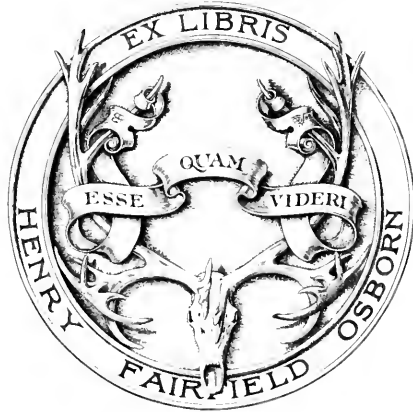


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LIFE-HISTORIES
OF
AFRICAN GAME ANIMALS

VOLUME II



The Great Elased
From a drawing by Philip R. Goodwin

59. 2

LIFE-HISTORIES

OF

AFRICAN GAME ANIMALS

BY

THEODORE ROOSEVELT

AND

EDMUND HELLER

WITH ILLUSTRATIONS FROM PHOTOGRAPHS, AND FROM DRAWINGS
BY PHILIP R. GOODWIN; AND WITH FORTY FAUNAL MAPS

VOLUME II

NEW YORK

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1914

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⊙ Represents type locality or exact spot from which the type or original specimen came.

LIFE-HISTORIES
OF
AFRICAN GAME ANIMALS

CHAPTER XV

BUSHBUCKS, SITATUNGAS, KOODOOS, BONGOS, AND ELANDS

SUBFAMILY *Tragelaphinæ*

THE tragelaphine antelopes of Africa form a compact natural group, comprising the bushbucks, sitatungas, koodoos, bongos, and elands. They are best defined by their spirally twisted horns, but they also show a singularly close agreement in the color pattern of the head and body. The white transverse body stripes, which are found in all the genera to a greater or less degree, are characteristic of the subfamily. Other white markings which are common to the whole group are the two white spots on the cheeks, the white lips and chin, the white spots above the hoof on the front of the pasterns, the white bars on the inside of the limbs at the axillæ and the groins, and the white inner surface of the ears. Some other markings which are almost universal are the white patches on the upper throat and on the chest and the white stripe down the inside of the legs. The group has an immense range in size almost equal to that of the family *Bovidæ* ranging as it does from the small harnessed bushbuck to the immense bulk of the elands, the largest of all antelope. The withers are distinctly low in some members, being less in height than the hips. The snout is rather short and without a lachrymal gland. The ears are large and broad owing to the bush-haunting habits

of most of the members; narrow in only one species, the common eland. The tail varies greatly from the short, bushy tail of the bushbuck to the long, tufted tail of the eland. The skull has long nasal bones, short snout and short nasal cavity, and no lachrymal vacuity in front of the orbit. A large sinus is present between the nasal and lachrymal glands as in the waterbucks.

The effort to divide this family into genera and species is fraught with difficulties that illustrate clearly how artificial the terms "genus," and "species" are. It is absolutely necessary to employ the terms and in some cases they meet all the needs of the situation, but in other cases, as with the tragelaphs, all that can be said is that they are necessary but that they are also unsatisfactory.

Nearly all the species of the *Tragelaphinæ* are so closely allied that they might all be included in a single genus. Such an arrangement would, however, result in considerable geographical confusion and obscure the real relationships of the species. Nevertheless, the attempt to make the genera of equal weight so as to express the relationships clearly, or avoid confusion, results in a multiplicity of genera; and this means splitting into groups a number of closely allied species. In fact, arguments of some weight can be advanced for either uniting all the tragelaphs into one genus, or for making almost as many genera as there are species; and in this same way arguments can be advanced for both splitting up into a large number of species, and for reducing the great majority of these from specific to subspecific rank. The genera adopted by most writers are based almost solely upon horn characters. As a single character, the shape of the horns is certainly the most re-

liable guide to the natural affinities of the various species. A careful study of the skulls, however, reveals some important differences between species which have hitherto been combined in the same genus on account of horn resemblances solely. The genus of the koodoos, *Strepsiceros*, is an instance of this sort. The lesser koodoo, *Strepsiceros imberbis*, is without doubt as closely allied to the bushbuck, *Tragelaphus*, as to the greater koodoo, as regards its skull characters and pattern of coloration. It is a geographical associate of both genera and deserves recognition as a separate genus in order to emphasize its true relationships. The nyala, *Tragelaphus angasi*, is another species which also must be accorded generic rank. Here, however, we have to do with a species showing almost identical horn characters with *Tragelaphus*, but differing distinctly in skull characters, pattern of coloration, and habits.

The tragelaphine antelopes range over Africa south of the Sahara, from the northern limits of the Abyssinian highlands and adjacent Red Sea coast south to the Cape. They are universally distributed throughout plains, forests, and swamps from sea-level to timber-line or the limits of forest growth. Geologically the subfamily is known as far back as the Miocene. Most of the fossil species are Eurasian and North African. Recently twisted horn-cores resembling those of the koodoo have been found by Merriam in the Pliocene of Nevada, but such forms were doubtful members of the tragelaphine group. Within the present year Gidley has described from a series of teeth from Pleistocene cave deposits in Maryland an American species of eland. It is, however, far from proven that the animal to which these teeth belonged was an eland or a member of the *Tragelaphinæ*,

which is an association founded upon horn and skull characters and not known to possess distinctive dental characters of much weight. It is highly improbable that the eland, if it did exist in America, lingered as late as the Pleistocene. Gidley's specimen doubtless represents a genus allied to the eland but peculiar to America.

KEY TO THE GENERA

Only males bearing horns

Horns curved in a narrow spiral, triangular in cross-section and seldom exceeding the head greatly in length

Hoofs normal; tail bushy; ears larger *Tragelaphus*

Hoofs greatly lengthened; tail tufted; ears smaller
Limnotragus

Horns curved in a wide open spiral, circular in cross-section, greatly exceeding the head in length

Male with a long throat mane; throat uniform in color
Strepsiceros

Male without throat mane; a white patch on forethroat and another on chest
Ammelaphus

Both sexes horned

Horns curved in an open spiral, broadly elliptical in cross-section and flattened, without a keel; coloration rufous

Boocercus

Horns closely spiral, circular in cross-section and furnished with a prominent, rounded keel; coloration grayish or fulvous
Taurotragus

BUSHBUCKS

Tragelaphus

Tragelaphus De Blainville, 1816, Bull. Soc. Philom., p. 75; type *T. sylvaticus* of South Africa.

The bushbucks are medium-sized antelopes in which the males are armed with short, spiral horns, the females being hornless. The horns seldom exceed the head much in length and are furnished with a wide keel which gives them

their characteristic triangular flattened shape. The spiral is very close and consists usually of but a single complete turn. The withers are low, and do not exceed the height of the hips. The tail is short and very bushy, as in the American white-tailed deer. The ears are large and expanded. The snout is rather short and without a lachrymal gland in front of the eye. The hoofs are normal in shape. The color pattern is very diverse, ranging from races marked with both transverse and longitudinal white stripes like the harnessed antelope of West Africa to uniformly colored races like *meneliki* of Abyssinia. In the eastern races great sexual differences in color prevail, the old males being sooty-brown or black, and the females bright rufous-red. Certain of the white markings are common to all of the races. Such are the white chin, lips, and upper throat areas, the white bar across the lower throat, the two white spots on the cheeks, the white bar on the inside of the thigh of the foreleg, the white patch at the axilla, and the two white spots immediately above the hoofs. White chevrons on the nose are often present, but they show great individual variation and are of no value as a color character. The bushbucks may be split into two natural groups occupying different geographical areas. The Congo, West African, and the upper Nile regions support the fully striped races in which the sexes are alike in coloration, while eastern Africa, from Abyssinia to the Cape, is inhabited by the races showing great sexual differences in body color and a great reduction in the amount of white striping or spotting in the coat. A collar of short hair is usually present at the base of the neck, formed by an area two or three inches wide of short hair having the appearance of having been rubbed. It is best marked and widest on the nape. The occurrence of this collar has been used by some naturalists to divide the bushbucks into two groups, but the result is unsatisfactory and artificial. Several of the races show much individual variation concerning its presence or absence, so that it cannot be relied upon as even a racial character. The only bushbucks which consistently lack the collar are the two highland forms inhabiting Abyssinia, and these mark the extreme northern extension of the genus in Africa.

The bushbucks parallel closely the American deer in

habits. Their haunts are forests or dense bush upon which they browse, and where they lead a solitary life. Like most of the deer they are very local and seldom range over an area of more than a few miles. In external appearance the resemblance in body and shape of head, ears, and tail is singularly close. The genus comprises a single species which splits up into numerous geographical races. Nowhere, however, are two races found occupying the same territory. The nyala, a large, transversely striped antelope, bearing in the male a long throat mane similar to that of the greater koodoo, is usually considered a member of this genus; but, owing to its differences in coloration and other structural differences, it has been distinguished as a genus, *Nyala*. *Tragelaphus* ranges throughout the whole of Ethiopia from the Cape northward to the southern edge of the Sahara Desert and the northern limits of Abyssinia. The altitudinal range covers a wide area from sea-level to 9,000 feet. The only fossil species assigned to the genus is one from the Miocene of Germany, but it is of very doubtful identity with the bushbucks of Africa.

THE BUSHBUCK
Tragelaphus scriptus

The bushbucks range from the Abyssinian highlands and the adjacent Red Sea coast westward along the southern border of the Sahara Desert to Senegal, and south throughout the whole continent to the Cape. They are absent only from the open plains, waterless deserts, and from altitudes above 10,000 feet.

Owing to the great geographical variation in color and the marked sexual color differences in some races, the species is difficult of definition. The forms which we now call races were nearly all described as species, owing to this great variation and the lack of specimens showing intermediate characters.

Scriptus may be described as a bushbuck having a large white patch on the lower throat, another on the upper throat, two white spots on the cheeks below the eye, white lips, chin, and gular region, a white band at the axilla and the groin, a white stripe down the inside of the legs to the

fetlocks, and two white spots above the hoofs in front of the pasterns. These white markings are always present. The body color ranges in shade from a bright tawny in females to a dark seal-brown in the males of some races, and in color pattern from ten white transverse stripes and one longitudinal one through every degree of spotting within the limits of these lines to races which are quite monocolored. The male in all races has a blackish breast and belly, or rather this area is always darker than the sides of the body, and the midline of the back is marked by a low mane of longer hair. The female lacks the dorsal mane and the darker coloration of the breast and belly. The young of the various races resemble closely their female parent in color, and the various races can be distinguished quite as readily at birth as can the adult female. The darker coloration of the male is gradually assumed during youth. The male is distinctly larger than the female.

We found the bushbuck common in different forms, from East Africa through Uganda to the Lado. We found it in the high, wet, cold mountains, in the hot, dry, low country, and in the wet, low country. Everywhere it avoided the open and lived in the timber or brush. But it showed a degree of adaptability to changing conditions, such as, for instance, the roan and waterbuck also show, but which other species, like the topi and oryx, do not show. In the Lado the bushbuck—here a form of harnessed bushbuck—lived in the rather thin, rather scanty patches of thorn scrub with which the dry country was dotted. They were always within such distance of water that they could drink at least once in the twenty-four hours. But except when drinking they were as apt to be found miles from water as in its vicinity, and we saw them feeding in the immediate neighborhood of hartebeest, kob, and waterbuck, all in the same type of country. In East Africa and Uganda

we never saw bushbuck in such country or in the neighborhood of such companions. In Uganda the bushbuck—another form of harnessed bushbuck—lived in wet, marshy ground, often where the water stood some inches deep among the tall grass and bushes. In much of East Africa we found the bushbuck—much less striped and spotted, and some of the males very dark-colored—living in thick forest, in the hills and broken country, where there were streams in the gullies and valleys, but where the forests themselves were dry; and there bushbuck were never seen in the open or on the feeding-grounds of the hartebeests or kob. In the Uasin Gishu the bushbuck were found in the belt of heavy timber along the river, and also in big reed beds, in places where reedbuck were also found; elsewhere we found them in the haunts of the duiker and impalla.

Bushbuck are solitary creatures. A buck and doe, or a doe and fawn, may be together, but generally we found them singly. As with other antelopes their times for feeding and drinking vary; in the Lado we came on them feeding in the bright daylight. But in East Africa they usually laid up during the day, and began to move about toward dusk. They trust for safety to skulking and hiding in the thick cover, and it is not easy to shoot them. They are rather noisy, and utter a deep bark when alarmed or disturbed; they sometimes utter this bark when they hear or smell a man or leopard. The leopard is their chief foe, as it lives in the same localities. Doubtless the lion kills them if it happens to get a chance, but it is not sufficiently adroit to take them while in cover. The bushbuck evidently know this, and have no fear whatever of the lions in the thick brush and

forest. In one place, by a stream, among the twisted, close-growing stems of big and little trees, in which lions habitually made their beds, and evidently passed much of their time, we also roused a bushbuck out of its bed. This bushbuck had used this bed for some days, and it was within twenty paces of a trail along which the lions had been continually passing and re-passing. Evidently the buck, as a finished diver and skulker in thick bush, able to dodge at full speed through the most tangled cover, felt entirely safe from any rush or spring of his huge and formidable neighbors. Bushbucks are browsers, but sometimes eat grass also. In the Lado they were feeding on leaves, twig tops, and pods of the yellow-barked acacia. In the Uasin Gishu they were feeding on leaves, wild olives, and a little grass. The buck is much larger than the doe, and is by far the most truculent of all the lesser antelopes; indeed for its size it is probably the most formidable fighter among all the antelopes, and its horns are very effective weapons. It will, when wounded, charge a man, and has even been known to kill one, as recorded by Drummond; it has also been known to kill both the leopard and the wild dog—Drummond recording the former feat, and Stevenson-Hamilton the latter. On one occasion, when we were beating a reed bed, a doe rushed back through the line of beaters, and fairly charged one beater, knocking him over with her rush. It is a very curious thing that among the tragelaphs it should be the little bushbuck which is so fierce, while the larger members of the subfamily, the eland and even the koodoo, are mild and gentle animals by comparison.

KEY TO ADULT MALES OF THE RACES OF *scriptus*

Neck without a collar of short hair	
No stripes or bands on body	<i>meneliki</i>
Sides marked by two longitudinal stripes	<i>decula</i>
Neck with a collar of short hair	
No stripes or bands on body	
Body color dark, chestnut or seal-brown	
Hind quarters marked with two or three white spots	<i>delamerei</i>
Hind quarters with many white spots	<i>massaicus</i>
Body color light, ochraceous or tawny	
Dorsal mane white	<i>dama</i>
Dorsal mane black	
Collar of short hair well marked	<i>multicolor</i>
Collar of short hair indistinct	<i>nigrinotatus</i>
Body color olive-gray, without reddish suffusion	<i>olivaceus</i>
Body crossed by transverse bands and one longitudinal stripe	<i>bor</i>

HIGHLAND BUSHBUCK

Tragelaphus scriptus delamerei

NATIVE NAMES: Kikuyu, *swalika*; Kikamba, *ndwayia*.

Tragelaphus delamerei Pocock, 1900, *Ann. & Mag. Nat. Hist.*, p. 95.

RANGE.—From the highlands south and east of Lake Rudolf southward through the highlands of British East Africa to the southern coast of the Victoria Nyanza.

The bushbuck named for Lord Delamere by Pocock, in 1900, was assigned to Sayer, Somaliland, erroneously, and has remained unrecognizable, partly owing to this confusion of locality, and partly to the immaturity and faded condition of the type specimen. Sayer is, however, in British East Africa. It is situated at the southern edge of the Lorogi Mountains, on the northeastern limits of the Laikipia Plateau, at an altitude of four thousand four hundred feet, and is on one of the old trade routes to Mount Marsabit and Lake Rudolf. A few years later Thomas described the

adult male of the same race as *haywoodi* from a specimen taken at Nyeri, which is situated almost within the same watershed, but one hundred miles south of Sayer. Still more recently a specimen from Nakuru has been made the type of a new race, *tjaderi*, by Doctor J. A. Allen.

The highland bushbuck is distinguishable by the dark seal-brown color of the old male, and the almost total absence of white markings on the sides. The hind quarters usually show two or three spots, but occasionally they are absolutely wanting. The adult female is tawny rufous.

The color of an old male is uniform raw umber-brown on the dorsal surface, but lighter on the rump, where there is some mixture with tawny hairs, and darker on the sides and breast, where the color becomes blackish seal-brown. The midline of the back is marked with a mane of long, white-tipped hair. On the sides are a faint indication of two transverse white stripes and two or three white spots on the flanks also. The tail is bushy; the dorsal surface and sides are rufous like the rump, the under-surface white, and the tip black. The legs are deep seal-brown like the belly, but are white on the inside of the axillæ and at the groins. The inside of the forelegs from knees to pasterns and a similar stripe on hind legs from the hocks are tawny-ochraceous. The front of the pasterns is marked with a pair of large white spots. The neck is encircled by a well-marked collar of short hair at the base, which is bone-brown in color. The fore part of the neck is tawny with a short, black mane on the nape. There is a white bar at the base of the throat and a rectangular one on the forethroat. The crown and forehead are bright-rufous, the snout umber-brown on top, and the sides of the face ochraceous-tawny. Below the eye on the cheek are two rounded white spots. The lips, chin, and upper throat are white. The ears are ochraceous-tawny on the back, with umber-brown tips and white inside.

Immature males at an age when the horns are two or three inches long are like the adult females in color, but the collar at the base of the neck is darker and the indications of transverse stripes more pronounced. Males with horns half grown are less reddish than the females and quite uniform wood-brown in color. The old adult female has the body bright russet on the midline of the back, and grades

on the sides gradually into bright-tawny. The legs are marked as in the male, but the upper part is much lighter—tawny instead of seal-brown. The head is colored quite as in the male; the neck, however, is lighter tawny like the body. The median dorsal line lacks the mane found in the male, which is indicated only by a dark stripe with occasional streaks of white hair. There is no indication on the sides of spots or transverse bands. Younger females show a row of white spots on the sides and indications of one or two transverse white stripes. Newly born young are like the young females in color and pattern, but lack the dark leg stripes, and have the head colored as in the adult. The collar is indicated by the dark-brown color of the hair on the nape, which is no shorter than on the rest of the neck. It is surprising how slight the color differences are between the nursing young and the adult female in a group showing such great sexual color difference in the adults. The absence of any indication in the young of the remote ancestral coloration would indicate great age in the present color pattern.

The type specimen collected at Sayer by Lord Delamere is an immature female with the milk teeth and first molar only in use, and has every appearance, as far as the skull is concerned, of being a kid six months old. The skin is in a faded condition and apparently lacks the white areas on the inside of the legs. It is matched closely in color by some skins of adult females from the Aberdare Mountains which show the same wood-brown color and absence of all spots on the sides and hind quarters. The collar of short hair on the neck is not always well marked in adults and is occasionally lacking, as is the case in the type of *haywoodi* which was one of the distinguishing characters used by Thomas for the race. The amount of white spotting on the sides is quite variable and is sometimes absent, as in the type specimens of both *delamerei* and *tjaderi*. The white chevrons on the snout are also subject to great individual variation in constancy, and their presence is of no racial value as a character. A large number of specimens have been examined from the Aberdare Mountains, Lake Naivasha, the Loita Plains, and the Uasin Gishu Plateau. This race is very similar in color to *sylvaticus* of the Zambesi region, the difference being much less than in the Uganda bushbuck, with

which it is closely associated geographically. Differences in coloration in bushbucks are a meridian affair with but slight latitudinal change.

The flesh measurements of an adult male are: head and body along curve of back, 53 inches; tail, 8 inches; hind foot, $14\frac{3}{4}$ inches; ear, $5\frac{3}{4}$ inches. The female is somewhat smaller in size and measures in length, 50 inches; tail, $7\frac{3}{4}$ inches; hind foot, 14 inches; ear, $5\frac{1}{2}$ inches. The skull of a large male measures $10\frac{1}{2}$ inches in greatest length. An adult female skull usually measures $8\frac{3}{4}$ inches. The longest horns in six males are 16 inches, measured on the curve of the keel. Average horns are somewhat less than the head in length and are approximately 10 inches long. Ward's record for this race is $18\frac{1}{2}$ inches.

MASAI BUSHBUCK

Tragelaphus scriptus massaicus

NATIVE NAMES: Kinyamwesi, *pongo*; Masai, *el mungu*.

Tragelaphus massaicus Neumann, 1902, Sitz.-Ber. Ges. Nat. Freunde, Berl., p. 96.

The Masai bushbuck was described by Herr Oscar Neumann from a specimen shot near Irangi, German East Africa, in the Rift Valley south of Mount Kilimanjaro. From the slopes of Mount Meru situated southwest of Kilimanjaro and some distance north of Irangi, Lönnerberg later described a race, *meruensis*, which is quite indistinguishable. His male specimens were more fully adult and showed darker coloration than the immature one described by Neumann, which accounts for the differences he discovered. The absence of the white chevrons given as a character is of no racial value, owing to the great individual variation in constancy to which they are subject.

The Masai bushbuck may be distinguished from *dela-merei* by its lighter body color in the male, and by the presence of three or four transverse white body stripes, and by the greater number of white spots on the hind quarters, which are present in both sexes.

SWAHILI BUSHBUCK

Tragelaphus scriptus olivaceus

NATIVE NAMES: Swahili, *kungu*; Taita, *sariga*.

Tragelaphus scriptus olivaceus Heller, 1913, Smith. Misc. Coll., vol. 61, No. 13, p. 1.

RANGE.—Eastern edge of Taru Desert from the German boundary of British East Africa north throughout the coast district as far as Lamu at least; limits of range unknown.

The Swahili race has been recently described from specimens secured at Maji-ya-Chumvi Station on the western edge of the moist tropical belt flanking the coast. A mounted specimen from Lamu in the British Museum represents the northern limits of the range of the race. The dorsal coloration of the male is grayish-olive without any rufous suffusion. The sides and hind quarters are marked by white spots and the legs are seal-brown. The neck is short-haired, but without evident collar, and the dorsal mane is white. The female is cinnamon and has the sides of the body crossed by six to eight white cross-bars. There are white spots on the lower sides and on the hind quarters. From both the highland and the Masai bushbuck the Swahili race may be distinguished by the absence of any rufous in the coat of the male and the presence of a line of white spots on the sides of the body. The female is distinguishable by the greater number of transverse white stripes on the body.

The coloration of an adult male is grayish-olive sparingly lined by buffy, with the midline of the back crossed by an indistinct white bar. The lower sides are marked by a line of irregular white spots and the hind quarters are spotted by several conspicuous white spots. The breast is dark seal-brown with a white bar at the axillæ; another back of the knee and a white spot on the inside from the knee to the pastern. The front of the pastern is marked by two large white spots. The hind legs are marked by a white spot behind the hocks and a broad white stripe on the inside of the legs from the hocks to the pasterns, the latter marked with two large white spots in front as on the forelegs. The tail is bushy and has the hair above and on the sides olive-brown, marked by a narrow streak of white on the under side; hair at tip is indistinctly blackish. The neck

is brown, without a definite collar, being short-haired to the white bar on the lower throat, where the long olive hair of the body begins abruptly. The upper throat has a large median white spot. The snout is without white chevrons. The crown of the head and the snout are olive-brown and the sides of the head are ochraceous-tawny. The cheeks below the eye are marked by two large white spots. The upper lips, chin, and forethroat are white. The back of the ears is olive-brown and the tips are seal-brown, while the inside and the base are whitish. The adult female has the sides of the body bright ochraceous-tawny, with the median area much darker cinnamon-brown, through the centre of which extends a thin white dorsal stripe from the withers to the tail. The sides of the body are marked with six or seven transverse white stripes, the anterior ones being the longest. The lower sides are marked by a line of white spots and the hind quarters with about a dozen similar spots irregularly arranged. The breast is buffy and lighter than the sides; the belly is white. The legs are bright-tawny with the white areas arranged as in the male. The tail shows much more white below than that of the male, only the median dorsal line being cinnamon like the body color. The collar on the neck is more distinctly marked than in the male. The crown of the head is bright-rufous, the snout dorsally olive-brown with narrow white chevrons from the eye to the snout, and the rest of the head is colored as in the male.

An adult male buck measured in the flesh: 44 inches in length of head and body; tail, 8 inches; hind foot, $14\frac{1}{2}$ inches; ear, $5\frac{1}{2}$ inches; length of skull, 9 inches. The horns of the type measure in length 12 inches on the curve of the keel. The specimen in the British Museum from Lamu has much greater horns, their length on the curve being $16\frac{5}{8}$ inches. The female is somewhat smaller than the male.

UGANDA BUSHBUCK
Tragelaphus scriptus dama

NATIVE NAMES: Kavirondo, *ngao*; Luganda, *engabi*.
Tragelaphus dama Neumann, 1902, Sitz.-Ber. Ges. Nat. Freunde, Berl., p. 97.

RANGE.—From the Kavirondo country on the northeast coast of the Victoria Nyanza westward throughout Uganda and northward through the highlands as far as the latitude

of Nimule. Absent from the low country bordering the Nile and the Victoria Nyanza, where the race *bor* occurs.

Herr Neumann described this race from some flat skins which he obtained from the natives in the Kavirondo country, where the race reaches its extreme eastern limits and is not so well marked as in central Uganda. Speke and Grant met with the bushbuck on several occasions in Uganda. Grant described one he shot very carefully and mentions the aversion the natives have for it, owing to their superstitious belief regarding the unwholesomeness of its flesh as food. This belief regarding the poisonous character of the flesh of the bushbuck is quite universal among the natives of British East Africa.

The Uganda bushbuck approaches the highland race of East Africa most closely in color and size. It is distinguishable from this race by the much lighter color of the old bucks, which never become seal-brown, but are a light ochraceous-tawny. They are marked more numerously by white spots, a row extending from the forelegs to the hind quarters, where they merge with an irregular assemblage of spots. No transverse white stripes are found in the old males. The body of the female is, however, crossed by from four to six transverse stripes, and she has also well-marked rows of spots on the flanks and hind quarters. The immature male is striped and spotted like the female, but has the blackish breast and belly and the dorsal mane of short hair of the adult male. From the Nile bushbuck this race is at once distinguishable by the absence of both transverse or longitudinal stripes in the adult male, and by the much larger body size. It does, however, approach the Nile race in the similarity in body color between the sexes. The line of spots on the flanks marks the position of the white longitudinal stripe in *bor*.

No measurements of adult male specimens in the flesh are available. An adult female, however, measured in length of head and body 49 inches; tail, $8\frac{3}{4}$ inches; hind foot, $13\frac{3}{4}$ inches; ear, $5\frac{1}{2}$ inches. The skull of an old male has a length of $9\frac{3}{4}$ inches, with a length of horn along the curve of the keel of $14\frac{1}{2}$ inches.

Specimens have been examined from the Maanja River in central Uganda and the types from Kavirondo. Bush-

buck from the headwaters of the 'Nzoia River immediately above the Kavirondo country are dark-colored like *delamerei*, old males from this elevated region being quite as dark as any from the Aberdare Mountains. The record horn length of this race recorded by Ward is $18\frac{3}{4}$ inches, based on a specimen shot in Unyoro by F. A. Knowles, the district commissioner.

NILE BUSHBUCK
Tragelaphus scriptus bor

NATIVE NAMES: Djeng, *bor*; Bongo, *tobbo*; Dinka, *pehr*.
Tragelaphus bor Heuglin, 1877, Reise, Nord-Ost Africa, II, p. 122.

RANGE.—Upper Nile from the Albert Nyanza north to the limit of the bush country in the White Nile region, east to the Nile-Rudolf watershed and west over the Congo watershed to the headwaters of the Congo system.

Heuglin described the bushbuck of the Bahr-el-Ghazal region in 1877, giving to it the name *bor*, by which it was known to the Djengs who dwell in the country lying between the mouth of the Sobat and the Bahr el Zeraf. Doctor Schweinfurth also met with it during his travels in the upper Bahr-el-Ghazal district in 1869. He makes mention of its extreme shyness, solitary habits, and the ease with which it is detected by the eye, owing to its striped coloration. In an appendix to his narrative of his travels he furnishes a long list of names by which the bushbuck is known to the various tribes he encountered.

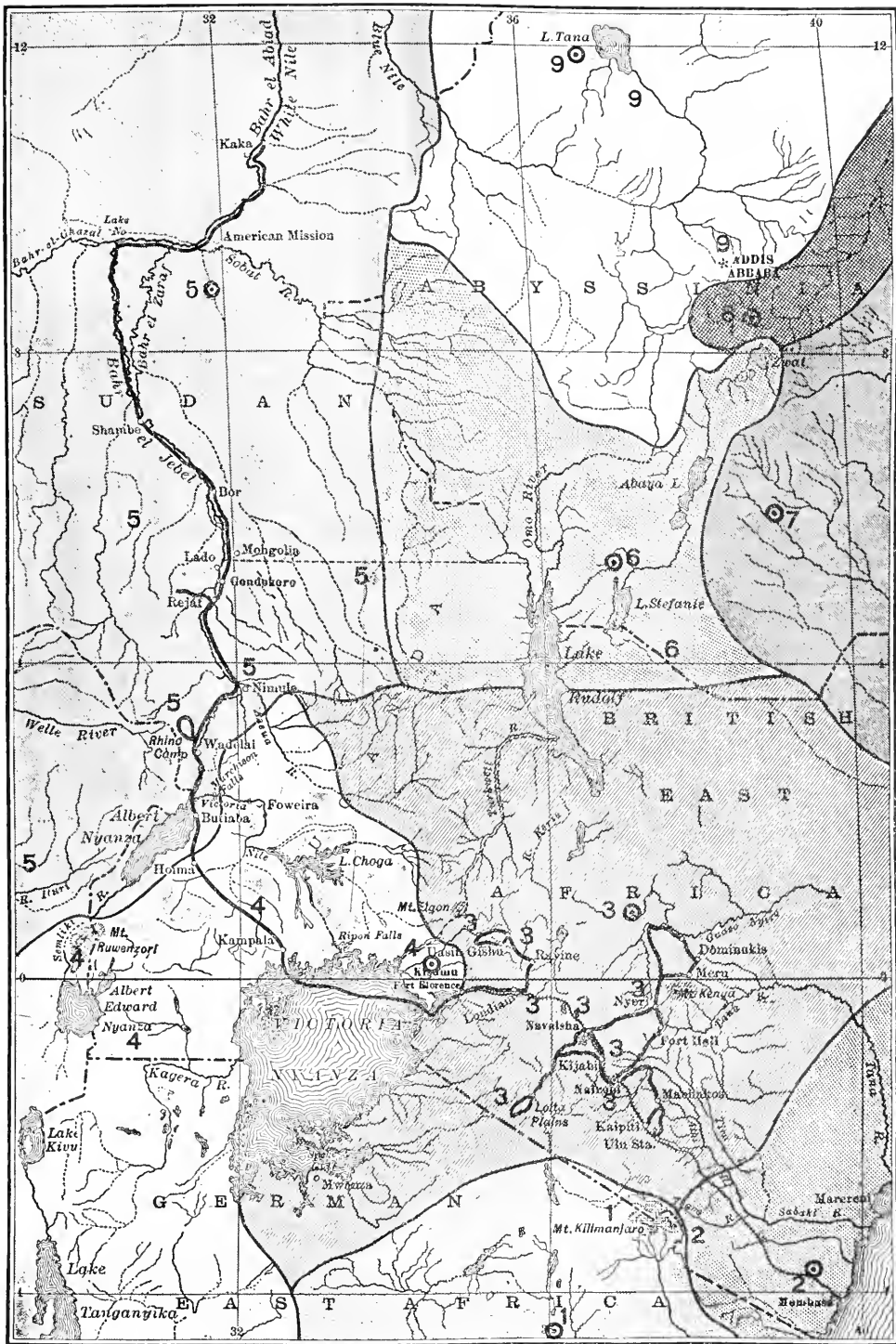
The Nile bushbuck is scarcely distinguishable from the typical race from West Africa. The male may be distinguished by the collar on the nape, and the darker throat, but the color pattern is quite the same as in *scriptus*. The female cannot be distinguished from the typical form. It is quite remarkable that the bushbucks show practically no racial variation from the Nile to Senegal, a distance of three thousand miles, while eastward they break up into several races within an area of less than one thousand miles' width. From *delamerei* it is distinguishable by its numerous transverse stripes, the single longitudinal stripe, and the rufous color of the adult male. It approaches more closely *dama* in coloration, but is readily distinguishable by the presence

of the longitudinal stripe and the more numerous transverse stripes, as well as by the smaller body size and much smaller ears.

The adult male has the collar indicated upon the nape by an area of short, uniform bone-brown hair which does not reach more than half-way down on the sides. In the female the collar is not indicated, either by color or length of hair. The male and female have the same color pattern, the body being crossed by eight to ten transverse white stripes, none of which are uniformly white. The lower sides are marked by a clear white longitudinal stripe extending from the shoulder to the middle of the body and continued to the hind quarters by elongate white spots. The hind quarters are marked by several rows of white spots which extend well up toward the base of the tail. The dorsal mane is blackish basally, and has the hair white-tipped, but is only indicated in the female by a dark stripe with occasional white hairs. The male has the breast seal-brown and the legs dark-brown with white areas as in *delamerei*. The female has the breast lighter than the sides, buffy-ochraceous, and the legs light-colored with only a median seal-brown stripe in front. The head is colored alike in both sexes and closely resembles *delamerei* in pattern and shade. The nursing young are like the female in color.

An adult male in the flesh measured: 49 inches in length of head and body; tail, 7 inches; hind foot, $14\frac{1}{2}$ inches; ear, $5\frac{1}{2}$ inches. A female measured: 44 inches in length; tail, 7 inches; hind foot, 13 inches; ear, 5 inches. Skull of a male measures in greatest length 9 inches, that of a female $8\frac{1}{2}$ inches. The longest horns measured $11\frac{1}{2}$ inches on the curve of the keel in a series of three adults. Ward's record is a Soudan specimen measuring $14\frac{1}{2}$ inches.

A series representing all ages has been examined from Rhino Camp, Lado Enclave, and single specimens from Nimule and a locality eighty miles east of Gondokoro. Specimens from the two sides of the Nile are quite alike, as are also those from the headwaters of the Congo tributaries of the Ituri and Welle. The race is not confined to the valley of the Nile, but extends westward into the Congo watershed.



MAP 12—DISTRIBUTION OF THE RACES OF THE BUSHBUCK

- 1 *Tragelaphus scriptus massaicus* 2 *Tragelaphus scriptus olivaceus* 3 *Tragelaphus scriptus delamerei*
 4 *Tragelaphus scriptus dama* 5 *Tragelaphus scriptus bor* 6 *Tragelaphus scriptus nigrinotatus*
 7 *Tragelaphus scriptus meneliki* 8 *Tragelaphus scriptus multicolor* 9 *Tragelaphus scriptus decula*

The heavy black line on this and the following maps indicates the route of Col. Roosevelt's African expedition of 1898-1900.

SITATUNGA
Limnotragus

Limnotragus Sclater and Thomas, 1900, Book of Antelopes, vol. 4, p. 149; type *L. spekei*.

The sitatunga has been accorded generic distinction from the bushbuck chiefly on account of its elongated hoofs and the more open spiral of the horns. In shape of body and coloration it closely resembles the bushbuck, but has the white markings of that species much less clearly marked. The tail is not bushy, but rather thin-haired basally, with a tuft at the tip. The ears are smaller than in the bushbuck, but have the same broad shape. The pelage is long everywhere on the body, but there is no dorsal mane as in the male bushbuck. The hoofs are very long and sharply pointed, their length being more than twice their basal width. The back of the pasterns and the area about the false hoofs are naked and pad-like as in the lechwi, which is also a swamp-haunting genus. The elongate shape of the hoof is an adaptation to give the foot greater support in the soft, swampy ground which the animal frequents. The horns are much longer than in the bushbuck, more openly spiral, with usually more than one complete turn, and white tipped for an inch or more at the point. The skull exhibits a much smaller orbit than in the bushbuck, and has much narrower mesopterygoid fossa. Three forms are included which exhibit discontinuous distribution paralleling the lechwi somewhat in this respect. One of these is known in Uganda, another from the swamps of the upper Zambesi, and a third from the mouth of the Congo and the West Coast of Africa. The differences in these races are in coloration chiefly, there being no difference in body size.

UGANDA SITATUNGA
Limnotragus spekei

NATIVE NAMES: Luganda, *chobe*; Karagwe, *nzoe*.
Tragelaphus spekei Sclater, 1863, Speke's Journ. Discov., p. 223.

RANGE.—North and west drainage area of the Victoria Nyanza from Mount Elgon westward as far as Mount Ruwenzori and north to the Bahr-el-Ghazal district.

Speke and Grant, while sojourning in Karagwe, west of the Victoria Nyanza, were presented by the ruler of the district, King Rumanika, with a live specimen and some heads of the sitatunga, obtained in some of the small lakes of the neighborhood. These specimens formed the basis for Sclater's description of the species in Speke's "Journal of the Discovery of the Source of the Nile." Very few sportsmen have met with the sitatunga, however. Gedge, in 1893, secured a large number from one of the small islands of the Sessi group in the Victoria Nyanza. More recently one has been obtained near Kampala, Uganda, by Kermit Roosevelt. Sportsmen have also recorded them from swamps at the west base of Elgon, on the headwaters of the 'Nzoia River, east of Elgon, and the Bahr-el-Ghazal district. Although sitatungas have been secured by several sportsmen recently in the Bahr-el-Ghazal district, they are not yet known to occur in the intervening stretch of the Nile from the Albert Nyanza to the mouth of the Bahr-el-Ghazal.

We only came on the sitatunga in the Uganda marshes. It is the most water-loving of antelopes, never leaving the marshes except at night to feed in the meadows in their immediate vicinity. Its exceedingly long hoofs make it a slow and clumsy runner on dry land, but enable it to thread its way with ease through mud and water among the high reeds. In the reed beds it is practically safe from all enemies, and it is rarely so much as seen; but at night when feeding outside them it is occasionally killed by the leopard, and even by the lion. In certain places it can be killed in time of flood from canoes, owing to having been drowned out of its proper haunts; but ordinarily the only way to get it is to have a marsh driven by beaters. It makes well-beaten paths through its haunts, in the papyrus, the reeds, and the long grass, and it sneaks through these so silently, and is so exceedingly shy that it is hard to get a glimpse of it as it

slides over the treacherous mud, or swims where the water is deep. We found the sitatunga living in papyrus where the water was waist-deep on a man. The stomach of the one Kermit shot was filled, not with grass, but with the leaves and twig tops of a shrub which grew in and alongside of the swamps.

The Uganda sitatunga is readily distinguishable from the Zambesi species, *selousi*, by the marked sexual difference in color, the female being rufous and the male drab-brown. In *selousi* both sexes are drab-brown. The males of the two species are distinguishable by the more spotted and striped character of the coat in the Uganda sitatunga, which has faint indications on the body of the white stripes and spots of the female. From the Congo sitatunga there are only slight racial differences, the two forms being closely related by the similarity of the coloration of the females, which are rufous, with indications of transverse white stripes on the body. The male of the Congo race is much more distinctly banded and spotted on the sides of the body than is the case with *spekei*, although both are alike in the general drab-brown tone of coloration.

The coloration of the male is uniform drab-brown with the median dorsal line marked by a whitish stripe. There is a white bar in front of the chest and a white spot on the fore-throat. The sides of the body are marked by three or four faint indications of white transverse stripes which reach only half-way down the sides. There are a few white hairs on the lower sides indicating the lower lateral line of spots in bushbucks, and the hind quarters are marked by several distinct spots. The breast is drab-brown, like the dorsal surface, and the belly whitish, the white extending down the inside of the hind leg to the hoof, where it merges with the white spots in front of the pastern; rest of leg drab-brown, like the body color. The foreleg is white at the axilla, the white area continuing down the inside of the leg to the pastern, as in the hind leg. The tail is tufted at the tip, the hair at the base being shorter and less abundant, and is colored above drab-brown, the under side being marked by a nar-



MAP 13—DISTRIBUTION OF THE SPECIES AND RACES OF SITUNGAS

1 *Limnotragus spekkii spekkii*

2 *Limnotragus spekkii gratus*

3 *Limnotragus selousi*

row line of white. The head is drab-brown and the snout is marked by two broad white chevrons from above the eye to the midline of the snout, where, however, they are separated by a narrow space. The cheeks below the eye are marked by two white spots. The upper lips and chin are white. The ears are small but broad, and are seal-brown on the terminal half with the rest of back, base, and whole inside white. The female is bright tawny-rufous with a dark stripe following the median line of the back, with indications of several white stripes on the body, and the legs are striped with white, as in the male. The young show the transverse white stripes much more distinctly than the adult female. The characteristic white markings on the head, throat, and legs of the bushbuck are found in the sitatunga, but they are much less conspicuous.

The male shot by Kermit Roosevelt measured in the flesh: in length of head and body, 54 inches; tail, $12\frac{1}{2}$ inches; hind foot, $19\frac{1}{2}$ inches; ear, $5\frac{1}{2}$ inches, and height at the withers, $39\frac{1}{2}$ inches. The skull of this specimen measures in length $10\frac{3}{4}$ inches. The longest horns recorded by Ward are from the Bahr el Ghazal, and show a length around the curve of 35 inches. Average horns are, however, much less in length, 20 inches being the usual length.

LESSER KOODOO

Ammelaphus

Ammelaphus Heller, 1912, Smith. Misc. Coll., vol. 60, No. 8, p. 15.

The lesser koodoo has been given generic distinction from the greater owing to the more narrowly spiral horns, absence of a throat mane, and presence of the white patches on the throat and chest, as in the bushbuck. It is quite evident from these differences in coloration that the lesser koodoo is no more closely related to the greater koodoo than it is to the bushbuck or the bongo. The color pattern is almost identical with that of the bongo in those features in which it differs from the greater koodoo, that is, the absence of a throat mane and the white patches on the throat and chest. The body stripes are practically the same in number and position as in the bongo, from which it differs decidedly by



LESSER KOODOO
From Somaliland. Group in Field Museum, Chicago
Mounted by Carl E. Akeley



GREATER KOODOO
From Somaliland. Group in Field Museum, Chicago
Mounted by Carl E. Akeley
THE GREATER AND THE LESSER KOODOO

the difference in the shape of the horns, and their absence in the female, and the bushy tail. Besides the color differences from the greater koodoo, there are some distinctions in the skull. The snout is longer, the premaxillary bones being much longer than in the greater koodoo. The genus contains but one species, the lesser koodoo.

EAST AFRICAN LESSER KOODOO
Ammelaphus imberbis australis

NATIVE NAMES: Swahili, *kungu*; Duruma, *chakwa*.

Ammelaphus imberbis australis Heller, 1913, Smith. Misc. Coll., vol. 61, No. 13, p. 2.

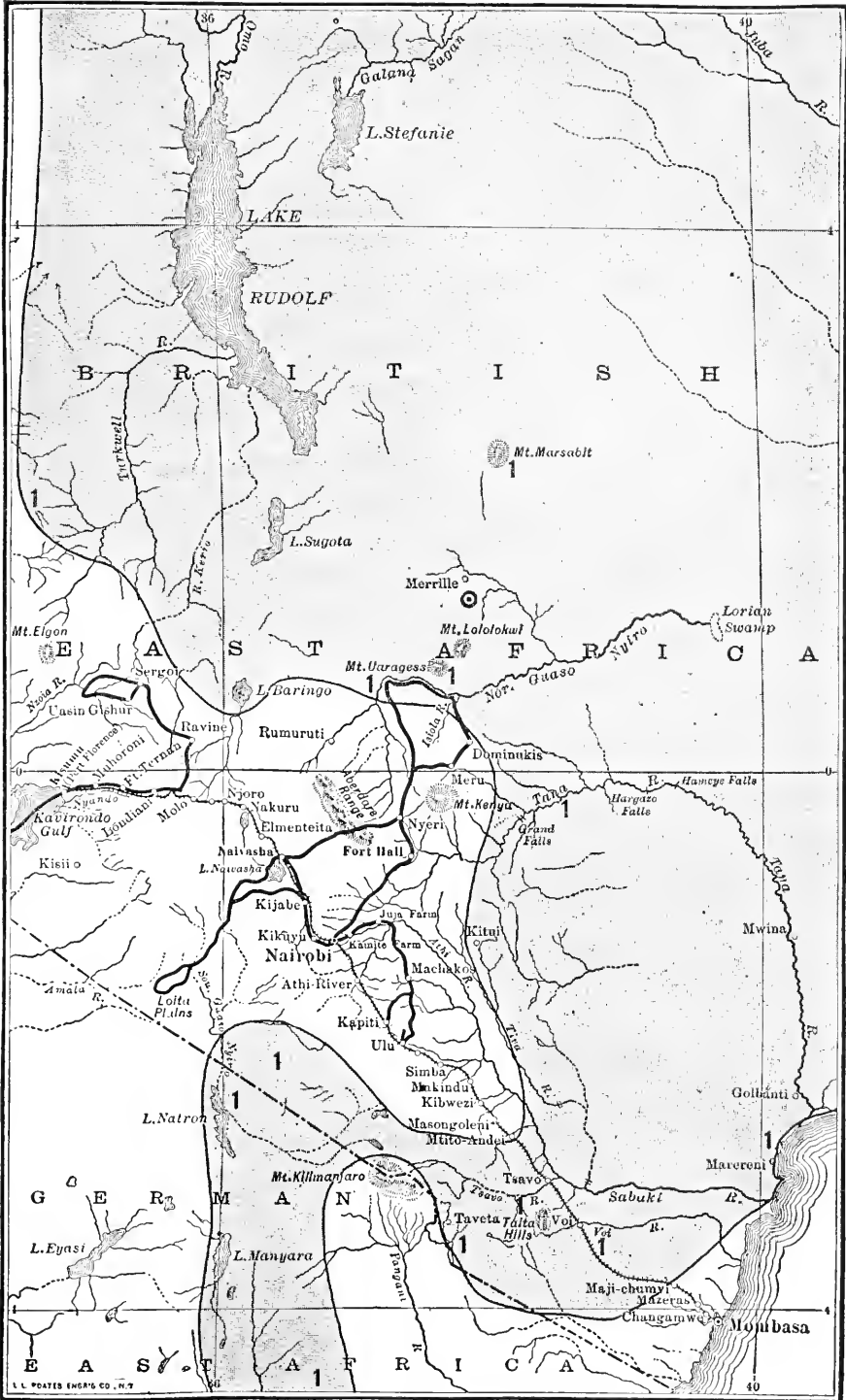
RANGE.—From Ugogo, in central German East Africa, northward through the Rift Valley to the British East African border, where it spreads eastward to the coast and northward to southern Abyssinia and Somaliland; not occurring above an altitude of three thousand feet.

The typical lesser koodoo was first described by Edward Blyth in 1869, but it was not for several years afterward that the difference with the greater koodoo was clearly defined, owing to the absence of specimens in Europe. Sir John Kirk obtained the first specimens in East Africa, in 1873, at Brava near the mouth of the Juba River. Later Willoughby and Jackson obtained specimens in the Taita country, east of Kilimanjaro. The present race was recently described from specimens secured by the Rainey expedition, south of Mount Marsabit.

The lesser koodoo inhabits the level, bush-covered desert at low altitudes, usually occurring in rather dense thickets and seldom in scattered or open bush. The males are usually solitary, but the females are found in smaller groups of two to four, with their young. Usually such groups are made up of an old female with a yearling offspring and a nursing kid. When startled they sometimes utter a sharp, barking call, similar to that made by the bushbuck, and bound away in great leaps, at times clearing bushes six feet high. Their feeding time is at dusk and again at dawn. The hot hours of midday are spent in the security of some impenetrable thicket. Their food consists chiefly of the twigs of acacias

and various other bushes. They are, no doubt, independent of water, although they are seldom found in absolutely waterless deserts. They have not, however, been observed drinking at water-holes, to which other game resort for such purposes in the desert districts they inhabit. The East African lesser koodoo resembles *imberbis* of Somaliland closely, but differs by darker coloration, absence of the white spots on the front of the pasterns on the forelegs, and shorter horns.

The coloration of the male is bright-tawny lined with black along the median dorsal region. The vertebral line is marked by an ill-defined white-and-black dorsal stripe and the sides are crossed by twelve to thirteen conspicuous transverse white stripes from the dorsal stripe to the underparts. The lower sides and the breast are ochraceous, and the midline of the chest is marked by a broad black stripe, but the belly and groins are pure white. The forelegs are pure ochraceous, without the white spot on the front of the pasterns. The band above the hoofs and the back of the pasterns are black. There is a black band on the back of the leg just above the knee, bordered below by a white band at the knee. The hind legs are ochraceous, with a white spot on the front of the pasterns and a black band above the hoofs, and the back of the pasterns are black. There is a white stripe on the inside of the leg from the white of the belly to the hock. The tail is tawny above, white below, and tip seal-brown. The neck is somewhat lighter than the body, being écru-drab with a narrow black stripe on the nape from the head to the withers. There is a white patch on the forethroat and a larger oval one near the base of the throat. The crown of the head is seal-brown, banded in front by white chevron bars from the eyes to the snout. The median line of the snout is walnut-brown. The sides of the head are écru-drab, with two white spots below the eye and a short white post-ocular stripe. The lips and chin are white, bordered by dusky. The back of ears is ochraceous, the tip narrowly margined by blackish; inside and base white. The female resembles the male closely in color, but is lighter, being ochraceous-tawny, very scantily lined by black, with the crown of the head lighter—tawny rather than seal-brown. The young are like the adult in pattern of coloration but in tone somewhat lighter. Sexes quite equal in size.



MAP 14—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE LESSER KOODOO

1 Ammelaphus imberbis australis

The measurements in the flesh of an adult female were: head and body, 59 inches; tail, 14 inches; hind foot, 18½ inches; ear, 8 inches. Length of skull, 12 inches. Fully grown horns usually measure 30 inches on the curve. The record length recorded by Ward for British East Africa is 33 inches. This specimen was shot by A. H. Neumann, the elephant hunter. Ward records a considerable number from Somaliland exceeding Neumann's head by an inch or two, the average horn length in Somaliland being about equal to the record of British East Africa.

GREATER KOODOO
Strepsiceros

Strepsiceros Hamilton Smith, 1827, Griffith's Anim. Kingd., V, p. 365; type species *S. strepsiceros*.

The koodoo is best characterized by its immense spiral horns and long throat mane, both of which are found in the male sex only. The horns are a wide, open spiral in shape which make two or three complete turns. In section the horns are circular, with a rounded keel, not flattened or furnished with a sharp keel as in the bushbuck. They more closely resemble the open spiral horns of the nyala, which is also a bearded or throat-maned antelope with transverse white body stripes. The lesser koodoo has horns very similar in shape, and on this account has been associated generically with the greater koodoo, but it differs by having the spiral much closer and lacking the throat mane. The female koodoo is hornless and without the throat mane, but in coloration is identical with the male. The tail is bushy throughout, the hair at the tip slightly longer than at the base and rather short in length, being intermediate in length between that of a bushbuck and an eland. The greater koodoo ranges from the Cape Colony northward to Angola on the West Coast, and on the east through the Zambesi Valley to Abyssinia. It is absent from the Congo basin and the region north and west to the Sahara. Owing to the bushy character of its haunts and its extreme alertness and shyness, the koodoo has persisted throughout most of its original range, even in Cape Colony. It is very local, the areas which it inhabits being widely scattered. A single living species is

known. Two fossil species are described, one from the Pliocene of India and a more recent Pleistocene species from Algeria.

EAST AFRICAN GREATER KOODOO
Strepsiceros strepsiceros bea

NATIVE NAMES: Swahili, *marua*; Masai, *olmaalo*.

Strepsiceros strepsiceros bea Heller, 1913; Smith. Misc. Coll., vol. 61, No. 13, p. 3.

RANGE.—Rift Valley and coast desert drainage in German and British East Africa. Confined to isolated localities which are widely separated.

The greater koodoo was first reported from British East Africa by Count Teleki, who obtained two in 1887, east of Lake Baringo, in the same district where Kermit Roosevelt obtained his specimens. Jackson early reported them from the coast district near the Taita Hills, and A. H. Neumann found a few in the hills near the south end of Lake Rudolf in 1895. Recently a few have been seen on the German border near the Southern Guaso Nyiro River. The present race was described from specimens shot by Kermit Roosevelt, at Donyo Gelasha, near Lake Baringo.

Kermit was the only member of our party who came across the koodoo, the most beautiful of African antelopes. He found them east of Lake Baringo, in rough, dry, volcanic country. They were always found on rocky hills, covered with a jungle of thorn scrub and tree euphorbias. Usually they rested during the hot midday hours, but once Kermit came on two which were drinking in a stream exactly at noon. They were wary. The stomachs of the two which Kermit shot, a bull and a cow, were filled with grass; the beasts were grazing at the time.

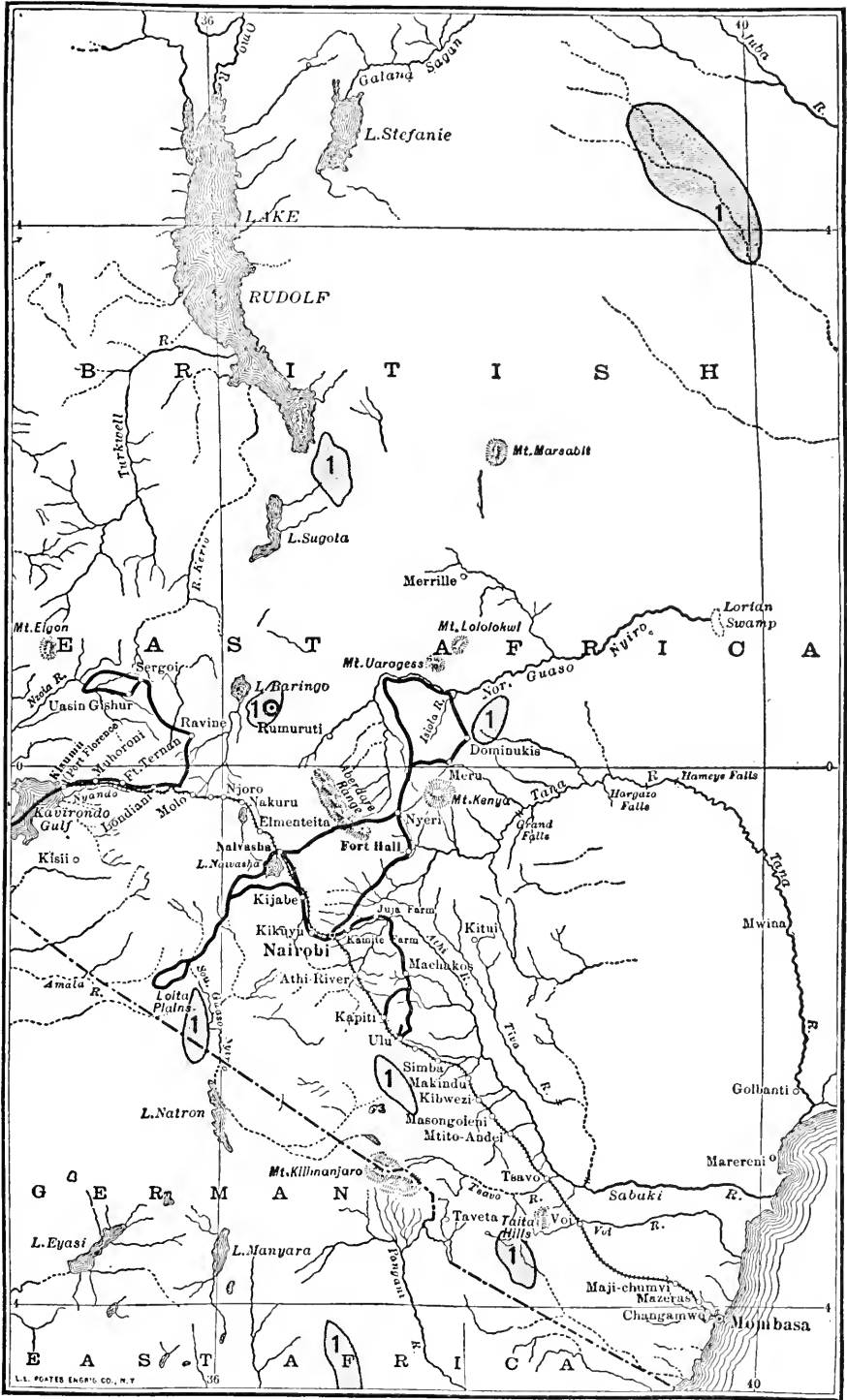
The East African race is similar to the Abyssinian race *chora* in the reduced number of body stripes, but decidedly darker in color on the median dorsal region, ear tips, and the

bands on the pasterns. The pelage is longer and the white stripes are very distinctly marked. It is brighter-colored than the typical race from South Africa, the stripes being much more conspicuous although less in number.

The coloration is ochraceous-tawny, but the median dorsal region is darker, being seal-brown with a white stripe following the vertebral column from the withers to the rump. The sides are marked by six or eight transverse white bands which extend from the median dorsal stripe to the ventral surface or lower sides. The under-parts are ochraceous with a broad blackish stripe extending medially on the breast. The groins and the inside of the legs are whitish and the front of the legs ochraceous. The band above the hoofs and the back of the pasterns are black, and the front of the pasterns are marked by a large blotch of whitish. The tail is tawny-ochraceous like the body, the tip darker walnut-brown, and the under side white. The neck is drab-gray, and the nape has a thin mane of long, dusky-brown hair, which is continued along the midline of the back to the tail. The throat has a long mane of brownish hair extending to the chest; the sides are buffy. The crown of the head is walnut-brown crossed on the snout by a wide diagonal white band from the eye, which meets its fellow on the snout. The sides of the face are écru-drab and marked by two indistinct white spots below the eye. The lips and chin are white. The back of the ears is hair-brown, the terminal half being seal-brown, and the inside and base whitish. The female is usually longer-haired than the male and has the white body stripes more distinctly marked. The throat mane is absent and the dorsal mane is not so distinct.

The koodoos found near Baringo are confined to a few square miles of country among rocky hills, and are widely separated from any other group. One hundred miles north, near the south shore of Lake Rudolf, are a few others, while to the south the nearest ones occur on the German border near the Southern Guaso Nyiro River. Wide breaks of this sort, however, are characteristic of the distribution of the greater koodoo, owing, no doubt, to the isolated nature of the hilly and rocky country which they select as their haunts.

No flesh measurements are available. The skull of the adult male measures 16 inches in greatest length. The



MAP 15—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE GREATER KOODOO

1 *Strepsiceros strepsiceros bea*

horns of the male shot by Kermit Roosevelt measure 47 inches along the curve. Ward records a specimen from East Africa having a horn length of 61 inches.

THE BONGO

Boocercus

Boocercus Thomas, 1902, *Ann. & Mag. Nat. Hist.*, vol. X, p. 309; type *B. eurycerus isaaci*.

The genus was founded by Thomas on the character of the horned female in distinction to the hornless females of the genus *Tragelaphus*, to which it was formerly assigned under the supposition that the females were hornless. The horns are, moreover, much broader and heavier than in the bushbuck. The coloration is quite different from that of the most fully striped bushbucks, the pattern consisting of transverse white stripes without the longitudinal stripes found in the harnessed bushbuck. The tail is bovine like that of the eland, not bushy as in the bushbuck. In the horned character of the female, the striped body, and bovine tail, the bongo resembles the eland and may be considered its forest representative. Only a single species is known, which exhibits wide, discontinuous distribution.

The genus occurs on the West Coast of Africa from the mouth of the Congo River north along the Guinea coast to Sierra Leone, and again appears in the highlands of British East Africa, where it ranges from the Mau Escarpment to Mount Kenia.

BONGO

Boocercus eurycerus isaaci

NATIVE NAMES: Kikuyu, *ndongoro*; 'Ndorobo, *siroya*.

RANGE.—Highland forest of British East Africa from the Mau Escarpment eastward through the Kikuyu Escarpment and the Aberdare Range to Mount Kenia. Not found below an altitude of six thousand feet.

The bongo was originally described by Ogilby as early as 1836, from a pair of horns of unknown origin. The coloration was not, however, known until 1861, when Du Chaillu described it from a skin which he had obtained in the forests

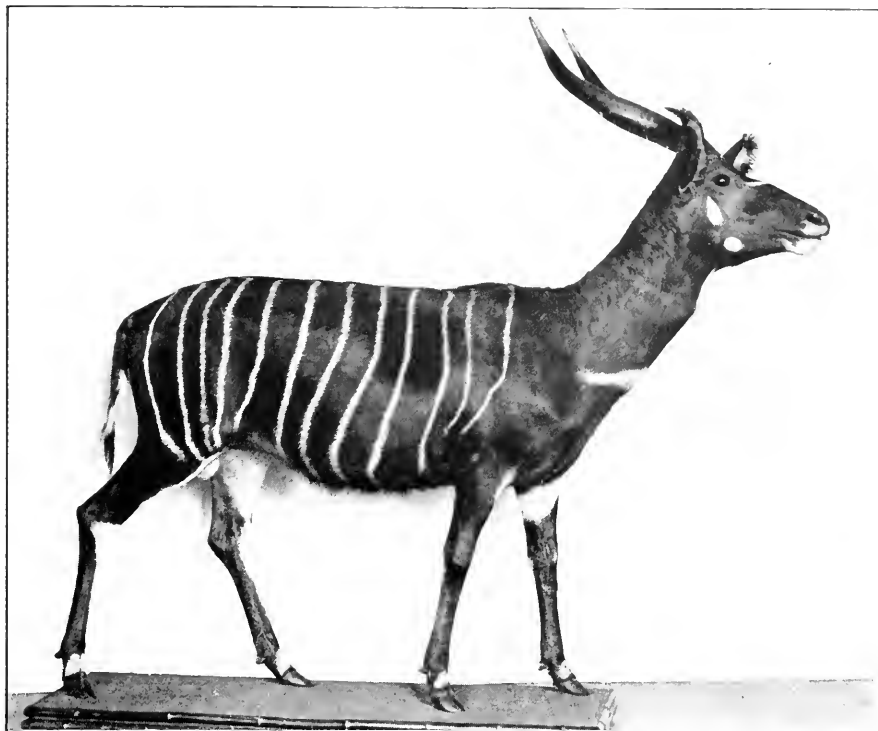
of the Gaboon, some distance north of the mouth of the Congo River. He gave it the name *albo-virgattus*, supposing it to be new to science. Although it was already named, he was the first to describe it fully and give it a definite locality. We owe also to Du Chaillu the name bongo, by which, he states, it is known to the natives of the Gaboon. Even at the present day the typical race is represented in museums by only a half-dozen skins, none of which are female, so that direct evidence is still lacking concerning the horned character of the female in the West African race. The race appears to be very local on the West Coast. Specimens have been secured in isolated localities north of the Gaboon on the Gold Coast, in Liberia, and in Sierra Leone. The first specimen secured in East Africa consisted of a pair of horns from the Ravine Station, on the Mau Escarpment, obtained from the native bushmen dwelling in the forest and sent by Jackson to the British Museum in 1897. They were erroneously identified by Sclater as horns of the nyala, a buck not known to occur north of the Zambesi drainage. In 1902 Isaac, who was then stationed at Ravine, obtained from the natives both skulls and skins, and these enabled Thomas to identify the animal positively. Recently sportsmen have made special efforts to obtain specimens, but the bongo is so secretive and keen-sensed that very few have been successful. Specimens obtained from the 'Ndorobo, who catch them occasionally in pits, are not rare, and many of these are now in collections.

Although in company with Lord Delamere and a number of 'Ndorobo friends of Delamere's we hunted several days for bongo, and followed their fresh trails for hours, the only member of our party who saw them was Kermit, who killed two, an adult cow and a half-grown one. Mr. George Grey (whose own lamentable death by a lion is elsewhere recorded) soon afterward killed a bull, which he most kindly presented to us, so as to complete the group for the Smithsonian. When mounted, the label is to record the fact that he is the donor of the bull.

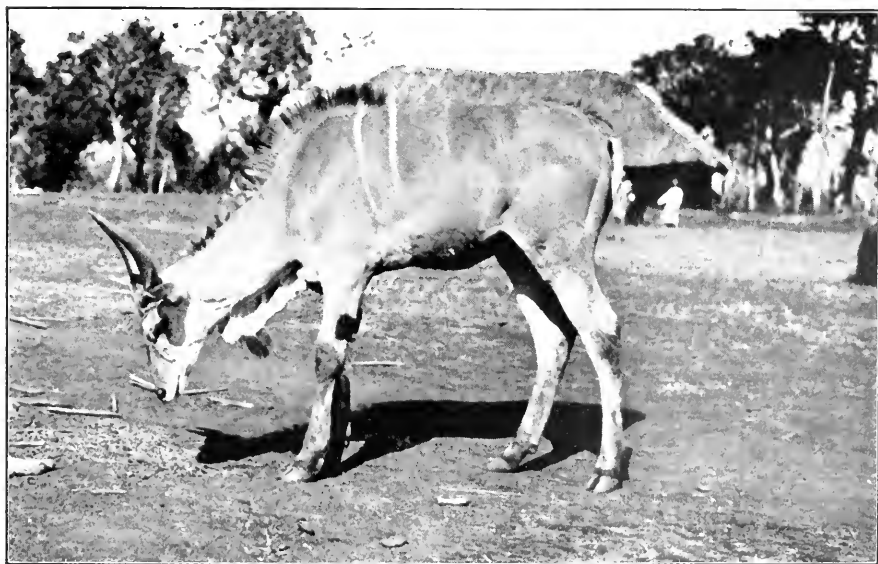
The bongo is intermediate in size and bodily characteristics between a bushbuck and an eland. It is also in some respects intermediate in habits; like the former, it haunts dense cover, and, like the latter, is found in herds. But it differs markedly from both in many other respects. It is a beast of the dense forests and high timber; among big beasts its haunts are shared only by the forest hog and the leopard. The leopard preys on the young of both the hog and the antelope; but it does not attack the adult hog, and never meddles with an adult bongo—an animal as large as an Alderney cow, both sexes of which carry long and sharp horns.

The dense, dark, wet forests in which the bongo dwells are filled with a mass of undergrowth—bushes, bamboo, plants of various kinds. It is impossible to see more than a few yards through this growth, and almost impossible for a man to traverse it noiselessly; whereas the bongo runs through it at speed and most often in a crouching position, getting under low limbs and through narrow openings in a way astounding for so big an animal. It is exceedingly shy and wary, and is such an adept in skulking, hiding, running, and watching that even the 'Ndorobo, the wild, naked hunters of the dense forests, find it very difficult to kill; while only half a dozen white men, or even fewer, have ever shot it.

We did not find the bongo nocturnal. The 'Ndorobo, with whom we hunted, said they never fed at night. We came across one solitary bull and four herds, and followed their trails for hours, studying what they did. The bull, and three of the four herds, lay down and rested in the middle of the day, and fed as they moved slowly forward through the forenoon and the afternoon. The fourth herd



EAST AFRICAN BONGO, MALE
From Mau Escarpment, B. E. A.
Presented by W. N. McMillan to the United States National Museum



EAST AFRICAN ELAND, YOUNG MALE, DOMESTICATED
Meru Station, Mt. Kenia
BONGO AND ELAND FROM EAST AFRICA

continued feeding, without lying down, from the middle of the forenoon, when we struck their tracks, until the middle of the afternoon, when we unfortunately alarmed the animals, whereupon they went straight up the mountain and over the rim rock. We twice found the night beds of a herd, which, as our 'Ndorobo trailers pointed out, had been occupied for the whole preceding night. It was cold, rainy weather, and the dark of the moon; perhaps they might feed under the full moon, and in better weather. They do not graze, but browse, cropping the leaves, flowers, and twigs of various shrubs, and eating thistles and the flowering tops of certain rank plants; the stomachs of Kermit's specimens contained leaves from a vine allied to the common grape, *Cissus*. The 'Ndorobo said they sometimes broke branches with their horns, and sometimes scored the earth with them. They wear deep trails through the gloomy mountain forests in which they dwell; these trails converge toward the rapid, foaming brooks which run between the steep, thickly wooded spurs of the mountains.

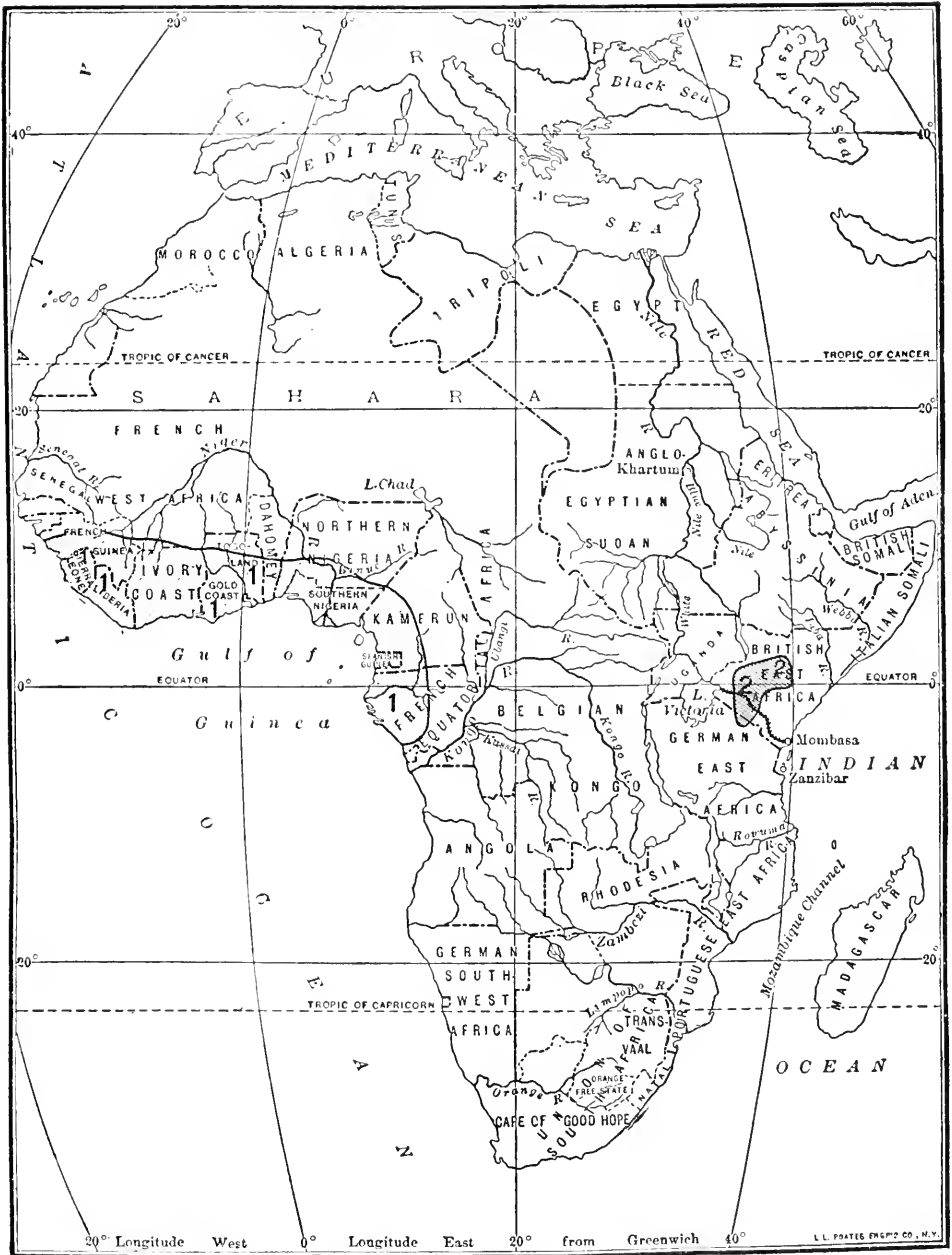
The bongo resembles closely the typical species of West Africa, but appears to be larger and darker colored and perhaps marked with a few less transverse stripes. No exact comparison, however, can be made at present, owing to the lack of specimens from West Africa available for examination.

The color of an adult male is bright burnt-sienna or chestnut, the body marked by twelve to fourteen conspicuous white bands from the dorsal mane to the lower sides. The stripes cover the area from the base of the neck to the base of the tail. Along the median dorsal region extends a thin mane of black hair crossed at intervals by the white bands. The tail is burnt-sienna like the back above with a narrow band of white below and a long tuft of black hair at the tip. The breast and belly are solid black. The

groins are white, the white extending in a narrow line to the base of the tail and continued as a broad band down the front of the leg to the hoof, but interrupted by the dark hock-band and the band at false hoofs. There is a white bar on the inside of the forelegs followed below on the inside by a black one, and a white bar behind the knee and another on the front of the pasterns; the rest of the foreleg is black. The neck is dark seal-brown on the nape and black on the median line of the throat. The lower throat is marked by a wide transverse band of white. The crown of head is chestnut and the interorbital region black with broad white chevrons extending from the eye. The snout is black on the top and the sides to the throat. The lips and chin are white, and the orbital region and area below the eye are tawny. The sides of the cheek behind the eye are marked by two large white spots. The ears are large and broad; the back chestnut, the outside edge and terminal half black, and the inside white. There is much variation in the extent of the black. In some males only the throat is blackish, the nape being chestnut. The female has the same pattern of color as the male, but is brighter red, the body being Mars-brown and the dorsal mane chiefly white. There is much less black than in the male, the nape being without black, the legs being chiefly reddish and only the median line of the belly is black. Newly born young have the color pattern of the adults, but the body is rich tawny and the dark areas are much suppressed. The tail is not bovine as in the adult but bushy throughout as in the koodoo, the tip being without a longer tuft. The muzzle and the median ventral stripe are hair-brown and the dorsal mane is white. Eight skins have been examined, six of which are adult males. The body stripes show considerable variation, and range from eleven to fourteen, and also show variations of number on the two sides. Twelve stripes seem to be the normal number.

Most of the specimens secured from natives come from the Mau forest west of Njoro, but the bongo has also been obtained in the Kikuyu forests near Escarpment Station and in the forest on the south slope of Mount Kenia.

The female shot by Kermit Roosevelt near Njoro measured in the flesh: $81\frac{1}{2}$ inches in length of head and body; tail, $14\frac{3}{4}$ inches; ear, $12\frac{1}{4}$ inches; and height at the withers, 44 inches. The skull of a large male measures in length 17 inches, that of the adult female 15 inches. The horns of the



MAP 16—DISTRIBUTION OF THE RACES OF THE BONGO

1 *Boocercus eurycercus eurycercus*

2 *Boocercus eurycercus isaaci*

female are 20 inches, those of the largest male in a series of three specimens $28\frac{1}{2}$ inches. Ward's record male is $36\frac{3}{4}$ inches in length of horns.

ELAND

Taurotragus

Taurotragus Wagner, 1855, Schreber's Säugethiere, Suppl., vol. V, p. 439; type, *T. oryx* Pallas.

In the eland the horns are present in both sexes, curved in a close spiral, and marked by a prominent rounded keel which is most pronounced basally. The horns usually exceed the head in length, and are heaviest in the male but longer in the female. The skull has practically no characters, the two species differing more from each other in shape and relative sizes of the lachrymal, nasal, and premaxillary bones than do the other genera of the *Tragelaphinae*. The body size is large, about equalling the ox, but the legs are more slender and the neck deeper. A dorsal mane extends from the head to the shoulders. The lower throat is adorned by a pendent dewlap which is best developed in the male. The hair on forehead becomes lengthened and bushy in old males. The tail reaches the hocks and is tufted. Both sexes are marked on the body by from ten to sixteen narrow white transverse stripes which become obsolete in old males. The inside of the foreleg above the knee is marked by a dark transverse bar and the breast and the belly along the median line are marked by a broad blackish band. The living species are *oryx* and *derbianus*, both having one or more geographical races.

The eland ranges in Africa from the Senegal and Gambia watersheds, the western affluents of the White Nile, Uganda and British East Africa from Gondokoro and Mount Elgon southward to the Cape region. They occur on open veldt and bush-covered country within a vertical range from sea-level to eight thousand feet. One Pliocene species is known from India and a later Pleistocene species from Algeria. The genus *Paleoreas*, which ranged from the Miocene to the Pliocene, is quite distinct, but shows the short rostrum of *derbianus*. It had, however, nearly vertically directed horns, like those of the koodoo, extending directly above the eyes.

KEY TO THE SPECIES OF *Taurotragus*

Ears broad and rounded with a black bar on inside of hinder margin; mane on nape black, long and extended, covering whole nape and sides of neck; throat fringed by a narrow mane; a white bar across lower throat; cheeks with two large white spots; fetlocks banded in front by a black bar; horns very long, twice length of head; rostral part of skull short. *derbianus*

Ears narrow and pointed, without a dark bar on inside; mane on neck when developed only covering nape and never black in color; no white throat bar or cheek spots; legs uniformly colored on outer side; horns short, not greatly exceeding length of head; rostral part of skull elongate. *oryx*

THE GIANT ELAND

Taurotragus derbianus gigas

NATIVE NAMES: Bari (Swaka), *tukectuk*; Bong Bong, *boroku*; Ojeng, *qual-qual*; Djur, *adjur*; Dor, *newarreh*.

Boselaphus gigas Heuglin, 1863, Nova Acta Acad. Leop., vol. XXX, p. 19, pl. 1, fig. 2 (horns).

RANGE.—So far as known the giant eland is confined to the Bahr-el-Ghazal and Lado Enclave Provinces of the Egyptian Soudan. It is limited to the western drainage of the Bahr-el-Jebel Nile, extending roughly from the vicinity of Rejaf northward to the Bahr-el-Ghazal River and its continuation the Bahr-el-Arab; westward it reaches Dem Zubeir in the Dar Fertit country. The distribution is limited to the eastward by the Nile and northward by its chief western affluent, the Bahr el Ghazal; while westward the heights of the Nile watershed confine it. In this latter region, however, it extends to the very borders of the watershed in the Niam-Niam country.

Throughout this range it is distributed only locally and is so rare that it is a very difficult species to obtain. From the typical race inhabiting Senegal it is separated by a distance of two thousand miles, the whole drainage system of the Niger intervening. The two races are so similar that such isolation must be very recent. The case is somewhat paralleled

by that of the white rhinoceros, which has the same range in the Bahr el Ghazal, but is widely isolated from its very close ally the southern white rhinoceros of South Africa.

The giant eland was discovered by Martin Theodore von Heuglin during his travels in the White Nile region in 1863. He described the species from a pair of horns collected somewhere near the present position of Wau, probably east of it. Later, in 1874, Doctor Georg Schweinfurth published the account of his travels in the Bahr-el-Ghazal region in which he referred to the eland occurring about the Lehssy River and the village of Sabby in the same vicinity. During the last fifteen years specimens have been shot in the Bahr el Ghazal by various sportsmen, notably by Colonel Sargeant Boardman, Captain Haynes, Leo Franco, Captain H. R. Headlan, "Bimbashi" Collins, and Prince E. Demidoff. More recently Colonel Roosevelt and his son Kermit shot three specimens in the Lado Enclave, and very recently F. C. Selous secured a female near Wau. The species, in 1894, was confounded with the common eland by Sclater and Thomas in the "Book of Antelopes," no skins at that time being preserved in any museum, the horns alone being represented. In April, 1905, Mr. A. L. Butler published in the Proceedings of the Zoological Society color descriptions of the two specimens shot by "Bimbashi" Collins, and pointed out the close agreement of these with the Derby eland. Later in the same year the Honorable Walter Rothschild published in *Novitates Zoologicae* a colored figure of a mounted head in the Cairo Turf Club with a note indicating the close relationship of this form and *derbianus*.

The giant eland has the regular eland horns, although very much magnified, but otherwise it resembles a bongo almost as much as it does the common eland. It frequents open country, covered by a growth of thorn scrub, its haunts being much more like those of the common eland than like those of the bongo; but it breaks the higher branches with its horns like a bongo, something which we happen never

to have known the common eland to do. These branches are broken to get at the leaves; we found them broken at a height of seven or eight feet, and the crack of the breaking was one of the sounds for which we listened as we followed the tracks of a herd. The stomach of one of the animals Kermit shot contained the leaves and pods of a small bean-tree, *Lonchocarpus laxiflorus*, and the leaves of the shea butter-tree, *Butyrospermum parki*, specimens of which were preserved by Kermit.

The country in which we found the giant eland was at that time very dry. The flats of endless dust-colored thorn scrub, which hid everything at a distance of one or two hundred yards, were broken by occasional ranges of low, ragged hills. In the empty watercourses the holes were many miles apart. The thorn scrub was varied by occasional palms and patches of bamboo, and more often by trees with bright green leaves and large bean pods. The elands which we killed had been browsing on the bean pods and leaves of this tree, and of another less conspicuous tree. They had not been grazing. They drank at some pool before dawn, and then travelled many miles into the heart of the parched flats, browsing as they went. Before noon they halted, standing or more often lying down, in the scanty shade of some clump of thorn trees. By mid-afternoon they again moved off, feeding. They walked fast, and when alarmed went at a slashing trot.

They were far more wary than the roan, hartebeest, and other buck found in the same locality. They were found in herds of from ten to thirty or forty individuals; the old bulls, as with all gregarious antelopes, were frequently solitary. The coloring of both the giant eland and the roan

antelope harmonized well with the dry landscape, and they were more difficult to make out than the hartebeests.

These eland are said speedily to leave a district if they are harassed by hunters. They wander far, their wandering being sometimes seasonal and sometimes due to individual vagaries. It is said that in the rainy season, when the grass is thick and tall, they are often killed by lions, which are then able to get so close as to seize them by the head; but that in the dry season few are killed by lions because then the big cat can rarely make his rush from such a short distance as to insure a grasp of the head, while the quarry is so huge and strong that if seized elsewhere it can generally break away.

The giant or Nile Derby eland differs from the typical race from the Senegal region chiefly by lighter color in the bull, the females of the two races being quite similar in color and size. In the Derby eland the old bull has the neck covered by long black hair, but in the Nile race the lower sides and throat lack the long black hair; this part being covered by thin grayish hair like the sides. The material available of the Derby eland, however, is very scanty. The only specimens examined were a male and female skin at the British Museum. The Nile race is much better represented in collections and it is quite certain that uniformly black-necked bulls such as the Derby eland at the British Museum do not occur in the Nile district. The most heavily maned bull examined is that shot by Colonel Roosevelt in the Lado. The long black hair covers the whole nape in this specimen and extends half-way down on the sides. The younger bull from the same locality shows only a narrow dorsal mane on the nape.

The old bull shot by Colonel Roosevelt has the ground-color of the body vinaceous-buff which becomes on the shoulders and the hind quarters ochraceous-buff and on the lower sides merges gradually into the cream-buff of the under-parts. A white dorsal stripe of irregular width extends from the black

mane at the shoulders to the loins and is continued on the rump by a black stripe. The left side of the body and the back are marked by twelve, the right by eleven narrow transverse white stripes at irregular intervals, the stripes being continuous with the white dorsal stripe and often forking before joining, but below they do not extend on to the under-parts. The tail, above, is light tawny and the brush of long hair at the tip black; but below it is white, sharply defined on the sides against the tawny. The legs, on the outside, are ochraceous-buff to the fetlocks, which are marked by a broad blackish blotch on the foreleg and a fainter dusky one on the hind leg. The pasterns behind and both the main and the false hoofs are encircled by black, but the front of the pastern is white. The under-parts and the inside of the legs are cream-buff. The breast and the belly are marked by a broad seal-brown stripe which is narrowest on the chest but widens posteriorly and covers the whole median portion of the belly. The foreleg is marked by a broad black bar on the inside below the elbow. The whole nape, from the base of the skull to between the shoulders, is covered by a broad mane of long black hair which extends half-way down to the throat on the sides of the neck, where it reaches its lowest point just in front of the shoulder. The individual hairs of the mane are four inches long, and black for three-fourths of their length, with the tip buff, but the hair so thin that the brown tips have no appreciable effect on the general blackness. The sides of the neck are drab, in contrast to the lighter sides of the head and body, and the dark area is bordered on the throat posteriorly by a wide band of white. The median line of the throat is fringed by a narrow mane of blackish hair intermixed with buffy, which forms at the lower part of the throat a short, pendent dewlap. The cheeks and upper throat are vinaceous-buff. The chin and upper lips are white. The cheeks are marked by a white spot below the eye and the throat by a similar one. The crown of the head has a slightly bushy mat of ferruginous hair extending from the horn bases to the interorbital region, where it is bounded by a white chevron stripe from the eye, but the stripes of the two sides do not meet on the snout, where they are separated by a broad black area which extends to the muzzle. The front of the muzzle and the area below the nostrils

posteriorly to the upper lips are white; the nostrils themselves seal-brown. The whiskers are black. The area above the eye is white with a dark blotch just below the horn base and the lower eyelid is white also. The occipital portion of the head and the back of the ears are ochraceous-buff. The terminal half of the ears is dark seal-brown and the inside of the ears is white with a broad seal-brown bar extending from the posterior border to the centre.

The female shot by Kermit Roosevelt is colored like the male, but differs distinctly in lacking the great bushy mane of the nape, this structure being represented by a narrow median line of black hair. The bush on the forehead is quite wanting and the ground-color of the body is more reddish, being ochraceous-buff without the vinaceous tint except on the lower sides. The dorsal mane of black is continued along the entire length to the root of the tail, and is crossed by the white side stripes which number fourteen on the left side and fifteen on the right. The greater number of stripes found in this female is not a sexual color difference but merely an individual variation. The black blotch on the front of the fetlocks is more distinctly marked than in the male and the mane on the throat is shorter-haired, the dewlap being hardly evident.

The coloration of the calf is not known, but it is without doubt similar to that of the female, as is the case in its near relative, the common eland. The younger male shot by Kermit Roosevelt is quite identical in color and mane characters with the female, although its horns were longer than those of the old bull. It is an animal just reaching maturity, the milk molars having only recently been shed. As age advances in the male, the mane on the neck is extended, working its way gradually down the sides of the neck; the body hair becomes thinner and more vinaceous; the stripes less distinct, some of them disappearing entirely; and the black bar in front of the fetlock grows fainter and smaller. The chief color differences of this species from the common eland are the white bar on the lower throat, the two white cheek spots, the great black mane on the nape and shoulders, the black bar on the front of the hocks, and the broad, black-tipped ears with a black bar on their inner side. Such color differences are merely a reversion to



MAP 17—DISTRIBUTION OF THE RACES OF THE GIANT ELAND

1 *Taurotragus derbianus derbianus*

2 *Taurotragus derbianus gigas*

those of the bongo, this animal being much less specialized than the common plains eland, which has lost much of its bush coloration and the broad ears which are a mark of such environment.

The skull characters of the Nile race are not determinable at the present time, owing to lack of skulls of the typical race from Senegal for comparison. In skull formation the species differs greatly from its nearest ally, the common eland. It is an eland by horn shape and bodily proportions only, its skull structure being quite similar to that of the bongo and bushbuck. In agreement with the two latter, it has the short nasal and premaxillary bones and the wide lachrymal bone so distinctive of them. In the common eland these bones are greatly lengthened, giving the animal an elongate snout. The Nile eland is intermediate between the bongo and the common eland in both color and skull characters. These differences in structure and color have no doubt been brought about by the gradual effect of the plains environment on the common eland which has forsaken its ancient bush habitat and browsing habits for the open plains and a grass diet. Its coloration has reacted to this change in environment by becoming paler, less striped, and less spotted; its ears have grown narrow; the muzzle has become more elongate; the hoofs have lost their pointed character and become broad; and the forehead has developed a great bushy mat of hair.

In size the giant eland is practically equalled by the common eland. The subspecific name has reference chiefly to the much greater length of the horns, which were the only available part of the animal for comparison at the time the race was named. The neck is considerably larger and deeper and the body somewhat longer than the common eland, which it exceeds but slightly in size. In the flesh the largest male measured 9 feet 2 inches in length of head and body; the tail had a length of 28 inches; the height at the shoulder was 5 feet 8 inches; the greatest girth of the neck was 5 feet 6 inches and the girth of the chest immediately behind the foreleg was 8 feet. The adult female nearly equalled these dimensions in length and height but was much less in girth of neck and chest or bulk of body. The skull of the old male, which is the largest, measures in greatest length $18\frac{1}{2}$

inches. That of the female is one inch shorter. Large skulls of the common eland are decidedly longer, being $19\frac{1}{2}$ inches in length.

The horns are curved in a wide open spiral and are quite distinct from the narrow spiral of the common eland; the keel is also higher and more pronounced in the former. In length they greatly exceed the common species, averaging a foot longer and are proportionately greater in girth. The young male had the longest horns of the three specimens shot near Rejaf. These measure 41 inches straight, or 47 inches along the curve of the keel, and equal the known record for the Nile race. The horn length in the old bull is somewhat less, being only $33\frac{1}{2}$ inches straight and 45 inches along the curve.

EAST AFRICAN ELAND

Taurotragus oryx pattersonianus

NATIVE NAMES: Swahili, *mpofu*; Masai, *osirua*; Kikuyu, *namu*.

Taurotragus oryx pattersonianus Lydekker, 1906, Field (London), vol. CVIII, p. 579.

RANGE.—From German East Africa northward through British East Africa as far as the Lorian swamp and Laikipia Plateau west through Uganda and the west side of the Nile as far as Mongolla; altitudinal range from sea-level to eight thousand feet (slopes of Mount Kenia and Mau Escarpment).

The eland has long been known to sportsmen in East Africa. It was recorded in central German East Africa as early as 1860 by Speke and Grant. Owing to its wide distribution it has been met by almost every traveller who has visited the country. Recently the race from East Africa has been described as *pattersonianus* by Lydekker, from a specimen secured by Colonel Patterson on the Laikipia Plateau north of Mount Kenia.

This huge, stately antelope, the size of an ox, was nowhere abundant in East Africa; but we found it fairly common in the Sotik, on the Athi Plains, and along the Northern Guaso Nyiro. Everywhere it was a beast of the dry, open

plains—both those that were bare of everything except grass, and those that were covered with a thin growth of scrub and dotted with clumps of thorn-trees. We have seen it in the edges of forest. Its ordinary gaits are a walk and a slashing trot. If not pressed hard this trot does not tire the animal, and it will go for many miles. When closely pressed or much alarmed it breaks into a gallop. A heavy old bull cannot keep up this gallop for a mile without exhaustion; but the cows, the lighter bulls, and the young animals run hard, although not as fast as the smaller antelopes. Of all African game eland are the easiest to ride down on horseback. We have rounded up a herd quite as easily as we could round up old-style Texan cattle.

It has one characteristic seemingly inconsistent with its great size and lack of speed, and that is its extraordinary power of leaping. When startled, and beginning a run, the huge cows, and even the bulls, bound like gazelles, leaping clear over one another's backs. It is extraordinary to see such bulky, heavy-bodied creatures spring with such goat-like agility. It would seem that the mechanical reasons which make the trot their natural gait, and make their gallop slower and more tiring than the gallop of the oryx or hartebeest, would also limit their jumping powers; but such is not the case. They are heavier-bodied than the moose or wapiti, with huge necks and barrels, and pendent dewlaps and wrinkled neck skin; yet, for a few seconds after starting, they make high jumps of a type which wapiti rarely, and moose never, attempt. The wapiti, however, although their normal gait is also the trot, and although heavy wapiti bulls are speedily exhausted by a hard gallop, at least sometimes run faster than running blacktail deer—we have seen this

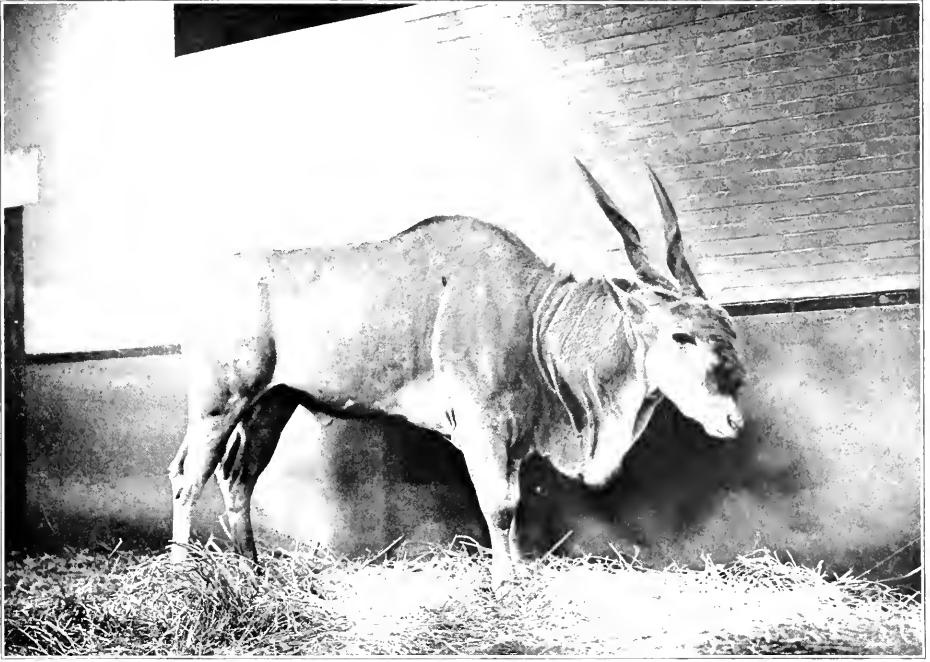
ourselves—whereas the eland is at once left behind by frightened oryx or hartebeest—as we have, also, ourselves seen. The moose is even more of a trotter than either eland or wapiti. Young moose will occasionally gallop, not only when frightened, but even when at play; but the old animals practically never break their trot, except that, as we have been informed by entirely trustworthy hunters, when suddenly and greatly startled they may plunge forward for a few rods in a kind of rolling run. We ourselves once saw the tracks where a big (although perhaps not quite full-grown) moose had thus plunged for a few jumps at a gallop. These very big and heavy species of antelope and deer evidently find the trot, and not the gallop, their natural-speed gait, whereas the smaller deer and antelope find the gallop equally natural—although the gerunuk trots fast and the Rocky Mountain blacktail proceeds by buck-jumps. The big zebra trots much more freely than the small zebra. From these examples it would seem natural to lay down the rule that increase in size and bulk tends to make the trot mechanically preferable to the canter and gallop. But this does not apply to cattle: bison and buffalo, unlike eland and moose, always gallop when at speed; and the giraffe, which is bigger and heavier than any of the pure trotters, never trots at all, passing immediately from a walk to a canter or gallop. It all illustrates anew how limited our knowledge really is, and how cautious we must be in dogmatizing, or in glibly advancing explanation theories of universal applicability.

The flesh of the eland is good, perhaps better than that of any other antelope; although personally we sometimes thought Tommy and reedbuck equalled it. We do not think the flesh of African antelopes as good eating as the venison

of wapiti, deer, prongbuck, and mountain-sheep; but it is hard to dogmatize in such matters, for much depends on the cooking, the climate, and the surroundings. The eland is by preference a grass-eater, and is usually fat, which makes him a godsend in the African land of lean animals. We also found eland eating aloe leaves. When the country is so parched that the eland's food consists of dry leaves from the thorn-trees, the flesh is poor and tasteless.

On the whole, eland are warier than any other antelope. They are soft-bodied, and are disabled by a wound which would not cripple one of the smaller antelope or an American deer. So many trustworthy observers report that African antelope are tougher than the deer of the northlands that we suppose they must be right; in our own experience it happened that we were not able to discern any difference between them.

We found eland in herds of from half a dozen to forty or fifty individuals, the two or three big bulls looming above the cows and young stock. We also occasionally came on bulls singly or in pairs. The very old bulls, called blue bulls because the hide shows through the thin hair, were usually solitary. They are so big and dark that we have known an entire safari mistake one for a rhino when seen a little way off in thin bush. Although so big, eland are less pugnacious than any other big antelope; why the eland, and to a less extent the koodoo, are so mild-tempered, when their small kinsfolk, the bushbucks, are such ferocious fighters, it is impossible to say. Eland are easily tamed. Our own government should make a business of importing, taming, and training them; and the African governments should do so at once. In a few generations they would be completely domes-



SOUTH AFRICAN ELAND, MALE
Showing absence of body stripes and white chevrons on snout



EAST AFRICAN ELAND, MALE
Shot by Theodore Roosevelt at Loita Plains
Mounted by J. L. Clark

THE SOUTH AND EAST AFRICAN RACES OF THE ELAND

ticated; they would give excellent food; they could be used as draught-animals; and lack of water and the dire fly-borne cattle diseases of Africa would have no terror for them. They would be a great addition to the world's stock of domestic animals.

Where we came across eland they were drinking every twenty-four hours. But there seems to be no reason to doubt the fact that in certain desert regions eland, like giraffe and oryx, go many months without water. How this is possible for so huge and fat a beast, in a climate of such intolerable dryness and heat, we cannot imagine. No problem is better worth the study of competent field naturalists.

The eland, like the roan antelope, and the full-grown buck Grant gazelle, possesses a coat which harmonizes well with the general hue of the landscape in which it dwells. It lacks the bold face markings of the roan, and the face markings and body stripes of the oryx, and therefore, in spite of its size, is perhaps a trifle less conspicuous than either. The thin stripes on its coat have not the slightest effect in either concealing or revealing it; seen sidewise, its body is neither more nor less conspicuous than the unstriped body of a roan antelope. On a bare plain or when coming to water all these and all other big antelope are conspicuous. In gray, dry thorn scrub the eland is sometimes hard to make out from a distance, *if it is not switching its tail*. But, as a matter of fact, it rarely stands still for any length of time without switching its tail; the only elands we ever saw in what might be called forest, revealed themselves to us when a hundred yards off by the switching of their tails. We doubt whether the eland's color is of even the smallest use to it as against its natural foes. As wild dogs always hunt purely by

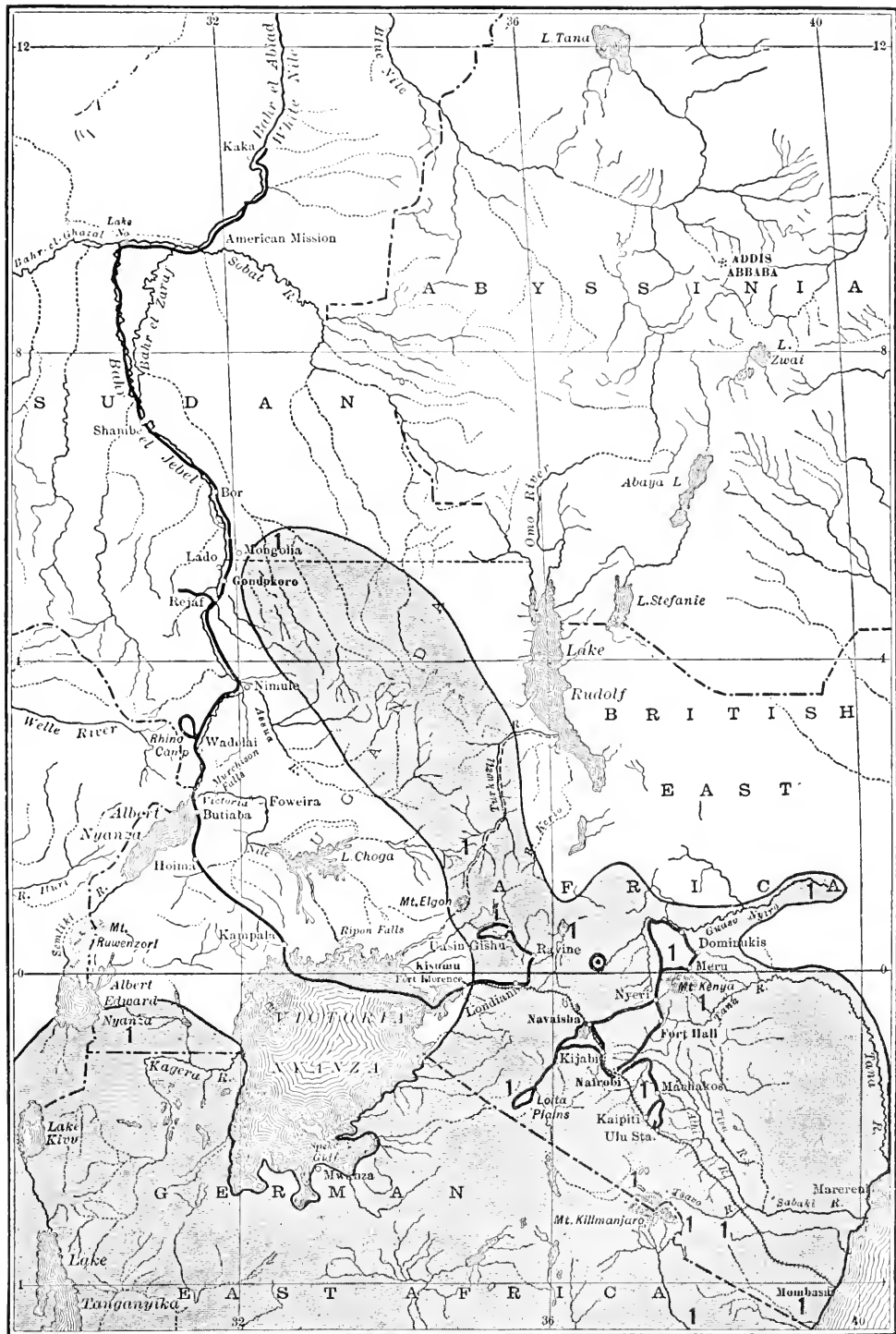
scent and leopards only occasionally kill an eland calf, the lion is the only foe that need be considered. On the rare occasions when lions hunt by day they do sometimes use their eyes. Governor Jackson has described a party of lions hunting eland by sight. But, unless wounded, the eland, though far less conspicuous in color than zebra, hartebeest, or wildebeest, and even than oryx or roan, makes no more effort to hide than any one of these, its constant companions. It never crouches or slinks, or seeks to take advantage of cover like a bushbuck or oribi. A herd rests like cattle, lying down or standing; and always there is some little play of ears or tail, sufficient to insure the attention of any beast of prey which is on the lookout in the neighborhood. Moreover, the elands lie down or stand resting during the heat of the day, when no beast of prey is abroad. In the morning and afternoon they are feeding; they then make no effort to hide, and are sure to be seen by any watchful foe which is trusting to its eyes for success. Ordinarily lion trust far more to nose than eyes, until close up, when the shade or markings of the coat becomes utterly unimportant. At night, especially on the very dark nights when the lion is boldest, probably his sense of smell is his only guide until he makes his final rush; and, in any event, on such a night all colors seem alike. Therefore, although the eland's coloring, like that of the wild ass or male Grant gazelle, is probably more concealing than that of any of the other antelopes or of the zebras, it has no effect whatever on the animal's habits, and probably in actual practice is of no consequence to it, one way or the other, as regards its foes. At any rate, the coloration is not a factor of survival value. The stripes, which closet theorists have treated as of concealing value in the eland, are of no con-

cealing value whatever. They are probably gradually disappearing; they diminish the farther the animals are found from the probable original centre of development in the Middle African forests; and in the form farthest from this, the South African form, which has certainly been the last to be differentiated, the stripes have completely disappeared. This of course means that they have no concealing value such as to make them in even the slightest degree a factor in securing through natural selection the survival of the wearer under the conditions of the existing environment. The eland is certainly less plentiful than the other antelopes which possess a more advertising coloration; and it is more shy, and, instead of seeking to elude observation, prefers to station itself where it can detect its foes at a distance and run off. If the color of its coat were of benefit to it, it would certainly act so as to get that benefit, and this it never does. Evidently its coloration is an entirely negligible factor so far as its survival is concerned.

The East African race differs very little from *livingstonii* of the Zambesi Valley. It may be distinguished usually by darker coloration and longer head, but the difference is merely an average affair. The race was based by Lydekker upon a specimen showing white chevrons on the snout and a narrow bush on the forehead. These characters are, however, juvenile, and are as prevalent in the immature eland of Mashonaland as they are in British East Africa. The old males in East Africa have the entire forehead covered with a heavy mat of hair and lack the white chevrons bordering the mat on the snout, as do also the old males from the Zambesi. Two bulls shot from the same herd on the Loita Plains by Colonel Roosevelt show both styles of coloration. The younger bull, which was a fully grown animal, had the narrow bush of hair on the forehead and white chevrons on the snout, while the aged bull of the same body size had the

entire forehead covered by a heavy mat of long hair, without any chevrons on the snout. Old bulls of both races retain a few of the body stripes even in old age. The black stripe on the chest and belly of *pattersonianus* is usually lacking in *livingstonii*. Specimens of the South African eland from the Kalahari Desert and Cape Colony, however, lack the body stripes even in immaturity in males, as is well shown by specimens in the National Museum. The skulls from East Africa exceed in length those from the Zambesi, but are less in breadth. We may describe *pattersonianus* as a longer and more slender-headed race with darker-colored mane and body.

The body color of an old male is usually ochraceous-buff, the hair often being so thin that the dark skin shows conspicuously and gives it a bluish-gray appearance. The body is crossed by two or three faint white transverse stripes. The nape of neck is covered by a broad mane of long wood-brown hair extending half-way down the sides and ending at the withers in a stripe which is continued on the back to the rump. The tail is thin-haired and is buff above and white below, with a tuft of long black hair at the tip. The under-parts have a broad seal-brown stripe from the chest to the middle of the belly. The belly and the sides of the body are light buff. The forelegs are ochraceous-buff in front, and white behind, with a broad black bar above and behind the knee. The border of the hoofs and the back of the pasterns are seal-brown. The hind legs are like the fore in color but lack the black band above the knee on the posterior side. The forehead is covered by an immense bush of thick hair, three inches in length and cinnamon-brown in color, bounded behind and above the eye by a black stripe and in front on the snout by buffy bases to the hair. The snout is seal-brown to the lips. The upper lips and chin are whitish and the chin is bordered behind by an indistinct drab bar. The sides of the head and the orbital region are buffy-drab. The ears on the back are buff, the tips seal-brown, and the inside and the base whitish. The base of the throat has a dewlap or bell covered by a short mane of ochraceous hair. Younger males lack the bush on the head, which is usually represented by a median tuft of long hair bounded in front by white chevrons; the nape mane is also greatly reduced in extent and confined to a narrow line



MAP 18—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE ELAND

1 *Taurotragus oryx pattersonianus*

and the body color is more reddish. The body stripes are more numerous and distinct and the dark stripe on the belly and above the knee is more pronounced. Often the snout is marked by conspicuous white chevrons extending diagonally in front of the eyes. The adult female is like the immature male in color, but usually brighter. The body color is ochraceous-orange crossed by twelve white stripes extending from the very distinct black dorsal stripe half-way down on the sides. The under-parts and the belly are marked as in the male. The nape mane is reduced to a narrow line of wood-brown hair which merges on the withers into the broad black dorsal stripe. The forehead is without a mat of long hair or white chevron stripes, and the snout is buffy-drab, not blackish as in the male. The throat has a well-developed dewlap covered by long blackish and buffy hairs. Newly born young have the color pattern of the adult female minutely reproduced, and are furnished with a dewlap on the throat. The snout has a dark blotch as in the male.

Flesh measurements of the Zambesi eland are not available for comparison, but, judging by the size of the skulls, the East African race is fully as large as the southern one. The flesh measurements of a large bull shot by Colonel Roosevelt on the Loita Plains were: head and body along curve of back, 106 inches; tail, 32 inches; hind foot, 29 inches; ear, $10\frac{1}{2}$ inches. An adult female measures 4 inches less in body, 1 inch less in length of tail, $1\frac{1}{2}$ inches less in hind foot, and $\frac{3}{4}$ inch less in length of ear. The largest male in the National Museum has a skull length of $19\frac{1}{2}$ inches. The average skull in a series of twelve is 18 inches in length, and 8 inches in greatest breadth. The female skulls average 17 inches in length. The horns in the male are very much heavier or greater in diameter than in the female, but they do not average any longer. The longest-horned specimen in a series of eight from British East Africa in the National Museum is $27\frac{1}{2}$ inches straight or 35 inches measured on the curve. The average horn length in the male is 25 inches. All old males have the tips of the horns greatly worn, and shorter by almost a foot than those of the younger males. Ward's record for East Africa is a specimen shot by Jackson measuring $31\frac{5}{8}$ inches straight. The spread at the tips is usually about 12

inches, but the horn direction varies greatly, and specimens exceeding 18 inches in spread sometimes occur.

The eland are to a considerable extent local in distribution, but they inhabit widely different sorts of country, from dry desert bush to moist highland meadows. In East Africa they have been found in the low desert district near the Taita Hills by Jackson. Selous has found skulls as far north as the Lorian swamp in the midst of the northern desert. These no doubt represent the skulls of eland which have strayed down the Northern Guaso Nyiro River from its headwaters on the Laikipia Plateau and perished in the desert, as they are not known on the lower reaches of the river. In the Nile Valley they reach the east bank of the Nile, and are there only separated by the river from the territory occupied by the giant eland. Lydekker has suggested that in this region intermediate individuals might be looked for, which would bridge the gap existing between the two species. Upon this point we can assure him that the difference in skull structure and shape of ears and horns are of too fundamental a character to permit such an assumption. The region east of the Soudan station of Mongolla in 6° north latitude marks the extreme northern limit of the East African eland in Africa.

CHAPTER XVI

THE WATERBUCKS AND REEDBUCKS

SUBFAMILY *Kobinae*

THE members of the *Kobinae* cover a wide range in body size, from the large, stately waterbucks to the small rock reedbucks. The group includes the waterbucks, lechwis, kobs, reedbucks, and rock reedbucks and is characterized by low withers, absence of the anteorbital gland, and the presence of horns in the male only. The horns are usually curved forward and ringed for the greater part of their length. The skull is without anteorbital fossa but shows a large lachrymal-nasal sinus on the sides of the snout. The range of the subfamily covers the continent of Africa from the Cape region northward to the southern edge of the Sahara Desert in the Senegal, Lake Chad, and Abyssinian regions. This subfamily has been usually known among naturalists as the *Cervicaprinae*; but, owing to the genus *Cervicapra* having been found untenable, the genus *Kobus*, being the best known and most typical, has been selected as the type.

KEY TO THE GENERA

- Horns sweeping backward and upward or with tips curved forward
 - Tail short and bushy; body size small; horns short and sharply hooked forward
 - Horns shorter than head; lachrymal-nasal sinus small; orbit large *Oreodorcas*
 - Horns longer than head; lachrymal-nasal sinus large; orbit small *Redunca*
 - Tail long and tufted; size large; horns slightly curved forward, greatly exceeding the head in length *Kobus*

Horns S-shaped, bowed forward at the base and then recurved at the tips

Back of pasterns haired; hoofs short; snout slender; horns shorter and narrower; tail short, not reaching hocks, without tuft; ears longer *Adenota*

Back of pasterns hairless; hoofs long; snout short and bulging; horns longer, broadly lyrate; tail long, reaching hocks, tufted at tip; ears shorter *Onotragus*

ROCK REEDBUCKS

Oreodorcas

Oreodorcas Heller, 1912, Smith. Misc. Coll., vol. 50, No. 8, p. 13; type species *Redunca fulvorufula*.

The rock reedbuck shows no striking external differences from the true reedbucks with the exception of the much shorter horns, the drab body color and the more bushy tail. The genus is based chiefly on the skull differences which consist of smaller lachrymal-nasal sinus, larger orbit, and the smaller size of the sphenoidal processes of the basioccipital bone. *Oreodorcas* has habits strikingly different from the swamp or plains haunting reedbuck. It dwells upon rocky hillsides and mountain slopes on the edge of the plains country, in close proximity to the haunts of the klipspringer. The genus includes a single species, *fulvorufula*, which covers a wide range of country in the eastern portion of Africa extending from Cape Colony north to southern Abyssinia. Over this region it exhibits some geographic variation which has given rise to the recognition of several races.

CHANLER ROCK REEDBUCK

Oreodorcas fulvorufula chanleri

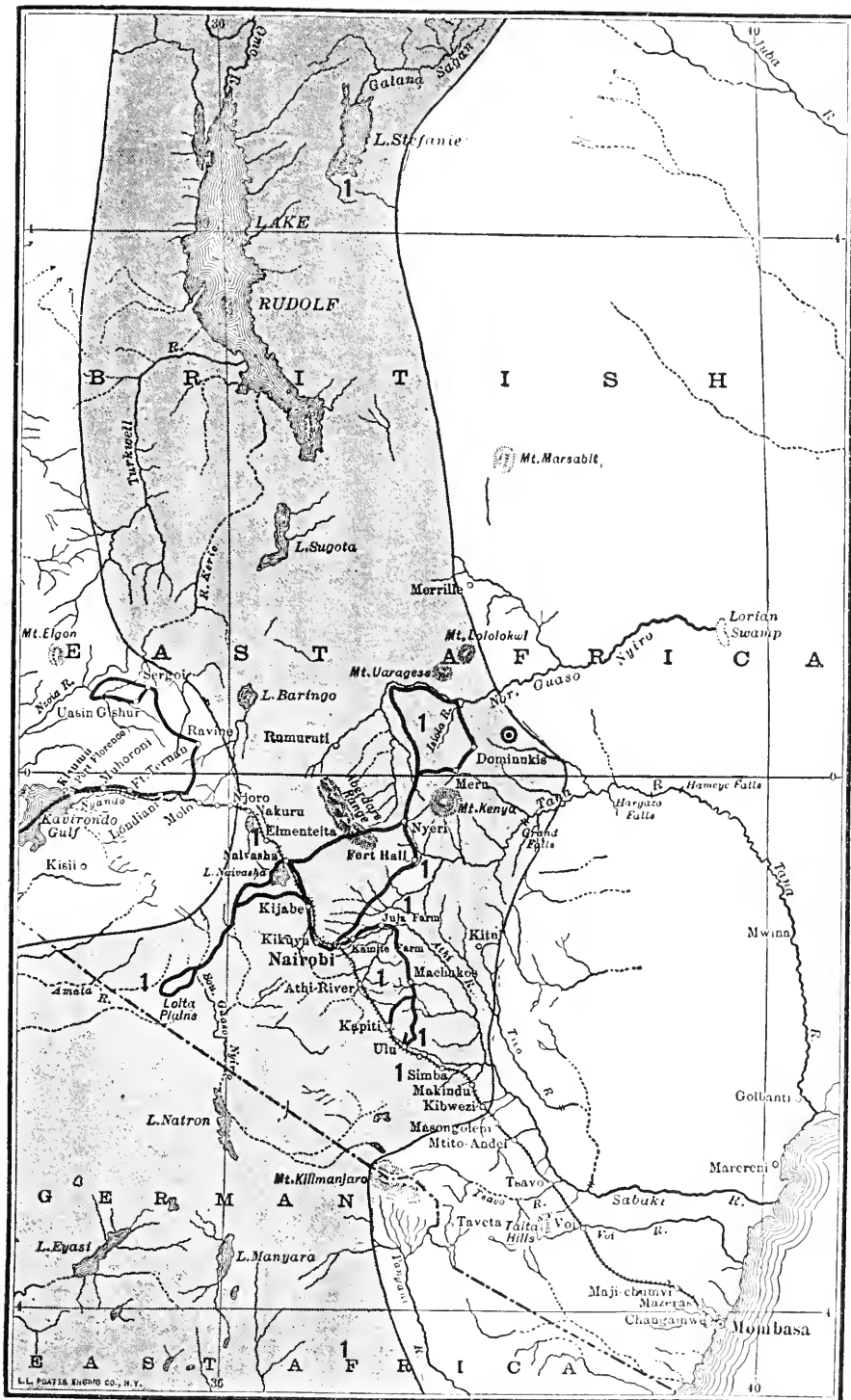
NATIVE NAMES: Kikuyu, *katabidi*; Wakamba, *ndabidi*.
Cervicapra chanleri Rothschild, 1895, Nov. Zool., p. 53.

RANGE.—British East Africa from the German border northward to southern Abyssinia in the Rift Valley and higher parts of the coast drainage areas.

During his explorations in British East Africa in 1893 Chanler secured the type specimen of the species which now bears his name. The type specimen was shot on the slopes of the Jombene Range, northeast of Mount Kenia in the Tana River drainage area. Upon its arrival in London at Rowland Ward's establishment, it was recognized as a new antelope and described by the Hon. Walter Rothschild before being sent to the United States National Museum.

These delicate and graceful kinsfolk of the reedbuck were found among the stony hills and small mountains in many parts of East Africa. Usually we found the does and fawns in couples or small parties, and the bucks singly. They were shy and elusive, but not wary in the sense that the bigger antelopes were wary. They lived on the steep slopes, among rocks and bush, and fed on the grass, the hill plants, and the leaves and twig tops of certain of the shrubs, and if frightened fled in frantic haste to the thickest cover, on the roughest ground. When alarmed a buck will occasionally utter a sharp whistle to warn its companions.

The East African race differs but little from the typical race of South Africa. It is distinguishable by its lighter and grayer color, showing little of the reddish tint seen in true *fulvorufula*; and also by the smaller body size and shorter horns. The dark streak on the snout which was used by the original describer as a character is a variable feature. In a series of twelve skins from British East Africa in the National Museum only six show a dark nose stripe, and in only two of these is it well marked. Oscar Neumann described the Abyssinian race as new in 1902, basing his difference principally upon the absence of the dark streak on the snout in his specimens from Lake Abaya, Abyssinia. This, however, has been shown to be a character of no value in *chanleri*. Specimens from Abyssinia examined at the British Museum showed no color or skull differences from British East African specimens by which they could be distinguished.



MAP 19—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE ROCK REEDBUCK

1 *Oreodorca fulvorufula chanleri*

The head and neck are ochraceous and distinctly different in color from the drab-gray body. The body is suffused lightly by buffy-tipped hairs, but the rump and hind quarters are paler drab-gray. The hind legs are decidedly lighter than the body, being cartridge-buff in color. The forelegs are drab-gray in front and pale olive-gray behind, with buff pasterns. The under-parts are white, sharply defined on the sides, but less so on the inside of the legs and on the lower throat. The tail is drab-olive, the tip, sides, and under-surface clothed by long, white hairs. The head and fore neck are bright ochraceous, and the nose near the tip has a slightly darker hair-brown median streak. There is an ill-defined whitish area above the eye. The upper throat, chin, and lips are white. The ear on the back is ochraceous, and the inside and base are white. There is a large dark bare spot below the ear. The sexes are alike in color. Nursing young are quite identical to adults in color, the body being perhaps slightly grayer and decidedly longer-haired.

The female equals or perhaps exceeds slightly the male in size, the largest skull in a series of fifteen being that of a female. The measurements of a large male in the flesh were: head and body, 45 inches; tail, $8\frac{1}{4}$ inches; hind foot, $13\frac{3}{4}$ inches; ear, $5\frac{3}{4}$ inches. The greatest length of the skull is: male, 9 inches; female, $9\frac{1}{6}$ inches. Longest horns in a series of seven are $5\frac{7}{8}$ inches measured along the curve, $5\frac{1}{4}$ inches spread at the tips.

Specimens have been examined from the Athi Plains taken on Wami Hill, the Ulukenia Hills, and Kilima Kui; from the Loita Plains, from Lake Elmentaita, from the Northern Guaso Nyiro near the Ngare Ndare branch, and from southern Abyssinia.

REEDBUCK

Redunca

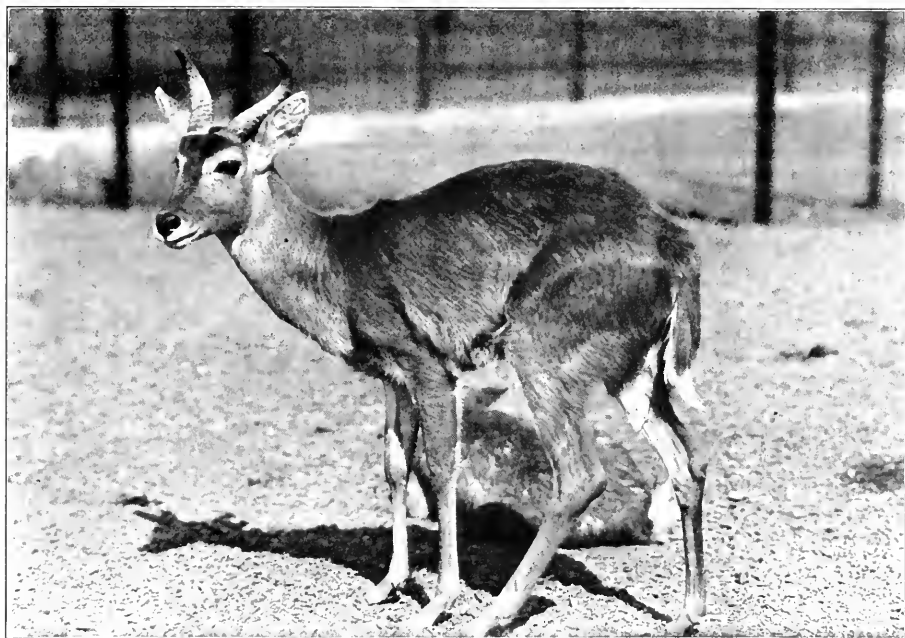
Redunca H. Smith, 1827, Griffith's Cuvier Animal Kingdom, V, p. 337; type *Antilope redunca* Pallas.

The well-known genus *Cervicapra*, by which the reedbucks have long been known, has been recently replaced

by *Redunca*. The genus *Cervicapra* founded by Sparrman in 1780 was based upon *Antilope cervicapra*, the common black buck of India. Smith a half century later founded the genus *Redunca* for the African reedbucks, basing it upon Pallas's description of the Senegal species, *Antilope redunca*, and this term must now be employed for designating the genus instead of the more familiar term *Cervicapra*, which applies only to the Indian black buck.

The dorsal coloration is uniform yellowish, but the legs in some races have a dark stripe in front. The size is medium, the height at the withers not exceeding three feet, and the tail is short and bushy. The short horns are curved forward sharply, and are ringed for at least half their length. The false hoofs are well developed. There is a rounded bare spot below the ear on the side of the head. The reedbuck is most closely allied to the rock reedbuck, but differs from it externally by much longer and more strongly hooked horns, by the shorter-haired tail, and larger body size. The sexes show some slight color differences, the female being marked by a dark blackish crown-patch which is absent in the adult male but present in the immature. The female almost equals the male in size, the difference in size of skulls being very little. The nursing young are longer-haired and much darker than the adults, being a uniform olive-drab grizzled by blackish on the upper parts with the dark leg stripes only present on the front of the pasterns, and the bare spot below the ear indicated by a growth of short white hair. The skull exhibits in comparison with *Oreodorcas* much larger nasal-lachrymal sinus and sphenoidal processes to the basioccipital, a longer snout having premaxillary bones which do not reach the nasals, and a smaller orbit. Two species are included in the genus; a large fulvous one, *arundinum*, inhabiting South Africa, and a smaller yellowish species, *redunca*, inhabiting equatorial Africa. Reedbucks range from Cape Colony northward through the East Coast drainage area to the Zambesi, where it spreads west to Angola and thence north throughout the whole extent of the continent as far as the southern borders of the Sahara Desert in Senegal, the Nile region, and northern Abyssinia. The only fossil species known is from the Pleistocene of Algeria.

The pretty reedbuck, which is about the size of a white-tail deer, was plentiful in the Uasin Gishu and in Uganda. It was strictly a beast of cover, and unlike all the waterbuck and their allies it was not gregarious, being found singly or in couples—usually a doe and her fawn, more rarely a buck and a doe. Like the oribi and klipspringer it utters a shrill whistle of alarm or curiosity, totally distinct from the whistle of either of the others. In Uganda the reedbuck were not wary, and in certain places were so plentiful that on a given flat of tall grass we might find a score or two in fairly close proximity, so that they looked almost like a herd, scattered out to feed; but when alarmed each went its own way without regard to the others. They were grass feeders, and their flesh was excellent. They were never found far from water; in no case that we happened to come across were they more than three or four miles from a stream or pond. They lived in grass, and in patches of bush or reeds. In the daytime we usually came on them lying up in the reed beds or in hollows among the tall grass, so that they offered rather hard running shots or very long standing shots. Favorite resting-places in the Loita Plains district, were the deserted grass-grown Masai kraals from which they were on several occasions routed. When disturbed they usually bounded gracefully over the walls of the kraal and sought cover in the nearest reed bed. Often, however, we saw them feeding in the morning or afternoon, and then they were not very difficult to approach. When hiding they would often let us get to within a few feet of them before making a headlong rush through the reeds or grass. When put up by a line of beaters they would either run while the beaters were still a long way off, or else wait



SOUTH AFRICAN REEDBUCK
In the New York Zoological Park



SWAHILI REEDBUCK
Shot by Dr. L. W. Abbott
Taveta Kilimanjaro, B. E. A.
United States National Museum



CHANLER ROCK REEDBUCK
Shot by William A. Chanler
Jombene Mountains, B. E. A.
United States National Museum

REEDBUCK

until nearly trodden on. Occasionally reed buck, like bush-buck, lie up for the day in patches of brush or reeds containing lions or hyenas. We put a doe out of a clump of reeds from which we also put out and killed two hyenas. Another pair were driven from a reed bed, an acre or two in area, from precisely the same part of which a big, maned lion was driven a few seconds afterward. Evidently the reed buck in such cover feel confident that they can detect and avoid any hostile approach of their neighbors. We never heard of their lying in such cover in company with a leopard.

KEY TO THE RACES OF *redunca*

- Dorsal color light, tawny-ochraceous lined with black; pelage long
 Horns sharply hooked forward; color lighter *wardi*
 Horns short and without pronounced forward hook; color darker
ugandæ
- Dorsal color light, ochraceous-buff, without black lining; pelage short
 Horns long and wide-spread, not hooked forward much *cottoni*
 Horns short and narrow; hooked forward at a sharp angle *tohi*

HIGHLAND REEDBUCK

Redunca redunca wardi

NATIVE NAMES: Masai, *erongo*; Luganda, *njazza*.

Cervicapra redunca wardi Thomas, 1900, *Ann. & Mag. Nat. Hist.*, p. 304.

RANGE.—Highland region of British East Africa from the German border north to the Turkwell River and from the Victoria Nyanza east to the headwaters of the Athi and Tana Rivers.

Oldfield Thomas described this race from specimens received from Rowland Ward. The types were collected by F. J. Jackson on the Mau Plateau, no doubt somewhere in the vicinity of Eldoma Ravine Station.

The highland reed buck is a dark-colored race, with long pelage and with short, sharply hooked forward horns. The dorsal region is heavily lined by black-tipped hairs on a tawny-ochraceous ground, the legs are marked in front by a broad, ill-defined blackish band, and the under-parts are white, sharply defined against the tawny of the dorsal surface.

The measurements of an adult male in the flesh were: head and body, 53 inches; tail, $7\frac{1}{2}$ inches; hind foot, $16\frac{1}{2}$ inches; ear, 6 inches. Greatest length of largest skull: male, $10\frac{1}{2}$ inches; female, $9\frac{5}{8}$ inches. The longest horns measure $10\frac{1}{4}$ inches on the curve and $9\frac{7}{8}$ inches in greatest spread, in a series of nine males. The specimens examined were collected in the Uasin Gishu Plateau, on the Mau Escarpment at Molo, Lake Elmentaita, the Amala River near the German border, the Athi Plains in the vicinity of Nairobi, and from the Maanja River of central Uganda.

NILE REEDBUCK

Redunca redunca cottoni

NATIVE NAMES: Dinka, *kao*; Bari, *bore*.

Cervicapra redunca cottoni Rothschild, 1902, in Powell-Cotton's "Sporting Trip Through Abyssinia," p. 470, two figures of skull and horns.

RANGE.—The Nile Valley from the Sobat River and Bahr el Ghazal southward in Uganda as far as the Albert Nyanza and the Victoria Nile.

The type of this race was collected by Major Powell-Cotton in the lowlands of the Nile between the main river and the branch known as the Bahr el Zeraf. It was described in 1902 by Walter Rothschild in an appendix to Powell-Cotton's "Sporting Trip Through Abyssinia," together with another race, *donaldsoni*, from a point midway between the head of Lake Rudolf and the Nile. The latter race, however, is indistinguishable in horn shape and coloration, and must be regarded as a synonym of the race first described.

The Nile reed buck is readily distinguishable from other equatorial races by its wide-spread horns. The horns spread outward, the expanse usually exceeding the length, and the

tips are hooked forward but little. The coloration is light, without the black lining so characteristic of *wardi*, the general dorsal color being ochraceous-buff. The stripe extending down the front of the leg is pale, usually mouse-gray in color. The horn dimensions of a large male shot at Nimule are: length along curve $11\frac{3}{4}$ inches, greatest spread 9 inches. Another large male collected by Donaldson Smith between Lake Rudolf and the Nile has longer and wider-spread horns, the dimensions being $14\frac{3}{4}$ inches in length, and 15 inches in expanse.

SWAHILI REEDBUCK

Redunca redunca tohi

NATIVE NAME: Swahili, *tohi*.

Redunca redunca tohi Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 10.

RANGE.—The moist coast belt from the Tana River southward to Kilimanjaro and German East Africa, but not occurring farther inland than the edge of the desert nyika.

The Swahili reedbuck is local in distribution and of rare occurrence. It is found along the railway only at Mariakani, where the type and several other specimens were secured in 1912 by Heller. It occurred in this district in the grassy valleys and hillsides in groups of three or four consisting of an old female and two or three offspring of various ages. No adult bucks were seen. Usually they were found lying down in the long grass, and were not detected until bounding away in great bounds over the grass. Sometimes when startled they uttered their peculiar sharp bark or bleat.

The Swahili reedbuck differs from *wardi* by smaller size; the basal length of skull being only 9 inches. The coloration is lighter and purer tawny, the black lining on the dorsal surface being much less evident. The dark leg streaks are much narrower or obsolete. The pelage is shorter and thinner, the length on the back being only three-fourths of an inch.

The color is tawny and purest on the sides and the legs, the dorsal region being darkest owing to the prevalence of black-tipped hairs, which are absent on the sides and the limbs. The crown of the head is marked by a dusky-brown

patch between the ears and the midline of the snout is speckled by dusky. The sides of the head are pure yellow-ochre, but the orbital area is lighter buff in color. The chin and the upper throat are cream color. The back of the ear is much darker than the body, the general effect being snuff-brown, but the hair covering itself is tawny. The inner side and the base of the ears including the bare spot are cream-buff. The legs are ochraceous-buff with a narrow, dusky-brown stripe in front from the hoofs to the shoulder on the forelegs, but only reaching half-way to the hocks on the hind legs. The tail is tawny above, and white below, with the tip chiefly white. The under-parts are pure white, and sharply defined on the sides against the tawny-ochraceous; the white reaches as far forward as the chest, and also extends as a narrow line down the inside of the legs.

An adult female specimen measured in the flesh: 49 inches in length of head and body; tail, $7\frac{1}{2}$ inches; hind foot, $15\frac{1}{2}$ inches; ear, 6 inches. Greatest length of skull, $9\frac{1}{4}$ inches.

Besides the specimens from the type locality, others have been examined from Taveta, on the east slope of Kilimanjaro, collected by Doctor L. W. Abbott. Three of these specimens are males, and exhibit short, narrow, and sharply hooked horns, by which they are distinguishable from the larger-horned *wardi*.

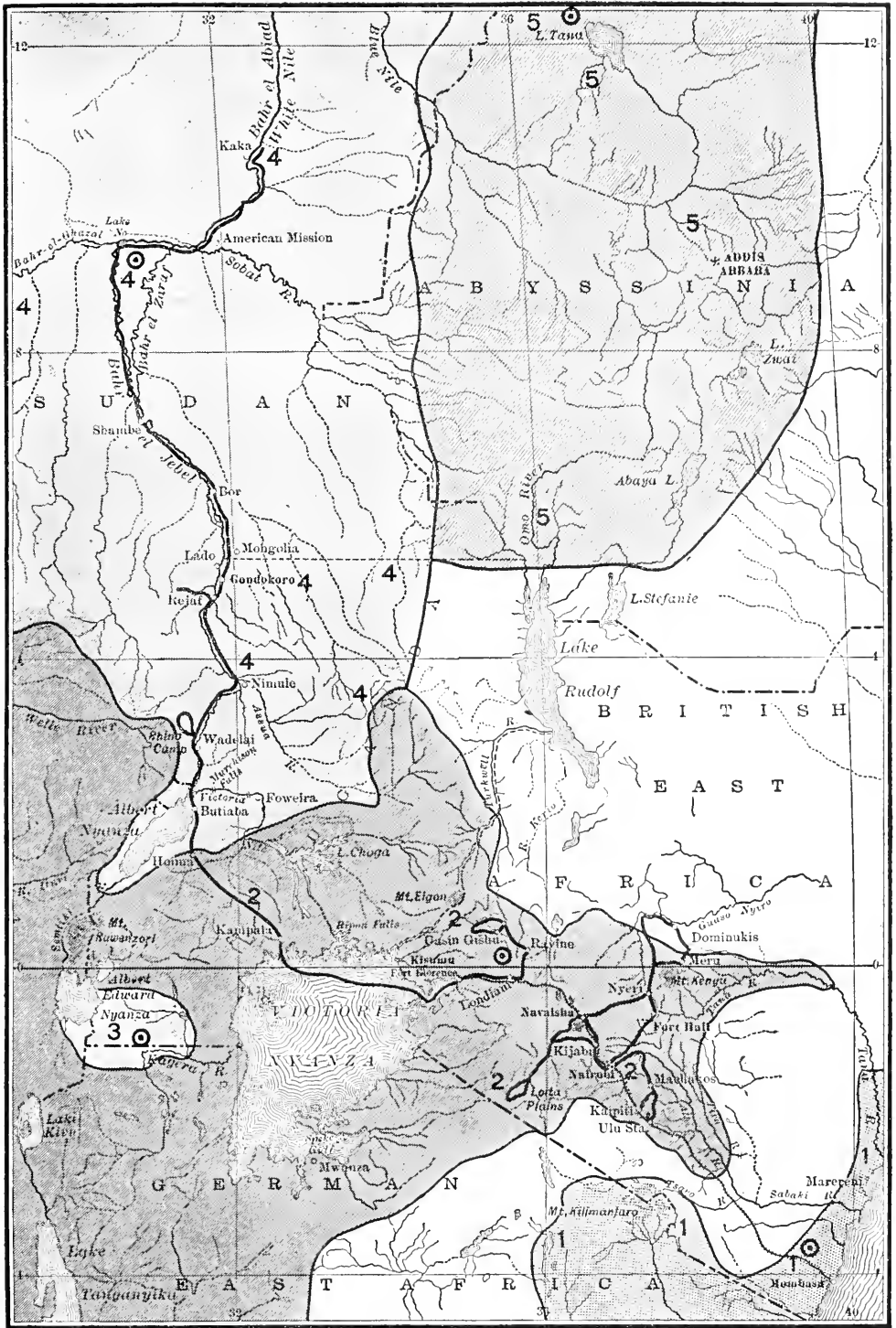
ANKOLE REEDBUCK

Redunca redunca ugandæ

Cervicapra bohor ugandæ Blaine, 1913, *Ann. & Mag. Nat. Hist.*, II, p. 291.

RANGE.—Highlands of Ankole, southwestern Uganda.

Mr. Gilbert Blaine has recently described from the highlands of Ankole in southwest Uganda a new race of reedbuck differing from *wardi* by its shorter, less-hooked horns, and darker and browner color. Specimens in the National Museum, collected in central Uganda from the Maanja River, are not distinguishable from *wardi* from the Uasin Gishu Plateau either in color or horn shape. The three males from the Maanja River have their horns sharply hooked forward as in typical *wardi*. The form described as *ugandæ* may be a local race confined to the Ankole highlands while central and eastern Uganda is occupied by *wardi*.



MAP 20—DISTRIBUTION OF THE RACES OF THE REDBUCK

- 1 *Redunca redunca tohi* 2 *Redunca redunca wardi* 3 *Redunca redunca ugandæ*
 4 *Redunca redunca cottoni* 5 *Redunca redunca bohor*

WATERBUCKS

Kobus

Kobus A. Smith, 1840, Illus. Zoology S. Africa, pt. VII, pl. XXVI; type *K. ellipsiprymnus*.

The waterbucks form a well-marked genus of large-sized antelopes having long, heavily ringed horns sweeping backward, with a slight forward curve at the extreme tips. The withers are low and the body is covered by a coat of long, coarse hair. In size and carriage they resemble the European stag or the American elk, but in habits they are more permanently gregarious and less forest-haunting. They are approached closely in size within the subfamily only by the lechwis from which they are at once distinguishable by the difference in horn shape, and the well-haired nature of the feet, the back of the pasterns being hairy. Waterbuck have a peculiar odor due to a glandular excretion from the skin. The skull is distinguishable by the flatness or depressed condition of the interorbital area, the large, hypsodont teeth, and the large sinuses in front of the orbit between the nasal bones and the lachrymal. Several fossil species are known from the Pliocene of India, China, and Algeria. The genus to-day occurs only in Ethiopia, or Africa south of the Sahara. It is found from Senegal and the Abyssinian highlands south throughout the whole continent as far as the Limpopo River, but is unknown in the Cape Colony proper. Two closely allied species, separable only by coloration differences, are comprised in the genus.

KEY TO THE SPECIES OF *Kobus*

Posterior surface of hind quarters white, in sharp contrast to the dark coat; tail tuft and legs from knee and hocks blackish seal-brown; coat often suffused with reddish; body size larger
defassa

Posterior surface of hind quarters marked on sides of rump by a wide, white, elliptical-shaped stripe, connected below with the white of the posterior surface of hind quarters but meeting

across the rump, completely encircling the tail; tail tuft and legs not conspicuously darker brown than the body; body size smaller, coat without reddish suffusion

ellipsiprymnus

THE DEFASSA WATERBUCK

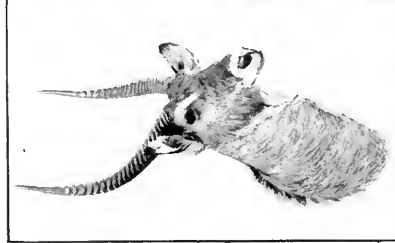
Kobus defassa

The defassa waterbuck is a singularly graceful buck with elk-like carriage and a long, rough coat of hair. It is somewhat larger than the common waterbuck which it resembles closely in color, differing, however, by lacking the white elliptical stripe on the sides of the rump, and by its darker legs and more reddish body color. The sexes are very similar in size, the female being scarcely inferior to the male. The newly born young are without the distinctive white patch on the posterior surface of the thighs, the brown of the sides extending on to the hinder surface and merging with the whitish color of the inner surface. The legs are lighter than the body, not darker as in the adults. The defassa breaks up into a great number of geographical races which are distinguishable by slight differences in tone of coloration. The earliest described race is the defassa named by the Abyssinian explorer Rüppell in 1840. Rüppell described it under its native Abyssinian name of *defassa*. Another name which is often applied to this group is that of sing-sing used by the natives of Gambia for the West African race of the defassa. The typical defassa was met with by Rüppell in the Abyssinian highlands near the shores of Lake Tana. It is one of the brightest-colored races, and has a large amount of reddish in its coloration. The defassa as a species is wide-spread throughout West and Central Africa, but nowhere does it reach the East Coast, its eastern limits being marked by the great Rift Valley, which extends from the Red Sea to Lake Nyasa. West of the Rift Valley the defassa ranges from the Abyssinian highlands and the southern edge of the Sahara Desert south to Angola and the Zambesi Valley as far west as Lake Nyasa.

This stately, shaggy-coated creature is close kin to the common waterbuck, differing chiefly in its white rump.

On the average we found its horns longer, but this may be merely an accident of geography, for locality has much to do with the size of an antelope's horns, no matter what the species—and, extraordinary to say, the horns of one species, say the impalla, may be less than the average size in a region where the horns of another, as the waterbuck, may be larger. It seems curious, inasmuch as so many African antelope have short and even rather thin coats, to find these marsh-loving, thicket-haunting waterbuck, dwelling right under the equator, with coats as long and shaggy as those of northern deer.

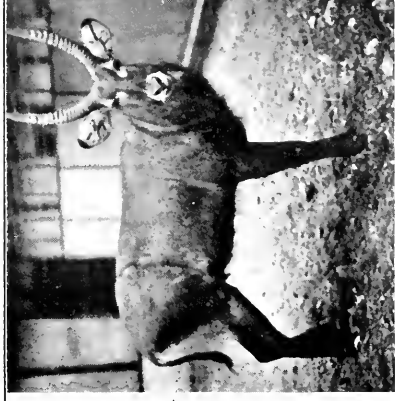
From Lake Naivasha westward we found the defassa; and from the Nyanza Lakes it extended down the Nile to the mouth of the Sobat. Everywhere the waterbucks were gregarious, and, therefore, polygamous, a heavy bull accompanying each herd of cows and young. The exact habitat in which they were found varied in rather astonishing manner. Around Lake Naivasha their home was in the dense papyrus beds which fringed the lake. The high, close-growing stems of the huge reeds formed a well-nigh impenetrable cover, save where the waterbuck had trodden out their trails. These made a network, a labyrinth which extended almost, but not quite, to the lake's edge, meeting and being crossed by the broader hippo trails which, of course, did go down to—or rather come up from—the water's edge. When alarmed the herds at once fled to the papyrus for protection, and loud was the noise as they crashed and crowded along the trails, splashing through the mud and water while the dead stalks cracked and popped. These reeds were merely their refuge and resting-place, and held no food for them. They fed outside them, grazing in



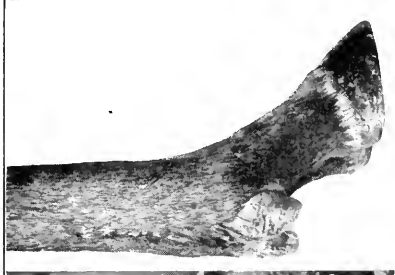
NZOIA DEFASSA WATERBUCK, MALE
Shot by J. T. McCutcheon
Usin Gishu Plateau



NZOIA DEFASSA WATERBUCK, ADULT MALE
Shot by Kermit Roosevelt
Nzoia River, B. E. A.



DEFASSA WATERBUCK
In the National Zoological Park,
Washington, D. C.



FOREFOOT OF DEFASSA WATERBUCK
Showing back of pasterns haired



UGANDA KOB MALE
Nzoia River,
Usin Gishu Plateau



NILE LECHWI, ADULT MALE
Shot by Theodore Roosevelt
Lake No, White Nile

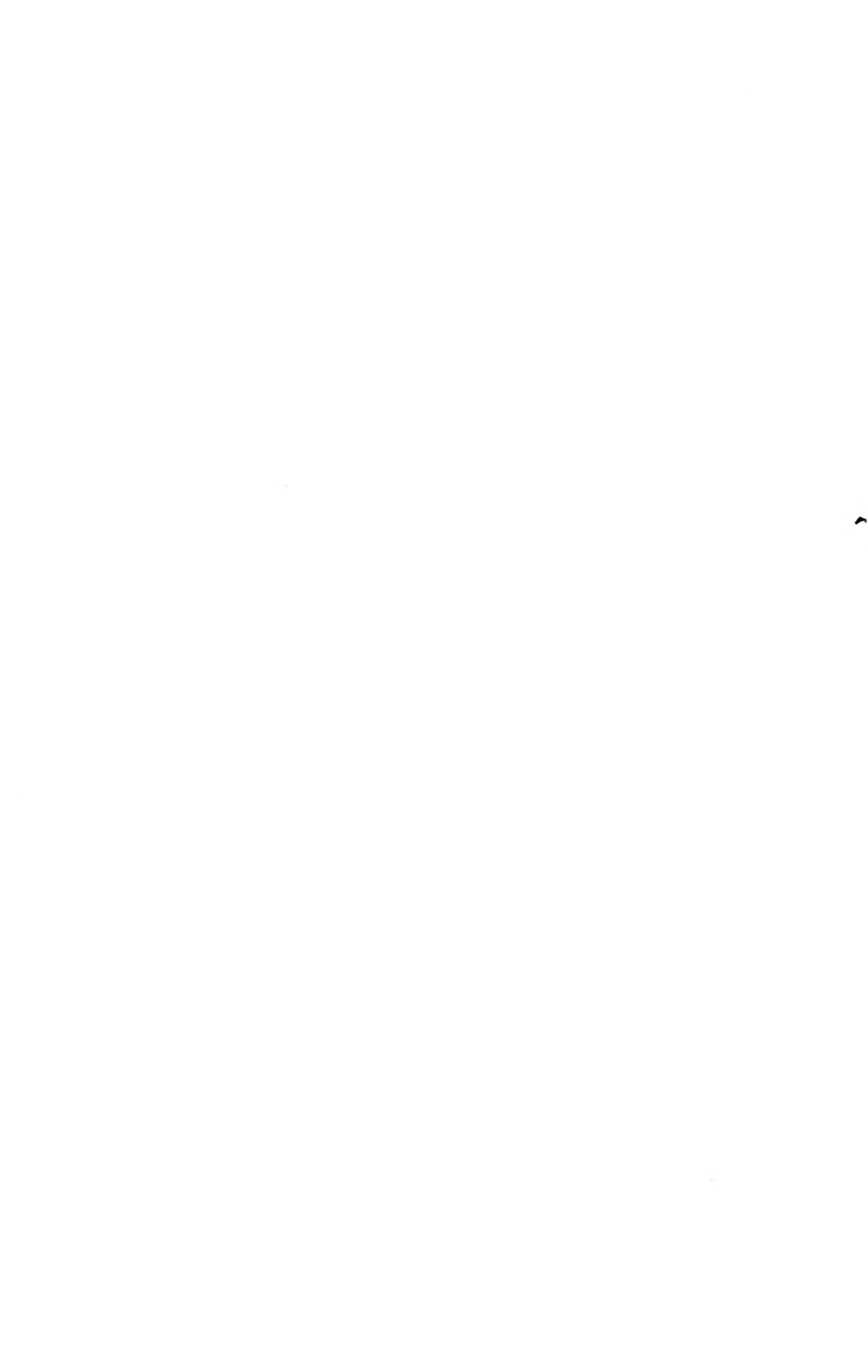


NILE LECHWI, ADULT MALE
Shot by Kermit Roosevelt
Lake No, White Nile



FOREFOOT OF NILE LECHWI
Showing hairless condition of back of pasterns

WATERBUCK, KOB AND LECHWI



the wet meadows, and in the glades among the masses of vine-draped trees and bushes. They fed at all hours of the day and night. We saw a small party of cows feeding on an absolutely treeless stretch of wet meadow at noon. We found a herd feeding in the glades among thick clusters of trees in mid-forenoon, and another herd in the mid-afternoon. We also found them grazing by moonlight.

In the Lado we did not find the waterbuck in the papyrus, but out among the thin groves of scantily leaved acacias, often many miles away from the Nile or from any water save small ponds, in practically the same localities frequented by the Nile hartebeests. Indeed, we often found the species together. When alarmed these waterbuck simply galloped off among the thickets, not heading for the reed beds, even if these were near by. In the Uasin Gishu country also we often found the Jackson hartebeest and the waterbuck in the same country, and even in the same herd; for the hartebeests occasionally ventured into the fairly thick brush, dotted with trees, which came just outside the belt of dense timber which fringed the river haunts of the waterbuck; while the waterbuck occasionally ventured far out on the open, grassy plains, into the ordinary haunts of the hartebeest. As a rule, however, the two species kept separate, although their habitats overlapped on the edges. We once shot a hartebeest bull from the top of an ant heap; and a waterbuck cow with her calf continued to lie under one of the many surrounding bushes for some minutes. It would be quite impossible to say, from our experience, which of the two species was the wariest. We found in one place, or at one time, the waterbuck shyer than the hartebeest; and in another place, or at another time, the harte-

beests were the more wary. We found waterbuck cows with calves so young that they had not yet joined the herd, on the Northern Guaso Nyiro in September, in the Uasin Gishu in November, and in the Lado in January; we believe that there is no regular breeding time.

The heavy bulls will not tolerate the presence of young bulls with the herds, forcing them out, to form bachelor groups of their own. The master bulls fight fiercely among themselves, and when at bay, especially if standing in a pool of water, are formidable antagonists to dogs. They are not, however, by any means as dangerous as sable, roan, oryx, or wildebeest. Against the lion, next to man their greatest enemy, they can make no effectual resistance.

KEY TO THE RACES OF *defassa*

Pelage long and heavy

Body color reddish, cinnamon-rufous *defassa*

Body color darker brown with little rufous in the coat

Body color cinnamon-drab, the nape and crown of head rufous
nzoia

Body color hair-brown or dusky-drab

Snout black as far as the interorbital region; body color
not suffused with cinnamon *tjaderi*

Snout black only on anterior half; body color suffused
with cinnamon *raineyi*

Pelage short and thin

Body color reddish, cinnamon-drab *matschiei*

Body color drab or hair-brown

Body size smaller, horns shorter *harnieri*

Body size larger, horns longer *ugandæ*

NILE DEFASSA WATERBUCK

Kobus defassa harnieri

NATIVE NAMES: Dinka, *katambur*; Bongo, *booboo*; Bari, *babu*.

Kobus harnieri Murie, 1867, Proc. Zool. Soc., p. 3; colored figure and two text figures.

RANGE.—White Nile district east to the foot of the Abyssinian highlands, south as far as the Albert Nyanza and westward throughout the Bahr-el-Ghazal watershed.

Doctor Murie in a communication to the Zoological Society in 1867, concerning the travels of Baron Wilhelm von Harnier on the White Nile, quotes Kaup as the authority for the present race, based upon the two heads presented by Harnier to the Darmstadt Museum. We have, however, no further published record of Kaup's name for which Murie must now stand as the only authority. Harnier lost his life in the upper Nile district in attempting to rescue his native gun-bearer from the charge of a wounded buffalo. At the time of this catastrophe he was shooting near a Catholic mission station some distance south of Shambe between 6° and 7° N. latitude, and it was from this locality presumably that the waterbuck named for him were obtained.

The Nile race of the defassa may be distinguished by its short thin coat of hair, by the drab or hair-brown coloration which is without cinnamon suffusion on the body, and by its smaller body size and horns. It closely resembles the Uganda defassa, in color and shortness of coat, but may be recognized by its smaller body and shorter horns. The typical race from Abyssinia has a decidedly cinnamon or even rufous tinge to its coloration and has much longer and more abundant hair. A newly born young secured at Rhino Camp is covered with woolly hair, rather short and thick, of a uniform dusky-drab, but darker on the breast and the throat. The white patch on the hinder surface of the hind quarters is not evident, owing to the brown of the sides spreading over this area and merging with the grayish-white of the inner surface and belly. The legs are slightly lighter than the sides. The markings on the head and the neck resemble those of the adult, but the dark snout patch is restricted to a spot near the muzzle.

Specimens of this race have been examined from Rhino Camp, Lado Enclave, and Gondokoro, Uganda. They are universally distributed in the vicinity of water and have been met with by every sportsman who has visited the upper Nile. Sir Samuel Baker, Von Heuglin, and Schweinfurth were some of the first to record the occurrence of the waterbuck in the Soudan.

No flesh measurements are available of specimens. The largest skull examined is $15\frac{3}{8}$ inches in length, which would indicate a somewhat smaller body size than the Uganda race in which the skulls are usually 16 inches in length. The longest horns recorded by Ward are a pair $33\frac{1}{2}$ inches in length from the Bahr el Ghazal collected by Mr. A. L. Butler, the game warden of the Soudan. Average horns, however, are very much smaller, 25 inches being a good adult size. The longest-horned waterbuck collected by the Smithsonian African expedition was one of this race shot by Colonel Roosevelt, near Rhino Camp, which measured 30 inches.

UGANDA DEFASSA WATERBUCK

Kobus defassa ugandæ

NATIVE NAME: Luganda, *nsama*.

Kobus unctuosus ugandæ Neumann, 1905, Sitz. Ber. Ges. Nat. Freund. Berl., p. 92.

RANGE.—From the western base of Mount Elgon westward throughout Uganda to the Semliki Valley north as far as the limits of the Victoria Nile drainage and south to Lake Kivu.

The Uganda defassa was described by Herr Neumann in 1905 from specimens shot on the Maanja River in central Uganda. Speke and Grant met with this antelope in Uganda and brought home with them two heads which were referred by Sclater to the sing-sing defassa of Gambia. At that time the preserved specimens of waterbuck were so few in number that the slight color differences now used to distinguish the geographical races had not been detected.

The defassa inhabiting Uganda and the Semliki Valley is a short and thin haired race like the Nile defassa, from which it is distinguishable by its larger body size and much longer horns. The color differences with the latter are slight, the

color averaging somewhat darker. From the 'Nzoia defassa the Uganda race is readily distinguishable by its short pelage and absence of cinnamon suffusion to the body coloration, as well as by its longer and more widely spread horns.

Dimensions of specimens in the flesh are not available for comparison, but those of the horns and skulls are abundantly recorded. Skulls of old adults usually measure sixteen inches in greatest length. The longest horns, as well as those showing the greatest spread, recorded by Ward are a pair shot by A. F. B. Wollaston near Lake Albert Edward. This pair has a length on the front curve of $36\frac{3}{4}$ inches with a spread of 36 inches. Several other heads of almost equal dimensions are recorded from the same general locality by Ward. The direction of the horns laterally, or the amount of spread, varies greatly from specimens in which it exceeds the length to ones having a spread only half the length. As a rule, however, the horns are remarkably wide-spread and exceed the horns of other races in this respect.

RUDOLF DEFASSA WATERBUCK

Kobus defassa matschiei

Kobus unctuosus matschiei Neumann, 1905, Sitz. Ber. Ges. Nat. Freund. Berl., p. 92.

RANGE.—Northern shores of Lake Rudolf north through the Rift Valley of southern Abyssinia as far as Lake Zwai.

The defassa from the Lake Rudolf region and the Rift Valley of southern Abyssinia has been named for Doctor Paul Matschie by Herr Neumann from specimens which he shot at Lake Abaya during his journey across Abyssinia to the Sobat River in 1899. Some years earlier, Donaldson Smith reported waterbuck on the north shore of Lake Stephanie, and about the same time A. H. Neumann met with this race of the defassa on the northeast shore of Lake Rudolf while elephant shooting. The race is distinguishable from the typical defassa of the highlands of Abyssinia by its more grayish or drab coloration and by its much shorter and thinner pelage, in which respect it approaches the Nile defassa. It can, however, be distinguished from the latter by its more cinnamon coloration. Judging by the

size of the skull, it is smaller than the races to the south of it in British territory. No measurements of the horns or body are recorded.

'NZOIA DEFASSA WATERBUCK

Kobus defassa nzoia

NATIVE NAMES: Karamojo, *ecoria*; Kamasia, *kisomere*; Kavirondo (Jaulo), *irigut*.

Kobus defassa nzoia Matschie, 1910, Sitz. Ber. Ges. Nat. Freund. Berl., p. 417.

RANGE.—From the eastern edge of the Mau Escarpment westward to Mount Elgon and northward to the highlands west of Lake Rudolf.

Doctor Matschie, the describer of innumerable races of antelopes from East Africa, named the present race from a specimen shot by Major Powell-Cotton on the Uasin Gishu Plateau. Jackson was perhaps the first sportsman to meet with this race. He records it as abundant as far north as the Turkwell River drainage. The 'Nzoia defassa is a handsome race with an abundance of long cinnamon-rufous hair in the coat. It is the reddest of all the East African races and has the heaviest coat of hair. Overlying the reddish hair is a heavy black lining of dark-tipped hair. The forehead and the sides of the snout are usually bright rufous and the nape of the neck is strongly suffused by cinnamon-rufous. The horns are much shorter than those of *ugandæ* and are more parallel in outline, seldom showing the great divergence at the tips exhibited by that race.

A fully adult male from the Uasin Gishu Plateau measured in the flesh: 84 inches in length of head and body; tail, 15½ inches; hind foot, 22 inches; ear, 8 inches. The horns of the largest male in a series of four are 26½ inches in length by 16 inches in spread.

RAINEY DEFASSA WATERBUCK

Kobus defassa raineyi

Kobus defassa raineyi Heller, 1913, Smith. Misc. Coll., vol. 61, No. 13, p. 5.

RANGE.—Southeastern drainage of the Victoria Nyanza from the headwaters of the Amala River in British East

Africa southward across the German border to central German East Africa.

The present race has recently been described from specimens shot by Paul J. Rainey on the headwaters of the Amala River near the German border of British East Africa. It is a large race, exceeding in body size that of any other in British East Africa. The coloration is nearest *tjaderi* of Laikipia, but differs by its more reddish body coloration and more restricted black snout patch which ends in front of the interorbital region. It is distinguishable from *nzoia* by larger body size, narrower skull, and the absence of strong rufous suffusion on the nape.

The body is cinnamon-drab in effect, the color being made up of a mixture of cinnamon hair with black tips interspersed sparingly with white hairs, the black tone due to black-tipped hairs which give a dark cast to the whole coloration. The back is darkest, the sides being lighter, and more grayish, and the breast fuscous-brown without cinnamon vermiculation. The belly and the posterior surface of the hind quarters are white, the latter in sharp contrast to the dark back and sides. The tail is darker than the back and is seal-brown without cinnamon mixture, but the narrow streak on the under side is whitish to within a few inches of the tip. The legs from the knees and the hock downward are uniform dark seal-brown with a fringe of whitish hair about the hoofs and the false hoofs. The neck is slightly lighter than the body. The sides and the throat are grayish with a white patch on the forethroat and with the nape decidedly cinnamon. The forehead is uniform rufous from the horn bases to the front of the eyes. The ridge of the snout as far as the muzzle is black or seal-brown, variegated by a few scattered white hairs. The tip of the snout bordering the muzzle, the upper lips, and the chin are white. The sides of the snout are tawny, lined by black. There is a broad, white stripe above the eye extending from the middle to an inch in front of the angle on the sides of the snout. The cheeks below are grayish, like the sides of the neck. The backs of the ears are cinnamon, gradually growing darker toward the tip, where they are broadly seal-brown on both sides, and the inside except the extreme tip is white. The female is like the male in color but darker, owing to heavier black tips to the hair,

and the ears are much more broadly tipped by seal-brown, the whole terminal half being dark. The rufous of the forehead is lined by black, but is not uniform as in the male. The tail on the dorsal surface is rufous, only the tip being seal-brown.

A large male had the following flesh measurements: head and body, 79 inches; tail, 21 inches; hind foot, 22 inches; ear, 9 inches. The average length of an adult male skull is $15\frac{1}{2}$ inches. The largest is $18\frac{1}{8}$ inches, which equals large skulls of *ugandæ* from the Semliki River. The female skulls are smaller, usually $14\frac{3}{4}$ inches in length. The horns of large bucks are seldom more than 25 inches in length, the longest in the National Museum being $28\frac{1}{2}$ inches.

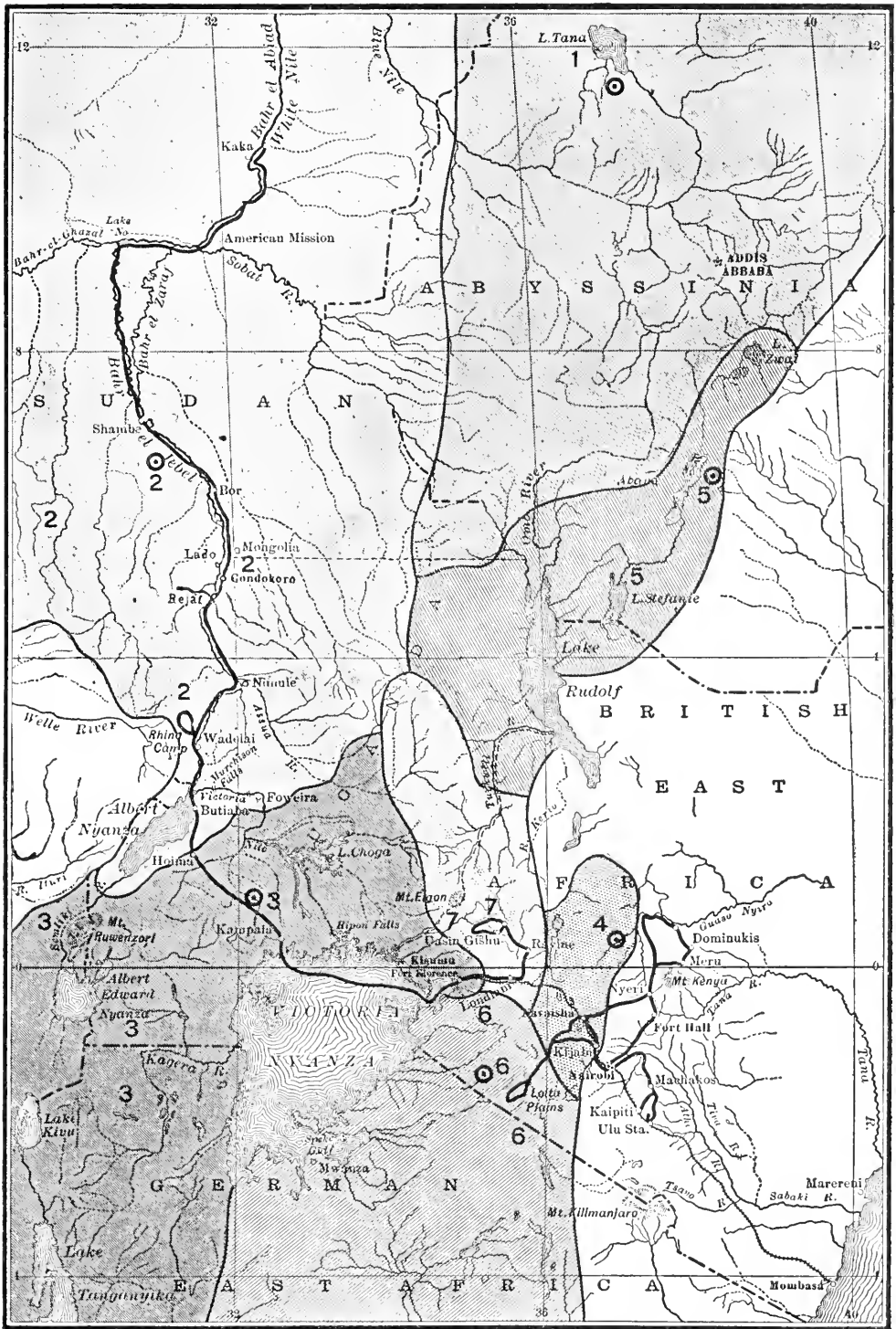
In the eastern limits of its range on the German border this race associates with the common waterbuck, *K. ellipsiprymnus*, living with it in the same meadows, but keeping apart in herds of its own kind. Captain Dickinson in "Big Game Shooting on the Equator" describes such association of the two species on the border. The common waterbuck has been reported as far west as Ikoma, German East Africa, on the headwaters of streams flowing to the Victoria Nyanza.

LAIKIPIA DEFASSA
Kobus defassa tjaderi

Cobus defassa tjaderi Lönnberg, 1907, Arkiv. Zool., Stockl., IV, p. 7.

RANGE.—Laikipia Plateau west to the eastern edge of the Rift Valley, north as far as Lake Baringo, and south to Mount Suswa, at least.

Recently a specimen of the defassa shot by R. Tjader at the extreme eastern limits of the species near the junction of the Guaso Narok and Northern Guaso Nyiro Rivers has been described as a new race by Lönnberg. The characters of this form are its dark coloration, the head being especially dark, the black color of the snout extending far up the forehead well into the interorbital area of the forehead. In size it is somewhat smaller than the other races.



MAP 21—DISTRIBUTION OF THE RACES OF THE DEFASSA WATERBUCK

- | | | |
|--------------------------------|----------------------------------|--------------------------------|
| 1 <i>Kobus defassa defassa</i> | 2 <i>Kobus defassa harnieri</i> | 3 <i>Kobus defassa ugandae</i> |
| 4 <i>Kobus defassa tjaderi</i> | 5 <i>Kobus defassa matschiei</i> | 6 <i>Kobus defassa raineyi</i> |
| | 7 <i>Kobus defassa nsoie</i> | |

COMMON WATERBUCK

Kobus ellipsiprymnus

The common waterbuck is well characterized by the broad white ring on the rump, which encircles the tail and contrasts conspicuously with the dark-brown coat. This is the only very obvious difference from the defassa, but other minor points, such as the lack of reddish suffusion to the coat, the smaller body size, and the light-colored legs, may be made out upon actual comparison of specimens. No intergrading races are known between these two species, although they lack skull differences and occupy separate geographical areas, as is characteristic of races rather than species. At the northern limits of its range the common waterbuck shows a reduction in the rump ring, the middle portion across the back being often obsolete or wanting. The common waterbuck is in some parts of its range subject to albinism, a condition never met with in the closely allied defassa. Several geographical races are recognized which are based on differences in the general tone of coloration. The common waterbuck is limited to the eastern coast region of Africa east of the Rift Valley, from southern Somaliland south to the Limpopo River in the Transvaal.

KEY TO THE RACES OF *ellipsiprymnus*

General dorsal coloration light, drab or hair-brown	<i>thikæ</i>
General dorsal coloration dark, warm sepia-brown	<i>kuru</i>

HIGHLAND WATERBUCK

Kobus ellipsiprymnus thikæ

NATIVE NAME: Kikamba, *ndoo*.

Kobus ellipsiprymnus thikæ Matschie, 1910, Sitz. Ber. Ges. Nat. Fre., Berl., p. 411.

RANGE.—From the Northern Guaso Nyiro River of British East Africa southward to the German border and westward through the Rift Valley; east along the Tana River and the flanks of the highlands to within a short distance of the coast, where it intergrades with the Swahili race.

The highland waterbuck was described recently by Matschie from a specimen shot by Major Powell-Cotton on the Thika a few miles north of the Athi Plains. It is distinguishable from the other races by its lighter color, with the exception of *pallidus* of Somaliland, which is the lightest of all the races. The general tone of the dorsal coloration is drab or hair-brown without any cinnamon suffusion, and so light that the white rump stripe and the throat patch are not very conspicuous. The legs are little darker than the body, but are much more brownish, being uniform cinnamon-brown. A specimen from the Northern Guaso Nyiro has been described by Lönnberg as a distinct race, but we fail to find any color differences in specimens from this locality and those from Juja Farm which represent the highland race. Along the lower reaches of the Northern Guaso Nyiro completely albino specimens are occasionally seen. Such individuals are described as having eyes of normal color and to occur associated in herds with normally colored specimens. Some of the albino females are reported as breeding, the offspring being normally colored. In the elevated region traversed by the Northern Guaso Nyiro through the eastern portion of the Laikipia Plateau the highland waterbuck meets and associates with the defassa.

We met the common waterbuck only in the eastern part of East Africa; as we went westward it was supplanted by its close kinsman, the defassa. In habits the two species are identical; there were sometimes wide differences in conduct and behavior between the waterbucks of one locality and those of another, but these differences were within the same species, and were parallel in the two species. Waterbuck are highly polygamous, one big bull having perhaps a score of cows in his herd. A few young bulls, yearlings, or two-year olds, may be allowed to stay with the herd or hang around the outskirts; but eventually the master bull drives them off, and they wander singly, or in small parties, until one or another grows big enough to rob of his harem

some master bull of failing thews; whereupon the latter, in his turn, begins a life of solitude. The master bull is not generally the herd leader; this function, as with the American wapiti, is usually performed by some old and wary cow. The carriage of the waterbuck is like that of the wapiti, proud and graceful, with the neck erect, instead of held almost in line with the back, as with the oryx; this proud port, and the long, shaggy hair, give it a look like that of some big northern stag. White waterbuck are in certain places not uncommon; it is certainly a singular thing that in a land teeming with beasts of prey any individual of such a strikingly conspicuous color should be able to reach maturity, and, as is frequently the case, to breed. I heard of one white waterbuck cow with a calf of the ordinary color.

The waterbuck is not a water antelope in the sense that is true of the lechwi and sitatunga. It lives on dry land, feeding and resting among the trees and bushes. But it is never found very far from water, and when hunted it takes to the water readily, even when there are crocodiles near; it swims well and boldly, and if hunted by dogs it will, if possible, come to bay in a pool. In the early morning we found waterbuck feeding a mile or two from any cover, on the bare, short-grass plains of the Athi, but when alarmed they at once fled for the trees along the river course. In one instance we found a small party of waterbuck taking a siesta under some small, almost leafless thorn-trees, miles away from water, on a bare plain swarming with zebra. Ordinarily, however, the waterbuck keeps to the groves and glades, feeding and resting alternately at all hours through the day and night. The cow keeps by herself for a few days

while the calf is very young. We have sat within a few yards of a cow and calf which were lying down, and watched them for many minutes before they took alarm. The food is usually grass, but sometimes the animals browse.

Waterbuck are not as formidable fighters as the roan, sable, or oryx; but the old bulls—perhaps trained by their desperate battles among themselves—must be approached with some caution if at bay, for their horns are sharp, and the strength of their heavy bodies is great. Doctor Rainsford was severely hurt by the sudden lunge and struggle of a wounded waterbuck bull when he attempted to cut its throat; and a white man with Major Bulpett was killed under similar conditions. A badly wounded bull attempted to charge Kermit and his gun-bearers.

An adult male shot at Juja Farm measured in the flesh: 79 inches in length of head and body; tail, 18 inches; hind foot, $21\frac{1}{2}$ inches, and ear, $9\frac{1}{4}$ inches. Skull length, 15 inches. The horns of this specimen were $23\frac{1}{2}$ inches on the front curve, while those of the longest are 25 inches. Ward's record for East Africa is 29 inches. The horns of the typical *ellipsiprymnus* of the Zambesi region are much longer, the record being $36\frac{1}{4}$ inches. This record is equal to that of *defassa*, but curiously enough the geographical position of greatest horn growth is reversed in the two species, the shortest-horned *defassa* occurring in the south in close proximity to the longest-horned *ellipsiprymnus*. The identification of heads, however, is attended with much uncertainty unless the body color or the exact locality are known, owing to the close color and horn resemblance of the *defassa* and *ellipsiprymnus*.

SWAHILI WATERBUCK

Kobus ellipsiprymnus kuru

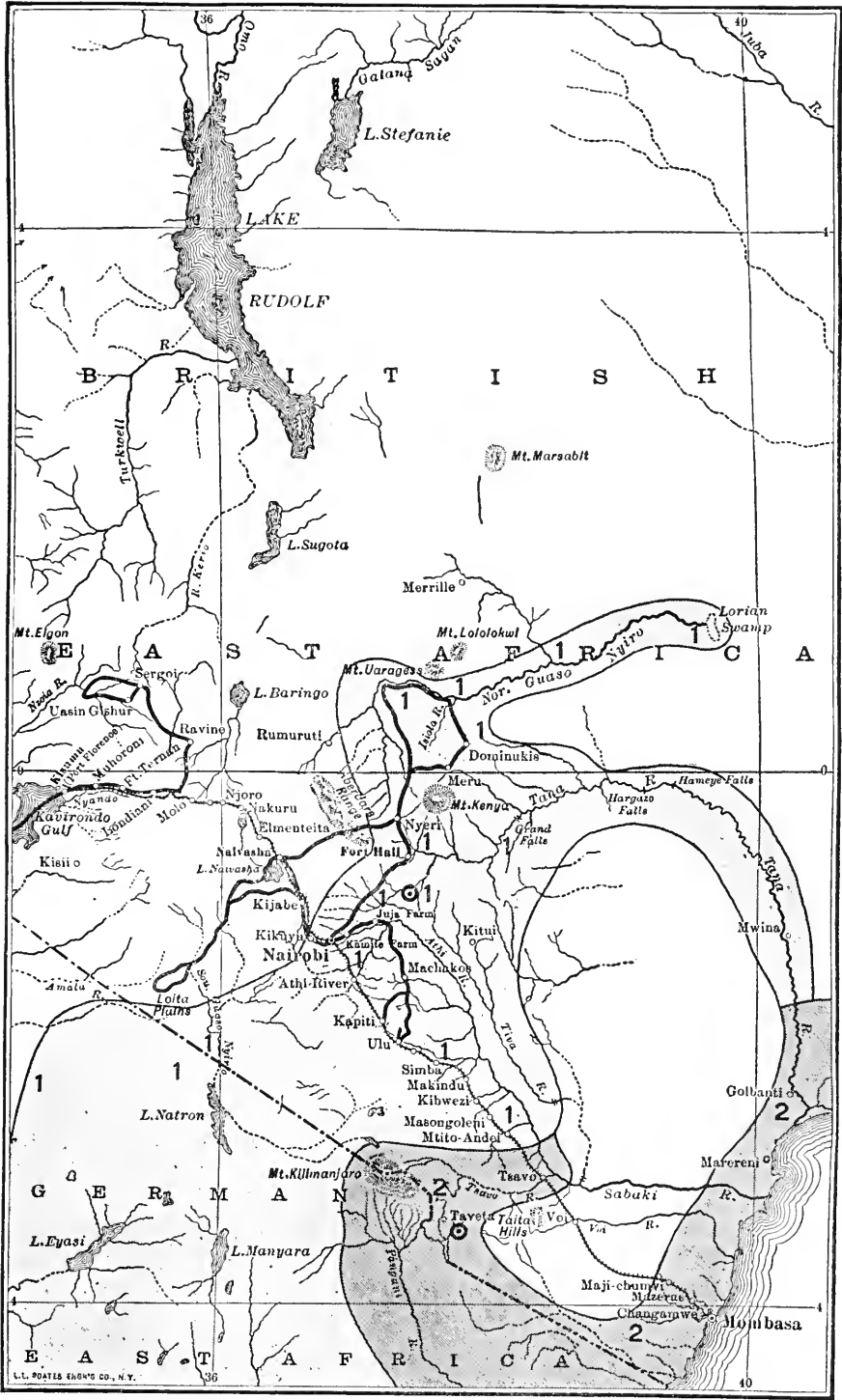
NATIVE NAME: Swahili, *kuru*.

Kobus ellipsiprymnus kuru Heller, 1913, Smith. Misc. Coll., vol. 61, No. 13, p. 6.

RANGE.—Coast district from the Tana River southward along the coast into German East Africa and westward along the larger watercourses to Kilimanjaro.

The race of the common waterbuck inhabiting the coast district of British and German East Africa has recently been described from specimens collected at Taveta by Doctor W. L. Abbott. The waterbuck mentioned by such early explorers of the coast district as Hildebrandt and Fischer refer to this race. Willoughby, Jackson, and several other sportsmen have given accounts of this race. The Swahili waterbuck is closely allied to *thikæ* of the Athi Plains, but differs from this race by its darker, sepia-brown color, darker-brown legs, and lighter-colored snout, which shows little contrast to the color of the forehead.

The color of the median dorsal region is uniform dark-brown or warm sepia, with the sides lighter, deep brownish-drab in color. The breast is drab and the belly whitish. The white stripe on the hind quarters is not continuous across the rump, but is broad and distinct on the sides. The tail is sepia like the back, the tip very little darker, and the under side has a narrow line of white. The legs from the knees and the hocks are uniform sepia-brown, and darker than the sides. There is a white fringe above the hoofs and the false hoofs. The neck is somewhat lighter than the body, being dark brownish-drab, but the nape is uniform in color with the throat. There is a whitish blotch on the upper throat. The sides of the head are like the neck in color. The dorsal surface of the snout is sepia-brown, but contrasts very little with the more reddish cinnamon-brown forehead. The rhinarium of the snout is bordered by a white band and the lips and chin are white. There is also a broad white area at the front angle of the eye about two inches long. The area about the eyes and the back of the ears is ochraceous-tawny. The tips of the ears are sepia-brown, and the inside is white.



MAP 22—DISTRIBUTION OF THE RACES OF THE COMMON WATERBUCK

1 *Kobus ellipsiprymnus thika*

2 *Kobus ellipsiprymnus kuru*

No flesh measurements of specimens are available. The race is smaller somewhat than the highland form, the skull measuring only 14 inches in length. Horns average 23 inches in length.

THE KOBUS

Adenota

Adenota Gray, 1850, Proc. Zool. Soc., p. 129; type *Kobus kob*.

The kobs are easily distinguishable from the reedbucks and waterbucks by the peculiar S-shaped curve assumed by the horns. The horns near the base are bowed backward, but the tips are recurved forward and inward giving them the shape of an elongated "S" when viewed from the side. The back of the pasterns and the border of the hoofs are well haired as in the waterbuck. The tail is short, usually less than fourteen inches in length, and does not reach the hocks. The tip has a distinct tuft of long hair. All of the races, with the exception of the white-eared, are a uniform tawny-yellow color on the dorsal surface without any very bold markings, with the exception of the black leg stripes present in most races. The nearest allies of the kobs are the lechwis, which have somewhat similarly shaped horns, but differ decidedly by having the whole posterior surface of the pasterns and a narrow border surrounding the hoofs and false hoofs bare or hairless. The tail is also much longer, usually reaching to the hocks, and bearing at the tips a distinct tuft of long hair. The length of this member averages four inches longer than in the kobs. The horn length is considerably greater in the lechwi, in which the horns are wider-spread, sublyrate, and less S-shaped. The skull is distinctly longer-snouted in the kobs, and is without the prominent swelling in the supraorbital region which is characteristic of the lechwi. The genus includes two species, *vardoni*, of the Zambesi region, which lacks the black leg stripes, and *kob*, of the equatorial region.

The kobs range from the Zambesi watershed northward through the central lake drainage area to the Nile Valley; east to British East Africa, and westward through Nigeria to Senegal.

EQUATORIAL KOB

Adenota kob

The equatorial kob is characterized chiefly by its black-fronted or striped legs, and by its uniformity in body size and shape of horns. The female is very little inferior in size to the male. In some of the races it shows great individual and age color differences in the male sex in the color of the ears, which assume a white coloration as age advances. In one race the male often becomes quite a deep brown or black on the upper parts. The color of the female is, however, quite constant in the various races. The nursing young have the general color pattern of their female parent, but are slightly lighter, the dorsal surface and head being ochraceous. They particularly resemble the female in the possession of dark, seal-brown ear tips and in the restricted white orbital area, but the legs are without the dark stripes in front, these being merely indicated by a slight darkening. The light hoof-bands are also but faintly indicated.

The range includes equatorial Africa from Senegal and the Niger eastward to the Nile Valley and the Victoria Nyanza, and northward to the edge of the Sahara Desert.

KEY TO THE RACES OF *kob*

Back of ears in male tawny like dorsal coloration or cream-buff, but always with decided dark tips; female with leg stripes dark seal-brown and without a white preocular stripe on the snout.

Size larger; coloration deeper tawny, pelage long; brain case deep; female lined with black on median dorsal surface *thomasi*

Size smaller; coloration lighter tawny; brain case shallower; female without black lining on upper parts *alura*

Back of ears in the male wholly white or cream-buff, the tip only slightly darker if at all; old males usually becoming deep seal-brown or black on dorsal surface, with white ears and orbital area; the female with leg stripes hair-brown, and with a white preocular stripe on the snout. *leucotis*

UGANDA KOB

Adenota kob thomasi

NATIVE NAME: Uganda, *nsunnu*.

Adenota thomasi Neumann, 1896, Proc. Zool. Soc., p. 192.

RANGE.—Upper Nile watershed from the headwaters of the 'Nzoia River on the flanks of the Uasin Gishu Plateau westward through Uganda to the Albert Nyanza, northward along the Elgon highlands west of Lake Rudolf to the Soudan boundary at least.

The Uganda kob has long been known to naturalists, but it has only comparatively recently been distinguished from the older species from Senegal and the Zambesi River. Speke and Grant brought heads from Uganda in 1863. These were the earliest specimens to reach Europe, and were confounded with the white-eared race by Sclater. Later, in 1891, F. J. Jackson sent specimens to the British Museum from Mount Elgon which were referred first to the Zambesi species, *vardoni*, and later to the typical race, *kob*, of Senegal. Finally, Herr Oscar Neumann distinguished the race in 1896 and described it under the present name, *Adenota thomasi*, naming it for Oldfield Thomas of the British Museum.

We found this species in one form or another, common from the Uasin Gishu across to the White Nile, and down the White Nile to the sud; below the sud its place was taken by the white-eared kob. They are rather chunky animals, big bucks reaching a weight of nearly two hundred and fifty pounds.

Although close kin to the waterbuck the golden-coated kob reminds the observer more of the impalla. Along the Uasin Gishu we found the kob in herds of twenty or thirty does and young animals, with a single master buck to each herd. Their range was much more limited than that of the waterbuck in the same region, for they did not go so far away from the river, out on the rolling and hilly plains, nor

on the other hand did they stay in the belt of thick timber by the river brink. Their country was the strip of land, a couple of miles broad, which fringed this timber belt on either side. Reedbuck were scattered through the same country, and always sought to escape notice by hiding and crouching or sneaking off with bent legs through the tall grass. The kob, on the contrary, did not seek to escape notice. They were always in plain sight, trusting to their senses to warn them of the approach of foes. When they ran they occasionally made big bounds in the air, like impalla. They were fond of using the ant-hills as lookout stations, and it was curious to see a score of them covering the top and sides of a big ant-hill, with all their necks stretched out as they watched. They are grass-eaters.

The Uganda kob differs from the typical race by its larger size and darker coloration, and from *leucotis* by the absence of the black coat in the old bucks, and the absence of wholly white ears. The color of the ears of the bucks shows much age variation. In old males of *thomasi* the ears are sometimes quite white with the exception of the tips, which are always darker, at least never lighter than tawny. From its nearest geographical ally, *alurae* of the west side of the Nile, it is distinguishable by the much darker dorsal color, which is due to the abundant suffusion of black-tipped hair. The female resembles the male in color, but the ears are tawny like the body, never whitish, and always with seal-brown tips.

In the adult male the head and body are ochraceous-rufous, overlaid on the rump with black to a slight extent, but lightening on the sides and the limbs to ochraceous-buff. The cheeks are ochraceous-buff and considerably lighter than the forehead and snout. The orbital area is whitish, and most pronounced in front of the eye. The backs of ears are ochraceous-buff and the tips distinctly darker ochraceous-tawny. The base, lower sides, and inside of the ears are

white, as are also the chin, throat, lips, and margin of the nostrils. The whole lower throat is ochraceous and somewhat lighter than the nape. The under-parts and the inside of the legs to the hocks and the knees and the under-surface of the tail are sharply defined white. The legs have a broad, blackish-brown band extending from the whitish hoof-band to the shoulder on the forelegs, and to the hocks on the hind legs. The back part of the forelegs is whitish, but this area in the hind legs is ochraceous. The false hoofs are bordered by a much narrower band of white than the hoofs. The female is like the male, but easily distinguishable by the dark seal-brown tips of the ears and the small extent of white in the orbital region. The female resembles the female *leucotis*, but the dorsal color is much darker tawny-ochraceous, the sides are more ochraceous-buff, and show considerable contrast to the white under-parts. The backs of ears are like the body color, the tips are broadly tipped by seal-brown, and the base and inside are white. The orbital white area is not produced forward as a preocular stripe. The legs have a dark streak in front which is deep seal-brown as in the females of *alurae*. The hoof-band and the inside of the legs are buffy.

The measurements of an adult male in the flesh from the Uasin Gishu Plateau are: head and body, 65 inches; tail, 13 inches; hind foot, 17 inches; ear, $6\frac{1}{2}$ inches. Length of skull, $11\frac{1}{2}$ inches. The average length of the horns along the curve is 16 inches and the spread is 14 inches. The longest horns in a series of three adult males are $17\frac{1}{2}$ inches, and the greatest spread is 11 inches. A series of both sexes from the headwaters of the 'Nzoia River in the Uasin Gishu Plateau region have been studied, also the types in the British Museum, including specimens from central Uganda.

LADO KOB

Adenota kob alurae

NATIVE NAMES: Madi, *lza*; Acholi, *til*.

Adenota kob alurae Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 11.

RANGE.—West side of the Nile from the Albert Nyanza northward to the Bahr-el-Ghazal drainage; limits of range not known.

The Lado kob was described recently from specimens shot by Colonel Roosevelt at Rhino Camp on the west bank of the Nile a few miles north of the station of Wadelai.

In the Lado, the territory was everywhere of much the same character, grassy plains covered with a sparse, scanty growth of trees and bushes; and the kob, like the other species, was far less specialized in its habitat than on the Uasin Gishu. Waterbuck, kob, and hartebeest were all found indiscriminately over the country, and often together; from the same spot in two shots, at only a couple of seconds interval, we shot a hartebeest bull and a fine buck kob. As a rule, none of the antelope were shy in the Lado.

The Lado race is like the Uganda kob in color, but lighter and decidedly smaller. The skull is smaller and flatter in both sexes and the size of the hoofs is smaller. It approaches the typical kob of Senegal in its small size and stands quite intermediate between it and *thomasi*, but differs by having the head more extensively white, the entire orbital region being white and the ears also showing a tendency to whiteness, in some being uniform buffy on the back without the blackish tip. The old males, however, never assume the black coat characteristic of this sex in *leucotis* nor do they show, as a rule, the white ears. The female is distinguishable from the female Uganda kob by its lighter color and the absence of the black lining to the dorsal region. The hair is considerably shorter than in *thomasi*, being at the hair whorl three-fourths of an inch or less, while on the Uasin Gishu specimen it is one and one-fourth inches in length at the same point.

The color of the head and body in the adult male is ochraceous, lightening on the lower sides and the midline of the throat to ochraceous-buff. The backs of the ears are lighter than the head, and are ochraceous-buff, but the tips are very little darker, being ochraceous-tawny. The orbital region, base and sides of ears, lips, borders of nostrils, chin, upper throat, chest, under-parts, inside of legs, under side of tail,

and band above hoofs and false hoofs are white. The front of the forelegs from the light hoof band to the shoulders, the front of the hind legs from the hoof band to the hock, and the tip of the tail are blackish-brown or dark seal-brown.

No flesh measurements of this race are available. The skull of an adult male measures $11\frac{1}{4}$ inches in length. In a series of six adult males the longest horns measure $21\frac{1}{4}$ inches along the curve by 13 inches in greatest spread. These horn measurements exceed those of *thomasi* from the 'Nzoia River by three or four inches and indicate a greater horn length for the Nile race, a difference which is further confirmed by the measurements given in Rowland Ward's "Records of Big Game."

WHITE-EARED KOB

Adenota kob leucotis

NATIVE NAMES: Djeng, *kul*; Dinka, *teel*.

Antilope leucotis Lichtenstein and Peters, 1853, N. B. Ak., Berl., p. 164.

RANGE.—The White Nile region in the vicinity of the junction of the Sobat and Bahr-el-Ghazal affluents eastward along the Sobat to the Abyssinian border.

The white-eared kob was first obtained by Werne, a German traveller, on the Sobat River, and described in 1853 by the well-known German naturalists Lichtenstein and Peters. This specimen was not one of the characteristic black males, but was of the tawny type like the recently described *vaughani*. Heuglin met with this species in 1861 in the Sobat and Bahr-el-Ghazal regions, and described it under its native names of *kul* and *wuil*. Sir Samuel Baker also met with the white-eared kob in his explorations of the Nile sources.

This handsome antelope was found in herds along the mouth of the Bahr el Zeraf. Their habits were substantially those of the common kob. They were found on the immense dry flats, sometimes among the scattered thorn-trees, sometimes out on the stretches of short grass; although

in the neighborhood of water, they sought it merely to drink. They were not very wary. They were grazers, like the rest of this genus. Like the common kob they went in big bands, each composed of ewes and young rams with one or, rarely, two or three old rams; and the old rams were also found singly, and occasionally the young rams were in small parties by themselves. The old rams were strikingly conspicuous, with their deep rich brown, almost black, coats, and the sharply contrasted black and white markings on their faces. Whether this dark coat is a permanent mark of advanced age, or whether the old rams only assume it seasonally, we do not know; some of the rams with horns as fully developed as those of any we saw were not in this adult pelage. It is certainly partly a matter of age and partly a matter of individual peculiarity. The young rams and ewes were a reddish-yellow, like the ewes of the white-withered lechwi.

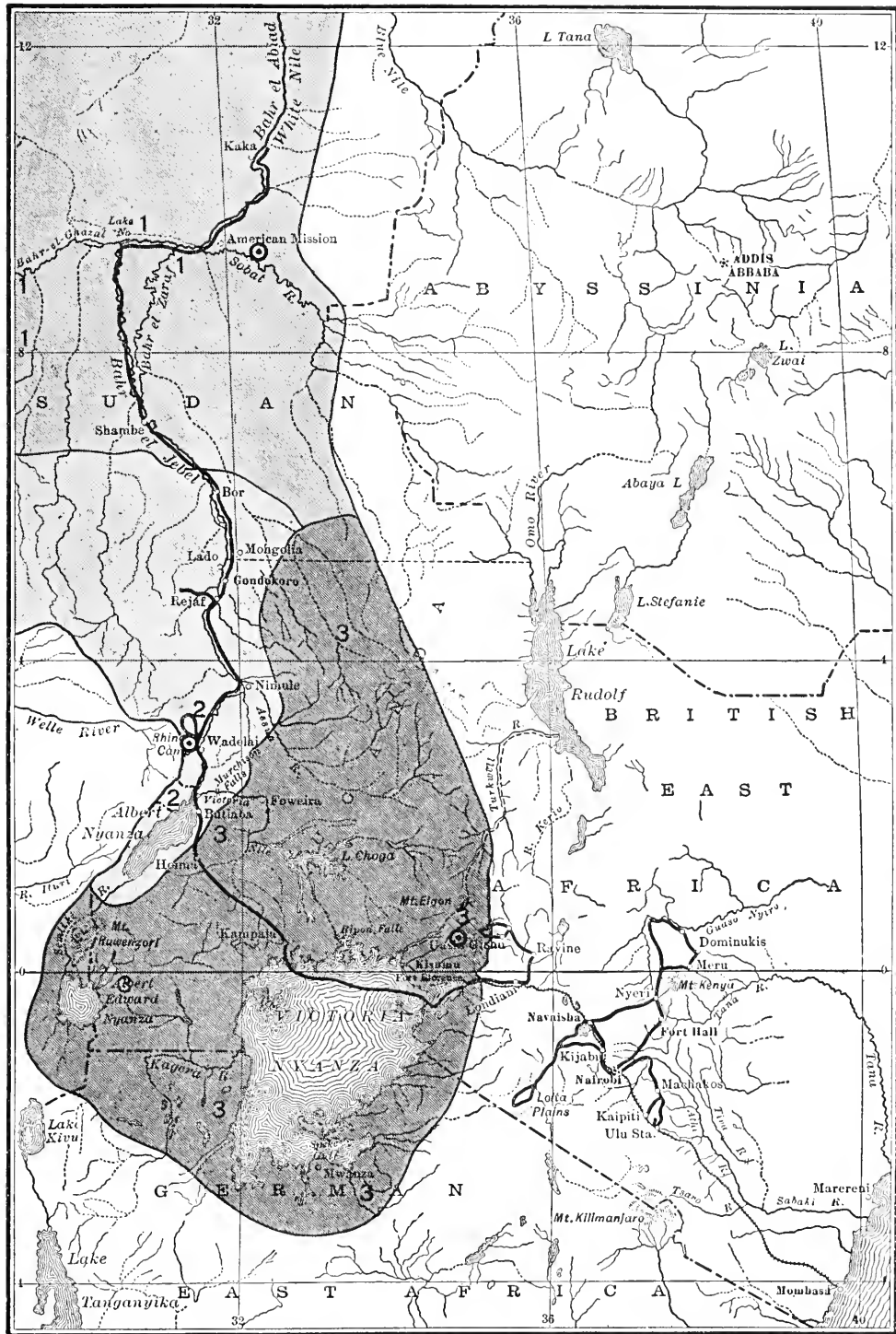
Vaughn's kob, which we found in the dry, thorn-studded flats beside the Bahr el Ghazal, is apparently only a color phase of the white-eared kob. Its habits were precisely the same. Watching a ram that stood almost concealed by tall grass, we were struck by the way in which its presence was betrayed by the incessant wagging of the ears, to drive away the biting flies. The ram stood otherwise motionless; and when we were too far off for its partly screened and dimly seen shape and color either to conceal or reveal it, the motion of its ears attracted attention.

The most marked character in this long-known race is the white ear which in old adult males is wholly white with no trace of a darker tip. In immature specimens and in the females the ears are ochraceous or buffy with dark-brown tips. Another striking characteristic of this race is the dark-

brown or black coat assumed by some of the old males, which is a color change not met with in any other kob. The female is distinguishable from the other races by the greater amount of white about the eye, which is continued forward on the snout as a preocular stripe, and also by the light color of the leg stripes which are hair-brown instead of seal-brown.

A male in the dark phase has the dorsal surface of the head and the body uniform dark seal-brown. The sides are somewhat lighter, being bone-brown, and sharply defined below from the white of the under-parts. The nape of the neck, the crown, and the hinder surface of the thighs are mixed with tawny hairs. The upper surface of the tail is pure ochraceous-tawny, only the tip being black. The ears are wholly white as well as a broad area at the base. The orbital region is extensively white, the light color extending forward as a preocular stripe toward the muzzle. The chin, throat, lips, and margin of nostrils are white. There is a small white spot on the cheeks below the ear. The white of the chest extends far up the throat, leaving a rather narrow band of seal-brown across the throat. The rest of the under-parts, including the inside of the legs to the hoofs, and the whole of the pasterns are white. The white stripe on the hind legs covers the front surface from the hocks, the hinder part of which is brown like the body.

At the northern limit of kobs in the Nile Valley the old males usually assume deep seal-brown or black upper parts similar to the adult livery of the sable antelope. Some individuals, however, do not assume this dark coat except to a slight degree, that is, only upon the sides of the throat, the shoulders, and the legs and flanks and snout. Such rufous-colored individuals were described as a new race, *nigroscapulata*, by Matschie in 1899. More recently, in 1906, Lydekker applied the name *vaughani* to similarly colored specimens from the same region. Both of these races are based on either immature or adult rufous-colored individuals of the white-eared kob with which they agree in having the ears white or cream-buff on the outer surface, and the lower parts of the legs, half-way to the knees, whitish. Some of these rufous individuals show, by the worn condition of their teeth and the obliteration of most of the sutures in their skulls, that they are really aged



MAP 23—DISTRIBUTION OF THE RACES OF THE KOB

1 *Adenota kob leucotis*

2 *Adenota kob alura*

3 *Adenota kob thomasi*

animals, and it is quite evident that the black livery is to some extent an individual character, although chiefly an age affair. Selous, by the comparison of dates furnished by sportsmen, has come to the conclusion that the black coat is a seasonal change, but our experience throws considerable doubt on this opinion. We found both color phases equally common at the same season, and in none of the specimens were there any marks showing shedding or any process by which a seasonal coat could be acquired. Specimens identical in coloration with both *nigroscapulata* and *vaughani* from the mouth of the Bahr el Ghazal were secured by the Smithsonian African expedition under the direction of Colonel Roosevelt. Some of the upper Nile specimens as well as the more remote ones from the Uasin Gishu Plateau known as *thomasi* occasionally exhibit whitish ears having the dark tips nearly obsolete. It is probable that somewhere in the upper Bahr el Ghazal, perhaps in the vicinity of Meshra-er-Rek, the two races meet. The white-eared kob is without doubt local and confined to the extreme northern limit of the range of the kobs in the Nile Valley. Westward we find little or no change in the coloration of the kobs between the Nile Valley and the Senegal or Nigerian regions, which is a really vast extent of country.

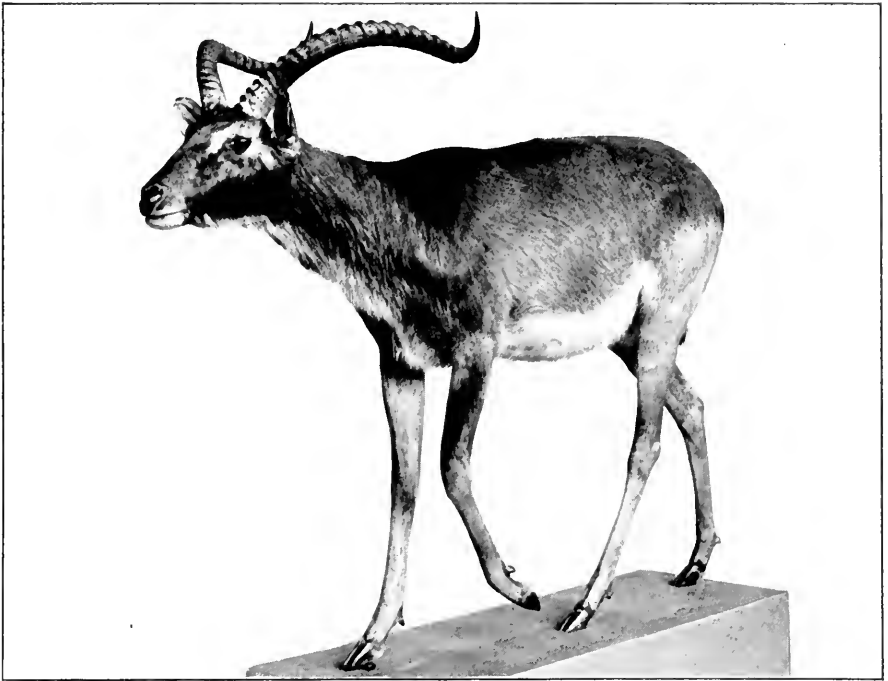
The flesh measurements of an adult male are: head and body, 61 inches; tail, 14 inches; hind foot, 17 inches; ear, 6 inches; greatest length of skull, 11 inches. Four adult male skulls have been examined from the Bahr el Zeraf and Lake No district. The average of horn dimensions in these specimens is 18 inches in length by 14 inches in greatest spread. Rowland Ward, however, records a great many specimens from the Nile of this race, all of which have horns exceeding 20 inches, the maximum measurement being $24\frac{3}{4}$ inches.

THE LECHWI

Onotragus

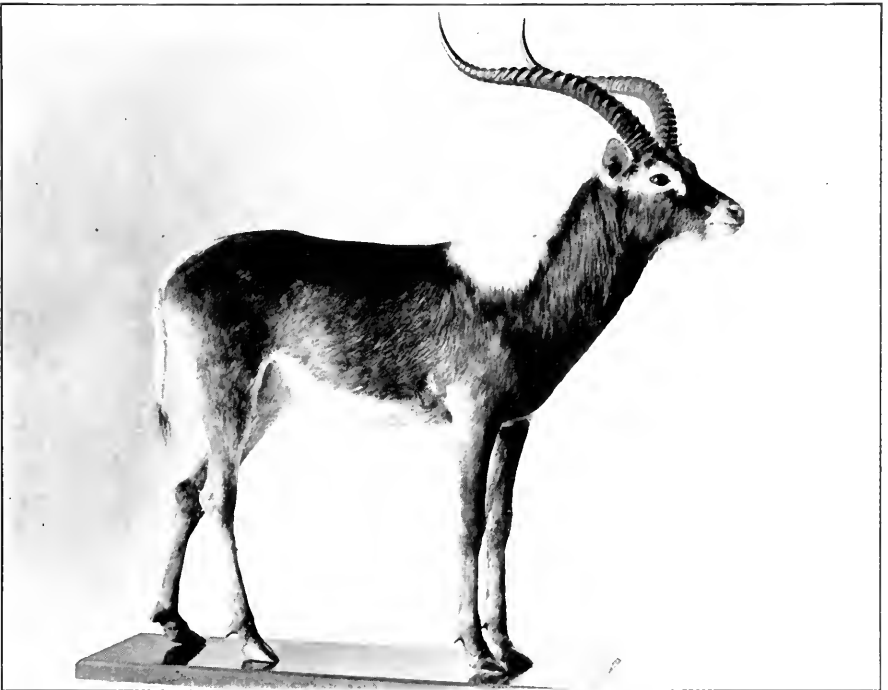
Onotragus Gray, 1872, Cat. Rum. Brit. Mus., p. 17; type *Cobus lechee*.

The genus *Onotragus* was founded by Gray in 1872 for the reception of the lechwi and based upon the character of the tufted tail and sublyrate shape of the horns in this



NILE LECHWI, ADULT MALE

Showing abnormal coloration, absence of white withers in age
Shot by Theodore Roosevelt, Lake No, White Nile
United States National Museum



NILE LECHWI, ADULT MALE

From White Nile
Field Museum, Chicago

MOUNTED SPECIMENS OF THE NILE LECHWI

species. No mention was made of the naked character of the pasterns, or the short, bulging snout and wide nasal bones so distinctive of the lechwi. Gray associated with the lechwi the poku or Zambesi kob, an antelope of the genus *Adenota*, while the Nile lechwi, which closely resembles the true lechwi in the horn characters used by Gray, was placed with the waterbucks. Later naturalists have not recognized Gray's genera, but have lumped the lechwis and kobs with the waterbucks in the genus *Kobus*. Most recent writers have adopted the arrangement of the species as given by Sclater and Thomas in the "Book of Antelopes," where the Zambesi lechwi is placed at the end of the line and the Nile lechwi widely separated from it and associated with the waterbucks under the subgenus *Cobus*.

The back of the pasterns and the border of the hoofs and the false hoofs are hairless, the skin being thickened and pad-like. The hoofs are long and slender. The tail is long, the tufted tip reaching the hocks. The horns are long, sublyrate in shape, and wide-spread. The snout is short and bulging. The lechwi shows important differences from the kobs and waterbucks in the short, wide nasal bones, the prominent swelling of the supraorbital region, and the great width of the basioccipital bone separating the tympanic bullæ. There are but two species: the Zambesi lechwi and the Nile lechwi.

The distribution is peculiar and discontinuous. The Zambesi lechwi ranges from Lake Ngami northward as far as Lake Mweru on the northern border of Rhodesia, while the Nile lechwi is confined to a very limited tract on the White Nile more than one thousand miles north of Lake Mweru.

NILE LECHWI

Onotragus megaceros

NATIVE NAMES: Dinka, *abokk*; Nuer, *til*.

Adenota megaceros Fitzinger, 1855, Sitz. Ak., Wien, XVII, p. 247.

RANGE.—Mouth of the Bahr el Ghazal at its junction with the White Nile. Apparently confined to the district near the mouth of the Bahr-el-Ghazal side and unknown

east of the Bahr el Zeraf. Limits of range not known, but reported as far north as Taufikia opposite the mouth of the Sobat, and as far south on the Bahr el Ghazal as Wau.

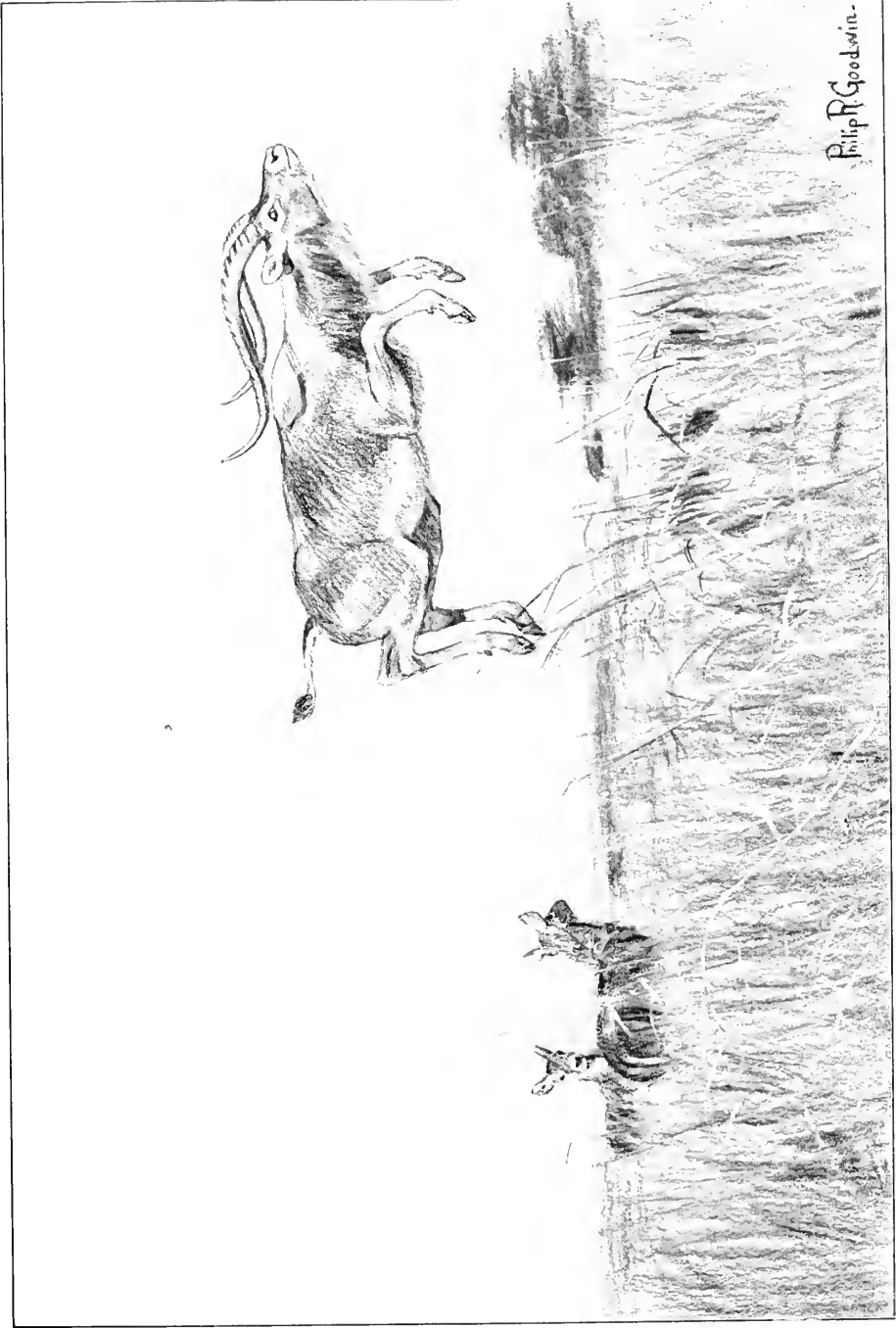
Soon after the discovery of this antelope by Heuglin in 1853, and the accidental description of it by Fitzinger, it was described as *Cobus maria* by Gray from specimens received from Consul Petherick taken on the White Nile. Under this name it has since been known to naturalists, owing to Fitzinger's description being considered inadequate. Fitzinger's name, however, is accompanied by a mention of its large horns and its general distinctness from the kob, and is moreover founded on a specimen still preserved at Vienna which was a few years later fully figured and described by Heuglin, so that the name is well founded. Fitzinger mentions Heuglin's intention of describing the species under the name *Adenota megaceros*, and refrains on that account from describing it beyond giving the horn characters and the history and locality of the specimen. Heuglin not only collected several specimens of the Nile lechwi, but brought back to Vienna with him a live female specimen, which, however, lived at the Zoological Gardens but a short time. This is the only specimen which has ever reached Europe alive. Inasmuch as the rigid rules governing modern scientific nomenclature sometimes give rather absurd results, it is a relief that in this case they do justice, and enable us to substitute an appropriate name, given to this fine riverbuck by its discoverer, for an inappropriate name subsequently given to it by a closet naturalist who had nothing to do with its discovery.

This interesting animal ought to be called waterbuck, for in its habits it is emphatically a buck of the water, whereas the true waterbuck merely lives in the neighborhood of water, on dry land. We found this lechwi on the flooded ground along Lake No and the mouth of the Bahr el Ghazal. It was first discovered by Heuglin, and for the fifty years intervening between his discovery and the date of our visit has been shot by various sportsmen and travellers, and

occasionally described by closet systematists. It is a singular proof of the extreme difficulty even good observers have in recognizing patent facts which are unexpected, that none of these men recognized that this White Nile antelope of the marshes was nearest of kin to the lechwi of the Zambesi and other South African rivers. They persistently compared it either with the neighboring waterbuck, or more frequently with the neighboring white-eared kob; at least one of the systematists actually suggested that it was not distinct from the latter. Yet it is difficult to understand how any observer of the animal in its haunts, or any student with specimens before him, could fail to see its real affinities. We had only read of the lechwi in the writings of Selous and other observers, but as soon as we saw the Nile riverbucks at home, we recognized their relationship to the riverbucks of the Zambesi. One of our number, when we reached Khartoum, wrote to Captain Stigand, who was on his way southward through that city, telling him that the white-withered antelopes were close kin to the lechwi; and, shortly afterward, when he had himself observed them, Captain Stigand confirmed this statement in a letter to Selous, which the latter showed us.

We found the white-withered lechwi in large herds, sometimes of forty or fifty individuals. These herds made a broad trail where they passed through the reeds or tall marsh-grass or the edges of the papyrus; and the long-hoofed antelopes swam the deep channels without hesitation, and splashed their way over the soft black mire, and across the pools through the tough stems of the close-growing water-lilies. Often the marshes through which they made their way were so deep in water that it was up to our shoulders.

They feed, however, where the ground is merely moist, or with only an inch or two of water, and where ant-hills dot the stretches of tall grass. They are grazers and crop the delicate grass of these moist stretches. Unlike the kob they never mount the ant-hills to watch; their trust is in skulking under cover out of the reach of danger, and not in detecting danger afar off and then fleeing in the open. They are among the most noisy of antelope, continually uttering croaking grunts; when a herd is suspicious or slightly alarmed these grunts make a perfect chorus. The animals almost always kept to the cover of the tall grass, walking and trotting with their necks outstretched, and the heads below the level of the blade tops. Looking out over the marsh from an ant-heap, we might at first see nothing; then, two or three hundred yards off, a dozen heads would pop up, gaze steadily at us, disappear, and then, after an interval of a couple of minutes or so, reappear several hundred yards farther off. Usually they skulked off at a trot or canter, with neck outstretched; but occasionally they galloped, now and then making great bounds over the tops of the tall grass. At other times they would stand in the tall grass until we were but a score of yards off, although they were completely screened from our view; then away they would steal, sometimes grunting loudly. The flexible pasterns and spread hoofs leave big marks in the mud. The beasts make a tremendous noise as they smash through the reeds and splash across the shallow lagoons. Some of the biggest-bodied bucks, with longest horns, did not have the white on the withers and the back of the neck. Perhaps, in addition to being a mark of sex and age, their white coloration only develops seasonally.



NILE LECHVI

Occasionally they galloped, now and then making great bounds over the tall grass
From a drawing by Philip R. Goodwin

This species resembles closely in body size and horn shape the Zambesi lechwi, but differs widely in coloration. The dorsal coloration of the male is bay or seal-brown with a large whitish patch on the withers extending along the nape and spreading over the crown of the head, the ears, and the orbital region. The tail is white with a black tuft at the tip. The under-parts and hoof bands are white. The female is uniform buffy in color on the dorsal surface, but the cheeks are dark-brown and the orbital region whitish with a light preocular stripe. In a normally colored adult male the dorsal color of the body is raw sienna merging on the sides to a light olive-gray, the under fur being everywhere seal-brown and showing through on the sides where the olive-gray only overlies the hair lightly. The tail above is lighter, buffy, and the tip black. The sides of the neck and the throat have the seal-brown predominating like the sides, and overlaid sparingly by a few buffy hairs. The withers are marked by a large oval area of whitish hair overlaid by a wash of raw sienna, the light area extending forward along the nape to the crown, where it includes the ears and broadens out greatly; on the nape it narrows down to a mere line, the whole area being in outline much like a dumb-bell. The legs are dusky-brown like the sides, being overlaid by light olive-gray. The hoofs and false hoofs are marked by a light band of cream-buff above the hairless border. The under-parts are white from the chest to the base of the tail as well as the inside of the hind legs. The forelegs at the axilla and on the inside are dusky-brown with a patch of buffy on the inside of the thighs. The side of the head is uniform seal-brown to the lower margin of the orbit, the seal-brown area being continued across the snout and up the forehead to the base of the horns. There is a wide cream-buff or whitish supraocular stripe continuous with the white area of the crown and the ear base. The back of the ear is buffy and the base and the inside are white. The snout has a broad tawny patch on each side and the nostrils and lips are bordered narrowly by white. The chin is white and merges gradually into the ochraceous-tawny forehead. The rest of throat to the chest is seal-brown like the sides and overlaid by light olive-gray sparingly. An old adult male is brighter red, the body behind ferruginous;

the dark seal-brown color of the basal hair showing through conspicuously everywhere, and the white area of the withers, nape, and head suffused extensively by the ferruginous. The hind part of the quarters and hind legs are everywhere except in front of the hocks uniform ochraceous-tawny.

An adult male intermediate in age between the two males described is peculiar in coloration. It lacks all trace of the whitish wither and head areas, being in color quite uniform ochraceous-buff like the female. The color of the body is ochraceous, but becomes lighter on sides or buffy. The hind limbs are buffy and the forelegs buffy with a dusky blotch in front on the thighs above the knee. The nape of the neck is like the back in color. The sides of the neck and the throat are dusky-brown overlaid by buffy hairs. The crown of the head and the snout and the back of the ears are ochraceous. The inside of the ears and the supraocular stripes are white, and the sides of the face dusky-brown. The lips, the border of the nostrils, and the chin are white, the latter merging into the buff of the throat which extends as a narrow line to the chest. The under-parts are white but not sharply contrasted with the buffy sides and the inside of the legs. The tail is buffy above and white beneath with dark seal-brown tip. The old female specimen, which has the teeth much worn, has the dorsal color ochraceous-tawny but lacks the light patch on the withers and the head of the male, and very little of the dark-brown under fur shows through the tawny. The sides are lighter and buffy, and the limbs are uniform buffy with an indefinite drab streak on the front side from the hoofs to the knees and the hocks. The tail is buffy with a tufted black tip. The under-parts, the inside of the legs, and the under side of the tail are white. The throat and the chest are cream-buff in contrast to the tawny nape. The back of the ears, crown, and snout are ochraceous-tawny. The inside of the ears and the base are cream-buff; and the supraocular stripe is similar in color. The eye has a seal-brown blotch below and the whole side of the face to the snout shows seal-brown under hair overlaid by buffy. The lips, chin, and borders of the nostrils are whitish. The general coloration is similar to that of the female *leucotis*, but is lighter and more buffy.



MAP 24—DISTRIBUTION OF THE SPECIES OF LECHWIS

1 *Onotragus megaceros*

2 *Onotragus lechae*

The three specimens described above shot by Colonel Roosevelt at Lake No show great color variation. The youngest specimen, a fully adult male with horns twenty-three inches in length and premolars showing slight wear, has the white areas of the withers and head most distinct with the remaining dorsal surface darkest in color. In the oldest male the body color has become suffused strongly with rufous, the white and black areas showing a strong tendency to become uniformly rufous. The male of intermediate age is no doubt an abnormally colored specimen or freak, being somewhat lighter and more uniform than the female in color. Adult males showing distinct white withers and dark bodies have been examined at the British Museum, the Congo Museum at Brussels, and the Field Museum at Chicago, all of which showed well-developed horns and were without doubt fully adult. A large series of specimens, however, are needed to determine the individual and age variation in color in this species. It is quite possible that this species is subject to as great individual color changes as its geographical associate, the white-eared kob.

An adult male showed the following flesh measurements: head and body, 63 inches; tail, $18\frac{3}{4}$ inches; hind foot, 20 inches; ear, $5\frac{1}{4}$ inches. The old female measured less in length of tail and hind foot, these measurements being $16\frac{1}{4}$ and 17 inches, respectively. In a series of three males the longest-horned specimen measured $29\frac{1}{2}$ inches in length, $20\frac{1}{2}$ inches in greatest spread, and had a skull length of $11\frac{1}{4}$ inches. The female skull measures $10\frac{1}{2}$ inches. The longest-horned specimen recorded by Rowland Ward in a series of 26 measures $33\frac{1}{2}$ inches.

CHAPTER XVII

DUIKERS AND SMALL ANTELOPES

DUIKERS

SUBFAMILY *Cephalophinæ*

THE duikers form a very compact group of small and diminutive antelopes having short, straight horns projecting backward in line with the dorsal profile of the head. The horns are quite straight and never exceed the head in length. A character peculiar to the duikers, and one by which they may always be recognized, is the linear arrangement of the anteorbital pores which form a long line on the sides of the snout in front of the eye. The duikers in general build are quite compact, with rather short legs and neck, low withers, and well-developed hind quarters. The hoofs are normal in shape, but the false hoofs show considerable specific variation in size. The tail is short but not rudimentary and is either well haired throughout or tufted. The female has four mammæ. The skull has a large anteorbital fossa, quite equalling the orbit in size. The snout is of medium length with very broad triangular nasal bones expanding laterally and roofing over the anteorbital fossa. Two generic groups are included, the typical or forest duikers and the bush or plains duikers, the latter being a recent offshoot which have forsaken the forest for a life in open bush country on the edge of plains. The

subfamily is distributed throughout all of Ethiopia and is the most wide-spread group of antelopes in Africa. In past geologic time duikers ranged as far as Algeria where they are represented by two Pleistocene species.

KEY TO THE GENERA

Horns projecting straight back in line with or slightly below the dorsal profile of the head, less than half the length of the head, with broad base and triangular in shape; hair unicolored without annulations

Cephalophus

Horns projecting backward and upward slightly above dorsal profile of head, the length more than one-half the head, base narrow, the horns long and cylindrical in shape; hair annulated, the coat being vermiculated

Sylvicapra

FOREST DUICKERS

Cephalophus

Cephalophus H. Smith, 1827, Griffith's Anim. Kingd., V, p. 344; type *C. sylvicultrix*, the yellow-backed duiker.

The forest duikers are characterized by their short, broad horns, which project backward from the skull slightly below the line of the dorsal profile of the head. The horns are much shorter than the head and often so diminutive as to be concealed by the long coronal tuft of hair. In distinction to the bush duikers the coloration is uniform or of solid colors, the hair not being annulated or vermiculated. The forest duikers occur only in heavy forest growth. Their centre of abundance is in the great Congo forest in much of which they are the only representatives of the *Bovidæ*. In distribution they are spread over all the forested areas of Africa south of the Sahara Desert, with the exception of Abyssinia.

KEY TO THE SPECIES OF *Cephalophus*

- Body size not diminutive; false hoofs well developed
 Body size large, skull 9 inches or more in length, coloration of
 back and rump seal-brown or black *spadix*
 Body size medium, skull less than 8 inches in length; coloration of
 back and rump bright rufous *natalensis*
 Body size diminutive; false hoofs minute; coloration fuscous or slaty
monticola

RED FOREST DUIKERS

Cephalophus natalensis

The red forest duikers form a very distinct group of small bay-colored antelopes which are confined in their distribution strictly to dense forest growth. In color they are bright or deep red with the whole top of the head and nape, chest, and legs blackish or dark in color. The tail is short with a bushy tuft at the tip showing a mixture of dark and light colors. The horns are short and so broad basally that they are quite triangular in shape. The female is equal to the male in size, but possesses much smaller horns. The sexes are identical in coloration. The young or immature are quite blackish or deep brown in color on the forward half of the body, the bay color making its appearance first upon the rump and gradually spreading forward to the head in adult life. The red duikers are distributed in several geographical forms from South Africa northward throughout the breadth of Africa as far as the equator in East Africa, but extend much farther north on the West Coast to the southern edge of the Sahara. They are solitary in habits and move about chiefly at night in definite runways or paths in the forest along which they browse on the undershrubs.

KEY TO THE RACES OF *natalensis*

- Body bright red or bay color
 Legs lighter than the crown patch, walnut-brown *harveyi*
 Legs blackish like the crown patch in color *ignifer*
 Body tawny or cinnamon-rufous *johnstoni*

KILIMANJARO RED DUIKER
Cephalophus natalensis harveyi

NATIVE NAME: Swahili, *nuno*.

Cephalophus harveyi Thomas, 1893, *Ann. & Mag. Nat. Hist.* (6), XI, p. 48.

RANGE.—From the Juba and Tana Rivers southward along the coast to German East Africa and westward to Kilimanjaro and Mount Meru.

Jackson collected the type which was named at his suggestion for Harvey, who had shot a specimen previously on the River Lumi near Taveta. The type specimen was obtained in the Kahe forest on the south slope of Kilimanjaro. Several years previous to the discovery of the species by Harvey, Sir John Kirk sent a specimen to the British Museum from Malindi which had been referred to *natalensis* and then forgotten. Other specimens have been shot on the coast of German East Africa near Tanga, Saadani, and Dar-es-Salam. The northern record is based on specimens secured on the lower Juba River by Captain Bottego in 1894.

The Kilimanjaro red duiker may be distinguished from the highland race of British East Africa by its lighter-colored legs, smaller body size, and absence of white on the inner side of the limbs on their basal portion. From the typical race, *natalensis*, of South Africa it differs by having the whole dorsal surface of the snout and head black or deep seal-brown in color. No flesh measurements of specimens are recorded. The skull length of the male specimen shot by Doctor L. W. Abbott near Taveta and now in the National Museum is $6\frac{3}{4}$ inches. The horn dimensions in this specimen are: length, $3\frac{7}{8}$ inches; girth at the base, $2\frac{3}{4}$ inches.

HIGHLAND RED DUIKER
Cephalophus natalensis ignifer

NATIVE NAME: 'Ndorobo, *meindet*.

Cephalophus ignifer Thomas, 1903, *Proc. Zool. Soc.*, p. 226.

RANGE.—Highland forest area of British East Africa from Mount Kenia westward over the Kikuyu and Mau Escarpments to Mount Elgon.

A red duiker obtained near Edoma Ravine was made the basis for the description of another race, *ignifer*, by Thomas in 1903. This specimen showed a smaller amount of black on the crown than the closely allied race, *nigrifrons*, of the Congo. It is distinguishable from *harveyi* by the dark color of the legs, by larger body size, and the presence of some rufous hair in the crown patch. Recently, specimens from Nairobi have been described as a different race, *kenia*, by Lönnberg, who gives the color differences with *harveyi* as the character of his race. Nairobi specimens have been compared at the British Museum with the type of *ignifer* and with other specimens from Ruwenzori, and have been found quite identical in coloration. Two adult female specimens from Nairobi are in the National Museum which show considerable variation in the amount of blackness on the crown, nape, and breast. The type has the color of the back bright bay or ochraceous-rufous, darkening forward on the neck and shoulders to dull brownish. The forehead is mixed rufous and black. The crown and occiput are bright-rufous, like the back; and the coronal tuft is a deeper and more chestnut or vinaceous rufous. The lips and chin are white. The ears are dark-brown on the back, with white edges and inner surfaces. The throat is rufous and the belly is brown mesially, grading into rufous, laterally. The inner side of the forearms, the inguinal region, and the inner side of the thighs are white. The outer side of the thighs and the forearms is rufous. The feet are brown, darkening almost to black above the hoofs. The tail is rufous above, white below proximally, with a mixed brown and white terminal tuft.

The skull length of an adult male is $6\frac{1}{2}$ inches, that of a female $6\frac{3}{4}$ inches. The horn length of a male from Eldoma Ravine is $3\frac{7}{8}$ inches with a basal diameter of $1\frac{1}{4}$ inches. The horns of an adult female from Nairobi are about one-half of these dimensions. They are $1\frac{7}{8}$ inches in length by $\frac{3}{4}$ of an inch in diameter at the base.

UGANDA RED DUICKER

Cephalophus natalensis johnstoni

Cephalophus johnstoni Thomas, 1901, Proc. Zool. Soc., p. 89.

RANGE.—Throughout the forest area of Uganda from the western base of Mount Elgon eastward to Ruwenzori,

on the slopes of which it ranges to an altitude of 10,000 feet.

The Uganda race of the red duiker was named by Oldfield Thomas from a specimen collected in 1900 by Sir Harry Johnston in Toro during his administration as special commissioner of Uganda. The type unfortunately is quite youthful, having only the milk teeth in use and does not represent the adult coloration. Immature specimens of *ignifer* of the same age are quite like the type of *johnstoni*. Another species described by Thomas as *rubidus*, from a flat native skin without skull obtained in the same general region, is doubtless an adult of *johnstoni* and is much redder than the younger specimen, which is in the blackish pelage of youth. The Uganda red duiker may be known from the highland race by its larger body size and lighter or more tawny coloration, old adults being quite yellowish or ochraceous-tawny, similar to *weynsi* of the upper Congo. In the young the head, neck, shoulders, and fore back are quite blackish or seal-brown with only the rump and the legs bright rufous.

The heads of a male and a female from Kampala, presented by District Commissioner Knowles to Colonel Roosevelt, are in the National Museum. The dimensions of these specimens are: length of skull, male, $7\frac{1}{8}$ inches; female, 7 inches; length of horns, male, $3\frac{5}{8}$ inches; female, $1\frac{5}{8}$ inches; diameter of horns at base, male, $1\frac{3}{8}$ inches; female, $\frac{3}{4}$ inch.

ABBOTT DUIKER

Cephalophus spadix

Cephalophus spadix True, 1890, Proc. U. S. Nat. Mus., p. 227.

RANGE.—Forests of Kilimanjaro and the Usambara Range.

The type specimen collected by Doctor L. W. Abbott at a high elevation on Kilimanjaro has remained unique for many years. Recently, the British Museum has received a head from the Usambara Range, at a point one hundred miles inland from Tanga, a port on the coast of German East Africa. This discovery would indicate that the species is not confined to the high forests of Kilimanjaro, but is distributed throughout the coast forests as well.

The Abbott duiker differs widely from any of the East African species by its large size. It resembles quite closely in size and color the black duiker of the West Coast of Africa, from which it differs by the absence of rufous on the chest and the character of the tail, which is long-haired throughout. The skull differs from that of the black duiker by its narrower mesopterygoid fossa and small tympanic bullæ. Sclater and Thomas in the "Book of Antelopes" suggest that the close agreement which True detected between this species and the black duiker is not well founded, and that it is really a close relative of the red duiker, *natalensis*. A comparison of skulls, however, shows close similarity in the shape of the palate between the Abbott and black duiker and less agreement with the red species. We are quite justified in considering it the East Coast representative of the black duiker of West Africa. It belongs in a general way to the group of giant duikers, of which the yellow-backed duiker *C. sylvicultrix* is typical.

The color of the type, which is an adult male, is uniform chestnut-brown on the body and legs, the under-parts being quite as dark as the flanks. The hinder parts of the back and the rump are darkest, and seal-brown in color. The tail is dark, like the rump, and has a few white-tipped hairs at the tip. The dorsal surface of the head is chestnut, like the body, and the crown has a long tuft of blackish hair. The sides of head and the snout are light-drab. The ears are chestnut on the back with lighter inner surfaces. The type is in the National Museum and measures as mounted: head and body, 38 inches; tail, 3 inches; hind foot, 11 inches; ear, $3\frac{1}{2}$ inches. The skull measures in greatest length $9\frac{1}{4}$ inches. Horn dimensions: length, $4\frac{1}{2}$ inches; diameter at base, $1\frac{3}{8}$ inches.

BLUE DUICKERS

Cephalophus monticola

The diminutive blue duiker in its numerous geographical forms is wide-spread throughout Africa from the extreme southern point north through all the forested regions to the southern edge of the Sahara on the west and the

Nile Lakes and Tana River on the east. The blue duikers may be distinguished from all other members of the genus by their small size and dark brownish or grayish coloration. In size they are among the smallest members of the *Bovidae*, rivalling the pygmy and the royal antelopes for diminutive body size. Their horns are the shortest found in the genus *Cephalophus*, being only one-third the length of the head. They extend backward and curve inward at the tips and are heavily ringed, the latter character giving them a close resemblance to those of the pygmy antelope. The false hoofs are greatly reduced and relatively much smaller than in the red duikers. The sexes are alike in color and size, but the female is usually without horns in the East African races. Like the red duikers, they are confined to dense forest growth, where they are either paired or lead a solitary life. They travel about through the forest on definite narrow paths of their own construction and browse upon the leaves and twigs of various shrubs. In movement they are extremely quick and avoid their enemies by the rapidity of their pace as well as by their wariness and shyness. The recognizable races number about twelve, three of which occur in East Africa.

KEY TO THE RACES OF *monticola*

Legs fuscous-brown, like the body

Under-parts dark-colored, like the sides of the body; body size smaller *æquatorialis*

Under-parts light grayish, contrasting conspicuously with the dark sides; body size larger *musculoides*

Legs vinaceous-cinnamon, decidedly lighter than the brown body *hecki*

UGANDA BLUE DUIKER

Cephalophus monticola æquatorialis

NATIVE NAME: Luganda, *entalaganya*.

Cephalophus æquatorialis Matschie, 1892, Sitz.-Ber. Ges. Nat. Freu. Berl., p. 112.

RANGE.—Forests of Uganda from Mount Elgon westward to Ruwenzori and from the Victoria Nile southward to Karagwe and the Edward Nyanza.

The Uganda race of the blue duiker was described by Matschie upon some skins obtained by Doctor Stuhlmann near Kampala, in the Chagwe district. The Baganda use the skins for mantles and robes, for which purpose the skins are roughly tanned and sewn together in a single piece. Duiker-skins are a common commodity in the native markets, where they are offered for sale. The animals are caught in snares set across their runways in the forest, and are trapped primarily for their flesh, of which the natives are very fond. The race may be distinguished from the Congo blue duiker, *melanorheus*, by its darker under-parts and the absence of horns in the female. No flesh measurements of specimens are available. The skull of an adult male from Kampala in the National Museum has a length of $4\frac{1}{4}$ inches, with horns $1\frac{1}{2}$ inches in length by $\frac{1}{2}$ inch in diameter at the base.

NANDI BLUE DUIKER

Cephalophus monticola musculoides

NATIVE NAME: Kavirondo (Jaluo), *kised*.

Cephalophus monticola musculoides Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 9.

RANGE.—Summit and west flank of the Mau Escarpment from Eldoma Ravine Station west to Mount Elgon and southward to the Uganda Railway at Muhoroni.

The Nandi blue duiker was described from specimens collected in the Kakumega forest at the base of the Nandi Escarpment. It differs from the Uganda race by the lighter-colored under-parts and larger body size, the skull being $\frac{1}{4}$ inch longer than in *aequatorialis*.

The median dorsal coloration of the head and the body is fuscous, merging on the sides and under-parts to écru-drab. The legs are somewhat darker than the back, being benzo-brown. The hinder border of the rump and the base of the tail are fuscous-black. The terminal half of the tail is white; but the hair basally is fuscous. The midline of the belly, the throat to the chin, and the inside of the legs are whitish. The top of the head and the muzzle are uniform fuscous, and the cheeks and the orbital region are

écru-drab which gradually shades into the whitish chin and throat. The ears are fuscous on the back, but the inner side is whitish, like the throat.

The flesh measurements of an adult male are: head and body, 20 inches; tail, $3\frac{1}{2}$ inches; hind foot, $6\frac{3}{4}$ inches; ear, $2\frac{1}{4}$ inches. Length of skull, $4\frac{1}{2}$ inches. Horns, $1\frac{1}{2}$ inches in length by $\frac{1}{2}$ inch in basal diameter.

The Nandi race occupies the highland forest of the Nandi Escarpment, lying at an average altitude of some 2,000 feet above the range of the Uganda race. The differences in color and size of the two races are, no doubt, due to this difference in altitude and environment. Specimens from the summit of the Mau, at Elgeyo, are in the British Museum collection. Owing to the forest habitat and the secretive nature of these small antelope, they are almost never met with by sportsmen. The recorded specimens have all been obtained from the natives who trap them for their flesh and skins.

COAST BLUE DUIKER

Cephalophus monticola hecki

NATIVE NAME: Swahili, *paa*.

Cephalophus hecki Matschie, 1897, Sitz.-Ber. Ges. Nat. Freu. Berl., p. 158.

RANGE.—From the Witu district and the mouth of the Tana River south through the forest area of the coast to Mozambique.

The blue duiker inhabiting the coast forest area is strikingly different from the Uganda race in color, but similar to it in size. The legs are light vinaceous-cinnamon, in marked contrast to the fuscous-brown body, and the underparts are pure white, at least medially. The tail is quite bushy and white in color, with a narrow black dorsal stripe. The race was described from a specimen in the Berlin Museum from Mozambique and named for Doctor Heck, the able director of the Berlin Zoological Garden. Specimens have been examined at the British Museum from the Shimba Hills near Mombasa and from Zanzibar Island, collected by Sir John Kirk. This material is quite indistinguishable from specimens from the Mozambique coast.

Jackson, who appears to be the only sportsman who has met with this rare little antelope, records it from the forests near Witu. Robin Kemp, the mammal collector for the British Museum, has collected a specimen recently in the Shimba Hills. It will doubtless be found in all the larger forest area of the coast district upon careful investigation.

BUSH DUICKERS

Sylvicapra

Sylvicapra Ogilby, 1863, Proc. Zool. Soc., p. 138; type *Cephalophus grimmia*.

The bush or common duikers are usually placed in the genus *Cephalophus* together with the true forest duikers. They have, however, several points of difference from the latter, and there is less liability of confusion if they are treated as a separate genus, *Sylvicapra*. The horns differ from those of the forest duikers in direction, slanting upward at an angle to the dorsal profile of the skull. In shape they differ somewhat, being long, slender, and circular in outline at the base, with no approach to the triangular flattened horns of the forest duikers. The female is distinguishable from the forest duikers by the absence of horns. The skull has a long, mesopterygoid fossa which extends well in front of the lateral ones. The nasal bones are broadly triangular and project out on the sides, overhanging the anteorbital fossa. The bush duikers inhabit scattered bush country on the edge of plains and are never found in the forests. They show great adaptability, being found throughout a greater altitudinal range than any other hoofed mammal in Africa. In equatorial Africa they are the only antelope which occurs as high as the alpine meadows near the snow-line. At such high altitudes they are quite as abundant as in the game country proper or in the maritime districts. The genus occurs from the Cape northward to the highlands of Abyssinia and westward across the Nile and Niger watersheds to Senegal. It is, however, absent from the Congo forest area, which is the centre of abundance of the forest duikers. The genus is represented by a single species, *grimmia*, which is separable into numerous geographical races. The species attains its maximum

size and darkest coloration in the Cape region. The sexes are alike in coloration, but the female exceeds the male somewhat in body size. The young differ only from the adults in tone of coloration, being darker and uniformly vermiculated with blackish. The under-parts are drab rather than white, and the head lacks any indication of the bright tawny coloration of the adult, although the black median stripe is well marked on the snout and forehead.

The duiker is widely distributed not only laterally but vertically. We found it feeding at night on the Aberdare Mountains when the temperature was below freezing, and we found it feeding at noon on the hot, dry plains of the Lado, where the leaves of the acacias were shrivelled and the thermometer stood high up in the nineties. It is a solitary little animal, even two being rarely found together. It is never found far away from thick cover, and when alarmed bolts into it without turning to look back. It runs with head extended, occasionally bounding high into the air, and in the bush it runs at full speed in zigzags through places which a hunter can hardly traverse at all. All these bush antelope—bongo, bushbuck, duiker—go at speed, nose straight out, through and under a tangle of branches which it seems literally incredible that they can penetrate. Duikers are browsers; they feed on twigs, leaves, bean pods, and fruits. We found them eating wild olives and also the berries of a plant that looked like nightshade; and in the Lado they ate grass tips and the stems and leaves of a low-growing bush plant.

The commonest food of the bush duiker is the foliage and yellow berries of the nightshade, *Solanum campylacanthum*. On the summit of the Aberdare Range we found the

stomach contents to consist chiefly of the twigs and leaves of the alpine shrub, *Alchemilla argrophylla*. At Voi the stomach contents of one individual consisted of the leaves and fruit of a native cucumber. Duikers are silent animals without any alarm or recognition notes.

Duikers are finished skulkers and hiders. They lie motionless, with neck outstretched, until the hunter is very close, if they think themselves concealed; and if they become suspicious they are adepts at sneaking quietly out of sight behind some bush and then making off rapidly through the cover for several hundred yards.

KEY TO THE RACES OF *grimmia*

Ears shorter, less than 4 inches in length

Body size smaller, skull less than 6 inches in length; lower part of feet brownish-drab *roosevelti*

Body size larger, skull 6 inches or greater in length; lower part of feet fuscous-brown *nyansæ*

Ears longer, exceeding 4 inches in length

Pelage long and heavy, much vermiculated with black or dark brown; lower part of feet black *altivallis*

Pelage shorter and more uniform with very little blackish vermiculation; feet fuscous or seal-brown

Dorsal color tawny or ochraceous-tawny *hindei*

Dorsal color buff *deserti*

NILE BUSH DUIKER

Sylvicapra grimmia roosevelti

NATIVE NAMES: Dinka, *amook*; Bongo, *dealg*.

Sylvicapra grimmia roosevelti Heller, 1912, Smith. Misc. Coll., vol. 60, No. 8, p. 9.

RANGE.—From the Albert Nyanza northward over the lowlands of the Nile drainage as far as the limits of the

bush country or the southern edge of the sand desert of the Sahara in the White Nile region.

The type of the Nile bush duiker was shot by Colonel Roosevelt near Rhino Camp, Lado Enclave, during his quest for the white rhinoceros in that district, and was described in 1912 by Heller. The earliest mention of the occurrence of the bush duiker in the Nile Valley is apparently Heuglin's reference, in 1869, in his account of his explorations on the White Nile, to some skins offered him by the natives at Meshra-er-Rek in the Bahr-el-Ghazal district. Schweinfurth included it in his list of Nile mammals published in 1873, and gives the native names by which it is known in the districts through which he travelled.

The Nile bush duiker may be known by its small size from any other race. Its distinctive color characters are the more grayish tone of the dorsal parts, the absence or faintness of the dark stripes on the legs below the knees, and the lighter brownish-drab color of the dark bands above the hoofs. Other characters are its short ears and the small size of the skull, which is less than six inches in length.

The dorsal body coloration is wood-brown vermiculated with blackish and darkest on the median line. Basally the hair is écru-drab. The sides of the body are lighter, becoming pure fawn where they meet the white of the underparts. The neck shows very little black vermiculation, being almost wholly cinnamon-brown, this color extending onto the head, where it deepens to russet on the crown and borders the black median stripe which extends from the rhinarium to the base of the horns. The cheeks and sides of the face are lighter, being fawn color. The rump is more grayish than the back, the drab-gray predominating. The tail is marked by a heavy black dorsal stripe, the sides and lower surfaces are white, and the tip is chiefly white. The belly and the inside of the legs are white, and the hair at the extreme base is drab. The chest is mixed white and fawn with the drab of the basal part showing through. The lower throat is fawn, like the sides. The chin, upper lips, and throat are white. The tip of the chin is marked by dark-brown spot on each side separated by the white of the throat. The limbs are grayish-fawn, like the back, with a

brownish-drab band encircling the hoofs and covering the whole pastern region, while a stripe of the same color extends to the knees on the forelegs. The outside of the ears is dark, and covered by minute scattered cinnamon hairs, the tips showing no darker borders. The inside of the ears is clothed by long white hairs.

The flesh measurements of an adult male from Rhino Camp are: head and body, $31\frac{1}{2}$ inches; tail, $4\frac{1}{2}$ inches; hind foot, 10 inches; ear, $3\frac{3}{4}$ inches. The basal length of the skull from the condyles to the tip of the snout is $5\frac{3}{4}$ inches. Three male specimens are in the National Museum collection, two of them from Rhino Camp and the third from Butiaba, a port on the northeast shore of the Albert Nyanza. The maximum horn measurements in these specimens are: length, straight, $3\frac{3}{4}$ inches; spread at the tips, $1\frac{7}{8}$ inches.

UGANDA BUSH DUIKER

Sylvicapra grimmia nyansæ

Sylvicapra abyssinica nyansæ Neumann, 1905, Sitz.-Ber. Ges. Nat. Freu., Berl., p. 89.

RANGE.—From the southern limits of the Victoria Nyanza drainage northward through Uganda and the Elgon highlands as far as the latitude of Nimule; eastward over the Mau Escarpment of British East Africa to the western edge of the Rift Valley.

Oscar Neumann described the Uganda bush duiker in 1905 from some flat native skins which he obtained in 1893 from the Kavirondo of the Kisumu district of British East Africa. It is one of the small-eared races, resembling the Nile race in this respect, but may be distinguished from the latter by its larger body size, more ochraceous coloration, and darker-brown color of the pastern region of the feet. Specimens have been examined in the National Museum from the Uasin Gishu Plateau collected by the Smithsonian African expedition. Powell-Cotton collected specimens north of Mount Elgon and also in the Kedef Valley east of Nimule, which represent the northern limits of this race. An adult female from the Uasin Gishu Plateau gives the following flesh measurements: head and body, 38 inches;

tail, $4\frac{3}{8}$ inches; hind foot, $10\frac{1}{4}$ inches; ear, $3\frac{3}{4}$ inches; basal length of skull, $6\frac{1}{4}$ inches. A male specimen from the same locality has horns $4\frac{3}{8}$ inches in length by 2 inches in spread at the tips.

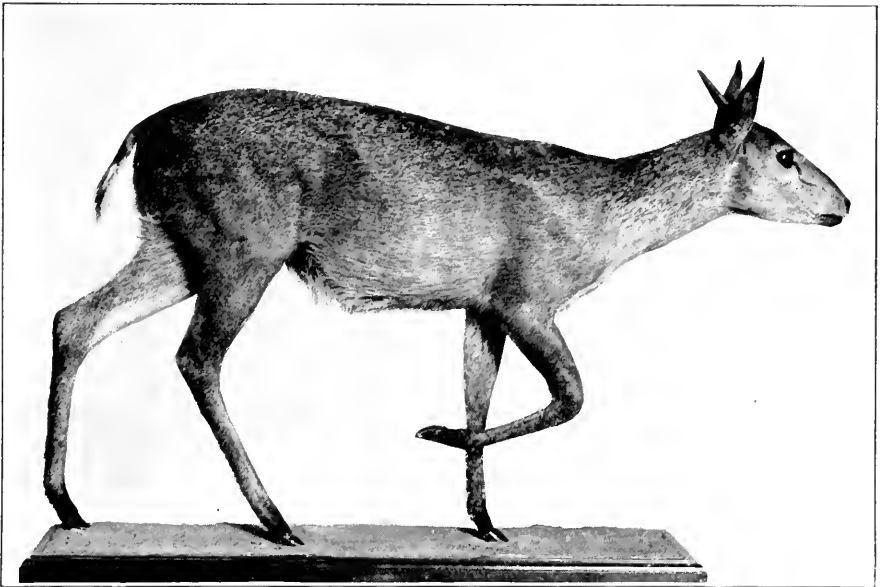
ALPINE BUSH DUIKER

Sylvicapra grimmia altivallis

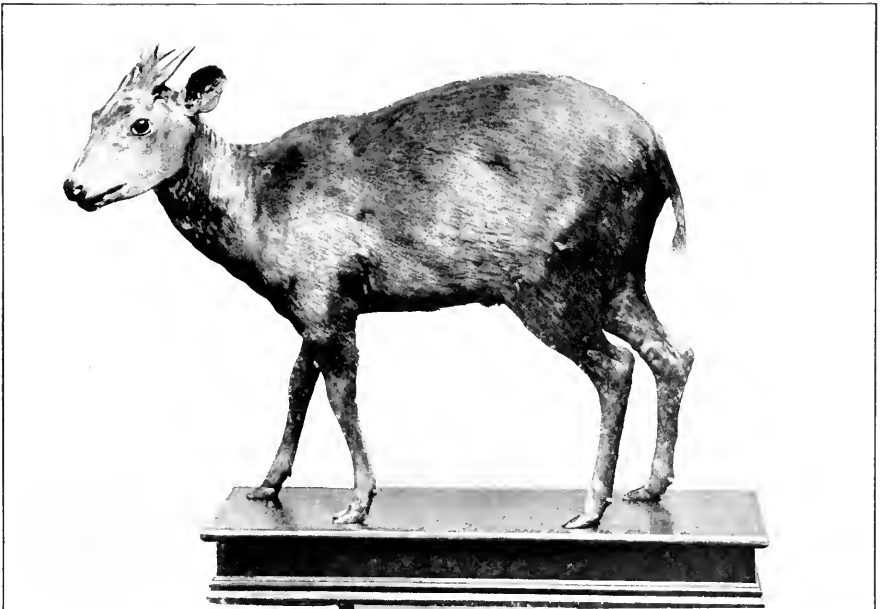
Sylvicapra grimmia altivallis Heller, 1912, Smith. Misc. Coll., vol. 60, No. 8, p. 10.

RANGE.—Alpine meadows of the Aberdare Range and Mount Kenia.

The summit of the Aberdare Range has supplied us with an alpine race of bush duikers. The soggy moorland meadows lying at an elevation of 9,000 to 11,000 feet are inhabited by a shaggy-coated race of dark coloration to which the name *altivallis* was given by Heller in 1912. The type specimen was shot by Colonel Roosevelt on the summit of the range where it is crossed by the Naivasha-Nyeri road. The spot was within a stone's throw of the safari camp at an elevation of approximately 10,500 feet. At this elevation the mountain range has a broad, flattened summit which extends in a north and south direction in a series of rolling downs for many miles. The downs are clothed everywhere by a thick carpet of alpine shrubs, chiefly various species of *Alchemilla*, interspersed with a few tussocks of rank grass and widely scattered thickets of heather bushes. The wet, spongy ground is broken up into hummocks and the *Alchemilla* shrubs grow so densely that travel over the moorland is very much like wading through soft snow-drifts. The duikers do not live in the open moorland but frequent the heather thickets where the ground is firmer. At night, however, they wander about over these boggy and shrubby moors upon the shrubs of which they feed. Surrounding this moorland on the slopes of the range is a dense forest of bamboo including a scattered growth of trees. On the lower slopes of the range the trees form a dense forest to the exclusion of the bamboo. This fringing forest is not inhabited by any of the *Sylvicapra* duikers, which are strictly plains or



ATHI BUSH DUIKER, MALE
Kitanga, Athi Plains, B. E. A.
United States National Museum



ABBOTT DUIKER, MALE
Type Specimen and only one known
Shot by Dr. L. W. Abbott in Kilimanjaro Forest
United States National Museum

DUIKERS

bush duikers, but serves as a barrier to their migration downward to the plains, which are inhabited by another closely allied race, *hindei*. We have the same conditions duplicated on Mount Kenia, the same race of high mountain duikers, *altivallis*, inhabiting the moorland down to the beginning of the dense bamboo and forest zone which absolutely limits their lower vertical range and keeps them apart from their close allies of the plains below.

The dorsal coloration is ochraceous-tawny, heavily lined by black, the latter predominating and giving a Prout's brown general effect, the hair basally being broccoli-brown. The rump is somewhat grayer than the back. The sides of the body and the neck are tawny-olive, the color merging gradually into the white under-parts. The neck and the sides are without black vermiculation. The top of the head is bright cinnamon-rufous, with a broad median band of black from the rhinarium to the coronal tuft; the tuft, however, is chiefly cinnamon-rufous. The sides of the face are lighter or cinnamon. The under-parts are white, the hair basally being écreu-drab. The chest is mixed with fawn centrally. The lower throat is tawny-olive, like the sides. The throat and the median line of the chin and the upper lips are white, but the sides of the chin are seal-brown, in marked contrast. The hind legs are vermiculated with black, like the rump. The pastern region above the hoofs is seal-brown, which is continued a few inches above as a faint streak. The forelegs are vermiculated with black, like the hind, and the seal-brown of the pasterns is more extensive and extends up the front of the limbs nearly to the shoulders. The ears are clothed by short tawny hairs on the outside and inside with long white hair.

Four specimens, two males and two females, of this race, from the summit of the Aberdare Range, have been examined at the National Museum. The larger male specimen measured in the flesh: head and body, 34 inches; tail, 4 inches; hind foot, $10\frac{3}{4}$ inches; ear, $4\frac{1}{8}$ inches. Length of skull, $6\frac{1}{4}$ inches. The horns of this specimen measured $4\frac{3}{8}$ inches in length by $1\frac{3}{4}$ inches in spread at the tips. The two female specimens are slightly larger than these dimensions.

ATHI BUSH DUIKER

Sylvicapra grimmia hindei

NATIVE NAME: Masai, *embutuwin*.

Cephalophus abyssinicus hindei Wroughton, 1910, *Ann. & Mag. Nat. Hist.* (8), vol. V, p. 273.

RANGE.—From the northern slopes of Mount Kenia and the headwaters of the Northern Guaso Nyiro River and Lake Baringo southward throughout the high veldt to Kilimanjaro and central German East Africa.

The Athi bush duiker was named by Wroughton from a specimen collected by Doctor H. S. Hinde at Fort Hall, where he was stationed for some years as district commissioner. The race is characterized by its bright ochraceous-tawny coloration and small amount of black vermiculation in its coat. It is readily distinguishable from the alpine race by the lighter or seal-brown color of the pasterns and the shorter pelage, but is indistinguishable from it in size. Specimens of this race were collected by the Smithsonian African expedition on the Athi Plains at Ngong, Bondoni, Ulu, and Machakos; near Fort Hall, at Chief Wambugu's village, on the northwest slope of Kenia, northeast of Nyeri, and on the Loita Plains, near the German border.

DESERT BUSH DUIKER

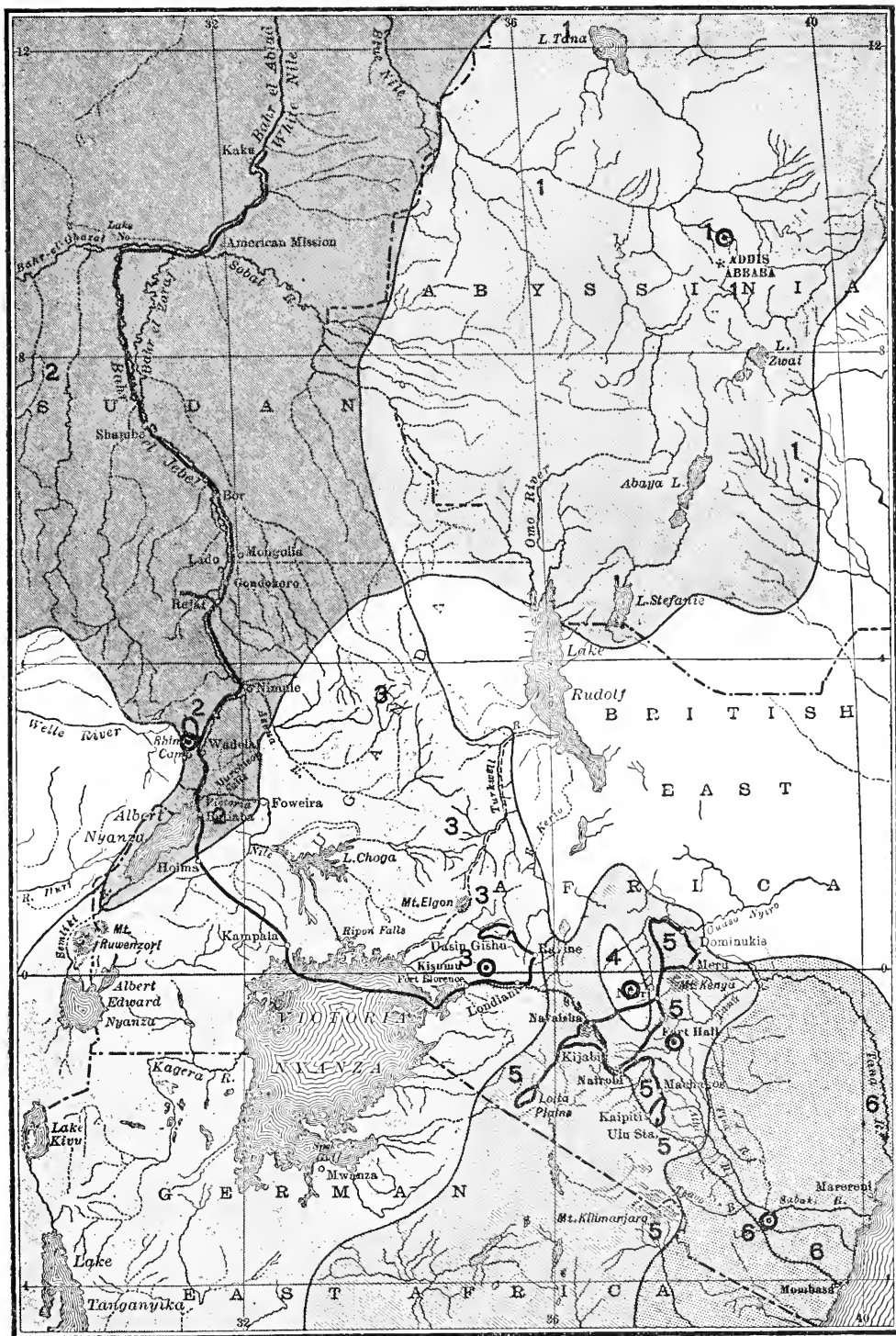
Sylvicapra grimmia deserti

NATIVE NAMES: Swahili, *ngruvu*; Duruma, *sah*.

Sylvicapra grimmia deserti Heller, 1913, *Smith. Misc. Coll.*, vol. 61, No. 17, p. 4.

RANGE.—Desert coast lands from the Tana River southward to German East Africa; inland as far as the east slopes of Kilimanjaro and Kenia.

The desert bush duiker was recently described from specimens collected by the Rainey expedition at Voi. It is markedly lighter in color than the other equatorial African races, being buffy, with almost no darker vermiculation showing in the coat, and readily distinguishable from the tawny or vermiculated color of the other races. The male is distinguishable by his more vertically directed horns.



MAP 25—DISTRIBUTION OF THE RACES OF THE BUSH DUIKER

- | | | |
|--|--|-------------------------------------|
| 1 <i>Sylvicapra grimmia abyssinica</i> | 2 <i>Sylvicapra grimmia roosevelti</i> | 3 <i>Sylvicapra grimmia nyansa</i> |
| 4 <i>Sylvicapra grimmia altivallis</i> | 5 <i>Sylvicapra grimmia hindei</i> | 6 <i>Sylvicapra grimmia deserti</i> |

The dorsal color is ochraceous-buff, speckled very lightly by narrow dusky vermiculations to the hair. The underparts are white, with the breast showing, but a slight tendency toward the ochraceous color of *hindei*. The legs are buffy, like the body, but lack the darker vermiculation and are from the fetlocks to the hoofs solid fuscous-brown, this color being continued upward in front as an indefinite darker leg stripe. The tail is marked by a median black dorsal stripe, the sides and under-surface being white, in sharp contrast, and the tip mixed black and white. The head is ochraceous, marked by a broad seal-brown or black median stripe from the muzzle to the horn bases. The lips, chin, and forethroat are white, the chin being marked on the sides by two faint drab spots representing the blackish patches of *hindei*. The eyelashes and anteorbital stripe are black. The ears on the back are covered by a short scattered growth of ochraceous hair, but their general color tone is brownish, due to the dark skin showing through, while the inner side and the base are white. The throat and the nape are ochraceous-buff and slightly darker than the body.

The body size and proportions are quite as in the Athi bush duiker. The horns of the type specimen are $4\frac{1}{8}$ inches in length by $2\frac{5}{8}$ inches in spread at the tips. They are directed upward from the dorsal profile of the skull at an angle of 130 degrees. Besides the Voi specimens, others were secured at Maji ya Chumvi and Mariakani Stations on the Uganda Railway. *Deserti* is a lowland race occupying the Taru Desert as far east as the edge of the cocoa-palm zone fringing the coast.

SUBFAMILY *Nesotraginae*

We have in this group antelopes of small or diminutive size and of somewhat diverse characters, such as the pygmy sunis and royal antelopes, the oribis and the steinboks. They agree in having the anteorbital gland of large size and opening on the face by a rounded pore, in having rudimentary tails, and in the small size of the horns, which are confined to the male sex. The pelage is of normal texture.

The skull exhibits a large anteorbital fossa which usually equals or exceeds the orbit in diameter, being smaller than the orbit only in the steinbok, *Raphicerus*. The bones of the snout are normal in development and arrangement, the premaxillary bones being in contact with the nasals and a lachrymal-nasal sinus being present. The genera included are *Nesotragus*, *Ourebia*, *Nototragus*, *Raphicerus*, and *Neotragus*, the last named confined to the forested area of the Congo and the West Coast of Africa.

KEY TO THE GENERA

- Anteorbital fossa large, the diameter about equalling that of the orbit;
horns heavily ringed at least at the base
Size diminutive, about equalling a hare; general coloration reddish; horns small, projecting straight backward in line with the snout; lateral hoofs absent; no knee-brushes
Nesotragus
- Size larger, in height equalling a goat; general coloration yellowish; horns small, projecting upward at an obtuse angle with the snout; lateral hoofs present; knee-brushes well developed; a bare spot on the side of the head below the ear
Ourebia
- Anteorbital fossa small, the diameter only one-third that of the orbit;
horns smooth, not ringed
Raphicerus

The subfamily *Neotraginæ* of Sclater and Thomas is a heterogeneous association of genera of small antelopes. It has been used almost universally by systematic naturalists as a left-over repository for the smaller species of antelopes which are not obviously allied to the better-marked divisions into which the larger may be arranged. It has thus come to be an association based almost solely upon small size. As constituted by its authors in 1892 it included the genera *Neotragus*, *Nesotragus*, *Ourebia*, *Raphicerus*, *Oreotragus*, and *Madoqua*. Gray, some years earlier, in 1872, proposed the family *Nesotragidæ* for *Nesotragus*, *Nanotragus* (*Neotragus*),

and *Pediotragus* (*Raphicerus*), placing *Neotragus* (*Madoqua*) in with the gazelles in the family *Antilopidæ* and *Oreotragus*, the klipspringer, in another family, *Heliotraginæ*, together with *Kobus*, the waterbucks, and *Tetraceros*, the four-horned antelopes.

This grouping by Gray is a more natural arrangement than that adopted by later authors, for *Madoqua* or the dikdik is obviously, as witnessed by its skull characters, more closely related to the gazelles than to any other of the genera with which it has been placed. *Oreotragus*, however, though quite distinct in general characters from its associates in the *Neotraginæ*, is certainly not an ally of *Kobus* or *Tetraceros*.

In 1907 Knottnerus-Meyer removed from this assemblage *Raphicerus* and *Grysbok* (*Nototragus*) for which he formed the subfamily *Raphicerotinæ*, which he based upon differences in the lachrymal bone, but left the other genera assembled together as arranged by Sclater and Thomas. We do not, however, consider the somewhat smaller size of the anteorbital fossa in the steinboks of sufficient systematic importance to justify the erection of a subfamily for the group. As the steinbok differs but little from the other genera included in the *Neotraginæ*, our ideas of their relationships are best expressed by leaving them in the subfamily.

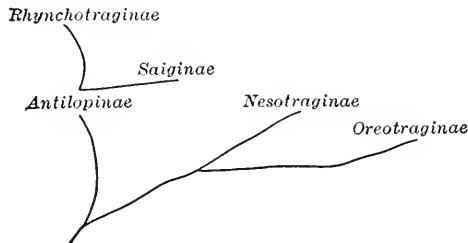
In order to show the true relationships of the various genera under consideration it is necessary to remove the very distinct *Madoqua* and *Rhynchotragus* and place them in a new subfamily near *Antilopinæ* and also place *Oreotragus* in a separate subfamily owing to its peculiar skull and hair characters. Such an arrangement will give us the following natural groups or subfamilies:

Nesotraginæ: Snout normal, premaxillæ long, and in contact with the nasal bones which are well developed; anteorbital fossa well developed, usually exceeding the orbit in size. Genera included: *Nesotragus*, *Neotragus*, *Ourebia*, *Raphicerus*, *Nototragus*.

Oreotraginæ: Snout somewhat shortened, the nasals very broad and extensive in area, anteorbital fossa large as in *Nesotraginæ*; pelage peculiar, coarse, and pithy like that of the American prong-horn, *Antilocapra*. Only one genus included, *Oreotragus*, the klipspringer.

Rhynchotraginæ: Snout with the anterior nares greatly enlarged in order to accommodate the proboscis; nasal bones greatly reduced, the length not greater than the width; premaxillæ greatly produced in the typical genus and turned downward at the tip; anteorbital fossa large as in the *Nesotraginæ*. Genera included: *Rhynchotragus* and *Madoqua*.

In the snout of *Rhynchotragus* we have a bony structure quite similar to that found in *Saiga*, which is also a proboscis-



bearing antelope. In the saiga, however, the premaxillary bones are confined to the tip of the maxillary bones and the lachrymal bone is greatly enlarged and projects forward to the narial chamber, where it forms a considerable part of the wall. This arrangement is a unique condition in the *Bovidæ*. The relationships of the subfamilies described may be expressed in the above diagram, *Gazella* being assumed to be nearest the parent stock.

PYGMY ANTELOPE

Nesotragus

Nesotragus von Düben, 1847, Oefvers, Akad. Forhandl., Stockholm, III, p. 221; type *Nesotragus moschatus*.

The pygmy antelopes are of diminutive size, about equaling a hare, and of rufous or reddish coloration. The tail is short, and the false or lateral hoofs are absent. The anteorbital gland opens on the side of the face by a single rounded pore. The horns are present in the male only, and are short, not exceeding the head in length, and project straight backward in line with the profile of the snout. They are heavily ringed except at the extreme tip. The

mammæ are four. The skull resembles closely that of the West African royal antelope, *Nesotragus*, but differs by the presence of a maxillary-premaxillary sinus, by the larger anteorbital fossa, and the much broader nasal bones. The female equals the male in size. A single species is known, *moschatus*, which breaks up into several geographical races, and ranges from Mount Kenia and the Tana River southward through the coast drainage area to the Zambesi River and Zululand. It occurs also on Zanzibar Island. No fossil species are known.

KEY TO THE RACES OF *moschatus*

- Throat with a broad collar of the dark dorsal color separating the white areas of the upper and lower throat
- Dorsal coloration dark-fuscous *akeleyi*
- Dorsal coloration rufous and grizzled *moschatus*
- Throat with the white areas almost continuous along midline
- Color dark, rufous; legs, including pasterns, rufous; tail rufous *kirchenpaueri*
- Color light, tawny; legs ochraceous, pasterns dark; tail blackish *deserticola*

ZANZIBAR PYGMY ANTELOPE

Nesotragus moschatus moschatus

NATIVE NAME: Swahili, *paa*.

Nesotragus moschatus von Düben, 1847, Oefvers, Akad. Forhandl. Stockholm, III, p. 221.

RANGE.—Two small islands, Grave Island and Bawe Island, at the entrance to Zanzibar harbor. Not known to occur on Zanzibar Island proper.

The Zanzibar antelope was described by its discoverer, Baron von Düben, a Swedish naturalist who obtained it in Zanzibar harbor in 1846. Sir John Kirk has, during his long residence at Zanzibar as the British Consul-General, received from the natives many specimens from the two small islands in the harbor where they were found living amid the dense growth of vines and bushes which clothe these small coral islands. The Zanzibar or typical form resembles the

Kenia highland race in the wide separation on the throat of the white areas of the upper and lower throat by a dark collar or bridge of the dorsal color of the nape, but differs by having the dorsal coloration decidedly rufous and grizzled rather than blackish or fuscous.

KENIA PYGMY ANTELOPE
Nesotragus moschatus akeleyi

Nesotragus moschatus akeleyi Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 1.

RANGE.—Highland forest area of Mount Kenia, the Aberdare Range, and the Kikuyu Escarpment south as far as Nairobi or Ngong.

The Kenia race was described from specimens collected by Carl E. Akeley from elephant pits in the depths of the forest on the southwestern slope of the mountain between the altitudes of six thousand and seven thousand feet. This race haunts only the deep forest and is quite as shy and elusive as the bushbuck. They feed by browsing on leaves and twigs and live a solitary life in the undergrowth flanking the forest streams. When flushed from such covert they bound away at great speed, twisting about among the trees and never stopping until well within the security of thick undergrowth. They are not known to utter any note of alarm. The race may be distinguished by the body color, which is much darker than *moschatus*, the dorsal region being chestnut-brown, and the white of the throat being separated medially for half its length by a fulvous band. The legs are darker, with blacker pasterns, and striped in front to the knee. The pelage is longer, the hair on the rump being one and one-fourth inches long.

The median dorsal area of the body is chestnut-brown, changing on the lower sides to vinaceous-tawny. The legs are ochraceous-tawny, and the pasterns fuscous, with a black stripe in front to the knees. The tail is fuscous, and somewhat darker than the body, and is marked below by a narrow white line. The crown of the head is bay. The snout is marked by a broad streak of fuscous, and a small white spot above the eye. The cheeks are vinaceous-tawny in

contrast to the white chin, lips, and throat. The back of the ears is fuscous, and the inner side and the base are whitish. The middle throat has a broad band, four inches long, of vinaceous-tawny, separating the white of the upper and lower throat. The under-parts are white, with a streak of white down the inside of each leg to the knee. The sexes are alike in color and length of hair, the hair on the forehead in the male being no longer or denser than in the female. The newly born young resemble the adults minutely in color. It is a rare antelope, and only a limited number of specimens have been available for study. They are chiefly from Mount Kenia, Kijabe, and Ngong in the immediate vicinity of Nairobi.

DESERT PYGMY ANTELOPE

Nesotragus moschatus deserticola

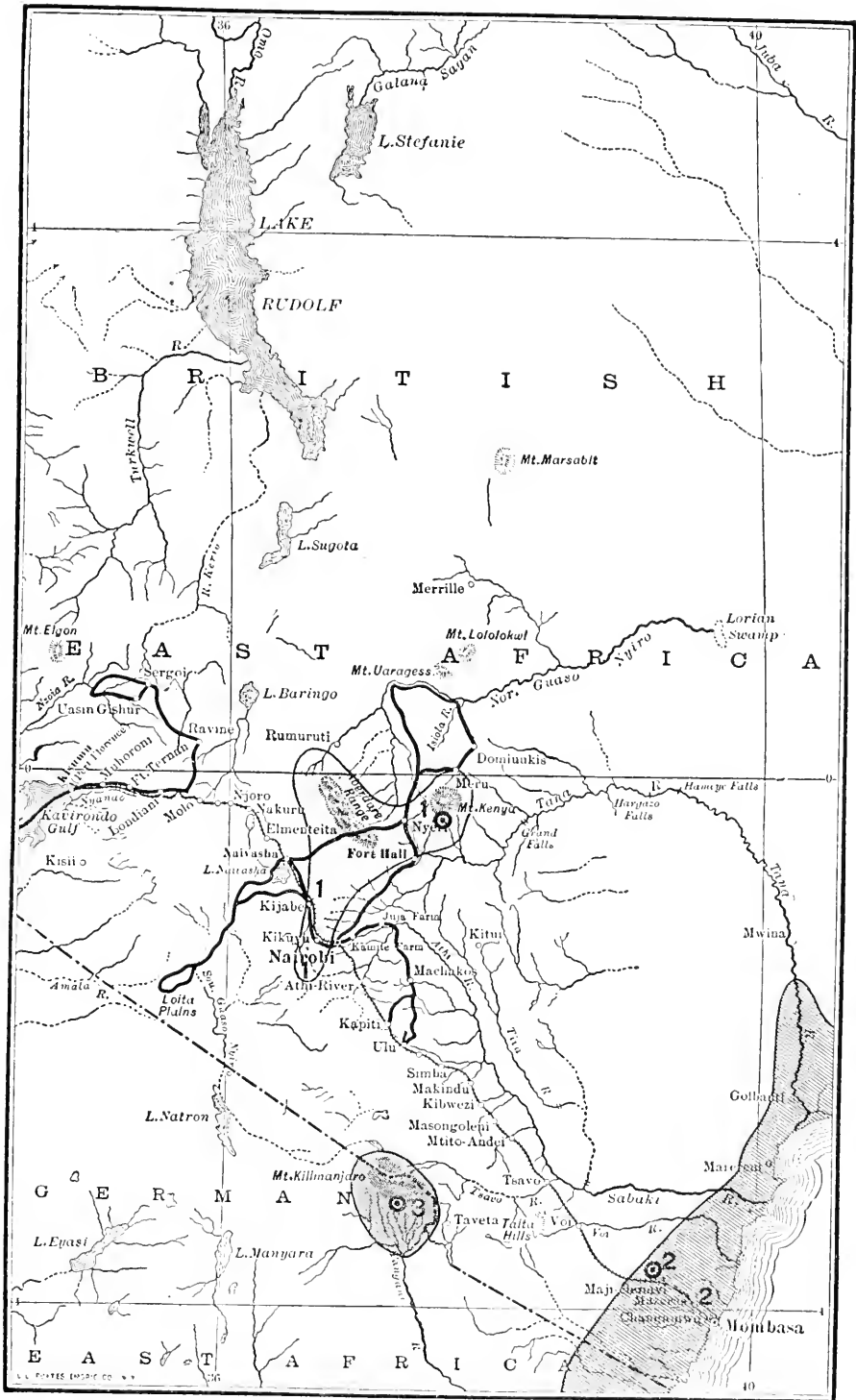
NATIVE NAME: Duruma, *palla*.

Nesotragus moschatus deserticola Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 2.

RANGE.—Desert or nyika country flanking the moist littoral zone of the coast district, ranging, no doubt, from the Tana River southward to the German border.

The type specimens were collected by the describer at the railway station of Maji ya Chumvi in the Taru Desert, in which district they were found inhabiting dense, impenetrable thickets of thorny bushes made up of several species of acacias, aloes, euphorbias, and sansevierias. At dusk they were occasionally seen on the edge of the thickets or crossing over paths and wood roads intersecting them. A mated pair were found associated, but no further instance of their association in pairs was observed.

The color is much lighter than that of *moschatus*, being cinnamon-rufous, and only slightly darker on the median dorsal region. The white of the throat is almost continuous, being broken only by a narrow band of fulvous one inch wide. The legs are light-colored and fulvous, but the pasterns are dark-fuscous. The tail is very light whitish, only the median dorsal line being dusky brown. The pelage is short, the hair on the rump being but one inch long. The body size equals that of *moschatus*.



MAP 26—DISTRIBUTION OF THE RACES OF THE PYGMY ANTELOPE

1 *Nesotragus moschatus akeleyi*

2 *Nesotragus moschatus deserticola*

3 *Nesotragus moschatus kirchenpauri*

The dorsal color of an adult male is bright cinnamon-rufous, the median area being only slightly darker, or hazel. The sides are cinnamon-buff, contrasting very little with the white under-parts. The legs are ochraceous-buff, lighter and brighter than the sides, and the pasterns are fuscous. The tail is grayish in effect, the sides and the under-surface being white, and the tip and the dorsal stripe fuscous. The crown of the head is cinnamon-rufous, bordered below by a whitish supraocular stripe. The midline of the snout and the orbital area are dusky. The cheeks and the sides of the head are cinnamon-rufous. The upper lips, chin, and throat are white, but the middle of the throat has the white areas separated by a narrow band of fulvous one inch wide. The ears are dusky on back, like the snout, and the inner side and base are whitish. The under-parts are silky-white, with a white stripe extending down the inner side of each leg to the knee. The sexes are alike in color.

Measurements of an average adult in the flesh: head and body, $22\frac{3}{4}$ inches; tail, $3\frac{1}{4}$ inches; hind foot, $6\frac{1}{4}$ inches; ear, $2\frac{3}{4}$ inches. Greatest length of skull, $4\frac{1}{2}$ inches. Horns of an adult male, $2\frac{1}{4}$ inches long by $1\frac{5}{8}$ inches spread.

KILIMANJARO PYGMY ANTELOPE

Nesotragus moschatus kirchenpaueri

NATIVE NAME: Wachaga, *sun*i (Abbott).

Nesotragus kirchenpaueri Pagenstecher, 1885, Jahr.-Ber. Mus., Hamburg, II, p. 36.

RANGE.—Highland forest area of Mount Kilimanjaro ranging down to three thousand feet.

Doctor G. A. Fischer during his explorations on Kilimanjaro in 1883 secured the type specimen of the species which Pagenstecher later named *kirchenpaueri*. In 1888 Doctor Abbott obtained an immature male from the natives while at Taveta. These two specimens represent all the available material from Kilimanjaro. The type is an adult mounted male in the Hamburg Museum, where it has been examined. It is somewhat darker than Abbott's specimen, but shows the same extensive white areas on the throat and the dark pasterns which characterize this race.

THE ORIBI

Ourebia

Ourebia Laurillard, 1841, Dict. Univ. d'H. N., I, p. 622; type *O. scoparia* of South Africa.

There is nothing distinctive about the uniform tawny-yellow color of the oribi, but it may be known at a glance from the reedbuck, which it resembles in color, by its small body size, long, slender legs, and rudimentary tail. Other important characters are the long tufts or brushes at the knees, the bare space on the head immediately below the ear, the rounded opening of the anteorbital gland in front of the eye, and the short, parallel horns of the male, which are ringed at the base. At the groin are a pair of deep inguinal sacks, marked by a growth of long, peculiar, pithy hair. The skull is distinguishable by the large size of the anteorbital fossa, which equals the orbit in area, and by the lack of the sinus between the nasal and the lachrymal bones. The snout is more elongate than in the steinbok or pygmy antelope. The females exceed the males slightly in size, their skulls averaging one-fourth of an inch greater. The sexes are alike in color with the exception of the crown, which is marked between the ears in the female by a large dark-brown blotch and is much darker than that of the male. The coloration of the young does not differ from that of the adult female in pattern, tone, or extent of the dark crown patch. The oribi, though extremely local, has a wide distribution. It ranges from the Cape northward along the East Coast drainage to the highlands of Abyssinia, and thence west along the borders of the Sahara to the West Coast in Senegal, but is absent from the Congo forest area. Owing to the local character of its distribution, the oribi breaks up into numerous geographical races showing slight color characters, and on this account it is quite difficult to distinguish the races from the species. It is quite probable that not more than two or three distinct species are recognizable.

This pretty and graceful little antelope was first met with by us on the Uasin Gishu Plateau, a fairly high, rather

cool country; and we also found another form, closely related to the first, abundant in the hot plains on both sides of the upper White Nile. The two habitats of these two varieties of the same species were very unlike; the Lado plains were physically and climatically more like the parts of East Africa from which the oribi is absent; perhaps some undetected peculiarity in the flora conditioned this broken distribution, which otherwise seems unaccountable. However, oribi are everywhere locally distributed. They live without water in some places, at least at Maji ya Chumvi, for instance, and in the coast desert strip. They resort to spots of bare earth for dunging. These patches of dung everywhere characterize their haunts.

The oribi is normally a skulking, cover-haunting, high grass and bush loving antelope, like the duiker, steinbok, and even reedbuck; and we often found it in the same patch of cover with both duiker and reedbuck, and behaving in exactly the same way. But, unlike all three, it also, when the long grass is burnt, wanders freely over the open plains and under these circumstances behaves precisely like a gazelle. The reedbuck is too big to hide when on plains of this kind, and rarely ventures out on them, away from cover. The steinbok and even the duiker venture on them, but when alarmed take advantage of the first patch of scanty cover and crouch. But the oribi, when out on such plains, never hides, never seeks cover, is always alert and on the watch, and trusts to its sharp senses, wariness, and speed for safety. In these respects, when on the plains, they behave exactly like Tommies, and, like Tommies, are often found in parties of ten or a dozen individuals; but such a party does not form a true herd, and when alarmed tends

to split up into little groups, which may not come together again. Normally the oribi prefers to go singly or in couples. On the short-grass plains it must be stalked like a gazelle; elsewhere it must be shot like a duiker or steinbok. The oribi is a grass-eater. We generally found it near water, but in the Lado we came across individuals in the dry noon-day haunts of the giant eland, so far from water that we doubted whether they drank, although the vegetation was so parched that it was hard to believe that they could get along without drinking. Unlike the duiker and steinbok, the oribi is one of the noisy, whistling antelope; its squealing whistle of alarm or curiosity is loud and shrill, entirely distinct from the whistling of either the klipspringer or the reedbuck. We have heard an oribi and a reedbuck each whistle, one after the other, as they sprang from the same patch of brush and made off with the usual pig-like rush under cover of grass so tall that neither could be seen. When in the open they run very fast, with great bounds; after going a couple of hundred yards they turn and face the hunter with their large ears thrown forward. The oribi offers a difficult mark to the rifleman. Its flesh is delicious.

We found the oribi moving and feeding at all hours of the day and night. Once in the Lado we came on a couple of individuals unconcernedly feeding under the blazing sun at high noon, on a patch of short, green grass, while a fire was rolling through the long, dry grass close on either side of them.

KEY TO THE RACES OF *montana*

Tail like the back in color, or with only a few black hairs at the tip

Coat bright ochraceous-tawny, heavy

Horns weakly ringed, smooth for most of their length

montana

Horns heavily ringed for half their length	<i>cottoni</i>
Coat dull, cinnamon-brown; horns well ringed	<i>æquatoria</i>
Tail black; contrasting conspicuously with the dorsal coloration	
Coat ochraceous-tawny, long; horns not compressed or keeled	<i>kenyæ</i>
Coat clay color or buff, short; horns compressed and furnished with a keel on the posterior side	<i>haggardi</i>

ABYSSINIAN ORIBI
Ourebia montana montana

NATIVE NAME: Abyssinian, *facka*.

Antelope montana Cretzschmar, 1826, Atl. Rüppell's Reise, Säug., p. II, pl. III.

RANGE.—Nile watershed of the Abyssinian highlands, as far east as the edge of the Nile lowlands and south to the headwaters of the Omo River and the highlands north of Lake Rudolf.

The Abyssinian oribi has been known since Rüppell's early explorations in Abyssinia. The type specimen was obtained by one of his collectors on the Fazogloa Mountains, in close proximity to the Blue Nile, well down in the foot-hill region of the Abyssinian highlands and at the extreme western limit of its range. Rüppell also met with it on the plateau region at elevations of six thousand feet or more. More recently Major Powell-Cotton collected specimens near the western edge of the highlands, west of Addis Abbaba and Lake Tana. The Abyssinian race resembles closely the Uasin Gishu race in color. Both are highland forms, having long, heavy coats of a bright, tawny color. The Abyssinian may be distinguished by its less heavily ringed and shorter horns. The horns are ringed for the basal third, the rings being quite low and less distinct than in the more southern race. The horn length averages four inches, which is one-half inch less than the Uasin Gishu race. From the Nile oribi this race may be recognized by its brighter color and longer hair, but resembles it closely in horn dimensions. Gilbert Blaine has recently described a new race founded on a specimen collected by W. N.

McMillan sixty miles south of Addis Abbaba, near Lake Helene. The character given for the race, absence of the dark crown patch, is, however, a sex affair and has no racial value. The dark crown patch is lacking in all the males of the East African races and present only in the females and young. Occasionally there is a slight indication of it in some males.

NILE ORIBI

Ourebia montana æquatoria

NATIVE NAMES: Dinka, *lohdj*; Bongo, *heggoleh*.

Ourebia montana æquatoria Heller, 1912, Smith. Misc. Coll., vol. 60, No. 8, p. 12.

RANGE.—Nile Valley, from the Albert Nyanza northward through the Bahr-el-Ghazal and Gondokoro regions to the Sobat River.

The type of the Nile oribi was shot by Colonel Roosevelt in the vicinity of Rhino Camp in the Lado Enclave. Both Heuglin and Schweinfurth met with this race in the Bahr el Ghazal on their journeys of exploration in the '60's. In the Nile Valley the oribi is not a local beast, but is generally distributed and has been reported by the great majority of travellers who have visited the region.

The Nile race is intermediate between the Abyssinian and the Uasin Gishu oribi. It differs from the latter by its more brownish coloration, the coat being cinnamon-brown and somewhat shorter, but resembles it closely in shape and size of horns. From the typical race of Abyssinia it may be distinguished by its heavier-ringed and larger horns and duller coloration.

The dorsal color of an adult male is cinnamon-brown, vermiculated by Vandyke-brown. The neck, rump, and sides are without the darker vermiculation, being tawny in color. The crown of the head is bright rufous, bordered on the sides by a broad white supraorbital band. The snout and the sides of the face are buffy. The rhinarium is bordered above by a broccoli-brown patch. The tail is tawny, like the rump, with a few black hairs at the tip, and bordered below by a few white hairs. The limbs are tawny, like the sides, but the clefts of the hoofs and the pasterns are whitish. The ears on the outside are buffy, with the extreme tip seal-

brown, and lined on the inside by long white hairs. The under-parts and the inside of the limbs are silky white, the hair being white to the roots. The chest is suffused with buffy, and the throat is ochraceous-buff. The chin, upper lips, and gular region are white.

The flesh measurements of this race are: head and body, 37 inches; tail, $3\frac{1}{4}$ inches; hind foot, 11 inches; ear, $4\frac{1}{4}$ inches. Average length of skull: $6\frac{1}{2}$ inches in males, $6\frac{3}{4}$ inches in females. The usual length of horn is 4 inches. The longest horns in a series of seven measure $4\frac{1}{2}$ inches.

A series of twenty specimens have been examined representing the Lado Enclave, Nimule, Gondokoro, and the highlands one hundred miles east of it, and the Bahr el Ghazal. There is no apparent difference in specimens from opposite sides of the Nile. Considering the low altitude and the torrid nature of the Nile Valley, this race shows comparatively slight color and pelage difference from *cottoni* of the cold highlands of the Uasin Gishu Plateau.

UASIN GISHU ORIBI

Ourebia montana cottoni

NATIVE NAME: Kavirondo (Jaluo), *ogundi*.

Ourebia cottoni Thomas, 1908, *Ann. & Mag. Nat. Hist.*, p. 387.

RANGE.—Western slope and crest of the Mau Escarpment, from the southern shores of the Victoria Nyanza northward beyond Mount Elgon to the headwaters of the Turkwell River.

Throughout the grassy downs of the Uasin Gishu Plateau the oribi is abundantly distributed. In this locality Major Powell-Cotton collected the type of the race which now bears his name, but Jackson was the first sportsman to record the oribi from the Uasin Gishu, where he met with it on his pioneer trip to Uganda in 1889. Hollister, the assistant curator of mammals at the National Museum, described in 1910, from a skull collected on the Uasin Gishu by J. J. White, a species which he named *microdon*, basing the name on the small size and the straight outline of the cheek-teeth. This skull, however, represents the extreme variation in size and shape of teeth in *cottoni*. The large series of skulls in the

National Museum show every intermediate condition, from skulls with large teeth, having tooth rows with convex outlines, to small teeth with the straight tooth row of *microdon*.

The characters by which the race may be known are the bright, tawny coloration, long pelage, and the large size and heavily ringed horns. In horn length it exceeds all other East African races. The average horn length is $4\frac{1}{2}$ inches, but horns over 5 inches in length are not uncommon. The longest specimen in the series of ten males in the National Museum is $5\frac{3}{4}$ inches. Ward recorded one of $6\frac{1}{2}$ inches taken near the Uasin Gishu Plateau. The flesh measurements of an average male are: head and body, 39 inches; tail, 4 inches; hind foot, $4\frac{3}{4}$ inches; ear, 4 inches. Skull length: male, $6\frac{1}{4}$ inches; female, $6\frac{1}{2}$.

Specimens have been examined from the Uasin Gishu Plateau, the headwaters of the Amala River, on the German border, and Karungu, on the east shore of the Victoria Nyanza. They are known to occur at Londiana, near the highest point reached by the Uganda Railway, and also north of Elgon as far as the highlands forming the crest of the Nile-Rudolf watershed.

KENIA ORIBI

Ourebia montana kenyæ

Ourebia kenyæ Minertzhagen, 1905, Proc. Zool. Soc., p. 169.

RANGE.—Limited to a small area along the Tana River on the south slope of Mount Kenia, from Fort Hall east to Embu Station and southward as far as the Ithangi Hills.

The Kenia oribi has recently been described by its discoverer, Lieutenant Minertzhagen from specimens which he collected near Fort Hall. The race has a very restricted habitat of a few square miles, and on this account has remained so long unknown. It is allied more closely to the coast oribi, *haggardi*, with which it was no doubt one time connected by way of the Tana Valley.

Like *haggardi*, it is distinguishable from other races by its black tail. In coloration it may be described as quite intermediate between the tawny *cottoni* and the clay color or buff of the coast race. From *haggardi* it is easily dis-

tinguished by the bright ochraceous coloration, long pelage, and absence of a keel on the posterior border of the horns. In size or proportions it is not distinguishable from the other races. The average length of specimens in the flesh is 40 inches. The horns are rather long, averaging, according to the series collected by the describer, $5\frac{1}{2}$ inches.

COAST ORIBI

Ourebia montana haggardi

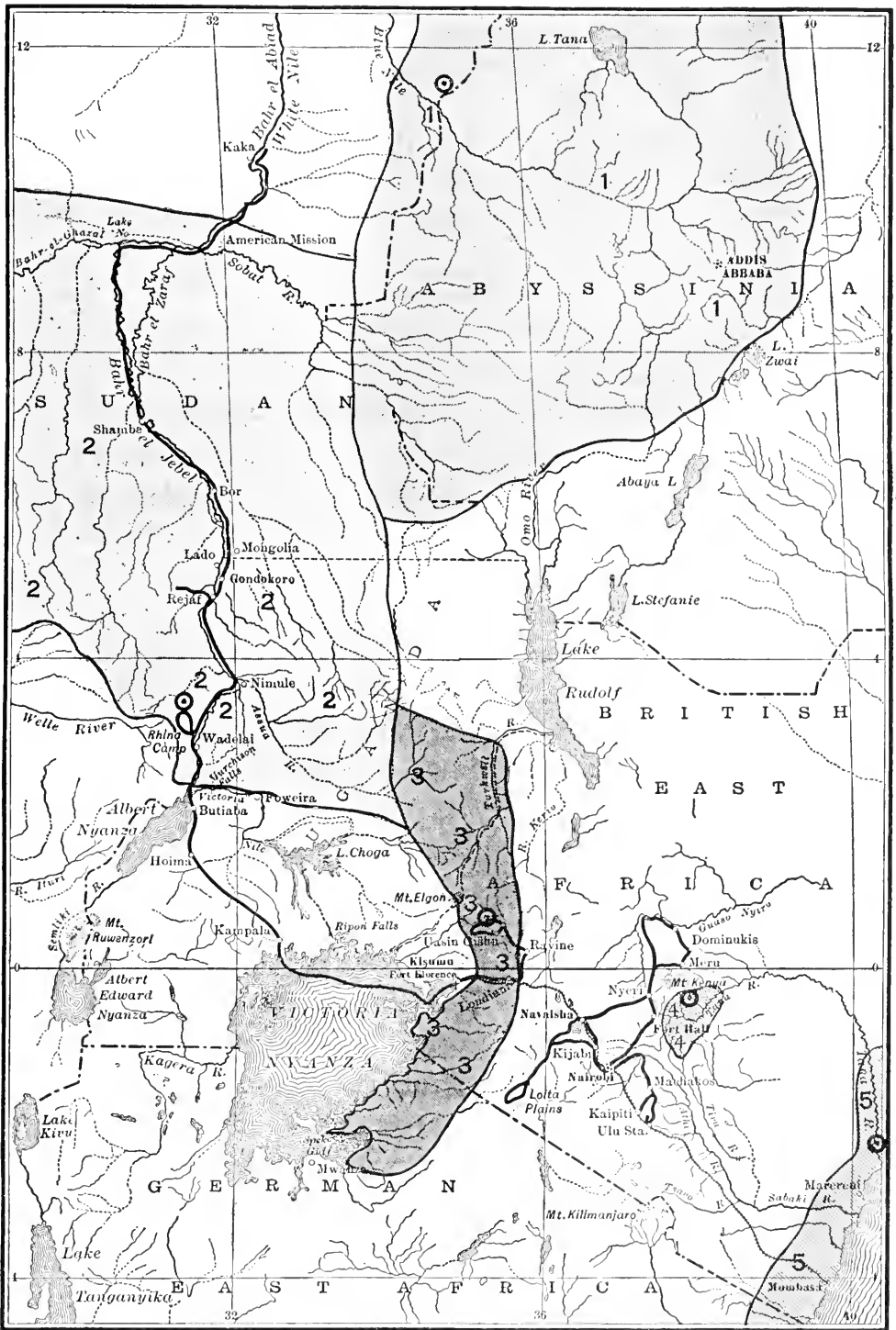
NATIVE NAMES: Swahili, *taya*; Duruma, *darendari*.

Ourebia haggardi Thomas, 1895, *Ann. & Mag. Nat. Hist.*, p. 187.

RANGE.—Coast of British East Africa, from the Lamu Islands and the Tana River south to the German border and as far inland as the eastern edge of the desert nyika.

The coast oribi was first met with by Vice-Consul Haggard, of Lamu. In 1887 he sent to the British Museum from Lamu several skulls which were eventually described by Thomas as a new race. A year or two after Haggard's discovery three of the pioneer sportsmen of East Africa, Harvey, Hunter, and Jackson, met with the oribi in the Tana River district. Although so long known by its skull and horns, the coast oribi has remained to this day without a description of its coloration. This is due to the absence of skins in museums. A considerable number of other species of antelope are in a similarly unknown state, that is, they are well known to sportsmen by their horns and heads, and a considerable number are shot annually and recorded on the registers of various game wardens; notwithstanding, they remain unrepresented in the large museums by complete specimens of the skins. Notable examples of this sort are the giant eland, Nile lechwi, Hunter antelope, and many races of the commoner species which are confined to isolated districts.

The dorsal color of the coast oribi is much lighter than that of any of the inland forms. An adult male collected at Mariakani Station by Heller is a uniform clay color on the dorsal surface, the crown and forehead being uniform in color with the back and without the contrast shown in the other races. The ridge of the snout is hair-brown, and



MAP 27—DISTRIBUTION OF THE RACES OF THE ORIBI

- | | | |
|----------------------------------|------------------------------------|----------------------------------|
| 1 <i>Ourebia montana montana</i> | 2 <i>Ourebia montana equatoria</i> | 3 <i>Ourebia montana coltoni</i> |
| 4 <i>Ourebia montana kenye</i> | 5 <i>Ourebia montana hagardi</i> | |

shows considerable contrast with the light clay color of the sides. The white areas of the head consist of a broad stripe above the eye, the lips, chin, forethroat, and inside of the ears. The back of the ears are clay color, with the tips broadly margined by umber-brown. There is a conspicuous bare black space below the ear. The tail is seal-brown or blackish, in marked contrast to the clay-colored rump and white border of the basal part. The lower sides of the body and the legs are somewhat lighter than the back, being ochraceous-buff, and darkest on the outside. The breast and the belly are pure white and sharply defined against the darker sides. The inguinal region is black and hairless with the exception of the two rosettes of white pithy hair marking the opening of the inguinal sacks.

The flesh measurements of this specimen were: head and body, 38 inches; hind foot, $11\frac{1}{2}$ inches; ear, 4 inches. Length of skull, $6\frac{1}{4}$ inches. Horns, $4\frac{3}{8}$ inches long. The longest horns recorded by Ward from the Tana Valley are $5\frac{3}{8}$ inches. One of the striking characters of this race are the heaviness or prominence of the basal rings and the compressed shape of the horn so as to form a keel along the posterior margin. Specimens have been recorded by sportsmen from the vicinity of Lamu, the lower Tana Valley, the Sabaki River, and the station of Maji ya Chumvi.

THE STEINBOK

Raphicerus

The steinbok is at once recognizable from all other antelopes by its bright sorrel-red color and small size. It is a trim-built little buck with well-rounded hind quarters and slender legs. The tail is not evident to the eye, being a mere rudiment, as in the klipspringer. A striking peculiarity is the enormous development of the ears, which exceed in size those of most other genera and are especially marked among the narrow-eared antelopes of the plains. Such great ear development is no doubt due to its habit of lying in cover out of sight, depending chiefly upon its scent and hearing to detect the approach of enemies. Directly in front of the eye is placed the small, rounded opening of the anteorbital gland, which is quite reduced in size. The male is armed

with short horns which rise vertically above the orbits and are without rings. False hoofs are lacking in this genus, but are present in the closely allied grysbok of South Africa. The skull shows considerable peculiarity of structure in the small size of the anteorbital fossa, which is a small, deep pit much less in size than in the other genera of the subfamily. The sinus between the nasal bones and the anteorbital pit is of very large size and quite equal in area to the pit. The snout is of moderate length and has very broad premaxillary bones bordering the nasal aperture. The sexes are alike in color and equal in size. The newly born young are in no way different in color from the adults, but their pelage is somewhat more woolly in texture.

The steinbok reaches in British East Africa its most northern limit. From the highlands near the base of Kenia it ranges southward along the East Coast to the immediate vicinity of the Cape. It, however, does not occur west of the Victoria Nyanza or Tanganyika drainage. The genus consists of a single species, *campestris*, with two or more geographical races, the most northern of which reaches British East Africa. No fossil species are known.

MASAILAND STEINBOK

Raphicerus campestris neumanni

NATIVE NAMES: Swahili, *ishah*; Masai, *olbwoansas*; Kikuyu, *thiya*.
Pediotragus neumanni Matschie, 1894; Sitz.-Ber. Nat. Freu. Berl., p. 122.

RANGE.—From German East Africa northward throughout the highlands of the Rift Valley and coast drainage area to the northern slopes of Kenia and Elgon, in British East Africa; east as far as the coast lowlands and west to the shores of the Victoria Nyanza.

The Masai steinbok was named by Doctor Matschie for Herr Oscar Neumann, who was one of the pioneer naturalists of East Africa. He collected the type specimen at Mount Gurui in central German East Africa. A specimen collected south of the Victoria Nyanza by Speke and Grant forms the first record of the species in equatorial Africa. Jackson, Willoughby, and other sportsmen who visited Kili-manjaro in the early days found the steinbok in abundance

on the plains at the foot of the mountain. In 1908 Lönnberg separated as a race specimens from Lake Natron, owing to the presence of the dark snout spot, a feature which Matschie had neglected to mention in his description of *neumanni*. An examination of the type specimen in Berlin, however, shows the existence of the dark snout patch, which is a characteristic marking of the steinbok throughout its whole range, from the Cape to the equator.

The little steinbok is common over most of East Africa. It is a brush or grass antelope, depending for safety upon cover, but it is not found in the thick forests, and it is found even on the treeless plains where the grass is long and there are patches of bush. It is a solitary little creature, usually found alone, although occasionally one runs across a buck and doe or a doe and a well-grown fawn. It both grazes and browses, and, although it is not found in desert country, it seems fairly independent of drinking. The contents of the stomach of one shot at Nyeri included twigs, leaves, and berries of the thorny nightshade, *Sclanum campactylanum*. This was the only stomach examined. Steinboks are not shy. We saw them feeding at all hours, like the oribi and the small gazelle, often on bare plains. When alarmed they dash for cover, and when in cover they lie very close. We have mentioned oribi and Tommies in connection with steinbok, because the three little antelopes, although often found in precisely similar ground, have such contrasting habits. The Tommy never seeks to escape observation, always avoids cover, always stands up when it spies danger, and trusts to its speed and sharp senses for safety. When alarmed it may run a mile or two, and then halts on the bare plain. The oribi, if on open plains of short grass, behaves precisely like a gazelle, but if in long grass or bush cover hides like a



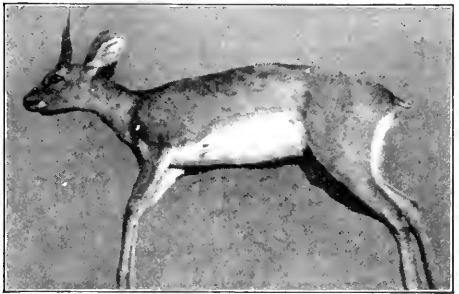
AKELLY PYGMY ANTELOPE, MALE
Nairobi (Ngong), B. E. A.



UASIN GISHU ORIBI, ADULT MALE
Shot by Theodore Roosevelt, Uasin Gishu Plateau



NILE BUSHBUCK, IMMATURE MALE
From Rhino Camp, Upper Nile



MASAILAND STEINBOK, ADULT MALE
Shot by Sir Alfred Pease, Kapiti Plains



UGANDA BUSHBUCK, FEMALE
Shot by Theodore Roosevelt, Maanja River, Uganda



MASAILAND KLIPSPRINGER, MALE
Shot by Theodore Roosevelt, Loita Plains, B. E. A.



YOUNG HIGHLAND BUSHBUCK
Loita Plains



NAIVASHA KIRK DIK-DIK, ADULT MALE
Lake Naivasha

BUSHBUCK AND SMALL ANTELOPES

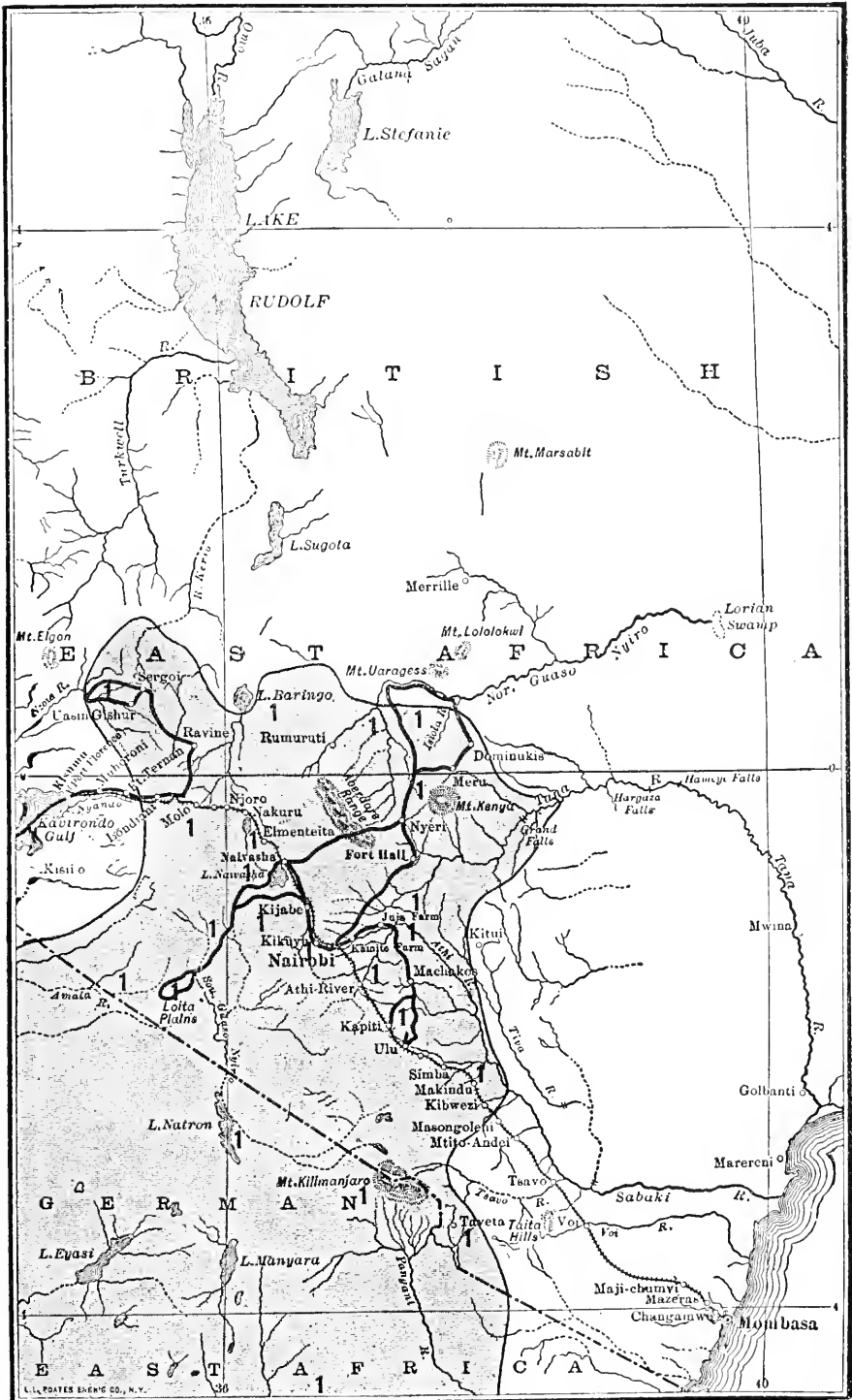
duiker or steinbok. The steinbok, no matter where it is, always seeks to hide, and always lies down when it spies danger, unless it thinks itself observed from near by. When forced to run, it races off for a few hundred yards, and lies down in another bit of cover. A Tommy lying down always feels at a disadvantage, and springs to its feet at the suspicion of danger. A steinbok regards lying down as its natural attitude at the approach of danger. Time and again we have seen a steinbok, when we were approaching from a distance, lie down beside or behind some bush or tuft of grass—it is astonishing how little cover will serve its needs—and watch us with head erect. If we approached too closely, or if it had been thoroughly alarmed and had already run once, it would lie with its head outstretched.

It is a very curious fact that an antelope which trusts so much to cover and concealment and to escaping observation, and which does not live in thick cover, yet possesses a revealing instead of a concealing coloration. The bright reddish of the steinbok's coat harmonizes with no background in which we have seen the animal, and never in our experience tends to conceal it. Doubtless there are exceptional cases where the coloration does tend to conceal it—there is no conceivable type of coloration which might not once in several thousand times harmonize with its environment—but we never happened to come across such cases. If the little animal was where it could be seen at all, and where any color could reveal it, in our experience the bright reddish coat always tended to reveal it. Yet no antelope trusts more persistently to hiding, to escaping observation. We have seen one when pursued slip round a small bush and lie flat with head and neck outstretched; but its color was too con-

spicuous to permit it to escape being seen. If in thick grass it cannot be seen because of the physical screen of the cover. If in bush, or lying where there is shifting light and shadow, even from thin little trees, it may be difficult to make out, because under such circumstances, the play of shade and sunlight, the varying vistas, the interposed twiggerly and patches of leafage, and the many different contours and color values tend to make it difficult for the eye to pick out any motionless object of any color. Moreover, absolute immobility will often render any object, of no matter what color or shape, likely to escape hasty notice. But, after making all allowances, it seems certain that on the whole the coloration of the little steinbok is revealing; and its habits are such that concealing coloration would certainly be a benefit to it; and yet it is common, and it persists in the land much longer than most antelopes after man appears. Evidently the other qualities which have helped it in the struggle for life have so far outweighed the matter of coloration that it has been unaffected by the latter, or so little affected that the coloration has never become concealing.

The Masai steinbok is distinguishable from the typical race from South Africa with difficulty. The general coloration is somewhat darker and the white areas about the eyes and muzzle are more extensive. Specimens from the Zambesi River which we have compared are scarcely distinguishable by coloration or size from British East African specimens. The presence of a dark crescent on the crown between the ears in the typical race is sometimes given as a character, but this dark patch is quite variable and is present in half the specimens from East Africa examined, irrespective of locality or sex.

The color of the upper parts is bright sorrel or vinaceous-tawny. The hair is everywhere minutely speckled with white,



MAP 28—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE STEINBOK

1 *Raphicerus campestris neumanni*

owing to the narrow white hair tips. The sides of the body are somewhat lighter, but the dorsal color is sharply defined against the white breast and belly. The legs are less pinkish than the body, usually being uniform cinnamon-buff, with the inside white as far down as the knees and hocks. The tail is very short, triangular in shape, and not differentiated by color or length of hair from the rump. The lower surface is naked. The hinder surfaces of the thighs are white in contrast to the sorrel sides, the hair on this portion of the body being lengthened considerably and forming a rump patch. The crown of the head is bright tawny, and is marked by a narrow, dark-brown crescent between the ears. The midline of the snout is marked by a triangular-shaped, seal-brown patch which extends from the muzzle half-way to the eyes. The sides of the head are vinaceous, and the eye is surrounded by a white ring. The lips, chin, and upper throat are white. The ears are grayish, margined narrowly by dark-brown; the back covered by short, buffy hair, and the inside by lines of long, white hair.

Specimens in the flesh average 33 inches in length of head and body; tail, $2\frac{1}{2}$ inches; hind foot, 10 inches; ear, $4\frac{1}{2}$ inches. Length of skull, $5\frac{1}{2}$ inches. The largest skull in a series of forty specimens is that of a female, which has a length of $5\frac{3}{4}$ inches. The horns average about $3\frac{3}{4}$ inches in length. The record in the National Museum is a specimen with horns 5 inches in length, shot by Sir Alfred Pease at his farm in the Mua Hills. Ward's record for British East Africa exceeds this specimen by $\frac{7}{8}$ of an inch.

The steinbok is very abundantly distributed over the high veldt region of British East Africa, but does not occur in the dry desert scrub of the nyika. The vertical range extends from three thousand to nine thousand feet. Specimens have been examined from the Kapiti and Loita Plains, northern slopes of Mount Kenia, Lake Naivasha, and the Kedong Valley. The steinbok is peculiarly uniform in coloration throughout its range and is not separable into geographical races in British East Africa.

THE KLIPSPRINGERS

SUBFAMILY *Oreotraginæ*

The klipspringers are distinguishable from all other African antelopes by their coarse, bristly, and pithy hair and by the very narrow, cylindrical hoofs, the extreme tips of which alone support the animal's weight. Besides these peculiarities the skull exhibits a marked brevity of snout with immense anteorbital glands on its sides, which open in front of the eye by a large, rounded pore. The horns are short, seldom exceeding the head in length, and project vertically above the eyes, being wide apart basally and parallel throughout their length. The body is rather heavily built, and the legs are short. The hoofs are rounded at the tips and the false hoofs are very broad. The inguinal region is without pits or sacks in the skin. The female has four mammæ. The skull is remarkable for the large size of its anteorbital fossa, which covers the entire side of the snout, almost equalling the orbit in area. The nasal bones are very broad and short, spreading out posteriorly so as to make them triangular in shape. The sinus between the nasal bones and the lachrymal is small and narrow or obsolete.

THE KLIPSPRINGER

Oreotragus

Oreotragus A. Smith, 1834, S. Af. Quart. Journ., II, p. 212; type *O. oreotragus*.

The klipspringer is the only African antelope which has made an attempt to occupy the place in nature taken by the wild sheep and goats of the northern hemisphere, the chamois of Europe, the goral of Asia, and the white antelope goat of America. He has succeeded remarkably well and has widely differentiated himself from his kin. In the matter of hoofs fitted for rock-climbing he has become specialized beyond all other hoofed mammals, and has produced for himself a very narrow but elongate hoof upon the extreme tip of which he walks, instead of upon the whole base. The narrow tips give him a firm footing on the steepest of rocks where often no foothold is visible on the

closest inspection. We have in vain striven to find even minute inequalities on cliffs up which we have seen him easily make his way. He is, however, one of the smallest of the antelopes, so that he has little difficulty in carrying his weight on the tiny points of his stubby hoofs. The klip-springer has low withers, with full, rounded hind quarters, is short-legged, and has rather a heavily built appearance. He is abbreviated at both his extremities, being extremely short-necked, short-snouted, and short-tailed; indeed, the tail is a mere rudiment, not evident to the eye. In pelage he is strikingly peculiar among African antelopes. The hair is very coarse and pithy and closely resembles that of the American pronghorn and to a less degree the hair of the whitetail deer.

The horns are short and parallel in direction, arising vertically above the orbits, and are ringed at the base. They are usually confined to the male sex, one race alone exhibiting horns in the female sex. There is no sexual difference in coloration or size, nor is there any appreciable age difference in coloration, the young being minutely similar to the adults in appearance. The genus to-day comprises a single species with several geographical races. One fossil species is known from the Pliocene of France. Klipspringers are confined to eastern Africa from the highlands of Abyssinia and the adjacent Red Sea coast south through the Rift Valley and coast drainage to the extreme southern tip of Africa.

This lively and interesting little antelope is found on the rocky hills throughout East Africa. In the ordinary East African form the females have horns, in the desert form which occurs from the Northern Guaso Nyiro northward the females are hornless. It is an extraordinary climber and jumper, bounding among the cliffs with absolute sure-footedness. The tiny hoofs—which, like the brittle hair, are unlike those of any other African antelope—enable it to perch on the smallest pinnacle, and to climb by means of the most trifling cracks and irregularities in a rock surface; and it will

bound down a cliff like a rubber ball. The gait is somewhat like the stiff-legged bounding of a Rocky Mountain blacktail deer. It certainly serves wonderfully well up and down the precipitous slopes, grassy or rocky, in which the klipspringer dwells. The little beast often grazes on the level ground at the foot of the rocks—by daytime if the country is uninhabited, otherwise at night—but on the slightest alarm it betakes itself at full speed toward its fastnesses. The dung is usually deposited at particular spots on the rocky hillside or cliffs. It utters a shrill whistle, usually heard when its curiosity is excited or when it is apprehensive but not yet much frightened. It both browses and grazes, feeding and resting alternately, and at various intervals throughout the twenty-four hours. Seemingly it sometimes goes for long periods without drinking. The northern or desert form certainly does not drink, but lives without water. The stomach contents of specimens of this race consisted chiefly of leaves and twigs of two small trees, *Strychnos* and *Dodonea*. It is usually found singly or in couples, but occasionally half a dozen individuals will gather together on a particular feeding-ground.

The klipspringer is an alert little creature, always on the lookout for foes, and trusting not to escaping notice but to seeing its foes first and then escaping among the rocks. Yet its coat harmonizes so well with its ordinary background that it is often difficult to make out, even when its alarm whistle shows that it is not consciously hiding. Indeed, this is one of the very few antelopes that may at times be aided in escaping notice by its countershading. Apparently its coloration may fairly be called concealing, and yet apparently this quality of its coloration is of little or no aid

to it, because of its habits. The case is directly the reverse of that of the steinbok, which does continually hide and skulk and try to escape observation, and yet has a coloration which is on the whole undoubtedly of revealing quality. From these facts it seems probable that in neither case has the color of the coat been developed for any utilitarian reason.

KEY TO THE RACES OF *oreotragus*

Female hornless; body color uniform, legs lighter than the body in color and marked by a wide black band above the hoof

aureus

Female horned; rump lighter and grayer than the back, legs not lighter than the body in color and without black hoof band

schillingsi

MARSABIT KLIPSPRINGER

Oreotragus oreotragus aureus

Oreotragus oreotragus aureus Heller, 1913, Smith. Misc. Coll., vol. 61, No. 13, p. 7.

RANGE.—From the drainage area of the Northern Guaso Nyiro River and the northern slopes of Mount Kenia northward to Lake Rudolf, west as far as Mount Elgon, and east in the lower desert region as far as the limits of the higher mountains, but not occurring in this region south of the Tana River.

The Marsabit race was recently described from specimens collected by the Rainey expedition on Mount Lolo-*lokwi*, a large table-topped mountain lying between the Northern Guaso Nyiro and Mount Marsabit. The race is distinguishable from the Masailand klipspringer by the absence of horns in the female and the uniform color of the dorsal surface, the rump coloration showing no contrast in tone to that of the anterior part of the body. It is more closely allied to the Abyssinian klipspringer, with which it is in agreement in the character of the hornless female,

but may be distinguished by its lighter-colored legs, brighter golden body color, more pronounced or extensive black bands above the hoofs, and dark-rufous forehead and crown.

The dorsal color is bright buff-yellow, and is everywhere speckled by seal-brown, owing to the basal color of the hair showing beneath the narrow yellow tips. The yellow is purest on the neck. The midline of the back shows most blackish, and is uniform in color with the rump. The sides are sharply defined against the pure white of the under-parts. The tail is not differentiated by color or longer hair from the rump. The forelegs are lighter-colored than the back, being buffy, with less of the dark hair bases showing through on the outside, and the inside is uniform whitish, like the under-parts. A heavy black band encircles the hoofs and reaches half-way to the false hoofs. The hind legs are like the fore, but the inside from the hocks to the hoof is uniform in color with the outside. The crown of the head is russet, lined heavily by black. The snout is buffy on the sides, like the legs, but the median portion is blackish. The lips and chin are whitish. The midline of the throat is buff-yellow, without darker vermiculations. The backs of the ears are clothed by short, buffy hairs, but the central portion and margin are blackish, except on the lower inner border, which is marked by a white bar or spot. The inside and the base of the ear are whitish.

The Marsabit race is practically identical in size with the Masailand form. An average specimen gives the following measurements in the flesh: head and body, 33 inches; tail, $3\frac{1}{2}$ inches; hind foot, 9 inches; ear, $3\frac{1}{2}$ inches. Greatest length of skull, $5\frac{1}{2}$ inches. A single male is in the collection. The horns of this specimen measure $3\frac{7}{8}$ inches.

Specimens of this race were secured on the summit of Mount Lololokwi, at six thousand feet altitude, and on the rocky kopjes which dot the west Kenia plateau. They were also seen on the slopes of Mount Uaragess, but nowhere were they encountered in the low desert region, and it is doubtful if they occur below an altitude of three thousand feet.

MASAILAND KLIPSPRINGER

Oreotragus oreotragus schillingsi

NATIVE NAME: Masai, *engine*.

Oreotragus schillingsi Neumann, 1902, Sitz.-Ber. Ges. Nat. Freu., Berl., p. 172.

RANGE.—From the Rift Valley in central German East Africa northward to Lake Baringo and the southern slopes of Mount Kenia, east to the southern shores of the Victoria Nyanza, and west to the lower edge of the highland country, at least as far as Kitui and Makindu. Altitudinal range from three thousand to nine thousand feet.

The Masailand klipspringer was named for Herr Schillings, the pioneer flash-light photographer of Africa, who has given us a vivid pictorial account in "With Flashlight and Rifle" of his exploits with the game animals of the Kilimanjaro district of German East Africa. He secured the type specimens on the small hill of Ngaptuk, situated northwest of Kilimanjaro and very close to the British East Africa boundary. Jackson was the first sportsman to report the klipspringer from British East Africa. In 1894, in "Big Game Shooting," he devotes a few lines to it and states that it is irregularly distributed upon rocky hills from the Taita district to the Turkwell River. The klipspringer, however, has been long known to inhabit South Africa and Abyssinia, the two extreme points of its range.

The Masailand klipspringer is at once distinguishable from all other races by the presence of horns in the female. This striking character was not known to the describer of the race, Herr Neumann, who based his differences on slight color discriminations. His material consisted of some unsexed skins with horned skulls which, he assumed, were all males, owing to the presence of the horns. The females are as well horned as the males; in fact, the longest-horned specimen in the series of twelve in the National Museum is that of a female shot by Kermit Roosevelt on the western edge of the Loita Plains. None of the females show rudimentary horns or any evidence of transition to the hornless condition of the races inhabiting the country north or south of them, nor do the females of such races show any trace of horns, not even such slight evidence as

bony knobs on the frontal bones of the skulls. The color differences of this race are very slight indeed, and it is distinguishable with difficulty by coloration from the race occurring south of it, *aceros*, in southern German East Africa, south to the Zambesi. It is difficult to account for the presence of horns in the females of a race having no peculiar habits, and surrounded on all sides by races in which the females are not only hornless, but show no tendency toward the acquiring of such structures.

Average male specimens measure in the flesh 33 inches in length of head and body; tail, $3\frac{3}{4}$ inches; hind foot, 11 inches; ear, $3\frac{1}{2}$ inches. Females are fully equal in size to the males. The longest-horned specimen is a female in which the horns are $4\frac{3}{8}$ inches in length. The longest male horns are $3\frac{3}{4}$ inches. These horn dimensions are exceeded very little by Ward's record for East Africa of $4\frac{3}{4}$ inches. The skull length of the two sexes is quite equal, the longest female skull being $5\frac{3}{4}$ inches, and the longest male $5\frac{7}{8}$ inches.

The distribution of the klipspringer is quite local, owing to their occurrence only on barren, rocky hills or mountainsides. The Rift Valley, with its innumerable lava cliffs and rough broken surface, is a favorite haunt of this race. They are distributed throughout the valley from central German East Africa and Kilimanjaro north to Lake Baringo. Upon the slopes of the volcanic cone of Longonot, immediately south of Lake Naivasha, they are particularly common and occur from its base to the summit, at nine thousand feet, where they reach their highest altitudinal range.

CHAPTER XVIII

THE GAZELLES AND THEIR ALLIES

SUBFAMILY *Antilopinæ*

THE gazelles are typical of the subfamily *Antilopinæ*, but with them are banded several peculiar or specialized genera. In East Africa we have two of these, the elongated, spidery gerenuk and the graceful, bush-haunting impalla. The various members agree, however, in having a large narial chamber, short nasal bones, and narrow cheek-teeth, and by these characters they may be distinguished from other antelopes. They are medium-sized antelopes with slender legs, short tails, and usually short-haired coats, showing fulvous or tawny coloration with black facial and flank stripes. The females are hornless in many of the genera and the mammæ formula ranges from two to four. They are typically an open-plains or desert stock with short, narrow ears, but many of the members have taken to a life in bushy areas while others have invaded high mountain plateaux. The subfamily ranges from central Asia westward to southeastern Europe and southward over the whole of Africa except the Congo forest tract. Geologically, the group has been represented since Miocene time in Asia and Europe and in the Mediterranean region of Africa since the Pliocene.

KEY TO THE GENERA

False hoofs and anteorbital pore present; horns lyrate or parallel in direction

Head rounded, snout short; neck and legs of normal length; face striped and flanks usually with a blackish band; female horned in East African species; mammæ, two

Gazella

Head elongate, flattened; snout produced; neck and legs greatly lengthened; sides of face uniform in color and flanks without dark band; female hornless; mammæ, four

Lithocranius

False hoofs and anteorbital pore absent; horns showing a tendency toward a spiral twist, broadly U-shaped and ringed; female hornless; body size medium *Æpyceros*

GAZELLES

Gazella

Gazella Lichtenstein, 1814, Mag. Nat. Freunde, Berl., VI, pp. 152 and 171; type *G. subguturosa*, fixed in Book of Antelopes, Sclater and Thomas, 1879, vol. III, p. 65.

The coloration is usually vinaceous or cinnamon on the dorsal surface and white on the under-parts. The face is marked by two or three bands and the tail is of medium length. The horns in the males are usually well developed and are lyrate or parallel. The females are usually horned and furnished with two mammæ. The muzzle is simple, the nasal bones being short and in contact with the maxillary and premaxillary bones. The anteorbital fossa are moderate or large.

The genus ranges from northern and eastern Africa south in the Nile Valley to the Victoria Nyanza and in East Africa to central German East Africa. Beyond Africa it extends through western and central Asia.

This, the largest and most wide-spread genus of antelopes, contains some twenty valid species. It is known as far back in geological time as the Upper Miocene of Europe. Several species are known from the Pliocene of Europe,

Asia, and the Mediterranean coast of Africa. Later, in the Pleistocene age, gazelles became abundant in North Africa, as shown by the several species which have been discovered in deposits of this age in Algeria.

KEY TO SPECIES OF *Gazella*

Size large, horns long in the male, more than two times head; adult male without dark flank band usually

Cinnamon coloration of back continued as a broad band on the rump to the tail and widely separating the white rump patch; horns short and diverging only slightly at tips; body size smaller *petersi*

White rump patch undivided by cinnamon of back or at most dorsal color only continued as a narrow stripe to the tail; horns larger and more lyrate in shape, body size larger *granti*

Size small, horns in the male much less than two times the length of the head; sides with a broad dark flank band

Dark flank band bordering the white of the belly; sides with a conspicuous groin gland clothed by pithy yellow hair; a dark nose spot *thomsoni*

Dark flank band separated by buffy band from the white belly; no lateral glands present; nose spot obsolete *rufifrons*

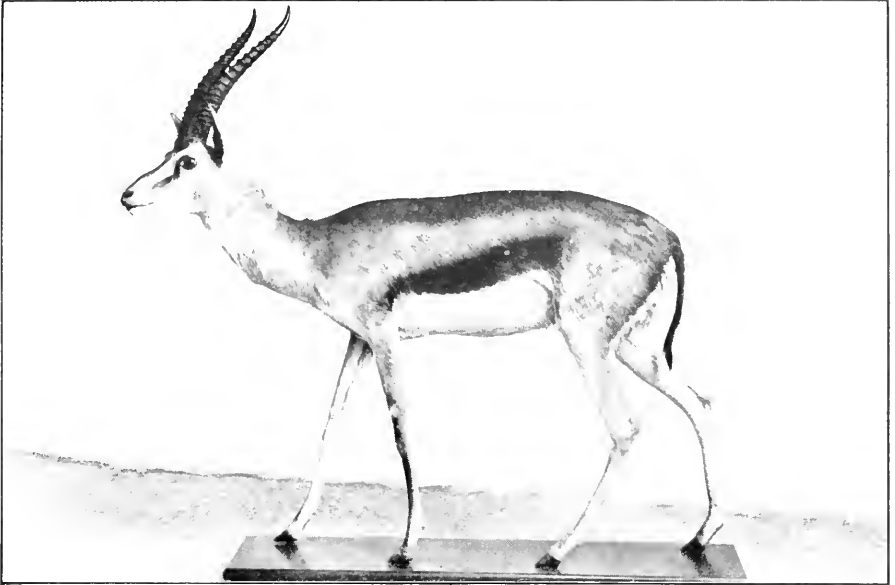
GRANT GAZELLE

Gazella granti

Typical *granti* is found only in central German East Africa, in Ugogo, where it was originally discovered by Speke and Grant, in 1848, during their journey of discovery of the source of the Nile. This point marks the southern limit of Grant gazelles in Africa. Here it was found inhabiting a dry, arid, saline valley at some 3,000 feet elevation. From this point the species ranges northward through the Rift Valley as far as Lake Zwai, in southern Abyssinia, where the race *lacuum* occurs. Westward the species spreads to the southern shores of the Victoria Nyanza and enters the Nile watershed. In this southwestern corner

it has evolved a form with wide-spreading horns which has been named *robertsi*. At the northwestern corner another race appears, *brighti*, which is the palest and the least banded of all. Near the coast at Kilimanjaro we find the darkest race, *serengeta*, which is somewhat intermediate in color with the closely allied *petersi*. The latter species carries the *granti* type still farther west and north to the mouth of the Tana River. Peters gazelle is much smaller and darker than any of the races of *granti* and is not known to intergrade. Occupying the central part of the range and also the most elevated region we have *roosevelti*. Lying between this elevated region on the southern edge of the Abyssinian desert we meet with the shorter-horned race known as *raineyi*. The horns reach their maximum spread in the southern race *robertsi*, but are also wide-spread and large in the neighboring typical *granti*. As we go northward the horns become more parallel and shorter until the extreme is reached in narrowness and shortness in *brighti*, inhabiting the country draining into Lake Rudolf from the west. *Notata* is apparently a highly colored local form occurring only on the high plateau flanking the Lorogi Mountains on the southwest and bears no very close relationship to the other races. The highland races known as *roosevelti* and *robertsi* are grazers, while the desert forms, such as *brighti* and *raineyi*, are browsers. A structural difference in these races has been noticed which can be traced to differences in food habits. In the browsing races the snout has become enlarged as indicated by the greater length of the nasal chamber. In *raineyi* the length of the nares from the tip of the nasal bones to the end of the premaxillaries or snout is much greater than the length of the nasal bones. In *roosevelti*, which is typically a grazer, the length of the nares is much less, equalling or only slightly exceeding the nasals in length.

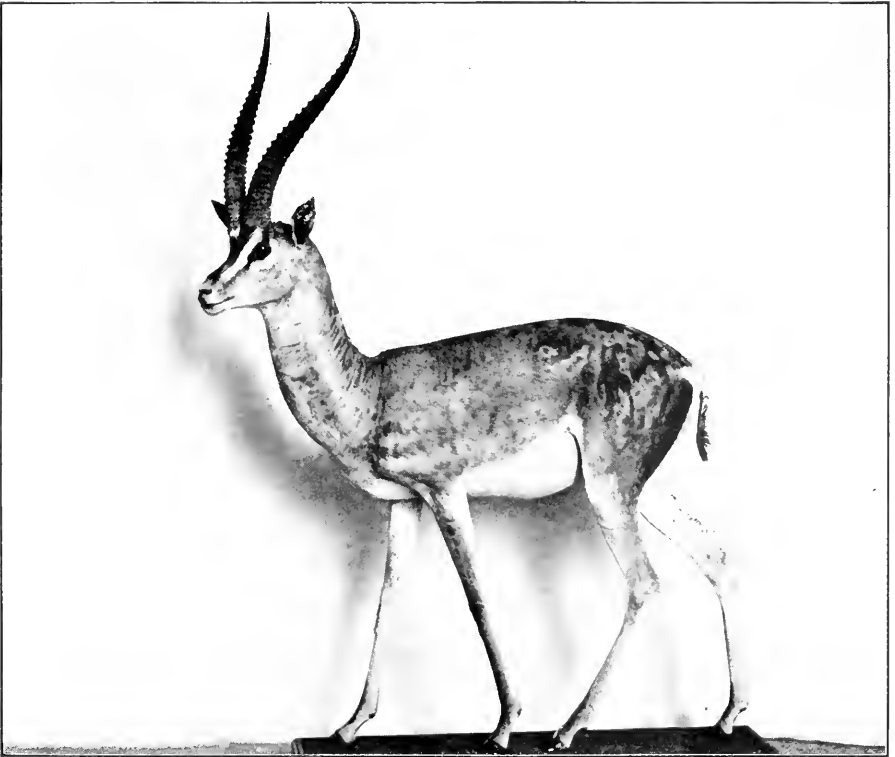
The Grant may be defined as a large-sized gazelle with immense horns, striped face, white rump patch, and white under-parts. The horns reach the maximum size among gazelles, ranging in the male from 20 to 30 inches in length along the curve. They are very heavy basally, where they are much compressed, or flattened laterally. They ascend vertically above the orbits and curve backward, ranging



KILIMANJARO THOMSON GAZELLE, MALE

Shot by Dr. L. W. Abbott, Taveta Kilimanjaro District

United States National Museum



ROOSEVELT GRANT GAZELLE, MALE

Shot by Theodore Roosevelt at Bondoni, Kapiti Plains, B. E. A.

United States National Museum

GRANT AND THOMSON GAZELLES

from broadly lyrate to parallel in shape, and are heavily ringed for most of their length. The adult male is usually without the dark flank band characteristic of the female, but both sexes have a dark pygal stripe bordering the white rump patch. The general dorsal color ranges from cinnamon to fulvous. The young are striped like the female but have the white of the rump much less extensive. The skull is distinguishable from that of *thomsoni* by its shallower anteorbital fossa, larger nasal-lachrymal sinus, and the spatulate shape of the nasal process of the maxillary bone.

This, the largest of the genus, is not only the most beautiful gazelle but one of the most beautiful of African antelopes. It is about the size of a white-tail deer. The long, lyre-shaped horns of the buck, the proud, graceful carriage of the head and neck, the supple and dainty strength of body and limbs, the delicacy of coloring, all combine to make the animal a pleasure to look upon. The many herds of these large gazelles which are scattered over the Athi and Kapiti Plains form one of the chief attractions to the traveller who rides across the long stretches of level or rolling grass-lands. In the Sotik country the horns of its bucks are even longer, with a more divergent bend. On the lower levels, near the coast, they are shorter. The does everywhere carry smaller horns than the bucks, less beautifully shaped.

All gazelles are beasts of the open plains, avoiding forests. They are most at home on the reaches of grass-land where there is not a shrub or a tree, but have no objection to thinly scattered thorns and are often found grazing or resting among them. They are primarily grazers, but occasionally become browsers; the stomach of one of the *raineyi* variety, killed on the Northern Guaso

Nyiro, contained acacia pods. They are highly gregarious, going in herds of a score or two, each composed of a master buck accompanied by does, kids, and half-grown animals. Young bucks are often found in small parties of half a dozen individuals. Old bucks are sometimes solitary but are more often found with herds of other game, such as hartebeest or zebra; an animal of one of the gregarious types not only appreciates company because of the advantage of having other eyes and ears on the watch against foes, but probably also from sheer love of companionship. Both the big and the small gazelle occasionally associate with one another; in one such case the leader of the little band was a female Tommy whose four companions, all of them Grant gazelles, two bucks and two does, allowed her to take the initiative and followed wherever she led. When grazing or going to water herds of Grant gazelle often mingle with herds of all the other plains game, from wildebeests down, into one big scattered herd.

The specifically, or subspecifically, different big gazelle found along the Northern Guaso Nyiro, scientifically known as the *raineyi*, was in most of its habits identical with the true Grant gazelle, although somewhat smaller, with shorter and less handsome horns. There seemed to us to be one difference, however, which, if real and not merely a mistaken observation on our part, was important. On the Athi and Kapiti Plains we were struck by the incessant switching of the tails of the Tommies, whereas by comparison the Grant gazelles kept their tails quiet, waving them at times, but not in the incessant, nervous, electric-attachment manner of the Tommies. On the Northern Guaso Nyiro there were no Tommies, and here it certainly seemed to us that

the big gazelles were always switching their tails, almost precisely like the Tommies and not in the manner of their own kinsmen. This may have been an error of observation on our part, induced by the fact that on the Northern Guaso Nyiro there were no Tommies with which to make comparisons. We wish other observers would look into the matter.

The lives of these big gazelles were led under the same conditions as those under which the other plains game with which they associated—wildebeest, hartebeest, topi, zebra, Tommies—led their lives, and their habits were essentially the same. The bucks now and then fought fiercely for the mastery of the herds. There was no fixed mating season, as far as we could see; at any rate, we found fawns of all ages. The mother left the herd for a few days at the time of the fawn's birth, but soon rejoined it, the little fawn being able to run with its elders at an early age. The herd would feed for a few hours and then rest for a few hours, watering once or twice a day. We could not find that these hours were definitely fixed. Usually the herd rested during the heat of the day, but several times we found herds feeding at high noon, and once we found one at a water-hole at that hour. We also, at one water-hole, found that the gazelles as well as the hartebeests visited it at night. We saw them grazing very early in the morning and very late in the evening. They differed widely and inexplicably in wariness, like so many other kinds of game. As a rule, they were not as wary as wildebeest and were much more wary than Tommies; but one herd would flee when we were half a mile off and another, for no reason that we could see, would let us ride by them within a couple of hundred yards. In the morning we might find

the antelope of a given band or bands shy to a degree; and in the afternoon, on our return to camp, they would let us pass reasonably close, even to windward of them, without showing alarm. Their eyesight was very good, and also their sense of smell. At night they were apparently more alert and uneasy than during the day. Perhaps this is true of all game, although, on the other hand, it is also true that game will allow a man to come closer in the darkness than in daylight. They rarely went where leopards could get at them; but lions occasionally preyed on them, although preferring the larger hartebeests or zebras; and they were objects of chase both for cheetahs and hunting hounds. They never sought to hide themselves or escape observation, although the adult males, which, unlike the females and young males, have no black side stripe, could, perhaps, be called concealingly colored—certainly as compared with impalla or Tommies or hartebeests or steinboks. Their trust was in their speed, eyesight, scent, and wariness. Sometimes, in time of drought, most of them desert a given district, in common with the other game, leaving only a few individuals behind. In other regions, as on the Athi and Kapiti Plains, they remain in practically the same country from year's end to year's end or make a shift of a few miles only. At any one time a herd will usually locate itself in a given area of a few square miles and lead a fairly regular and ordered life, so that each day at about the same time the individuals can be found in or near the same place doing about the same thing. While staying in a permanent camp or on a ranch we would frequently grow acquainted with some gazelle herd which, if unmolested, we could almost always find within a mile or two of the spot to

which, as experience had taught us, it resorted in the morning or afternoon in the course of its daily round of existence. In some places we found stamping-grounds, or areas of bare earth several roods in extent, to which, apparently, herds of these gazelles must have resorted at intervals for long periods of time, for they were thickly covered with dung pellets in various stages of dryness.

At McMillan's ranch there was a tame doe of the big gazelle which was as friendly and as much at home as any domestic animal.

KEY TO THE RACES OF *granti*

Cinnamon of back extending onto the tail as a narrow line separating the white rump patch or else stopping within one inch of the base; tail chiefly black, only basal one-third white

serengetae

Cinnamon of back well separated by a broad white rump patch two or three inches wide; black of tail less extensive, confined to terminal one-half

A dark flank band in adult males *notata*

Flanks without dark band in adult males

A dark pygal stripe bordering the white rump patch in adult males

Horns turned outward and wide-spread, the tips hooked backward *robertsi*

Horns evenly spreading and lyrate in shape, the tips approaching one another

Dorsal color lighter cinnamon, horns longer and wider-spread *granti*

Dorsal color darker cinnamon, horns smaller and narrower *roosevelti*

Horns more nearly parallel, not curved outward

Dorsal color lighter, dark flank band obsolete in the adult female *lacuum*

Dorsal color darker, dark flank band distinct in the
adult female *raineyi*

No dark pygal stripe bordering the white rump patch
brighti

TYPICAL GRANT GAZELLE

Gazella granti granti

Gazella granti Brooke, 1872, Proc. Zool. Soc., p. 601, pl. LIX (colored).

RANGE.—German East Africa from Ugogo, in the vicinity of Kanyenye and Mpwapwa, northward at least as far as Irangi, but not reaching British East Africa; limits of range unknown.

The large, stately gazelle which bears Colonel J. A. Grant's name was discovered by Speke and Grant at Kanyenye, Ugogo district, in 1860, during their journey of discovery of the source of the Nile. It was found inhabiting a dry saline plain having an elevation of three thousand feet approximately. The discoverers recognized the species as new and took precautions to make sketches of the specimens in the field. The specimens collected were unfortunately lost in transit, so that it became necessary to describe the species from the notes and sketches of the explorers. Even at the present day specimens from near the type locality are preserved in only one or two European museums. The typical is really the least known form of Grant gazelle, owing to the region which it inhabits having seldom been visited by sportsmen or naturalists. The typical race may be distinguished by the long, wide-spread horns, the light cinnamon body, and well-marked, dark nose spot and pygal band in the male.

ROBERTS GRANT GAZELLE

Gazella granti robertsi

NATIVE NAME: Winyamwezi, *kisi*.

Gazella granti robertsi Thomas, 1903, Proc. Zool. Soc., vol. II, p. 119, 2 figs. of skull and horns.

RANGE.—Southeastern drainage area of the Victoria Nyanza from Speke Gulf, in German East Africa, northward

to the Amala River and Loita Plains district of British East Africa. Confined to the Nile drainage except at its extreme northeast limits on the Loita Plains, where it enters the Rift Valley system. South of this point and lower down the Rift Valley it meets or merges into the highland race of British East Africa, *roosevelti*.

The Roberts race of the Grant gazelle was described by Oldfield Thomas from specimens collected by F. Russel Roberts and Gilbert Blaine in the vicinity of Mwanza, a lake port on the southern coast of the Victoria Nyanza. Ten years previous to this discovery Oscar Neumann had collected specimens of the same race on the Loita Plains of British East Africa and had noted their peculiar horn shape, but had regarded them as abnormal specimens of the typical race. In characters this race is distinguishable from the other races chiefly by the peculiar wide-spread horns which turn outward and diverge widely, the extreme tips turning backward. Normally the spread equals the length of horn taken along the curve, but in abnormally twisted horns the spread greatly exceeds the length. The females do not show the peculiar horn characters, but are distinguishable by their almost total loss of the dark flank band which is either obsolete or only faintly indicated posteriorly. Both sexes differ further from their nearest ally, *roosevelti*, by their lighter dorsal coloration.

In size this race is practically equal to *roosevelti*. An average specimen measures: in length of head and body along the curve of the back, male 59 inches, female 53 inches; length of tail, male $11\frac{1}{2}$ inches, female $10\frac{1}{2}$ inches; length of hind foot from the hock to the tips of the hoof, male $17\frac{3}{4}$ inches, female, $16\frac{1}{2}$ inches; length of ear from notch, male $6\frac{1}{2}$ inches, female $6\frac{1}{4}$ inches. The length of the horns along the curve in the record male, a specimen shot by R. J. Cuninghame on the Loita Plains and now in the United States National Museum, is $28\frac{1}{2}$ inches, and the greatest spread at the tips is $39\frac{1}{2}$ inches (record). The second longest-horned male in the same institution is very little above the average, measuring in length 25 inches and in spread $25\frac{1}{2}$ inches. The longest-horned female has horns 15 inches in length with a spread of only $6\frac{7}{8}$ inches. The widest-spread female horns show a width of $11\frac{1}{2}$ inches and

a length of only 10 inches. A large series of specimens have been examined in the National Museum from the Loita Plains and Amala River in British East Africa.

ROOSEVELT GRANT GAZELLE

Gazella granti roosevelti

NATIVE NAMES: Masai, *olkwargas*; Kikuyu, *ndaratari*.

Gazella granti roosevelti Heller, Smith. Misc. Coll., 1913, vol. 61, No. 7, p. 4.

RANGE.—Typical of the elevated Athi Plains district ranging southeast to Makindu, north as far as the southern slopes of Kenia, and westward to the Rift Valley, where it extends as far north as the south shore of Lake Baringo. West of the Rift Valley of British East Africa, it is separated from *robertsi* by the Mau Escarpment, and farther south in the valley it merges, no doubt, into typical *granti* and eastward into *serengetæ* on the northwestern slopes of Kili-manjaro.

This race has been considered by sportsmen and naturalists as typical *granti* owing to the lack of specimens from the original locality in Ugogo for comparison of differences. The type specimen was shot by Colonel Roosevelt near Kitanga Farm, Mau Hills, Athi Plains, April 26, 1909, and described recently by Heller as a new race. Others were shot in the same vicinity near Kapiti Station and near Kilima Kui, while other specimens were secured in the Rift Valley near Lakes Naivasha and Elementaita. The Roosevelt Grant gazelle is nearest the typical *granti* of Ugogo, German East Africa, in color, but differs by its darker coloration and by the smaller and less wide-spread horns. From *robertsi* it differs by decidedly less widely spread horns and somewhat darker color in the males and further by the female being marked by a distinct dark flank band. From *serengetæ* it differs by the wider and less divided white rump patch and considerably lighter body coloration.

The dorsal color of the adult male is vinaceous-cinnamon paling toward the head and on the sides to pinkish-buff. The top of the rump and hinder border of the thighs is marked by a wide area of pure white which is continuous



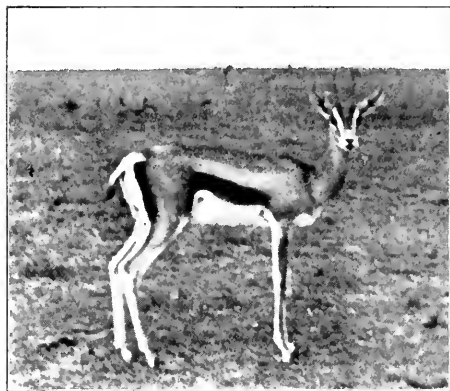
BLACK-SNOUDED THOMSON
GAZELLE, MALE
From British East Africa
Record horns, 16 inches



EAST AFRICAN IMPALLA
MALE
British East Africa



ROOSEVELT GRANT GAZELLE
MALE
Shot by Theodore Roosevelt
Bondeni, Kapiti Plains, B. E. A.



ROOSEVELT GRANT GAZELLE, FEMALE
Photograph by J. L. Clark at Juju Farm, B. E. A.
Presented by W. M. McMillan to National Zoological Park



EAST AFRICAN IMPALLA, ADULT MALE
Shot by Theodore Roosevelt, Loita Plains



ROBERTS GRANT GAZELLE, MALE
Shot by R. J. Cuninghame, Loita Plains, B. E. A.
Record spread and length of horns



BLACK-SNOUDED THOMSON GAZELLE
ADULT FEMALE
Loita Plains, B. E. A.

GAZELLES AND IMPALLA

with the white basal portion of the tail, the terminal half of which is black. The rump area is bordered in front by a dark bistre pygal stripe one-half inch wide. The flanks show a very slight indication of the flank band, which is set off by a lighter band of light buff bordering the broad band of pinkish-buff above along middle of body. The outside of the legs is pinkish-buff, like the sides; and the hoofs in front are bordered by tufts of brown hair. The under-parts and the inside of the legs and the lower throat are silky white. The top of the head and the median line of the snout is cinnamon-rufous, and the middle of the snout is marked by a large clove-brown blotch. There is a grayish border of hair about the horn bases, and a blackish blotch above the eyes. The sides of the face are marked by a broad white band above the eye extending forward to the dark snout spot, and bordered below by an ill-defined, narrow, dusky-cinnamon streak from the eye to the muzzle. The orbital area is white with a bistre-brown supraocular spot extending to the horn bases. The tip of the snout is pale pinkish-buff. The lips and chin are white. The forethroat is white like the chin, but the midthroat is pinkish-cinnamon like the nape. The ears are pinkish-cinnamon, bordered at the tip by bistre, and the inside and a spot below the base is white. The adult female resembles the male closely in general coloration with the exception of the sides, which are marked by a broad flank band bordered above and below by an equally wide band of pinkish-vinaceous distinctly lighter than the cinnamon of the back. The dark pygal band is much wider than in the male. Newly born young are different in color from the adults, but the color pattern is quite similar. The dorsal color is drab-gray lined sparingly by black, and the hind legs are similar, but the forelegs are more buffy. The head markings of the adult are indicated, but the white areas are suffused with buffy and do not show much contrast. The crown of the head is buffy, not rufous, as in the adult. The dark flank band is much less distinct than in the adult female, and is mixed largely with buffy and does not show the light band below separating it from the white of the belly. The white rump patch is only indicated, being narrow and separated on the median line by the color of the back extending onto the tail, and is not pure white, but suffused with buffy. The

black pygal stripe is very narrow and short. The young are distinguishable from the young of *thomsoni* of the same age by their larger size and more extensive white rump patch and white tail base.

The measurements in the flesh of average adults are: head and body along curve of back, male 58 inches, female 53 inches; tail, male 11 inches, female $10\frac{1}{2}$ inches; hind foot from hock to tip of hoofs, male $18\frac{3}{4}$ inches, female $16\frac{1}{2}$ inches; length of ear from notch, male $6\frac{1}{4}$ inches, female 6 inches. Length of horns along curve of largest male in the National Museum $24\frac{1}{2}$ inches, female $13\frac{1}{2}$ inches; greatest spread on outside curve in male 16 inches, female $9\frac{1}{4}$ inches. Specimens have been examined at the National Museum from the Athi Plains, Kitanga, Bondoni, Potha, Rift Valley, Lake Naivasha, Lake Elementaita, and Mount Suswa. The vertical range of the race extends from 3,000 to 6,500 feet throughout the open grassy plains country.

RAINEY GRANT GAZELLE

Gazella granti raineyi

NATIVE NAME: Rendile, *haul*.

Gazella granti raineyi Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 6.

RANGE.—From the northern slopes of Kenia, northward throughout the desert region to the eastern shore of Lake Rudolf, eastward at least as far as the Lorian swamp. Limits of range not known owing to lack of specimens from the intermediate districts.

The Rainey Grant gazelle was described from specimens shot by Paul J. Rainey near the junction of the Northern Guaso Nyiro and the Isiola Rivers, some sixty miles due north of Mount Kenia. Specimens from this district have long been known to sportsmen under the name of *notata*. The latter, although coming from the same general district, is a peculiar local highland form of the Lorogi Mountains, while *raineyi* is a close ally of *brighti*, from the Turkana country west of Lake Rudolf. The Rainey Grant gazelle resembles *brighti* closely, but differs by the presence of a distinct dark pygal band or border to the white flank patch, by darker dorsal color and larger

size and more wide-spread horns. It differs from *lacuum* by darker coloration and the presence in the adult female of a dark flank band. From *roosevelti* it may be distinguished by the decidedly smaller and more parallel horns and by the smaller and lighter-colored dark nose spot.

The dorsal color of the adult male is light vinaceous-cinnamon, paling toward the head and on the sides, where it becomes pinkish-buff. The top of the rump and the hinder border of the thighs is marked by a wide area of pure white, which is continuous with the white basal portion of the tail. The terminal half of the tail is black. The rump area is bordered in front by a bistre pygal stripe one-half inch wide. The flanks have a very slight indication of the flank band in the form of a lighter band of light buff bordering the broad band of pinkish-buff above. The outside of the legs is pinkish-buff like the sides of the body. The hoofs in front are bordered by brown hair. The underparts and the inside of the legs and the lower throat are silky white. The top of the head and the median line of the snout are cinnamon-rufous. The middle of the snout is marked by a dark sepia blotch. There is a grayish patch about the horn bases and a blackish one above the eyes. The sides of the face are marked by a broad white band above the eye extending forward to the dark snout spot, and bordered below by an ill-defined, narrow dusky-cinnamon streak from the eye to the muzzle. The orbital area is white with a bistre-brown supraocular spot extending to the horn base. The tip of the snout is pale pinkish-buff. The lips and chin are white. The forethroat is white like the chin, but the midthroat is pinkish-cinnamon like the nape. The ears are pinkish-cinnamon, bordered at the tip by bistre, and the inside and the base are white. The adult female is like the male in color, but has a well-marked dark flank band and broader and darker pygal stripes. The nursing young are buffy-drab in color, as described under *roosevelti*.

Specimens collected by the Rainey expedition have been examined from the desert country watered by the Northern Guaso Nyiro from the junction of the Ngare Narok down as far as the Lakiundu junction. North of this latter point specimens have been examined from Karo, Longaya, and

Merille in the country just south of Mount Marsabit. This race inhabits the low thorn-scrub desert between the altitudes of two thousand five hundred and one thousand feet.

The measurements of an average adult are: head and body, along the curve of the back, male 55 inches, female 53 inches; tail vertebræ, male $11\frac{1}{2}$ inches, female $10\frac{1}{2}$ inches; hind foot from hock to hoof, male $18\frac{1}{4}$ inches, female $16\frac{1}{2}$ inches; ear from notch, male $6\frac{1}{4}$ inches, female 6 inches. The longest-horned male in the National Museum has horns 25 inches in length and a spread of $10\frac{1}{2}$ inches. The widest-spread male horns in a series of fifteen measure 12 inches. An average pair is about 22 inches in length by 10 inches in spread. The female horns vary greatly in a series of seven, in which the longest pair is also the widest and measures $14\frac{3}{4}$ by $10\frac{3}{8}$ inches. An average pair is somewhat shorter and much narrower, being 12 by 6 inches.

BRIGHT GRANT GAZELLE

Gazella granti brighti

Gazella granti brighti Thomas, 1900, Proc. Zool. Soc., p. 805.

RANGE.—Northwest shore of Lake Rudolf west to the head of the Nile watershed.

Doctor Donaldson Smith, who collected the specimens which led to the discovery of this race, has supplied practically all of the material upon which our present knowledge of the race is based. These include the type and a few others from the Magois district, situated near the Nile-Rudolf watershed, one hundred miles west of the north end of the lake. Some months previous to Donaldson Smith's expedition Major Bright, for whom the race has been named, collected a female gazelle from the northwest shore of Lake Rudolf, which was later, upon the evidence supplied by Smith's specimens, determined as a member of the new race by Oldfield Thomas. In this race the dorsal coloration is very light, buffy-fulvous, the dark flank band is wanting, and the pygal stripe quite obsolete or but faintly indicated by a narrow line of dark hairs. The horns are small and extend almost parallel, showing very little spread at the tips.

ABYSSINIAN GRANT GAZELLE

Gazella granti lacuum

Gazella granti lacuum Neumann, 1906, Sitz.-Ber. Ges. Nat. Freu., No. 9, p. 243.

RANGE.—The Rift Valley of southern Abyssinia in the neighborhood of Lake Zwai, and thence southward to Lake Abaya. Limits of range not known.

This, the most northern race, was described by its discoverer, Oscar Neumann, from specimens collected at Lake Zwai, supplemented by others from Lake Abaya. It apparently occupies an isolated plateau region north of and distinct from the low desert where *brighti* is found. It is described as a small race, but with larger and wider-spread horns than *brighti*, and with the dark pygal band fairly well marked. No dimensions have been given by the describer. Two specimens from Lake Zwai, collected by W. N. McMillan, have been examined at the British Museum. Only one of these is without the dark side stripe, but both have the dark pygal band broad and the horns fairly wide-spread.

LOROGI GRANT GAZELLE

Gazella granti notata

Gazella granti notata Thomas, 1897, *Ann. & Mag. Nat. Hist.*, ser. 6, vol. XV, p. 479.

RANGE.—Southwest slope of the Lorogi Mountains.

The type was collected by A. H. Neumann while elephant hunting on the southwest slope of the Lorogi Mountains, near a small lake or swamp known as Kisima. It was only on this high plateau, having an altitude of some five thousand feet, that this boldly marked race was found. The characters of the race are the presence of a dark lateral band present in the adult male, very wide and dark, extending from the shoulder to the rump patch, and the dorsal coloration very dark or rufous. The Lorogi Grant gazelle is known only from the type specimen, which is a headless skin.

SERENGETI GRANT GAZELLE

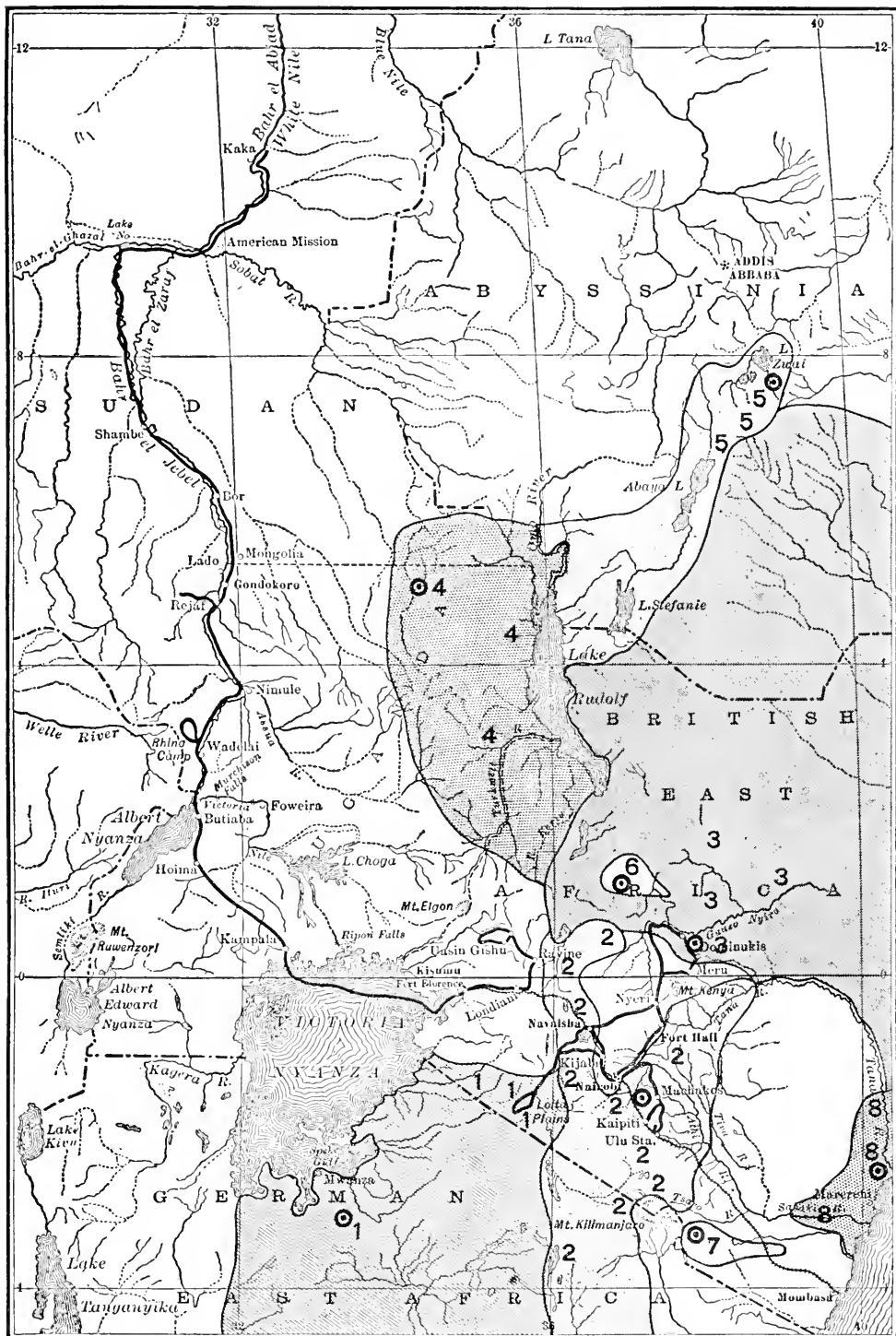
Gazella granti serengetæ

Gazella granti serengetæ Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7, p. 5.

RANGE.—Serengeti Plains east of Kilimanjaro. Limits of range not known.

The type specimens were collected by Doctor W. L. Abbott, near Taveta, in 1888, during his expedition to Kilimanjaro. No other specimens agreeing with these in color have been examined from East Africa. The Serengeti Grant gazelle is most closely allied in size to the typical *granti*, from which it differs by having the white rump patch divided by a narrow streak of the cinnamon of the back extending to the base of the tail. In this character it approaches *petersi*, which, however, has the rump broadly divided by the color of the back and differs by the smaller and more parallel horns.

The dorsal color in the adult male is mikado-brown paling toward the head and on the sides, where it becomes pinkish-buff. The top of the rump and the hinder border of the thighs are marked by a wide area of pure white, which is continuous with the white basal portion of the tail. The terminal half of the tail is black. The white rump patch is narrow, being one inch wide at the base of the tail as well as on the hinder parts of the thighs. The cinnamon of the back extends on the tail as a narrow dorsal stripe to the black tip, only the basal one-third of the tail being white, leaving the terminal two-thirds black. The white pygal band is well marked, but the dark flank band is absent. The outside of the legs is pinkish-buff, like the sides. The hoofs in front are bordered by tufts of brown hair. The under-parts and the inside of the legs and the lower throat are silky white. The top of the head and the median line of the snout are cinnamon-rufous. The middle of the snout is marked by a dark sepia blotch. There is a blackish blotch above the eyes. The sides of the face are marked by a broad white band above the eye extending forward to the dark snout spot, and bordered below by an ill-defined, narrow dusky-cinnamon streak from the eye to the muzzle. The orbital area is marked by a bistre-brown supraocular spot extending to the horn bases. The tip of the



MAP 30—DISTRIBUTION OF THE RACES OF GRANT AND PETERS GAZELLES

- | | | | |
|----------------------------------|------------------------------------|-----------------------------------|---------------------------------|
| 1 <i>Gazella granti robertsi</i> | 2 <i>Gazella granti roosevelti</i> | 3 <i>Gazella granti raineyi</i> | 4 <i>Gazella granti brighti</i> |
| 5 <i>Gazella granti lacuum</i> | 6 <i>Gazella granti notata</i> | 7 <i>Gazella granti serengetæ</i> | 8 <i>Gazella petersi</i> |

snout is pale pinkish-buff. The lips and the chin are white. The forethroat is white like the chin and the midthroat pinkish-cinnamon like the nape. The ear is pinkish-cinnamon, bordered at the tip by bistre, and the inside and the spot at the base are white. The female resembles the male in the darkness of the dorsal coloration. The dark lateral band is present as in *roosevelti*, but it is decidedly less distinctly marked or obsolete anteriorly near the shoulders.

No flesh measurements of this race are available. The horns of the two adult males are very much alike in shape and size. They diverge gradually toward their tips, but are not bowed out or lyrate in shape, and closely resemble horns of the smaller species *petersi*. In length along the curve they measure $21\frac{1}{4}$ and $20\frac{1}{2}$ inches, and in greatest spread $9\frac{1}{2}$ and 12 inches, respectively. The horns of the two females are quite similar in shape to the males, but much smaller, measuring in length 14 and $12\frac{1}{4}$ inches, and in spread $6\frac{3}{4}$ and 6 inches, respectively.

This race approaches the smaller gazelle of the coast district, *petersi*, really closely in horn characters and somewhat in the color characters of the rump. It is, moreover, found occupying an intermediate territory. Peters gazelle is said to occur near Voi, some seventy miles east of Taveta, in the low desert flanking the Serengeti Plains, and it is quite probable that a series of specimens from this intermediate territory would exhibit intermediate characters. Peters gazelle occupies a distributional area distinct from that of any of the races of Grant gazelle, but adjacent to some of them, and has every appearance of being one of these races, though the lack of specimens prevents us from determining the exact status of this form.

PETERS GAZELLE

Gazella petersi

NATIVE NAME: Swahili, *sala*.

Gazella petersi Günther, 1884, *Ann. & Mag. Nat. Hist.*, ser. 5, vol. XIV, p. 428.

RANGE.—From the Taru Desert northward to the mouth of the Tana River and thence northeast along the coast through the Jubaland Province.

Doctor G. A. Fischer, during his exploration of the lower Tana Valley in 1878, collected the first specimens of this gazelle at Gelidja, near the delta of the Tana. This material was referred by Doctor Peters to *Gazella granti* in his report on the collection of mammals made by Fischer. A figure of the skull and horns published by Peters led Doctor Günther, some five years later, to the conclusion that they represented a species different from *granti*, owing to the difference in horn shape and size. He described the species as new, naming it for Doctor Wilhelm Peters, director of the Berlin Museum.

Peters gazelle may be known by the following characters: white rump patch divided widely by the extension of the body color to the tail base, the dorsal bridge of cinnamon being almost as wide a separation as in *Gazella thomsoni*; width of white rump patch on sides of thighs much less than in *granti*; dark pygal stripe wide and pronounced, but dark lateral band wanting in adult males; horns short and narrow and without the lyrate spread or S-shaped curve backward as in *granti*; body size smaller.

No flesh measurements of specimens are available. The horns seldom exceed 21 inches in length along the curve, or more than 8 inches in spread near the tips. Specimens are recorded from the Taru Desert, Mount Pika-Pika, Merereni on the coast of Formosa Bay and the mouth of the Tana River.

THOMSON GAZELLE

Gazella thomsoni

The small gazelle of East Africa is distinguishable from the large Grant gazelle by many important characters other than size. The small size and parallel direction of the horns at once distinguish the male. The black lateral band, which is equally well developed in both sexes, is of a different character than the black band of the female Grant gazelle, in which the white of the belly is separated from the black by a narrower fulvous band. In the Thomson gazelle the black band borders the white of the under-parts, and is as well marked in old age as in youth. The Thomson gazelle differs further from its larger associate by the possession

of a pair of large inguinal glands on the flanks, which are conspicuously marked by tufts of long white glandular hair. The tail of the Thomson gazelle is also quite different in character, being covered by long hair throughout, as in the impalla, and not short-haired at the base with a tufted tip, as in the Grant. The knees are furnished with brushes. The females exhibit short, crooked, irregular horns varying from mere stubs to six inches in length. No absolutely hornless female specimens are known, although statements to this effect are occasionally recorded. It appears, however, that the females are gradually losing their horns, which are now subject to great irregularity and are no longer of value as weapons. The sexes agree closely in coloration. The male in age becomes lighter on the crown and nape, the reddish color being replaced by whitish. The young are dark, with little of the fulvous color of the adults, being drab in color. They exhibit the black flank band, the dark nose spot and eye stripe and the absence of white on the rump, and by these characters may be recognized from *granti* of the same age. The female is somewhat smaller than the male in body size. The skull shows much variation in the size of the nasal and premaxillary bones, but differs from *granti* by its much deeper or larger anteorbital fossa. There is also marked variation in the shape of the horns, individual specimens showing much difference in the spread at the tips. A German naturalist, Knottnerus-Meyer, has recently divided the Thomson gazelle into many races, some thirteen, based on differences noted in the horns and skulls of a few individuals. Such differences, however, when applied to the large series of specimens in the National Museum, have been found to be individual and of no racial value. The two races here recognized were as many as appeared worthy of distinct names. The Thomson gazelle is essentially a highland antelope and typical of the Rift Valley and the highland region bounding it, throughout which it ranges from the Rift Valley of central German East Africa north to Kilimanjaro and Mount Kenia and westward to the south and east shores of the Victoria Nyanza. The distribution of the Masai tribe coincides quite perfectly with that of this small gazelle.

KEY TO THE RACES OF *thomsoni*

Snout without a darker patch near the tip; the dark stripe through the eye dark reddish, not blackish; dark pygal stripe narrow; horns parallel in direction with the tips close together *thomsoni*

Snout marked by a large black patch near the tip; the diagonal stripe through the eye blackish; pygal stripe wide and distinctly blackish; horns wider-spread at the tips *nasalis*

KILIMANJARO THOMSON GAZELLE

Gazella thomsoni thomsoni

Gazella thomsoni Günther, 1884, *Ann. & Mag. Nat. Hist.*, vol. XIV, p. 427, fig. of horns.

RANGE.—From the Kilimanjaro region southward through the Rift Valley to Irangi in German East Africa.

The Thomson gazelle bears the name of a noted explorer of British East Africa, Joseph Thomson. Thomson arrived at Mombasa in 1883 and journeyed inland by way of Kilimanjaro and the Masai highlands as far as Lake Baringo. During his travels he met frequently with this gazelle and brought back with him to England several pairs of the horns. No exact locality was attached to these specimens, nor was any mention made in his account of the journey in "Through Masailand," as to where the specimens were shot or regarding the occurrence of gazelles on his route. The horns were figured and described by Doctor Günther as those of a new gazelle which he dedicated to Thomson, but no exact locality was given the specimens collected by him. In the absence of a definite locality the typical race has been assigned to the Kilimanjaro region, where Thomson spent considerable time in exploring the south, east, and north slopes of the great mountain. Willoughby, Hunter, and Abbott, a few years later, shot specimens on the plains flanking Kilimanjaro on the south-east. The first complete specimens of the gazelle received at the British Museum were sent by Jackson, and upon one of these was based the colored figure in the "Book of Antelopes."

The typical form of the Thomson gazelle may be known by the absence of the dark patch on the nose and by the lighter color of the dark eye stripe of the face, which is rufous rather than black. The dark pygal stripe on the hind quarters is also narrower and less distinctly marked, usually being brownish in color. The horns of the Kilimanjaro race are more parallel in direction and less widely spread at the tips than those of *nasalis*, but they are no shorter in length. No flesh measurements of specimens are available. The length of fully adult horns is stated by Willoughby to be 14 inches in length. The specimen in the National Museum, collected by Doctor Abbott at Taveta, has horns one inch less than this dimension. Specimens have been recorded by Oscar Neumann as far south as Mount Gurui in the Irangi district of German East Africa.

BLACK-SNOURED THOMSON GAZELLE

Gazella thomsoni nasalis

NATIVE NAMES: Masai, *ol-oilin*; Kikuyu, *enclaratali*.

Gazella thomsoni nasalis Lönnberg, 1908, Mams. Sjöstedt Exp. Kilimanjaro, p. 46.

RANGE.—From the southern and eastern shores of the Victoria Nyanza, in German East Africa, northward to British East Africa as far as the southwestern slope of the Lorigi Mountains and eastward to the eastern edge of the highland region as far as Makindu Station and Mount Kenia.

The Thomson gazelle inhabiting the highlands of British East Africa was named *nasalis* by Lönnberg, owing to the presence of a black nose spot by which the race may be distinguished from the typical form. Upon comparing specimens from Kilimanjaro with the colored figure of Thomson gazelle in the "Book of Antelopes," the difference in snout coloration was discovered and led to the naming of the highland race as new. The describer, however, assigned his race to northern Uganda and the Lado Enclave, under the assumption that such localities represented the extreme northern range of the gazelle. The northern limits, however, fall many miles short of these territories, but as the name is based on a colored illustra-

tion which is founded on a mounted specimen secured by Jackson in British East Africa, it is available for the gazelle inhabiting the interior highlands.

The Thomson gazelle, everywhere known as the Tommy, is an abundant animal on the plains of much of British East Africa. Its range roughly corresponds with the range of the common kongoni hartebeest and the wildebeest; why it should not, like the zebra, extend this range to take in other stretches of country of seemingly the same character is hard to understand. It is another case like that of the hartebeests, like that of the topi and the wildebeests, where the sharply drawn line of distribution seems entirely artificial, there being no difference of flora or of climate to account for the abundance of the species in one place and its absence from another place substantially the same in character.

The Tommy is the smallest of the true plains game. It is purely a beast of the open grass-land, and in its habits it does not differ materially from the bigger plains game with which it associates. It is generally found where there are no trees at all, but it does not object to the presence of the thinly scattered acacias which in Africa one grows accustomed to associate with the sight of teeming wild life. It is one of the numerous antelope which never hide and never seek to escape observation. Its coloring is conspicuous because of the vivid black lateral stripe, and as its tail is twitching violently all the time, and, as it never seeks cover, it never, when adult, eludes the sight of any foe if the conditions are such that any animal can be seen at all. The fawns, as is the case with the young of all antelopes, and even of wild oxen, and probably

of wild horses, do crouch flat and endeavor to escape the eyes of their foes; but the adults trust only to their keen senses and their speed for safety. Tommies frequently lie down, but they never seek to escape observation when lying down, and, on the contrary, usually seem more anxious and alert at such times than when standing. They seem to know that they are at a disadvantage when not standing. Their speed is great. Mr. Rainey's greyhounds were unable to catch them. When pursued by an ordinary dog they merely play along in front of him, bounding and cutting pranks, and treating the whole affair as a frolic. The cheetah, however, can run them down, as it can every other animal on the face of the earth. The fawns are preyed on by jackals, other small beasts of prey, and eagles, the adults by hunting hounds and cheetahs; but they do not wander into the domain of the leopard and are too small to be eagerly pursued by the lion, the arch enemy of all the bigger ruminants.

Tommies are gregarious and polygamous. They are found in small parties and also at times in bands of forty or fifty individuals; and occasionally they are found singly or in couples, an old buck by himself or a doe with a couple of fawns or a couple of young bucks. The does are prolific; we found fawns of every age, and sometimes one, sometimes two, with the mother. Tommies are grazers. They feed and rest alternately for a few hours at a time. They may be seen resting, feeding, or drinking at every hour of the day. They are easily tamed and make pretty and amusing pets. We often ran across them in the houses of the Boer settlers on terms of the utmost familiarity with the children. Normally, they are the least wild of the

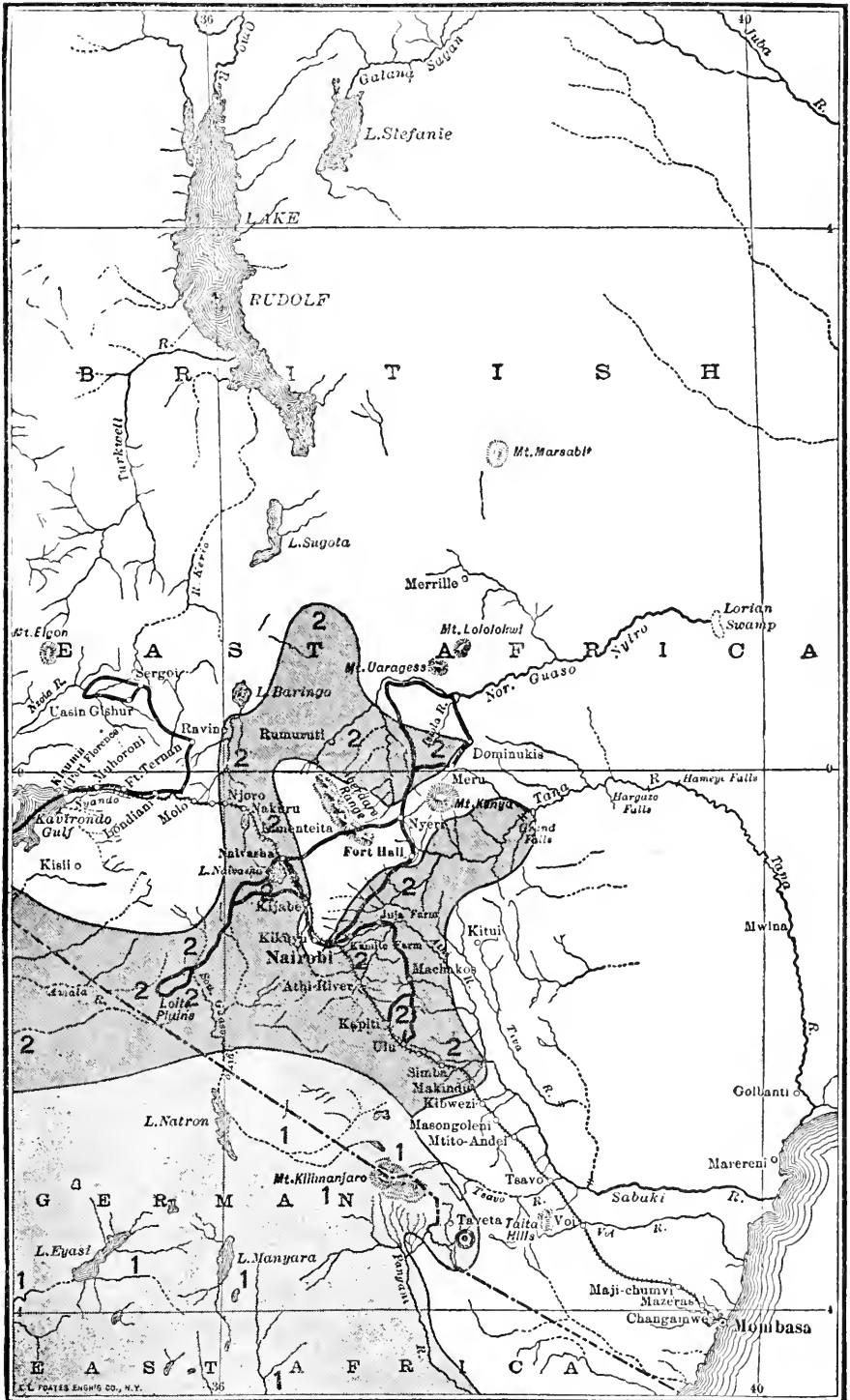
game. They do almost no damage to the settler, and they are so easily protected that there can be no excuse for their extermination or serious diminution. Any man or any woman interested in natural history could easily make an invaluable life study of these pretty and interesting little gazelles, because their tameness, their accessibility, and the nature of their haunts render it possible to study all their actions continuously and minutely from day to day throughout the seasons. Such a study, if serious and prolonged, and by a competent and interested observer, would throw much light on many problems of animal psychology. Most, although not all, of the plains game lead substantially the same lives, and as a rule they are very simple lives; but there are queer breaks in and exceptions to these lives, and on some points the species differed widely from one another, while in others the differences are individual rather than specific; and we need to know both the general rules of their conduct and, so far as possible, the explanations for the seeming exceptions.

The black-snouted Thomson gazelle is well characterized by its name. Besides this distinguishing character, it may be recognized by its darker colored or blackish facial stripes and by the more pronounced black pygal stripe. The horns are usually distinguishable by their wider spread and by their slightly greater length. The differences in these dimensions average two inches more in spread at the tips and one inch more in length compared to the typical race.

The coloration on the dorsal surface is a uniform cinnamon from the base of the tail to the nape. The lower sides are marked by a broad black flank band extending from the shoulder to the hind quarters, bordered below by the white under-parts and above by a wide stripe of vinaceous-buff distinctly lighter than the cinnamon dorsal

color. The hind quarters posteriorly are white, the white area bordered by a prominent black pygal stripe in front extending from the rump toward the hock. The tail is black and clothed uniformly with long hair. The legs on the outer surface are vinaceous-buff, and white on the inside where they are connected with the white under-parts. The dorsal surface of the snout is rufous, except the tip, which is marked by a large black patch. The sides of the face are marked by a broad white stripe from the horn base and eye region to the muzzle, which is bordered above by the dark dorsal surface of the snout and below by a black band from the anteorbital pore to the muzzle. The upper lips, chin, and throat are white. The crown, back of the ears, and the sides of the head are vinaceous-buff. The inside and the tips of the ears are white. The female shows only slight differences in color from the male, which are confined solely to the head, the crown being rufous or brownish and the nape cinnamon in conformity with the back. The young do not show the fulvous coloring of their parents, but are quite dark in color. They are drab, lined lightly by black, and have the dark side stripe much less conspicuous than the adults. They show the dark snout patch and have the whole crown and ears brownish or dusky as well as having the pygal band and white area to the hind quarters indicated.

The average measurements of adult male specimens in the flesh are: 47 inches in length of head and body; tail, $9\frac{1}{2}$ inches; hind foot, $13\frac{1}{2}$ inches; ear, $4\frac{3}{4}$ inches. The female is somewhat less in size, being usually 1 inch less in length of hind foot. The average horn length in this race is 13 inches, but specimens 15 inches in length are by no means rare. The record length given by Ward is $16\frac{1}{2}$ inches. The horns are really very uniform in length. The extremes in a series of sixty heads from British East Africa in the National Museum are: longest, $15\frac{3}{4}$ inches; shortest, $11\frac{3}{4}$ inches. The width, however, varies greatly, the extremes in the same series being from 3 to $8\frac{1}{4}$ inches. The horns of the females vary greatly in size and direction. Usually they are quite deformed and contorted and are seldom symmetrical. The extremes in length of a series of sixteen are: length, $2\frac{1}{2}$ to $5\frac{1}{2}$ inches; spread, $\frac{1}{2}$ to $3\frac{1}{2}$



MAP 31—DISTRIBUTION OF THE RACES OF THE THOMSON GAZELLE

1 *Gazella thomsoni thomsoni*

2 *Gazella thomsoni nasalis*

inches. A large series of specimens of this race have been examined in the National Museum, from the Kapiti and Athi Plains, the Rift Valley in the vicinity of Lake Naivasha, the Laikipia Plains north of Mount Kenia, and the Loita Plains and Southern Guaso Nyiro River district.

UGANDA RED FRONTED GAZELLE

Gazella rufifrons albonota

NATIVE NAME: Dinka, *el hamra*.

Gazella rufifrons albonota Rothschild, 1903, Nov. Zool., vol. V, p. 480.

RANGE.—From the northern frontier of Uganda, in the vicinity of Gondokoro, northward through the eastern drainage area of the Nile as far as the Sobat River, and eastward to the crest of the Nile watershed.

The Uganda race of the red-fronted gazelle was described by Walter Rothschild in 1903 from specimens collected near the Soudan station of Mongolla. In characters it differs from the northern Soudan race, *salmi*, by more contrasted head markings, the nose and lower half of the central face stripe being black mixed with rufous instead of buff, and the horns are wider-spread and more recurved backward with the points turned inward more. The general coloration resembles that of *Gazella thomsoni*, but it differs by having the dark flank band bordered below by a buffy band which separates it from the white of the under-parts. The body size and length of horns are similar to *G. thomsoni*. Horns of males average 12 inches in length along the curve with a spread at the tips of 6 inches.

The recorded specimens practically all come from the vicinity of Mongolla. Thomas, however, records a specimen of *G. thomsoni* collected by Donaldson Smith at a point ninety miles east of Mongolla, at the crest of the Nile-Lake Rudolf watershed, which may well be the Rothschild race of *rufifrons*. The Thomson gazelle is not known to occur in the Rudolf basin at all, its northern limits not extending beyond Lake Baringo and the Lorogi Mountains. The specimen recorded by Thomas is, moreover, well within the range of *Gazella rufifrons albonota*.

THE GERENUK

Lithocranius

Lithocranius Kohl, 1886, Ann. Mus. Wien, I, p. 79; type *L. walleri*.

The gerenuk is a striking peculiarity among East African antelopes in almost all its characteristics whether of body form or of habit. In Somaliland it is associated with an understudy, the dibatag, but in British East Africa, into which country it has but recently wandered, it stands alone. The grotesque figure of the gerenuk needs no description. It can be recognized as far as it is visible by its extreme slenderness, gauntness, and spidery aspect. The body is very narrow and mounted on extremely long, slender legs. The great length and slenderness of the neck, however, is one of its chief peculiarities. This structure is almost equal to the body in length and merges quite imperceptibly into the narrow head. The snout is long and produced at the tip into a short, prehensile lip or proboscis. The ears are large and somewhat more expanded than in the typical gazelles. The tail is thin-haired and of medium length. The knees are furnished with well-marked brushes. The male is armed with horns of a peculiar lyrate shape which are hooked forward sharply at the tips and ringed throughout most of their length, but the female is hornless. Four mammæ are present in the female. The dorsal color is a uniform cinnamon-red without the dark side stripe or head stripes of gazelles. The skull is peculiar among gazelles in its great flatness and length, the posterior part being produced backward into a knobbed crest on the occiput. The bones of the snout or premaxillaries are very slender and bent downward at their tips, as in the dikdik, and are of the characteristic shape found among species possessing a proboscis. The males are distinctly larger than the females, but are not distinguishable in coloration except by the absence of a dark crown patch. The young resemble the adult female in coloration. A single species is known which ranges from Somaliland and southern Abyssinia south to Kilimanjaro and German East Africa. The peculiar structure of the animal and its adaptability to a desert

habitat would suggest its origin in the Somaliland region and its extension later southward into British and German East Africa.

GERENUK

Lithocranius walleri

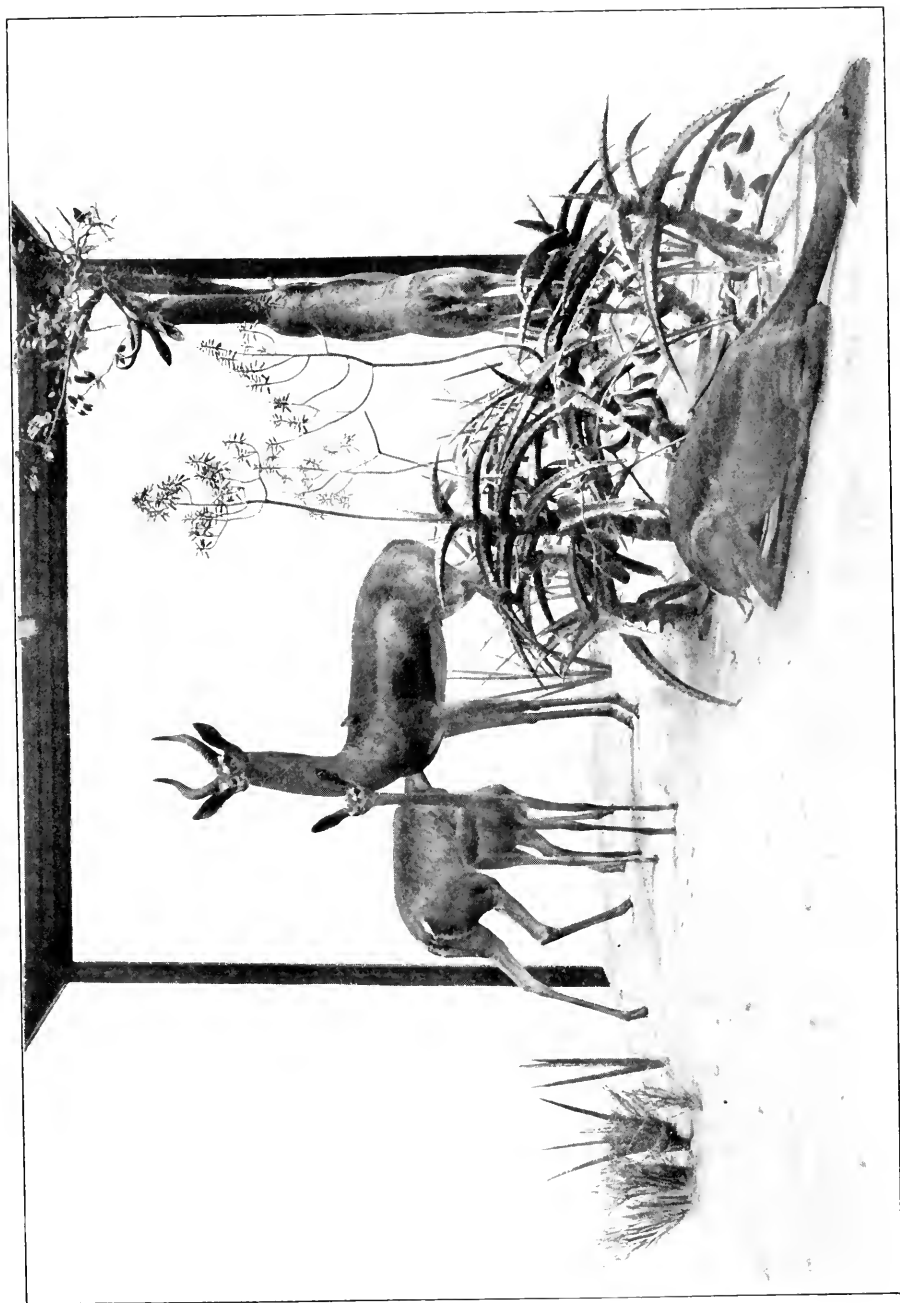
NATIVE NAMES: Somali, *gerenuk*; Rendile, *tange*.

Gazella walleri Brooke, 1878, Proc. Zool. Soc., p. 929, pl. LVI.

RANGE.—From Somaliland and southern Abyssinia southward throughout the coast and Lake Rudolf drainage area to the Kilimanjaro district and the Rift Valley of German East Africa as far south as the mouth of the Pangani River.

The gerenuk was first described by Sir Victor Brooke from specimens received from Waller, supposedly from the Kilimanjaro region. Sclater and Thomas, however, in the "Book of Antelopes," refer the origin of these specimens to the coast district near the mouth of the Juba River, on information received from Sir John Kirk, from whom Waller is alleged to have obtained the specimens sent to Brooke. The species is of rare or local occurrence in the Kilimanjaro region and has been obtained by very few sportsmen in that district. North of the Tana River, however, and throughout Somaliland it is universally distributed and is well known to every traveller who has visited these regions. It is doubtless from this latter region that the specimens described by Brooke were obtained. Herr Oscar Neumann, in 1899, described the gerenuk of Somaliland as a new race, giving as characters larger body size, paler color, lighter-colored knee-brushes, and less extent to the white area on the back of the hind quarters. Specimens from the Northern Guaso Nyiro district in the National Museum are fully as large as the dimensions of Somaliland specimens and resemble them closely in color and extent of the white on the hind quarters. The color of the knee-brushes in these specimens varies from light brown to seal-brown or black. We doubt very much if the Somali gerenuk can be distinguished from specimens from British East Africa.

This queer, long-legged, long-necked antelope, called by the Swahilis "little camel," was common in the dry, thorn-



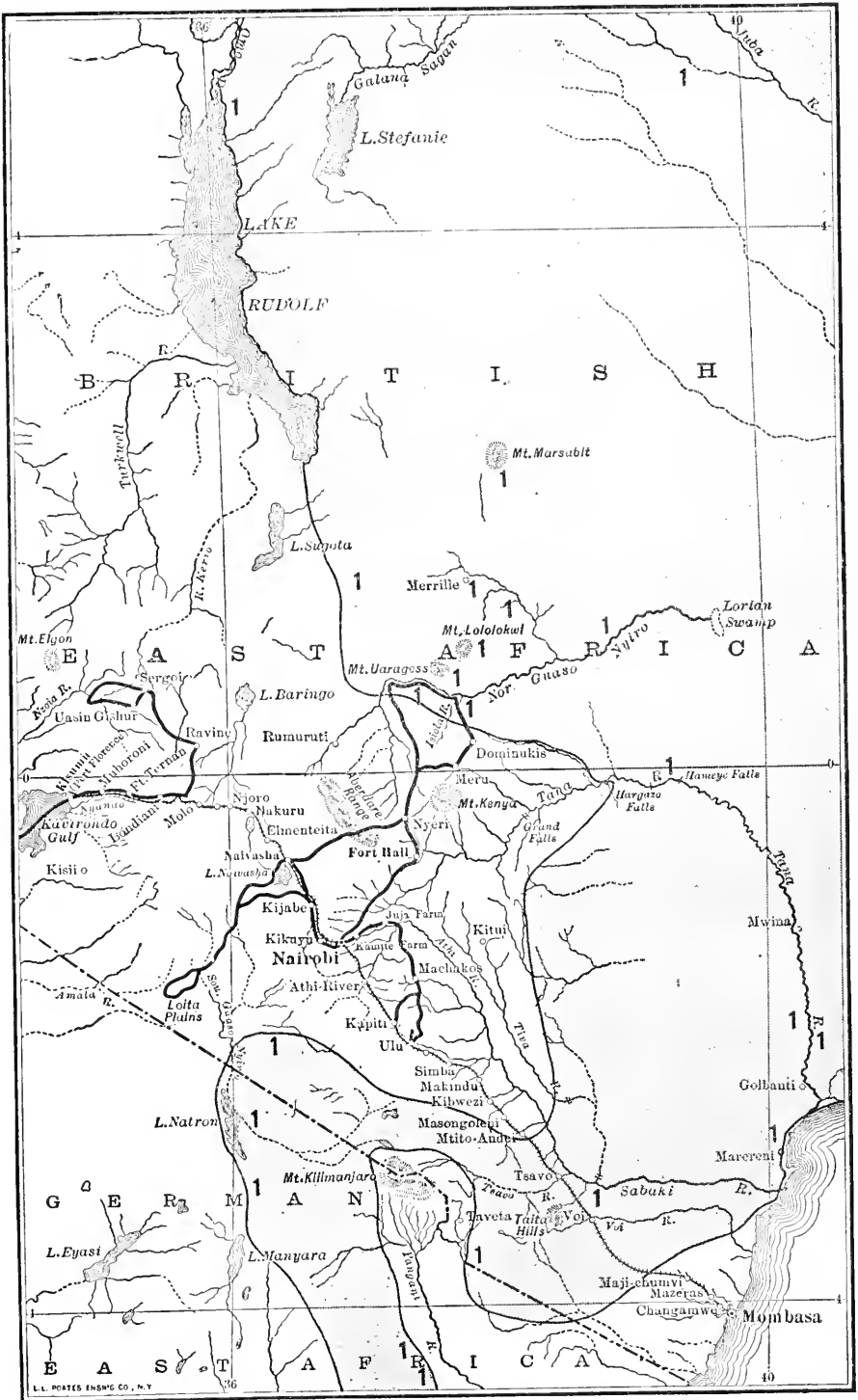
GREYHOK FROM SOMALILAND
Group mounted by Carl E. Akely in the Field Museum, Chicago

scrub-covered country along the Northern Guaso Nyiro. It was as wild and wary as the gazelle of the neighborhood was tame. It was always found singly or in small parties, sometimes near the river, more often in the driest regions; and the gerenuk, which lived away from the neighborhood of water, certainly did not drink at all. They browsed on the twigs and withered leaves of the bushes and low thorn-trees. The stomach contents of two or three specimens included leaves of the tooth-brush bush, *Salvadora persica*; wait-a-bit acacia leaves, *A. mellifera*; and berries of nightshade, *Solanum campylacanthum*. All their attitudes are characteristic and unlike those of other antelopes. They frequently rise on their hind legs to snatch some bunch of leaves which is beyond the reach of their long necks, and when alarmed they sneak off at a trot through the bushes with the head and neck stretched straight in front of them. They were quite indifferent to heat, and we saw them feeding at noon as often as in the morning or evening. They were sometimes found in the barren, open plains, crossing from one patch of scrub to another, and if surprised in such a place they would break into a gallop. More often they were found in the rather thinly bushed tracts—the bushes at the time of our visit being well-nigh leafless—and then they preferred to skulk and hide.

The dorsal color of the body is uniform cinnamon-rufous and covers the back like a short blanket, being sharply defined along the middle of the sides by a band of lighter color, or buff-pink. The buff-pink extends over the middle and lower sides, and is defined in its turn sharply against the white under-parts. Upon the sides of the neck, however, there is no sharp contrast between the color of the nape and that of the throat. The limbs are uniform

buff-pink like the sides of the body with the exception of the knee-brushes on the forelegs, which are usually blackish centrally and very conspicuous. The color of the body is continued on to the tail as a narrow crest of cinnamon hair to the black tufted tip. The under-surface of the tail is quite hairless. The crown is bright rufous from the horn bases to the tip of the snout, the red color merging gradually on the sides to the buff-pink. Above the eye is a conspicuous white stripe from the horn base to well in front of the eye. The region below the eye is also whitish, as well as the lips, chin, and a median stripe extending down the centre of the throat a short distance. The back of the ears is like the sides, buff-pink, and the inside is marked by a few diagonal rows of long white hairs. The female differs in coloration from the male by having a dark-brown or blackish patch on the crown and by dark tips and backs to the ears. The young have the dark crown patch of the female and are quite like their female parent in coloration.

The dimensions of an adult male in the flesh were: head and body, 50 inches; tail, 11 inches; hind foot, 17 inches; ear, $5\frac{3}{4}$ inches. The largest male skull in a series of eight is $9\frac{3}{4}$ inches in greatest length. An adult female skull measures $8\frac{1}{4}$ inches. Horns measuring 14 inches in length are not rare in British East Africa. The record is not greatly in excess of this average, being only 16 inches. The Somaliland record only exceeds this by one inch. A series of nineteen specimens from the Northern Guaso Nyiro are in the National Museum, collected by the Roosevelt and Rainey expeditions. These represent localities along the middle course of the river and northward in the desert near Mount Marsabit. Donaldson Smith has shot specimens much farther north at the north end of Lake Rudolf and others east of the lake on the headwaters of the Juba River. The southern limits of the range are marked by specimens shot in German East Africa by Schillings on the Pangani River south of Kilimanjaro. Hunter met with the gerenuk near Lake Jipe, southeast of Kilimanjaro and also on the Tana River. Jackson records it as abundant on the coast at Merereni, north of the Sabaki River.



MAP 32—DISTRIBUTION OF THE GERENUK

1 *Lithocranius walleri*

THE IMPALLA

Æpyceros

Æpyceros Sundevall, 1847, K. Vet. Akad. Handl., 1845, p. 271; type *A. melampus*.

The impalla is one of the aberrant members of the subfamily *Antilopinae*, of which the gazelles are typical. It resembles the gazelles more closely in skull structure than any other group, and in conformity with them the snout shows a large narial chamber and broad, short nasal bones, but differs by having a large oval sinus on the sides of the snout between the premaxillary and maxillary bones. In the absence of anteorbital fossæ it differs decidedly from African gazelles, but in this respect resembles such Asiatic members as the chiru, *Pantholops*, of Tibet and the Mongolian gazelles of the genus *Procapra*. The absence of false hoofs distinguishes the impalla from all other large antelopes. Other characters which serve to separate it from the African gazelles are the absence of the anteorbital gland and pore on the face, the absence of horns in the female, the lack of stripes on the face or body, the bushy tail and the presence of four mammæ in the female. The only gazelle marking in the coat is the black pygal stripe on the hind quarters. A color character, confined to this antelope alone, concerns the feet. The hind legs are marked on the cannon-bones by two oval black patches in which the hair is much longer and coarser and overlies a glandular area of the skin similar to the metatarsal glands of the white tail deer. The position of the fetlocks is marked by two smaller black patches. The sexes are alike in color, but the female is somewhat smaller than the buck in size. The newly born young differ in no way conspicuously from the coloration of their parents.

The genus contains a single species which is confined to the Ethiopian region, where it ranges from the Orange River, in South Africa, northward on the East Coast as far as British East Africa and southern Uganda. In the southern part of its range it spreads westward to Angola, but is not found north of that district in the Congo forest area or the Nigerian region.

EQUATORIAL IMPALLA
Æpyceros melampus suara

NATIVE NAMES: Kinyamwesi, *suara* ; Swahili, *swala* ; Kikamba, *ndadai*.
Strepsiceros suara Matschie, 1892, Sitz.-Ber. Ges. Nat. Freu., Berl., p. 135.

RANGE.—Occurring throughout German East Africa and extending north in British East Africa as far as the Tana River drainage and the northern slopes of Mount Kenia, thence westward to the Turkwell River. In Uganda it extends as far north as Ankole.

The present name of *suara*, by which the equatorial impalla is now known in zoology, was applied by Matschie originally to an association of material consisting of the skull and horns of a lesser koodoo, the skin of a female impalla, and the painting of an impalla by Doctor Richard Böhm. Some years afterward, upon discovering his mistake, Matschie applied the name *suara* to the impalla in his monograph on the mammals of German East Africa, published in 1894, thus eliminating the koodoo element of the original description. The impalla was first recorded in 1863 from East Africa by Speke and Grant, who met with it in German East Africa. Since their time it has been reported by practically every traveller in the region. Von Heuglin reported the impalla from the White Nile, but it is now known not to occur in the Nile Valley proper. This error may have been due to a confusion of the impalla with the kob, which it resembles closely in color and size, and from which it is not distinguishable in life except on close inspection.

The equatorial impalla is distinguishable with some difficulty from the typical form of South Africa. It differs chiefly by its lighter or brighter tawny coloration and by larger horns. From the Angola race, *petersi*, it is distinguishable by the absence of a black face blaze and ocular stripes. Indications of these dark markings, however, are often found on specimens from British East Africa, where only the old males are without some faint trace of them.

The dorsal coloration is bright cinnamon-rufous, and extends well down on the sides, where it is sharply defined against the ochraceous-buff of the sides, which covers a strip about three inches wide extending the whole length of the

flanks and is well defined against the white of the underparts and the inside of the hind legs. The hind quarters and rump are ochraceous-buff and marked by a black pygal stripe extending from the base of the tail one-third of the way to the hocks. The rump and the tail are marked by a black dorsal stripe which extends almost to the tufted tip of the latter, which is buff at the base and white terminally. The legs are ochraceous-buff like the lower sides. The hind legs are marked by two black oval patches on the cannon-bones, the black being continued down to another pair on the fetlocks. The pastern region above the hoof is whitish. The back of the hock is marked by a black spot. The fore limbs are like the hind in color, but lack the black patches, except the pair at the fetlocks. The head shows some decided contrast in color. The ears are conspicuous by their broad black tips and white inner side, and the eye region is relieved by a broad white stripe extending forward from the eye a short distance. The lips, chin, and throat are also white, the two latter areas being separated by a bar of ochraceous on the upper throat. The rest of the head is uniform cinnamon-rufous, with the exception of the crown, which is black between the horns in the male, while in the female the whole crown region is black. A majority of specimens show slight indication of a black face blaze and black diagonal stripe through the eye. These black markings are most distinct on females and young. The latter often show in addition black leg stripes.

An adult male shot by Colonel Roosevelt on the Loita Plains measured in the flesh: 59 inches in length of head and body along the curve of the back; tail, 14 inches; hind foot, $17\frac{3}{4}$ inches; ear, $6\frac{1}{2}$ inches. This specimen represents the average size attained by the males. The females are somewhat smaller, judging from the flesh dimensions of a fully adult female from the same district, which measured: length of head and body, 54 inches; tail, 12 inches; hind foot, $16\frac{1}{2}$ inches; ear, 6 inches. The skull of this specimen measured $9\frac{3}{4}$ inches in length. Male skulls are considerably larger than this one and average $10\frac{1}{2}$ inches in length. The longest-horned specimen in the series of twenty-seven males in the National Museum is a specimen measuring 29 inches in length on the curve. This specimen



HERD OF IMPALLA ANTILOPE ON THE BANKS OF THE TANA RIVER NEAR FORT HILL, B. E. A.
From a photograph by Carl F. Allen.

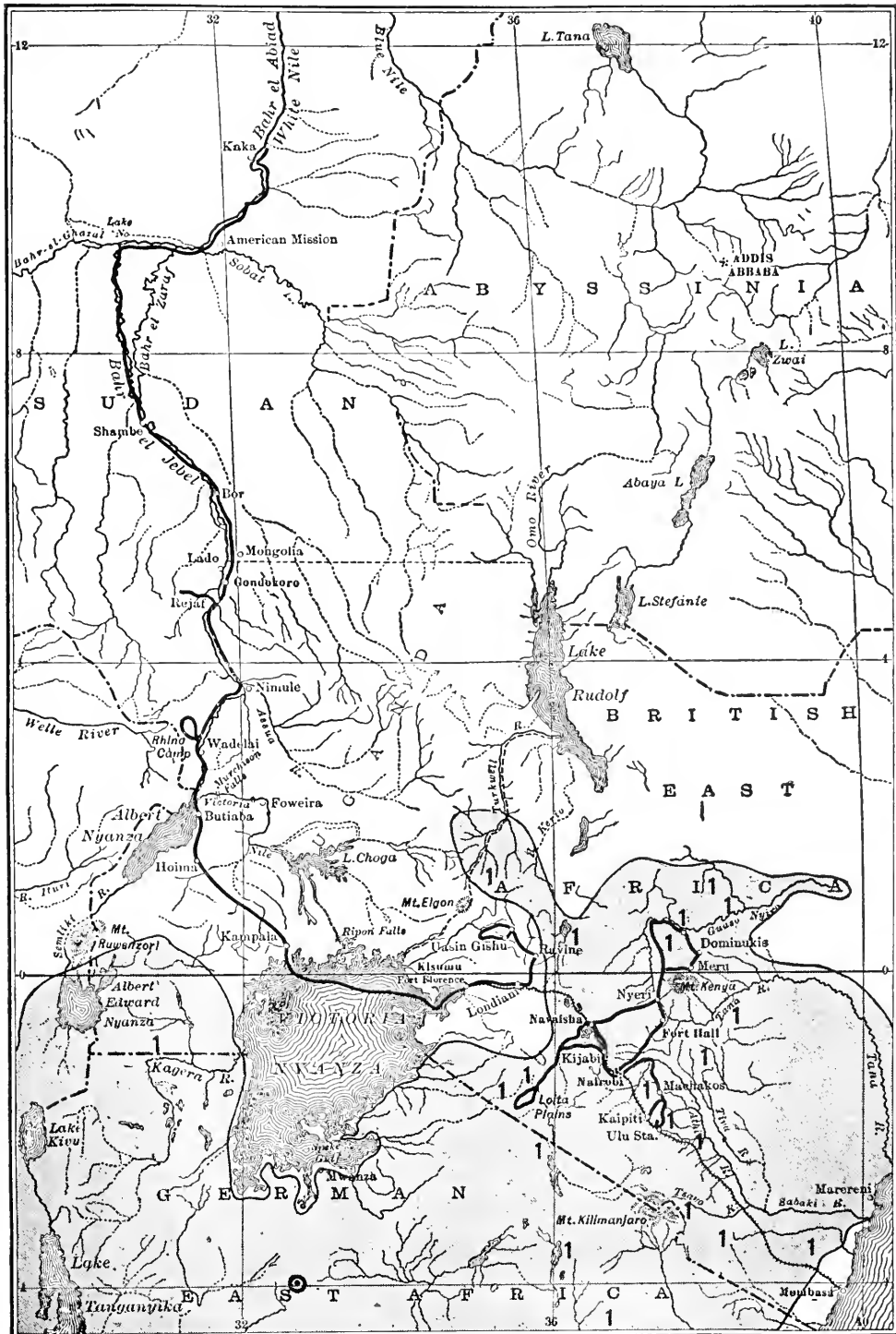
was shot near the headwaters of the Amala River, close to the German border, by Heller. The average horn length in this large series is 24 inches. The record horn length for British East Africa, given by Ward, is $31\frac{5}{8}$ inches, while that for the typical race of South Africa is $27\frac{1}{2}$ inches. The difference in these lengths represents fairly well the amount of difference in size of the two races. Specimens measuring $27\frac{1}{2}$ inches are not at all rare in British East Africa.

In Millais's delightful "Breath from the Veldt," a book which illustrates well why photographs can never approach in value true pictures of wild life by a competent nature artist, a special study is made of the springbuck. This South African gazelle is shown in all its extraordinary leaping postures. There are also pictures of the impalla, but not in its characteristic attitudes. It is a pity that Millais did not do for the impalla what he did so well for the springbuck and for that most eccentric of four-footed beasts, the white-tailed gnu. Among all the horned animals of middle Africa the impalla is the one which when alarmed takes the most extraordinary leaps and bounds. When a herd is frightened in fairly thick but low bush, the animals go off almost like birds, springing in every direction, clear over the bushes, or many feet into the air even when there are no bushes. Their carriage is beautiful, their movements are the perfection of grace and agility. Their annulated horns describe each a spiral, and their beautifully colored coats, contrasted red and white, have a satin sheen. Their coloring makes them very conspicuous, as it contrasts sharply with all their usual surroundings. The buck, when amorous, displays the coloration by strutting among the does with tail erect and the hair of the rump and sides

raised; the head usually up and back, but sometimes stretched in front; and often he grunts.

Impalla are gregarious. Each master buck—or ram, as the males of all the lesser antelope are called in Africa—has a harem of twenty or thirty or forty does. Young bucks and very old bucks may be found solitary or in parties of half a dozen; a doe with a new-born fawn keeps by itself. Once we crept up to within ten yards of a doe and fawn lying down among the bushes. The big bucks fight fiercely for the mastery of the does. Kermit killed one with the broken horn of a rival imbedded in its neck. Evidently the two supple, vigorous beasts had bounded together with such force that the horn was broken off short; the piece was about ten inches long, of which the tip to the extent of three inches or so was imbedded in the muscle so firmly that it was pulled out only with effort. The wounded animal seemed in perfect health.

Impalla live in cover, sometimes thick, sometimes thin, and never go more than a few miles from water. On the Athi we found them grazing on the open plains, a mile or two away from water, with gazelles and hartebeests, early in the morning and late in the afternoon; if disturbed, the gazelles and the hartebeests ran in the open, whereas the impalla at once left them and headed for the cover which bordered the river, a thick growth of trees and bushes. In this cover they passed several hours during the heat of the day, usually lying down, sometimes feeding. On the Northern Guaso Nyiro and the Sotik I never happened to see them more than a couple of hundred yards from cover. They are chiefly grazers. They feed and rest alternately, day and night, for a few hours at a stretch. Of course, where much



MAP 33—DISTRIBUTION OF THE EAST AFRICAN RACE OF THE IMPALLA

1 *Epyceros melampus suara*

pursued by man they lie hid in cover during the daytime. We found one herd coming to water early in the afternoon and another about sunset. They advanced in the fashion of most game, keeping in the open with no attempt to hide, continually halting and bounding away on false alarms. One herd took half an hour in traversing the last three hundred yards to the drinking-place; then they drank at a shallow place, evidently fearing crocodiles nearly as much as leopards. Impalla, like waterbuck, reedbuck, and bushbuck, drink frequently—two or three times a day—being wholly unable to stand thirst like the species of the plains and the desert.

Some of them on the Athi were infected with ticks, which clustered at the bases of the horns. The leopard was their chief enemy. They were very shy on the plains, less so in the woods. We did not find them tenacious of life, as most African game is said to be; twice individuals succumbed to wounds which would hardly have prevented a blacktail or a whitetail deer from making off.

Impalla are abundant about the slopes of Kilimanjaro, and are occasionally found in the adjacent desert tracts of Taita and the Taru, but are absent from the moist coast belt. Westward they are not uncommon along the German border as far west as the Victoria Nyanza, but their real centre of abundance is the Rift Valley. Both Count Teleki and Jackson have found them as far north as the Turkwell River, in which region they reach their extreme northern limit. The Ankole district in southern Uganda represents the northwestern limit of the range of the impalla, which is not known to occur farther north in the Nile Valley proper. Böhm, who furnished Matschie with the material for the description of the equatorial race of the impalla, obtained his specimen near Tabora, directly south of the Victoria Nyanza and east of the northern shores

of Lake Tanganyika. Specimens from the Northern Guaso Nyiro region have recently been described by a Swedish naturalist, Inar Lönnberg, as a new race, based upon their apparently lighter color and longer nasal bones. The impalla from this region in the National Museum, however, show no differences in color or other characters by which they may be distinguished from specimens from the highland region.

CHAPTER XIX

THE DIKDIKS

SUBFAMILY *Rhynchotraginæ*

THE dikdiks are antelopes of very small size, having the snout produced into a short proboscis and the anteorbital gland of large size and opening by a circular orifice on the face. The tail is rudimentary, and less than two inches long. The male alone is horned. The horns are short, ringed, and project backward in a line with the profile of the snout. The female has four mammæ. The hoofs are slender and the false hoofs are minute. The coloration of the sexes is alike, but the tuft of long hair on the forehead is decidedly coarser and denser in the male. The color pattern of the young at birth is identical to that of the adults. The female is distinctly larger than the male. The skull has the anterior narial opening greatly enlarged to accommodate the proboscis, which is brought about partially by the nasal bones being much reduced, their length being not greater than their width. The premaxillæ are very slender in the typical genus, and reduced so that they do not extend more than half-way to the nasal bones. The anteorbital fossæ are much enlarged to accommodate the large anteorbital glands. Young skulls in which the first molars are just erupting show well-developed upper canine teeth, but these are absorbed again by the time the second molars are erupted. Similar canine teeth are found in *Gazella* at the

same age, but have not been observed in other genera of antelopes.

The short nasal bones, the large anteorbital fossæ and the great size of the narial opening of the dikdiks ally them closely to the gazelles and separate them fairly widely from the other groups of small antelopes with which they are usually grouped. In the structure of the snout they resemble closely the proboscis-bearing *Saiga*, which shows an even greater reduction of the nasal and the premaxillary bones. The skulls of newly born gazelles are scarcely distinguishable in shape of nasal bones or relative size of the narial opening from those of adult dikdik. There are two genera: *Rhynchotragus*, bearing a large proboscis, and *Madoqua*, having the proboscis smaller and the premaxillary bones normal. The latter genus is confined to Somaliland and Abyssinia, and is not known to occur in British East Africa.

LONG-SNOUDED DIKDIKS

Rhynchotragus

Rhynchotragus Neumann, 1905, Sitz.-Ber. Ges. Nat. Freu., Berl., p. 88; type *Madoqua guentheri* Thomas.

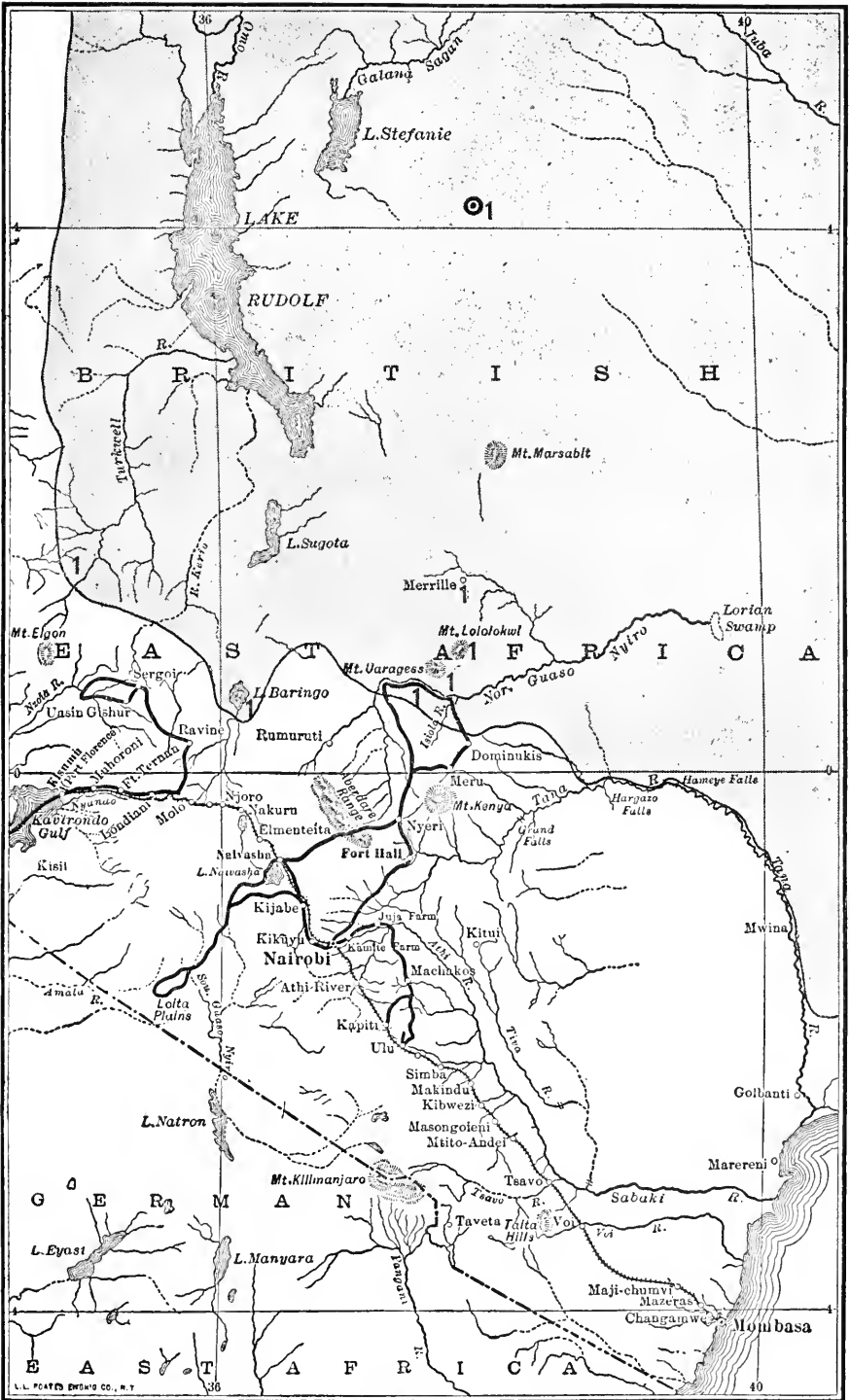
In the long-snouted dikdiks the coloration is much more subdued than in *Madoqua*, the colors never being bright orange. The body size is also larger and the proboscis is much more developed, being fully twice as great in length. The skull has the nasal bones more reduced and the premaxillary bones widely separated from the nasals. The last lower molar tooth has three folds to the crown instead of two as in *Madoqua*. The genus ranges from central Somaliland and Abyssinia southward through the coast and Rift Valley drainage area to central German East Africa. It is not known to occur west of the Rift Valley in the Nile drainage. An isolated species, *damarensis*, occurs in German Southwest Africa and Angola. No fossil species are known.

We came across two species and several races of dikdiks. In these tiny animals the sexes are of almost equal size, the female being, if anything, slightly larger. The little creatures live in thick cover, and run under the branches like a civet or a mongoose. The voice is a bird-like whistle or chirp. They are always found singly or in pairs, or in pairs with one young one, and are shy, timid, and alert. They browse, graze, and eat roots; one was seen digging grass tubers at 10 A.M. in the bright sunlight in the desert region of the Northern Guaso Nyiro. They go entirely without water; at least we found them in thickets which apparently they never left and which were miles from any water. In the desert they never came to water; it is possible that some of those in the highlands drink at pools. We thought we found signs that this was so.

The tiny dikdik has one habit which it shares with the huge rhinoceros. It tends to deposit its dung in one place; at any rate, we found dung heaps which had evidently been resorted to for many weeks by one or two of the little creatures. On account of its habits and of the dense bush in which it dwells, it is rarely seen. The stomach of a specimen killed at the Northern Guaso Nyiro contained the leaves of two bushes, *Strychnos* and *Salvadora*, the latter the tooth-brush bush of the Somalis. Another specimen collected at Naivasha contained the leaves and parts of the hard yellow berries of a nightshade, *Solanum campylacanthum*.

KEY TO THE SPECIES OF *Rhynchotragus*

Proboscis large and expanded; premaxillæ short, only reaching halfway to nasals; nasals very short, only reaching as far as front of last upper premolar; belly white without fulvous margin on sides *guentheri*



MAP 34—DISTRIBUTION OF THE EAST AFRICAN RACE OF LONG-SNOUDED DIKDIK

1 *Rhynchotragus guentheri smithi*

Proboscis smaller and narrow; premaxillæ long, reaching nasals; nasal bones longer, reaching as far forward as front of tooth row; white of belly bordered by fulvous

kirki

LARGE-SNOURED DIKDIK

Rhynchotragus guentheri smithi

NATIVE NAME: Rendile, *sagari*.

Madoqua guentheri smithi Thomas, 1900, Proc. Zool. Soc., p. 804.

RANGE.—From the Rift Valley of southern Abyssinia south through the Lake Rudolf region to Lake Baringo and the Northern Guaso Nyiro River of British East Africa; west as far as the Nile watershed and east at least as far as the Lorian swamp.

The type specimen of this race was collected by Doctor Donaldson Smith thirty miles southeast of Lake Stefanie, on the Abyssinian border, during his journey in 1898-9 from Lake Rudolf to the Nile. Lönnberg, in 1907, described another race from Lake Baringo which he called *nasoguttata* owing to the proboscis showing white flecks. A series of specimens from Lake Baringo have been examined in the British Museum and found to be indistinguishable from *smithi* in size or coloration.

This race is at once distinguishable from all other British East African dikdiks by the enormous development of the proboscis, which is fully twice the size of that of other races, and by the absence of a fulvous lateral band to the under-parts, which are wholly white. The skull differs decidedly by its small nasal bones, which are much broader than long, and by the shortness of the premaxillary bones, which reach only half-way to the nasals. The nasal chamber is of enormous extent, greatly exceeding in length the interorbital breadth of the skull.

The dorsal coloration is buffy-gray vermiculated with blackish, giving a pepper-and-salt effect. The tail is haired above and is like the back in color, but below it is naked. The legs to the knees and hocks are similar to the back in color, but the lower part of the limbs are ochraceous-buff. The under-parts are pure white without any indication of a fulvous band along the sides. The lower and middle

throat are vermiculated with blackish like the nape; but the forethroat and chin are white. The head has the long tuft on the crown vermiculated like the back, but the buffy annulations are distinctly lighter. The snout and proboscis are bright tawny dorsally, but the sides of the face and the back of the ears are lighter or ochraceous-buff. The lips and the inside of the ears are white. The anteorbital pore and eyelids are black.

The average measurements of adults in the flesh are: length of head and body, male, $23\frac{1}{2}$ inches, female, 25 inches; tail, $1\frac{1}{2}$ inches; length of hind foot, male, $7\frac{3}{4}$ inches, female, 8 inches; ear, $3\frac{1}{4}$ inches. Greatest length of skull: male, $4\frac{9}{16}$ inches, female, $4\frac{3}{4}$ inches; length of nasal chamber, male, $1\frac{7}{8}$ inches, female, $1\frac{7}{8}$ inches. The longest-horned male in a series of ten adults has horns $3\frac{3}{16}$ inches long in a straight line and $1\frac{7}{8}$ inches spread at the tips. Average horns are a half inch less than these dimensions.

A large series of specimens collected by the Rainey expedition have been examined from the Northern Guaso Nyiro near its junction with the Lakiundu and from the region just north of this point on the Marsabit Road at Merille and Longaya. Specimens have also been examined from the juniper forest on the summit of Mount Lololokwi at an elevation of six thousand feet. Other specimens from the upper Turkwell River north of Mount Elgon, from Lake Baringo, and from the type locality near Lake Stefanie have been examined. The range of this species overlaps that of the *kirki* group in the region watered by the Northern Guaso Nyiro, where it is found associated everywhere with a much smaller race, *kirki minor*.

KIRK DIKDIK

Rhynchotragus kirki

RANGE.—From the Northern Guaso Nyiro River and Lake Baringo southward through the Rift Valley and coast drainage area to central German East Africa.

The Kirk dikdik differs from the *guentheri* group of the northern desert area by its much smaller proboscis and the broad fulvous border to the under-parts. The skull

differs decidedly by the longer premaxillary bones which reach to the nasals. The nasal bones are longer, and reach forward as far as the first upper premolar; their breadth is decidedly less than their length. The length of the nasal chamber is much less and never exceeds the interorbital width of the skull as in the large-snouted species.

KEY TO THE RACES OF *kirki*

- Dorsal coloration very light buffy-drab without tawny suffusion
minor
- Dorsal coloration darker, showing marked tawny suffusion
Sides of body buffy, showing little contrast with the white under-parts
Size small, length of hind foot $6\frac{1}{4}$ inches *kirki*
Size large, length of hind foot $7\frac{1}{2}$ inches *nyikæ*
- Sides of body bright tawny-ochraceous, in marked contrast to white under-parts
Size small, skull length $4\frac{1}{2}$ inches; ear small, less than 3 inches in length *hindei*
Size large, skull length $4\frac{3}{4}$ to 5 inches; ear large, more than 3 inches in length *cavendishi*

TYPICAL KIRK DIKDIK

Rhynchotragus kirki kirki

Neotragus kirkii Günther, 1880, Proc. Zool. Soc., p. 17; fig. head and skull.

RANGE.—Coast district of Jubaland south at least as far as the Tana River. Occupies the northeastern limits of the range of the species.

The typical race of Kirk dikdik was described by Doctor Günther from specimens sent to the British Museum by Sir John Kirk, who obtained them from Brava, a port on the coast of Italian Somaliland a short distance north of the Juba River. Other specimens have been collected in the vicinity of Lamu near the mouth of the Tana River. This is the smallest race, the hind foot having a length from the

hock to the hoof of only $6\frac{1}{4}$ inches. The northern race *minor* of the desert interior regions is scarcely of larger size, but *kirki* is much darker. In color it resembles the highland races *hindei* and *cavendishi*, but is somewhat less rufous, being more vinaceous on the sides.

NORTHERN KIRK DIKDIK

Rhynchotragus kirki minor

Rhynchotragus kirki minor Lönnberg, 1912, *Ann. & Mag. Nat. Hist.*, vol. IX, p. 65.

RANGE.—Watershed of the Northern Guaso Nyiro River northward to Mount Marsabit and eastward as far, at least, as the Lorian swamp, no doubt extending within a few miles of the coast, where it intergrades with the typical *kirki*.

This light-colored desert race was described by Lönnberg from specimens which he collected near Chanler Falls in the lower Northern Guaso Nyiro River. It may be distinguished from the other races by its lighter color and smaller size. The body color is buffy-drab, and the legs and head are buffy-ochraceous. The color of the lower sides bordering the white under-parts is buffy, and shows very little contrast to the white. The measurements of adults in the flesh are: length of head and body, male, $23\frac{1}{4}$ inches, female, $24\frac{1}{2}$ inches; tail, $1\frac{1}{2}$ inches; hind foot, male, $7\frac{3}{4}$ inches, female, 8 inches; ear, $2\frac{3}{4}$ inches. Greatest length of skull: male, $4\frac{1}{4}$ inches, female, $4\frac{1}{2}$ inches; length of narial chamber, male, $1\frac{1}{4}$ inches, female, $1\frac{5}{16}$ inches. The longest-horned male in a series of six adults has horns $2\frac{3}{4}$ inches, measured in a straight line, with a spread at the tips of $2\frac{1}{8}$ inches.

A large series have been examined in the National Museum from the Northern Guaso Nyiro River and its junction with the Lakiundu and from watering-places on the Marsabit Road at Merille, Longaya, and Koya. The race is confined to the lower desert levels to altitudes below two thousand five hundred feet and is unknown on the summits of the desert mountains.

NYIKA KIRK DIKDIK
Rhynchotragus kirki nyikæ

NATIVE NAMES: Duruma, *kivi*; Taita, *sha*.

Rhynchotragus kirki nyikæ Heller, 1913, Smith. Misc. Coll., vol. 61, No. 7,
p. 3.

RANGE.—From the eastern and northern slopes of Mount Kilimanjaro northward in the desert nyikæ to the Tana River; westward on the slopes of the inland plateau to an elevation of two thousand five hundred feet.

The type of this race came from Ndi near the railway station of Voi. In characters it resembles *kirki* most closely, but the size is decidedly greater, equalling that of *hindei* from which it differs by lighter coloration. The coloration of the dorsal region is ochraceous-tawny, changing gradually on the sides to buff. The whole dorsal region is vermiculated by dusky annulations to the hair. The under-parts are sharply defined against this vermiculated area by a wide band of light ochraceous-buff succeeded by the pure white of the median ventral area. The legs are uniform ochraceous-tawny. The tail is buffy-gray vermiculated by dusky, and the posterior border of the thighs is clothed by long white hair in sharp contrast to the buffy-gray rump and sides. The head has the coronal crest ochraceous-tawny vermiculated only in the central part by dusky, and the snout is lighter, being cinnamon-buff. The orbital area is white with a blackish diagonal streak extending through the eye to the anteorbital gland. The sides of the head are buffy faintly vermiculated with dusky. The back of the ears is buffy, and the inner side, the chin, and the lips are white. The forethroat is pure ochraceous-buff, but the middle throat is vermiculated heavily with dusky like nape.

The body size equals that of *hindei*. The largest horns in a series of three males are: length, straight, 3 inches; spread at tips, $2\frac{1}{8}$ inches.

Specimens have been examined from the Voi district, Maji ya Chumvi, and from Taveta on the southeastern slopes of Mount Kilimanjaro.

UKAMBA KIRK DIKDIK
Rhynchotragus kirki hindei

Madoqua kirki hindei Thomas, 1922, *Ann. & Mag. Nat. Hist.*, vol. V, p. 242.

RANGE.—Confined to the foothill region flanking the highlands from the southern boundary of British East Africa north to the southern slopes of Mount Kenia between the altitudes of two thousand five hundred and five thousand feet.

The type of this species was collected at the government post of Kitui by Doctor S. L. Hinde, to whom the British Museum is indebted for many of its African types of small mammals. We have examined specimens in the National Museum from the Athi Plains and the station of Mtoto Andei. Sir Alfred Pease has recorded in a letter to Colonel Roosevelt his discovery of a family of spotted dikdiks on his Kitanga Farm near Machakos. While out shooting he met a family party of three dikdiks: a male, female, and half-grown young, all of which were marked by large white blotches upon the flanks, shoulders, neck, and rump. With the exception of the spots they differed in no way from the ordinary dikdik found in the same locality. The discovery of one individual showing partial albinism of this sort would not be extraordinarily remarkable, but the discovery of three individuals all showing the same markings and associated together in a family is indeed a really remarkable occurrence. Apparently in this family at least the white markings are well established and are transmitted to the offspring. The dikdik were under observation for some time at a distance of only fifteen yards, but owing to the tender regard in which they were held by the observer no attempt was made to collect a specimen. No other case among dikdik of partial or complete albinism is known to us. The proboscis occasionally shows small white spots or flecks, but these are never numerous or extensive in area.

The Ukamba dikdik may be known by its dark coloration and extensive tawny suffusion, the sides being bright tawny and the legs more uniform tawny. In size it is

larger than the coast and desert races, and only slightly smaller than the Naivasha dikdik. No flesh measurements are available. The longest horns in a series of three adults are: length, $2\frac{3}{4}$ inches; spread, $1\frac{1}{2}$ inches. Skull: greatest length, $4\frac{9}{16}$ inches; length of nasal chamber, $1\frac{3}{8}$ inches.

NAIVASHA KIRK DIKDIK
Rhynchotragus kirki cavendishi

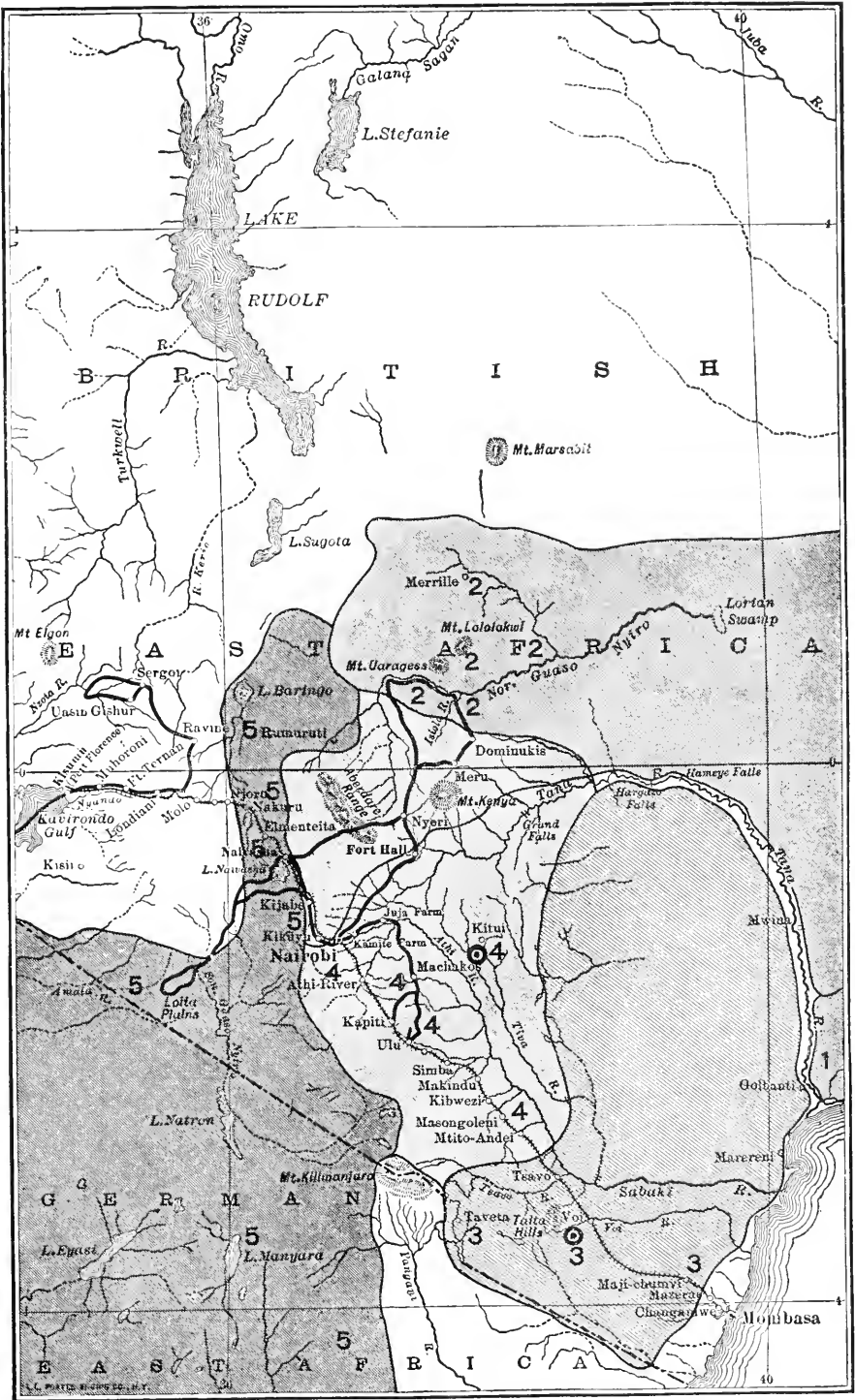
NATIVE NAME: Masai, *engomani*.

Madoqua cavendishi Thomas, 1898, Proc. Zool. Soc., p. 278.

RANGE.—Distributed throughout the Rift Valley of British East Africa from Lake Baringo southward to the German border; spreading westward in the southern part of its range across the Loita Plains to the Amala River and the southeastern drainage area of the Victoria Nyanza.

The specimen collected by Mr. H. S. H. Cavendish, which has formed the basis for Thomas's description and name of the present race, is of uncertain locality. The type was one of a number of specimens bearing no locality, which were collected in British East Africa by Cavendish and presented to the British Museum. The describer erroneously attributed the dikdik to Lake Rudolf, which was one of the districts visited by Cavendish. The type specimen, however, agrees minutely with the large race found south of Baringo, a district also visited by the collector and without doubt the source of the type. The only race of *kirki* which may possibly reach the Rudolf basin is the small, pale-colored race, *minor*, with which it could not possibly be confounded. In 1909 Doctor J. A. Allen, of the American Museum of Natural History of New York, described as *Madoqua langi* specimens collected by Herbert Lang near Lake Elementaita. These specimens, however, are not distinguishable from *cavendishi*, which came without doubt from a neighboring locality.

This race attains the maximum of size of the *kirki* group and has also distinctly larger ears than other races. In color it resembles its nearest geographical ally, *hindei*, but is on an average somewhat less rufous, lacking the rufous suffusion of the throat, and in its general grayness of color-



MAP 35—DISTRIBUTION OF THE RACES OF THE KIRK DIKDIK

- 1 *Rhynchotragus kirki kirki*
- 2 *Rhynchotragus kirki minor*
- 3 *Rhynchotragus kirki nyika*
- 4 *Rhynchotragus kirki hindei*
- 5 *Rhynchotragus kirki cavendishi*

ation approaching *nyikæ*. The flesh measurements of adult specimens are: length of head and body, male, 25 inches, female, 26 inches; tail, $1\frac{1}{2}$ inches; hind foot, male, $7\frac{1}{2}$ inches, female, 8 inches; ear, $3\frac{1}{4}$ inches. Greatest length of skull, male, $4\frac{7}{8}$ inches, female, 5 inches; length of narial chamber, male, $1\frac{3}{8}$ inches, female, $1\frac{7}{8}$ inches. In a series of three males the longest horns are $3\frac{3}{8}$ inches with a spread at the tips of $2\frac{1}{4}$ inches. In British East Africa specimens of this race have been secured at Lakes Naivasha and Elmentaita, the Loita Plains, and the headwaters of the Amala River.

CHAPTER XX

THE HOOK-LIPPED OR BLACK RHINOCEROS

RHINOCEROSSES

FAMILY *Rhinocerotidae*

ALL of the living rhinoceroses are ponderous, thick-skinned mammals armed on the snout by one or two dermal horns. The structure of the horns is peculiar among mammals and quite unlike either the bony horns of the deer or the hollow, chitinous horns of antelopes and their kindred. The horn of the rhinoceros is made up of a compact, hard mass of agglutinated, hair-like fibres which are an outgrowth from the skin. The horns receive no bony support from the skull but rest on the nasal bones, where they are firmly held in place by their continuity with the thick skin of the snout. A slight concession, however, is made toward their support by the part of the nasal bones upon which they rest, this portion being set with numerous small, bony tubercles. So constant are these bony tubercles that paleontologists are enabled by such evidence to determine the presence and position of horns of extinct species. The horns are not strictly a family character, although so prominent a feature of the later forms, for some of the oldest genera were quite hornless. Rhinoceroses are evenly three-toed, and are members of the odd-toed or perissodactyl division of the hoofed mammals. In the structure of their feet they are fairly closely allied to the tapirs and distantly

to the modern horses, only the remote ancestral forms of which were three-toed like the rhinoceros. In shape of body the rhinoceros is not very unlike the hippopotamus, the body being almost equally long, but the legs are in most of the forms decidedly longer, so that the animal is capable of travelling at really astonishing speed considering its immense size. The skin is very thick, dense in texture, and usually quite hairless. The skin of the two African genera resembles in general appearance that of the elephant, but it is of a very different quality, being much denser and more armor-like. The hair is confined in the existing species chiefly to the tips of the ears and the tail, but the recently extinct woolly rhinoceros, which lived far north in Europe and Asia, was clothed by a coat of long hair to protect it from the cold. In dental characters the various genera of rhinoceroses exhibit much diversity, but the cheek-teeth show a peculiar pattern of folds which are characteristic of the family. The great bulk of the genera had well-developed incisor teeth in both jaws, and some of the very ancient types had canine teeth as well, but the living African forms lack all indication of either incisor or canine teeth. The cheek-teeth usually consist of the full number found in mammals, that is, four premolars which have milk predecessors and three molars. The premolars and molars are quite alike in shape and size, except the first premolar which is usually small and sometimes wanting. The cheek-teeth, as a rule, are composed only of dentine and enamel and are broad-crowned, the crowns being thrown into two transverse folds projecting inward with deep valleys separating them. Certain forms, however, such as the white rhinoceros of Africa and the woolly rhinoceros of the boreal

regions, have in addition to the dentine and enamel a thick layer of cement which enters to an important degree into the composition of the teeth. Such teeth represent the highest specialization in rhinoceroses, and have long crowns in which the folds are united so as to enclose the cement layer as islands surrounded by enamel. Rhinoceroses are, without doubt, long-lived forms, but little data, however, are available upon which to base an estimate of the length of life of an individual in its native state. As they are not known to breed in captivity, practically nothing is known regarding the length of the period of gestation. But one young is produced at a birth. In body size the female is but little inferior to the male. The mammæ are two in number.

The extinct forms of rhinoceroses are very numerous, many different genera being represented throughout North America, Eurasia, and Africa, but so numerous have been the lines of divergence that it is quite impossible to trace back through the maze of forms any of the modern genera. The most ancient genera were contemporaneous in the Oligocene in both Eurasia and North America, but in the latter country they died out early in the Pliocene. In Eurasia the family persisted to the present time, and the modern Asiatic forms were evolved there during the Pliocene and Pleistocene. Africa, no doubt, also played an important part as a field of rhinoceros evolution, but, owing to the almost complete absence of fossil-bearing deposits in that continent, this is chiefly a matter of conjecture. The black rhinoceros has been reported by Scott from the Pliocene of Natal, and two other fossil species are described by Pomel in the Pleistocene of Algeria. A more significant discovery,

however, is that made by Oswald,* recently, of a tooth of one of the ancient hornless rhinoceroses in Miocene beds at Karungu on the east shore of the Victoria Nyanza. This discovery seems to indicate nearly as great antiquity to the rhinoceros in Africa as in either Eurasia or America. The living species are confined to southern Asia, Sumatra, Java, Borneo, and Africa south of the Sahara Desert. Until very recently Siberia and northern Europe were the habitat of the woolly rhinoceros, which was contemporaneous with early man. The one-horned species of India and Java seem always to have been limited to southern Asia and the adjacent islands, in which region alone have fossil remains of allied one-horned species been found. Two-horned rhinoceroses, however, are found quite as wide-spread as the geographical limits of the family. The African genera, both of which lack teeth in the front part of the jaws, are not met with in a fossil condition beyond the limits of Africa, and they no doubt represent types peculiar to the Ethiopian region.

KEY TO THE LIVING GENERA IN AFRICA

Skull short, the posterior part not produced beyond the condyles; snout produced into a pointed lip; nape of neck normal in outline; teeth without the cement layer and with deep ridges on the inner side separated by open valleys; the first premolar persisting, the cheek-teeth being seven on each side; base of first horn rounded in front. *Diceros*

Skull greatly lengthened, the posterior part produced far beyond the condyles; snout ending square in front, the mouth being broadly truncate; nape of neck marked by a prominent fleshy hump; teeth with a thick cement

* 1913. *Journ. E. Africa and Uganda Nat. Hist. Soc.*, vol. III, No. 6, p. 4.

layer, the crowns solid and rectangular in shape, the valleys being filled with cement; first premolar shed early, the cheek-teeth in the adult being six on each side; base of first horn square in front

Ceratotherium

BLACK RHINOCEROS

Diceros

Diceros Gray, 1821, London Med. Repos., vol. XV, p. 306; type *Rhinoceros bicornis*.

The black rhinoceros differs so widely in many important details of its structure from the other living forms that it has been found necessary to separate it generically from them. It has been the custom of naturalists to include all the living forms in one genus, *Rhinoceros*, owing to the small number of species. This has been done merely as a matter of convenience, but we feel that the more logical course is to classify the various forms on the merits of their structural differences or affinities so as to balance them with other groups. Such a division into several genera will also facilitate the tracing of their relationships with the numerous fossil forms. In conformity with the white and the Sumatran, it carries two dermal horns on the snout, the rear one being situated directly behind the front one and usually is much smaller and compressed laterally into a blade-like knob. The genus *Diceros*, of which the black rhinoceros is the type, differs almost as radically from the other African genus, *Ceratotherium*, or white rhinoceros, as from either the single-horned Indian or the two-horned Sumatran rhinoceroses. It differs from the white by having a short head which is deeply concave in profile on the top owing to the great elevation of the occipital part. In these two characters it resembles the Asiatic one-horned and two-horned genera, but differs from them by its want of incisor teeth and the distinctness of the post-tympanic process. The genus is much less specialized than *Ceratotherium*; its short skull and the simple structure of its short-crowned teeth ally it much more closely to the remote ancestral forms. The black rhinoceros in its dentition still shows traces of the incisor teeth, and occasionally also of canines,

but such teeth persist as mere rudiments beneath the gums and never become functional. A more permanent feature of this sort is the persistence of the first premolar throughout life. The genus to-day is represented by a single species, *bicornis*, and is confined to Ethiopian Africa, but in the Pleistocene it occurred as far north as Algeria in the Mediterranean region. Besides the Pleistocene species of Algeria another has been described from Northern Rhodesia by Chubb, which is smaller but closely allied to the living *bicornis*. Scott described some cheek-teeth of a rhinoceros from the Pliocene of Natal, which he referred to a new species, but they are quite indistinguishable in size or shape from those of *bicornis*. It is evident from these discoveries that *bicornis* has long been an inhabitant of Africa and doubtless is a form which originated on that continent.

The black or common African rhinoceros was fairly plentiful in most parts of East Africa which we visited; there were stretches of territory, however, in which we found none, as, for instance, on the Uasin Gishu. Why the species was absent from these places we cannot say, for elsewhere we came across them in all kinds of country. They were found in the dense, rather cold forests of Mount Kenia; they were found in the forest country near Kijabe; they were common in the thick thorn scrub and dry bush jungle in many places; and in the Sotik and along the Guaso Nyiro of the north, as well as here and there elsewhere, they were to be seen every day as we journeyed and hunted across the bare, open plains. "Plentiful" is, of course, a relative term; there were thousands of zebras, hartebeests, gazelles, and other buck for every one or two rhinos; it is doubtful whether we saw more than two or three hundred black rhinos all told, and we do not remember seeing more than half a dozen or so on any one day. Probably they were most abundant in the brush and forest on the lower slopes

of the northern base of Kenia, where, however, they were hard to see. They prefer dry country, although they need to drink freely every twenty-four hours.

Apparently the cow does not permit her old calf to stay with her after the new calf is born. We never saw a cow with two calves of different ages (or, for the matter of that, of the same age); yet many times we saw a cow followed by a half-grown or more than half-grown beast that must have been several years old. Generally we found the bulls solitary and the cows either solitary or followed by their calves. Occasionally we found a bull and cow, or a bull, cow, and calf, together. There is no regular breeding time; the calf may be produced at any season. It follows its mother within a very few days, or even hours, of its birth, and is jealously guarded by the mother. When very young any one of the bigger beasts of prey will pounce on it, and instances have been known of a party of lions killing even a three parts grown animal. The adult fears no beast of the land, not even the lion, although it will usually move out of the elephant's way. Yet the crocodile, or perhaps a party of crocodiles, may pull a rhino under water and drown it. Mr. Fleischman, of Cincinnati, not merely witnessed but photographed such an incident, in the Tana River, where the rhinoceros was seized by the hind leg as it stood in the water, could not reach the bank, and after a prolonged struggle was finally pulled beneath the surface. Such an occurrence must be wholly exceptional; for the rhinoceros shows no hesitation in approaching deep water, not merely drinking but bathing in it.

The animals are fond of wallowing in mud holes, and also at times in dusty places. Often the dung will be

dropped anywhere, if the rhino is travelling much; but where a rhino, as is often the case, is spending its whole time in one rather limited locality, it returns again and again to the same place to dung. It kicks and scatters the dung about with its hind feet—not its horn. In one place we found a cow rhino which had evidently been living for many weeks in the river-bottom of the Athi. There was plenty of food in the brush jungle which filled the spaces between the trees, and which afforded thick cover; there was abundant water in pools near by; and evidently the rhino had kept close to the immediate neighborhood. The dunging place was kicked and ploughed up, and it looked as if the beast had rolled and wallowed much, in addition to kicking around the dung. This rhino spent its time in the immediate vicinity of its drinking-place, and during most of the day lay up in the dense shade of the green river-bottom jungle, apparently feeding at night and in the early morning and late evening. In other localities the animals differed in their habits. On the Northern Guaso Nyiro we found the rhinos drinking once every twenty-four hours, at night, and then travelling back at a good gait in a fairly direct course for eight or ten miles into the wastes of leafless thorn scrub, upon which they fed and in which they passed their noon-day hours of rest. In the Sotik the rhinos spent their whole time in the bare, open plains, drinking at one or another of the widely scattered, rapidly drying little pools. They usually drank at dusk; that is, about nightfall, and again about sunrise. Sometimes during the noon hours they lay out in the open, without a particle of cover; sometimes they lay under an acacia, or wild olive, or candelabra euphorbia. They sometimes stood while resting, but usually lay down,

either on their sides or in a kneeling position. They not only fed on the thorny, partially leaved twigs—the black rhino is a browser, whereas the white rhino is exclusively a grazer—but also fed greedily in the bare plains on the low-growing, shrubby plants, only a few inches high, with woody stems. I do not believe that they were really grazing, but together with the shrub stems they cropped they swallowed the tough jointed grass. They also ate aloes and a kind of prickly euphorbia with a blistering juice; it is hard to understand how even their palates could stand the thorns and the acrid sap. We saw them feed at noon; once we stumbled on one feeding by moonlight; but their favorite feeding times were in the morning and afternoon.

Like other game, rhinos are assailed by various insect pests. Biting flies annoy them much; even when resting their ears are usually in motion to drive away their winged assailants. The ticks swarm on them; loathsome creatures, swollen with blood, which might be so crowded under the armpits, in the groin, and in the soft parts generally that they looked like mussels on an old dock. We do not quite understand why the tick-birds fail to keep down these ticks. These tick-birds, rather handsome, noisy creatures, are in most places the well-nigh invariable attendants of rhinos when the latter dwell on the plains or in fairly open bush. They clamber all over their huge hosts, like nuthatches round a tree trunk, and usually go in flocks. So invariably are they attendants upon the big game that if we heard them chattering as we threaded our way among bushes we were always at once on the alert to see a rhino. Sometimes they are wary, and chatter and fly off on seeing the hunter; at other times they pay but little heed; and the rhino may

or may not have its suspicions aroused when they fly away. If a party is seen on the wing, by watching their flight until they light it may be possible to discover the rhino.

The hook-lipped rhino is dull of wit and eyesight. Its sense of smell is good, and so is its hearing; but its vision is astonishingly bad. We doubt if it sees better than a very near-sighted man. Again and again we have walked up to one, on an absolutely bare and level plain, to within a hundred yards without its paying the least heed. We wore dull-colored clothes, of course, and made no abrupt motions; but it was unnecessary to take advantage of cover until we were well within a hundred yards. In thick brush it is often difficult to approach, for all bush-dwellers are harder to approach than plains-dwellers, as they cannot be seen until within a distance so short that both their hearing and their smell have in all probability given them warning. But in all places, bush, forest, and open plain, it is the easiest to approach of all the creatures that dwell in that particular habitat, because of the dulness of its brain-matter and the pooriness of its vision. It is the most stupid of the very big creatures. It seems to have a marvellous memory for local geography, as is shown by the way it will traverse many miles of country to some remote water-hole in the middle of a vast and monotonous plain; and it has the patience to stand motionless for many minutes listening for anything suspicious. But these seem to be well-nigh its only lines of mental effort. Its life is passed in feeding, travelling to and from water, sleeping, and when awake and at leisure either fidgeting, or much more often standing motionless to rest. There is occasional love-making and the exhibition of occasional fits of truculence and petulance or of muddled curi-

osity. When one rhino comes within ken of another the meeting always betrays bewilderment and incipient defiance on the part of both. Apparently the first suggestion that another rhinoceros is in the neighborhood always arouses suspicion and potential resentment in the bosom of the rhinoceros to which the suggestion comes. Usually the rhino which has heard, smelt, or dimly seen another trots toward it quickly and then stands motionless for some minutes close to it, in the effort to decide whether to adopt an attitude of indifference or hostility—indifference almost always carrying the day. They are silent beasts, but very rarely utter a kind of squeal or squeak, apparently when courting. They utter a shrill and long, often a steam-whistle scream when dying; and they make a succession of puffs or snorts while charging or even when only startled.

The recognized presence of men rouses in the rhinoceros several emotions, which in the order of their intensity we should put as bewilderment, fear, dull curiosity, and truculence. If the men are merely seen, usually the only emotions aroused are bewilderment and curiosity; if smelt, fear is the usual result; but in a certain number of cases even the sight or the smell of men arouses senseless rage. Some rhinos are always cross and evil-tempered; but many others which are normally good-natured now and then have fits of berserker fury. Anything conspicuous which arouses their interest may also arouse their hostility. White has an evil attraction for them. Our friends the McMillans, while travelling through a rhino country, found that the two white horses of their cavalcade were so frequently charged that they finally painted them khaki-color. We have never seen them charge other game, and gazelles and hartebeests feed

in their immediate neighborhood with indifference; yet we have been informed by trustworthy eye-witnesses of one rhinoceros charging a herd of zebra, and another some buffalo. The rhinoceros gets out of the way of the elephant. It will unquestionably on occasions charge men and domestic animals entirely unprovoked. Twice we have known of one charging an ox wagon; in one case an ox was killed; in the other the rhino got entangled in the yokes and trek tow, and the driver, an Africander, lashed it lustily with his great whip, until it broke loose and ran off, leaving the ox-span tumbled in wild confusion. The year before we were at Nyeri one killed a white man, a surveyor, near that station, charging him without any provocation at all. At that time all the rhinos in that immediate neighborhood seemed to suffer from a fit of bad temper; they kept charging any one they met, and killed several natives. At last the district commissioner undertook a crusade against them, and killed fifteen, evidently including the various vicious ones, for from that time all attacks on human beings ceased. Rhinos frequently attack the long lines of porters on a safari, if they pass to windward of it. Probably this is not, as a rule, done from ferocity, but from angry bewilderment, the rhino finding the scent of man in his nostrils whichever way he goes, and finally thinking he is surrounded, and charging the line. Usually he merely runs through the line, tossing any porter who happens to be in his way; but he may grow irritated and turn and hunt down a porter. One man was thus killed while we were in Africa. Von Höhnel, the companion of Teleki and Chanler on their explorations, was on one occasion thus hunted down and very badly wounded by a cow rhino which had charged through the safari and had

then returned on her footsteps. Mr. Hurlburt, the head of the American mission at Kijabe, had been wantonly charged by a rhino which killed his mule.

A dozen times we came across rhinos while we were on safari, or while we were on the trail of game. In such cases one of us kept watch over the rhino, rifle cocked, while the safari, or, if we were hunting, the trackers, marched so as to keep to leeward. Once or twice the rhino never noticed us. On the other occasions the beast saw us, but dimly, and evidently could not make out what we were. It would gaze toward us, head and tail up, and ears forward, and make little runs to and fro, perhaps even advancing a few yards; but in no case did the beast actually charge. In one instance, however, it did charge and toss a man, a few minutes after we had left it. This was a rhino we had come across while we were trailing a buffalo herd. Cuninghame did not wish to leave the trail, so Colonel Roosevelt went toward the rhino, and by waving his hat and shouting—not too loud, for fear of scaring the buffalo—he finally made it move off a couple of hundred yards, and he and Cuninghame went on unmolested. But a quarter of an hour afterward three of the porters returned to look for a knife which one of them had dropped while we were engaged in frightening away the rhino; and this time the brute came for them, and tossed one, goring him in the thigh, and then galloped on without turning. Whenever they got our wind they always ran, except on one occasion when a cow rhino advanced on us, unprovoked, from thick brush, tossing and twisting her head. We are not sure that she meant to charge; but when she got within forty yards we grew unpleasantly uncertain as to her intentions and shot her.

Stewart Edward White states that on one occasion, near the Tana River, he struck a locality where rhinoceros after rhinoceros charged quite unprovoked, and he had to shoot half a dozen. We have known a rhino charge through a camp at night and cause wild panic; they not infrequently charge hunters or travellers after dark.

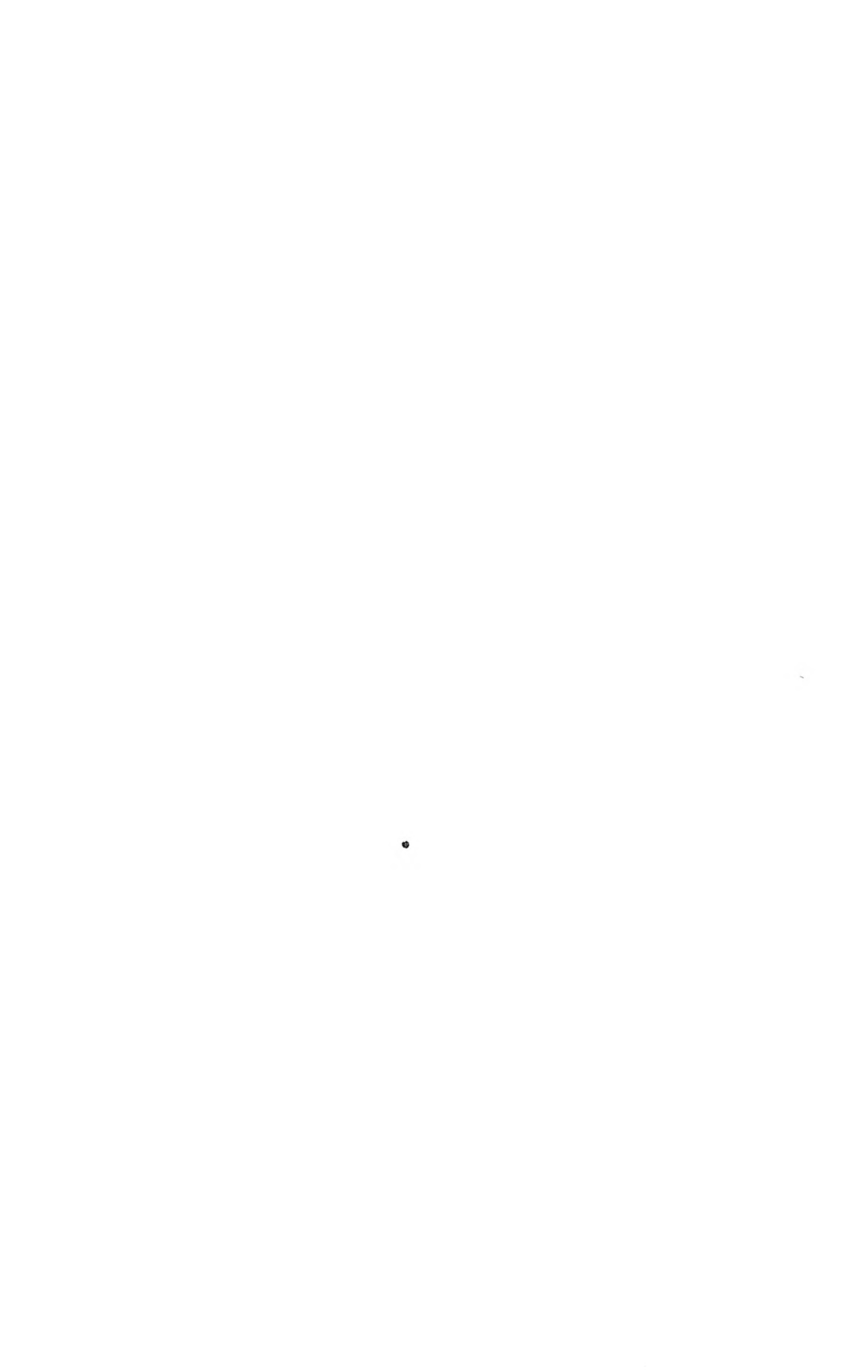
Personally, we consider the rhinoceros the least dangerous of all really dangerous game, although many good hunters hold the contrary view. The first one any of us saw, a bull, charged savagely when mortally wounded at a distance of a little over thirty yards, and was killed just thirteen yards from the hunter. But we were never really charged again. Colonel Roosevelt hit and knocked over one animal which we had stalked, as it was galloping toward us at a distance of seventy or eighty yards, but we think that this rhino was curious rather than enraged, and would not have charged home. Kermit was charged by one which he had mortally wounded, but it turned upon receiving another and much slighter wound. Two or three of our American friends who have hunted in East Africa have had narrow escapes from rhinos which charged after being wounded, or when the effort was made to photograph them.

Unquestionably, compared to his mild and placid square-mouthed kinsman, the hook-lipped rhino is a fidgety, restless, irritable, and at times dangerous, creature. Yet his occasional truculence is more than offset by his stupidity and dull eyesight, so far as the actual contest with the hunter is concerned. As far as we know but one white man has ever been killed while hunting rhinos in East Africa (the English official already mentioned was not hunting the beast which killed him). This was a German,



BLACK RHINOCEROS TOSSING A PORTER, NORTHERN GUASO NYIRO DISTRICT

From a drawing by Philip R. Goodwin



Doctor Kolb, who killed scores of rhinos, and was finally mortally hurt by a cow which, upon being wounded, charged him and thrust her horn through his stomach. An English official was also crippled for life by a rhino he had wounded. In dense bush a rhino is undoubtedly a dangerous antagonist at times, as well as being difficult to approach. On the open plains we found them easy to approach and easy to kill, and only occasionally dangerous; they were slow to detect us, and then spent some moments deliberating before concluding either to make off or to charge. But though less dangerous than other dangerous game when hunted, the rhinoceros is more prone than any other beast to act aggressively when entirely unprovoked. The very stupidity and dulness of sense which tend to render his truculence of little danger to the hunter immensely add to the menace which that truculence contains for the non-hunter, the wayfarer, who stumbles across him. He fails to make out the man until close by, and then waits, stupid and curious, until he suddenly thinks himself menaced, or is excited to rage by seeing the stranger near at hand, and forthwith charges. There are some rhinos which charge from sheer wickedness; but we are convinced that stupidity and curiosity are chiefly responsible for the conduct of the average rhino, which makes people think that it is about to charge them. When it does charge, however, it shows astonishing speed and agility for such an apparently unwieldy animal, whipping round in its tracks like a polo pony, and galloping at a pace that forces a horse to stretch himself. If it loses sight of the man it will sometimes quarter for him like a pointer dog, swinging its large head near the earth and snuffing for his tracks. The 'Ndorobo told us that they found the rhino more dan-

gerous to assail than the buffalo, because it often had to be attacked where there were no trees.

The rhinoceros, unlike the elephant and buffalo, does not haunt the neighborhood of the negro villages, to make raids on the fields and gardens. It is a beast of the lonely wastes. Even in the dry desert it is at home if there is an occasional pool of water; and it is only at these desert drinking-pools, when driven thither by thirst, that the solitude-loving beasts are found in any number. A score or over may congregate at night round such a pool, to which each has trodden his path through a dozen miles of barren wilderness; and there they may fight for the water. If two or three rhinoceroses—a cow and calf, or a bull and a cow, perhaps with a calf—come to such a pool together they do not loiter in the neighborhood. But we have seen a single rhino remain by such a pool, motionless for an hour, until another appeared, when the two beasts approached each other, as if for company. It seemed as if they had each known that the other would come there about that time, and had reckoned on the meeting. We have seen the same thing with other game, where one individual waited with evident expectancy, as if at a rendezvous, until another of the same species appeared. But of course it is possible that in these cases the waiting animal's keen senses made it aware that the other was somewhere in the neighborhood long before the onlooker could discern the faintest hint of its presence.

KEY TO THE RACES OF *bicornis*

- Size larger, the skull exceeding 21 inches in length; concavity of upper profile deep, more than $2\frac{1}{4}$ inches *bicornis*
 Size smaller, the skull 20 inches or less in length; concavity of upper profile 2 inches or less in depth *somaliensis*

TYPICAL BLACK RHINOCEROS

Diceros bicornis bicornis

NATIVE NAMES: Swahili, *faru*; Masai, *emune*; Kikuyu, *huria*; Kikamba, *mbuzya*.

Rhinoceros bicornis Linnæus, 1758, *Systema Naturæ*, 10 ed., p. 56.

RANGE.—In East Africa from German East Africa northward to the south bank of the Tana River, westward through northern Uganda as far as the east bank of the Nile, and north as far as Mongolla and the north end of Lake Rudolf; west of the Victoria Nyanza the northern distribution is limited by the Kagera River; absent from Uganda proper, the Kavirondo country, and the moist, tropical coast belt from the Sabaki River southward.

The black rhinoceros has an extensive range in Africa from the Cape region northward to Upper Egypt and from the East Coast westward to Nigeria. It is lacking throughout the whole Congo basin and also locally throughout much of the range as here defined. Large rivers have a peculiar effect in limiting its dispersal locally. In the upper Nile region it is found only on the east bank and in northern German East Africa it is found no farther north than the south bank of the Kagera River. Moist or damp tropical districts seem to be distasteful to it, and on this account it is lacking from the Congo basin, central and western Uganda, and the moist strip of lowland flanking the East Coast from Mombasa southward. Dense upland forest is also avoided by them, although they may be found at times in the lower parts of such forests or in thick bush bordering them.

The black rhinoceros is still found in Upper Egypt in the provinces of Kassala and Senaar and also in the Lake Chad region. From the Cape region of South Africa it seems to have been first made known to European civilization in 1650. At the present time it is quite extinct in the Cape Colony and the region just north of it, and is not found in a wild state except in remote districts near the Zambesi River. Formerly, in this region, the rhinoceroses were separated into two races, on the basis of horn shape, the normal one in which the front horn greatly ex-

ceeded the rear one being considered the common species and those having the two horns of nearly equal size being the keitloa race. These distinctions, however, have long since been abandoned, and to-day a single form is recognized throughout the greater part of Africa and another smaller one in the desert region of East Africa and Somaliland. The horns everywhere show great diversity of shape and no dependence for racial characters can be assigned to them. This is owing, in a measure, to their being skin structures solely without any definite connection with the bony structure of the skull. They thus have great freedom of form and position and show decided variation in number at times. Three-horned specimens are occasionally met with, and a five-horned one has recently been recorded. This one is described by Rowland Ward in his well-known "Records of Big Game," who quotes the original discoverer to the effect that besides the two front horns the three rear horns which follow are good-sized, the shortest being nine inches long, but they are not all in line; some spring laterally from the bases of the others.

Speke and Grant met with great numbers of black rhinoceroses in Karagwe, just west of the Victoria Nyanza and south of the Uganda boundary in what is now German territory. Besides the black species they fancied that the white also inhabited this district, and they referred certain long-horned specimens of the black to that species. In their account of the game animals met with they state accurately the well-known difference in the shape of the lips in the two rhinoceroses, but give a figure of a typical pointed-lipped rhinoceros head as that of a white specimen. The same region was visited by Stanley some years later, and he also gives an account of the great numbers of rhinoceroses met with and the killing of several for food. He refers to some of the specimens as white, his statement referring merely to their color, he being apparently quite unaware of the existence of the species to which sportsmen have applied the name "white." Since these early days several sportsmen well acquainted with the distinguishing characters of the two species have visited Karagwe and have found only the black species in the district.

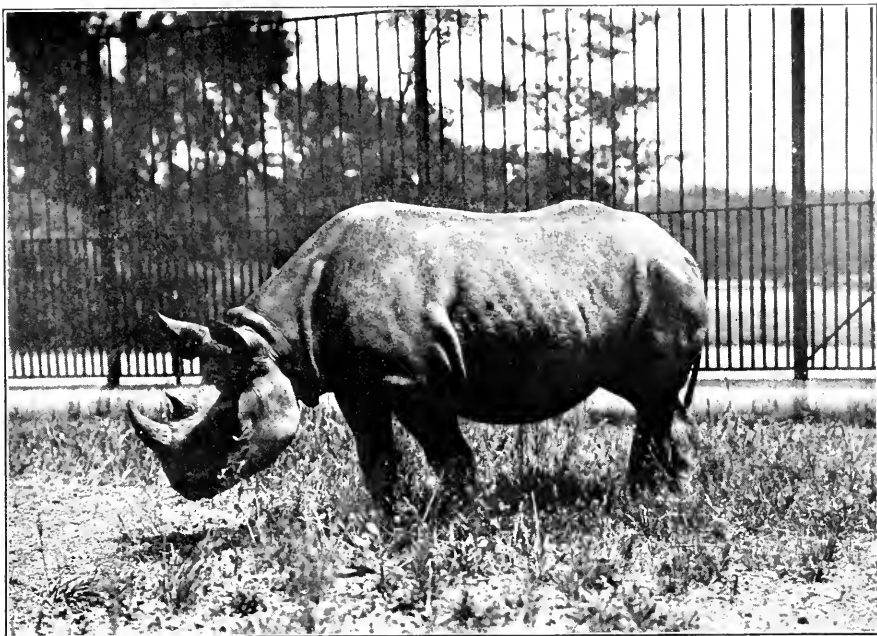
The black rhinoceros of East Africa is occasionally re-

ferred to in natural-history literature as a race, *holmwoodi*, described by Sclater in 1893, and based on two extremely long front horns having a length of more than forty inches, and obtained by purchase at Zanzibar by Holmwood. The describer of the species supposed the horns to belong to a distinct race having very long and slender front horns. They, however, represent merely the extremes in length of several hundred horns which have reached Zanzibar as articles of trade accumulated by safaris in the interior of the continent. As the rhinoceroses of East Africa are not distinguishable by horn characters or by size from those of South Africa, the name *holmwoodi* is at present not applicable to any race. We have examined several skulls of black rhinoceroses from South Africa in the British Museum and have found them quite indistinguishable from specimens from East Africa.

The black rhinoceros has not received its common English name because its coloration is actually blacker than that of other species, but rather to contrast it with the other African rhinoceros which has been so unfortunate as to have the designation of "white" bestowed upon it. Under these circumstances we may describe the black rhinoceros as slightly blacker than the white one, but both would be considered black in color by the average observer. The color of the skin of the black rhinoceros, upon close scrutiny, is found to vary from a deep neutral gray to blackish-brown. The color is uniform over the whole dorsal surface, but becomes on the belly and under-parts slightly lighter and more grayish. About the groins and the axillæ it is dull whitish and quite devoid of dark pigment. Both sexes are quite alike in color. The calves are usually deep neutral gray and usually a shade lighter than their parents. The body is absolutely hairless with the exception of the tips of the ears, the tip of the tail, and the eyebrows, which parts are clothed by a fringe of black hair. The tail is furnished along the two edges of its compressed tip by a crest of hair which projects stiffly out in line with the compressed surface, the two crests meeting at the tip but not forming a tuft distinct from the lateral crests. The hair has a length of from 4 to 6 inches and covers usually merely the terminal 5 inches of the tail. The hair

covering of the ears is much shorter than that of the tail, being $1\frac{1}{2}$ inches in length and confined to the terminal third on the extreme edge of the ear-conch. The eyebrows are armed by a few stiff black hairs, but they are quite inconspicuous in such a colossal animal. This scanty hair covering is black except occasionally at the tips where it fades to brownish. The skin is quite smooth, the only definite folds being a transverse one on the foreleg above the knee and another across the nape immediately behind the ears. This latter fold, however, disappears when the head is lowered in feeding. Besides these large folds, the sides of the body are streaked by narrow, rib-like folds, a peculiarity not found on other rhinoceroses. These folds, however, are quite independent of the ribs, although they show a similar arrangement and direction. The calves are marked by these peculiar rib-like folds quite as distinctly as the adults.

The black rhinoceros is very little inferior in size to either the white or the single-horned Indian species, but is somewhat different in body shape from both. From the white it may be distinguished, aside from the shorter head, by its slightly longer body and the absence of the fleshy hump on the nape. The great Indian rhinoceros is at once distinguishable from it by its folded skin, which has the appearance of plates of armor, and by its shorter legs. The largest specimen in bulk of body in the National Museum is an old male from the Loita Plains, British East Africa, shot by Colonel Roosevelt. This one measured, in the flesh: 12 feet 3 inches in length of head and body, measured along the contour of the back; tail, 30 inches; hind foot, from the hock to the tip of the middle hoof, $17\frac{1}{2}$ inches; ear length from notch, $9\frac{1}{4}$ inches; standing height at the withers, 4 feet 9 inches. The greatest length of the skull of this specimen is $23\frac{1}{2}$ inches, measured from the tip of the nasal boss to the end of the occipital crests. The largest female is also a specimen from the Loita Plains shot by Colonel Roosevelt. She is but little less in size than the male and exceeded him in the height dimension; but this superiority in height is doubtless due to some error in taking the measurement rather than to an actual difference, as the skull and length of the specimen are both less



BLACK RHINOCEROS, FEMALE, SEVEN YEARS OLD
From Mwanza, German East Africa
In the New York Zoological Park



NILE WHITE RHINOCEROS, FEMALE AND YOUNG
Rhino Camp near Wadelai
From a photograph by Kermit Roosevelt
LIVING SPECIMENS OF AFRICAN RHINOCEROSSES

than those of the male. This female measured: length of head and body along contour, 11 feet 3 inches; tail, $26\frac{1}{2}$ inches; hind foot, 17 inches; ear, $8\frac{1}{2}$ inches; height at withers, 5 feet 1 inch. The greatest length of the skull is 23 inches, which is but half an inch less than the male. Many of the old adults approach these dimensions very closely, and show surprisingly little variation in size considering their great bulk. The skulls of fully adult animals from British East Africa range in greatest length from $21\frac{1}{2}$ inches to $23\frac{1}{2}$ inches. The female skulls may be distinguished from the male by their lesser width across the back or occipital part. To this portion of the skull are attached the great muscles which move the head and make the horns effective in fighting, and it is no doubt this latter function which has carried the development of the occipital part of the skull in the male beyond that of the female. The nasal boss or rounded tip of the nasal bones upon which the front horn rests exhibits no differences in the two sexes such as we find in the white species, or rather genus. In conformity with this similarity in nasal bones in the two sexes we find the horns indistinguishable in size of base. Although the female does not carry a front horn, having a smaller base, she usually carries the longer and more slender horns. The front and rear horns vary greatly, however, in respect to one another. The typical condition is a front horn three or four times the length of the rear horn, rounded in outline, tapering gradually to a sharp point, and curving backward in a wide arc. From such horns as these there is every intermediate condition of relative length to the keitloa variety in which the rear horn equals or exceeds the front one in size. The usual length of the front horn is approximately 16 inches, but the record horns exceed this dimension greatly. The longest specimen in the National Museum is one having a length of 29 inches, shot by Kermit Roosevelt near Meru, a government station situated on the northeast slope of Mount Kenia. The record horn for Africa, recorded by Rowland Ward, is one with a length of $53\frac{1}{2}$ inches, from East Africa, now in the possession of Doctor C. H. Osman. The second longest is one of 47 inches in length belonging to the well-known district commissioner of British East Africa, Doctor S. L. Hinde. We have examined at

the National Museum some thirty specimens of skins and skulls from the Loita, Kapiti, and Athi Plains, the northern slopes of Mount Kenia and Taveta on the southwest flank of Kilimanjaro in British East Africa; from Gondokoro, Uganda; and Mashonaland, Southern Rhodesia. Other specimens examined at the British Museum have come from northern Abyssinia, British East Africa, and Mashonaland.

SOMALI BLACK RHINOCEROS

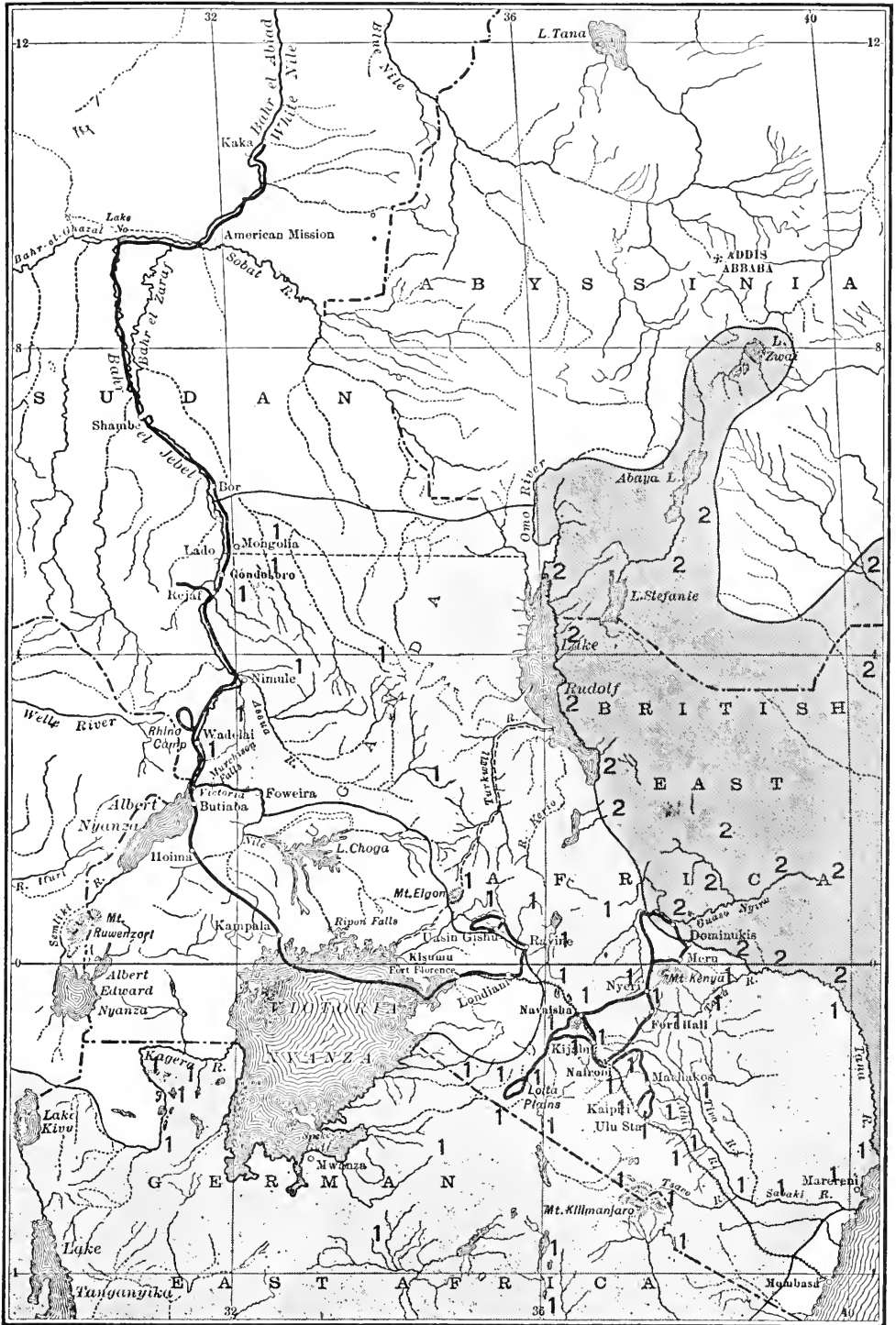
Diceros bicornis somaliensis

NATIVE NAMES: Somali, *wiyil*; Galla, *wartses*.

Diceros bicornis somaliensis Potocki, 1900, Sport in Somaliland, p. 82.

RANGE.—From the desert nyika zone of the northern Guaso Nyiro River and the north bank of the Tana River northward throughout the Lake Rudolf region to the Rift Valley of southern Abyssinia; east as far as western Somaliland and west as far as the east shore of Lake Rudolf.

Count Potocki has unwittingly become the authority for the name of the small race of the black rhinoceros inhabiting western Somaliland and the desert south of it. In his account of his hunting experiences in Somaliland, as narrated in "Sport in Somaliland," he mentions the rhinoceros of Somaliland, giving its scientific name as *Rhinoceros bicornis somaliensis*, and states that it does not differ from the rhinoceros of central Africa, but that specimens first obtained by Captain Swayne some years previously in Somaliland are said to differ, and he therefore apparently applies the name *somaliensis* under the assumption that this is the name by which it is already known. Count Teleki was the first sportsman to call attention to this race, which he pointed out in Von Höhnel's narrative of his discovery of Lake Rudolf. He refers to it as a smaller race than that inhabiting the highland country of East Africa, and records meeting with it first a short way south of Lake Rudolf and thence northward along the east shore of the lake to its extreme northern end. In distribution it coincides in a general way with that of the reticulated giraffe, Grévy zebra, and desert wart-hog. Lydekker has recently given a short account of this race in the Proceedings of the Zoological Society of London for 1911.



MAP 36—DISTRIBUTION OF THE RACES OF THE BLACK RHINOCEROS

1 *Diceros bicornis bicornis*

2 *Diceros bicornis somaliensis*

The Somali race of the black rhinoceros differs chiefly by being smaller than the typical form of British East Africa and the region south of it. The skull shows a flatter outline, the occipital crest being much less elevated than in the larger race. The depth of this dorsal concavity varies from $1\frac{3}{4}$ inches to $2\frac{1}{4}$ inches and averages a half inch less than specimens from the highlands of British East Africa. The body coloration is also slightly lighter, being neutral gray, and the ears have a shorter fringe of hair at their tips. Two specimens are in the National Museum, shot by Paul J. Rainey on the low desert plains in the vicinity of the Northern Guaso Nyiro. The skins of these two specimens are neutral gray and distinguishable by their lighter color and shorter growth of hair on the ear tips from specimens from the Loita Plains of British East Africa. Both of these specimens are females. The older and more typical one showed the following measurements in the flesh: head and body, 9 feet 8 inches; tail, 26 inches; hind foot, 17 inches; ear, $7\frac{1}{2}$ inches. The skull has a length of $21\frac{1}{4}$ inches. A very old skull from Longaya Spring, with the teeth worn down almost to the gums, has a length of $20\frac{3}{4}$ inches, which is the average length for the race. The horns do not differ in shape or relative size from those of the typical race. The length of the front one in the specimen of which the flesh measurements have been given was 28 inches, while another one has a horn length of 22 inches, but these are both exceptionally long-horned specimens, and were the longest seen among some thirty or forty observed in the field. The Somaliland record given by Ward is $29\frac{1}{2}$ inches. Besides the specimens examined at the National Museum, from the lower course of the Northern Guaso Nyiro and the region north of it toward Mount Marsabit, specimens from Somaliland have been examined in the British Museum and in Powell-Cotton's collection at Quex Park.

CHAPTER XXI

WHITE OR SQUARE-MOUTHED RHINOCEROS

Ceratotherium

Ceratotherium Gray, 1867, Proc. Zool. Soc., p. 1027; type *Rhinoceros simus*.

THE white rhinoceros, like the black, represents a distinct type of which it is the sole living member. In fact, it is the most highly specialized form living. Its extreme specialization is brought about by the lengthening of the skull until it has become remarkably dolichocephalic or long-headed. The teeth are quite as specialized as its skull, and in some respects parallel those of horses. Like the horses, the crowns have become very long or hypsodont, and the cement layer has grown in thickness until it forms an important part of the grinding surface of the teeth. The teeth are no longer composed of loops which are separated by deep valleys and are open on the inside, but the loops have united and enclose the cement layer as islands or fossettes in the tooth. The crown is perfectly flat and shows a complicated pattern of alternating folds of enamel, dentine, and cement. This tooth specialization has been brought about by the grass diet, the lengthening of the crowns and their increased surface being necessary in order to masticate the tough grass stems which form the chief part of their food. The dental apparatus of the other living species of rhinoceroses, which are chiefly browsing animals, consists of short-crowned teeth,

with a surface made up of ridges separated by open valleys. Such a tooth structure is capable of masticating the softer food of a browsing animal, but is less able to stand the wear which a grass diet would demand. The recently extinct woolly rhinoceros was in some respects like the white, being a long-headed, long-toothed form, but it had a very peculiar snout, the nasal bones curving downward and uniting with the premaxillary in a solid, bony mass. This sort of structure gave it a long ridge-like or compressed base to the front horn, which projected forward, owing to the downward curvature of the nasal bones upon which it rested. Some naturalists have suggested a close blood relationship between the woolly and the white, but they are really only remotely related. The white rhinoceros resembles its geographical associate, the black, in having two horns and lacking both incisor and canine teeth. The white rhinoceros is doubtless, like the black, a form which has had its origin on the continent on which it is still found. The only known member of the genus is the living white rhinoceros, of which two races are recognized, one, *simum*, in South Africa, occupying the territory from the Zambesi River southward, and the other, *cottoni*, widely separated in the upper Nile region.

NILE WHITE RHINOCEROS

Ceratotherium simum cottoni

NATIVE NAMES: Aluru, *kenga*; Sudani, *khartyt*; Bongo, *basha*; Dyoor *umwovh*.
Rhinoceros simus cottoni Lydekker, 1908, Field (London), vol. III, p. 319.

RANGE.—West side of the Nile from the Arau River opposite Wadelai northward through the Lado Enclave, along the west bank as far as Shambe, and west across the Bahr-el-Ghazal drainage to the Dar Fertit country, but not known to extend beyond the Nile watershed.

The Nile race of the white rhinoceros is the only one which still exists in a wild state. The southern race at the present time is represented by some dozen living individuals which are strictly preserved on an estate in Zululand. These are the survivors of the immense numbers which formerly inhabited the country between the Zambesi and Orange Rivers. In the Nile Valley they are confined to the district west of the river and are of local distribution only. The southern limit is the Arau River, which enters the Nile opposite Wadelai. Here they occur abundantly in the vicinity of Rhino Camp and a few miles to the north of this spot. They are not again met with until we proceed some hundred miles northward to the stations of Lado and Kiro. The most northern record is one reported by Selous west of the Shambe. Far westward several hundred miles we have a further record by General Mahon of one shot in the Dar Fertit country near the headwaters of the Bahr-el-Ghazal drainage.

The distribution of this species is everywhere bounded by rivers, both in the south of Africa and in the Nile Valley. They are found most abundantly in the close proximity of the Nile but do not occur on the east bank. In South Africa a similar impassable boundary was formed for the species by the Zambesi River. They formerly occurred abundantly on the south bank, but were never known to occur on the north side. To the south the Orange River formed the southern boundary. The river boundaries illustrate forcibly the strong aversion these great quadrupeds have to crossing streams. This aversion must be due to their fear of drowning, for they are quite immune from attack by aquatic animals.

During historic times the white rhinoceros has not been known to inhabit the region lying between the north bank of the Zambesi and the Lado Enclave. This is a great stretch of country of some eleven hundred miles and is apparently well suited to the habits of the species under consideration. At what period the white rhinoceros disappeared from this intermediate territory is not known but it is doubtless quite recent, for the Nile race has developed but slight structural differences.

Explorers have reported the occurrence of white rhi-

noceroses in various parts of equatorial and central Africa outside of the ranges here designated. Such records have all been found to be due to mistaken identity or confusion with the black species. The best known of such instances are the references of Speke, Grant, and Stanley to white rhinoceroses in Karagwe, German East Africa. The first Nile specimen to reach Europe was a skull collected by Major A. St. H. Gibbons, near Lado Station in 1900. This specimen was sent to Mr. Oldfield Thomas of the British Museum for examination, and upon its identification credence was given to the records of occurrence in Karagwe by the early explorers. More recent investigation, however, has shown these earlier reports to be erroneous. The race was named by Lydekker several years after Major Gibbons's discovery from the evidence furnished by skulls collected by Major Powell-Cotton near the station of Lado. The differences detected by Lydekker, greater width of the nasal boss and its more forward projection, are sexual characters confined to the male and are of no racial value. The Nile race resembles very closely, in external appearance and size, the southern race which formerly inhabited the territory lying between the south bank of the Zambesi and the north bank of the Orange Rivers. It differs, however, by the possession of a flatter dorsal outline to the skull, owing to the lesser production of the occipital crests above the dorsal plane, and by the smaller size of the teeth. The measurements of skulls of the two races show them to be of practically the same bodily size. The largest known skull in bulk is one secured in the Lado Enclave by Kermit Roosevelt, but this one exceeds only slightly the largest preserved one from South Africa.

It has been said by first-rate observers that the square-mouthed rhinoceros is of exactly the same color as the hook-lipped rhinoceros. This did not seem to us to be the case when we saw the square-mouthed rhinos living; they seemed to be of a perceptibly lighter gray, which under certain conditions of sky-effect and sun-angle seemed very light indeed, although as dark as the ordinary rhino when

the sun was at another angle, or when the sky-effect was different. A comparison of the skins shows that there is a very real difference of color, the hook-lipped rhino being of such a dark gray that it can legitimately be called black, while the square-mouthed species is of a smoky gray, a gray which can readily look whitish in certain lights. The ordinary name is by no means so much of a misnomer as we had supposed. The square-mouthed animal is totally unlike the hook-lipped one, so much so that it undoubtedly ought to go in a different genus; the two are at least as distinct as the moose and the wapiti. According to our observations the square-mouthed rhino averaged considerably larger than the hook-lipped, but there was overlapping between the smaller individuals of the first and the exceptionally big ones of the second; and the same was true of the horns, which averaged longer in the square-mouthed.

African big-game animals offer many puzzling examples of discontinuous distribution, and none more so than the square-mouthed rhinoceros. It was first known from the region between the Orange and the Zambesi, where it abounded, but was practically exterminated in the late eighties, so that now only a few individuals are left in a game reserve. North of the Zambesi it is not found until the great Nyanza Lakes are passed. Indeed, until Major Gibbons discovered it on the left bank of the upper White Nile, it was believed to be confined to South Africa. Examination of the series of specimens we brought home shows that there is only the smallest distinction, hardly of sub-specific value, between these two widely separated groups of white rhinos. According to what Mr. Selous writes it appears probable that all the rhinos west of the Nile belong

to the square-mouthed species, which is never found east of the river, in the domain of the hook-lipped species. It is an added singularity in the distribution of these African rhinos that in South Africa they should have abounded in the same localities, while in the north their ranges are sharply divided by the upper Nile.

Our observations of the square-mouthed rhino were made during the three or four weeks we spent at and near our camp in the Lado, about midway between Lake Albert Nyanza and Nimule. All told we must have seen about fifty individuals. Of course we molested none after obtaining the full series needed for the collection; the extreme rarity of the species in collections rendered it of much importance that the series should be full.

We found them rather more gregarious than the common kind. Once we found four, and once five, together; in the former case they were lying down, so that it was not a mere fortuitous gathering to graze. Ordinarily they were found singly, or a cow and calf—often two or three years old—together; or a bull might be with the cow and calf. They are purely grazers, grass-feeders, and live only where there are great plains covered with the dry African pasturage; but these plains are generally dotted with clumps of bushes, and with a scattered growth of scantily leaved thorn-trees, acacias. The country is crossed here and there by broad, smooth, well-trodden trails, made by the elephants with some help from the rhinos, and often travelled by other game. We found the rhinos going to water, either at the Nile or some pond, during the night. They would then feed slowly back into the dry wastes, their spoor through the tall grass or over the burnt places being readily followed by



NILE WHITE RHINOCEROS, MALE
 Shot by Theodore Roosevelt, Rhino Camp, Lado Enclave
 Mounted by J. L. Clark in the United States National Museum



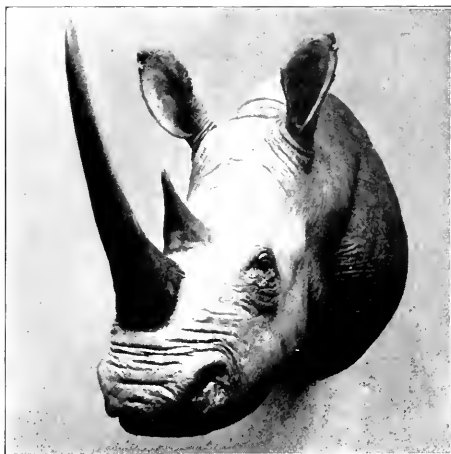
BLACK RHINOCEROS
 Shot by J. T. McCutcheon
 Tana River near Fort Hall



NILE WHITE RHINOCEROS, FEMALE
 Shot by Kermit Roosevelt at Lado Enclave
 Longest horned specimen, 31 inches



BLACK RHINOCEROS, FEMALE
 KEITLOA VARIETY
 Shot by Theodore Roosevelt at Loita Plains



NILE WHITE RHINOCEROS, MALE
 Shot by Theodore Roosevelt at Lado Enclave

THE BLACK AND THE WHITE AFRICAN RHINOCEROS

expert trackers. About ten o'clock they lay down under some tree; occasionally standing motionless in the half-shade for an hour at a time. Usually we found them lying on their sides, but sometimes kneeling. When roused they sometimes jumped at once to their feet, and sometimes sat up on their haunches like a dog; once Kermit saw one that had been walking to and fro, trying to make out what he was, sit down in this position. About mid-afternoon they rose from sleep and began to feed, making their way toward the water after nightfall. They fed a good deal during the night also. They frequently rubbed their noses and horns against the big ant-hills, for what purpose we cannot say. In walking they held their heads very low, the huge, square muzzles almost sweeping the ground. They trotted, and, if alarmed, galloped at some speed.

They were slow, dull, stupid beasts, rather mild-tempered. Once a badly wounded one made an attempt to charge Kermit, and on another occasion, after he had spent some time taking photographs of a cow and calf, he got so close that the cow finally charged, coming on at a fair pace, with the big, loose lips shaking from side to side. A big calf, over half-grown, also charged him, and he had to turn it by a shot in one cheek. None of the others of our party were charged, although we frequently watched the huge beasts close up, and then withdrew while they trotted to and fro. They were not as nervous and irritable as the black rhinos, and their eyes were even duller. Once having spent some time watching a cow and her big calf feeding, as we stood by a tree thirty yards off, they finally suspected our presence and stopped to look at us. We withdrew for forty yards or so, not wishing to have them charge and

force us to shoot in self-defence. Then we found the skull of one of their dead kinsfolk; one of the party stopped to pick it up and give it to one of the porters. We were talking and laughing; and all the time the two rhinos, their ears cocked forward, looked toward us with solemn bewilderment. So off we strode, and left them still standing, foolish and puzzled, among the sparse and withered trees, in the dry landscape.

If they got our wind the rhinos usually made off at once; but if they merely saw us they would stare at us and move to and fro, their ears up and perhaps their tails cocked, with dull curiosity. We frequently found cow-herons with them, and once a party of black-legged egrets. The herons perched on their heads and backs with entire indifference, and the result was that the rhinos generally looked as if they had been splashed with whitewash. Once, while walking through rather tall grass, we saw some white objects moving rapidly off in single file through the grass tops; and it took a second glance before we realized that they were white herons perched on the back of a rhino bull.

We have never known of a white rhino attacking man or beast in wantonness; but one of the few white rhinos on the South African game reserve, a bull, was charged, and killed, by a stab behind the shoulder, by a solitary bull elephant, a big tusker, which was also on the reserve.

The white rhino has been termed a slow breeder. Of course such a huge animal cannot breed like a guinea-pig. But our experience goes to show that it is for its size really a rather rapid breeder, that the cows breed before they are fully adult, and that they breed again before the calf they already have has left them. Two of the cows which we

found accompanied by calves had not yet shed all their milk teeth; and one cow, accompanied by a good-sized calf, was nearly on the point of giving birth to another.

The white or square-mouthed rhinoceros is a long-headed, tall-bodied animal with a flattened or truncate nose and a wide, square mouth. The excessively long head distinguishes this species at once from all other living forms. The ears are much longer and the feet larger than in the black rhinoceros. One of the peculiarities of this species is the prominent, rounded, fleshy hump upon the nape of the neck just forward of the withers. This hump is purely a muscular structure and receives no support from the dorsal processes of the cervical vertebræ. With the exception of three short folds the skin is smooth and lacks even such shallow markings as the rib furrows which are so characteristic of the black rhinoceros. The best marked of these folds, and the only one which is permanent, is a transverse fold on the foreleg encircling the limb just above the elbow. When the head is held level with the back a prominent transverse fold is formed on the nape just behind the ears. This fold disappears when the head is lowered in feeding and another longer transverse one is formed on the throat. The young at birth do not differ from the adults in color or skin structure and but slightly in proportions. The changes which take place with age are chiefly the growth of the horns and the lengthening of the head.

In size this species exceeds but slightly the big Indian single-horned species and but little the black African species. Measurements of the length and height of the Indian species given by Lydekker* are scarcely inferior to authentic dimensions of the largest South African specimens. Measurements of mounted skeletons of these two species show the Indian very little less in size. The black rhinoceros of East Africa stands several inches lower and measures less in length of head. The superiority in size of the white rhinoceros over the other living species has been greatly exaggerated. The utmost that can be said is that there is a slight average superiority.

* "Great and Small Game of India, Burma and Tibet."

In size the sexes are very similar, the male exceeding the female but little. The only appreciable secondary sexual characters are found in the size of the horn bases, the nasal bones which support them, and the general massiveness of the skull. The base of the front horn in the male is always greater than in the female, this dimension showing no relationship to the length of the structure. The width of the nasal boss which supports the front horn is correspondingly greater in the male. Male skulls are usually actually wider than those of females and are always relatively so as well as being longer. So marked are these sexual characters in the skulls that they can be sexed with a fair amount of certainty.

The species is normally two-horned, the front horn greatly exceeding the rear one in size. The front horn is situated on a prominent bony boss at the tip of the nasal bones and is immediately followed by the rear horn which is much compressed laterally and placed on the suture between the nasal and frontal bones. The front horn is squared in front where it partakes of the shape of the snout, and is normally curved backward as in the black rhinoceros. The usual length of this horn is two feet although occasional specimens attain a length of five feet. The record horn for the South African race is sixty-two and one-half inches. Such enlarged horns are attained only by the females in which they project forward in advance of the snout. The rear horn is usually low, sharply conical, and considerably compressed. It seldom exceeds more than a few inches in height and is occasionally wanting. The rear horn never approaches the front one in size as in the keitloa variety of the black rhinoceros in which the two horns are equal in size. The rear horn is so small that it is obviously disappearing, the species showing a marked tendency to become single-horned; but actual single-horned specimens are rare.

The only parts of the body which show a growth of hair are the terminal margins of the ears and the apical one-fourth of the tail. The hair of the ears is quite soft and an inch or so in length. The hair covering of the tail is stiff and bristly, and confined to a streak along both edges of the flattened tip. In the two male skins the hair covering

TABLE OF FLESH MEASUREMENTS OF SPECIMENS COLLECTED DURING JANUARY, 1910, AT RHINO CAMP, LADO ENCLAVE, BY THE SMITHSONIAN AFRICAN EXPEDITION UNDER THE DIRECTION OF COLONEL ROOSEVELT.

Sex and Age	Length of Head and Body		Length of Tail	Standing Height at the Withers		Length of Front Horn	Diameter of Base of Front Horn	Nature of Specimen	Collector
	Ft.	in.		Ft.	in.				
Male adult . .	11	9	2	5	8	24 $\frac{1}{4}$	7 $\frac{7}{8}$	Skin and skeleton	Theodore Roosevelt
Male adult . .	11	5	2	6	3	14 $\frac{3}{4}$	7	Skin and skeleton	Kermit Roosevelt
Female adult .	11	3	2	3	4	23 $\frac{1}{4}$	6 $\frac{7}{8}$	Skin and skeleton	Theodore Roosevelt
Female old . .	11	1	2	4	5	23 $\frac{3}{4}$	7	Skin and skeleton	Kermit Roosevelt
Female adult .	10	2	2	4	5	13 $\frac{1}{4}$	6 $\frac{3}{4}$	Head skin and skull	Theodore Roosevelt
Female adult	29	6 $\frac{3}{4}$	Head skin and skull	Kermit Roosevelt

these parts is glossy black and quite profuse, but in the female skins the covering is much thinner and decidedly brownish in color. The young at birth are no more hairy than the adults, possessing only the ear and tail fringes of coarse hair.

The skins of the white rhinoceroses cannot under the most lenient consideration be classed as white. They are, however, distinctly lighter than those of the black species, and may on this account be allowed to retain their popular designation of white. The blackness seen in the mounted specimens is due to pigment put on by the taxidermists, and such specimens do not represent the natural color of the animal. Their true color is smoke-gray, as defined by Ridgway, a color conspicuously lighter than the dark clove-brown of their geographical ally, *Diceros bicornis*. The four adult skins from the Lado Enclave show some variation, the color ranging from smoke-gray to broccoli-brown. The two male skins are lighter than the female but the color differences are not constant, the two female skins varying more in color from each other than they do from the male skins.

Measurements of an adult male in the flesh shot by Colonel Roosevelt at Rhino Camp, Lado Enclave, are: length of head and body along contour, 11 feet 9 inches; length of tail to end of vertebræ, 2 feet 5 inches; standing height at shoulders, 5 feet 8 inches; length of ear, 11 inches; length of hind foot (hock to tip of middle hoof), 1 foot 7 inches. Skull of the largest male: greatest length, 2 feet 9 inches; zygomatic width, 1 foot $3\frac{1}{8}$ inches; length of upper tooth row, 10 inches; projection of occipital crests above dorsal plane of skull, $1\frac{3}{4}$ inches. The largest-horned specimen in the National Museum is a female shot by Kermit Roosevelt. This horn measures $29\frac{1}{2}$ inches in length and exhibits the peculiar forward pitch which is not infrequently shown by specimens from South Africa. The pitch forward in this case is extreme, the point coming in contact with the ground in feeding, so that the point is worn flat on its outer face. No other Lado horn showing this peculiarity of curvature has been seen. The longest horn in Major Powell-Cotton's collection is 36 inches in length, and in shape curves backward in the normal way. This



MAP 37—DISTRIBUTION OF THE RACES OF THE WHITE RHINOCEROS

1 *Ceratherium simum simum*

2 *Ceratherium simum cottoni*

is also from a female specimen and is the longest one which has been examined. Ward records a horn $40\frac{1}{4}$ inches in length secured in the Bahr el Ghazal by Captain F. G. Poole.

The specimens examined consist of the series collected by the Smithsonian African expedition under the direction of Colonel Roosevelt at Rhino Camp, Lado Enclave. The precise geographical position of this spot is latitude $2^{\circ} 55'$ north, on the west bank of the Nile, some fifteen miles north of the station of Wadelai. This material consists of fourteen specimens: the complete skins and skeletons of two adult males, two adult females, one calf, and one mature fœtus; the head skins and skulls of three adult females; the skull of a male, and four weathered skulls found on the veldt, two of which are undoubted males and two females. Besides this material in the National Museum the writers have examined specimens from South Africa in the British, Paris, and Hamburg Museums as well as Nile specimens in the Congo Museum at Brussels, and a large series in the private museum of Major Powell-Cotton at Quex Park, England.

CHAPTER XXII

THE COMMON ZEBRA OR BONTE-QUAGGA

HORSE FAMILY

Equidæ

THE living members of the *Equidæ* are distinguishable from all other hoofed mammals by the single-toed character of their feet. They represent the highest specialization in foot structure of the odd-toed ungulates or perissodactyles but are united by intermediate fossil forms to remote five-toed ancestors of small size which lived during the Lower Eocene in both Europe and North America. Such ancient types showed little resemblance to the modern horse, being diminutive, carnivore-like mammals the size of a rabbit, and if they were not united by intermediate forms their equine relationship would scarcely be suspected. The family *Equidæ* consists of horse-like genera having but a single toe to each foot, the lateral toes being represented by the splint-bones, which have lost all trace of false hoofs at their tips. The forms having three toes comprise a distinct family of fossil horses intermediate between true horses and the diminutive five-toed ones. The dental apparatus of the modern horses also shows much specialization. It is especially fitted to withstand a great amount of wear due to mastication. To serve this purpose all the cheek-teeth have become very long-crowned; the crowns at their tips being broad and composed of alternate layers of

enamel, dentine, and cement, which form a perfect grinding surface. The great length of the crown gives the teeth a long period of wear. The horse is in this way fitted to masticate tough herbage rapidly and thoroughly and is placed at very little less disadvantage than the ruminant hoofed mammals which have an accessory pouch to the stomach from which the food is returned to the mouth and masticated at leisure. The incisor teeth are well developed in both jaws and are also very long-crowned and subject to a great amount of wear. The pits or "cups" in the crowns of these teeth are a peculiarity found only in the horse and its fossil allies. In age they disappear, but they persist for a period of eight or ten years, and by their relative size in the various incisor teeth the age of a horse is commonly determined by horse dealers. In addition to the incisor teeth, which provide the horse with a formidable biting apparatus, the males are furnished with well-developed canine teeth in both jaws. The females lack the canines, which are only represented occasionally by vestiges beneath the gums.

During the last geological period or Pleistocene age the *Equidæ* were a dominant type, and widely spread through North and South America, Europe, Asia, and North Africa; but to-day they are totally absent in a wild state from the New World and occur only in a small part of the Old, namely, in southern Asia and in the eastern half of the African continent. The fossil species were quite numerous and several distinct generic types were represented. At the present time there exist a single or at most two generic types, and some seven distinct species. Their extinction in the New World is of such recent occurrence that it was doubtless due to some insect-born infection akin to the

tsetse-fly diseases so prevalent among the big game of Africa to-day and not to any change in the climate, flora, or balance of large carnivorous animals which preyed upon them.

KEY TO THE GENERA OF *Equidæ*

Head not enlarged; skull wider, the snout or rostral portion not greatly lengthened; occipital portion of skull not produced backward beyond the condyles; lambdoidal crests narrow; coloration when striped having the dark stripes much wider than the light ones and the hind quarters crossed by diagonal or longitudinal stripes

Equus

Head somewhat enlarged and elongate or dolichocephalic; skull narrower, the rostral portion lengthened and the occipital or lambdoidal crests very wide and extending well behind the condyles; dark and light stripes numerous and equal in width over most of the body; rump crossed by transverse stripes to below the hips

Dolichohippus

HORSES, ASSES, AND ZEBRAS

Equus

Equus Linnæus, 1758, *Systema Naturæ*, p. 73; type *E. caballus*, the domestic horse.

The modern representatives of the genus *Equus* show great range of coloration from the fully striped zebras through the partially striped asses to the unicolor horse. In body shape or in actual size there is comparatively little range if we exclude the giant domestic breeds of horses which have no standing in nature. The ears range from the great length found in some asses to the short, narrow ear of the horse and bonte-quagga. There is a progressive development in the size of the tail tuft from the small terminal tuft of the zebra to the complete tufted tail of the horse. The skulls, however, show surprisingly slight differences in shape or dentition and are scarcely distinguishable. The horse is more distinct than the other species and may be distinguished by its larger cheek-teeth in which the inner

fold or protocone of enamel is enlarged. Notwithstanding this similarity of structure, the various groups which are recognized by distinct English names have been employed as genera by some writers, who divide the genus up into zebras (*Hippotigris*), asses (*Asinus*), and the horse (*Equus*), on the basis of external differences. Unfortunately, when we come to consider the fossil species such differences cannot be employed, and we are at a loss to know whether in these extinct species we are dealing with zebras, asses, or horses. The fossil species first make their appearance in the Upper Pliocene and the genus continues on down through the Pleistocene to the present time. The former range covered North America, Europe, Asia, and North and South Africa, being absent only from South America. Recently the first specimen of fossil horse has been recorded from South Africa by Broom. It is based on some tooth remains from Pleistocene deposits near Cape Town, which indicate a very large species apparently exceeding the horse in size. The existing representatives occur in a small part of central and southern Asia and Africa. In the latter continent they extend from the northeastern portion southward along the eastern half to the Cape region and southwest coast as far north as Angola. The number of living representatives does not exceed six or seven valid species, which are comprised in the horse, two zebras, and three or four species of asses.

THE BONTE-QUAGGA OR QUAGGA ZEBRA

Equus quagga

Equus quagga Gmelin, 1788, *Systema Naturæ*, p. 213.

The name quagga has been derived from the call of the zebra, which consists of a short bark, kwa-ha, repeated several times. The name came originally from the Hottentot word quaha, through the Cape Dutch, who applied it first to the true quagga and later distinguished the other or more fully striped races as bonte-quaggas. The quagga has by most recent writers been considered a distinct species from the Burchell zebra and its northern races owing to the restriction in the quagga of the stripes to the forward part of the body. It is, however, less widely separated in coloration from the

typical Burchell zebra than the latter is from its more northern fully striped races. There is a continuous progressive change in coloration from the immediate vicinity of the Cape or southern point of Africa, which was the habitat of the extinct quagga, to typical *burchelli*, inhabiting the Orange River district, and on through other striped forms in the Transvaal to the fully striped races of southern Rhodesia or Matabeleland. The typical Burchell zebra had only the body striped, the legs being uniform whitish and the hind quarters but weakly striped. The few specimens of the typical quagga which are now preserved in museums show considerable variation in the extent of the striping, some in this regard being striped on the hind quarters almost as distinctly as true *burchelli*. The change from a partially striped animal to a fully striped one takes place in the southern part of the range of the species, or that portion south of the Zambesi River. North of the Zambesi River no additional stripes or greater intensity of striping occurs, the races north of this point showing only slight differences in body size or color tone. Curiously enough, the most fully striped of all the races, *crawshayi*, inhabits the middle region of the Zambesi, north of which races occur having a slightly less number of stripes but no less distinctly striped. We thus have in this zebra practically the whole range of its color scheme exhibited in the southern third of its range, while the northern two thirds show almost no variation. What the real significance of this break in the progressive color change is really due to is quite problematical. Two theories suggest themselves: one that it is a climatic affair, the country from the Zambesi River southward being in the temperate zone and consequently showing a gradual range of temperature which coincides with the gradual color change, the country north of the Zambesi River being tropical and of uniform climate; the other that there is an important time element involved—South Africa having long been the home of this particular species, the color differences have come about slowly in that region, but the zebra's extension northward to beyond the equator is of such recent date that there has not elapsed time sufficient for important color changes to take place such as are found in the south.

In East Africa, north to the Northern Guaso Nyiro, the most plentiful big animal next to the hartebeest was the common zebra—not the very uncommon and narrowly limited mountain zebra of South Africa, but the bonte-quagga, which is found in a dozen different forms from the Orange River to beyond the equator.

The zebra is eminently gregarious. Of course, an occasional stallion is found by himself, usually an immature, a weak, or an aged animal. But ordinarily zebras are found in herds of from a dozen to a couple of hundred; and, moreover, half the time there are other animals mixed in with these herds—hartebeests, wildebeests, oryxes, elands, gazelles, or ostriches. Each herd is usually under the leadership of a master stallion.

Zebras are vicious fighters. Against a lion they make no fight at all, and against man they are only dangerous in the sense that a bull moose or wapiti is dangerous; that is, they will bite viciously if approached when wounded; and on rare occasions when crippled and brought to a standstill, but not wholly disabled, they will charge at the hunter from a distance of several rods. We, personally, have never known one do more than skin its teeth at us as we approached it when on the ground, or perhaps as we galloped through a herd after some more desirable game; but Mr. Stewart Edward White was regularly charged. It would be interesting to know whether zebras can stand off wild hounds—those inveterate enemies of other game. We once saw a zebra make a race at a wild hound which had trotted near by, and drive it off, although the pied hunter did not seem much frightened; and Loring saw a zebra standing with two wild hounds near by to which it

paid not the slightest attention. But it is impossible to generalize from such instances; often game animals seem to recognize when beasts of prey are not after them, and then betray a curious indifference to the otherwise dreaded presence. We have seen zebras trot a few rods out of the path of a lion and then turn to gaze at him as he walked by. The chief fighting is done by the stallions among themselves. When at liberty the beaten party can generally escape; but if a herd is captured and left overnight in a corral, by morning the weaker males are sure to have been frightfully savaged, and some of them killed. The jaws are very powerful and inflict a merciless bite. In captivity the animals must be carefully handled, as they sometimes grow very vicious.

Zebras are noisy, much more so than any antelope. Their barking cry—qua-ha, or ba-ha—sounds not unlike that of a dog when heard at a distance; watching from behind a bush we have seen the stallions canter close by with ears forward and mouths open as they uttered this cry. They often utter it when leaving a pool after drinking, or when their alarm or curiosity is excited; and often for no reason as far as we could discern.

Game differ wonderfully in tameness and shyness, both individually and locally; and, moreover, individuals will be shy at one time, and, for no apparent reason, tame at another. On the whole, however, the common zebra is among the tamest of African game. It is, moreover, much influenced by curiosity. Again and again herds have stood watching us from different sides, even down wind, as we sat under a tree eating lunch or resting. Zebras are quick to catch motion, but will feed right up to a man lying

motionless, especially if he is under or beside even the smallest and most scantily leaved bush. Their sense of smell is keen, as with all game.

They are grass-eaters, and are emphatically animals of the open plains, seeming to be indifferent as to whether these are entirely bare of trees or are thinly dotted with occasional thorny acacias. We never saw them in anything resembling thick cover, not even in such cover as that to which their companions, the hartebeests, sometimes penetrated; but in places they seemed to like the plains over which acacias were scattered, and would stand or rest at mid-day in their shade. As with other game, it was astonishing to see how they abounded, and how fat they became, in dry, open country, where water was scarce and the pasturage brown and withered. As long as they could reach water once in twenty-four hours, and find abundant pasturage of the kind they liked—no matter how dry—within eight or ten miles of the water, they thrived. In such a district they lived throughout the year, seeming to migrate much less freely than the wildebeest and some other game—in fact, the only migrations we heard of were those occurring when they had to leave a given district because the water and herbage failed outright. On the Athi and Kapiti Plains we were informed by the settlers that the zebras stayed all the time, with very slight shifts of a few miles one way or the other, as the different series of pools dried or filled. In the Sotik we were informed that in times of drought the zebra and almost all the other game were obliged to abandon extensive regions in which they swarmed after the rains. Like so many big animals, zebras are not favored by a rank and luxurious plant growth. We never saw them in

the forests or thick, wet bush. There were none on the cold, well-watered slopes of Kenia, with their thick growth of bush grass. They were not abundant in any of the regions fitted for a thick, agricultural population. The country which they most affected was like our own Western ranch country: the grass grew thick and fairly high on it for a short period after the rains, but during most of the time it was dry, and the grass withered and short; the trees were acacias or euphorbias, or on the lower grounds palms.

Few things are more interesting or puzzling to the naturalist in East Africa than the distribution of the various big animals. The limits of the range of many species seem in our eyes purely arbitrary, uninfluenced by any physical barriers; doubtless there is an explanation, but it has not yet been discovered. In most places the big and the small gazelles are found in abundance on the same plains, but, although there seems no change in the country, except that the altitude is lower, the small gazelles are not found northward along the Northern Guaso Nyiro, where one form of the big gazelle abounds. The wildebeest abounds in the Sotik and on the Athi and Kapiti Plains, but is not found along the Northern Guaso Nyiro. The hartebeests are the most abundant big mammals throughout their range; one species, the Coke, is the commonest game of the Sotik and the Athi, another, the Jackson, the commonest game in the 'Nzoia country, neither intruding on the range of the other, and both being absent from the Northern Guaso Nyiro, where the oryx is common; and in this case the explanation of altitude, which can be given as regards the small gazelle, does not apply, for hartebeests are found on the Nile where the altitude is the same as that of the Northern

Guaso Nyiro. But the common zebra covers the range of all these animals in East Africa. It is abundant in the Sotik and on the Athi and Kapiti Plains, although inferior in number to the Coke hartebeest, with which it there associates together with the wildebeest and big and little gazelles; but the causes, whatever they are, which so sharply limit the range of the Coke hartebeest and wildebeest do not affect the zebra, which is also plentiful along the Northern Guaso Nyiro in company with the oryx and the big Grévy zebra. On the other hand, while the zebra's range overlaps that of the big hartebeests, the latter extend far to the westward of the regions in which the zebras are found; we found no zebras in the brush-covered and fairly well wooded and watered districts of Uganda in which hartebeests were not uncommon, and we saw none along the upper White Nile in regions in which hartebeests were plentiful and which were seemingly in their essential characteristics like the Sotik and the Athi, but they are known to occur locally in these regions. Moreover, while the hartebeests have become differentiated into sharply defined and totally distinct species, the common zebra extends over a range which includes several of these hartebeest species, without itself undergoing anything like the same differentiation; in fact, the different varieties of the common zebra grade into one another, from the southern form with white legs to the more richly colored northern form with fully striped legs.

Where water is plentiful and the pasturage good a herd of zebra will contentedly exist within an area of a dozen miles square, or less. In the absence of hunters such a herd normally leads an uneventful life, the placidity of which is

disturbed only by the ravages of the lion. Most of the zebra's existence is spent in eating, and most of the remainder in sleeping or in drowsy rest. If undisturbed and unalarmed the herds, after drinking, graze off toward their favorite feeding grounds, or, if the grass is poor in the intervening country, walk or canter toward them, strung out in Indian file. After eating their temporary fill of grass they rest for three or four hours, sometimes lying down, more often standing. Most often they may be found resting right in the open plain; but if a clump of thorn-trees is handy they may stand or lie in the slight shade of their thinly leaved branches. After resting the herd rises and slowly grazes back to the water-hole or river. They may drink only once a day, but they are thirsty animals and prefer to visit the water at least twice every twenty-four hours. We have seen them drink in the morning and afternoon and late evening; they also drink at night. Noon is their favorite hour for rest, but they are by no means regular, and they sometimes rest at night, although we believe that they generally spend the night feeding, and are then more alert than in the daytime.

Night is the lion's hunting season, and the sight or smell of him or even the suspicion of him at that time throws the animals he hunts into a frenzy of terror. Under the influence of these ever-recurring panics, the zebras stampede in a mad rush. This habit makes them obnoxious to the settlers, for they are powerful animals with thick skins, and in such a stampede they go right through any wire fence; while they are of no value to the settlers except for their hides, as their flesh is not good eating from the white man's standpoint, although

most of the natives devour it greedily. During the moments of panic the zebra's terror is like the horrible fear felt in a nightmare, and under its influence the animal will rush anywhere; but as with other wild beasts the feeling is as short-lived as it is intense. If one of their number has been killed the herd may wander about for a few minutes whinnying; but after these few minutes they settle down to their ordinary life business, and feed, or rest, or make love, or fight as before. Night is a time of frequent panic, but during the day there is little fear of present molestation, and nothing either of remembrance of past or anticipation of future molestation. In approaching the drinking-places, there is usually much watchfulness and suspicion, the advance being made by fits and starts, with halts and sudden backward wheels; for, although the lion generally kills them on the open plain, he also often lies in wait for them by some much-frequented pool.

We have already discussed the alleged "protective coloration" of big game. As regards the game of the open plains protective coloration plays practically no part; and as regards the zebra it plays absolutely no part whatever. Under the glaring African sun, and in the African landscape, any animal, of any color or shape, is sometimes hard to see—a rhino, buffalo, giraffe, or zebra, or even an elephant; and there are exceptional circumstances under which any conceivable color or coloration scheme will merge the wearer with the surroundings. But the game animals of the East African plains do not rely on their coloration for their protection; they are colored in all kinds of ways, and they are neither helped nor hurt by their coloration, whether it is concealing or revealing. The zebra has an advertising color-

tion; that is, its coloration reveals it far more often than it conceals it. It is less conspicuous than the wildebeest, sable, or topi; about as conspicuous as the hartebeest; and much more conspicuous than the eland, oryx, roan, Grant gazelle, or Thomson gazelle. When coming to water it is, of course, in motion, never attempts to hide or slink, and is always and under all circumstances conspicuous to every beast of prey in the neighborhood. After drinking it immediately returns to the open country, where it can be seen at once even by dull eyes. When standing or lying down under acacia-trees at noon it shows up as above indicated—more conspicuously than an eland or oryx, less so than a wildebeest. The stripes, when they can be seen at all, have an advertising effect; this is especially true of the broad rump stripes which advertise the animal at a distance at which the big Grévy zebra seems gray like an ass. At a distance the zebra is apt to look white or black, according as the sun strikes it, and then gray. Even while standing still under a thorn-tree, in the puzzling lights and shadows which tend to conceal any animal of any color, the zebra frequently whisks its tail, which at once attracts attention. All game animals with long tails are continually twitching or swinging them, and this motion catches the eye at once, even at a distance at which the coloration would neither conceal nor reveal the wearer. The only time we ever saw zebras helped by any concealing quality of their coloration was once when we found a few standing in partially burnt grass; the infrequent black or yellow stalks harmonized well with their coats, and made it difficult to see them.

At nightfall all animals become hard to see, of course; and in thick darkness all are alike invisible. In dusk, in

moonlight, and on very clear, moonless nights, we found that grayish, countershaded animals like domestic asses, and eland and oryx, were most difficult to see. Zebras were much more clearly visible; they seemed whitish; if close up their stripes could be made out. Mr. Selous has recorded an interesting observation to this effect: he found that even the Grévy zebra, which is less conspicuously colored than the common kind, showed up at night more plainly than eland, oryx, or koodoo, and that in the moonlight the stripes were very distinct, making the animal readily visible.

On the Athi and Kapiti Plains ticks swarmed, and they clustered in masses around the eyes of the zebras and in the groin, and wherever there was bare skin. Yet, in spite of the abundance of these loathsome creatures, the zebras were fat and in high condition. Ticks were much less plentiful both in the Sotik and along the Northern Guaso Nyiro. Wherever they teemed, as they did on the Kapiti Plains, it was hard to understand how the game supported their presence. But the zebra and antelope were just as fat there as elsewhere. Evidently the ticks did not really trouble them, whereas the biting flies bothered them greatly.

All animals which live in herds tend to develop a herd leader. This herd leader sometimes may, and sometimes may not, be the master male. Thus in a herd of wapiti, containing a heavy master bull, we have seen an old cow assume complete leadership, watching while the herd was at rest and leading the others whenever the herd was in motion. We also once saw a Tommy doe, which was associating with four Grant gazelles, take complete charge of the whole party, its big associates following it submissively wherever it led. It seemed as if in the zebra herds the

master stallion generally acted as leader, when there was any leader. He would round up the mares and drive them whither he wished; and he would trot a few paces toward any strange object, leaving the herd behind and watching intently, with ears pricked forward. We have never been able to watch a herd of wild game close enough to tell whether the individuals all fall into an ordered system of precedence, as ranch cattle do, where gradually each steer, bull, or cow seems to accept its exact place with reference to its fellows.

KEY TO THE RACES OF *quagga*

- Dark stripes blackish or deep seal-brown; light stripes (ground-color) cream color or whitish without ochraceous suffusion
 Body size smaller, skull length usually less than 21 inches; light stripes whitish *granti*
- Body size large, skull length usually greater than 21 inches; light stripes cream color *böhmi*
- Dark stripes, seal-brown or bistre; light stripes darker than cream color, usually pale ochraceous-buff. Body size small, the skull length less than 20 inches *cuninghamei*

HIGHLAND QUAGGA ZEBRA

Equus quagga granti

NATIVE NAMES: Masai, *ol-oitigo*; Kikamba, *nthai*; Kikuyu, *njagi*; Acholi, *lagware*; Luganda, *entulege*.

Equus burchelli granti DeWinton, 1896, *Ann. & Mag. Hist.*, XVII, p. 319.

RANGE.—The highlands of British East Africa westward through Uganda to the Edward Nyanza and northward on the east side of the Nile as far as the Mongolla district and the headwaters of the Sobat River northwest of Lake Rudolf, east to the eastern edge of the highland plateau down to an altitude of three thousand feet in British East Africa, and north as far as the south bank of the Tana River; southern limits of range in German East Africa unknown.

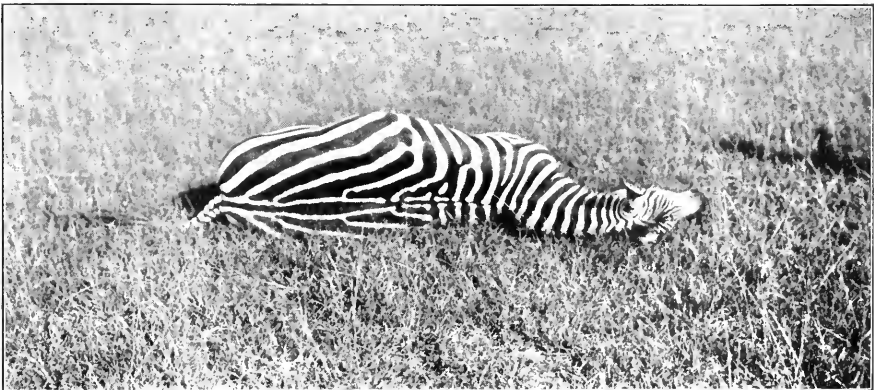
The highland quagga of British East Africa was described as a distinct race in 1896 by DeWinton, from specimens collected near the Thika River by Doctor J. W. Gregory, who has given us an account of his journey in "The Great Rift Valley." In the original description, which is very brief, DeWinton makes no allusion to his use of Grant's name for this race. He has named the race, without doubt, for Colonel Grant of the Speke and Grant expedition, who mentions the zebra in his notes in the natural history account of the expedition, published in 1872, where he calls attention to the color differences between this race and the typical Burchell zebra of South Africa. Sportsmen, however, seem to be very uncertain as to the distinctness of this race from those found south of the Zambesi River and often refer to the East African race as "Chapman's." They have, no doubt, been led to this course by the occasional presence of faint shadow stripes in specimens which in this respect resemble the Chapman zebra. Although shadow stripes are occasionally present on the hind quarters in specimens from British East Africa, the absence of such stripes is much more common and must be accepted as one of the characters of the highland race known to naturalists as *Equus quagga granti*. Other characters for the race in comparison with South African forms are the great width of the dark stripes on the hind quarters, the whiteness of the light stripes, and the fully striped character of the legs. The stripes are especially numerous on the pasterns above the hoofs, where they unite to form a wide black band covering nearly the whole pastern region. The quagga zebra, commonly known as the Burchell zebra, covers a great expanse of territory in East Africa, as well as a great altitudinal range, and is consequently subject to great diversity of climatic conditions. Nevertheless, they show almost no color changes which agree with difference in environment. This is in marked contrast to their color behavior in South Africa as well as to the color behavior of the Grant gazelle, giraffe, and a host of other species with which they are intimately associated in East Africa and which exhibit well-marked geographical differences in color over the same area. The zebra affords us a striking example of how independently species react to environment and how ob-



HIGHLAND QUAGGA ZEBRA, MALE
Shot by Theodore Roosevelt, Loita Plains



HIGHLAND QUAGGA ZEBRA, MALE
Shot by Theodore Roosevelt, Loita Plains



HIGHLAND QUAGGA ZEBRA, MALE
Shot by Theodore Roosevelt, Loita Plains

SHOWING VARIATIONS IN DORSAL COLOR PATTERNS OF HIGHLAND
QUAGGA ZEBRA

viously each is a "law unto itself." Not only does the coloration of the quagga zebras emphasize this point, but it goes much further toward breaking down our general theories by responding very diversely in color changes over the northern and southern parts of its range, or, in other words, the changes we find in effect in one part of the range cannot be used as a clew to what may be expected to occur over other parts of the range.

A freak or abnormally colored specimen of the highland quagga zebra has been collected near Lake Nakuru, British East Africa, by G. H. Goldfinch and described recently as a new race, *goldfinchi*, by Ridgway. This specimen has a peculiar large, irregular white blotch across the middle of the back which is divided on the midline by the dark dorsal stripe. Two other similar specimens have been seen at the same spot which are, without doubt, blood relatives of the type. Specimens of this sort have no standing in nature as a race, but merely represent abnormal individuals. Colonel Delme-Radcliffe records, in the proceedings of the Zoological Society of London for 1905, a zebra observed by him near Rushenyi, Uganda, which was much more extensively white, the stripes being evident only on the neck and the hind quarters, the rest of the body being quite albinistic. This specimen was associated with a large herd of normally colored zebras. An albino zebra is also recorded by Oscar Neumann from Manyara Lake in the Rift Valley of German East Africa. Albinism has also been observed by Percival among Grévy zebra in the vicinity of the Lorian swamp.

The highland quagga is distinguishable from the coast and the northern desert forms by only average characters or slight differences. From *böhmi*, the race occupying the low coast lands, it is distinguishable by the smaller body size, the somewhat narrower stripes on the hind quarters, and by the whiter color of the light stripes which seldom show any buffy suffusion. The Northern Guaso Nyiro desert race, *cuninghamei*, differs from *granti* by smaller body size much as *granti* does from *böhmi* but has better marked color differences, the dark stripes being quite brownish, bistre or seal-brown, instead of black. The average length of male skulls in *granti* is 20 inches as against 19

inches in *cunninghamei* and 21 inches in *böhmi*. The greatest width of the oblique stripes on the hind quarters on *granti* is 3 inches, while in *cunninghamei* their width is only $2\frac{3}{4}$ inches, but in *böhmi* they are greatest of all, being $3\frac{1}{2}$ inches. The amount of actual color variation is slight but the color pattern is extremely variable in certain parts, especially in the region of the dorsal stripe and on the pasterns, that is, the part of the leg immediately above the hoof. Usually the dorsal stripe is bordered for its whole length by a white stripe so that the lateral stripes do not unite with it. But there is every intermediate condition from such an unbroken dorsal stripe to one which unites with practically all of the transverse and oblique stripes on the loins and rump. The pastern region varies, independent of age or sex, from a fully striped condition, in which the margin of the hoof is marked by a broad whitish border, to a condition in which the lower half of the pastern is solid black and the light band immediately above the hoof wholly absent. There appears to be a fairly well-marked sexual color difference in the nose, which in the males is black only at the tip about the nostrils and the lips and bright tan posteriorly between the nostrils and the tips of the narrow forehead stripes. This area in the females is usually black like the nostril area, the whole snout being black. Shadow stripes occur on but a very small per cent of the specimens. In a series of fourteen males from the Loita Plains only two show shadow stripes, and in these they are confined to faint traces on the hind quarters. One female in a series of eight from the same locality shows shadow stripes similar in distinctness and position. The shadow stripes are individual affairs and are no more prevalent in the young than in adults, as witnessed in a series of three newly born young in which indications of shadow stripes are present in only one of the specimens. The lesser width of the stripes on the hind quarters, which is one of the characters of the highland form, shows less variation than the same dimension in the dorsal or the neck stripes. The oblique stripes on the hind quarters vary in different individuals in greatest width from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches, the dorsal stripe from $2\frac{1}{2}$ to $5\frac{1}{2}$ inches, and the broadest neck stripe from $2\frac{3}{4}$ to 4 inches. One of the distinctive features of this

zebra over *crawshayi* of South Africa is the lesser number and broader character of the transverse stripes on the middle of the body between the shoulder stripe and the first oblique stripe. They number five in all the specimens, except two in which they are reduced to four. In *crawshayi* they number six or more and are correspondingly narrower. The color of the dark stripes is black in all the adult specimens, but in the immature ones the stripes are usually less blackish, being seal-brown or, in very young animals, russet-brown. The light stripes or the ground-color are usually quite whitish or cream color. In some individuals there is occasionally a buff intermixture, but the immature animals and the very young are usually quite as whitish as the adults. The ears lose their dark markings to some extent in age. The dark tip is, however, never absent, but it is greatly reduced in old age when the ear becomes almost completely white in appearance. The hair coat is shortest in adults and longest in the young. In the nursing young it is usually quite woolly. In very old adults the mane, which in adults is usually some 5 or 6 inches long, becomes worn down to a thin fringe only 1 or 2 inches long, and so thin that the white stripes which are present in the perfect condition have been eliminated by wear, leaving only black. Specimens of this sort from the Uasin Gishu Plateau have been mentioned by Lydekker as perhaps representing a distinct race owing to their maneless condition. They are, however, only aged males in which the mane is normally greatly reduced. Female zebras do not, however, share in this mane reduction but retain well-developed manes throughout their lives. The tail tuft seems to be a more constant affair and has usually a length of 17 inches beyond the end of the tail vertebræ. It varies, however, from 15 to 19 inches in length but appears not to show any decrease in age like the mane.

The size variation in this race is really considerable if we take as a basis the dimensions of skulls which offer in this respect the most reliable data. The length of the skull in males varies from $19\frac{1}{4}$ inches to $21\frac{1}{2}$ inches, which gives an actual variation of $2\frac{1}{4}$ inches. In the females the skull length varies from $18\frac{1}{2}$ inches to $20\frac{1}{2}$ inches and shows an actual variation of 2 inches, which is practically the same

as in the males. These figures are based on the measurements of some fifty specimens of adults in the National Museum. The skulls of females average an inch less in actual length than those of males, but in the living animals the two sexes appear quite indistinguishable in size, and flesh measurements show them to be very nearly equal. The largest-skulled male zebra in the series at the National Museum is one having a length of $21\frac{1}{2}$ inches, shot by Colonel Roosevelt on the Loita Plains. This one measured, in the flesh: head and body, 87 inches; tail, 16 inches; hind foot, 22 inches; ear, 8 inches. A very large female from the Kapiti Plains nearly equals these dimensions in the flesh, the chief differences being in the length of the hind foot, which is $\frac{3}{4}$ of an inch less than in the male. The tail of this specimen is somewhat longer than that of the male, being 18 inches, which is the usual tail length of the race. At the National Museum a large series of skins and skulls have been examined from the Kapiti, Athi, and Loita Plains, Lakes Naivasha and Baringo, Laikipia and Uasin Gishu Plateaux. Others have been examined in the British Museum from the Rift Valley of British East Africa and the Athi Plains.

The highland quagga zebra occurs wide-spread throughout British and German East Africa, except in the low coast country and in the northern deserts, where it is represented by other races. In Uganda, however, it is much less abundant, owing to the growths of tall elephant-grass which cover much of the plains country and make the region unsuitable for open-plains game such as zebras. In places where open plains of short grass are to be found the zebra is found in small numbers. They occur in such districts near the Maanja River west of Kampala, and on the German border in the highlands of Ankole. Northward from Mount Elgon they are found over the highlands as far as the Soudan station of Mongolla where they reach their extreme northern limit in the immediate vicinity of the Nile, which stands as a barrier to their westward extension. On the headwaters of the Sobat River they occur somewhat farther northeast, and here they reach their extreme northern limit. In this region they have been reported by but one sportsman, William N. McMillan, who

met with zebra in the plateau region of the Boma country at the head of the Kaia River, a tributary of the Sobat. Some distance east of this region, in this extreme northeast corner of their range, they meet the Abyssinian form of the quagga, *jollæ*, in the valley of the Omo River.

KILIMANJARO QUAGGA ZEBRA

Equus quagga böhmi

NATIVE NAMES: Swahili, *punda milia*; Duruma, *forru*.

Equus böhmi Matschie, 1892, Sitz.-Ber. Nat. Freu., Berlin, p. 131.

RANGE.—Lowlands of the coast drainage from three thousand feet to sea-level, north in British East Africa as far as the south bank of the Tana River, and inland to the limits of the desert nyika zone; limits of range southward in German East Africa unknown.

The zebra is known to the Swahili as *punda milia*, or striped donkey, and this name has been carried through the length and breadth of East Africa by the Swahili porters. The name is being constantly impressed on the minds of sportsmen by the insistent porter, whose stomach is always demanding zebra meat. *Punda milia* has thus become as familiar a term for the zebra to the European traveller in East Africa as *quagga* is to his cousins in South Africa. The coast race of the quagga zebra was described by Matschie in 1892 from a skin collected by Herr Kuhnert on the Pangani River south of Kilimanjaro and partly from a painting by Richard Böhm for whom the species was named. The original skin is now in the Berlin Museum, where it has been examined by Heller. It is a flat skin lacking the head and the feet. Faint shadow stripes occur between the broad stripes on the hind quarters but they are not well marked. Undue emphasis has been placed on the presence of shadow stripes in this race owing to their presence in the type, but they are really a variable feature and are of no racial significance. The type happens to be so marked, but specimens from Kilimanjaro lack the shadow stripes in at least fifty per cent of the individuals, and we have no doubt that the actual occurrence of shadow stripes will be found, upon the examination of a larger number of skins, to be a very much less per cent. A mounted specimen from

Kilimanjaro in the British Museum is without indications of shadow stripes. There is in the National Museum a single old male specimen representing this race, collected by the Rainey expedition at Mtoto Andei Station in the desert nyika zone. This specimen is decidedly larger than any of the highland race, has a larger skull, broader stripes on the quarters, and more buffy ground-color, but is without any trace of shadow stripes. It is evident from this specimen that the coast race is a larger form having a somewhat more buffy tinge to the light stripes. Owing to the aged character of this specimen the mane on the nape is reduced to a thin line of short black hair an inch in length. The nose has the tan blotch between the nostrils and the tips of the forehead stripes well marked as in the males of *granti*. The dark stripes are also deep black, as in *granti*, and are quite the same in arrangement. The width of the broadest stripes on the hind quarters is somewhat greater, being $3\frac{3}{4}$ inches. The flesh measurements of this specimen were: head and body, 91 inches; tail, 18 inches; hind foot, 22 inches; ear, $7\frac{1}{4}$ inches. The greatest length of the skull is 22 inches.

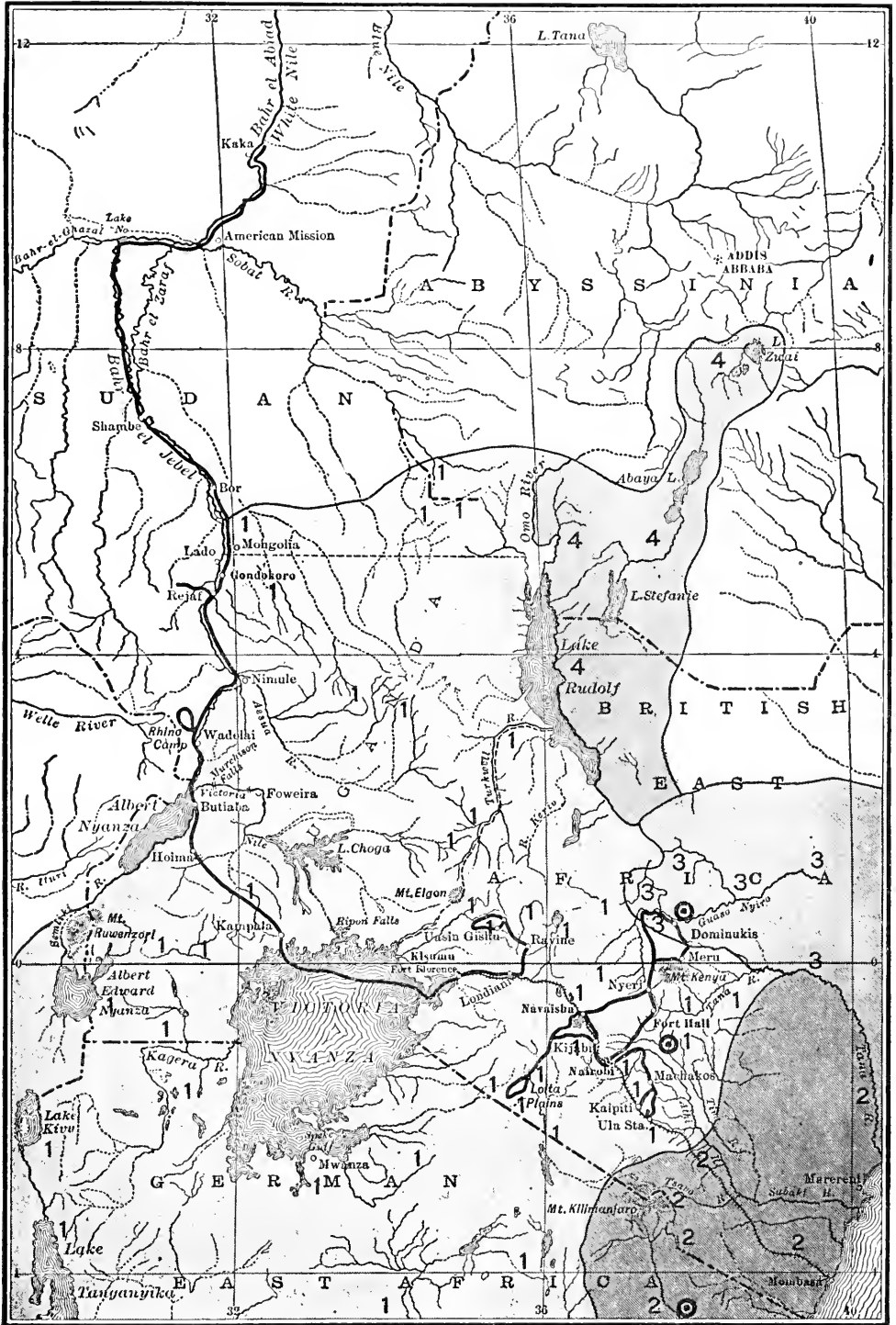
The coast race is found in well-watered districts throughout the coast plain and the desert bush country. On the lower slopes or plains of Kilimanjaro it is especially abundant. In the thorn scrub of the desert nyika they are only found locally in the vicinity of a permanent water supply. Herds have been seen near Mtoto Andei Station and also near the coast at Maji ya Chumvi. They have also been reported on the lower Tana River and the lower Sabaki River.

SAMBURU QUAGGA ZEBRA

Equus quagga cunninghamei

Equus quagga cunninghamei Heller, 1914, Smith. Misc. Coll., vol. 61, No. 22, p. 3.

RANGE.—Desert drainage area of the Northern Guaso Nyiro from the eastern base of the Laikipia Escarpment eastward to the Lorian swamp, south as far as the north bank of the Tana River and north at least as far as the Lorogi Mountains; northern and eastern limits of range unknown.



MAP 38—DISTRIBUTION OF THE RACES OF THE QUAGGA ZEBRA

- 1 *Equus quagga granti*
- 3 *Equus quagga cuninghamei*

- 2 *Equus quagga böhmi*
- 4 *Equus quagga jollie*

The occurrence of the quagga zebra in the Northern Guaso Nyiro district has been reported by nearly every traveller who has visited the district, and the association of the quagga and the Grévy together in the same herds has often been commented upon. It is, however, not alone in this region that such association occurs, for the two types of zebra continue together northward over the desert area to their northern limits in Abyssinia. The quagga zebra inhabiting the Northern Guaso Nyiro district may be distinguished by lighter coloration and smaller body size from the highland quagga of East Africa and Uganda and has recently been named for R. J. Cuninghame, the well-known safari leader of British East Africa.

The race is distinguishable from *granti* by its darker ground-color as represented by the light stripes which are pale ochraceous-buff and the lighter color of its dark stripes which are bistre-brown instead of black. The skull differs from that of *granti* by the shortness of the rostral portion and the narrowness of the diastema between the cheek-teeth and the incisors. The skull averages smaller in length with narrower palatal width and wider lambdoidal crest than in *granti*. From *böhmi*, of the Kilimanjaro district, it differs in color the same way as from *granti*, but is further distinguishable by its much smaller body size.

The ground-color as represented by the light stripes is pale ochraceous-buff and shows considerable contrast to the white belly and inner surface of the hind quarters. The dark stripes are uniform bistre-brown on the body but darker somewhat on the head, where they become seal-brown in conformity with the seal-brown nose patch. The legs below the knees and hocks are marked by lighter stripes than the body, being snuff-brown and fully striped to the hoofs. The tail tuft is black with the exception of the mixture of a few white hairs in the upper part. The ears are cream-white, marked on the back at the tip by a broad area of bistre-brown and another brown area near the base. The mane is well developed, the hair having a length of 6 inches, with an extent from the crown of the head to the shoulders, and is striped pale buff and seal-brown in conformity with the stripes of the neck. The body stripes are arranged quite as in *granti* or *böhmi*, but there is no in-

dication of shadow stripes anywhere. The widest stripes are the oblique ones crossing the hind quarters, which have a width of $2\frac{3}{4}$ inches at their widest part. The body is crossed behind the shoulders from the last neck stripe to the first oblique stripe by four transverse stripes, which completely encircle the body and join the longitudinal ventral stripe. The neck is crossed by nine transverse stripes, the anterior of which are narrow and a few of the posterior very wide. The leg stripes are broken on the inner side on the upper part of the legs, but below the knees and the hocks they completely encircle the legs, and on the lower part of the pasterns, immediately above the hoof, they usually become fused into a solid dark band.

There is in addition to the type skin at the National Museum another skin of the same age taken at the same time. This latter specimen is quite identical in color with the type. Specimens of *granti* of the same age from the Athi Plains differ from the type by their whitish ground-color and dark stripes which are seal-brown in color. The stripes of the old adults of *cunninghamei*, however, as observed in the live specimens in the field, are somewhat darker than the type but are never deep black as in *granti*. The lighter color of the dark stripes is no doubt due to the arid conditions and intense heat and sunlight to which the Northern Guaso Nyiro race is subject. *Cunninghamei* is a desert race occupying the Northern Guaso Nyiro watershed from its formation by the Guaso Narok and Guaso Nyuki Rivers eastward to its termination in the Lorian swamp. Northward the race reaches at least as far as the northern slopes of the Lorogi Mountains. The quagga zebras occurring along the east shore of Lake Rudolf may be *jollæ*, the Abyssinian race, which was described by Camerano from the Rift Valley of central Abyssinia.

A fully adult male from Archer's Post, Northern Guaso Nyiro River, had the following flesh measurements: head and body, 75 inches; tail, 18 inches; hind foot, 20 inches; ear, $6\frac{3}{4}$ inches. These flesh measurements are considerably less than adult males of the highland quagga.

CHAPTER XXIII

THE GREVY ZEBRA

Dolichohippus

Dolichohippus Heller, 1912, Smith. Misc. Coll., vol. 60, No. 8, p. 1; type *D. grevyi*.

THE striped horses, or zebras, have been associated by some naturalists in a genus *Hippotigris*, a name by which they were known to the ancient Romans. Beyond their striped coats, however, they have no other common character separating them from other existing *Equidæ*. This assemblage illustrates well the popular idea that all the striped horses are closely related. As a matter of fact, they differ more among themselves than they do from either asses or the domestic horse. In this connection it may be well to call attention to the probability of many of the fossil horses having had striped coats and their probable close relationship with some of the African zebras rather than the horse. One, at least, of the living striped horses we believe deserves generic rank. The Grévy zebra stands out in shape of skull and proportions of head and body further from the other zebras and asses than does the horse, which is commonly regarded as the most highly specialized member. Considering the large number of fossil species, it is of some advantage to discriminate as finely as possible between the few existing species so as to show their probable relationships to such forms by means of distinct generic names. The enlargement of the head in

Dolichohippus is decidedly great. The head in length is quite equal to that of a large draught-horse, an animal having twice the bulk of a Grévy zebra. The lengthening of the skull is due to the production forward of the rostral portion or the part in front of the grinding-teeth, which gives the skull a long diastema or break between the grinding-teeth and the incisors, and also gives the skull a long nasal cavity. The most distinctive feature of the skull is the great width of the occipital crests and their production backward beyond the occipital condyles. The cheek-teeth are better developed than in the quagga, being larger in proportion. In general shape and size the skull of *Dolichohippus* resembles closely that of horses of Arabian stock, but is distinguishable by the broader occipital crests. The skull of the wild horse, *Equus prevalski*, is shorter and more like that of the ass and differs more from the long, narrow skull of *Dolichohippus* than do some domestic races. By some recent writers the Grévy zebra has been considered the least specialized of the living *Equidæ*, and it has been therefore assumed that its coloration may be taken as representing that of the ancestral stock. Such a conclusion, however, does not agree well with the extremely long-headed nature of this zebra and the somewhat higher specialization of its dental apparatus. It has been shown by paleontologists that the lengthening of the head in the horse has been a progressive affair which has gone on simultaneously with the gradual elongation of the teeth and the complication of their folds. In both of these characters the Grévy zebra is slightly more advanced than any of the other living horse-like ungulates. Its coloration is distinctive but nearer, perhaps, that of the mountain zebra, *E. zebra*, which shows

on the rump the beginning of the gridiron or transverse pattern of stripes which in the Grévy are lengthened out and extend below the hips.

Dolichohippus is confined to the low desert area of northern British East Africa and southeastern Abyssinia. The range is so limited and uniform in climatic conditions that but a single species, *grevyi*, is recognizable.

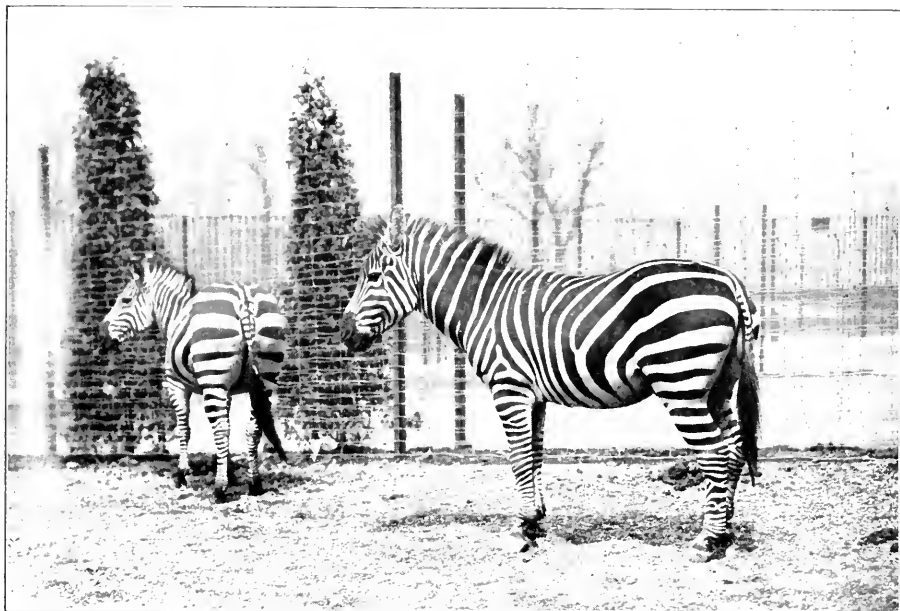
GRÉVY ZEBRA

Dolichohippus grevyi

NATIVE NAMES: Swahili, *kangani*: Samburru, *kanga*.
Equus grevyi Oustalet, 1882, *La Nature*, X, p. 12, figs. 2.

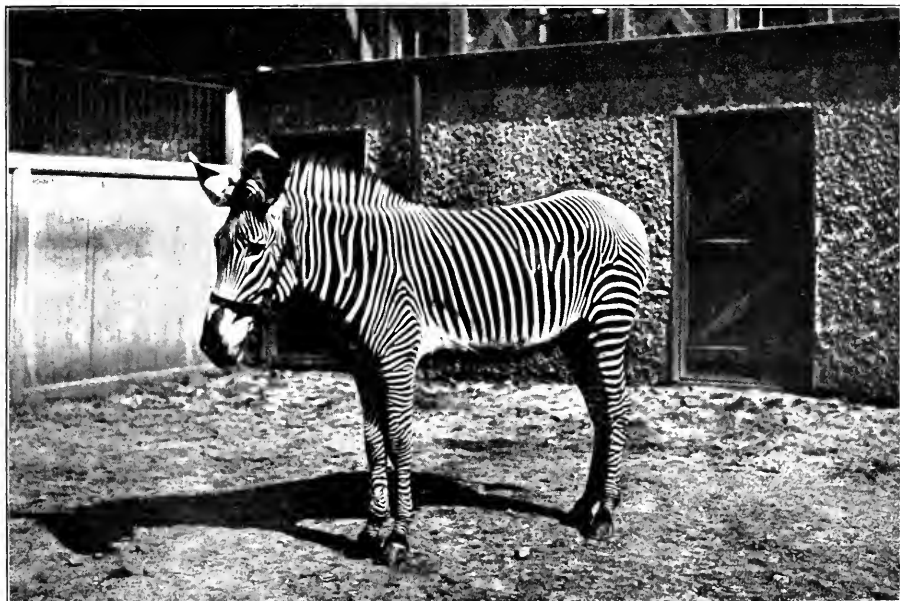
RANGE.—From the Northern Guaso Nyiro drainage and the north bank of the Tana River northward to Lake Zwai in Abyssinia, westward to the eastern shore of Lake Rudolf and the Omo River, and east to the limits of Abyssinia, but not known to occur actually within British Somaliland.

The kings of Abyssinia have from the very earliest times sent as gifts from time to time living specimens of the Grévy zebra to rulers of friendly European nations. This custom early introduced the zebra to European civilization. The zebra shown in the Roman amphitheatre is supposed to have been this species and to be the one referred to by the ancients as *Hippotigris*. Menelik, the late ruler of Abyssinia, sent several specimens to various heads of government in Europe and America. One of these sent to President Grévy, of France, was described by Oustalet in 1882 and named for the chief executive. Although the Grévy was without doubt the first species of zebra to be known to Europe, it remained unknown, or rather unnamed, until described in 1882. Linnæus, who founded our modern system of binomial nomenclature, mentioned in 1758 only the mountain zebra, to which he gave the specific name *zebra*, a name virtually applicable primarily to the present species. The Abyssinians appear to have a special fondness for the large Grévy zebra, which is the only one they capture, although the smaller, broad-striped



HIGHLAND QUAGGA ZEBRA, MALE AND FEMALE

From German East Africa
In the New York Zoological Park



GRÉVY ZEBRA FROM ABYSSINIA, MALE

Presented to Theodore Roosevelt by Emperor Menelik of Abyssinia
In the National Zoological Park, Washington, D. C.

LIVING SPECIMENS OF HIGHLAND QUAGGA AND GRÉVY ZEBRAS

quagga is equally abundant in their domain and shares much of the same territory as the former. It is commonly assumed that the Grévy zebra occurs on the plains of Shoa, in the vicinity of Addis Abbaba, the capital of Abyssinia, but this is by no means the case. The Grévy zebra is confined to the Rift Valley of Abyssinia, from Lake Zwai southward, and is an inhabitant of low desert or semiarid country, very different in character from the cool, moist Abyssinian highlands of the capital. It is doubtless from the northern extremity of the range, in the vicinity of Lake Zwai, that the specimens donated by Menelik to foreign rulers have come. At the present time the Grévy zebra is not found as far north as that district, but its absence there may be due to recent extermination by the Abyssinians consequent upon the extensive introduction of firearms in the country. Specimens from the western frontier of Somaliland have been separated by Pocock as a race, owing to the dark stripes being seal-brown rather than black. Such color differences, however, are due merely to the fading effect of the intense desert light and heat. The specimens with which the Somaliland ones were compared were zoological-garden specimens, obtained by donations originally from Emperor Menelik. The pure white character of their light stripes and the blackness of the dark stripes is due chiefly to the temperate climate in which they were living. There is practically no difference in environment and very little in geographical position to warrant a race in southeastern Abyssinia. In this connection it may be stated that specimens from British East Africa are quite identical in shade of coloration of both the dark and the light stripes to those from Somaliland. Matschie, some years previous to Pocock's description of *berberensis*, gave the name *faurei* to a specimen living at the Zoological Gardens of Paris which had been sent by Menelik as a gift to President Faure of France. The name was based on a photograph of the specimen which gave it the appearance of having a white tail tuft, the character by which Matschie distinguished his race. The specimen in question, however, has the tail tuft normal in color, that is, white on the upper side or outside as it hangs down and black on the inner or lower side. The black inner side of

the tuft is much narrower than the white part of the tuft and in a photograph is often quite invisible. Notwithstanding the long-known character of the Grévy zebra in Abyssinia, it has been known from the southern part of its range in British East Africa only recently. Count Teleki, during his journey of discovery of Lake Rudolf in 1888, was the first sportsman to report its occurrence in British territory. He met with it near the south end of Lake Rudolf and along its eastern shore. William Astor Chanler was, perhaps, the next sportsman to meet with it, in 1892, during his exploration of the Northern Guaso Nyiro River and the Lorian swamp. In 1898 A. H. Neumann, in his "Elephant Hunting in East Equatorial Africa," gave the first careful account of the habits and distribution of the species in British East Africa.

The big zebra, which our porters called kangani, was only met with by us on the banks of the Northern Guaso Nyiro. The country was very dry, it being evident that no rain had fallen for many months, and under the blazing equatorial sun the grass had withered almost to straw, and the dry acacias and wait-a-bit thorns were almost leafless. The strange candelabra euphorbias, and trees covered by a mass of green, fleshy thorns instead of leaves, seemed to harmonize well with the landscape. The only water was in the Northern Guaso Nyiro or an occasional rare stream flowing into it. Back from the river were hills and buttes, bordering the dry plains, which were sometimes bare and sometimes covered with stretches of leafless thorn scrub. It was bad galloping, for the ground was rotten in places, and in other places covered with volcanic stones; but the game ran as if unhampered by either the stones or the rotten ground.

On the bare, grassy plains, and more rarely where there

was thin thorn scrub, the kangani were met with in small parties and troops of half a dozen to thirty or forty individuals. Once we came on a plain where the troops had gathered into a loose herd of several hundred individuals. The big zebras mix freely not only with the oryx herds but also with the herds of the smaller zebra. It is curious that they should associate continually and on such good terms with the smaller zebra, and yet never breed with them. Apparently they treat their smaller cousins precisely as they do the various species of antelope. Sometimes the mixed herds of kanganis, bonte-quaggas, and oryxes are divided almost equally among the three species; more often one or two individuals of one species are found with a herd of another; and often, of course, the herd is composed exclusively of one species. The kangani herds usually contain one master stallion. The stallions fight viciously with one another. In several instances we killed stallions whose testicles had not come down, and were concealed within the belly wall.

The gaits of the big zebra are a slashing trot and a gallop, whereas the small zebra canters. It has a peculiar screaming whinny, utterly unlike the barking cry of the common zebra. Its very long ears, thrown forward in curious interest, enable it to be recognized at a distance. Its stripes, being narrow and uniform, fade into a general gray at a distance at which the stripes of the ordinary zebra, especially those on the rump, are still plainly visible; afar off the zebras look like wild asses. We found the big zebra much more wary than the common zebra, but in their habits of grazing, drinking, and resting the two species were not distinguishable; indeed in these respects they behaved much

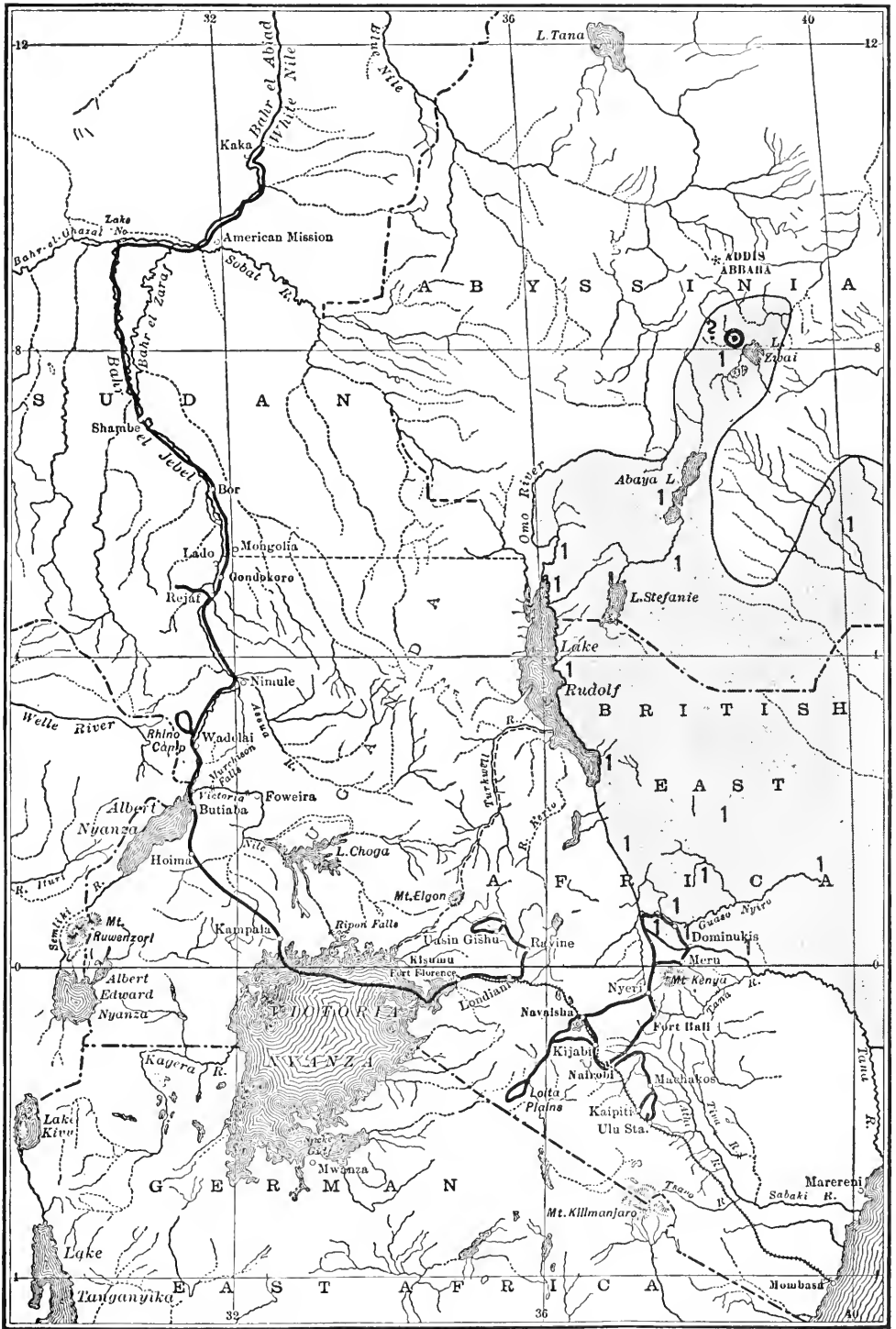
like the oryx, with which they were associated, although it is said that the oryx can go without drinking while the zebra cannot, and so is found in much drier regions. The great enemy of the big zebra, as of the common zebra and the oryx, was the lion; and we also found one instance in which a leopard had killed a half-grown kangani and actually dragged part of the carcass into the branches of a thorn-tree.

Aside from the well-marked difference in color pattern, the Grévy zebra has distinctive differences in body proportions and shape. The head is decidedly enlarged and lengthened, the hoofs are broad, and the ears are greatly expanded and lengthened, exceeding in width the long ears of the African ass. The broad ears are apparently an adaptation which conforms with the brushy nature of their habitat, where acute hearing is of vital importance, and the broad hoofs are also to be attributed to environmental effect, that is, to the sandy and porous nature of much of the desert area in which they dwell. The tail tuft is rather small and confined to the extreme tip of the tail. The body coloration is quite distinctive. It consists of numerous, narrow transverse stripes, alternate whitish and blackish in color and of equal width, except on the neck, where the dark stripes are broader. An important distinction in the Grévy is the absence of diagonal or longitudinal stripes on the rump and hips, where the stripes are transverse. In the mountain zebra of South Africa there is a suggestion of this pattern in the narrow gridiron of the rump. In general, the color pattern resembles more closely that of the latter species than the quagga or bonte-quagga type. The stripes of the head are arranged quite as in the other two species. The sexes are quite indistinguishable in coloration, and the newly born young are essentially the same in pattern, though somewhat lighter in color. The ground-color, or rather the color of the light stripes, is pale ochraceous-buff, except on the under-parts and inside of the legs, where it is more whitish or cream color. The dark stripes vary in intensity from

seal-brown to bistre, and are always a decided brown rather than black in tone. They are darkest on the neck and lightest on the rump and face, where they sometimes assume a reddish tint or chestnut color. The median ventral stripe is hair-brown and much lighter than the stripes on the dorsal surface. The nose is marked by a bright-tawny patch bordered behind by an unstriped area of pale-buff and in front by the white lips and chin. The terminal half of the ears is seal or bistre brown, in contrast to the pale-cream ground-color of the lower half and inner side. The tail tuft is rather shorter than in other zebras and measures only 9 or 10 inches in length. In appearance it is cream-white above, lined below by black hair. From the crown to the withers extends a short, erect mane some 6 or 7 inches in height and striped alternately with light and dark transverse stripes continuous with their fellows on the neck. No variation in mane due to age, such as takes place in the quagga, occurs in this species. The newly born young are quite reddish on the body, due to the russet color of the body stripes, but the forward half of the body and the legs are striped by dark seal-brown, as in the adults. At this early age the nape mane is short and fuzzy and continuous along the midline of the back by a low mane covering the dorsal stripe. The striped pattern in the adult consists of twenty or twenty-two transverse dark stripes on the body between the shoulder stripe and the hip stripe, the stripes having a width of 1 to $1\frac{1}{2}$ inches, the light interspaces being somewhat narrower and measuring $\frac{3}{4}$ of an inch in width. They extend vertically from the light border of the dorsal stripe to the lower sides, but do not cross the belly and join the ventral stripe, but terminate abruptly on the lower sides. Posterior to the hip stripe the rump is marked by very narrow transverse stripes $\frac{1}{2}$ inch in width, which are somewhat diagonal in direction and become progressively shortened as the base of the tail is approached. Below the forking of the hip stripe the transverse leg stripes begin and continue down the hind limb to the hoof. The middle line of the back is marked by a broad dorsal stripe 2 inches wide from the withers quite to the tail tuft and is bordered for most of its length by a broad light stripe of the ground-color, except on the withers, where the transverse

stripes unite with it. The neck is marked by nine or ten transverse stripes varying much in width, the widest being the median ones, which attain a width of $2\frac{1}{2}$ or 3 inches. The crown of the head is marked by numerous very fine longitudinal stripes which terminate on the snout midway between the tip and the eyes. The sides of the head and the cheeks are marked by wider transverse stripes which meet below on the throat. The legs are marked by numerous narrow transverse stripes which completely encircle the limb with the exception of the upper part, near the body, where they are broken on the inner side. A series of twelve adult skins from the Northern Guaso Nyiro district show very little variation in color. The stripes, however, vary considerably in different individuals or on different sides of the same individual. The transverse stripes of the back and neck often fork irregularly on the sides of the body, and the leg-bands are even more irregular in this regard. Albinism, though rare, is not unknown among Grévy zebras, but no instances of partial albinism have been reported. One of the British East African game rangers, A. Blayne Percival, collected a uniformly white specimen near the Lorian swamp from a herd of normally colored individuals. This specimen was presented by Percival to the British Museum and is now on exhibition in one of the galleries. Although it is entirely white, the dark stripes can be traced in its coat as faint darker shadows.

An adult male specimen from the Northern Guaso Nyiro, shot by Colonel Roosevelt, measured in the flesh: head and body, 8 feet 3 inches; tail, 22 inches; hind foot, 24 inches; length of ear, 9 inches. These dimensions represent an average adult of either sex, the females being quite equal to the males in size. The largest skulls in a series of fourteen specimens in the National Museum measure in greatest length: male, 25 inches; female, $24\frac{1}{2}$ inches. Specimens have been recorded by A. H. Neumann in British East Africa as far south as the junction of the Tana and Mackenzie Rivers, east of Mount Kenia, thence northward to the northeast slope of the Lorigi Mountains and northward along the east shore of Lake Rudolf to the mouth of the Omo River. No authentic records of Grévy zebra in the Turkana country west or southwest of Lake Rudolf have



MAP 39—DISTRIBUTION OF THE GRÉVY ZEBRA

1 *Dolichohippus grevyi*

been found, and it appears that Lake Rudolf marks the eastern limits of its range. On the Northern Guaso Nyiro it is found along both banks throughout the low desert lands traversed by the river from its formation by the junction of the Guaso Nyuki and Guaso Narok down to its terminus in the Lorian swamp. North of the river it is found throughout the desert in the vicinity of springs or water-holes. Eastward toward the sea the limits of its range are not known except in the north where it extends as far east as the boundary of British Somaliland. As it has not been reported from the coast north of the Tana River, it doubtless does not extend much farther east than the Lorian swamp.

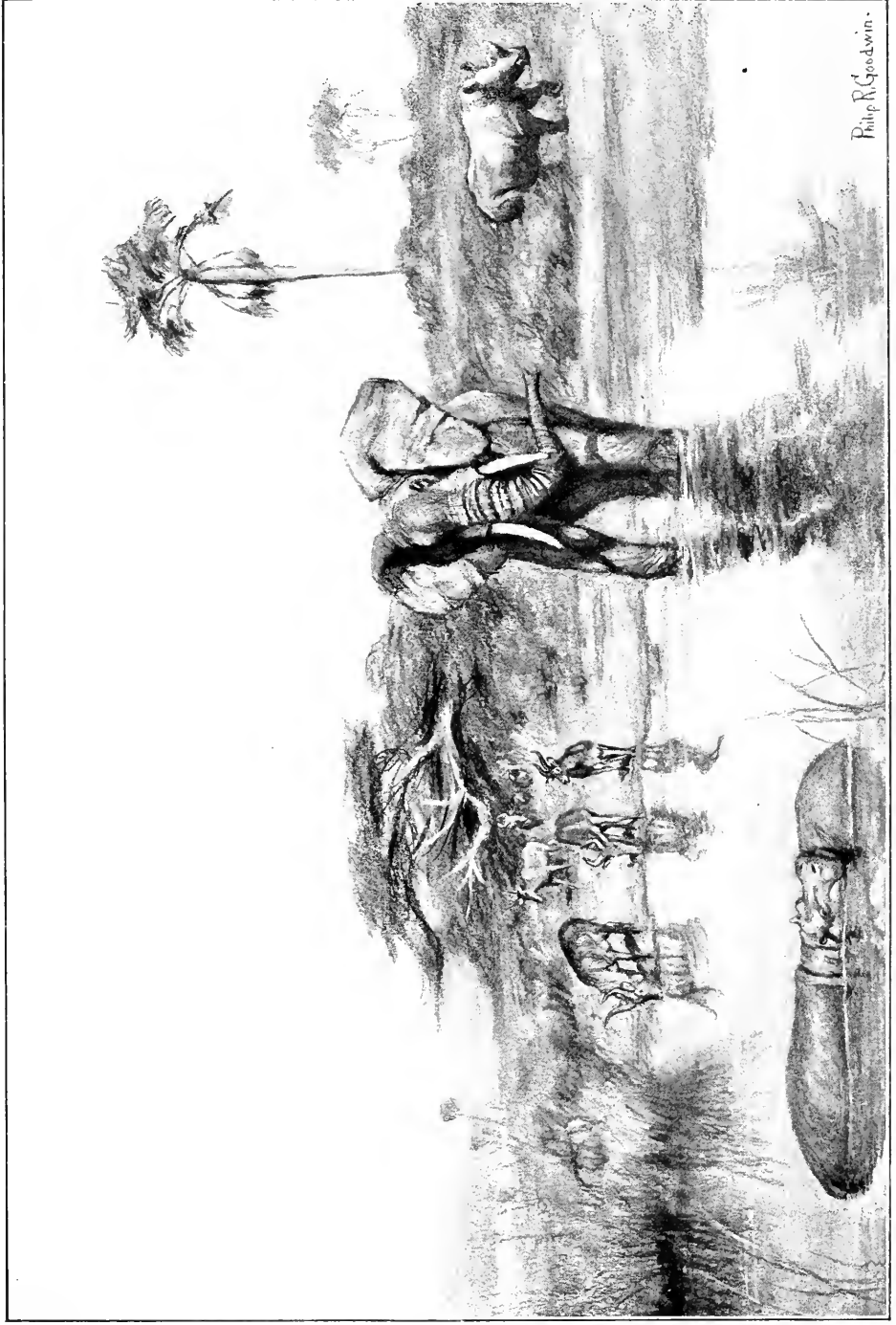
CHAPTER XXIV

ELEPHANTS

FAMILY *Elephantidæ*

THE elephants are perhaps best characterized by their proboscis, or trunk, which in the true elephant has developed into a grasping or prehensile organ several feet in length and capable of as delicate manipulation as the hand of the higher apes. The great length of the proboscis in the typical elephants has given rise to the name *Proboscidæ*, by which the order is known. This group comprises the living elephants and all of the fossil elephant-like mammals, the most primitive of which were quite unlike modern elephants, being no larger than tapirs, with very short trunks and tusks. The great bodily bulk of the living members, however, is quite characteristic of the family *Elephantidæ*. Combined with the great bodily size we find an adaptive leg structure, the legs being straight and columnar so as to support the great body weight, a condition also common to some extinct groups of giant mammals and such colossal reptiles as the giant dinosaurs. The primitive or remote ancestral elephant-like mammals had bent or angulated limbs similar to those of the hoofed mammals. The knees are placed low, being well outside the body and very different from the position they occupy in the horse and other hoofed mammals. The feet are primitive in structure, being evenly five-toed, but are united at the base into a more or

less solid hoof which shows evidence of three or four of the toes in the nail-like division on its margin. Placed almost immediately above the hoof we find the ankle, which occupies a position somewhat similar to that in man and the apes. This arrangement gives the foot great flexibility and enables the elephant to perform many movements of which the hoofed mammals are quite incapable. The head is immensely enlarged so as to support the tusks or canine teeth, the enormous size of which is a further peculiarity of elephants. In order to increase the size of the skull so as to give greater surface for muscular attachment, the occipital and parietal bones have been increased greatly in extent and thickness by the development of sinuses having a light honeycomb structure. The brain case has in this way attained a thickness of some fifteen or twenty inches, and it is this great mass of bony tissue surrounding the brain which makes the elephant so difficult an animal to kill, owing to the difficulty of locating the brain. The bony expansion of the skull is chiefly upward, over the occipital portion, in the form of a great dome, which is cut off abruptly at the back so as to build a great wall for the attachment of the muscles which move the head. A further striking peculiarity of the skull is the expansion of the premaxillary bones into great sheaths for the support of the immense tusks. The elephants also show marked specialization in the structure of their molar or cheek-teeth. These in the true elephants are made up of a series of folds of enamel and dentine, which are bound together by a cement layer forming a tooth with a very long crown, a foot or more in length and of great height, so that it can withstand an immense amount of wear. Only one or part of two teeth are in use



Philip R. Goodwin.

A NILE GROUP

WHITE RHINOCEROS, ELEPHANT, HIPPOPOTAMUS, KOB, WATERBUCK, AND HARTBEEST
From a drawing by Philip R. Goodwin

at a time on either side above and below. As they wear down they are pushed forward and upward by succeeding teeth behind them. In this way the teeth are continually being moved forward, and pass through the jaws from behind forward as they are worn down. No other living group of mammals, with the exception of the manatees, are known to possess a similar method of tooth succession. The teeth usually number six on a side, the first three which pass through the jaw being considered the milk molars. The largest tooth of all in number of enamel plates and in size is the last one to appear, the number of plates usually being more than twice as many as in the first tooth. The lower jaw is extremely short in the typical elephants, and furnished only with molar teeth, but is armed in some of the more primitive elephants, such as the mastodon, by short incisor tusks. The living elephants are remarkably distinct from other mammals, and until recently paleontologists have not been able to trace them back to their probable remote ancestral forms. Recently, in beds of Eocene age at Fayum, Egypt, Doctor Andrews, of the British Museum, discovered fossil remains of some ancestral forms which tend to link the modern elephants with forms which show some affinity to the ancestors of the manatees. The examination of the bones of these remote elephant-like mammals has led Doctor Andrews to believe that Africa was the original home of the elephants, and that later, during Miocene time, some of the more highly developed forms spread northward into Europe, Asia, and North America, and finally, during Pleistocene time, into South America. The fossil genera and species of elephants are very abundant in the Pliocene and Pleistocene of Europe, Asia, and North America.

The ancient African evidence rests chiefly upon the Fayum beds, but elephant remains of Miocene age, representing an aberrant type, *Dinotherium*, have also been found near Lakes Victoria Nyanza and Rudolf, in equatorial Africa. A mastodon of Pleistocene age is also recorded from South Africa. There exists to-day only a small remnant of the family, representing but two genera, *Elephas*, confined to southern Asia, and *Loxodonta*, confined to Ethiopian Africa.

AFRICAN ELEPHANT

Loxodonta

Loxodonta F. Cuvier, 1827, Zool. Journ., vol. III, p. 140; type *Elephas africanus* Blumenbach.

Although Cuvier established the genus *Loxodonta* for the African elephants more than eighty years ago, the African has been associated by naturalists generally with the Indian elephant in the genus *Elephas*. Cuvier called attention to the much wider or lozenge shape and the lesser number of the enamel plates in the molar teeth in the African elephant in comparison with the Indian, and upon such distinction the genus was founded. Owing, however, to there being but two living forms, no attempt has been made to recognize the generic distinction between the two except by some paleontologists, who have many species to consider and find such a generic division of importance in the classification. Besides the differences in the molar teeth there are many other distinctions in structure which are of generic value. The skull in the African elephant is evenly rounded on the crown, being perfectly dome-shaped and without the median depression which in the Indian separates the crown into two rounded knobs or bosses. An important external distinction between the two elephants is the enormous size of the ear in the African elephant, in which it covers the entire neck and withers and reaches as low as the breast, the height often equalling half the standing height of the animal. The African also has a more sloping dorsal profile, the body sloping downward from the crown of the

head rather than from the withers, owing to the higher carriage of the head. Other differences are the presence of a nipple on the lower edge of the tip of the trunk as well as the one on the upper, the larger tusks, and the lesser number of hoof-like nails on the margin of the hoof in the African. The genus *Loxodonta* is a much less specialized group than *Elephas*, as shown by the lesser number of enamel plates in the molar teeth and the rounded outline of the dorsal surface of the skull. The enormous size of the ears, the additional nipple on the tip of the trunk, and the lesser number of hoof-like divisions in the feet of *Loxodonta* are, however, specializations not found in the living representative of the genus *Elephas*. In skull shape the African is, however, decidedly like the genus *Mastodon*, being evenly rounded over the parietal or occipital part, and also convex in profile on the forehead above the nasal opening, instead of concave as in *Elephas*. In tooth structure it is somewhat intermediate between *Mastodon* or *Stegodon* and *Elephas*, the number of plates being intermediate in number and the teeth narrower and often showing, when unworn, a want of cement on the crown, so that the enamel plates project when unworn as ridges similar somewhat to the condition found in *Mastodon*. The teeth, however, are long-crowned, as in *Elephas*, and very different in this character from the short-crowned teeth of *Mastodon*. The Indian elephant, although having as many as twenty-four plates to its last molar tooth, is not the most highly specialized form in this regard, but such distinction belongs to the recently extinct hairy elephant, or mammoth, *Elephas primigenius*, of the boreal regions. The plates in the mammoth number as many as twenty-seven in the last molar and were narrower, much more crowded, and longer than in the Indian. The molar teeth of all elephants have progressively more and more ridges as we advance from the first to the last tooth in the order of their succession. Usually only the formula of the last three, or permanent set, is considered. In the African elephant the ridge formula in the permanent molars is: first, 6 or 7; second, 8 or 9; and last, 10 or 12. In the Indian this formula runs usually: first, 12; second, 16; and third, 24. The two living elephants are both less specialized than some of the extinct forms belonging to the same genera. In a broader way,

the persistence of ancient types occurred among the genera in past geologic ages. Thus one of the primitive genera, *Mastodon*, lingered until the last or Pleistocene age in the northern hemisphere, in much of which territory it lived with and supplanted the more highly specialized genus *Elephas*. The African elephant, which is to-day the giant among the land mammals, was exceeded in height by some of the fossil species, notably by *Elephas imperator*, from the Pliocene of North America, which attained a height of 13 feet or over at the withers. Another form of gigantic size was the Pleistocene species, *Elephas meridionalis*, of southern Europe, which attained a height of considerably more than 12 feet and was, like *imperator*, one of the allies of the Indian elephant. A gigantic fossil species, *antiquus*, of the Pliocene of southern Europe, related to the African elephant and likewise a member of the genus *Loxodonta*, was scarcely less in height than *imperator*. The African elephant, which attains a height of 11 feet or slightly more at the withers, although exceeded in height by these fossil species, can scarcely be said to be a smaller animal in bulk. No fossil elephant is known which had a larger skull. The gigantic species, though taller, were relatively small-skulled forms. The tusks of many of the extinct species were very long and exceeded the average African tusks greatly in this dimension. The great length in the extinct species was often due to their having become of no functional use, so that, in the absence of wear, their points grew to immense length, curving either upward or inward in a large circle and overlapping one another, as in the case of some mammoths. Record tusks of the African elephant approach very closely in thickness or diameter to the largest of those of the gigantic fossil species. The disuse to which the tusks were subjected in the mammoths would account for the smaller size of the skull, there being less need for the development of bony crests for muscular attachment for wielding the tusks than in the living African species in which the tusks are subject to much use and wear. At the time these giant species were flourishing there were also pygmy species, some five feet in height, living actually with their larger kin on some of the islands in the Mediterranean, notably Malta and Crete. Such small species were related to the African elephant and

may be considered members of the genus *Loxodonta*. A pygmy species living in West Africa has been described recently, but it has no standing in nature, being simply a young specimen of the West African elephant. The only true pygmy species at present known are the fossil ones from the Mediterranean basin. The genus *Loxodonta* was doubtless of African derivation in late Miocene time. Allied forms derived from the African stock appeared in southern Europe and Asia in the Pliocene, but the genus continued to exist in tropical Africa, to which region it is now confined. The genus is represented by a single species of which three or four geographical races may be recognized by differences in shape of ears and body size. Elephants were until recently quite universally distributed over Africa, from the northern borders of Abyssinia and the southern edge of the Sahara Desert southward to the Cape, from sea-level to the limits of vegetation on the highest mountains. At the present time they have been exterminated over a considerable part of this area and exist only in the more remote and inaccessible tropical portions of the continent.

CAPE ELEPHANT

Loxodonta africana capensis

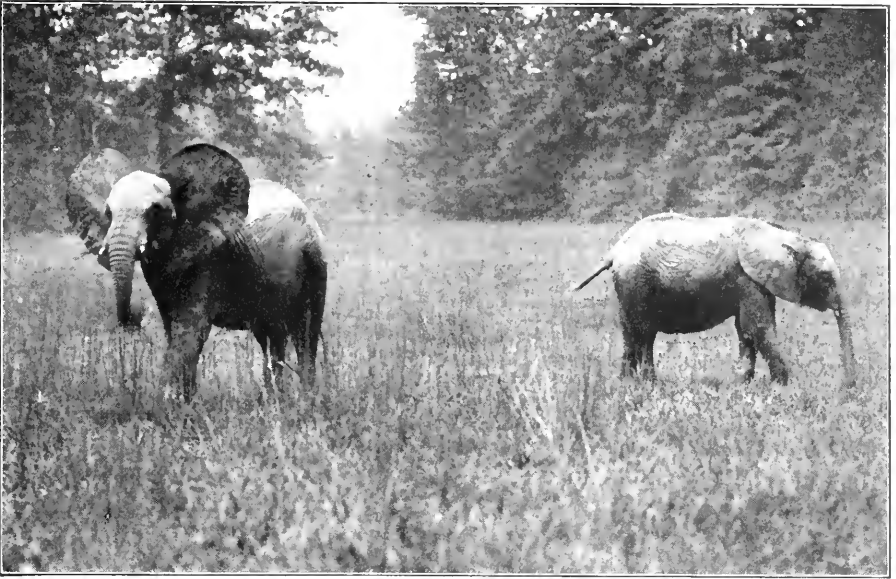
NATIVE NAMES: Swahili, *tembo*; Masai, *ol-tome*; Luganda, *njovu*; Acholi, *leati*.

Elephas capensis Cuvier, 1798, Tableau Élémentaire, p. 149.

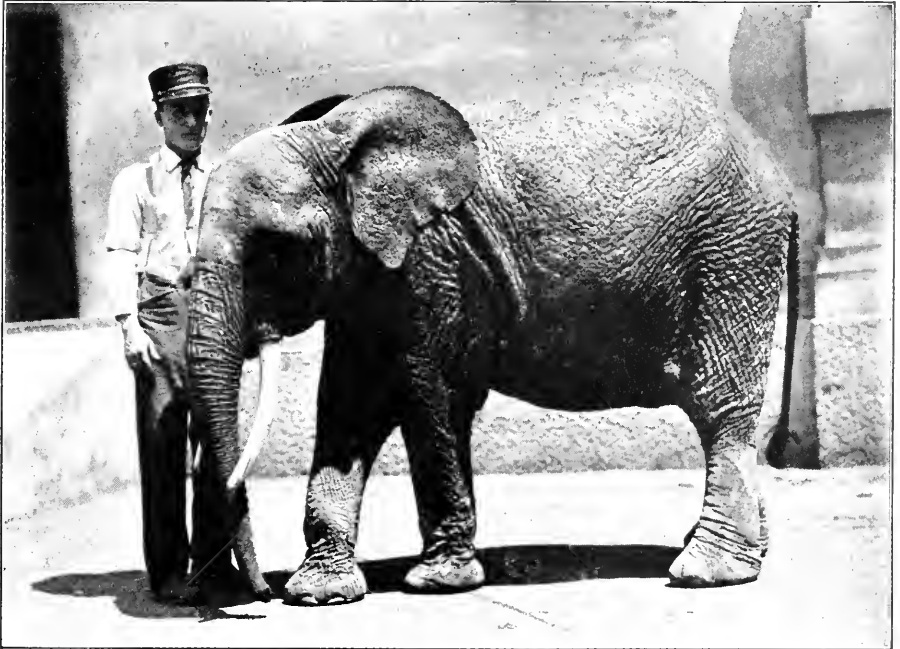
RANGE.—From the Cape region of South Africa northward throughout the East Coast and central lake region, through British East Africa and Uganda to the Abyssinian highlands and Somaliland; west as far as the Congo-Nile watershed; at present exterminated over much of this territory and confined, except where preserved, to the more inaccessible parts.

The earliest name for the African elephant was proposed by Blumenbach in 1779, who applied to it the name *africana* and described the range as Middle and South Africa. A decade later Cuvier described the African elephant as a species, *capensis*, not being aware of Blumenbach's earlier name. In order to make Cuvier's name applicable for the race occurring in southern and eastern Africa,

we have applied the older name, *africana*, to the form inhabiting the Congo basin, which may be taken as representing part, at least, of the area which Blumenbach called Middle Africa. Since the eighteenth century no new names for African elephants have been proposed until the year 1900, when Matschie published a paper describing three new species, one from East Africa, another from Abyssinia, and a third from the Cameroons. Matschie recognized four species: *capensis* of South Africa, *knochenhaueri* of East Africa, *oxyotis* of Abyssinia, and *cyclotis* of West Africa, typically the Cameroons. His species were founded upon differences in ear shape chiefly and, as far as our present knowledge is concerned, hold good as racial distinctions, with the exception of the distinctions drawn between the East African and the Cape elephant, which are apparently racially identical. The Cape or East African race is characterized by the large size of the ear, which has a height in adult bulls of from 4 to 5½ feet, or quite half that of the standing height of the animal. The ear is rectangular in shape, being folded in at the top so that the upper outline runs parallel with the neck, and the point or lappet being formed by the lower margin and the hinder meeting at right angles below the throat, or rather in front of the chest, gives the ear its rectangular shape. This is the largest race, the record elephants in height of body and dimensions of tusks being South or East African specimens. In the highland region of Abyssinia, particularly the northern slopes of its plateau region in the area drained by the Blue Nile and the Atbara River, we find a second race of elephants, called by Matschie *oxyotis*. It may be distinguished from the East African race, or *capensis*, by the absence of the fold on the upper margin of the ears, the ears folding over the nape of the neck but not bent back upon themselves. The ear is also more pointed or pear-shaped, being narrower, with a longer lappet. In some specimens the hinder and part of the upper margin of the ear is folded forward for a width of two or three inches, as in the Indian elephant. The species described from the Cameroons by Matschie as *cyclotis* is the most distinct in ear shape of all the races. The ear in this race is elongate and evenly rounded on its entire hinder border and is without any fold



ABYSSINIAN ELEPHANTS
In the New York Zoological Park
Showing absence of folds on upper margin of ears



CAMEROON ELEPHANT, MALE
*Type of *Elephas pumilio**
In the New York Zoological Park
Showing small circular ears typical of *cyclotis*

THE ABYSSINIAN AND WEST AFRICAN RACES OF THE ELEPHANT

on its upper margin. The elephants of this type are the smallest in Africa and have also relatively the smallest ears. A member of this race was described in 1906 as a pygmy race, for which the name *pumilio* was proposed. The specimen on which this race was based was a living specimen at the Hagenbeck Gardens and was at the time only 3½ feet in height and weighed some 600 pounds, but was assumed to be at least half grown, the age being stated to be six years. It was, however, a small animal in 1906, when described, but has since grown up under the care of the New York Zoological Park and at present has a height of 5 feet 7 inches and a weight of 2,250 pounds. It is annually subject to some incurable skin disease, which has retarded its growth and no doubt accounts for its undersized condition. The shape of the ears is quite identical with those of typical *cyclotis* of West Africa, from which region it is said to have come. Whether the Congo elephants have rounded ears, similar to those of *cyclotis*, is not at present known, but it appears from photographic evidence that they are somewhat different in shape and are intermediate in size between the small-eared race, *cyclotis*, and the large-eared, *capensis*, and have an inward fold on the upper margin of the ears, as in the latter race. We have, accordingly, allowed them to stand as the typical race, *africana*, of Blumenbach. Since Matschie has pointed out the ear differences in the races here recognized, several other races have been described by other naturalists. We have failed to find, however, substantial proof of their distinctness in the specimens we have examined. Most of such races are based on slight distinctions drawn between individual specimens from various parts of East and South Africa, and represent, to a considerable degree at least, individual variation. Differences in skull shape between the races here recognized have not yet been established, owing to the great individual variation to which the skull is subject. The size of the tusks influences the premaxillary region greatly, the size of the premaxillary bones which sheath the tusks being in direct relation to the size of the tusks, which are well known to have an immense individual variation. Distinctions based upon the relationship of the width to the length in such bones is on this account of questionable racial value.

The depth or size of the fossa occupying the upper surface of the premaxillary bones likewise depends upon the size of the tusks also. In a great measure the size of the skull is influenced by the tusks, the larger-tusked elephants having decidedly the larger skulls. Besides the individual variations in skulls due to tusk differences, there is a marked age variation. The dome of the skull as represented by the cellular mass of bony tissue which surrounds the brain grows throughout a long period and seems to keep pace in its development with the growth of the tusks. On this account only skulls of absolutely the same age may be compared as regards their shape or the relative proportion of parts.

We found elephant in the cool forests and bamboo belts of Mount Kenia and among its foot-hills; in the open plains and scanty thorn woods near the 'Nzoia River; in the tree jungle and tall elephant grass of Uganda; and in the hot, dry country along both banks of the upper White Nile.

With the possible exception of the lion, the elephant is the wisest and most interesting of all the kinds of big game. Most wild animals lead very simple lives; and, while most of them at times perform queer and unexpected feats or show traits that upset the observer's previous generalizations, there is ordinarily not much variety or originality in what they do. But the lion is forced by the exigencies of a life of prey to develop abilities as marked as they are sinister; and the elephant, instead of growing in stupidity as well as weight, has become the most intelligent of graminivores, with an emotional and intellectual nature sufficiently complex to make him a subject of endless interest to the observer.

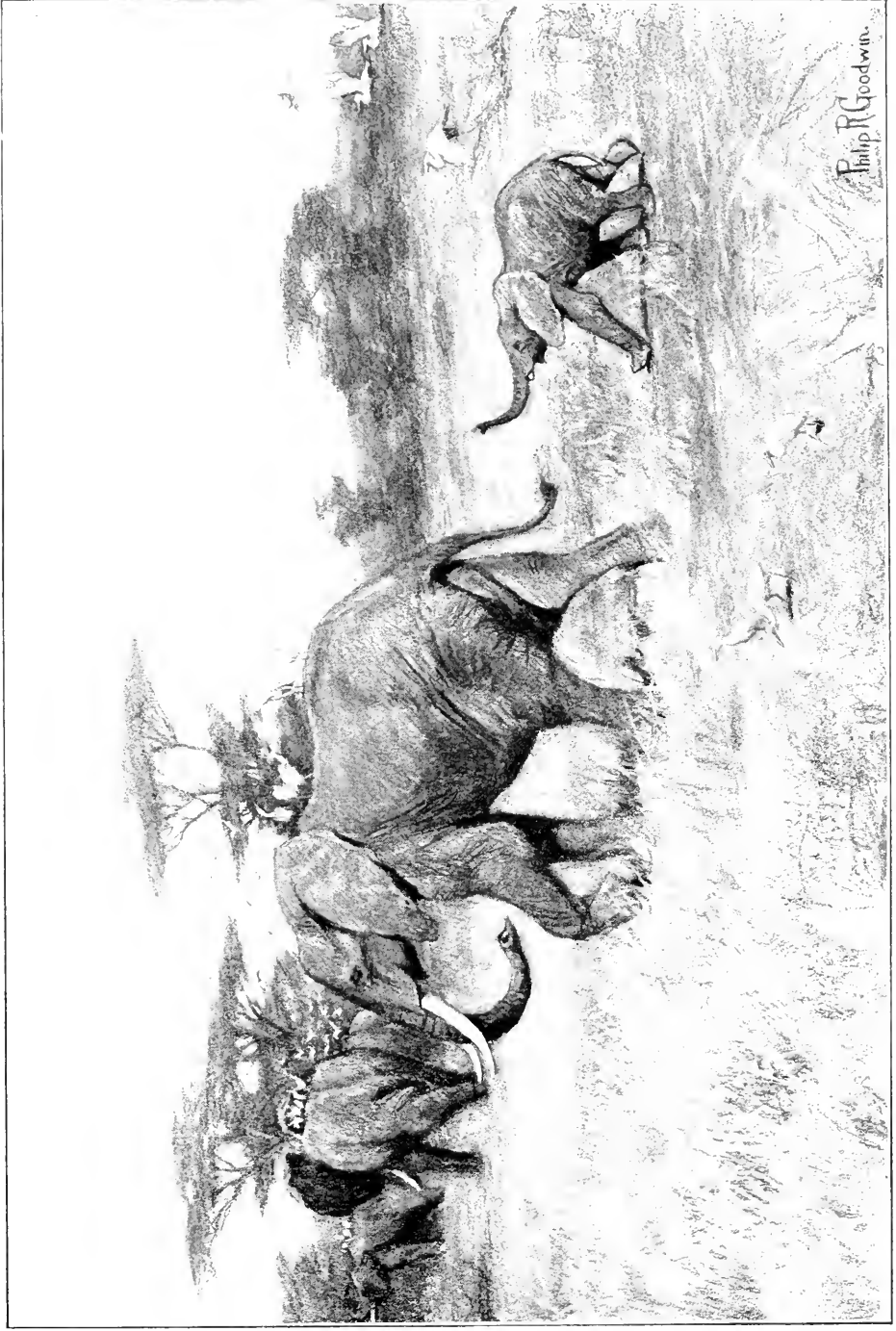
The elephant's physical and mental equipment fits it for life under utterly diverse conditions. Most game animals live in narrowly circumscribed habitats; for instance, the

bushbuck in the forests, the hartebeests on the plains, the oryx in dry, almost desert country. But the elephant wanders everywhere, being equally at home in the haunts of bushbuck, oryx, and hartebeest. It goes high among the cold bamboo belts of the mountains; it loves the hot, dense, swampy lowland forests; it lives in the barren desert where it has to travel a score of miles for a drink of bitter water. Sometimes herds make long migrations, swarming for several months in a locality, while during the rest of the year not an elephant will be found within a hundred miles of it. Elsewhere they may live in the same neighborhood all the year round. On the south slope of Mount Kenia we found the elephants living in the daytime in the thick forest, but at night often wandering down into the plain to ravage the shambas, the cultivated fields near the native villages. In the Lado we found herds of elephants living day and night in the same places, in the dry, open plains of tallish grass sprinkled with acacias and a few palms. The old bulls usually keep by themselves, alone or in small parties; herds exclusively composed of cows and calves are common; but often both sexes mingle in a herd, and some of the largest tuskers are always accompanied by herds of cows, which seem to take a pride in them and watch over and protect them.

The wide individual and local variation in habits should make the observer very cautious about making sweeping generalizations; and, moreover, there is often an undoubted difference of personal equation in the observer. In Sanderson's capital book "The Wild Beasts of India" he states that elephant cows do not leave the herd to calve and that both bulls and cows habitually lie down. In the parts of

Africa the Roosevelt safari visited the elephants practically never lie down at all; that is, the cases where they do are so wholly exceptional that they can be disregarded. We heard of such instances from the 'Ndorobo or Wakamba hunters, or from old white elephant hunters, but always as something curious and unusual. In carefully following various herds and individuals, carefully examining the trails they had made during the preceding twenty-four or even forty-eight hours, we never came across an instance where any elephant had lain down. They slept and rested standing. But in the desert, north of the Northern Guaso Nyiro, Heller found them lying down. Whether the cows ever calve without leaving the herd we cannot say; in the only case brought to our attention of the site of a calf's birth being found, the cow had retired to an isolated place, where she had evidently spent the first two or three days after the calf was born before rejoining the herd.

By the time the calf is a week old, the mother has joined the herd, usually composed of other nursing or expectant mothers and of half-grown animals of both sexes. The cow takes the utmost care of the calf; if it is drinking at a pool she will chase away any other member of the herd which she thinks may interfere with it. The cows guard the calves against the attacks of wild beasts. In extremely rare cases three-parts grown elephant cows or half-grown bulls have been attacked by parties of hungry lions; but, as a rule, an animal is safe after it is three or four years old. Young calves, however, are eagerly sought after by lions and even by leopards and hyenas. The cows are always on the alert against such foes, and drive them away in a twinkling if they are discovered, uniting in the rush against them, just



THE ELEPHANT HERDS IN THE LADO ENCLAVE WERE OFTEN ACCOMPANIED BY FLOCKS OF WHITE COW-BIRDS

From a drawing by Philip R. Goodwin

as they frequently unite in a rush against the human hunter. Tarlton once witnessed such a charge by a party of elephant cows against a lion. They chased it several score yards. It just managed to escape into a belt of thick forest, which the cows in their rage then proceeded to wreck for an area of many yards.

Elephants are at home in all kinds of ground. They climb astonishingly well, clambering up and down places where it seems extraordinary so huge a creature can go at all. They also frequent swamps and marshes and swim broad rivers, but they sometimes get mired down. The captain of the launch that took us from Butiaba told us that he once found three elephants still alive, but fast in the deep mud some distance from the bank of the Nile. They were youngish beasts, nearly full grown. Elephants travel very great distances when thoroughly alarmed or when on migration; no other game comes anywhere near them in this respect. They prefer shade at noon, but do not find it essential. Again and again we saw herds standing throughout the hot hours, in bush no higher than their backs, in tall grass that did not reach as high as their backs, or in short grass among almost leafless acacias; and this not only among the fairly cool foot-hills of Kenia and by the 'Nzoia River, but by the banks of the White Nile. By the Nile the elephant herds, like the rhinos, and like the buffalo near Nairobi, were often accompanied by flocks of white cow herons. It was often possible to tell where the great beasts were by watching the flocks of white herons circling over the reeds or perched in the tree tops near by. On burnt ground or in short grass the herons would all march alongside their hosts, catching the grasshoppers which were disturbed by the

tramping of the huge feet. As soon as the elephants entered reeds or tall grass, the herons all flew up and lit on their heads and backs. With their trunks the elephants could readily have gotten rid of the birds, but from the oldest to the youngest—perhaps a pink calf—they evidently accepted the situation as a matter of course.

Elephants, like most game, spend the major part of their time eating; but unlike most game their food is of great variety. They graze and browse indifferently. They are fond of making inroads on the fields of the natives, devouring immense quantities of beans and corn and melons, and destroying far more than they devour. They are fond of various fruits, some of them so small that it must be both laborious and delicate work to pick them in sufficient numbers to stay the giant beasts' appetite. We have watched one feeding on grass; it behaved in the usual leisurely elephant manner, plucking a roll of grass with its trunk, perhaps waving it about, and then tucking it away into its mouth. In the stomach of another we found bark, leaves, abutilon tips, and the flowers and twig ends of a big shrub or bush *Dombeya nairobiensis*. They wreck the small trees on which they feed, butting or rather pressing them down with their foreheads, or getting on their knees and uprooting them with their tusks. They are fond of feeding on the acacias, although it is hard to see how they avoid wounding both their trunks and their tongues and jaws with the thorns. We have watched one break off an acacia branch, thrust it into its mouth, and withdraw it with the leaves stripped off. Many of the branches it will chew to get the sap, and then spit out; these chewed branches or canes, together with the wrecked trees, mark plainly the road a herd

has travelled. They do not often feed at noon; but during all the remainder of the day and night they feed at any time they choose. They drink great quantities of water; but in desert lands this may be only on every other day, and they may travel fifty miles between drinks. If much hunted they drink only at night.

Elephants are interesting because they have such varied feelings, such a wide range of intelligent appreciation. Doubtless this is in part due to the possession, in the trunk, of an organ the development of which has itself permitted development of brain power. Very great brain power could not have been developed as an accompaniment merely of hoofs; hands, however imperfect, were necessary, or else something that would serve as a partial substitute for hands. By watching a herd of elephants any one can speedily see the wide range of uses to which the trunk is put, and the many needs and emotions which it develops and satisfies. During courtship the bull and cow caress one another with their trunks. Elephants are very curious, and the trunks are used to test every object which arouses their curiosity. The cow is constantly fondling and guiding the calf with her trunk. The trunk is used to gather every species of food and to draw water. It is used to spurt dust or water over the body; it is used to test rotten and dangerous ground. It is in constant use to try the wind so as to guard against the approach of any foe. As one watches the great beasts the trunks continually appear in the air above them, uncurling, twisting, feeling each breath of air. Now and then a great ear is flapped. Now and then the weight of the body is slightly shifted from one colossal leg to another. The huge beasts are rarely entirely motionless for any

length of time. Nor are they long silent, for aside from subdued squeaks or growls, and occasional shrill calls, there are queer internal rumblings. Their eyes are very bad. Like the rhino, they can see only as a very near-sighted man sees. At a distance of eighty yards or so, when in dull-colored hunting clothes, one can walk slowly toward them or shift position without fear of discovery. Even near by, if a man is absolutely motionless, he stands a good chance to escape observation, although not hidden. But the hearing is good, and the sense of smell exquisite. They make many different noises, and to none of these ordinary noises do the other elephants pay any heed. But there are certain notes, to our ears indistinguishable from the others, which signify alarm or suspicion, and it is extraordinary to see the instantaneous way in which, on the utterance of such a sound, a whole herd will first stand motionless and then move away.

From immemorial ages elephants have been hunted for their ivory. Whether the great Egyptian monarchs hunted the African elephant is uncertain, although on their Asiatic forays they certainly killed the Asiatic elephants which then existed in Syria and along the valley of the Euphrates. But the big tusks of the African elephants were already at that time obtained by barter from the negro tribes south of the deserts which border the lower Nile. For thousands of years the range of the great beast has slowly shrunk; but the slaughter did not become appalling until the nineteenth century. In that century, however, the white elephant hunters, and later the natives to whom the white traders furnished fire-arms, worked huge havoc among the herds, the work of destruction being, beyond all comparison, greater than ever before. In South Africa, and over immense tracts

elsewhere, the elephants were absolutely or practically exterminated. Fortunately there is now efficient protection afforded them in many places by the laws of the European governments, especially by the British Government. In Uganda and British East Africa, and along certain parts of the Nile, the killing of cows and young stock has almost ceased, and the herds are quite or nearly holding their own.

Naturally, where the beasts are much hunted they become exceedingly shy. They then drink only at night, and if possible never twice at the same place, and they travel extraordinary distances between times. The slightest taint in the air will stampede them, and they then go many miles without stopping. Sometimes their way will be for many miles across the burning plains, sometimes through dense jungle, sometimes through soft, wet soil, in which their feet punch huge holes. Under such conditions elephant hunting becomes a work of wearing fatigue, entailing severer and longer-continued labor than any other form of the chase. But where the herds are not much molested they often show astonishing tameness and indifference to man. Near one of our camps in the Lado we one morning encountered a herd of thirty or forty cows, calves, and young beasts, half and three-quarters grown. They were in a broad, shallow valley, evidently a swamp in the wet season. The valley was covered with tall, rank grass, burned off in places, and dotted here and there with ant heaps and bushes and acacias. A big flock of cow herons accompanied the herd. The beasts were feeding on the grass when we first saw them, and we approached them close enough to see that there were no big bulls. After finishing feeding they moved off up the valley, the herons riding on their backs, but dismount-

ing to stalk through the burned places so as to catch grasshoppers. The herd stationed itself for the day among the thorn-trees on one of the small rises of ground, the herons advertising the place by perching in a snowy mass on the acacias. In mid-afternoon the elephants again strolled forth to feed. They went to water, and were feeding when night fell. They spent most of the following day in the neighborhood. During all this time they were within a couple of miles of camp, and as we watched them close by we could distinctly hear an occasional camp noise, and the report of the shot-guns of the ornithologists of the expedition. Yet the elephants were totally unconcerned.

In regions where the natives are timid and unarmed the elephants sometimes become not merely familiar but dangerous. They are always fond of ravaging fields and gardens, and when they find that they can do this with impunity they are apt to become truculent toward mankind. In Uganda we more than once came across deserted villages, already far on the way again to becoming parts of the jungle, which we found had been abandoned by the inhabitants because of the ravages of elephants. At one camp the chief of a neighboring village called on us to ask us to kill a rogue bull, the leader of a small herd of elephants which were in its immediate vicinity. He said that the elephants were very bold, were not afraid of men, and that the bull had grown so vicious that he attacked every man he came across. Colonel Roosevelt and Kermit went after the rogue. They found the herd so close to the camp that they could hear the porters talking and the sound of the axes, and were charged by the bull as soon as he made them out, at a distance of some fifty or sixty yards. They killed him.

We learned that the village, which was a couple of miles away, had been destroyed by these elephants, under the lead of the rogue bull. The elephants had begun by ravaging the gardens and plots of cultivated ground; the natives tried to drive them away; the beasts grew bolder and finally one night when the natives yelled at them, they charged them, drove them into their huts, and then destroyed several of the huts; and one, the rogue bull, killed one and maimed another of the inhabitants. In out-of-the-way places wicked herds will sometimes thus attack hunters' camps, being attracted rather than repelled by the fire. Mr. Paul Niedieck in his "Rifle in Five Continents" describes an attack thus made on him in which he nearly lost his life. Not only are some individual elephants particularly vicious, but there are whole herds which are vicious.

Elephant hunting, in addition to being ordinarily very hard work, is often dangerous. As we have elsewhere said, experienced hunters often differ widely in their estimates as to how the different kinds of dangerous game rank as foes. There are many men who regard elephants as the most dangerous of all; and again there are many others who regard the lion and the buffalo as beyond comparison more formidable. Our own view is that there is a very wide range of individual variation among the individuals of each species, and, moreover, that the conditions of country and surroundings vary so that one must be very cautious about generalizing. Judging partly from our own limited experience, and partly from a very careful sifting of the statements of many good observers with far wider experience, we believe that, taking the average of a large number of cases under varied conditions, the lion is the most dangerous; that a buffalo

that does charge, especially a bull, when it has actually begun its charge, is more dangerous than a lion and much more dangerous than an elephant; that a single elephant is less dangerous to attack than a single buffalo, and that the charge of an elephant is more easily stopped or evaded than that of a buffalo; but that elephants are very much more apt themselves to attack than are buffalo, and that, therefore, there is more danger in the first approach to an elephant herd than is the case with buffalo. If a big tusker is in a herd of cows it may be impossible to kill him, because the cows charge with such savageness as soon as they detect the approach of the hunter—and, of course, a herd is much more apt than a single beast to detect him. At the sound of a shot the cows of a vicious herd, screaming and trumpeting, crash through the jungle in all directions, and may quarter to and fro down-wind, trying to catch the scent of their enemy. If a man is caught he is frequently killed; but often he escapes, for the very hugeness of an elephant's bulk makes it unfit to cope with so small an antagonist. An elephant is more easily turned than a buffalo, when in full charge, although an occasional elephant, usually a vicious bull, will charge right through the shots, taking the punishment of the heavy bullets without flinching, and getting home. Of course, a ball that would cripple a charging lion may have no effect on the huge bulk of an elephant or the sinewy mass of a buffalo.

An elephant that means mischief may charge in silence, the trunk hanging straight down and the great ears cocked at right angles to the head; it may extend the trunk, screaming or coming on silently; or it may scream loudly, and make the actual charge with the trunk curled, and this not only

when it is passing through jungle, but even in the open. It is said that elephants only scream when the trunk is extended, but if this is so, then in some cases the elephants must curl the trunk the very moment the scream is finished, for the impression conveyed is that the screaming and the advent of the furious animal with its trunk curled are simultaneous. On one occasion, when an elephant charged us and was stopped by a right and left from Cuninghame when but a few feet distant, it threw its trunk high in the air on or immediately after receiving the bullets. Carl Akeley informs us that one elephant that charged him came on screaming and thrashing the tall grass, tearing up and tossing and plucking and brandishing branches and bunches of grass, so that it looked like a hay-tedder. If an elephant catches a man it usually falls on its knees and endeavors to stab him with its tusks; but sometimes it knocks him down, puts one foot on him, and plucks off his head or legs or arms with its trunk; and sometimes it snatches him aloft with its trunk and beats him against the ground, or perhaps against a tree. A wounded cow elephant, on being approached by us, struggled to arise and uttered, not a scream, but a kind of roaring growl.

We spoke above of the fact that elephants are sometimes found in the desert. This was a surprise to us. We had already found them high on the cold mountain slopes, in cool, park-like uplands, in wet, rank, steaming tropic jungles, in thick forest, and in hot, open, grassy plains. Our old hunting companion, Mr. R. J. Cuninghame, wrote us of his experiences with them in the desert north of the Northern Guaso Nyiro shortly after we left Africa: "From the Chanler Falls we went north 40 or 50 miles. The country is covered

with thick, low thorn scrub, all the trees the same height and the ground flat and without land marks. It was absolutely waterless except a few water holes scraped in dry sand river beds, and these days apart, weather scorching hot, and ground covered with sharp quartz and granite, loose stones. Found our first water at noon on the second day; got the men in without loads, and the donkeys not until the next day. The water, which was almost undrinkable owing to strong alkaline salts, was in old Rendile wells, 8 and 10 feet below the surface of the ground. What was my astonishment at 4 P. M., on the day we struck water to see a herd of elephants, cows, and totos (young and half-grown animals) pass within 50 yards of our camp, go and drink from our wells, and march off again. Eventually I found another water hole and lots more elephant. The water made the men sick. I found the next water 40 miles north of these wells and it was absolutely stinking and untouched even by giraffe. It had not rained up here for $2\frac{1}{2}$ years and the heat was really very trying.

“A word about your grand 450 [a Holland double-barrel, like Mr. Roosevelt’s own] for it saved my life twice on this expedition when out elephant hunting. On the first occasion I had quite unexpectedly found three elephants standing under some palm trees on the bank of a dry river bed. I took my companion up to look over the animals. We were on the opposite bank of the dry river and we went up to about 30 yards to look them over. They proved to be two cows with calves and a three parts grown animal, sex undetermined. My companion wished to take a kodak as they made such a typical African scene. He fussed about with the kodak and I saw that the elephants had grown sus-

picious. At length he pressed the button, which proved too much for the nervous system of the tembos [Swahili for elephants]. With ears outspread and trunks curled up, and screaming like locomotives they seemed spontaneously all to charge straight for us. I knew *my* retreat, as I invariably make a study of the ground immediately behind and to each side of me when I go in to tackle elephants and I turned and fled to the only tree within reasonable distance. This was 12 yards off. The other man bolted on and so did all the niggers (6 of them). On reaching my tree (15 inches in diameter) I turned to face the charge and found the 3 animals just topping the bank from which we had been photographing (12 paces off). I picked out the leader, the largest cow, and fired. This brought her up all acheck [second mate's language*] but the others came and jostled her and she, with them, started for me again. The 2d barrel killed her dead at 9 paces, and as I knew the others would get me if I stayed, I bolted for the river bed. The dead cow caused them to swerve and I escaped them by a *very* narrow margin. It was the nearest call I have had for quite some time with elephant. The other man's 450 double jammed in the safety bolt and he never fired but wisely kept on running like the niggers, through the bush. The whole incident was all over in 20 to 25 seconds.

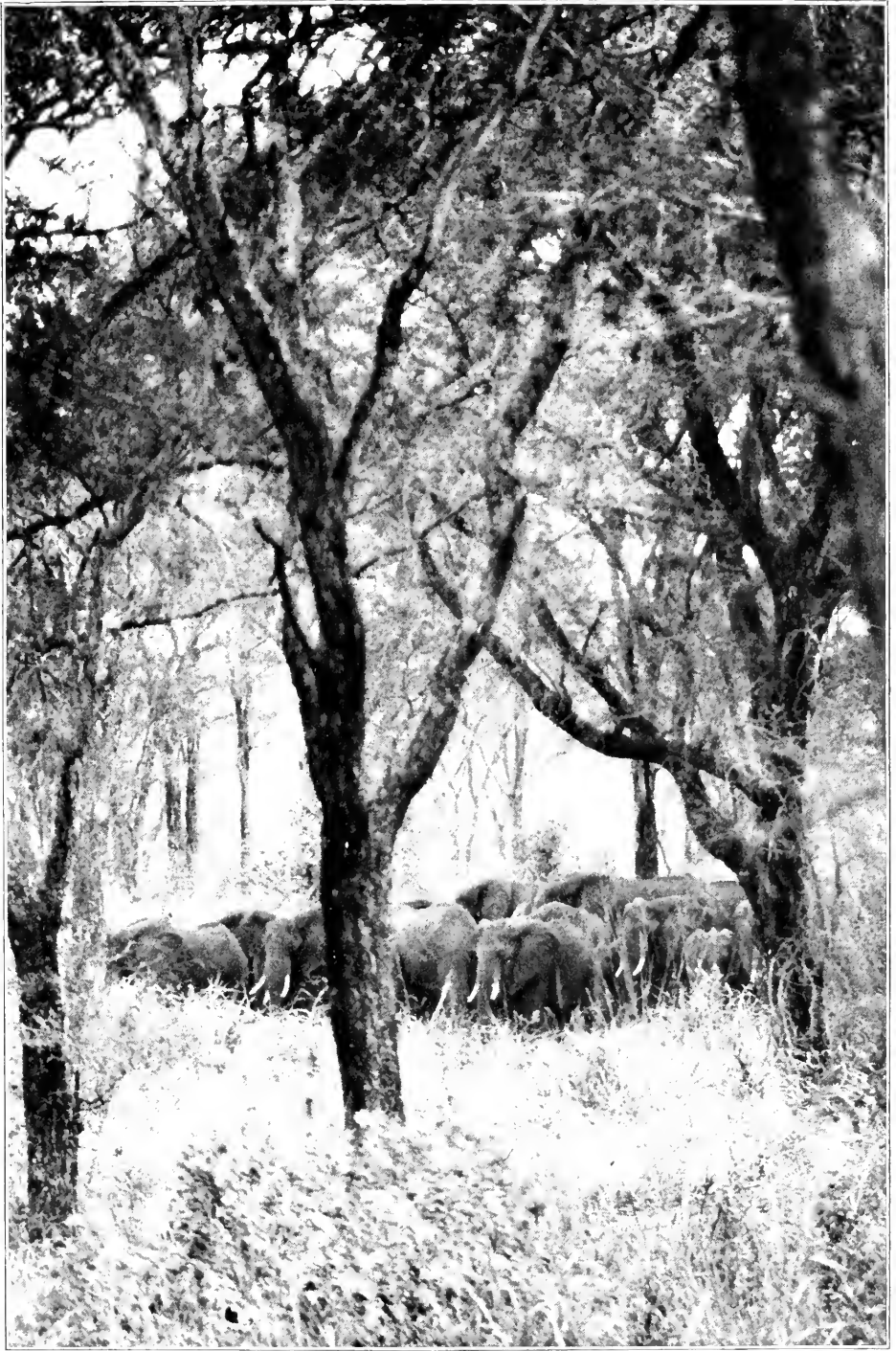
“On the second occasion I was out with the same man on the foothills of south Kenia and camping in the same small open patch in the forest where you may remember I took you to [near where Colonel Roosevelt killed his first ele-

*He had served on whaling ships in the Arctic seas; and we used to compare cow-punchers', lion hunters', elephant hunters', and whaling dialects.

phant, a big bull, and not far from where Akeley was nearly killed by another bull]. We got a single bull elephant standing about 15 yards off. I motioned my man to shoot, but he was decidedly jumpy over the business and made some noise. Round swung our friend and started to charge right on us. My companion let drive with one barrel and managed to hit one of the outspread ears! He had waited so long that it didn't give me a fair chance, but one shot of the 'Roosevelt gun' brought him down dead as a nail barely ten yards from me. On this occasion there was absolutely no chance of escape as we could not move a step in any direction in the mass of tangled vegetation."

The coloration of the Cape elephant is decidedly of a gray cast, usually some shade of smoke-gray or light olive-gray, and is uniform in tint over the whole body except in the region of the axillæ, groins, and lips, where a pinkish tone usually manifests itself. The calves are a lighter and purer gray than the adults. The coloration of the elephant, however, is not dependent upon the color of the actual skin, as in other pachyderms, but upon a roughened layer of dead epidermis which coats the skin. This dead epidermal layer is heaviest upon the crown of the head and over the back, where it is visible as a caked or flaking mass of dried grayish tissue. The tanned skins of elephants or the mounted specimens, as a rule, do not show the layer of dead epidermis, which is usually lost in the tanning process to which the skins are subjected, and such skins are on this account brighter or clearer in color and quite olivaceous-gray in tint. Albino specimens, such as the so-called white elephants occasionally found in India, are not known in Africa.

The body of the East African elephant is clothed everywhere by hair, but the individual hairs are so widely scattered and so short that they are only evident upon close scrutiny of the skin. Over the greater part of the dorsal surface the individual hairs stand half an inch or an inch



AFRICAN ELEPHANT HERD

Wachi Forest, Meru, Mt. Kenya

From a photograph, copyright 1910, by Kermit Roosevelt

apart and are roughly an inch or two in length, but on certain parts of the body they grow much more numerous and form a definite hair covering. Bordering the ear opening there is such an area forming a conspicuous fringe of buffy or whitish hair in the shape of a band one or two inches wide and several inches in length. The hair throughout the body generally, however, is black and quite unlike the fringe near the ear opening in color. The lips are margined by a scanty growth of long black hair which is most abundant at the angle of the mouth. The eyelashes are formed of long black hair and are quite conspicuous. The trunk is armed at its tip and also at intervals along the sides by stiff, bristle-like tufts of hair somewhat in character like the tail hair, but quite short and bristle-like. The really only conspicuous growth of hair possessed by the elephant is the black tuft at the tip of the tail. It is composed of exceedingly stiff, wire-like hair the diameter of which represents the maximum of hair growth among mammals. The hairs, which are individually some 15 to 30 inches in length, are confined to the edges of the flattened or compressed tip, and project out as a thin mane at right angles to the flattened surface. The tail hairs are individually very few in number and cover a much greater extent on the lower surface of the tail, where they extend along the margin some 8 inches, while above they occupy only half that distance or the terminal 4 inches of the tail. The flattened tip of the tail and the manner in which the hair projects from it in the same plane as the compressed surface are closely similar to the arrangement in the rhinoceros and the hippopotamus, both thick-skinned animals but quite unrelated to the elephant.

The hoof-like divisions on the margin of the foot in East African elephants are four on the front foot and three on the hind, but usually there is some indication in the form of a slight knob of the fifth on the forefoot and the fourth on the hind. The Indian elephant possesses these additional hoof or nail indications as well marked as the other nails, and the West African race, *cyclotis*, is also said to have them. The internal or bony structure of the toes, however, shows five to each foot in the East African, which does not differ in this respect from the Indian, and it is

evident that the external, nail-like hoofs are no indication of any real differences in bone structure.

There is a large sexual difference in size in the East African elephant, the males being in bulk fully a third greater than the females. In weight such difference amounts to approximately two tons, the adult female attaining an approximate weight of four tons and a large male six tons. The female averages in height at the withers $1\frac{1}{2}$ feet less than the male and is correspondingly less in size of skull, ears, and other dimensions generally. The sexual differences in size of tusks, however, do not follow this proportion, but they are much less in the female, being only a fourth the weight and size of those of the male.

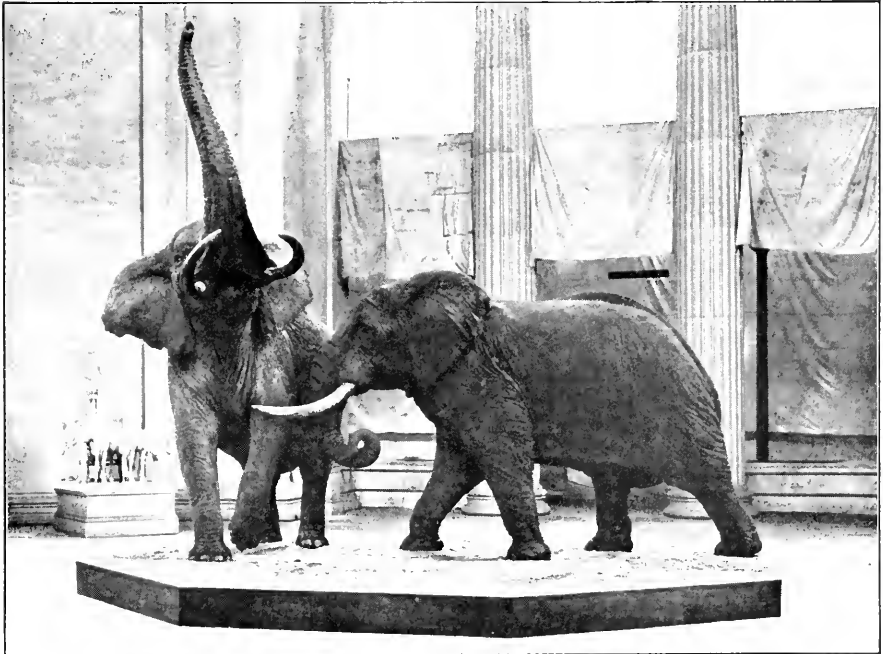
Much uncertainty apparently exists among sportsmen concerning the possible height to which the African elephant may attain. The recorded heights of large male specimens measured in the flesh by elephant hunters range from 10 to 12 feet. The differences between these extremes, however, do not represent the actual variation in specimens, but rather discrepancies due to differences in methods of taking measurements. Some of the difficulty of measurement is due to the immense bulk of a bull elephant, which prevents the body from being moved into a position favorable for taking the height unless the animal has fallen on a level surface in such a way that the legs can be straightened. The tallest record which appears authentic to us is that of Major Powell-Cotton's of 11 feet $6\frac{1}{2}$ inches for a bull elephant which he shot near the station of Wadelai, on the upper Nile. Major Powell-Cotton has made many careful measurements of elephants in the flesh, and his measurements may be taken as fairly reliable. Mr. E. S. Grogan, while engaged on his "Cape to Cairo" journey, shot a similarly large bull elephant near the same locality, which he has recorded as 11 feet 6 inches high at the withers. The tallest bull shot by Carl E. Akeley, who has recently devoted a number of years in East Africa to the securing of a giant specimen, was one measuring 11 feet 4 inches at the withers from the Budonga forest. He has measured others having a height of 11 feet 2 inches from Uganda and one from Kenia, the latter bearing immense tusks weighing 250 pounds and now mounted in the Field Museum of Chicago. We know

of no one who has been more painstaking in measuring elephants in the flesh than Akeley. He is of the opinion that his tallest bull, which was shot primarily for the large size of its tusks, does not represent the largest bodily size attainable by the African elephant, and that larger-sized though smaller-tusked bulls have been seen by him in Uganda. It would be of real service in this connection if a few of the largest-bodied specimens out of as large a herd of bulls as could be found together were collected and their skeletons deposited in some museum where they would be available for comparison. There are many other records by sportsmen of 11 feet or more for elephants shot in East Africa. Selous, the veteran elephant hunter of the Zambesi, however, has never met with any having a height of 11 feet, but states that the range in height in that part of Africa is from 10 feet to 10 feet 6 inches. Another elephant hunter, A. H. Neumann, who has had a wide experience and was also a careful observer, gives 11 feet 3 inches as the height of the tallest specimen he has killed, but states that the largest bulls he has shot in the Lake Rudolf region were less than this, and ranged from 10 feet 6 inches to 10 feet 9 inches in height. Our own measurements of the height of East African bulls fall within these limits. The tallest elephant in the National Museum collection is a rogue bull shot by Colonel Roosevelt in Uganda, having a height of 10 feet 9 inches at the withers. The bulkiest or largest bull, however, was the first one which he shot, on the southwest slope of Mount Kenia, which had a height of 10 feet 6 inches, and tusks weighing 65 pounds apiece. Another large bull, which he shot later, near Meru, had a height of 10 feet 4 inches. The actual relative bulk of elephants may best be determined by a comparison of the size of their skulls. Using this sort of evidence, we are justified in concluding that the bull from the southwest slope of Kenia equalled the famous "Jumbo" in bulk, the skull being decidedly greater in greatest breadth (some 2 inches), which is a better comparison of relative size than the height at the withers. "Jumbo" is usually stated to have stood 11 feet, but Ward only credits him with 10 feet 7 inches, which is perhaps nearer his actual height and agrees with the height of his skeleton, 10 feet 4 inches, as mounted at the American Museum of New

York. Jumbo, however, was a member of another race, *oxyotis*; his ears, being without the inward fold on the upper margin, met one another and overlapped on the nape. The largest elephant skull examined by us in a series of some fifty in the museums of America and Europe is a specimen at the American Museum of Natural History of New York, collected by Akeley in the Budonga forest of Uganda. This skull is that of a bull just arrived at adult size, but not an old animal, and measures in basal length from the condyles to the tip of the premaxillary bones 40 inches, and in greatest breadth 36 inches, in which latter dimension it exceeds the next largest by 2 inches. The tusks of this skull weighed 101 and 102 pounds, and are far from record size. In order to ascertain the maximum size to which an elephant's skull may attain it is desirable to have the dimensions of the skulls from which record tusks have been obtained. In this connection the girth of the tusk is the important consideration, for both the weight and length affect the size of the skull less, as they vary without regard to the size of the skull. There are at present no skulls preserved in any museum to our knowledge from which record tusks have come. This is really unfortunate, for it is very doubtful if any elephants bearing really record tusks are still alive, owing to the slaughter to which large-tusked bulls have been subject in every part of Africa. The tusk record for both weight and circumference is that of an East African tusk now in the possession of Sir E. G. Loder, having a weight of 235 pounds and a circumference of 26 inches. This is really a very unusual tusk, being three times the weight of an average or normal one. Major Powell-Cotton, however, has a tusk from the upper Nile almost equalling this one in circumference, being but 1 inch less in this dimension. The largest tusk in the British Museum, which has a girth but little less, is $24\frac{1}{2}$ inches in circumference, and has a weight of $226\frac{1}{2}$ pounds, standing second to the record in this latter respect. The longest tusk is one of 11 feet 5 inches in length, also from East Africa and now in the National Collection of Heads and Horns of New York. The average tusk weight in old bulls to-day is not more than 40 pounds, but under normal conditions before the large bulls were shot for their ivory the



EAST AFRICAN ELEPHANT, FEMALE
Uasin Gishu Plateau
From a photograph by Carl E. Akeley



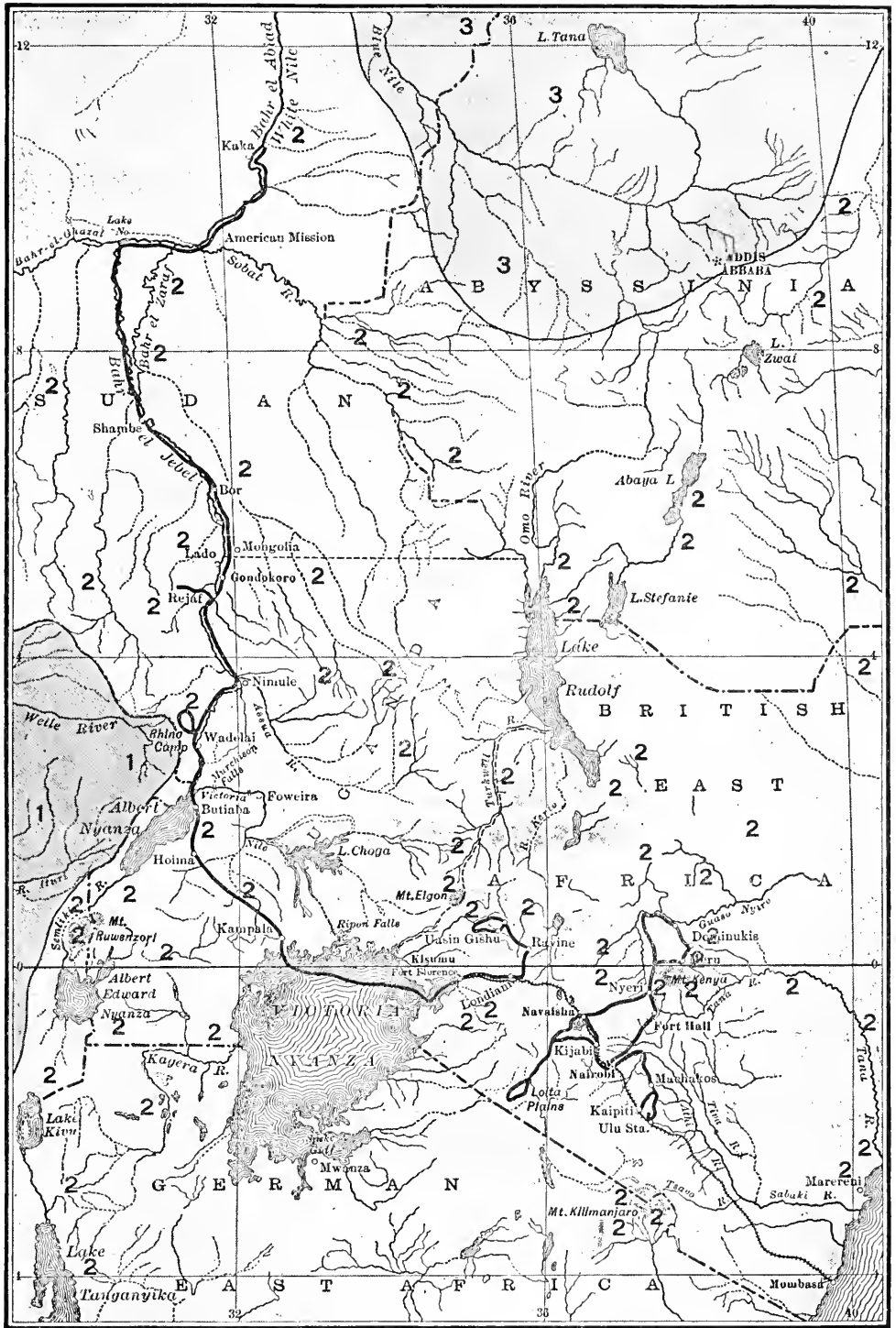
EAST AFRICAN ELEPHANTS (OLD MALES FIGHTING)
Shot on Mt. Kenia. The elephant with trunk raised, shot by Mrs. C. E. Akeley
Group mounted by Carl E. Akeley in the Field Museum, Chicago

EAST AFRICAN ELEPHANTS FROM MT. KENIA AND THE UASIN GISHU PLATEAU

average was approximately 80 pounds per tusk. In this connection it is interesting to compare the dimensions of fossil tusks of the recently extinct hairy mammoth, *Elephas primigenius*, a species closely related to the Indian elephant and of considerably smaller body proportions than the African elephant. The tusks of this species were considerably greater than the African records in every dimension. The record mammoth tusk has a length of 12 feet 10½ inches. The record one, according to Ward, in weight is estimated to have been 330 pounds, it having an actual circumference of 35 inches, but this gigantic tusk may not be referable to the hairy mammoth but rather to the giant-tusked Siwalik elephant, *Stegodon ganesa*. The record Indian elephant tusk is surprisingly small compared with its close relative, the mammoth. The records for the Indian are: length, 8 feet 9 inches; weight, 102 pounds; girth, 18¾ inches, or about half that of the mammoth. The average bull Indian elephant, however, has tusks little larger than those of the cow African elephant. The large bull from the southwest slope of Mount Kenia previously mentioned measured in the flesh: in length of head and body from the tip of the trunk to the base of the tail, 22 feet; in length of tail, 4 feet 7 inches; in length of trunk measured from the mouth, 6 feet 11 inches; in height of ear measured over the fold on the upper margin, 5 feet; in length of ear from the ear opening horizontally backward to the hinder border, 3 feet 4 inches. The rogue bull shot in Uganda, which was, according to measurement, a taller animal, measured considerably less in length of body, the length from the tip of the trunk to the base of the tail being 19 feet 10 inches. The other dimensions were: length of the tail, 4 feet 8 inches; height of the ear measured over the fold on the upper margin, 5 feet 8 inches; length of the ear from the ear opening to the hinder border, 3 feet 4 inches. The flesh measurements of a fully adult cow shot by Colonel Roosevelt at Meru, on the northwest slope of Mount Kenia, were: length of head and body from tip of trunk to base of tail, 18 feet 3 inches; length of tail, 3 feet 8 inches; height at withers, 8 feet 9 inches; height of ear, including the fold on upper margin, 4 feet 9 inches; length from ear opening to hinder border 3 feet 2 inches. Another cow, a specimen shot by Paul J.

Rainey near Mount Marsabit, a hundred miles north of Meru, measured quite the same as this cow in every dimension. The skull of this specimen is also quite identical in shape and size. They were both aged animals, having all the plates of their last molars in use. The dimensions of this skull are: greatest length from the condyles to the tip of the premaxillary bones, $31\frac{1}{2}$ inches; greatest width across zygomatic arches, $26\frac{1}{2}$ inches; greatest width across back of occipital expansion, $24\frac{1}{2}$ inches. The tusks of this cow are very large and exceed in length any others known to us. The right is 5 feet 7 inches in length, the left 5 feet 10 inches, and both show a diameter of 10 inches. The heavier one weighs 28 pounds. The heaviest cow tusk of which we have a record is one recorded by Selous, from the Zambesi region, weighing 39 pounds. Cow tusks average 15 pounds in weight and vary in size much less than those of the bull, the normal limits ranging from 10 to 20 pounds per tusk. No size or proportional differences of a racial character between this cow from the Marsabit desert country and the one from the Kenia forests have been detected, notwithstanding the great physical differences of the habitats of the two specimens. The measurements of large bulls, given by Neumann, of the Lake Rudolf country, which is a part of the Marsabit desert region, are quite the same as those of large bulls from the Kenia forest. At the present time, however, there is no migration between this region and Mount Kenia, and we doubt very much whether in the past the highland forest elephants and the desert ones ever left their respective environments for long periods. The African elephant seems capable of adapting himself to great differences in climate or environment without undergoing any noticeable change in external appearance, and on this account shows no characters of a geographical or racial sort except in a very broad or general way.

The elephant, until comparatively recently, ranged over every part of British East Africa and Uganda, from the sea-coast to the alpine meadows of the high mountains, as high as an altitude of 12,000 feet. They migrated freely everywhere over plains, through forest, in scattered bush country, and even through low, arid deserts, where there is only a scanty supply of brackish water, confined to widely iso-



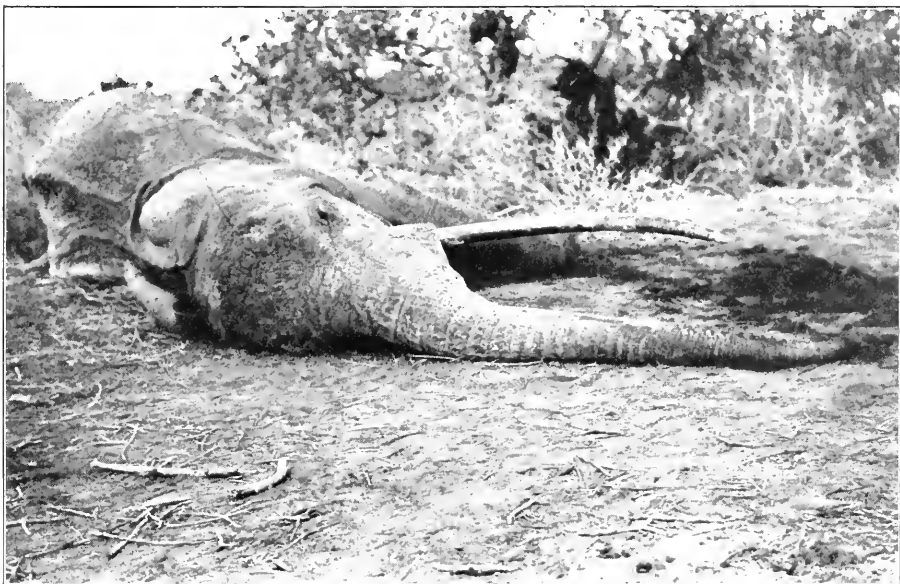
MAP 40—DISTRIBUTION OF THE RACES OF THE AFRICAN ELEPHANT

1 *Loxodonta africana africana* 2 *Loxodonta africana capensis* 3 *Loxodonta africana oxyotis*

lated springs. No other single species or race of mammal in East Africa shows such versatility or superiority over the environmental factors which control animal distribution. To-day these conditions are much altered, owing to the persecution of the elephants by ivory hunters and the extermination of them over much of the territory. As late as thirty years ago the elephants roamed unmolested in East Africa, except, perhaps, in the country immediately adjacent to the coast, where they were subject to occasional onslaughts by Arab and European trading caravans. Count Teleki's expedition, in 1887 and 1888, met with extraordinary numbers of elephants under conditions which to-day are quite unknown. About the southern end of Lake Rudolf Teleki found elephants on open plains many miles from cover, and had no difficulty whatever in approaching them and shooting any which possessed large tusks. Some years later, in the desert region at the foot of Mount Marsabit, Lord Delamere found elephants living under similar conditions in open country. During his hunting operations there he took photographs of many elephants standing or resting in the open country, and found little difficulty in going up to within a few yards of them by exercising care to keep down-wind. At the present time elephants, although they still exist in limited numbers near these localities, are never found in such open country during daylight. The well-known migratory routes formerly used by elephants in East Africa in going from one feeding-ground to another are no longer in use, the elephants being at the present time so reduced in numbers that they are confined to certain patches of forest or bush, from which they fear to roam. The elephants remaining in British East Africa are to-day confined to the forest area on the slopes of Mount Kenia; to the Aberdare forest; the western slope of the Mau Escarpment, in the Kisi country, east of the Victoria Nyanza and south of the Uganda Railway; the forested region of Mount Elgon, from which they wander occasionally east as far as the Uasin Gishu Plateau and the west shore of Lake Baringo. From the Elgon region northward and westward they extend rather generally over the whole of Uganda and the Nile basin, but they are permanently found in this area only in certain forest tracts;



EAST AFRICAN ELEPHANT, MALE
Shot by Theodore Roosevelt at Meru, Mt. Kenia
Showing inward fold of ear on upper margin



EAST AFRICAN ELEPHANT, FEMALE (WITH RECORD TUSKS)
Shot by Paul J. Rainey near Mt. Marsabit, B. E. A.
Showing inward fold of ear on upper margin

EAST AFRICAN ELEPHANTS

although they are occasionally met with throughout most of Uganda. A favorite place for them in Uganda is the Budonga forest, east of the Albert Nyanza, where Akeley has recently secured specimens for the American Museum of Natural History. They are also to be found in the Bugoma forest, farther south; in the Semliki Valley, and the region about Ruwenzori generally; and the forest area at the mouth of the Kagera River, on the west shore of the Victoria Nyanza. North of Mount Elgon they occur in limited numbers in the forests clothing the slopes of the numerous high peaks such as Debasien, Kizima, and Agora. They occur also in the grass country near Gondokoro and throughout the whole Lado Enclave, or western side of the Nile north through the Bahr-el-Ghazal drainage. Northward along the White Nile they occasionally occur still as far north as Kaka, where they reach the river by way of the streams flowing from the Abyssinian highlands. In the low but desert portions of British East Africa, which are quite uninhabited, the elephants still have considerable freedom of movement. The middle and lower Tana Valley is occupied by them, as is also the coast strip south of it, at least as far as the mouth of the Sabaki River. North of the Tana River we find them still in the desert region dominated by the Northern Guaso Nyiro. At the present time they seldom or never come to the river, but are found a few miles north of it watering at the brackish desert springs and feeding on the foliage and twigs of the desert acacias. In this region they are found in small family parties northward to Mount Marsabit, Mount Nyiro, and throughout the desert generally as far as southern Abyssinia and the north end of Lake Rudolf. On the southern border of British East Africa a few elephants are still to be found in the Kilimanjaro forest.

The total number of skins and skulls of the Cape elephant examined by us comprise some fifty specimens representing the following localities: Mount Kenia, Marsabit region, Lake Rudolf, Uasin Gishu Plateau, British East Africa; Lindi, German East Africa; Budonga forest, Albert Nyanza, Kisinga, Uganda; Rhino Camp, Wadelai, Lado Enclave; Fort Manning, Nyasaland; northern Rhodesia; Cape Elizabeth, South Africa. The East African and the Uganda

specimens represent material in the National Museum at Washington and the American Museum of New York. Other specimens were examined at the British and Berlin Museums and in various other European institutions.

CHAPTER XXV

EQUIPMENT, ARMS, AND PRESERVATION OF SPECIMENS

WE do not think it necessary to go into details of the equipment of a safari for a trip in East or Middle Africa, because so much must depend upon the length of the trip, the locality traversed, and the purposes and individual habits and tastes of the party. A short hunting or collecting trip along the line of the Uganda Railway can be managed very inexpensively by any fairly competent tyro without a guide. A long trip, however, can only be undertaken either by a man who is thoroughly up to his work or who has some good and competent man with him to supply his own shortcomings. Our own recommendation is that the outfitting should be done on the spot, although provisions and equipment can readily be obtained in London also. Messrs. Newland, Tarlton & Co., of Nairobi, attended to our outfit, and were we to repeat the trip we would go to them again. According to American standards, however, especially of the old-time West, the average East African sportsmen's outfit is rather needlessly elaborate; nevertheless, we question whether a newcomer will know what it is safe to discard. Mr. Stewart Edward White in the appendix to his book gives some good recommendations from the standpoint of a hardy man who does not expect luxuries. Mr. White is wrong in some of his

comments, however; as, for example, in his unsparing condemnation of "shorts," which leave the knees bare. Personally, we do not use these. Kermit Roosevelt always used them, and in our judgment they are the best leg gear for those with tough enough skins to stand them. It must be remembered that East African hunting is based on the rather luxurious standards of India. Unquestionably, the country is not such as to permit men to rough it as in the Rocky Mountains and the north woods, and a safari for scientific purposes necessarily carries much equipment; but it is well to keep in mind that there is a tendency toward overelaboration of outfit in East Africa as in India.

As for weapons, we, personally, believe in a heavy double-barrelled cordite, such as the English .450-calibre and .400-calibre modern rifles, for buffalo, rhinoceros, and elephant. The ordinary weapon to be used for nine-tenths of the game should be a first-class small-bore repeater of not more than .300 calibre. These two types of rifles are all that are necessary, and, at a pinch, the latter will serve *all* purposes. But the heavy gun should be used by those who intend regularly to hunt the different kinds of heavy, dangerous game; and if lion and leopard are to be hunted, it would be well to have an intermediate repeating rifle of about .350 to .405 calibre. This will not carry such long distances as the small calibre, but it is better for stopping purposes, and is yet very handy. We emphatically believe in a repeater for use against the big cats.

From a zoological or museum standpoint the whole success of a shooting expedition hinges upon the successful preservation of the trophies secured by the hunters. It is

rare, however, to find a sportsman who devotes the proper attention and time to this feature of his expedition. Few indeed have the cardinal principles of skin preservation in mind, however good their intentions may be toward the collecting of the skins of the animals killed. The great majority of sportsmen leave the work to ignorant and indolent native assistants, whose work is only of value when under the constant supervision of a responsible person.

Specimens destined for scientific use in collections or museums should be carefully measured in the flesh. The four measurements universally required are: (1) the total length from the tip of the snout to the terminal end of the tail vertebræ, taken along the contour of the dorsal profile with the head stretched out in line with the body [sometimes this measurement is taken in a straight line between uprights; Colonel Roosevelt took many in this fashion]; (2) length of tail vertebræ, taken by holding the tail at right angles to the body and measuring from the base of the angle to the terminal tip of the flesh, but not including the hair; (3) length of the hind foot, taken from the tip of the hoof or longest claw to the back of the heel or hock; (4) length of ear, taken from the inner notch as near the auditory meatus as possible to the extreme tip. The height is often taken, as it is a favorite measurement of sportsmen. Little reliance can be placed on its accuracy, however, on account of the very diverse conditions under which it is necessarily taken. In the live, standing animal the measurement of the height at the withers is of value when it can be obtained. The same measurement taken in dead animals is not, however, strictly comparable with this, owing partly to the fact that the shoulder-blade in the hoofed mammals is set free in the

muscles of the shoulder, being without any direct bone connection with the trunk skeleton, and partly to the fact that an animal lying on its side has the weight of the body relieved from the forelegs which are then capable of being stretched out to varying lengths to accommodate the measurer's ideas of correct position. The measurement when taken should be the distance between uprights from the worn surface of the hoof or sole of the foot in carnivorous mammals, to the top of the withers with the foreleg held straightened but not stretched. If the specimens are intended for mounting, innumerable measurements of value may be taken of the circumference and thickness of the body and limbs at various points. The skeleton is, however, of more value to the taxidermist than any number of careful measurements and should be preserved if facilities are available. If it is not possible to preserve the whole skeleton, the limb bones and pelvis should be collected, for they alone are of great assistance to the taxidermist in modeling the manikin. The sportsman should at least, in all cases, preserve the complete skull, for it serves a double purpose. After it has served as a model for the manikin of the taxidermist, it is of permanent value to the zoologist for study, and is often absolutely necessary for the determination of the species. Photographs should also be taken of the specimen in the flesh as an aid to the taxidermist.

At the present time skulls of several of the large African mammals are much needed for the determination of the racial characters of the described subspecies. This is particularly true of elephant, hippopotamus, rhinoceros, and giraffe. Of all skulls that of the elephant is the rarest in collections and the most valuable. What is particularly

desirable are the skulls of specimens with really large tusks which would show the changes of bone structure which accompany gigantic tusk development. The largest skulls at present preserved in museums possess tusks of considerably less than two hundred pounds per pair, which are less than half the weight of record tusks. It is well to bear in mind that our large mammals are disappearing more rapidly than the smaller ones, and in the districts where they are now rare special efforts should be made to obtain and preserve specimens before their extinction. In order to determine the characters of the geographical races of a species it is necessary to have specimens for study from every district inhabited by the species. Game reserves can only protect or preserve species in certain limited areas, and we cannot therefore possibly preserve by such means all the geographical races of widely distributed species. To carry out such complete preservation would require the protection of all the species of game animals throughout their entire ranges, which is obviously impossible. It should be our especial purpose to obtain specimens of the species which are disappearing most rapidly, in those districts where they are already rarest.

The salt method of preservation here described is essentially that of Carl E. Akeley, and was the one employed by the Smithsonian African expedition under the direction of Colonel Roosevelt. Owing to the great quantities of salt required both in dry-salting the skins in the field and later in packing them in barrels for shipment, it is a very expensive process. To the cost of the salt must be added the much greater cost of transportation of the skins in the field due to the added weight of salt. It has great advan-

tages over other methods wherever quality is of prime importance, and in most regions where drying cannot be resorted to. Salt leaves the skin in all its original pliability and strength, and is quickly removed by water. It performs the work of preservation with the minimum of danger either to the quality of the skin or to the coloration. The method which has been found most successful in equatorial Africa in the preservation of the skins of large mammals concerns itself with the use of salt exclusively. All skins contain a large per cent of water, which combines with the other elements in the tissues after death to assist decay. In order to preserve the skin it is necessary speedily to extract the moisture which the skin contains. Salt when applied in a pulverized condition to the dermal side of skins acts at once upon the moisture in the skin, with which it unites. Its extreme solubility when in the presence of moisture allows it to penetrate into the skin through the pores and unite with the moisture in every part of the tissues. Salt has no other preservative effect, however, than drying; that is, it is not an insecticide or a poison to bacteria or other organisms which destroy skins. It must also be borne in mind that it is far from stable in its preservative qualities. As long as salt is in the skin moisture other than salt brine must be kept away, for there is constant danger of the salt being extracted by outside moisture, which may thus find entrance into the skin and cause its decay just as would have taken place originally had not the salt been present to extract the moisture and preserve the skin. The successful use of salt in preservation depends first upon applying it to every part of the skin, and second in making its action universal throughout. In the case of large skins

paring down, to a thinness which will allow the salt to penetrate through the dermal layer to the epidermis and preserve the hair covering, must be resorted to. The salt method is simple in application; its success depends chiefly upon eternal vigilance in seeing that it reaches every part of the skin in its action.

Salt should be applied as soon after the removal of the skin as is possible. Usually this cannot be done until the skin reaches camp. Here it is spread out hair side down and carefully fleshed, all the fatty tissue being removed, as it forms an impenetrable barrier to salt. Finely pulverized salt is then spread over the skin in a uniform layer about a quarter of an inch thick. Skins in which the legs and neck have not been slit longitudinally will need to be treated by filling these members with salt, leaving the hair side turned out. It is then rubbed into the skin to insure its immediate action, after which the skin is tightly rolled, as smoothly as its folds will allow. In this state it is allowed to remain overnight, usually from twelve to twenty-four hours, so as to give the salt ample time to extract the moisture. At the end of this time it is unrolled, when it will be found that most of the salt has been dissolved by the moisture in the skin which now rests in pools of brine in the folds. This liquid is then drained off and the skin covered by a fresh layer of salt, after having been carefully inspected to see that no spots are left where the action of the salt has not penetrated and where decay is beginning to take place. Such spots may usually be detected by their softness, the skin being of a putty-like consistency, or by the ease with which the hair may be pulled out. Inspection of this sort of each skin should be continued daily for a few days until it is certain

that the salt has entered into every part of the skin tissue, when it may be left for weeks either rolled up more or less moist or dried in the shade. Care should be taken with dried, salted skins not to subject them to the atmospheric moisture of rainy weather or of moist districts near the coast or otherwise, as the moisture in the atmosphere is then often able to extract the salt and cause the skin to decay. The best plan to follow is to pack the salted skins in barrels and cover them with brine or, if they have been thoroughly dried, pack them in tin cases and seal them up so that they may remain protected from any external moisture. Barrels for this purpose should be free from oil, grease, or infection of any sort which may be communicated to the skins. Packing in this way also prevents the action of skin-eating beetles or the growth of bacteria or fungi which may destroy the skins if left exposed.

Salt not being available, the skins may be simply dried provided the climatic conditions will permit. The skins should be carefully spread out horizontally, hair side down, in the shade of trees or of a tent stretched either on poles or a series of lines, so as to allow free access of the air to both surfaces. In very dry regions perfect skins may be obtained by simply pegging the skins out on the ground in the shade, hair side to the earth. The drying must take place rather rapidly, that is, within a day or two, otherwise decay will set in. Drying skins in the sun usually causes them to decay and slip on the epidermal or hair side and then dry afterward. Such a dried skin has the appearance of a perfectly dried specimen, but its condition is at once evident upon softening in water by the separation or sloughing of the hair as well as the epidermal layer. In the preparation of

dried skins powdered arsenic is of valuable assistance as an insecticide. It may be applied to the dermal side of the skin while it is still green, or the skin after being thoroughly dried may be dipped into a solution of it and redried. This last process renders the whole hair surface, as well as the dermal layer, insect proof.

The use of alum in any form is to be avoided except as a last resort in decaying skins. The astringent action which it exerts upon the skin has a killing or hardening effect on the tissues which remains in them permanently. Such action affects seriously their elasticity, and makes it difficult for the taxidermist to restore them to their natural shape. Alum is of use occasionally in decaying skins, for its astringent action is powerful enough to set the hair which decay has already caused to slip.

As the game trophies of sportsmen consist almost invariably of only the head skin and horns, the skinning of the head is of first importance. Care should be taken to make all cuts from the under side of the skin so as to avoid cutting the hair bordering the incisions, particularly about the base of the horns where the hair is unusually long. The neck should be cut off at the shoulders, so that it may have enough length to give it a graceful appearance when mounted. Make the cut as far back as the withers and the base of the forelegs. From a point a few inches behind the horns make a longitudinal cut, following the midline of the nape to the withers; then connect the neck cut with both horn bases by a short cut to the back of the horn bases and continue the cut completely around each horn. Begin skinning at the base of the neck by pulling the skin forward, being careful to leave all the fat and skin muscle attached

to the body, as it is much less difficult to get a clean skin at once than to flesh it after it has been removed. When the ears are reached cut the cartilage well down near the bone, where it is but a mere tube, then continue on forward to the eyes, where you will need to use some caution so as not to cut the lids. This may be prevented by cutting the skin close to the eyeball, using one of your fingers as a guide thrust into the eye from the outside. Continue on down to the mouth, cutting the lips off near the base of the gums, and being careful to cut the nose cartilage well back near its base so as to avoid cutting into the external nostrils. After the skin has been cut free of the head, begin by splitting the lips and the eyelids as well as the nose cartilage. The splitting of such fine membranes is made necessary, owing to the failure of salt to penetrate membranes and to act only from the inside of tissues. The ears may now be skinned by turning or pulling the skin toward their tips, at the same time forcing the cartilage down; continue the process to the very tip of the ear so as to insure preservation. It is not necessary usually to skin the cartilage on the inside as well, unless fat is present, in which case the salt cannot reach the inside until the cartilage is completely removed.

In the skinning of the heads of hornless female antelope, the cut from the base of the skull along the median line of the nape will not be found necessary in species having narrow heads. Never make the cut along the median line of the throat where it may show when the head is mounted and where the hair is usually so short that it will at all events be easy to detect. The heads of large carnivores can be skinned out from the shoulder cut by reversing the

skin over the base of the skull, which is very little broader than the neck. The lips in these animals need particular care, as they are usually mounted with their mouths open and should, therefore, be cut far back along the base of the teeth, which will give them the greatest possible length. Owing to the refractory nature of the heavy skin of the hippopotamus, the head skin must be cut down the entire length of the median ventral side from the chin to the chest.

The rhinoceros head skin should be cut down the median line of the nape. Giraffe require similar treatment, the cut here following along the dorsal mane, which occupies the median line of the nape, and then forking at the horns and extending up the inside of each of the large horns and across their tips, as they require skinning to preserve their hair covering. The head of the elephant offers some exceptions to the general rule and is the only case, with the exception of the hippopotamus, in which the cut down the throat is preferable or rather allowable. After making the circular cut at the withers and shoulders, make a second extending from the tip of the trunk along the median line of the under side to the mouth, and through the chin down the midline of the throat to the chest. The great ears must be especially treated by a cut on their back or inside extending from the base or point of insertion back of the auditory meatus to the extreme tip or angle marking the termination of the folded upper border. From this longitudinal cut the cartilage can be separated from the skin by cutting it free and then skinning down both surfaces of it as far toward the ear margin as possible without cutting through the skin which here is quite thin. When the ear cartilage has been skinned out as far as possible it should be severed along the

whole margin and thrown away, as it is of no value in the mounting and is very refractory when dried. The head skins of these four animals—the hippopotamus, rhinoceros, giraffe, and elephant—require to be pared down at least to half their original thickness in order to allow the salt to penetrate through the dermal layer to the epidermis. The necks of such large animals as buffalo, eland, and oryx also require a considerable amount of paring to insure preservation.

The skins of antelope and the hoofed mammals generally can be most conveniently preserved as flat skins. In removing the skin for this purpose a longitudinal cut is made from the base of the tail forward to the point of the breast, to which four cuts are joined, one down the inside of each leg, beginning at the hoof. The cuts for skinning the head are made as usual on the nape. A further cut is made the whole length of the tail, following the median line of the under side. In skinning the body the leg bones are severed as far down in each hoof as it is possible to reach with the knife after first severing the bone at the fetlocks. In rhinoceros and hippopotamus the ventral cut must be continued to the chin, as it is not possible in such thick-skinned animals to peel the skin off over the head. In giraffe, however, it will be found necessary only to continue the neck cut along the dorsal mane to the withers.

If the skins are desired for mounting it is better to make as few cuts as will answer the purpose of preservation. In such collecting, case skins may be advantageously made. In antelope and carnivores the cuts down the legs may be dispensed with, the leg bones in the case of antelopes being removed by first skinning down to the hock or knee from the

ventral cut and severing the leg and then, by making a short cut on the back at the fetlocks, the leg bones may be severed at that point and the skin of the leg stripped back to the knee or hock, as the case may be, and the bone removed from below. This method can only be employed where salt is to be used or where, as in carnivores, the skin can be completely reversed and dried wrong side out. The method cannot be used on such thick-skinned mammals as rhinoceros, hippopotamus, giraffe, and elephant, in which the skin is too thick to be manipulated. Buffalo and eland are the limit of its possibilities.

The preservation of the entire skin of the elephant presents a special case; for, owing to its large size, it cannot be handled in one piece as is possible in rhinoceros and giraffe. Cow elephants and small bulls may be conveniently manipulated by cutting the skins into three sections. The head is first cut off close behind the skull where the cut is hidden by the immense ears, and further cuts are made on the ears and trunk as already described. The body skin is then cut into halves by a cut extending along the median line of the whole length of the back from the neck to the tail and continued on the ventral surface, following the median line of the belly to the throat. A cut along the inner side of each leg is then made from the hoof to the median ventral cut. An additional cut on the under side of the tail is made from the base to the tip. In very large bull elephants it is found necessary to again divide each half by a transverse cut extending midway between the two legs from the dorsal cut to the ventral. This results in sectioning the elephant's skin into five pieces.

In the preservation of skulls for scientific purposes great

care should be used in guarding them against breakage, especially such parts as the teeth and the delicate bony processes which are extremely important structures in their classification. A strong tendency is manifest among sportsmen to remove as much meat as possible from the skull in the field so as to minimize the odoriferous effects which emanate from such dried specimens. The cutting of muscle, however, from skulls by the rough methods usually employed by native assistants often results in cutting off the delicate processes or in scarring the bones by knife cuts. As much of the meat as can be dried thoroughly on the skull serves as a protection to the bones, and is in no way a menace to its preservation. An ideal way of getting rid of the smell and the insect larvæ which feed upon dried meat and bones is to soak the bones several hours in a solution of arsenic water after they have become thoroughly dry, and then redry them for a few hours in the sun. The arsenic not only kills the insects which are on them at the time, but it prevents further insect attack. The skulls of the smaller species should be carefully carried in boxes in the field to prevent their being knocked about and broken.

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APPENDIX

APPENDIX

THE Secretary of the Smithsonian Institution made public, February 15, 1913, the list of those who contributed to the fund covering the expenses of the Smithsonian African expedition under the leadership of Colonel Theodore Roosevelt. This list is not complete, as it only contains the names of those persons who were willing that the Secretary of the Smithsonian Institution should make public their names.

In a statement issued by the Secretary it is stated that up to February, 1913, Mr. Roosevelt did not know who the contributors were, with the exception of Andrew Carnegie, and possibly one or two personal friends.

The list includes the names of Edward D. Adams of New York, former Secretary Robert Bacon of Boston, Cornelius N. Bliss of New York, James Campbell of Saint Louis, W. Bayard Cutting of New York, Andrew Carnegie of New York, Cleveland H. Dodge of New York, E. H. Gary of New York, John Hays Hammond of Washington, H. L. Higginson of Boston, Hennen Jennings of Washington, J. S. Kennedy of New York, Ralph King of Cleveland, former Secretary George L. von Meyer of Washington, D. O. Mills of New York, former Secretary T. H. Newberry of Michigan, L. L. Nunn of Provo, Utah, H. C. Perkins of Washington, Henry Phipps of New York, Mrs. Whitelaw Reid of New York, Elihu Root of New York, J. C. Rosengarten of Philadelphia, Jacob H. Schiff of New York, Isaac N. Seligman of New York, O. M. Stafford of Cleveland, former Secretary Oscar S. Straus of New York, and Isidor Straus of New York.

From the contributions the Smithsonian's three-fifths share of all the expenses were paid; the other two-fifths were paid by Colonel Roosevelt, which covered all his personal expenses and those of his son, and their proportionate two-fifths share of the total expenses of the expedition.

The following is the complete list of the collections made by the expedition that have been received by the institution:

	Specimens
Mammals	5,013
Birds	4,453
Birds' eggs and nests	131
Reptiles and batrachians	2,322
Fish	447
Plants	5,135
Insects	3,500
Shells	1,500
Miscellaneous invertebrates	650
	<hr/>
Total	23,151

As a result of this expedition the biological collections now in the National Museum from East Africa are probably the most complete of any in the world.

Considerable interest is being taken by the public in relation to the disposition of the collections made by the Smithsonian African expedition under the leadership of Colonel Roosevelt. The collections, when received, were distributed to the various departments of the National Museum to which they pertained—the birds were sent to the bird department, the mammals to the mammal department, the plants to the botanical department, and so on.

A number of groups of the large mammals have been prepared, and a number of individual specimens mounted for exhibition purposes. The greater portion of the specimens have been placed in the study series, and the duplicates will be distributed by exchange or otherwise. The groups of large mammals now mounted are on exhibition in the new museum mammal hall.

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