CONSERVATION STATUS AND DISTRIBUTON OF THE

TANA RIVER RED COLOBUS AND CRESTED MANGABEY

by

Thomas M. Butynski PhD
Senior Conservation Biologist
Zoo Atlanta/Institute of Primate Research/National Museums of Kenya

Geoffrey Mwangi MSc
Research Division
Kenya Wildlife Service

Report for:

Zoo Atlanta

Kenya Wildlife Service

National Museums of Kenya

Institute of Primate Research

East African Wildlife Society

September 1994

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SUMMARY

1. The lower Tana River of eastern Kenya supports about 60 small riverine forests with their unique and important biodiversity. Many of the species of plants and animals here are endemic or have small distributions. As such, many are endangered or nearly so. Conservation biologists see the conservation of the forests of the lower Tana River as one of East Africa's most serious and challenging biodiversity conservation problems.

2. Eight species of nonhuman primates live along the lower Tana River. The Tana River red colobus (*Colobus badius rufomitratus)* and Tana River crested mangabey (*Cercocebus galeritus galeritus*) are both "endangered" subspecies endemic to gallery forest of the lower Tana River. These are two of Kenya's rarest mammals. Of additional concern is the conservation of the "vulnerable" Zanzibar galago (*Galago zanzibaricus*).

3. A census of monkeys in the riverine forests of the lower Tana River was conducted in February and March 1994. This report (1) presents the results of this census, (2) discusses the conservation status and distribution of the red colobus, crested mangabey and forests, and (3) makes recommendations for their conservation.

4. Tana River red colobus have a distributional range which extends for about 60 km along the lower Tana River from Kipende to Mitapani. They were found in 34 (63%) of the forests. At least 86 groups occur. The total population is estimated as 1,100 - 1,300 animals. While the population appears to be down somewhat from the estimated 1,200 - 1,800 red colobus in 1975, the data indicate that there are about 5-fold more red colobus than suggested by censuses conducted during the l980s.

5. Tana River crested mangabeys have a distributional range which is similar to that of the red colobus, extending for about 60 km from Nkanjonja to Hewani. Mangabeys were found in 27 (50%) of the forests. Forty-eight groups of mangabeys were found during the census. We estimate the total population size to be 1,000 - 1,200 animals. The population appears to be somewhat below the 1975 estimate of 1,200 - 1,600 individuals.

6. While both the red colobus and crested mangabey are in higher numbers than suggested by other censuses undertaken in the past decade, both appear to have declined roughly 10 - 30% since 1975.

7. The Tana River Primate National Reserve (TRPNR) holds about 37% of the colobus groups and 56% of the mangabey groups. Approximately 53% of the forests with colobus, and 48% of those with mangabeys, are found outside of the Reserve. This means that a far greater portion of these two populations, and of their habitats, occur outside of the Reserve than previously estimated. Of the animals outside of TRPNR, about 19% of the colobus groups and 10% of the mangabey groups live in forests under the management of the Tana Delta Irrigation Project (TDIP) while the remainder are on Trust/Government Land.

8. Condition of the forests varied greatly. Some forests, even those outside of the Reserve, were in excellent condition, little utilized by people and probably expanding in size. Other forests, particularly those outside the Reserve and near villages, were being rapidly degraded, cut for farmland and lost. Due to insecurity along much of the east bank of the Tana River, most forests on that side of the river were being little exploited.

9. It appears that the greatest threat to the forests of the lower Tana River is conversion to farmland. The other important problems facing these forests are fire, felling of large trees for canoes, and pole cutting. Poaching occurs but appears to be at a low level within the forests.

10. Some of the recommendations arising from this census are as follows:

- Obtain accurate information on the size of Tana River red colobus and crested mangabey groups throughout their range so that more recent, and more representative, data on mean group size are available.

- Obtain accurate data on the size, shape and location of all lower Tana River forests.

- Meet with Tana and Athi Rivers Development Authority (TARDA) and TDIP biologists and officials to: (1) review the TDIP environmental monitoring data, (2) obtain an up-date on TDIP ground activities and future plans, (3) make a current assessment of the impact of past, present and future TDIP activities on red colobus and crested mangabeys living within the TDIP managed area, and if necessary, (4) find additional ways to enhance the long-term survival prospects of the two endangered primates and the forests.

- Given the importance of forests outside of the TRPNR to primate and biodiversity conservation along the lower Tana River, serious thought should be given to reconsidering how the World Bank Global Environment Facility (GEF) funds to the Tana River Primate National Reserve Conservation Project are to be used. It may be most effective to increase the size of the project area so as to include, to some degree, all of the riverine forests of the lower Tana River.

- Census all lower Tana River forests which the 1994 census did not reach and recensus several other forests.

- Examine the impact, feasibility and costs of introducing red colobus to the Greater Wenje Forest.

ACKNOWLEDGEMENTS

Financial support for this work was provided by Zoo Atlanta, the Kenya Wildlife Service and the World Bank Global Environment Facility. The "British Airways Assisting Nature Conservation" program provided the senior author with a round-trip ticket between the USA and Kenya.

Many people worked under extremely difficult conditions to assist us, directly and indirectly, in the collection of the data presented in this report. In particular, we wish to mention Dr. Glyn Davies of the Kenya Indigenous Forest Conservation Project, Mwangi Gathua and Ismael Chirchir of the National Museums of Kenya, Genesio Mgambe and Francis Muli of the Institute of Primate Research, Ryouta Suzuki of JICA, and the eight field technicians and staff of the Kenya Wildlife Service's Mchelelo Research Camp: Abio Lysania Gafo, Isaih Abio Jilo, Juma Galana, Abeid Said, Hassan H. Jillo, Isumaili Galole Galana, Mustasa Lodi and Bwana Mweez Said Galana.

Kenya Wildlife Service wardens and rangers based at the Tana River Primate National Reserve provided excellent security and logistic support. This was done under the leadership of Ali Jama and Paul Rere Kipkoech.

At Kenya Wildlife Service Headquarters, Dr. Jim Else and Kamau Wakenene always ensured that the field work had the required logistic, financial and manpower support.

The Biodiversity Centre at the National Museums of Kenya, and the Institute of Primate Research, provided office and library facilities while this report was being written.

To all of these individuals, institutions and companies we extend our deepest appreciation and thanks.

INTRODUCT ION

The Tana River red colobus (*Colobus badius rufomitratus*) and Tana River crested mangabey (*Cercocebus galeritus galeritus*) are endemic to gallery forest along the floodplain of the lower Tana River in eastern Kenya. These are two of Kenya's rarest mammals and they live in one of the most complex, unique and rare habitats in East Africa. The IUCN Red Data Book classifies both subspecies as "endangered" (Lee et al. 1988). This means that both subspecies have declined to such a critical number of individuals, and their habitats so drastically reduced, that they are in danger of extinction if the causal factors continue to operate.

The main objective of the Tana River Primate National Reserve (TRPNR) is to conserve these two endangered primates and the biodiversity of their unique riverine forest habitat. The conservation of these two subspecies is the top priority for primate conservation in Kenya. As such, since 1972, the Tana River red colobus and crested mangabey have been the focus of several population censuses and detailed ecological / behavioral studies (see references in Marsh 1986, Decker 1994, this report).

Of additional concern is the conservation of the Zanzibar galago (*Galago zanzibaricus*), a species which the Red Data Book (Lee et al. 1988) lists as "vulnerable", and the Tana Sykes monkey (*Cercopithecus mitis albotorquatus*), a subspecies endemic to the region (Kingdon 1971). Four other nonhuman primates are found along the lower Tana River. These are the vervet monkey (*Cercopithecus aethiops pygerythrus*), yellow baboon (*Papio cynocephalus cynocephalus*), Garnett's galago (*Otolemur garnettii*) and Senegal galago (*Galago senegalensis*).

Knowledge of a species' distribution and population size is critical both to an understanding of its ecology and the development of an effective conservation management program. Therefore, the main objectives of the 1994 census were to:

- assess the conservation status and distribution of primates along the lower Tana River, particularly the two endangered subspecies;

- determine the conservation status and distribution of red colobus and crested mangabey habitats along the lower Tana River;

- evaluate the effectiveness and importance of the TRPNR to the conservation of the red colobus and crested mangabey.

This report presents the results of the 1994 census of primates along the lower Tana River.

Cover: Tana River crested mangabey. Drawing from Kingdon (1971).

BACKGROUND

The Tana River

The Tana River (l°55'S, 40°07'E), its environment, hydrology, nonhuman primates, people, and conservation values and problems, are described and discussed in considerable detail in Groves et al. (1974), Andrews et al. (1975), Homewood (1975, 1976), Marsh (1978, 1986), Hughes (1984, 1990), Medley et al. (1989), Seal et al. (1991), Medley (1992, 1993a, 1993b) and Decker (1994). The following background information is taken from these sources.

The Tana River is Kenya's longest river (Fig. 1). This river rises in the humid highlands of the Aberdare Mountains and Mt. Kenya, flows through an arid floodplain between Garissa and Garsen, and enters the Indian Ocean at Kipini, north of Malindi. The Tana River has a length of about 650 km following the main outline of its course and about 1,000 km when every bend is traced. All of the tributaries enter along the upper Tana. The Tana receives no new water in its middle and lower sections and loses about one-half of its water, through evaporation and seepage to groundwater, before it reaches the Indian Ocean.

The lower Tana River is marked by a broad floodplain which varies from 1 to 6 km in width and which is covered by alluvial sediments deposited during floods. The edge of the floodplain is 3 - 5 m below the level of the surrounding ground. The floodplain is largely grass-cover but there are numerous patches of bushland, woodland and forest. When not in flood, the lower Tana averages about 60 m in width but is 100 m in width in some places.

Flooding is a result of rain in the Aberdare and Mt. Kenya watersheds, not local rains. Prior to the construction of five dams along the headwaters, the Tana River flooded, on average, about once per year with a major flood every 3 years. Extremely heavy and prolonged flooding (3 - 4 months long) is estimated to be a one in 80 year event with the last great flood occurring from October 1961 - January 1962. Flooding is most likely in May and November.

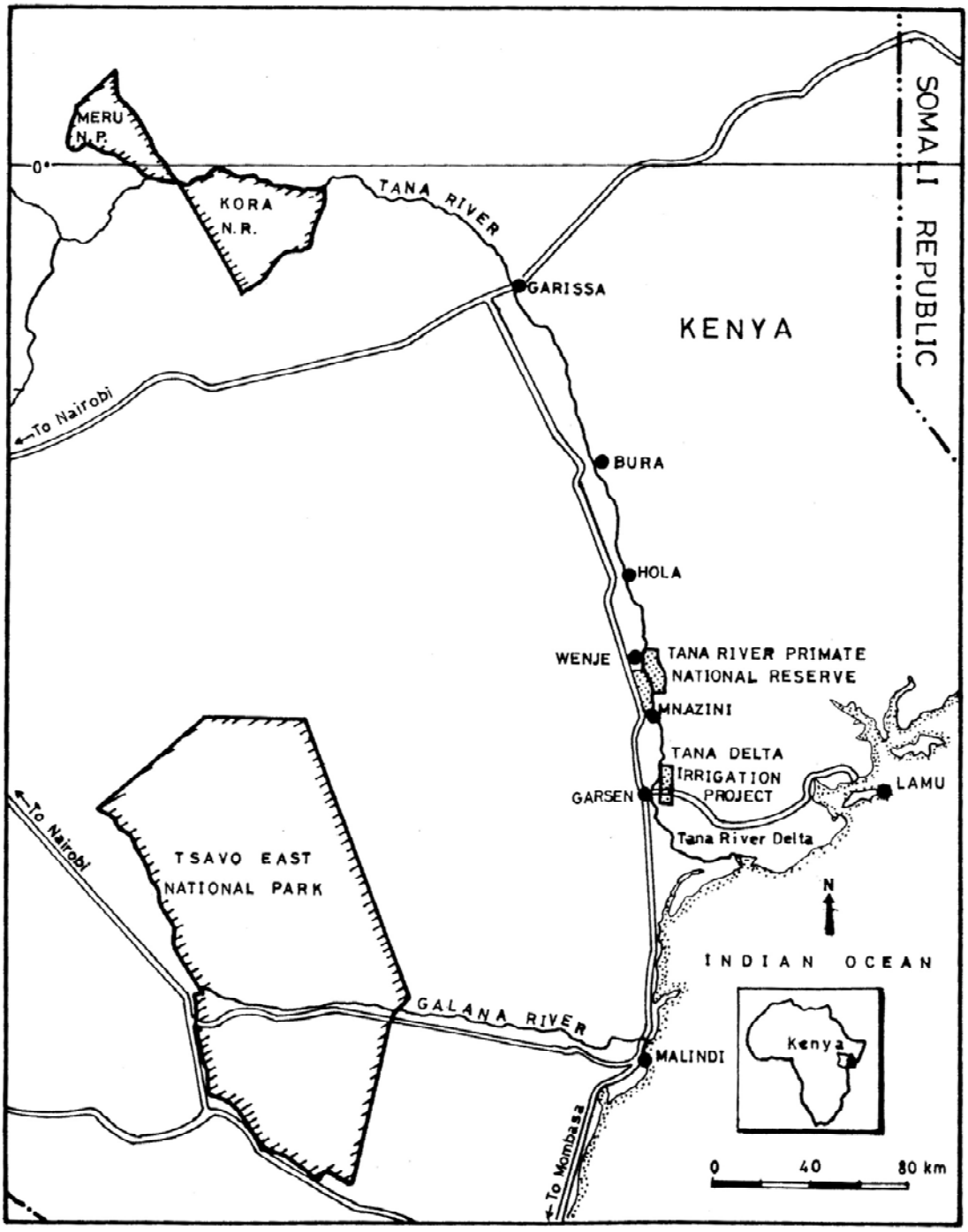
The climate of the lower Tana River is generally hot and dry. Mean monthly maximum daily temperature along the lower Tana River ranges from about 30 - 38°C while mean monthly minimum daily temperature ranges from approximately 17 - 25°C. Temperatures are highest during January - February and lowest during May - July. Mean annual rainfall is between 500 and 600 mm. The wettest months are March - April and November - December.

The soils of the lower Tana River are largely heavy black clays ("black cotton soils").

Vegetation of the Lower Tana River

Forest patches along the lower Tana are remnants of a vast tropical forest which extended from the East Coast of Africa to the Congo Basin during the Miocene (13 - 25 million years ago). Most recently, continuous forest belts extended between the Congo Basin and the Kenya coast during the more moist periods of the Pleistocene (c. 31,000 - 26,000 and 8000 BP). Severe drying after 4000 BP isolated East African evergreen forests in the highlands

Fig.1. East-central Kenya showing the location of the Tana River, Tana River Primate National Reserve, and Tana Delta Irrigation Project. Map adapted from Marsh (1986).


MERU N.P.
0°
KORA N.R.
TANA RIVER
GARISSA
KENYA
SOMALI REPUBLIC
To Nairobi
BURA
HOLA
WENJE
TANA RIVER PRIMATE NATIONAL RESERVE
MNAZINI
TANA DELTA IRRIGATION PROJECT
GARSEN
LAMU
Tana River Delta
To Nairobi
TSAVO EAST NATIONAL PARK
N
INDIAN OCEAN
GALANA RIVER
MALINDI
Kenya
To Mombasa
0
40
80 km

and riverine localities. The remnant forests of the lower Tana River are the only true representatives in East Africa of a West African type of riverine forest. Although the remaining Tana River forests cover but a small area, they are considered among the most important habitats in Kenya for biodiversity conservation.

The main vegetation types along the lower Tana River are grassland, wooded grassland, bushland, deciduous woodland and lowland evergreen forest. There is general agreement that the evergreen-semievergreen riverine forests along the Tana River, and thus the red colobus and crested mangabey, are dependent upon at least two things; the level of the groundwater and fairly frequent flooding. Periodic disturbances through flooding and human activity have lead to the creation and maintenance of a patchy distribution of isolated forests over a floodplain corridor that extends to about one-half kilometer on either side of the river. Before their near extirpation from the area, elephants probably also played a major role in the dynamics of these forests. The riverine vegetation along the lower Tana River can be viewed as a dynamic patch mosaic of colonizing forests, young forests with low species diversity, mature forests of considerable diversity and stability, and dying or senescent forests. These forests of 1 to roughly 1,100 ha are linked by stretches of woodland, bush and grass on soils that are poorer, less permeable, more saline and more subject to flooding.

Tana River Primate National Reserve (TRPNR)

The TRPNR (Fig. 1) was established in 1976 to protect some of the best remaining forest along the Tana River together with significant portions of the populations of the Tana River red colobus and the Tana River crested mangabey. The total area covered by the 16 distinct evergreen forests within the 171 km² TRPNR is between 9.5 km² and 17.5 km², depending on the definition used to define evergreen forest (Medley 1993a, Decker 1994). About 39% of the Reserve lies within the floodplain. The altitude is about 30 m a.s.l. The TRPNR extends for about 36 km along the present channel of the Tana River.

Between 1960 and 1985, 56% of the forest in the area now covered by the TRPNR was lost, largely as a result of forest clearance by farmers. Five large forests were fragmented into 15 small forest patches.

Tana Delta Irrigation Project (TDIP)

The Tana Delta Irrigation Project (TDIP) is a large rice irrigation project located at the northern end of the Tana Delta near Garsen (Figs. 1 & 2). This project is administered by the Tana and Athi Rivers Development Authority (TARDA). Funding is provided by the Japan International Cooperation Agency (JICA). TDIP will grow rice exclusively for export.

Medley et al. (1989) give a good review of TDIP, the importance to biodiversity conservation of the forests in the TDIP managed area, current and long-term impact of TDIP activities on the primates and forests, and recommendations for TDIP protection and management of these forest and their primates.

The following overview is taken largely from Medley et al. (1989). The plan is for the project to eventually encompass 160 km2 divided into sections or "polders". Polder 1 is divided into north and south sections (Fig. 2). Polder 1 North is north of the Garsen-Lamu Road (Kulesa/Wema/Hewani Area), covers 40 km2, and includes Forests 48a, 48b, 56, 60, 61, 63, 64, 65, 66 and 68. Polder 1 South is south of the Garsen-Lamu Road (Mitapani Area) and includes Forest 69 and 70, and part of Forest 67. Sections south of Polder 1 are some distance from the Tana River and are not expected to affect the riverine forests.

The area planned for rice production, and thus flooding, in Polder 1 North includes the eastern portion of the land enclosed by the dike. Forests 63, 65, 66 and 68 are located in this area. All other forests in this section are within the protected area between the western dike and rice growing area to the east.

The 1989 Change in the Course of the Lower Tana River

Along the present channel of the lower Tana, from Hola to Garsen, are old channels and ox-bow lakes indicative of numerous changes in the course along this section. These include the four major old channels as described in Andrews et al. (1975). Here we are most concerned with what we call "Channel 1" and "Channel 2" (Fig. 2). These are the two longest channels and the two along which most of the present riverine forest is located.

FORESTS OF THE LOWER TANA RIVER

Forest Size

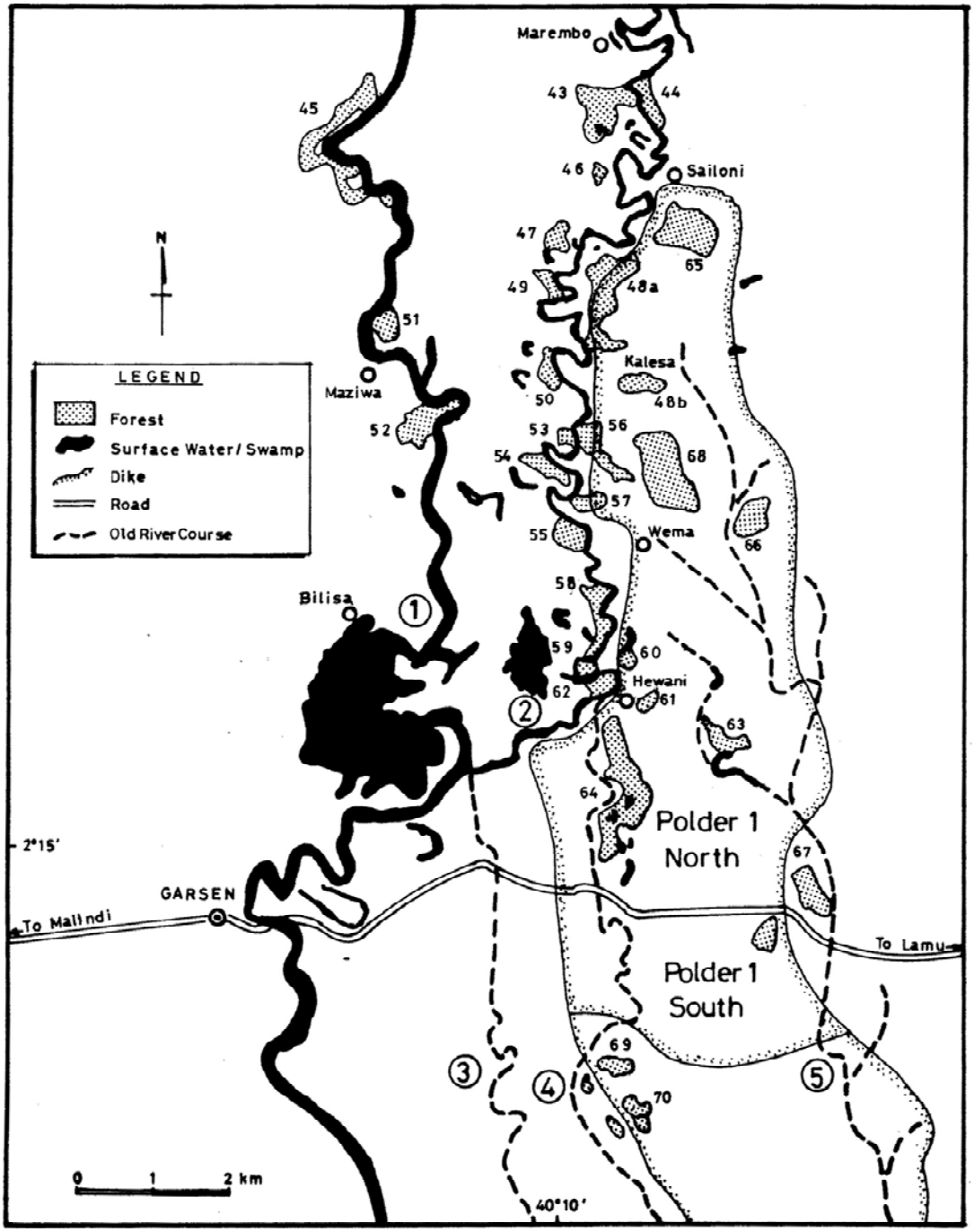
In Table 1 we give the approximate size of each forest along the lower Tana River. In most cases, this information was taken from the literature. However, the various researchers often differed considerably in the area they assessed for each forest, sometimes more than two-fold. In most cases we took the mean value. We used our own estimates of forest size when no information was available in the literature.

One of the priorities for primate research and conservation along the lower Tana River is to obtain far better information on the distribution, size and shape of forests, particularly for forests outside of the TRPNR. Good aerial photographs and their analyses should be undertaken as soon as possible. The biggest unknown is the size of Nkanjonja Forest. We estimate that it is at least 500 ha in size.

Forest Numbers and Names

For Forests 1 - 64, the forest numbers and names as proposed by Marsh (1986) were adopted for the 1994 census. It was necessary, however, to add one forest (Forest 39b) to Marsh's list and to subdivide or lump several other forests. For Forests 65 - 70, Decker's (1994) numbers and names were used (Table 1, Fig. 3, Appendices A & B).

Fig. 2. Location of the Tana Delta Irrigation Project and distribution of forests along the present and old channels of the lower Tana River from Marembo to Mitapani. Forest numbers coincide with the names provided in Table 1. The circled numbers are the numbers of the channels. The location of Channels 1, 3, 4 and 5 is only approximate as no recent, detailed, maps are available. The main channel, as of 1989, is Channel 1. Channel 2, the main channel prior to 1989, still carries a small portion of the Tana's flow. It is along Channel 2 that most of the forest and primates occur. Map adapted from Andrews et al. (1975), Marsh (1986), Medley et al. (1989) and Decker (1994).


Marembo
Sailoni
Kalesa
Maziwa
Wema
Bilisa
Hewani
GARSEN
To Malindi
To Lamu
Polder 1 North
Polder 1 South
LEGEND
Forest
Surface Water / Swamp
Dike
Road
Old River Course
N
0 1 2 km
2°15'
40°10'

For purposes of research and censusing, previous researchers at Tana River subdivided two of the largest forests into sections and gave each section a number and name as if dealing with several distinct forests. In some cases, the opposite was done; two distinct forests were lumped under one forest number and name. While there have been good reasons for subdividing and lumping forests at Tana River, this has lead to some confusion and creates some problems when comparing number of forests, their true size, primate distribution and the number of primate groups they hold. In short, when comparing the results of primate censuses it is usually best to refer to truly distinct forests.

For the 1994 census, forests on the Marsh (1986) list were sub-divided into two or more distinct "new forests" if separated by a forest gap (c. 30 m or more) across which it seemed red colobus would rarely move. Using this criterion, we subdivided five of the forests on the Marsh list (Forests 3, 4, 10, 36, 48) so that our new list has 10 new forest numbers (Forests 3a, 3b, 4a, 4b, l0a, l0b, 36a, 36b, 48a, 48b).

Conversely, not all "forests" on the Marsh (1986) list are distinct forests, being sections of a more-or-less continuous large forest. Two or more previously named forests were lumped to delineate one large forest if they were not separated by a vegetation gap (c. 30 m or more) that would probably prevent the ready movement of red colobus throughout the forest. Marsh lists eight forests which today are really sections of two large forests which we call the "Greater Wenje Forest" (Forest Sections 1, 2a, 2b) and the "Greater McheleloForest" (Forest Sections l0b, 11, 13, 14, 17).

THE 1994 LOWER TANA RIVER PRIMATE CENSUS

Personnel, Man-hours and Equipment

The 1994 primate census along the lower Tana River was conducted from 16 - 20 February, 8 - 29 March and 7 - 9 June. Throughout the census there were 10 - 13 census workers or "observers". These included ourselves, the eight Kenya Wildlife Service (KWS) field technicians based at the TRPNR, and six researchers/technicians from the Kenya Institute of Primate Research (IPR), National Museums of Kenya (NMK) and Kenya Indigenous Forest Conservation Project (KIFCON). Eleven of the observers were involved in at least one previous Tana River primate census. Most of the observers had participated in several earlier primate censuses along the Tana River and/or elsewhere in Africa. Local guides assisted the observers in the less well-known forests. In the 14 forest with potential security problems, the observers were accompanied by 18 KWS Security Rangers. The census itself required a total of 710 "observer man hours" and 560 "security man hours", making it the most comprehensive effort to date to obtain data on the number and distribution of primates along the lower Tana River. The numbers of man hours devoted to this census would probably double if one considered the time required for such activities as census preparation, travel between forests, camp establishment and pre-census security patrols.

Photocopies of maps taken from Marsh (1986), Kahumbu (1992) and Decker (1994) were carried in the field. All observers were equipped with binoculars and at least one member of each observer pair carried a watch, compass, data sheets and pen.

Table 1. Number of primate groups found in forests along the lower Tana River, Kenya, from Nkanjonja Village to Mitapani (1994).

Forest number	Forest name	Size (ha)#	Colobus	Mangabeys	Sykes	Baboons	Census man hrs	Security man hrs	Human activity
1.	Nkanjonja	500	0	4 -5	15	2	34	81	light
*2a.	Wenje 1	400	0	4	16	4	22	30	light
*2b.	Wenje 2	225	0	1	2	2	52	122	light
3a.	Kipende 1	25	[1]	0	3	1	8	0	heavy
3b.	Kipende 2	21	1	0	0	1	6	0	light
4a.	Maroni West 1	27	1[1]	0	5	2	10	0	moderate
4b.	Maroni West 2	10	1	0	1	1	6	0	moderate
*5.	Maroni East	35	0	2 -3	6	0	23	40	light
6.	Makere West	48	2	0	2	2	17	0	v. heavy
*7.	Kwechi	55	-	-	Not censused		-	-	-
*8.	Makere East	7	0	1	2	2	7	16	light
*9.	Guru East	5	0	1	1[1]	0	4	9	light
*l0a.	Guru North	5	1	0	2	1	12	0	light
*10b.	Guru South	46	3	3	5	(2)	19	0	light
*11.	Mchelelo West	17	1	(1)	3	1	10	0	light
*12.	Mchelelo East	10	1	1	2	2	18	21	light
*13.	Congolani Central	50	2	2	4	0	11	0	light
*14.	Congolani West	40	0	0	3	0	5	0	light
*15.	Unnamed Woodland 1	Not censused, no longer exists, cut down.							
*16.	Sifa East	150	5[1]	5 -7	11	2	90	167	light
*17.	Sifa West	3	1	1	2	1	8	0	v. heavy
*18.	Mariadadi	2	0	0	0	0	5	0	light

Forest number	Forest name	Size (ha)	Colobus	Mangabeys	Sykes	Baboons	Census man hrs	Security man hrs	Human activity
*19.	Hadribu	1	1	0	3	1	3	0	light
*20.	Baomo East	6	1-2	1	4	1	10	0	light
*21.	Baomo North	20	l[1]	(1)	1	0	10	0	moderate
*22.	Baomo South	220	7[3]	4	11[2]	7	36	0	v. heavy
*23.	Lemu	30	-	-	not censused		-	-	-
*24.	Kitere	18	1	(1)	1	1	23	0	moderate
*25.	Kombeni	1	0	0	0	1	9	0	light
*26.	Mnazini North	38	4[1]	1	5	2	24	0	moderate
*27.	Mnazini South	50	3	1	3	3	28	0	moderate
28.	Mnazini East	135	8[1]	2	7[2]	3	23	39	moderate
29.	Unnamed Woodland 2	170	-	#(1)	not censused		-	-	-
30.	Matalani North	50	-	-	not censused		-	-	-
31.	Mungaveni	4	0	0	0	0	2	0	v. heavy
32.	Kinyadu West	60	6 -7	1	6	2	15	0	moderate
33.	Matalani South	150	-	#(1)	not censused		-	-	-
34.	Kinyadu East	5	-	-	not censused		-	-	-
35.	Bubesa East	5	1	0	0	3	5	0	light
36a.	Bubesa West 1	10	5	0	3[1]	1	8	0	moderate
36b.	Bubesa West 2	9	1[2]	1	1	1	11	0	light
37.	Mwina West	30	-	-	not censused		-	-	-
38.	Mikamani	16	I[1]	0	0	0	5	12	light
39a.	Unnamed Woodland 3	45	-	-	not censused		-	-	-
39b.	Peponi	1	(1)	0	0	1	1	3	heavy

Forest number	Forest name	Size (ha)	Colobus	Mangabeys	Sykes	Baboons	Census man hrs	Security man hrs	Human activity
40.	Lazima North	4	0	0	1[1]	0	3	0	light
41.	Sera	90	-	-	not censused		-	-	-
42.	Lazima East	4	0	0	1	0	2	0	light
43.	Marembo West	40	1	1	1	2	3	7	light
44.	Marembo East	20	(1)	1	2	2	11	0	light
45.	Giritu Woodland	106	-	-	not censused		-	-	-
46.	Sailoni 1	5	1	0	0	0	2	6	light
47.	Sailoni 2	3	0	1	0	0	2	0	light
&48a.	Kulesa East 1	30	0	1	2	0	9	0	heavy
&48b.	Kulesa East 2	4	0	0	2	0	2	0	heavy
49.	Kulesa West I	1	0	0	0	1	1	0	light
50.	Kulesa West 2	2	0	0	1	0	4	0	light
51.	Maziwa North	160	-	-	not censused		-	-	-
52.	Maziwa South	16	0	1	2	1	2	7	heavy
53.	Wema West I	2	1	0	1	1	1	0	light
54.	Wema West 2	14	1	1-2	2	2	9	0	moderate
55.	Wema West 3	13	[1]	0	1	2	9	0	moderate
&56.	Wema East I	22	0	0	2	1	5	0	heavy
&57.	Wema East 2	5	-	-	not censused		-	-	-
58.	Hewani West 1	34	3	1	1	1	5	0	light
&59.	Hewani East 1	3	1	0	1	0	2	0	moderate
&60.	Hewani East 2	2	1	0	0	0	1	0	light
&61.	Hewani East 3	1	1	0	1	0	1	0	light

Forest number	Forest name	Size (ha)	Colobus	Mangabeys	Sykes	Baboons	Census man hrs	Security man hrs	Human activity
62.	Hewani West 2	16	1	1	2	1	8	0	light
&63.	Hewani South 1	17	-	-	not censused		-	-	-
&64.	Hewani South 2	124	10-13 [1]	4	8[4]	3	28	0	moderate
&65.	Bvumbwe North	53	0	0	5	3	5	0	heavy
&66.	Bvumbwe South	4	-	-	not censused		-	-	-
67.	Lango La Simba	15	#(2)	#0	not censused		-	-	-
&68.	Wema East 4	63	-	-	Not censused-		-	-	-
&69.	Mitapani 1	3	[(1)]	0	4	0	2	0	heavy
&70.	Mitapani 2	7	3	0	2	0	7	0	heavy

\# Data on forest size taken fron Marsh 1978; Ochiago 1990; Decker 1994, pers. comm.; Medley 1993; Kahumbu 1993; Butynski & Mwangi upubl. data.

* Forest located within TRPNR.

& Forest located within TDIP managed area.

\- Forest not censused.

[ ] Number of probable solitary animals seen.

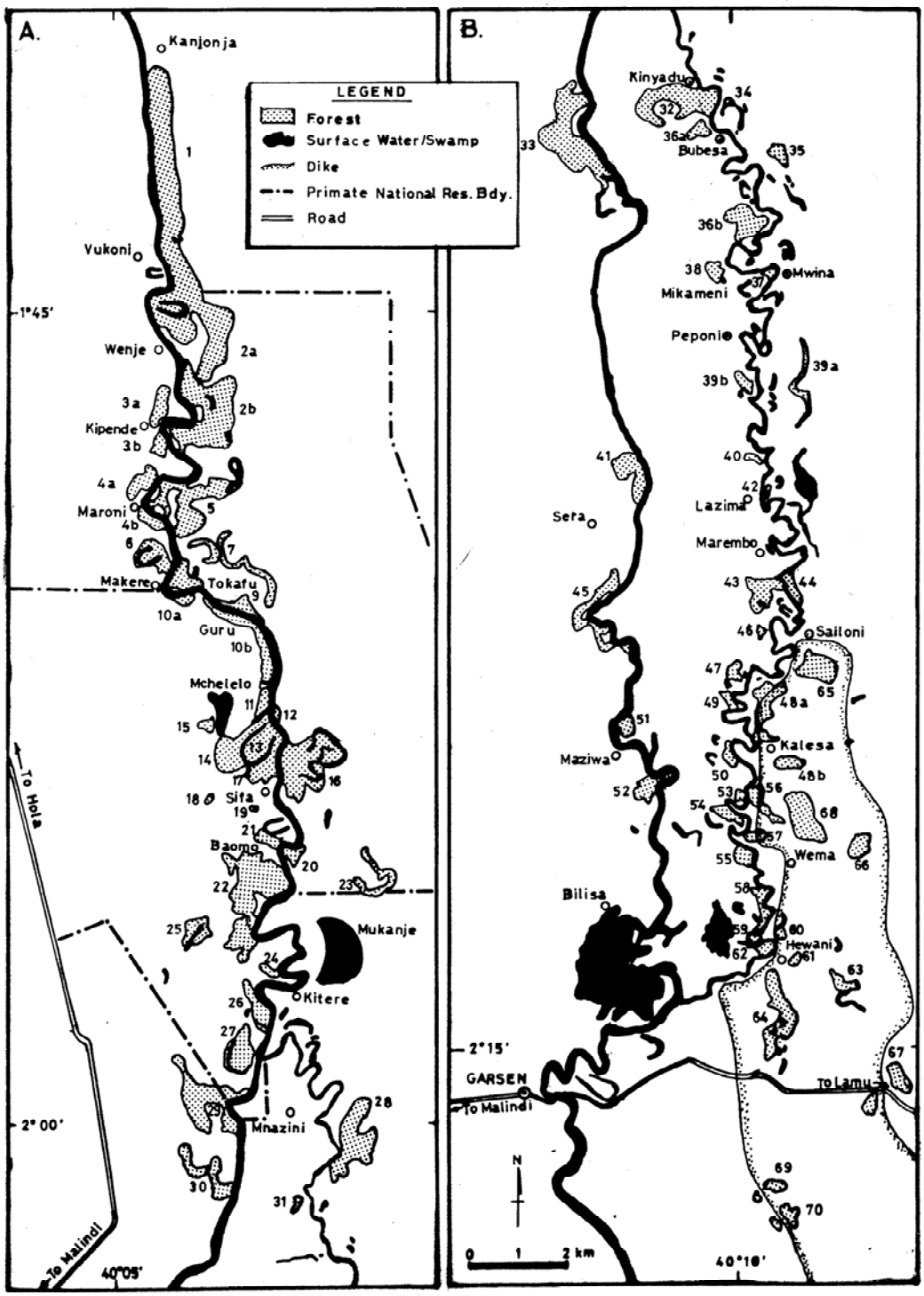
( ) Number of groups reported but not found.

\# Forest not censused in 1994 but reliable sources indicate that this number of groups was present after 1988.

Notes: We subdivided six of the forests on the Marsh (1986) list (Forests 2, 3, 4, 10, 36 & 48) so that the above list has 12 new forest numbers (Forests 2a, 2b, 3a, 3b, 4a, 4b, 10a, l0b, 36a, 36b, 48a, 48b).

The Marsh (1986) list of forests actually includes eight forest sections which, when lumped together, make two large forests which we refer to as the "Greater Wenje Forest" (Forests 1, 2a, 2b) and the "Greater Mchelelo Forest" (Forests l0b, 11, 13, 14, 17).

Fig. 3. The distribution of 77 forests and forest sections along the lower Tana River from Kanjonja to Mitapani. Note that Tana River divides into Channels 1 and 2 at Mnazini and that these meet again near Hewani. Forest numbers coincide with the names provided in Table 1. Two aspects to this map require special mention. First, the size and shape of the Kanjonja Forest are poorly known. Second, the course of Channel 1 is very approximate as no recent maps are available. It undoubtedly meanders much more than shown. Map adapted from Marsh (1986) and Decker (1994). For the distribution of woodland see Marsh (1986). The floodplain along the lower Tana River is shown in maps provided by Marsh (1978, 1985) and Kahumbu & Davies (1993).


A.
B.
LEGEND
Forest
Surface Water/Swamp
Dike
Primate National Res. Bdy.
Road
Kanjonja
Vukoni
Wenje
Kipende
Maroni
Makere
Tokafu
Guru
Mchelelo
Sifa
Baomo
Mukanje
Kitere
Mnazini
To Hola
To Malindi
1°45'
2°00'
40°05'
Kinyadu
Bubesa
Mwina
Mikameni
Peponi
Lazima
Marembo
Sailoni
Sera
Mazziwa
Kalesa
Wema
Bilisa
Hewani
GARSEN
To Malindi
To Lamu
2°15'
40°10'
N
0 1 2 km

Census Method

The "quadrat census method" (Struhsaker 1981) was used throughout the 1994 census. There were two reasons for choosing this method. First, the quadrat census method has become accepted as the standard method for censusing Tana River primates (Marsh 1978, 1986, Kahumbu & Davies 1993). As such, its use helps to minimize the variables and, thereby, permits comparisons among censuses. Second, this method appeared to be the best method given the circumstances of the 1994 census. It is most appropriate when the forests being sampled are relatively small and, therefore, offer natural boundaries within which primate groups are generally confined. It is particularly appropriate where good maps exist, where several observers are available to undertake the census, and where the observers are familiar with the behavioral and ecological characteristics of each species (e.g., habitat preferences, group spread, vocalizations and rate of travel).

The quadrat census method involves searching a predefined area (the forest or forest section) and counting all primates groups within that area. To ensure maximum coverage, observers start at a baseline and walk parallel to one another through the forest. During this study, the observers usually moved in pairs. The larger forests were censused by five pairs of observers moving parallel to one another, usually at 50 - 150 m intervals. The smaller the forest the fewer the number of observer pairs required. Observers moved at the rate of about 1 km/h and made frequent stops to look and listen for primates. They spent about 10 min with each group of colobus or mangabeys encountered.

During encounters the following information was recorded on check-sheets by one member of the observer pair: date, forest name and number, team members, time the census began and ended, time each encounter with primates began and ended, minimum number of monkeys seen, age/sex of each monkey seen clearly, tree species in which the monkeys were seen and direction moving when the encounter ended. When monkeys were heard calling, but not seen, the caller's location was assessed by taking a compass bearing and making an estimate of the distance from the observer.

Considerable effort was made to conduct the censuses between 6:00 - 10:00 h and 16:00 - 18:30 h but this was often not possible due to logistic and time constraints, and the large size of some of the forests.

Most forests were censused only once but 10 were censused twice and two were censused three times. The recensused forests were those in which the first census was judged to be inadequate for any one of several reasons. These included poor coverage of the forest, observer disorientation, confusion which might lead to serious double counting of primate groups and, in the better studied forests, the missing of "known" groups of colobus or mangabeys.

Soon after a forest was censused, all of the participants were brought together to review the results and determine the number of primate groups detected. In order to weed-out those groups detected by more than one pair of observers and, therefore, minimize double counting, considerable time was devoted to reviewing when observers where with a particular group, group location, major tree species involved, and group travel rate and direction. The general consensus is that the number of groups double counted is more than offset by the number of groups missed, particularly in the larger forests. The counts for

each forest are, therefore, generally taken to be minimum counts.

In the 14 forests where there was a risk of encountering bandits, it was necessary to limit the number of observer teams to two. All of these forests were located on the east bank of the Tana River. Depending on the size and shape of the forests, the two teams either moved parallel to one another through the forest or divided the forest into two sections and one group systematically searched each section. Each group was followed at a short distance by nine security rangers. This meant that these forests were censused under conditions which were less than ideal, and that coverage in the larger of these forests was not as good as in those forests where security precautions were not needed. Nonetheless, these censuses were generally judged to be reasonably good and it was very useful to visit and census these forests, many of which had not been censused for 20 years.

During censuses, and immediately thereafter, notes were made of the dominant tree species, forest structure, extent of ground vegetation and litter, evidence of large mammals, kinds of human activities, forest damage and general condition of the forest. Estimates were also made of the mean length and mean width of the less well known forests so as to obtain an indication of size. The senior author also kept a list of the less common bird species seen or heard.

The local Pokomo, particularly the guides, were often questioned as to which species of primates occurred in particular forests, past land-use practices, habitat changes and forest history. The information they provided proved to be fairly reliable and highly valuable.

Census Coverage

Using the original Marsh/Decker forest designation system we censused 54 (77%) of 70 forests and forest sections along the approximately 60 km long range of the Tana River red colobus and Tana River crested mangabey. Using our new system we censused 60 (78%) of 77 forests and forest sections, and 54 (76%) of 71 “distinct forests” (Table 1).

Uncensused Forests

Of the 17 uncensused forests, nine have never been reported to hold red colobus or crested mangabeys and five have not been reported to harbor either species since 1972 or 1975 (Appendices A & B). Only three uncensused forests are known to have colobus or mangabeys as of 1989 (Forests 29, 33, 67). Most of the 17 uncensused forests are better classified as dry bush and woodland. Many are along Channel 1 and are senescent or dying. Several of these forests have declined considerably in size since 1975 and at least one no longer exists. There is little chance that red colobus occur in any of them other than Forest 67. Mangabeys are probably still present in Forests 29 and 33, and possibly a few of the others. Forests 29, 33 and 67 are at the top of the list of forests to census in the near future. Six forests (Forests 36b, 38, 39b, 42, 50, 55) were apparently censused for the first time in 1994.

Differences Among Censuses

Although the basic method used during the 1994 and all previous censuses of primates along the lower Tana River was nearly identical, the 1994 census differed from the earlier censuses in two important ways. First, more time was available so that nearly all of the forests could be censused intensively. In 1974/75, C. Marsh and one local guide censused about 67 forests and forest sections from near Garissa to near Garsen (Marsh 1978). This is the largest number of forests visited during any census. Prior to 1994, all other censuses of the Tana River red colobus and crested mangabey were largely confined to the TRPNR and the TDIP managed area. These censuses covered 22 - 32 of the 77 forests and forest sections between Konjonja Village and Mitapani (Table 2). Thus, the best data on colobus and mangabey numbers and population trends are available for the TRPNR, with the TDIP area second. Some workers extrapolated their data to provide an estimate of the total number of red colobus and crested mangabeys along the entire lower Tana River.

Second, a large number of highly experienced observers were available for the 1994 census. Most of the earlier censuses were undertaken by one, rarely two, teams of observers working each forest. For the 1994 census this translated into more thorough and systematic coverage of most forests, particularly the larger forests.

Differences in the Detection of Colobus and Mangabey Groups

We found that the number of observers affects the number of colobus groups detected much more than the number of mangabey groups. The impact of differing census intensities on numbers of groups detected can be clearly seen when comparing the results of the 1993 and 1994 censuses of primates within the TRPNR and three nearby forests. In 1993, 21 colobus groups were located in these forests whereas 37 groups were found in 1994. There can be little doubt that this 16 group (76%) increase is due largely to differences in the intensity of the censusing. With mangabeys, almost exactly the same number of groups were detected in 1993 (29 groups) as in 1994 (28 groups). We believe this difference between the two species is due simply to the considerable differences in species detectability. Red colobus are relatively quiet, inactive monkeys which living in rather small groups, have small group spread and lack a loud call. This means that observers need to be close to a colobus group in order to detect it. Crested mangabeys are noisy, very active monkeys which live in large groups, have a considerable group spread and males frequently give loud calls that can be heard for at least 1 km. As such, this species is much more readily detected than the colobus. If the goal were only to census mangabeys, the coverage provided by the 1993 census would appear to be adequate.

RESULTS OF, AND COMMENTS ON, EARLIER CENSUSES

General

The numbers of red colobus and crested mangabeys estimated from the results of previous censuses in the TRPNR and along the lower Tana River are summarized in Table 2, and

Table 2. Summary of total population estimates for the Tana River red colobus and the Tana River crested mangabey (1972 - 1994) along the lower Tana River, Kenya, from Konjonja Village to Mitapani. The number of forests and forest sections censused is also provided. Researchers extrapolated from the forests surveyed to obtain estimates of total population size. Estimates rounded-off to nearest 100 animals.

Year	No. Forests*	No. Colobus	No. Mangabeys	References
1972	27	1900	2200 1500 – 3000	Groves et al. 1974 Andrews et al. 1975
1974	22	1900 - 4300	900 – 1500	Homewood 1976
1975	59	1200 - 1800	1200 – 1600	Marsh 1978, 1986
1985	32	200 - 300	800 – 1100	Marsh 1986
1989	26	200 - 300	-	Ochiago 1990, 1991
1990	29	200 - 300	-	Ochiago 1991
1994	60	1100 - 1300	1000 – 1200	This report

* The number refers to censused forests only and is based on the system for naming forests and forest sections along the lower Tana River as given in Table 1.

detailed in Appendices A and B. It is important to emphasize that, in most cases, the censuses differed considerably in the number of people participating, amount of time and effort expended, and number of forests visited. This, of course, leads to some problems in comparing the results and assessing population numbers and trends.

The 1972 Census

The 1972 census (Groves et al. 1974, Andrews et al. 1975) represents the first attempt to obtain an estimate of the total numbers of red colobus and crested mangabeys along the Tana River. The researchers visited about 27 forests and woodlands, and obtained estimates of colobus and mangabey densities for about six forests. They used these density values, together with their estimate of the total forest area occupied by each of the two subspecies, to obtain their estimate of total population size (Table 2).

Based upon preliminary information provided by K. Homewood and C. Marsh, the authors suggest that the lower estimate given for mangabeys (1,466 animals) was probably closer to the actual number.

This census provided the first good data both on population size and range limits of the Tana River red colobus and Tana River crested mangabey.

The 1974 Census

Homewood (1976) conducted the first detailed ecological and behavioural studies on the Tana River mangabeys. She visited 22 forests and forest sections along the lower Tana River to determine which primate species were present. In addition, she also visited seven forests scattered through the Tana Delta. No colobus, mangabeys or, surprisingly, Sykes monkeys were found in the Delta.

Primate densities were obtained from repeated strip censuses in Mnazini North and Mnazini South Forests. The number of groups/km2 was multiplied by the amount of habitat thought to be occupied by red colobus and crested mangabeys along the lower Tana River (15 km2). This value was multiplied by mean group size (Table 3) to yield an estimate of total population size (Table 2).

The 1975 Census

Marsh (1978) was the first to undertake a detailed field study of the Tana River red colobus. His 1975 census covered 59 (77%) of the 77 or so forests and forest sections between Nkanjonja Village and Mitapani. These included nearly all forests and forest sections thought likely to hold red colobus and crested mangabeys (Marsh 1978, 1986). Only one group of census takers, however, searched each forest. As such, coverage was probably minimal, particularly in the larger forests. Nevertheless, this census provides the best baseline against which to assess population trends in these two primates (Table 2, Appendices A & B).

Marsh (1978) also surveyed about six forests to the north and south of the known range of

Table 3. Summary of mean group size data for the Tana River red colobus and Tana River crested mangabey (1972 - 1992) along the lower Tana River, Kenya.

Year	No. Colobus			No. Mangabeys			References
	$\overline{X}$	range	n	$\overline{X}$	range	n	
1972	*15.0 ** 8.0	(7-24) (5-12)	? ?	28.0	?	?	Groves et al. 1974 Andrews et al. 1975
1975	18.8	(13-30)	13	26.4	(13-36)	4	Homewood 1975, 1976 Marsh 1978, 1986
1985	9.8	(6-13)	6		-		Marsh 1985, 1986
1987	12.0	(4-23)	13	17.0	(9-24)	5	Decker & Kinnaird 1992
1987-92	11.3	(2-37)	20		-		Decker 1994
1989	12.0	(2-22)	16		-		Ochiago 1990
1989		-		20.5	(15-28)	7	Kinnaird & O'Brien 1991
1990	14.4	(2-29)	14		-		Ochiago 1991

* Estimate for "larger forests".

** Estimate for "tiny cultivation forests".

the red colobus and crested mangabey but this effort only slightly altered the distributions of these two subspecies as defined by Groves et al. (1974) and Andrews et al. (1975).

The 1985 Census

The 1985 census was also undertaken by Marsh (1985, 1986). In order to assess changes in numbers of red colobus and crested mangabeys, he visited 32 of the same forests and forest patches which he had censused in 1975. In most cases, only one team surveyed each forest but in some of the larger forests two census teams were used. Many forests were visited two or more times. The results from this work were extrapolated to give an estimate of the total number of colobus and mangabeys over their entire range (Table 2).

Note that Table 1 in Marsh (1986) has some typographical errors in the alignment of the data against forests. Throughout this report, therefore, we used the data as presented in Table 1 of Marsh (1985).

The 1989 Census

This census by Ochiago (1990, 1991) is based on visits to 26 forests and forest sections. All forests were censused by one team. The mean size (12) of the 16 colobus groups counted was multiplied by the number of groups (22) in the forests surveyed to obtain the figure of 264 for the total number of colobus along the lower Tana River. No recognition was made of the fact that some colobus certainly continued to survive in some of the 38 or so other forests and forest sections along the Tana River which had suitable vegetation and which had been surveyed by other researchers in 1975 and 1985. Thus, the figure of 264 animals is certainly a considerable underestimate.

The 1990 Census

This census was also conducted by Ochiago (1991). The approach used in the 1989 Census was again used in 1990. Twenty-nine forests and forest sections were surveyed. The total size of the red colobus population was estimated at 288 animals. As for the 1989 Census, no consideration was given to the numbers of colobus present in the 35 or so uncensused forests.

THE 1994 TANA RIVER PRIMATE CENSUS: RESULTS AND DISCUSSION

Distributional Range of the Red Colobus and Crested Mangabey

Red Colobus

The present distributional ranges of the Tana River red colobus and crested mangabey are surprisingly similar (Figs. 4 & 5).

Fig. 4. Distribution of the Tana River red colobus in 1994. See caption to Fig. 3.

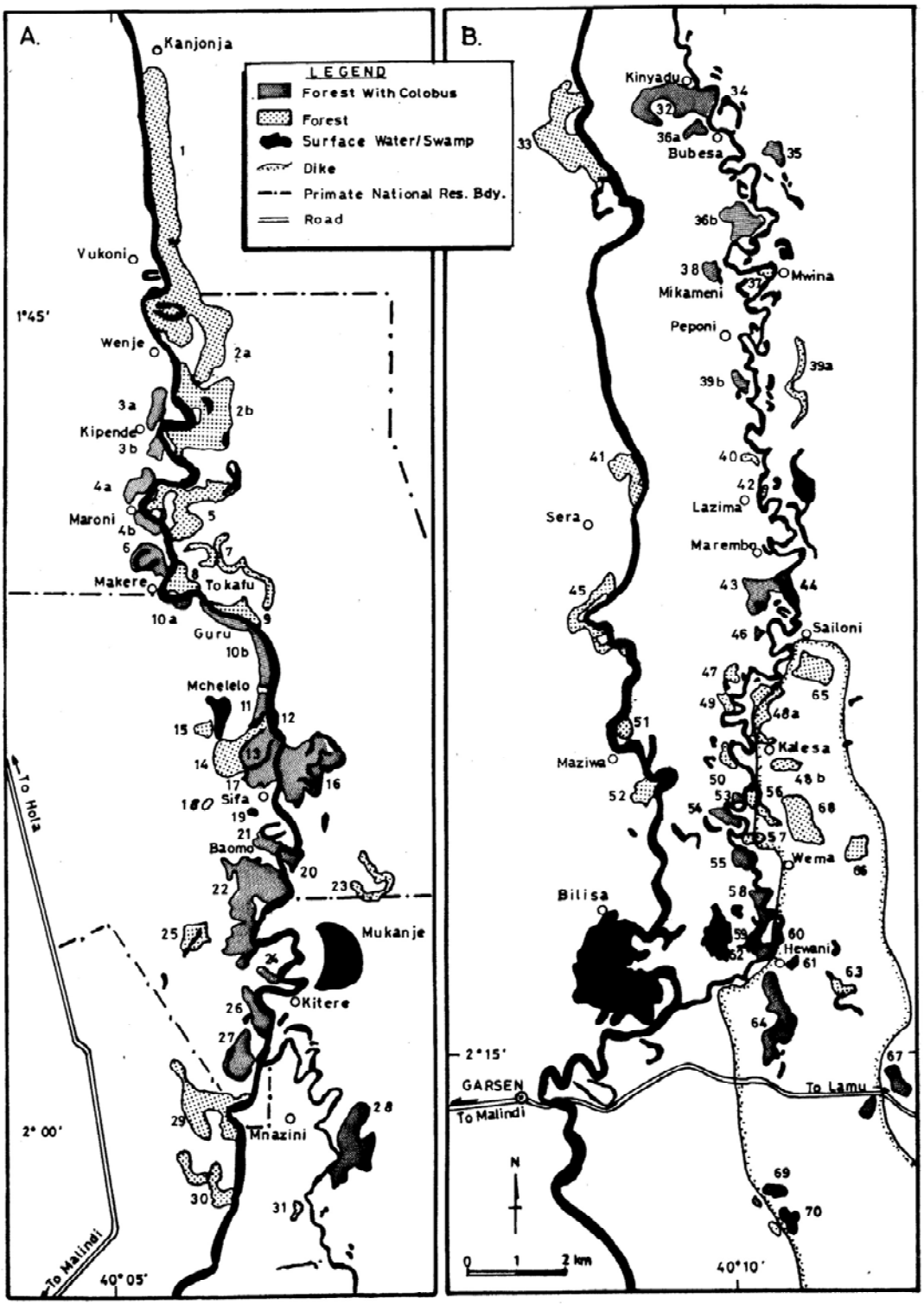
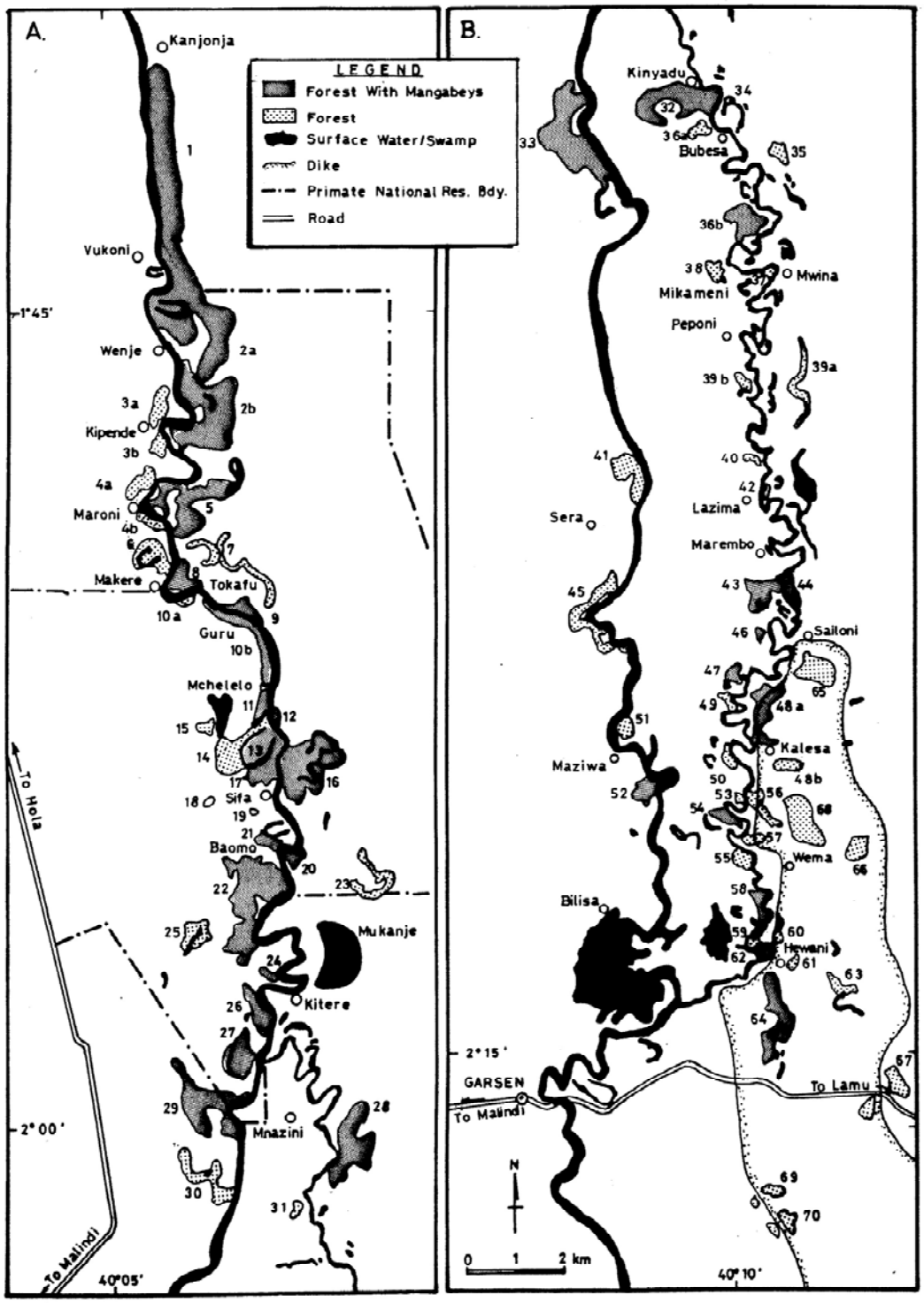

A.
B.
LEGEND
Forest With Colobus
Forest
Surface Water/Swamp
Dike
Primate National Res. Bdy.
Road
Kanjonja
Vukoni
Wenje
Kipende
Maroni
Makere
Tokafu
Guru
Mchelelo
Sifa
Baomo
Mukanje
Kitere
Mnazini
To Hola
To Malindi
1°45'
2° 00'
40° 05'
Kinyadu
Bubesa
Mwina
Mikameni
Peponi
Lazima
Marembo
Sera
Sailoni
Kalesa
Maziwa
Wema
Bilisa
Hewani
GARSEN
To Malindi
To Lamu
2°15'
40°10'
N
0 1 2 km

Fig. 5. Distribution of the Tana River crested mangabeys in 1994. See caption to Fig. 3.


A.
B.
LEGEND
Forest With Mangabeys
Forest
Surface Water/Swamp
Dike
Primate National Res. Bdy.
Road
Kanjonja
Vukoni
Wenje
Kipende
Maroni
Makere
Tokafu
Guru
Mchelelo
Sifa
Baomo
Mukanje
Kitere
Mnazini
To Hola
To Malindi
1°45'
2°00'
40°05'
Kinyadu
Bubesa
Mwina
Mikameni
Peponi
Sera
Lazima
Marembo
Saitoni
Kalesa
Maziwa
Wema
Bilisa
Hewani
GARSEN
To Malindi
To Lamu
2°15'
40°10'
N
0 1 2 km

A census conducted in 1972 found that, at the extreme north of their range, red colobus occurred in Kipende Forest on the west bank and in Maroni East Forest on the east bank (Groves et al. 1974, Andrews et al. 1975). Lango la Simba Forest was taken to be the southern limit. This gave a north-south range of about 60 km.

Colobus are primarily found in forests along the main channel of the Tana River, being largely absent from the senescent and dying forests along old river channels. This is particularly true for forests/woodland along Channel 1 (Forests 30, 33, 41, 45, 51, 52) (Figs. 2 & 3). The only record for colobus in these forests was obtained in 1975 in Matalani South Forest by Marsh (1978) when he sighted one group. Elsewhere, the only known "old channel forests" with colobus are Hewani South 2 Forest and Lango la Simba Woodland (Appendix A).

Unfortunately, we were unable to walk through but a few of the forests along Channel 1 in 1994. A drive through the area, however, showed that these forests continue to degenerate and die. For the most part, all that remains are dead and fallen trees and bush. There is probably no forest remaining which can provide habitat for colobus. Nonetheless, these forests should be thoroughly checked in the near future for both colobus and mangabeys.

Today, the northern extreme of the red colobus range remains Kipende Forest on the west bank. On the east bank, however, no colobus have been observed north of Mchelelo East Forest since 1985. It appears that Maroni East Forest lost its one group prior to 1985 and that Guru East Forest lost its one group prior to 1990 (Appendix A). If so, the range on the east bank has contracted southwards about 5 km and at least two groups of colobus have either died-out or emigrated. Today, colobus occur about 10 km farther north along the Tana River on the west bank than on the east bank. Within the Reserve, colobus occur in virtually all of the evergreen forests on the west bank. Within the Reserve on the east bank, however, they are limited to those forests of the southern half. Colobus are surprisingly absent from the Greater Wenje Forest, the largest and, perhaps botanically richest, forest along the lower Tana River.

At the southern end of the range, Decker (1994) extended the known range for colobus another 5 km when she discovered them in Mitapani South 2 Forest, an old Channel 4 forest. Given that this forest is rather isolated, it is likely that colobus were present there long before 1972 and that this does not represent a range expansion for this species.

It is of some concern that between Mikamani Forest (No. 38) and Marembo West Forest (No. 43) there is about a 6 km stretch of river along which colobus are apparently absent (Fig. 4). This gap probably ensures that there is no movement of colobus between what we might view as northern and southern populations. While this is the largest gap, several other forests with colobus are more than 1 km from the nearest other forest with colobus (Forests 28, 35, 67, 70). The Tana River itself, of course, serves as a serious barrier between many much closer, across-river, forests that harbor colobus.

Above, we mention that colobus were once present in Maroni East and Guru East Forests but are now apparently absent. The only other forest known to have held colobus, but where they are now absent, is Wema East 1. The number of colobus groups in Wema East 1 has declined from 2 to 0 since 1989. The Kipende 1 and Wema West 3 Forests once held colobus groups but now harbor single animals. Kipende 1 had about 11 colobus in two groups as recently as 1990. This decline in numbers of colobus in Wema East 1 and

Kipende 1 is almost certainly a result of extensive loss of forest to farmland at both sites.

While we note the disappearance of red colobus from three forests, the 1994 census provides the first sightings of colobus in seven forests (Forests 35, 36b, 38, 46, 53, 54, 55). Forest 35, 36b, 38 and 55 had never before been censused. Forests 46, 53 and 54 had only been censused once or twice and that was in the early 1970's. In addition, a group of colobus was found in Hadribu Forest, a forest in which colobus have not been reported since 1975.

In 1975, red colobus groups were found in 33 (56%) of 59 forests and forest sections surveyed (Marsh 1978). During the 1994 census we located colobus groups in 36 (60%) of the 60 forests and forest sections censused (Appendix A). Additionally, we know that colobus groups occur in one other forest, Lango La Simba Forest. This gives a total of 37 forests and forest sections with one or more colobus groups. Two other forests held but a single colobus.

The total number of "distinct forests" known to hold colobus groups in 1994 is 34 (63%). No colobus were found in 18 of the 54 distinct forests which were censused and two held but a single animal. Twenty-one distinct forests hold only one group of colobus (Fig. 6). Only seven forests harbor five or more groups of colobus. The two forests with the largest number of colobus groups are Mnazini East (8 groups) and Hewani South 2 (10 groups). Both of these forests are located outside of the TRPNR.

The total area of the 34 distinct forests with colobus groups is roughly 1,300 ha (Table 1). Since colobus do not use all parts of every forest, it can be said that this subspecies has a total distributional range which is considerably less than 1,300 ha.

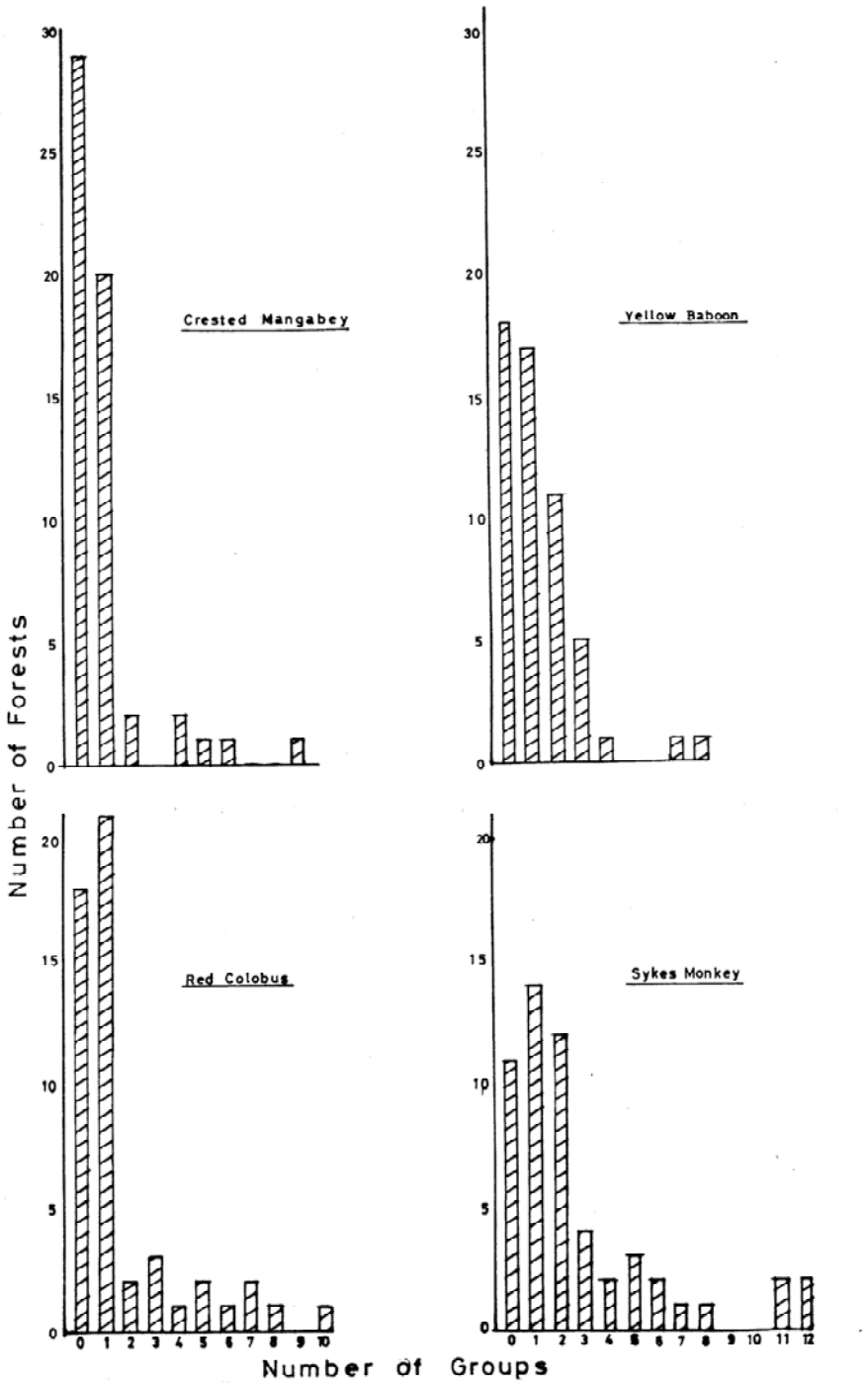
Crested Mangabey

As with the red colobus, the range limits of the Tana River crested mangabey were largely determined during field work conducted in the early and mid-l970s (Groves et al. 1974, Andrews et al. 1975, Homewood 1976, Marsh 1978) (Fig. 4). On the east bank, the northern limit of the mangabey's distribution is the Nkanjonja Forest while on the west bank the northern limit is Guru South Forest. Thus, mangabeys occur about 11 km farther up-stream on the east bank than on the west bank. The Hewani South 2 Forest represents the known southern limit of the mangabey. This gives a linear north-south range of about 60 km, about the same as reported in the mid-1970s.

Unlike colobus, all the larger forests in the TRPNR are occupied by mangabeys (Table 1, Fig. 5). Two small forests (Forests 21, 24), while not supporting mangabey groups full-time, are known to be visited by mangabey groups moving from larger forests.

Like red colobus, the crested mangabey might be viewed as occurring in two populations between which there is probably no movement of animals (Fig. 5). These northern and southern populations are separated by approximately a 7 km wide gap between Bubesa West 2 Forest (No. 36b) and Marembo West Forest (No. 43). At least five other forests with mangabeys are more than 1 km from the nearest neighbouring forest with mangabeys (Forests 28, 33, 32, 42, 52).

Fig. 6. Distribution of numbers of groups per forest for red colobus, crested mangabey, Sykes monkey and baboon along the lower Tana River, Kenya, in 1994.


Crested Mangabey
Yellow Baboon
Red Colobus
Sykes Monkey
Number of Forests
Number of Groups

Mangabeys were once present in, but are now apparently absent from, seven forests (Forests 18, 23, 35, 56, 59, 60, 67). The 1994 census found mangabeys in four forests where they had not been previously reported (Forests 8, 47, 48a, 54).

In 1975, crested mangabey groups were found in 31 (53%) of the 59 forests and forest sections surveyed (Marsh 1978). During the 1994 census we located mangabey groups in 30 (50%) of the 60 forests and forest sections surveyed (Appendix B). In addition, we know that, in 1989, mangabey groups were present in Forests 29 and 33 (Kinnaird & O'Brien 1991). If we assume that these two forests still have mangabeys, this gives a total of 32 forests and forest sections with one or more mangabey groups.

The total number of distinct forests known to hold mangabey groups is 27 (50%). No mangabeys were found in 27 of the distinct forests surveyed. Twenty distinct forests held only one group of mangabeys (Fig. 6). Only five forests harbored four or more groups of mangabeys. The two forests with the largest number of mangabey groups were the Greater Mchelelo Forest (6 groups) and the Greater Wenje Forest (9 groups).

Mangabeys appear to have more ability to survive in senescent and dying forests than do colobus. In 1989, Kinnaird and O'Brien (1991) found at least one mangabey group in three of the Channel 1 forests (Forests 29, 33, 52). We were able to visit only Forest 52 (Maziwa South) where one group was found. In 1972 this forest held an estimated 160 - 200 mangabeys. The priority for additional census work is to visit Forests 29 and 33. Lango la Simba Forest, another old channel forest in the southeast corner of the mangabeys range, lost its one group of mangabeys sometime after 1974 (Homewood 1976) (Appendix B).

The 27 distinct forests with mangabeys have a total area of approximately 2,600 ha (Table 1). While mangabeys occupy fewer forests than colobus (27 vs 34 forests), the total area of forests with mangabeys is close to twice that of forests with colobus (2,600 vs 1,300 ha). Most of this difference is due to the fact that mangabeys, but not colobus, are found in the Greater Wenje Forest (1,100 ha), the largest forest along the lower Tana River.

Population Size of the Red Colobus and Crested Mangabey

Red Colobus

A minimum of 83 groups of red colobus were detected in the 60 forests and forest sections (54 distinct forests) surveyed. During this census we did not detect one group known to live in the Marembo East Forest (Decker pers. comm.). In addition, we did not census the Lango la Simba Forest where two groups probably still occur (Decker pers. comm.). The available data suggest that mean group size for colobus during the period 1987 - 1992 was about 13.0 (Table 3). Thus, the total number of Tana River red colobus living in groups is at least 1,118. To this can be added the 14 solitary adult males observed. This raises the number to 1,132.

This can be taken as the minimum figure for the following reasons:

- Five groups of colobus were encountered but not counted as there was some possibility they had already been counted once.

- There are probably a few forests with colobus which have yet to be censused.

- The mean size of colobus groups is likely to be somewhat higher than 13.0. This is because many of the group counts used to derive this mean value were made during censuses when it is likely that counts missed some group members (Marsh 1986, Kahumbu & Davies 1993).

- While it is likely that a few groups were double counted during the census, the strong impression is that many more groups were missed. As such, the total number of groups in the forests censused was likely considerably more than 83, particularly in the large East Bank forests where the security situation meant that the census methodology was far from ideal. We suggest that we missed at least 10% of the colobus groups in the forests where we were not accompanied by security forces and 20% in forests where security forces were used.

Taking the above factors into consideration, we suggest 1,300 red colobus as an upper figure.

Crested Mangabey

At least 48 groups of crested mangabeys were detected in the 60 forests and forest sections (54 distinct forests) censused. To this we added the single groups reported in Forest 29 and Matalani South Forest during the 1989 census (Kinnaird & O'Brien 1991). We did not census these two forests in 1994 but it is likely that they still harbour mangabeys. Mean group size for mangabeys in 1989 was 20.5 individuals (Table 3). Thus, the total number of surviving mangabeys is at least 1025. Since some groups probably went undetected in the forests censused, and since some mangabeys likely occur in a few uncensused forests, we suggest that there may be as many as 1200 animals. Contrary to what the censuses since 1985 indicate, there are today probably slightly fewer crested mangabeys remaining than red colobus (Table 2).

Population Trends of the Red Colobus and Crested Mangabey

Red Colobus

The data on the size of the Tana River red colobus population from 1972 through 1994 (Table 2) are not easy to interpret as they are the results of censuses which differed considerably in the number of forests visited, time allocated, number of census takers, etc. Of the earlier censuses, the most comprehensive was the 1975 census (Marsh 1986) on the basis of which the population was estimated at 1,200 -1,800 animals. The present population estimate (1,100 - 1,300 animals), is lower than, but overlaps with, the 1975 estimate. Given the considerable loss of habitat within the range of this subspecies it would be surprising if the population today were not a few hundred animals lower than in 1975.

Population estimates from less extensive censuses in 1985, 1989 and 1990 all yielded a population size range of 200 - 300 colobus. We believe that these figures seriously underestimated the size of the population during these years.

Table 4. Summary of total groups and numbers of Tana River red colobus and Tana River crested mangabeys within the Tana River Primate National Reserve and three nearby forests.* Includes groups known to occur but not seen during the censuses. Mean group sizes used to calculate numbers of animals are taken from Table 3.

Year	No. Colobus		No. Mangabeys		References
	Groups@	Animals	Groups#	Animals	
1975	44	814	28	739	Marsh 1978, 1986
1985	15	147	20	340	Marsh 1985, 1986
1989	-	-	21	430	Kinnaird & O'Brien 1991
1989	16	208	-	-	Ochiago 1991
1990	14	182	-	-	Ochiago 1991
1993	21	273	29	595	Kahumbu & Davies 1993
1994	37	481	28	574	This report

* The three nearby forests are Kipende West, Maroni West and Makere West.

@ Not included are colobus groups which were probably present in the following uncensused forests during the year indicated (Appendix A):

1975: Makere East

1985: Makere East, Baomo East, Kitere West

1990: Makere East, Hadribu

1993: Hadribu

Not included are mangabey groups which were probably present in the following uncensused forests during the year indicated (Appendix B):

1985: Makere East, Baomo East, Kitere West

1989: Makere East, Mchelelo East

The best set of baseline data for assessing trends in the populations of red colobus and crested mangabeys exists for the forests of the TRPNR and three neighboring forests (Table 4). These are the forests in which detailed primate studies were conducted and where the most comprehensive censuses were undertaken. In 1975 there were approximately 814 colobus in 44 groups in the TRPNR while in 1994 there were about 481 colobus in 37 groups. There are now about 7 fewer groups than in 1975 and roughly 333 fewer animals. We have more confidence in the data on numbers of groups than on the total number of animals as this second value is dependent upon good data for calculating mean group size. No data on group size have been collected since 1990. Nonetheless, it appears highly likely that the number of groups of colobus in the TRPNR is somewhat lower now than in 1975 and that the mean size of groups is now smaller. The result is that there are probably 200 - 400 fewer colobus in the TRPNR now than 20 years ago.

The next best data set for assessing the red colobus population trend is from the area now managed by TDIP (Table 5). Here the opposite trend is suggested. In 1975, 10 groups of red colobus were found in these forests. In 1994 we located 20 groups. Taking everything into consideration, we suggest that this difference is largely the result of a more intensive census methodology rather than a true increase in numbers of groups.

Crested Mangabeys

In 1975 there were an estimated 1,200 - 1600 Tana River crested mangabeys (Table 2). The estimate for 1994 is 1,000 - 1,200 animals. As with the red colobus, we believe that there has been a modest, but significant, decline in the size of this population. This is likely the result of considerable habitat loss and degradation within the range of this subspecies.

In the relatively well studied TRPNR there were about 28 groups totaling approximately 739 individuals in 1975. The 1994 census also yielded 28 groups (Table 4). Since mean group size is believed to have declined between 1975 and 1994 (Table 3), the total number of animals in the TRPNR is estimated to be 574. As with colobus, the apparent decline in population size is more a reflection of a drop in mean group size than in the numbers of groups. Since a good knowledge of mean group size is critical to our estimates of population size it is now a priority to get ample, current, data on group size from groups throughout the range of both species.

In the TDIP managed forests there were an estimated five groups of mangabeys in 1975, 1985 and 1992. We located seven groups (Table 5).

Status and Distribution of the Tana Sykes Monkey

Distribution

When present, groups of Sykes monkeys are relatively easy to detect as they are fairly

Table 5. Summary of total groups and numbers of Tana River red colobus and Tana River crested mangabeys within the area now managed by the Tana Delta Irrigation Project (TDIP) plus two nearby forests.* Includes groups known to occur but not seen during the censuses. Mean group sizes used to calculate numbers of animals are taken from Table 3.

Year	No. Colobus		No. Mangabeys		References
	Groups@	Animals	Groups#	Animals	
1975	10	188	5	132	Marsh 1978, 1986
1985	2	20	5	85	Marsh 1985, 1986
1987	8	104	2	34	Decker & Kinnaird 1992
1989	-	-	3	62	Kinnaird & O'Brien 1991
1992	10	130	5	102	Decker 1994, pers. comm.
1994	20	260	7	144	This report

* The two nearby forests are Hewani West 1 and Hewani West 2.

@ Not included are colobus groups which were probably present in the following uncensused forests during the year indicated (Appendix A):

1975: Mitapani South 2

1985: Mitapani South 2

1987: Hewani West 2, Mitapani South 2

Not included are mangabey groups which were probably present in the following uncensused forests during the year indicated (Appendix B):

1975: Kulesa East

1985: Kulesa East

1987: Kulesa East

1989: Kulesa East

active primates and group-living males give loud "pyow" calls which can be heard at distances of up to 1 km (Butynski 1991).

The Tana Sykes monkey is limited in its distribution to southern Somalia, north coast of Kenya, lower Tana River and Tana Delta. In 1972, Anderson et al. (1975) found Sykes in bush/woodland as far up the Tana River as Bura (Fig. 1). Marsh (1978) suggested that, unlike red colobus and crested mangabeys, Sykes monkeys, baboons and vervet monkeys are present along the whole of the Tana River.

The Tana Sykes monkey is both widespread and common along the lower Tana River, being present in at least 43 (80%) of the 54 distinct forests censused (Table 1). Fifteen forests had three or more groups of Sykes monkeys (Fig. 6). This species seems to be absent only in the very smallest forests (e.g., Forests 3b, 31, 39b) and in dry "forests" (better classified as open woodland/bushland) that are rather far from the river (e.g., Forests 18, 35, 25).

Numbers of Animals

A total of 172 Sykes groups were detected during the census. Thirteen forests harbored four or more groups of this species. The two forests with the largest numbers of groups were the Greater Mchelelo Forest (17 groups) and the Greater Wenje Forest (33 groups).

Harcourt (1974) found the mean size of Sykes monkey groups in the TRPNR to be 18 (n = 4). Marsh (1978) estimated mean group size at 20 animals (n = 5). Decker (1994) found the mean group size for Sykes monkeys to be about 15 individuals (n = 6). These mean group size values are fairly typical for the species (Wolfheim 1983, Butynski 1991). Using a mean value of 17 animals per group, we estimate that there are roughly 3,000 Sykes monkeys in the forests censused.

This species is likely found in good numbers in many other forests in the lower Tana River region which are far from the present course of the river and which (reportedly) do not hold red colobus or crested mangabeys. Examples are the sizeable Bvumbwe and Sailoni Forests, and the very large Witu Forest.

It should be noted that, although the Sykes monkey is said to occur in the Tana Delta (Kingdon 1991), it may not be nearly as common there as along the lower Tana River and along the north coast of Kenya (Butynski per. observ.). We say this because, in 1974, Homewood (1976) visited six forests (Kibusu, Ngao, Samikaro, Seidibabo, Maongo, Ozi) in widely different locations in the Delta and did not report Sykes monkeys in any of them. It appears that the Tana Delta provides habitat more suitable for vervets and baboons than for any of the other monkeys found along the lower Tana River.

While the Tana Sykes monkey is not yet considered endangered, its distribution should be better determined and its numbers monitored. With a rather small subspecies' range, and apparent overall loss of habitat due to agriculture, burning and development, its numbers are likely on the decline.

Status and Distribution of the Yellow Baboon

Distribution

The yellow baboon is a common and widespread species which occurs in at least nine African countries (Wolfheim 1983). It is found over most of the eastern half of Kenya (Kingdon 1971).

Of the Tana River primates, the yellow baboon is probably the easiest to detect and observe as it lives in large, active, noisy groups and adult males frequently give loud calls. The problem with counting baboon groups in the forests of the lower Tana River is that they spend much of their time foraging in bushland and savannah some distance away from the forest patches. The data obtained during this census on numbers of groups, therefore, certainly underrepresent the numbers of baboons and baboon groups using these forests.

Baboons were found in 36 (67%) of the 54 distinct forests censused (Table 1). It is likely that all forests are, at least occasionally, visited by one or more groups of baboons. Three or more groups were found in eight forests (Fig. 6). This is undoubtedly the most widespread and abundant monkey in the TRPNR and along the lower Tana River.

Numbers of Animals

A total of 73 baboon groups were counted during the census. Groups range in size from about 63 to 185 individuals (Marsh 1986, Kahumbu & Davies 1993). Here we use a mean group size of 70 animals. Thus, the number of baboons using the 54 distinct forests which we censused along lower Tana River, cannot be fewer than 5,000. The actual figure could be twice this. In addition, like the Tana Sykes monkey, baboons certainly occurs in many other forests in the region which are unsuitable for colobus or mangabeys, and which we did not census. These include Bvumbwe, Sailoni and Witu Forests, and forests in, and near, the Tana Delta (Anderson et al. 1975, Homewood 1976).

Status and Distribution of the Vervet (Green) Monkey

The vervet monkey is, by far, the most widespread monkey in Africa (Wolfheim 1983). It is typically a species of open woodland, thick bush and the surrounding savannah. In some parts of its range, the vervet utilizes riverine forest (Kingdon 1971). This is not so along the lower Tana River. Along the Tana, vervets were occasionally found on the forest edge but never even a few metres inside close canopy riverine forest.

During the 1994 census, we saw only two groups of vervets, both on the edge of Hewani South 2 Forest. This low number is surprising for a species which is common over much of its range. The vervet is the rarest primate along the lower Tana River.

While conducting non-census work in the TRPNR, we encountered vervet groups on only about three occasions over a two month period. These were off the edge of Congolani Central Forest and at TRPNR Headquarters. The research technicians based at Mchelelo

Research Camp are all life-long residents of the area. They claim that, in recent years, they have seen vervet groups near six other forests (Forests 3a, 4a, l0a, 11, 14, 17).

During her 1974 census, Homewood (1976) did not find vervets until she reached the southern end of the lower Tana River (Wema near Hewani). She did, however, find vervets associated with six of seven forests in or near the Tana Delta. Unfortunately, we were unable to census in the Delta. It appears, however, that vervets may be much more common there, and Sykes monkeys less common, than along the lower Tana River.

Zanzibar Galago

Three species of prosimians occur in the TRPNR, not two as previously indicated (e.g., Homewood 1976, Marsh 1978, Decker 1994).

The Zanzibar galago is a Red Data Book species with a known distribution limited to the lowland and montane forests of Somalia, Kenya, Tanzania (including Zanzibar), Malawi and Mozambique (Kingdon 1971, Lee et al. 1988, Harcourt & Bearder 1989). Its northern-most distribution along the coast may be the Tana Delta.

The Zanzibar galago and Senegal galago are difficult to distinguish from one another under field conditions. Their vocalizations are, however, very distinctive (Bearder et al. 1994). Recent tape recordings at Mchelelo Research Camp in the TRPNR confirm that the common small forest galago there is the Zanzibar galago (Butynski unpubl. data), not the Senegal galago. As far as we are aware, the only researchers to indicate that the Zanzibar galago is in the area identified one animal in Mnazini South Forest in 1972 (Groves et al. 1974, Andrews et al. 1975). Mnazini South Forest is the southern-most forest in the TRPNR and is located about 9 km south of Mchelelo on the same side (west) of the Tana River. As far as we are aware, Mchelelo now represents the northern limit of this species. It would, however, be surprising if the Zanzibar galago did not occur at least as far north as the Greater Wenje Forest.

We have not looked for the Zanzibar galago in other forests in the TRPNR. Therefore, the only thing we can say about the status and distribution of this species is that it is common and frequently heard in the Mchelelo West Forest.

Senegal (Lesser) Galago

The Senegal galago is Africa's most widespread prosimian. It is found in savannah, scrub, woodland and riverine forest habitats. The lower Tana River lies well within its range (Kingdon 1971, Wolfheim 1983). Andrews et al. (1975) mention that the Senegal galago is found in the bush country along the lower Tana River and Homewood (1976), Marsh (1978) and Decker (1994) state that it is present in the TRPNR.

Garnett's Galago

Garnett's galago is a large galago of moist vegetation types, including riverine forest and coastal thicket forest (Kingdon 1971, Wolfheim 1983). Once classified as a subspecies of *Otolemur crassicaudatus* (thick-tailed or large-eared greater galago), it is now considered a distinct species. Certainly the loud calls of Garnett's galago differ dramatically from those of the large-eared greater galago (Bearder et al. 1994). The lower Tana River is well within the range of Garnett's galago and recordings made at Mchelelo Research Camp in the TRPNR leave no doubt that the large galago there should be referred to as Garnett's galago and not the large- eared greater galago (Butynski unpubl. data).

We did not have time to look for galagos along the lower Tana River except within the Mchelelo West Forest. There, Garnett's galago was very common, readily seen and often heard. Both the Zanzibar galago and Garnett's galago were most frequently heard calling within an hour after dark and within an hour before daybreak.

Primates and Forests of the TRPNR

Primates

Of the 20 distinct forests within the TRPNR, 11 have at least one group of colobus. These forests hold about 37% of all red colobus groups and 56% of all crested mangabey groups (Table 6). This suggests that the TRPNR is more important for the conservation of the mangabey than the colobus. It also means that the forests outside of the TRPNR are far more important to the long-term future of both subspecies than previously thought. For example, Marsh (1986) estimated that, in 1985, only 10 - 15% of the red colobus and crested mangabeys lived in forests outside of the TRPNR. We found roughly 63% and 44%, respectively.

Based upon the numbers of colobus groups they hold, the most important forests within the TRPNR are the Greater Mchelelo Forest (7 groups), Baomo South (7 groups), Sifa East (5 groups), Mnazini North (4 groups) and Mnazini South (3 groups) (Table 1). Together, these five forests harbour 26 (81%) of the 32 groups in the TRPNR.

Total area covered by the 15 distinct forests within the TRPNR which actually have colobus and/or mangabeys is approximately 13 km2 (Table 1). None of the five "forests" without either colobus or mangabeys (Forests 7, 15, 18, 23, 25) have ever been reported to hold either species. All five are some distance from the present channel of the Tana River and largely bush/woodland rather than true forest. We doubt that any of them could support either colobus or mangabeys even in the unlikely event that either species reached them. We recommend that all five forests be removed from future lists of forests to be surveyed for colobus or mangabeys.

Forests

All forests within the TRPNR on the east bank, and all of the forests on the west bank north of Congolani Central Forest, were assessed as receiving light use by local people (Table 1). In some cases, the use was extremely low. Four of the west bank forests south of Congolani

Table 6. Number of "distinct" forests with Tana River red colobus and Tana River crested mangabey groups in the Tana River Primate National Reserve (TRPNR), in the Tana Delta Irrigation Project (TDIP) area, and in the forests outside of TRPNR and TDIP. Data from the 1994 census of the lower Tana River, Kenya (Table 1).

Area	Red colobus			Crested mangabeys		
	No.* forests	No. groups	% groups	No.* forests	No. groups	% groups
TRPNR	11	32	37	13@	28	56
TDIP	5	16	19	2	5	10
Outside	18**	38***	44	13+	17++	34
Total	34	86	100	27	50	100

* The figure presented is the number of distinct forests (not forest sections) in which at least one group of the species was found.

** Not included are two forests occupied by one colobus only.

*** Includes three groups not seen during the 1994 census but known to exist.

\+ The large "Greater Wenje Forest" is about half in and half out of the TRPNR. It was, therefore, counted twice, one under "TRPNR" and once under "Outside". Of the nine groups of mangabeys counted in this forest, five groups were allocated to "TRPNR" and four groups were allocated to "Outside". At least two of the 13 forests in the TRPNR are used by mangabeys but the mangabeys are not resident in them.

++ Includes two groups not seen during the 1994 census.

Central are being moderately used (Forests 21, 24, 26, 27) and two are heavily used (Sifa West and Baomo South Forests). This pattern of use is similar to that found in 1993 (Kahumbu & Davies 1993). The damage to forest was most severe in those forests nearest villages and farms.

Sifa West and Baomo South are being encroached upon by farmers. Sifa West recently lost about 2 ha of forest cover to the encroachment activities of one of the Research Assistants and his brother. Cutting of this forest was still occurring during a May 1994 visit. About 8 ha of fine forest in Baomo South were destroyed by a farmer in November 1992. The area continues to be cultivated and the destruction, by fire, of many of the remaining large trees was on-going in July 1994. The Baomo South encroachment is the subject of a pending KWS court case.

The census team found a minimum of 660 cut building poles on the ground, and two recently cut canoes, within the forests of the TRPNR. During the 1993 census we observe charcoal production in the TRPNR for the first time (Kahumbu & Davies 1993). This activity seems to have stopped as we saw no evidence of it in 1994.

Of Special Interest

- The Greater Wenje Forest is the largest forest along the Tana River and has an exceptional biodiversity (Andrews et al. 1975). Colobus are surprisingly absent but the habitat appears highly suitable for them. Serious consideration should be given to translocating colobus to this forest from those small, isolated, forests which hold threatened individuals.

- Kitere West Forest holds at least one pair of Uluguru violet-backed sunbirds, *Anthreptes neglectus* (Butynski in press), a new species for the TRPNR. This is a rare bird in Kenya with only about six published sight or collection records. The senior author searched for this species in all of the forests he visited during the 1994 primate census. It was found only in Kitere West Forest (18 ha) and observed there during each of three visits. This species could well be in some of the other forests of the lower Tana River but it is undoubtably rare in the area. The only other record of this bird north of Mombasa is of a female collected in Makere West Forest 32 years ago. Makere West Forest is now badly degraded and visits to it have not revealed the Uluguru vio1et-backed Sunbird. Kitere West Forest now represents the northern-most site in the range of this species and the only known site north of Mombasa. For this reason, special consideration should be given to the protection of this small forest.

Primates and Forests Under TDIP Management

Primates

There are 14 forests within the area managed by TDIP (Fig.2). At least six of these forests hold colobus and/or mangabeys groups (Tables 1 & 6). Together, the six forests cover an area of roughly 1.4 km2. TDIP forests provide habitat to approximately 19% of the colobus groups and 10% of the mangabey groups. These are not insignificant percentages when dealing with highly endangered animals.

Forests

It is important to the survival of both subspecies that TDIP do all that it can to not only prevent further damage to these forests but to actively manage and protect them (Medley et al. 1989). An independent "Environmental Expert Group", comprised of seven experts, was assembled in 1991 by the Nippon Koei Company on behalf of TARDA. The objectives of this group were to (1) evaluate the function of mitigation measures applied to the TDIP area and (2) identify the unexpected environmental effects based on the monitoring plan and the schedule prepared during the pre-construction environmental impact study for TDIP. The Environmental Expert Group planned to conduct independent monitoring activities in the TDIP area every three months from 1991 through 1996. As far as we are aware, however, the last time the Group worked at TDIP was in July 1992. TARDA and TDIP should be contacted to determine whether there is any on-going, independent, monitoring by qualified scientists/sociologists at TDIP at this time.

In 1989, Medley et al. (1989) noted damage to forests within the dike system as a result of dike construction and increased utilization by the local people. They suggested that additional damage was likely as a consequent of changes in flood and water Table regimes. The following specific damage was noted: forest fragmentation (Forest 56), burning or tree felling along forest edges (Forests 59, 60) and increased forest utilization (Forest 60). The paper concluded by making six specific recommendations to TARDA/ TDIP for maintaining the area's riverine forests and primates while allowing for development and operation of the rice project.

The 1994 census found that some of the forests most heavily utilized by people, and forests most damaged in the recent past, are under TDIP management. Seven of the 10 censused forests in the TDIP area were rated as heavily damaged by dikes, fire and/or the removal of forest products (Forests 48a, 48b, 56, 64, 65, 69, 70) (Table 1). Of particular concern is the damage to Mitapani South 2 Forest and Hewani South 2 Forest.

Mitapani South 2 Forest is the southern-most forest in the range of the Tana River red colobus. It, and the smaller Mitapani South 1, are strikingly different from all of the other lower Tana River forest in terms of structure and tree species. Both are dominated by the endemic tree *Oxystigma msoo*, have a high density of trees and a relatively deep ground litter. In addition to the construction of a dike though Mitapani South 2, we found five *O. msoo* trees felled for canoes and heavy extraction of the palm *Phoenix reclinata.* A total of 250 *P. reclinata* poles were found piled on the dike.

The Hewani South 2 Forest, the largest forest in the region, appears to be the single most important forest anywhere for the combined conservation of the red colobus (10 groups) and crested mangabey (4 groups). Hewani South 2, and the other forests in the TDIP area, hold a number of plant and animal species not found within the TRPNR (Andrews et al. 1975, Medley 1992, Medley et al. 1989). This forest also represents the known northern limit for two species of birds, the little rush warbler (*Bradypterus baboecala*) and the plain-backed sunbird *(Anthreptes reichenowi)* (Anderson et al. 1995).

During the census of Hewani South 2, we found two *Mimusops fruticosa* trees cut for lumber, and exploitation of *P. reclinata* for fronds and beer. In July we found a much more serious situation with considerable, on-going, TDIP bulldozer damage to the eastern edge

of the forest. The ecotone had been severely affected with some trees pushed over and others isolated. The purpose of this construction activity is unclear.

Dike construction destroys natural vegetation across a 50 - 60 m wide swath. Dikes have been built through at least parts of Forests 48a-b, 56, 65, 67, 69 and 70. The edges of Forests 44 and 64 have also been damaged. We are not in a position to say whether or not all the damage was necessary, or to evaluate the exact impact on the environment. We can say with certainty, however, that TDIP construction activities have destroyed portions of some of East Africa's rarest habitats and that the dependent plant and animal species must now be in lower populations as a result.

One of the biggest differences between forests in the TRPNR and outside the Reserve was the extent of fire damage outside of the Reserve. Fire is probably the factor, other than water, which most limits forest expansion and regeneration along the lower Tana River. There was fire damage to the edges of several forests in the TDIP area, particularly Forests 48a, 56 and 65. In some places within the TDIP area (e.g., Bvumbwe North Forest) fire is used to burn away the colonizing vegetation on dikes. Such fires spread to the edges of the forest on either side of the dike.

Primates and Forests Outside of TRPNR and TDIP

Primates

Approximately 44% of the red colobus and 34% of the crested mangabey groups are in 18 of the 26 forests which lie outside of either TRPNR or TDIP. Many of these animals were found in forests which had not been çensused since 1975 or, in three cases, never before. These 18 forests cover an area of roughly 13 km2.

Of the 34 distinct forests with red colobus groups, 18 (53%) occur outside of TRPNR or TDIP. Of the 27 forests with crested mangabeys, 13 (48%) lie outside of TRPNR and TDIP. These forests are on Trust Land or Government Land and, in practice, the local people protect, use or destroy them as they wish.

Forests

Due to continuing security problems along most of the east bank of the Tana River there is only limited human activity there. This is likely the primarily reason why most of the east bank forests which occur outside of the TRPNR and TDIP are not being, in some way, over-exploited by the local people (Table 1).

Most people now live and farm on the west bank. This places considerable pressure on some of the west bank forests. It is in the west bank forests where the bulk of the unsustainable exploitation of forest resources is occurring, particularly the cutting of forest

for agriculture, burning and the removal of large trees for canoes. Forest damage was assessed as heavy in five of the forests censused outside of TRPNR and TDIP. Forest degradation and loss were particularly noticeable in small forests near the larger villages.

This said, it was surprising how much fairly good evergreen forest, and how many red colobus and crested mangabey groups, still survive in west bank forests outside of TRPNR and TDIP.

Twenty trees felled for canoes were located in forests outside of TRPNR and TDIP. This appears to be the most damaging extraction activity in the larger forests. It was particularly prevalent in Mnazini East and Kinyadu West Forests.

The greatest amount of damage to forests outside of TRPNR and TDIP is caused by clearing for farmland and the associated burning. These activities, together with the taking of firewood and poles, were rapidly destroying what little remained of the Kipende 1, Makere West, Mungaveni and Peponi Forests. These forests are all near villages. The villagers are losing one their most important natural resources.

Fire alone was doing considerable damage to several forests outside of TRPNR and TDIP, most notably Kinyadu West and Maziwa South Forests. Much of the Tana River floodplain is burnt every year and this destroys the bushland which is successional to woodland and forest (Andrews et al. 1975). In some cases, burning destroys the edge of the forest itself.

Of the forests which lie outside of the TRPNR and TDIP areas, five are of particular importance for the survival of the Tana River red colobus and crested mangabey. Most notable among these are the Nkanjonja, Mnazini East, Kinyadu West, Bubesa West 1 and Hewani West 1 Forests (Table 1). Each of these five forests holds four or more groups of Tana River red colobus and/or crested mangabeys. These forests rival the best of the forests within the TRPNR and undoubtedly hold many species which do not occur within the Reserve. Much effort should be given to ensuring their long-term survival.

At about 500 ha, Nkanjonja Forest is a major component of what is the largest single forested area on the lower Tana River, the Greater Wenje Forest (c. 1,100 ha). Biologically, Nkanjonja is almost totally unknown. The occurrence of large mango trees *(Mangifera indica),* together with information provided by local residents, indicate that this forest was once heavily used by people. Now, due to security problems on the east bank, there is little human activity here except near Nkanjonja Village at its extreme north end. Human use is so low that there are no footpaths in most of Nkanjonja Forest. The forest appears to be good habitat for red colobus but this species is apparently absent from all east bank forests from Mchelelo East Forest northwards. If red colobus translocation becomes a management activity, this forest might well head the list of places to translocate red colobus to. Nkanjonja contains some habitats which are rare in other Tana River forests. For example, there are large stands of the endemic tree *Populus ilicifolia.* Other large areas are dominated by an unusual mix of *P. reclinata* and *Acacia robusta*. The largest specimens of *Ficus sycomorus* and *M. indica* observed along the lower Tana River during this census were found here.

Mnazini East is much larger than indicated on earlier maps. Like Nkanjonja, no biological studies have ever been conducted in this forest. It is one of the finest evergreen forests along the lower Tana River. The impression obtained during the census was that this forest

was particularly rich in plant and animal species. Mnazini East is near the northern limit of the endemic tree *0. msoo.* Two important red colobus food tree species, *Pachystela msolo* and *F. sycomorus*, are particularly common here. From the stand point of the primates it holds, and its size, Mnazini East may be the most important forest outside of the TRPNR

and TDIP areas. Although this forest appears to be in good condition there is a moderate amount of human use. This is, no doubt, a reflection of its close proximity to the large village of Mnazini. Particularly noticeable was the cutting of big trees for canoes and bee-hives. At least nine recently cut large trees were seen during the census.

Kinyadu West Forest is a good, medium size, evergreen forest with what seems to be an unusually high density of red colobus groups (6). At least one group of mangabeys is also present. The endemic tree, *0. msoo*, and *P. msolo* are common here. Kinyadu Village is on the edge of this forest. As such, there is moderate human exploitation of Kinyadu West and considerable fire damage to edge regeneration.

Bubesa West 1 Forest covers a relatively small area. Because of the dominance of *A. robusta* and *M. fruticosa* trees, this forest is best described as dry, open, deciduous woodland. A surprisingly large number of colobus groups (5) are found here, however. Mangabeys are apparently not present. People from nearby Bubesa Village make moderate use of this forest.

Hewani West 1 Forest is a small forest lying near the southern limit of the distribution of the Tana River red colobus and crested mangabey. The 1994 census counted three groups of red colobus and one group of crested mangabeys here. Human use is moderate.

Conserving Primates and Forest Outside of the TRPNR

The protection of red colobus and crested mangabey habitat outside of the TRPNR will greatly enhance the long-term survival prospects for both subspecies. Many of these forests continue to be in good condition and some are probably expanding in size. As human populations in the region continue to increase, however, there will be a rise in the level of unsustainable exploitation and loss of forest to agriculture.

People living in the vicinity of the forests of the lower Tana River are obviously aware of the direct benefits they receive from the remaining forests. It is not known, however, to what extent they actively protect this resource or control exploitation. This should be investigated.

Given the low number of forests remaining, and their relatively small size, it should be possible to mount an effective conservation education program which provides the local people with information on the indirect benefits they receive from “their forests” and project for them what is likely to happen to “their forests” if the human population continues to increase at its present rate and there is a concomitant increase in forest exploitation.

Now is also the time to promote community development and conservation initiatives designed to reduce exploitation of these forests (e.g., family planning, agroforestry and the establishment of pole/fuelwood plantations).

The two activities which are presently causing the greatest damage to many forests are burning and the cutting of large trees for canoes and bee-hives. The cutting of trees for canoes and bee-hives is probably not sustainable as currently conducted in most forests. This is serious since some of the trees (e.g., *F. sycomorus*, *M. fruticosa*) are particularly

important primate food trees. Local people should be encouraged to cut fewer trees and to select those of least importance to red colobus and crested mangabeys. Also, fewer trees would be cut if the longevity of the canoes were increased (e.g., by painting or wood sealing them) and/or if aluminium or fibreglass canoes were made available (Kahumbu 1992).

Fire is the greatest threat to many Tana River forests at the present time. People should be encouraged to reduce their use of fire and to do all that is possible to prevent fires from burning in and near forests. Firebreaks could provide some benefit. "Self-policing" mechanisms that might help local communities to better monitor and control their use of nearby forests, and that help reduce the incidence and damage of fires, should be sought, investigated and promoted.

TDIP, with its considerable capacity to move vegetation and soil, might be encouraged to establish and maintain firebreaks around the most important forests within its management area, particularly the Hewani South 2 Forest. TDIP should also mount more effective patrols to curve the considerable exploitation/degradation now occurring in Mitapani South 2 and Hewani South 2 Forests. Dikes should always be located to minimize the negative impact on the forests and primates.

Tree Cutting for Canoe Making

During the census, 31 large trees were found which had been cut. Twenty-six were either in the process of being carved into canoes, or had already been carved and removed from the site. Two *O. msoo* were cut to make bee hives and two *M. fruticosa* had been converted into boards. The species of tree cut are as follows:

17	*Oxystigma msoo*
4	*Diospyros mespiliformes*
2	*Ficus sycomorus*
2	*Mimusops fruticosa*
2	*Populus ilicifolia*
1	*Albizzia glaberrima*
1	*Albizzia gummifera*
1	*Mangifera indica*
1	*Sorindeia madagascariensis*

In 1975, within the TRPNR, Marsh (1976) found that 32% of 20 canoes were made from *P. ilicifolia* and 23% from *M. fruticosa*. In 1991, Kahumbu (1992) found that 35% of 60 canoes were made from *M. fruticosa* and 25% from *M. indica.* Of the trees cut for canoes and located during the 1994 census, 15 (56%) were *O. msoo*, a species rarely used in the TRPNR for making canoes. Most of the felled large trees located during the 1994 census were to the south of the TRPNR where *O. msoo* is more common. In fact, this endemic species just reaches the southern part of the TRPNR. It would be useful to know whether *O. msoo* is often used for canoes in the southern part of the lower Tana River because it is preferred or because the preferred trees have been over-exploited and are no longer available.

Poaching

Surprisingly, poaching does not appear to be a serious problem in the forests of the lower Tana River. Evidence of poaching was found in only two forests, Kulesa East 1 and Wema West 2. Buffalo seem to be the main target of poachers. No traps (wire snares) were found during the 1994 census. Red colobus are probably never hunted and crested mangabeys are hunted/trapped only on the rare occasion when they cause damage to crops.

Impact of the 1989 Channel Change on Primates and Forests

Channel 1 (Fig. 2) is the present main channel of the Tana River and has been since 1989. Prior to 1989, the last time Channel 1 flowed was probably several hundred years ago as there is no mention of it in Pokomo traditions (Andrews et al. 1975). If so, this is important as it suggests that some evergreen forest, together with small numbers of colobus and mangabeys, can sometimes persist along old channels for several centuries after the Tana drastically changes course. Now that Channel 1 receives most of the Tana's flow we might expect gradual forest regeneration and establishment, and a concomitant recolonization and expansion of the colobus and mangabey populations in these forests. Some forests, together with groups of colobus and mangabeys, have also persisted along other old Tana River channels such as Channels 3, 4 and 5.

Until 1989, Channel 2 was the Tana's main channel and probably had been for 160 years or so (Andrews et al. 1975). Roughly 40% of the forests, 60% of the colobus groups and 40% of the mangabey groups are today along Channel 2. While Channel 2 still carries a small portion of the Tana's flow, it is expected that, as long as the present situation persists, there will be a decline in the size and biodiversity of the forests along its banks, and a gradual drop in the numbers of colobus and mangabeys. This situation needs to be monitored and studied.

RECOMMENDATIONS

1. Obtain accurate information on the size of Tana River red colobus and crested mangabey groups throughout their range so that up-to-date, reliable, data on mean group size are available.

2. Obtain accurate data on the size, shape and location of all lower Tana River Forests.

3. Meetings should be held with TARDA and TDIP biologists and officials to: (1) review the TDIP environmental monitoring data, (2) obtain an up-date on TDIP ground activities and future plans, (3) make a current assessment of the impact of past, present and future TDIP activities on red colobus and crested mangabeys living within the TDIP managed area, and if necessary, (4) find ways to enhance the long-term survival prospects of the two endangered primates and the forests. To effectively understand the situation and its possible impacts, a brief site visit to all forests within Polder 1 should be made.

4.. Given the considerable importance of forests outside of the TRPNR to primate and biodiversity conservation along the lower Tana River, serious thought should be given to reconsidering how the World Bank Global Environment Facility (GEF) Funds to the Tana River Primate National Reserve Conservation Project are to be used. It may be most effective to increase the size of the project area so as to include, to some degree, all of the riverine forests of the lower Tana River.

5. Recensus, as soon as possible, the Hewani South 2 Forest. All forests censused in 1994 with the assistance of KWS security rangers should be censused again with more than two pairs of observers (Table 1).

6. Census those forests along the lower Tana River which the 1994 census did not get to (Forests 29, 30, 33, 34, 37, 39a, 41, 45, 51, 57, 63, 66, 67, 68).

7. Undertake brief surveys of Witu Forest Reserve, Boni National Reserve and Dodori National Reserve, and of forests in and near the Tana Delta, for endangered primates and other endangered species.

8. Examine the impact, feasibility and costs of introducing red colobus to the Greater Wenje Forest. If translocation is considered, the best candidates for translocation might be the red colobus living alone or in small groups in the smallest, most isolated, forests (e.g., Forests 3a, 19, 60, 61, 67). Given that there is probably little or no gene flow between colobus of the northern and southern forests, it may also be advisable to move animals from the more southern forests to the Greater Wenje Forest in the north.

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Appendix A. Number of Tana River red colobus groups found in forests along the lower Tana River, Kenya, from Nkanjonja Village to Mitapani during censuses conducted from 1972-1974.@

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1990	1992	1993	1994
1.	Nkanjonja	0	0	0	-	-	0	0	-	-	0
*2a.	Wenje 1	0	0	0	-	-	0	0	-	0	0
*2b.	Wenje 2	0	0	0	-	-	0	0	-	0	0
3a.	Kipende 1	some	1	1	1	1	1	2	-	(1)	[1]
3b.	Kipende 2	some							-		1
4a.	Maroni West 1	-	2	0	0	1	1	0	-	1	1[1]
4b.	Maroni West 2	-		0	0			0	-		1
*5.	Maroni East	-	1	0	-	-	0	0	-	0	0
6.	Makere West	-	1	1	1	1	1	1	-	(1)	2
*7.	Kwechi	-	0	-	-	-	-	-	-	-	-
*8.	Makere East	-	-	-	-	-	-	0	-	0	0
*9.	Guru East	-	1	1	-	-	-	0	-	0	0
*l0a.	Guru North	some				1	1	1	-	1[1]	1
*10b.	Guru South	some	8	1	1	1	1	1	-	2[1]	3
*11.	Mchelelo West	some	2	1	1	1	1	1	-	1	1
*12.	Mchelelo East	-	1	0	-	-	-	1	-	1	1
*13.	Congolani Central	some	3	1	1	1	1	1	-	1	2
*14.	Congolani West	-	1	0	0	0	0	0	-	0	0
*15.	Unnamed Woodland 1	-	-	-	-	-	-	-	-	-	-
*16.	Sifa East	some	4	2	-	-	1	-	-	5	5[1]
*17.	Sifa West	-	1	0	0	0	0	0	-	1	1
*18.	Mariadadi	-	0	0	0	0	-	-	-	-	0

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1990	1992	1993	1994
*19.	Hadribu	some	1	0	0	0	0	0	-	-	1
*20.	Baomo East	-	1	-	-	-	-	-	-	0	1-2
*21.	Baomo North	some	2	0	0	0	1	0	-	0	1[1]
*22.	Baomo South	some	6	4	3	4	3	3	-	2	7[3]
*23.	Lemu	-	0	-	-	-	-	-	-	0	-
*24.	Kitere	some	2	-	0	0	1	0	-	1	1
*25.	Kombeni	-	0	-	-	-	-	-	-	-	0
*26.	Mnazini North	some	3	1	2	2	2	2	-	1	4[1]
*27.	Mnazini South	6	3	2	2	1	1	1	-	1	3
28.	Mnazini East	some	3	-	-	-	2	2	-	-	8[1]
29.	Unnamed Woodland 2	-	0	-	-	-	-	-	-	-	-
30.	Matalani North	-	0	-	-	-	-	-	-	-	-
31.	Mungaveni	some	1	-	-	-	-	-	-	-	0
32.	Kinyadu West	0	2	-	-	-	-	-	-	-	6 -7
33.	Matalani South	-	1	-	-	-	-	-	-	-	-
34.	Kinyadu East	-	-	-	-	-	-	-	-	-	-
35.	Bubesa East	0	0	-	-	-	-	-	-	-	1
36a.	Bubesa West 1	-	1	-	-	-	1	0	-	-	5
36b.	Bubesa West 2	-	-	-	-	-	-	-	-	-	1[2]
37.	Mwina West	0	0	-	-	-	-	-	-	-	-
38.	Mikamani	-	-	-	-	-	-	-	-	-	1[1]
39a.	Unnamed Woodland 3	-	-	-	-	-	-	-	-	-	-
39b.	Peponi	-	-	-	-	-	-	-	-	-	(1)

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1990	1992	1993	1994
40.	Lazima North	-	0	-	-	-	-	-	-	-	0
41.	Sera	-	0	-	-	-	-	-	-	-	-
42.	Lazima East	-	-	-	-	-	-	-	-	-	0
43.	Marembo West	-	1	-	-	-	-	-	-	-	1
44.	Marembo East	some	1	-	-	-	-	-	1	-	(1)
45.	Giritu Woodland	-	-	-	-	-	-	-	-	-	-
46.	Sailoni 1	0	-	-	-	-	-	-	-	-	1
47.	Sailoni 2	0	-	-	-	-	-	-	-	-	0
&48a.	Kulesa East 1	-	0	-	-	-	-	1	0	-	0
&48b.	Kulesa East 2	-	0	-	-	-	-	-	-	-	0
49.	Kulesa West 1	-	0	-	-	-	-	-	-	-	0
50.	Kulesa West 2	-	-	-	-	-	-	-	-	-	0
51.	Maziwa North	0	-	-	-	-	-	-	-	-	-
52.	Maziwa South	0	0	-	-	-	-	-	-	-	0
53.	Wema West 1	-	0	0	-	-	-	-	-	-	1
54.	Wema West 2	-	0	-	-	-	-	-	-	-	1
55.	Wema West 3	some	-	-	-	-	-	-	-	-	[1]
&56.	Wema East 1	0	1	0	1	0	2	1	0	-	0
&57.	Wema East 2	0	0	-	-	-	-	-	0	-	-
58.	Hewani West 1	some	1	0	0	1	-	1	1	-	3
&59.	Hewani East 1	some	0	0	1	[1]	-	-	1	-	1
&60.	Hewani East 2	some	1	1	1	2	-	-	1	-	1
&61.	Hewani East 3	-	1	1	0	1	1	-	1	-	1

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1990	1992	1993	1994
62.	Hewani West 2	some	1	0	-	-	-	-	1	-	1
&63.	Hewani South 1	0	0	-	0	0	-	-	0	-	-
&64.	Hewani South 2	8	5	0	1-2	2	-	-	3	-	10-13[1]
&65.	Bvumbwe North	0	-	-	-	-	-	-	0	-	0
&66.	Bvumbwe South	0	-	-	-	-	-	-	-	-	-
67.	Lango La Simba	2	0	-	-	-	-	-	2	-	#(2)
&68.	Wema East 4	0	0	-	-	-	-	-	-	-	-
&69.	Mitapani 1	-	-	-	-	-	-	-	0	-	[(1)]
&70.	Mitapani 2	-	-	-	-	-	-	-	2	-	3

@ Data on number of groups are taken from the following sources:
1972 from Groves et al. 1974; Andrews et al. 1975.
1974 from Homewood 1976.
1975 from Marsh 1976, 1978, 1986.
1985 from Marsh 1985.
1986 and 1987 from Decker & Kinnaird 1992; Decker 1994.
1989 and 1990 from Ochiago 1990, 1991.
1992 from Decker 1994, pers. comm.
1993 from Kahumbu & Davies 1993.
1994 from Butynski & Mwangi this report.

* Forest located within TRPNR.

& Forest located within TARDA managed area.

\- Forest not censused.

[ ] Number of probable solitary animals seen.

( ) Number of groups reported but not found.

\# Forest not censused in 1994 but reliable sources indicate that this number of groups was present after 1988.

Notes: Circled forests where considered together as one forest during this census.

We subdivided six of the forests on the Marsh (1986) list (Forests 2, 3, 4, 10, 36 & 48) so that the above list has 12 new forest numbers (Forests 2a, 2b, 3a, 3b, 4a, 4b, l0a, l0b, 36a, 36b, 48a, 48b).

The Marsh (1986) list of forests actually includes eight forest sections which, when lumped together, make two large forests which we refer to as the “Greater Wenje Forest” (Forests 1, 2a, 2b) and the “Greater Mchelelo Forest” (Forests l0b, 11, 13, 14, 17).

Appendix B. Number of Tana River crested mangabey groups found in forests along the lower Tana River, Kenya, from Nkanjonja Village to Mitapani during censuses conducted from 1972 - 1994.@

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1992	1993	1994
1.	Nkanjonja	some	4	2	-	-	2	-	-	4 -5
*2a.	Wenje 1	3		2	-	-	2	-	4	4
*2b.	Wenje 2	some			-	-		-	2	1
3a.	Kipende 1	0	0	0	0	0	-	-	0	0
3b.	Kipende 2	0	0	0	0	0	-	-	0	0
4a.	Maroni West 1	-	0	0	0	0	-	-	0	0
4b.	Maroni West 2	-	0	0	0	0	-	-	0	0
*5.	Maroni East	-	1	1	-	-	1	-	1	2 -3
6.	Makere West	-	0	0	0	0	-	-	0	0
*7.	Kwechi	-	0	-	-	-	-	-	-	-
*8.	Makere East	-	-	-	-	-	-	-	0	1
*9.	Guru East	-	1	1	-	-	1	-	1	1
*l0a.	Guru North	0				0	0	-	0	0
*l0b.	Guru South	some	3	2	2	2	2	-	2	3
*11.	Mchelelo West	some	2	1	1-2	2	1	-	2	(1)
*12.	Mchelelo East	-	0	0	-	-	-	-	1	1
*13.	Congolani Central	some	2	1	1	1	2	-	1	2
*14.	Congolani West	-	1	0	0	0	0	-	0	0
*15.	Unnamed Woodland 1	-	-	-	-	-	-	-	-	-
*16.	Sifa East	some	2	3 -5	-	-	2 -3	-	6[1]	5 -7
*17.	Sifa West	-	1	0	0	0	0	-	1	1
*18.	Mariadadi	-	1	0	0	0	0	-	-	0

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1992	1993	1994
*19.	Hadribu	0	0	0	0	0	-	-	-	0
*20.	Baomo East	-	1	-	-	-	1	-	1	1
*21.	Baomo North	some	1	1	1	1	1	-	1	(1)
*22.	Baomo South	many	5	5 -7	4 -5	5	3 -4	-	3	4
*23.	Lemu	-	1	-	-	-	-	-	0	-
*24.	Kitere	some	0	-	1	1	1	-	1	(1)
*25.	Kombeni	-	0	-	-	-	-	-	-	0
*26.	Mnazini North	some	2	2	2	2	2	-	2	1
*27.	Mnazini South	many	2	1	1	1	1	-	0	1
28.	Mnazini East	some	2	-	-	-	2	-	-	2
29.	Unnamed Woodland 2	-	1	-	-	-	1	-	-	#(1)
30.	Matalani North	-	1	-	-	-	-	-	-	-
31.	Mungaveni	0	0	-	-	-	-	-	-	0
32.	Kinyadu West	0	1	-	-	-	0	-	-	1
33.	Matalani South	-	0	-	-	-	1	-	-	#(1)
34.	Kinyadu East	-	-	-	-	-	-	-	-	-
35.	Bubesa East	0	1	-	-	-	0	-	-	0
36a.	Bubesa West 1	-	1	-	-	-	0	-	-	0
36b.	Bubesa West 2	-	-	-	-	-	-	-	-	1
37.	Mwina West	0	0	-	-	-	-	-	-	-
38.	Mikamani	-	-	-	-	-	-	-	-	0
39a.	Unnamed Woodland 3	-	-	-	-	-	-	-	-	-
39b.	Peponi	-	-	-	-	-	-	-	-	0

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1992	1993	1994
40.	Lazima North	-	0	-	-	-	-	-	-	0
41.	Sera	-	0	-	-	-	-	-	-	-
42.	Lazima East	-	-	-	-	-	-	-	-	0
43.	Marembo West	-	1	-	-	-	1	-	-	1
44.	Marembo East	some	1	-	-	-	1	1	-	1
45.	Giritu Woodland	-	-	-	-	-	-	-	-	-
46.	Sailoni 1	0	-	-	-	-	-	-	-	0
47.	Sailoni 2	0	-	-	-	-	-	-	-	1
&48a.	Kulesa East 1	-	0	-	-	-	-	0	-	1
&48b.	Kulesa East 2	-	0	-	-	-	-	-	-	0
49.	Kulesa West 1	-	0	-	-	-	-	-	-	0
50.	Kulesa West 2	-	-	-	-	-	-	-	-	0
51.	Maziwa North	some	-	-	-	-	-	-	-	-
52.	Maziwa South	many	1	-	-	-	1-2	-	-	1
53.	Wema West 1	-	0	0	-	-	-	-	-	0
54.	Wema West 2	-	0	-	-	-	-	-	-	1-2
55.	Wema West 3	some	-	-	-	-	-	-	-	0
&56.	Wema East 1	0	1	1	1-2	1	1	0	-	0
&57.	Wema East 2	some	0	-	-	-	-	0	-	-
58.	Hewani West 1	some	1	1	0	0	1	1	-	1
&59.	Hewani East 1	some	0	0	0	0	0	0	-	0
&60.	Hewani East 2	some	0	0	0	0	0	0	-	0
&61.	Hewani East 3	-	0	0	0	0	0	0	-	0

Forest number	Forest name	1972/74	1975	1985	1986	1987	1989	1992	1993	1994
62.	Hewani West 2	1	1	1	-	-	0	1	-	1
&63.	Hewani South 1	0	0	-	0	0	-	0	-	-
&64.	Hewani South 2	2	2	2	1-2	1	1	3	-	4
&65.	Bvumbwe North	0	-	-	-	-	-	0	-	0
&66.	Bvumbwe South	0	-	-	-	-	-	-	-	-
67.	Lango La Simba	some	0	-	-	-	-	0	-	#0
&68.	Wema East 4	0	0	-	-	-	-	-	-	-
&69.	Mitapani 1	-	-	-	-	-	-	0	-	0
&70.	Mitapani 2	-	-	-	-	-	-	0	-	0

@ Data on the number of groups are taken from the following sources:
1972 from Groves et al. 1974; Andrews et al. 1975.
1974 from Homewood 1976.
1975 from Marsh 1976, 1978, 1986; Kinnaird & O'Brien 1991.
1985 from Marsh 1985.
1986 and 1987 from Decker & Kinnaird 1992.
1989 from Kinnaird & O'Brien 1991.
1992 from Decker pers. comm.
1993 from Kahumbu & Davies 1993.
1994 from Butynski & Mwangi this report.

* Forest located within TRPNR.

& Forest located within TARDA managed area.

\- Forest not censused.

[ ] Number of probable solitary animals seen.

( ) Number of groups reported but not found.

Forest not censused in 1994 but reliable sources indicate that this number of groups was present after 1988.

Notes: Circled forests where considered together as one forest during this census.

We subdivided six of the forests on the Marsh (1986) list (Forests 2, 3, 4, 10, 36 & 48) so that the above list has 12 new forest numbers (Forests 2a, 2b, 3a, 3b, 4a, 4b, l0a, l0b, 36a, 36b, 48a, 48b).

The Marsh (1986) list of forests actually includes eight forest sections which, when lumped together, make two large forests which we refer to as the "Greater Wenje Forest" (Forests 1, 2a, 2b) and the "Greater Mchelelo Forest" (Forests l0b, 11, 13, 14, 17).