

CONSERVATION & MANAGEMENT OF
JAVAN RHINO (*Rhinoceros
sondaicus*) IN VIETNAM

Charles Santiapillai (WWF)
Pham Mong Giao (MOF)
Vu Van Dung (FIPI)



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(Rhinoceros sondaicus annamiticus)
IN VIETNAM

by

Charles Santiapillai
WWF-
PO Box 133, Bogor, Indonesia

Pham Mong Giao
Ministry of Forestry (MOF)
123 Lo Duc Street, Hanoi, Vietnam

and

Mr Vu Van Dung
Forest Inventory and Planning
Institute (FIPI)
Van Dien - Thanh Tri, Hanoi, Vietnam

Abstract

The Javan rhino (Rhinoceros sondaicus) is perhaps the most endangered species of large mammal in the world. Only two populations of it are known in the wild: one in Indonesia and another in Vietnam. None exist in the zoos. In March 1991, a survey was carried out in the Lam Dong province about 250 km north-east of Ho Chi Minh City to re-assess the status of the Javan rhino and establish a sanctuary for its protection. The survey indicates that between 8-12 animals may still survive in the 35,000 ha area which is a low-land, semi-evergreen forest dominated by the commercially important family Dipterocarpaceae. The area is inhabited by a number of families belonging to the Stieng and Chauna minority tribes who practice slash and burn agriculture and also hunt big game for meat. Therefore the principal threats to the rhino are poaching and forest clearance. On the basis of the survey, a core area was demarcated as the Rhino Sanctuary and protected further from human encroachment with the establishment of buffer zones both to the north and south of the sanctuary. It is further recommended that the Rhino sanctuary and its buffer zones be linked to the Nam Bai Cat Tien National Park in the Dong Nai province adjacent to the Lam Dong province. It is also recommended that the entire conservation area incorporating the Rhino Sanctuary, Buffer Zones and Nam Bai Cat Tien National Park be declared a Man and Biosphere (MAB) Reserve. A comprehensive project proposal for the conservation and management of Javan rhino in Vietnam was prepared for 1991-1994, and it has the support and endorsement of the Ministry of Forestry (MOF) in Hanoi, Vietnam.

1.0 Introduction:

In the past, until about a hundred years ago, the Javan rhinoceros was widely distributed throughout much of South and South-east Asia. Its geographic distribution stretched from Assam and Bangladesh in the Indian Sub-continent, eastwards through Burma, Peninsular Malaysia, Thailand, Laos, Cambodia, Vietnam and possibly south-west China and further south-eastward into the islands of Sumatra and Java in the Indonesian archipelago (Loch, 1937; Sody, 1959; Groves, 1967; Schenkel and Schenkel-Hulliger, 1969; Hoogerwerf, 1970; Rookmaaker, 1980). But over the years, a combination of forest conversion and poaching for the horn had eliminated the species throughout much of its range. At the turn of the century the only population that was known to have had any long-term survival prospects was that in the Ujung Kulon National Park in the south-western tip of Java where today, about 57 animals survive (Santiapillai et al., 1990). In addition it was thought that there would be some animals still surviving in Thailand, Laos and Cambodia (McNeely and Laurie, 1976) and in Vietnam (Talbot, 1960; Rookmaaker, 1980; Penny, 1988). There is at present firm evidence for the continued survival of a small population of Javan rhino in Vietnam (Dang, 1986; Schaller et al., 1990; Dang et al., 1990; MacKinnon, 1990). This paper re-assesses the status of the Javan rhino population in Vietnam and recommends the conservation and management measures needed to ensure its long-term survival in its natural habitat in Vietnam.

2.0 Distribution of Javan rhinos in Vietnam:

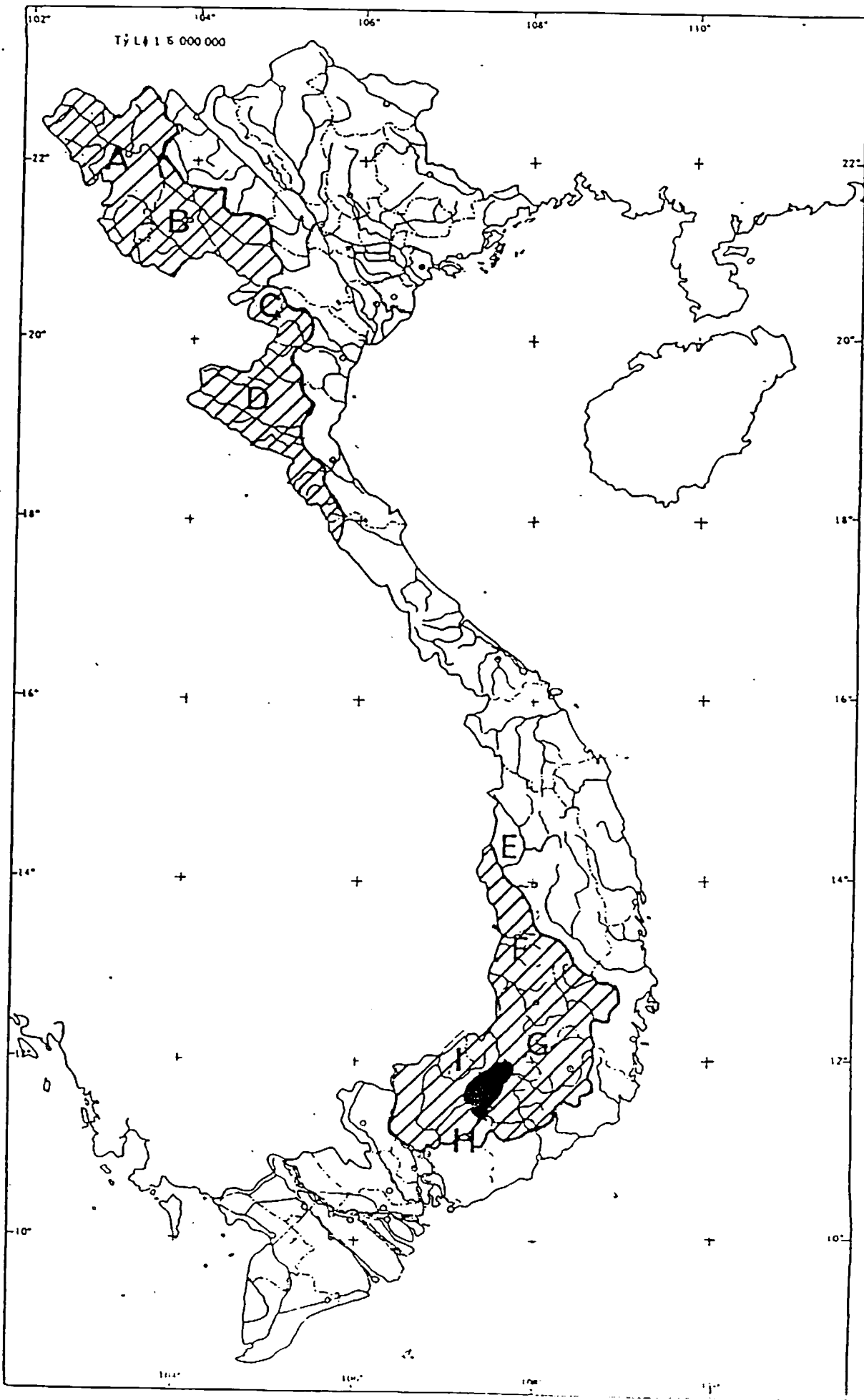
In the distant past, both the Javan and the Sumatran rhino (Dicerorhinus sumatrensis) co-existed in Vietnam. By early this century, the Sumatran rhino had become extinct (Schaller et al., 1990). The Javan rhino by contrast has managed to survive although in very small numbers up to the present time. Until about 50 years ago, its distribution extended from the Lai Chau province in the north down through Son La to the western parts of Thanh Hoa and Nghe Tinh provinces and in the south from Gia Lai-Con Tum province through Dac Lac, Lam Dong and Dong Nai to Song Be province (Fig. 1). Today however, the last stronghold of the Javan rhino appears to be the Lam Dong province along the Dong Nai river where the four provinces (Dac Lac, Song Be, Dong Nai and Lam Dong) meet (Fig. 2).

3.0 Rhino area:

The rhino area is in the north-west of Lam Dong province and incorporates the two districts of Cat Tien and Bao Loc and is bordered on the west and north by the Dong Nai river (Fig. 2). The survey was carried out in the Cat Tien district in March 1991 assisted by Forestry Officials from the Lam Dong Province. The core area inhabited by the rhinos amounts to about 35,000 ha and it includes both Cat Tien and Bao Loc districts. The area receives about 2,400 mm of rain much of it falling during the period May to October. The dry season extends from November to April.

Fig. 1 Map of Vietnam showing the extent of the past (cross hatching) and present (solid shading) distribution of the Javan rhino in Vietnam.

Provinces: A: Lai Chau, B: Son La, C: Thanh Hoa,
D: Nghe Tinh, E: Gia Lai-Con Tun, F: Dac Lac,
G: Lam Dong, H: Dong Nai, I: Song Be



3.1 Habitat and vegetation:

The core area inhabited by the rhinos represents one of the few tracts of lowland forests left in Vietnam. Much of the area is between 100-600 m in altitude and is characterised by a range of low hills covered with tropical semi-evergreen vegetation dominated by the commercially important family Dipterocarpaceae. Logging still goes on but the extraction of timber is selective.

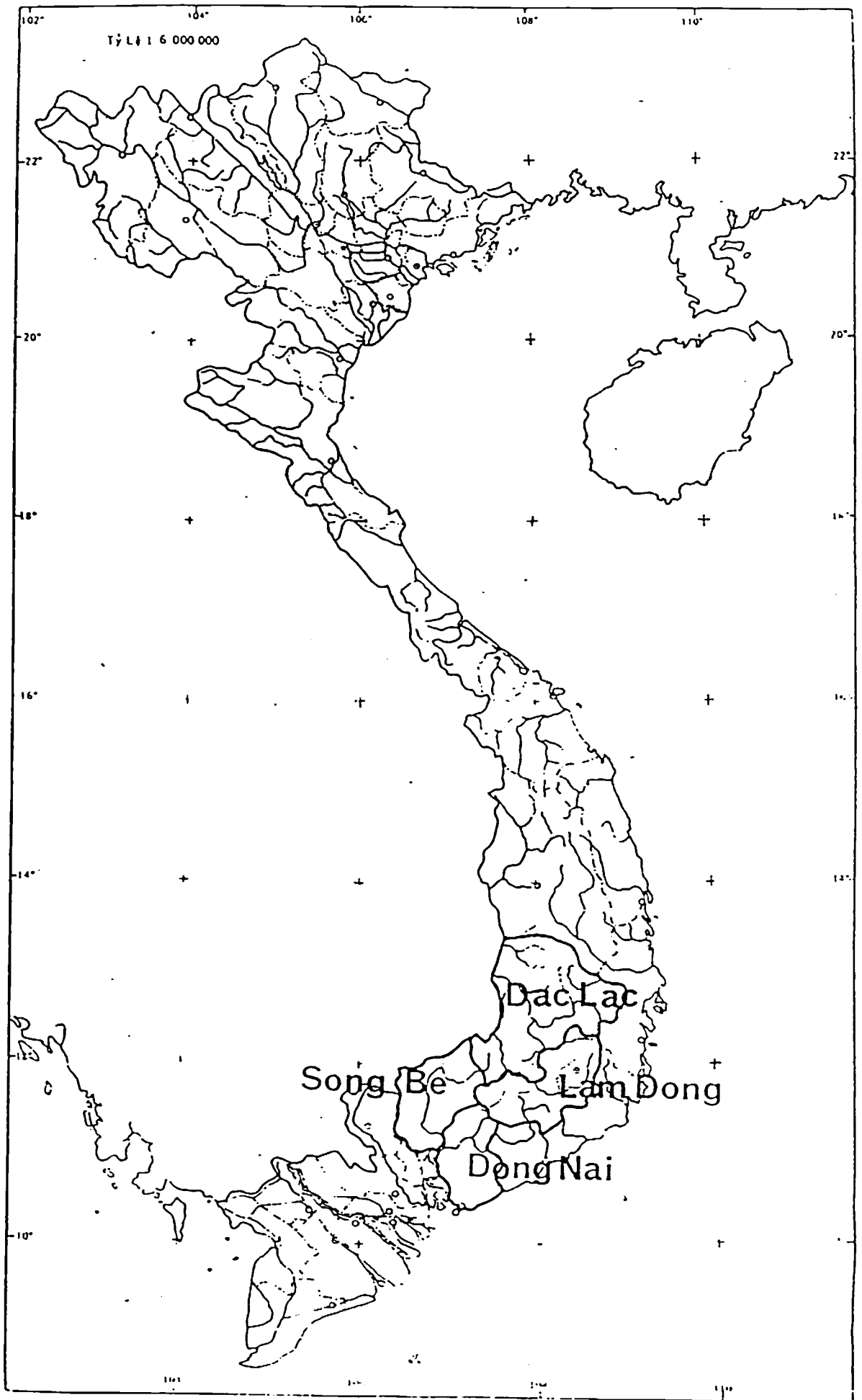
Tree species include among others, Dipterocarpus alatus, Dipterocarpus turbinatus, Lagerstroemia tomentosa, Lagerstroemia calyculata, Hopea odorata and Elaeocarpus dubius while the bamboos are represented by Oxytenanthera nigro-ciliata, Bambusa blumeana, Bambusa procera etc. The rattans include Calamus rudentrum, Calamus poilanei, Calamus tetradactylus, Daemonorop pierrei, Plectocomia elongata. In addition there are many shrubs such as Hemecylon edule and Ixora coccinea. Grass cover is mainly of Pennesetum polystachion and Imperata cylindrica (American grass) which is considered to be a weed that invades cleared areas rapidly and is difficult to eradicate.

There are many swampy areas throughout the habitat of the rhinos in the Cat Tien part and even during the dry season, some swamps remain wet enough to provide the wallows for the rhinos and other herbivores especially the Gaur (Bos gaurus), the Banteng (Bos javanicus) and the Wild pig (Sus scrofa).

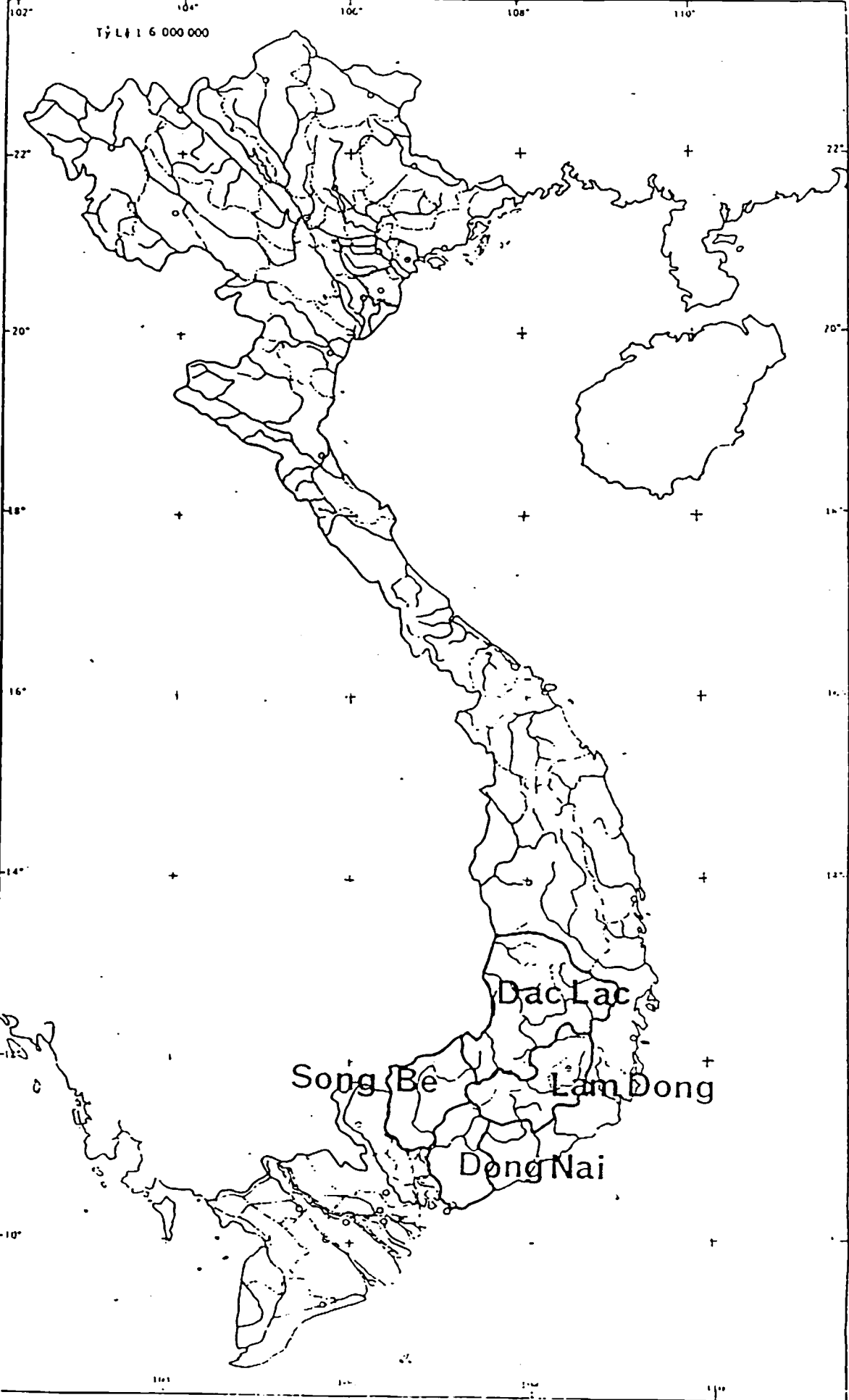
4.0 Status of the rhino:

For many years in the past, there had been reports of the presence of Javan rhinos in the area in and around the Dong Nai river. Hunters and soldiers have reported having seen "herds" of rhinos of 14 and 20 animals (Schaller et al., 1990). These are more likely to be exaggerations as the Javan rhino is largely a solitary animal and groups of more than 3 animals are unknown (Ammann, 1985). During the war, a number of animals might have been poached by soldiers and quite a few may have even succumbed to the land mines. In 1988 a rhino was killed by a member of the Stieng minority tribe in the Cat Tien district (Fig. 3) of Lam Dong province (A). Its skeleton was discovered by Mr Pham Van An (Deputy Director of Forest Protection Department of Lam Dong Province) and the skull and bones were brought to Hanoi and assembled by Mr Pham Mong Giao (Ministry of Forestry). Other reliable records of the Javan rhino comes from Bao Loc district in 1982 where an animal was seen in between the Da R Somi and Da Len rivers (B); another from the banks of the Da Dim Be river in 1984 (C) and later in 1988 (D). More recent information comes from the survey carried out by Schaller et al. (1990) when tracks of an animal were seen on both banks of the Dong Nai river in Song Be and Lam Dong provinces (E) & (F).

Fig. 2 Map of the four provinces integral to
the Javan rhino conservation.



Tỷ lệ 1:6 000 000



Dac Lac
Song Be Lam Dong
Dong Nai

In our survey carried out in March 1991, we saw clear evidence for the presence of 3 or 4 animals in the Cat Tien district of Lam Dong Province. There were tracks of two animals measuring 26.0 cm and 17.0 cm, perhaps belonging to an adult female and her calf respectively (G). The longest distance between the fore and hind foot was 44.0 cm. These tracks were seen in a logged out area dominated by rattans and shrubs. Further about a km to the north we saw a pile of dung (H) with clear rounded boli that cannot be confused with that of either the Gaur or the Banteng. Further down in the swampy area, there was a wallow (I). We also saw a clear trail of a rhino within a forest patch dominated by rattan species. There were two foot prints (26.0 and 28.0 cm) in the vicinity (J).

We also talked to Stieng and Chauma tribe members who hunt. They told us that they had come across rhinos on several occasions in the past and that the animals were mostly solitary and were known to move seasonally in search of food and mates. Two members of these tribes accompanied us throughout the survey. In addition, staff from the logging unit based in the Cat Tien district told of sighting one animal in February 1991 just north of a Stieng Village (K), while another referred to seeing the foot prints of 3 animals in the central part of the core area in the Bao Loc district in July 1990 (L) and another reported encountering three animals along the southern boundary of the core area in August 1990 (M).

4.1 Number of rhinos:

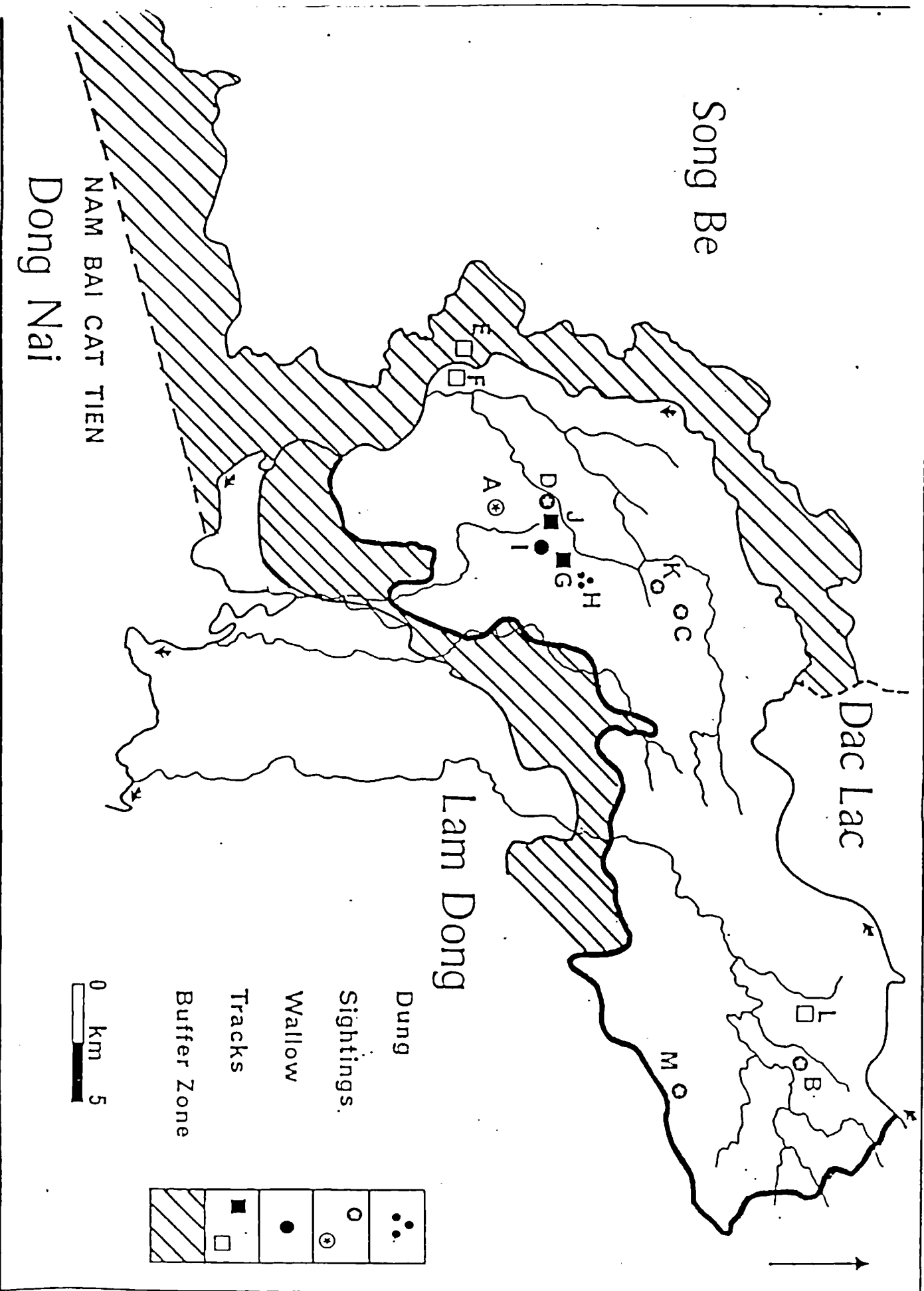
We estimate a minimum of 8 animals in the core area based on the evidence seen in the field. There could be between 8 to 12 animals in the 350 km² core area. Schaller *et al.* (1990) estimate that at most 10-15 animals may survive in the 750 km² area which includes the core area as well as buffer areas to the north and west of it.

Although the Javan rhino in Lam Dong province is very small it does not necessarily mean that it is doomed. Small populations of rhinos have showed remarkable recovery and increased in number substantially in Asia under strict protection. The Ministry of Forestry in Hanoi and the Forest Protection Department in Lam Dong Province have identified the in-situ conservation of the Javan rhino as a high priority.

4.2 Food and feeding:

The study area showed ample evidence of rhino feeding activity. A crude analysis of the dung also revealed the presence of undigested plant material some of which were identifiable. Among the plants that formed the diet of the rhinos were: Acacia pennata, Calamus tetradactylus, Calamus poilanei, Combretum sp., Bambusa procera, Bambusa blumeana, Plectocomia elongata, Daemonorop nigro-ciliata. In addition, it appears that the rhinos might be feeding on wood-fern (Cyathea sp.) and even on Strychnos nux-vomica which is highly poisonous to many other species of animals.

Fig. 3 Map of the Lan Dong Province showing the known rhino localities within the proposed Javan Rhino Sanctuary.



Song Be

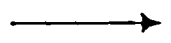
NAM BAI CAT TIEN
Dong Nai

Dac Lac

Lam Dong

	Dung
	Sightings.
	Wallow
	Tracks
	Buffer Zone

0 km 5



5.0 Threats to the Javan rhino:

The Javan rhino occurs only in two areas in the world: the Ujung Kulon NP in West Java in Indonesia and in the Lam Dong province in Vietnam. None exist outside these areas, not even in the zoos. Of the two populations, the one in Vietnam appears to be the most seriously endangered. The main threats to the rhino population are poaching and habitat destruction.

5.1 Poaching:

This is the most serious threat facing the rhinos today. It is serious given the small number of animals extant in Lam Dong province. In the past, hunters from the Stieng minority tribes have killed rhinos for the horns which were sold to Chinese merchants in Ho Chi Minh City. There are two small populations of Javan rhino in Cat Tien and Bao Loc districts of the Lam Dong Province. In each there may be about 4-6 animals. Given the uncertain sex ratio, poaching of any animal could easily undermine the long-term survival of the species. The problem is further compounded by the fact that there are many guns and rifles (a legacy of the long war with the Americans) available freely for anyone wishing to poach. Besides, hunting is a form of traditional way of life for many of the minority tribal people. Most of them being illiterate do not realise the importance of the rhino in their scheme of things. But fortunately, the poaching problem is being brought under control by the authorities concerned. Since 1988 there had been no new reports of rhinos being killed by poachers or hunters.

5.2 Logging:

The rhino area is rich in commercially important timber species which are being exploited by the Forestry Department. The extraction of timber is based on a system of selective felling that specifies a minimum diameter (dbh) of 60 cm felling limit and a cutting cycle of 35-40 years. Logging as it is carried out in Vietnam in itself is not a direct threat to the rhinos. In fact, the logged out areas offer some of the best habitats to the rhinos and other herbivorous mammals. Selective logging provides ample food resources for the rhinos. However, the threat to the rhinos is indirect: By opening up the forests through the construction of motorable logging roads, the core area of the rhinos are made accessible to the people and poachers alike. Hitherto inaccessible areas where the rhinos may survive are made vulnerable to the threat of poaching. Herein lies the threat from logging.

5.3 Slash and burn agriculture:

Almost all the minority tribal people resident within the rhino habitat practice slash and burn agriculture. The fires set by farmers inhabiting the rhino area may easily spread into the forests especially during the dry season when there is plenty of combustible plant material. Shifting cultivators have been identified as one of the primary agents of forest destruction throughout Asia and Vietnam is no exception.

5.4 Inbreeding depression:

Given its small size, the population of Javan rhino in Lam Dong Province may suffer from loss of genetic diversity through random losses of rare genes and increased levels of inbreeding. An immediate effect of the depletion of genetic variability is increasing homozygosity of the individuals in the population (Lacy, 1987). Without genetic variation, the population may not be able to adapt to changing conditions in its environment and is therefore vulnerable to diseases, parasites, changes in food supplies and climate, and inter-specific competition. However, inbreeding depression does not mean the end of the population. In respect of viability of small populations, inbreeding initially may cause a loss of fitness through the exposure of deleterious recessives, but once these have been selected out, viability of the population usually returns.

6.0 Management of Javan rhino:

As Caughley (1977) points out, the aims of population management are few and specific. In fact there are only three problems of population management:-

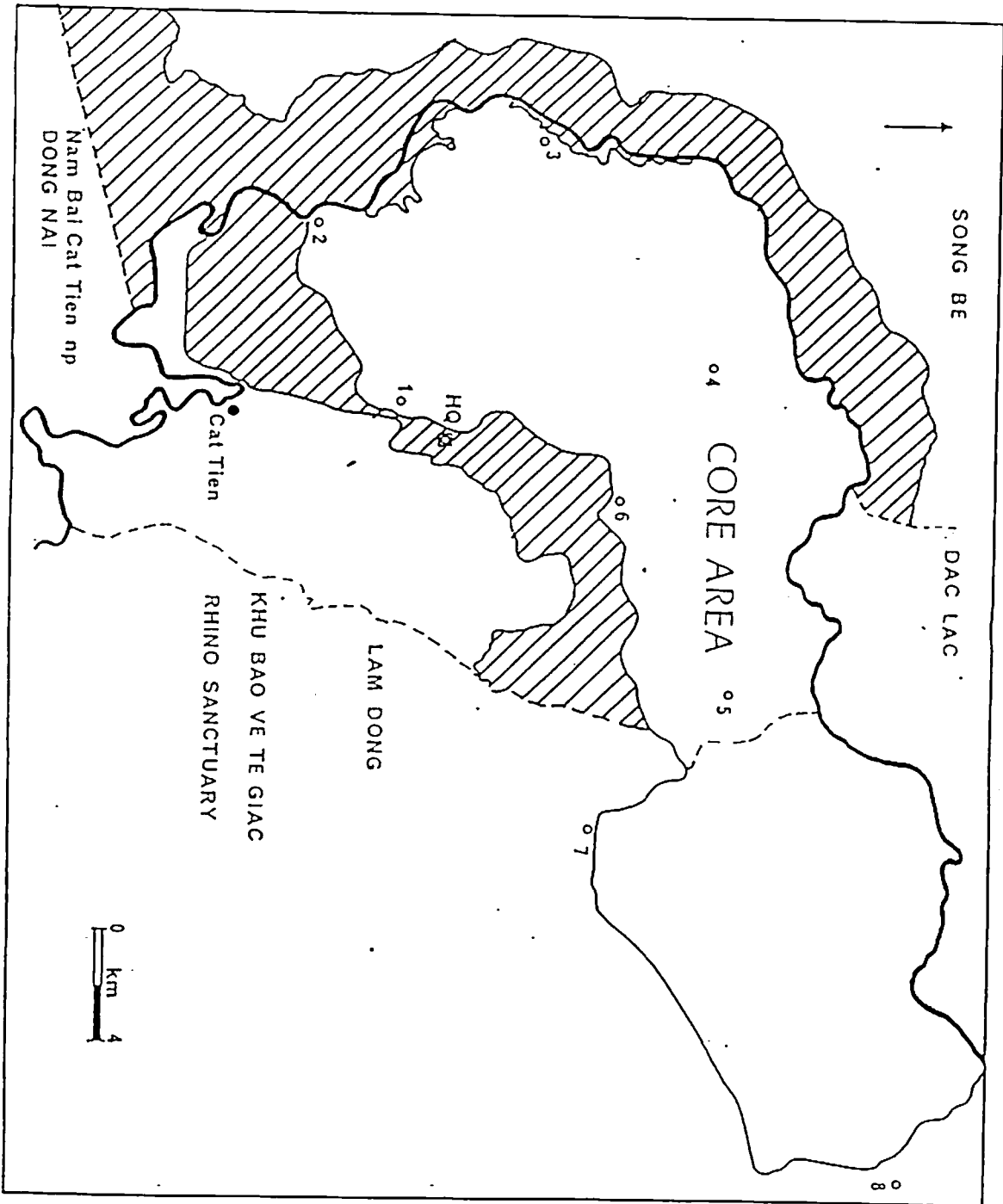
1. the treatment of a small or declining population to raise its density (i.e. conservation),
2. the exploitation of a population to take from it a sustained yield (i.e. sustained yield harvesting),
3. the treatment of a population that is too dense, or which has an unacceptably high rate of increase, to stabilize or to reduce its density (i.e. control).

In Vietnam the most overriding concern is to enhance the long-term survival of the Javan rhino population in its natural habitat. To achieve this long-term goal, several short term measures need to be adopted in Vietnam. They are:-

6.1 Government support: The most important requirement for any successful conservation programme must surely be the Government support for the programme. In Vietnam this was forthcoming. At a meeting held after the survey in Dalat, the Vice-Chairman of the Lam Dong Province gave us his unstinted support in establishing a special Rhino Sanctuary to ensure the long-term survival of the species. Given the global importance of the Javan rhino population, the Provincial Government plans to stop logging and ban hunting within the core area.

6.2 Demarcation of core and buffer areas: On the basis of the survey, it was possible to identify the core area and demarcate its southern and eastern boundaries, with the Dong Nai river making the western and northern boundaries (Fig. 3).

Fig. 4 Locations of the proposed Guard Posts
for the Rhino Sanctuary



The proposed management plan recommends the establishment of appropriate buffer zones both to the north and south of the core area and linking the rhino sanctuary to the adjacent Nam Bai Cat Tien National Park (44,000 ha) thus effectively increasing the total area under conservation to about 100,000 ha.

6.3 Guard posts: At present, the rhino area has no guard posts. It is proposed therefore to establish 8 Guard Posts both within the core area and outside (Fig. 4) from where the guards after training could carry out the patrolling of the area. In order that the patrolling is carried out effectively, the guards and guard posts would be adequately equipped.

6.4 Public awareness campaigns: Conservation programmes if they are to succeed must have the support of the local communities that live nearby. This is especially important in Vietnam where many of the human populations inhabiting wilderness areas still rely on their traditional way of life (hunting, slash and burn agriculture etc). The Ministry of Forestry is aware of the importance of "educating" the people at large on the plight of the Javan rhino and other endangered species. It therefore plans to launch a conservation awareness campaign to promote greater understanding and co-operation among the tribal people. The Rhino conservation programme will therefore have a component to enhance the way of life of the people and improve their livelihood.

7.0 Conservation of the Javan rhino population:

Despite the war and the damage caused to the forests by the massive spraying of defoliants and toxic chemicals such as Agent Orange, the Javan rhino has managed to retain a toe hold in Vietnam. That it has survived so far underlines the fact that as long as suitable habitat is available to them and poaching is eliminated, the animals will survive in their natural habitat. Not all small populations are necessarily doomed. Small populations of rhinos have managed to build up their numbers as a result of better protection alone. There are several examples of such recovery:-

1 India: The Great Indian one-horned rhinoceros (Rhinoceros unicornis) in the Kaziranga National Park in Assam, through rampant poaching fell to a dozen or so individuals at the turn of the century (Deb Roy. pers. comm.). However, improvement in the protection of the park resulted in a steady increase in the number of rhinos. By 1940, the animals increased to 400 (Gee, 1952). By 1980 there were about 1,000 animals (Singh and Rao, 1984). Today, Kaziranga is estimated to have about 1,500 animals (Dinerstein and McCracken, 1990).

2 Indonesia: Prior to the improvement of the protection of Ujung Kulon National Park where the Javan rhino occurs, the animal was poached so heavily that in the 39 years from 1929 to 1967, on an average one animal was killed by poachers. The numbers declined to about 25 in 1967. However, under improved protection, the number of rhinos increased at an annual average rate of 6.2% to 52 animals by 1980 (Ammann, 1985). Today, the number of Javan rhinos in Ujung Kulon is estimated to be about 57 (52-62) (Santiapillai et al., 1990).

3 Nepal: Excessive land clearing and hunting fragmented the range of Rhinoceros unicornis in Nepal and led to the elimination of the species from all areas but the Chitwan Valley (Dinerstein and McCracken, 1990). The number of rhinos fell from 1,000 to 120 by 1960 (Pelnick and Upreti, 1972). Today however, as a result of better and more efficient means of protection, the number of rhinos has increased to more than 400.

4 South Africa: The number of white rhinos (Certaotherium sinum) in the Umfolozi Game Reserve according to Schaurte (1960) increased from a stock of about 20 animals to over 600 within 50 years' time and in an area of comparable size to that of both Ujung Kulon NP and the core area of the proposed Rhino Sanctuary in Lam Dong province in Vietnam.

7.1 Recommendations:

-The first priority is to legally establish a Rhino Sanctuary to protect the core-habitat of the animals in Lam Dong Province.

-Once the Sanctuary is established, logging and hunting within this core area must be stopped.

-For the protection of the rhinos and their habitat, a system of guard posts must be built both within and outside the core area and be manned by trained and fully equipped guards.

-The core area must be further isolated from human encroachment by the establishment of appropriate buffer zones both to the north and south.

-The rhino habitat could be vastly increased if the core area and the buffer zones are linked to the Nam Bai Cat Tien National Park situated in the adjacent Dong Nai province. This would increase the effective rhino habitat to 100,000 ha and thus would become the most important conservation area in southern Vietnam.

-The entire complex of the Rhino Sanctuary, its buffer zones and the Nam Bai Cat Tien National Park should be declared a Man and Biosphere (MAB) Reserve.

-A detailed survey must be carried out both within the core area and in its environs (especially in Dac Lac and Song Be provinces) to determine the range and number of rhinos.

-Regular surveys should be carried out to monitor the population trends. If there are some animals outside the protected area, then they must be captured and translocated to the core area.

-Stricter penalties must be meted out to persons killing rhinos or trading on rhino products. Buying and selling of rhino horn must be made illegal. It is in fact easier to stop the trade in the shops and ports than to catch all the poachers in the forest (MacKinnon, 1990).

-A strong conservation education programme must be mounted and be addressed at the villagers who still hunt animals so that the threat to the Javan rhino and other large mammals could be greatly minimised.

-The conservation programme should also address the needs of the local communities that live in the vicinity of the rhino sanctuary and provide every assistance to improve their livelihood. Villagers could be given an alternative to practising slash and burn agriculture in favour of cultivating permanent plots of cash crops (Schaller et al., 1990).

The Javan rhino is well adapted to respond to a "sanctuary strategy". The small population in Lam Dong province, if thoroughly protected, has every chance of increasing in number and becoming viable. The estimated 8-12 animals in Lam Dong province are valuable and so should be protected and not abandoned on the unproven hypothesis that genetic degeneration will set in and automatically eliminate them. In Vietnam the factors adverse to the Javan rhino's long-term survival lie in the human population and its aspirations to an enhanced standard of living. Another hidden danger may come from the demands by industrialised countries for goods of the kind which lead to pressures on the rhino's life support systems.

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Javan rhinoceros in Vietnam

George B. Schaller, Nguyen Xuan Dang, Le Dinh Thuy and Vo Thann Son

Two species of rhinoceros—the Javan and the Sumatran—once inhabited Vietnam but the Sumatran rhinoceros apparently became extinct there early this century and by the late 1960s it was feared that the Javan rhinoceros probably no longer occurred there either. Then, in November 1988, a hunter shot an adult female rhinoceros about 130 km north-east of Saigon. He was arrested when he tried to sell the horn and hide. In early 1989 the authors were conducting wildlife surveys near where the killing took place and they took this opportunity to check the status of the species. They found evidence that perhaps 10–15 Javan rhinoceros still survive in Vietnam. As a result of this discovery the Vietnamese Government has set up a Rhinoceros Conservation Group.

During the nineteenth century the Javan rhinoceros *Rhinoceros sondaicus* was distributed from Bangladesh east through Burma, Thailand, the Malaysian Peninsula and Indo-China to Sumatra and Java. Hunting decimated the species rapidly and to such an extent that, in the early decades of this century, only one known population survived, that in the Ujung Kulon National Park at the western tip of Java where no more than 50 individuals remain today (Sajudin and Lusli, 1986). In addition it was thought that a few animals might persist in Thailand, Laos and Cambodia (McNeely and Laurie, 1976), as well as in Vietnam* (Talbot, 1960; Rookmaaker, 1980; Penny, 1988). Indeed, evidence for the presence of Javan rhino in Vietnam has been found repeatedly in recent decades, but wars and other problems have prevented this information from becoming widely known. Van Peenen (1969), for example, wrote that 'at present there probably are no living members in South Vietnam, although as recently as the 1920s rhinoceroses were hunted not far from Saigon'.

In November 1988, a hunter of the Stieng tribal minority shot an adult female rhino near the Dong Nai River in the Bao Loc District of

western Lam Dong Province about 130 km north-east of Ho Chi Minh City (Saigon). Having taken the horn and hide to town for sale, he was arrested for killing a legally protected species and was given a 1 year jail term (commuted after 2 months). In February and March 1989, while conducting wildlife surveys in eastern Song Be Province near where the killing took place, we were shown the horn (height 4 cm) and a piece of skin of the dead animal. We took this opportunity to check on the status of the species. Field work was conducted along 15 km of the Dong Nai River valley where it forms the border between Song Be and Lam Dong provinces, and along parts of the Mada River (Figure 1). In addition we asked hunters, local officials and others if they had recently seen or heard of rhinos in the region.

Distribution and status

Both Javan rhino and Sumatran rhino *Dicerorhinus sumatrensis* once occurred in Vietnam, but the latter apparently became extinct there early this century. By contrast, Javan rhinos maintained a wide distribution in northern, central and southern Vietnam until the 1930s and 1940s, judging by accounts of foreign hunters and other travellers (Groves, 1967; Dang, 1986). Published records after

* The Javan rhinoceros in Vietnam may be a different subspecies, *Rhinoceros sondaicus annamiticus*, from that found in Java *R. s. sondaicus* (Groves and Guenn, 1980).

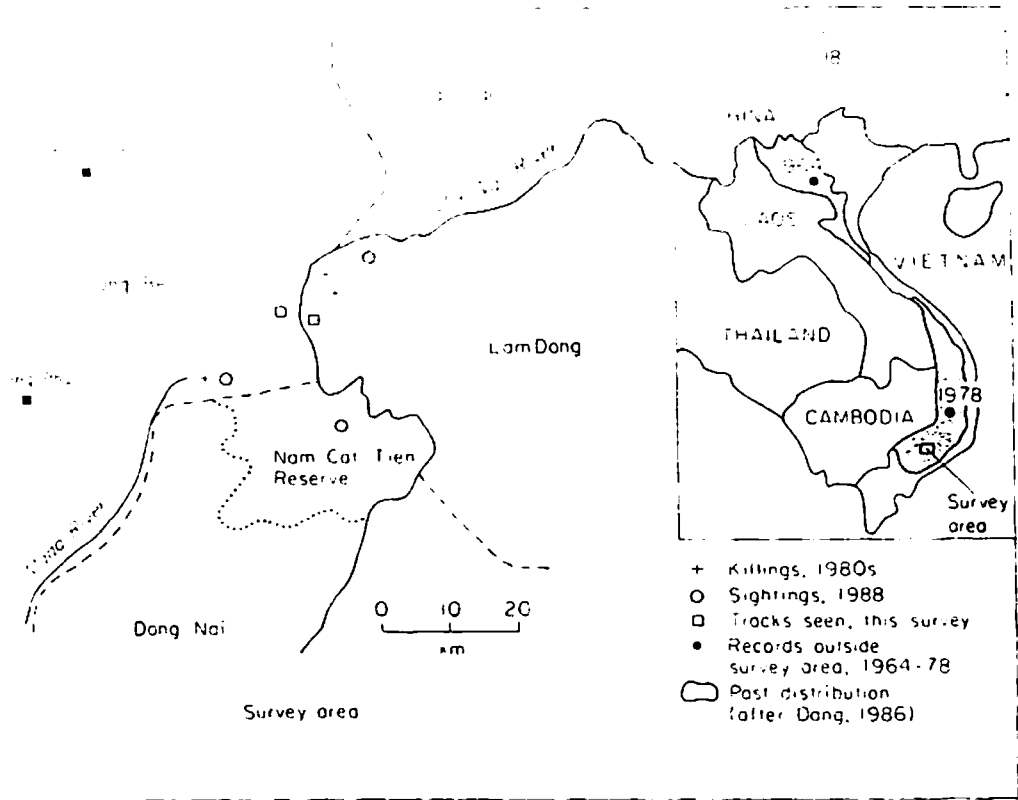


Figure 1 Former distribution of Javan rhinoceros in Vietnam (inset) and current distribution in the Dong Nai River area

1950 are scarce. Dang (1986) mentions three such records from Vietnamese scientific journals: rhino tracks were observed in 1964 in Son La Province, the last such observation from northern Vietnam; the remains of a rhino were seen near Darmil in Dac Lac (Darlac) Province in 1978; and one rhino was killed near Phuoc Long in Song Be Province in 1962 (Figure 1).

Except for the one 12-year-old record from Dac Lac Province, all recent evidence of rhinos comes from the Dong Nai River area where we conducted our survey (Figure 1). This river touches the borders of four provinces—Dac Lac, Lam Dong, Song Be and Dong Nai—as it winds through a range of low hills, which to the south and west soon give way to undulating terrain. Elevations range from about 100 to 300 m. Tropical semi-evergreen rain forest once covered the region. Trees of the genus *Dipterocarpus* are the dominant evergreens and

Lagerstroemia tomentosa is conspicuous among the deciduous species. Centuries of shifting agriculture by Stieng, Mnong and other tribal peoples have destroyed much of the primary forest. Abandoned fields do not revert to forest but become covered with tall (up to 15 m) stands of a bamboo *Schizostachyum*, which may cover large tracts in dense stands. This mosaic of forest, bamboo and ephemeral fields harboured many rhinos as well as much other wildlife until the 1960s, according to our informants. Rhinos extended west almost to the town of Dong Phu at that time. Tran Ngoc Khanh told us that as a revolutionary soldier he and his comrades once saw an aggregation of 14 rhinos and another time 20 and that they shot four of these. Nguyen Quoc Thang (unpub. data, 1987) reported that soldiers killed at least 17 rhinos between 1952 and 1976 in what is now the Nam Cat Tien Reserve. With the revolutionary army from northern Vietnam based for over

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a decade in these forests and the American military bombing them and spraying vegetation with Agent Orange and other defoliants, wildlife declined rapidly. By war's end in 1975, the rhino had almost been exterminated.

Nam Cat Dien was established as a reserve in 1978. A survey team of the provincial forest department found tracks of 3-4 rhinos the following year (Nguyen Quoc Thang, unpub. data, 1987). Tracks were also occasionally reported there in the 1980s (Thai, 1987; Dang, 1988), and a female with young was observed by a reserve guard in 1988 (Doan Canh, pers. comm., 1989).

One rhino was killed in 1986 or 1987 just north of the reserve around the headwaters of the Mada River. We saw fragments (horn, tooth, hoof, skin, bone) of it, presumably all from the same animal, in the possession of two people who used them for medicinal purposes. A pair of rhinos, probably a female with young, was reported from the same area in 1988 by several people. One rhino was killed in Lam Dong Province north of the reserve in about 1980 (Dang, 1986), not far from where the female was killed in 1988. Tracks of a solitary individual were also

observed there in late 1988 (Figure 1).

We examined tracks on two occasions, on 25 and 27 February 1989, most likely of the same animal. In the first instance, a rhino had crossed an abandoned field, moving about 5 km west of the Dong Nai River, in the second, it had crossed the river and left deep footprints in the muddy bank.

The distribution of the rhino based on these records encompasses no more than 750 sq km. Within this area we estimate that at most 10-15 animals survive.

Conservation

Van Peenen (1969) wrote that 'the sighting of a living rhinoceros in South Vietnam would probably cause rejoicing among conservationists'. When he wrote this Vietnam still had the largest population of Javan rhino in existence but the animals became a casualty of war. Now, unless rejoicing is accompanied by prompt action the few survivors will not persist for long.

In spite of the extensive commercial logging



Some of the last Javan rhinoceroses in Vietnam live in a mosaic of bamboo, forest and fields in the Dong Nai River valley. Cashew trees have been planted in the recently cleared field (C. B. Schaller).

The Javan Rhino as a Flagship Species

Not surprisingly, the Javan rhino has been chosen as the official symbol for Ujung Kulon National Park. But efforts mounted to protect the Javan rhino and its habitat will do much more than safeguard a living symbol of this wilderness, they will help preserve one of the most diverse ecosystems in the world.

Java is an island of Indonesia, an archipelago nation in the Asian Pacific which occupies little more than one percent of the globe's land surface, but harbors one eighth of the world's mammal, bird, reptile, amphibian, and plant species. Most of Java's natural forests, and virtually all of its lowland rainforests, have been logged to support the 100 million people living there. Ujung Kulon constitutes the largest and most pristine natural ecosystem remaining on this biologically important island.

Some 40 mammal species are known to inhabit the Park. In addition to the Javan rhino, the Javan gibbon, two species of lemur monkey and the Javan tree shrew are found nowhere else in the world. Other important species include the flying lemur, banteng (a form of wild cattle), and several carnivore species such as the wild dog, leopard, binturong, small-toothed palm civet, Asian small-clawed otter and hairy-nosed otter.

More than 250 bird species are found in Ujung Kulon. Among the many species of interest to conservationists in this region are three types of hornbills, eight each of kingfishers and bulbuls, and ten of babblers. The green peafowl, green junglefowl and white-winged wood duck are also recorded.

The Park also shelters populations of many rare or threatened species of reptiles and amphibians, including most notably the green sea turtle and saltwater crocodile, and more than 50 rare species of plants.

How You Can Help

You can play a direct role in the Minnesota Zoo's efforts to protect Ujung Kulon National Park, the last refuge of the Javan rhino. The continued success of the Zoo's Adopt-A-Park program depends on your financial contribution.

In the first year, donations to the Minnesota Zoo Foundation and contributions from Steve Martin's "World of Birds Show" for this program totaled \$25,000. These funds purchased a field communication system (complete with two-way radios, antennas, cables, boosters, speakers and solar power generators) for the guard posts, field bikes for patrolling the edge of the Park, two diesel marine engines and an ocean-going boat (built locally) for ferrying staff and supplies to remote areas, and smaller boats or canoes for patrolling in-land rivers.

Next year's contributions will be used to complete the purchase of field equipment for Park staff, and begin developing education materials for a local conservation outreach program. The third year will be devoted to expanding this program. Fund-raising goals for both years have been set at \$25,000 per year.

This Adopt-A-Park program has attracted international attention for Ujung Kulon. The Zoo's initiative has rekindled World Wildlife Fund's long-term interest in the region, and the New Zealand government has also offered technical assistance to improve park management.

To help protect this threatened jungle, send your tax-deductible contribution to:

Minnesota Zoo Foundation
Adopt-A-Park
13000 Zoo Boulevard
Apple Valley, MN 55124 USA



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Ujung Kulon Last Refuge of the Javan Rhino

An Adopt-A-Park Program of the Minnesota Zoo
In 1990, the Minnesota Zoo chartered a new course for wildlife conservationists in zoos worldwide by "adopting" Ujung Kulon National Park in Java, Indonesia. Through this first-of-its-kind *in situ* (on location) conservation project, the Zoo provides direct assistance to the Indonesian Department of Nature Conservation's (PHPA) efforts to protect the unique and threatened ecosystem of Ujung Kulon, the last refuge of the Javan rhino.

Several features of the Adopt-A-Park program distinguish it from other zoo wildlife conservation initiatives:

- the program is based on a long-term commitment to support *in situ* conservation actions;
- it emphasizes a grass-roots approach to give financial support directly to Park programs;
- costs are modest, yet the program is having a major and immediate impact;
- the program is not linked to bringing animals back to the Minnesota Zoo in return for our support.

Why would the Minnesota Zoo concern itself with a conservation dilemma located half a globe away? This outreach program is a natural extension of the Zoo's conservation policy, which pledges to "support the preservation and restoration of endangered species' natural habitats."

Ujung Kulon is a perfect choice. In addition to the critically endangered Javan rhino, this national park provides refuge for several threatened wildlife species displayed in the Zoo's premiere exhibit, the Asian Tropics. Zoo staff also have considerable expertise in this region. Most compelling, this important area of biological diversity is in clear need of support.

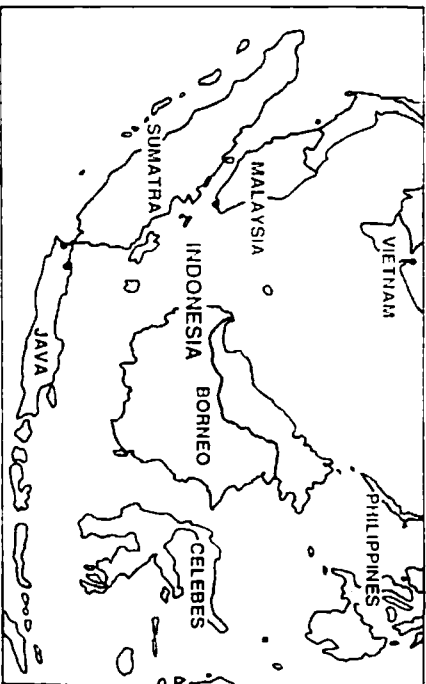
The Javan Rhino

Once ranging from Assam in northern India through much of Indochina, the Javan rhino had already disappeared from all but Java's Ujung Kulon peninsula by the turn of the last century. Less than 60 Javan rhinos are believed to exist in the world today, all in the swampy lowland forests of this small wilderness (one fourth the size of Yellowstone National Park) on the western tip of Java. A handful of animals may also persist in the jungles of southern Vietnam.

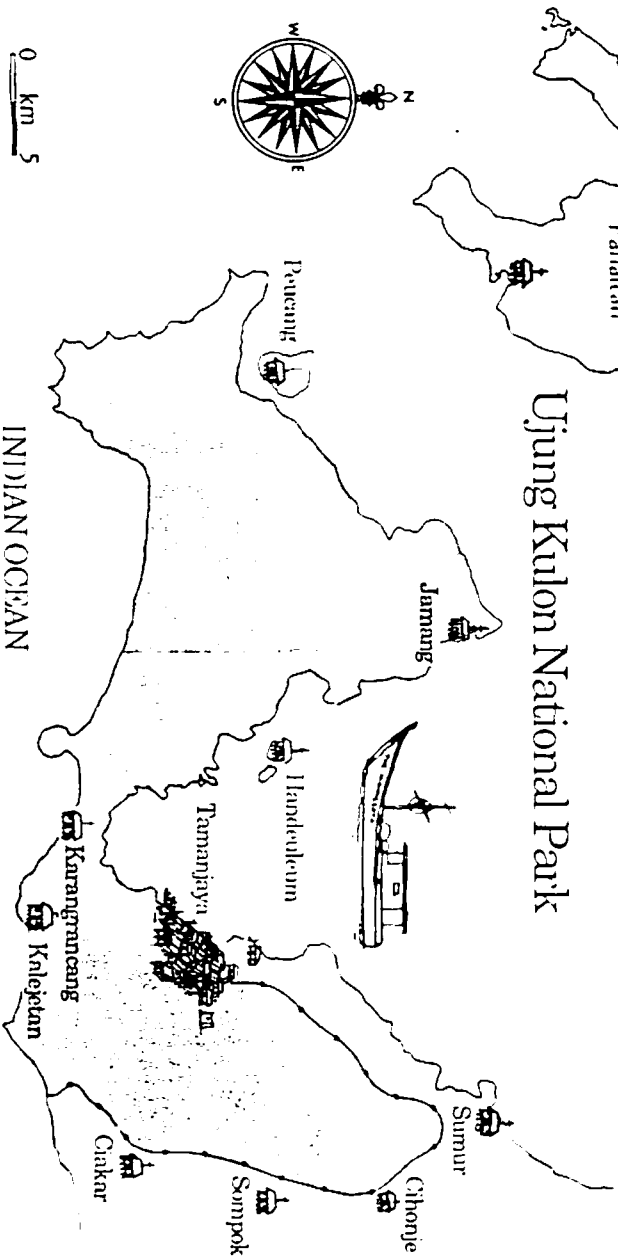
So severe were the pressures of human hunting and forest encroachment that some believe only the explosion of the volcano on nearby Krakatau Island saved this diminutive rhino species from total extinction. In the wake of the volcano's eruption in 1883, people shunned Java's western peninsula in fear of the great tidal waves that had devastated villages and crops. This respite lasted long enough

for Ujung Kulon to receive official protection as a nature reserve in 1921, (expanded in 1980 to 300 square mile Ujung Kulon National Park).

Unfortunately, not even this last remote island population of the Javan rhino can be considered safe from extinction. Beyond the risks of natural disaster, genetic problems and disease that all small, isolated populations must face (five Javan rhinos



Ujung Kulon National Park



succumbed to an unknown disease in 1982), the threat of poaching still looms large in Ujung Kulon. Poachers killed two rhinos in the Park as recently as 1985 and 1987.

The Adopt-A-Park program helps to protect this critically endangered species and its natural habitat.

A Model Program

The Minnesota Zoo's Adopt-A-Park program officially began in September 1990 when the Zoo entered into a formal agreement with Indonesia's PHPA to work together to protect the ecological stability of Ujung Kulon National Park, and thus ensure the long-term survival of the Javan rhino.

Reflecting the most urgent needs of the Park, the Zoo's first year goal in its three-year commitment was to assist PHPA in purchasing field communication and transportation equipment so that Ujung Kulon staff could more effectively guard against poaching. Next on the agenda is the development of education materials suitable for use in a conservation outreach program both for the Javanese people living on the borders of the Park and the 3,000 international tourists who visit Ujung Kulon each year. Future goals will be identified in cooperation with PHPA.

Recognizing the benefits and goodwill generated by this *in situ* program, the Sumatran Rhino Trust, a consortium of North American zoos working for the conservation of the Sumatran rhino, has decided to similarly support Kerinci National Park in northern Sumatra.