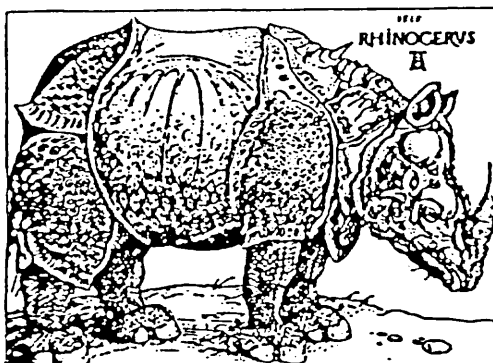


CONSERVATION AND MANAGEMENT OF RHINOS IN INDONESIA

1. Javan Rhino (*Rhinoceros sondaicus*)

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For Nature

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1.0 Introduction

Prehistorically, as many as 30 genera of rhinoceros may have roamed the world (Nowak & Paradiso 1983). But today there are only four genera and five species left: three species in Asia and two in Africa. Of the three species of rhinos that are extant in Asia, two occur in Indonesia, viz. the Javan or Lesser One-horned Rhino (Rhinoceros sondaicus) and the Sumatran or Two-horned Rhino (Dicerorhinus sumatrensis). Both are in conflict with man and are among the species of large mammals that are most seriously endangered in Indonesia. Because of the high price of rhino horn on the international market, the rhinos in Indonesia like their cousins throughout Asia and Africa are currently suffering from drastic reduction in numbers through illegal hunting. The Javan rhino in Ujung Kulon National Park at the southwestern tip of Java (Fig. 1) finds itself with its back against the wall. It is on the verge of extinction on account of its small number, localised distribution, and vulnerability to poaching, disease and environmental disturbance such as volcanic eruption. The Sumatran rhino although more widely distributed in Sumatra and perhaps found in Kalimantan as well is nevertheless threatened by a combination of indiscriminate deforestation and poaching. Both species are among those animals legally protected in Indonesia. However, legislation and statutory provisions to protect the two species of the rhino and the reservation of their habitats alone have not been sufficient to prevent them from being on the verge of extinction in the absence of strong protection and surveillance of their habitats. Therefore the most urgent conservation measure is to ensure that the rhino habitats are adequately guarded. This as Hoogerwerf (1970) points out, is a sine qua non for saving the rhinos from becoming extinct.

2.0 Species Account: Javan rhino

Of all the species of rhinos in the world, it is the Javan rhino that is in the most precarious situation (Sheeline 1987). There are only two known populations: one in Indonesia and the other in Vietnam and the entire world population is thought to number less than 100 animals. Poaching which had extracted a heavy toll in the past is still the main threat to the Javan rhino.

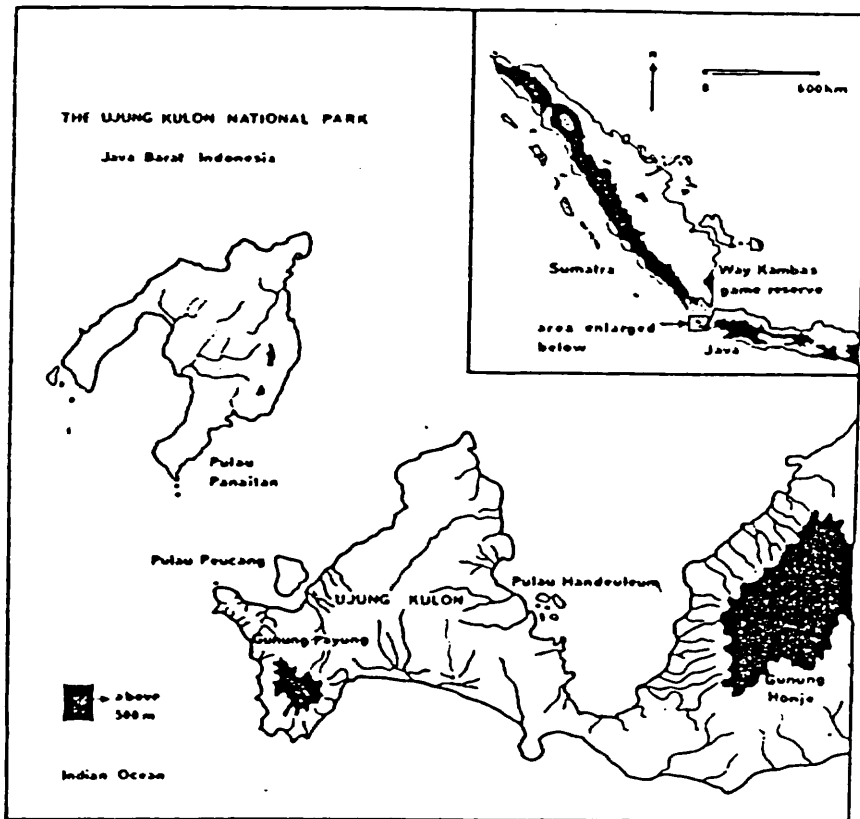


Fig. 1. Map showing the location of Ujung Kulon National Park in relation to Sumatra and Java
Source: Santiapillai & Suprahman (1986).

2.1 Distribution & Population: Historically, the Javan rhino enjoyed wide geographic distribution and good numbers in South and Southeast Asia. Until about 150 years ago, prior to the large scale modification of its habitat by man, the range of Javan rhino extended from the Assam in the west through Asia south of the Himalayas to Indochina in the east. It was known from India, Bhutan, the Sunderbans (Bangladesh), Burma, southern Thailand, peninsular Malaysia, Laos, Cambodia, Vietnam, Southwestern China, Sumatra and much of Java (Loch 1937, Sody 1959, Groves 1967, Rookmaker 1980 and Hoogerwerf 1970). The only limiting factor for its range is the availability of suitable habitats. This is perhaps the reason why its range could not extend into northern Thailand or eastern Java (Groves 1967). The habitats with the greatest potential rhino carrying capacity were the fertile flood plains in Asia. Because of the strong ecological relationship between rhinos and the floodplains, development activities on the part of man might have had an adverse impact on the rhinos from the beginning. This may perhaps explain why the Javan rhino was never recorded from central regions of Burma and Thailand in recent historical times (Ammann 1985). Today, Javan rhino is known from only two places: 1. Ujung Kulon National Park in west Java (Fig. 1) and 2. an area near the Dong Nai river in the Bao Loc District of Western Lam Dong Province about 130 km northeast of Ho Chi Minh City in Southern Vietnam (Schaller *et al.* 1989, Dang *et al.* 1990)).

During 18th century, the number of rhinos in Java were so numerous and the damage they caused to agricultural plantations so heavy that the Government of the day was forced to pay a premium of 10 crowns for every animal that was killed (Hoogerwerf 1970). In Java, until about the turn of the century, the rhino was common even in the vicinity of Jakarta in the Krawang area according to Hoogerwerf (1970) who identified south of Kediri as the most easterly point in the animal's distribution (Fig. 2). Since then the decline in the rhino's range and numbers had been dramatic. Today, perhaps only about 60 animals are estimated to occur in Ujung Kulon National Park (Santiapillai *et al.* 1990), while between 10-15 animals are likely to survive in Southern Vietnam (Anon 1989)

2.2 Reserve where Javan rhino occurs: In Indonesia the Javan rhino is found only in the Ujung Kulon National Park, which is 300 km² in extent and is situated at the southwestern tip of Java (Fig. 3). Ujung Kulon was first established as a Nature Reserve in 1921 and declared a National Park only in 1980 and has remained in the wild state ever since the eruption of the Krakatau volcano in 1883 (Santiapillai & Suprahman 1986).

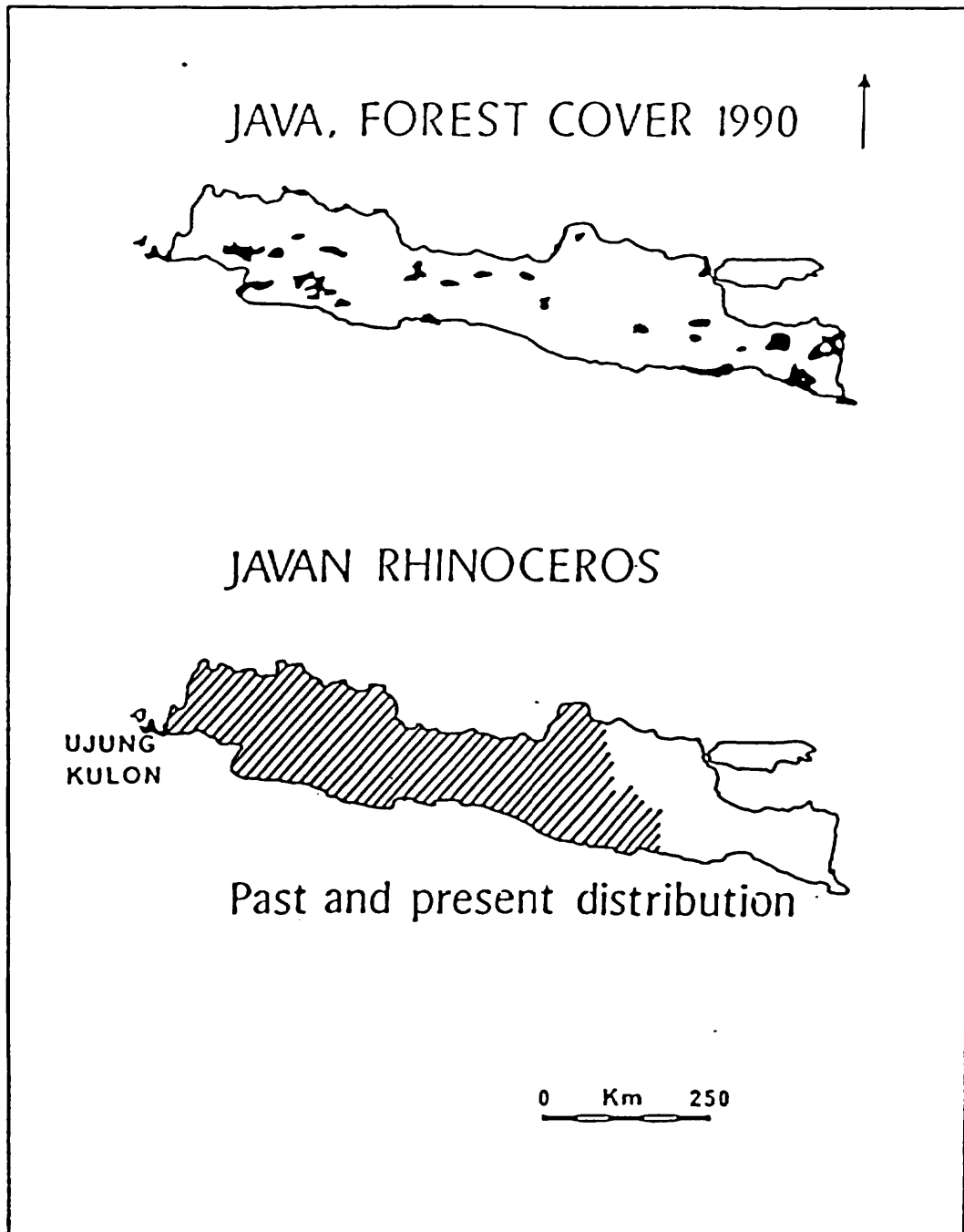


Fig. 2. Map of Java to showing:-
(a) the amount of forest cover left in 1990 and
(b) the past (cross hatched) and the present distribution
(solid shading) of Javan rhino.

Ujung Kulon peninsula is triangular in outline and is joined to the mainland by a narrow isthmus. The National Park extends from the eastern slopes of Gunung Honje in the east to the southwestern tip of Java and includes the islands of Peucang, Handeuleum and Panaitan (Fig. 1). But the rhinos inhabit mostly the peninsula and some parts of the mainland especially in the southeast. The animals have not been recorded from Gunung Honje in recent times.

2.3 Rhino habitat: The Javan rhino is essentially an animal of the lowlands in contrast to the Sumatran rhino which prefers forests at higher altitudes (Groves 1967). In the peninsula where most of the rhinos occur, the principal topographical feature is the Gunung (mountain) Payung which rises to a height of 500 m. The rest of the area is under 150 m in altitude. Rainforest occurs only on the upper slopes of Gunung Payung while on the lower slopes the vegetation is strongly dominated by one species of Palm tree namely, Arenga obtusifolia (Hommel 1987). Palms are common throughout the park while there are extensive stands of bamboo-forests and shrub vegetation characterised by a number of spiny-rattan species. As Hommel (1987) points out, the common occurrence of spiny-rattans has been largely responsible for the inaccessibility of Ujung Kulon's interior to man and thus has contributed somewhat to the survival of the rhino and other fauna to-date. In addition there are patches of grasslands: the so called grazing grounds, all of them being the result of past human impact. At the time of the Krakatau volcanic eruption in 1883, a village existed in Djungkulon just opposite the Peucang island, which is one of the well known grazing grounds in the mainland. Other human settlements were known from rivers such as Cibunar, Cigenter, Cikarang and Cibandawoh where rice was cultivated (Hommel 1987). These areas today support extensive patches of grasslands. Coastal vegetation is either mangrove in the north or dense thickets of Pandanus tectorius (Anmann 1985).

2.4 Population trends: It was only in 1910 that hunting of the rhino without a legal permit was made a criminal offence. Until then, the animal was so numerous that its killing was even encouraged by the Government. However, with the increase in human population and the availability of fire arms, the decline in both range and number of rhino in Java was rapid. By 1930, Ujung Kulon had become the only area where the Javan rhino could survive (Hoogerwerf 1970). But even then, poaching continued within the reserve unabated. Table 1 provides the number of Javan rhino that were known officially to have been killed (or reported dead) in Ujung Kulon between 1929-1967 and from 1967-1990.

Table 1. Number of Javan rhino killed (or reported dead) in Ujung Kulon between 1929-1967 and from 1967-1990

Year	Number	Authority
1929	2	Hoogerwerf (1970)
1931	3	Hoogerwerf (1970)
1932	4	Hoogerwerf (1970)
1935/36	10/15	Hoogerwerf (1970)
1939	3	Hoogerwerf (1970)
1943	1	Hoogerwerf (1970)
1946/50	5	Hoogerwerf (1970)
1955	1	Hoogerwerf (1970)
1954/64	11/13	Talbot & Talbot (1964)
1965	6	Hoogerwerf (1970)
1967	1	Hoogerwerf (1970)
1967 WWF/PHPA programme commenced to improve and strengthen the protection of Ujung Kulon NP.		
1978/80	2 (dead*)	Ammann (1985)
1981/82	5 (dead#)	Schenkel & Schenkel (1982) Haerudin <i>et al.</i> (1982)
1984/85	1	PHPA
1986/87	1	PHPA

* from old age

cause unknown (perhaps disease or poison)

It is significant to note that prior to the improvement of the protection of the nature reserve in 1967, the Javan rhino was under constant threat from poachers. On an average, in the 39 years from 1929 to 1967 one rhino was poached annually. Under improved management, the number of Javan rhino increased from about 25 in 1967 to 52 in 1980 giving an average rate of growth of 6.2% per annum (Ammann 1985). The latest estimate of the number of Javan rhino in Ujung Kulon NP is 57 (52-62) (Santiapillai *et al.* 1990). It is therefore more likely that given adequate protection and better management of the rhino habitat, the Javan rhino numbers will continue to increase in the years to come. In the past Ujung Kulon may have supported up to 100 Javan rhinos. Therefore as Hoogerwerf (1970) points out, "the most urgent measure is ensuring that the sanctuary is adequately guarded; this is a sine qua non for saving Rhinoceros sondaicus from disappearing. Only when surveillance is adequately regulated can other means of expanding the rhino population be sought".

2.5 Conservation importance of Ujung Kulon: Ujung Kulon is not only vital for the survival of the Javan rhino but it is also a habitat that supports a spectacular array of other wildlife species which will benefit directly from any effort to improve the protection and security of the park. Of the 29 species of mammals that Hoogerwerf (1970) identified as being present in Ujung Kulon (Table 2), 9 (or 31.0%) are on IUCN's (1988) Red List of Threatened Animals. These include 3 (or 10%) species that are endangered (Javan rhino, Javan gibbon and Javan leaf monkey). As far as the birds are concerned, Ujung Kulon supports about 50% of all the species known from Java (233 species out of a total of 460 birds), including the Green Peafowl (Pavo muticus) and the White Winged wood duck (Cairina scutulata) listed as Vulnerable by IUCN (1988).

Table 2. List of Mammals found in Ujung Kulon
(Source: Hoogerwerf (1970))

Common name	Scientific name	IUCN Status
1. <u>Javan rhino</u>	<u>Rhinoceros sondaicus</u>	E
2. <u>Banteng</u>	<u>Bos javanicus</u>	V
3. Rusa deer	<u>Cervus timorensis</u>	
4. Wild boar	<u>Sus scrofa</u>	
5. Mouse deer	<u>Tragulus javanicus</u>	
6. Barking deer	<u>Muntiacus muntjak</u>	
7. <u>Wild dog</u>	<u>Cuon alpinus</u>	V
8. <u>Leopard</u>	<u>Panthera pardus</u>	T
T9. <u>Javan gibbon</u>	<u>Hylobates moloch</u>	E
10. Long-tailed macaque	<u>Macaca fascicularis</u>	
11. Silvered leaf monkey	<u>Presbytis cristata</u>	
12. <u>Javan leaf monkey</u>	<u>Presbytis comata</u>	E
13. Fishing cat	<u>Felis viverrina</u>	
14. Leopard cat	<u>Felis bengalensis</u>	
15. <u>Small-toothed palm civet</u>	<u>Arctogalidia trivirgata</u>	I
16. Javan civet	<u>Viverricula malaccensis</u>	
17. Common palm civet	<u>Paradoxurus hermaphroditus</u>	
18. Bearcat	<u>Arctitis binturong</u>	
19. Javan mongoose	<u>Herpestes javanicus</u>	
20. <u>Small clawed otter</u>	<u>Aonyx cinerea</u>	K
21. <u>Hairy nose otter</u>	<u>Lutra sumatrana</u>	K
22. Giant squirrel	<u>Ratuf bicolor</u>	
23. Coconut squirrel	<u>Callosciurus notatus</u>	
24. Tree rat	<u>Rattus rattus</u>	
25. Flying lemur	<u>Cynocephalus variegatus</u>	
26. Malay tree shrew	<u>Tupaia glis</u>	
27. Javan tree shrew	<u>Tupaia javanica</u>	
28. Flying fox	<u>Pteropus vampyrus</u>	
29. Javan leaf-nosed bat	<u>Hiposideros larvatus</u>	

E = Endangered; V = Vulnerable; I = Indeterminate;
T = Threatened; and K = Insufficiently known (IUCN 1988).

At least 10 species of amphibians have been recorded in Ujung Kulon and this includes a new species of frog Kalophrynus pleurostigma not known from elsewhere in Java (Hoogerwerf 1970). At least 14 species of Reptiles are known to occur in Ujung Kulon including the Common Monitor Lizard (Varanus salvator) and two endangered species such as the Estuarine Crocodile (Crocodylus porosus) and the Green Turtle (Chelonia mydas).

Ujung Kulon National Park thus provides a refuge for not only the Javan rhino but to hundreds of other species that are being increasingly squeezed out of their habitats elsewhere in the over crowded and highly agricultural island of Java. This alone is a sound justification for safeguarding the park against any form of human encroachment and poaching.

2.6 Threats to Javan rhino: Today, the Javan rhino in Ujung Kulon faces a number of threats that range from poaching, outbreak of epidemic diseases, volcanic eruption to the deleterious effects of inbreeding given the population's small size and localised distribution.

2.6.1 Poaching: In the early 1960's, one-third of the Javan rhinos fell victim to poachers (Martin & Martin 1982). Although the incidence of poaching (reported officially) seems to have declined somewhat since 1967 in comparison to the pre-1967 situation in Ujung Kulon, poaching still remains the paramount threat to the rhinos. The park is easily accessible to poachers especially via the Handeuleum Bay and the present anti-poaching measures are not adequate. It is moreover relatively easy for single poacher to kill a rhino and remove its horn without attracting attention (Western 1982), for unlike the elephant, the rhino is rather solitary and has a smaller home range and so very easy for an experienced poacher to track it down in the forest. On the other hand, the killing of elephants for their tusks requires the co-operative help of a number of poachers. In Kenya, it was intensive poaching that was responsible for the reduction of rhino numbers to near extinction (Hillman & Martin 1979). According to the IUCN's Captive Breeding Specialist Group (CBSG), "the removal of 1 animal every 2 years is sufficient to prevent population growth and is a threat to survival of this small population" (Seal and Foose 1989). It is likely that poaching still occurs although it is not reported as a result of inadequate surveillance of the park.

2.6.2 Epidemic diseases: It is commonly acknowledged that the five rhinos that died in Ujung Kulon in 1981/82 might have succumbed to some disease such as anthrax (Schenkel & Schenkel 1982). Given the number of villages that lie around the eastern boundary of the park, disease can be transmitted from infected cattle that may stray into the park. There may be concern that low rhino numbers in the past several decades may have caused rapid loss of genetic variability and thereby making the animals less resistant to diseases.

2.6.3 Volcanic eruption: A major eruption by the Krakatau volcano as in 1883 could cause considerable damage to the rhino's habitat in Ujung Kulon and may even wipe out a substantial number of the rhino itself. Krakatau had shown some signs of renewed activity in 1982. The volcanic eruption in 1883 did some good to the rhino as well: the huge tidal waves destroyed a number of settlements that dotted along the northern coast of Ujung Kulon. Had these villages remained unaffected, the rhino might have become extinct long ago as a result of competition with man. (The danger of volcanic eruption is sometimes over played by some who advocate for the removal of some rhinos to a few Zoos in USA to ensure better protection. However, both San Diego and Los Angeles straddle the San Andreas fault and are themselves vulnerable to earthquakes!).

2.6.4 Inbreeding depression: Given its small size, the population of the Javan rhino in Ujung Kulon 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. For captive populations, as Lacy (1987) points out, "the loss of evolutionary flexibility may be especially rapid and particularly hazardous to long-term survival". Not all small populations in the wild are necessarily doomed and so must be protected wherever practicable, and not abandoned on the unproven hypothesis that genetic degeneration will set in and automatically eliminate them.

3.0 Conservation needs and action.

3.1 Statement: Given the fact that the Javan rhino is one of the world's most endangered species of large mammals and that the only population with some degree of long-term viability is to be found in the Ujung Kulon National Park in Indonesia, the WWF Indonesia Programme in close collaboration with the Directorate of Forest Protection and Nature Conservation (PHPA) of the Ministry of Forestry intends to resume its long-term commitment to support the in-situ conservation of the Javan rhino in Ujung Kulon National Park. It is a multi-year project focussing on:-

- a. the strengthening of the protection of the rhino habitat
- b. the improvement of the current guard force and its morale
- c. the regular (bi-annual) monitoring of the Javan rhino population and its trends

d. the promotion of conservation education and awareness among the people (both local and foreign).

e. the rehabilitation of a suitable natural area in Sumatra (within the former range of the species) where a second population of Javan rhino could be established should the need arise.

3.2 Pre-conditions:

3.2.1 Discuss the serious plight of the Javan rhino in Ujung Kulon NP with the PHPA and obtain a written commitment (in the form of a memorandum of understanding) from them to assist WWF in a long-term (minimum 5 years) in-situ conservation programme.

3.2.2 Appoint a competent person (preferably an expatriate Biologist from VSO or CUSO) acceptable to PHPA to be the resident project manager in Ujung Kulon for an initial period of three years.

The Project Manager will be based in Ujung Kulon and will work in parallel with the Chief of the NP and implement projects mutually agreed upon by PHPA and WWF in the memorandum of understanding. The PHPA would assign two young, bright and motivated staff from Ujung Kulon NP to work closely with the Project Manager so that they would be able to continue the management when the expatriate ends his or her contract. The PHPA must ensure that the trainees would not be transferred to other parks but would be retained in Ujung Kulon NP at least for a minimum period of 5 years.

4.0 Plan of Action:

4.1 Objective: Strengthening of the Guard Posts. The entire National Park has 14 guard posts (in various stages of disrepair) of which 5 are located in the peninsula (e.g: Pulau Peucang, Handeuleum, Jamang, Karangrancang and Sanghiyangsirah); 1 in Krakatau, 2 in Pulau Panaitan, 5 in Gunung Honje region (Taman Jaya, Sumur, Cihonje, Sompok, Ciakar and Kalejetan). A post once existed in Cibunar but was abandoned subsequently (Fig. 3).

Action needed: Select those guard posts that are key to the protection of the Javan rhino and its habitat and provide each of these posts with all the basic facilities needed to support three guards at a time. Each guard post must have two bed rooms, one office room, one store room, one kitchen and one toilet. It must have an assured supply of fresh water. Each guard post must be furnished with the following items:-

- four (4) beds - one extra in case of any visitor.
- four (4) mosquito nets
- two tables in the bed rooms
- one large table in the office with 5 chairs
- one cupboard
- one dining table and six chairs
- office stationery (note books, pens, pencils, etc)
- kitchen equipment (stove, pots and pans, etc)
- Field equipment (to be specified)
- either a generator (kerosene operated) or a solar panel to provide electricity (or at least petromax lamps (2)).
- a large map of the Ujung Kulon NP on the wall with a detailed section of the area that comes under the control of the guards

An inventory of the items at each guard post must be made and any damage to or loss of items must be reported by the guards to the Project Manager and the Chief.

For patrolling, WWF would provide appropriate vehicles (motor cycles for the guard posts along the eastern part of the park especially for Taman Jaya, Cikawung, Cihonje, Sompok, Ciakar and perhaps Cegog) and speed boats (for Pulau Peucang, Pulau Handeleum, Taman Jaya and Jamang) and prahus elsewhere (at Cigenter, Niyur, Pulau Peucang and Pulau Handeuleum). All speed boats must be provided with radio communication gear and linked to the central office in Pulau Peucang and/or Taman Jaya and other key Guard Posts identified by the Project Manager.

4.2 Objective: Improvement of the Guard force and its morale.
This can be brought about by:-

4.2.1 a visit to the Park by the country's highest authority (The President) who must talk to the guards and instil in them a sense of national pride in defending the last habitat of the Javan rhino. The guards must feel that they are carrying out a noble task that is being much appreciated by the authorities concerned. If this is not feasible, then the Minister of Forestry or the Director-General of PHPA (in that order) should address the guards. A system of promotion of the guards on merit must be established in Ujung Kulon by PHPA and the best guards must be given the due recognition for their services.

4.2.2 The current Chief in Ujung Kulon NP needs to be promoted to either Jakarta or Bogor and in his place in Ujung Kulon NP must appoint someone who is young, dynamic and genuinely concerned with the plight of the rhino and its habitat.

4.2.3 Guards should be recruited whenever possible, from the villages in the vicinity of the park and not brought over from distant areas.

4.2.4 The Guards should be paid their salaries promptly without any delay. In addition, the Project Manager must arrange for the supplies (rice and other food stuff) to reach the guard posts regularly. It would be necessary to get a Medical Doctor to visit the Guard Posts at least 4 times a year to check the health of the staff. Each Guard post must be provided with an emergency medical kit (There is not even an aspirin in any of the Guard Posts and personnel from the Kalejetan Guard post have to walk for 4 hours carrying their sick on their back through the forest to reach the nearest medical facility in Ujung Kulon).

4.3.5 Patrol routes must be established by the Project Manager in such a way that the guards from two posts regularly meet and exchange information. Each guard post must have 3 guards of which one must always be in the post when the other two go out on patrol. During every patrol, the guards must record the condition of the forest, signs of rhino and other animals, and the activities of man (poaching and encroachment).

4.3 Objective: Monitoring of the Javan rhino population WWF would fund initially a project by Mr Mike Griffiths to set up photographic equipment in Ujung Kulon NP with the view to identifying individual animals and their habitats. This would give the PHPA an idea of the population structure of the rhino and also an occasion to make an inventory of the lesser known nocturnal mammals in the park.

This exercise is costly and therefore will not become routine practice to be carried out by the guards. The guards will carry out, under proper scientific guidance from ecologists, the more traditional ground surveys twice annually (once in the dry season and another in the rainy season). This exercise would become routine to be used in the monitoring of the Javan rhino population and its trends. All that is needed to carry out this exercise are measuring tapes, binoculars, note books, compasses, pencils and water bottles.

4.4 Objective: Conservation education and public awareness. A visitor centre must be built both at the Park's HQ in Pulau Peucang and at Taman Jaya in the east which can serve the people in the villages.

The visitor centre must be a centre of excellence with superb audio-visual material to promote the conservation message to the public at large. It could (should) enlist the help of photographers such as Mike Griffiths and Alain Compost and obtain from them material for display. The centre should have regular video/slide shows for the school children and others who visit the area.

For the Visitor Centre to be effective, in its initial stages, it should be manned by a VSO or CUSO volunteer supported by two young, motivated staff from PHPA who would eventually run the Centre. WWF could assist with the provision of the necessary audio-visual material for the Centre.

4.5 Establishment of a second population of Javan rhino within its former range in Indonesia: The Javan rhino population in Ujung Kulon may be vulnerable as it is small in size and confined to just one locality. Therefore it makes good conservation sense to look into the possibility of establishing a second population in situ within its former range in Indonesia.

One of the areas identified as a target site for re-introduction is Way Kambas Game Reserve (1,200 km²) in Southern Sumatra where Javan rhino did occur until 1930. But before this translocation is even contemplated, it is imperative to select an area in Way Kambas which would form the habitat for the founder population. This area needs to be strengthened and rehabilitated so that the founder population does not flounder and perish. Thus, while the improvement of Ujung Kulon NP goes on, there should be parallel efforts to strengthen and improve the Way Kambas Game Reserve (already nominated as a National Park). In particular, the anti-poaching measures must be strengthened and the food resources in the target area must prove appropriate and adequate to support the founder population.

In discussing the possibility of establishing a second population in Indonesia, it is important to heed Hoogerwerf's (1970) advice. According to him, "A second means of preserving this species from disappearance is the transfer of one or a few breeding pairs to areas outside the densely populated Java, first of all to places where the species is known to have lived before. But as long as there is no complete guarantee that surveillance there will be adequate, such an artificial transmigration is of course not of the slightest significance".

IUCN/SSC Asian Rhino Specialist Group prepared an Action Plan for the Asian Rhinos Conservation (see Khan 1989) which recommends inter alia the starting "as soon as possible a captive propagation programme" and provides the rationale for this as "the only possibility to expand the population rapidly....". This is nothing but wishful thinking. There is no way that the Javan rhino population could be increased rapidly in Zoos. On the other hand, there are very successful in-situ examples where the numbers have increased substantially through the strict protection afforded to the rhino's habitat and better anti-poaching efforts.

4.5.1 In the Kaziranga nature reserve in Assam (Northeast India), the number of the Great Indian One-horned rhino (Rhinoceros unicornis) increased its number from a much depleted stock of a dozen or so in 1908 to about 400 in 1940 (Gee 1952). Today, the number of rhinos in Kaziranga is estimated to be about 1000 (Singh & Rao 1984).

4.5.2 In Nepal, as a result of indiscriminate forest encroachment within the Royal Chitwan National Park, the number of Indian rhino fell from 1000 to 120 in 1960 (Pelnick and Upreti 1972). Today however, as a result of strict protection of the park, the number of Indian rhino in Chitwan has increased to more than 400.

4.5.3 In Garamba National Park in the Republic of Congo, the number of rhinos increased from 100 in 1939 to more than 1000 in 1963 (Verschuren 1967).

4.5.4 In South Africa, the number of White rhinoceros (Ceratotherium simum) in the Umfolozi National Park increased in number from a stock of about 20 animals to over 600 within 50 years' time and in an area of comparable size to that of Ujung Kulon (Schaurte 1960).

4.5.5 Overhunting reduced the population of the White rhino in South Africa to a few dozen in 1922 and the animal was at a hair's breath from extinction. But strict protection and careful conservation measures by South Africa led to the gradual but steady recovery in numbers and today there are some 5,000 animals left (Dybro 1989).

In all these five instances, the increase in number of rhino was effected solely through better protection of the animal's habitat and a strict control on poaching. The lesson is clear: Protection is easier, cheaper and likely to be more successful than captive breeding programmes which are difficult, costly and are likely to fail. PHPA must take the safest of the two options available to it as far as the Javan rhino is concerned.

At the last Rhino meeting held in Bogor in June 1989, the CBSG recommended the capture of 18-26 Javan rhino (from an estimated population of about 60 animals) for breeding in captivity. Such a removal would signal the end of the Javan rhino as a viable population in Ujung Kulon NP. In a population of 60 animals, only about 20-30 may be adults capable of breeding. How many Javan rhinos will die in the capture/removal operations? The IUCN/SSC's own Action Plan admits that there was 60% mortality at one time in the transport of the more numerous Sumatran rhino. The overall mortality of the whole capture programme was 29.4% (Khan 1989). It would be foolhardy to take such risks in the case of the most seriously endangered Javan rhino population in Ujung Kulon NP. The rarity of the species alone makes any experimentation with it unwise. Indonesia is losing its forests day by day.

If it is not possible to protect the large mammals while there is still adequate habitat left, how would it be possible to do so when much of the remaining forests are converted to other land uses in say 25-50 years' time by then the human population would have increased from 180 to 200 million? A reference to Fig. 2 would indicate the pitifully little forest cover that is left in Java today. All the surviving mammalian species in Java are confined to these tiny patches of conservation areas and are surrounded by a hostile landscape dominated by man. Had these areas not been identified and set aside at the turn of the century and actively protected, they would have been converted long ago to agriculture or human settlements. The survival of Javan rhino in Ujung Kulon is an anachronism! given the fact that Java alone supports a human population of 100 million which at the current rate of growth adds 2 million people annually to the population of Indonesia. This is yet another powerful argument in favour of habitat protection in the outer islands of Indonesia while there is still time. Tomorrow may be too late. At the current rate of growth, even Sumatra could be full within a couple of decades. If the Javan rhino in Ujung Kulon NP is already under threat, then its status could only be twice as precarious in a couple of decades.

Hoogerwerf (1970) must have had incredible foresight and premonition when he wrote, "...if the present propagation in Ujung Kulon is indeed as favourably as Schenkel's figures suggest artificial breeding may be considered off the point. Finally, there will be little apprehension in Indonesia for such a radical interference within a so strictly protected reserve as is Ujung Kulon; it might fling open the door to making an economic object of living specimens of this rare animal, which of course should be avoided at all costs".

5.0 WWF's Contribution:

- 5.1 Appoint a Project Officer from VSO or CUSO for an initial period of three years.
- 5.2 Appoint of a Conservation Education Officer from VSO or CUSO for an initial period of three years.
- 5.3 Strengthen 10 key guard posts during the first three years: provide equipment for the guard posts and the guards. Establish radio communication at the Guard Posts. Provide two additional Solar Panels - already brought to Indonesia by WWF-International.

- 5.4 Provide 5 motorcycles for the Guard Posts in the eastern part during the initial three years. WWF should pay for the running and maintenance of these vehicles for the first year and subsequently their management must become the responsibility of the PHPA.
 - 5.5 Provide 4 speed boats, 4 prahus and one passenger boat capable of carrying 20-30 people to and from Labuan/Taman Jaya. Every boat must have radio communication gear to link it up with the central office in Ujung Kulon. WWF should provide the funds needed initially (in the first year) for the running and maintenance. Subsequently, the PHPA must take over from WWF.
 - 5.6 Fund one Photographic survey of Ujung Kulon NP by Mr Mike Griffiths. This will not be repeated.
 - 5.7 Carry out joint surveys with PHPA twice a year for five years to assess the status of the Javan rhino and other large mammal populations and monitor the trends. Funds for the surveys should be provided by WWF.
 - 5.8 Hold a Training Course for the Guards every year in Ujung Kulon NP. This course would focus on the duties to be performed by the guards and how best they could carry them out. The course would also deal with the identification of the common flora and fauna of the park.
 - 5.9 Strengthen two Visitor Centres in Ujung Kulon and provide the necessary audio-visual material for Conservation Education.
 - 5.10 Make available funds for Indonesian scientists to carry out management-oriented research projects in Ujung Kulon NP, especially along the Buffer-Zone on the eastern boundary.
- 6.0 Other recommendations:
- 6.1 WWF could appeal to World Bank to provide funds to repair the road from Sumur to Taman Jaya (Fig. 3). This would facilitate the Taman Jaya Office becoming an active centre for the management of the eastern part of Ujung Kulon. It would also open up the eastern part of the park for limited nature oriented tourism.

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6.2 WWF could invite ODA to fund appropriate agro-forestry projects in the Buffer-Zone in the eastern part. Encroachment is rampant here and unless alternative land-use practices could be established, gradually much of the forests in Gunung Honje region would disappear. Rattan can be easily grown here and it could form a valuable cash crop for the villagers. Another economic crop is bamboo which can bring in cash benefits to the villagers. Propagation of rattan would also ensure that the people retain tree cover in the area as the rattans need them to climb.

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JAVA

Ujung Kulon National Park

- Locality: Southwestern tip of Java.
- Area: 30,000 ha (300 km²)
- Formation: Nature Reserve in 1921, National Park in 1980
- Vegetation: Luxuriant Primary Rainforest on Gunung Payung. On the lower slopes, vegetation is dominated by *Arenga obtusifolia* palm (langkap). Extensive stands of bamboo and spiny rattan species. Coastal vegetation: mangroves.
- Access: By boat: from Labuan in West Java to Pulau Peucang (6-7h). By road from Labuan to Taman Jaya (3h) and from Taman Jaya by boat to Pulau Handeuleum (2h).
- Facilities: Accommodation in a Guest House in P. Peucang, with water and electricity for 24 visitors. Guest House in P. Handeuleum for 15 visitors. Transport by prahus (dug-outs) or on foot. Guides available.
- Tracks: Good trail across Pulau Peucang (2km); from Cidaon to Citadahan via Cibunar (10km); Cidaon to Tanjung Layar (7km); Cidaon to Tanjung Alang Alang (22km); Tanjung Alang Alang to Mouth of Cigenter river (25 km); Karangrancang to Cibandowoh (6km); Kalejetan to Karangrancang (8km); Kalejetan to Cikawung (10km). Total: 90 km.
- Open: Throughout the year.
- Rainfall: Rainy season from October-April. 3,249 mm/annum. Highest in Dec.: 474 mm; lowest in July 130 mm.
- Visitors: 2,400 both local and foreign.

Principal Mammal Species

Javan rhino (r)	Banteng (c)
Rusa deer (c)	Wild boar (c)
Mouse deer (c)	Barking deer (a)
Red dog (r)	Leopard (r)
Javan gibbon (r)	Long-tailed macaque (c)
Silvered leaf-monkey (r)	Javan leaf-monkey (r)
Fishing cat (r)	Leopard cat (c)
Small-toothed palm civet (r)	Javan civet (r)
Common palm civet (c)	Bearcat (r)
Javan mongoose (c)	Small clawed otter (r)
Hairy-nose otter (r)	Giant squirrel (c)
Coconut squirrel (c)	Tree rat (c)
Flying lemur (c)	Malay tree shrew (r)
Javan tree shrew (r)	Flying fox (a)
Javan leaf-nosed bat (c)	Javan pangolin (c)

(The abundance of mammals is indicated by: a = abundant; common; and r = rare. The visitor is almost certain to 'abundant' species, and will probably see the 'common' ones. 'rare' species are often not seen although they certainly exi