
STATUS OF THE BLACK RHINOCEROS IN THE MASAI MARA NATIONAL RESERVE, KENYA

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INTRODUCTION

It is generally acknowledged that the population of black rhino *Diceros bicornis michaeli* in what is now the Masai Mara National Reserve (the Reserve) during the mid-900s probably numbered between 150-200 animals (Brett, 1995). However, as a result of poaching, the thinning of the *Croton dichogamus* thickets (that are such a characteristic feature of the Mara and northern Serengeti), and an appreciable increase in elephant numbers (Dublin, 1991), this figure has been greatly reduced. By 1972 there were known to be only 108 rhinos remaining in the Reserve (Mukinya, 1973). In the following decade poaching continued and by 1985 the population of rhinos had been reduced by over 80% to fewer than 13 animals (Brett, 1995). The status of the black rhino had reached crisis point in the Reserve.

In early 1980, in an attempt to halt the continued poaching and almost certain extinction of the species within the Reserve, a special rhino surveillance team was established and jointly administered by the Narok County Council (NCC), custodian of the Reserve, Friends of Conservation (FOC), then Friends of the Masai Mara, World Wide Fund for Nature, and the then Wildlife Conservation and Management Department of Kenya. Since 1983 the surveillance team has been administered solely by FOC in collaboration with NCC and their rangers.

Although the rhinos of the Reserve have been under surveillance since 1983, it was only during the period of this study (1992 to 1995) that the population was once again monitored with a view to acquiring more up-to-date information on the population of this large, free-ranging black rhino population in Kenya. The only previous studies of these animals in the Reserve were made in 1971 and 1972 by Mukinya (1973, 1977).

Within a span of 12 years rhino numbers have trebled to a healthy population of 40 animals. The increase has been due to improved surveillance and

monitoring, the cessation of rhino poaching within the Reserve, the birth of 25 calves and the identification of four, hitherto unrecorded animals during the period of this study.

This paper outlines the present status of the black rhino in the Reserve and makes certain comparisons with the findings of Mukinya (1973). It also offers recommendations for the future long-term security and management of these animals.

STUDY AREA

The Reserve is centred on 1 30'S and 35 0 'E in the Narok District of Kenya, approximately 200km southwest of Nairobi. It covers an area of 1,510km² (Cumming *et al.*, 1990). Altitude varies from 1,450m ASL along the lower reaches of the Mara River where it crosses the Kenya/Tanzania international boundary, to 1,950m on top of the Siria Escarpment and Ngama Hills to the west and east respectively.

The Reserve forms the northern portion of the Serengeti/Mara ecosystem (Dublin, 1991). It is bounded on the north-east by the Loita Plains, on the east by the Laleta Hills, on the west by the Siria Escarpment, and on the south by the northern Serengeti National Park.

There is an annual mean gradient in rainfall across the Reserve from ca. 900mm in the east around the Ngama Hills to ca. 1,500mm in the west along the Siria Escarpment (Masai Mara Ecological Monitoring records).

The poorly drained "black cotton" soil areas supports the vast undulating areas of *Themeda triandra* grasslands that are the major vegetation community of the Reserve. This is the dry season habitat for the annual migration of wildebeests, zebras and Thomson's gazelles from the adjoining Serengeti National Park. The grasslands are intersected by the Mara, Talek and Sand Rivers and their numerous tributaries. The riverine forests and thickets provide shelter and security for

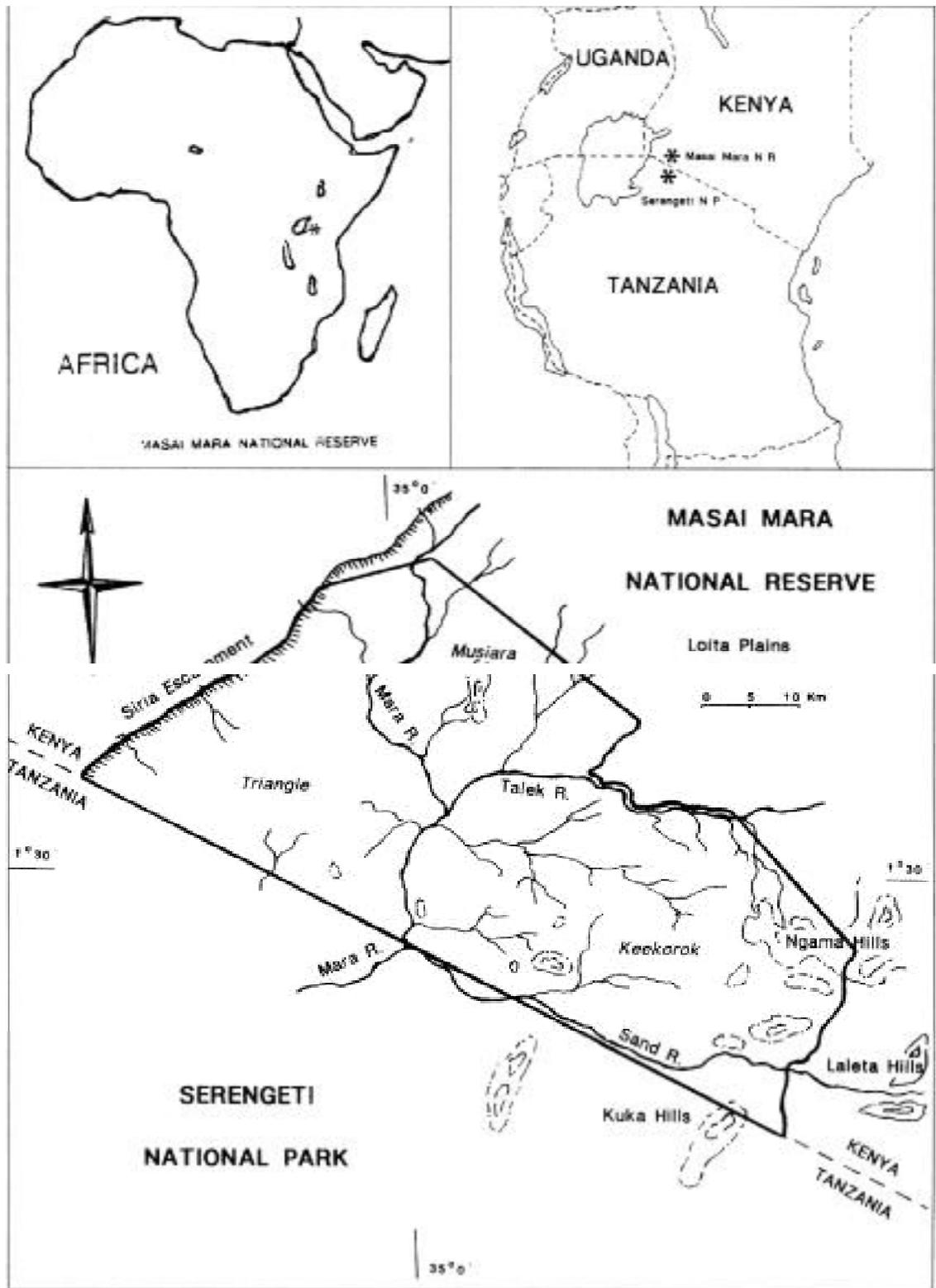


Figure 1. Map of the Masai Mara National Reserve, Kenya, in relation to the Serengeti National Park, Tanzania.

rhinos. But it is the higher ground and hills with their shallow, porous, sandy soils, their greater cover of *Croton* and *Euclea* thickets, with the possibly greater abundance of herbs, legumes, shrubs and other favoured food plants, that constitute the preferred habitat for the majority of rhinos.

METHODS

At every opportunity during the study period all rhinos were photographed at as close a range as possible either from a vehicle or on foot. Individual identifications were further enhanced by using physiological characteristics such as gender and age class (Hitchins, 1970), and various morphological characteristics such as horn shape and size (Morgan-Davis, 1996), permanent body scars, the location of cuts and notches on the ears, and the distribution and extent of the fringe of hair on the ears.

Rhino locations were initially established by the use of three point azimuth bearings and later in the study with the use of a Global Positioning System (Trimble Navigation) using the UTM grid system. These bearings were then entered onto a 1:50,000 topographical map from which home ranges and distribution areas, as defined by Mukinya (1973), were determined.

Individual home range sizes were assessed by computing the area of a polygon by connecting the recorded peripheral points of each home range. Distribution areas were determined from groups of rhinos whose home ranges overlapped to a considerable extent. The measured home ranges, distribution areas, and population statistics were then compared with the findings of Mukinya (1973).

DISTRIBUTION AND DENSITY

In the mid-1900s, the Masai Mara had a justified reputation as being a haven for wildlife. Rhinos were reported to have occurred in relatively large numbers in suitable habitats throughout the Reserve. The majority were located in the Triangle area, some in the Keekorok area and a few in the Musiara area - in total, an estimated 150-200 animals (Jack Barrah, pers.comm.).

However, in the 1960s, as a result of extensive poaching for rhino, combined with the destruction of the habitat by constant, uncontrolled, annual (and even biannual) bush fires and an exceptionally heavy influx of elephants seeking asylum in the Reserve (Dublin,

1991), rhino numbers declined appreciably. By 1972 only 49% of the area was occupied by 108 rhinos in 13 separate distribution areas (Mukinya, 1973), as shown in Figure 2A as areas A to M.

Persistent and extensive poaching during the following ten years resulted in the further removal of many of the remaining rhinos. This was most noticeable in the Triangle area west of the Mara River, the area between Sand River and the Kuka Hills where rhinos have been eliminated, and in the Musiara area where only a single animal remains. Only 30% of the Reserve is now occupied by 40 rhinos in five distribution areas (A-E), all of which are located east of the Mara River, as illustrated in Figure 2B.

The present study indicates that the configuration of rhino home ranges and distribution areas have altered considerably over the past 20 years.

Home ranges

Home range sizes for seven of the II adult males and five of the 13 adult females vary from seven to 126km², with a mean of 46km². Female home ranges are slightly larger than males. Females range from 12 to 126km², with a mean of 51km², while males range from seven to 83km² with a mean of 42km². No account has been taken of eight adult rhinos whose home ranges extend into the northern Serengeti though the extent of their ranges within the Reserve are known.

In 1971/72 when Mukinya (1973) did his studies, the Reserve rhino densities were higher and overall home ranges were smaller, varying from 5.6km² to 22.7km² with a mean of 13.1km².

The marked increase in the size of home ranges can be possibly attributed to each or a combination of the following:

- Reduced competition for suitable habitat
- Reduction in food resources due to annual, uncontrolled fires
- Deterioration of the environment caused by excessive, off-road driving by thousands of tourist vehicles each year
- Increased searching for mates by rhinos due to their lower densities

Distribution areas

The Reserve presently has five distinct rhino distribution areas (Table 1) comprised of closely overlapping individual home ranges of more than one rhino except for Musiara (E), with only one remaining animal. Currently 22(55%) of the Reserve's 40 rhinos are resident in area A, which has always had a relatively large number of these animals. Mukinya (1973) also records this as being a heavily populated area with 31 (29%) of the 108 rhinos then resident in the Reserve. However, area A is the largest. In terms of density, area D supports the highest number of rhinos per km², as seen in Table 1.

Table 1. Individual distribution areas, numbers of rhinos and their relative densities in June 1995

Area	Number of rhinos	% of total population	Distribution area in km ²	Number of rhino per km ²
A	22	55.0	181	0.12
B	7	17.5	118	0.06
C	4	10.0	58	0.07
D	6	15.0	16	0.38
E	1	2.5	86	0.01
Total	40	100.0	459	0.09
Excluding area of overlap	40	100.0	399	0.10

Overlap of distribution areas

Although four of the five distribution areas presently overlap (Figure 2B), Mukinya (1973) recorded that overlaps only occurred with home ranges and not with distribution areas, and that the latter were clearly separated from each other (Figure 2A). At present there are three distinct distribution area overlaps totaling 60km² or 16% of the total area occupied by rhinos east of the Mara River (12km² in areas A-B, 38km² in areas A-C, and 10km² in areas B-D). It is possible that these overlaps allow the exchange of genes between members of adjacent distribution areas. Rhinos from geographically separate distribution areas were seen consorting in these overlaps on at least ten occasions between 1992 to 1995 but no mating was observed. In each instance, the rhinos

involved had returned to their respective home ranges within two to four days.

Density

Mukinya (1973) records that the total area of the Reserve occupied by rhinos in 1972 was 749km², thereby giving a density of 0.14 rhino per km². At present the total area occupied by rhinos is only 399km², with a density of 0.10 rhino per km². However, taking into account the 60km² overlap of distribution areas (Figure 2B), the total area occupied by rhinos is 459km², with a corresponding density of 0.09 rhino per km².

Movement of rhinos into and out of the Reserve

Not only is the Reserve an integral part of the Mara/Serengeti ecosystem on account of the annual migration of about two million ungulates, but also due to the movement, throughout the year, of at least 15 rhinos (the majority being females with their calves) between the Mara and northern Serengeti. These movements are not without their dangers. Although the rhinos move from one protected area to another, they run the considerable risk of being poached by cattle raiders which infiltrate the Park and Reserve along the Serengeti/Mara international boundary to steal Maasai livestock on the Reserve's western and eastern boundaries. There could also be the occasional movement of one or more rhinos between the Reserve and the Laleta Hills, four to five kilometres east of the Reserve. Two or three times each year, reports are received of rhinos being seen within the Maasai group ranches, up to eight kilometres north of the Reserve. These could be sub-adult animals from the Reserve trying to establish home ranges, or adults in search of mates.

POPULATION STRUCTURE AND RECRUITMENT

At the present time, the Reserve holds a modest and healthy population of rhinos, as shown in Figure 3, despite their near elimination in the Masai Mara between the 1960s and 1980s.

The adult male: female ratio of 1:1.2 compares favourably with Mukinya's (1973) figure of 1:0.9, though the present cow:calf ratio of 1:0.6 is slightly less than Mukinya's (1973) figure of 1:0.8. However, indications are that between three to four calves might be born during 1996 which would improve this ratio.

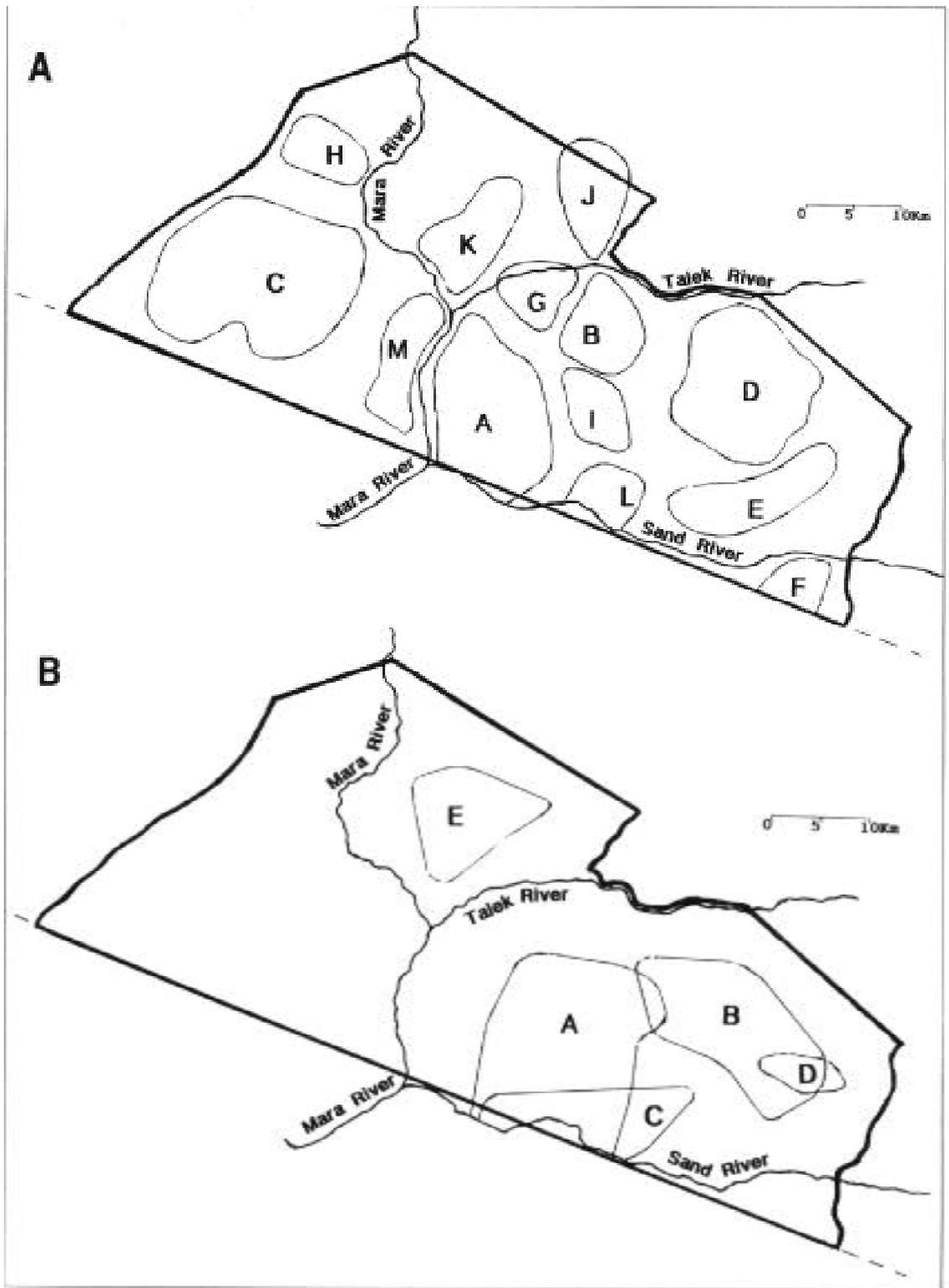


Figure 2. Comparative distribution areas of black rhinos in the Masai Mara National Reserve in A) 1972 (Mukinya, 1973) and B) 1995

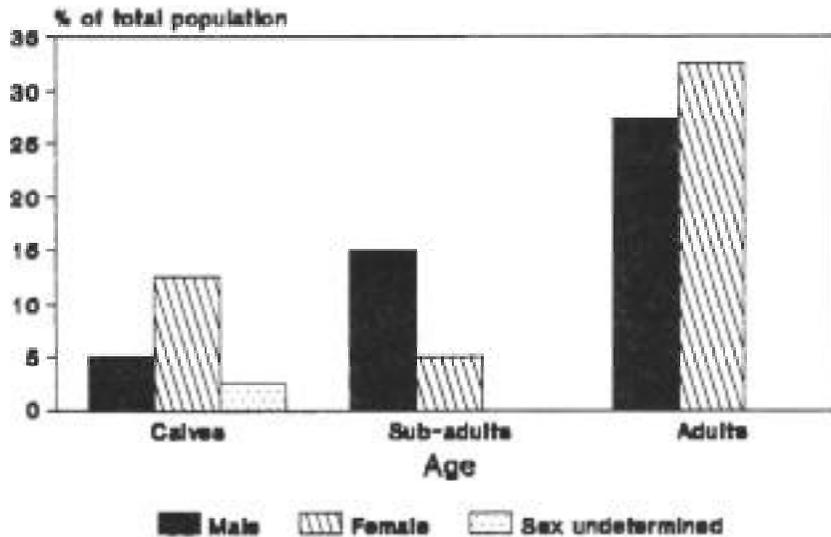


Figure 3. Population structure, by age and sex, of the black rhino population in the Masai Mara National Reserve in 1995

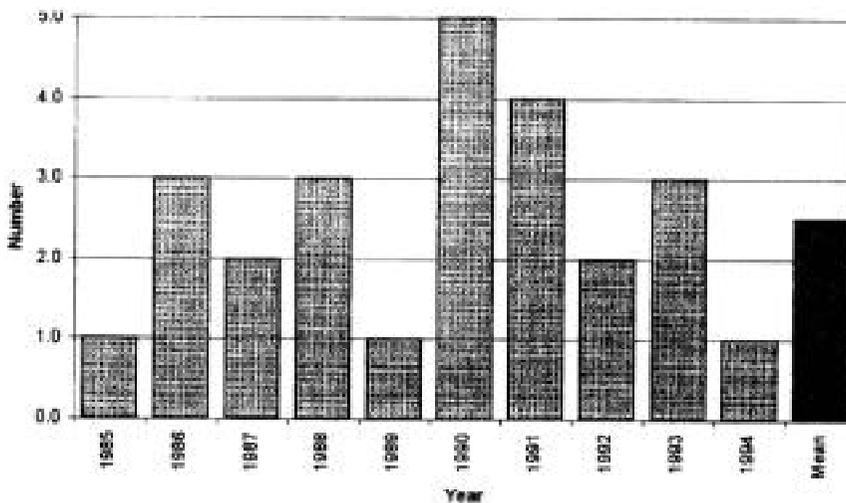


Figure 4. The number of black rhino calves born in the Masai Mara National Reserve from 1985 to 1994

Figure 4 illustrates the number of calves born between 1985 - 1994 and shows that the mean number of calves born per annum over the past ten years is 2.4. Assuming that the population remains stable and that an average of 2.4 calves continue to be born each year it should be possible for the population to reach 50 rhinos by the year 2000.

Calving intervals

The calving interval, to the nearest month, is known in 11 cases and varies from 16-34 months, with a mean of 25.4 months.

The only record of the age at maturity of a black rhino in the Reserve is that of Chebrech, who is recorded to have been born in May 1984 and who produced her first calf in December 1991. Based on a mean gestation period of 454 days (Hitchins & Anderson, 1983), Chebrech probably conceived in September 1989, at 64 months (5.4 years) of age.

RECOMMENDATIONS

Despite the accomplishments of FOC and the NCC over the past decade, there is no room for complacency. What has been gained in ten years could be lost overnight. The following recommendations are made in the long-term interests of rhino management within the Reserve.

Fire management

Uncontrolled, annual (and sometimes biannual), hot fires, are having a notable and deleterious effect on the remaining thicket and woodland habitat of the rhino, specifically with regard to food resources. Fire is not a new phenomenon for the Reserve for it has played an important role in the vegetation dynamics of the area over a long period (Dublin, 1991). If permitted to continue, uncontrolled fire will lead to the loss of even more valuable rhino habitat. The management authorities must decide now if the Reserve should remain a predominantly grassland habitat, which is what it is at present (and which is largely unsuitable for black rhino), or if fires should be managed and controlled, thereby maintaining and improving a mixed woodland and grassland habitat. Improved habitat management would cater both for the annual migration of grazers from the Serengeti and for the maintenance of the largest, free-ranging population of the black rhino in Kenya. The Reserve

has had an approved fire management plan since 1993 but its implementation is now long overdue. This, together with a study of the impact of fire on rhino habitat, feeding patterns and browse availability, is a priority.

Movement of rhinos between Masai Mara and the Serengeti

Between 1992 and 1995 the standard of rhino surveillance and monitoring improved appreciably. An important outcome of this has been better knowledge of the individual rhinos and greater awareness of the extent of their movements back and forth between the Reserve and northern Serengeti. Rhinos require exceptionally close surveillance, monitoring and security. Although there is an anti stock-theft unit in the vicinity to monitor and combat cattle rustling and to help the security of visitors in the area, its duties do not officially include surveillance or security of the local rhino population. A dedicated ranger post should be placed at a strategic location along the Sand River, from where a minimum of six, suitably equipped rhino surveillance rangers can operate. In addition, some form of regular and joint Mara/Serengeti rhino surveillance and monitoring patrols should be undertaken along the Kenya/Tanzania international boundary.

Illegal encroachment of livestock

Black rhinos are normally very shy of cattle and have had to abandon about 50km² of two prime habitats in the Reserve, one immediately south of the Talek River, the other in the northern Ngama Hills. Continuous, illegal incursions into these two areas by hundreds of domestic livestock, which originate from neighbouring group ranches on the Reserve's northern boundary, are denying the rhinos two important habitat localities in the Keekorok area. The Reserve's new by-laws cater for the prosecution of illegal grazing and they should now be strongly enforced.

Ranger training

Since the inception of a ranger force specifically for rhino surveillance and monitoring, inadequate attention has been given to the practical and theoretical training of these men and their officers. A suitable in-service training programme similar to that of the Natal Parks Board (Sandwith, 1990), incorporating aspects of rhino biology and the status of the rhino as a highly valuable, endangered species is urgently required. After successfully completing such a programme, the rangers should not be withdrawn or replaced after only

Photo credit: Max Morgan-Davies



Many of the Croton dichogamus thickets have already been destroyed by fire. Others are being reduced in area as wild fires encroach on their peripheries, thereby denying rhino the benefit of important areas of cover and security.

a few months of service as is frequently the case now. The long-term presence of motivated and well-disciplined personnel who have an extensive knowledge of the individual rhinos under their charge and a high degree of esprit de corps, is an essential component of an efficient rhino surveillance, monitoring and security programme.

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REFERENCES

Brett, R.A. (1995) Conservation strategy and management plan for the black rhinoceros (*Diceros bicornis*) in Kenya. Kenya Wildlife Service. Unpublished Report.

Cumming, D.H.M., Du Toit, R.F., Stuart, S.N. (1990) *African Elephants and Rhinos - Status Survey and Conservation Action Plan*. IUCN/SSC African Elephant and Rhino Specialist Group. IUCN, Gland, Switzerland.

Dublin, H.T., (1991) Dynamics of the Serengeti-Mara woodlands - an historical perspective. *Forest and Conservation History*. 35,169-178.

Goddard, J. (1967) Home range, behaviour, and recruitment rates of two black rhinoceros populations. *E.Afr. Wildl.J.* 5,133-150.

Hitchins, P.M. (1970) Field criteria for ageing immature black rhinoceros (*Diceros bicornis* L.). *Lammergeyer*. 12, 48-55.

Hitchins, P.M. & Anderson, J.L. (1983) Reproduction, population characteristics and management of black rhinoceros *Diceros bicornis minor* in the Hluhluwe/Corridor/Umfolozi Game Reserve Complex. *S. Afr. J. Wildl. Res.* 13,78-85.

Lamprey, H.F. (1979) Structure and functioning of the semi-arid grazing land ecosystem of the Serengeti region (Tanzania). In: *Tropical Grazing Land Ecosystems, Natural Resources Research XVI*. UNESCO.

Morgan-Davis, A.M. A photographic method for identifying black rhinoceros individuals. *Pachyderm* 21, 35-37.

Mukinya, J.G. (1973) Density, distribution, population structure and social organization of the black rhinoceros in Masai Mara Game Reserve. *E. Afr. Wildl.J.* 11,385-400.

Mukinya, J.G. (1977) Feeding and drinking habits of the black rhinoceros in Masai Mara Game Reserve. *E.Afr. Wildl. J.* 15,125-138.

Sandwith, T.S. (1990) A training programme for Game Scouts involved in the monitoring of black rhinoceros populations - Instructors Handbook. Natal Parks Board/Wildlife Society of Southern Africa.