

THE FATE OF BLACK RHINOCEROSSES RELEASED IN NAIROBI NATIONAL PARK

P. H. Hamilton and J. M. King

SUMMARY

Information on the black rhinoceros population of Nairobi National Park has been obtained from two-month surveys in 1967 and 1968 backed by data collected at random over the past few years. It proved impossible to identify some of the rhinoceroses whose presence was indicated by spoor and unidentified sightings, and an estimate of the total number present at the end of 1968 must vary between 27 and 33 animals. Twenty-two rhinoceroses have been brought into the Park by the Game Department Capture Unit since November 1966. The fate of these animals has been: two dead, two not seen and 18 identified in the Park 3-33 months after release. The newcomers have produced only one serious conflict with a resident rhinoceros and two collisions with motor vehicles. Despite the small size of the Park, the inadequacy of its boundaries and the legendary intolerance of the species, it would appear that the translocation operations have been a success.

INTRODUCTION

The black rhinoceros (*Diceros bicornis bicornis* (Linnaeus)) has disappeared entirely from vast areas of Africa and in many parts where it still exists it is in sadly depleted numbers (Ritchie, 1963). Kenya remains a stronghold for the species which is common in the Tsavo, Aberdares and Mount Kenya National Parks. These sanctuaries offer security for the survival of the species but represent only a small fraction of the total area still inhabited by the rhinoceros. These habitats outside the National Parks are being rapidly destroyed by agricultural settlement. The Game Department and other wildlife conservationists have been unable to witness this destruction without making some attempt to rescue a number of these extremely valuable animals. The translocation operations have aroused considerable interest up to the point at which the rescued animal has been released into the new habitat. It is then usually assumed that the future of the animal is secured. It is the purpose of this paper to examine this assumption in detail. The problem of the released rhinoceros is not primarily one of survival against predation (Ritchie, 1963), but relates to the provision of suitable habitat and adequate space within the sanctuary and often the acceptance of the newcomer by a resident rhinoceros population. Goddard (1967) has shown that animals whose home ranges overlap are reasonably sociable, but that neither sex is very tolerant of a strange rhinoceros.

This paper is based on general observations gathered in the last few years, supplemented by two intensive study periods. These two surveys were carried out in 1967 and 1968 over the periods 26th June-10th August and 10th-21st September, 1967, and 17th June-7th August, 1968. Their aims were:

- (1) to become acquainted with the rhinoceros population of Nairobi National Park;
- (2) to build up a set of reference photographs for the identification of individual animals;
- (3) to study their distribution and movements;
- (4) to study, specifically, rhinoceroses released since November 1966 by the Game Department Capture Unit (GCU) with special reference to their behaviour towards the established population.

MATERIALS AND METHODS

The Nairobi National Park covers an area of only 11,680 ha (44 sq. miles) and consists of open veld (10,385 ha) traversed by strips of riverine forest, with a small, broken forest (1,295 ha) in the western portion. There is a good network of roads and tracks. Further details may be found in Foster and Coe (1968).

A total of 437 h was spent in the Park and its immediate environs during the survey periods. Observations were confined to the

first three and last two hours of daylight plus five night watches. Most of the time was spent patrolling in a Land-Rover with 10×40 Leitz Trinovid binoculars and a Nikkormat camera with a 1:4.5, f=300 lens. The entire Park was surveyed at least once a week and certain areas more frequently. Patrolling was not carried out according to any rigid systematic pattern but as rhinoceros reports and evidence of rhinoceros activity dictated. Although the Land-Rover could be taken off the roads easily, it was found that in thick scrub or forest the noise of the vehicle driving against bushes usually put the rhinoceroses to flight before they could be seen. If the vehicle was driven quietly, bulls would often approach to investigate, but cows remained shy and usually fled. Much of the time was spent patrolling on the roads, but fresh tracks were sometimes followed up on foot.

An aid to identification was a photographic index consisting of frontal and lateral cut-out photographs of the head of each rhinoceros, as used by Klingel (1966) and Goddard (1967). Photographs of most of the GCU animals had been taken before release, but there were only a few of the established population. The identification of individual animals was based on five main features:

Sex. The two sexes could be readily distinguished by the appearance of the external genitalia. The vulva was visible below the anus whereas the prepuce showed between the hindlegs. The udder occupied the same position as the prepuce but was less pendulous.

Horns. There was a degree of sexual dimorphism: in the male the posterior horn was usually much shorter than the anterior (Plate 1a); in the female both horns tended to be of similar length (Plate 1b and c). Horn type also varied with the place of capture: forest rhinoceroses (Plate 1c) often possessed thin horns growing from conspicuously matted bases but these horns were not necessarily longer than those of animals captured in open bush country; rhinoceroses caught amongst the rocks of the Kapiti plains 40 km south of the Park had short, stout horns (Plates 1b and 2a).

Ears. There was considerable variation in hair tufts, tears and notches in the ears. In addition rhinoceroses caught by the GCU since November 1966 had a coloured

plastic tag (Jumbo Rototag, Dalton Supplies Ltd., Nettlebed, Henley-on-Thames, England) inserted in one ear at the time of capture (e.g. Plate 1d).

Sores and scars. Sores were not a feature of resident Nairobi Park rhinoceroses, and had been effectively treated on GCU animals. The healed area sometimes lacked pigmentation. Other wounds often healed to form an obvious cicatrice.

Size. Mature animals varied in size from 770 to at least 1,270 kg (King, 1969) with little difference between the sexes.

The pattern of the wrinkle contours on the snout (Goddard, 1966) could only be seen on very placid animals in the open and was therefore found to be of no value.

RESULTS

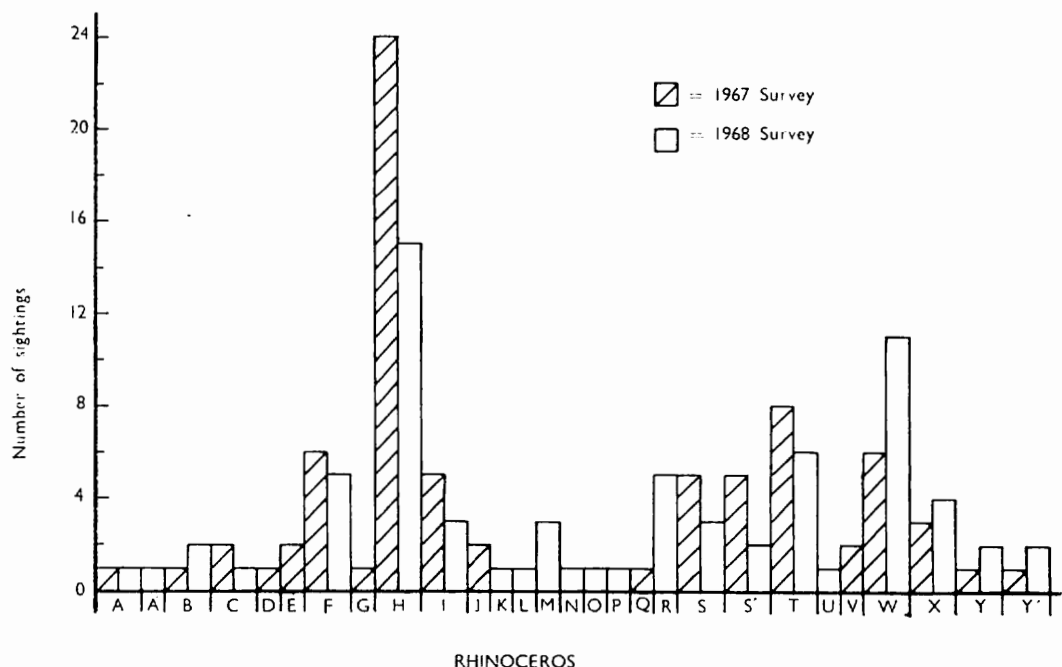
Rhinoceros sightings

Rhinoceroses were not easily seen in Nairobi Park, even when an observer with a four-wheel drive vehicle was searching during the most favourable hours of the day and knew where to look. The average was one sighting in 2.75 h; in practice occasionally as many as four or five animals were seen in one day's searches, but more often several days would pass without a sighting.

During the survey periods 159 sightings of rhinoceroses were made, all but 11 resulting in positive identification. Twenty-eight animals were seen (12 bulls, 14 cows, and two calves of undetermined sex); 16 of these (six bulls and ten cows) had been introduced by the GCU since November 1966.

It was found that some rhinoceroses were much more reclusive than others (Figure 1) and that six of the eight individuals most frequently seen, including the four seen most often, were bulls.

A comparison of observations made in 1967 and 1968 showed that there was a distinct change in the length and shape of some of the horn profiles. This was particularly noticeable in animals captured amongst the rocks of the Kapiti plains; their short, stout horns grew longer and sharper in their new habitat (Plate 2). It was, therefore, important to keep the photographic index up to date, especially as eartags did not remain in position indefinitely. Several of the GCU rhinoceroses had lost their plastic tags within 18 months of release (Table 1). When visible, eartags were very useful in confirming



RHINOCEROS

Figure 1

Frequency with which individual rhinoceroses were seen during the survey periods.

A—P = released since November 1966

Q—Y' = resident prior to 1966

S' = calf of S, etc.

TABLE 1

The black rhinoceroses released in the Nairobi National Park by the Game Department Capture Unit since November 1966

Animal	Sex	Place and date of capture	Colour of tag	Last seen with tag	First seen without tag
		Kiboko scrub	8. 10. 66	Yellow	7. 11. 66
		" "	9. 10. 66	Blue	12. 66
A		Nyeri forest	28. 10. 66	Red	21. 6. 67
B		" "	10. 11. 66	Red	21. 9. 67
C		" "	30. 11. 66	Yellow	22. 6. 68
D		" "	1. 12. 66	Blue	21. 12. 66
E		Kitengela plains	11. 1. 67	Blue	28. 6. 67
F		Kapiti plains	7. 3. 67	Pink	4. 8. 67
		" "	7. 3. 67	Green	11. 4. 67
		" "	8. 3. 67	Green	4. 5. 68
G		" "	8. 3. 67	White	20. 7. 67
H		" "	9. 3. 67	Yellow	15. 6. 69
I		" "	9. 3. 67	Yellow	21. 6. 68
J		" "	20. 3. 67	White	20. 4. 67
K		Darajani scrub	20. 2. 68	Red	6. 69
L		" "	21. 2. 68	Blue	21. 7. 68
		" "	22. 2. 68	White	30. 3. 68
M		" "	23. 2. 68	Red	7. 8. 68
N		" "	5. 3. 68	Green	15. 7. 68
		" "	5. 3. 68	Pink	6. 1. 69
O		" "	6. 3. 68	Pink	27. 6. 68
P		" "	6. 3. 68	Pink	13. 7. 69

All adult with the exception of animal C.

Animals were cartagged on date of capture and released about four weeks later.

Individuals seen during the survey periods and therefore represented on the distribution maps have been assigned letters of the alphabet.

identity but they were often extremely difficult to see, particularly in poor light or if the animal was in thick bush. Pink was the colour most easily seen, closely followed by yellow and white; red, blue and green could be remarkably inconspicuous inside the ear and almost invisible in poor light.

Estimate of population

For the purposes of the surveys, the Nairobi Park rhinoceroses were divided into two categories: those released since November 1966 by the GCU and those which were already resident. The majority of the resident population were in fact also newcomers which had been released in the Park by professional trappers or the GCU before 1965. National Parks' records show that between June 1963 and December 1964 12 rhinoceroses were released (five bulls, four cows, three calves). Not all of these animals were penned before release. One bull died and a cow and calf from Kitengela on the southern boundary of the Park returned across the Athi river. Most, if not all, of the other nine animals, four more of which were from Kitengela, were thought to have remained in the Park. In addition to these nine, at least six truly indigenous animals were present.

During the surveys, 11 of these resident rhinoceroses were seen (five adult bulls, four adult cows and two 5 y old calves). There was possibly one other resident bull (Kearney—pers. comm.).

Of the 22 animals introduced by the GCU since November 1966 two were known to have died, 16 were personally observed and two more were reliably reported by Park staff. The second survey established that there were not less than 12 GCU rhinoceroses in the Park in mid-1968 but spoor indicated that several of the others were still present and two of these have since been sighted. In addition, one of the translocated cows (A) gave birth to a calf in late 1967 or early 1968.

It is impossible from these results to state the exact number of rhinoceroses in the Park. Some of the animals which were seen in 1967 but not in 1968 may have died, or confined their movements to dense undergrowth or to the hours of darkness, or left the Park. The two GCU rhinoceroses not identified since release may be accounted for by evidence of spoor and unidentified sightings. An estimate of the rhinoceros

population at the end of 1968, based on all the information available, gives a minimum number of 27 and a maximum of 33.

Movement after release

All the GCU animals were released from the same point, namely the pens marked in Figures 2 and 3. The translocated rhinoceros was detained in these pens for approximately one month. The pen was then opened in the evening and the animal allowed to wander out in its own time during the night. At first the rhinoceros was reluctant to leave the familiar security of its pen and move into strange surroundings: some animals returned to the pens for food and water for several days before finally dispersing. Even then newly released rhinoceroses remained in the adjacent forest for some months after release. All of the six animals from Darajani plains (200 km south-east of the Park) released prior to the second survey were still in the forested portion of the Park four months later. Eventually the rhinoceroses dispersed throughout the Park.

The maximum distance a released animal has moved before establishing a home range is 21 km. This bull (I) was seen during the first survey only 24 km from the centre of the Kapiti plains where he had been caught three months earlier. He was living south of the Athi river on the Park boundary (Figure 2) and there was nothing to restrain him from returning to his former habitat. He was always seen in the same area and appeared to have settled down contentedly. However, in the second survey he was only seen north of the Athi (Figures 3 and 4), though there were indications that he sometimes crossed the river.

The northern and western boundaries have been fenced with barbed-wire netting or chainlink wire, except on two steep railway embankments. These embankments had been considered ungulate-proof until July 1967 when a bull (F) started climbing up and down the 50° slope and in and out of the Park. Although he had been caught on the Kapiti plains he showed no signs of returning there. He was recaptured and held while the bottoms of the embankments were sealed off with strands of barbed wire up to a height of 1.2 m. On being released two weeks later he wandered around the outside of the pens for less than an hour and then walked 18 km through the night to his former home range.

within the Park. He has since remained in that area and made no attempt to break through the wire.

The southern boundary, below the Mbagathi gorge, provided the easiest line of exit from the Park, when the Athi river was not in flood. Spoor and Masai reports indicated that rhinoceroses used the river crossing fairly frequently to move in and out of the Kitengela area. The seven animals caught on the Kapiti plains were therefore free to return to their former habitat, a journey of less than a day from the Park boundary. This possibility was considered unlikely because although rhinoceroses move rapidly through familiar surroundings (e.g. bull F mentioned above), they were not thought to possess a true homing instinct across unknown country. To confirm this point the Kapiti plains, which are devoid of cover, were searched for 2 h from a helicopter five months after the translocated animals had been released in the Park. These 2 h equalled the total hunting time originally taken to find all the 11 rhinoceroses captured on the Kapiti plains. Since no rhinoceroses were seen it was assumed that the two animals not identified during the first survey were still in the Park (Table I). Unfortunately only four (F, H, I, J) were seen during 1968, although evidence of spoor suggested that the others might still be present.

Although the easiest exit was along the southern boundary, the Park has few natural barriers and no fencing that can withstand the determined onslaught of a rhinoceros. This was illustrated by cow M which broke out of its pen four nights after arriving at Nairobi National Park. The animal crossed a game grid, smashed through a barbed wire netting fence and occupied the barracks of the 5th Kenya Rifles for 12 h before being redarted. No other cases of damage to fencing have occurred.

Home ranges

Daytime observations confirmed the sedentary behaviour of the black rhinoceros and its preference for a small area, often less than 780 ha (3 sq. miles). Bull W, one of the largest resident bulls in the Park, was an exception to this observation and roamed over a considerable area of the plains (Figure 4). The home ranges of the forest rhinoceroses were very difficult to define because most individuals were infrequently seen and some moved from one side of the

forest to the other, as well as making nocturnal forages down to the plains. These areas overlapped and the animals which shared parts of their home ranges appeared to live without conflict.

A comparison of the two distribution maps (Figures 2 and 3) reveals that several changes of home range took place between 1967 and 1968 (Figure 4). An explanation for some of these changes has been provided in the section on behaviour.

Distribution within the Park

The distribution of 28 rhinoceroses positively identified during the two survey periods is shown by the maps (Figures 2 and 3). The sightings give a fair indication of density but do not reflect it accurately. The forest and gorges hid several animals which were not identified in the surveys. Forest rhinoceroses were generally difficult to see on account of the thick vegetation while some of the plains animals were equally difficult to find because of their secretive habits and haunts. Indeed, as a rhinoceros habitat, the plains portion of the Park can best be considered as a branching system of bush-clothed gorges and valleys along which the animals tend to move and in which they remain during daylight, often emerging only after dusk.

Of the 28 rhinoceroses identified, 11 were seen on the plains, seven in the forest, and ten in both habitats. The majority of the animals in the last group in fact lived in the forest for most of the time, descending to the plains only at night. These nocturnal movements became more frequent as the dry season advanced and reached their peak in February (Kearney—pers. comm.). Both surveys began shortly after the rains when the animals preferred to stay in the forest; during the second survey the forest was known to contain at least 17 rhinoceroses, although more animals had moved onto the plains since September 1967.

Behaviour

Although occasional reports of groups of up to seven have been submitted by Park staff, the rhinoceroses were seen singly with the following exceptions: cow with calf, cow in oestrus with one or two attendant bulls, two bulls (F and I), and one released adolescent cow (C) which joined a resident cow and calf (S and S').

All the cows and most of the bulls that

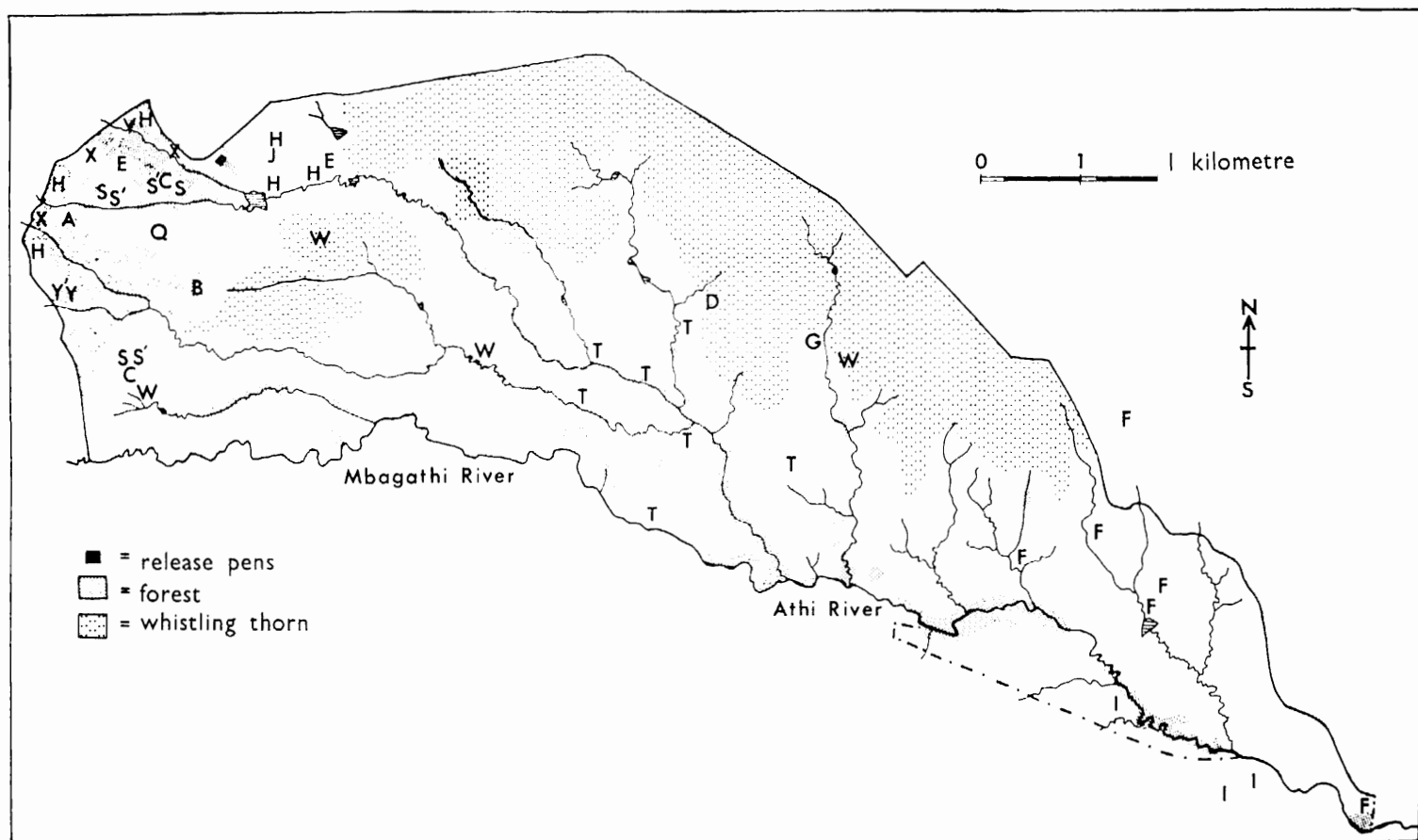


Figure 2

Distribution of rhinoceroses identified during the 1967 survey.
Q—Y' in Park prior to 1966
A—P released since November 1966
S'—calf of S, etc.

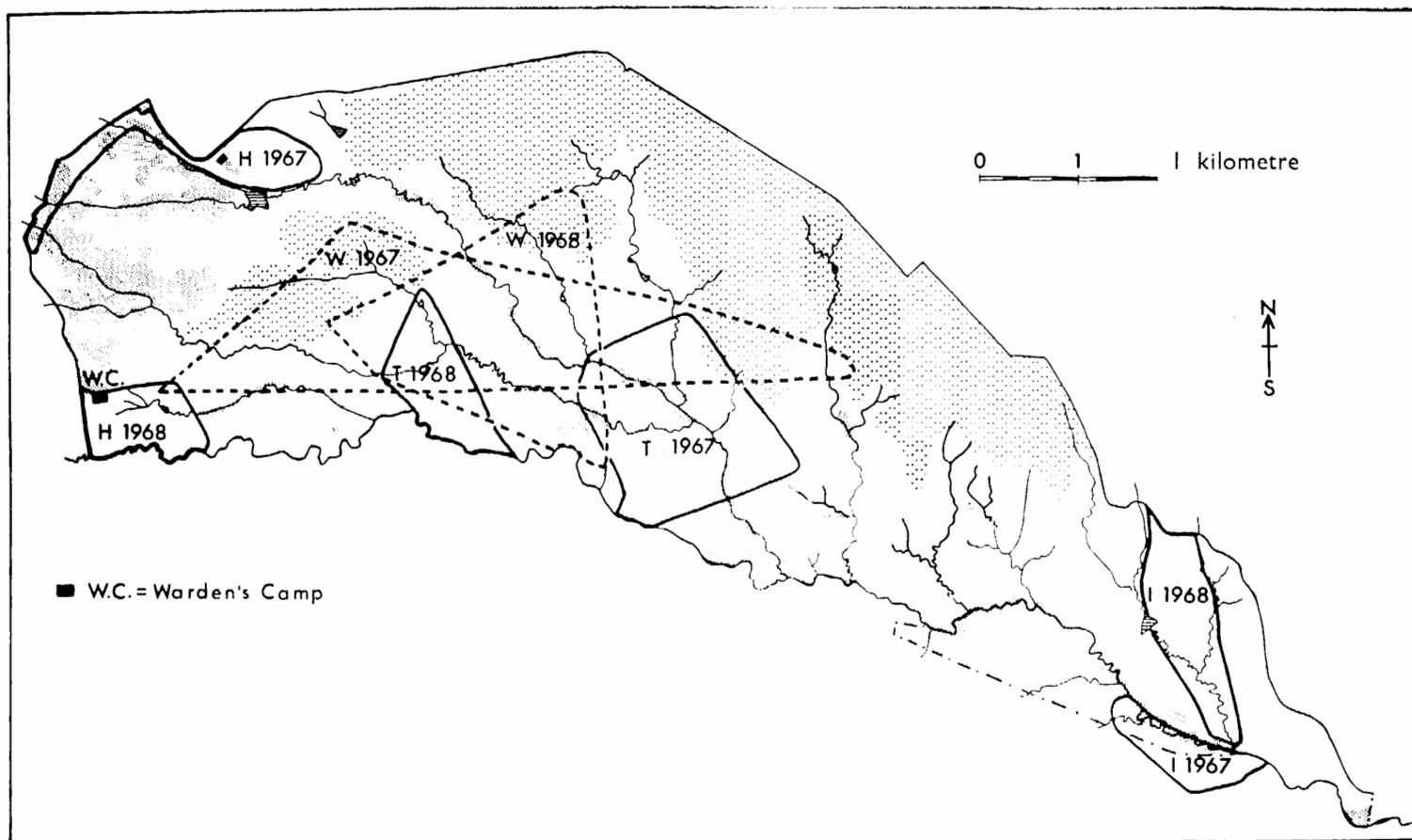


Figure 4

A comparison of the two distribution maps (Figures 2 and 3) to reveal several apparent changes of home range that occurred between 1967 and 1968.

were released were accepted by the resident population. Only two released bulls were observed to have fights with resident bulls. The first was an extremely aggressive animal from Kiboko (130 km south-east of the Park) which was released in November 1966. A month later his physical condition had deteriorated, he was knocked down by a resident bull (V) and, although the Warden intervened, he died within a few hours. In addition to severe horn wounds, the post mortem revealed large abscesses in the neck muscles and around the oesophagus (Windsor—pers. comm.). These may have resulted from deep bruising during previous fights and contributed to his death. The second bull to be involved in fights was a large animal (H) from the Kapiti plains who bore fighting wounds at the time of capture and was very truculent after release. During the first survey period he had at least two fights with each of two large resident bulls (V and X) in the forest. Superficial wounds on the face, chest or flank were inflicted by the long horns of his opponents but none of the four fights resulted in serious injury to any of the combatants and no rhinoceros was driven out of the area. No fighting wounds were seen on H in the second survey but he had by then taken up a new home range south of the forest, near the Wardens' Camp, and become very placid.

The Park contained two resident cows with calves estimated to be five years old. The first calf born to a released cow (A) was observed during the second survey period. This calf (A') had probably been conceived prior to capture in October 1966. However, a mating was witnessed in June 1968 between a resident bull (X) and a Darajani cow (O) which had been released less than four months earlier.

The presence of human habitation inside the Park boundary has influenced the behaviour and movement of released and resident rhinoceroses. In May 1967 some Somali villages, together with 900 cattle and 450 sheep, were removed from the plains north of the Mbagathi river. A comparison of the distribution maps (Figures 2 and 3) shows that it took several months for resident rhinoceroses to move into this vacated area which now holds a greater concentration than any other part of the plains. In contrast the building of a Masai manyatta, south of the Athi river but within the Park boundary,

forced a released bull (I) to vacate his adopted home range in the same area and move north across the river (Figure 4). Another released bull was speared in the same area, inside the National Park, in November 1968 and had to be removed and penned for treatment.

The reaction of the rhinoceros population to the tourist was also studied. The Park records an average of 3,000 visitors in 800 motor vehicles per week. Most of the translocated rhinoceroses had been caught in areas free of vehicles, with the notable exception of those from Darajani which had been harried by the catching cars of professional trappers and often charged vehicles without hesitation in their original habitat. After capture, the period of taming, transportation and adjustment to the presence of vehicles removed much of this aggression. Within a year of release the rhinoceroses that were most readily seen, e.g. bull H, became extremely tolerant of motor traffic. This encouraged the tourists to take more liberties with the animals. As a result several released rhinoceroses have chased cars but only two cases of impact have occurred during the period November 1966 to January 1969. These two cases occurred on Saturday 4th May, 1968 and involved a bull, and a cow (M), that had been released 13 months and five weeks respectively. The bull was reported to have met a Ford Zephyr on a blind corner with a bank on one side and a gorge on the other. He charged from a distance of about 15m, hooked at the radiator grill three times, breaking a headlight, puncturing the radiator and lifting the bonnet. On the same day cow M was encountered moving at a fast trot away from the centre of the plains to her preferred area below the release pens. The cause of her agitation appeared to be a white Mercedes hire-car in pursuit. The Mercedes was unable to keep up with the rhinoceros which crossed a ridge and joined a road that led homewards. Unfortunately a stationary Holden Premier, covered with baboons, blocked her path. The rhinoceros broke into a gallop at about 25 m, hit the front bumper, rose in the air like a pole vaulter, stamped the bonnet with her front feet and slid backwards down the nearside of the car. The animal then chased a Citroen for a short distance before continuing westwards. She did not stop until she had reached her chosen patch of scrub, having covered at least 6.5 km in 30 min. A month prior to this incident, cow M had been observed to allow a queue

of cars to approach to within 18 m without showing signs of aggression.

Mortalities

Two of the 22 rhinoceroses released by the GCU since November 1966 are known to have died. One was the aggressive Kiboko bull already mentioned. The other was no more than a skeleton when it was discovered in July 1967 by the Kiserian river, 1.2 km outside the south-western boundary of the Park. There was severe osteomyelitis and erosion of the articular surfaces of the lower jaw on one side, so that feeding must have been very painful. The animal was probably very emaciated when it succumbed either to lions or poachers. The end of a dart needle, overlooked at the time of capture, was recovered and identified the animal as a GCU rhinoceros.

DISCUSSION

Nairobi National Park is ideal for a study of this nature because of its small size and extensive network of good roads. The Park is not, however, an ideal release area for the translocation of black rhinoceroses.

A rhinoceros can walk the length of the Park in one night and it is not surprising that some animals released immediately after capture and translocation have not stayed in the new habitat. It is assumed that the rhinoceros unloaded from a crate wanders through strange surroundings looking for a familiar haunt. The animal can cover a lot of ground and may by chance return to its previous home range if this is located a few kilometres outside the Park. The Park has few natural boundaries and no fencing that can withstand the determined onslaught of a rhinoceros. However, after a few weeks in captivity these unpredictable animals have come to respect even single-strand barbed-wire fencing.

This study has shown, therefore, that despite the limitations of Nairobi National Park the majority of the rhinoceroses released into the area have remained, although free to leave and in some cases to return to their former habitats. The implication is that the newcomers are content with the new habitat and have been accepted by the resident population, despite the observation by Goddard (1967) that the intrusion of an alien into a community of rhinoceroses has provoked aggressive behaviour. The few

confrontations that were recorded were confined to new and resident bulls and were vocal rather than physical, provided both contestants were healthy. These encounters varied with the temperaments of the individuals concerned, and it was unfortunate that the area of forest adjacent to the release pens was occupied by two large and aggressive bulls (V and X). Even these individuals did not drive intruders out of their home ranges, although the progress of the Kapiti plains bull (H) along the Park perimeter fence suggested that he was not actively seeking human contact so much as avoiding trouble from his own kind.

One of the main reasons for this translocation operation was to provide the many tourists that visit Nairobi National Park with an opportunity to see the black rhinoceros. This objective required a reasonable number of animals to be tolerant of motor traffic. During the period following translocation the authorities have been primarily concerned with limiting the impact of rhinoceroses on the tourist by ensuring that the animals have become fairly tame prior to release. The conclusion reached is that the rhinoceroses seldom charge without provocation. This explanation may not be obvious to the target car, as in the case of cow M charging the stationary Holden. It is thought that this animal had followed the riverine vegetation out onto the plains during an undisturbed week of heavy rain and impassable roads. The sun shone on the fateful Saturday and traffic streamed into the Park. The rhinoceros probably slept undetected in the long grass until the evening when she stood up and became the centre of attraction. Her one aim then, no doubt, was to avoid the attentions of the motor cars and return to the safety of the forest. The degree of her anxiety can be judged by the ferocity of her charge at the car that blocked her escape. The unfortunate occupants of the Holden were merely reaping the seeds of provocation sown by the white Mercedes.

Since there are at least ten adult females in the Park with an expected calving interval of 27 months (Goddard, 1967), the future of this population would appear to be secure with one important qualification: the degree of human interference. The removal of the Somali villages from the Park and the influx of rhinoceroses into the vacant areas has been countered by the occupation of the southern boundary by the Masai. Although

these Masai manyattas may have helped to contain the movements of some of these released rhinoceroses (e.g. bull I) they will ultimately decrease the carrying capacity of the Park for all game animals. They will in effect deprive many species of access to the Kitengela Conservation Area which has been considered an essential part of the ecology of Nairobi National Park.

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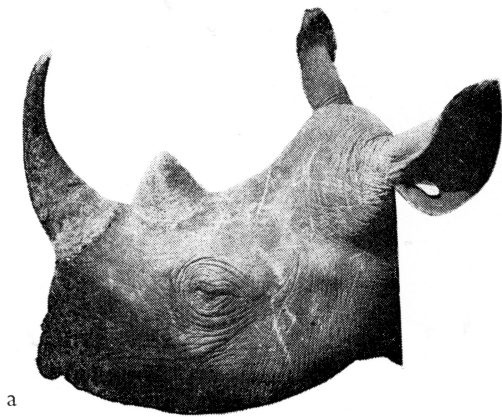
assistance, without which this study could not have been undertaken. We would also like to thank Dr. R. V. Short for his helpful comments and Mrs. C. A. King for typing the manuscript.

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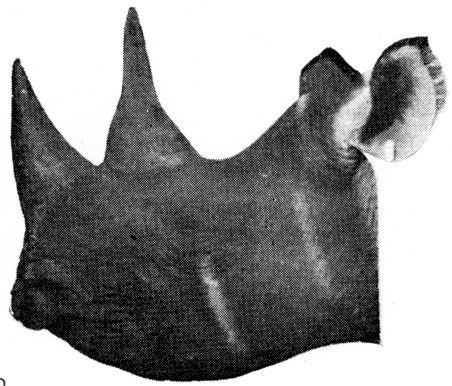
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Authors' addresses: P. H. Hamilton, P.O. Box 30333, Nairobi and J. M. King, Game Department, P.O. Box 241, Nairobi, Kenya.

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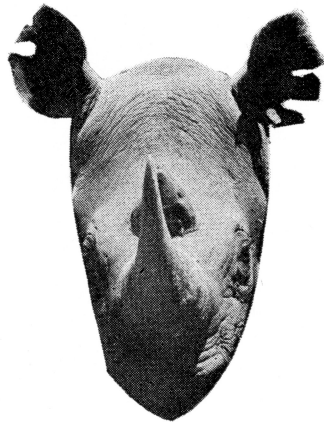
a



b



c



d

Plate 1

Aids to identification.

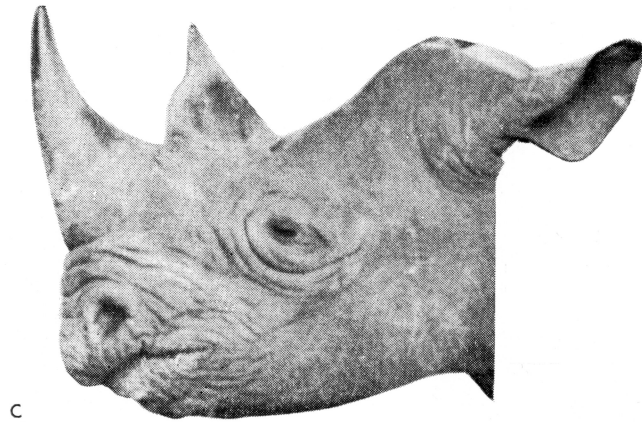
a Young adult bull + eartag

b Adult cow caught amongst the rocks of the Kapiti Plains + eartag

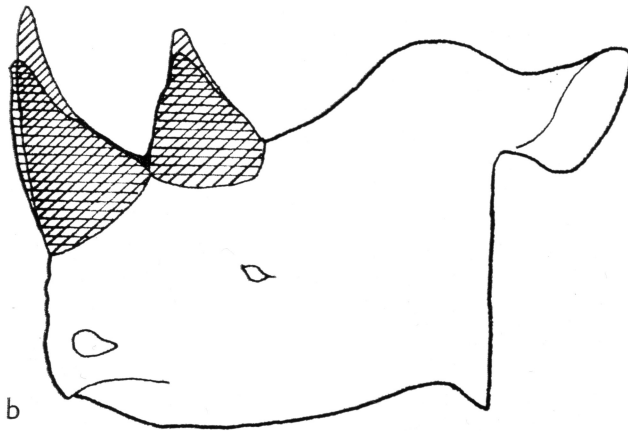
c Adult cow caught in Nyeri forest

d Adult bull showing ear tufts, notches and tag

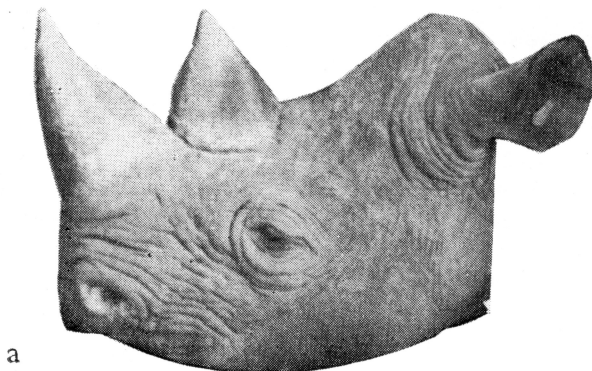
RELEASE OF RHINOCEROSSES IN NAIROBI PARK



c



b



a

Plate 2

Change of identity

- a* Adult bull H at time of capture 9.3.67 amongst the rocks on the Kapiti Plains
b Diagram to illustrate the change of shape and length of the horn profiles
c Bull H after 18 months in Nairobi Park (Oct. 68)