

MISSION REPORT

CAT LOC VIETNAMESE RHINO
(Rhinoceros sondaicus annamiticus):
Training for Monitoring and Status Assessment

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3 - 15 December 2001

In December 2001 a short mission was undertaken to the Cat Tien National Park, Vietnam with funding from the WWF AREAS program (See the *itinerary below*). The mission focused on the further development of the monitoring of the small population of Vietnamese Rhino (*Rhinoceros sondaicus annamiticus*) in the Cat Loc part of the Park, and on re-assessing the status of the rhino population.

Field Data Sheets were made to encourage and enable the Rhino Patrol Units, in operation since September 2001, to make comprehensive standardized field reports. The field sheets allow recording of all activities of the Patrol Units, all observations on rhinos and other important wildlife, and all cases of human interference, using standardized categories and tagged to time, date and location. The design of the data sheets is based on the forms developed for the Rhino Patrol Units operating in Indonesia, adopted for the conditions in Vietnam. The sample data sheets are attached in Appendix 1.

An MS Access database was initiated for the storage and analysis of the field data. The input forms have the same layout as the field data sheets to enable field data to be inserted accurately and quickly. The structure of the database and the principles of editing tables and forms was shown to the local. They will be able to further improve and adapt the data sheets and database forms to suit the local needs.

As an example of the type of reporting that could be made from the field data collected by the Rhino teams and entered into the database the 2000 Annual report from the Indonesian Rhino Conservation Program is attached in Appendix 2.

A short training session was held with the leaders of the Rhino teams to familiarize them with the new field data sheets and to emphasize important aspects of the monitoring process, especially on the need to collect more plastercasts and to make regular checks of areas attractive for rhinos, like saltlicks and wallows, and where good clear footprints can be expected.

All the plastercast collected since 1998 were reviewed again to identify individuals and establish individual ranges. Also the camera trap pictures and other data were reviewed. All the rhino records reported by the field teams had already been tabled in a GIS database and this was used to determine the total area used by the rhinos and to map the records of the tracks that could be identified.

The results of the re-assessment of the rhino data are presented in a separate report, attached in Appendix 3.

ITINERARY

<i>Mon</i>	03 Dec. 2001	Preparations for travel to Vietnam.
<i>Tue</i>	04 Dec. 2001	Travel to Vietnam - HCMC, via Bangkok.
<i>Wed</i>	05 Dec. 2001	Travel to Cat Tien. Discussions with Park Staff, WWF Staff and Consultants on Mission program.
<i>Thu</i>	06 Dec. 2001	Meeting on design of data sheets. Drafting of data sheets.
<i>Fri</i>	07 Dec. 2001	Drafting of data sheets. Design of database.
<i>Sat</i>	08 Dec. 2001	Evaluation of rhino plaster casts.
<i>Sun</i>	09 Dec. 2001	Evaluation of rhino plaster casts.
<i>Mon</i>	10 Dec. 2001	Evaluation of rhino plaster casts.
<i>Tue</i>	11 Dec. 2001	Reporting on rhino status.
<i>Wed</i>	12 Dec. 2001	Day visit to Bau Chiem sattlick. Training of Leaders of rhino units in the use of data sheets
<i>Thu</i>	13 Dec. 2001	Reporting. Travel to HCMC
<i>Fri</i>	14 Dec. 2001	Travel to Bangkok
<i>Sat</i>	15 Dec. 2001	Travel to Jakarta

APPENDIX 3

RE-ASSESSMENT OF THE STATUS OF THE VIETNAMESE RHINO (*Rhinoceros sondaicus annamiticus*) IN CAT LOC.

Dr. Nico J. van Strien, International Rhino Foundation
Mr. Bui Huu Manh, Cat Tien National Park, Rhino Coordinator

INTRODUCTION

The Javan rhinoceros (*Rhinoceros sondaicus*) is one of the rarest large mammals, with probably less than 60 surviving in two small populations, each representing a distinct subspecies. Formerly the species ranged over a large area, from eastern India and Southern China, throughout Southeast Asia and Indochina and on the islands of Sumatra and Borneo.

Of the nominative subspecies (*R. s. sondaicus*) approximately 50 survive in the Ujung Kulon National Park on the west tip of Java. The population recovered from probably less than 30 in the 1930s till at least 60 about 1980. Since then the population has declined and estimated numbers have been about 50 ever since. Poaching has largely been eliminated for over two decades and the stagnation of the population is most likely caused by a gradual reduction of resources available for the rhinos, in particular by the regeneration of high forest with very little forage for rhinos over most of Ujung Kulon.

The Ujung Kulon rhinos have been isolated in a comparatively small area for over 75 years and the survival of the species in Ujung Kulon is unlikely unless the population is allowed to expand considerably by increasing the carrying capacity in Ujung Kulon and by re-introduction of Javan rhinos into other secure habitats within the historic range.

Of the Indochinese subspecies (*R. s. annamiticus*)¹ a few individuals survive in the Cat Loc area of the Cat Tien National Park in Vietnam. The presence of these rhinos was confirmed in 1989 and since then the establishment of Wildlife Reserve and other conservation measures have enabled a few rhinos to survive in about 4000 Ha of severely degraded habitat, reduced from about 15,000 Ha in 1990. Currently there are strong indications that this very small population not only lost most of its habitat, but also has lost its potential to reproduce (see below), and extinction seems almost unavoidable unless drastic and unorthodox action is taken.

STATUS OF PROTECTION

There has been great progress in protection, with new guard posts and other infrastructure in place, and more guards conducting regular patrols throughout the rhino area. Since September 2001 two

¹The taxon *Rhinoceros sondaicus annamiticus* was validly published by Heude in 1892 (Heude, P.-M., 1892. Etudes odontologiques, première partie: herbivores trizygodontes et dizygodontes. Mémoires concernant l'histoire naturelle de l'empire chinois, 2(2): 65-84, pls. 19A, 20, 20A, 20B.). He published drawings of three teeth from his collection without a description. The name was re-validated by Groves and Guerin in 1980 (Groves, C.P., Guerin, C., Le *Rhinoceros sondaicus annamiticus* (Mammalia, Perissodactyla) D'Indochine: Distinction taxonomique et anatomique; relations phylétiques. Geobios 13(2), 1999-208). Heude's drawings of the holotype (iconotype) are copied in this publication. The diagnosis of *R. sondaicus annamiticus* as given by Groves and Guerin is: "*Rp. sondaicus* dont le crâne a une longueur occipito-nasale réduite par rapport à la longueur basilaire; face nuchale inclinée vers l'avant; forte largeur antéorbitaire mais largeur bizygomatique réduite; os palatins plus longs que larges. Prémolaires supérieures avec crochet parfois double et crista généralement absente; molaires supérieures avec crochet simple et crista présente dans la moitié des cas. Jugales inférieures courtes avec prémolaires étroites. Métapodes médians courts."

teams composed of National park guards are making routine checks of the rhino habitat for 10 days each month.

The purchase of land around the important Bau Chiem saltlick has enabled the rhino to have undisturbed access to this important resource, and the frequency of visits has increased. Natural regeneration of shrubs and trees is slowly occurring in the area around the saltlick, and in the future this area may also become an important feeding area.

The education programme has established the rhino as an important symbol and icon in the area. Hence, both the local community and the government widely support conserving rhinos and their habitat.

First steps have already been made to secure more land for them and a better habitat by translocation isolated settlements from inside the rhino area to newly created settlement areas outside the conservation areas.

The rhinos appear to be quite safe now from poaching, as hunting specifically for rhinos is no longer likely to take place. Nevertheless firearms are still present among the communities around the National Park and hunting for meat is still occurring. Therefore accidental shooting of rhino could still occur.

The area the rhinos use is very small - only about 4000 ha - and although there is more suitable habitat available around the current area of distribution, surveys there have shown that rhinos do not use this area. This is probably also an indication of a very low population size².

STATUS OF MONITORING

The first census of the rhino population in Cat Loc was attempted in 1993 by Vietnamese scientists and WWF-Indonesia experts from Ujung Kulon N.P. in Indonesia. Only track measurements were taken, using the method that is used in Ujung Kulon. The census concluded that there were about 7-9 rhinos, virtually all subadults, based on the small size of the footprints³.

In 1997 a biodiversity survey, carried out by Vietnamese scientists, concluded that the rhino population was less than 10.

In 1998/1999 two census surveys were conducted by park staff with assistance from Staff of the IEBR in Hanoi and the Asian Rhino Specialist Group/International Rhino Foundation. The census started with a 10-day training program instructing the participants how to measure tracks and make plaster casts of good clear footprints. The use of plaster casts to identify individual rhinos has been used successfully in the Gunung Leuser N. P. and also on a much smaller scale in Ujung Kulon N. P.

Participants in the training conducted a survey in April and May 1998 on three groups covering the whole rhino area in Cat Loc. Rhino sign were found over an area of approximately 6000 Ha, of which almost 1000 Ha was already lost to encroachment. A large number of tracks was measured and 45 plastercast were collected, 13 of full prints, the remainder of fronthoofs only. After the census all casts were measured and compared for characteristic form differences. Nineteen casts were not clear enough to be identified, and among the rest 4 different types were found. But the number of good

²Density of Javan rhino in Ujung Kulon is currently approximately one animal per 500 Ha. For Sumatran rhino in primary forest the optimal density is about one per 700 Ha.

³See the note on the size of the Indochinese Javan rhino after the recommendations.

casts, from fresh tracks in smooth soft clay, not too much damaged by rain or surface water, were only 7.

This means that there was evidence of 4 rhinos living in Cat Loc. To account for individuals missed by the census that covered about 95% of the rhino area for about two months, the total population estimate was set at 5-8. This may have been too optimistic, but the total amount of usable casts and other data from the field was small, and most of the team members had no prior experience in surveying for rhino.

In December 1998 and January 1999 another survey was carried out by the National Park and WWF, with assistance from Vietnamese experts, by two teams and 144 plastercasts were collected as well as a large number of track measurements. The initial analysis of this sample of plastercasts concluded that 111 were good enough for analysis and 6 different types were distinguished. The report concluded that the total population was 7-8

Historic estimates of the Cat Loc Rhino population		
YEAR	SIZE OF RHINO AREA (Ha)	NUMBER
~1990	51,000	-
1993	35,000	7-9
1997	-	<10
1998	6000	min 4 (5-8)
1999	6500	min 6 (7-8)
2001	4000	min 3

In 2001 the same sample of plastercasts were analysed again by the authors. The results of this analysis are rather different from the initial analysis, probably again because of limited experience with the difficulties of recognizing individuals from plastercasts, many of which have been made under very variable conditions and often by people lacking long-term experience with selecting, cleaning and casting.

Identifying rhinos from casts of their footprints is not a simple straightforward process, but requires insight into how a particular cast reflects the form of the foot

that made it, and what is caused by soil type, movement, age of the track and damage by rain, poor casting, etc. Such insight can only be developed over a long period by working with large numbers of good plastercasts. The first author used over 600 good plastercasts for his analysis of the population structure of the Sumatran rhinos in Gunung Leuser, and only the sorting and identification of the casts took two full years.

When the 1999 plastercasts collection was re-evaluated, together with 6 casts made by Park Guards in 1999 and 2001, all casts (148 in total, including fronthoofs only) were first laid out by date and location on benches, and numbered by 'track'. All casts were carefully inspected and those that were good enough to make at least one of the standard measurements (see the diagram below) were selected. It was found that the WIDTH could only be reliably measured on 23 of the 144 casts. The width can only be measured if the tip of the sidehoofs is clearly visible in the cast, and in the majority of casts one or both of the tips could not be seen clearly. The LONGWIDTH could be measured on 14 casts, and the width of the FRONTHOOF could be measured on 55 casts.

Of the total sample of 148 only 70 (<50%) allowed the taking of at least one measurement. All the others were not clear enough to allow accurate measuring. It appears therefore that in the initial analysis too many casts of poor quality were included, resulting in a too high number of types being recognized.

The 'good' casts were measured (See the summary in the table below) and carefully compared, one against all the others, looking for consistent differences over three days. Nevertheless among the poor

quality casts there were none that showed any characteristic that would indicate that they could not have been made by any of the rhinos that were identified among the good casts.

Eventually three different types could be identified, and the best casts for each were selected to be photographed and drawn (See the figures at the end of the report). The locations where each of the three types were found were plotted on the GIS map. A table was made of all casts, with numbers, locations, and measurements. This table is not reproduced in this report.

Unfortunately the 1998 plastercasts collection is still being kept in Hanoi, so no direct comparison could be made. It is clear though that except for the very small track found in 1999, the overall impression of the 1998 casts is not different from the 1999 collection. It is desirable though to return the 1998 to Cat Tien so that a direct comparison of the good casts can be made.

The three plastercast types in the 1999 census were called 'Green', 'Red' and 'Yellow', for easy reference.

Since the establishments of the rhino patrols in Cai Toc the whole area has been surveyed intensively, including the areas outside the known rhino range. The survey routes and all rhino signs are recorded in a GIS database. The data collected show that the area occupied by the rhinos is approximately 4000 Ha, less than was estimated earlier (See the map attached).

Green Rhino

Good casts of 'Green' have been found at the Bau Chiem saltlick on a number of dates. 'Green's tracks are found throughout the rhino area that is about 4000 ha (See the map below). We speculate that this is the animal that has been photographed a number of times at or near the saltlick. We also are of the opinion that all photographs made so far are from the same individual, as there are no clearly distinguishing features on any of the pictures (See the page with the cut-outs of all the heads) The photographed rhino is a female, as shown on a camera trap picture taken from behind (See the page with the plastercast picture of 'Green'.)

The photographed animal appears quite young as there are no scars, the ears do not have tears, and in general the body features - folds, ridges, skin scales etc - are quite 'weak' in development.

Therefore we conclude that 'Green' is a young female that comes to the Bau Chien saltlick about once a month, and uses most of the rhino area, in particular the western side.

Red Rhino

Casts of 'Red' were also found through most of the area, in particular the center, and quite close, but not at, the Bau Chiem saltlick. In size the footprint is very similar to 'green', but the front hoof is clearly wider. Judging from the size and form of the footprint this is also a youngish individual.

Since 'Red' was found together with the small 'Yellow' (See below), this rhino could very well be also a female.

Therefore we conclude that 'Red' is most likely also a young female, possibly even the mother of "Yellow" and may also use the Bau Chiem saltlick.

Yellow Rhino

A single cast of 'Yellow' was found in the north of the rhino area together with tracks of 'red'. From the data available it is not clear whether the two tracks were of equal age and were moving in the same

direction, or not. The cast is of such quality that there is no doubt about its distinctness. It is a very small footprint clearly from a very young animal⁴. It may have been about 1 year old early 1999.

Therefore our conclusion is that 'Yellow' is a young rhino, sex unknown, most likely born from 'Red'.

Reproduction of Rhino in Cat Loc.

The villagers living around the Bau Chiem saltlick reported to have seen a rhino with a calf in 1989⁵. In that year also tracks of a female with a calf were seen by Vietnamese scientists.

'Yellow' was presumably born in late 1997, or early 1998, and conceived in early 1996. We may assume that the interbirth interval is comparable to other rhino species and be about 4 years. If red gave birth in 1997/98, she could have had another calf about 2001. So far there are no signs, tracks or sightings, of a calf.

Female 'green', whose tracks have regularly been seen at Bau Chiem for 4 years, although probably still young, could have had a calf since it's tracks were first recorded in 1998.

The lack of signs of reproduction since 'Yellow's birth in 1997/98, despite having at least one female and probably two, is reason for great concern. It appears that in early 1996 there must still have been a male, the father of 'Yellow'. The fact that since that time there are no signs of calves, could mean that there are no more adult males in the Cat Loc rhino population⁶. One of the sexes disappearing from a very small population can easily be caused by hunting, if the males are targeted, but it can also be the result of stochastic variation in the distribution between the sexes.

Conclusion

The earlier estimates made after the 1998 and 1999 censuses were too optimistic. The 1998 estimate of 5-8 was too high mainly because of a too high estimate of the size of the rhino area, and hence of the number of animals 'missed'. The 1999 estimate of 7-8 was too high because in the analysis of the plastercasts too much weight was given to observed differences that were not caused by the size and form of the foot, but by other factors.

It can never be excluded that rhinos are not represented in the sample of casts, or that their foot is so similar to another rhino that it cannot be recognized. Nevertheless the experience from Gunung Leuser has learned that there are many distinguishing characteristics in size and form of the foot and the hoofs and that it is possible to recognize 40 different individuals solely on the size and form, provided that one has a large sample of good casts.

⁴The cast is very distinct from all the others and if it had not been found in Cat Loc, it would certainly have been identified as a Sumatran rhino, especially because of the narrowness of the front hoof in comparison to the size of the foot, and the long and narrow 'middle-finger'. Unfortunately the authors are not familiar with the general form and size of footprints of young and subadult rhinos in Ujung Kulon.

⁵It could be that the calf recorded in 1989 is the 'green' rhino, which would set her age at about 13 years now.

⁶Consensus among the local (ex)hunters is that there are only 3-4 rhinos left in Cat Loc and that there are no more males, as these have the bigger horns and were therefore taken out by the hunters. The analysis of the recorded tracks seems to confirm the local opinion, although the sex of 'Yellow' is unknown. It could be a male that would be sexually mature about 2002/2003.

The number of good and fair casts collected in Cat Loc is still rather small, less than 50 in total. nevertheless one would have expected much more variability, and hence much more difficulties in identifying 'individuals', if more than 3-4 rhinos are present in the area.

Therefore it is necessary, first of all, to compare the casts made in 1998 with those from the 1999 sample, and to collect more, and better casts, throughout the rhino area. The number of places in Cat Loc where soils are found that will make good footprints is limited, and the patrols should target those places and check them for new tracks every few days. With a bigger sample of good tracks the conclusions can be drawn with a higher level of accuracy.

RECOMMENDATIONS

Protection

- Strict gun controls and suppression of hunting for meat in the conservation areas, since rhinos may accidentally be hurt or killed.
- Increasing the regularity and intensity of the patrols by freeing the rhino patrol members from all other tasks.
- Intensify the efforts to restore the integrity of the rhino habitat by removing cultivation and habitation in critical areas, in particular around saltlicks and on the fertile alluvial soils, to provide better access and availability of critical resources. like water, food and minerals.

Monitoring

- Return the 1998 plastercast sample to Cat Tien for comparison
- Conduct an Intensive survey during the 2002 dry season, targeting saltlicks, wallows and all other places where good tracks might be found. Survey key areas on a weekly basis during the dry season and more frequently during the rainy season
- Intensify the Camera trap survey, in particular by trying to cover more different parts of the rhino range and placing multiple cameras at good locations to get pictures of the whole body and of the behind to identify the sex.
- Re-assessment of all the data with new samples to be collected in 2002. The target should be to collect at least 50 good clear plastercasts of fresh tracks.
- Re-evaluate the Action Plan based on the results of the revaluation.

Notes on the size of the the Indochinese Javan rhino (*Rhinoceros sondaicus annamiticus*)

The smallness of the footprints of the Javan rhinos in Cat Loc in comparison with those in Ujung Kulon is striking, and has initially led to speculation that the rhinos were all subadults, or that there were Sumatran instead of Javan rhinos in cat Loc. The footprint of the rhios in cat Loc is only about 70% of the average size of an adult rhio in java.

The footprint size has not increased over the years, which would have happened if they were all subadults almost 10 years ago, and therefore we must conclude that the current Cat Loc rhino population is small in footprint size compared to the other population in Java.

Groves & Guerin⁷ (Groves, C.P., Guerin, C., *Le Rhinoceros sondaicus annamiticus* (Mammalia, Perissodactyla) D'Indochine: Distinction taxonomique et anatomique; relations phylétiques. *Geobios* 13(2), 1999-208) measured a small number of limb bones of Javan rhinos from different locations and found that the leg bones of the old Indochinese specimens are comparatively long, while the foot bones are short. See the table below.

Average length of leg and foot bones of Javan rhinos from Java, Sumatra and Indochina
(Number of measurements between brackets. Highest values in bold)

Leg bones	JAVA	SUMATRA	INDOCHINA
Humerus			
Length	430 (6)	420 (2)	436 (2)
Max. Transversal Diameter	148 (6)	148 (2)	146 (2)
Max. Anteroposterior Diameter	115 (6)	112 (2)	112 (2)
Radius			
Length	349 (6)	350 (2)	360 (2)
Max. Transversal Diameter	102 (6)	100 (2)	100 (2)
Max. Anteroposterior Diameter	62 (6)	63 (2)	60 (2)
Femur			
Length	472 (7)	471 (2)	480 (2)
Max. Transversal Diameter	149 (2)	144 (2)	137 (2)
Max. Anteroposterior Diameter	169 (2)	162 (2)	156 (2)
Tibia			
Length	343 (7)	336 (2)	336 (1)
Max. Transversal Diameter	102 (7)	106 (2)	102 (1)
Max. Anteroposterior Diameter	74 (7)	72 (2)	68 (1)
Foot bones			
Metacarpal III			
Length	182 (6)	182 (2)	179 (1)
Max. Transversal Diameter	67 (6)	68 (2)	67 (1)
Max. Anteroposterior Diameter	51 (5)	51 (2)	48 (1)
Metatarsal III			
Length	157 (6)	160 (2)	150 (1)
Max. Transversal Diameter	59 (6)	58 (2)	52 (1)
Max. Anteroposterior Diameter	47 (5)	49 (2)	44 (1)

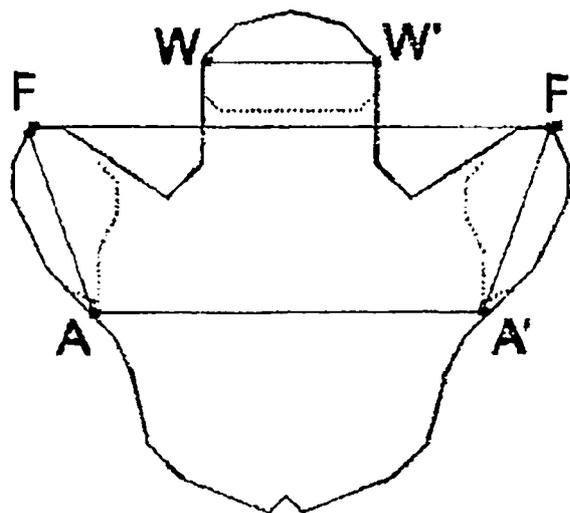
⁷Groves, C.P., Guerin, C., *Le Rhinoceros sondaicus annamiticus* (Mammalia, Perissodactyla) D'Indochine: Distinction taxonomique et anatomique; relations phylétiques. *Geobios* 13(2), 1999-208

Although the samples are small and the differences not very large, it seems that the leg bones of *R. s. annamiticus* are comparatively long, and less wide than those from Java and Sumatra, while for the foot bones both the length and the width of in Indochinese specimens is less. This would indicate that *R. s. annamiticus* is probably not much smaller in height than the Javan rhinos of Java and Sumatra, but that it is more slender, of lighter build, and therefore much less heavy. This could be an adaptation to a more hilly environment or to more mobility, for instance for seasonal migration. The more slender foot bones and the smaller footprint are the result of the lighter body.

CAT TIEN RHINO FOOTPRINT CHARACTERISTICS

CAST MEASUREMENTS OF IDENTIFIED RHINOS (mm)

PRINT WIDTH - FF'	GREEN	RED	
Average	198.0	208.7	185,0
Standard Deviation	11.6	2.1	
Number	23	3	1
LONG WIDTH - FAA'F'			
Average	316.0	327.0	304.0
Standard Deviation	10.2	7.8	
Number	14	2	1
FRONTHOOF WIDTH - WW'			
Average	97.5	103.8	76,0
Standard Deviation	2.9	2.9	
Number	26	26	1



Cm

20

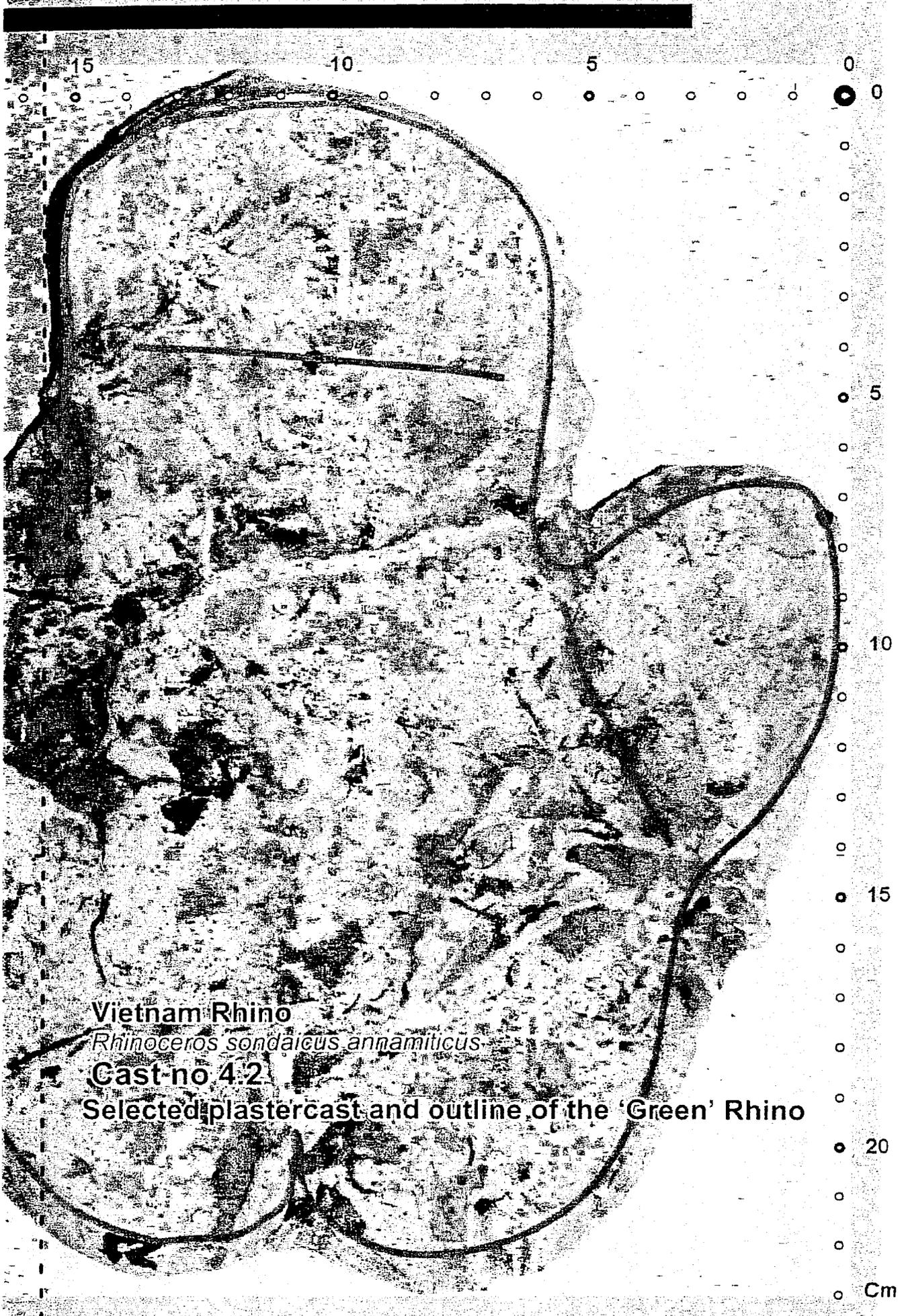
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The 'GREEN' Rhino

The most often recorded rhino, through most of the rhino area. A female, identified on a automatic camera photo (See below), that regularly visits the Bau Chiem saltlick.



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Vietnam Rhino

Rhinoceros sondaicus annamiticus

Cast no 4.2

Selected plaster cast and outline of the 'Green' Rhino

The 'RED' Rhino

This rhino was also recorded through most of the rhino area, including close to the Bau Chiem saltlick. In form quite similar to the 'GREEN' rhino, but with a clearly wider fronthoof. Also the sidehoofs are slightly longer.

This rhino is most likely a female as its tracks were found together in January 1999 with those of the 'YELLOW' rhino, a young rhino.



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Vietnam Rhino

Rhinoceros sondaicus annamiticus

Cast no 6-1

Selected plastercast and outline of the 'Red' Rhino

Cm

The ' _____ ' Rhino

This rhino has a much smaller footprint than both other animals, and is clearly a young animal, estimated to be between one and two year of age in January 1999.

Only one good plastercast was found of this rhino in the northern part of the rhino area.



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Vietnam Rhino

Rhinoceros sondaicus annamiticus

Cast no 10.3

Selected plastercast and outline of the 'Yellow' Rhino

Cm

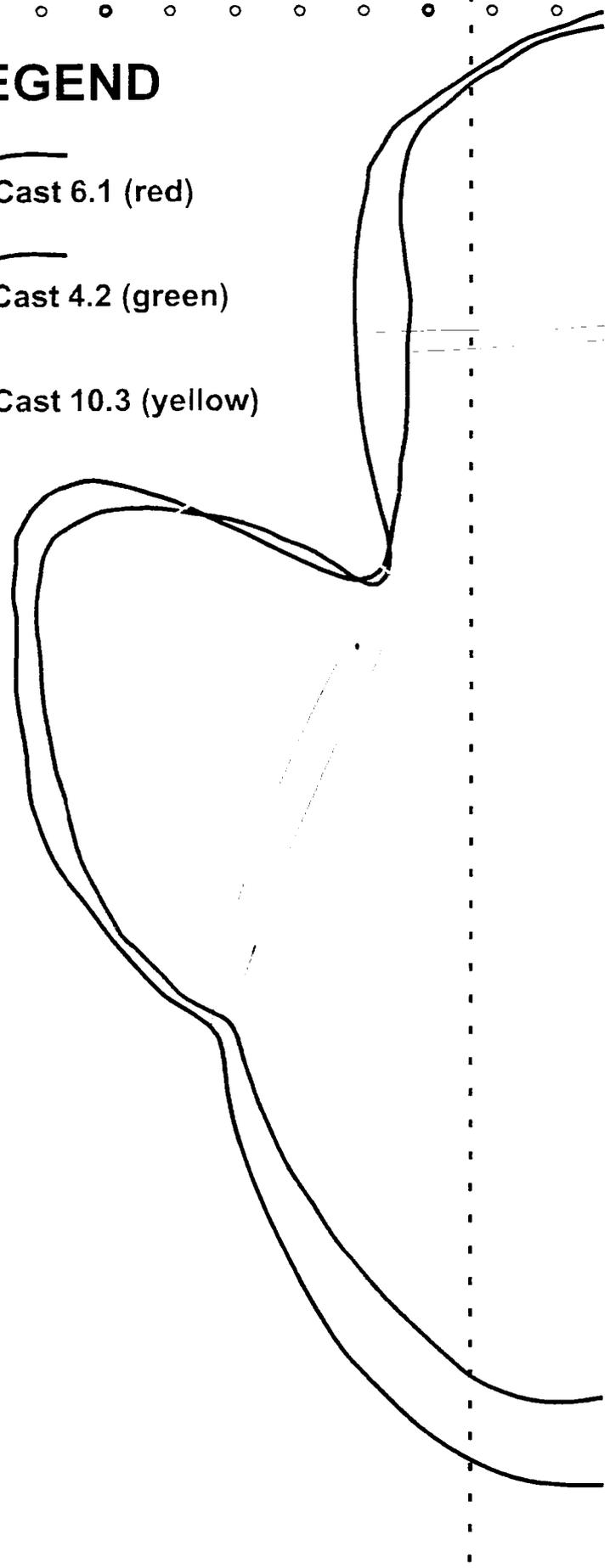


LEGEND

 Cast 6.1 (red)

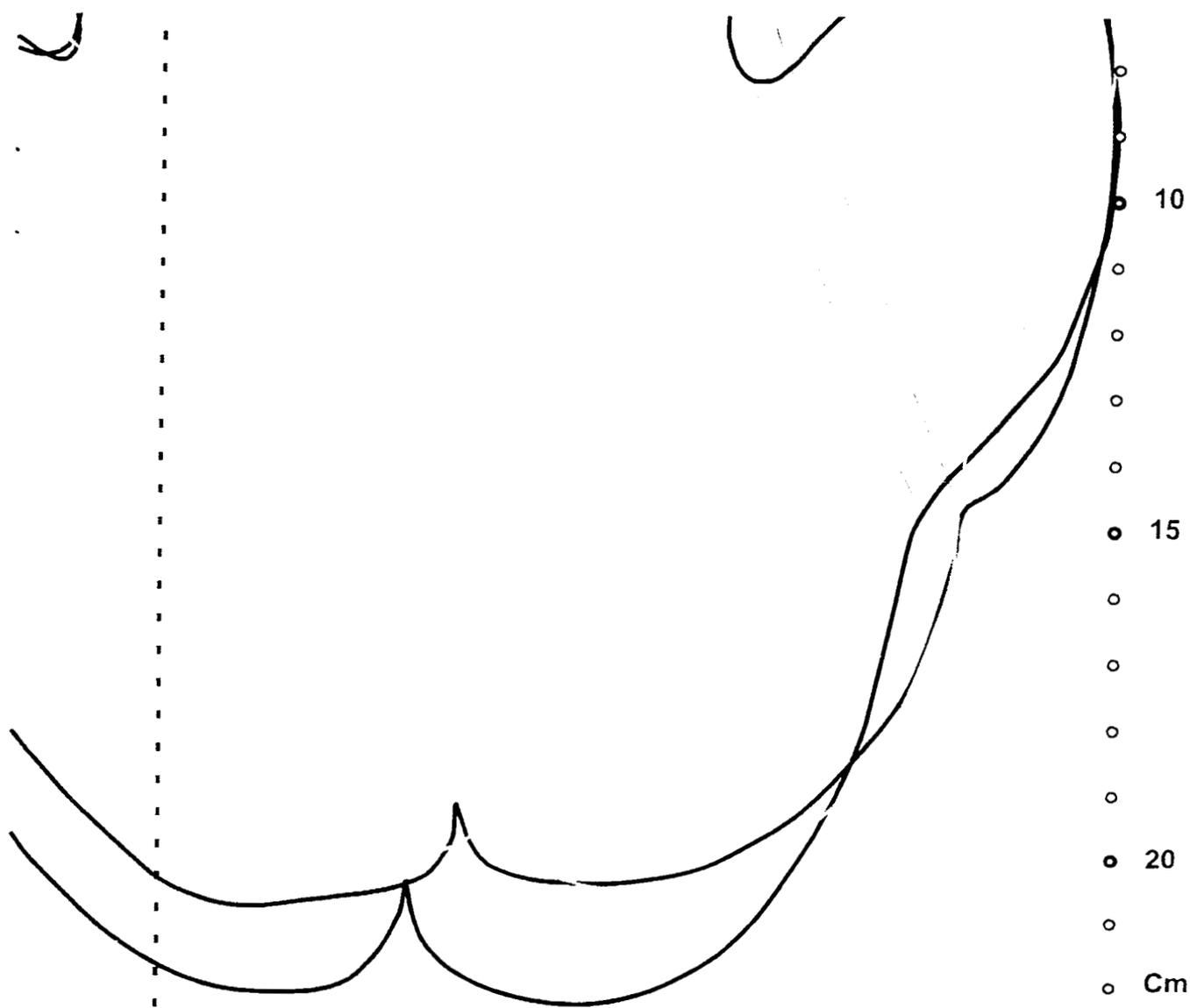
 Cast 4.2 (green)

 Cast 10.3 (yellow)



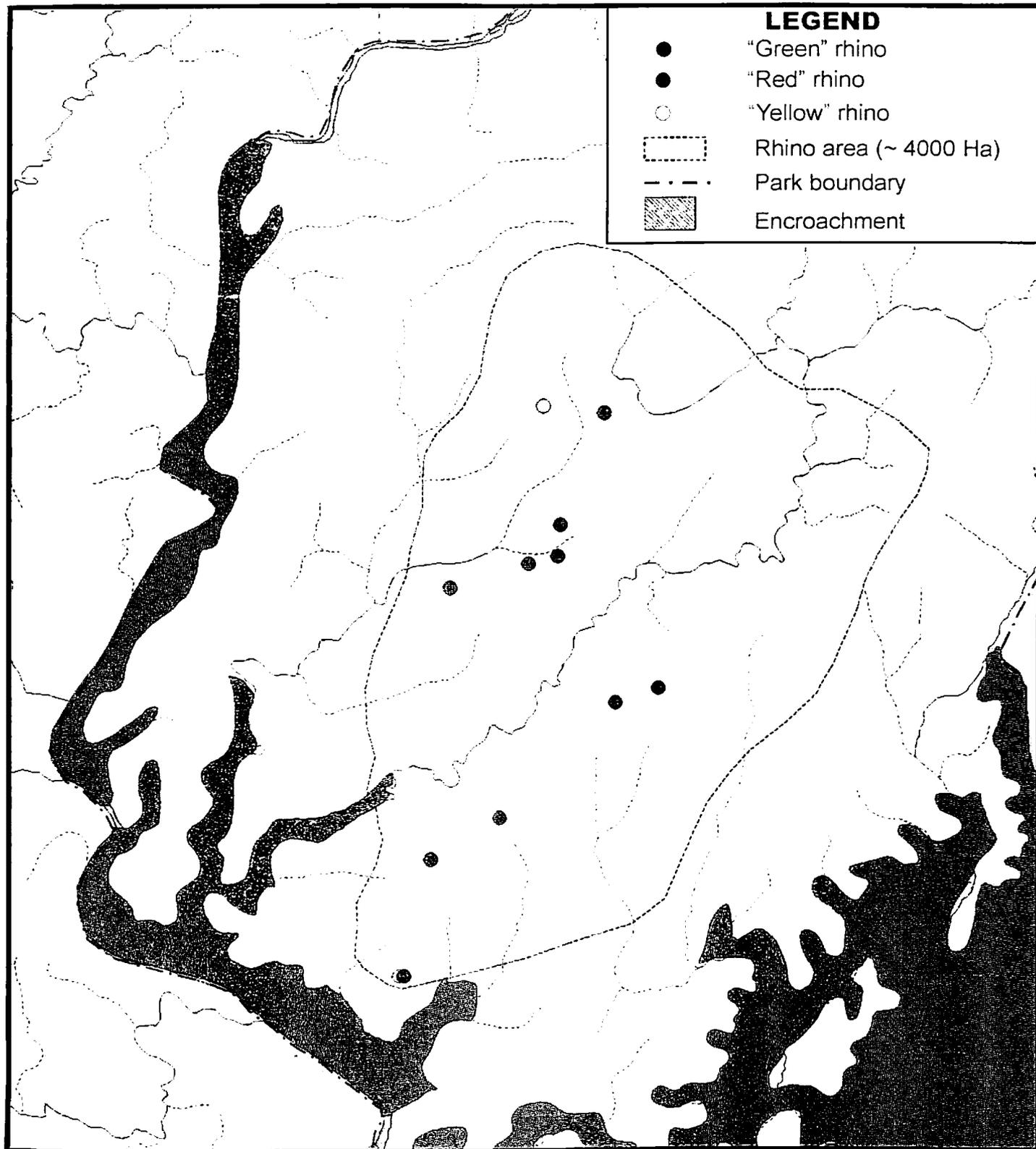
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Vietnam Rhino (Cat Tien NP) - *Rhinoceros sondaicus annamiticus*
 Outlines of selected plastercasts of the three individuals identified

Cat Loc rhino area and distribution of identified footprints



Cat Loc Rhino heads

The head and shoulder of the rhinos on the good camera trap pictures were cut out from the background, enlarged to the same size and moved into the same position

