PROJECT TO CONSERVE THE JAVAN RHINOCEROS

(The Lesser One-Horned Asiatic Rhinoceros - *Rhinoceros sondaicus* Desm.

Project Rationale and Outline

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BACKGROUND

Introduction

At the Asian Rhino Action Plan Meeting in Kuala Lumpur, October 1987, it was agreed in principle that a captive-breeding programme for the Javan rhinoceros should proceed. This paper seeks to outline the background to this decision and the future modus operandi for this programme.

THE JAVAN RHINOCEROS

(The Lesser One-Horned Asiatic Rhinoceros)

(*Rhinoceros sondaicus*)

The Problem:

The Javan rhinoceros probably is the rarest large mammal on Earth today. There is not one individual to be found in any of the world's zoos.

The Javan rhinoceros is in a more serious plight than is the approximately 800-strong Sumatran species (*Dicerorhinus sumatrensis*): there is only one remaining viable population of the Javan species, numbering approximately 50 individuals, possibly not enough to allow the birth of many young. Not all the members of the group may be capable of breeding in any case - about 25 breeding adults are estimated - nor may the sexes, or the animals' age ratio, necessarily be balanced.

In addition, this population is concentrated in the 30,000-hectare Ujung Kulon National Park in Java, Indonesia.

A single population concentrated in a single location in this way is extremely vulnerable: to natural disasters (such as another catastrophic eruption of the Krakatau volcano within the park), drought or flood, poaching, demographic instability, inbreeding depression etc.

The Problem...

This vulnerability was highlighted dramatically in 1982 by the mysterious death of five rhinoceroses in Ujung Kulon. Whether these were attributable to disease, inbreeding pressures or poaching is still not clear.

Some studies have offered tentative evidence that Ujung Kulon may have reached its maximum carrying capacity for the Javan rhinoceros, with the population levelling out from the late 1970s. The numbers of rhinoceroses had actually doubled over the previous 17 years since Professor Rudolf Schenkel's successful joint effort with the Indonesian authorities to improve management and quash the poaching rampant until the late 1960s. The population estimate in 1967 was 21-28, by 1980, 54-62.

Still other studies suggest there may have been a relatively recent vegetation change in the area disadvantageous to the rhinoceros in terms of its foodplant preferences. Possibly linked with this is potential competition for resources with a burgeoning banteng (Bos javanicus) population within the same area.

The Problem...

Even without such direct threats, the peculiar economic and demographic dilemma in which Indonesia finds itself unfortunately makes the survival of the Javan rhinoceros in the long term problematic.

As usual, the reasons for this species' sharp decline include the ever-growing pressure of a rapidly increasing human population - doubled in Java between 1900 and 1950 - combined with the depredations of both hunters and poachers.

There are about four million Chinese in Indonesia, a ready market for rhinoceros horn products considering the beliefs about the power of such products entrenched in their culture, not to mention the one billion Chinese in China itself: Javan rhinoceros horn is sought after because the smaller Asian rhinoceros horns are considered to contain more concentrated medicinal properties than the larger African horns. Such properties include efficacy against high fever, typhus and even poison.

Historical Background:

The first full zoological description of a Javan rhinoceros came comparatively late, in 1822, when AG Desmarest included Cuvier's account of the animal in the second volume of his Mammalogie. Cuvier apparently called it javanicus, but Desmarest seems to have preferred sondaicus.

There are earlier records of the Javan rhinoceros from Asia itself: Chinese records from T'ang Dynasty times, 618-906 AD, mention the export of rhinoceros horn from Java.

A relief sculpture at the Cambodian temple of Angkor Wat, dating from the twelfth to thirteenth century, clearly depicts a single-horned Javan rhinoceros.

The "unicorn" Venetian traveller Marco Polo saw in Sumatra, in 1292, also may well have been a Javan rhinoceros.

The Javan species was not distinguished from the Indian Rhinoceros unicornis until late in the eighteenth century. The differentiation of the two species was finally confirmed when the Museum National d'Histoire Naturelle received the type specimen in 1821.

Historical Background...

The relative lack of information about the Javan rhinoceros may be explained in part by the small number ever kept in captivity. This rhinoceros has been exhibited less often than any other species.

Apart from those kept in private menageries by Javan princes in the seventeenth and eighteenth centuries, Reynolds (1961) records only 10 others in captivity, including a male kept at Adelaide, Australia, from 1886 to 1907 - the longest life span known - and mistakenly exhibited as an Indian rhinoceros.

Previous Conservation Work/Poaching:

Attempts to protect the animals in Java began in 1908, when hunting in the state forests was limited to those who had obtained special permission.

Even so, the hunters were not closely supervised and A.R.W. Kerkhoven was able to shoot nine rhinoceroses in Ujung Kulon about the same time. In 1909, the Javan rhinoceros was declared a protected species, though this had little effect on hunting, for which special permits were still issued, or on trapping.

Previous Conservation Work/Poaching...

Another set of regulations for the protection of wild animals was brought into force in 1931, attempting to ban the trade in rhinoceros products. These regulations remained in force after Indonesia gained Independence in 1949, but the poaching still did not stop.

Schenkel says that 16 rhinoceros were poached just between 1935 and 1936; other reports suggested another 20-25 taken during 1937, and in 1939, one European hunter took a cow with her calf.

The shock of this latter outrage did however lead to intensified patrolling of the Ujung Kulon area. Ironically, the Japanese Occupation stabilised the situation somewhat, since the penalties for carrying firearms or ammunition were so severe at this time, and the opportunities for international trade restricted.

Perhaps a total of about 42 animals were taken between 1930 and 1970. In a group as small as at Ujung Kulon, poachers may take more animals than can be replaced by natural population increase. The Ujung Kulon population was estimated at 25 in 1937 and between 30 and 35 in 1955 (Hoogerwerf, 1970). In the decade 1955-65, however, 13 rhinoceros were killed, an enormous loss to a group numbering less than 50.

Previous Conservation Work/Poaching...

By 1967, the world population of Javan rhinoceroses totalled only 25, all of them at Ujung Kulon. Thanks to concerted efforts on the part of Professor Schenkel, Prof R. Geigy and WWF, and the Indonesian guards, poaching has since 1967 been virtually eliminated, except for isolated cases in 1969 and again in 1983 and in 1987.

Since 1967, the World Wildlife Fund (WWF) and the International Union for the Conservation of Nature and Natural Resources (IUCN) have been helping the Indonesian government with the protection of Ujung Kulon, encouraging the provision and training of more guards and the organisation of regular scientific expeditions to monitor the number and state of the animals in the reserve.

Some of the assistance rendered has been very basic but very effective, such as the provision of patrol boats and vehicles. The Schenkels found that even a new uniform, shoes and hats raised the spirits of the guards, significantly improving their effectiveness.

Geographical Range...

The Javan rhinoceros was still common in western and central Java in the nineteenth century, especially in high or sparsely populated regions, although it was also found in the plains of the southern part of the island until the 1920s. The last specimens from the northern plains were recorded in 1910 and 1912.

Physical Characteristics:

The Javan rhinoceros is similar in size to its Indian relative, but is more lightly built, with a smaller head. The average height at the animal's shoulder is about 160 centimetres and body-length, including the approximately 70-centimetre long head, about 300 centimetres.

The thick, dark grey skin is segmented by deep folds, with those on the neck meeting on top to form a distinctive "saddle" on the front of the shoulder. This folded skin is one reason for the armoured appearance of both the Javan and the Indian rhinoceros. Another is the embossed, nodular quality of the Javan species' skin.

This characteristic, together with the Javan rhinoceros' virtually hairless hide easily distinguishes it from the smaller, hairier, Sumatran rhinoceros.

The single horn of the male Javan rhinoceros reaches an average length of 20 centimetres, with the longest on record measuring only 27 centimetres. Females often have no horn at all, or only a very small, almost vestigial, one.

Physical Characteristics...

The Javan rhinoceros, like the Sumatran, is armed with more formidable incisors than the African rhinoceros, much valued by the Javanese for various pseudo-magical and medical purposes.

The broad, almost circular, flat feet bear three toes each, rather larger than those of the Sumatran rhinoceros. Prater (1939) stated that both the Indian and the Javan rhinoceros have foot glands embedded in the integument of the feet, scent glands which the Sumatran rhinoceros does not appear to possess.

The Javan rhinoceros' feet bear short toes, compared with the Sumatran's more elongated, almost claw-like toes: the Javan species may not be so well adapted to climbing.

Habitat:

Ujung Kulon is now the only habitat of relevance to study of the Javan rhinoceros. Only part of the Ujung Kulon park is suitable for rhinoceros, and now they seem to prefer the lower forest zones along the coast, including swamps, to the rolling hills further inland.

Thickets of vegetation - rattan, bamboo and mangrove, amongst others - make access difficult for humans, but the rhinoceros apparently find it relatively easy to manoeuvre their way at surprising speed through even the thickest of scrub, and the roughest of terrain.

The best possible habitat for a Javan rhinoceros appears to be "a mosaic of glades interspersed with patches of forest," as Hartmann Amman of Basel University has put it (1985). Ujung Kulon fits this bill perfectly.

Behaviour/Feeding:

Over 190 plant species from 61 families have been identified among the animal's food, 179 of them dicotyledones, only 11 of them monocots, from rattan and pandanus palms to young bamboos, mangoes and figs.

Contrary to early supposition, there is no evidence of the animal's eating grasses. The four principal species eaten, 44 per cent of the total, are : Spondia pinnata, an herbaceous Amomum sp., Leea sambucina and Dillenia excelsa. The rhinoceros prefers open-space and secondary vegetation.

The animal uses its neck and head to force down attractive foliage, and sometimes also its horn to twist branches, seizing foliage with its prehensile upper lip.

The rhinoceros constantly changes its foodplants through a very diverse range of choices, eating mainly the highly nutritious young parts.

Behaviour/Territory and Range:

Like the Sumatran rhinoceros, the Javan is a retiring, solitary wanderer, although it does not range quite so far afield, resulting in greater concentrations of the Javan species than is usual for the Sumatran.

An animal's home range is not a permanent, life-time thing and may shift according to changing circumstances. A Javan rhinoceros may travel a maximum 15 to 20 kilometres in a single day, but will also restrict itself to a much smaller patch if feeding conditions are attractive, for as long as three weeks at a time.

While female territories overlap each other quite a lot, male ones do so only a little, at their periphery, since males seem to be quite intolerant of each other - although Hoogerwerf has reported instances of two bulls wallowing together.

A typical male's territory may range from 12.5 to 21 square kilometres, while the female will range over only 2.6 to 13.4 square kilometres.

Behaviour/ Territory and Range...

The rhinoceros travels along a not always continuous network of trails, often linking wallows and pools or river courses, in which the animal has been seen swimming.

The Javan rhinoceros seems more likely to opt for the easiest route than its Sumatran relative, detouring dense vegetation or steep slopes, another indication of the greater adaptation to lowlands already mentioned.

Behaviour/Communication:

Communication amongst the rhinoceroses is mainly olfactory, particularly through urine traces. The odour of rhinoceros urine squirted high on the vegetation is noticeable even to human beings.

Common piles of pungent-smelling faeces deposited by more than one animal at one apparently regular spot, usually beside a trail, or even in running water, are another olfactory means of communication or advertisement of the rhinoceros presence.

Behaviour/Communication...

Vocal communication is rare. However, the rhinoceros has been observed to "neigh" (a high blowing whistle), often on scenting a female, "bleat" (mostly cow-calf communication), snort explosively or even shriek when disturbed, and to indulge in lip vibration while feeding, this latter being more comfort behaviour than true communication.

The animal's loud roars, probably uttered when wounded or fighting as well as during the male's rut, have been compared to the trumpeting of elephants.

Behaviour/Reproduction:

Like many other aspects of the Javan rhinoceros' life cycle, its behaviour when mating is little known and needs more study.

Estimates so far suggest that females are sexually mature when they are five or six years old, males when they are six. The male apparently traces and follows the scent of a female in heat, but it is still not certain how long a mating pair stays together - perhaps only about four days.

The males are generally aggressive during their rut, which is sporadic and does not seem to follow any set season. They appear to indulge in a fairly prolonged "courtship" of the female, following her for some time and also to preface mating with a fight, accompanied by loud roaring.

Behaviour/Reproduction...

Both the period of gestation for the Javan rhinoceros, and the length of time a calf remains with its mother are uncertain, although the calf is said to be slow in maturing, staying with its mother until it is nearly adult. Some observers estimate gestation at about 16 months and the cow-calf relationship at about two years (Plage, National Geographic, June 1985).

UJUNG KULON NATIONAL PARK

Location and General Environment/Physical Features:

The 30,000-hectare Ujong Kulon National Park is a virtual island on the western-most tip of Java, a peninsula connected to the main island only by an extremely narrow isthmus.

The park is best reached from the fishing village of Labuan, population about 30,000, on the west coast of Java, about five hours' drive from Jakarta. There is also the option of (expensive) helicopter hire to land on Pulau Peucang, where a basic guesthouse without catering facilities can accommodate up to 20 people, complementing another such guesthouse for only eight people, on Pulau Handeuleum on the east coast of Ujung Kulon.

Location and General Environment/Physical Features...

The peninsula consists of raised sediments of Miocene age, its central and eastern portion composed of limestone, with the 500-metre Gunung Payung massif originating from classic sediments (tufa and sandstone). It is most mountainous to the west.

Tanjung Layar, the lighthouse, is on the north-western extremity of the peninsula, claimed as the westernmost point of Java. There are traces of coal in the sandstones and tufas of this area.

The two largest rivers in the park are the Cikarang and the Cigenter.

There are two islands to the north of the peninsula: Pulau Peucang (441 hectares) and Pulau Panaitan (12,034 hectares).

Pulau Peucang, marked by precipitous limestone cliffs on its northernmost point, is separated from the Ujung Kulon peninsula by a narrow 500-metre channel, a 10-minute crossing. The boundaries of the park generally extend seaward for 500 metres to include magnificent coral reefs teeming with life; the sands of Pulau Peucang are dead-coral sands.

Location and General Environment/Physical Features...

The park has a typical tropical maritime climate, with a mean annual rainfall of about 3,140 millimetres. The average temperature is 25 to 30 degrees Centigrade, with 80-90 per cent humidity. The wettest season, the north-west monsoonal period, lasts from October to April, but even in the driest season, from May to September, over 100 millimetres of rain falls monthly.

As the park lies between the Indian Ocean and the Sunda Straits, it is very exposed to the strong westerly winds and occasional storms between December and March, which can make boat travel very difficult.

History:

Ujung Kulon was once a hunter's paradise where Javan rhinoceros had been known to be present as far back as 1861. The area, including the island, Pulau Panaitan, was first declared a nature reserve, a "Nature Monument," in 1921.

The reserve was turned into a "game sanctuary" in 1937, allowing controlled exploitation, partly to raise the funds for better protection - the same year saw the first attempts to post guards on the area. This area added the small islands of Pulau Peucang and Pulau Handeuleum.

History...

To this area was added the mountainous Gunung Honje region, to the east, in 1967.

After World War II, the embryonic nation of Indonesia had other, largely political, concerns to distract it from wildlife conservation issues, and was also too poor to implement even the measures clearly desired by the authorities.

In 1977, however, a management plan was drawn up by an FAO group (Blower and Van der Zon, 1977), preparatory to the designation of the area as a full national park in 1980, with its boundaries extended to include the Krakatau archipelago.

Vegetation:

Though this is one of the largest remaining areas of natural forest in Java, it has been exposed to a variety of human and other influences such as the Krakatau volcanic eruption in 1883, all of which have left their traces, particularly in terms of its vegetation profile. Prior to 1883, the area was relatively heavily cultivated by the residents of several villages, being an indiarubber export centre amongst other things.

Vegetation...

The 1883 Krakatau eruption was one of the greatest in recorded history, being heard over 4,000 kilometres away and darkening the surrounding skies for nearly two days. Huge tidal waves killed over 36,000 people, sweeping over the park area at a height of 12-15 metres and devastating the forest.

Only about half the area's forest today can be considered primary and this is limited to the upper slopes of Gunung Payung mountain (500 metres); forest regeneration has possibly been inhibited by a deep layer of volcanic ash over the original cultivated areas. The resulting open areas, with small plants and saplings, are perfect Javan rhinoceros feeding centres.

The largely semi-deciduous forest (except for the evergreen south-west), especially on the peninsula and on the island of Panaitan, is characterised by an abundance of palms of many species, with a closed canopy of 10-15 metres' height. Among the commonest palm species are Arenga obtusifolia or "langkap", and Arenga pinnata, besides others like Areca sp.

The middle canopy is mostly Ardisia humilis. Secondary growth features include an abundance of Zingiberaceae, Araceae, the tuberous Colocasia esculenta or "talas Bogor", and the pink-flowered Lagerstroemia speciosa or "bungur," are also found, as well as three species of climbers are found, including rotans or Calamus spp.

Vegetation...

The west side of Pulau Peucang features a densely wooded shoreline dominated by Barringtonia asiatica.

It seems that some parts of Peucang were not affected by the Krakatau volcano explosion in 1883.

Other common vegetation includes the small pandanus tree Pandanuas tectorius, found chiefly on exposed sites such as those on the west coast of Ujung Kulon and on Pulau Panaitan. Pandanus vegetation is also found on the south coast near the mouth of the Citadahan river.

In view of the scarcity of mangrove in Java today, the extensive stands along the northern coast of the Ujung Kulon peninsula, and on some coasts of Pulau Panaitan, are particularly valuable.

Fauna:

The animal of greatest interest to this paper, besides the rhinoceros itself, probably is the banteng or Javanese wild cattle (Bos javanicus). In Ujung Kulon, four clearings totalling 64 hectares - three on the north-west coast near Pulau Peucang, and one on the east coast - are artificially maintained by periodic clearance as grazing grounds for these cattle.

There were thought to be approximately 200 of these animals in this area in 1969/71. The total Java population is estimated at 2,000 however, and the majority of these live either in Ujung Kulon or in the Baluran reserve. The 18-hectare grazing area of Cijungkulon is a few hundred metres from the Ujung Kulon coast; it features a watch-tower, a prime wildlife-watching viewpoint for tourists.

Also common in the park are wild boar (Sus scrofa) and pig (Sus verrucosus) - the latter occurs only on the peninsula and around Gunung Honje. The lesser mouse-deer or chevrotain, Tragulus javanicus, is also present. The trees harbour the slow loris, Nycticebus coucang, the common flying fox, Pteropus vampyrus, the yellow palm civet, Arctogalidia trivirgata, and the Javan or silver gibbon, Hylobates moloch. Leopard tracks (Panthera pardus) are commonly sighted, but the largest predator, the tiger, has not been seen since 1964.

Fauna...

The monitor lizard Varanus salvator is commonly found in the mangroves. Python reticulatus is a resident. Estuarine crocodiles (Crocodilus porosus) can often be seen, especially up the Ciganter river on the east coast of the peninsula.

The "labi-labi" tortoise, Cuora amboinensis, is also a common, semi-aquatic, species, fetching high prices as food on the local markets, especially amongst the Chinese.

The southern Citadahan beach is a nesting site for the green sea turtle (Chelonia mydas), one of the five highly endangered sea turtle species recorded in Indonesia. Egg-plundering by human beings occurs even in remote Ujung Kulon.

The beaches are also home to hermit crabs (Pagurus sp.), rock lobsters (Palinurus sp.), and mudskippers (Periophthalmus spp.)

Some 250 species of avifauna have been recorded in the park, including the peafowl Pavo muticus, the jungle fowl Gallus gallus and Gallus varius, the green imperial pigeon Ducula aenea, the southern pied hornbill Anthracoceros convexus and two species of bee-eater, Merops viridis and Merops leschenaulti.

Fauna...

Boobies (Sulidae) and terns (Laridae) are commonly found along the coasts, especially at Tanjung Layar. Coastal species include the great thick knee, Esacus magnirostris, the common sandpiper, Actitis hypoleucos, and the white-bellied sea-eagle, Haliaeetus leucogaster.

The Javan Rhinoceros in Ujung Kulon:

Since 1935, the park has been the Javan rhinoceros' last refuge. The estimated population has boomed from the 12-14 reported by Talbot (1960) in 1958, to 21-28 in 1967 (Schenkel & Schenkel-Hulliger, 1969), through 44-52 in 1977 (PHPA - Directorate General of Forest Protection and Nature Conservation, Indonesia), to 50-54 in 1984 (Haerudin, Fakultas Biologi Universitas Nasional).

A 1984 census (of 147 Javan rhinoceros tracks) carried out by the Fakultas Biologi Universitas Nasional of Indonesia (Haerudin R. Sadjudin, 1986), funded by the Sub Bali Kawasan Pelestarian Alam Ujung Kulon, showed uneven distribution of Javan rhinoceroses within the park, but a happy preponderance of young adults (74.83 per cent of tracks), and the presence of three newly weaned calves.

The Javan Rhinoceros in Ujung Kulon...

The Sadjudin report foresaw a potentially high birth rate as the natural consequence of these data, although the study by Sadjudin and Djaja (1984) had reported that the reproduction rate among the Javan rhinoceroses in Ujung Kulon was low for 1980-83, at an estimated 3.08-4.59 per cent.

The Sadjudin report of 1984 found the biggest Javan rhinoceros population concentration in the central part of the peninsula. West of the Gunung Payang complex to the tip of Tanjung Layar, very few tracks were found. However, the animals seemed to have begun to return to the Karang Ranjang area, where the five mysteriously dead rhinoceroses were found in 1982, an area they had previously avoided since that mishap.

AN ANALYSIS OF THE OPTIONS FOR THE CONSERVATION OF THE JAVAN RHINOCEROS

Introduction:

Although all are agreed on the urgency of the matter, opinions have varied sharply on exactly how to conserve the Javan rhinoceros. The animal's rarity does not permit dangerous experimentation; any deaths at all would be unacceptable in so small a population.

This paper proposes a combination of in situ conservation with captive breeding on Pulau Panaitan, outside of the Ujung Kulon peninsula. This would lead later to further captive-breeding of the resulting progeny in zoos, in Indonesia and abroad.

However, the Pulau Panaitan project can only go ahead providing a preliminary survey of Ujung Kulon reveals a population strength which can withstand such a programme.

As with the Sumatran rhinoceros operation, transfer of both technology and funds to the host country, Indonesia, would be an integral part of the conservation plan.

Introduction...

Finally, it goes without saying that we must never lose sight of our ultimate objective: the re-introduction of the species into the wild. It may also be possible in the long run to establish a second natural population on Pulau Panaitan, whether through translocation from Ujung Kulon, or through rehabilitation of the progeny resulting from captive breeding.

First however, let us review the total spectrum of conservation options.

These are:

* In situ conservation with management of the habitat, patrolling, improved ranger conditions etc.
* Natural fenced/patrolled "gene-pool" area.
* Translocation to another park.
* Translocation to Pulau Panaitan.
* Captive breeding on Pulau Panaitan and at zoos.

In situ conservation:

In the aftermath of the mysterious deaths of five Javan rhinoceros at Ujung Kulon in 1982, Professor Rudolf Schenkel made some excellent recommendations on future management, aimed at avoiding a recurrence of this tragedy and increasing the park's carrying capacity.

In situ conservation...

In summary, these were:

* Careful monitoring and censusing of the rhinoceros both during the dry and during the wet seasons;

* Drafting of a detailed vegetation map of the area, paying special attention to the rhinoceros' foodplants;

* Deliberate vegetation management so as to encourage growth of the rhinoceros's preferred foodplant environment - open unshaded areas with saplings and bushes etc. This would mean the cutting back of certain palms etc.

* Control of the banteng population, but only if further studies prove the animal is in competition with the rhinoceros;

* Translocation of about 10 rhinoceros to a second location, perhaps in southern Sumatra, to start a second viable population. This measure only to be embarked upon when the Ujung Kulon population had recovered from the effects of the 1982 disease and begun to reproduce again.

Professor Schenkel felt quite strongly that any conservation programme for the Javan rhinoceros also needed to address the factor of working conditions for the Indonesian rangers and guards assigned to protect the rhinoceros.

He felt they needed field allowances to enhance their salaries, better clothing and equipment, better medical care and better training, for example on how to collect blood and tissue samples during any emergency like the 1982 epidemic.

In-situ conservation...

Professor Schenkel however, was generally opposed to captive breeding, treating it as an undesirable alternative to in situ conservation.

It should be noted that in situ conservation is not by any means an infallible method in management terms. The element of habitat management, or alteration, in the rhinoceros' favour, for example, poses the problem ofinterference with the larger eco-system.

We see in situ conservation and captive breeding as being of equal priority, as well as complementary to one another.

In situ conservation as outlined by Schenkel will however undoubtedly be expensive - one estimate has put the recurrent annual cost of poaching control and forest management alone at US$70,000. However, it is intended that a Foundation for the Conservation of the Sumatran and Javan Rhinoceros be set up, headquartered in Singapore, to spearhead fundraising for in situ conservation. We outline further details of how this Foundation would function at the end of this paper.

In situ conservation...

Simultaneously with the move to promote in situ conservation, captive breeding should commence as soon as feasible, applying the lessons already learned in the current Sumatran Rhinoceros Capture Operation. This view was duly endorsed at the Asian Rhino Action Plan Meeting in Kuala Lumpur, October 1987. The detailed proposal for captive breeding (on Pulau Panaitan) is discussed later in this paper.

Natural fenced/patrolled "gene-pool" area:

This is a better idea on paper than in practice. It premises an area of natural habitat in which the rhinoceros can breed safely and naturally, undisturbed by men, and largely un-managed. However, the area would be fenced in and heavily protected with regular ranger patrols.

The definition of "gene-pool" so far has been vague. If the area envisaged is too small, say, only a few thousand hectares, it really becomes little better than a large and badly managed zoo enclosure. If much larger, it would be a desirable concept, but extremely difficult to fund for proper patrolling and fencing. Monitoring of the animals' condition would similarly be very difficult.

Translocation to another park:

Translocation is inherently risky - rhinoceros, despite their apparent bulk, are extremely delicate, and sensitive to transportation.

This is also an expensive method of conservation, difficult to fund.

Furthermore, the site chosen for translocation must be free from diseases or predators unfamiliar to the translocated animal, and from ecological-niche competitors, not to mention poachers or hostile villagers. The habitat, including foodplants, must also be exactly similar to that of the animal's home range.

Two areas have been suggested for possible translocation of about five pairs of Javan rhinoceros: Way Kambas Game Reserve in southern Sumatra (130,000 hectares), where the Javan rhinoceros became extinct only in 1961, or Pulau Panaitan (12,034 hectares), an island off the Ujung Kulon peninsula.

Way Kambas however, situated in Lampung, one of Sumatra's most densely populated provinces, is not secure from poaching.

Translocation to another park...

Furthermore, since the disappearance of the rhinoceros there, the habitat has been logged indiscriminately, converting it to scrub, bush and Imperata cylindrica or "alang alang " grasslands. However, some of the Javan rhinoceros' foodplants survive there and the rhinoceros is known to do well in secondary and logged forests.

Translocation to Pulau Panaitan

Pulau Panaitan is an uninhabited island off the Ujung Kulon peninsula. The island is itself about one-third the size of the park, at 12,034 hectares, suitable for a population of about 12 rhinoceros.

The plan to use the island for the rhinoceros is attractive for several reasons. First, it minimises transportation of and therefore disturbance of the rhinoceros, maintaining it in a familiar habitat and climate, with its normal foodplants easily available.

Second, it is much cheaper in money terms and in terms of manpower.

Third, it obviates the problem of hurt national pride involved when transporting animals to foreign facilities.

Translocation to Pulau Panaitan...

Being an island, Pulau Panaitan offers itself as a safe haven from intruders which could easily be guarded and protected, without the huge expense of a fence. Manpower costs, at least in terms of the numbers needed if not of the quality, could be reduced.

The dangers of disease, possibly imported from the peninsula, and volcanic eruption, however still remain in the case of Pulau Panaitan. Possible adverse impact on the Ujung Kulon source population's breeding capacity through removal of some breeding pairs would again have to be considered.

Captive breeding on Pulau Panaitan:

All the factors discussed above in connection with translocation to Pulau Panaitan, including the many advantages of the island as a location, once again apply in the case of our proposal to captive breed on the island. This is the option we propose to adopt.

Captive breeding on Pulau Panaitan...

The idea of captive breeding on Pulau Panaitan as envisaged by the authors of this paper, incorporates a plan to take progeny for captive-breeding in zoos, in Indonesia and overseas. This avoids the danger of reducing the total source population through accidents, a danger certainly implied in outright removal for captive-breeding in zoos from the outset. The source population should remain stable; only the new progeny would be risked.

We believe captive breeding to be safer than any other conservation option, from the point of view of monitoring disease, poaching and territorial competition, amongst other likely problems.

Captive breeding also allows closer observation so that valuable data on the animals' habits can be gathered for application to better management of populations still in the wild.

When captive breeding is done in the animal's home country, as it would be in the case of Pulau Panaitan, in consultation with foreign experts, there is also the benefit of "technology transfer" to local zoo directors, keepers, veterinarians etc.

Captive breeding on Pulau Panaitan...

We would recommend that the zoos to be considered for captive breeding of the Pulau Panaitan facility's progeny should include those at Jakarta in Indonesia, Malacca in Malaysia, Howletts and Port Lympne in England and member zoos of the American Association of Zoological Parks and Aquariums.

PULAU PANAITAN - PROPOSED LOCATION FOR CAPTIVE BREEDING

Physical features:

The island is mostly lowland, Gunung Raksa being the highest peak, at 320 metres, making up a hilly area to the south-east together with Gunung Tajimalela.

The eastern coast is mostly mangrove swamp, with beaches and coral rocks. There is a large bay semi-enclosed by two projecting "arms" of land to the south-west, the Kasuaris area. The terrain is hilly, up to 100 metres, on the eastern side of Kasuaris Bay.

There are two major rivers, the Cirarashas and the Cidarhayu.

javan rhinoceros

History:

An ancient site on Gunung Raksa mountain featuring a statue of the Hindu elephant-faced god, Ganesh, testifies to the presence of an early Hindu culture on the island. In the eighteeenth century, the island was used by the Sultan of Bantam as a place to exile enemies. In 1883, the Krakatau volcanic eruption killed all the inhabitants and the island has remained unpopulated since then. From 1921, the island was included in the Ujung Kulon nature reserve area.

Vegetation:

Most of the island's vegetation is secondary, except for the higher parts where the mature forest of the past, featuring fig trees etc, can still be seen.

Beach forest, mangrove, fresh-water swamp forest and rainforest are all present on the island. The Sabini area also features abundant coconut palms along a sandy beach.

Fauna:

Hoogerwerf (1953) has recorded about 72 species of birds, some of them protected: Egretta sacra; E. alba; Haliaetus leucogaster; Pandion haliaetus; Falco peregrinus; Halcyon cyanoventris; Pelargopsis capensis; Numenius phaeopus; Rhipidura javanica; Anthreptes malacensis.

Fauna...

Of the mammals, the most interesting are: Muntiacus muntjak; Tragulus javanicus; Ratufa bicolor; Macaca fascicularis; Collosciurus notatus and Sus scrofa.

The PHPA has translocated 16 "rusa" deer from Peucang island to Panaitan since 1978.

Monitor lizards, turtles and bats are other animals which have been observed on the island.

The waters around the island are biologically rich, especially around the coral reefs. Schools of dolphins have been seen swimming along the northern and eastern coasts.

Current management:

Since January 1985, there has been a ranger post with nine personnel at the Anggasa area of the island, to the far south-east - "Pos Butun". Previously, the nearest post had been on Peucang island.

The management plan for Ujung Kulon National Park has proposed that Panaitan remain a wilderness zone, with ranger posts at Semadang (far south) and Kadam (far north) on the island. There is already a semi-derelict ranger facility at Kadam, first built in 1983 but never manned since then.

Current management...

The Anggasa facility, about 100 metres from the beach, consists of two buildings and one shelter. One building is used as the Panaitan headquarters office and chief ranger's quarters, while the other accommodates the eight other personnel in three rooms - there usually are two or three of these staff away on leave at any one time. There is no specific job description for each of these staff.

Facilities are minimal. A manual water pump has been installed about 100 metres inland to provide a water supply.

For transportation, there is a six-metre long wooden boat powered by a 40-HP Johnson engine.

For patrolling the island, the only inland trail is a three-kilometre track cut up the western side of the island. Most patrolling is done along the coasts.

Human intrusions:

There are no boundary poles or warning signboards around the island to mark the official boundary of the island, which extends for 500 metres beyond the island's low tide mark.

There is a history of illegal timber logging along the southern and eastern coasts, by loggers using small boats.

Human intrusions...

Illegal fishing, mostly for lobsters and crabs, is also a problem. Fishermen habitually camp along the coast. Most serious is the incidence of dynamite fishing, usually conducted under cover of night. There have been cases of rangers being attacked by such night-fishermen. Their activity has already destroyed significant stretches of coral reef.

Past proposals for the island have suggested tourism development. Tourism to Ujung Kulon generally, both to the peninsula and to Peucang island, has been growing gradually but steadily during the 1980s, reaching 2,055 people in 1984. Of these, 678 were foreign tourists, 1,377 Indonesian.

Tourism development proposals for Panaitan have envisaged an air strip in the Anggasa area, besides an all-weather motor boat which would require a permanent jetty at Anggasa. Tourism would also entail more extensive trail-cutting than before, camping grounds, a guest-house and sanitation etc.

Need for surveys...

These cameras, with built-in flash, should be positioned on known rhinoceros trails at several locations within the Ujung Kulon park. Professional wildlife photographer Alain Compost, who is based in Indonesia, has already confirmed that he is available to install the cameras and indeed he himself has already obtained striking photos of leopards, tigers etc using this method.

A couple of rangers can check the cameras every few days. The whole operation will require only a few months and will not be disturbing to the rhinoceros.

Further work also needs to be done on the banteng present in Ujung Kulon and the exact nature of their competition with the Javan rhinoceros, if any. Similarly, more careful records should be kept of other wildlife in the park, and studies should be conducted on the availability of rhinoceros foodplants.

Analysis of surveys:

The analysis of the population census survey will be crucial to the captive breeding project on Panaitan. If the Javan rhinoceros prove to number only up to 30, i.e. only one rhinoceros per 1000 hectares, the Panaitan project cannot proceed; strong measures would then have to be taken to enhance in situ conservation until the population reaches at least 50 animals.

Analysis of surveys...

If the population is estimated at about 50, 15 per cent could then be safely moved to Panaitan.

Should the population exceed 50, which would indicate that the park has greater carrying capacity than previously expected, then 10 per cent should be moved to Panaitan.

The sex ratio of the source population on the peninsula should ideally be 1:1, but 1:2 in favour of females would also be acceptable as a precondition for the move to Panaitan.

The captive population ideally should be three or four unrelated pairs.

Proposed capture method:

Once the preliminary surveys have been completed, capture can commence. The capture operation should probably be concentrated along the eastern fringes of the Ujung Kulon National Park, where poachers and disease are a more likely threat to the animals, thus leaving the core area's population as undisturbed as possible.

Perhaps the most valuable lesson learned from the Sumatran rhinoceros capture operation, is that the pit trap, while dangerously susceptible to flooding during monsoonal rains, is less stressful than the stockade type, perhaps because it is darker and movement is more restricted inside it.

Proposed capture method...

One female rhinoceros was lost during the Sumatran operation when she panicked in an open stockade trap only hours after capture and injured herself by throwing herself against the fencing, inducing a fatal cerebral haemorrhage.

An important adaptation of the pit trap, used successfully in the Sumatran rhinoceros capture operation, is the addition of a sliding-ramp which can tip the rhinoceros gently into the pit, avoiding a sharp drop which could injure the animal (as appears to have happened recently in the case of one Sumatran rhinoceros fatality in Sabah, Malaysia).

However, once caught in a pit trap, the animal must be moved to a holding pen nearby as soon as possible.

For obvious reasons, the use of local trees for the construction of the holding pens and traps should be avoided. Carrying in the necessary poles from outside the park might be difficult, or expensive, but hopefully, pre-fabricated, removeable wood panels can be used for the operation.

Captive breeding and management methods :

Steps will have to be taken to enhance the rhinoceros' chances of survival and breeding on Pulau Panaitan.

It will be necessary to conduct a survey of natural physical resources on the island - water, foodplants etc.

In addition, careful patrolling inland and offshore, improved rangers' facilities, new trails and also warning signboards around the island boundary will be particularly important.

New facilities will have to be constructed for captive breeding. Initially, the basic minimum will be one animal-house connected with four naturally landscaped enclosures of at least one hectare each, together with simple base-camp facilities for the project personnel (see attached plan).

A very important and potentially more expensive facility at the captive breeding facility would be a laboratory which could perform speedy and scientific analysis of any medical problems which might arise amongst the captive rhinoceros, besides conducting ongoing general research.

As with the Sumatran rhinoceros, it is expected that the Javan species will require a long period of acclimatisation in the wild, virtually at the capture site itself, of at least two months following capture.

Captive breeding and management methods...

Similarly, any move from the capture site to the Pulau Panaitan captive breeding facility, or any transportation to zoos outside of Ujung Kulon should be preceded by careful and lengthy acclimatisation.

Diet during captivity should be a mixture of local foliage, gradually integrated to a slowly increasing extent with alfalfa hay, selected vegetables and fruit, and concentrate feed pellets.

Manpower/Personnel:

As far as possible, it would be advisable to use the same personnel who have staffed the Sumatran rhinoceros project, since they already have valuable experience of this similar operation.

There should also be a full-time veterinarian and keeper from overseas on the spot at the captive breeding facility. They will not only ensure the health of the rhinoceros, but also see that meaningful technology-transfer to the Indonesian personnel actually takes place.

The Sumatran rhinoceros capture operation experience has taught that it is imperative to have proper veterinarian expertise on the spot.

Public Relations/Tourism:

Public relations is important, both in Indonesia and worldwide, and not only for fundraising purposes, but also for conservation itself to succeed. Every effort should be made to increase public awareness of the rhinoceros' plight, by publishing press articles, leaflets, posters, books, photos and films etc.

The dissemination of research information to the scientific community is another important semi-public relations dimension of pioneering projects like the proposed captive breeding of the Javan rhinoceros.

Once the rhino breeding project has been safely established, with some progeny already sent to zoos, tourism promotion on environmentally benevolent lines, as exemplified by "Tiger Tops" in Nepal, is a possible future option which should be considered.

Tourism is good for public relations. It can be an important means of giving governments and their people a stake in the preservation of wildlife and habitats, as well as enhancing public education. Naturally, tourism would also have fundraising or revenue-earning potential.

Budget/Funding:

A major source of funds will be Howletts & Port Lympne Zoo Parks of England, and the AAZPA zoos, which expect to be recipients of the Pulau Panaitan project progeny.

Providing publicity is well managed, we do not anticipate serious problems with raising donations from commercial sponsors, particularly for in situ conservation. An important channel for such donations will be a new body which is

The Foundation for the Conservation of the Sumatran and Javan Rhinoceros.

This foundation is to be established and run as a charitable trust, hopefully with tax exemption both for its own "income" and for that of donors wishing to give sums of money to the centre.

Interested individuals and institutions should also be a source of funds. Once again, to arouse public interest sufficiently to stimulate donations, publicity will be important.

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