CURRENT STATUS OF THE JAVAN RHINO (*Rhinoceros sondaicus*) IN UJUNG KULON NATIONAL PARK

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Introduction

The future survival of the Javan rhinoceros (*Rhinoceros sondaicus*) on earth is at risk and the animal is critically close to extinction. Only two populations of this species are known to exist: one population of 10-15 individuals in Vietnam (Schaller *et al*, 1990), and another 50 individuals in the Ujung Kulon peninsula, Ujung Kulon National Park (UKNP), Indonesia. Based on the size of the populations in both habitats, it would appear that UNKP offers a better opportunity for their survival over the longer term; however, the population size there has not increased over the last decade, suggesting that the carrying capacity of the habitat may have been reached. No efforts have been made to propagate this species, and management strategies have relied on strengthening protection efforts to guarantee its natural growth. Thus, it is expected that by strengthening protection efforts to eliminate poaching pressure, the Javan rhino population would increase to the carrying capacity of the peninsula.

A word of caution about the actual population size of the Javan rhino in Ujung Kulon is necessary here. Nothing was known about the rhino population size when the Ujung Kulon peninsula was established as a nature reserve in 1921. Hoogerwerf (1970) noted that mounting poaching of the rhinos in the mid-1960s had severely reduced their numbers. In 1967, when the first census was made by track count and identification, only about 25 individuals were estimated to be present (Schenkel and Schenkel-Hulliger, 1969). Periodic censuses every 2-3 years until 1980 using the same method recorded an annual population growth of 6.2%. During the 1980s and 1990s, the population fluctuated at around 50 individuals, which was attributed to poaching pressure.

Study Area

The Ujung Kulon peninsula, included in Ujung Kulon National Park, encompasses about 39 ha. This region consists of mostly lowland forest in the eastern parts and the small mountain range of Gunung Payung in the southwest. The vast majority of lowland areas, destroyed at the time of the Krakatau eruption in 1883, are leading to climax forests, and this may create more suitable habitats for the Javan rhinos.

Within the Ujung Kulon peninsula, patches of habitat utilized by rhinos are widely distributed and appear to cover a large extent of the reserve. The optimal habitat of its population may be about 30,000 ha, which includes the lowlands of the eastern foot of Gunung Payung and parts of the Gunung Honje. However, not all parts of the habitat are similarly preferred by rhinos, as their primary food plants and water sources exist in certain patches of the forests (Schenkel and Schenkel-Hulliger, 1969; Amman, 1985; Hommel, 1987). This may induce rhinos to become concentrated in particular parts of the habitat. Another possible cause of uneven distribution is the presence of other large mammals (e.g, banteng (*Bos javanicus*), barking deer (*Muntiacus muntjak*), rusa deer (*Cervus timorensis*), and wild pig (*Sus scrofa*)), which tend to compete for food plants and space.

Human activities in Ujung Kulon are also increasing. Tourists use park trails, but the influence of their activities on the rhino's habitat is not clear. Other human activities come from communities living in and around the park.

Some of them traditionally utilize resources available in the forests, while other still poach wild animals. This could contribute to the concentrated distribution of the secretive, shy rhinos in the central parts of the habitat.

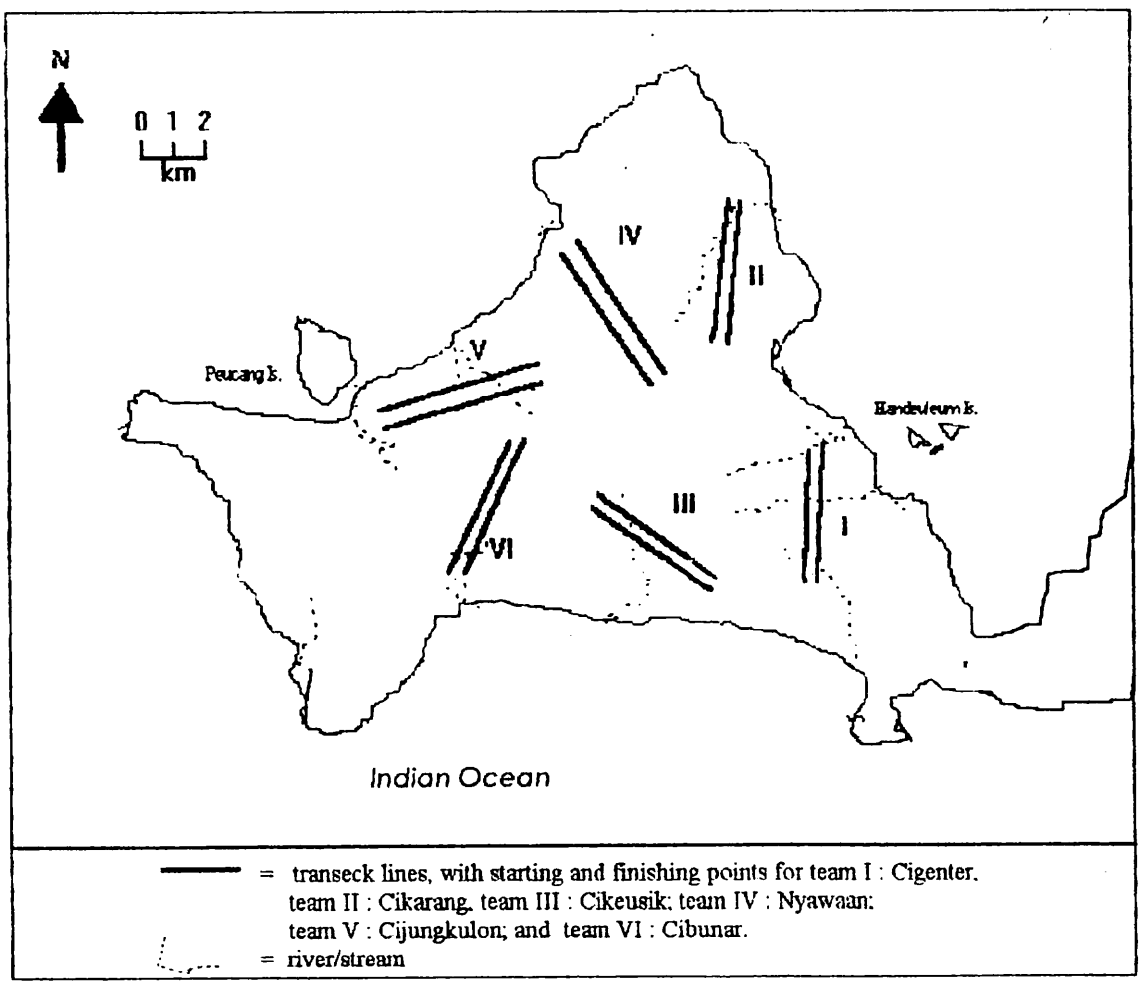
Methods

Census

The method used in this census of the Javan rhinoceros population was based on track counts with individual identification of the species. This method was modified from Schenkel and Schenkel-Hulliger (1969) and Santiapillai *et al* (1990). The rhino distribution in the Ujung Kulon peninsula was assessed by rangers during routine patrols, and checks were made by the survey team prior to the census. Considering the field information that the current distribution was concentrated in certain areas, it was impractical to census rhino tracks in all parts of the reserve.

The census was carried out in November 1995 over six concentrated areas in the peninsula. Six teams were formed consisting of five experienced guards and one trained and licensed local guide. Each team patrolled each plotted transect and identified rhino tracks along the transact line. Wherever tracks were found, the type of habitat was recorded along with vegetation type, topographical features, traces of other wild animals, etc. Other signs indicating the presence of rhinos included dung, urine, partially eaten food plants or other plants possibly affected by the animal's presence.

Locations of transect lines on 6 concentrated areas surveyed in Ujung Kulon peninsula, UKNP



Rhino track measurement

Each track was measured by taking the average of the width of the fore and hind foot (in centimeters). The direction of the track was also recorded. Before measuring the track, its age on the ground was assessed to determine whether it was a positive track (less than 1 day old) or an alternative track (2-3 days old). Both types were included in the count. Tracks which appeared to be more than 3 days old were excluded from the count, but recorded for supporting data.

Rhino population analysis

Age classes in the population structure of the rhinos were classified according to Santiapillai *et al* (1990) and TNUK (1992). Class I includes juveniles (less than 6 months old), Class II includes larger juveniles (6 months to 1 year), Class III includes 1-2 year olds, Class IV covers females and sub-adult males, and Class V consisted of adult males and the oldest females.

The population size was estimated using a formula once used by BPPSI (1989):

$$\mathbf{N_e\ min,\ max = CF \times N_l\ min,\ max}$$

Where: N_e min, max = estimated minimum population, or maximum population
N_l min, max = a number of positive tracks (minimum), or alternative tracks (maximum)
CF = a corrected factor, which is derived from:

$$CF = \frac{\text{the utilized habitat in Ujung Kulon x \% effective area}}{\text{total observation areas}}$$

and

$$\text{\% effective area} = \frac{\text{total transects where tracks were found}}{\text{total observation transects}}$$

Results

Population size

A total number of 23 positive tracks and 27 alternative tracks were recorded. As the percentage of effective areas covered was about 75%, and the total areas observed was about 9,600 ha, the corrected factor for 30,000 ha utilized by rhinos was 2.34. Therefore, the minimum and maximum estimated population counts were about 54 and 60 rhinos, respectively.

Table 1: Number of positive and alternative rhino tracks and their classes in the six concentrated survey areas

Track size (cm)	Number of tracks												Total Number	
	CA_1		CA_2		CA_3		CA_4		CA_5		CA_6			
	PT	AT	PT	AT	PT	AT	PT	AT	PT	AT	PT	AT	PT	AT
30-29	-	-	-	-	-	-	1	-	-	-	-	-	1	-
29-28	-	-	-	-	1	-	-	-	1	1	-	-	2	1
28-27	1	2	-	-	-	-	1	1	1	1	1	1	4	5
27-26	1	2	-	-	1	-	1	2	-	1	-	1	3	6
26-25	1	-	-	1	-	-	1	2	-	-	-	1	2	4
25-24	1	3	-	-	1	-	1	1	-	-	2	-	5	4
24-23	2	1	-	-	-	1	-	-	-	-	-	-	2	2
23-22	1	2	-	-	-	-	-	1	-	-	-	-	1	3
22-21	-	1	-	-	-	-	-	-	-	-	-	-	-	1
21-20	-	1	-	-	1	-	-	-	-	-	-	-	1	1
20-19	-	-	-	-	-	-	1	-	-	-	-	-	1	-
19-18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17-16	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Total	7	12	-	1	4	1	7	7	2	3	3	3	23	27

Note: $CA_{1...6}$ = *survey areas*
PT = positive track
AT = alternative track

Population Structure

The population structure of the rhinos based on the size of tracks indicated that the structures for the estimated minimum and maximum population differed. The minimum population estimate represented all categories of age classes, whereas the maximum estimated population included no juveniles.

Distribution

The distribution of rhinos in Ujung Kulon tended to be concentrated in the central reserve, particularly around streams above Cigenter and Cikarang. Most of the tracks found in these and other parts of the reserve were associated with patches of riverine forests. The vegetation type where the tracks were measured were commonly dominated by rattan, *Arenga* sp. shrublands. Within these areas, rhinos seemed to prefer certain species of vegetation e.g., sulangkar (*Leea sambucina*), kilaja (*Poyalthia odorissima*), cente (*Lantana camara*), Jambu kopo (*Eugenia suriageriana*), Gempol (*Nauclea orientalis*), and secang (*Caesalpinia sappa*), as these plant species were observed to have been chewed on by rhinos. This feeding activity was observed in parts of the north (Nyawaan-Nyiur) and northeast of the reserve (Balagadigi-Cikarang), where there are salt and fresh water swamp forests, which indicated the presence of rhinos even though the tracks could not be identified.

Table 2: Number of positive and alternative tracks on vegetation types of the Ujung Kulon peninsula

Vegetation type*	Positive tracks	Alternative tracks
Evergreen hill forest	2	1
Salt swamp forest	-	-
Fresh water forest	-	1
Arenga-dominated forest	2	4
Rattan shrublands**	12	10
Mixed giant bamboo forest	1	2
Salacca-dominated forest	3	3
Dune forest	4	7

**Types adapted from Griffiths (1993)*
***Mostly associated with riverine forests*

Discussion

The Javan rhino population and its regeneration

Currently, the rhino population in the Ujung Kulon peninsula, UKNP, is estimated to be about 54-60 animals. It is not a surprising census result and appears to be accepted. But if one carefully accounts for the area surveyed in the present census, one could conclude that the estimated population is less than the real population size. The present census, which surveyed about 9,600 ha, may be reliable for the findings of 23 positive and 27 alternative tracks. Therefore, the estimated minimum population which was calculated to be 54 rhinos for the entire habitat of 30,000 ha may be sufficiently valid, but after further thought could also be an underestimate. The unsurveyed area of 20,400 ha could possibly have added another 31 positive tracks to the minimum population estimation of rhinos in its optimum habitat.

The present census was conducted by an experimental management method, applying more efficient resources and causing less disturbance to the habitat. The formula used to calculate the estimated population was once used by BPPSI in the Javan rhino census in 1989. Although the formula gave an adequately reliable rhino population estimate, the formula has never been tested further. Thus, the present result may provide a case test of the formula. One limitation of the formula that has been revealed is the unreliability in determining the estimated maximum population.

The chance of regeneration of the rhino population in the Ujung Kulon peninsula was also indicated in the present census. Tracks of a positive nursing female (27-28 cm track width) with one positive calf (16-17 cm track width) were recorded from a stream above the Cikarang river. This confirms a recent census using camera trapping (Griffiths, 1993), which identified the presence of calves and nursing females. Thus, this finding indicates an active breeding population, and the habitat appears able to support the long-term survival of rhinos.

Rhino distribution

Within the Ujung Kulon peninsula, the rhinos do not appear to be restrained by any topographical features. This confirms a previous hypothesis (Griffiths, 1993) which ruled out the impossibility of rhinos ranging over hilly and swampy areas (Schenkel and Schenkel-Hulliger, 1969; Hommel, 1987). The present results also found that the rhinos were mostly centrally concentrated in riverine patches of the reserve, from east Chandeuleum, east Cikeusik and Citadahan in the north to above the Cikarang and Cinogar streams. This may be due to easier access to their requirements, i.e. the abundance of foodplant species and water sources.

However, the results fail to prove the previous hypothesis that historically many rhinos utilized dune forests in the southern peninsula. This area was shown to have a high density of rhinos in previous censuses (e.g. Santiapillai et al, 1990; TNUK, 1992; Griffiths, 1993). The current distribution could be due more to the frequent presence of poachers around the southern peninsula (i.e. Karang Ranjang, Cibandawoh and Cikeusik), rather than for ecological reasons. Thus, the rhinos experience of human disturbance may have caused them to leave the dune forests. If this is the case, poaching might have restricted the rhino's range, causing them to be concentrated in the central and northern parts of the reserve. However, whether the rhino's ranges have been disrupted by the presence of human activities or not, comprehensive studies should be carried out on the effects of human activities and habitat trends.

Census method

One could question the sophistication of the method used in the present census. Some previous results were affected by errors in the estimation of population size and structure. Errors in the method were noted by Amman (1985), BPPSI (1989), Santiapillai *et al* (1990), and TNUK (1992). One common error is the failure to detect calves, as their tracks are not deeply printed on the soil. Thus, some previous censuses were not able to count the rhino juveniles. Another common error is the inability to see tracks on forest floors covered by thick litters of leaves. Even when rhino tracks are found, they are often very hard to identify as the leaf litter covers the soil where the print is made. Both of these difficulties in identifying tracks could be solved if other evidence of rhinos is present, such as the remains of chewed leaves and bark.

Another possible error could be made when two or more tracks of the same size are found separately within two kilometers distance. As a rule, these tracks are categorized as the same rhino, based on the rhino's solitary behaviour and usual range of 2-4 kilometers (although this was not a factor in the present census since the distance between each transect line was more than two kilometers.) This rule does not seem to consider any overlap in home range among individuals, even though there is quite strong evidence of overlapping among rhinos which have the same or similar track width size, such as among adult males and between sub-adult and adult males (Griffith, 1993). Thus, if there was an overlap in range of rhinos of the same age class and having similar track widths, the estimated population of previous census results was probably lower than the actual figure.

Another error that occurred in the present census was when rhino calf tracks (15-16 cm in width) accompanied by the mother (28-29 cm track width) were found but excluded from the count because they were more than three days old. Their presence indicates that these animals once utilized these patches but have moved on to another location.

Taking the above into consideration, the rules applied in the census method should be further evaluated to get develop a standardized method which would be used for future rhino track censuses.

Conclusion and Recommendations

A continuous and consistent policy of strengthening protection in areas vulnerable to rhino poaching needs to be undertaken by field guards. The south peninsula, where dune forests have historically been preferred by rhinos, needs to be cleared of any human activities. This area must be monitored at all times and any human entry, including tourists, needs to be checked for official permits.

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A young female Javan rhino browsing a plant. (Photo: Aat Hidayat, Ujung Kulon N.P.)