
CONSERVATION PROGRAMMES FOR SUMATRAN AND JAVAN RHINOS IN INDONESIA AND MALAYSIA

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ABSTRACT

There is an intensive and international programme in progress to try to conserve the Sumatran and Javan rhinos. The effort is employing a diversified and integrated strategy that is attempting to: (1) protect the species in the wild using anti-poaching teams known as Rhino Protection Units (RPU's); and, (2) breed the species under managed conditions, originally in traditional captive situations, but more recently in breeding centres in native habitat. Moreover, the *in situ* protection and managed breeding are linked because the managed breeding centres in natural habitat will also be used as the centrepieces of a conservation tourism programme that is projected to have the potential to generate very significant income to support the protection in the wild.

RESUME

Il y a un intensif programme international en cour pour la conservation des rhinos du Sumatran et de Javan. L'effort s'appuie sur une stratégie intégrée et diversifiée visant à: (1) protéger les espèces sauvages en utilisant des équipes de lutte anti-braconnage spécialisées comme les Unités de Protection du Rhino (UPR); (2) reproduire les espèces dans des conditions de gestion originale et traditionnelle dans des situations de captivité et plus récemment dans des centres de reproduction au niveau des habitats de natalité. En plus, la protection *in situ* et la gestion de la reproduction sont liés, parce que les centres de reproduction dans l'habitat naturel seront aussi utilisés comme éléments principaux de conservation du programme touristique qui est destiné à développer le potentiel, pour générer un revenu significatif qui pourra supporter la protection de la vie sauvage.

INTRODUCTION

The Sumatran (*Dicerorhinus sumatrensis*) and Javan (*Rhinoceros sondaicus*) rhinos of South East Asia are the most endangered of the five surviving species of rhino (Foose and van Strien, 1997). As recently as the early 20th century, both species were widespread over South Eastern Asia from eastern India through Indochina, the Malay Peninsula and selectively on Sumatra (Sumatran and Javan rhinos), Java (Javan), and Borneo (Sumatran, and Javan rhinos until about 12,000 years ago). Today, the only confirmed, significant populations of Sumatran rhinos survive in three geographically distinct areas of two range states: in Indonesia on Sumatra; in Malaysia, on the Peninsula; and in the Malaysian State of Sabah on the island of Borneo. Recent evidence suggests that some Sumatran rhinos still exist in Thailand along the border with Malaysia, in northern Myanmar, and perhaps in India on the border with Myanmar, but the significance and validity of these reports is yet to be confirmed. About 300 Sumatran rhinos are estimated to survive worldwide.

Although not as rare as the Javan rhino poaching pressure

is more intense on the Sumatran rhino, whose populations have declined at least 50% in the last decade, almost entirely due to poachers. Thus, the Sumatran rhino is considered the most critically endangered species of rhino by the IUCN/SSC Asian Rhino Specialist Group (AsRSG) (Foose and van Strien, 1997). There are two confirmed Javan rhino populations: about 50 in Ujung Kulon National Park on the western tip of Java in Indonesia; and another five to seven in the Cat Loc area which is now part of Cat Tien National Park in southern Vietnam (Sung *et al.*, 1998). Hence, there are fewer than 70 Javan rhinos remaining. However, the Indonesian population is consolidated in a relatively well protected Park and the population has remained unchanged in numbers for the last decade. The major rhino areas and estimated numbers are provided in Table 1 and Figures 1-3.

The predominant cause of decline of both rhino species is poaching for the horn. Considerable habitat loss has occurred throughout their range as forests are destroyed for timber or converted to agriculture, but the AsRSG estimates that sufficient habitat remains for at least several thousands of both species, even within the two range state

Table 1. Rhino Areas and Numbers in Indonesia and Malaysia.

Area size (km ²)		Status	Estimated number of rhinos	RPU's	
				IRF/AsRSG	EU
Indonesia:					
Sumatran Rhino					
Gunung Leuser	8,000	National Park	40-80	4	7
Way Kambas	1,300	National Park	~30	6	
Bukit Barisan Selatan	3,600	National Park	20-30	3	
Kerinci Seblat	10,000	National Park	~10		
Berbak	?	National Park	?		
Javan Rhino					
Ujung Kulon	760	National Park	50-60	3	
Peninsula Malaysia					
Taman Negara	4,400	National Park	40-60	4	
Endau Rompin	1,000+	State Parks (in 2 states)	4-8	2	
Belum	1,400	State Park	6-10	1	
Ulu Selama	1,000	Proposed Wildlife Reserve	4-6	1	
Gunung Inas	500	Forest Reserve	2-3	1	
Jeli	?	Forest Reserve	2-3	1	
Main Range	5,000+	Mixed - Mostly Forest Res.	10+		
Sabah					
Tabin	1,200	Wildlife Reserve	20-35	3	
Danum Valley	2,000	Protected Forest Reserve	20-35	1	
Total			208 - 320 Sumatran 50-60 Javan		

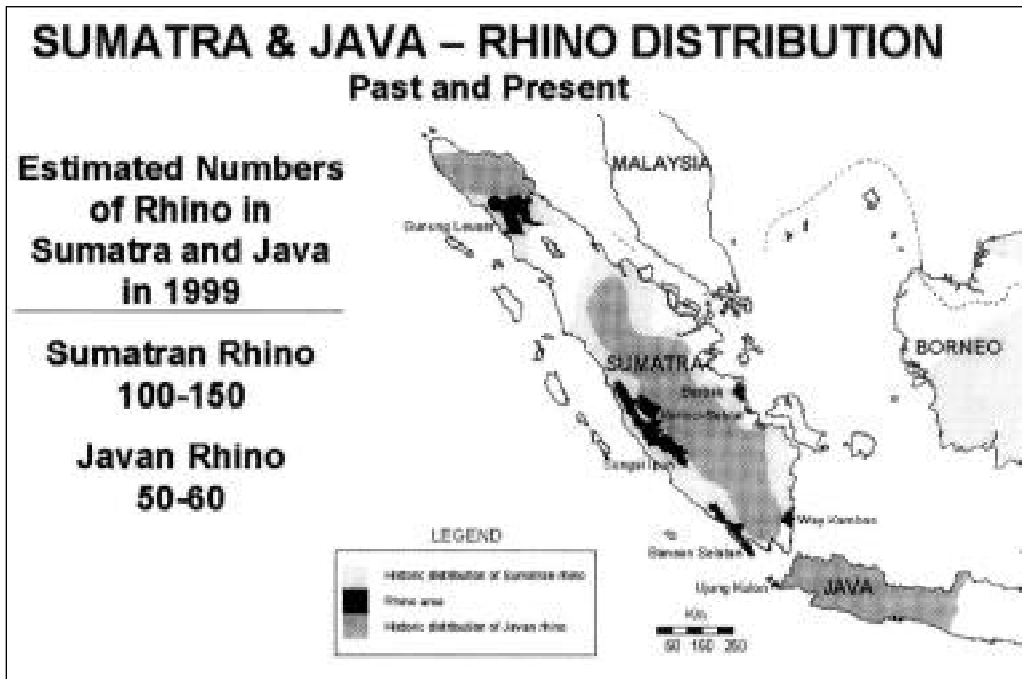


Figure 1. Map of past and present distribution of Sumatran and Javan rhinos in Indonesia.

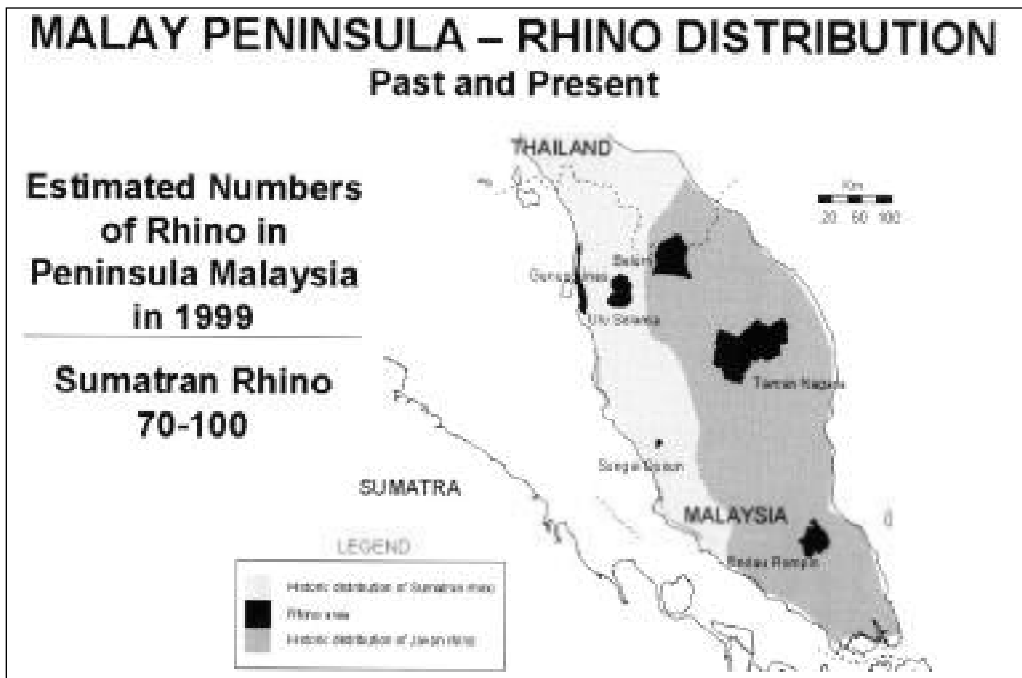


Figure 2. Map of past and present distribution of Sumatran rhinos in Peninsula Malaysia.

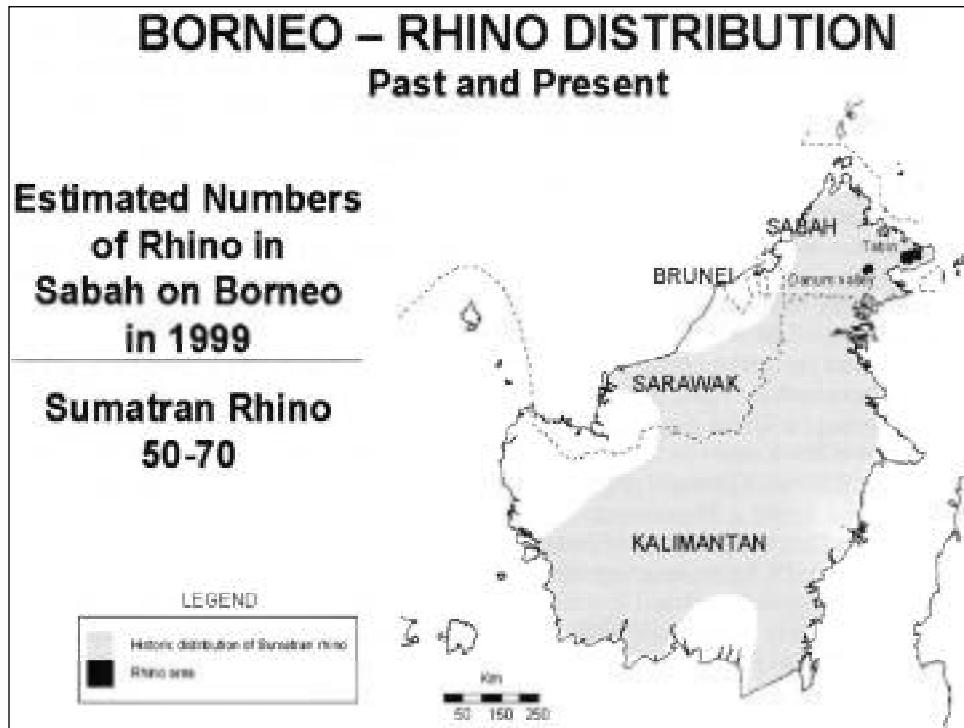


Figure 3. Map of past and present distribution of Sumatran rhinos in Borneo.

of Indonesia and Malaysia. Consequently, while habitat and ecosystem conservation are vital for long-term viability, direct protection of rhinos from poachers is much more critical over the short term. Otherwise, habitat and ecosystems may survive but the rhinos will not, as evidently has been the case in Kerinci Seblat National Park where the rhino population appears to have declined 90% over the last ten to 15 years and by 50 rhinos from 1989 to 1991 alone (Wells & Franklin, in prep).

In response to this crisis, the action plan for conservation of these two species in Indonesia and Malaysia emphasizes two major components:

- (1) Anti-poaching teams known as **Rhino Protection Units (RPUs)** for both Sumatran and Javan rhinos, and
- (2) **Managed Breeding Centres in Native Habitat**, currently for Sumatran rhinos but eventually perhaps for the Javan as well, both to propagate the species as a back-up for wild populations and to serve as centrepieces for a conservation tourism programme that can generate funds to support the RPUs and other *in situ* efforts for the rhino.

However, a number of aspects of the biology of the Sumatran rhino have complicated efforts to conserve the

species. In the wild, the Sumatran rhino inhabits very dense forests, occurs at very low densities, and is by nature very solitary, secretive and elusive. Hence, the rhinos, their poachers, and the anti-poaching teams trying to protect them are all to a certain extent wandering around independently in the forest with only intermittent contact. In captivity, the Sumatran rhino has proven to be one of the most complicated species in terms of both husbandry and reproduction of any mammal species.

RHINO PROTECTION UNITS (RPUS)

Under the conditions that have prevailed in Indonesia and Malaysia over the last five years, Rhino Protection Units (RPUs) appeared to be the best method to protect effectively tropical forest rhinos. The current RPU programme in Indonesia and Malaysia was initiated with and catalyzed by a grant from the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP). The GEF provided \$2,000,000 over three years (1995-1998) to initiate and catalyze a major programme to conserve the Sumatran rhinoceros. Funds were equally divided between Indonesia and Malaysia, the wildlife conservation departments of which administered a large portion of the funds and supplemented them with governmental allocations to rhino conservation. The International Rhino Foundation (IRF) and the IUCN/

SSC Asian Rhino Specialist Group (AsRSG), for which IRF operates as the financial and administrative agent under an MOU with IUCN-The World Conservation Union, co-ordinated and facilitated the GEF Project.

To supplement the GEF funds during the initial three years and particularly to continue the programme after the expiration of the GEF grant in December 1998, the AsRSG and IRF have contributed funds and recruited a number of other donor partners including: the United States Rhinoceros and Tiger Conservation Fund (RTCF) administered by the Office of International Affairs of the US Fish & Wildlife Service (USFWS); WWF-Indonesia (WWF-IP), which in turn has received funds from other WWF National Organisations (UK, Switzerland, Netherlands); the Bowling for Rhinos programme of the American Association of Zoo Keepers (AAZK); and the Anna Merz Trust. The IRF/AsRSG initiated programme operates in Indonesia under a Memorandum of Understanding with the Directorate General of Nature Protection and Conservation (PKA); similar arrangements exist and are evolving in Malaysia through the Department of Wildlife and National Parks in Peninsula Malaysia, and the Wildlife Department in Sabah.

Under the IRF/AsRSG-initiated programme, RPUs have been formed in all areas where Sumatran rhinos exist, with the exception of Gunung Leuser National Park in Sumatra where the European Union has organised and is managing RPUs, albeit with technical assistance from AsRSG/IRF. As of late 1998, RPUs have also been formed for Javan rhinos as a result and at the recommendation of a Javan Rhino Colloquium organised by the AsRSG and IRF with a grant from the USFWS RTCF (Javan Rhino Colloquium Editorial Committee, 1997).

There are a total of 37 RPUs operating in Indonesia and Malaysia under the two auspices described above: (1) the IRF/AsRSG with joint funding in Indonesia from WWF-Indonesia; and, (2) the European Union Project in Gunung Leuser. A summary of these RPUs are provided in Table 1.

Moreover, the RPU programme initiated in Indonesia and Malaysia is extending to other range states in South East Asia. Another recommendation from the 1997 Javan Rhino Colloquium was to provide technical assistance for Javan rhino conservation in Vietnam, which AsRSG



Figure 4. Indonesia RPUs in dress and field uniforms.

has provided with funds from IRF and the USFWS RTCF. An improved rhino census has been conducted and a revised action plan formulated in Vietnam (Sung *et al.*, 1998). One objective is to establish RPUs as soon as possible and they may materialise with funds from WWF-US as well as the Cat Tien Project funded by the Netherlands Government and administered through the WWF-Indochina programme.

In Indonesia and Malaysia, each RPU usually consists of four to five persons (Figure 4) and is engaged in anti-poaching activities, intelligence operations, and community outreach work. The RPUs are attempting to create intensive protection zones (IPZs) for the rhinos in each area. The emphasis for the RPUs is to patrol in the rhino core areas, to destroy traps and snares and to interdict intruders. The RPUs also engage in community outreach efforts as well as intelligence operations to identify poachers in the local area. Each park or reserve (or sometimes a combination of two parks or areas) has an area co-ordinator and there is a programme manager for each of the three major political units where the RPUs operate: Indonesia; Peninsula Malaysia, and Sabah. There are also technical advisers provided by AsRSG/IRF who assist with the training and monitoring of the RPUs.

In Indonesia, the RPUs for Sumatran rhino comprise one PKA *Jagawana* ranger and three members who are recruited from the local community and trained by

the co-ordinators and technical advisers. The area coordinators have also been recruited from outside PKA. The RPUs for the Javan rhino are somewhat different in composition and consists of two PKA rangers and three local recruits. The area co-ordinator for Ujung Kulon is a national park employee. In Malaysia, all the members of the RPUs are government rangers. However, it has recently been decided in Malaysia to recruit area coordinators who are outside of the government structure.

In all cases, the RPUs co-ordinate closely with the existing staff of the national park but are concentrating specifically on anti-poaching in rhino core areas. Prior to the inception of the GEF project, rhino conservation was merely a limited part of the many activities of regular wildlife staff. RPUs were formed because the existing government staff of protected areas simply did not have the time, flexibility and resources to concentrate on the intensive patrols and intelligence work required to protect the rhinos. Hence, a system that combines government rangers and more autonomous staff has proven more effective and is being employed in several variations whose relative performance will be evaluated. Indeed, there have been and will continue to be many adaptive modifications of the system to respond to assessment of performance as well as changes in circumstances.

The most important activity of each RPU is the forest patrols. Each patrol continues for about four to seven



Figure 5. Daytime photographs of Sumatran rhinos collected by RPIJs with hand-held cameras

days, with a day of rest, a day of reporting and a day of preparation for the next patrol. In conjunction with ten days of leave every three months, the optimum number of patrol days per team is 14 per month. To date, many RPUs are realising ten to 12 days of patrol per month. The emphasis in the patrols is to detect and destroy snares and traps and to interdict intruders. One indication of the greater activity and effectiveness of the RPUs compared to previous efforts is the fact that on several occasions RPU members have been able to photograph for the first time, with hand-held cameras, Sumatran rhinos during daytime encounters (Figure 5).

The difficulty, particularly in Indonesia, of prosecuting poachers (a difficulty that is increasing with the economic and political instability) argues for concentration on preventative rather than corrective measures. This reality also limits the value of intelligence operations versus actual patrols. Intelligence is crucial and the RPUs have engaged in such activities and will probably increase these efforts in the future, but the patrols seem still to be the most critical activity.

The RPUs have been effective over the last three years.

However, because the number of RPUs is limited, they have not been able to provide coverage of the entire area of the parks. Thus, for example, in Way Kambas, where there has been no evidence of rhino poaching, there have been several cases of tigers lost to poachers. In response, the 13 persons involved with the RPUs combined forces with the research staff of the Sumatran Tiger Project based in the Park as well as some additional *jagawanas* to form 13 anti-poaching teams, each led by an RPU member. This intensive operation was successful in apprehending the poachers and stopping their activities. This result emphasises the need for more RPUs to provide greater and better coverage. IRF/AsRSG are currently attempting to secure the additional funds required to add one RPU in Way Kambas for the first half of 1999.

Over the last year the need for more RPUs has intensified due to the economic crisis and political changes in Indonesia and to a somewhat lesser extent in Malaysia. In Indonesia particularly, there have been significant disruptions of civil law and order which are increasing the pressure on the parks and intensifying the challenge, including personal danger, to the RPUs. The approximate annual budget for the IRF/AsRSGRPUs in Indonesia and Malaysia is in Table 2.

Table 2. The approximate annual budget for the IRF/AsRSG RPUs

30 RPUs (four to five persons each) at US\$1 2,000/RPU4/year	\$360,000
Technical Assistance & Co-ordination	\$140,000
(May seem high but actually covers 13 persons in Indonesia and/or Malaysia, including:	
• nine area field co-ordinators (for each park or combinations thereof)	
• two national programme managers	
• one field technical assistant	
• one regional SE co-ordinator/technical adviser)	
Total	\$500,000

Poaching has been eliminated or drastically reduced in areas where RPUs have been operating. For example, in the first six months of 1998 for which a formal assessment has been compiled (Wells, 1999), the RPUs in Way Kambas National Park interdicted 101 intruders, of which 46 were apprehended and 32 delivered to the police for prosecution (of which 75% were successfully prosecuted). Sixty-seven snares/traps were also destroyed or confiscated. Quantitative assessments for other areas (eg., Bukit Barisan Selatan and Kerinci Seblat) are in progress.

A major problem with the RPU programme is that there have not been sufficient funds to deploy an adequate number of RPUs to provide satisfactory coverage of the parks. The RPUs have the objective of protecting the other large mammals as well as the rhinos in the

The GEF funds concluded at the end of 1998, and under the current GEF system, there was no possibility of renewing or extending the grant, even though the RPU project received excellent reviews. It is difficult to recruit funds for the existing RPUs, and a much greater number of RPUs are needed. Hence, a major objective currently in progress is to develop financial sustainability of the rhino conservation programmes independent of support from range state governments. Financial self-sufficiency for the rhino conservation programmes is critical as government funds are inadequate and external donor support uncertain.

Over the shorter term, ie. 1999 to 2002, the IRF is attempting both to provide and to recruit bridging funds (until the eco-tourism programmes are in full operation) from other conservation partners such as:

WWF; the USFWS RTCF; AAZK; and the Anna Merz Trust. Over the long term (Year 2002 and beyond), a major mechanism being developed for financial sustainability are the conservation tourism programmes associated with the managed breeding centres described in the next section.

MANAGED BREEDING CENTRES IN NATIVE HABITAT FOR SUMATRAN RHINO

The second major component of the conservation programme for Sumatran and Javan rhinos are managed breeding centres in native habitat. Currently, these centres are being developed for only Sumatran rhinos, but if successful they may be extended to Javan rhinos (van Strien and Sadjudin, 1995).

The managed breeding centres have two major components, biological and conservation tourism.

Biological component:

The breeding centres for Sumatran rhinos are attempting to propagate this species under managed conditions as a back-up to the *in situ* protection efforts. Since *in situ* protection has proven to be difficult, a supporting mechanism through managed breeding could be critical. On this premise, and in response to the dire status of this species, an *ex situ* captive propagation programme was initiated in 1984 as an integral component of the conservation strategy for this species under the auspices of the Species Survival

(black, white, and especially Indian) that have been maintained in captivity in modern times provided encouragement that this *ex situ* programme would also be successful (Foose and Miller, 1997). Indeed, the second rhino known to be born in captivity was a Sumatran at the Calcutta Zoo in 1889 (Rookmaaker, 1998). Moreover, it was decided that only so-called "doomed" rhinos would be rescued for captivity. "Doomed" rhinos are defined as animals located outside protected areas in situations which were not be protectable with available resources, or areas which did not contain enough rhinos to be viable demographically or genetically (IUCN/SSC, 1984).

Three separate captive programmes were initiated in the major and geographically distinct regions where appreciable populations of Sumatran rhino still survive: Indonesia, Peninsula Malaysia, and Sabah (on the island of Borneo). The Indonesian programme was the most international of the programmes with rescued rhinos being placed in captive facilities in Indonesia, the United Kingdom and the United States.

Unfortunately, traditional captive methods have not worked for the Sumatran rhino. The Sumatran rhino is a much more formidable challenge than anticipated. Since 1984, 40 rhino have been collected from the wild. However, mortality has been high: 23 of the 40 have died (60%). Today only 17 (five males and 12 females) survive in ten captive facilities. Moreover, to date no reproduction has occurred although one calf has been born to a female captured pregnant very early in her gestation period (Table 2).

Table 3. Summary of captive (managed breeding) programmes for Sumatran rhinos, 1984-1999.

Country	Captured (males/females)	Born	Imported	Exported	Released	Died Escaped	Alive
Peninsula Malaysia	3/9	0/1	1/0	0/2	0/0	2/2	2/6
Sabah	8/2	0/0	0/0	0/0	0/0	6/0	1/2
Indonesia	7/11	0/0	0/1	4/7	0/0	3/3	0/2
Thailand	0/0	0/0	0/1	0/0	0/0	0/1	0/0
UK 0/0	0/0	1/2	1/0	0/0	0/2	1/0	
USA 0/0	0/0	2/5	0/0	0/0	1/3	1/2	
Total 18/22=40	0/1	4/9	5/9	1/0	12/11=23		5/12=17

Commission (SSC) of IUCN. The recommendation for *ex situ* programmes derived from the extreme difficulties of trying to protect this species in the wild and because an estimated 25% of the rhinos were located in areas where they could never be protected or be part of a viable population.

Successful propagation of the other three species of rhinos

A number of reasons have been proposed for the problems with this captive programme:

- Many of the mortalities seem consistent with nutritional difficulties. The facilities with the lowest rates of mortality (Sungai Dusun and Malacca Zoo) are adjacent to natural habitat forest and use exclusively native browse for the rhino diets. This browse may pro-

vide a better balance of nutrients needed by the rhinos than the diets including browse provided by the captive facilities more distant from native habitat

- Mortalities may also be related to the size and configuration of captive enclosures. Sumatran rhinos have large home ranges (10-15km² for females and 30km² or more for males) in the wild and individual adult rhino probably seldom encounter each other except when females are in oestrus. Most of the captive facilities are relatively small (0.4 hectares). Moreover, males and females are kept in adjacent or even in the same enclosures which do not provide adequate complexity for flight and evasion during the often violent interactions between the sexes. At least one of the mortalities in captivity appears the direct result of such conflict.
- The small size and configuration of enclosures may also inhibit breeding. Indeed, because the rhinos are aggressive if they come into contact with one another, many managers do not place the sexes together. It is also the case that bad luck concerning the sequence of sexes captured (Foose, 1999) and the subsequent distribution of rhinos among facilities due to political agreements rather than biological objectives, has prevented adult males and females from being in the same facility for enough time or in sufficient numbers to try different breeding combinations.
- The reproductive biology of the species causes it to be one of the most difficult that captive managers have ever tried to breed. For one thing, males are very, sometimes fatally, aggressive towards females except when females are in oestrus. Consequently, there is reluctance to place males with females until the female is in oestrus. However, it is difficult to know when the female is receptive without placing her with the male. This presents a real dilemma. Moreover, recently it has been revealed that females are induced ovulators, that is they will not produce eggs that can be fertilised by male sperm until or unless copulation occurs. Furthermore, if the female becomes pregnant, there is speculation that it is important to separate her immediately from the male or she may lose her pregnancy, as occurred three known times at the Cincinnati Zoo and perhaps another half dozen times at other facilities during the captive breeding programme.
- A final cause of captive breeding problems is stress due to exposure, both to human activities and to environmental factors, especially intense sunlight (notably its ultraviolet component), for these normally deep forest animals. Cataracts presumably

caused by exposure to sunlight have been a recurrent problem with captive rhinos.

The conclusion from consideration of the programme performance and suspected problems has been a recommendation that the surviving rhinos in captivity be consolidated in the most spacious enclosures and natural conditions possible consistent with continuation of the intensive protection and management believed necessary because of the precarious situation in totally free-ranging situations in the wild. By providing much larger enclosures and more natural conditions in a managed breeding centre in natural habitat, the hope is that propagation can succeed. These areas have been designated as "sanctuaries", a slightly different use of the term than has occurred in Africa (Leader-Williams *et al.*, 1997) because rhinos in the Sumatran rhino sanctuaries are initially not as free-ranging as their African counterparts. Moreover, food is supplemented and mating controlled. However, as protection improves and the rhino population grows, the objective is to evolve more towards the African model.

Three managed breeding centres in native habitat are already in operation:

The Sumatran Rhino Sanctuary/Suaka Rhino Sumatera (SRS) in Way Kambas National Park, Sumatra, Indonesia

The SRS complex comprises 10,000 hectares (25,000 acres) within Way Kambas National Park (Figure 6). The Government of Indonesia, Ministry of Forestry is providing 'concessions' for management of this area to the conservation partners involved, including the IRF, the AsRSG, and Taman Safari Indonesia (TSI). The SRS complex is divided into two parts: a **Rhino Conservation Zone** of 9,000 hectares and a **Conservation Tourism Zone** of 1,000 hectares.

Within the conservation zone, the first set of enclosures has been completed and encompasses 250 acres (100 hectares) in native forest. This area is currently divided into five 25-acre and one 125-acre enclosures (Figure 7.). The enclosures largely consist of a simple electrified fence and have been constructed with minimal disturbance to the tropical forest habitat. Facilities for the animal staff are adjacent to the rhino enclosures. Completion of construction of this first rhino complex was delayed several months due to the unusually heavy and long rainy season during late 1996 and early 1997.

The first three rhinos (one male and two females) were moved to the SRS in January 1998. This movement

was delayed due to the drought and fires caused by El Niño during late 1997. The rhinos have re-adapted well to their native environment (Figure 8) after many years in captivity as indicated by their increasing weights, which are measured weekly. A monthly Curator's Report is produced by the SRS Curator and his staff. The male rhino (Torgamba; Studbook Number 4) was moved from the Port Lympne Zoo in the United Kingdom; one of the females (Bina, Studbook Number 32) was from Taman Safari Indonesia and the other (Dusun, Studbook Number 12; this animal was captured in Peninsula Malaysia, and exchanged for a male from Indonesia) was from Ragunan Zoo in Jakarta (Foose 1999). These rhinos comprise all but three of the five surviving rhinos of the 18 (seven males and 11 females) originally captured in Indonesia as part of the effort to establish a captive propagation programme for this species. There had been two other rhinos in Indonesia zoos (a male at Taman Safari and a female at Surabaya Zoo) which were designated for the SRS at the inception of the programme. Unfortunately, these rhinos died during 1997 before they could be moved to the SRS.

The other three surviving Sumatran rhinos from Indonesia in captivity are at the Cincinnati Zoo in the United States. During the last year, the programme there has succeeded in producing pregnancy in one of the females (Emi, Studbook Number 29) on actually three occasions (Roth and Brown, 1999).

However, none of the pregnancies has been sustained; two continued for about one to two months; the longest for four months.

One of the females, Bina, at the SRS is definitely manifesting estrus. There is an ongoing programme of placing this female together with the male. To date, there has been increasing courtship activity (particularly intense during November and December 1998) and hopes are high for a pregnancy in the near future. All three rhinos at the Way Kambas SRS were examined by a team of reproductive specialists in February 1999. The conclusions were that the reproductive system of Bina, the female apparently cycling, is in excellent condition. The male Torgamba also appears to be healthy reproductively with evidence of sperm production. Curiously, the other female Dusun seems to be hyper lactating, a condition that reportedly commenced in 1992, when she may have developed but lost a pregnancy. This hyper lactation is suppressing the estrus cycle in this individual. A case of continued lactation due to hyperprolactinemia has been reported in an African elephant (Brown and Lehnardt, 1997).

The IRF provided the initial capital (about US\$500,000) for development of the rhino facilities and is supporting operation of the biological programme (about US\$50,000/year).



Figure 8. Rhino in SRS at Way Kambas

The Sumatran Rhino Conservation Centre -Sungai Dusun (SRCCSD) at Sungai Dusun Wildlife Reserve in Peninsula Malaysia

This centre is currently smaller in size than the SRS in Way Kambas (Figure 9) but has more rhinos: two males and five females. The original facility consisted of a barn with seven enclosures, in total about half a hectare in size. With funds from and through the IRF, a larger enclosure of four hectares contained by an electric fence has been constructed to extend the facilities into the adjacent forest. A project by the Malaysian government will enclose another 40 hectares of forest by the end of 1999. The IRF and AsRSG have now an assumed joint financial and managerial responsibility (with the Department of Wild Life and National Parks of Peninsula Malaysia) for this centre. An objective is to manage the two breeding centres at Way Kambas and Sungai Dusun in an integrated and interactive manner. It is likely that there may be some movement of rhinos between the Way Kambas SRS and the Sungai Dusun Centre to manage the surviving rhinos as a single population to maximise propagation.

The same reproductive team that visited Way Kambas also examined many of the rhinos at Sungai Dusun

in collaboration with the resident staff and other Malaysia scientists. Pathology was observed in some of the female reproductive tracts, but encouragingly three of the females have been observed to copulate in the last six months (one in September 1998, another in December 1998, and the most recent in February 1999). All these matings have occurred in the larger four hectare enclosure in the forest.

The Sepilok Sumatran Rhino Breeding Centre in Sabah

This is the smallest of the three centres and has just a pair of Sumatran rhinos currently. A second female that had been until recently held at Sepilok has been moved to a small enclosure in Tabin Wildlife Reserve. Although there has previously been copulation at this centre (Bosi 1996), the site is deteriorating and another centre may be developed at Tabin or at a new zoo that the State of Sabah is constructing near Kota Kinabalu.

Conservation tourism component:

Ultimately, a more important part of the sanctuary programme is the development of a conservation tourism component to generate funds for operation of the breeding centres as well as other rhino conservation

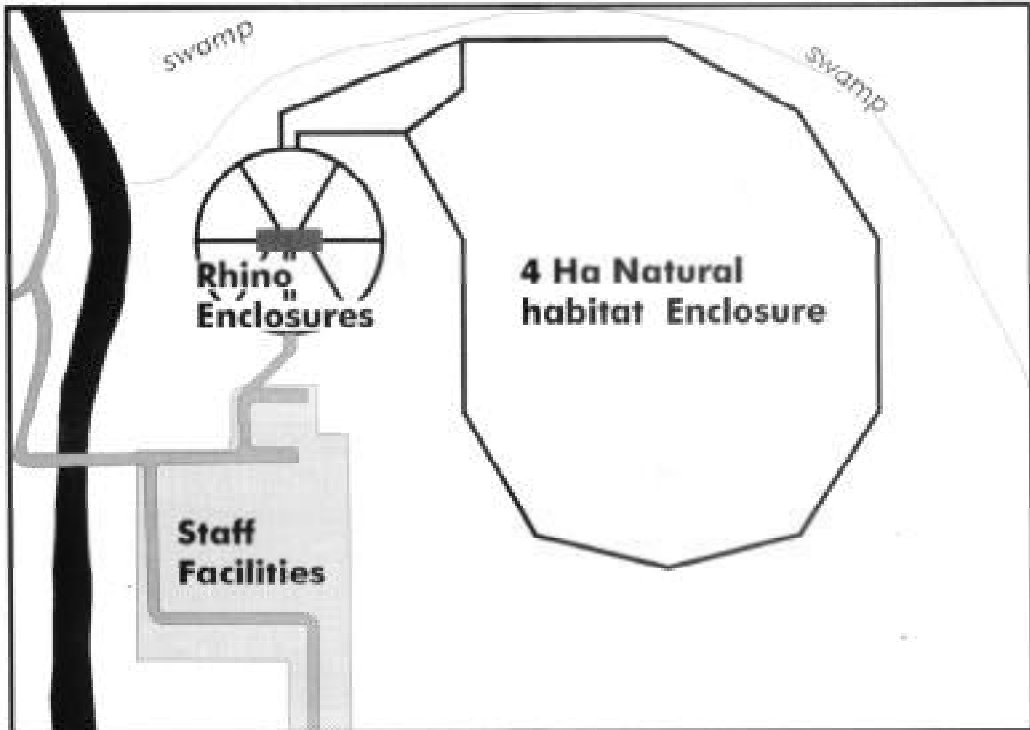


Figure 9. Diagram of Sumatran rhino Conservation Centre - Sungai Dusun.

projects, especially the RPU Programme. A preliminary business plan has been formulated, and projects significant revenue earning for the sanctuaries and rhino protection units in three to five years.

The SRS at Way Kambas is being used as the focal point for the conservation tourism programme. While to date efforts at the SRS have concentrated on ini-

tiation of the biological programme, there has also been steady progress towards the tourism objective.

To achieve these dual objectives, the SRS in Way Kambas is undergoing a joint venture with the Directorate General of Nature Protection and Conservation (PKA) in the Ministry of Forestry and Estate Crops of Indonesia, the Indonesian Centre for

Management Structure for SUMATRAN RHINO SANCTUARY (SRS)

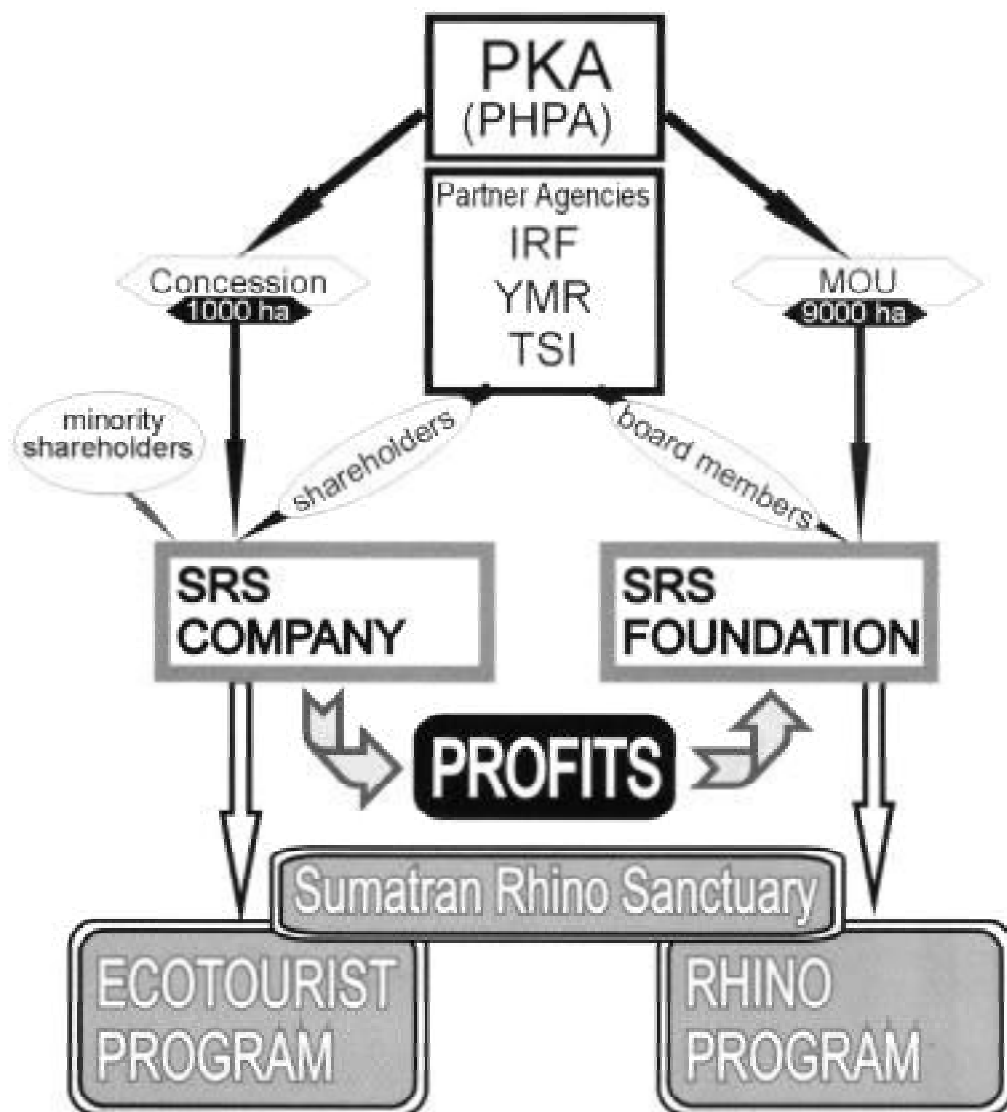


Figure 10. Diagram of structure of and relationship between SRS Foundation & Company.

Reproduction of Endangered Wildlife at Taman Safari Indonesia (TSI), Yayasan Mitra Rhino (YMR - The Rhino Foundation of Indonesia) and the International Rhino Foundation (IRF). Both a SRS Foundation and a SRS Company have been formed. The SRS Foundation, administered by a Board with both Indonesian and non-Indonesian members, manages the biological component of the SRS as well as linking with the Rhino Protection Unit (RPU) Programme through the PHPA/AsRSG/IRF/YMRMOU. The SRS Company is developing and will manage the eco-tourism component through a Board representing the major partners in this programme. All “profits” from the SRS Company will be transferred to the SRS Foundation for rhino conservation, first operating expenses of the sanctuary but then for support of the RPUs. Figure 10 presents a diagram of the structure of and relationship between the SRS Company and Foundation in support of rhino conservation. Similar arrangements are under development for Sungai Dusun.

Conceptual plans for the tourist facilities have been completed. The start-up costs for the eco-tourism programme are estimated at approximately US\$1 million and are not yet secured. However, efforts to recruit funds to initiate construction of the tourism facilities have already commenced. Also in progress are discussions with major international tour operators about possible partnerships in developing the tourism facilities and programmes. Indeed a programme of day visits by tour groups has already provided some income for operating expenses at the SRS. However, it must also be acknowledged that the recent political instability and economic crisis in Indonesia will retard development of the programmes to some degree.

As mentioned above, the prospects provided by the SRS have already induced Peninsula Malaysia to provide joint responsibility for management of Sungai Dusun to the IRF/AsRSG so that there can be integrated and interactive management of this Centre and the SRS in terms of both rhino propagation and conservation tourism. Ultimately, the tourism programme in Way Kambas may also attempt to co-ordinate with similar programmes for the Javan rhino in Ujung Kulon to provide a package that will virtually ensure visitors of observing both species in their natural habitat. This opportunity has indeed been rare. Since World War II, there has been less than 60 minutes of total observation time of Sumatran rhinos in the wild by the substantial number of managers and researchers who have worked on this species. Conservation tourism is much less developed in Asia than in Africa because, in general, it is more difficult to observe wildlife easily. The programmes

associated with the Sumatran rhino breeding centres will be an important and innovative step toward developing more conservation tourism in Asia

RESULTS AND CONCLUSIONS

Despite all the obstacles, the effort to conserve the Sumatran and Javan rhinos continues, and has recently shown signs of progress. In the wild, where RPUs are operating, there has been no (in some areas) or greatly reduced (in other areas) losses of rhinos to poachers. However, the economic and political instabilities in the principal range states present greater challenges. In the breeding centres, matings are occurring and pregnancies have been produced, although not yet sustained, but there are new ideas of how to correct this problem.

The funds available for Sumatran, and Javan, rhino conservation are low in comparison with expenditures, on a unit-area basis, that have proven successful for rhino conservation with the Indian rhino *Rhinoceros unicornis* (Martin, 1996; Martin & Vigne, 1995) as well as for some of the more intensively protected areas for black (*Diceros bicornis*) and white (*Ceratotherium simum*) rhinos in Africa. However, the Sumatran rhino occurs at much lower densities than either the Indian rhino or the African species, and it will not be feasible to expend as much on an area basis as has proven necessary and successful for these other species of rhino. Nevertheless, more rhino areas must be expanded if the Sumatran and Javan rhinos are to survive.

As a final observation, the Sumatran rhino is also known as the “hairy rhino”, because under certain conditions, individuals of the species will develop a rather thick and long coat of hair. This hairy rhino is probably related to the Woolly rhino that lived in Eurasia during the Ice Ages of the Pleistocene. There is compelling, although circumstantial, evidence from the fossil record that humans caused the extinction of the woolly rhino at the end of the Ice Ages. Now, the hairy rhino is also on the brink of extinction. A small but growing and determined group of conservationists is trying to ensure that humans do not commit the same crime twice.

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