kerinci Seblat NP
23 Torgamba
24 Gunung Leuser
25 Gunung Abongabong
26 Lesten-Lukup
27 Proposed Rokan-Berumun Reserve
28 Phu Khlores
29 Tenasserim
30 Koo Soi Doo Reserve
31 Schwe U Daung
32 Burma Border

Figure 2 : The distribution of Rhinoceros unicornis

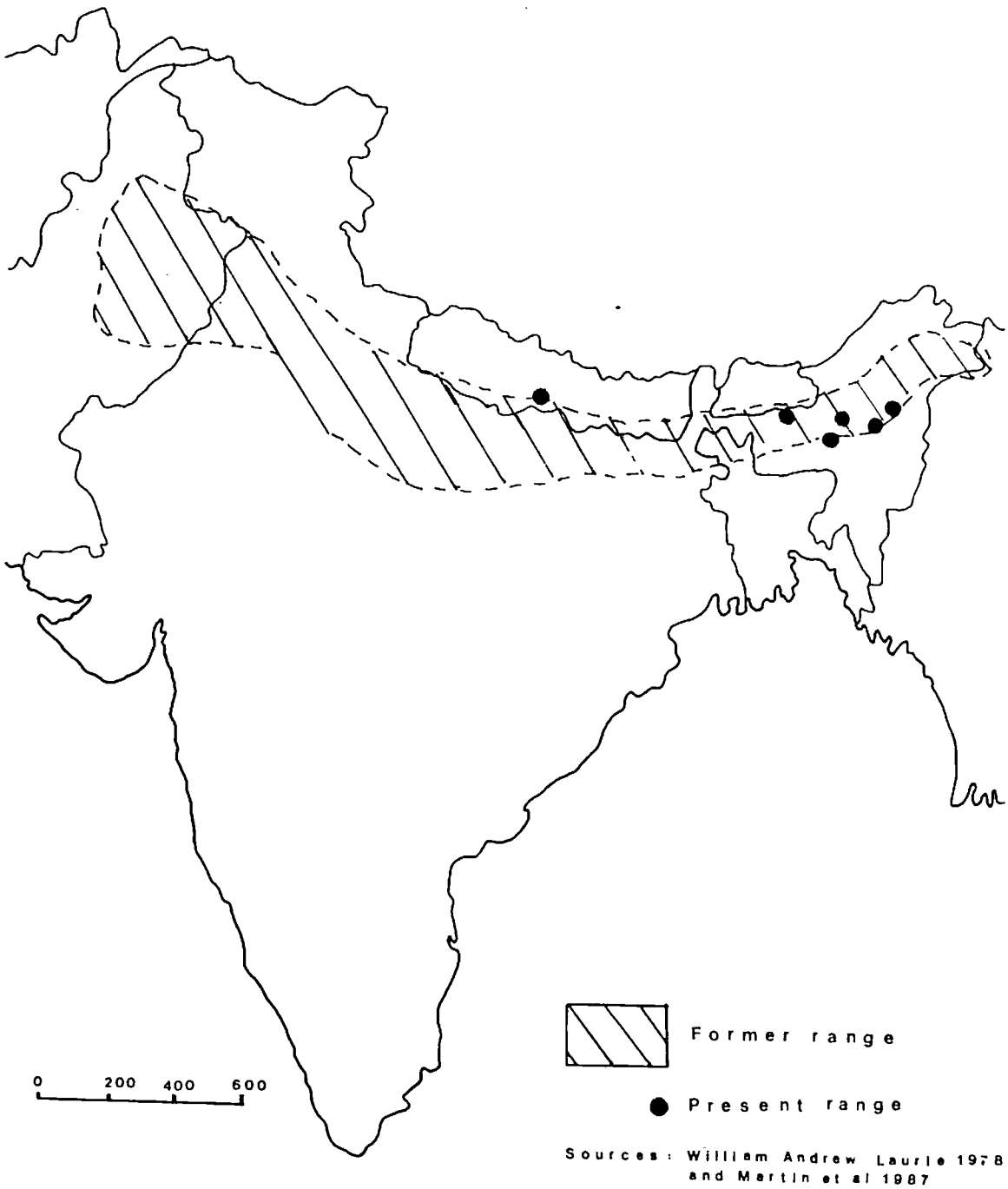


Figure 3 : The distribution of Dicerohinus sumatrensis

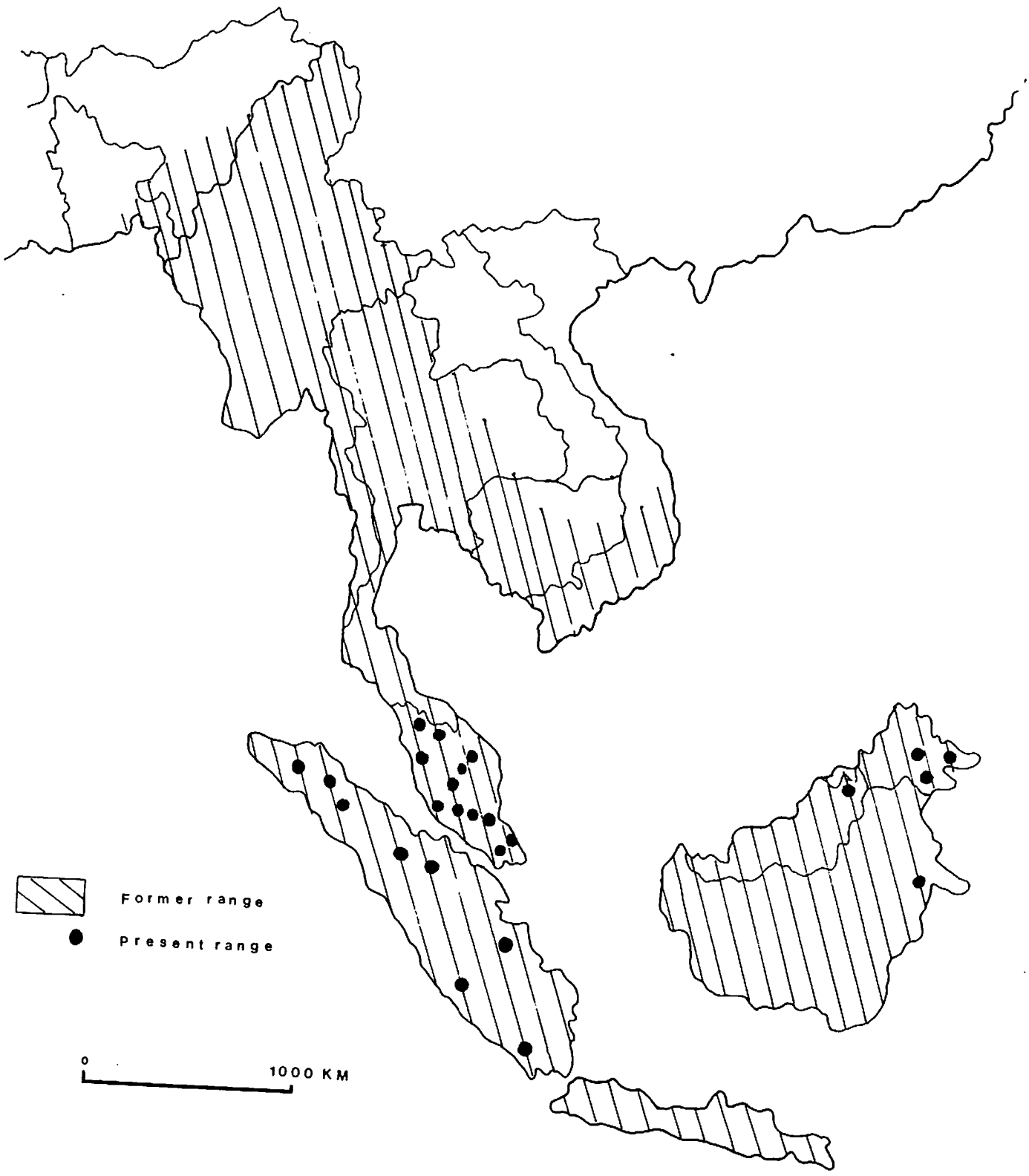


Figure 4 : The distribution of Rhinoceros sondaicus

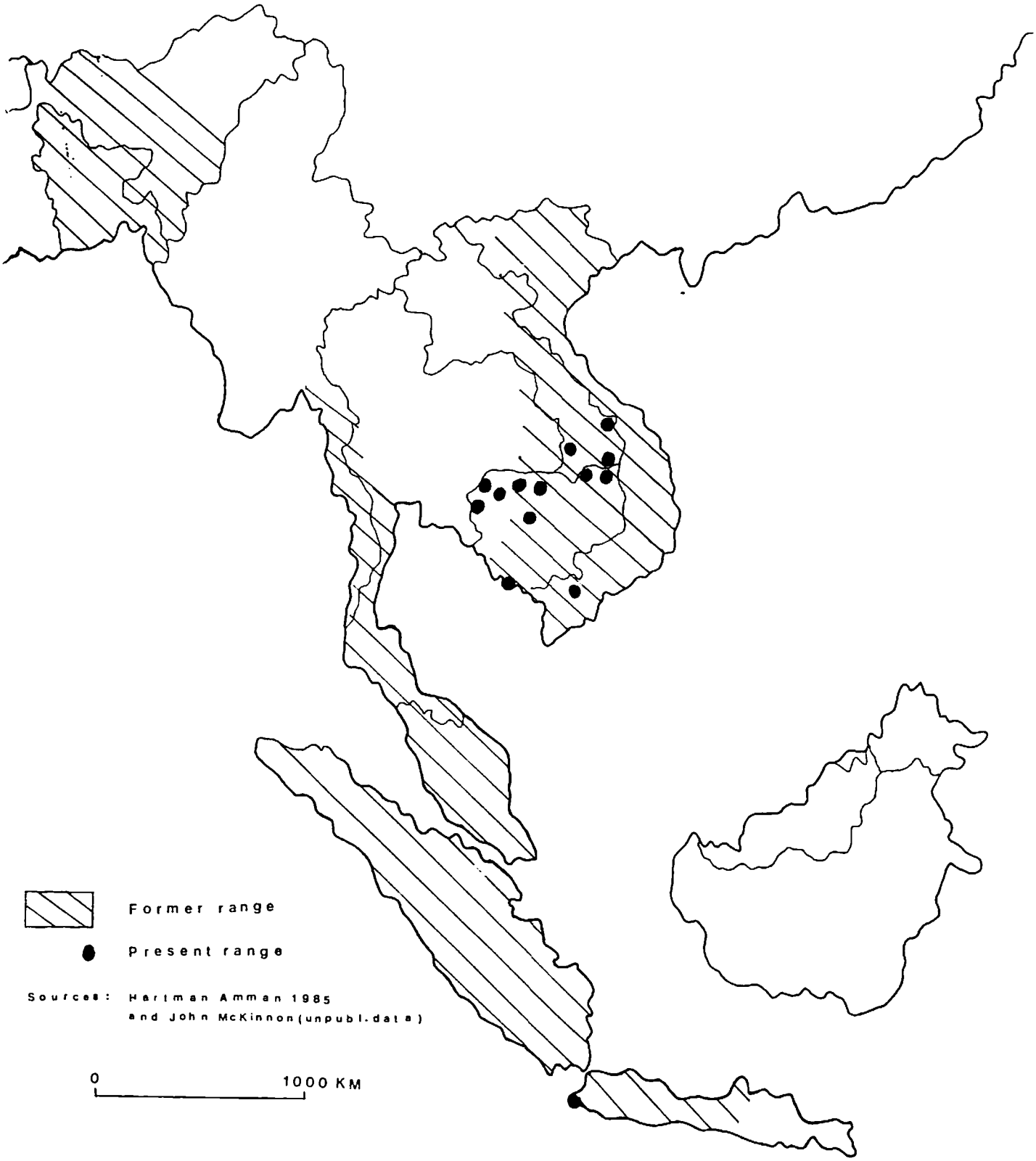


Table 1. Population Estimates of Asian Rhinos

	Area of Country	Location	Estimate of Rhinos	Habitat Status
A.	SABAH	Tabin Reserve**	20+	Perhaps protectable
		Kretam/Dent Peninsula	8	Being converted to agriculture
		Danum Balley**	10	Perhaps protectable
		TOTAL	28 - 38	
	SARAWAK		5 - 15	Protection proposed
	WEST MALAYSIA	Endau Rompin**	10 - 25	1000 Km2 Reserve; Park
		Taman Negara**	22 - 36	National Park
		Sungai Dusun**	3 - 4	State Wildlife Reserve
		Gunung Belumut	3 - 5	Wildlife Preserve proposed
		Mersing Coast	5 - 6	Being deforested
		Sungai Depak	2 - 4	Being deforested
		Sungai Yong	3 - 5	No information
		Kuala Balah	2 - 4	Being deforested
		Bukit Gebok	2	Being deforested
		Krau Reserve	1	Unstable
		Ulu Lepar	2	Unprotected and being deforested
		Ulu Atok	1	No information
		Ulu Selama	6 - 7	Unprotected
		Ulu Belum	2 - 4	Unsecure area
		Bubu Forest	2	No information
		Kedah	1	Unsecure
		TOTAL	67 -109	

Table 1. Population Estimates of Asian Rhinos (Continued)

Area of Country	Location	Estimate of Rhinos	Habitat Status
SUMATRA	Gunung Leuser**	130 - 200	National Park with disturbance
	G. Peta Raja Mandera	?	
	Kerinci/Seblat**	250 - 500	
	North Achah	15 - 25	Park proposed
	Riau-Utara	?	Being deforested
	Barisan Selatan**	25 - 60	Deforestation occurring
	TOTAL	420 - 785	
KALIMANTAN	Banumuda	0	Being deforested
THAILAND	Phu Khio Reserve		
	Tenasserim Range	6 - 15	Unstable
	Khao Soi Dao Reserve		
BURMA	Schwe U Daung Reserve	4	No information
	Elsewhere	?	No information
INDONESIA		?	Very unstable
	TOTAL	539 - 991	None totally secure
B. Javan rhinoceros			
INDONESIA	Ujung Kulon	50 - 54	Nature reserve

Table 1. Population Estimates of Asian Rhinos (Continued)

Area of Country	Location	Estimate of Rhinos	Habitat Status
C. Greater One-Horned rhinoceros			
INDIA	Kaziranga	1,080	
	Manas	80	
	Orang	65	
	Pobitora	40	
	Lackhowa	5	
	Pockets in Assam	25	
	Pockets in West Bengal	32	
	Dudhwa	7	
NEPAL	Royal Chitwan	375	
	Royal Bardia	13	
PAKISTAN		2	
	TOTAL	1,724	

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