

THE AVIFAUNA OF THE KAKAMEGA
FOREST, WESTERN KENYA,
INCLUDING A BIRD POPULATION
STUDY

DALE A. ZIMMERMAN

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 149 : ARTICLE 3 NEW YORK : 1972

THE AVIFAUNA OF THE KAKAMEGA FOREST,
WESTERN KENYA, INCLUDING A BIRD
POPULATION STUDY

DALE A. ZIMMERMAN

Western New Mexico University

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 149 : ARTICLE 3 NEW YORK : 1972

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 149, article 3, pages 255-340, figures 1-8, tables 1-8

Issued December 4, 1972

Price \$3.40 a copy

CONTENTS

ABSTRACT	259
INTRODUCTION	259
Acknowledgments	260
THE KAKAMEGA FOREST	262
Location and Description	262
Climate	263
Vegetation	264
Animal Life Other than Birds	268
THE CENSUS AREA	271
THE BIRDS ON THE CENSUS AREA	274
Methods and Sources of Error in the Census	274
Recoveries of Banded Birds	277
Breeding Seasons	281
Mixed Species Flocks	282
Explanation of Table 2 and the Annotated List	283
Annotated List of Species Recorded on the Census Tract	286
Nonpasserines	286
Family Falconidae	286
Family Accipitridae	286
Family Phasianidae	287
Family Numididae	287
Family Rallidae	287
Family Columbidae	288
Family Cuculidae	289
Family Musophagidae	289
Family Psittacidae	290
Family Meropidae	290
Family Bucerotidae	291
Family Phoeniculidae	291
Family Strigidae	291
Family Caprimulgidae	292
Family Trogonidae	292
Family Capitonidae	292
Family Indicatoridae	293
Family Picidae	295
Family Apodidae	296
Passerines	297
Family Eurylaimidae	297
Family Timaliidae	297
Family Pycnonotidae	300
Family Muscicapidae	306
Family Turdidae	309
Family Sylviidae	311
Family Hirundinidae	314
Family Campephagidae	314
Family Dicruridae	315
Family Laniidae	316
Family Paridae	316

Family Oriolidae	317
Family Sturnidae	317
Family Zosteropidae	317
Family Nectariniidae	318
Family Ploceidae	319
Family Fringillidae	322
ADDITIONAL SPECIES KNOWN FROM THE KAKAMEGA FOREST	323
ANALYSIS OF THE AVIFAUNA	325
Ecological Classification: Forest and Nonforest Birds	325
Affinities with Congo and Western Uganda Forests	326
Comparisons with the Amani Forest	329
APPENDIX 1. LIST OF FOREST BIRDS OF THE KAKAMEGA REGION, KENYA	334
APPENDIX 2. HYPOTHETICAL LIST	336
LITERATURE CITED	336

ABSTRACT

THE BIRD FAUNA of the Kakamega Forest in western Kenya was studied between June and August, 1963, 1965, and 1966. Special attention was given to a 20-acre tract within relatively undisturbed climax growth where continued bird censusing was undertaken. The census area was utilized by a minimum of 408 adult birds in 1963 and a maximum of 487 adults in 1966. On the tract 125 species—largely true forest birds—were identified. One hundred and forty-four bird species dependent on forest or closely associated with forest have been recorded in the Kakamega region. These are named in an appendix prepared by the author and Alec Forbes-Watson.

The avifaunal affinities of Kakamega are with the lowland Congo and western Uganda forests, as indicated by the 107 species (78 true forest birds) they share in common. Although very few east-central African sylvan avifaunas have been studied in detail,

the number of forest bird species in Kakamega appears second only to the altitudinally diverse Impenetrable Forest of western Uganda. Impenetrable Forest supports 69 montane and 99 lowland bird species compared with 34 and 98, respectively, at Kakamega.

Despite apparent similarities in general climate and vegetation structure of Kakamega and the Amani Forest of northeastern Tanzania, more than 57 percent of the Amani Forest birds are lacking at Kakamega and 80 percent of the birds of Kakamega do not occur at Amani. Historic factors are presumed to be responsible for some of the differences. As suggested by Moreau, a rough correlation may exist between bird species diversity and woody plant species diversity—at least in tropical African lowland evergreen forests. Scarcity of floristic data limits detailed comparisons at present.

INTRODUCTION

PROBABLY NO FOREST IN EAST AFRICA is so familiar to so many living ornithologists as that in the Kakamega (formerly North Nyanza or North Kavirondo) District of Kenya. Collectors and observers have visited it for years, and thousands of birds from within its borders have been distributed among museums on three continents. Yet there has been no definitive account of the bird fauna of the region.

Richard Meinertzhagen probably was the first ornithologist to visit the Kakamega and Nandi forests but his duties there from 1902 to 1906 were of a military rather than a scientific nature. During subsequent years, Allan Turner collected in the Kakamega and Nandi forests for Meinertzhagen and for V. G. L. van Someren. Some of the resulting specimens were reported upon by van Someren (1922), who specifically attributed 45 species to Kakamega (sometimes written Kakamegoes). Many of these were savanna not forest species. However, the same paper also recorded 13 typical forest species from the Yala River, which flows through the Kakamega Forest near its boundary with the South Nandi Forest. Still other birds were listed from Kaimosi, within the Nandi. Van Someren evidently collected a few birds in the Kakamega-

Nandi region but seems to have spent little time within the forest. A second paper published by him (1932) dealt with a few more species from the area.

Jackson's classic volumes (1938) contained many references to Kakamega birds, based largely on the specimens of others. However, Jackson collected in the Kakamega and adjacent Nandi forests at least once, as evidenced by his references to personally taken specimens. Chapin's *Birds of the Belgian Congo* (1932, 1939, 1953, 1954) contained numerous original references to Kakamega specimens. The brief paper on the birds of this forest by Tennent (1965), based on sight records, listed 85 species (including some of questionable occurrence). Other references to Kakamega Forest birds in the recent literature are primarily in taxonomic or zoogeographic discussions and involve few specimens.

During June, July, and August, 1963, 1965, and 1966, I studied in this region, concentrating on a 20-acre tract of climax evergreen forest where I conducted a detailed census of all bird species present. Observations and selective collecting were carried out in several sections of the forest. The unique avifauna of Kakamega

Forest, plus the accessibility of the area and a convenient base in the form of a Forest Department rest house, made it a logical choice for the study of forest birds. Furthermore, it seemed likely that much of the primeval forest of Western Kenya would be destroyed or severely modified in the wake of the expanding human population in the region. This has indeed been the case; the Kakamega Forest is now retreating before the advance of charcoal burners and agriculturists.

The destruction of the forests of East Africa has, of course, been in progress for years although the rate is presently accelerating. More than three decades ago Moreau (1935, p. 170), writing of northeastern Tanganyika, stated that the Usambara Mountain forest "has been constantly reduced, in some localities rapidly and to a mere vestige of the area it occupied 50 years ago." Shantz and Turner (1958, p. iii) pointed out that European agriculture in Kenya "combined with the increase in native population, has accounted for much of the recent destruction of Temperate Rain Forest." There are no published quantitative data on bird populations from these receding forests. Hall and Moreau (1962, p. 365), referring to estimates of surviving populations of rare African forest birds, wrote that "no censuses on tropical mountains exist." Even the species composition of certain forest avifaunas may be affected. Deforestation of the Nandi Escarpment, for example, may force montane birds to seek refuge in surviving lower elevation stands nearer Kakamega. There is and has been some exchange of birds between these areas, but we know virtually nothing of the normal altitudinal movements of the species involved. With the present rate of forest destruction we are likely to be denied the opportunity to learn.

ACKNOWLEDGMENTS

The 1963 field work was made possible by assistance from the Frank M. Chapman Memorial Fund through the American Museum of Natural History. In 1965 and 1966 field work was financed by a National Science Foundation Grant (GB-3506) to Western New Mexico University. To these institutions I am most grateful. I also record my appreciation to my parents, Dr. and Mrs. L. M. Zimmerman, who partially financed the 1963 expedition and who contributed to the success of later trips.

Sufficient thanks can hardly be extended to Mr. and Mrs. John Start, then of Molo, and to the late Mr. Myles E. W. North of Nairobi, who permitted their homes to serve as bases for my operations during two expeditions. I express my gratitude to Mr. David Brown and many present and former officials of the Kenya Game Department for granting collecting privileges and for assistance in all phases of my study. Similarly, numerous officials of the Kenya Forestry Department were very helpful. At the National Museum in Nairobi, Messrs. Robert H. Carcasson, A. D. Forbes-Watson, and his predecessor John G. Williams, generously made facilities of the Museum available to me from 1961 through 1970. I extend special thanks to Mr. Forbes-Watson for providing me with data on birds taken or seen by him at Kakamega, for the recording of recaptured birds banded by me in the forest, and for compiling with me Appendix I of the present paper. Mr. Graeme Backhurst, Mr. Peter Britton, and Mrs. Jennifer Horne have kindly supplied me with information on their recaptures of birds I had banded at Kakamega.

I am indebted to the following persons for the loan of specimens, for comparing skins for me at their institutions, and for other courtesies: Dr. Dean Amadon and Mr. G. Stuart Keith (the American Museum of Natural History), Drs. Herbert Friedmann and Kenneth E. Stager (Los Angeles County Museum of Natural History), Drs. George H. Lowery, Jr., and Burt L. Monroe, Jr. (Louisiana State University Museum of Zoology), Dr. S. Dillon Ripley and Mr. Gorman M. Bond (National Museum of Natural History, Smithsonian Institution), and Dr. Robert W. Storer (University of Michigan Museum of Zoology). I gratefully acknowledge the help of Drs. Bruce J. Hayward and Russell E. Mumford for contributing information on mammals and for congenial companionship in the field during 1963.

The following abbreviations are of the institutions which house the specimens examined in this study.

AMNH, the American Museum of Natural History
KNM, the Kenya National Museum
LACM, Los Angeles County Museum of Natural History
LSUMZ, Louisiana State University Museum of Zoology
UMMZ, University of Michigan Museum of Zoology
WNMU, Western New Mexico University

Messrs. John W. Boettcher, David M. Sillu, and Antony N. Start assisted me in the field work in 1965 and 1966. In addition to aiding me with tape-recordings of bird vocalizations and bird banding, my wife, Marian, handled all

the time-consuming domestic chores thus permitting me to devote many more hours to the forest than would otherwise have been possible in the limited time I spent at Kakamega.



FIG. 1. Portion of Kakamega Forest and the Nandi Escarpment. Large clearing is man-made; smaller one at far right is presumably natural. (Photograph by Bruce J. Hayward, July, 1963.)

THE KAKAMEGA FOREST

LOCATION AND DESCRIPTION

THE KAKAMEGA FOREST lies in the East African Highland District, one of Chapin's (1932) 17 faunal districts of the Ethiopian Region based upon the distribution of birds. In terms of major vegetation types it represents the Semi-Tropical Rain Forest of Battiscombe (1936) or the African Temperate Rain Forest as defined by Shantz and Marbut (1923). Kakamega seems to come under Moreau's (1966) Intermediate Evergreen Forest category, but Moreau dealt with no forest that quite matches that at Kakamega, and he does not include the Kakamega-Nandi forest region on his map of montane and evergreen East African forests (1966, fig. 42, facing p. 188).

Most of the Kakamega Forest lies in the Victoria Nyanza basin. Its eastern flank approaches the North Nandi Forest atop the Nandi Escarpment; to the south and southeast lies the South Nandi Forest. These three forests form a belt almost 30 miles from north to south and up to 15 miles wide, consisting largely of woods but embracing some open country as well. The name Kakamega Forest has been variously used by authors, often in a broad sense to include the South Nandi. Some of van Someren's records are difficult or impossible to locate specifically in one forest block or another. Jackson continued the usage of including South Nandi in Kakamega, as revealed by his reference (1938, p. 934) to "the southern border of the Kakamega forest between Kisumu and Nandi," which actually delineates the southern edge of the South Nandi Forest as shown on maps. Chapin's (1954, p. 671) gazetteer restricts the Kakamega Forest to "0°17'N., 34°53'E." This location marks the center of the forest block in which I carried on my studies and which extends from about latitude 0°09'N to 0°22'N, and from longitude 34°50'E to 34°58'E. Chapin (*op. cit.*, p. 710) considered the Nandi Forest to range from latitude 0°09'N to 0°24'N, and from longitude 34°58'E to 35°09'E. These coordinates would embrace the South Nandi and most of the North Nandi forests. The failure of some authors to distinguish between the Kakamega and South Nandi reflects the fact that the two forests are

biotically very similar if not identical, and as they form a continuous unit connected by a corridor of dense woods just north of Kaimosi, I consider them as one under the name Kakamega Forest herein. They range in altitude from about 4800 feet (along the Yala and Sioko rivers) to 6600 feet, with one hill extending to 6800 feet. Most of the forest lies between the 5000- and 6000-foot contours.

The North Nandi Forest apparently has been contiguous with the South Nandi in the Kaptarop area northwest of Kapsabet and perhaps with the Kakamega Forest proper via a narrow belt of thin woodland west of Kaptarop and Chakiakak along the escarpment. The North Nandi Forest, however, is largely disjunct, and it is uniformly higher, ranging from about 6300 feet to over 7000 feet; most of it is above the 6500-foot level. I have done little in this forest and therefore exclude it from consideration in my discussions unless specifically stated.

Forty miles north-northwest of Kakamega are the forests of Mt. Elgon on the Kenya-Uganda border; and some 20 miles to the east of the Kakamega-Nandi block begin the forests of North Tinderet and Lembus, part of a great wooded zone that extends north into the Cherangani Hills and southward (as the Mau Forest) to the Loita and Mara plains. In the latter at elevations of 5000 to 5500 feet savanna or grassland conditions prevail, and well-developed forest exists only as riverine "gallery" strips maintained by ground water not rainfall. The Mara River Forest is of this type. The Mau is a true montane forest, containing in places great junipers and lofty *Podocarpus* trees not to be found about Kakamega; for the most part such woods exist only above 7000 feet in western Kenya.

Cultivation and other manifestations of human pressure are hastening isolation of the South Nandi and Kakamega forests. The latter, estimated by Prickett ([1969], p. 83) to cover 70,000 acres, includes the main Kakamega Forest and the three barely separated forest "islands" of Kisere, Malaba, and Bunyala. The Nandi Forest, according to Prickett, occupies another 90,000 acres. Included in this acreage are many treeless glades, some quite large, so



FIG. 2. Natural opening about one mile from the Kakamega Forest Station. Habitat of *Centropus monachus*, *Lanius mackinnoni* (at edge), *Cisticola robusta*, and *Coliuspasser macrocercus* (July, 1965).

that the actual combined wooded area of both forests probably covers less than 120,000 acres, of which possibly half is in reasonably undisturbed condition today.

CLIMATE

Situated in one of Kenya's wetter areas, the Kakamega Forest annually receives more than 80 inches of rain (Kenya Colony and Protectorate, 1962, p. 12). Average precipitation at the Forest Station adjacent to my study area for the three-year period 1963-1965 was 87 inches. However, almost 138 inches fell in 1963. That season, camped in a tent at the forest edge, I found it difficult to believe that any section of

Kenya could receive more rainfall. The forest lies in a belt of heavy thunderstorm activity and many of the rains and electrical displays are violent. During our stay in 1963, clouds gathered by midday and heavy rains fell every afternoon save one, and often during the night as well; 1964 and 1965 were relatively dry with 61.50 and 61.29 inches of rain respectively; 1966 was wetter and more normal, with between 80 and 90 inches of rain (exact figures are not available to me).

I have found no temperature data for localities nearer to Kakamega than Kisumu, more than 1500 feet lower, and Kitale, more than 900 feet higher. The climate of Kakamega might be termed semitropical with warm to very

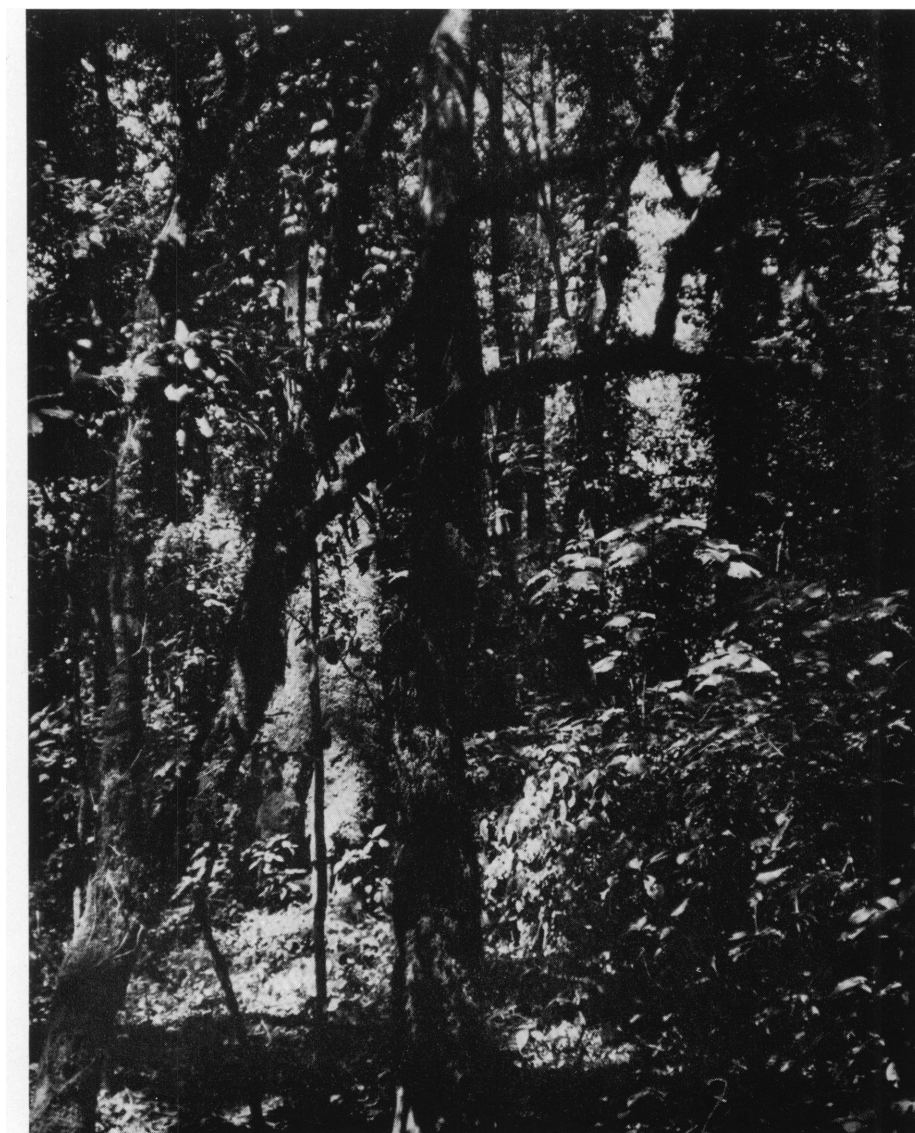


FIG. 3. Kakamega Forest interior. Site inhabited by *Glaucidium tephronotum*, *Malacocincla albipectus*, *Bleda syndactyla*, *Dyaphorophya concreta* (August, 1966).

warm days and cool to very cool nights. Humidity is perpetually high between May and August, and Prickett ([1969], p. 83) termed Kakamega "hot and humid for most of the year." The mean annual temperature probably lies about halfway between those of Kisumu (73.9°F.) and Kitale (65.6°F.). The mean maximum temperature at Kisumu is 84.9°F., that of Kitale 77.5°F. (Kenya Colony and Protectorate, 1962, p. 14).

VEGETATION

No floristic study of the Kakamega Forest has been published and such will not be attempted here. On pages 272–273 I discuss the plant life in my study area in some detail.

The observant visitor to Kakamega notices some differences in vegetation structure and species composition between the wet and dry portions of the forest and the lowest and highest points. Such differences generally are noticeable



FIG. 4. Site near small opening in the Kakamega Forest. Area shown in photograph inhabited by *Sarothrura elegans*, *Malacocincla fulvescens*, *Baeopogon indicator*, *Andropadus gracilirostris*, *A. latirostris*, *Phyllastrephus cabanisi*, *Bathmocercus rufus*, *Cameroptera chloronota*, *Seicercus budongoensis* (June, 1966).

only when comparing a typical upland area with a section along one of the rivers or streams, for the undisturbed woods at Kakamega seem comparatively uniform. Lumbering has modified parts of the forest so that today second- or third-growth stands and recently deforested areas exist beside mature forest, itself variously disturbed. Scattered throughout the Kakamega

region are small plantations of exotic trees, usually pure stands of pines (*Pinus* spp.) or gums (*Eucalyptus* spp., especially *E. saligna*). Some of these blue gums approach heights of 190 feet 25 years after planting, attesting to the ability of the climate and soil of the region to support tree growth.

The Kakamega Forest is characterized by



FIG. 5. Erecting nets along a trail in the Kakamega Forest. Site frequented by *Mala-cocincla albipectus*, *M. rufipennis*, *Arizelocichla masukuensis*, *Phyllastrephus cabanisi*, *Andropadus virens*, *A. ansorgei*, *Dyaphorophya blissetti* and *D. castanea* (June, 1965).

numerous grassy glades, often virtually treeless, distributed within the extensive stands of tall forest. Some of these, although not all, are utilized today for cattle grazing. These glades support a grass known as *kalunya*, widely used by the local people for thatch. Along the forest borders grow various trees, including some species of *Acacia*, and the conspicuous *Spathodea nilotica* or Nandi flame tree, well known in

cultivation but here indigenous. Between clearing and forest there is typically a narrow belt of scrub often dominated by the tall, thistle-like *Acanthus arboreus*. Field workers early make acquaintance with this sharp-leaved plant which protects most points of entry into the wood except where established trails have been cut through it.

Dale and Greenway (1961) specifically attribute 73 trees and shrubs to this forest. I can add



FIG. 6. Female Red-chested Owlet, *Glaucidium tephronotum*, captured in the Kakamega Forest July 2, 1966.

four others personally collected and the literature mentions 23 additional widespread, or typically western Kenyan, species that almost certainly occur there, making a total of 100. As I probably have overlooked some, I estimate the total number of major woody plants in the Kakamega Forest to be about 150, of which perhaps 125 are trees. I cannot, however, extend this to the 200 tree species estimated

to occur here by a forester formerly stationed at Kakamega and with whom I discussed the matter. His figure was, admittedly, an educated guess. Even inclusion of the North Nandi Forest, with some additional highland species, would produce a total short of this number.

Botanical nomenclature employed herein is largely that of Dale and Greenway (1961).



FIG. 7. Adult Least Honey-guide, *Indicator exilis*, captured near the Kakamega Forest Station June 20, 1965.

ANIMAL LIFE OTHER THAN BIRDS

The Kakamega Forest is not known for its large mammals. Elephants (*Loxodonta africana*) were exterminated about 1912 and Cape Buffalo (*Syncerus caffer*) probably a few years later, according to Prickett ([1969], p. 86). That author believed the Uganda kob (*Adenota kob*) to have been present formerly in the glades, and he presumed the Defassa waterbuck (*Kobus defassa*) to have been common. Kob are now extirpated and waterbuck are decidedly rare. Prickett considered leopards (*Felis pardus*) to be rare and I saw no evidence of their presence. Elimination, or great reduction in numbers, of these large mammals surely has had some effect on the ecology of the forest. In contrast with my experiences in other western Kenya forests, only two

mist-nets were destroyed by mammals, one by a bush pig (*Potamochoerus porcus*) or giant forest hog (*Hylochoerus meinertzhageni*), both of which lived in the forest; another by a black and white colobus monkey (*Colobus polykomos*) in a rare descent to near ground level. These handsome and conspicuous primates were rather numerous. Their loud reverberating roars were as much a part of the forest as the rolling, far-carrying calls of the Great Blue Turacos (*Corythaeola cristata*) and the loud braying of the big casqued hornbills (*Bycanistes subcylindricus*). In addition to colobus, the blue monkey (*Cercopithecus mitis*) and the colorful copper-tailed monkey (*C. nictitans schmidtii*) could be seen somewhere in the forest daily.

Other arboreal mammals included the giant



FIG. 8. Adult male Yellow-bellied Wattle-eye, *Dyaphorophya concreta*, captured and banded in the Kakamega Forest June 30, 1966.

forest squirrel (*Protoxerus stangeri*) and the smaller *Heliosciurus rufobrachium*. One of the most impressive animals was the large, nocturnal scaly-tailed squirrel (*Anomalurus fraseri*), a glider and rare inhabitant of deep forest. We recorded the potto (*Perodicticus potto*) and tree pangolin (*Manis tricuspis*) in the forest in 1961, but not during subsequent years. Spotted hyenas (*Crocuta crocuta*) occurred in the region and once at dawn

I saw a side-striped jackal (*Canis adustus*), but I found no signs of these animals away from the clearings. Probably several viverrids lived in the forest but I saw only the large-spotted genet (*Genetta tigrina*). Of the small forest antelopes I encountered only tracks in the soft earth or along muddy paths in the early mornings. The red duiker (*Cephalophus harveyi*), suni (*Nesotragus moschatus*), and bushbuck (*Tragelaphus scriptus*)

were present but all were uncommon and extremely shy.

Among the smaller mammals collected by Hayward and Mumford on and near my study area were several shrews (*Crocidura* spp.), the soft-furred rat (*Praomys jacksoni*), giant rat (*Cricetomys gambianus*), pygmy mouse (*Mus bella*), harsh-furred mouse (*Lophuromys aquilis*), and several bats including *Rousettus angolensis*, *Epomorphus wahlbergi*, *Hipposideros caffer*, *Scotophilus nigritta*, and a tiny *Eptesicus*, probably *E. capensis*.

Snakes of several species occurred but I rarely saw them. A large cobra, apparently *Naja melanoleuca*, was killed near my study area in 1963. That year I twice saw a large arboreal snake that I identified as Jameson's mamba (*Dendroaspis jamesoni*) being mobbed by birds. Boomslangs (*Dispholidus typus*), Gaboon vipers (*Bitis gabonica*), and horned vipers (*B. nasicornis*) were captured in various parts of the forest by others but I never encountered them myself. At least one lizard (the terrestrial chameleon,

Rampholeon) lived within the forest as did numerous unidentified amphibian species.

Invertebrates were abundant and diverse. In wet weather, usually at night, we saw numerous molluscs including giant snails (*Achatina iredalei*) on the tree trunks and paths. Goliath beetles (*Goliathus goliathus*) buzzed in the canopy, and at night countless lesser coleopterans and orthopterans frustrated many netting attempts. Bees and wasps were not remarkably common, but ants were ubiquitous and literally made their presence felt on many occasions. On the other hand, mosquitos and ticks were so scarce in most parts of the forest as to present not even a minor annoyance. Both nocturnal and diurnal Lepidoptera were sufficiently numerous and varied to attract any naturalist's attention. I have seen few butterfly faunas that surpass that of the Kakamega Forest in a favorable season. The frequency with which I saw damaged individuals indicated that they were more than occasionally attacked by birds.

THE CENSUS AREA

THE MAIN STUDY TRACT and plot selected for bird censusing was a rectangular area, 347 by 277 yards, divided into 20 1-acre squares by measuring and pacing lines through the forest and, at 208-foot intervals, extending additional lines at right angles to these. An interval of 208 feet, $8\frac{1}{2}$ inches would produce square units exactly 1 acre in size. Attaining such accuracy in heavy forest was not practical, but double-checking and readjustment where necessary during the first few days produced a grid delineating the area into squared sections of approximately 1 acre. Along most of these grid lines narrow trails were cut to serve as sighting lanes and points of orientation, to facilitate movement, and also to provide suitable sites for erection of mist-nets. On trails where nets were regularly used an attempt was made to clear vegetation to the soil surface.

In 1965 and 1966 slight adjustment was made of the original boundaries to make use of new paths cut through the tract by local Forest Department workers. Some of the original paths had been widened by them and others were abandoned or rerouted because of fallen trees across the former right of way.

Care was exercised in selecting a census area that would provide a representative stand, one reasonably homogeneous in terms of slope and vegetation density and near enough to camp so that all possible time could be spent on the tract. The southern edge of the census area was established along a line no nearer than 30 yards to the clearings and second growth along the border of the forest proper. This eliminated many of the "edge" species which never ventured inside the forest.

In 1963 our campsite was at the boundary of the forest between the forest officer's quarters and the rest house. During 1965 and 1966 my family and I occupied the rest house, which was only a few feet from the forest and some 50 yards from the southwest corner of the census tract. The plot, then, was situated some 30 to 50 yards from the forest edge between the two named buildings, its western edge paralleling and almost in line with the east wall of the rest house.

The tract is situated in a block of 220 acres of

continuous woods partially separated from the main mass of the Kakamega Forest in this area by a natural grassy opening of about 100 acres. This glade is surrounded by forest. It does not closely approach my census tract and has no influence upon it. Around the glade unbroken forest extends practically to the base of the Nandi Escarpment 7 miles beyond. The census tract and forest immediately adjacent to it is subject to some disturbance; footpaths used by nearby inhabitants and forest officers penetrate it in several places. However, these doubtless differ little from the elephant and buffalo trails through the forest in bygone years. Poaching of mammals and galliform birds is present wherever people live near the forest. Twice I found snares set for guineafowl or francolins within my census tract. Yet the proximity of this forest plot to the forest station provides it with a certain degree of protection from woodcutting, shooting, and other serious forms of disturbance. A few trees have been selectively removed in past years, leaving small openings now in various stages of revegetation. During the three seasons of my study, local inhabitants regularly chopped down small to medium-sized dead trees for firewood in and near my tract. Cutting of living trees is forbidden, and I saw no evidence of it. The activities of woodcutters probably drove birds away from local sites, and the flattening of vegetation surrounding newly fallen trees certainly modified those areas within the tract where the men worked. Nevertheless such places were very few and scattered. In spite of this removal of dead trees there was no evident shortage of breeding sites for barbets and woodpeckers. When I returned to Kakamega in 1965 after a two-year interval, I found the tract had not been unduly affected by human activity. Two of the main trails had been widened (to about 6 feet) by Forest Department workers, and additional narrower paths were obviously being kept open. Some of these were trails I had cut in 1963. There were a few new natural clearings where great trees in falling had torn down numerous smaller ones, leaving noticeable breaks in the canopy.

The first impression of the forest on the census tract is one of very large trees; many are 3 to 4

feet in diameter and a few approach 6 feet. Fewer than half have buttressed bases and they are not so impressive as many lowland rain-forest trees in the western Uganda forests. Nevertheless, buttresses of the widely scattered, very tall emergents may exceed 20 or 25 feet in height. Trunks of the trees whose crowns compose the canopy are unevenly spaced, separated by distances of 20 to 50 feet or more. Between these are smaller specimens, to 2 feet in diameter, sometimes growing only 6 to 10 feet from one another or from larger trees. Saplings of various sizes are abundant throughout. Some are straight but many are bent and twisted. Away from the clearings and dense trailside thickets one can walk about without great difficulty, although shrubby undergrowth is fairly common and the ground is largely concealed by low vegetation. Hence it is difficult to see terrestrial animals or retrieve downed specimens. Some trees both of canopy and understory have an enormous spread, and their great lower branches—seldom lower than 50 to 70 feet above ground—extend laterally for many yards.

Typically, several distinct strata of vegetation exist in the forest: (1) the uppermost, consisting of widely spaced crowns of the emergent trees, ranging from the top of the canopy to a height of 150 feet; (2) the canopy itself, 80 to 100 feet high; (3) the understory, from 30 or 40 feet to about 70 feet in places merging with the canopy but often distinct; (4) a shrub layer in the form of thickets and trailside strips, consisting of young trees, shrubs, and tall herbaceous growth; merging with (5) a greatly varying ground cover of graminoids, forbs, seedlings, and bryophytes. This layer often is continuous with the shrub layer. In some places it is poorly developed but it is almost nowhere lacking. It is of course most luxuriant where maximum light penetrates the tree layers.

The canopy was not completely "closed" and coverage for the 20-acre tract as a whole, including all clearings, was approximately 85 percent in 1963, dwindling to perhaps 75 percent in 1965. In many places coverage approached 100 percent, and in general the forest appeared dark—as dark as a mature northeast American broadleaved climax forest in summer, or a lowland wet forest in Central America. In 1963 there were three clearings of note in the tract, the two largest about one-half acre in extent. By 1965 there were three more, all small, but con-

tributing to a more "open" structural aspect. These sunlit clearings supported a mass of tangled vegetation—vines, tall herbs, low shrubbery, and small trees—with no evident stratification. Rather dense undergrowth extended into the forest, particularly along established paths. Beneath the foliage such places were surprisingly dark. The needle of a photographic light meter directed earthward scarcely moved, and positive identification of drab-plumaged birds was sometimes difficult.

In the evening darkness came an hour earlier within the forest than it did on the outside, and correspondingly lingered that much longer after dawn. When the storm clouds of afternoon thundershowers failed to disperse, darkness settled by 5 p.m. Late one afternoon it was so dark in the forest I could scarcely read the engraved numbers on my bird bands. On a normal clear morning the first rays of the sun touched the treetops about 6:30 or 6:40 a.m., and flecks of sunlight appeared on the forest floor 20 or 30 minutes later. Steam then rose impressively from the rain-drenched vegetation, and everywhere the sound of dripping water mingled with the calls of birds and monkeys. With each successive day of rain the trails from which we had cleared all vegetation became treacherously slippery, as did the huge fallen trees that lay across many of the paths.

Floristically, this is a "mixed" forest; there is no one dominant tree species, nor even two or three major ones, in the tract. Among the most common and noticeable is *Olea welwitschii*, the Elgon olive or mutukuyu (Oleaceae), a climax species and one of the largest. The stand of timber in which my tract is situated is listed as an Elgon olive plot on Forest Department maps, reflecting the importance of this species. It is often prominent as an emergent tree, extending upward to 120 or, rarely, 150 feet, with a breast-height diameter of several feet. These emergents rise above the more or less even canopy, itself high above ground, and small birds in their foliage may be impossible to identify with certainty. A few large Elgon olives were removed some years ago from the study area. Their stumps remain in the former clearings now claimed by second growth forest averaging perhaps 75 feet in height. After removing these trees, others of the same species were planted by the Forest Department. (According to official records a few "khaya" trees, a Ugandan species

unfamiliar to me, were planted in the area between 1942 and 1945, but apparently did not long survive.) Also rather common is *Funtumia latifolia* or mutondo (Apocynaceae), a latex-producing tree with smooth, light-colored bark and large, dark green leaves. Other important species in the composition of the canopy are: *Manilkara butugi* (Sapotaceae) with rough bark and leathery, terminally clustered leaves; *Bosquiea phoberos* (Moraceae), a rather figlike tree with smooth gray bark and drooping branches; *Teclea nobilis* (Rutaceae), a gray-barked species with trifoliolate leaves; *Diospyros abyssinica* (Ebenaceae), a straight, dark, slender tree of the same genus as the American persimmon; *Monodora myristica*, one of the Annonaceae; a tall fig, *Ficus* sp., possibly *F. kitubalu* (Moraceae); *Celtis africana* (Ulmaceae), a gray-barked species, and the whitish barked *C. mildbraedii*, congeneric with the American hackberry trees; satinwoods, *Fagara macrophylla* and *F. mildbraedii* (Rutaceae), tall trees with very long, pinnately compound leaves and conical woody spines on their trunks; *Antiaris toxicaria* (Moraceae), a buttressed tree with smooth, light gray bark that may extend up through the canopy to a height of more than 100 feet; *Cordia abyssinica* or mukomari (Boraginaceae) with its yellow drupes and almost orbicular leaves, and the taller *C. milleni* with broad spreading crown and thick buttressed trunk of light brown and fibrous bark. Another fine species growing very near the tract was *Albizia gummifera* (Mimosaceae), a flat-crowned canopy tree with lovely white flowers.

The many understory species, in addition to smaller trees named above, include several figs (among which are *Ficus capensis* and *F. urceolaris*); *Premna angolensis* (Verbenaceae), slender with a rather sinuous trunk; *Trichilia strigulosa* (Meliaceae), a species with large compound leaves; *Cassipourea ruwensorensis* (Rhizophoraceae), a relative of the mangroves with a maximum height of 40 or 50 feet; *Bridelia micrantha*

(Euphorbiaceae), with spiny branches and dense, broad crown; the common *Trema guineensis* (Ulmaceae), 30 to 50 feet tall with pale gray bark and densely pubescent, serrate leaves; *Maesopsis eminii* (Rhamnaceae) with fissured, whitish bark and lustrous, pointed leaves. The last two species are particularly common in clearings within the forest.

Tall undershrubs reaching a height of 20 feet are *Rinorea poggei* (a woody member of the Violaceae), *Craterispermum laurinum*, *Heinsenia diervilleoides*, and *Coffea eugenoides*, the Nandi coffee (all Rubiaceae). Other apparently rubiaceous shrubs are present, and there is a rubiaceous creeper, *Mussaenda erythrophylla*. The semiwoody dark green *Dracaena studense* (Liliaceae) is conspicuous in darker parts of the forest where it may form pure stands that cover several square yards, with plants 8 to 10 feet in height. The twining *Piper capense* (Piperaceae) with cordate leaves and numerous white-flowered spikes, grows in many places along trails. A woody creeper, not identified, grows around tree trunks and bears small orange fruits of which some greenbuls are very fond. Small leafy climbers are common, but really large lianas are not so conspicuous here as in some African forests. Large epiphytes are rare in the tract and in most parts of the Kakamega Forest. Epiphytic bryophytes, however, are abundant.

Conspicuous among the taller herbaceous plants is *Brillantaisia cicatricosa* var. *kivuensis* (Acanthaceae)—a tall *Mimulopsis*-like species with lavender-blue flowers and large, coarse leaves. It is abundant in clearings and along the wider trails where it provides refuge for shy prinias and camaropteras. Of ground plants there are bryophytes and many small angiospermous seedlings, but rarely is an inflorescence in evidence. Occasionally one's eye is attracted to the brilliant scarlet fruits of an *Aframomum* (Zingiberaceae) growing among the fallen leaves, but aside from these and certain fungi the low-growing plants are not remarkable.

THE BIRDS ON THE CENSUS AREA

METHODS AND SOURCES OF ERROR IN THE CENSUS

THE BIRD POPULATION was determined by a combination of conventional "spot-mapping," using the so-called Williams method (Anon., 1950), and capturing birds with Japanese mist-nets for permanent marking with numbered aluminum bands. Basically, the spot-mapping was accomplished by walking along the trails, plotting on field maps of the census tract all individual birds seen and heard, and combining the totals on daily record sheets. Several trips were made each day, beginning between 6 and 7 AM. (Earlier excursions rarely were productive. Within the forest there seldom was much activity until after sunrise.) The number of trips per day and the routes followed through the tract varied. They were dictated by circumstances such as the number and size of bird parties encountered, the number of birds to be removed from nets, and the frequency and severity of rains. Birds netted were recorded separately from those seen or heard. The first trip through the tract each morning was devoted in part to a count of singing birds, but this method of censusing was of limited use and received no special emphasis.

Exclusive of time spent in selecting the tract, preparing the grid lines, and initial trail cutting, censusing of birds in 1963 occupied 131 hours in the following periods: June 11–17, July 18–22, and July 30–August 1. During 1965 I spent 137 hours on the tract between June 18 and June 23, and from August 2 to August 10. In 1966 the total was 163 hours, from June 18 to June 30, and between July 1 and July 6. A pedometer worn daily during the latter season revealed that I walked 119 miles within the census tract in 1966. The foregoing figures do not include time spent by assistants who took no part in the censusing but attended nets and performed other duties.

In 1965 and 1966 spot-mapping of some species was facilitated by replaying in the tract pre-recorded songs of various birds. This often stimulated silent birds to respond by singing and/or showing themselves. This method proved the most reliable to determine numbers of

Andropadus gracilirostris and *Phyllastrephus cabanisi*, but most other greenbulbs failed to respond consistently. Tape playback also helped to determine numbers of *Camaroptera chloronota* and *Bathmocercus rufus*, and confirmed counts of these birds based on banded individuals.

In 1963 netting was done on only about half of the 20 acres, with emphasis in censusing placed on recording birds seen and heard. In 1965 and 1966 netting was extended to cover the entire tract. The first year I employed six 42-foot nets, six 18-foot nets and one 60-foot net, all 7 feet wide and of standard 1½-inch black nylon mesh. An additional 60-foot net of 2¾-inch mesh tried experimentally caught nothing but fruit bats, although doves struck it occasionally. In general, nets longer than 42 feet and shorter than 30 feet proved more bother than they were worth; in 1965 and 1966 only 42-foot nets were used.

Twelve nets were operated 24 hours each day, weather permitting. At irregular intervals, two to four additional nets were erected along trails for periods of a few hours when they could be kept under observation. Most nets were placed in specially cut trails concealed from the main footpaths to avoid the problem of theft—both of captured birds and the nets themselves. All nets were visited shortly after dawn, again at 9 or 10 AM, and at 2-hour intervals thereafter (varying somewhat depending upon the rains). The last examination was after sunset, when the forest was dark. Before periods of heavy afternoon rain, when the forest darkened early and when entangled birds soon would have been endangered through exposure, all nets were rolled up, left in position, and rendered operable again early the following morning. Sudden, unexpected downpours occasionally caught us unprepared, and, despite efforts to promptly reach all nets and careful drying of wet chilled birds near the fire, a few casualties resulted. Rescued birds were kept indoors overnight in dry cloth bags and released at the point of capture the next morning. Some of them were subsequently recaptured several times indicating that our salvage efforts were successful.

Although at first we moved most nets to new sites every two days, we learned that a good set

continued to capture unbanded birds for as long as five or six days. Thereafter we left an initially effective net in the original location for as long as it was productive, usually four days.

Captures with nets varied greatly with the time of day. The first examination after day-break rarely disclosed birds captured. Minor net damage by mammals and insects during the night, and increased visibility of the net strands glistening with water film or speckled with leaves and beetles from the night before, doubtless were responsible for this. Nets set along footpaths were most productive at or just before dusk. Some birds (notably *Cossypha*, *Malacocincla*, *Sheppardia*, and *Alethe*) frequently were found in nets just after dark. Either these birds avoided the nets earlier, when the mesh was more conspicuous, or they seldom moved across the trails during the day.

In 1963 all nets were operated from ground level to a height of 7 feet. During the other 2 years three nets were erected to 12 feet and two additional ones to about 20 feet, usually with little reward for the effort. Their failure probably stemmed from too few nets thus employed, and possibly poor locations. Generally speaking, mist-nets served to reveal the presence of undergrowth and ground birds; censusing of treetop species fell to conventional observation. Representatives of 45 of the total 125 species on the tract were captured in nets, 13 of these only once, and but 18 with any frequency.

Whereas in 1963 approximately half of my time on the tract was devoted to attending nets in one capacity or another, in 1965 and 1966 this time was reduced to a third or less because of the help from assistants. It was, in any event, time well spent. To determine numbers of some species without using nets would have been virtually impossible.

Some netted birds were preserved as specimens but most were ringed with numbered aluminum bands and released at the point of capture. Experiments in 1963 with colored metal and plastic bands were not successful. Although I could often see a bird's foot sufficiently well to detect a band, I could not always determine its color. Uncolored aluminum bands, more noticeable than any others, were the only type used after the first year. Bands of the East Africa Natural History Society were obtained for this purpose. During the study, 571 birds of 38 species were banded. Only 70 individuals were

marked during the first season. In 1965 with increased emphasis on this aspect of censusing, the 1963 figures were nearly doubled. These in turn were more than doubled in 1966, owing in part to (a) greater emphasis on netting in the belief that more undergrowth birds than were captured in 1965 might be present, (b) large numbers of immature birds on the tract (44.6 percent of the total banded as compared with 32.4 percent immatures in 1965), (c) a higher number of adult birds as well. Reasons for this increase are not known. Increased rainfall prior to the 1966 census period perhaps contributed to more breeding activity and greater nesting success than in the dry preceding year. There appeared to be more available fruits on the trees and vines in the forest during 1966, and an outbreak of some unidentified insect larva had partially defoliated some of the larger trees. Otherwise there were no obvious changes in the tract compared with the previous year.

Another factor of unknown significance was the collecting of specimens by others in the plot of forest containing the census tract prior to my field work in 1965. This may have lowered the population of those understory species readily captured in nets. That year several hundred birds were collected in the Kakamega Forest; it is not known how many of them were taken in my study area. Impossible to assess, too, was the amount of illegal netting of birds by some local inhabitants during 1965. Probably very little of this activity was carried on in the census tract owing to its proximity to the Forest Station, but the number of illegally taken birds in the general vicinity exceeded 100.

My own collecting of specimens within and near the tract was of course kept to a minimum consistent with positive identifications, but an effort was made in 1963 to secure record specimens of most species. Including accidental net casualties, we collected 109 adult birds and 13 immatures that year, many of them near the end of the period (when future study of the area was not contemplated). I did virtually no collecting on the tract during 1965 and 1966.

Removal of individuals from an area theoretically permits replacement by other individuals of the same species recruited from adjacent areas. Recruitment could have been responsible in 1963 for some birds being present in late July and August following removal by me of certain specimens in June. However, I found no evidence

of this and I am inclined to think that several months may be required to fill the gaps created through collecting of low-density species. The single pairs of *Prinia bairdii* and *Laniarius ludherti* killed in mid-June were not replaced by August. Males of conspicuous arboreal species such as *Trachylaemus purpuratus* and *Poeoptera stuhlmanni* collected from certain parts of my plot were not replaced by the end of the season. As with the prinia and the shrike, their former territories remained vacant of their species to the best of my knowledge.

No study of this type is possible without introducing certain unnatural conditions. Direct disturbance by trail cutting in 1963 doubtless disturbed birds and possibly forced some out of the tract, although I doubt that the effect was significant; paths of one sort or another have penetrated this plot for years. And, since 1963, these trails have been maintained by humans so that the birds are, presumably, accustomed to both the paths and the presence of people.

Operation of mist-nets is known by any bird-bander to result in "net-shyness" or avoidance by birds of sites where nets have been placed. Frequently, after removal of a net birds will habitually veer away suddenly from a former net location in the flight path. But, although a disturbing factor, net operation probably does not make any large area unattractive to birds; it merely changes their paths of movement to some degree. By moving nets from one section of the 20-acre tract to another, and by ceasing operation for several days or weeks between census periods (in 1963 and 1965), I endeavored to minimize the problem of disturbance from this source. Furthermore, netting so greatly enhanced my ability to determine abundance of various species that this more than compensated for any upsetting of natural conditions. The use of mist-nets except for collecting need not necessarily be interpreted as "unscientific" as implied by Slud (1960, p. 56), although nets admittedly are "unbalanced in favor of small birds of the undergrowth." We reduced to the minimum the overlooking of secretive, skulking species by their use, and netting served as a useful check on numbers otherwise based on sight or voice records. Usually it demonstrated the presence of more individuals than I had accounted for by eye and ear alone despite repeated, careful covering of a given area several times a day.

The population figures in the present report for *Alethe poliocephala*, *Sheppardia aequatorialis*, *Malacocincla* spp., and for most of the greenbuls, are based largely on captures owing to the otherwise inaccurate picture reflected by the silence of these birds or (in *Malacocincla*) possibly similar songs from different species. I failed to learn the songs of *Alethe* and *Sheppardia* despite the abundance of the species in all three seasons. To the best of my knowledge I never heard either sing.

Failure to identify avian sounds was a source of error early in the study but few problems of this sort remained unsolved. The difficulties in identifying the voices of primary forest birds can only be overcome with experience, but concentration on one area combined with judicious collecting and utilization of tape recorders with playback facilities greatly simplified the task. The nightjar *Caprimulgus natalensis* was the only bird listed by me on the basis of voice identification alone. Some nocturnal sounds remained undetermined; certain of these most likely were nonavian.

Counts based largely on vocalizations must be viewed with caution, because of undercounting of species that sing irregularly (or not at all) on the census tract during seasons when field work is conducted. At Kakamega it was evident that not all individual males sang regularly, or else they sang away from the study area. Some birds captured at intervals but never heard singing may have held territories largely outside of the tract, entering the tract only to forage. However, I think this unlikely in the majority of cases. The birds were present but conventional census methods did not reveal them. My experience at Kakamega and in other African forests prompts me to question the validity of censuses in tropical areas by the singing male counts so frequently relied upon, especially if a census is based on only a few hours of actual field work. Davis (1965) has published a warning to census-takers who employ this method. He cited data showing not only the critical importance of the time of day when a count is made along a route, but also that "any deviation from an established schedule of censusing may be disastrous."

Enemar (1962) published on the differences among data obtained by six experienced ornithologists in the censusing of a single forest plot. Their results were very different, presumably

because the routes taken by the observers differed within the plot, the observers focused their auditory and visual attention toward different sectors of the plot, and there were individual differences in the "human factors" that produce errors such as double entries. Each observer recorded only one-half to two-thirds of the breeding passerines on the census plot, and "many" species were not listed by a given observer. Again, one of the main sources of error apparently was the temporary silence of singing males. Enemar's analysis indicated that the census taker was not normally aware of all possible visible and audible phenomena originating from the bird population on a particular area. If such be true in the north-temperate zone it would certainly be more so for the worker in a complex tropical forest.

The majority of available census data (e.g. the "breeding bird censuses" published annually by Audubon Field Notes) are expressed in terms of territorial males per 100 acres, based on counts of birds seen and heard. "Visiting" species and individuals—those not utilizing the census area regularly, or not breeding within it—are excluded from most such counts or they are listed separately. The territorial male figure, if doubled, provides an approximate number of adults per 100 acres, although often some of the males reported are unmated. Results of such censuses are not comparable to my total census figures for Kakamega as shown in table 2. To permit more meaningful comparison, table 5 consists of a summary of my Kakamega spot-mapping results which exclude all captured species and individuals and also those which might be considered "visitors" to the study tract. Although comparable to most published breeding bird censuses these data are misleading. They do not reflect the presence of a few species and many individuals which netting revealed to be present daily yet which I never knowingly heard and only rarely saw. Furthermore, the "visiting" birds that roam through the tract regularly are excluded. Some of these are always present, although species composition varies in the tract from day to day. In compiling table 5 certain inclusions and exclusions have been made rather arbitrarily. In my African census areas, at Kakamega and elsewhere, it is unrealistic to try to fit even the more regularly occurring gregarious birds into a "territorial male" category. The only satisfactory way to treat a

group of wood-hoopoes, a flock of guineafowl, or the numerous members of a mixed bird party was to list all the individuals.

RECOVERIES OF BANDED BIRDS

Almost 18 percent of the 571 birds banded during this study were recaptured five months or more after their initial capture and marking. Table 1 lists the 132 recoveries of 102 individual birds made prior to June 1, 1970. Recaptures were made on the census tract (unless otherwise stated, below), and they were made by me after a period of one year or more with the following exceptions: five birds collected in October, 1964, by Charles G. Sibley and A. D. Forbes-Watson (bands lost but species recorded); four collected between March and June, 1965, by Forbes-Watson; five captured (and released) slightly beyond the tract boundaries by Forbes-Watson in December, 1965; 32 captured (all but three released) by Forbes-Watson in December, 1966; four captured and released in August, 1967, by G. C. Backhurst; 41 captured and released at various times between 1968 and May, 1970, by Peter Britton.

Had time allowed the erection of nets in the forest outside the census tract boundaries, additional recoveries probably would have resulted. That at least 33 of the 147 individuals (22.4 percent) marked in 1965 were alive in December of that year, and at least 28 (19.0 percent) a full year after banding, indicates a reasonable survival rate. Only one 1963-banded bird (*Andropadus latirostris*) was retaken by me in 1966, but in December of that year Forbes-Watson captured an adult *Cossypha cyanocamptus* ringed in June, 1963. And an adult *Arizelocichla masukuensis* banded in June, 1963, was recaptured by Britton in January, 1969, netted with another of this species banded in August, 1965. Three other banded individuals dating from 1965 were not captured by me during intensive netting in 1966 but were subsequently secured by others.

Adult-banded birds of 15 species exhibited apparent fidelity (or return) to the vicinity of the tract in which they were banded, with 43 individuals recorded there two or more years following banding. Almost half of these were birds between three and four years old; two individuals were more than five years old when last recaptured.

Of 142 birds ringed as juveniles and immatures, 16 (11.3 percent) were retaken there six months or more following their banding. Nine (6.3 percent) were recorded 16 months or more after banding. In December, 1966, Forbes-Watson recaptured on or close to the tract five birds banded as juveniles or immatures the preceding June, suggesting that at least some young do not move very far for half a year or more. It should be emphasized, however, that none of these individuals was known to have been hatched on the 20 acres with which I was concerned, although I suspect that some of them were. The species involved were *Malacocincla albipectus*, *Andropadus latirostris*, *Phyllastrephus cabanisi*, *Dyaphorophya blissetti*, and *Alethe poliocephala*. In the summer of 1966 I personally recaptured six birds banded there as young during the preceding summer. Represented were *Malacocincla fulvescens*, *M. albipectus*, *Andropadus latirostris*, and *Phyllastrephus cabanisi*. Furthermore, a juvenile *M. albipectus*, almost certainly raised on the tract, was recaptured there 14 months later. The table shows several additional examples. The numerous recoveries of this sort suggest that the bird population in a given part of the Kakamega Forest may be made up in significant part of young raised in the immediate vicinity remaining to replace adults lost through mortality. It may be, too, that in years of favorable food supply the locally reared young remain very near their birthplaces, swelling that population beyond its carrying capacity in a less favorable year when exodus of such birds may occur. The relative importance of retention of local young and the immigration of individuals from other parts of the forest is a matter worthy of further study.

Little is known of natural mortality. All birds found dead by me or others within the study area were those killed in nets by predators or the elements. And there were those purposely killed for specimens. Between October, 1964, and December, 1966, 13 of the 571 banded birds (2.3 percent) were known to have been accidentally or intentionally killed by persons engaged in ornithological activities on or closely adjacent to the study area.

Stamm, Davis, and Robbins (1960) found that population estimates by recapture of previously netted and banded birds "agreed closely" with the conventional spot-mapping census on an area of mixed habitat in Maryland.

Those workers banded 80 percent of the individuals representing 90 percent of the species on their plot, and their netting yielded 301 recaptures from 431 banded individuals. At Kakamega I could not band enough birds to warrant calculation of the population on the basis of recaptures. In the most successful season I marked birds of only 33 species (of the 98 known to be present). Of the 353 individuals wearing bands I obtained only 100 repeats involving 80 birds of 15 species. My netting did not permit capture of canopy species or, indeed, most of those that did not inhabit the lower undergrowth. In such a forest half of the species present rarely come low enough to be captured in nets with any regularity. Refinement of technique, greatly increased manpower, efficient use of nets between 50 and 90 feet above ground, and a census period extending over several months would possibly allow application of the banding-recapture method to a mature tropical forest. However, I question its practicality; the difficulty and the disturbance factor would be considerable. Anyone who has attempted to raise mist-nets high into the trees in such a way as to avoid physical disturbance to the site, yet which will permit ready lowering of nets for bird removal and frequent cleaning, can appreciate the problem. An additional difficulty arises in forests like Kakamega with a large monkey population. The relatively simple combination of mist-netting and banding of undergrowth species—those most difficult to see—plus conventional spot-mapping, probably provides sufficiently accurate census data for most purposes.

The figures in tables 2, 3 and 4 reflect numbers of birds on a small plot at a given time, but no more than that. Obviously such an area must be studied through at least one full year before a true picture of the population can be obtained. There is so much movement of birds through the tract, as evidenced by observation and continued capture of unbanded birds in spots I believed to be "exhausted," as to reveal any given 20-acre plot as only an integral part of a considerably larger unit, the whole of which is essential to the ecological well-being of the forest. In terms of conservation practices, for example, it would be almost pointless to preserve 20 or even 50 acres of the Kakamega Forest as an adequate sample. I would guess that 500 acres would represent the minimum area capable of supporting a reasonably natural bird population, and additional

TABLE 1
RECOVERIES OF BIRDS Banded ON THE CENSUS TRACT

Species	Band No.	Banding Date	Recovery Date	Remarks
<i>Trachylaemus purpuratus</i>	B0925	June 21, 1966	Dec. 8, 1966	Collected
<i>Malacocincla fulvescens</i>	A1567	Aug. 10, 1965	Dec. 17, 1966	Immature
<i>Malacocincla fulvescens</i>	A1568	Aug. 10, 1965	June 19, 1966	Immature
<i>Malacocincla rufipennis</i>	A2156	July 6, 1966	Feb. 1, 1969	—
<i>Malacocincla albipectus</i>	?	July 30, 1963	mid-Oct., 1964	Collected
<i>Malacocincla albipectus</i>	?	July 30, 1963	mid-Oct., 1964	Collected
<i>Malacocincla albipectus</i>	A0884	Aug. 4, 1965	July 4, 1966	—
<i>Malacocincla albipectus</i>	A0893	Aug. 5, 1965	June 27, 1966; Dec. 6, 1966	Immature
<i>Malacocincla albipectus</i>	A1708	June 22, 1965	July 4, 1969	—
<i>Malacocincla albipectus</i>	A1876	June 22, 1966	Dec. 5, 1966	—
<i>Malacocincla albipectus</i>	A1869	June 22, 1966	Dec. 6, 1966; Dec. 9, 1966	—
<i>Malacocincla albipectus</i>	A2001	June 28, 1966	Dec. 6, 1966	Juvenile
<i>Bleda syndactyla</i>	B0923	Aug. 9, 1965	Nov. 2, 1968; Dec. 19, 1968	—
<i>Bleda syndactyla</i>	B0924	June 21, 1966	Dec. 9, 1966	—
<i>Bleda syndactyla</i>	B0926	June 22, 1966	Dec. 10, 1966	—
<i>Bleda syndactyla</i>	B0930	July 1, 1966	Jan. 13, 1969; July 5, 1969	—
<i>Bleda syndactyla</i>	B0933	July 6, 1966	Dec. 5, 1969	—
<i>Phyllastrephus cabanisi</i>	223	July 20, 1963	Mar. 10, 1965	Collected
<i>Phyllastrephus cabanisi</i>	217	June 16, 1963	June 17, 1965	Rebanded A1769
<i>Phyllastrephus cabanisi</i>	A1577	June 18, 1965	Nov. 2, 1968; Dec. 18, 1968	—
<i>Phyllastrephus cabanisi</i>	A1702	June 22, 1965	June 18, 1966; Nov. 2, 1968	—
<i>Phyllastrephus cabanisi</i>	A1765	June 17, 1965	May 31, 1970	—
<i>Phyllastrephus cabanisi</i>	A1767	June 17, 1965	June 19, 1966; Jan. 11, 1969; Feb. 1, 1969	Immature
<i>Phyllastrephus cabanisi</i>	A1771	June 25, 1965	July 5, 1966	—
<i>Phyllastrephus cabanisi</i>	A1778	June 20, 1965	July 6, 1966	—
<i>Phyllastrephus cabanisi</i>	A1583	June 19, 1966	Nov. 2, 1968	—
<i>Phyllastrephus cabanisi</i>	A1855	June 20, 1966	Dec. 9, 1966	—
<i>Phyllastrephus cabanisi</i>	A2099	July 6, 1966	Dec. 12, 1966	Juvenile
<i>Phyllastrephus hypochloris</i>	A1865	June 21, 1966	Nov. 3, 1968	—
<i>Phyllastrephus hypochloris</i>	A2023	June 29, 1966	Jan. 12, 1969	—
<i>Arizelocichla masukuensis</i>	227	July 21, 1963	June 21, 1965; Jan. 13, 1969	Rebanded A1784
<i>Arizelocichla masukuensis</i>	A1566	Aug. 9, 1965	Jan. 13, 1969	—
<i>Arizelocichla masukuensis</i>	A1572	June 18, 1966	Dec. 10, 1966	—
<i>Andropadus curvirostris</i>	A1555	Aug. 8, 1965	Dec. 17, 1968	Immature
<i>Andropadus curvirostris</i>	A1563	Aug. 9, 1965	Aug. 6, 1967	—
<i>Andropadus virens</i>	A1795	June 21, 1965	June 19, 1966; Dec. 7, 1966; Aug. 6, 1967	—
<i>Andropadus latirostris</i>	213	June 16, 1963	Aug. 7, 1965; June 23, 1966	Rebanded A1791
<i>Andropadus latirostris</i>	208	June 13, 1963	Dec. 11, 1966	Recaptured near tract
<i>Andropadus latirostris</i>	118	July 30, 1963	Aug. 7, 1965	—
<i>Andropadus latirostris</i>	A1764	June 17, 1965	June 21, 1966	—

TABLE 1—(Continued)

Species	Band No.	Banding Date	Recovery Date	Remarks
<i>Andropadus latirostris</i>	A1780	June 21, 1965	June 28, 1966; Jan. 11, 1969	—
<i>Andropadus latirostris</i>	A1785	June 21, 1965	June 28, 1966; Dec. 12, 1968	Immature
<i>Andropadus latirostris</i>	A1789	June 21, 1965	June 28, 1966; Nov. 3, 1968	—
<i>Andropadus latirostris</i>	A1706	June 23, 1965	June 21, 1966; Jan. 13, 1969; July 5, 1969	—
<i>Andropadus latirostris</i>	A1715	June 23, 1965	Dec. 5, 1966	Died in net
<i>Andropadus latirostris</i>	A0888	Aug. 4, 1965	June 19, 1966	Juvenile
<i>Andropadus latirostris</i>	A0889	Aug. 4, 1965	July 5, 1969	Immature
<i>Andropadus latirostris</i>	A0897	Aug. 6, 1965	June 21, 1966; Nov. 3, 1968	Immature
<i>Andropadus latirostris</i>	A1571	Aug. 10, 1965	June 24, 1966	—
<i>Andropadus latirostris</i>	A1858	June 20, 1966	Dec. 7, 1966	Juvenile
<i>Andropadus latirostris</i>	A1812	June 25, 1966	Dec. 8, 1966	—
<i>Andropadus latirostris</i>	A1818	June 25, 1966	July 5, 1969	—
<i>Andropadus latirostris</i>	A1830	June 27, 1966	Dec. 3, 1966	—
<i>Andropadus latirostris</i>	A2075	July 3, 1966	Jan. 13, 1969	—
<i>Andropadus latirostris</i>	A2083	July 4, 1966	Jan. 12, 1969	—
<i>Andropadus latirostris</i>	A2085	July 4, 1966	Feb. 1, 1969	—
<i>Dyaphorophyia castanea</i>	J2472	June 26, 1965	July 5, 1969	—
<i>Dyaphorophyia blissetti</i>	107	June 16, 1963	June 4, 1965	Collected
<i>Dyaphorophyia blissetti</i>	J2356	June 17, 1965	Dec. 3, 1965	Recaptured near tract
<i>Dyaphorophyia blissetti</i>	J2417	Aug. 3, 1965	Dec. 6, 1965	Recaptured near tract
<i>Dyaphorophyia blissetti</i>	J2459	June 22, 1966	Dec. 12, 1966	Immature
<i>Dyaphorophyia blissetti</i>	J2464	June 25, 1966	Jan. 12, 1969; Feb. 1, 1969	—
<i>Dyaphorophyia blissetti</i>	J758	July 3, 1966	Jan. 12, 1969; Jan. 13, 1969	—
<i>Trochocercus nigromitratus</i>	J2423	Aug. 4, 1965	June 18, 1966	Recaptured near tract
<i>Trochocercus nigromitratus</i>	J2424	Aug. 5, 1965	Dec. 3, 1965; Dec. 12, 1966	Recaptured near tract
<i>Trochocercus nigromitratus</i>	J2432	June 18, 1966	Dec. 12, 1966	—
<i>Cossypha cyanocampter</i>	204	June 15, 1963	Dec. 9, 1966; Dec. 12, 1966	—
<i>Cossypha cyanocampter</i>	117	July 20, 1963	Mar. 26, 1965	Collected
<i>Sheppardia aequatorialis</i>	J2359	June 17, 1965	Dec. 2, 1965; June 28, 1966; Dec. 11, 1966; Dec. 17, 1968; Jan. 12, 1969	All recoveries except first on the tract
<i>Sheppardia aequatorialis</i>	J2370	June 22, 1965	June 19, 1966	—
<i>Sheppardia aequatorialis</i>	J2420	Aug. 4, 1965	June 28, 1966; Dec. 20, 1968	—
<i>Sheppardia aequatorialis</i>	J2422	Aug. 4, 1965	Dec. 20, 1968	—
<i>Sheppardia aequatorialis</i>	J2447	June 24, 1966	Dec. 11, 1966	—
<i>Sheppardia aequatorialis</i>	J2488	June 28, 1966	Dec. 19, 1968	—
<i>Sheppardia aequatorialis</i>	J770	July 4, 1966	Dec. 10, 1966	—
<i>Alethe poliocephala</i>	?	June, 1963	mid-Oct., 1964	Collected
<i>Alethe poliocephala</i>	?	June, 1963	mid-Oct., 1964	Collected
<i>Alethe poliocephala</i>	A1777	June 19, 1965	Dec. 2, 1965; Dec. 10, 1966	Immature

TABLE 1—(Continued)

Species	Band No.	Banding Date	Recovery Date	Remarks
<i>Alethe poliocephala</i>	A0892	June 21, 1965	Dec. 16, 1968	—
<i>Alethe poliocephala</i>	A0880	Aug. 3, 1965	June 29, 1966; Dec. 8, 1966	—
<i>Alethe poliocephala</i>	A0899	Aug. 7, 1965	June 18, 1966; July 5, 1969	—
<i>Alethe poliocephala</i>	A2030	June 30, 1966	Dec. 12, 1966	Juvenile
<i>Hylia prasina</i>	J2437	June 19, 1966	Dec. 12, 1966	—
<i>Camaroptera chloronota</i>	103	July 19, 1963	Mar. 22, 1965	Collected
<i>Camaroptera chloronota</i>	J2424	Aug. 5, 1965	June 18, 1966	—
<i>Camaroptera chloronota</i>	J2451	June 23, 1966	Dec. 7, 1966; Aug. 7, 1967; Nov. 3, 1968; Dec. 17, 1968	—
<i>Camaroptera chloronota</i>	J2467	June 25, 1966	Jan. 12, 1969	—
<i>Bathmocercus rufus</i>	?	June 12, 1963	mid-Oct., 1964	Collected
<i>Bathmocercus rufus</i>	A1773	June 18, 1965	June 25, 1966	—
<i>Bathmocercus rufus</i>	J2378	June 23, 1965	July 5, 1966	Died in net
<i>Bathmocercus rufus</i>	J2453	June 23, 1966	July 5, 1969	—
<i>Nectarinia olivacea</i>	J2372	June 22, 1965	Dec. 11, 1966	—
<i>Nectarinia olivacea</i>	J2379	June 23, 1965	June 27, 1966; Aug. 7, 1967	—
<i>Nectarinia olivacea</i>	J2489	June 28, 1966	Nov. 3, 1968; Feb. 1, 1969	Juvenile
<i>Spermophaga ruficapilla</i>	A1578	June 18, 1966	Dec. 11, 1966; Dec. 12, 1966	Died in net

study may show this figure to be far too low. Certainly a unit so restricted could not maintain itself as a truly natural forest environment indefinitely.

BREEDING SEASONS

Although I avoided the migration seasons and periods of wintering Palearctic birds, there was on the study area little of the constancy of a breeding bird population familiar to one who has worked in a temperate zone forest. Breeding and nonbreeding individuals of the same species, adults, subadults, and juveniles of others, all mingled on the tract. And, aside from a nucleus of regular territorial birds, species composition varied considerably from day to day. During 19 field days on the census tract in 1965, I devoted between 7.5 and 10.5 hours every day but one censusing birds yet the number of species recorded varied from 36 to 59 per day, averaging about 45; I recorded 108 species there during the entire period. In 1966 I recorded a minimum of 30 and a maximum of 51 species per day

(average 41) with 98 species on the tract during 18 days of censusing. Singing birds (e.g. *Apaloderma vittatum* and *Malacotus bocagei*) would be in one portion of the tract for a day or several days, followed by an apparent absence of a week or longer. Throughout the tract (and the adjacent forest) much bird song could be heard, but few territorial displays were witnessed and only rarely was any nesting activity observed. Flocks of wandering greenbuls in the undergrowth, apparent family groups of malacocinclas on the forest floor, and mixed species parties working through the trees joined the more sedentary forms on the tract to present a complex mosaic of activity unparalleled in a north-temperate zone breeding season.

A characteristic of the Kakamega Forest avifauna was the apparent concurrence of as many nonbreeding-as breeding birds at the time of my investigations. Van Someren and van Someren (1949) noted this is Bwamba. They also noticed as did I, that different individuals of a given species taken at the same time very

often were in different stages of the breeding cycle. Chapin (1932, p. 320) concluded that in the Ruwenzori forests many small passerine species "must nest throughout the year, without reference to dry periods," and that nowhere in the Congo was there "any approach to a universal breeding season." Although my work at Kakamega has been seasonally restricted I suspect that a similar situation prevails there.

However, one wonders if some birds with relatively small gonads are in fact nonbreeding individuals. I have been impressed by the very few male birds collected at Kakamega which displayed truly large testes such as we consider commonplace among breeding males in north-temperate breeding birds. There are few data on this phenomenon, but the paper of Moreau, Wilk, and Rowan (1946) suggested that considerably less testicular enlargement takes place in tropical African birds. In the few Tanganyikan species they investigated "spermatogenesis commonly takes place in testes that have not attained full size." This is a matter that deserves further study.

MIXED SPECIES FLOCKS

Wandering bird parties or flocks composed of mixed species are characteristic of tropical forests and woodlands; several writers have commented upon them at length. In the Kakamega Forest such flocks are met with almost daily and sometimes several times per day, but beyond endeavoring to identify and count all the birds involved I gave them no special study on my census tract.

These roving bands of birds are feeding aggregations. They are loosely, although definitely, organized and progress through the forest so rapidly that detailed enumeration of the members is sometimes difficult. Real study of these flocks requires considerable attention. Their movements are not always the aimless wanderings they appear to be at first. Often a flock seems to follow essentially the same path through the forest on successive days, even though the species composition of the flock varies somewhat from day to day. Some species, although seen largely or exclusively as components of mixed species parties, are encountered only in certain specific parts of the forest.

These flocks are so characteristic of the African woods that one is prompted to speculate

upon the organization and upon the benefit presumably derived from such associations. Winterbottom (1943) believed that none of the traditional reasons then advanced to explain this type of behavior was really satisfactory and I would agree with this. Stanford (1947) suggested that "the local disturbance and excitement produced in the quiet forest by a moving twittering flock, in much the same way as the presence of a cat, or an owl, will stimulate a number of species to collect . . ." This, of course, assumes at least a small group of birds already assembled and does not explain the initial organization of a flock. Nevertheless, a high state of excitement may very well serve to maintain the flock and increase its size, particularly if the "nucleus species" themselves tend to be sufficiently vociferous and gregarious to provide the necessary stimulation to other birds. *Parus funereus*, a very frequent nucleus species (present in 80 percent or more of the Kakamega bird parties) is one that qualifies in these particulars.

Of the 37 species I observed as members of mixed flocks at Kakamega, nine were seen in such associations only once, and several others participated on only two or three known occasions. The most frequently observed were (in approximate order of frequency): *Apalis rufogularis*, *Seicercus budongoensis*, *Andropadus gracilirostris*, *Parus funereus*, *Symplectes bicolor*, *Dicrurus ludwigii*, *Anthreptes collaris*, and *Zosterops senegalensis*. At least one of these was in every bird party noted. Fifteen flocks which I observed rather closely were composed of from four to 16 species (averaging about 10), and from 12 to 38 individual birds (averaging 24). Participation in bird parties is commented upon in the species accounts which follow.

Certain bird species are known to assemble in response to the insect (and other) prey disturbed by advancing groups of driver, or safari, ants. Such ants are abundant at Kakamega and columns of them are encountered frequently in the forest. However, most bird parties I observed there were independent of ants. This is in contrast to my observations in Central American forests and to the situation in lowland Congo forests where ant armies very often are accompanied by birds (cf. Chapin, 1932, pp. 216-219). The apparent rarity of this phenomenon at Kakamega may be dispelled by detailed observation of ant columns, particularly at different times of the year.

EXPLANATION OF TABLE 2 AND THE ANNOTATED LIST

The species listed in the table are only those I recorded on the 20-acre tract at various times during June, July, and August during three different years. Numbers of individuals here listed are the carefully estimated totals based on a combination of spot-mapping, observing, mist-netting, and banding and they include all individuals collected.

Of the 125 species listed 107 are documented by specimens that I have examined. I have personally collected 93 on or adjacent to the census tract. I have seen no specimens from Kakamega of *Falco ardosiaecus*, *Hieraaetus spilogaster*, *Stephanoaetus coronatus*, *Polyboroides typus*, *Columba arquatrix*, *Turtur afer*, *Aplopelia larvata*, *Cuculus clamosus*, *Chrysococcyx klaas*, *C. caprius*, *Tauraco schuttii*, *Psittacus erithacus*, *Caprimulgus natalensis*, the *Apus* species, and *Muscicapa caerulescens*. All of these species, however, have been seen in the area by other workers and all but the swifts are readily identified in the field. Records of several of these birds, based on specimens from the Kakamega region, are mentioned by van Someren (1922) and Chapin (1939, 1953, 1954); they are referred to in the annotated list. Most of the personally collected specimens discussed in this paper are deposited in the American Museum of Natural History. The remainder are housed at Western New Mexico University.

TABLE 2
NUMBERS OF ADULT BIRDS RECORDED ON THE
20-ACRE CENSUS TRACT, KAKAMEGA FOREST

Species	1963	1965	1966
<i>Falco ardosiaecus</i>	—	—	2
<i>Hieraaetus spilogaster</i>	—	—	1
<i>Stephanoaetus coronatus</i>	—	1	1
<i>Lophoaetus occipitalis</i>	—	1	2
<i>Accipiter melanoleucus</i>	—	—	1
<i>Accipiter tachiro</i>	—	1	1
<i>Polyboroides typus</i>	1	—	—
<i>Francolinus squamatus</i>	1	2	2
<i>Guttera edouardi</i>	—	3	—
<i>Sarothrura elegans</i>	1	1	1
<i>Columba arquatrix</i>	—	6	—
<i>Columba delegorguei</i>	2	5	2
<i>Streptopelia semitorquata</i>	2	1	1
<i>Turtur tympanistria</i>	2	4	4

TABLE 2—(Continued)

Species	1963	1965	1966
<i>Turtur afer</i>	2	2	2
<i>Aplopelia larvata</i>	1	1	2
<i>Treron australis</i>	10	2	—
<i>Cuculus solitarius</i>	—	1	1
<i>Cuculus clamosus</i>	—	1	2
<i>Chrysococcyx cupreus</i>	2	2	2
<i>Chrysococcyx caprius</i>	—	2	1
<i>Chrysococcyx klaas</i>	2	1	2
<i>Ceuthmochares aereus</i>	2	3	2
<i>Tauraco schuttii</i>	—	2	—
<i>Corythaeola cristata</i>	7	1	1
<i>Psittacus erithacus</i>	—	2	2
<i>Merops lafresnayii</i>	1	—	—
<i>Merops mulleri</i>	—	4	2
<i>Bycanistes subcylindricus</i>	32	14	5
<i>Tockus albeterminatus</i>	—	1	1
<i>Phoeniculus bollei</i>	3	5	3
<i>Ciccaba woodfordii</i>	2	2	2
<i>Glaucidium tephronotum</i>	—	—	2
<i>Caprimulgus</i> (?natalensis)	—	—	1
<i>Apaloderma vittatum</i>	1	1	1
<i>Gymnobucco bonapartei</i>	2	2	2
<i>Bucconodon duchaillui</i>	8	5	2
<i>Pogoniulus bilineatus</i>	6	10	4
<i>Trachylaemus purpuratus</i>	5	2	2
<i>Indicator variegatus</i>	—	1	—
<i>Indicator conirostris</i>	1	1	1
<i>Indicator exilis</i>	1	4	1
<i>Indicator pumilio</i>	—	—	1
<i>Campethera caroli</i>	2	3	1
<i>Campethera nivosa</i>	2	2	2
<i>Dendropicos fuscescens</i>	—	1	2
<i>Mesopicos xantholophus</i>	—	2	4
<i>Apus</i> (?barbatus)	—	3	—
<i>Apus myoptilus</i>	8	—	—
<i>Apus aequatorialis</i>	—	1	—
<i>Chaetura sabini</i>	—	2	—
<i>Smithornis capensis</i>	1	1	1
<i>Malacocincla fulvescens</i>	—	3	7
<i>Malacocincla rufipennis</i>	6	6	9
<i>Malacocincla albipectus</i>	2	8	6
<i>Malacocincla pyrrhoptera</i>	2	—	—
<i>Pycnonotus barbatus</i>	4	2	10
<i>Bleda syndactyla</i>	2	6	6
<i>Baeopogon indicator</i>	2	2	2
<i>Phyllastrephus cabanisi</i>	12	10	14
<i>Phyllastrephus hypochloris</i>	2	3	6
<i>Arizelocichla masukuensis</i>	6	6	7
<i>Chlorocichla laetissima</i>	2	2	4
<i>Andropadus gracilirostris</i>	5	12	7
<i>Andropadus gracilis</i>	2	2	—
<i>Andropadus ansorgei</i>	4	6	2
<i>Andropadus curvirostris</i>	4	10	10
<i>Andropadus virens</i>	1	6	8

TABLE 2—(Continued)

Species	1963	1965	1966
<i>Andropadus latirostris</i>	32	30	67
<i>Muscicapa adusta</i>	2	1	—
<i>Muscicapa caerulescens</i>	1	—	—
<i>Megabyas flammulatus</i>	2	—	5
<i>Hyltiota australis</i>	—	—	1
<i>Platysteira cyanea</i>	1	1	—
<i>Dyaphorophya castanea</i>	8	8	11
<i>Dyaphorophya blissetti</i>	11	10	10
<i>Dyaphorophya concreta</i>	—	2	2
<i>Elminia longicauda</i>	2	2	—
<i>Trochocercus nigromitratus</i>	4	8	10
<i>Terpsiphone rufiventer</i>	2	4	2
<i>Neocossyphus poensis</i>	1	2	1
<i>Cossypha cyanocampter</i>	4	4	7
<i>Sheppardia aequatorialis</i>	12	11	19
<i>Alethe poliocephala</i>	10	4	6
<i>Seicercus budongoensis</i>	8	10	7
<i>Hylia prasina</i>	3	1	3
<i>Apalis rufogularis</i>	4	4	4
<i>Eremomela turneri</i>	3	2	3
<i>Camaroptera chloronota</i>	6	8	18
<i>Camaroptera brachyura</i>	4	2	2
<i>Cisticola chubbii</i>	—	1	—
<i>Prinia leucopogon</i>	2	2	—
<i>Prinia bairdii</i>	2	2	6
<i>Bathmocercus rufus</i>	10	8	19
<i>Psalidoprocne holomelaena</i>	2	—	—
<i>Psalidoprocne albiceps</i>	3	7	10
<i>Campephaga sulphurata</i>	—	3	—
<i>Campephaga petiti</i>	2	2	3
<i>Campephaga quiscalina</i>	—	2	4
<i>Dicrurus modestus</i>	—	—	2
<i>Dicrurus ludwigii</i>	—	2	2
<i>Laniarius luhderi</i>	2	4	4
<i>Dryoscopus angolensis</i>	4	2	2
<i>Malaconotus bocagei</i>	4	2	2
<i>Parus funereus</i>	6	9	4
<i>Oriolus brachyrynchus</i>	5	2	2
<i>Cinnyricinclus leucogaster</i>	10	—	—
<i>Poeoptera stuhlmanni</i>	26	15	22
<i>Zosterops senegalensis</i>	4	14	7
<i>Nectarinia rubescens</i>	1	3	3
<i>Nectarinia verticalis</i>	3	—	—
<i>Nectarinia olivacea</i>	4	10	6
<i>Anthreptes collaris</i>	4	6	4
<i>Anthreptes tephrolaema</i>	2	2	2
<i>Symplectes bicolor</i>	1	4	4
<i>Hyphanturgus nigricollis</i>	1	2	3
<i>Hyphanturgus melanogaster</i>	1	1	—
<i>Ploceus nigerrimus</i>	10	—	—
<i>Phormoplectes insignis</i>	2	1	2
<i>Malimbus rubricollis</i>	1	3	2
<i>Amblyospiza albifrons</i>	—	3	5
<i>Nigrita canicapilla</i>	2	1	—

TABLE 2—(Continued)

Species	1963	1965	1966
<i>Nigrita fusconota</i>	1	1	1
<i>Spermophaga ruficapilla</i>	6	3	13
<i>Serinus burtoni</i>	1	3	2
Totals	408	430	487

TABLE 3
IMMATURE BIRDS RECORDED ON THE CENSUS TRACT
IN 1965 AND 1966

Species	1965	1966
<i>Malacocincla fulvescens</i>	2	—
<i>Malacocincla rufipennis</i>	—	3
<i>Malacocincla albipectus</i>	4	8
<i>Phyllastrephus cabanisi</i>	—	6
<i>Phyllastrephus hypochloris</i>	—	2
<i>Andropadus curvirostris</i>	2	3
<i>Andropadus virens</i>	1	10
<i>Andropadus latirostris</i>	18	73
<i>Megabyas flammulatus</i>	—	1
<i>Dyaphorophya castanea</i>	—	2
<i>Dyaphorophya blissetti</i>	—	3
<i>Trochocercus nigromitratus</i>	—	1
<i>Sheppardia aequatorialis</i>	1	4
<i>Alethe poliocephala</i>	10	12
<i>Camaroptera chloronota</i>	2	4
<i>Prinia bairdii</i>	—	4
<i>Bathmocercus rufus</i>	—	6
<i>Campephaga petiti</i>	1	—
<i>Dryoscopus angolensis</i>	1	—
<i>Poeoptera stuhlmanni</i>	5	—
<i>Zosterops senegalensis</i>	—	1
<i>Nectarinia olivacea</i>	—	1
<i>Symplectes bicolor</i>	—	2
<i>Phormoplectes insignis</i>	—	1
<i>Amblyospiza albifrons</i>	—	2
<i>Spermophaga ruficapilla</i>	2	1
Totals	49	150

Nomenclature generally follows that in Mackworth-Praed and Grant (1957, 1960) except where recent studies indicate necessary change. I have partially followed current practice in uniting certain genera which seem entirely artificial (as in the Nectariniidae). My reasons for deviating in several cases are mentioned in the species accounts. James Chapin's

TABLE 4
TOTAL INDIVIDUALS AND SPECIES RECORDED ON THE CENSUS TRACT

Year	Species	Adults on 20-Acre Tract	Young on 20-Acre Tract	Total Individuals	Total Adults/100 Acres	Total Indiv./100 Acres
1963	92	408	14	422	2040	2110
1965	107	430	49	479	2150	2395
1966	98	485	150	635	2425	3175

TABLE 5
SPECIES AND INDIVIDUALS ON THE CENSUS TRACT,
EXCLUSIVE OF CAPTURED BIRDS AND VISITORS

Year	No. of Species	No. of Territorial Males	Territorial Males per 100 Acres
1963	55	116	580
1965	61	134	640
1966	64	152	740

unrivaled knowledge of African equatorial forest birds, as partially reflected in his "Birds of the Belgian Congo," has served as a foundation for my taxonomic interpretations in cases where current handbook or checklist treatment seems unsatisfactory to me.

This is not primarily a taxonomic paper but in preparing the species accounts I have felt obliged to comment on current classification in many instances. My field work with African birds during the past decade has forced me to conclude that too many of the recent taxonomic changes are the product of specimen tray contemplation guided by very little experience with the birds in life. There is no point whatsoever in instituting changes in established classifica-

tion until good reason exists. Merely revising our interpretation of series of skins every few years is not good enough. Although penned some years ago, Chapin's words (1932, p. 266) on this subject would seem equally timely today: "Hasty 'lumping' under a binomial name, without due consideration of abrupt differences, even if slight, does not mark an advance in knowledge . . . [Important] considerations are ignored when a single specific name is clapped arbitrarily on geographic representatives. Let us study the birds alive as well as dead, let us look for evidence, instead of making premature decisions."

Birds not obviously immature were considered adults for purposes of compiling table 2. Juveniles and immatures are listed separately in table 3. Very few young birds were found in 1963, in part because of limited mist-netting that season; data for that year are omitted. Table 4 summarizes total species and individuals of all age classes. The low 1963 figures (except possibly the species total) almost certainly reflect overlooked individuals and should not be considered as accurate as those for 1965 and 1966. Numerous individual birds appearing adult in the forest are revealed as immatures in the hand; thus figures for young birds are probably uniformly too low excepting those of readily captured undergrowth species.

ANNOTATED LIST OF SPECIES RECORDED ON THE CENSUS TRACT

NONPASSERINES

FAMILY FALCONIDAE

Falco ardosiaceus Bonnaterre and Vieillot

The Gray Kestrel was recorded almost every evening in 1966 near the forest border. Usually a pair was seen flying together, emerging from the forest just east of the census tract. They appeared regularly following disappearance of the sun below the treetops, except on evenings of heavy rain when we did not see them. Shortly after daybreak what I assumed to be the same two birds would reappear, flying into the forest presumably to roost. The pair was seen to enter the census tract woods at 7 AM on June 29. On July 1 a single bird flew into the canopy near the center of the tract about 6:30 AM. Occasionally in the evenings the two kestrels briefly indulged in apparent play over the clearing at which times the bright yellow feet, cere, and orbital skin were conspicuous. The tail-banding was evident when the rectrices of a circling bird were spread. Like *Machaerhamphus*, this crepuscular falcon feeds largely on bats (Williams, 1964, p. 50). The Kakamega birds took wing much earlier than the local bats and doubtless were merely en route to some distant feeding area when we saw them.

I was not able to collect the species and to my knowledge it has never been taken near Kakamega. Several of us were, however, able to observe the birds for a few minutes at a time through 20 by 60 (and other) binoculars on several days, in the morning and in the evening. Observation was sufficient to establish beyond question the identity of the birds; I was familiar with the Gray Kestrel before seeing the individuals at Kakamega.

FAMILY ACCIPITRIDAE

Hieraaetus spilogaster (Bonaparte)

Although seen occasionally over other parts of the Kakamega Forest, the African Hawk-eagle was recorded from the census tract but once: an adult circling just above the canopy on June 29, 1966. Probably it occurred more frequently, for unidentified large raptors were glimpsed several times during all three seasons of the study.

Stephanoaetus coronatus (Linnaeus)

Crowned Eagles were recorded twice in 1965 and three times in 1966. In each instance the bird was seen over the tract, at times between the tallest emergent trees and the main canopy in apparent pursuit of monkeys. The distinctive far-carrying call of this eagle was heard at intervals from points outside the census tract each year. The species is a regular inhabitant of the forest. Tennent (1965, p. 95) recorded an occupied nest in June and July of 1959, and several ornithologists have seen the species there. However, I am not aware that it has been collected at Kakamega.

Lophoaetus occipitalis (Daudin)

Each year that I visited Kakamega a pair of Long-crested Hawk-eagles occupied a territory at the edge of the forest near the rest house. There, above patches of grass and scrubby *Acanthus*, they perched for extensive periods, occasionally dropping to the ground for a rodent. They were seen to enter the forest once in 1965 and four times in 1966. In most instances their temporary presence was occasioned by one hawk-eagle chasing another in and around the forest edge, the pursuit at times taking them into the census tract itself.

Accipiter melanoleucus Smith

The Great Sparrow-hawk was seen in the census tract only on June 20, 1966. Twice, the same or another adult was seen perched in tall trees just outside the study area. B. L. Monroe, Jr., collected an adult (LSUMZ) near this site in June, 1961.

Accipiter tachiro (Daudin)

African Goshawks were not positively identified in 1963, although three times that year undetermined accipiters were glimpsed in the forest on and near the census tract. A perched adult was positively identified once in June, and twice in August, in 1965. That year my wife and I tape-recorded the peculiar aerial calls of one of these birds over the study area. Probably a pair of goshawks inhabited the tract, but I saw only the presumed male. I examined one that

had been shot nearby before our arrival but I have not personally taken the species there. On June 22 and 28, 1966, single adults were seen perched in the census tract and on several other occasions nearby.

Polyboroides typus Smith

A savanna or woodland bird, the Harrier-hawk is not often seen in heavy forest. In 1963 one regularly raided a colony of Vieillot's Black Weavers in a tree some 100 feet from the forest border. It often approached the nest tree from the forest and was seen inside the census tract on June 12, perching quietly on a branch overhanging a footpath. The weavers nested farther from the forest in 1965 and 1966 and *Polyboroides* was then seen only in the more open areas.

Its approach would produce pandemonium among the weavers in the colony. The hawk would extend a long tarsus well into a nest, obviously seeking nestlings, while hanging upside-down with the other foot, flapping its wings wildly to maintain itself in position. I did not see any birds successfully extracted but several attempts were made. Its visits to the colony were brief, perhaps because the eggs of the weavers had not yet hatched. The feeding behavior of this species is very reminiscent of that of *Geranospiza* in the American tropics. Like that bird, *Polyboroides* is exceedingly agile, and at times "grasps" a branch or stub with its wings—as would a primate with its arms—when attempting to extend a foot into a cavity or deep woven nest.

FAMILY PHASIANIDAE

Francolinus squamatus (Cassin)

Unlike their noisy, conspicuous behavior in some parts of Kenya, the Scaly Francolins at Kakamega are exceedingly shy and so quiet that they can be readily overlooked. Persecution by the local human inhabitants doubtless is responsible for their wariness. Although I saw only two birds within the tract each season, there could easily have been more. However, there was nothing to indicate the presence of a flock, and most observations were of two birds together.

I have not collected *F. squamatus* but there are specimens from the Kakamega Forest in the Kenya National Museum. The species ranges

throughout the region wherever there is dense undergrowth adjacent to or within the forest.

FAMILY NUMIDIDAE

Guttera edouardi (Hartlaub)

Crested Guinea-fowl were recorded only in 1965, and as presence of this species is obvious (owing to innumerable feathers, tracks, and dusting sites on forest trails), it is doubtful if they were merely overlooked in other years. Burt L. Monroe, Jr., informed me that he saw the species twice in this area in 1961, and probably it was not uncommon in the forest at one time. Aside from numerous feathers that I picked up I know of no evidence of specimens from the Kakamega Forest. The population there presumably represents the race *sethsmithi* Neumann.

FAMILY RALLIDAE

Sarothrura elegans (A. Smith)

In 1963 I recorded this crane only on July 22 when a female with an enlarged ovary was captured in a mist-net at the edge of the census tract, about 75 feet from a large clearing but within tall forest. On August 7, 1965, I saw a male walking on a dark section of the forest floor where I was crouched, motionless, observing a *Malacocincla*. On noticing me the crane ran swiftly into the vegetation and was not found again. On two evenings in August we heard and tape-recorded the weird, mournful whistle of this species from just within the forest and from the dense rank growth at the forest edge. Another female, with the ovary somewhat enlarged, was collected near the edge of a small clearing within the census tract on June 21, 1966. It weighed 37 grams. Soft part colors of the two females were: feet and bill dark olive-gray, gonys flesh-colored; iris gray.

The Buff-spotted Crane apparently has not been recorded from this forest heretofore, although my finding it each year suggests that it occurs regularly. Jackson (1938, p. 299) and van Someren (1922, p. 22) recorded *Sarothrura rufa* from Kakamega, and van Someren also listed *S. pulchra*. In the Congo, Chapin (1939, p. 22) considered *S. elegans* a bird of second-growth and forest border regions, and this would seem to apply to Kakamega as well. Although we encountered birds within mature forest, they were invariably near or in small

clearings or within a short distance of the forest border itself.

FAMILY COLUMBIDAE

Columba arquatrix Temminck and Knip

The Olive Pigeon is typically a species of montane forests in Kenya, and in the three seasons of this study it was recorded in the Kakamega Forest only between June 21 and June 23, and on August 7, 1965. From three to six birds were seen flying over the tract on each occasion. I have found no record of a specimen having been taken near Kakamega. Because of the very few records of any kind, plus my failure to see the species anywhere in the Kakamega Forest in 1963 and 1966 (when they were common in the Mau and other high forests), I question the statement of Tennent (1965, p. 95) that the species is "always abundant" in the Kakamega Forest. All bird records cited by date in Tennent's paper are for 1959, and it may well have been common that year. Its occurrence in the Kakamega area seems irregular and doubtless is related to the food supply.

Columba delegorguei sharpei (Salvadori)

One pair of Bronze-naped Pigeons inhabited the census tract in 1963 and 1965. In 1966 two pairs were present; from one to four individuals were seen almost daily that year. They did not call very frequently and were easily overlooked when perched silently in the canopy. Usually they were encountered feeding on various fruits in the upper and lower tree layers. A nonbreeding female taken on August 6, 1965, had dark red irides, the bill blue-gray becoming slate at base, and the feet bright pink; its wing measured 175 mm.

Streptopelia semitorquata semitorquata (Ruppell)

In cutover areas near Kakamega the Red-eyed Dove is seen rather frequently, but within the heavy forest it is of casual occurrence. Occasionally one or a group alights in a tall tree to feed or rest. One or two birds were seen twice in 1963, twice in 1965, and three times in 1966. B. L. Monroe, Jr., secured a specimen (LSUMZ) here in June, 1961; R. E. Mumford collected another (Purdue University) near my census tract in July, 1963.

Turtur tympanistria fraseri (Bonaparte)

Tambourine Doves were seen or heard almost daily in the census tract (except in June, 1963 when most pigeons and doves were absent). If not encountered within the confines of the study area, the species was usually found nearby. Usually a pair could be seen in its particular part of the forest where it spent much time feeding along the trails. Adult males collected in the forest in late July and early August were not in breeding condition.

Turtur afer (Linnaeus)

A pair of Blue-spotted Wood Doves regularly inhabited the tract in July, 1963, and again in 1965. The birds spent only a part of each day in the forest, flying in from the edge where they were encountered more regularly. In spite of new clearings and wider trails in the census tract in 1966, I saw wood doves only three times, yet a pair occupied its usual territory not far away at the forest edge.

Aplopelia larvata larvata (Temminck and Knip)

The Lemon Dove was rare in the part of the forest in which the census tract was situated. It was seen on 25 percent of the census days in 1963, on 16 percent in 1965, and only once (5 percent of the days) in 1966. This dove was reported from Kakamega by van Someren (1922, p. 35) and by Tennent (1965, p. 96). The latter considered it common "in cut-over forest and drier parts of the primary forest."

Treron australis granviki (Grote)

Although Green Pigeons were common in the census tract and elsewhere in the forest during July and August, 1963, they were otherwise rare. I recorded only three birds (August 5 and 10) in 1965, and none in 1966. Tennent (1965) did not list the species, and A. D. Forbes-Watson, who has enjoyed considerable field experience at Kakamega, informed me in 1966 that he had never seen Green Pigeons there. Monroe, however, found them common in June, 1961, and secured one specimen (LSUMZ). Two years later I found none in June, despite their abundance after mid-July. It is doubtful that they breed in the Kakamega Forest which they probably visit irregularly after their nesting season in the higher altitude forests. A male that I collected July 20, 1963, had very small testes. Birds

seen that year were in groups of two to 10 individuals, were almost silent, and exhibited no evidence of courtship or breeding behavior.

FAMILY CUCULIDAE

Cuculus solitarius Stephens

I recorded the Red-chested Cuckoo only on August 9, 1965, and June 25, 1966; a non-breeding female (weight 71 grams) was collected on the latter date. The voice of this species, a characteristic sound in much of Kenya, was very rarely heard in the Kakamega Forest during my visits.

Cuculus clamosus Latham

I did not encounter the Black Cuckoo in 1963, but listed it on 21 percent of the census days in 1965, and on 42 percent in 1966. The increased frequency of observation in the last years may reflect the greater amount of opening of the forest but more likely reflects fluctuation in numbers from one year to another. Nevertheless, this cuckoo is not a bird of heavy primary forest, and where the canopy is continuous at Kakamega I have neither seen nor heard it.

Chrysococcyx cupreus (Shaw)

In 1963 a singing male Emerald Cuckoo was in evidence daily during June, but I neither saw nor heard the species again until August 1 when I collected a female. In 1965 the song period of the single male on the census tract continued through June, but in 10 census days during August I saw only one. When silent this cuckoo is easily missed. One pair inhabited the tract in 1966, but there was less singing than in earlier years, even during June. A singing male was observed on July 1, but birds seen after that were silent. Normally a bird of the lower part of the canopy, these cuckoos fed at times in the understory trees. Twice I saw them as apparent members of one of the mixed-bird parties that moved through the tract.

The female specimen secured is strongly suffused with yellow from throat to crissum. Its eye ring and base of the mandible were pale jade green, with the remainder of the bill black; its feet were bright blue above, the toes dull olive beneath. The race represented is presumably *intermedius* Hartlaub.

Chrysococcyx caprius Boddaert

Single Didric Cuckoos were seen twice in 1965 and once in 1966. These birds briefly visited small clearings within the census tract. The species was frequently seen and heard outside of the forest.

Chrysococcyx klaas (Stephens)

Klaas' Cuckoo is regularly seen and heard in the Kakamega region, usually at the forest border where very tall trees are adjacent to cleared areas. At times they enter the forest, and a singing bird was recorded almost daily in 1963 in the census tract. Although I noted this species there only four times in 1965 and twice in 1966, it was present along the forest border almost daily during my visits in those years. Tennent (1965, p. 96) referred to both *C. cupreus* and *C. klaas* as "common," but although widespread and readily noticed because of their distinctive voices, these cuckoos are not actually numerous.

Ceuthmochares aereus australis Sharpe

Although easily overlooked when not uttering its shrill hawklike cry, the Yellow-bill appeared to be regularly present in the census tract. I saw it on one-third of the census days in 1963 and 1966. In 1965 when a calling bird (apparently on territory) was heard frequently, I recorded the species on 58 percent of the census days. Its favored haunts were the dense tangles of creepers ascending into the tall trees, but when in pursuit of caterpillars it entered rather open areas and remained exposed for many minutes at a time.

Several Kakamega Forest specimens in the Kenya National Museum represent this race.

FAMILY MUSOPHAGIDAE

Tauraco schuttii emini Reichenow

The Black-billed Turaco was recorded in the census tract once: two birds on August 9, 1965. These individuals were moving through the forest rather rapidly, having entered my study area from the block of timber south of the Forest Station clearing. This is the common green turaco of the Kakamega-Nandi region and may be seen in numerous places within the forest although it appears to be somewhat local. Specimens are reported upon by van Someren (1922, p. 49). Tennent (1965, p. 96) gave a sight record of Hartlaub's Turaco (*T. hartlaubi*) from the

Kakamega Forest but failed to mention the regularly occurring *T. schuttii*. I have seen Hartlaub's Turaco in the higher part of the forest below the Nandi Escarpment only a few miles away. This species frequently wanders to lower elevations and doubtless visits the Kakamega Forest at intervals. However, it has not yet been taken there.

Moreau (1958, p. 92) treated *T. schuttii* and others as members of a polytypic species, *T. corythaix*, but he admitted the "almost complete absence of transitional specimens." As the differences between the forms I know are rather striking, and in the absence of intermediate populations, I prefer to follow the alternative stated by Moreau and consider these birds as members of a superspecies of five allopatric species.

Corythaola cristata (Vieillot)

The Great Blue Turaco, once quite numerous about the Forest Station and in the area of my census tract at Kakamega, is now declining in numbers as large birds are being more and more pursued by gunners. Unfortunately, the big turacos are excellent eating. And owing to their spectacular plumage and often unwary nature, not a few are shot for no worthwhile purpose, as is attested by the crudely mounted individuals appearing in Nairobi curio shops. In 1963 I recorded the species daily in my census tract. Five to seven individuals roosted there nightly and one pair behaved as if nesting was in progress. In 1965 I recorded the species only five times, and in each case only a single bird. The following year one was seen in the tract on June 18 but not again anywhere in the entire area. Some of the blame for the apparent decrease may rest with collectors who visit Kakamega with increasing frequency. *Corythaola* utilizes, but does not require, heavy forest and can survive indefinitely where isolated forest trees remain in rather extensively cleared areas. With protection it loses all fear and nests in isolated trees among occupied dwellings, but without enforced protection from shooting the Kakamega population could easily disappear.

My failure to employ a trinomial does not necessarily imply that I do not recognize *C. c. yalensis* Mearns, but the single near-topotype at hand (adult male, August 6, 1965) shows no green tinge above. Moreau (1958, p. 83) commented on the general lack of geographic vari-

ation in the species and seemed inclined not to recognize *yalensis*.

FAMILY PSITTACIDAE

Psittacus erithacus Linnaeus

Gray Parrots were rarely seen in the vicinity of the census tract where I had records of pairs flying over on August 6, 1965, and July 1, 1966. Nearer Kaimosi they were more regular and could be seen over the forest each morning and evening. Van Someren (1922, p. 46) recorded specimens from Nyarondo, some 20 miles east of Kisumu, and he also (1916, p. 226) reported the species from Mumias, about 18 miles west of Kakamega.

FAMILY MEROPIDAE

Merops lafresnayii oreobates (Sharpe)

Locally near the forest edge, in second growth, and in artificially opened forest the Cinnamon-chested Bee-eater is fairly common. Within the mature forest, it occurs only casually. On the census tract I recorded it three times in 1963 but not at all in the other years. In the forest clearings its niche is usually filled by the following species.

Merops mulleri (Cassin)

The Blue-headed Bee-eater is a bird of small forest openings and trailsides, usually seen perched 40 to 80 feet above ground silhouetted in the dead branches of a tall tree from which it sallies forth after flying insects. Under these conditions it appears almost black, but its posture, long bill, and habit of twitching the tail readily identify it. Stuart Keith told me that it nests in the sides of old logging pits near some of the trails in the Kakamega Forest. I found no evidence of breeding during my visits. These bee-eaters were not in the tract in 1963 (when *M. l. oreobates* was seen occasionally). In 1965 two pairs were present but only rarely did I record all four individuals in one day because of the movement of the birds in and out of the tract. The single pair present in 1966 was seen only three times. Outside of the census tract I often encountered one or two bee-eaters, very likely those that visited my study area, and I suspected that the territory of a pair covered as much as 40 or 50 acres.

My single specimen, taken March 15, 1963, by J. G. Williams was not in breeding condition; it weighed 25 grams.

FAMILY BUCEROTIDAE

Bycanistes subcylindricus subquadratus Cabanis

Formerly one of the most conspicuous and characteristic birds of the Kakamega Forest, the Black-and-white Casqued Hornbill has shown an apparent decline in numbers since 1963. That year it was numerous. Its loud braying notes were heard almost throughout the day, and from two to 19 individuals were seen in the tract daily, the number reaching 32 on August 1. Usually six to 10 could be found at any time of day, feeding on figs or olives somewhere in the forest. At dusk, with much raucous calling and a great "whooshing" of wings, the birds from the tract joined other groups—a dozen or more birds—in flying across the clearings to roost in a plantation of 200-foot *Eucalyptus* trees a half-mile away.

In 1965 the hornbills were less abundant, but common enough to be seen daily although on June 16 and 17 I saw none in the study area itself. From two to five were normally present, with a maximum of 14 on June 20. In 1966 they were seen on all but three days, but usually only one or two individuals; the maximum was five in early July.

An adult male (wing 350 mm.) taken October 11, 1959, by Norman Mitton, was near breeding condition. The label records that it had been feeding on figs.

Tockus alboterminatus geloensis (Neumann)

Single Crowned Hornbills were seen to enter the forest tract from the rest house clearing on June 22, 1965, and July 6, 1966 (J. W. Boettcher, Allan Zimmerman). The species was not seen regularly in the vicinity. A nonbreeding male (WNMU) taken near the forest by A. N. Start on August 6, 1965, clearly represents this dark race. In color it is indistinguishable from Mau Forest birds collected near Molo; the wing measures 275 mm., the tail 240 mm.

FAMILY PHOENICULIDAE

Phoeniculus bollei jacksoni (Sharpe)

Pairs or small groups of White-headed Woodhoopoes are met with in the Kakamega Forest at

rather frequent intervals but the species is not common there. In 1963 I saw it in my study area on one-third of the census days; in both 1965 and 1966 on 22 percent. Only once was it recorded in the tract on two consecutive days. Never were more than five individuals seen together, and they seldom remained in the tract for more than an hour or two, moving restlessly on to another part of the forest. Occasionally they would appear with a mixed bird party, but normally they were by themselves.

A male and female collected August 9, 1965, were not in breeding condition. The former has considerably less white on the forecrown and postocular area than a male from the Mau Forest near Molo, but otherwise it appears identical.

FAMILY STRIGIDAE

Ciccaba woodfordii (Smith)

During each field season a pair of African Wood Owls was present in or adjacent to the study tract. I saw them only a few times but their voices were a nightly feature except during heavy rains. They called both from the clearings and the heavy forest, and occasionally one or both birds would visit trees in the rest house yard.

Burt L. Monroe, Jr., collected two specimens in the Kakamega Forest in June, 1961. I have not compared these with birds from other Kenya localities and therefore hesitate to employ a trinomial.

Glaucidium tephronotum Sharpe

Mackworth-Praed and Grant (1957, p. 655) recorded this rare species from only Mt. Elgon, the type locality of *G. t. elgonense* Granvik. Keith and Twomey (1968, p. 540) reported three other specimens (1960, 1966) from western Uganda forests. On my census tract in the Kakamega Forest I collected a nonbreeding female July 2, 1966. It was captured 3 feet above ground in a mist-net placed in heavy forest. At this site the following evening I saw another apparently pursuing an insect in foliage about 30 feet above ground. The white tail spots and those beneath the wings were conspicuous in the beam of my headlamp; the bird appeared very light-colored from below. Chapin (1939, p. 396), referring to an individual of *G. t. medje* that he saw in flight and perched, remarked, "Until I picked it up I

thought I had seen a small *Accipiter*." This was precisely my thought for an instant on first seeing our captured bird. It certainly seemed less owl-like in general appearance than *G. perlatus*, and exhibited a remarkable superficial resemblance to an immature male Little Sparrow-hawk (*Accipiter minullus*) with which it was identical in size.

The wing of this specimen measures 118 mm., the tail 86.5 mm.—9 and 4½ mm. shorter, respectively, than measurements given by Chapin (*loc. cit.*) for the type of *elgonense*. The Kakamega specimen weighed 100 grams. Its iris was bright yellow, the feet orange, and the claws dusky except basally. It had eaten three brown scarab beetles, each 1 inch long. It has only a small amount of rufous at the sides of the chest, being essentially white beneath with blackish spots. The crown is decidedly gray, apparently more like nominate *tephronotum* than the type of *elgonense*. The latter form, say Mackworth-Praed and Grant (1957, p. 655) "has the whole upperside uniform dark umber brown, with a white collar on hind neck." Our bird further differs from *elgonense* in having merely a small concealed patch of white in the middle of the nape, widely separated from a few similar white feathers below and behind the auricular region.

Stuart Keith has kindly compared the Kakamega bird with others of this species at the American Museum, including the types of *medje* and *lukolelae*. As there is some doubt concerning the validity of the latter it seems best to tentatively refer the Kakamega specimen to *medje*. Keith (*in litt.*) considers our specimen "certainly assignable" to that form. *Glaucidium tephronotum* exhibits considerable individual variation, and this combined with its present scarcity in collections renders subspecific determinations difficult. It is not unlikely that western Kenya birds are referable to *medje* from the Ituri Forest, but it also seems probable that the same form occurs on Mt. Elgon.

I have been informed by Peter Britton of another Red-chested Owlet mist-netted by him on my study area on February 2, 1969, and banded with ring number C1205. Its wing measured 116 mm. and it weighed 88 grams.

FAMILY CAPRIMULGIDAE

Caprimulgus natalensis Smith

At 5 AM on June 27, and on the night of July 2, 1966, a nightjar was heard calling from trails

or small openings in the forest. We recorded its voice on tape, on which the identification is based; we did not see the bird. Chapin (1939, p. 415) recorded *C. natalensis chadensis* from Kakamega.

FAMILY TROGONIDAE

Apaloderma vittatum (Shelley)

We recorded singing male Bar-tailed Trogons in the tract once in 1963 and once in 1965. During the latter year, one could be heard singing at times from some distance outside of the study area. In 1966 a male sang repeatedly from the center of the tract from June 18 through June 23, was not seen or heard for the next nine days, and reappeared, singing loudly, on July 3, July 5, and July 6. Tennent (1965, p. 96) considered *Apaloderma narina* common in the Kakamega Forest, especially in "enrichment glades." I have never seen Narina's Trogon in the vicinity of the census tract or in the adjacent primary forest, although A. D. Forbes-Watson found it there once. Perhaps it prefers lighter forest than, or cannot compete with, the Bar-tailed Trogon.

FAMILY CAPITONIDAE

Gymnobucco bonapartei cinereiceps Sharpe

One pair of Gray-throated Barbets resided in the tract each season. They were seen daily either on the study area or nearby usually well above ground on branches of tall, dead trees. A breeding female banded in 1965 was the only one captured alive, and this was in a net raised to a height of about 25 feet at the edge of the tract. This barbet and her mate were bothered greatly by one or more Least Honey-guides (*Indicator exilis*) about the nest tree, and I saw a honey-guide enter the barbet's nest cavity on one occasion. Despite the excitement induced by the presence of an *Indicator* the barbets were not seen to chase their potential parasites. In more disturbed parts of the forest with larger clearings and more dead trees I commonly noted groups of six or more of these barbets together, but in the study area they were much less common. One unsexed specimen was collected June 13, 1963. Kakamega birds are, as van Someren (1922, p. 57) indicated, typical *cinereiceps*.

Buccanodon duchaillui duchaillui (Cassin)

The Yellow-spotted Barbet is, at times, a fairly common bird in the Kakamega Forest.

When fig trees are fruiting several of these barbets can be seen together, although except at such concentration points they remain high in the canopy and are rather difficult to detect. Their distinctive purring or snoring note, frequently uttered, is a more reliable index of abundance than actual sightings. In 1963 and 1965 I saw one to three birds daily, and groups of five adults on June 17 (1963) and June 23 (1965). There appeared to be three territorial males in the latter year—unless the female also calls. Chapin (1939, p. 508) noted that a young female, as well as young males, uttered this call in captivity. On June 15, 1963, three birds were seen to enter a hole in a large branch about 100 feet high. However, three June specimens of both sexes and an early August male showed no indication of breeding. In 1966 the species was not recorded on over a third of the census days, and no more than two were known to enter the tract, compared to eight known individuals in 1963. The species occasionally joined mixed-bird parties. Two males weighed 43 and 45 grams, a female 40 grams. These and several other Kakamega specimens examined show considerable variation in the amount of dorsal yellow spotting and the degree of iridescence of the blue-black plumage.

Chapin (1939, pp. 507–508) pointed out that this species has a larger hind toe and a naked oil gland, unlike *Pogoniulus*. The very different voices, too, suggest that *duchailui* and the tinker-birds should not be considered congeneric without further study.

Pogoniulus bilineatus jacksoni (Sharpe)

The Golden-rumped Tinker-bird was one of the few species recorded almost daily each season in the census tract. On those rare occasions when it was missed within the study plot the birds were seen or heard nearby. Three pairs inhabited the tract in 1963. The males sang regularly and were occasionally seen with their apparent mates. In 1965 five singing birds were present, and as most if not all of these seemed to associate with silent individuals I estimated that five pairs were present. One was seen excavating in a dead stub by one of the trails, June 22. Only two pairs were present in 1966.

A male taken July 19, 1963, was near breeding condition; another collected on July 30 had small testes. Both were singing when collected. One male and one female each weighed 15 grams.

Trachylaemus purpuratus elgonensis (Sharpe)

The colorful Yellow-billed Barbet is not often seen except in trees, yet I have captured three barely above the ground in mist-nets. Mackworth-Praed and Grant (1957, p. 737) stated that it is mostly seen in "flocks of six to ten in tops of tall fig trees, feeding on the fruits." I have seen no such concentrations at Kakamega where *Pogoniulus bilineatus* and especially *Buccanodon duchailui* congregate in fruiting fig trees, even those well outside the forest. I have never seen more than two *Trachylaemus* individuals together, but its numbers and occurrence in any one place fluctuate considerably from year to year (and doubtless seasonally as well). In my study tract I saw them every day but one in 1963, on 20 percent of the census days in 1965, and half of the days in 1966. Although Mackworth-Praed and Grant (*loc. cit.*) and Tennent (1965, p. 97) termed it "common," both B. L. Monroe, Jr. (*in litt.*) and I considered it uncommon in the Kakamega Forest and in other western Kenya forests. Two males (June 13, July 30) and a female (June 14) were not in breeding condition. One male weighed 76 grams, the female 67.

I cannot follow the recent practice of merging *Trachylaemus* with *Trachyphonus*. Aside from the "toothed" maxilla, large bare orbital space, numerous plumage differences (unspotted pattern, lack of crest, and stiffened throat feathers) of the former, the voice is exceedingly different from those of the dry country *Trachyphonus* species.

FAMILY INDICATORIDAE

Indicator variegatus Lesson

A male Scaly-throated Honey-guide was collected in the tract August 7, 1965. As it is essentially a species of woodland and gallery forest its rarity in true forest is not surprising.

Indicator conirostris conirostris (Cassin)

I recorded Thick-billed Honey-guides in the study tract once each in 1963 and 1965, and three times in 1966. I also encountered it at intervals in other parts of the Kakamega Forest where it is uncommon but of regular occurrence. I have not taken it there but there are specimens from this forest in the Kenya National Museum. I have examined another taken at Kakamega by Monroe in June, 1961 (LSUMZ), and Chapin

(1939, p. 545) cited three specimens of *conirostris* from this locality.

Although Friedmann (1955, p. 179; 1966, p. 27) maintained *conirostris* as a race of *I. minor* their apparent sympatry at Kakamega would argue to the contrary. The former is a forest bird, the latter one of woodland or secondary forest edge. Under the name *I. minor teitensis* (now treated as synonymous with nominate *minor*), van Someren (1922, p. 54) referred to specimens from Kakamega, presumably the basis of the reference in Jackson (1938, p. 735). Although I have seen *conirostris* regularly at Kakamega I have never heard it call. *Indicator minor*, wherever I have found it, is characteristically vocal, the loud and persistent "peew" or "kleeu" notes commanding attention. Interestingly, Friedmann (1955, p. 182) mentioned the apparent silence of *conirostris*, referring to Bates, Chapin and Marchant in this connection. In 1965 in scrubby woodland a half-mile from the census tract, I heard notes like those of *I. minor* but I did not see the bird until it flew. Ripley and Heinrich (1966a, p. 10) commented on the ecological separation of *conirostris* and *minor* and considered them specifically distinct, following Mackworth-Praed and Grant (1957). This seems the more reasonable interpretation in view of our present limited knowledge of the birds.

Indicator exilis pachyrhynchus (Heuglin)

The Least Honey-guide is the most common member of its family in the Kakamega Forest. The birds are all but silent and seem to be constantly on the move, remaining in one spot for only a few moments. Thus encounters with them are a matter of chance unless one patiently waits near a bees' nest where sooner or later one will appear. I was certain only of single birds in the tract in 1963 and 1966, but at least four were present (and collected) in 1965. Several others had been taken not far from the census tract by Forbes-Watson prior to my arrival in 1965, indicating a sizable population that year. Quite possibly the collecting of at least seven that season was responsible for the recording of but a single individual (and this seen but once) during 1966.

The stomachs of all specimens contained beeswax and insects. As this species does not "guide" humans to bees' nests, Chapin (1939, p. 540) suspected *I. exilis* of "having some other

mammalian ally" to lead it. In the Kakamega Forest I have seen these birds perhaps 20 times, and those I have followed made a practice of investigating every hollow branch or tree cavity they encountered. We were able to bait them to cavities which formerly held bees' nests by placing honeycomb therein. Certain individuals seemed to cover at least parts of their route more than once, and probably regularly, returning after intervals of several days. This is assumption as the birds were not marked. However, one individual whose rectrices were damaged by my unsuccessful shot was captured three days later in a mist-net erected near the honeycomb-filled tree cavity where I originally saw it. The activity of bees obviously is not necessary to indicate presence of honeycomb to these birds, at least after they have once associated a given cavity with food. Very likely they watch for bees, but I also believe that their restless wanderings through the forest, covering considerable territory in a single day during which they could examine many potentially productive tree cavities, allows them to discover bees' nests without the aid of any vertebrate animal.

I suspected this honey-guide of parasitizing *Pogoniulus bilineatus*, for twice it was seen entering holes excavated by these barbets. Friedmann (1955, pp. 225, 227) mentioned that the single definite host record of *I. exilis* involved the Golden-rumped Tinker-bird on Mt. Elgon, but apparently the form was *meliphilus* which may not be conspecific with *exilis* (see below). At Kakamega Least Honey-guides several times disturbed and obviously alarmed pairs of *Gymnobucco bonapartei* in their nest tree, so this barbet probably is also a host.

A short, dry rattle or trill is the only sound I have heard from *I. exilis*, once as a bird flew into a tree just prior to alighting by a bees' nest, and once from a captive bird just extracted from a net and being held for photography. Chapin (1939, p. 540) heard a similar sound from *I. e. exilis* in the Congo. *Indicator meliphilus*, a pale form of generally drier country, apparently has a similar call. This bird may bear the same ecological relationship to *exilis* (including *pachyrhynchus*) that *minor* bears to *conirostris*. Friedmann (1955, pp. 225, 227) cited a breeding record of *meliphilus* from Mt. Elgon (whose forest avifauna is much like that of Kakamega and where I think *pachyrhynchus* will be found). In the same publication (p. 224) Friedmann pointed out

"the possibility of *meliphilus* being a species and not a race of *exilis*," and he recently (1968, p. 5) concluded that the specific distinctness of the two "has to be granted."

Birds collected at Kakamega in June, July, and August showed no signs of breeding. A female collected by Forbes-Watson in March had recently bred, however. This specimen stands out from all other Kakamega *exilis* I have examined in being gray below, not olive, with a grayer head, and an all-black bill, and "blackish" feet. Its measurements fit those of *exilis*, although both its plumage and soft-part coloration appear rather different; it weighed 18 grams. The wings of two females measure 70 and 70.5 mm., the tails 43 and 45 mm.; two males have wings of 78 and 79 mm., and tails 48 and 52.5 mm. One female weighed 17 grams, a male 16 grams.

Indicator pumilio Chapin

On June 25, 1966, a very small dark-colored honey-guide believed to represent this recently described species (Chapin, 1958) alighted beside me on a dead tree along a trail in the census tract. It was near enough for me to readily discern the minute, stubby bill and the diffuse ventral streaking with the naked eye. I was soon able to examine it with the binocular (at the minimum focusing distance of the instrument—about 7 feet) but the bird was too near to shoot. Backing off a minute later I startled the bird which flew to a tall dead stub some 30 feet away and disappeared into a small cavity. Some minutes later it flew out with such speed that I did not react rapidly enough to fire. It sped directly through the trees and out of sight in the heavy forest. Continued search and much waiting over the next 10 days failed to provide another opportunity.

Two weeks earlier in Nairobi I had examined a specimen of *I. pumilio* taken in western Uganda by J. G. Williams, and its image was fresh in my mind. Williams and Friedmann (1965) reported a specimen of *pumilio* from Kakamega and that bird was referred to again by Friedmann (1968). It evidently lacks the ventral streaks characteristic of more western examples of *pumilio*, prompting these authors to consider the possibility that the Kakamega population was racially distinct. The individual I saw in life was noticeably streaked below. More recently, Friedmann and Williams (1968,

p. 19) reported an unstreaked specimen from Bwamba and remarked that there is noticeable individual variation within the species.

Surprisingly, in view of the *pumilio* example from Kakamega mentioned in the papers cited above, Kakamega is not one of the eight African localities listed by Friedmann (1968, p. 8) where two or more of the similar small *Indicator* species occur together. Of the forms considered by Friedmann in his recent paper, *pumilio*, *exilis*, and *conirostris* all exist sympatrically in the Kakamega Forest.

FAMILY PICIDAE

To one familiar with Neotropical woodlands the scarcity of woodpeckers in the great forests of East Africa comes as a surprise. This has repeatedly impressed me in Kenya and Uganda. Meinertzhagen (1937, p. 745) commented on their scarcity in Kenya forests, and Chapin (1939, p. 573) mentioned traveling afoot along a Congo forest road for 10 days before seeing his first woodpecker. In my initial two weeks of intensive field work in the Kakamega Forest I saw but three: one *Campethera nivosus* and two *C. caroli*, all of which were snared in mist-nets and which might well have been overlooked otherwise. Owen (1966, p. 20) has commented on this scarcity of woodpeckers, wondering if they are replaced to some extent by predatory insects. In the Kakamega Forest, at least, we need not look to arthropods in this connection, for the bark-gleaning niches customarily occupied elsewhere by members of the Picidae are here at least partially filled by various other birds. *Phoeniculus bollei* is one of these; the rest are passerine. Several bulbuls occasionally grasp rough bark in their search for invertebrates, but *Arizelocichla masukuensis kakamegae* does so habitually. *Parus funereus* and the sunbirds do not neglect tree trunks in their busy feeding; *Nectarinia olivacea* quite often forages on rough or bryophyte-covered trunks. Three weavers of the Kakamega Forest—*Malimbus*, *Phormoplectes*, and *Melanoploceus*—also engage in nuthatch-like foraging on the boles and great branches of forest trees.

Campethera caroli budongoensis van Someren

The Brown-eared Woodpecker is not a bird of the treetops but spends most of its time within 30 feet of the ground. Thus it is often hidden by

a screen of foliage, and, as it is disinclined to peck vigorously much of the time, it is easily overlooked. Twice I saw individuals fly through the forest within 2 to 3 feet of the ground, and those captured were no higher than this in the nets. When it calls (very infrequently) it immediately attracts attention with a unique, three-noted slurred call which I unfortunately failed to transcribe. Two birds collected in June were in nonbreeding condition; the male weighed 65 grams, the female 56.

Campethera nivosa herberti (Alexander)

The Buff-spotted Woodpecker is another quiet species that keeps to the lower strata. In the census tract and surrounding forest it is almost as common as *C. caroli* but is more likely to be overlooked. Both species feed largely on ants gleaned from trees. *Campethera nivosa* forages among saplings and thin vines but at times works along the large branches of tall trees. I have seen one nearly 60 feet above the ground but that is exceptional.

Two males taken in June had slightly enlarged gonads. Their wings measured 85 and 91 mm.; an August male measured 86.5 mm. The wing of a female I secured in the Budongo Forest of western Uganda measured 85 mm., and Friedmann (1966, p. 27) found that several Uganda birds had wings ranging from 81 to 91 mm. in males, 81 to 86 mm. in females, thus casting doubt on the validity of *yalensis* from the Kakamega region, a race supposedly characterized only by its larger size (wing 87 to 92 mm.).

Dendropicos fuscescens lepidus (Cabanis and Heine)

I did not record the Cardinal Woodpecker in 1963 from within my census tract. I saw it twice in 1965 and five times in 1966. Apparently not feeding on ants and working high as well as low on the trees, it competes little if at all with the two *Campethera* species. It is regularly encountered in more open parts of the forest, and as pointed out by van Someren (1939), *lepidus* is a true forest bird from Nairobi and Kiambu north and west to the vicinity of Elgon. Three Kakamega specimens examined are typical of this virtually plain-backed race.

Mesopicos xantholophus (Hargitt)

The large Yellow-crested Woodpecker is widely distributed in the Kakamega Forest but

is by no means a common bird. None was known to visit the census tract in 1963; one pair resided there in 1965, and two pairs the following year. One of the latter began excavating a nest hole 10 feet above ground in a tall, topless dead tree in a small forest clearing on June 25, one day after I first noted the birds in the area. They worked in the mornings, not very industriously, at least through July 1 after which I no longer recorded the species. Woodpecker drumming heard in the Kakamega Forest can usually be attributed to this bird. *Dendropicos* may drum, but one's attention is usually drawn to it by its *Dendrocopos*-like rattle. The Yellow-crested Woodpecker is a bird of large forest trees, working the trunks and great branches usually at some height. Thus it may avoid competition with the low-foraging *Campethera* species and with *Dendropicos f. lepidus* which confines itself in the main to smaller growth in the middle level of the forest, primarily about the clearings.

FAMILY APODIDAE

Apus barbatus (Sclater)

In 1965, groups of two and three swifts appeared over the census tract on August 7 and 8. Although they were not far above the trees, collecting was impossible. The birds were studied for some time, through binoculars both in the morning and afternoon. They seemed identical in flight and pattern to *A. barbatus*, which I studied intensively and collected that season in the Mau Forest. Had I not become very familiar with *barbatus*, seeing them daily for several weeks, shooting them, and capturing them in mist-nets at their roosts, I would hesitate to assign the Kakamega swifts to that species. In addition to seeing them over the census tract I several times noted them over forest glades a few miles away. The identification must be considered tentative, however, for I have failed to locate any specimens of this (or similar) species taken in the area.

Apus myoptilus (Salvadori)

The Scarce Swift surely is not so rare as the paucity of specimens would indicate, but it seems to be decidedly local. My only record at Kakamega is of eight birds over the census tract and adjacent forest for 30 minutes or more on June 16, 1963. None was collected, but it is so

distinctive with its rapid flight and pointed tail (like that of *Hirundo rustica*, both when closed—the normal position—and when spread) that field identification is not difficult. The only similar species would seem to be *A. batesi*, which has been taken in the Semliki Valley. According to Chapin (1939, p. 454), it too has rapid wingbeats and a rather long tail “usually held closed so that the fork is not apparent.” But *batesi* is a darker bird, with a dark throat (not truly pale as in *myoptilus*) and, to judge from Bannerman’s (1953) illustration, with a differently shaped tail.

Elsewhere, I have seen *A. myoptilus* only near Nanyuki, Kenya, where at times it flies in small numbers with other swifts. There are so few available specimens that it is worth recording a male (WNMU) with rather large testes collected for me at Nanyuki on December 16, 1965 by R. D. Seed. Its wing measures 125 mm., slightly shorter than the minimum recorded in the literature.

Apus aequatorialis (von Müller)

This species has not been collected in the Kakamega area but the very large swifts occasionally seen over the forest and meadows, in company with the presumed *A. barbatus* and *Chaetura sabini*, can hardly be anything else. One was seen over the census tract August 9, 1965, and independently identified as *aequatorialis* by A. N. Start and myself.

Chaetura sabini ogowensis Newmann

Apparently first seen near Kakamega by Tennent (1965, p. 97) in 1959, Sabine’s Spinetail was collected by Monroe and others in 1961. During June, 1965, I saw the species twice in the area where specimens (LSUMZ, KNM) were obtained, about 1 mile from the census tract, and again over the tract itself on June 18. They were seen only at intervals between afternoon thunderstorms and again near sunset. Their slow, somewhat butterfly-like flight would permit identification long before the distinctive plumage pattern could be seen.

PASSERINES

FAMILY EURYLAIMIDAE

Smithornis capensis meinertzhageni van Someren

I recorded single African Broadbills in the census tract from two to four times each season.

The birds displayed no territoriality and were generally silent. I heard the characteristic “Klaxon horn” sound only twice (June 11, 1963; June 20, 1966), suggesting that the display season was largely over by the time I arrived for field work in the forest. A nonbreeding male taken August 9, 1965, a mile or more from the census area, is in fresh plumage with rectrices bearing traces of the sheaths at their bases; the wing measures 71 mm. Chapin (1953, p. 15) and White (1961, p. 4) both recognized *meinertzhageni*. For the reasons given by the latter I prefer to follow this course rather than assign the west Kenya birds to *medianus*.

FAMILY TIMALIIDAE

Malacocincla fulvescens ugandae (van Someren)

The Brown Thrush-babbler, or Illadopsis, was absent or overlooked in 1963 when I did not know its song. In 1965 three adults and two immatures appeared on the tract in August (none, apparently, having been there in June). One of these immatures was banded. In 1966 when the species was recorded almost daily, there were at least seven residing on the tract: two pairs regularly heard (and eventually captured and marked), an adult and an immature female collected, and the bird banded as an immature on the tract in 1965, which, in 1966, was in typical adult plumage.

Malacocincla fulvescens responded more frequently than other thrush-babblers to “squeaking” although I seldom lured them into full view this way. Playback of their tape-recorded voices, however, greatly disturbed them and once enabled me to capture a singing pair by placing the recorder by a mist-net set for this purpose. Unlike other species of *Malacocincla* at Kakamega, *fulvescens* ascends well into the shrubbery and sings from perches 8 or 10 feet above ground.

The commonest species of its genus in the lowland Congo forests, *M. fulvescens* seems not to extend above 5000 feet (Chapin, 1953, p. 210). It may, therefore, be at the limit of its altitudinal range in the Kakamega Forest, which might explain its apparent fluctuation in numbers there from year to year. It is invariably less numerous at Kakamega than *M. albipectus* and *M. rufipennis*, but more numerous than *M. pyrrhoptera*. Deignan (1964) does not include Kenya in the range of this species but it has been recorded from the Kakamega region by both

van Someren (1922) and by Chapin (1953, p. 210).

To Chapin's meaningful description of the song I can add that both sexes sometimes sing antiphonally. Shortly after dawn one morning I recorded the varied vocalizations of a pair, the male on one side of a trail, the female on the other. One bird uttered the (usually) double-whistled note which was quickly followed by a "twangy" nasal *chwaa* from the other individual. Each bird flew across the trail above the tape recorder several times before I could capture them, making it impossible to determine which sex was responsible for the different notes.

Four adults taken between July 19 and August 8 showed little or no gonadal enlargement, but a female (UMMZ) collected here April 19, 1966, had a large ovary. An adult-plumaged male with light bill taken August 8, 1965, had an unossified skull. A full-tailed juvenal female (June 19, 1966), also with unossified skull, had the iris dull brown (not bright brown or orange-brown as in adults), the bill brown with base of the mandible paler (black above, pale blue-gray below in adults), and the feet dull maroon (purplish gray in adults). The juvenile weighed 24 grams, an adult female 25 grams.

Malacocincla rufipennis rufipennis (Sharpe)
and *M. albipectus barakae* (Jackson)

I prefer to discuss these two species together, for although Chapin (1953, p. 217) commented in some detail on the differences between them, sufficient confusion remains to permit misidentification of living birds in the hand and museum specimens as well. Morphologically, *rufipennis* and *albipectus* seem most distinct in western Kenya, and skins from there can often be distinguished at a glance. Chapin (*loc. cit.*) wrote that scaly chest-feather edges in *T. albipectus* appeared most pronounced in the Kakamega District, and a dozen specimens and all living birds I have examined confirm this. Many western Uganda birds, on the other hand, have so little of the dark feather edging as to be decidedly confusing. One must then rely on the larger feet and shorter rictal bristles to distinguish them from *rufipennis*. The squamate ventral markings of *albipectus* are independent of age. The two most heavily marked individuals from Kakamega are females; one, an immature

banded in July, 1965, was found dead on the tract a year later.

As soft part colors vary, the following notes from live birds at Kakamega may be of interest. Foot color of adult *rufipennis* ranged from olive gray (female, June 16) to dull purplish blue (two males, July and August) or purplish gray (male, July 20). An unsexed juvenile had the feet whitish flesh color, toes somewhat darker. An immature (with a few juvenal wing coverts remaining) had pale yellowish white feet.

An adult male *albipectus* had whitish gray feet; those of an adult female were pale grayish pink with a faint purple tinge. Two immature females had the feet pearly lavender and pale purplish white, the toes more purple; the maxillae were black, mandibles dusky brown fading to dull yellow basally with yellow gape. The plumage of these immature *albipectus* is generally brighter than that of adults, with a faint yellowish wash across the breast. Their heads are more brown, less gray, with conspicuous rufous supraorbital and eyelid feathers; this coloration extends to the forehead in some individuals.

Iris color of adult and immature *albipectus* was brown, that of adult *rufipennis* russet orange to rufous, almost buff around the pupil. Two immature female *rufipennis* had pale olive-brown irides; those of an immature male were dull grayish tan. The bills of female *rufipennis* were black above with the mandible tipped black, becoming posteriorly blue, olive, and finally yellow at the gape. A full-tailed immature male had a black maxilla but the mandible was bright orange, becoming blackish at the tip and with an orange-yellow gape. In dried skins of immature *albipectus* and *rufipennis* the mandibles become largely black, the maxillae darkening as well; in adults of both species the maxillae remain very pale.

Plumage of immature *rufipennis* is perhaps even brighter than that of the young *albipectus*, some birds being decidedly browner dorsally than adults. In life immature *rufipennis* show a suggestion of dark malar streaks and rusty brown wings strongly suggesting the larger *M. fulvescens*. The immature *fulvescens* with whitish belly (not uniformly buffy below as in the adult) provides another source of confusion between these two species.

So much for the birds in the hand. In the dim light of the forest floor positive sight identifica-

described the song of *M. rufipennis distans* in Tanganyika as "a slow and meditative call, 'hoooit-hooooee,' in a human-like whistle." I cannot satisfactorily fit this description to the *Malacocincla* songs I know, and Chapin evidently thought similarly about the Ituri Forest birds. In the (British) Cameroons, Serle (1950, p. 371) found the nominate race of *rufipennis* "Ordinarily silent" but the birds were "heard to utter on occasion a few fine melodious notes." It is clear that the problem posed by vocalizations in these various birds merits additional attention.

Examination of stomachs from two *albipectus* and four *rufipennis* collected at Kakamega disclosed no differences in preferred food. Minute snails and ants were eaten in numbers by both species. Five *M. rufipennis* of both sexes weighed from 18 to 25 grams; six *albipectus* varied from 25 to 33 grams.

Malacocincla pyrrhoptera pyrrhoptera (Reichenow
and Newmann)

I recorded two of these thrush-babblers in 1963, including a female with moderately enlarged ovary collected July 18. Another (UMMZ) was collected near my study area by J. G. Williams October 8, 1962. The species seems very rare at Kakamega and I suspect that it does not breed in the vicinity of my census tract. It is a common bird in forests above 7500 feet and the Kakamega birds may be wanderers from higher elevations. Woosnam (*in* Jackson, 1938, p. 846) wrote that the habits and notes of this bird "exactly resembled" those of *M. fulvescens* from the Ituri forest. However, the description by van Someren (*in* Mackworth-Praed and Grant, 1960, p. 103) sounds not at all like the voice of *M. fulvescens* as I know it. Nor have I heard anything resembling the song of *fulvescens* in the Mau Forest where *M. pyrrhoptera* occurs regularly.

Soft part colors of an adult female from Kakamega were: iris reddish brown; bill dusky above, gray below; feet dull blue-gray. This bird weighed 20 grams. Its stomach contained remains of ants and a small cricket.

FAMILY PYCNONOTIDAE

There is considerable difference of opinion among recent authors on the number of

pycnonotid genera to recognize. The 13 forms occurring at Kakamega are distributed among as many as 10 genera (Mackworth-Praed and Grant, 1960) or as few as five or six (Rand, 1958; White, 1962). Chapin (1953) placed them in seven genera. As his treatment seems to me to reflect natural groupings which become obscured when so many diverse forms are lumped together, I prefer to follow Chapin—at least until we know considerably more of the biology of the birds than we do at present. Except for merging *Arizelocichla* with *Andropadus*, this is also the treatment used by White. As this author stated (1962, p. 76), "It seems unlikely that *Andropadus* is in fact an assemblage of species which are monophyletic in any close respect with the species of *Pycnonotus*, and the resemblances to a few Oriental species of *Pycnonotus* may well be convergence."

Pycnonotus barbatus fayi Mearns

The familiar voice of this open country bird always seemed out of place in the forest. On my study area the increase from one or two pairs in 1963 and 1965 to 10 individuals in 1966 may reflect the slightly greater amount of clearing in the tract. More likely, however, the birds merely were attracted from the forest edge by fruiting trees. Within the forest this was essentially a canopy species, seeking the sunlit parts of tall trees and seldom descending to the undergrowth except in the larger clearings. At times most or all the Dark-capped Bulbuls in the tract gathered together in the treetops where they indulged in much singing. These gatherings followed periods of feeding (individually or collectively) and invariably took place in some tall, thinly foliated tree.

Occasionally individuals accompanied mixed species flocks, but more often they remained by themselves in one area for a considerable time. From six to 10 were seen daily in 1966, but only four birds seemed to be paired. Two males taken in late June had very small testes, and no breeding behavior was noted.

Bleda syndactyla woosnami Ogilvie-Grant

The presence of three pairs of Bristle-bills on the census tract was disclosed by netting in 1965 and 1966. Singing was regular but not extensive in June and July. Despite its large size and rather pleasing song, this bulbul is not easily

observed. I only saw one individual leave the dense undergrowth even momentarily, and that bird merely descended to the ground in pursuit of an insect. The 11 that I captured in nets were all within 2 to 3 feet of the ground.

A female killed on June 19, and a male taken August 4, 1965, were not in breeding condition. One testis of a male collected June 15, 1963, was moderately enlarged, the other small. Weights of the two males were 39 and 52 grams.

Baeopogon indicator Verreaux

Were it not for its loud and distinctive song, the Honey-guide Greenbul might be rarely encountered. It seldom leaves the leafy cover of the forest canopy (although I captured one near the ground in a net). The two individuals listed each year in the census tract represent singing territorial birds, not a pair. One was heard almost daily, and its territory covered at least 10 acres. The other sang less frequently in the tract, its territory existing largely outside of my study area.

Chapin (1953, pp. 124–125) considered *Baeopogon* a bird of plantations or open second growth, not of primary forest. It is in such places that I have found it in Uganda. At Kakamega it is found well inside primary forest but usually in the vicinity of clearings. It sometimes sings from near the forest edge but I have never discovered one away from the forest itself.

The description of the song in Mackworth-Praed and Grant (1960, p. 121) is misleading for it in no way resembles vocalizations I have heard in the Uganda forests or at Kakamega. Chapin (1953, p. 125) wrote that after each outburst of song from a male, the female replies with a "loud semi-musical call," something I have not knowingly heard from birds I have had under observation.

Phyllastrephus cabanisi sucosus Reichenow

Although treated as a race of *P. fischeri* by most recent authors, *cabanisi* differs markedly from Fischer's Greenbuls in eastern Kenya in voice and iris color, and (more subtly) in plumage as well. Ripley and Heinrich (1966b, pp. 13–14) have recently discussed in detail the several reasons for considering them specifically distinct. Mackworth-Praed and Grant (1960, p. 130) included *sucosus* in *P. f. cabanisi*, but Rand (1958, p. 210) maintained both races,

restricting the larger *cabanisi* to Angola, southern Congo, Zambia, and southwestern Tanganyika. Comparison of 12 fresh Kakamega birds plus four from the Mara River with fresh skins of *placidus* from near Nairobi reveals the same color differences mentioned by Rand, particularly the much more yellow throat and yellowish olive chest and belly of the western birds. Immature *sucosus* are decidedly yellow beneath.

Cabanis' Greenbul was the second most numerous pycnonotid on the census tract. Five to seven pairs (and usually numerous immature birds as well) were present, and their calls were a characteristic forest sound. Birds were encountered singly, in pairs, or more frequently in small groups that seemed to be family parties. Certain of these, usually four to six birds, could be found in a given part of the tract day after day, often alongside the more abundant *Andropadus latirostris*. Always curious and responsive to playback of their recorded voices, these greenbuls were relatively easy to census.

One male collected in June, 1963, had very large testes, but those of another taken a few days later were quite small. There was similar variation in ovary development in females taken that month elsewhere in the forest. I found no nests, but some individuals seemed to be breeding.

A male banded June 16, 1963, was recaptured with a female and a juvenile on July 20. He was again netted on July 31 in company with two unbanded adults, possibly "recruits" from outside the tract replacing birds I had earlier collected. These two are not included in the six-pair estimate in table 2.

Bills of adult *P. c. sucosus* were dusky horn color, bluish gray toward the base of the mandible. Feet were bright blue-gray or grayish blue, the toes yellowish olive or yellow beneath. Iris color was pale grayish tan, and in one bird pale gray with little or no hint of brown. Weights of four Kakamega males ranged from 26 to 31 grams, those of four females 20 to 26 grams.

Phyllastrephus hypochloris (Jackson)

The Toro Olive Greenbul is a rare species but like many others it fluctuates greatly in numbers at Kakamega. In 1963 I recorded it with certainty only on July 19 when two were captured together, about 2 feet above the ground in

dense undergrowth. One was banded; the larger, a male, was preserved. I next recorded the species on June 20, 1965, when a breeding female was collected from a net. Another was banded the next day. A single bird was captured on August 5 but escaped before I could band it. Three adults and one immature were banded in 1966; the male of another pair and two young also were taken in nets and preserved as specimens. An unidentified lone greenbul that was shot from a tree while it was feeding on insect larvae 30 or 35 feet above ground proved to be a female of this species, the first individual I encountered outside dense, low undergrowth. Chapin (1953, p. 163) collected one "as it sought food amid the lower boughs of forest trees"—his only experience with the species. These records, I think, reflect only occasional visits to trees, for the net captures (and several uncertain but probably authentic sight records) indicate that *P. hypochloris* normally inhabits the dense undergrowth, possibly foraging even lower than *P. cabanisi*. Both species inhabit the same parts of the forest. Stomach examinations suggest that *P. hypochloris* is more of a fruit eater than its congener. *Phyllastrephus cabanisi placidus* appears to be almost entirely insectivorous (van Someren, 1956, p. 252) and I believe this applies to *sucosus* as well.

Almost nothing is recorded of the habits of *P. hypochloris*. It does not necessarily inhabit stream sides or the forest edge as the statement by Mackworth-Praed and Grant (1960, p. 131) might imply. I have never seen it at the forest edge or along streams in those parts of the Kakamega Forest where I have collected. Its voice remains unknown to me.

Although the young bird is said to be duller than the adult, my small series of four adults and two immatures does not bear this out. In fact both the young male and female are somewhat lighter below than the adults. The plumulaceous crissum feathers of these two birds are pale rufous, not yellowish olive as in adults, and their pointed rectrices lack the narrow pale tips present in unworn adult tail feathers.

Differences between greenbul species may be so slight that I seriously question the suggested merger of *hypochloris* with *P. baumanni* of West Africa. To point out some differences between the former and Bannerman's (1953, p. 882) description of *baumanni*, the back of *hypochloris* is

olive green, not olive brown, the rump is concolor with the back, not rust-colored. Nor is *hypochloris* "uniform greyish olive, not unlike *Andropadus gracilirostris*" beneath. It is noticeably, although indistinctly, streaked with yellowish and gray on the breast, wholly different from the plain *gracilirostris*. Furthermore, the feathers of the throat and breast do not have "very distinct white shaft streaks" and the flanks and undertail coverts are not pale brown, but dull olive or yellowish olive. Surely with these distinctions, and with so little knowledge of the habits of either bird, to consider the two as conspecific at this time is at best premature.

As Chapin (1953, p. 163) pointed out, *hypochloris* bears considerable resemblance to *Andropadus* in the plumage texture and coloration. Considering both *hypochloris* and *sucosus*, the exclusion of *Phyllastrephus* from recent mergers of pycnonotid genera seems surprising.

Soft part colors of *P. hypochloris* are as follows: iris brownish orange (adult male), rust-brown (adult female), or brown (immature female); bill dull black above, below similar but with gonys pale flesh color becoming yellow at extreme tip; gape dull yellowish flesh color (adult male); bill of female brownish black, gape and tomia olive to yellowish horn color, gonys pale olive-flesh; bill of immature female dark brown with yellow tomia and tip; feet greenish gray (adult male), or bluish gray (adult male), the toes more blue-gray above and dull yellow beneath, claws brown; feet of immature female pale bluish with edges of scutes, claws and ventral side of toes dull pale yellow. Weights of five birds (both sexes) varied only from 20 to 22 grams.

Arizelocichla masukuensis kakamegae (Sharpe)

Shelley's Greenbul is not common but sufficiently widespread and easily enough identified to be recorded on seven or eight days out of 10 in the Kakamega Forest. With its gray head, white eyelids, and bright green back, the species is readily distinguished from any other pycnonotid there. It inhabits the undergrowth as well as the trees. I once shot one near the top of a 100-foot tree, although they seldom go so high. Often they are seen clinging to the side of a large tree trunk which they cover systematically, examining the crevices and patches of bryophytes for small invertebrates. I have watched one start at

the bottom of a tree, work upward for 20 or 30 feet then fly down to the base of a nearby tree and repeat the performance, reminding me of the feeding behavior of a Brown Creeper (*Certhia*) in an American woodlot. This greenbul devotes much time to examining the dense clusters of fruiting vines that cover certain trees, searching for insects, but it also consumes quantities of the berries. Only its foraging behavior renders it conspicuous for it seems to be a silent bird. Those I have watched have not uttered even the "soft nasal 'kwew, kwa, kwew'" that Sclater and Moreau (1932b, p. 681) attributed to *A. m. roehlii* in the Usambaras. Those authors do not mention tree-trunk foraging which is so characteristic of *kakamegae*. Nor do Friedmann and Stager (1964, p. 31), who reported *roehlii* as the most abundant greenbul in the Uluguru and Ukaguru mountains.

Arizelocichla masukuensis may or may not be the eastern representative of *A. montana*. Too little is yet known about the latter for us to do more than guess at the relationship. The East African birds are very inadequately studied.

Three mid-June specimens from Kakamega, collected in 1963, were in breeding condition. Two males (UMMZ) taken in early May, 1966, had very small testes as did two I collected in July and August. An immature female secured July 20 had almost completed its molt. This bird is similar to adults except for the deeper olive chest, and more olive crown and nape. Adults have red-brown or bright brown eyes; the bill is dusky or slaty black above, blue-gray below; the feet are slaty blue to blue-gray, the toes yellowish olive beneath. Weights of two adult females were 23 and 25 grams; of two males, 24 and 27 grams.

Chlorocichla laetissima (Sharpe)

The Joyful Greenbul was seen in the census tract on about 50 percent of the field days each year. It frequently traveled through the forest in pairs or groups of four to six birds usually not mingling with other species. I rarely saw them amid the lower undergrowth. They occupied the low trees occasionally moving up into the canopy. Chapin (1953, p. 140) considered them rather silent, but I always thought of them as quite vociferous at Kakamega where their pleasant bubbling chatter would often announce their presence. Like Chapin, though, I heard no

sweet melodious song such as Woosnam attributed to this species.

A female collected July 20, 1963, was laying. Single females taken August 3, 1965, and June 27, 1966, were not breeding. Iris color was bright russet, the bill slaty black fading to brown along tomia and tip, the feet greenish gray. Weights were 50, 50, and 55 grams.

Andropadus gracilirostris chagwensis (van Someren)

The Slender-billed Greenbul is fairly common throughout the Kakamega Forest but would easily be overlooked were it not for its frequently given call—a high, somewhat burry, plaintive whistle, "qua-whee-a," with accent on the second and highest note. This bird seems to feed largely on fruits and not infrequently associates with *Pycnonotus barbatus* and *Andropadus latirostris* in the crowns of tall fruiting trees. It leaves the treetops rarely; the only one I captured in a mist-net was an immature bird, June 14, 1963.

Five adults collected in the Kakamega Forest during the last half of June were in breeding condition. One female (June 18) held an egg nearly ready for laying. This bird gave the call described above, which I earlier had attributed only to males. Birds taken in August had smaller gonads than those secured in June. I am inclined to question Granvik's statement (*in* Jackson, 1938, p. 875) that this greenbul is an "excellent singer, often continuing its melody after nightfall." Also, Jackson's own account (*loc. cit.*) in his journal, apparently of an encounter in the Kakamega Forest, seems to apply in part to another species although he did collect four *A. gracilirostris*. His remark that it is "very noisy and always proclaims its presence" and his reference to the "excitable chatter" kept up by the birds following a shot, and their reluctance to leave the "thick bush and undergrowth" are all at variance with my experience and evidently with Chapin's (1953, p. 118) as well. Chapin commented that their "quiet demeanor" rendered them inconspicuous in the trees "where they feed at some height."

Andropadus gracilis gracilis Cabanis

The Little Gray Greenbul is astonishingly like the following species, and the two often are confused (see below). *Andropadus gracilis* is very rare at Kakamega. I did not collect it in 1963,

but on July 30 that year I saw two birds almost certainly of this species foraging on low boughs in such a way as to reveal their yellow bellies. They were near an individual of *A. ansorgei* so that comparison was possible. On August 5 and 6, 1965, I collected a nonbreeding male and female on the tract. I had been particularly alert for this species in June yet failed to find it. Monroe, however, collected a male (LSUMZ) here on June 18, 1961. I am almost positive that the species was absent from my study area during the 1966 field work. My specimens, and the two birds seen in 1963 all were in the branches of trees between 25 and 35 feet above ground. One was seen feeding on some small fruits.

It is difficult to understand how two such similar species as *gracilis* and *ansorgei* can coexist. They inhabit the same stratum, look remarkably alike, have no apparent food differences, and even seem to resemble each other in their calls. Furthermore, both are morphologically very like *A. curvirostris*, and Chapin (1953, p. 105) wrote that he did "not know that *curvirostris* differs by its voice from *gracilis*." The situation recalls that of the *Malacocincla* species at Kakamega and is one deserving of study.

Their predilection for low tree branches renders *A. gracilis* and *A. ansorgei* more readily identifiable in life than some greenbuls despite their similarities. Both species are smaller, lighter, and with more conspicuous eye-rings than *curvirostris*; *gracilis* is greenish yellow on the belly, unlike the olive-gray *ansorgei*, and has yellowish olive not brownish olive flanks. These differences are much more striking in life, or in a freshly killed bird than in museum specimens.

Although I have handled few specimens, I am inclined to follow Chapin (1953) and Mackworth-Praed and Grant (1960) in not recognizing *A. g. ugandae* van Someren. This form is accepted by Rand (1960, p. 253) who, however, attributed no race of *A. gracilis* to Kenya.

Soft part colors of male and female were: iris dull brown; bill black becoming blackish brown at tip; feet dull grayish olive. Weights: male 19.5 grams; female 17 grams.

Andropadus ansorgei kavirondensis (van Someren)

Ansorge's Greenbul is uncommon in the Kakamega Forest, but it is seen rather often in

pairs or with mixed species flocks foraging in the lower tree branches. There it feeds largely on small fruits. Rarely is it seen in the shrubby undergrowth. It is usually silent, but on July 31, 1963, the male of an apparently mated pair was collected immediately after it uttered a high-pitched three-note whistle. The only other sound I heard was a rattling whistled note reminiscent of the flight call of a Brown-headed Cowbird (*Molothrus ater*).

Soft part colors of adults were as follows: iris brown, occasionally reddish brown; bill black to brownish horn color with black base and culmen (males) to dull blackish brown (female); feet grayish olive or dark olive (males) to greenish gray (female). A female with unossified skull but otherwise appearing adult, had the feet light olive, bill dusky black with tomia and tip light brownish horn color. Gonads of my five June and early July birds were moderately enlarged. Two females taken at Kakamega in June, 1961 by Monroe (LSUMZ) were breeding; testes of a male were somewhat enlarged, those of another quite small. Two males weighed 17 and 19 grams, two females 17 and 23 grams.

Andropadus curvirostris curvirostris Cassin

Like the two similar preceding species, this greenbul tends to avoid the lowest levels of undergrowth inhabited by *A. latirostris* and *A. virens*. It forages in the higher shrubs and tangles of vines extending up into the lowest trees. I cannot recall seeing one above 30 feet. We did not often capture them in mist-nets extending from ground level to a height of 6 or 7 feet, but by netting the 10- to 15-foot stratum we caught more, confirming my impression that the species regularly inhabited this level. Whereas *A. gracilis* and *A. ansorgei* seem to forage more among low tree branches, *curvirostris* spends most of its time in the leafy tops of tall shrubs. Consequently it is not as frequently seen as *ansorgei* even though it is more numerous.

In 1963 only four individuals were recorded on the census tract, but probably some were overlooked. Ten adults were present in each of the other years. An immature male collected July 21, 1963, was accompanying a mixed bird party. An adult of this species was part of the group. The immature, with incompletely ossified skull and plumulaceous undertail coverts, has the very pointed rectrices characteristic of

young greenbuls. It is much brighter yellow on the belly and grayer (less brown) on the throat, chest, and flanks than adults and when first handled it was thought to represent a different species; the differences remain striking in the skin. Iris color in this species is bright rusty brown and the feet are olive-green in both adults and immatures. Bills are black but the immature bird has some olive or yellow at the tip, this color extending a short distance along the tomia.

I never knowingly heard this species sing at Kakamega or in the western Uganda forests. Chapin (1953, p. 105) wrote that it is "much more silent" than either *A. virens* or *A. latirostris*, both of which attract attention with their chattering songs.

Andropadus curvirostris is difficult to distinguish from *A. gracilis*, *A. ansorgei*, and *A. virens* in the field when its more slender darker bill is not readily apparent. The grayish throat, contrasting more with the olive breast is of limited use; these parts are more or less concolor in *virens* but hard to see in the undergrowth. The feet of *A. virens* are light yellowish brown, not olive-green or dark greenish gray as in *A. curvirostris*.

Weights of seven adults and immatures ranged from 20 grams (immature female) to 29 grams (adult male).

Andropadus virens Cassin

I have found no published record of the Little Greenbul for western Kenya, but the species is not rare in the Kakamega Forest. It showed an increase on the study tract, perhaps as a result of trail widening and the appearance of new clearings (for it is more a bird of second growth than of virgin forest). I captured but one individual in 1963, and Monroe secured only a single specimen in 1961. It is possible that the relative abundance of the species in 1965 and 1966 resulted from an influx of birds to exploit a particular source of food on the census tract. Limited data indicate that they feed largely on small fruits between June and August. None of the five adults collected during these months showed evidence of breeding activity. Two immatures, with some juvenal feathers remaining, were collected on June 14, 1963, and August 7, 1965.

Perhaps the voice is often lost in the chorus of similar calls from the abundant *A. latirostris*, but

in any event *virens* seems less vocal at Kakamega than in the lowland forests of Uganda. It is far from conspicuous on my study area, and unless seen singing it is virtually impossible to identify in the thickets. Adults are difficult to distinguish from the darker *A. curvirostris*, and the young are deceptively similar to the young of *A. latirostris*. Compared to the latter, immature *virens* is shorter billed (but as broad-billed as some *latirostris*), yellowish olive not dusky olive on the throat and chest, and the crissum is largely pale olive not tawny. *Andropadus virens* lacks the dusky malar streaks that contrast with the throat in immature *latirostris*. Another point of distinction is foot color: dull brown or yellowish brown in the young *virens*, bright orange to orange-yellow in *latirostris*. Feet of adult *virens* are yellowish orange to yellowish brown; the iris is dull gray-brown; the bill is blackish or dusky, browner below with the corners of the mouth bright yellow.

Two apparently adult birds (male, June 24; female, July 21) have the chest conspicuously dark, contrasting sharply with the lighter belly, much as in immature *latirostris*. Similar dark-chested individuals of *A. curvirostris* occur and I wonder if this may represent a subadult plumage common to these several related forms.

Owing to a lack of adequate, freshly collected comparative material I cannot racially designate the Kakamega birds.

Andropadus latirostris eugenius Reichenow

The ubiquitous Yellow-whiskered Greenbul is very common throughout the Kakamega Forest, and it is the most numerous bird species on the census tract. Its voice is a constant reminder of its presence, and the birds themselves are seen rather often for greenbuls. In the undergrowth from which they customarily sing they are not easy to observe, but any fruiting tree or creeper lures them into the open where they can be studied at leisure. They often feed, alone or with other species, in fruit-bearing trees high above the ground although normally they are associated with the dense undergrowth. At Kakamega they are curious and not excessively shy; but where relatively rare, as in the Mau or the forests near Nanyuki, they seem wary, less vocal, and difficult to see.

Ripley and Heinrich (1966b, pp. 12-13) discussed the voice of *A. l. australis* Moreau, a

form synonymized with *saturatus* by Rand (1960, p. 256) and with *eugenius* by Mackworth-Praed and Grant (1955, p. 150). It would appear that the "most characteristic voice [of *australis*] is a sound like 'zik', repeated a number of times in rapid sequence . . . so similar to the call of the Nectarine *Chalcomitra senegalensis* that it can easily be mistaken for it." This is startlingly different from the voice of *eugenius* in Kenya and western Uganda, and also from Chapin's (1953, p. 114) description of the calls of nominate *latirostris* in the Congo.

Ripley and Heinrich (1966b) pointed out an apparent difference in foot color between the nominate Angolan population and that of *A. l. australis* in Tanganyika: "light yellow in the former, olive-brown in the latter." They continue: "It seems possible that two sibling species are involved—one a high mountain bird, the other an inhabitant of lowland jungle, the two being similar in color of plumage but different in ecology, behavior, voice and color of feet." In *eugenius* there is considerable variation in foot color even within the Kakamega population. More than 200 living and freshly killed individuals revealed that most adults possessed dark brownish orange to yellowish brown tarsi and toes; in juveniles and immatures these parts were bright orange or bright orange-yellow. However, one breeding adult male collected had orange-yellow feet, and a few other birds, apparently adult, had similar foot color. Perhaps these "adults" with very brightly colored feet are first-year birds, or possibly there is a color change between the breeding and non-breeding condition.

In addition to more brightly colored feet, the young *A. l. eugenius* has considerably more yellow (or orange-yellow) on the bill, producing a mottled effect.

Wing measurements of seven males ranged from 86 to 92 mm.; those of five females 79 to 83 mm. Weights of seven adult males were between 27 and 32 grams; weights of four females ranged from 22 to 30 grams.

FAMILY MUSCICAPIDAE

Muscicapa adusta subsp.

In 1963 a pair of Dusky Flycatchers nested near the forest boundary not far from the census tract into which they occasionally wandered. During 1965 a single bird was seen in the tract

three times. None was recorded in 1966 despite the usual presence of a pair in the nearby Forest Station clearing. When observed within the forest these flycatchers almost invariably were hunting from dead twigs in tall trees adjacent to openings; usually they operated between 50 and 75 feet above the ground. Outside the forest they more often frequented fences and similar low perches.

Muscicapa caerulescens subsp.

A single Ashy Flycatcher was seen foraging in the canopy on June 16, July 20, and July 30, 1963. Otherwise it was not recorded in or near the census tract. I have examined no specimens from Kakamega.

Megabyas flammulatus aequatorialis Jackson

The Shrike-flycatcher was not attributed to Kenya by Mackworth-Praed and Grant (1960) but Chapin (1953, p. 655) included Kakamega within the range of this form. I found it irregular in occurrence there. Neither Monroe nor I positively identified it in 1961, and it was not present during my 1965 visit. During 1963 I noted a pair on the census tract from June 11 to June 16 but not thereafter. In 1966 five adults and at least one large immature were seen from mid-June into early July. Farther west this is "distinctly a lowland bird, scarcely venturing above 5000 feet" (Chapin, *loc. cit.*), so its irregularity in the generally high Kakamega Forest is not very surprising. In western Uganda, *Megabyas* is a bird of second-growth forest, as in the Congo. Probably it occurs in similar habitat about Kakamega, but there it certainly does not shun primary forest. It is a striking bird, not easily overlooked. Even in flight the white rump and underparts of the male permit prompt identification. Perched, too, they are conspicuous, as they forage to a great extent below the main mass of canopy foliage. Avoiding the twigs and lesser branches, they often rest on large and comparatively leafless limbs and their habit of tail-twitching frequently attracts the eye. They are occasional members of mixed bird parties in the forest, invariably staying high and avoiding the undergrowth. At first glance, the heavily streaked female or immature can be mistaken for a *Smithornis*. The males are similar in plumage to male *Dryoscopus gambensis* and *D. cubla*, but they differ in behavior and neither of

these shrikes is likely within heavy forest at Kakamega.

I have no evidence that *Megabyas* breeds on the census tract, and the birds recorded there may be post-breeding visitants from elsewhere. Those I have seen were silent and none exhibited any territoriality. An adult male collected June 17, 1966, had very small testes. Its eyes were brilliant red-orange, the bill black, and the feet dull plum color with toes pale yellowish beneath. An immature had dark orange irides, black bill and dull brownish pink feet. The latter bird weighed 25 grams; the adult male weighed 28 grams.

Hyliota australis australis Shelley

The Southern Yellow-bellied Flycatcher was a rare bird in the Kakamega Forest during each of my visits. I saw it but once on the study tract, a single individual on July 5, 1966. However, Monroe collected two specimens (LSUMZ) of the nominate race near the Forest Station in June, 1961, and Forbes-Watson has subsequently secured one on my census tract.

Platysteira cyanea nyanzae Neumann

We saw or heard Wattle-eyes almost daily at the forest border and single males appeared in clearings within the census tract in June of both 1963 and 1965. One collected June 21, 1965, was molting into adult plumage. A full-sized immature female taken June 19 in nearby second-growth woods had the eye wattle dull orange-red, not vermilion as in adults.

Dyaphorophya castanea castanea (Fraser)

The Chestnut Wattle-eye was recorded almost daily during each season of study. Four pairs lived on the census tract in 1963 and 1965. During 1966 the species was noticeably more common, and at least 11 adults (probably representing six pairs) and two immatures were present. Of these, nine individuals were captured and banded.

The displays of these birds, with their amusing vocalizations and wing snappings, recalled to mind those of certain manakins (Pipridae) in the Neotropics. The apparent predilection of the birds for display perches along trails, plus the usual participation of four or more individuals, attracted attention despite the rather soft and unobtrusive sounds they made. Displays lasted

for at least 15 minutes but I never witnessed the beginning. I tape-recorded parts of one in which three vocal males flew back and forth across a trail at intervals while the only visible female perched quietly, apparently not actively participating in any way, on a vine 25 feet above ground. The males indulged in various sounds, the most common being a penetrating, hollow "p'qwunk" or "twunk," repeated six to 10 times. These calls mingled with poppings and snappings produced by the wings and perhaps in part by the bill. Often this medley was accompanied by similar and different sounds from the perched birds but most of it seemed to be produced by the particular individual which was flying through the opening. The snappings and "twunk" notes were constant features in a seemingly patternless mixture of somewhat nasal chatterings and sputterings. Notes sounding like "chwa" and "pwick," and a hiccup-like "p'kwup" also were parts of the repertoire.

This species ranges through the taller shrubs and low trees, is most often seen from 10 to 25 feet above ground, and seldom forages low enough to be captured in mist-nets erected at the usual 6- or 8-foot level. On July 4, 1966, I was surprised to see a male and a juvenile feeding in the canopy bottom, 80 to 90 feet high.

Three individuals taken in June and July were not in breeding condition. Weight ranged from 12 to 15 grams, the same as reported by Friedmann (1966, p. 34).

Dyaphorophya blissetti jamesoni Sharpe

Although less conspicuous than the preceding species, Jameson's Wattle-eye was recorded more often owing to its frequency of capture in mist-nets. This is an undergrowth bird, living from just above ground to about the 10-foot level. Thus it appears to avoid direct competition with the almost equally numerous *D. castanea*. Both occur in the same sections of the forest, although *jamesoni* is less often encountered in the more open areas. Foraging lower than *castanea*, these birds were netted every day, and some banded individuals were recaptured repeatedly. They were often a problem in the nets owing to their delicacy; careful and prompt extraction was necessary to prevent injury or death. Two apparently uninjured birds died in the hand, and two others were found dead in the nets.

Numbers of adults on the tract remained essentially the same during the three seasons but only in 1966 did I note any immature birds. A young female collected June 24 had greenish blue eye wattles, grayish brown irides, and grayish purple feet. Seven adults taken at various times between June 14 and August 6 were in nonbreeding condition. Weights of these ranged from 10 to 12 grams; the immature female weighed 12 grams.

I follow Chapin (1953, p. 674) in considering *jamesoni* a race of *D. blissetti*, for although appearing quite different from *D. b. chalybea* (which lacks the chestnut cheeks) it is very similar to nominate *blissetti*. And I prefer to maintain the genus *Dyaphorophyia*, for while it exhibits points of similarity with *Platysteira* so does the latter with *Batis*. Morphologically and biologically all three seem close and all may prove to be congeneric.

Dyaphorophyia concreta silvae Hartert
and van Someren

The Yellow-bellied Wattle-eye was first recorded on the census tract on August 6, 1965, when Antony Start and I collected a female. On August 7 and 9 I saw another female. The following year a singing male was discovered on June 24 and its distinctive voice was recorded the next day. In addition to churring scold-notes there is an emphatic alarm call: "tchwik! tchwik!" or "whick! whick! whick! whick!" that may be variously repeated and which may lead into a full song: "whick whick tch'wee wherk!"—the phrase repeated (with slight variation) and often followed by prolonged repetition of the terminal, strongly accented "wherk!" These notes have a whistled nasal quality and, unlike the subdued calls of the two preceding species, possess considerable carrying power. Subsequent playback (June 29) of our tapes in the area where the recording was made elicited almost instantaneous response, a vocal male appearing followed by a female, which the male promptly chased from my view. He sang repeatedly, then scolded and dived at me whenever I played his vocalizations. Perching in full view within a few feet of me he showed no fear or shyness and sang almost steadily for 40 minutes. The following day one of several mist-nets erected at this spot captured him for banding.

Although decidedly rare and local, this wattle-eye obviously is not extirpated from Kakamega as White (1963) suggested might be the case. At least four specimens have been taken in this forest since 1962, and I have seen three or four individuals in life. Nevertheless, I can scarcely believe it to be "Common in places" as Tennent (1965, p. 98) asserted. This statement may stem from observation of a family party. I have observed only single birds or pairs at Kakamega, but Chapin (1953, p. 678) mentioned family groups of *D. c. graueri* in the Congo.

The ecological relationships of *D. concreta* to *D. castanea* and *D. b. jamesoni* are not clear. All three may inhabit the same general area, and I once observed males of each species simultaneously. My impression is that *concreta* tends to remain rather high, like *castanea*, but unlike that species it prefers parts of the forest where deep shade prevails and where the low tree layer is well developed over dark areas with little ground cover. I have come to associate this bird with fairly extensive stands of the tall *Dracaena studense* which occur in the immediate vicinity of all sites where I have observed this wattle-eye, but this may be entirely coincidental.

The female we collected was not breeding. Its iris color was dark maroon and of a peculiar granular-appearing texture, with a very narrow bluish white ring around the pupil. The eye wattle was bright apple-green, the bill black, and the feet blue-gray with a slight purple tinge. The male had a bright maroon iris with a narrower inner ring of lavender; its feet were purple.

White (1963, p. 32) considered *silvae* (as well as *harterti* and *kumbaensis*) synonymous with *graueri* and probably correctly so, but as more collected specimens become available perhaps the described plumage differences will be substantiated. Apparently this species undergoes considerable postmortem fading. Also, iris colors of the Kakamega birds I have handled differ from those given by Chapin (1953, p. 676) for *graueri*.

Our female weighed 9.0 grams, the male 9.8 grams.

Elminia longicauda teresita Antinori

Blue Flycatchers were regularly seen in small numbers about the forest edge but they seldom entered the forest. I recorded a pair in the census

tract on June 15 and July 31, 1963, and August 7, 1965. Wings of two nonbreeding females (July 31, August 11) from the Forest Station clearing measured 63 and 63.5 mm.

Trochocercus nigromitratus Reichenow

Although fairly common in the census tract these little crested-flycatchers are not seen in any numbers. They probably would have been considered uncommon were it not for their frequent capture in the mist-nets. They are exclusively undergrowth birds and seldom seen more than a meter above the ground even when accompanying a bird party through the forest. Only four birds were known on the tract in 1963, almost certainly the result of insufficient netting. The four to five pairs present in 1965 and 1966 probably are more indicative of the species' status.

Chapin (1953, p. 693) included Kakamega within the range of *T. nigromitratus* which he considered a monotypic species, listing *toroensis* as a race of *T. albiventris*. Similar treatment was employed by White (1963, p. 37), but not by Friedmann (1966, p. 35) who followed Mackworth-Praed and Grant (1955, p. 219) in considering *toroensis* as a race of *nigromitratus*. According to Jackson (1938, p. 941), the female of *toroensis* (which he attributes to Kakamega) "appears to show some white in the centre of the abdomen." Chapin's key distinguishes between *nigromitratus* and *albiventris* (including *toroensis*) on the basis of gray or white abdomen feathers. Two females collected at Kakamega, and others presumed to be of this sex, captured and banded as members of pairs, showed no white feathering; nor did an immature collected June 28, 1965. I therefore hesitate to apply the name *toroensis* to the Kakamega population.

None of eight adults collected in June, July, and August was in breeding condition. Weights of four males varied from 7 to 11 grams.

Terpsiphone rufiventer emini Reichenow

Chapin (1953) and White (1963) both assigned the Black-headed Paradise-flycatchers from the Kakamega Forest to *emini*. Certainly many of the individuals seen and collected there are hybrids, confirming Chapin's statement (1953, p. 710) that there is "considerable evidence of continued hybridization between *emini* and *T. viridis*" in this region.

An adult banded June 26, 1966, in the census tract seemed typical of *emini* except for some white on the lower belly. Representative of the hybrids was a nonbreeding male, collected August 9, 1965, entirely gray beneath except for a tawny crissum. I saw few paradise-flycatchers at Kakamega, but my impression was that deep-forest birds were more frequently orange-rufous below (as in *emini*), whereas the gray-bellied individuals were found at or very near the forest border. One such specimen taken August 4, 1965, just outside my census tract, is most like *T. viridis*: long-crested, the dark glossy feathering extending onto the breast, and with considerable white in the wing; the undertail coverts largely white with some mixture of gray and tawny. This is the only individual of *viridis* phenotype that I encountered at Kakamega, although these should occur regularly in second-growth forest and savanna communities. Tennent (1965, p. 98) listed only *T. viridis* for the Kakamega Forest region, stating that it occurs in "thickets in glades, but not in the forest proper."

FAMILY TURDIDAE

Neocossyphus poensis (Strickland)

The White-tailed Ant-thrush is a rare but regular inhabitant of the Kakamega Forest. It easily escapes detection in dense forest undergrowth and is very seldom seen unless captured in a mist-net. It was recorded twice in 1963, six times in 1965, and twice (a single bird) in 1966. The species appeared to be decidedly more numerous in 1965 not only in the census tract but throughout the Kakamega Forest.

These ant-thrushes were largely insectivorous. Stomachs contained remains of ants, termites, beetles, and roaches—all probably gleaned from the forest floor and among the tangles of roots and twigs near the ground.

The three Kakamega specimens reported by Zimmerman and Mumford (1965, pp. 282–283) differ somewhat in color from *N. p. praepectoralis* Jackson described from Toro. I have now assembled eight fresh specimens of this thrush from Kakamega for comparison with six *praepectoralis* from western Uganda and the Congo. When allowances for possible changes in older skins through "foxing" are made, certain differences are apparent. Viewed as a series, the eight Kakamega birds are darker ventrally, with

rather distinct dusky olive upper breast and sides of chest, and a grayish throat. The undertail coverts tend to be more heavily streaked, and the spot on the outer rectrix is considerably larger in most Kakamega birds (average length of the white area 33.6 mm. in males, 34.2 mm. in females, compared to 29.5 mm. and 25.6 mm. in respective sexes of Congo birds). The Kakamega specimens are large, with wings measuring 105 to 113 mm. (average 110 mm. in males, 106.5 mm. in females); tails average 93.7 mm. in males, 94.2 mm. in females. Too few specimens are available to determine how much of this variation is geographic. There is considerable individual variation and there may be some correlation with altitude as well. A female I collected in the lowland Budongo Forest in Uganda is colored like *praepectoralis* from lowland Congo forests; it also matches a female from the Bwamba Forest (LACM 57395). However, a recently taken male (LACM 57396) from 5000 feet in the Kibale Forest of Toro is identical with Kakamega specimens from a similar elevation. Friedmann (1966, p. 37) extended the range of *praepectoralis* to the Kakamega Forest on the basis of a female (not seen by me) in the Los Angeles County Museum.

Cossypha cyanocamptus bartteloti Shelley

Seldom seen, the Blue-shouldered Robin-chat nevertheless was frequently recorded in the Kakamega Forest. Its sweet, melodious song, replete with imitations of the calls of other species together with its occasional mimicking of human whistling, draws attention to its presence. On my study area counts based on singing birds, compared with the number of pairs captured and banded, indicated that only the male sings, as Chapin (1953, p. 526) believed to be the case. In 1963 and 1965 I was positive that no more than two pairs occupied the census tract. In 1966 there were three pairs (all marked) plus an apparently unmated male. A given pair of robin-chats could almost invariably be found in their particular part of the forest. Playback of recorded songs stimulated them to sing but rarely brought them out of the undergrowth into view. However, they were readily captured in mist-nets.

Two males from Kakamega have wings of 82.5 and 84 mm.; that of one female is 76 mm., the minimum measurement for *bartteloti* as given

by Chapin. A female taken June 16, 1963, was in breeding condition but gonads of four other June, July, and August birds were small.

Sheppardia aequatorialis (Jackson)

Six pairs of this akalat were recorded on the census tract in 1963, and although one bird may have been overlooked this figure is close to the 11 adults recorded there in 1965. The 1966 population, however, was at least 19 adults probably representing 10 pairs. Although a male with enlarged testes was collected June 20, and a female with a large brood patch on July 31, the species seemed to be largely done breeding by early June, with full-tailed juveniles either accompanying adults or moving independently by the middle of the month. Four of these young were on the tract in 1966.

This common but remarkably silent and inconspicuous bird is often encountered along the trails at dusk, a trait commented upon by both Cave and Moreau (*see* MacDonald, 1940, p. 670) in connection with related forms. The bird moves about in the thickets throughout the day, however, as mist-net captures disclose. Despite its abundance it is difficult to study, and I have never been able to ascribe any song or call-notes to it. It inhabits the lower stratum of undergrowth, below 4 or 5 feet, but I have not seen it on the ground. I have found it more difficult to observe than *S. gunningi sokokensis* of the coastal Kenya forests which forages on and just above the ground as well as through the dense growth at slightly higher levels.

The juvenal plumage is very dark (blackish on throat, chest, and sides), speckled and spotted with ochraceous or tawny marks on the head, wing-coverts, and throughout below excepting the white belly; the crissum is plain tawny. A molting juvenile (collected June 19) has the spotted ventral plumage partly replaced by the bright ochraceous orange of the adult, this color coming in on mid-throat and in two anteriorly connecting strips on each side of the mid-ventral line. Birds largely in adult plumage may retain a few speckled lesser wing-coverts as late as August.

In view of limited comparative material available for study I am assigning no trinomial. Chapin (1953, p. 503) considered this bird a race of *S. cyornithopsis*. Ripley (1964, p. 35) maintained the two as separate species as did Mackworth-

Praed and Grant (1960). The last authors, however, followed MacDonald (1940) in considering the Sudanese *acholiensis* to be a race of *aequatorialis*, not of *S. cyornithopsis* as listed by Ripley (*loc. cit.*). I have not seen the apparently unique type of *acholiensis*, but I wonder about the validity of this race based as it is only on the olive-brown, as distinct from russet-brown, color of the head and mantle. Certainly most of the Kakamega birds are more olive-brown than russet-brown above.

Four Kakamega females had wing lengths of 65 to 66 mm.; wings of four males measured 67.5 to 70 mm. Mackworth-Praed and Grant gave 66 mm. as the maximum wing length for this bird. Weights of seven specimens ranged from 13 to 18 grams.

Alethe poliocephala carruthersi Ogilvie-Grant

The Brown-chested Alethe is another secretive species of the undergrowth, feeding on and close to the ground. The account in Ripley (1964, p. 64) created the impression that *A. p. carruthersi* extends east only "to Mount Elgon" with no representative of the species in Kenya west of the Rift Valley. However, it is one of the most characteristic birds of the entire Kakamega-Nandi Forest. It is usually seen only after its capture in mist-nets, or as an occasional individual is startled along a forest trail. Were it not readily netted it would be almost impossible to census accurately, for, like *Sheppardia*, it appears to be remarkably silent. I have never knowingly heard its song. In its crepuscular activity, too, it is similar to the akalat. Its nesting habits apparently remain unknown.

The 10 adults (probably representing five pairs) in 1963 may have reflected an abnormally high population, for only two and three pairs were present in 1965 and 1966, respectively. Netting in other parts of the forest indicated the more recent densities to be typical. The 10 to 12 immatures on the census tract in 1965 and 1966 probably were in part the progeny of pairs in adjacent sections of the forest. Observations and captures of adults and young together suggested that in at least two instances a pair was attending two young.

Two of our 14 specimens from the Kakamega region fed on ants but I noted no particular association of this thrush with ant columns. Weights of five adults ranged from 29 to 31

grams; three full-sized juveniles each weighed 29 grams.

FAMILY SYLVIIDAE

Seicercus budongoensis (Seth-Smith)

Uganda Woodland Warblers were seen and heard almost daily usually near clearings within the forest although not at the forest border itself. On the study tract they exhibited a decided predilection for the lower part of the canopy. Chapin (1953, p. 474), who had little experience with the species, found one bird in the "lower levels" of the forest and wrote of Gyldenstolpe's observation of one "feeding on the ground." These surely are exceptional occurrences, or the behavior of Ituri Forest birds is different from that of more eastern birds. In neither the Kakamega nor Budongo forests have I taken this warbler in a mist-net, and only in two instances have I seen any lower than about 70 feet above ground. One of the latter was a bird gathering food at the 15- or 20-foot level. At Kakamega the species definitely is not one of "dense undergrowth" as stated by Mackworth-Praed and Grant (1960, p. 391). Nor does the statement in Jackson (1938, p. 1037) that the song is "frequently uttered when moving about in the thickets" convey the proper impression. The short, high-pitched, and rather pretty song of this warbler is heard regularly from the canopy, occasionally from the tops of understory trees, but not from the undergrowth. The birds frequent thinly foliated trees and thus are not particularly difficult to observe.

Of two singing males collected from high in the canopy at Kakamega in June, one had greatly enlarged testes; the testes of the other were small. A female taken (also from the canopy) on June 20 was not in breeding condition. However, the food-gathering bird cited above was seen eight days later as one of a pair whose behavior suggested that they had young nearby.

Soft part colors of adults were similar to those in the literature with the following exception: the mandible of an adult female was dull olive with an orange tip, and that of another female (suspected of being immature) was pinkish yellow becoming dusky at the base. The latter bird is darker on the crown, and slightly more olive on the chest and flanks than known adults of the same sex; the dusky eye-streak also is

darker. Weights of three adults ranged from 7 to 10 grams.

Little is known about the *Seicercus* species, especially the present one, and as there seems as much reason to maintain this genus as to merge it with *Phylloscopus* I follow Chapin's (1953, p. 474) treatment.

Hylia prasina prasina (Cassin)

I recorded the Green Hylia six times in June and July during 1963. In 1965 it seemed absent on the census tract until I netted and banded one on the morning of August 10 and recaptured it the same evening at the opposite end of the tract. I recorded it five times in 1966, including three individuals banded. One of these, captured June 30, revealed a large incubation patch. Hylia usually were seen in low trees, but that they spent considerable time in the undergrowth was indicated by seven of my 13 records resulting from mist-netted birds. Mackworth-Praed and Grant (1960, p. 819) stated that *Hylia* is often a member of mixed-bird parties, but I did not record it as such at Kakamega.

Five males collected between June 13 and July 20 had testes slightly to moderately enlarged. I recorded weights of 15 and 16 grams from four of these birds.

Apalis rufogularis nigrescens (Jackson)

Two pairs of this warbler inhabited the tract during each year of my study. Although not seen every day, a pair could usually be counted somewhere within the 20 acres. On six occasions they were seen as members of mixed bird parties in the canopy or tall understory trees. Chapin (1953, p. 290) remarked that in the Congo this species did not join such groups.

That *A. nigrescens* and *A. rufogularis* are male and female of but one species, there can be little doubt. Years ago Jackson (1938, p. 1053) so considered them based on extensive series of specimens, and Chapin (1953, p. 289) did likewise. Recently Friedmann (1966, p. 39) commented on this viewpoint and on that of Mackworth-Praed and Grant (1955), who maintained *nigrescens* as a separate species, citing the "need for further study to settle this matter." However, Mackworth-Praed and Grant later (1960, p. 1103) reversed their earlier opinion and treated the two as conspecific. Friedmann's three adult *rufogularis* from Uganda all were

females, the two *nigrescens* males. Field experience in the Uganda and Kenya forests reveals the buff-throated (female) bird as a very frequent companion of the plain-throated (male) individuals. It is apparent on such occasions that the two are paired. At Kakamega such pairs are more frequently encountered (at least from June through August) than are single birds. I have not collected both members of a pair at the same time, but a buff-throated individual taken from alongside a singing, plain-throated one proved to be a female. Two plain-throated birds taken were males.

Aside from Chapin's reference to a short "cheeping" sound, I find no comment on this bird's voice in the literature. At Kakamega the song was an emphatic, repeated "chirrip" or "chidip," the note accented terminally and often with a churring quality somewhat reminiscent of that of an American Mourning Warbler (*Oporornis philadelphia*). The note is repeated from three to 12 times in a series, with approximately two notes per second. The song period may last, with minor interruptions, for several minutes. The notes are loud and they can be heard at considerable distances in the forest.

None of the three specimens collected during June, July, and August was in breeding condition. Two males each weighed 10 grams.

Eremomela turneri turneri van Someren

The distinctness of Turner's Eremomela from *E. badiceps* has been demonstrated by Prigogine (1958, pp. 146-148). Little is known about the habits of either form, and at Kakamega I learned almost nothing of *turneri* although I saw individuals at intervals in several parts of the forest. On my census tract I recorded them three times in 1963 and 1966, and twice in 1965, almost invariably with mixed species parties moving through the treetops. They may have been more frequent, but they were difficult to identify as they appeared simply as minute, animated silhouettes against the bright sky. Chapin (1953, p. 275) associated *E. badiceps* with forest clearings and second growth, and this seemed true of the birds at Kakamega. However, the species might readily be missed in the dense canopy of primary forest. I never knowingly saw more than three together. Their weak, chippering calls were not very noteworthy. Several times I tried to link an unidentified

warbler-like song with these eremomelas but without success.

A male collected July 4, 1966, had an unossified skull but otherwise seemed fully mature, and it was in rather worn plumage. Another male taken August 7, 1965, had enlarged gonads. Soft part colors were similar to those given by Chapin (1953, p. 275) for *E. badiceps* although I recorded the feet as "pinkish orange." One male from Kakamega weighed 6 grams, a female 9.

Camaroptera chloronota toroensis (Jackson)

The Olive-green Camaroptera is a common bird in the undergrowth of the Kakamega Forest. It fluctuates noticeably in numbers as evidenced by the nine pairs on my census tract in 1966 and but four the preceding year. This species is characteristic of shaded areas with great tangles of creepers ascending into the trees. Generally it is not found in the open, sunlit areas of brush at the forest border favored by *C. brachyura*. Rarely are the two species encountered side by side at Kakamega, but *brachyura* is a remarkably rare bird within the forest compared with its abundance in wooded areas farther east. Possibly competition with the present species largely restricts *brachyura* to the forest borders in regions where both forms occur.

Chapin (1953, p. 314) somewhat inadequately described the song of *C. chloronota*, which to me is one of the most remarkable in the African forest in terms of volume and duration, considering the size of the bird. It is decidedly ventriloquial and so forceful that one searches for a much larger bird in his initial quest for the vocalist.

Six adults collected at Kakamega weighed between 11 and 12 grams, two weighed 10 grams, and one only 9.

Camaroptera brachyura subsp.

The Gray-backed Camaroptera is largely replaced in the Kakamega Forest by the preceding species. Two pairs inhabited brushy clearings in my census tract in 1963, and at least one of these nested on or very near the area. A female with large brood patch, banded June 16, was recaptured with two juveniles four days later. In 1963 I recorded the species on all but three days. By contrast, I noted it only three times in 1965 and twice in 1966, a pair in each

case. Widening of trails and introduction of new brushy clearings in the tract should have favored this species, but the birds certainly did not breed on the tract during my study periods in the last two years. Competition with *C. chloronota* may be a factor, but so may be normal fluctuation in numbers.

My two specimens from Kakamega are immature and I have examined no adults taken there. Probably they represent the race *tincta*. A puzzling *Camaroptera*, taken June 22, 1966, differs from any I have seen in its white rather than gray throat. The head and back are clear gray of a shade unmatched in any specimens with which I have compared it. Nor have I seen another like it among scores of camaropteras I have handled in the field in East Africa. The very faint yellowish wash on the breast and the yellow bill tip may reflect immaturity. The skull was unossified, but a specimen of *C. chloronota* (June 30, 1966) in full adult plumage also possessed an unossified skull. There is considerable variation in the plumage of these two species and positive identification of some individuals is not simple.

White (1960b, pp. 147-148) has rather convincingly shown that *C. brevicaudata* and *C. brachyura* cannot be maintained as two species and must be combined under the latter name. My experience with *brachyura* on the Kenya coast (where to my ear it sounds like inland *brevicaudata*) and the great difficulty in identifying specimens earns my support of this action.

Cisticola chubbi Sharpe

Chubb's *Cisticola* is not a forest bird, but it is seen on occasion in clearings within the Kakamega Forest usually not far from the forest border. I recorded a single bird in my census tract three times in 1965.

Prinia leucopogon reichenowi (Hartlaub)

The White-chinned *Prinia* is another bird of the forest border or brushy second-growth rather than of true forest. Like Chubb's *Cisticola* it occasionally appears in overgrown openings within blocks of primary forest, doubtless working its way along trails from nearby open areas. In my study area I recorded a pair four times in 1963, and twice in 1965. Two males collected at Kakamega weighed 11 and 15 grams.

Prinia bairdii melanops (Reichenow
and Neumann)

At Kakamega the handsome and shy Banded *Prinia* inhabits many brushy areas, both in primary forest and second-growth. It prefers the latter but may be found wherever sufficient sunlight penetrates the canopy to produce extensive stands of tall herbs and low shrubs amid which it hides skillfully. Were it not for its loud "wink" notes, it could easily be passed by. Only single pairs inhabited the census tract during the first two years, but in 1966 three pairs were present. Two of these were accompanied by immatures forming family groups that were encountered almost daily along certain trails. A male and female in this forest each weighed 11 grams.

Bathmocercus rufus vulpinus Reichenow

The Black-faced Rufous Warbler is a characteristic bird of the Kakamega Forest. Its loud, extremely penetrating, slowly repeated whistles are heard from the undergrowth throughout the day. These notes, sometimes uttered antiphonally by a male and female, are of the same quality and pitch as calls of certain *Malacocincla* species in the forest, and it is interesting that *Bathmocercus* has at times been considered to be a timaliid. Despite having several views of singing birds, I was not able to determine if the neck was sufficiently distended to reveal the blue skin. The birds were readily lured near by playback of their pre-recorded voices, and they sang within a few yards of me but there was always some intervening vegetation.

The 19 adults (probably representing 10 pairs) on my census tract in 1966 reflected a great increase over the four pairs there in the preceding year. Six immatures captured in 1966 indicated at least moderate breeding success, whereas in 1965 I saw no evidence of breeding. In the Kakamega Forest only one of six adults collected between June 13 and August 5, in the favorable breeding years of 1963 and 1966 showed appreciable gonadal enlargement.

In both western Kenya and the Uganda forests where I have come to know *Bathmocercus* fairly well, the bird exhibits no preference for "marshy places" as Mackworth-Praed and Grant (1960, p. 517) suggested. It may indeed inhabit wet areas within the forest but it is widespread and common on dry sites as well. The main requirement seems to be a dense growth of

tall, herbaceous plants and low shrubs in areas of dappled light and shade under the forest canopy.

Although *B. rufus* certainly seems to be congeneric with *B. cerviniventris* the two are not necessarily conspecific. White (1960a, p. 21) enumerated several major differences and it seems better to treat them as separate species until more is known of both forms.

Seven adults and full-sized immatures from Kakamega weighed 15 grams; two others 16, and one 17 grams.

FAMILY HIRUNDINIDAE

Psalidoprocne holomelaena (Sundevall)

Two Black Rough-wings appeared over the census tract twice during June, 1963, but at no other time. I only rarely saw the species in the vicinity although it was common at higher elevations not far away.

I think it unlikely that *holomelaena* is conspecific with the Blue Rough-wing, *P. pristoptera*, a bird with generally different coloration and white wing-linings.

Psalidoprocne albiceps albiceps Sclater

The handsome White-headed Rough-wing Swallow is common in clearings about Kakamega, and it flies at intervals over the forest sometimes dipping low enough to forage briefly within the larger clearings. However, most of the birds thus seen are en route to or from extensive open areas of grassland where they feed regularly.

A nonbreeding female collected June 23, 1966, weighed 14 grams.

FAMILY CAMPEPHAGIDAE

Campephaga sulphurata (Lichtenstein)

Black Cuckoo-shrikes visited the census tract four times in 1965. The two females and one male fed rather high in the trees along trails and were not associated with bird parties. This species was seen occasionally in the second-growth or third-growth woods near Kakamega, but I did not find it in savannas occupied by *C. phoenicea*. It rarely enters primary forest, the realm of *C. petiti* and *C. quiscalina*, being essentially a bird of the forest border and lesser woods.

Campephaga petiti Oustalet

Petit's Cuckoo-shrike is the one most likely to be seen in the Kakamega Forest. It is only fairly common, but on my census area it is conspicuous enough to have been recorded on about one-third of the field days during each of my visits. The bright yellow females and immature males are readily identified, but lone adult males in the treetops are virtually impossible to distinguish from other male cuckoo-shrikes. The bright orange-yellow gape (not dull yellow as in *C. sulphurata*) may be a reliable aid if birds are seen at close range. I have seen no color at the gape of *C. quiscalina*, but twice I have seen males of the latter open their mouths widely to reveal the brilliant red lining, very different from the yellowish orange or orange-yellow mouth linings of *sulphurata* or *petiti*. The male of a courting pair of *C. petiti*, collected July 31, 1963, had the gape bright yellow and the thin circle of bare orbital skin dull apple-green.

Several authors list *petiti* as a race of *C. phoenicea* but the apparently constant differences between these birds and their sympatric occurrence in western Kenya argues in favor of specific distinction. Chapin (1953, p. 197) wrote that "females of *flava* and *phoenicea* can scarcely be distinguished in Uganda where males of both forms are found. The males of these two races do not intergrade. . . . Thus it is that *phoenicea* and *flava* have both been recorded from Entebbe and Mubendi in Uganda, and *phoenicea* and *petiti* from Kakamega. The weight of evidence, however, is against specific distinctness." That Chapin himself entertained some doubt is indicated by his remark a few pages later (p. 201) that "*C. p. petiti* thus seems to behave like a valid species." It is noteworthy that the swollen gape area on *C. phoenicea* is reported by Chapin to be "pale pink in color," quite unlike that of *petiti*. Perhaps color differences in gape corners and/or mouth linings serve to distinguish the otherwise similar males to females of their respective species.

Two males taken in June and July had testes approaching 4 mm. in diameter; one of these birds was the courting male mentioned above. One adult male weighed 35 grams.

Campephaga quiscalina martini Jackson

I did not record the Purple-throated Cuckoo-shrike in 1963. During 1965 one bird of each sex appeared infrequently in the census tract, and

another male was collected at the edge of that area. In 1966 two pairs inhabited the tract after June 26 (but they were not seen on eight field days prior to that time). Occasionally a pair would be attached to a mixed bird party. A male collected from such a group on June 19, 1965, had testes 8 mm. in length and almost certainly was a breeding bird. Both members of a pair were seen carrying food on July 4, 1966. I observed no differences in the ecology of this and the preceding species.

FAMILY DICRURIDAE

Dicrurus modestus coracinus Verreaux

The Velvet-mantled Drongo was widespread in the Kakamega Forest but I did not find it common. In 1966 two were in the census tract for three days in early July; otherwise I did not record it there. In general this drongo preferred forest borders adjacent to large clearings or along roadways, not the closed-canopy forest, where *D. ludwigii* occurred regularly.

The taxonomic status of this bird is perhaps similar to that of Petit's Cuckoo-shrike discussed earlier. Vaurie (1949, pp. 225-226) and some subsequent authors have listed *coracinus* as a race of the common *D. adsimilis*. Among these authors is Chapin (1954, p. 10) who, however, pointed out the sympatry without known interbreeding in Uganda and western Kenya. Admitting that the Upper Guinea *atactus* "may well be considered as a hybrid population," Chapin wrote: "In the main, however, *coracinus* behaves in the Congo like a distinct species." He later emphasized that in the Uelle District *coracinus* and *D. a. divaricatus* "look and act more like different species than like races." This certainly is true of *coracinus* and *adsimilis* in western Kenya where the former is restricted to forest areas and *adsimilis* to drier savanna or bush. Both forms are aggressive in behavior, but I have found *coracinus* noticeably more shy and difficult to approach than its open country counterpart. Thus, as there seems to be no intergradation, despite a broad area of overlap in east-central Africa, I believe it more realistic to tentatively follow Mackworth-Praed and Grant (1960, p. 563) in treating these drongos as separate species.

Dicrurus ludwigii (Smith)

The Square-tailed Drongo inhabits the lower strata of vegetation under the forest canopy often

in areas of second-growth surrounded by, or adjacent to, primary forest. They occasionally pursue insects in rather thick shrubbery, and I have captured two in mist-nets set in such places. On my census tract I failed to record it in 1963, saw it three times in 1965, and in 1966 found it on nine of 19 field days devoted to the area. On four occasions two birds appeared with a mixed species flock, and I believed these to have been the pair known to have a recently fledged young bird (captured June 24) on the tract.

My single specimen is a female collected June 17, 1965. Its wing measures 116 mm., 4 mm. longer than the maximum given for *D. l. sharpei*, the largest of the three East African races, by Mackworth-Praed and Grant (1960, p. 566). This bird had a small ovary and weighed 26 grams.

FAMILY LANIIDAE

Laniarius luhderi luhderi (Reichenow)

Lühder's Bush-shrike is found throughout the Kakamega Forest wherever there are thick tangles of brush and vines in which it skulks. Its guttural "whoooo" or "whoook," however, reveals its presence daily although the birds themselves are sometimes difficult to see. Yet at times I have watched one feeding in full view on caterpillars at the edge of a trail, apparently not in the least concerned by my presence a few feet away.

In 1963 the pair of shrikes on the census tract probably had bred not long before my arrival, for I captured two birds in the very different juvenal dress on June 14. These birds weighed 37 and 40 grams; an adult female weighed 40 grams and a male 48 grams.

Dryoscopus angolensis nandensis Sharpe

Some authors have termed the Pink-footed Puff-back "common" in the Kakamega District forests but I have found it uncommon there, at least within primary forest. Although it is a tree-top species, it is readily detected as it moves deliberately about the branches in search of insects. Two pairs lived on the study tract in 1963, and I recorded the species five times. There was but one pair in 1965, but perhaps because their attendant young restricted their movements I encountered them on 50 percent of my field days. The following year one pair again

lived on the tract, but I saw them on only one-fourth of the field days.

Two males taken June 24 (1966) and July 19 (1963) had somewhat enlarged testes. Another male collected on August 2 (1965) had the gonads unenlarged. Weights of three adults were 32, 33, and 35 grams.

Malaconotus bocagei (Reichenow)

The Gray Bush-shrike at Kakamega is not a bird of bush, but a treetop species of the forest border. It often invades the canopy of primary forest, particularly about the larger clearings. I recorded it on my census tract regularly during the first two years (74 percent of the days in 1963, 78 percent in 1965); in 1966, however, I saw it on only 26 percent of the days spent in the field. Its whistled song was pleasant and distinctive and carried for some distance, but if the birds were silent they were easily overlooked among the foliage. Individual birds seemed to have particular song patterns so that I could, with reasonable certainty, distinguish them from one another. Careful watching and following a singing male often revealed a silent bird, presumably a female, nearby. I was not able to establish that both sexes indulged in song, but members of a pair closely accompanied each other from tree to tree, feeding sometimes side by side on the lepidopterous larvae which seemed to be a favorite food. The four individuals from 1963, listed in table 2, represented two pairs; figures for the other two years also represent apparently mated pairs.

I follow Hall, Moreau, and Galbraith (1966) in submerging the genus *Chlorophoneus* in *Malaconotus*. Kakamega specimens of *M. bocagei* presumably represent the weakly characterized race *jacksoni* described from Nandi. My only specimen (a male collected June 17, 1963) cannot be subspecifically determined. This bird weighed 27 grams.

FAMILY PARIDAE

Parus funereus (Verreaux)

Small, noisy groups of Dusky Tits were one of the characteristic avian features of the Kakamega Forest. They seemed restricted to the primary forest where they fed well above ground, never descending into the dense shrub layer. Often a group of four or five appeared as

prominent members of mixed bird parties moving rapidly through the forest.

During 1963 I encountered the species in my census area on approximately 27 percent of the field days. The percentages were 67 and 95 in 1965 and 1966, respectively. During 1966 I saw a group of four almost daily until July 4 when I collected one of them. On July 2, two additional birds were encountered at the edge of the census tract but did not enter. The four "resident" birds ranged well off the 20-acre study plot, probably covering an area at least twice that size. They seemed to be in adult plumage; the one collected proved to be a nonbreeding male. Although not in juvenal dress, it was considerably grayer below than a male with enlarged testes collected from a bird party on June 19, 1965. The bird secured in 1966 weighed 25 grams; the other was not weighed.

FAMILY ORIOLIDAE

Oriolus brachyrhynchus laetior Sharpe

Western Black-headed Orioles were fairly common in mature growth throughout the Kakamega Forest. In 1963 two pairs inhabited the census tract and a third male occasionally wandered in from an adjacent section of forest. All of these sang regularly. A female collected June 17 seemed not to be in breeding condition, but another was watched in the initial stages of nest construction on July 31. The site was 30 feet above ground in a sapling beside a forest trail. The female was seen to make three visits to the nest, once with some plant fiber, while a male sang repeatedly from the trees overhead. During 1965 I found only two birds, both regularly singing males, on the study tract. One of these was accidentally killed on August 9; its testes were not enlarged. An apparently unmated, nonbreeding female was collected in another part of the forest four days earlier.

Although seen and heard on the tract almost daily in 1963 and 1965, orioles were recorded in 1966 on fewer than one-third of the days, and (on the basis of song frequency) they seemed comparatively uncommon everywhere in the adjacent forest as well.

Although Mackworth-Praed and Grant (1960 p. 667) restricted the East African range of this form to Uganda, Chapin (1954, p. 117) mentioned specimens of *laetior* from Kakamega.

Wings of the two females measured 119 and 120 mm.; both birds weighed 53 grams.

FAMILY STURNIDAE

Cinnyricinclus leucogaster verreauxi (Bocage)

A group of 10 Violet-backed Starlings visited the census tract to feed on ripe figs between July 18 and July 21, 1963; I did not otherwise record the species. A male taken July 18 represents the present race, with more than half of the outer web of the outermost rectrix white; it weighed 45 grams. A female secured the following day weighed 50 grams.

Poeoptera stuhlmanni (Reichenow)

Stuhlmann's Starling was common everywhere in the forest. Although from 20 to 26 birds foraged on the census tract during each of my study periods, only one or two were seen on certain days. Small flocks, however, were the general rule, particularly by late June and early July when ripening arboreal fruits attracted them to the vicinity of the census tract. Feeding flocks normally were very noisy, attracting attention with their loud and not unpleasant trilling calls. The compact flocks of these nomadic starlings often were seen high above the forest. Occasionally they would settle briefly in the top of a dead tree emerging from the canopy before moving on. Sometimes ripe fruits lured the birds to within 20 feet of the ground but generally they were seen only in the treetops.

Iris color varied in our specimens. That of three adult males collected in June and August was bright yellow. An immature male, taken August 3, 1965, with unossified skull and grayish ventral plumage, had brown eyes. Those of an apparently adult female collected the following day were brown with a sharply defined yellow peripheral ring, as were those of a highly plumaged adult male taken at the same time. There was no correlation between iris color and gonadal enlargement. With the exception of a male shot June 16, 1963, which had the left testis about 7 mm. in length, none of the birds exhibited any gonadal enlargement. Weights of two females were 35 and 39 grams; those of four males ranged from 40 to 46 grams.

FAMILY ZOSTEROPIDAE

Zosterops senegalensis Bonaparte

I recorded white-eyes almost daily in the census tract, occasionally in flocks numbering

up to 10 individuals but more often only one to three birds. Two pairs resided in the tract each year. In 1963 I discovered one building a nest on June 16. The male of another pair was in breeding condition when collected on August 1. During 1966 I first saw a pair feeding recently fledged young on June 19; the two young remained on the census tract at least to June 27 but were not positively identified thereafter. In addition to flocking with others of their kind, white-eyes often joined mixed bird parties.

Kakamega Forest white-eyes are dark, with broad eye-rings and dark greenish sides. A female collected outside of the forest is considerably paler, with yellowish sides; its wing measures 57 mm., the tail 52 mm. With the exception of this bird, Kakamega specimens are referable to the race *yalensis* van Someren (= *Z. virens jacksoni* Neumann of Mackworth-Praed and Grant [1960]). White (1963) considered the Kakamega birds as intergrades between *stuhlmanni* Reichenow and *jacksoni*.

FAMILY NECTARINIIDAE

Nectarinia rubescens kakamegae (van Someren)

Green-throated Sunbirds were seen at intervals during my visits to the Kakamega Forest but their abundance varied considerably according to the flowering time of favored food plants. During June, for example, they were uncommon in 1961, absent in 1963, fairly common in 1965, and again uncommon in 1966, based on observations both on and away from my census tract where they were seen infrequently. Usually they appeared with mixed bird parties. At such times they fed on insects gleaned from foliage from 20 to 100 feet above the ground, and they were by no means confined to flowering trees. Very few plants were in bloom within the census tract in any year, but the abundance of these sunbirds at flowering trees outside the forest coincided with an increase in observations of them within the forest itself. Perhaps they were attracted to active bird parties moving along the forest border.

Three specimens collected in June and one in August showed no evidence of breeding.

Nectarinia verticalis viridisplendens (Reichenow)

Green-headed Sunbirds occurred regularly at the forest border, but they rarely ventured far under the canopy. On my census tract I saw a

male once during July and a pair on August 1, 1963. I did not otherwise see them within the forest.

Nectarinia olivacea vincenti (Grant and Mackworth-Praed)

Olive Sunbirds are fairly common in the Kakamega region, living almost exclusively within the forest. Each year I recorded the species on approximately half of the days I worked in the census tract. Although they may be seen in the trees, 50 to 75 feet above the ground, they are typically birds of the undergrowth and tall shrubs where they feed on insects and probably small fruits. They are difficult to census, and the figures for this species in table 2 are based largely on birds captured and banded. I suspect that the 1963 figure is too low. My notes on the voice and general behavior of the species parallel those of Chapin (1954, pp. 208–209) for *C. o. cephalis*.

White (1963, p. 62) sinks the race *vincenti* in *ragazzii*, citing wing measurements of 65–73 mm. for western Kenya and Uganda birds. Chapin (1954) recognized *vincenti* as “a rather large and deeply colored form of Uganda, with wings 57–73 mm.” Wings of two males from Kakamega measure 65 and 65.5 mm.; those of two females, 59 and 60 mm. Seven western Kenya birds that I have compared with more northern and eastern specimens are considerably darker as well as larger.

Of six birds collected in June and July, only a male taken July 21, 1963, showed any gonadal enlargement. Weights of three males from Kakamega were 11, 12, and 14 grams; a female weighed 10 grams.

Anthreptes collaris (Vieillot)

I recorded Collared Sunbirds only twice on the census tract in 1963, yet during the other two years I saw them almost daily. Numbers of individuals apparently remained much the same, however, each year. During 1966 one pair behaved as if they were about to nest on the tract; I could usually rely on their presence in a particular portion of the area. On seven days that season an additional bird or (more frequently) a pair appeared, usually with a mixed species party moving through the tract. A banded male, almost certainly one captured on June 24, and not the one belonging to the

resident pair, was seen on July 4, suggesting that not all birds seen on different days were different individuals. I could not be certain of this, however, and the numbers in table 2 may well be too low.

I collected a male, with testes somewhat enlarged, July 20, 1963, and an immature female on June 18, 1966. Probably these birds represent the rather poorly defined *A. c. garguensis* Mearns. The male weighed 7 grams, the young female 5 grams.

Anthreptes tephrolaema (Jardine and Fraser)

The Gray-chinned Sunbird always appeared on the census tract as a component of a mixed bird party. I recorded the species four times each in 1963 and 1965, but only once in 1966—a female and male which I assumed to be paired.

An apparently mated, male-plumaged bird, collected on June 30, 1966, had an incompletely ossified skull and very small testes. Two males taken June 15 and 17, 1963, were very drab and possessed few iridescent feathers. Both had testes considerably larger than those of the adult plumaged male mentioned; those of the duller bird (with no visible iridescent feathers) measured 4 mm. in length. Skull pneumatization of these birds was not checked. Weights of the three males were 11, 12, and 14 grams.

Friedmann (1966, p. 48) considered this bird not particularly rare in certain western Uganda forests. At Kakamega, like some other sunbirds (e.g. *Nectarinia bouvieri* Shelley), *A. tephrolaema* may be common in certain years and very rare or absent in others. Its status in Kenya remains poorly known.

I prefer to follow Chapin (1954, p. 193) and J. G. Williams (personal commun.) who consider *tephrolaema* specifically distinct from the yellow-chinned *A. rectirostris* (Shaw) of Upper Guinea, although most recent authors have united these forms.

FAMILY PLOCEIDAE

Generic classification of certain ploceine weavers is notoriously difficult, and although the problem is thoroughly reviewed and analyzed by Moreau (1960), I have not followed his treatment. The genera employed by Mackworth-Praed and Grant (1960) obviously are in part artificial, but some seem worthy of perpetuation. Sclater's (1930) concept of a comprehensive

genus *Ploceus*, resurrected in recent years, would be convenient if the 60-odd species involved shared the degree of similarity *inter se* that we find, for example, among members of the large thrush genus *Turdus*. Sclater wrote that the characters which defined his subgenera were "quite as distinct as the generic characters in many other families." It is decidedly convenient and meaningful to refer to *Phormoplectes* or *Symplectes* or *Hyphanturgus* without cumbersome inserting each such name parenthetically after *Ploceus*. (And convenience enters the picture eventually if one works with the birds.) All authors, including Moreau, "conveniently" keep the malimbines generically distinct from *Ploceus*, but I doubt that they would if these weavers were yellow and black instead of red and black. Surely *Malimbus rubricollis* qualifies for acceptance into *Ploceus* as well as does *Symplectes bicolor*. "*Melanopteryx*" *nigerrimus*, however, appears to be merely an all-black *Ploceus*, hybridizing in the wild with *P. cucullatus* to which it is behaviorally similar. "*Heterhyphantes*" *melanogaster*, another largely black form placed next to *Melanopteryx* by Mackworth-Praed and Grant (1955, p. 927) is behaviorally distinct from *nigerrimus* and seems in the field to be nearest to *nigricollis*. Using Chapin's precedent (1954, p. 319), I here consider it in the genus *Hyphanturgus*.

Symplectes bicolor mentalis Hartlaub

This distinctive weaver was confined to heavy forest at Kakamega, and small groups were conspicuous as they moved titlike through the woods adroitly gathering insects either in the trees or tall undergrowth by themselves or as members of bird parties. At least some groups of these weavers were family parties composed of a pair and two or more full-sized immatures; the most I saw together was six birds. I recorded Dark-backed Weavers on my census tract only once in 1963, but their low density that year was in contrast to my visits in 1965 and 1966 when I saw them almost every day. In general habits, and particularly in their wonderful vocalizations, these birds differ greatly from the graminivorous weavers of more open country. Ecologically, *S. bicolor* bears more resemblance to *Parus funereus* than to the other weavers, although it feeds among thicker foliage as a rule.

Published descriptions of the song leave the listener wholly unprepared for one of the most delightful African forest bird voices. To me it most resembles the voice of another forest weaver, *Malimbus rubricollis*, but *Symplectes* sings in duet if not actually in chorus, several birds in a group all appearing to contribute to a discordant yet appealing combination of loud, squeaking, clanging, ringing notes rapidly uttered in frequently repeated phrases. It is slightly reminiscent of the rollicking duets of *Cisticola hunteri* or *Trachyphonus erythrocephalus* in terms of rhythm although not in quality.

Mackworth-Praed and Grant (1960, p. 916) gave wing measurements of 81 to 88 mm. for *S. b. mentalis*, but two females from Kakamega measure 78 and 79 mm., and a male 83 mm. Wings of an immature female measure 78 mm. Only in this immature does the yellow extend "up the centre of the throat" as described for *mentalis*. The adults have evenly black throats, although the lower throat feathers of females are black with yellow tips producing a speckled effect. Three adult specimens weighed 24, 26, and 30 grams.

Hyphanturgus nigricollis nigricollis (Vieillot)

The Black-necked Weaver is less frequently encountered in deep forest than is *Symplectes bicolor* and unlike that species it is often seen at the border or outside the forest. I recorded it on half of the field days in 1965, and on one-third in 1966. As with *Symplectes* I saw it only once on the census tract during 1963. The pair seen so frequently during 1965 had nested nearby for the birds were feeding large young on June 22. A male collected from a foraging bird party on June 20, 1966, had testes three times the size of those of a male taken a week later.

This is another insectivorous weaver that, in my experience, is as likely to inhabit semi-open areas and clearing edges as it is to inhabit the forest itself. It seems to forage in undergrowth more than *Symplectes* although in much the same manner, but it is a quiet bird and more likely to be overlooked.

Two males from Kakamega are actually lighter in color above than the single male at hand from the Budongo Forest and therefore show no approach to the more eastern *H. n. melanoxanthus* Cabanis. These birds each weighed 30 grams.

Hyphanturgus melanogaster stephanophorus (Sharpe)

I have recorded Black-billed Weavers on the census tract only three times: once with a mixed bird party, twice as single individuals. Elsewhere at Kakamega, particularly in second-growth woods, it is more numerous. It is a silent, skulking bird easily overlooked until one learns the trick of listening for the rustle of hanging clumps of dead leaves which these weavers are prone to investigate at every opportunity. In the higher Mau Forest, where the species is more common, a rustling of dry leaves coming from above ground level is very likely to lead an observer to a Black-billed Weaver. Although shyer than *H. nigricollis*, the two species are quite similar in behavior, and it is interesting that both are more characteristic of secondary growth than of primary forest where *Symplectes* occupies the comparable niche. *Hyphanturgus nigricollis* is generally a lowland forest bird, whereas *H. melanogaster* is a highland form. In the Congo Chapin (1954, p. 322) found the former scarcely ascending above 5000 feet, and the latter (p. 320) usually "around 5000 and 6000 feet" but once as low as 4600 feet. He did not mention the two living together, and I suspect such occurrences are rare. Of the two *H. nigricollis* is more adaptable, less dependent on forest. Not infrequently one sees it in native shambas, scattered woody thickets, or patches of *Acanthus* scrub. In both Kenya and Uganda I have found it nesting well outside the forest in quite open situations, including widely spaced trees on the lawn of an occupied European residence, something I should think utterly impossible of the shy, thicket-inhabiting *melanogaster*. So far as I know the latter has been found nesting only inside forest. Thus the two similar forms avoid constant competition and exist side by side in a region of diverse forest and numerous clearings as at Kakamega.

In 1961 B. L. Monroe, Jr. (*in litt.*) considered *H. nigricollis* "fairly common" and *melanogaster* "uncommon" at Kakamega. This agrees with my impression of their abundance. Tennent's (1965) omission of the easily seen *nigricollis* from his list of Kakamega Forest birds must surely be unintentional. He considered *H. melanogaster* "common."

Ploceus nigerrimus Vieillot

This black weaver is not a forest bird but it frequently nests so near the border (particularly

about the Kakamega Forest Station) that a few birds or small flocks occasionally fly into the dense woods for brief periods. I recorded groups of four to 10 birds on my census tract four times in 1963. The main attraction appeared to be certain fruiting trees.

Phormoplectes insignis insignis (Sharpe)

The Brown-capped Weaver was rare at Kakamega. It appeared infrequently on my census tract, usually accompanying mixed bird parties. Pairs were occasionally seen and the female of one of these, collected July 30, 1963, proved to be in breeding condition. I saw the species only once in 1965—a single male with a bird party. In 1966 a “pair” appeared for the first time on June 28 and the yellow-throated female was collected. Her skull was not completely ossified and there were numerous yellow feathers about the face. The male seen with her appeared to be in full adult plumage, and a single bird of that sex collected from a bird party two days later was a nonbreeding adult.

Chapin's reference (1954, p. 394) to this bird as a “nuthatch-weaver” is highly descriptive, for in addition to gleaning insects from foliage it works along the bark of large branches and even upright trunks very much like a *Sitta*. Its large feet and claws are an adaptation to this feeding behavior.

The adult male referred to above weighed 26 grams, the immature female weighed 29 grams.

Malimbus rubricollis centralis Reichenow

The Red-headed Malimbe was considered common in the Kakamega Forest by Tennent (1965, p. 100) but on my census tract it was uncommon or rare. During 1963 and 1966 I recorded the species only once. In 1965, however, I saw one pair seven times and a third bird once. These malimbos appeared twice as members of mixed species flocks. By themselves, or with other species, I saw them only in one section of the tract. I suspected they were on territory perhaps about to breed, and they may have been overlooked on days when I did not record them. They stayed high in the trees, but were easily identified as they crawled nuthatch-like around and over large branches, revealing their red crowns as they worked upside down. When they foraged among the smaller leafy twigs, they

usually appeared plain black from below; insects seemed to be their main food.

The song is remarkable and it must be infrequently uttered for it has prompted little comment in the literature. It reminds me somewhat of that of *Symplectes bicolor* but would never be mistaken for the song of that bird. The reference in Mackworth-Praed and Grant (1960) to a “low wheezy call” certainly does not do it justice. It is loud and complex, from 4 to 6 seconds long, and begins typically with one or more “tsuck” or “chick” notes followed by several clear, shrill, slightly squeaky whistles very rapidly uttered; these lead into the terminal wheezy chatter. We recorded this song as it was delivered scores of times one morning by a male perched 12 or 15 inches from a female in the very top of a 90-foot tree. Some of the notes may have been contributed by the female, but if so her bill remained closed; the male sang with open bill.

I collected no malimbos at Kakamega, but a pair (WNMU) of birds secured by John G. Williams on July 12, 1960, were in breeding condition. The male weighed 45 grams, the female 40 grams.

Amblyospiza albifrons melanota (Heuglin)

I did not record Grosbeak Weavers near Kakamega during 1963. Two years later I saw one or two almost daily in late June, feeding in the forest canopy. The first one fell to my gun on June 21 when I failed to recognize the heavy dark bird that was foraging with a mixed species flock in thick foliage nearly 100 feet above me. In August of that year I repeatedly saw them flying over the forest although they alighted in the census tract only rarely. During 1966 I observed them in the tract on 11 of 19 days from mid-June to early July. I saw no more than three adults together, but one female was accompanied by short-tailed young birds which she fed in the undergrowth along one of the trails. An adult female collected on June 28 in another part of the forest had bred recently, but an adult male taken at the same time had testes that were not at all enlarged.

Nigrita canicapilla schistacea Sharpe

The Gray-headed Negro-finch was recorded only twice on the census tract although there was apparently suitable dense undergrowth in

some of the clearings. These birds seemed largely restricted to areas of thinned forest with considerable brush cover. Occasionally they visited isolated trees near the rest house or forest station buildings.

My single specimen, a female in breeding condition, collected July 20, 1963, is indistinguishable from examples of *schistacea* from farther east as are two other Kakamega birds (KNM) examined.

Nigrita fusconota fusconota Fraser

I saw the White-breasted Negro-finch only once in 1963: a single bird on July 20. I failed to find it in eight days of work on the census tract in June, 1965, but saw it twice during the first 10 days of August. In 1966 one appeared on June 29 after being apparently absent for the preceding 11 days, and I saw single birds again on three occasions in July. Although small and therefore easily overlooked when it is not singing, its frequently delivered, high-pitched, descending song commands attention. All my records are of birds accompanying mixed species parties in the treetops.

A nonbreeding female collected on August 5 weighed 7 grams.

Spermophaga ruficapilla ruficapilla (Shelley)

The Red-headed Bluebill is common in second-growth forest and in brushy clearings or trailsides in primary forest. Despite its striking colors it is difficult to observe, being extraordinarily shy; only mist-netting demonstrates how numerous it is. Two pairs resided on the census tract in 1963, when I recorded the species five times. In spite of increased netting I obtained but six records in 1965, and could be certain of only three adults in the area. Some movement of the species was evident in August of that year: On August 8, elsewhere in the forest, I saw two bluebills in an unlikely place, and the following day a male appeared in the yard of the rest house, foraged briefly under the hedge and disappeared in the direction of the forest. For no apparent reason the population was much greater in 1966 when I recorded bluebills in the census tract on 14 different days. And

whereas I netted three adults and two immatures in 1965, I captured 12 adults and one immature in 1966 in the same places. As this species was readily captured, we obtained numerous repeats of banded individuals after July 25. The four adults banded in the first week of July may have been birds moving into the tract from another part of the forest.

This species normally inhabits the dense undergrowth, but I once saw a male perched quietly for nearly one minute on an exposed perch about 30 feet above ground. I suspected that this individual was a newcomer to the census tract for it wore no band and was in a locality where regular netting disclosed no bluebills.

Usually some full-sized immature birds are seen accompanying adults by mid-June, but some young birds are independent by that time. One young male with red feathers just beginning to appear on the head was collected on August 6, but adults of both sexes taken about the same time showed some gonadal enlargement. An adult female weighed 20 grams, a male 25 grams.

FAMILY FRINGILLIDAE

Serinus burtoni gurneti Gyldenstolpe

Thick-billed Seed-eaters seldom penetrated very far into the forest but the species was seen rather frequently along the forest border, usually in small flocks of six to 10 birds always by themselves and not joining the mixed bird parties so far as I could ascertain. Presence of ripe fruits or seeds occasionally lured them into small forest openings or, less often still, into the trees of the canopy. Each year I recorded them twice on the census tract: from one to three individuals feeding silently by themselves and independent of mixed bird parties that were observed very near.

Kakamega birds represent the race *gurneti* with no white on the forehead. However, one male collected on July 5 has a wing of only 84 mm., 3 mm. less than the minimum cited by Mackworth-Praed and Grant (1960, p. 1080) for this form. This bird weighed 31 grams.

ADDITIONAL SPECIES KNOWN FROM THE KAKAMEGA FOREST

THE FOLLOWING 15 SPECIES not recorded by me have been reported from my census tract in recent years. *Machaerhamphus* is listed on the basis of repeated sight records in June, 1970, by Jennifer Horne. The others have been collected by A. D. Forbes-Watson, each on but one or two occasions. Names with asterisks represent the nine Palaearctic migrants or winter visitants known from the Kakamega Forest. The others are *Buteo vulpinus* (Gloger), *Pernis apivorus* (Linnaeus), and *Sylvia borin* (Boddaert).

Falco cuvieri Smith
Machaerhamphus alcinus Westernman
**Merops apiaster* Linnaeus
**Caprimulgus europaeus* Linnaeus
Apaloderma narina (Stephens)
Tricholaema hirsutum Oustalet
**Anthus trivialis* Linnaeus
Malacocincla poliothorax (Reichenow)
**Muscicapa hypoleuca* (Pallas)
**Sylvia atricapilla* (Linnaeus)
**Phylloscopus trochilus* (Linnaeus)
Apalis pulchra Sharpe
Coracina caesia (Lichtenstein)
Oriolus nigrispennis Verreaux
Hypargos nitidulus Shelley

Six additional species recorded elsewhere in the Kakamega-Nandi Forest, hence appearing on the forest bird list comprising Appendix 1, require comment; these are listed below.

Bostrychia olivacea (Dubus)

Discussing the Green Ibis in Kenya, Meinertzhagen (1937, p. 738) wrote that in 1902 he was "familiar with the bird . . . in the Nandi Forest near Old Nandi Fort" in which forest "they were frequently heard and seen." He stated that he had seen "many of these rare birds in Nandi and the Aberdares." This is a sylvan bird, nesting in trees in dense forest and feeding terrestrially in forest glades and apparently in thick woods as well. Akeley, quoted by Jackson (1938, p. 86), evidently found it on Mt. Elgon only above 8000 feet, but its occurrence at lower elevations in the Nandi Forest is not very surprising and I see no reason to doubt Meinertzhagen's statements. The western races of *B. olivacea* are lowland birds, and even the

typically montane *B. o. akeleyorum* occurs from 500 to 3500 feet in the Usambara Mountains (Sclater and Moreau, 1933c, p. 420). The voice of this ibis is somewhat like that of *Bostrychia hagedash* and the bird is similarly vociferous in crepuscular flight. One wonders, therefore, whether the hadadas reported from the Kakamega region in recent years have all been properly identified.

Alcippe abyssinica (Rüppell)

Tennent's (1965, p. 97) observation of the Abyssinian Hill-babbler was made in "the higher eastern part of the forest at 5600 ft." I know of no others seen there, but this species is no more unlikely at Kakamega than *Malacocincla pyrrhoptera* or other high altitude birds. *Alcippe*, seen from below, is nearly identical with this *Malacocincla* save for its darker throat. In the Mau Forest where both occur, I have momentarily misidentified them even in the hand; sight records of both species must be made with great care.

Muscicapa lendu (Chapin)

Although not recorded from Kenya except in the table in Keith et al. (1969, p. 29) this flycatcher has been collected at Kakamega at least three times by A. D. Forbes-Watson. I have examined one of the specimens in the field shortly after collection and later in Nairobi (KNM). The others (USNM) have been examined by Stuart Keith (personal commun.) who confirms the identification. On June 20, 1965, along a road through a stand of mature forest at Kakamega, I saw a flycatcher believed to be of this obscure species, but I was not able to collect it.

Cossypha polioptera Reichenow

This species was collected by or for van Someren (1922, p. 240) near Kaimosi in the South Nandi Forest. I have heard and seen it 6½ miles southeast of my census tract near the southern boundary of the Kakamega Forest not far from Kaimosi.

Malaconotus cruentus (Lesson)

The specimen (now apparently lost) of *M. monteiri* reported from the Kakamega Forest by van Someren (1932, p. 311) was discussed by Hall, Moreau, and Galbraith (1966, pp. 169–181). These authors consider *M. cruentus* and *monteiri* to be the lowland forest forms of *Malaconotus*, with *monteiri* “thought to be a color phase of *cruentus*.” No recent worker has reported this bird from the Kakamega region.

Lamprotornis splendidus (Vieillot)

The Splendid Glossy Starling is another species not recorded by recent visitors to the Kakamega Forest but it is listed for Kakamega by Jackson (1938, p. 1283), presumably on the basis of specimens taken there by Allan Turner, collecting for Meinertzhagen. As the species is one not likely to be overlooked, it may be

extirpated from the area. On the other hand, it may be merely an exceedingly infrequent and irregular visitor.

Melanoploceus tricolor (Hartlaub)

This forest weaver was not recorded from Kenya by either Mackworth-Praed and Grant (1960) or White (1963), but it has been known from the Kakamega Forest for some years. Both Jackson (1938, p. 1406) and Chapin (1954, p. 370) attributed it to the Yala River. “Kairondo,” a locality for this species in Moreau and Greenway (1962, p. 50), may be a misprint for Kavirondo. I have seen this weaver in heavy forest near my census tract in July, 1963, and near the Ikuywa River, 6 miles distant, in June, 1965. Forbes-Watson has also seen it in this forest although neither of us has collected it there.

ANALYSIS OF THE AVIFAUNA

ECOLOGICAL CLASSIFICATION: FOREST AND NONFOREST BIRDS

MOREAU (1966, pp. 285–301) HAS SUMMARIZED available data on numbers of bird species from various African forests, but the Kakamega-Nandi region is not included in his analysis. We cannot, however, directly compare his figures for other forests with the total number of species recorded on my census tract. In his forest bird analyses Moreau eliminated all water birds and shorebirds, rails, and falconiform birds. For meaningful comparison this would necessitate deletion of a dozen raptors from my list. Some of these, such as *Stephanoaetus coronatus*, *Ciccaba woodfordii*, and *Glaucidium tephronotum*, are of course forest birds in every sense. Keith et al. (1969), while generally following Moreau's guidelines, retained these and others among their forest species. I consider them similarly here.

Definitely requiring deletion from my study area list, however, are species that occur only casually in or over the forest. These include several bush country or savanna forms whose appearance in the forest is almost accidental, resulting from individual birds following paths leading into the forest from the outside. The swifts, too, except *Chaetura sabini*, which is strictly a bird of forested areas, are of incidental occurrence. Their more frequent appearance in treeless areas attests to their independence of insect species found only above the forest canopy. *Caprimulgus natalensis* is not a forest nightjar and can readily be dismissed from consideration. *Amblyospiza albifrons* haunts the treetops when fruits are ripe and it even brings its young into forest openings. Nevertheless, although attracted to the forest for part of the year, the Grosbeak Weaver would not be considered a forest bird by anyone familiar with it.

Certain "edge" birds render grouping into forest and nonforest species difficult, for these are forms often associated with forest but not living in it. Among them is the sunbird *Nectarinia verticalis*, termed by Chapin (1954, p. 215) a bird of forest clearings and "shady groups of trees in the savannas." Ecologically similar are *Ploceus nigerrimus* and the flycatcher *Elminia*. These are decidedly clearing birds, requiring

few trees. But whereas at Kakamega they seem invariably to be found adjacent to heavy woods they appear to be wholly independent of forest elsewhere in Africa and are thus not to be counted as forest species. The two cuckoos, *Chrysococcyx klaas* and *C. caprius*, might be similarly classified, whereas *C. cupreus* must be considered a bird of the forest. *Cuculus clamosus* also is difficult to assign for it occurs both in forest and in isolated patches of scrubby trees or gallery forests in the savannas. The virtually ubiquitous *Pycnonotus barbatus* provides a similar problem. The warbler *Camaroptera brachyura* is practically restricted to the very border of the forest at Kakamega. At times it forages just inside, wandering into small openings or along shaded paths, eventually finding itself surrounded by dense woods. *Cisticola chubbi* and the dove *Turtur afer* behave in like fashion.

Also defying strict categorizing are *Tockus alboterminatus*, *Dendropicos fuscescens lepidus*, and *Campephaga sulphurata*, all of which spend some time in the forest but are typical of more open formations. The hornbill enters true forest only casually at Kakamega. The Black Cuckoo-shrike is largely a scrub or secondary forest species. (It sometimes is seen in primary forest but is not at home there as are its congeners *C. petiti* and *C. quisqualina*.) The Cardinal Woodpecker at Kakamega and in the Mau Forest is closely attached to mature forest. Interestingly, this hornbill, woodpecker, and cuckoo-shrike were listed by Moreau (1935, p. 169) among six forms he considered at home in climax forest as well as other habitats in the Usambara Mountains. As a point of difference, though, Moreau found *Turtur tympanistria* to "frequent the edges of Evergreen Forest without penetrating its depths," but at Kakamega one sometimes encounters this dove in deep woods a mile or so from major clearings. I prefer to consider it a forest species as did Keith et al. (1969). These authors faced the same problem in assigning certain "borderline" birds to a given category. They discussed several of the species dealt with here, and to facilitate comparisons I have in all but three cases followed their decisions. Out of necessity I have adopted their "forest and non-forest" category to which I relegate *Falco*

ardosiaceus and *Dendropicos fuscescens lepidus* (both, however, considered nonforest birds by those authors), and I am retaining *Zosterops senegalensis* among the forest birds as did Moreau. Another possibly controversial inclusion is *Bostrychia olivacea*, but it is as much a forest bird as is *Lanius mackinnoni*, for example, and in many respects more so. This shrike never enters the woods, but although it is found only in open places it seems invariably to be associated with clearings in forested country, never with savannas. Thus the apparent incongruity of considering Mackinnon's Shrike a forest bird but not so terming Ross's Turaco (*Musophaga rossae*), which, although inseparable from gallery forests maintained by ground water, does not inhabit "true" forest maintained by rainfall. This distinction, made by Moreau (1966) and followed by Keith et al. (1969), I adhere to for purposes of comparison albeit with some misgivings.

Although 39 species are deleted from the 140 listed for my study tract, 31 others known from elsewhere in the Kakamega-Nandi Forest must be added for meaningful comparisons with the data of these authors. The total figure of 132 forest species may be incomplete for a few birds probably will be added to the avifauna. Nevertheless, it is probably nearer the actual total than figures from other forests, as shown in table 6, except the very well-worked Amani area. This table reveals the Kakamega-Nandi avifauna as one of the richest yet reported from East Africa, second only to the diverse Impenetrable Forest

with its great development of both lowland and montane forms.

The total number of birds recorded from all habitats in the Kakamega-Nandi forest region exceeds 300 species. The 132 forest birds plus 12 "forest and non-forest" species are presented with their altitudinal affinities in Appendix 1. Several of these have been recorded at Kakamega only by Forbes-Watson, and the list here presented is a product of his endeavors as well as my own. However, interpretation and categorizing of the birds, as well as responsibility for errors is entirely mine. In this list L signifies lowland species, and M indicates montane birds. Species substantiated by collected specimens (including such reports in the literature) are designated C; S indicates those reported solely on the basis of sight records. A hypothetical list, embracing a few species whose reported occurrence in the Kakamega Forest seems to us questionable, constitutes Appendix 2.

AFFINITIES WITH CONGO AND WESTERN UGANDA FORESTS

The Kakamega region has for many years been known to harbor numerous birds more typical of west-central Africa than of Kenya. Despite repeated and sometimes intensive collecting, species new to the avifauna of the country continue to be discovered there (Zimmerman and Mumford, 1965; Zimmerman, 1967). And, although it is 5000 feet and

TABLE 6
NUMBERS OF SPECIES IN TWELVE EAST AND CENTRAL AFRICAN FOREST AVIFAUNAS

Forest Type	Name and Location	Number of Forest Bird Species	Source
Lowland-Montane Continuum	Impenetrable, West Uganda	168	Keith et al. (1969)
Lowland	Bwamba, West Uganda	128	Moreau (1966)
Lowland	Budongo, West Uganda	120	Zimmerman (Unpublished)
Lowland Coastal	Sokoke, East Kenya	40	Zimmerman (Unpublished)
Intermediate	Kakamega-Nandi, West Kenya	132	Zimmerman (Present study)
Intermediate	Amani, NE Tanganyika	69	Moreau (1966)
Montane	Mt. Kenya, Central Kenya	43	Moreau (1966)
Montane	W Usambara Mts., NE Tanganyika	43	Moreau (1966)
Montane	Mt. Kilimanjaro, NE Tanganyika	37	Moreau (1966)
Montane	Nairobi, Southcentral Kenya	ca. 45	Moreau (1966)
Montane	Ruwenzori Mts., East Congo	57	Moreau (1966)
Montane	Mau, West Kenya	55	Zimmerman (Unpublished)

above in elevation, the affinities of the birds of this forest are with the lowland forest species of central Africa, not with the montane birds as might be expected. Chapin (1932, p. 93) considered areas of mountain forest above 5000–6000 feet in the Congo as belonging to his East African subregion, and stated that 5000 feet was “the lowest level of montane forests” in the wetter parts. His description (*op. cit.*, p. 105) of higher altitude Congo forests with their smaller trees, presence of *Podocarpus*, abundant epiphytes and plant species more similar to those of temperate regions does not well describe the Kakamega Forest.

Carcasson (1964) has pointed out the lowland forest character of the Kakamega area based on the distribution of diurnal Lepidoptera. The Kakamega Forest is part of the western subdivision of that author's Lowland Forest Division. Of his two more western subdivisions, the “Ugandan Zone is poorer in species than the Congolese, the eastern extremity being very impoverished (Kakamega Forest) . . . Many of these forests merge with highland forest, but there are unmistakable lowland elements at the lower levels.”

So it is with birds as well. Of the 134 species listed by Chapin (1932, pp. 216–226) as characteristic of virgin lowland forests in the Congo, 37 occur in the Kakamega Forest. (This figure would be 38 if *Sheppardia aequatorialis* is considered conspecific with *S. cyornithopsis* as Chapin believed.) Of 125 African species listed by Chapin (*op. cit.*, pp. 226–234) for Congo lowland secondary forest, plus edges, borders, and clearings, 57 are known from Kakamega. Altogether, 107 species are common to the lowland Congo forest and the Kakamega forest regions. All but one of these I consider characteristic of the latter. These birds are listed below. The 78 marked with asterisks are forest species.

Aviceda cuculoides
Machaerhamphus alcinus
 **Stephanoaetus coronatus*
Lophoaetus occipitalis
Accipiter melanoleucus
Polyboroides typus
 **Francolinus squamatus*
 **Guttera edouardi*
 **Sarothrura pulchra*
Sarothrura elegans
Streptopelia semitorquata
 **Turtur tympanistria*

Turtur afer
Treron australis
Cuculus solitarius
 **Cuculus clamosus*
 **Chrysococcyx cupreus*
Chrysococcyx caprius
Chrysococcyx klaas
 **Ceuthmochares aereus*
 **Tauraco schuttii*
 **Corythaeta cristata*
 **Psittacus erithacus*
 **Merops mulleri*
 **Bycanistes subcylindricus*
 **Phoeniculus bollei*
 **Ciccaba woodfordii*
 **Glaucidium tephronotum*
Colius striatus
 **Apaloderma narina*
 **Tricholaema hirsutum*
 **Gymnobucco bonapartei*
 **Buccanodon duchaillui*
 **Pogoniulus scolopaceus*
 **Trachylaemus purpuratus*
 **Indicator exilis*
 **Campethera caroli*
 **Campethera nivosus*
 **Mesopicos xantholophus*
 **Chaetura sabini*
Motacilla aguimp
 **Malacocincla fulvescens*
 **Malacocincla rufipennis*
Pycnonotus barbatus
 **Bleda syndactyla*
 **Baeopogon indicator*
 **Phyllastrephus hypochloris*
 **Arizelocichla masukuensis*
 **Chlorocichla laetissima*
 **Andropadus gracilirostris*
 **Andropadus gracilis*
 **Andropadus curvirostris*
 **Andropadus virens*
 **Andropadus latirostris*
 **Megabyas flammulatus*
 **Hylia australis*
 **Platysteira cyanea*
 **Dyaphorophya castanea*
 **Dyaphorophya blissetti*
 **Dyaphorophya concreta*
Elminia longicauda
 **Trochocercus nigromitratus*
Terpsiphone viridis
 **Neocossyphus poensis*
 **Cossyphus cyanocampeter*
 **Alethe poliocephala*
Erythropygia leucophrys
 **Seicercus budongoensis*
 **Hylia prasina*
 **Apalis rufogularis*

Camaroptera brachyura
 **Camaroptera chloronota*
 **Prinia leucopogon*
 **Prinia bairdii*
 **Bathmocercus rufus*
Hirundo senegalensis
Hirundo semirufa
 **Campephaga quiscalina*
 **Campephaga petiti*
 **Dicrurus modestus*
 **Lanius mackinnoni*
 **Laniarius luhderi*
 **Dryocopus angolensis*
Malaconotus bocagei
 **Parus funereus*
 **Oriolus brachyrynchus*
 **Oriolus nigripennis*
Corvus albus
 **Lamprocolius splendidus*
 **Nectarinia chloropygia*
 **Nectarinia rubescens*
 **Anthreptes collaris*
 **Anthreptes tephrolaema*
Passer griseus
 **Hyphanturgus nigricollis*
Ploceus nigerrimus
 **Melanoploceus tricolor*
 **Malimbus rubricollis*
Amblyospiza albifrons
 **Nigrita canicapilla*
 **Nigrita fusconota*
 **Spermophaga ruficapilla*
 **Hypargos nitidulus*
Lonchura cucullata
Lonchura poensis
Estrilda astrild
 **Estrilda nonnula*

Chapin (1932, pp. 252–253) considered 101 species typical of the mountain forest zone in the Congo. At the time of Chapin's report, several species were not yet known from those forests, but allowing for these, and by applying Moreau's (1966) criteria to Chapin's list, Keith et al. (1969, pp. 27–28) reduced the number of eastern Congo montane forest birds to 77. Those authors considered the montane forest bird fauna of the Impenetrable Forest of Uganda to number 69 species. The Kakamega avifauna, in contrast, contains but 34 montane forms compared to 98 lowland forest species. (See Appendix 1.) This is about 26 percent of the Kakamega Forest avifauna but the percentage is highly misleading as very few of the montane birds are of regular occurrence there. For example, of the 34 highland species on the

Kakamega list I have personally encountered only 19, and but 10 of these with any regularity. Furthermore, only three can be considered common. By any criteria the montane element at Kakamega must be considered impoverished, although some allowance should be made for slightly differing opinions as to what constitutes a montane or lowland species. I have followed Keith et al. (1969) in this regard.

The affinities of montane birds of Kakamega with the Impenetrable and eastern Congo forest avifaunas are reflected in table 7 which also shows the apparent status of each species at Kakamega in light of our present knowledge. Some of these birds warrant brief mention here. *Malacocincla poliothorax*, for which I have unsuccessfully searched between mid-June and late August, has been collected three times at Kakamega by Forbes-Watson, and (on my census tract December 18, 1968) by Peter Britton. Possibly these birds were wanderers from forest patches at higher elevations, although they may breed rarely in the vicinity of my study area. In the same category, but I think even less likely to nest at Kakamega, are *Campethera taeniolaema*, *Trochocercus albonotatus*, *Parus albiventris*, *Malacocincla pyrrhoptera*, *Alcippe abyssinica*, *Coracina caesia*, *Seicercus umbrovirens*, *Apalis porphyrolaema*, *A. cinerea*, *A. pulchra*, *Sylvietta leucophrys*, *Telophorus dohertyi*, *Cinnyricinclus sharpii*, *Onychognathus walleri*, and *Estrilda melanotis*. All of these breed regularly and not uncommonly in forests above 7000 feet not many miles to the east.

Keith et al. (1969) revealed the Impenetrable Forest (including the Kalinzu and Kayonza forests) as one with far greater altitudinal diversity than the comparatively uniform Kakamega-Nandi belt. The former extends from 3500 to 8200 feet and supports 69 montane and 99 lowland bird species compared with 34 and 98, respectively, for the Kakamega-Nandi Forest. Differences in the composition of the two avifaunas are shown in table 8. As yet, little is known about the status of most of the birds in these forests. Breeding evidence is lacking for many, and abundance (except in crude terms) must be surmised. Nor can we say to what extent seasonal movements occur. At present we can do little more than compare species lists, but in table 7 I have attempted to show that mere presence of montane species at Kakamega does not imply that the species is "typical" of that forest.

TABLE 7
MONTANE SPECIES OF THE KAKAMEGA FOREST AND THEIR OCCURRENCE IN WESTERN UGANDA
AND THE CONGO

Species	Apparent Status in Kakamega Forest	Occurrence in Impenetrable Forest	Occurrence in Eastern Congo Forest
<i>Buteo oreophilus</i>	Rare visitor; 1 or 2 records	X	—
<i>Columba arquatrix</i>	Irregular visitor; sometimes common	X	X
<i>Tauraco hartlaubi</i>	Rare visitor	—	—
<i>Apaloderma vittatum</i>	Uncommon resident; no breeding record	X	X
<i>Merops l. oreobates</i>	(?) Uncommon resident; no breeding record	X	X
<i>Indicator pumilio</i>	Status uncertain; 2 records	X	X
<i>Campethera taeniolaema</i>	Rare visitor; 3 records	X	X
<i>Smithornis capensis</i>	Uncommon resident	X	X
<i>Parus albiventris</i>	Rare visitor	—	—
<i>Malacocincla pyrrhoptera</i>	Status uncertain; 2 or 3 records	X	X
<i>Malacocincla poliothorax</i>	Status uncertain; 4 records	X	X
<i>Alcippe abyssinica</i>	Rare visitor; 1 record	X	X
<i>Coracina caesia</i>	Rare visitor; 2 records	X	X
<i>Phyllastrephus cabanisi</i>	Common resident	X	X
<i>Sheppardia aequatorialis</i>	Common resident	X	X
<i>Seicercus umbrovirens</i>	Rare visitor; 1 or 2 records	—	X
<i>Apalis porphyrolaema</i>	Rare visitor	X	X
<i>Apalis cinerea</i>	Rare visitor	X	X
<i>Apalis pulchra</i>	Status uncertain	—	X
<i>Sylvietta leucophrys</i>	Rare visitor; 3 records	X	X
<i>Muscicapa adusta</i>	Regular resident; uncommon	X	X
<i>Muscicapa lendu</i>	Status uncertain; 4 records	X	X
<i>Dioptrornis fischeri</i>	Status uncertain; no breeding records	X	X
<i>Trochocercus albonotatus</i>	Rare visitor; 2 records	X	X
<i>Telophorus dohertyi</i>	Rare visitor; 1 record	X	X
<i>Cimyrincinclus sharpii</i>	Rare visitor	X	X
<i>Onychognathus walleri</i>	Uncommon or rare visitor	X	X
<i>Poeoptera stuhlmanni</i>	Common resident	X	X
<i>Nectarinia preussi</i>	(?) Uncommon resident	X	X
<i>Hyphanturgus melanogaster</i>	Rare resident	X	X
<i>Phormoplectes insignis</i>	Uncommon resident	X	X
<i>Estrilda melanotis</i>	Status uncertain	X	X
<i>Serinus burtoni</i>	Fairly common resident	X	X
<i>Linurgus olivaceus</i>	Status uncertain	X	X

COMPARISONS WITH THE AMANI FOREST

In altitude, Kakamega would at first seem likely to exhibit more montane elements than it does. Although Chapin (1932), Moreau (1966), and Carcasson (1964) all establish the dividing line between lowland and montane forests around 5000 feet in central Africa, only Carcasson (1964, p. 134) really emphasizes the "wide zone of vertical overlap between the two divisions, particularly at the equator, where

highland species [of butterflies] do not normally descend below 3000 ft. and lowland species do not rise above 6000 ft." It is of course this overlap that accounts for some of the bird species diversity in the Kakamega region. But it alone should not account for the presence of 132 forest species at 5300 feet above sea level at Kakamega and only 69 at Amani some 2000 feet lower. Nor, as we have seen, does it result from a preponderance of montane forms at Kakamega. The Amani Forest, despite its elevation, has an abnormal temperature-altitude gradient and,

wrote Moreau (1966, p. 292), "the consequence is that there at 3000 ft. it is no hotter than it is at 5000 ft. in Kenya; and no doubt partly as a result of this a number of typically montane species are present, while at the same time other typically lowland species . . . find their upper limit at about this altitude."

I have not seen the forest at Amani but published photographs of it (e.g. in Moreau, 1934, facing p. 64 and 1966, p. 291) very closely resemble places in the Kakamega Forest. Amani at latitude 5°30'S apparently receives a similar amount of rainfall, about 80 inches per year on the average. From descriptions and photographs the Amani Forest appears to support more large epiphytes and lianas, both of which are poorly represented at Kakamega. I have received from a former forest officer at Kakamega an unofficial estimate of about 200 woody plant species for that forest. The Amani Forest too, according to Moreau (1966, p. 292) is "botanically very rich" but apparently no estimate of the number of woody plant species has been made.

One of the factors accounting for so many secondary forest birds in primary forest at Kakamega is the rather open canopy in many places and the consequent increase in undergrowth. Photographs of the Amani Forest reflect this additional similarity between the two, and it is supported by the statement of Sclater and Moreau (1932a, p. 488) that the canopy of the Amani Forest is "by no means so dense as that of the great West African forests." Thus, differences between the two areas in climate, vegetation structure, and availability of the forest to both highland and lowland birds would seem insufficient to produce the avifaunal differences shown in tables 6 and 8. The latter reveals five families with representatives at Kakamega but none in the Amani Forest. Of those families present in both areas, 18 are represented by more species at Kakamega, and nine have the same number in both forests; only the Turdidae are better represented at Amani.

My figures for the Amani avifauna may be slightly inaccurate and some explanation of these is necessary. Moreau (1966) did not provide lists of his forest birds, and his family analysis totals 61 species on pages 286-287 (although he wrote of 60 species on pages 296-297). From the annotated lists of Sclater and Moreau (1932a, 1932b, 1933a, 1933b, 1933c) one can determine nearly all the forms involved.

A few discrepancies may result from my uncertainty as to whether a particular bird occurred in the Amani Forest or elsewhere in the Usambaras. (*Alcippe*, for example, apparently does not figure in the Amani avifauna although it occurs in the West Usambaras.) Moreau's recent list (1966, p. 287) attributes only five Turdidae to Amani, but the Sclater and Moreau papers included six forest thrushes: *Turdus gurneyi*, *T. abyssinicus*, *Neocossyphus rufus*, *Sheppardia cyornithopsis*, *Alethe fulleborni*, and *Pogonocichla stellata* plus *Modulatrix*, then considered a babbler. All but *Pogonocichla* are specifically mentioned by Sclater and Moreau as forest inhabitants. In 1966 Moreau (*loc. cit.*) counted six forest Sylviidae but I can account for only five unless *Apalis thoracica* occurs lower than the 4000-foot elevation mentioned. Moreau also counted four muscicapids for the Amani Forest, but the Sclater and Moreau papers specifically attribute only three to forest habitation: *Batis capensis*, *Trochocercus albonotatus*, and *Bias musicus*. The fourth must be selected from *Hylia australis*, *Muscicapa adusta*, or *Platysteira peltata*, which occur about Amani and all of which can qualify as forest species. Moreau's two forest woodpeckers must be *Mesopicos griseocephalus* and *Dendropicos fuscescens*, as the only other picid listed for the Amani area is *Campethera abingoni*, definitely a savanna species. Three honey-guides are known from Amani: *Prodotiscus insignis*, *Indicator variegatus*, and *I. minor* (not *conirostris*). I assume the first two to be those accepted by Moreau as forest birds for his 1966 list. He must also have considered *Cinnyricinclus leucogaster* a forest species as this is one of but four starlings present at Amani. Among sunbirds, the Sclater and Moreau papers specifically refer to *Anthreptes rubritorques*, *A. neglectus*, and *Nectarinia olivacea* as being in the forest, but Moreau (1966, p. 88) also listed *A. collaris* and *A. rectirostris* (= *tephrolaema*) as forest species at Amani, and he retained *Zosterops virens* (= *senegalensis*), the only white-eye at Amani, in his 1966 list.

Of the birds named above, which occur also in the Impenetrable Forest, Keith et al. (1969) considered *Dendropicos fuscescens* and *Cinnyricinclus leucogaster* to be nonforest forms, and *Indicator variegatus* and *Zosterops* to be "forest and non-forest" birds. The honey-guide and white-eye are among several which Moreau (1966, pp. 83, 88) could not categorize to his own satisfaction. Thus the "forest and non-forest" category

becomes handy. But to thus allocate the white-eye tends to exclude it from consideration from the forest faunas of Amani, Kakamega, and the Impenetrable Forest, and this seems to me somewhat artificial.

I therefore follow Moreau in treating *Zosterops virens* (= *senegalensis*) as a forest species. To his Amani Forest list I am adding two sunbirds, two flycatchers, two thrushes, plus one ibis (*Bostrychia olivacea*), two falconiform birds (*Stephanoaetus coronatus* and *Circaetus fasciolatus*), one francolin (*Francolinus squamatus*), one dove (*Turtur tympanistris*), and one owl (*Ciccaba woodfordii*)—all elements of the Amani fauna which I consider forest species. From Moreau's list I am deleting one honey-guide, one woodpecker, and one starling in the belief that these forms (named above) are better listed as "forest and non-forest" birds, following Keith et al. (1969). This produces a total of 69 forest species for Amani and provides better comparison of this avifauna with those studied by Keith and me.

Amani boasts 30 forest bird species (43.5 percent) that are not found in either the Kakamega or the Impenetrable regions, whereas only 16.9 percent of Kakamega's rich avifauna is lacking in the other two forests. The differences between the two are such that 105 species (80 percent) of the birds of Kakamega do not occur at Amani, and 39 (57.3 percent) of the Amani birds are absent from Kakamega.

The east coast lowland forest avifauna (which contributes elements to Amani) is very impoverished (Moreau, 1966), and a parallel exists among the diurnal Lepidoptera as well (Carcasson, 1964). In relation to this impoverishment, both authors discuss the undoubted former forest connection between central Africa and the east coast but disagree as to its location. If the most recent connection of consequence were more or less direct (via the Lake Victoria Basin, southern Kenya, and northern Tanganyika), I should expect greater similarity than now exists between the birds of two similar forests such as Amani and Kakamega. Either the Usambara refuges were too small and insufficiently diverse to maintain a great many species, or the link with central Africa was so indirect (perhaps south of Lake Tanganyika as Carcasson postulates), that some species now ranging disjunctly from the Ituri and western Uganda to Kakamega never reached the Usambaras at all.

Factors other than zoogeographic ones of course bear on faunistic differences, but as yet we have too few data to apply to the forests of Africa. Floristic differences between forests and the relationship between vegetation structure and faunistic variability need to be examined. MacArthur and MacArthur (1961) wrote that in American deciduous forests, except by influencing the "height profile of the foliage density" plant species diversity "has nothing to do with bird species diversity." Moreau (1966, pp. 296–297), in discussing possible explanations for the differences between tropical African lowland and montane forest avifaunas, doubted whether the conclusions of MacArthur, MacArthur, and Preer (1962) concerning bird species diversity being proportional to foliage height diversity "would be found applicable" to African forests. He suggested that an "alternative, and superficially more attractive hypothesis is that the species diversity of the birds varies with the species diversity of the plants, which in evergreen forest practically means that of the trees."

Certainly each tree (or shrub or vine) species has its own array of insects which chew its foliage, suck its juices, lay eggs on its twigs, and feed among its flowers. Some trees are, for various reasons, able to support more and different epiphytes and plant parasites than others, thus contributing further to not only floristic but faunistic variability within the community. These secondary plants may support their own peculiar fauna, both invertebrate and vertebrate. Periodicity varies too in a forest of many species so that different plants bloom and fruit at different times thus promoting additional variation. Different bark types, and different kinds and numbers of branching and twig arrangement from one species to another also influence the kinds of foraging and nest building that are possible. It would therefore seem that greater plant species diversity in a tropical forest could bear significantly on avian species diversity. That there is no relationship at all I find difficult to accept.

Moreau stressed that data are lacking to either prove or disprove the hypothesis, but until more floristic information becomes available from ornithologically studied forest areas it certainly should not be rejected. Complexity of stratification or foliage height diversity would not seem to provide a complete explanation for

TABLE 8
COMPARISON OF AVIFAUNAS IN THREE WELL-STUDIED EAST AFRICAN FORESTS

Family	Number of Species						
	Amani Forest	Kakamega Forest	Impenetrable Forest	Common to all	Amani Only	Kakamega Only	Impenetrable Only
Threskiornithidae	1	1	—	—	—	—	—
Accipitridae	2	2	3	1	1	—	1
Phasianidae	1	1	1	—	—	—	1
Numididae	—	1	1	—	—	—	—
Rallidae	—	1	—	—	—	1	—
Columbidae	3	4	4	2	—	—	2
Cuculidae	3	3	5	2	—	—	1
Strigidae	1	2	3	1	—	—	1
Musophagidae	1	3	3	—	1	1	1
Psittacidae	—	1	—	—	—	1	—
Alcedinidae	—	—	2	—	—	—	2
Meropidae	—	2	2	—	—	1	1
Bucerotidae	1	1	2	—	1	—	1
Phoeniculidae	—	1	1	—	—	—	—
Trogonidae	1	2	2	1	—	—	—
Capitonidae	3	6	7	—	3	1	2
Indicatoridae	1	4	5	1	—	—	1
Picidae	1	4	6	—	—	—	1
Apodidae	1	1	1	—	—	1	—
Eurylaimidae	1	1	2	1	—	—	1
Pittidae	— ^a	—	1	—	—	—	1
Timaliidae	1	6	5	—	—	—	—
Pycnonotidae	9	12	13	3	4	3	1
Muscicapidae	6	12	15	2	2	2	5
Turdidae	7	5	12	—	5	1	6
Sylviidae	6	13	19	—	6	4	11
Hirundinidae	1	1	1	1	—	—	—
Campephagidae	1	3	2	—	—	1	—
Dicruridae	1	2	1	—	—	—	—
Laniidae	1	6	8	—	1	1	3
Paridae	—	2	2	—	—	1	—
Oriolidae	1	2	1	—	1	1	—
Sturnidae	3	4	5	1	2	1	2
Zosteropidae	1	1	1	1	—	—	—
Nectariniidae	5	8	14	3	2	1	7
Ploceidae	5	12	17	2	1	1	6
Fringillidae	—	2	2	—	—	—	—
Totals	69	132	169	22	30	23	58

^a*Pitta angolensis* occurs at Amani but as a migrant only, hence its exclusion by Moreau.

the differences between bird species diversity in these forests. Superficially at least, the Kakamega and Amani forests seem too similar. Unfortunately, we lack a floristic figure for the latter area. Kakamega Forest, with perhaps 125 to 150 tree species supports 132 forest birds. Moreau listed no tree figure for the Budongo Forest but perusal of the detailed lists of Eggeling (1947) produces a total of 153 trees

and 32 shrubs in the four distinct associations which comprise this Ugandan forest. Probably this figure is reasonably complete. Eggeling's study was very detailed and my observations in the Budongo indicated a woody flora at least as great as that in Kakamega with fewer plants of highland affinities but more lowland forest ones. For the Budongo Forest Moreau (1966, p. 297) listed 106 forest birds, but my list is 120 and is

doubtless incomplete. I predict the total will be in the neighborhood of 135 or 140 species. Farther south, the Cholo Forest in Malawi, with an estimated 30 tree species, has 36 forest birds; and the lowland Gambari in Nigeria with "75+" trees supports 85 species of birds (Moreau, *loc. cit.*). A rough correlation may, therefore, exist between bird species diversity and the numbers of woody plant species in tropical African lowland evergreen forest.

The situation in montane forests seems dissimilar, however, although data are extremely limited. For only two such forests in tropical Africa did Moreau (1966) have figures on tree species: the West Usambara Mountains with

"perhaps ninety" trees and 43 birds; and Kilimanjaro with "between 100 and 150" tree species and but 37 forest birds. Obviously no close correlation is apparent here, even making allowance for possible exaggeration of the woody flora of Kilimanjaro. However, on the basis of my own studies and the paper of Betts (1966) we can derive a total of 55 forest birds from the Mau Forest of Kenya which probably supports 50 to 60 trees and major shrubs. (Nineteen such plants are attributed to the Mau by Dale and Greenway, 1961, who listed 30 additional widespread montane species which probably occur; I have personally identified 10 of the latter there.)

APPENDIX 1

LIST OF FOREST BIRDS OF THE KAKAMEGA REGION, KENYA^a

(By D. A. Zimmerman and A. D. Forbes-Watson)

Species	Altitudinal Affinity	Forest	Forest and Non-forest	Species	Altitudinal Affinity	Forest	Forest and Non-forest
<i>Bostrychia olivacea</i>	L	S	—	<i>Mesopicos xantholophus</i>	L	C	—
<i>Falco ardosiaceus</i>	L	—	S	<i>Dendropicos fuscescens</i>	M	—	C
<i>Aviceda cuculoides</i>	L	—	S	<i>Chaetura sabini</i>	L	C	—
<i>Machaerhamphus alcinus</i>	L	—	S	<i>Smithornis capensis</i>	L	C	—
<i>Stephanoetus coronatus</i>	L	S	—	<i>Malacocincla fulvescens</i>	L	C	—
<i>Buteo oreophilus</i>	M	S	—	<i>Malacocincla rufipennis</i>	L	C	—
<i>Accipiter minullus</i>	L	—	S	<i>Malacocincla albipectus</i>	L	C	—
<i>Accipiter melanoleucus</i>	L	—	C	<i>Malacocincla pyrrhoptera</i>	M	C	—
<i>Accipiter tachiro</i>	L	—	C	<i>Malacocincla poliothorax</i>	M	C	—
<i>Francolinus squamatus</i>	L	C	—	<i>Alcippe abyssinica</i>	M	C	—
<i>Guttera edouardi</i>	L	C	—	<i>Bleda syndactyla</i>	L	C	—
<i>Sarothrura pulchra</i>	L	C	—	<i>Baeopogon indicator</i>	L	C	—
<i>Columba arquatrix</i>	M	S	—	<i>Phyllastrephus cabanisi</i>	M	C	—
<i>Turturoena delegorguei</i>	L	C	—	<i>Phyllastrephus hypochloris</i>	L	C	—
<i>Streptopelia semitorquata</i>	L	—	C	<i>Arizelocichla masukuensis</i>	L	C	—
<i>Turtur tympanistris</i>	L	C	—	<i>Chlorocichla laetissima</i>	L	C	—
<i>Aplopelia larvata</i>	L	C	—	<i>Andropadus gracilirostris</i>	L	C	—
<i>Treeron australis</i>	L	—	C	<i>Andropadus ansorgei</i>	L	C	—
<i>Cuculus solitarius</i>	L	—	S	<i>Andropadus gracilis</i>	L	C	—
<i>Cuculus clamosus</i>	L	C	—	<i>Andropadus curvirostris</i>	L	C	—
<i>Chrysococcyx cupreus</i>	L	C	—	<i>Andropadus virens</i>	L	C	—
<i>Ceuthmochares aereus</i>	L	C	—	<i>Andropadus latirostris</i>	L	C	—
<i>Tauraco schuttii</i>	L	S	—	<i>Muscicapa adusta</i>	M	C	—
<i>Tauraco hartlaubi</i>	M	S	—	<i>Muscicapa caerulescens</i>	L	—	C
<i>Corythaëola cristata</i>	L	C	—	<i>Muscicapa lendu</i>	M	C	—
<i>Psittacus erithacus</i>	L	S	—	<i>Dioptrornis fischeri</i>	M	C	—
<i>Merops lafresnayii</i>	M	S	—	<i>Megabyas flammulatus</i>	L	C	—
<i>Merops mulleri</i>	L	C	—	<i>Hylia australis</i>	L	C	—
<i>Bycanistes subcylindricus</i>	L	C	—	<i>Platysteira cyanea</i>	L	C	—
<i>Phoeniculus bollei</i>	L	C	—	<i>Dyaphorophya castanea</i>	L	C	—
<i>Ciccaba woodfordii</i>	L	C	—	<i>Dyaphorophya blissetti</i>	L	C	—
<i>Glaucidium tephronotum</i>	L	C	—	<i>Dyaphorophya concreta</i>	L	C	—
<i>Apaloderma narina</i>	L	C	—	<i>Trochocercus nigromitratus</i>	L	C	—
<i>Apaloderma vittatum</i>	M	C	—	<i>Trochocercus albonotatus</i>	M	C	—
<i>Tricholaema hirsutum</i>	L	C	—	<i>Terpsiphone rufiventer</i>	L	C	—
<i>Gymnabucco bonapartei</i>	L	C	—	<i>Turdus pelios</i>	L	—	S
<i>Buccanodon duchaillui</i>	L	C	—	<i>Neocossyphus poensis</i>	L	C	—
<i>Pogoniulus bilineatus</i>	L	C	—	<i>Cossypha polioptera</i>	L	C	—
<i>Pogoniulus scolopaceus</i>	L	S	—	<i>Cossypha cyanocampter</i>	L	C	—
<i>Trachylaemus purpuratus</i>	L	S	—	<i>Sheppardia aequatorialis</i>	M	C	—
<i>Indicator variegatus</i>	L	—	C	<i>Alethe poliocephala</i>	L	C	—
<i>Indicator conirostris</i>	L	C	—	<i>Seicercus budongoensis</i>	L	C	—
<i>Indicator exilis</i>	L	C	—	<i>Seicercus umbrovirens</i>	M	C	—
<i>Indicator pumilio</i>	M	C	—	<i>Hylia prasina</i>	L	C	—
<i>Prodotiscus insignis</i>	L	C	—	<i>Apalis porphyrolaema</i>	M	C	—
<i>Campethera caroli</i>	L	C	—	<i>Apalis rufogularis</i>	L	C	—
<i>Campethera nivosa</i>	L	C	—				
<i>Campethera taeniolaema</i>	M	C	—				

^aSee p. 326 for explanation of symbols.

Species	Altitudinal Affinity	Forest	Forest and Non- forest	Species	Altitudinal Affinity	Forest	Forest and Non- forest
<i>Apalis cinerea</i>	M	C	—	<i>Onychognathus walleri</i>	M	S	—
<i>Apalis pulchra</i>	M	S	—	<i>Poeoptera stuhlmanni</i>	M	C	—
<i>Sylvietta leucophrys</i>	M	C	—	<i>Lamprotornis splendidus</i>	L	C	—
<i>Eremomela turneri</i>	L	C	—	<i>Zosterops senegalensis</i>	L	C	—
<i>Camaroptera chloronota</i>	L	C	—	<i>Nectarinia bouvieri</i>	L	C	—
<i>Prinia leucopogon</i>	L	C	—	<i>Nectarinia preussi</i>	M	C	—
<i>Prinia bairdii</i>	L	C	—	<i>Nectarinia chloropygia</i>	L	C	—
<i>Bathmocercus rufus</i>	L	C	—	<i>Nectarinia rubescens</i>	L	C	—
<i>Psaldoprocne holomelaena</i>	L	C	—	<i>Nectarinia verticalis</i>	L	C	—
<i>Campephaga petiti</i>	L	C	—	<i>Nectarinia olivacea</i>	L	C	—
<i>Campephaga quiscalina</i>	L	C	—	<i>Anthreptes collaris</i>	L	C	—
<i>Coracina caesia</i>	M	C	—	<i>Anthreptes tephrolaema</i>	L	C	—
<i>Dicrurus modestus</i>	L	C	—	<i>Symplectes bicolor</i>	L	C	—
<i>Dicrurus ludwigii</i>	L	C	—	<i>Hyphanturgus nigricollis</i>	L	C	—
<i>Lanius mackinnoni</i>	L	C	—	<i>Hyphanturgus melanogaster</i>	M	C	—
<i>Laniarius luhderi</i>	L	C	—	<i>Phormoplectes insignis</i>	M	C	—
<i>Dryoscopus angolensis</i>	L	C	—	<i>Melanoploceus tricolor</i>	L	C	—
<i>Malaconotus bocagei</i>	L	C	—	<i>Malimbus rubricollis</i>	L	C	—
<i>Malaconotus cruentus</i>	L	C	—	<i>Nigrita canicapilla</i>	L	C	—
<i>Telophorus dohertyi</i>	M	C	—	<i>Nigrita fusconota</i>	L	C	—
<i>Parus albiventris</i>	M	C	—	<i>Spermophaga ruficapilla</i>	L	C	—
<i>Parus funereus</i>	L	C	—	<i>Hypargos nitidulus</i>	L	C	—
<i>Oriolus brachyrynchus</i>	L	C	—	<i>Estrilda melanotis</i>	M	C	—
<i>Oriolus nigripennis</i>	L	C	—	<i>Estrilda nonnula</i>	L	C	—
<i>Cinnyricinclus sharpii</i>	M	S	—	<i>Serinus burtoni</i>	M	C	—
				<i>Linurgus olivaceus</i>	M	C	—

APPENDIX 2

HYPOTHETICAL LIST

Francolinus lathamii (Hartlaub): Tennent (1965, p. 95) listed this francolin, stating it was "probably this species which was very common" in the Kakamega Forest. However, the species has never been collected (or seen by other observers) in the Kakamega-Nandi region.

Neafrapus boehmi (Schalow): C. D. Fisher reported (*in litt.*) seeing this species in March, 1960, over the Kakamega Forest, but it has not been otherwise recorded anywhere in the region. *Chaetura sabini*, which is regular at Kakamega, may have been mistaken for this form.

Hylia flavigaster Swainson: This flycatcher has been reported from the Kakamega Forest by C. D. Fisher (*in litt.*) and by Tennent (1965, p. 98). Forbes-Watson and I have recorded only *H. australis* there and I think it wise to consider *H. flavigaster* of hypothetical status in the absence of a specimen.

Stizorhina fraseri (Strickland): Burt L. Monroe, Jr. (*in litt.*) referred to a sight record of the Rufous Flycatcher in the Kakamega Forest by John G. Williams in June, 1961. The species has not otherwise been reported from this forest, or indeed, anywhere in Kenya to my knowledge.

Turdus abyssinicus Gmelin: Although reported by Tennent (1965, p. 98), the Olive Thrush has not been recorded by others in the Kakamega region. *Turdus pelios* occurs there and as this species was not listed by Tennent it seems best to place *T. abyssinicus* on the hypothetical list for the present.

Stiphornis erythrorhax Hartlaub: A specimen of the Forest Robin has been taken in forest west of Kipkabus, some 40 miles east of Kakamega (Zimmerman, 1967, p. 595). West of the latter area the species ranges practically to the Uganda-Kenya border. It is therefore very likely in the Kakamega Forest but to date it has not been reported.¹

¹Mr. Clive F. Mann, of Kapsabet, informed me (March

Alethe diademata (Bonaparte): Tennent (1965, p. 98) reported seeing a single Fire-crested Alethe in the Kakamega Forest in May, 1959. Although not an unlikely occurrence, the species has not been captured or seen by the numerous collectors and banders working the forest with mist-nets. Its presence should be considered hypothetical until a specimen is secured.

Oriolus larvatus Lichtenstein: This is the only Black-headed Oriole listed for Kakamega by Tennent (1965). As *Oriolus brachyrynchus* is known to be a common species of this forest, and with no other reports of *O. larvatus* from the many collectors and observers who have worked there, the identification must be considered questionable.

Nectarinia superba (Shaw): Probably this sunbird is no more unlikely to occur at Kakamega than *N. bowieri* or *N. chloropygia* but it has not yet been reported from there. However, van Someren (1916, p. 444) refers to a specimen from Mumias [=Mumia's] about 20 miles west of the Kakamega Forest.

Nectarinia cyanolaema Jardine: Although listed without comment among Kakamega Forest birds by Williams (1967, p. 86), there appears to be no known record of this species from Kenya. Probably the report should be viewed as erroneous until evidence is forthcoming.

Pirenestes ostrinus (Vieillot): C. D. Fisher reported (*in litt.*) seeing this seed-cracker in the Kakamega Forest in March, 1960, and it is listed for this locality by Williams (1967, p. 333), perhaps on the basis of Fisher's list which was available to him. No specimen has been reported from Kenya, and sight records are questionable owing to its close resemblance to the common *Spermophaga ruficapilla*.

14, 1971) that he has twice seen *Stiphornis* in the Kakamega-Nandi Forest, once near Kaimosi and once near Kakamega.

LITERATURE CITED

- | | |
|---|---|
| <p>ANON.
1950. Instructions for making bird population studies. Breeding bird census. Audubon Field Notes, vol. 4, no. 2, pp. 185-187.</p> <p>BANNERMAN, DAVID A.
1953. The birds of west and equatorial Africa. Edinburgh and London, Oliver and Boyd, vol. 1, xiii + 795 pp., vol. 2, pp. viii, 797-1526.</p> | <p>BATTISCOMBE, E.
1936. Trees and shrubs of Kenya Colony. Nairobi, xi + 50 pp.</p> <p>BETTS, F. N.
1966. Notes on some resident breeding birds of southwest Kenya. Ibis, vol. 108, pp. 513-530.</p> <p>CARCASSON, ROBERT H.
1964. A preliminary survey of the zoogeography</p> |
|---|---|

- of African butterflies. *East African Wildlife Jour.*, vol. 2, pp. 122-157.
- CHAPIN, JAMES PAUL
1932. The birds of the Belgian Congo. Part I. *Bull. Amer. Mus. Nat. Hist.*, vol. 65, x+756 pp.
1939. The birds of the Belgian Congo. Part II. *Ibid.*, vol. 75, vii+632 pp.
1953. The birds of the Belgian Congo. Part III. *Ibid.*, vol. 75a, 821 pp.
1954. The birds of the Belgian Congo. Part IV. *Ibid.*, vol. 75b, ix+846 pp.
1958. A new honey-guide from the Kivu District, Belgian Congo. *Bull. Brit. Ornith. Club*, vol. 78, pp. 46-48.
- DALE, I. R., AND P. J. GREENWAY
1961. Kenya trees and shrubs. Nairobi, Bucanan's Kenya Estates Ltd., xxvii+654 pp.
- DAVIS, JOHN
1965. The "singing male" method of censusing birds: a warning. *Condor*, vol. 67, pp. 86-87.
- DEIGNAN, H. G.
1964. Subfamily Timaliinae. In Peters, J. L., Check-list of birds of the world. Cambridge, Harvard Univ. Press, vol. 10, pp. 240-427.
- EGGELING, W. J.
1947. Observations on the ecology of the Budongo rain forest, Uganda. *Jour. Ecol.*, vol. 34, pp. 20-87.
- ENEMAR, A.
1962. A comparison between bird census results of different ornithologists. *Vår Fågelvärld*, vol. 21, pp. 109-120 [summary by M. D. F. Udvardy, 1964, *Auk*, vol. 81, p. 468].
- FRIEDMANN, HERBERT
1955. The honey-guides. *U.S. Natl. Mus. Bull.* 208, vii+292 pp.
1966. A contribution to the ornithology of Uganda. *Bull. Los Angeles County Mus. Nat. Hist., Science*, no. 3, pp. 1-55.
1968. Parallel evolution in the small species of *Indicator* (Aves). *Proc. U.S. Natl. Mus.*, vol. 125, no. 3655, pp. 1-10.
- FRIEDMANN, HERBERT, AND K. E. STAGER
1964. Results of the 1964 Cheney Tanganyikan expedition. *Ornithology. Los Angeles County Mus. Contrib. Sci.*, no. 84, 50 pp.
- FRIEDMANN, HERBERT, AND J. G. WILLIAMS
1968. Notable records of rare or little-known birds from western Uganda. *Rev. Zool. Bot. Africaines*, LXXVII, 1-2, pp. 12-36.
- HALL, B. P., AND R. E. MOREAU
1962. A study of the rare birds of Africa. *Bull. Brit. Mus. (Nat. Hist.)*, vol. 8, no. 7, pp. 316-378.
- HALL, B. P., R. E. MOREAU, AND I. C. J. GALBRAITH
1966. Polymorphism and parallelism in the African bush-shrikes of the genus *Malaconotus* (including *Chlorophoneus*). *Ibis*, vol. 108, pp. 161-182.
- JACKSON, FREDERICK JOHN
1938. The birds of Kenya Colony and the Uganda Protectorate. Completed and edited by W. L. Sclater. London and Edinburgh, 3 vols., lii+1592 pp.
- KEITH, STUART, AND ARTHUR TWOMEY
1968. New distributional records of some East African birds. *Ibis*, vol. 110, pp. 537-548.
- KEITH, STUART, ARTHUR TWOMEY, HERBERT FRIEDMANN, AND JOHN WILLIAMS
1969. The avifauna of the Impenetrable Forest, Uganda. *Amer. Mus. Novitates* no. 2389, pp. 1-41.
- KENYA COLONY AND PROTECTORATE
1962. Nairobi, the survey of Kenya, ix+47 pp.
- MACARTHUR, R. H., AND J. W. MACARTHUR
1961. On bird species diversity. *Ecol. Monogr.*, vol. 42, pp. 594-598.
- MACARTHUR, R. H., J. W. MACARTHUR, AND J. PREER
1962. On bird species diversity II. Prediction of bird census from habitat measurement. *Amer. Nat.*, vol. 96, pp. 167-174.
- MACDONALD, J. D.
1940. The genus *Sheppardia*. *Ibis*, vol. 4, pp. 663-671.
- MACKWORTH-PRAED, C. W., AND C. H. B. GRANT
1955. Birds of eastern and north eastern Africa. African handbook of birds, ser. 1, vol. 2. London, Longmans, Green and Co. Ltd., viii+1149 pp.
1957. [Same title.] African handbook of birds, ser. 1, vol. 1 (second edition). London, Longmans, Green and Co. Ltd., xxvi+845 pp.
1960. [Same title.] African handbook of birds, ser. 1, vol. 2 (second edition). London, Longmans, Green and Co. Ltd., viii+1117 pp.
- MEINERTZHAGEN, RICHARD
1937. Some notes on the birds of Kenya Colony, with especial reference to Mount Kenya. *Ibis*, ser. 14, vol. 1, pp. 731-760.
- MOREAU, REGINALD E.
1934. A contribution to tropical African bird-ecology. *Jour. Animal Ecol.*, vol. 3, no. 1, pp. 41-69.
1935. A critical analysis of the distribution of birds in a tropical African area. *Ibid.*, vol. 4, no. 2, pp. 167-191.
1958. Some aspects of the Musophagidae. *Ibis*, vol. 100, pp. 67-112, 238-270.
1960. Conspectus and classification of the plover weaver birds. *Ibid.*, vol. 102, pp. 298-321, 443-471.
1966. The bird faunas of Africa and its islands. London, Academic Press, vii+424 pp.

- MOREAU, R. E., AND JAMES C. GREENWAY, JR.
1962. Ploceidae. In Peters, J. L., Check-list of birds of the world. Cambridge, Harvard Univ. Press, vol. 15, pp. 3-75.
- MOREAU, R. E., A. L. WILK, AND W. ROWAN
1946. The moult and gonad cycles of three species of birds at five degrees south of the equator. Proc. Zool. Soc., vol. 117, pts. 2, 3, pp. 345-364.
- OWEN, DENNIS F.
1966. Animal ecology in tropical Africa. San Francisco, W. H. Freeman and Co., 122 pp.
- PRICKETT, R. J.
[1969]. The living forest. Nairobi, published by the author, xvi+163 pp.
- PRIGOGINE, A.
1958. The status of *Eremomela turneri* van Someren and the description of a new race from the Belgian Congo. Bull. Brit. Ornith. Club, vol. 78, pp. 146-148.
- RAND, AUSTIN L.
1958. Notes on African bulbuls. Fieldiana: Zool., vol. 35, pp. 145-220.
1960. [African Pyconotidae]. In Peters, J. L., Check-list of birds of the world. Cambridge, Harvard Univ. Press, vol. 9, pp. 221-300.
- RIPLEY, S. DILLON
1964. Turdinae. In Peters, J. L., Check-list of birds of the world. Cambridge, Harvard Univ. Press, vol. 10, pp. 13-227.
- RIPLEY, S. DILLON, AND G. H. HEINRICH
1966a. Additions to the avifauna of northern Angola II. Postilla, no. 95, 29 pp.
1966b. Comments on the avifauna of Tanzania I. *Ibid.*, no. 96, 45 pp.
- SCLATER, WILLIAM L.
1924-1930. Systema avium Aethiopicarum. London. Taylor and Francis, xi+922 pp.
- SCLATER, WILLIAM L., AND R. E. MOREAU
1932a. Taxonomic and field notes on some birds of north eastern Tanganyika Territory. Part 1. *Ibis*, ser. 13, vol. 2, pp. 487-522.
1932b. Taxonomic and field notes on some birds of north eastern Tanganyika Territory. Part 2. *Ibid.*, ser. 13, vol. 2, pp. 656-683.
1933a. Taxonomic and field notes on some birds of north eastern Tanganyika Territory. Part 3. *Ibid.*, ser. 13, vol. 3, pp. 1-33.
1933b. Taxonomic and field notes on some birds of north eastern Tanganyika Territory. Part 4. *Ibid.*, ser. 13, vol. 3, pp. 187-219.
1933c. Taxonomic and field notes on some birds of north eastern Tanganyika Territory. Part 5. *Ibid.*, ser. 13, vol. 3, pp. 400-440.
- SERLE, WILLIAM
1950. A contribution to the ornithology of the British Cameroons. *Ibis*, vol. 92, pp. 344-376.
- SHANTZ, H. L., AND C. F. MARBUT
1923. The vegetation and soils of Africa. Amer. Geogr. Soc. Res. Ser., no. 13, New York, 263 pp.
- SHANTZ, H. L., AND B. L. TURNER
1958. Photographic documentation of vegetational changes in Africa over a third of a century. Univ. Arizona College of Agr. Rept., no. 169. Tucson, Arizona, vi+158 pp.
- SLUD, PAUL
1960. The birds of Finca "La Selva," Costa Rica: a tropical wet forest locality. Bull. Amer. Mus. Nat. Hist., vol. 121, pp. 49-148.
- STAMM, D. D., D. E. DAVIS, AND C. S. ROBBINS
1960. A method of studying wild bird populations by mist-netting and banding. Bird-Banding, vol. 31, no. 3, pp. 115-130.
- STANFORD, J. K.
1947. Bird parties in forest in Burma. *Ibis*, vol. 89, pp. 507-509.
- TENNENT, J. R. M.
1965. Notes on the birds of Kakamega Forest. Jour. East Africa Nat. Hist. Soc. Natl. Mus., vol. 30, no 2, pp. 95-100.
- VAN SOMEREN, V. G. L.
1916. A list of birds collected in Uganda and British East Africa, with notes on their nesting and other habits. *Ibis*, ser. 10, vol. 4, pp. 193-252, 373-472, pls. 5, 6, 8-13.
1922. Notes on the birds of East Africa. Novitates Zool., vol. 29, pp. 1-246.
1932. Birds of Kenya and Uganda (addenda and corrigenda). *Ibid.*, vol. 37, pp. 252-380.
1939. Birds of the Chyulu Hills. Jour. East Africa Uganda Nat. Hist. Soc., vol. 14, pp. 15-129.
1956. Days with birds. Studies of habits of some east African species. Fieldiana: Zool., vol. 38, pp. 1-520.
- VAN SOMEREN, V. G. L., AND G. R. C. VAN SOMEREN
1949. The birds of Bwamba (Bwamba County, Toro District, Uganda). Uganda Jour., vol. 13, special suppl., 111 pp.
- VAURIE, CHARLES
1949. A revision of the bird family Dicruridae. Bull. Amer. Mus. Nat. Hist., vol. 93, pp. 199-343.
- WHITE, C. M. N.
1960a. Notes on some African warblers. Part one. Bull. Brit. Ornith. Club, vol. 80, pp. 18-21.
1960b. Further notes on African warblers. *Ibid.*, pp. 147-152.
1961. A revised check list of African broadbills[,] pittas, larks, swallows[,] wagtails and pipits. Lusaka, Govt. Printer, iv+84 pp.
1962. A revised check list of African shrikes, orioles, drongos, starlings, crows, wax-

- wings, cuckoo-shrikes, bulbuls, accentors, thrushes and babblers. Lusaka, Govt. Printer, iv+176 pp.
1963. A revised check list of African flycatchers, tits, tree creepers, sunbirds, white-eyes, honey eaters, buntings, finches, weavers and waxbills. Lusaka, Govt. Printer, vi+142 pp.
- WILLIAMS, JOHN G.
1964. A field guide to the birds of east and central Africa. Boston, Houghton-Mifflin Co., 288 pp.
1967. A field guide to the national parks of east Africa. London, Collins, 352 pp.
- WILLIAMS, JOHN G., AND H. FRIEDMANN
1965. The pygmy honey-guide, *Indicator pumilio* Chapin, in East Africa. Bull. Brit. Ornith. Club, vol. 85, pp. 21-22.
- WINTERBOTTOM, J. M.
1943. On woodland bird parties in Northern Rhodesia. Ibis, vol. 85, pp. 437-442.
- ZIMMERMAN, DALE A.
1967. *Agapornis fischeri*, *Lybius guifsobalito*, and *Stiphronis erythrothorax* in Kenya. Auk, vol. 84, pp. 594-595.
- ZIMMERMAN, DALE A., AND R. E. MUMFORD
1965. First specimens of three species of birds from Kenya. Auk, vol. 82, pp. 282-283.

