STATUS AND DISTRIBUTION OF THE JAVAN RHINO (Rhinoceros sondaicus DESM.) IN UJUNG KULON NATIONAL PARK *)

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ABSTRACT

Field study on status and distribution of the Javan rhino was carried out periodically in Ujung Kulon peninsula from January 1980 to April 1984, included several observation until September 1989.

The basic methods put forward by Schenkel & Schenkel (1969). The study was conducted by tracking, measuring and mapping of rhino footprints; it was caused that the rhinos were encountered directly only 29 times. The study was emphasised to monitor population and distribution, although some aspect of behaviour and ecological will be discussed too.

Composition of the footprints classes found in the annually census suggests that the population of Javan rhino in Ujung Kulon peninsula can be expected to grow further. However, the last result of the census indicated that the population of Javan rhino was estimated to be 52-62, with no young detected (Santiapillai et. al., 1989).

The biggest concentration of individuals occurs in the central part of the peninsula. In the other parts, especially from the west of Gunung Payung complex to the tip of peninsula in Tanjung Layar, relatively very few footprints were recorded. The distribution extends eastwards to the Karang Ranjang area. This indicates that the area that was empty after the sudden death of five animals in 1981/82 (SADJUDIN, 1987) has been re-established as a range.

It seems that the population of rhinos should to continue to increase. However, Ujung Kulon as its habitat is a relatively constant and small area (39.120 hectars). Therefore, adequote measures for future management must be established as soon as feasible, including the possibility of transferring some animals to a second home should be realyzed. It is hope that the results of this study will be useful in determining future management. Beside this, further fieldworks are still needed for this study comprises still only a small portion of biological aspects of Javan rhino in Ujung Kulon as its natural habitat. Therefore, some behaviour and other ecological aspects of Javan rhino in Ujung Kulon peninsula will be discussed also in this manuscript.

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0.1. Introduction

The principle surviving population of the Javan rhino is located on the Ujung Kulon peninsula, which forms the westernmost extremity of the island of Java. The species was once widespread throughout the Oriental Realm from Bengal eastward to include Burma (Myanmar), Thailand, Cambodia, Laos, Vietnam and southwards to the Malay peninsula and the islands of Sumatra and Java. About 150 years ago the species occured as three discrete populations. The first, belonging to the subspecies inermis (now almost certainly extinc) was found from Bengal to Assam and eastwards to Burma. The second subspecies annamiticus occured in Vietnam, Laos, Cambodia and the easternmost part of Thailand. The third subspecies, the nominate form, was found from Tennasserim through the Kra Ithmus into the Peninsula and Sumatra and in the western half of Java. All this population have disappeared, except for in Ujung Kulon and some scattered remnants surviving in Indochina. The Javan rhino has the distinction of being the rarest large mammal in the world (Khan, 1989).

In 1934 Frank shot a male Javan rhino at Karangnunggal, near Tasikmalaya in West Java. The mounted specimen is now kept in the Zoological Museum in Bogor. It was recorded as the last Javan rhino found outside the Ujung Kulon area (HOOGERWERF, 1970; Sadjudin, 1987). The drastic decline in number of this once widely distributed animal in Java began at the turn of the 20th century. Indiscriminate hunting practices in the past were responsible for the elimination of the rhino throughout Java.

Today the last remaining viable population of Javan rhino is rsetricted to the Ujung Kulon National Park, at the western tip of Java (Fig. 1). None survive even in zoos. The factors adverse to the Javan rhino's survival stem not only from its small size and hence vulnerability to sudden perturbation in its enviroment, but also from the transmission of infectious diseases from cattle that move in and out across the eastern boundary and from poaching (Ramono & Santiapillai, 1989).

The ecology and behaviour of the Javan rhino has been studied in the past by several scientists (Schenkel & Schenkel, 1969; Hoogerwerf, 1970; Sadjudin, 1984; Ammann, 1986). During his time (1935-1955) Hoogerwerf reported frequent incidence of hunting. In 1955, Hoogerwerf estimated the population of the rhino to be about 35. Poaching seems to have continued up to the time Schenkel & Schenkel (1969) initiated their studies. They estimated the population to be only 25 at that time. Their findings focussed international attention on tne plight of the Javan rhino. In an effort to save the rhino from getting extinc, the Government of Indonesia and the World Wildlife Fund for nature cooperated in taking effective measures to strengthen the protection of Ujung Kulon National Park. Guard posts were established, extra personnel were recruited and equipped with the poachers. Ujung Kulon was therefore heavily patrolled and census of the animal was carried out annually. These efforts enable the rhino to increase in number over the years, although slowly (Sadjudin, 1987).

In the Asian Rhino Specialist Group Meeting (October 1986 and June 1989), Species Survival Commission experts have already discussed concerning the Javan rhino will be translocated to second area of population and to captive breeding sites. Therefore, it is suggested that the situation facing this species be looked at very closely to see if recommendations to translocate some animals into other areas, such as Way Kambas or southern part of Bukit Barisan Selatan National Park in Sumatra should not be seriously considered. A single small population is always extremely vulnerable. A second approach is that the Indonesian authorities should also consider bringing some animals into a captive breeding project to be based

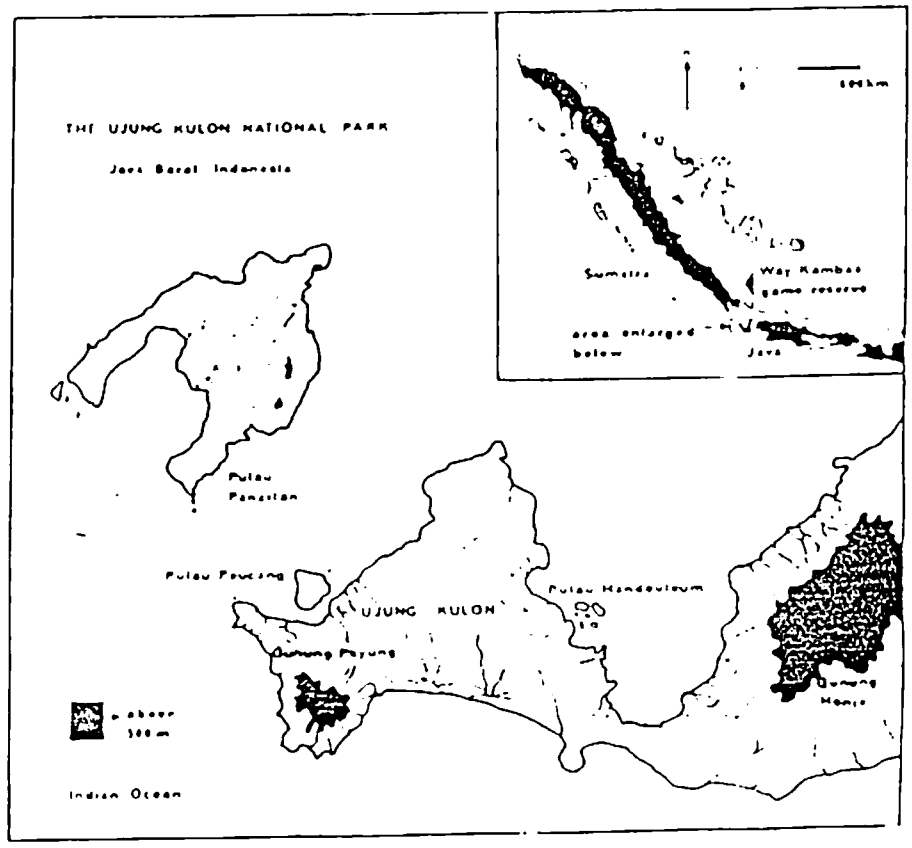

Fig. 1 Map of Ujung Kulon National Park to indicate its location in relation to Sumatra and Java (Ramono & Santiapillai, 1989).

at least partly in Indonesia (Khan, 1989), especially it will be better if captive breeding site is located in natural habitat as like as for Sumatran rhinos in Sungai Dusun Game Reserve-Malaysia (it was observed by author in June 1989).

A fieldstudy as an intensive survey of tne species in Ujung Kulon National Park is an essential pre-requisite to recommending furtner conservation action (Khan, 1989). Therefore, it is hope that the results of this study will be useful for conservation action in tne future.

2.0. Methods

The basic methods put forward by Schenkel & Schenkel (1969), it was conducted by tracking, measuring and mapping of rhino footprints; it was caused that the rhinos were encountered directly only 29 times. The study was carried out periodically throughout Ujung Kulon peninsula from January 1980 to April 1984, included several observation until September 1989.

Methods and constraints for conducting annually census were described in a census report by Sadjudin (1987). Mainly for mapping of rhino distribution in Ujung Kulon peninsula was compared from footprints map of census result in 1981 and the results of periodically fieldsurvey 1980-1981 and 1982-1983.

Nevertheless the topography precluded a systematic survey of the whole area. This led to difficulties in plotting the positions of the rhino footprints on a map. However, points of observation can still be identified in each trail with reference to previous reports (Schenkel & Schenkel, 1969; Hoogerwerf, 1970).

Rain was another factor that made the census and field survey operation difficult. Especially in a census (1984), it rained very heavily day for more than an hour after which footprints were difficult to locate and estimating their 'age' was even more difficult. In periodically field survey (1982-1983), it was dry season that sometime footprints were unrecognized or unmeasured.

3.0. Results of population and distribution studies

The status of population size should be described as have seen in (Table 1). Therefore one to the other should be compared too. These data were collected from footprints mapping that were found while to conduct an intensive field survey (Fig. 2, 3 and 4).

Table 1. Status of Javan rhino population size in Ujung Kulon National Park 1980-1984 (Based on the size of footprints of fore and hind feet).

No.	Footprints size (cm.)	Numbers of individual (1980-1981)	Number of individual of a census (1981)	Number of individual (1982-1983)	Number of individual of a census (1984)
1.	14/15	00	01	00	00
2.	15/16	01	00	00	00
3.	16/17	00	00	00	00
4.	17/18	00	00	00	00
5.	18/19	00	00	00	00
6.	19/20	00	00	01	00
7.	20/21	02	01	00	01
8.	21/22	01	01	02	02
9.	22/23	05	05	04	00
10.	23/24	08	09	07	04
11.	24/25	10	11	10	06
12.	25/26	09	13	09	11
13.	25/27	00	00	00	03
14.	26/27	08	07	07	10
15.	27/28	04	04	03	09
16.	28/29	01	00	01	04
17.	28/30	00	00	00	01
18.	29/30	00	00	00	02
	T o t a l	49	52	44	52

Fig. 2 Areas of population concentration from collecting footprints while field observation was conducted in 1980/1981 (footprints n = 244).

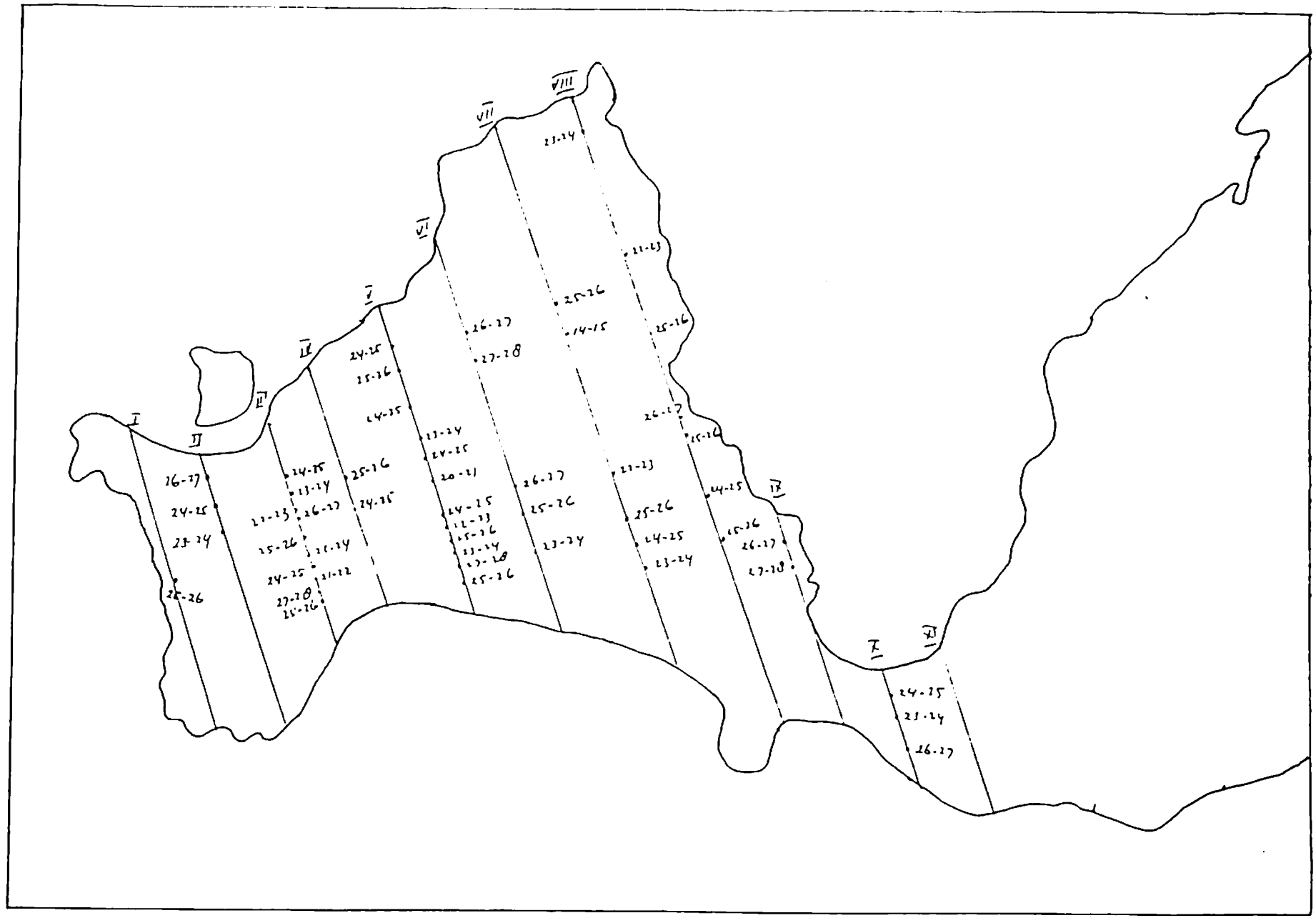

Fig. 3 Areas of population concentration from collecting footprints of number individual was found while conducting a census in 1981 (rhinos individual n = 52).

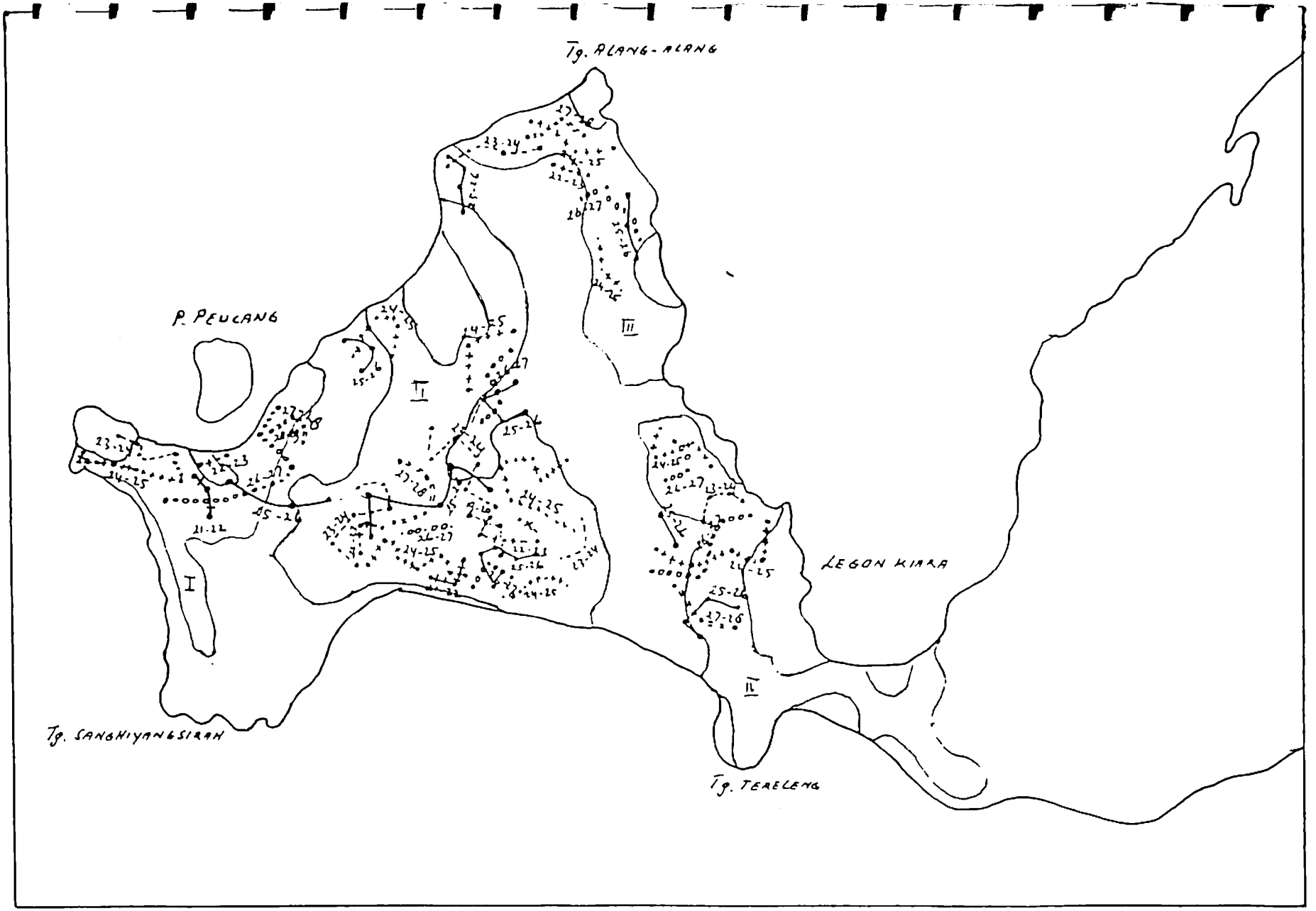

Fig. 4 Areas of population concentration from collecting footprints while field observation was conducted in 1982/1983 (footprints n = 205).

These footprints mapping also should be decided distribution which to indicate areas of population concentration (Fig. 5). The distribution of the Javan rhino in Ujung Kulon peninsula was found to be uneven. The biggest concentration of individual occurs in the central part of the peninsula. In the other parts, especially from the west of Gunung Payung complex to the tip of peninsula in Tanjung Layar, relatively very few footprints were recorded. The distribution extends eastwards to the Karang Ranjang area. This indicates that the area that was empty after the sudden death of five animals in 1981/82 (Sadjudin, 1987) has been re-established as a range. The drastic decline of individual number in 1982/83 (Table 1) was caused by its evidence.

The number of population of the study indicates a difference if to be compared with the results of anually census (Table 1 & 2).

Table 2. Population growth of Javan rhino in Ujung Kulon peninsula from census results (1967-1989).

Year	minimum	maximum	average	source
1967	21	28	24.5	Schenkel & Schenkel (1969)
1968	20	29	24.5	idem
1969	22	34	28.0	PPA
1970	--	--	----	no census
1971	33	42	37.5	PPA
1972	40	48	44.0	PPA
1973	38	46	42.0	PPA
1974	41	52	46.5	PPA
1975	45	54	49.5	PPA
1976	44	52	48.0	PPA
1977	44	52	48.0	PPA
1978	47	57	52.0	PPA
	46	55	50.5	Ammann (1980)
1979	--	--	----	no census
1980	54	62	58.0	PPA
	57	66	61.5	Ammann (1980)
1981	51	77	64.0	PPA
	54	60	57.0	Sadjudin *et al* (1981)
1982	53	59	56.0	PPA
1983	58	69	63.5	PPA
1984	50	54	52.0	Sadjudin & PHPA (1984)
1985/ 1988	--	--	----	no reference
1989	52	62	57.0	Santiapillai *et al* (1989)

Areas of population concentration as a cencus result (1984) was described by Sadjudin (1987) as following; There were no footprints found along the area from Ciramea river westwards to the Tanjung Layar. In Gunung Payung complex and its surroundings, a few footprints thougnt to belong to three animals were found below the northern slope, while in the summit of Gunung Payung itself, no footprints were found. Even in the central part of Ujung Kulon cape, there seemed to be an uneven distribution in the footprints. In the Gunung Telanca area which extends northwards to

the cost, an eastwards to tne Nyiur and Jamang swamps, not many foot were seen. Footprint concentrations were found in tne soutnern part of Gunung Telanca extending eastwards to tne area of Citadaham, Cikeusik and Cibandawoh. Footprints were also found in tne nortn i.e near Tanjung Balagadigi, Cigenter and Cihandeuleum, and in tne east to points beyond tne Karang Ranjang area. In the easternmost area, footprints were found in Pangorok, close to Kalejetan. In addition, footprints of four animals were found in Tanjung Tereleng area. These evidence were no difference witn areas of population concentration from previous and recent field observation reports (Fig. 5).

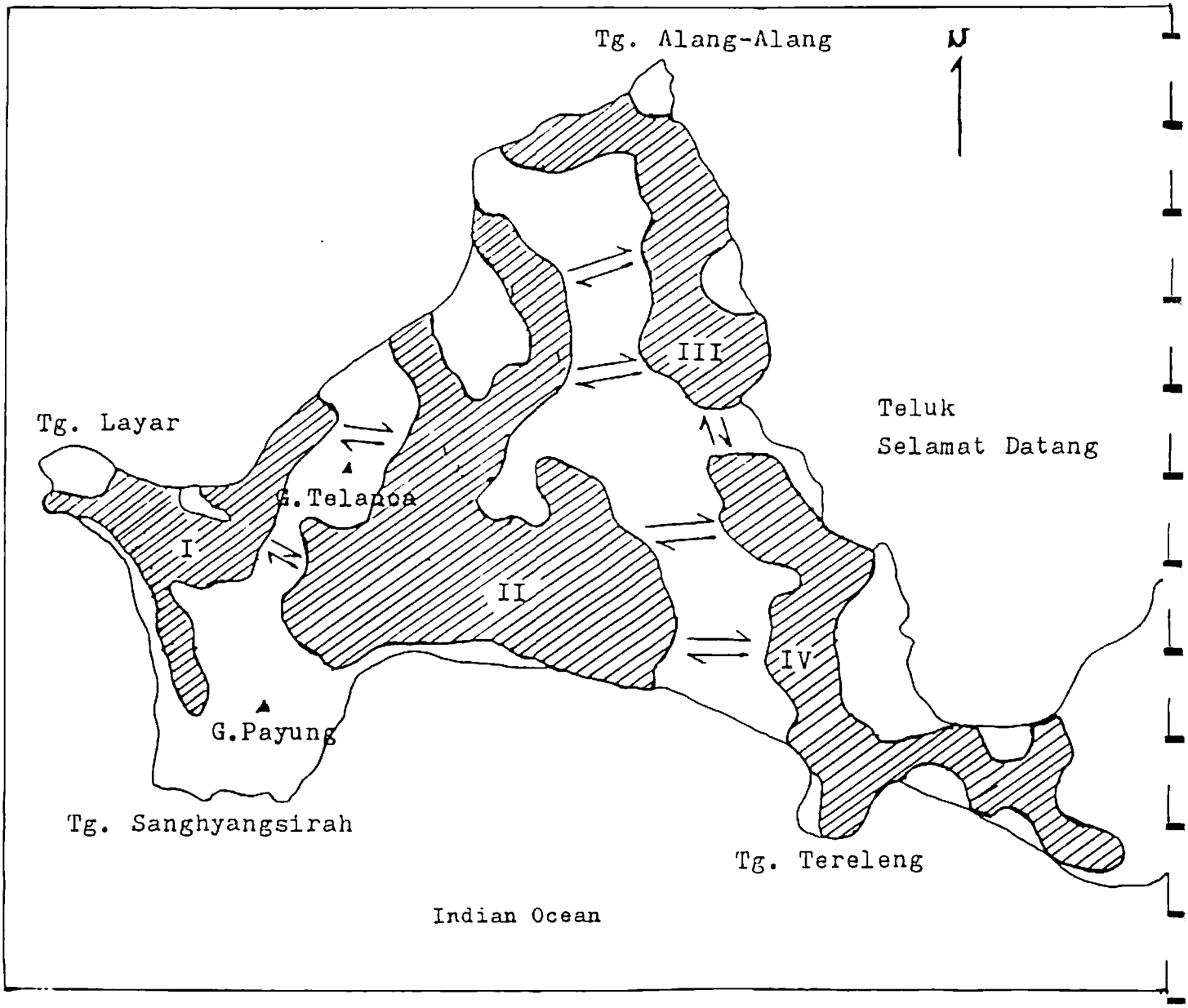

Fig. 5 Approximate a recent distribution of the Javan rhino in Ujung Kulon peninsula (shaded area, the arrow signs are movement areas).

Approximate a recent distribution or areas of population concentration (footprints n = 691) should be compared with approximate population density as a relation on Table 3 and Fig. 6.

Table 3. The Javan rhino population at four areas of population concentration in Ujung Kulon peninsula, especially in 1980 to 1983 (Based on the size of footprints of fore and hind feet).

No.	Footprints size (cm.)	population at four areas of population concentration											
		I			II			III			IV		
		*	**	***	*	**	***	*	**	***	*	**	***
1.	14/15	o	o	o	o	o	o	o	1	o	o	o	o
2.	15/16	o	o	o	1	o	o	o	o	o	o	o	o
3.	16/17	o	o	o	o	o	o	o	o	o	o	o	o
4.	17/18	o	o	o	o	o	o	o	o	o	o	o	o
5.	18/19	o	o	o	o	o	o	o	o	o	o	o	o
6.	19/20	o	o	o	o	o	1	o	o	o	o	o	o
7.	20/21	o	o	o	2	1	o	o	o	o	o	o	o
8.	21/22	o	o	1	1	1	1	o	o	o	o	o	o
9.	22/23	o	1	1	3	3	2	1	1	1	1	o	o
10.	23/24	2	o	1	4	5	4	1	2	1	1	2	1
11.	24/25	2	1	1	4	5	5	2	2	2	2	3	2
12.	25/26	1	1	1	5	6	4	1	2	2	2	4	2
13.	26/27	1	o	1	4	4	3	1	1	1	2	2	2
14.	27/28	1	o	o	1	2	1	o	o	1	2	2	1
15.	28/29	o	o	1	1	o	o	o	o	o	o	o	o
	T o t a l	7	3	7	26	27	21	6	9	8	10	13	8

* Result of field observation in 1980/1981
** Result of a census in 1981
*** Result of field observation in 1982/1983

Population composition of Javan rhino in Ujung Kulon peninsula at the time of a census (1981) and field observations (1980/1981 and 1982/1983) that to be found on Table 4.

Table 4. Population composition of Javan rhino in Ujung Kulon peninsula in 1980/1983 (It is based on the various estimated age-classes).

No.	Age-classes	Footprints size (cm.)	Number of individual of eacn observation		
			(1980/1981)	a census (1981)	(1982/1983)
1.	Infant	(14/17)	1	1	o
2.	Juvenile	(17/20)	o	o	1
3.	Adolescent	(20/23)	8	7	6
4.	Sub-adult	(23/25)	18	20	17
5.	Adult	(25/29)	22	24	20
	T o t a l		49	52	44

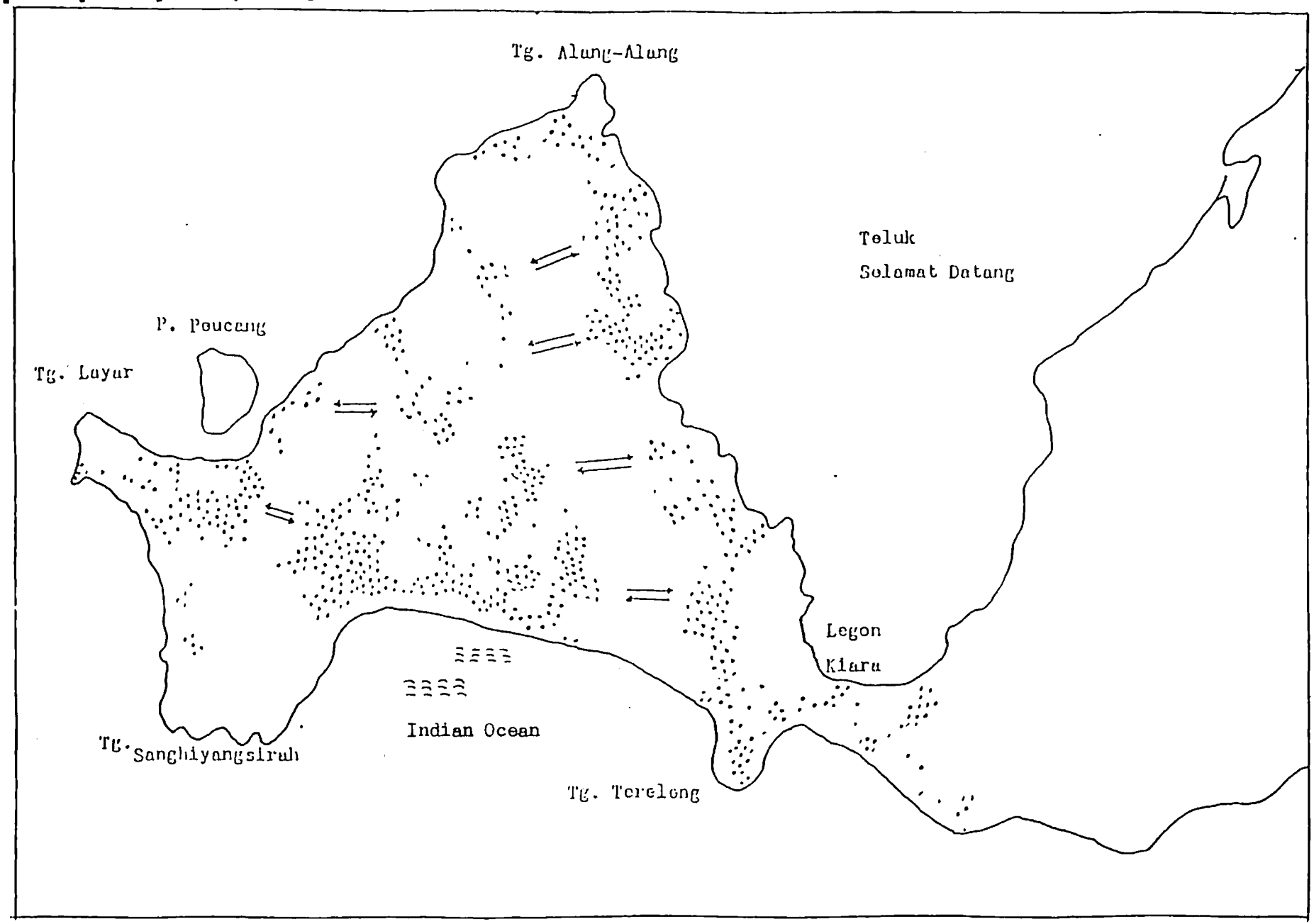

Fig. 6 Map of Javan rhino footprints in Ujung Kulon Peninsula (footprints n = 691)

4.0. Conclusion

4.1. Population

Population size of the Javan rhino in Ujung Kulon peninsula that indicates not different one to another results of field observation. Schenkel & Schenkel (1969) modification-methods certainly to be approximated closely to real.

In an observation (1980/83) just one infant and one largest individual (footprints size fore and hind feet 28/29 cm.) were found. Based on footprints classes it was found for infant, juvenile and adolescent in observation period 1980/81 they were found 9 individuals (18.37 %); in a census period 1981 they were found 8 individuals (15.39 %) and in observation period 1982/83 that to be found 7 individuals (15.91 %), its so highly of reproduction rate.

In Table 4., it should be calculated that reproduction rate to be approximated (3.18-4.59 %). It means that reproduction rate of the Javan rhino in Ujung Kulon peninsula indicates to be low. If population is about 44-52 or 52-62 individuals (Santiapillai et. al., 1989), that means only 1-2 individual infant will be born each a year.

4.2. Areas of population concentration

Map of areas of population concentration was pointed from 691 footprints (Fig. 6), who divided Ujung Kulon peninsula into four areas of rhinos concentration (Fig. 5).

Ujung Kulon peninsula was certainly divided into three areas, they are western, middle and eastern part (Hoogerwerf, 1970). The western part is an area of population concentration part I, there was recorded 92 footprints in periodically field observation. The middle part is an area of population concentration part II, there was recorded 315 footprints and to be approximated from 30-40 rhinos. It means to be approximated 50 % or half of Javan rhino population in Ujung Kulon peninsula were found there. Three other parts not many rhinos should be found.

While certain season, some animals of the Javan rhino moves from one into other an area of population concentration. As such in a dry season 1982/83 (it was more than six months), the Javan rhino should be observed to move from an area of population concentration part I into part II. In an each wet season they move from a part IV to eastwards the bottle neck area throughout Kalejetan; Santiapillai et. al (1989) were pointed that they move to most eastwards throughout Aermokla area. However, in the dry season almost no rhinos moving into this area.

This uneven distribution of the Javan rhino in Ujung Kulon peninsula is caused by a number of factors such dry topography, vegetation and the alternation of wet and dry seasons (Sadjudin, 1987). It means each area has a different population density (Table 3 and Fig. 6).

Results of the study indicates that the Javan rhino population in Ujung Kulon peninsula was concentrated in lowland areas to be about 80 % (altitude is approximated 0-30 m above sea level). In the valley areas they were found only 20 % (altitude is more and less than 80 m.) and just one rhino was found in the altitude of 200 m. while conducting the census in 1981.

Most of areas of population concentration is own rivers, rivulets and stretches of muddy soil are frequent. The Javan rhino footprints were found at stretches of muddy soil are about 47 %, surroundings rivers are approximated 35 % and rivulets are 18 %. However, in Nyiur and Ranca Balen swampy areas no rhinos should be found there becaused of water so deeply and muddy .

4.3. Vegetation type in Ujung Kulon peninsula and Javan rhino food requirement

Vegetation in Ujung Kulon peninsula should be different in few tipes that based on structure of plant community. Javan rhinos in Ujung Kulon peninsula were given evidence of getting food from many kinds of vegetation tipes such formations of (pescaprae, barringtonia and sand dunes); mangrove, salt marsh, peat swamp and lowland forest.

In the formation of (pescaprae, barringtonia and sand dunes); the evidence of Javan rhinos food were found as frequent of Desmodium umbellatum, Hibiscus tiliaceus, Thespesia populnea, Alstonia scholaris, Pongamia pinnata, Premna corymbosa and Ficus septica. Only few times they were found to browse plants from areas of mangrove as Acanthus ilicifolius, Acrostichum aureum and Lumnitzera littorea. Other areas were found to abound of plants species as Javan rhinos food such Ardisia humilis, Barringtonia macrocarpa, Semecarpus heterophylla, Dillenia excelsa and Leea indica. Especially in lowland forest was found very aboundance with Javan rhino food plants as Amomum coccineum, Pterospermum javanicum, P. diversifolium, Diospyros macrophylla, Eugenia polyantha, E. subglauca, Ficus variegata, Artocarpus elastica, Spondias dulcis, S. pinnata and Oxymitra cunneiformis.

It seems that areas of population concentration of the Javan rhino in Ujung Kulon peninsula was very corelated with the aboundance of food plant species.

5.0. Recommendations

According to 'Asian Rhinos An Action Plan for their Conservation' which was compiled by Khan (1989) that conduct an intensive survey of the Javan rhinos in Ujung Kulon peninsula is an essential pre-requisite to recommending further conservation action. The survey is of such importance that it should be led by top quality ecologist should concentrate on the size, composition and habitat preferences of the population occurring there, and should assess the principal threats to its continued survival.

The representative method is especially for conducting study on size and composition of the population was exactly described by Strien (1985) in 'The Sumatran Rhinoceros (Dicerorhinus sumatrensis Fischer, 1814) in the Gunung Leuser National Park, Sumatra, Indonesia.' Its should be compared by standardised censuses should be carried out annually thereafter.

According to Sadjudin (1987) that population stabilization needs to be observed. Special studies on the ecological competition between banteng (Bos javanicus) and rhino must be carried out. The next census must estimate the population size of the banteng too.

All the available data must be collected and studied carefully in order to carry out the management of Ujung Kulon more effectively and along sound ecological lines. A field work in Ujung Kulon must be carefully planned in advance, especially its timing. The most appropriate times are the end of the rainy season and the beginning of the dry season. At other times, it would be difficult to measure the footprints on the substrate, although be printed by plastercast.

One final recommendation it was writen by Schenkel & Schenkel (1969) that the species of the Javan rhinoceros must be saved from extinction by all means. There is a good chance of success provided the efforts of WWF in collaboration with the Indonesian government are continued.

6.0. References

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