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MAMMALS

92

COLLECTED BY

THE SWEDISH ZOOLOGICAL EXPEDITION TO BRITISH EAST AFRICA 1911

BY

EINAR LÖNNBERG

WITH 15 PLATES AND 6 FIGURES IN THE TEXT

UPPSALA & STOCKHOLM. ALMQVIST & WIKSELLS BOKTRYCKERI-A.-B.

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1912

W W W

The first collecting of mammals was begun in the end of December 1910. I turned then my attention chiefly to the fauna of the small forests around Nairobi. The acting Governor His Excellency F. J. JACKSON, whose name is so honourably connected with the scientific exploration of East Africa, kindly granted me, among other favours, a personal complimentary license to shoot a certain number of game animals for which great kindness I wish to publicly express my deepfelt gratitude. I keep also in grateful and pleasant remembrance several other gentlemen, among whom, although the others are not forgotten, I especially wish to mention the Provincial Commissioner Mr. C. W. HOBLEY, and the Game Warden Mr. R. B. WOOSNAM, who kindly favoured me with good advice and assistance. The 7th of January I went to Escarpment station and did some collecting there, chiefly in the forests, for six days. In the meantime our caravan, or safari as is the East African expression, had been fitted out under the supervision of Mr. R. J. CUNNINGHAME, and Mr. Å. SJÖGREN, who joined the expedition to shoot game for his own interests, had arrived. We started on our way north the 17th of Jan. 1911 and arrived the following day at Juja farm. In this domain the typical East African steppefauna is beautifully preserved as in a private game reserve, and the owner Mr. W. N. Mc MILLAN kindly presented a Whitebearded Gnu to the scientific collections. From this place we continued our way ²⁰/₁ partly over steppe, and partly through rather densely populated districts via Blue Post, Punda Melia, Fort Hall, Kagio and Kutu to Embu boma. A little trapping was done at every camping place. From Embu we turned towards Mount Kenia and marched for three days through the lower forest region to the Meru country. Only a few mammals were obtained in the forest. We arrived at a native village Kanyakeni the 29th of Jan. and reached Meru boma the following day, where we stayed a couple of days. Several small mammals were obtained there by trapping, and some were also received from the natives as the district commissioner Mr. HORNE kindly had told them that we wanted to buy such. This was almost the only place where the native population was useful in this respect. Some mammals were also shot in the forests near Meru. Meru boma is, according to barometric observation, situated at an altitude of 1775 m. above the sea.

were, before mankind altered the natural conditions in East Africa probably ›three different kinds of main types of landscape which with their different subtypes, or gradations and intergradations, more or less mixed, occupied the greatest part of the country. These principal kinds of landscape are, or rather were, steppe, thorn-bush and forest› and to this has now to be added the more or less cultivated country with ›shambas› or neglected and overgrown former shambas.

This last type of landscape occupies vast areas, especially in the Kikuyu- and Meru countries. But the mammals living in the shambas and their surroundings, although now in many cases characteristic of the shamba country, are late immigrants from steppe, or forest and bush. They have found plenty of food there and have come to feed on the crops, or on other animals attracted by the crops. The fauna of the shamba country has accordingly not originated there, and it has not been subjected to special adaptations to live in such surroundings. A great number especially of the somewhat larger mammals only make raids into the shambas, like the baboons, bushpigs, bushbucks, duikers and other antelopes, porcupines, etc. not to speak of the giants, the elephants, and they retire again to their hiding places in bush or forest. But also the recent farmers on the open plains have found that some members of the steppe fauna like zebras and hartebeests etc, may make invasions and be destructive to their crops as well. Permanent residents in and at the shambas are a number of rodents and small carnivores, but these can also be found elsewhere, even if they, thanks to the abundance of food in such localities, become more numerous there. Thus. from a biotopographical point of view the mammals of the shamba country do not form a faunistic unit of their own. They are invaders from elsewhere, just as the rats (*Epimys panya*, *E. effectus*, *E. medicatus*, *E. rattus* etc.) which live in and at the native dwellings.

The shambas are also different in different places according to the crops grown there. In the Kikuyu country where the crop chiefly consists of beans, sweet potatoes, maize, *Pennisetum*, and other kinds of grain they do not offer suitable conditions for any arboreal animals, and not many hiding places except for quite small mammals. The others have to take their refuge in the bush covering former shambas or other suitable places and there as well small antelopes (duikers etc.) as carnivorous animals find shelter. In the Meru country where the shambas oftener contain bananas, and above all a number of small trees supporting the *Dioscorea*-vines even arboreal animals like the ›tumbili›-monkey (*Cercopithecus pygerythrus*) and the small Squirrel (*Paraxerus jacksoni kahari*) feel at home. In addition to this the numerous hedges of spiny *Solanums*, large *Salvias* etc. form good hiding places for some mammals like Mongooses, Genets etc. But the cultivated area has not given any new addition to the fauna neither in Kikuyu nor in Meru, even if many species now are more abundant in such country than elsewhere. In the following list of mammals such species are enumerated as were collected or observed in or at cultivated land.

The steppe may be regarded as the most typical landscape in great parts of British East Africa but it exhibits a number of different modifications. The flat open plains like the Athi plains near Nairobi and at Juja with a sometimes scanty,

Distribution of the genus or subgenus	Distribution of the species and closely allied forms	Mammals in cultivated or formerly cultivated land.
A ¹	E.	<i>Cercopithecus pygerythrus luteus</i> ELLIOT in trees, Meru boma, Kanyakeni.
A	At.	<i>Papio anubis</i> subsp. Escarpment, Nairobi.
A	E.	<i>Crocidura martiensseni</i> NEUMANN Meru country, near Kenia forest.
»	E Wc	» <i>fumosa</i> THOMAS Blue Post, Kagio, Embu, Kanyakeni.
»	E.	» <i>hildegardæ</i> THOMAS Blue Post, Kutu, Kazere.
A	E.	<i>Genetta suahelica</i> MATSCHIE Meru boma.
»	E Wc	» <i>stuhmanni</i> MATSCHIE Embu boma.
A	E (a)	<i>Mungos sanguineus ibex</i> WROUGHTON Port Hall, Kutu.
»	A	» <i>paludinosus conf. mitis</i> Nairobi.
A	E (A)	<i>Ichneumia albicaudus ibeanus</i> THOMAS Kikuyu.
A	Ea	<i>Felis ocreata</i> subsp. Kagio.
A	E.	<i>Paraxerus jacksoni kahari</i> (HELLER) Mera boma, in trees.
A	E.	<i>Graphiurus parvus dollmani</i> OSGOOD Kutu.
Ea Wc	E(ni)	<i>Otomys angoniensis elassadon</i> OSGOOD Kutu.
A	E Wc	<i>Dendromys insignis</i> THOMAS Kutu, Kazere.
A	cosmopolitan	<i>Epimys rattus</i> LINNÆUS Nairobi.
»	E.	» <i>medicatus</i> WROUGHTON Meru boma.
»	E.	» <i>hindei</i> THOMAS Ruiru river.
»	E.	» <i>effectus</i> DOLLMAN Fort Hall te Luazomela.
»	E.	» <i>panya</i> HELLER Juja—Fort Hall.
E	E.	<i>Zelotomys hildegardæ</i> THOMAS Ruiru river.
A	Eni(no)	<i>Leggada bella</i> THOMAS Punda Melia.
»	E Wc	» <i>triton</i> » Kazere.
»	E. (Wc)	» » <i>murilla</i> THOMAS Blue Post.
At.	E. Wc	<i>Lophuromys aquilus zena</i> DOLLMAN Embu, Kutu.
A	E (no)	<i>Arvicanthis abyssinicus præceps</i> WROUGHTON Fort Hall.
»	E Wc (At)	» <i>pulchellus massaicus</i> (PAGENST.) Kikuyu and Meru countries.
Eno	E(no)	<i>Tachyoryctes splendens ibeanus</i> THOMAS Nairobi, Meru.
A	E.	<i>Hystrix galeata</i> THOMAS Nairobi Escarpment.
A	E(a)	<i>Potamocheerus chæropotamus kenia</i> LÖNNBERG Nairobi.
A	E(no)	<i>Cephalophus abyssinicus hindei</i> WROUGHTON Nairobi, Punda Melia.
A	E.	<i>Tragelaphus Maywoodi</i> THOMAS Escarpment.
A	?	<i>Orycteropus</i> sp. Nairobi.

sometimes rich growth of grass, and with hardly any or only a few widely scattered acacia bushes constitute the pasture-lands of many antelopes. The most common of all of these is Coke's Hartebeest, the 'Kongoni', which still is numerous even quite near Nairobi. Its peculiar silhouette, ungainly as if carved in wood, is often seen against the sky-line and then, especially if a Kongoni has climbed up on the top of a termite hill, it often looks almost like a monstrous giant bird until its four

¹ In this and following tables A = Æthiopian region, At = widely distributed across tropical Africa, E = East Africa s. str., Ea = all over East Africa, Eni = East Africa s. str. to Nyassaland, Ez = East Africa to the Zambesidistrict, Es = East Africa to South Africa, Eno = East Africa and northward, S = Somaliland, Wc = Central African lake district, W = West African forest region.

legs are used in a stiff jointed gallop when its wariness gets the upper hand of its curiosity. The pretty little Thomson's Gazelles are also still rather common, although strongly decimated near settled districts. At Juja farm Whitebearded Gnus and Grant's Gazelles which also are typical members of this fauna were seen. The Zebras are together with the Kongonis with which they often join in mixed herds the most numerous mammals on these open plains, but they constitute also the only species of those hitherto mentioned which (without modification) extends north of Tana river. Along water courses on the steppe where there is bush or other covert Impalas and Waterbucks are at home, and perhaps also a Reedbuck. Here on the steppe among the big grazing animals the Lion hunts its prey, and the carrion feeding Hyenas (*Crocotta panganensis*(?) and *Hyaena schillingsi*), and Jackals (*Canis adustus* and *C. mesomelas*) share with the Vultures the remains. The Cheetah is also seen on the open steppe. *Pedetes* and *Otocyon* appear to inhabit the open plains, although their nocturnal habits are not easily studied. Where the growth of grass is rich and the bushes become numerous so that the landscape can be termed bush steppe the Serval, the Cheetah, the Wild Cat, Mongoose, and even the Lion and Leopard find suitable covert. The Duiker (*Cephalophus abyssinicus hindei*) is fond of hiding in high grass, and the Steinbocks (*Rhaphicercus*) which I saw were all found on bush steppe. In similar localities Warthogs are found, although they visit the open steppe as well. The Zebras and Kongonis also enter the bush steppe, if the bushes are not too numerous. The Hares (*Lepus victorice* and *L. crawshayi*) lie up in patches of high grass or among tall herbs and bushes which as a rule grow on old termite hills which are deserted and have fallen down. Similar resting places are sometimes selected by Duikers, Wild Cats and others. Certain rodents like *Arvicanthis*, *Zelotomys*, *Otomys*, *Tachyoryctes* etc. inhabit the steppe as well as insectivores, chiefly of the genus *Crocidura*. But as the expedition only passed over a short stretch of these plains and only camped there a few days the collection of small mammals from this district does not give any fair idea of the fauna. Several species caught in the cultivated land and enumerated in the list above live also in the bush- and grass steppe. Along rivers and small water-courses in the steppe country there is often a fringe of trees and there is the home of the »Tumbili» monkeys (*Cercopithecus pygerytherus*).

The steppe country south of Guaso Nyiri which we visited is mostly covered with scattered flat topped acacias, although here and there broad stretches of open grassy plains extend, and in some places also patches of thornbush are found. On the grass-covered plains the soil is often very loose but sometimes hard and dusty like a country road, so that a cloud of dust rises when the big game animals move. Among the acacias the ground as a rule is thickly strewn with sharp-edged black stones of volcanic origin, but there is often a rich growth of grass if the stones do not absolutely cover the ground which sometimes is the case.¹ In the thornbush patches the soil is hard and dry often with very little vegetation except the bushes,

¹ A photo of a typical acaciasteppe with grass and such black stones is reproduced in the report on the birds of this expedition K. Sv. Vet. Akad. Handl. Bd. 47. No 5. Pl. 1, fig. 2. while fig. 1 on the same plate shows a more open steppe.

although grass-covered spots can be found within the thornbush as well. This country is comparatively well watered by the small tributaries, Itiolu, Luazomela and Lekundu, to Guaso Nyiri.

The fauna of this district is not identical with that of the Athi plains. One especially misses there the Kongoni, Whitebearded Gnu and Thomson's Gazelle, which are so characteristic of the latter. Grant's Gazelle of the Guaso Nyiri steppe belongs to another race and probably this is the case with the Impala and the Waterbuck found among the bushes at the small rivers mentioned, although material of these animals for comparison was not collected on the Athi plains. In fact among the big grazing mammals, which are common on the latter, only the Zebra appears to be the same in the northern district. The Oryx (*O. beisa annectens*), the Gerenuk, Grévy's Zebra and the Somali Giraffe (*G. c. reticulata*) prove by their presence that here is a different zoogeographical territory. Pattersons Eland is also found on these plains, although not common, and the big black Buffaloes inhabit suitable thornbush patches. The Rhinoceros is not uncommon as well on the open ground as among bush and under the acacias. Of carnivorous animals Lion, Leopard, Cheetah, and Hyenas are represented. The Porcupine is of the *H. galeata* type which inhabits the more southern parts of Brit. East Africa as well, but the Hare (*Lepus somalensis*) of the Guaso Nyiri country is an entirely different type, a member of the Somalifauna. To the latter belongs also the Ground Squirrel the colonies of which inhabit dry places. The *Otomys* is the same as further south, but the *Arvicanthis* is different (*A. somalicus reptans*). Among other small rodents may be mentioned a Spiny Mouse (*Acomys ablutus*) apparently characteristic of this locality, *Thamnomys oblitus*, *Saccostomus mearnsi* and *Dasymys savannus*. A new *Sylvisorex* and a *Crocidura* represent the shrews.

Baboons occurred in large troops at Luazomela river on bush steppe. The Yellow-winged bat (*Lavia frons*) used to hang in thornbushes. Quite small bats were seen in some places after sunset but none was secured.

The following list gives the names of the mammals collected or observed by this expedition in steppe country as well near Nairobi as just south of Guaso Nyiri, and the differences of the faunas at these two localities is to some extent elucidated by this, although, of course, several names could have been added if the time at our disposal had not been so short.

In such cases when the name or the + mark is put within parenthesis exact identification of the subspecies has not been made.

Distribution of genus or subgenus	Distribution of species and closely allied forms	Steppe-mammals	Plains S. of Tana river		Acacia steppe S. of Guaso Nyiri
			grass- or bush steppe	open steppe	
A.	E.	<i>Cercopithecus pygerythrus luteus</i> ELLIOT	.	.	+
"	At.	<i>Papio anubis</i> subsp.	(+)	(+)	(bush)
"	Es.	<i>Epomophorus wahlbergi</i> SUNDEVALL	.	.	(bush)
At.	At.	<i>Lavia frons frons</i> (GEOFFROY)	.	.	(bush)
"	E(ni).	<i>Sylvisorex sorelloides</i> LÖNNBERG	.	.	+
A.	Eni.	<i>Crocidura turba</i> DOLLMAN	.	.	+
"	E.	" <i>hindei</i> THOMAS	+	.	.
"	Ea.	<i>Canis mesomelas</i> SCHREBER	+	+	?
"	EsW,	" <i>adustus</i> SUNDEVALL	+	+	?
Ea.	E(a).	<i>Otocyon megalotis virgatus</i> (MILLER)	.	+	.
A.	E.	<i>Crocotta panganensis</i> LÖNNBERG	.	+	.
"	"	(<i>Crocotta</i> sp.)	.	.	(+)
Ea.	"	<i>Hyæna schillingsi</i> MATSCHIE	.	+	.
A.	E(a).	<i>Mungos sanguineus. ibex</i> WROUGHTON	+	.	.
"	Ea.	<i>Felis ocreata</i> subsp.	+	.	.
"	E.	(<i>Felis leo sabakiensis</i> LÖNNBERG)	+	+	+
"	A.	" <i>pardus</i> LIN.	+	.	+
"	E(a).	" <i>capensis hindei</i> WROUGHTON	+	.	.
"	Ea.	" <i>caracal nubica</i> (FITZINGER) MATSCHIE	.	+	.
Ea.	"	<i>Cynelurus jubatus guttatus</i> (HERMANN)	+	+	+
Eno.	S.	<i>Xerus rutilus dabagala</i> (HEUGLIN)	.	.	+
EAWc.	E(ni).	<i>Otomys angoniensis elassodon</i> OSGOOD	+	.	+
"	E.	<i>Thamnomys oblitus</i> OSGOOD	.	.	+
E.	"	<i>Zelotomys hildegardeæ</i> THOMAS	+	.	.
A.	E(s).	<i>Saccostomus mearnsi</i> HELLER	.	.	+
"	"	<i>Acomys ablutus</i> DOLLMAN	.	.	+
"	E.	<i>Dasymys savannus</i> HELLER	.	.	+
"	E(no).	<i>Arvicanthis abyssinicus nairobiæ</i> (ALLEN)	+	.	.
"	S.	" <i>somalicus reptans</i> (DOLLMAN)	.	.	+
Eno.	E(no).	<i>Tachyoryctes splendens ibeanus</i> THOMAS	+	.	.
Es.	E(s).	<i>Pedetes surdaster</i> THOMAS	.	+	.
A.	E.	<i>Hystrix galeata</i> THOMAS	+	.	+
Ea.	"	<i>Lepus victoriæ</i> THOMAS	+	+	.
"	"	" <i>crawshayi</i> DE WINTON	+	+	.
"	S.	" <i>somalensis</i> HEUGLIN	.	.	+
"	Ea.	<i>Rhinoceros (Diceros) bicornis</i> LIN.	+	+	+
"	E(s).	<i>Equus burchelli böhmi</i> MATSCHIE (v. <i>granti</i>)	+	+	+
"	S.	" <i>grevyi</i> OUSTALET (<i>faurei</i> MATSCHIE?)	.	.	+
A.	—	<i>Phacocheærus africanus</i> subsp.?	+	+	.
"	S.	<i>Giraffa camelopardalis reticulata</i> DE WINTON	.	.	+
Ea.	E.	<i>Bubalis cokei</i> GÜNTHER	+	+	.
Es.	"	<i>Connochætes albojubatus</i> THOMAS	.	+	.
A.	E(no).	<i>Cephalophus abyssinicus hindei</i> WROUGHTON	+	.	.
Es.	E.	<i>Rhaphicerus neumanni</i> MATSCHIE	+	.	.
—	—	(<i>Kobus ellipsiprymnus</i> subsp.)	(+)	.	.

Distribution of genus or subgenus	Distribution of species and closely allied forms	Steppe-mammals	Plains S. of Tana river		Acacia steppe S. of Guaso Nyiri
			grass- or bush steppe	open steppe	
A.	E (S).	<i>Kobus ellipsiprymnus canescens</i> LÖNNBERG	.	.	+
"	—	(<i>Redunca</i> sp.)	(+)	.	.
Es.	E (S).	<i>Apyceros melampus (rendilis)</i> LÖNNB.)	.	(+)	+
Ea	E.	<i>Gazella thomsoni</i> GÜNTHER	.	+	.
"	"	" <i>granti</i> BROOKE	.	+	.
"	S(e).	" <i>lacuum</i> NEUMANN	.	.	+
Se.	Se.	<i>Lithocranius walleri</i> (BROOKE)	.	.	+
Ea.	S.	<i>Oryx beisa annectens</i> HOLLISTER	.	.	+
"	E.	<i>Taurotragus oryx pattersonianus</i> LYDECKER	.	.	+
A.	E(s).	<i>Buffelus caffer radcliffei</i> THOMAS	.	.	+
"	—	<i>Orycteropus</i> subsp.	+	+	.

On the northern side of Guaso Nyiri the landscape is quite different from that of the southern side. The river forms to a great extent a geological boundary line between the southern formerly volcanic district, and the northern with archaic rocks and gravel. It is true that in some few places the black lava extends across the present river-bed so that the river has had to cut itself a canyon through these black rocks, as is the case at and below Chanler Falls. At such places there are certain areas strewn with the sharp-edged, slag-like stones also on the northern side of the river. On the whole, however, the ground there consists of very hard-packed gravel, so hard indeed that not even the foot of an Elephant or a Rhinoceros makes any visible impression. This gravel is mostly somewhat rust-coloured but in some places quartz stones are numerous. In some localities the soil is more sandy, especially near the river. The ground is then, by the tramping and treading of many generations of game animals, covered with a layer of dust in which the spoor are plainly printed. The same is also the case in the numerous game paths which lead down to the river. The type of vegetation is 'thornbush' and it consists of a great number of mostly thorny, spiny, and prickly bushes of many different kinds. A common kind is a funnel-shaped acacia 3—4 m. in height, or more, with a narrow base but a broad, flat top. Other acacia-bushes have long slender branches and twigs with small but sharp hooks. Some bushes have thick branches with yellowish bark, others have dark brown bark, but the prevailing colour in the leafless thornbush is grey. Many different families and genera of bushes are represented in this landscape, but during the dry season when all branches are bare and naked it is difficult to form any opinion about them. Some acacias showed their yellow cylindrical flower brushes, slightly reminding about willows. A small pale greyish bush displayed pink flowers with crimson inside, shaped as those of a *Convolvulus*. Once I saw large yellow flowers in the top of a big bush and a few times large crimson flowers.

Some slender bushes have dry yellow berries with hard seeds. These berries have a sweetish taste somewhat like raisins, but I did not observe if they were eaten.

A plumlike fruit of the size and shape of an olive with a flat wrinkled stone and with aromatic taste, although very adstringent before it is ripe, is much liked by the Baboons. This bush has long thorns and the new, still very small leaves were seen a few times and found to be pinnate. Another very common bush has a kind of peculiar »berries» of the size of large pease. These sit on the upper side of the branches and contain a hard seed in the centre, but between that and the exterior brownish cover is a milky looking, very resinous and sticky but aromatic juice. These »berries» were eaten in quantities by the Gerenuks. Evergreen bushes are not numerous but seen here and there, usually along the dry river beds which are not far between. The Grant Gazelles used to feed on the leaves of these evergreen bushes. Large Euphorbias rise above the thornbush but they are few in number. Flat-topped acacias are fairly numerous in some localities, but they are always more widely scattered than on the acacia steppe. Some of these acacias began to get leaves towards the middle of March, but the shade thrown by them was not very effective, and that of the Euphorbias decidedly better, although the latter always are without leaves. A coarse grass growing in tufts is to be found here and there and sometimes it almost covers the ground on some open places in the thornbush, offering pasture lands for Buffaloes, Grévy's Zebras etc. Although this grass looks very dry and coarse it must be nourishing, because as well the wild grazing animals as the cattle, sheep and goats of the nomadic tribes were in fairly good condition.

Low bushes with wooden stems and branches but more herbaceous tops are common, and the Rhinoceros feeds chiefly on such. At Thera I saw once some kind of such bushes with white flowers.

Along Guaso Nyiri grows a fringe of doumpalms, and among them also high poplar-like trees of 2—3 different species, and sometimes also big acacias. Among these trees the Tumbili-monkeys (*Cercopithecus pygerythrus*), live but they are very good runners on the ground and are often met with in the thornbush far from any trees and then know how to save themselves by slipping in among the thick bush. The doumpalms are also commonly found along all more important dry river beds. The Elephants eat the palmnuts but are not able to crush them. I often saw that nuts lying on the ground had been gnawed on the exterior somewhat sweetish layer by small rodents (*Acomys?*). It is possible that the Baboons also gnaw on these nuts because my gunbearer Kongoni, who knew a great deal about animals pointed to these nuts once and said »chakula nyani» (»food of Baboons»).

Here and there rocks of granite rise above the level ground, sometimes forming real little mountains. Among such rocks the Hyraxes find their home, and they are often seen basking in the sunshine outside the crevices and cracks into which they flee when any danger threatens. If the rocks are high and steep the Baboons have their stronghold on them.

With the exception of the river Guaso Nyiri, water is very scarce in this country. The numerous river-beds which are directed as affluents to Guaso Nyiri were all of them dry, at least in Febr. and March, when we were there, and probably many of them, if not all, are permanently dry. A few waterholes exist in the bottom of

otherwise dry riverbeds as at Njoro and Thera. As mentioned above the water at the former place is salt. It appeared to me to be of interest even from a biological point of view to know the chemical composition of this salt water of which so many animals drink. Therefore I brought along with me a carefully corked bottle containing a sample of this salt water from Njoro, and when I had come home my friend Count K. A. H. MÖRNER, Professor of Chemistry, kindly undertook the work of analysing this water, and he has prepared the following report for which I wish to express my gratitude.

Analysis of water from Njoro in the Rendile country, British East Africa.

By

K. A. H. MÖRNER.

When Professor EINAR LÖNNBERG returned from his zoological expedition to British East Africa in May this year (1911) he brought with him a sample of water which he had taken from a place called Njoro in the dry thornbush-country north of Guaso Nyiri which is inhabited by the nomadic Rendile tribes. Professor LÖNNBERG informs me that the water originates from one of a series of holes dug by the Rendiles in a dry river-bed. Almost all of these holes contained water but that water was not of the same quality in all, it was more salt in some than in others. It was used by the Rendiles as well for themselves as for their animals. Almost every day many hundreds of sheep and goats were driven down to the river and quenched their thirst with that water which was scooped up and offered to them in dug out logs. About every third day several hundreds of camels were in a similar way watered there. In consequence of the manner in which the watering took place it lasted several hours during which the animals stood densely crowded in the river-bed. The water-holes were also visited during night time by wild animals even elephants and rhinoceroses. Some of the wild beasts preferred, however, a small natural pool at the base of a rock further down the river bed.

Considering the great number of animals which visit these water-holes and the long time some of them remain in the river-bed Professor LÖNNBERG suspected that the water might be polluted by the droppings and the urine of the animals which might be expected to penetrate the loose layers of sand and reach the aquiferous layers. The analysis does not, however, bear out that this suspicion is founded. As will be set forth below there are no nitrates no nitrites of any kind nor ammonia to be found. It appears also, to judge from the analysis, as if the water originated from a natural mineral spring and was not fully stagnant.

The present author received the sample of water the 31st of May 1911, and set to work at once. The quantity of water¹ was only 750 cm³ and the investigation

¹ As everything must be carried from Njoro by native porters and the other collections were large as well as heavy it was connected with difficulty to take more.

could therefore not be carried out in such a manner as is usual at a complete analysis of water.

The water showed a grey-coloured deposited sediment. A microscopical examination of this deposit did not reveal anything worth mentioning. The dried deposit contained organic substance which was burnt; the quantity of organic substance was 8,1 mgm. corresponding to 1,1 pr. 100,000 parts of water. The inorganic part of the sediment weighed 37 mgm. corresponding to 4,9 pr. 100,000 parts of water; it contained iron, lime, and magnesia, together with a small quantity of insoluble remains; arsenic was not found in it.

The water had a rather strong smell of sulphuretted hydrogen,¹ and the fumes blackened a lead acetate-paper. The specific weight of the water was 1,0318. Its reaction on litmus was neutral.

The qualitative analysis proved the presence of calcium, magnesium, sodium, and potassium; further sulphuric acid, chlor, and carbonic acid; trying for boric acid with turmeric paper gave a feeble reaction at a direct investigation of the water, and after concentration of a sample of water boric acid could undoubtedly be stated to be present in such a degree as to be worth mentioning. Nitrates and nitrites were completely absent; even ammonia was absent or only present as a questionable trace. The investigation proved further the absence of lithium, of phosphoric acid and — as far as the investigation could be carried out with such a small quantity of water — of metals with the exception of a trace of iron.

The quantitative determination gave the following results estimated for 100,000 parts of water:

The quantity of anhydrous salts after evaporation with carbonate of soda was 344,7.

The quantity of bases transformed to sulphates and after removing the silicic acid as fluorsilicium amounted to 411,0.

Chlor, as Cl, was	= 1,56
Sulphuric acid, as SO ₃ was	= 22,61
Lime, as CaO, was	= 31,75
Magnesia, as MgO, was	= 27,9

The chlorides of alkalines amounted to 203,9 of which chloride of potassium was = 6,3.

All these values for the bases calculated as sulphates give the following figures:

Ca SO ₄	77,17
Mg SO ₄	83,77
K ₂ SO ₄	7,87
Na ₂ SO ₄	238,80
Total	407,11

¹ This smell was not apparent at the time of the bottling. E. L.

Compared with the quantity of sulphates directly determined (411,0) this sum shows a difference of 3,9 or 0,9 %.

The summing up of the results of the analysis in the usual manner gives the following result for 100,000 parts of water:

KCl	6,3
NaCl	197,6
CaSO ₄	38,4
CaCl ₂	31,5
MgCl ₂	17,4
MgCO ₃	43,3
Organic substance, Silicic acid, boric acid etc.	10,2
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Total	344,7

According to the experience of Prof. LÖNNBERG and his companions the use of this water for drinking purposes produced diarrhea which, however, subsided after a few days. In spite of the quantity of salt it contained, this water quenched the thirst perfectly, and when once accustomed to it the members of the expedition liked it very well so that when they again, after some time, had the opportunity of drinking the quite fresh water of the river Guaso Nyiri the latter seemed flat and tasteless.

The scarcity of water in the thornbush country and its general aridity makes it to some extent the equivalent to a desert. When one sees the grey leafless thornbush during the dry season and the apparently barren ground scorched by the merciless rays of the glaring equatorial sun it looks rather unpromising to a biologist. It hardly appears as if such a country could offer the necessities of life to any animals. As soon as one turns away from the river there is hardly anything green to be seen, if not perhaps a fringe of doumpalms at a distance which appears to denote a watercourse. But if one hastens there in the hope of finding water one is sadly deceived, the river bed contains nothing but hot and dry sand. In spite of all these apparently unfavourable conditions, which cannot fail to make an, at first, almost saddening impression on the visitor, the thornbush country is not at all so bad as it looks. The naturalist will on the contrary very soon find that it is quite an interesting country. The bird life is rather rich and the number of species is, as can be seen in the report on the birds collected by this expedition, greater than could be expected. The numerous spoor seen in the game paths prove that many big mammals live here as well. Most apparent are the big three-toed tracks of the Rhinoceros, the marks of the broad horse-like hoofs of Grévy's zebra etc. But soon more than spoor are seen. The long necks of the Somali Giraffes tower high above the thornbush and are thus observed even if rather far away. The coarse bark of

the old Baboons and the yell of the young when they are chastised are heard from the thickets and, if some steep rocks are near, the whole troop is soon seen climbing up to a safe distance. The slender necks of the Gerenuks appear as reddish looking streaks against the grey bush when the animals stand gazing at the intruder. Long-eared Somali Hares and pretty little Dikdiks in pairs or threes start now and then out from below the bushes and run away. On more or less open places Grévy's Zebras in small herds, but sometimes single and often in company with splendid Oryxes, have their pasture. Grant Gazelles in small flocks are usually found not very far from the river, and the Waterbucks as a rule live in still closer proximity to it. The usual haunts of the Impalas are among bushes around small ravines not far from water. The herds of Buffaloes select such districts where open places with grass are surrounded by dense thornbush and they have their well beaten tracks from there to the water. The big animals appear to be in need of water every day (or night).¹ In consequence of this they cannot live too far from water, but some species like the Rhinoceros have their feeding grounds at a distance of two or three hours march and perhaps even more from the water and they must thus travel such a distance every night. Buffaloes and Oryxes are also sometimes found more than one or two hours from water. The long legs of the Elephants and Giraffes enable them to cover great distances without difficulty and they can thus feed far from their drinking places. Warthog spoors were seen every day at the waterpools at Njoro and the few specimens observed were seen, partly not far from there, partly not far from Guaso Nyiri. Some of the smaller animals are probably more independent of the pools and the river whether they slake their thirst with the dew, or with the juices contained in the vegetative matter they feed on. I am uncertain whether the Gerenuks ever drink, but it seems quite impossible to think that all Dikdiks, which appear so stationary and which sometimes are found to become more and more common, the further one proceeds from the river, should crowd down to the water to drink and then disperse to their haunts again every night. It would be far too dangerous for their existence to travel so much. The rodents of this country probably do not drink, and the same is no doubt the case with the Hyraxes. The Baboons and the Tumbili monkeys are seldom seen far from the water and the former come down very regularly to drink. The spoors of the carnivores, Lion, Leopard, Striped Hyena and the Black-backed Jackal as well as the animals themselves were mostly seen near the water. The Genet (*Genetta dongolana*) and the Mongoose (*Mungos sanguineus rendilis*) were trapped near the river, but *Helogale* which often lives among the colonies of Ground Squirrels was almost always shot at a comparatively considerable distance from it.

The small mammals are comparatively less numerous than the big and medium sized. There is no tree squirrel in the thornbush, and the only climbing mammal except the monkeys mentioned above is the small *Galago gallarum*. Two species of bats were observed, the yellow-winged *Lavia*, and the small *Nycteris hispida*. Of in-

¹ I am uncertain, however, whether the Elephants as mentioned below need to drink oftener than every second night.

sectivores a Hedgehog appeared to be common to judge from the numerous skins scattered in the thornbush, and an Elephant Shrew was now and then seen tripping through the bushes. Three species of *Acomys* were comparatively numerous but otherwise no small rodents were observed except the peculiar Naked Rat (*Heterocephalus*) which had its burrows in places where the soil consisted of sand. In the hard packed gravel it probably would not be able to work its way.

Although Guaso Nyiri is pretty well stocked with fish I did not see any signs of Otters along its banks. The only water mammal there was the *Hippopotamus*.

In the following list the names of the mammals observed in the thornbush country north of Guaso Nyiri are enumerated. It may be seen from the same that strange enough there are two Baboons, two Hyraxes and two Dikdiks and of these one subspecies lives above and the other below Chanler Falls. This appears to indicate two small zoogeographical areas meeting there.

Distribution of the genus or subgenus	Distribution of the species and closely allied forms	Thornbush mammals	Above Chanler Falls	Njoro and below Chanler Falls
A.	E.	<i>Cercopithecus pygerythrus luteus</i> ELLIOT	.	+
»	E(no).	<i>Papio anubis furax</i> ELLIOT	+	.
»	Eno.	» » <i>doguera</i> PUCH. & SCHIMP.	.	+
»	S.	<i>Galago gallarum</i> THOMAS	.	+
At.	»	<i>Lavia frons affinis</i> ANDERSEN & WROUGHTON	.	+
A.	A.	<i>Nycteris hispida</i> (SCHREBER)	.	+
Ea.	E(no).	<i>Erinaceus hindei</i> THOMAS	+	+
»	S(E).	<i>Elephantulus pulcher rendilis</i> LÖNNBERG	+	+
A.	Ea.	<i>Canis mesomelas</i> SCHREBER	+	+
Ea.	S(e).	<i>Hyaena schillingsi rendilis</i> LÖNNBERG	+	+
A.	Sno.	<i>Genetta dongolana</i> HEMPR. & EHRENBG	.	+
»	S(Ea).	<i>Mungos sanguineus rendilis</i> LÖNNBERG	.	+
»	S.	<i>Helogale hirtula ahlseili</i> LÖNNBERG	.	+
»	»	<i>Felis leo somaliensis</i> NOACK	+	+
»	A.	» <i>pardus</i> LIN.	+	+
Eno.	S.	<i>Xerus rutilus dabagala</i> (HEUGLIN)	+	+
A.	»	<i>Acomys percivali</i> DOLLMAN	.	+
»	»	» <i>kempi</i> »	+	+
»	»	» <i>pulchellus</i> »	.	+
S.	»	<i>Heterocephalus glaber progrediens</i> LÖNNBERG	+	+
A.	S(E).	<i>Hystrix galeata somalensis</i> LÖNNBERG	+	+
Ea.	S.	<i>Lepus somalensis</i> HEUGLIN	+	+
A	»	<i>Procavia brucei borana</i> LÖNNBERG	+	.
»	»	» <i>rudolfi pumila</i> THOMAS	.	+
»	»	<i>Elephas africanus cavendishi</i> (LYDEKKER)	.	+
Ea.	Ea.	<i>Rhinoceros (Diceros) bicornis</i> LIN.	+	+
»	E(s)	<i>Equus burchelli bohmi</i> MATSCHIE (v. <i>granti</i> D. W.)	(+)	.
»	S.	» <i>grevyi</i> OUSTALET (<i>faurei</i> MATSCHIE?)	+	+
A.	»	<i>Phacocheilus delamerei</i> LÖNNBERG	+	+

Distribution of the genus or subgenus	Distribution of the species and closely allied forms	Thornbush mammals	Above Chanler Falls	Njoro and below Chanler Falls
A.	A.	<i>Hippopotamus amphibius</i> LIN.	.	+
"	S.	<i>Giraffa camelopardalis reticulata</i> DE WINTON	+	+
Ea.	"	<i>Rhynchotragus cavendishi minor</i> LÖNNBERG	.	+
"	"	" <i>guentheri wroughtoni</i> DRAKE-BROCKMAN	+	.
A.	(E(S).	<i>Kokus ellipsiprymnus canescens</i> LÖNNBERG	+	+
Es.	"	<i>Æpyceros melampus rendilis</i> LÖNNBERG	+	+
Ea.	S(E).	<i>Gazella granti lacuum</i> NEUMANN	+	+
S.	Se.	<i>Lithocranius walleri</i> BROOKE	+	+
Ea.	S.	<i>Oryx beisa annectens</i> HOLLISTER	+	+
"	E.	<i>Taurotragus oryx pattersonianus</i> LYDEKKER	+	+
A.	E(s).	<i>Buffelus caffer radcliffei</i> THOMAS	+	+

The forests of British East Africa in which I had the opportunity of studying the fauna some little time are those near Nairobi and Escarpment station, the primeval forest on the eastern slopes of Kenia, and the woods near Meru boma. These exhibit several different types, although these intergrade with each other. The forests near Nairobi are more or less xerophilous with comparatively small leaves and a thin foliage which admits the light to penetrate. The result of this is that a very thick undergrowth of bushes and lianæ is produced, and in the darkness of this several animals find suitable covert. Among these are the Bushbuck, the »Suni» (*Nesotragus moschatus*) and the Red Forest Duiker. not to mention the Bushpigs. The small greenish looking Scrub Squirrel (*Paraxerus jacksoni*) skulks also among this undergrowth. The only monkey in the Nairobi forests is the »Kima» (*Cereopithecus kolbi*).

The forest at Escarpment is different. It contains (or contained) in some places numerous cedars, Podocarpus etc. In other places different kinds of trees, some with large leaves grow at such a distance from each other that a very dense undergrowth of bushes and very tall (2—3 m.) plants can develop and cover the ground. The Kima-monkey was common there, but a White-tailed Guereza (*Colobus abyssinicus kikuyuensis*) inhabits also the forest chiefly on the top of the mountain plateau. A new *Galago* of the *Otolemur* group was also secured at this place, and its screams could be heard almost every night from the crowns of the trees. Still more noisy and very numerous are the Tree Hyraxes (*Procarica crawshayi*). Of small rodents *Lophuromus aquilus*, *Arvicanthis pumilio diminutus* and *Dendromys insignis* were trapped in bush, and the Scrub Squirrel (*Paraxerus jacksoni*) was found to be common. I did not see any larger Squirrel in this forest but Mr. WOOSNAM showed me once two skins which were from the Escarpment and looked like melanistic specimens of *Heliosciurus kenice* without any white on the foreneck. A *Cephalophus* was seen a couple of times in bush at the edge of the forest; but as I did not have any opportunity of shooting it, I could not ascertain to which species it belonged. Bushbucks were common, and a Kikuyu told me that they used to feed on some plants of the family

Labiatae which grew in quantities in open places in the forest. The bush at the edge of the forest was also a refuge for the Baboons which ravaged among the crops of the natives.

The primeval forest on the slopes of Kenia exhibits many different types of vegetation. In the lower forest region the foliage of the big trees form a dense roof which does not admit the light, and there is consequently no undergrowth except in certain places where an opening has been made by the fall of some of the old giants. There a number of young saplings struggle towards the light. Otherwise this forest with its sombre twilight gives the impression of a mighty cathedral with numerous columns. Along the ravines, at the bottom of which a rivulet seeks its way down the mountain, the vegetation is more compact, so to say, entangled with lianae interwoven in the bushes and among the trees. In such localities grow tree-like ferns, *Musa*, and other luxuriant members of the tropical forest vegetation. At a greater altitude the trees often stand further apart and a dense undergrowth of bushes, sprouts of *Abutilon*-like appearance, tall ($2-3\frac{1}{2}$ m. or more) herbs etc. is formed. In other places again, probably on more dry ground, the plants are low not reaching much above the knee of a walking man. *Labiatae* are especially common but even grass grows here. In a peculiar formation of forest the trees have not straight trunks as usual, but look more like gigantic overgrown bushes with the stems irregularly crooked and branched. In the upper forest region¹ clumps of bamboo mix with the trees and become finally dominant. The lower forestregion does not appear to be rich in mammals. The Tree Hyraxes are of course numerous here as well as at higher altitude. *Cricetomys* and *Genetta stuhlmanni* were trapped here. Leopards were said to be common in the lower forest region. They had snatched away three dogs in a few weeks from an Englishman who was collecting rubber there, but we did not see any signs of them. The Kima monkey and the Elephant are found from the lower forest to the bamboos. The Guerezas, which were seen when we passed through the forest, were observed at an altitude of about 2,500 m. or a little more. The trees were here often festooned with *Usnea* lichens. The little Suni Antelope (*Nesotragus*) extends to a height of 2,700 m. The Bushbuck and Bushpig appear to be common there as well, and the regular home of the Bongo and the Black Forest Hog is in the region where forest and bamboo mix, to judge from the numerous spoors and droppings seen there. The Wandorobbos² have most of their pitfalls dug in the upper forest region. They are of varying size according to the size of the animal for which they are intended, from Elephant to Bushbuck. They are rectangular in shape and very deep but narrow. The scheme appears to be that the animal shall fall down entirely or with the forequarters and be squeezed in between the walls so that it cannot get up again, especially as it does not reach the bottom of the pit with its feet.

¹ On open places at an altitude of 2,500—2,700 a number of plants grow which belong to wellknown European genera as *Alchemilla*, *Pinguicula*, *Trifolium*, *Thalictrum*, *Rubus*, *Carex*, *Lycopodium* etc.

² The dwellings of the Wandorobbos were seen here as well. In some places they inhabited big hollow trees to the interior of which they had made an entrance hole by burning. A bed of dry leaves and firewood was found inside. In one place they lived under a big fallen tree and had put some branches in front for protection. Remains after their quite small camp fires were very common.

Small mammals as well are perhaps more common in the upper forest region than in the lower. In the latter *Heliosciurus keniaë* was shot and *Epimys jacksoni* trapped; at higher altitudes, *Otomys irroratus elgonis*, *Epimys denniaë*, *Leggada triton* and *Lophuromys* but the two latter occur also outside the forests in the cultivated region. The Shrews (*Crocidura fumosa* and *turba*) were found as well in the forest as outside the same.

On our return march through the forest we found numerous tracks of Buffaloes at an altitude of about 2,400 m. in a tract with many open places between the trees, clumps of bamboo and thickets of bushes. The ground was there mostly covered with plants belonging to *Labiataë*, and *Cyperus*. It made a strange impression to find Buffaloes and Elephants here in the evergreen forest when we recently had met with them in the dry grey thornbush. Evidently the forest must suit at least the Elephants better, but the occurrence of both in localities so widely different with regard to the natural conditions prove the great faculty of adaptation in these animals. In the thornbush country, where hardly any shade was to be found, the usual temperature during our stay there in Febr. and March was + 33° to + 38° C. under the doumpalms and of course very much more out in the open thornbush where there was no protection against the scorching sun. In the upper forest region + 8° C. was observed one morning in March so late as 8 o'clock, and the same temperature at sundown another day. At an altitude of 2,700 m. it was only + 1° C. at sunrise, but fresh tracks of Elephants were seen near our camp. Bushbuck, Bongo, Bushpig, Black Forest Hog, Kima monkeys and many other »tropical» animals do well in such a temperature.

The woods near Meru boma, although not so extensive, resemble those on Kenia. There is represented as well the forest with very tall trees with or without an undergrowth of bushes and plants, as the peculiar type of forest in which the trees resemble gigantic overgrown bushes. The latter forest is situated an hour to the north of Meru boma. Typical mammals of the forest at Meru are the Kima (*Cercopithecus kolbi*), the Forest Squirrel (*Heliosciurus keniaë*) the Meru Scrub Squirrel (*Paraxerus jacksoni kahari*) Bushpigs, Bushbucks, Suni Antelopes and Red Forest Duiker. The dark Mongoose (*Mungos sanguineus orestes*) was also found there.

The following list gives the names of the mammals observed or collected during my short visit in the forests mentioned above.

Distribution of the genus or subgenus	Distribution of species and closely allied forms.	Forests-mammals	Nairobi xerophile forests	Escarpment	Kenia	Meru
At.	E.	<i>Colobus abyssinicus kikuyuensis</i> LÖNNBERG	.	+	(+)	.
»	»	<i>Cercopithecus kolbi</i> NEUMANN	+	+	+	+
A	At.	<i>Papio anubis</i> subsp.	(+)	(+)	.	.
E.	E.	<i>Galago (Otolemur) kikuyuensis</i> LÖNNBERG	.	+	.	.
A	E Wc	<i>Crocidura fumosa</i> THOMAS	.	.	+	.
»	Eni.	» <i>turba</i> DOLLMAN	.	.	+	.
»	E Wc	<i>Genetta stuhlmanni</i> MATSCHIE	.	.	+	.

Distribution of genus or subgenus	Distribution of species and closely allied forms.	Forests-mammals	Nairobi xerophile forests	Escarpment	Kenia	Meru
A	E (Wc)	<i>Mungos sanguineus orestes</i> HELLER	.	.	.	+
"	A	<i>Felis pardus</i> LIN.	.	.	+	.
At.	E	<i>Heliosciurus kenia</i> NEUMANN	.	(+)	+	+
A	"	<i>Paraxerus jacksoni</i> DE WINTON (<i>capitis</i> THOS.) . . .	+	+	.	.
"	"	" " <i>kahari</i> (HELLER)	.	.	.	+
Ea Wc	E Wc	<i>Otomys irroratus elgonis</i> WROUGHTON	.	.	+	.
A	"	<i>Dendromys insignis</i> THOMAS	.	+	.	.
"	"	<i>Epimys jacksoni</i> DE WINTON	.	.	+	.
"	"	" <i>denniae</i> THOMAS	.	.	+	.
"	"	<i>Leggada triton</i> THOMAS	.	.	+	.
At.	E. (At)	<i>Cricetomys gambianus kenyensis</i> OSGOOD	.	.	+	.
"	E Wc	<i>Lophuromys aquilus zena</i> (DOLLMAN)	.	+	+	.
A	E Wc (At)	<i>Arvicanthis pulchellus massaicus</i> (PAGENST.)	.	.	+	.
"	Es	" <i>pumilio diminutus</i> THOMAS	.	+	.	.
Eno	E.	<i>Lophiomys ibeanus</i> THOMAS	.	Mau	.	.
A	"	<i>Procavia (Dendrohyrax) crawshayi</i> THOMAS	.	+	(+)	.
"	E (a)	(<i>Elephas africanus peeli</i> LYDEKKER)	.	.	(+)	.
"	"	<i>Potamochoerus chaeropotamus kenia</i> LÖNNBERG	+	.	(+)	(+)
W E	E (W)	<i>Hylochoerus meinertzhageni</i> THOMAS	.	.	+	.
A	E.	<i>Cephalophus harveyi kenia</i> LÖNNBERG	+	.	+	+
"	—	<i>Cephalophus</i> sp.	.	(+)	.	.
Es	E (s)	<i>Nesotragus moschatus</i> v. DÜBEN	+	.	+	+
A	E	<i>Tragelaphus haywoodi</i> THOMAS	+	+	+	.
W (At)	E (W)	<i>Boocercus eurycerus isaaci</i> THOMAS	.	(+)	+	.
A	E (s)	<i>Buffelus caffer radcliffei</i> THOMAS	.	.	(+)	.

A short discussion of the geographical distribution of these animals collected or observed by this expedition in British East Africa may not be out of the way. Before this is begun, however, a few words ought to be said about some of the principal zoogeographical systems applied to the African continent. The perhaps best known is that of WALLACE¹ from the year 1876. He proposed »three great continental subregions» cutting off from the Ethiopian region the land to the north of Sahara,² which was laid to the Palearctic region. These three subregions were: 1:o the East African, which principally included »the open pasture lands of interior tropical Africa»³ — — — — — »with a hot and dry climate and characterised by a grassy vegetation interspersed with patches of forest»; 2:o the West African »being almost wholly dense forests where not cleared by man, and having the hot moist

¹ Geographical Distribution of Animals. Vol. I p. 251.

² This proceeding is of course artificial and arbitrary. As far as the mammals are concerned at least, North Africa is (or has been) a border-land which has received contingencies as well from the Palearctic as from Ethiopian regions and its fauna is mixed containing still elements from both, but probably the Ethiopian elements formerly have been more numerous than they are in the present time.

³ Or »all the open country of tropical Africa south of Sahara» — — (l. c. p. 258).

uniform climate, and perennial luxuriance of vegetation» — — —; 3:o the South African to which belonged the »extra-tropical» southern portion of the continent. The boundary-lines need not to be quoted, they have of course had to be altered, because at the time when WALLACE wrote this the knowledge of the interior of Africa was, as he points out himself, imperfect.

The chief interest with this division is that WALLACE on the base of as well physical as biological conditions forms the East- and West African subregions, the »extra-tropical» has subsequently proved less important. HEILPRIN divided¹ also »the Ethiopian Realm» in three subregions which he named the »East-Central African», the »West African» and the »Saharan». The first of these included also South Africa, and the last, the northern desert country, the fauna of which »with almost insensible gradations, merges into the fauna of the Mediterranean transition tract».

LYDEKKER prefers HEILPRIN's subdivision but adds that Somaliland probably ought to be regarded as a separate subregion.

In a book entitled »The Geography of Mammals» W. L. and P. L. SCLATER in the year 1899 used a zoogeographical subdivision of the Ethiopian continent which is intermediate between WALLACE's and HEILPRIN's systems. They have 1:o »the West African subregion, including the great equatorial forest of Central Africa contained in the basins of the western rivers, from the Senegal to the Congo inclusive»; 2:o »the Cape subregion including all Africa south of the watershed of the Congo on the West and of the Tana on the East coast»; 3:o »the Saharan subregion, consisting (if we exclude the Abyssinian plateau) chiefly of desert, or at any rate of a comparatively dry country, including the Sahara, Eastern Africa as far south as the Tana river, and Southern Arabia.»

In this division as well due regard is taken to the physical and biological conditions of the three subregions. The characteristic features of the landscape of these subregions are just those three original types of African landscape which have been mentioned above viz. forest, steppe, and thornbush resp. desert.

It appears also evident that certain faunistic elements are more or less strictly bound to one or the other of these types of landscape. But not all mammals by far are so dependent on the environment. Many strong or adaptive mammals may occur in two, and some even in all three of these kinds of landscape. Steppe and thornbush are, however, more alike than either with the forest, and the faunas of the two former have therefore a greater number of elements in common than either of them have with the forest.

The three geographical subregions as defined by the Messrs. SCLATER are, however, not homogenous. There are forests outside the »West African subregion», there is open country outside the »Cape Subregion», and so on. These outlying portions of landscape, otherwise typical to another zoogeographical subregion, must, however, be taken in possession by some kind of animals to which they offer suitable conditions of life (whether this primarily or secondarily is the case). Now it depends

¹ The Geographical and geological Distribution of Animals. Eded. 1894.

² Die geograph. Verbreitung u. geolog. Entwicklung der Säugetiere 1897.

upon the situation of this outlying portion of landscape if it is, or has been accessible to animals from the subregion where this kind of landscape is the dominating type or not. In the former case the faunistic elements of the proper kind wander in (or have done so), in the latter it remains uninhabited until some animals from the surrounding country have been able to adapt themselves to the life in such a landscape. For instance there are tracts of forest in East Africa within SCLATER's »Cape subregion», which offer as well from a physical as a biological point of view similar conditions of life to mammals as a corresponding portion of forest in the West African genuine forest subregion. If such a forest in East Africa has been accessible to some West African forest mammals these have, of course, extended their distribution to that district, notwithstanding that it lies outside the regular and continuous area of distribution for West African forest mammals. Some of the latter have also been able to reach further and to occupy more isolated spots than other less endowed species.¹ Many examples of such a distribution have become known during these last years, and some of them will be mentioned later on.

If on the contrary a tract of forest in East Africa is and has been so completely isolated from the West African forest region that no inhabitants of the latter can or could reach the former its fauna must be recruited by members of the surrounding real East African fauna which then had to adapt themselves to live in this forest. Thus a true East African forest fauna can originate.

It is also evident that some East African forests have such a situation that their fauna is partly of West African origin, partly endemic. As will be shown further below the forests of Kenia form such a district with a mixed fauna and even Kilimanjaro has certain western elements.

The knowledge about the African fauna has made great progress during the last 10—15 years. The relation between the fauna of the West African subregion and that of the other subregions has therefore in many respects been found to be different and the boundarylines of several genera and species have been drawn up quite differently to what was known and done at the time when »the Geography of Mammals» was written. As an instance of this the following mammals may be mentioned. They were at that time believed to be exclusively West African but have later been found outside this subregion. A Potto (*Perodictus ibeanus*) has been described by THOMAS from Kakamega Forest near Elgon, British East Africa. The genus *Nandinia* reaches even Kilimanjaro, Uhehe, Nyasa etc.

On the other hand it was also stated in the work quoted that »the West African Region is further characterized by the absence of the following families, well represented in other parts of Africa: *Orycteropidae* (Aard-vark), *Giraffidae* (Giraffes)» — — — Since that time have, however, been described *Orycteropus hausanus* from Togo, *D. erikssoni* from Kongo, and *O. leptodon* from Cameroon; and further *Giraffa camelopardalis peralta* from Nigeria and *G. c. congoensis* from Katanga, Kongo. By this are of course not the differences between the West African forest subregion

¹ About another possible explanation for the occurrence of certain forest mammals in East Africa conf. below.

and the others abolished, but the facts mentioned form another of the numerous proofs that many members of the typical fauna of a subregion extend into other subregions as well, if suitable conditions of life in accessible districts are offered to them. On this depends the distribution.

Since »the Geography of Mammals» appeared also several important discoveries of new mammals characteristic of the West African forest region have been made.¹ The one which created most interest was probably the Okapi, but it is also striking that the first specimen of a new genus *Hylochoerus* which evidently is a typical forest mammal was obtained at Mau, British East Africa, outside of the West African forest region, although later on it was proved that members of this genus live in the Kongo forest, in Cameroon and so on.

Before an investigation is made whether any West African mammals have been obtained by this expedition in British East Africa the discussion about the two other subregions of SCLATER's system ought to be continued. The »Cape Subregion» as defined above includes WALLACE's South African and the southern half of his East African subregion. It was undoubtedly a step in the right direction to unite these two subregions as they have proved to be more similar with regard to their faunas than was known when WALLACE wrote his book on geographical distribution, but it is more uncertain whether the limitation towards the north of SCLATER's »Cape subregion» is successfully chosen. The name is certainly not very characteristic. It is true that »Cape» or South Africa has a certain number of endemic mammalian genera as for instance *Cynictis*, *Suricata*, *Petromys*, *Bathyergus*, *Pelea* etc. and probably is *Chrysochloris* still more typical for South Africa, although some of its species reach much further north. There are also some endemic species like *Hyæna brunnea*, *Equus zebra* a. o. but they have near relatives further north. Very little of the fauna belonging to SCLATER's »Cape Subregion» can be supposed to have its origin in South Africa, or even to be especially characteristic for that country. Not a few of the genera enumerated by SCLATER as typical for this »subregion» extend according to what we know now beyond its proposed northern boundaryline for instance *Æpyceros*, *Pachyuromys*, *Myoscalops*, *Proteles*, *Otocyon*, *Rhynchocyon* and *Myosorex*.

The »Saharan Subregion» according to SCLATER's definition appears to be artificial. Its easternmost portion, Somaliland with its borderlands form a zoogeographical centre of its own with several endemic mammals, for instance not less than three genera of antelopes, *Ammodorcas*, *Lithocranius* and *Dorcatragus* to which might be added *Strepsiceros imberbis*, further the rodents *Heterocephalus*, *Fornarina* and *Pectinator*. In Somaliland is the centre for the genus *Rhynchotragus* as well. There live also the aberrant Grévy's Zebra and the Somali Ass in addition to several other endemic species of genera with a wider distribution. But these characteristic members of the Somali fauna do not extend their distribution westwards through Sudan

¹ But at that time 1899, there were already several typical West African mammals known which are not mentioned, as f. i. *Idiurus*, *Zenkerella*, *Limacomys* etc., and in addition to these genera a very great number of species.

and Sahara where the animal life is different, and in some respects more similar to that of East Africa, at the same time as endemic forms are to be found there.

The Somali district is, however, as fully entitled to be regarded as an independent zoogeographical district as South Africa, but both show great affinities with East Africa.

It appears therefore better to accept also for the mammals the same system for the zoogeographical subdivision of the Ethiopian continent as REICHENOW has used for the birds in his great work »die Vögel Afrikas».¹ The author quoted divides Africa in a Western forest region and an Eastern Southern steppe region. This system is, of course, in the same way as its forerunners based on the biological conditions which are the results of the topographical, meteorological and climatological factors which have made the forest dominating in one, steppe (and thornbush) in another part of the continent. These two main regions are afterwards subdivided in a number of smaller zoogeographical provinces and these constitute, so to say, smaller zoogeographical centres, or in some cases transition tracts with a mixed fauna. There is evidently no sharp boundary lines between these minor provinces, some of which will be mentioned below, and not even always or in every respect between the main regions. This can the less be the case as the types of landscape and the upon the same depending biological conditions are not completely uniform. There are thus to be found broad open tracts of land within the forest region, and patches of forest scattered in the steppe region with the consequences with regard to the fauna which have been set forth above.

It must also in this connection be remembered that the occurrence of the different species of mammals in different localities of Africa in the present time is not only the result of the present possibilities for distribution to this or that locality, but it is in many cases depending upon the possibility to survive which the locality in question has been able to offer certain animals. Paleontological facts indicate that the ancestors of a great number of the present Ethiopian mammals have invaded the continent from the northeast and east during the Miocene and Pliocene. It is also wellknown that several mammals which now inhabit Western Africa have their nearest relatives in the Oriental region. For instance:

<i>Perodictius</i>	<i>Nycticebus</i>
<i>Poiana</i>	<i>Linsanga</i>
<i>Nandinia</i>	<i>Paradoxurus</i>
<i>Dorcatherium</i> etc.	<i>Tragululus</i> etc.

The ancestors of the, in present time, West African mammals which invaded the continent from the northeast must thus evidently have passed through the country which is termed East Africa nowadays, and for some time lived there. If such mammals still should be represented in East Africa, these representatives may perhaps

¹ Berlin 1900—1901.

in some instances be the remnants of such an invasion which have been able to survive in suitable localities. In other cases they may have come secondarily from the west. Considering the great desiccation which large tracts of Africa have been subjected to within the historic time or even up to the present time, — one need only to think about the gradual disappearance of Lake Ngami and the diminution of Lake Tsad — it appears quite possible, or even probable that East Africa formerly has not suffered so much from drought as it does now. But if the climate has been somewhat more moist and the annual rainfall greater, the forests certainly would have extended and covered a greater area. This would have again, in a high degree, facilitated as well the survival of forest animals as even their distribution over a wider area than now.

The minor subdivisions of the Western forest region according to REICHENOW do not need to be repeated all here. It is sufficient for our purpose to mention the most eastern of them which may be called the Central Lake district. It extends over the countries round Albert Nyanza, Albert Edward Nyanza, and Lake Kiwu, the districts round Victoria Nyanza with the exception of its southern and south-eastern shores, and finally the countries bordering the northern part of Lake Tanganyika.

Among the provinces of the Eastern Southern steppe region may be mentioned the »Northeastern» extending southward to Shoa and westward to Lake Tsad; the »Somali-Witu» district southwards to Tana river; »German East Africa» southwards to Rufiji; thence come the »Nyasa» »Zambese» and »South African» districts, etc.

To indicate the distribution of the animals collected or observed by this expedition the following letters have been used above.

- A = ranging all over the Ethiopian region.
- At = widely distributed across tropical Africa.
- E = East Africa s. str. that is German East Africa and the southern parts of British East Africa.
- Ea = all over, or at least over the greater part of the Eastern Southern steppe region.
- Eni = East Africa southwards to Nyasa land.
- Ez = East Africa southwards to Zambesi district.
- Es = East Africa to South Africa.
- Eno = East Africa and northwards beyond Somaliland.
- S = Somali district southwards to Tana.
- Se = Somalidistrict southwards to Kilimanjaro.
- Sno = Somalidistrict and northwards.
- W = West African forest region.
- Wc = Central Lake district of Western forest region.

These letters are used in two different columns to express partly the distribution of the species with subspecies or closely allied forms, and partly that of the genus or subgenus. It is clear that such an attempt to denote the geographical distribution of some animals with some letters must be only approximate partly because the distribution of the animals is irregular and partly because our knowledge in this matter still is very incomplete. I think, however, that this method in spite of its deficiency may facilitate a general survey of the matter.

In the first table (p. 7) those 33 mammals are enumerated which have been found in cultivated land. These are of comparatively little interest from a zoogeographical point of view. The greatest number of them is East African, at least as subspecies. Some few are widely distributed. But there are also some which extend into the Central Lake district of the Western forest region, viz. *Crocidura fumosa*, *Genetta stuhlmanni*, *Dendromys insignis*, *Leggada triton* and *Lophuromus aquilus*. All of these are, however, really to be regarded as more or less forest animals and they have also been obtained by this expedition in the forests as well (conf. table p. 20, 21). They have, however, remained and found suitable conditions of life even since the natives have cleared away the forest to give place for their shambas. In the Kikuyu and Meru countries the shambas as a rule are made, or have been made, on forest land, even if they in the present time sometimes are rather far from the forest. *Arvicanthis pulchellus massaicus* which mostly lives among bush is not a forest loving animal but extends westwards to Ruwenzori and perhaps beyond. The genera of these mammals have almost all a wide distribution only one (*Zelotomys*) is endemic and one (*Tachyoryctes*) chiefly northeastern.

On steppe land about 54 different mammals have been observed or collected (conf. the table p. 10, 11). The exact number cannot be stated because in some instances it could not be ascertained to which subspecies an observed animal belonged. Some of these have been observed as well on the Athi plains as on the northern acacia-steppe south of Guaso Nyiri but as the time which could be spent at both localities was very short the list of small mammals especially is not complete. It might, however, be expected that the most common and characteristic mammals are included. *Epomophorus wahlbergi* is probably not to be regarded as a steppe mammal, although it was found hanging in bushes on the acacia steppe at Luazomela but a forest of tall acacias and other trees was not far off. On the other hand probably some of the small mammals from the list of those observed in the cultivated region could have been added. The greatest number or about 32 of these species or subspecies belong to East Africa in a stricter sense, but 3 of them have near relatives in the whole or the greater part of the Eastern Southern steppe region. Four have near relatives ranging to South Africa. The Buffalo for instance is very closely related to the typical Cape Buffalo, *Saccostomus mearnsi* is related to *S. masonæ*, *Pedetes surdaster* to *P. cafer*, and the Zebra to the southern zebras of the *burchelli* group. Two others have their near relatives not further south than in the Nyasa district (*Otomys angoniensis elassodon* and *Sylvisorex sorelloides*). Three have their relatives further northeast being subspecies of Abyssinian mammals (*Tachyoryctes splendens*

ibeanus, *Arvicanthis abyssinicus nairobae* and *Cephalophus abyssinicus hindei*). Three have been marked E(S) because they themselves live on the verge of the Somali district but have their relatives in East Africa. Seven species can be counted to the Somali fauna and they are all from the Guaso Nyiri district. Four carnivores and the Rhinoceros are practically distributed over the whole Eastern Southern steppe region even if the last does not extend to the northwestern parts of that region. *Canis adustus* goes as well west as south but not further north. *Lavia* and the Baboons of the *anubis*-group range across tropical Africa.

The genera have mostly a wide range. One northeastern genus *Xerus*, and a Somali genus, *Lithocranius*, live in the Guaso Nyiri district and one genus from the Athi plains, *Zelotomys*, is endemic, while *Tachyoryctes* may be termed northeastern.

As a general result of this discussion can be said that the fauna of the Athi plains is typically East African s. str., but that some members of the Somalifauna cross to the acaciasteppe on the southern side of Guaso Nyiri.

The list of the thornbush mammals (conf. the table p. 17, 18) from the northern side of Guaso Nyiri comprises about 40 species. Among these 3 viz. *Nycteris hispida*, the Leopard and Hippopotamus are found in the whole Ethiopian region and 2 viz. the Blackbacked Jackal and the Rhinoceros in the whole Eastern Southern steppe region except the northwest. Grants Zebra with southern affinities is only a rare guest on the northern bank of Guaso Nyiri in this part of the country. The Buffalo as well probably does not extend further north. The Waterbuck and the Impala are represented by separate geographic races here near their northern boundary line and they do not reach the genuine Somaliland. The Tumbili monkey and Pattersons Eland may be regarded as East African near their northern frontier as well. *Papio anubis furax* being described from the Baringo district, and *Erinaceus hindei* from the central parts of British East Africa may be counted to the East African fauna but they have their nearest relatives further north resp. *Papio a. doguera* and *Erinaceus albiventris*. The remaining lot, or about 26 species, may be counted to the Somali fauna, even if the Elephant Shrew, the Striped Hyena and the Porcupine only are subspecies of East African species, and some like the Gerenuk extend southwards a little further than the others. Several of the mammals found here form separate subspecies of the species found in northern or central Somaliland, but on the whole the fauna can be said to be a real Somali fauna. Even if it is to some degree modified and has representatives of its own it is quite of Somali type.

The genera have mostly a wide range but *Xerus* is northeastern, and *Lithocranius* and *Heterocephalus* are characteristic of the Somali district.

The mammals (conf. table p. 20, 21) obtained or observed by this expedition in the forests at the four different localities mentioned are not very numerous as they only amount to 32. Of these the Baboon is not a real forest animal, although it takes its refuge to the forest and thus was observed there. The Leopard has a very wide range. *Arvicanthis pumilio diminutus* extends southwards to Matabele land, and *Crocidura turba* to Nyasa land. The Bongo and the Black Forest Hog evidently represent animals which typically belong to the Western forest region. Even if they

can be distinguished from their near allies living in the Congo forest and further West, they must be regarded as members of the same fauna, and it is therefore of great interest to have stated their occurrence as far as to the northeastern slopes of Kenia. Their ancestors have arrived in Africa from the northeast, but if they themselves have developed and remained in their present habitat while the other members of the same invasion were pressed further westward, or if they secondarily have arrived there again from the West cannot be decided before the geological development and age of the former volcano Kenia has become definitely known.

Not less than nine of these forest animals enumerated in this list have also been found in the Central Lake district of the Western forest region, and a tenth, *Mungos sanguineus orestes*, is said by its describer to be most nearly related to a subspecies *M. s. proteus* living on Ruwenzori. The two long-tailed forest rats, *Epi-mys jacksoni* and *E. denniae*, have decidedly western affinities as they are most closely related to the West African *E. alleni* and to *E. carillus* from northern Angola thus both members of the fauna of the Western forest region. In a similar way *Leggada triton* is allied with the Western *L. musculoides*.

The remainder of the lot is at least in their quality as subspecies East African s. str. Although this proves that the majority of these forest animals have become differentiated to subspecies, or even species in East Africa s. str., it does not follow that they all are exclusively of East African origin. Some of them have relatives in other parts of Africa as well. The genera to which these endemic forms belong have mostly a wide distribution. Some of them range all over the Ethiopian region. *Lophiomys* extends from East Africa s. str. chiefly northeastwards, and *Nesotragus* southwards but the latter is also related to the genera *Hylarnus* and *Neotragus* of West Africa. *Colobus*, *Heliosciurus*, *Cricetomys* and *Lophuromys* are represented as well to the east as to the west of the Kenia district, but do not reach to South Africa. The occurrence of their members is thus chiefly bound to the tropical forests of Africa. In any case, whether the members of these latter genera are regarded as western or not, the fauna of Kenia shows a decided affinity with the fauna of the Western forest-region.

Kenia and Kilimanjaro present certain analogies in many respects. Both of them are old extinguished volcanoes which rise from the hot plains at their feet to such a height that their tops are capped with perpetual snow, while their slopes are covered with the luxuriant growth of the tropical forest. It is thus only natural that their faunas shall offer several analogies as well. The number of identical species is not so great. They have been isolated too long for that, but in such cases when the species are not identical there are others present as substitutes and fill the place that otherwise would have been empty. The following list is meant to give a review of this even if additions might be made.

	Kenia district	Kilimanjaro
White-tailed Guereza	<i>Colobus abyssinicus kikuyuensis</i>	<i>C. a. caudatus</i>
»Kima» Monkey	<i>Cercopithecus kolbi</i>	<i>C. albogularis kibonotensis</i>
»Komba» Lemur	<i>Galago (Otolemur) kikuyuensis</i>	<i>G. (O.) panganiensis</i>
Dusky Shrew	<i>Crocidura fumosa & turba</i>	<i>C. fumosa & monax</i>
Forest Squirrel	<i>Heliosciurus kenia</i>	<i>H. undulatus</i>
Serub Squirrel	<i>Paraxerus jacksoni</i>	<i>P. ganana (aruscensis)</i>
Otomys Rat	<i>Otomys irroratus elgonis</i>	<i>O. divinorum</i>
Tree Mouse	<i>Dendromys insignis</i>	<i>D. nigrifrons</i>
Longtailed Forest Rats	<i>Epimys jacksoni & denniae</i>	<i>E. jacksoni</i>
Pigmy Mouse	<i>Leggada triton</i>	<i>L. triton murilla</i>
Striped Rat	<i>Arvicanthis pulchellus massaicus</i>	<i>A. pulchellus ardens</i>
Fourstriped Rat	<i>A. pumilio diminutus</i>	<i>A. pumilio</i>
Tree Hyrax	<i>Procavia (Dendrohyrax) crawshayi</i>	<i>P. (D.) valida</i>
Elephant	<i>Elephas africanus peeli</i>	<i>E. afr. subsp.</i>
Bushpig	<i>Potamochoerus chæropotamus kenia</i>	<i>P. ch. dæmonis</i>
Red Forest Duiker	<i>Cephalophus harveyi kenia</i>	<i>C. harveyi</i>
Suni Antelope	<i>Nesotragus moschatus</i>	<i>N. moschatus</i>

The most important difference between the faunas of Kenia and Kilimanjaro is that the Bongo and the Black Forest Hog do not extend into the latter district. Of less importance is perhaps the absence there of *Genetta stuhlmanni* which, however, belongs to the Central Lake district. *Nandinia* on the other hand is lacking on Kenia as far as is known for the present. If the little known *Cephalophus spadix* of Kilimanjaro is most nearly allied to the West African *C. niger* as TRUE has said, it is another hint about the affinity with the Western forest fauna. It does not seem impossible, however, that such an animal or a related form might be found in the thick forests on Kenia as well, although not yet known.

As a summary of the discussion above may be concluded that in the district on the Eastern and Northeastern sides of Kenia three different faunas meet and partly intermingle viz. 1° the forest fauna of the mountain itself which shows several important western affinities, 2° the fauna of the steppe country which is a typical East African fauna s. str., and 3° the fauna of the thornbush which north of Guaso Nyiri is an almost pure Somali fauna.

There are thus three different types of faunas bound each to its own type of landscape (conf. above).

In the cultivated region, which mostly has been conquered from the forest, remains of the forest fauna meet invaders from the bushsteppe, and in some degree this is also the case in the xerophilous thin forests at the edge of the steppe.

In the district between Guaso Nyiri river in the north, and Tana river in the south many members of the Somali fauna and the East-African fauna s. str. meet. The former which preeminently is bound to the thornbush extends with some of its members still further south along the strips of thornbush in some instances all the way to the northern side of Kilimanjaro.

In the following systematic part the mammals collected by this expedition are enumerated with some notes about their occurrence and on their habits as far as any observations in this respect could be made. Too much work prevented me, however, from making a more thorough study of the biology which otherwise would have been of great interest to me, but I could not sacrifice much time on such problems.

In some cases I think that most probably the mammal quoted is only of sub-specific rank, but when I have not had the opportunity of forming myself an opinion about its relation to other forms I have used only binomials, although trinomials perhaps will prove better when more material has been studied. The law of priority has been followed except in one case, which will be mentioned below, because the confusion resulting from an alteration of this old well known name would be too great.¹

With regard to the correct determination of some specimens I have had the pleasure of consulting colleagues at other museums which is gratefully acknowledged here and especially mentioned in each case below.

Primates.

Cercopithecidaë.

Colobus abyssinicus kikuyuensis n. subsp.

In the forests near Escarpment station I had the opportunity of collecting the six specimens of Guerezas to which I was entitled by my license. I had believed that the true *Colobus caudatus* should be met with at the locality mentioned, because that species has been recorded from Kenia, thus not very far from Escarpment. When I had shot the first pair, however, they appeared to me rather small and their tail-tufts were only little developed, whereas the black at the root of the tail had a broader extension than in the true *C. caudatus* from Kilimanjaro. The same observation was made on the following specimens obtained, and when I finally found that a small young was not white as that of the Kilimanjaro Guereza, it appeared evident that the Escarpment forests were the home of a separate race of Guerezas. This was also born out by a closer examination of the material at home, when the relative characteristics of the fur were supported by cranial measurements.

The new subspecies may be characterized in the following way: A Guereza closely related to *C. abyssinicus caudatus* THOMAS but smaller with the white tuft of the tail shorter and less developed, measuring to the tips of the hair 44 cm. in a rather old male, about 33 cm. in a young adult male and about 39 in the best female. The black of the upper side of the tail which terminally is more or less mixed with white extends in these three specimens resp. 27, 24, and 24 cm. from the root of the tail. The greatest length of single hairs in the tuft of the old male is about 18—19 cm. and much shorter in the other specimens. The hair of the

¹ I omit to change this name, for the present at least, because many prominent zoologists are agreed about the desirability of fixing certain old wellknown names to avoid confusion in spite of the priority law.

white mantle attain in the old male a maximum length at the shoulders of about 28—29 cm. and in the sacral region about 40 cm. In the female the same measurements are resp. about 23, and 25—26 cm.¹

Fig. 1. Young of *Colobus abyssinicus kikuyuensis*.

The most striking exterior difference between the Escarpment Guereza and that of Kilimanjaro is the difference in the development of the tail-tuft which in the latter is 15 to 30 cm. longer. This depends partly upon the fact that the tail-tuft begins where the white hair of the tail begin, and the black basal portion being longer in *C. a. kikuyuensis* causes the beginning of the tail-tuft to be removed further distally. But the Kilimanjaro Guereza has also longer hair in the tuft and at least often a longer tail (without hair), although its length is variable. Another difference lies therein that the hair of the black region of the tail in most cases is basally white in *C. a. caudatus* but in *C. a. kikuyuensis* it is as a rule entirely black or grey, although I have seen it whitish in one specimen.

The young of *C. a. kikuyuensis* (Fig. 1) is entirely different from that of *C. a. caudatus* which latter is white with a transverse triangular black patch on the head above the eyebrow stripe, and with blackish legs. A young *Colobus* from the forest at Escarpment exactly of the same size as the one from Kilimanjaro described above viz. about 23 cm. from the root of the tail to the vertex of the head in a straight line, and with the tail measuring about 24 cm. has almost the colours of the adult (conf. fig. 1). The white mane is not developed but foreshadowed by longer hair in the place where the mane shall

be developed later. These longer hair are, however, mixed black and white. In the sacral region white hair with dusky tips predominate. The back is not pure black

¹ These measurements may be compared with the corresponding ones of *C. a. caudatus* communicated by CAMERANO Ricerche int. al *Colobus occidentalis* ROCHEBR., p. 15 (Il Ruwenzori, Rel. scient.).

as in the adult because greyish white hairs are mixed with the black. The same is the case with the upper portion of the thighs. Other parts are coloured as in the adult.

	<i>Colobus abyssinicus kikyensis</i>		<i>Colobus abyssinicus caudatus</i>		
	♂ (old)	♀ ad.	♂ old	♂ ad.	♀ ad.
Condylbasal length	101 mm	95 mm.	111 mm.	110 mm.	93 »
Basicranial »	92 »	86 »	99 »	100 »	83,5 »
Occipitonasal »	91 »	89 »	101 »	102 »	88,5 »
Zygomatic breadth	79 »	80 »	89 »	92,5 »	75,5 »
Breadth of braincase	56 »	59 »	62 »	65 »	61 »
Least postorbital width	43,5 »	50 »	46 »	43,5 »	44 »
Least interorbital width below the nasal bump.	11,7 »	11,2 »	14,2 »	15 »	12 »
Breadth across middle of orbits	67,5 »	67 »	78,5 »	76,5 »	66,5 »
Length of palate mesially	53 »	48 »	58 »	57 »	52 »
Front of canine to back of m ^s	41 »	37,3 »	44 »	44 »	40 »
Length of upper molar series	32 »	31 »	34 »	33,3 »	32,6 »
Breadth of snout across last premolar	36 »	33,4 »	39,2 »	38,8 »	34,5 »
Distance from occiput to middle of superciliary ridge	78,5 »	78,3 »	88 »	88,3 »	77,3 »

The measurements above prove that the males of the Kilimanjaro Guereza have considerable larger skulls in every respect than the Escarpment Guereza. The difference between the female skulls is, however, less apparent, and some dimensions may even be larger in the Escarpment Guereza. That female animals of two geographic races are rather similar while the males are very different is a common occurrence. That the Kilimanjaro Guereza belongs to a larger race is among other things indicated by the teeth being, even in the females, larger than those of the Escarpment animals. In the former the ridge above the orbits (the eyebrow-ridge) is less prominent and situated lower down when compared with the vertex of the skull than in the latter. The profile contour of the Escarpment Guereza (Pl. I, fig. 1) is therefore much more evenly sloping than in the larger race. This difference is well visible in the females as well.

The forest inhabited by the new race of Guereza is partly not very thick, but the undergrowth consisting of tall herbs, bushes and small trees is very thick in such places where the big trees stand a little apart. In the early morning the males were heard producing the same humming or buzzing noise (something like »brmm brrrm» long continued) as has been described for other Guerezas. When in comparatively low trees this monkey hastens to escape, but in high trees it often thinks itself safe, and it can hardly be termed very shy. For a person who has a little time to spare it is easy to shoot the 6 specimens which are permitted by the shooting license, and this number is far too great to afford sufficient protection for the species, if it should become fashionable among sportsmen to secure their full allowance of Guerezas in the Escarpment forests.

If a Guereza remains motionless, hidden among the branches, foliage or lichens in a high tree it may be difficult to see just as every other object under similar circumstances, even if it is coloured differently.¹ But as soon as the Guereza moves, or if it is not directly hidden it is very easily seen. When I now have had a little personal experience in this matter it is difficult for me to believe in the protective colouration of this animal at least in such surroundings as those in which I have seen it.

When passing through the primeval forest on Kenia I saw Guerezas twice, once at a long distance when looking over the tops of the trees in a valley an early morning at sunrise, and another time at less distance, but as I was not able to secure any specimen I cannot say from my own experience whether it is more like the Kilimanjaro race than this race, or not, but OLDFIELD THOMAS has stated (Proc. Zool. Soc. London 1900, p. 174) that there is no difference between specimens from the western slopes of Kenia (8,000—10,000 feet altitude) and specimens from Kilimanjaro.

*Cercopithecus*² *kolbi* NEUM.

Росоок: Proc. Zool. Soc. 1907 p. 703.

This is the common »Kima» of the forests of Brit. East Africa. I collected a good series of both sexes in different ages as well in the forests round Nairobi (f. i. at Mc Naughtons farm, and Sandback Baker's »The Homestead») as at Escarpment station which appears to be the type locality of the species.³ It was also observed in the big forest on the slopes of Kenia even at an altitude of 2,700 m. where bamboo thickets are interspersed in the regular woods. It was common in a forest near Meru boma. One specimen of the same kind was also shot in a grove of big acacias at upper Luazomela river, but this place appears to be outside its regular haunts because the Kima is evidently a forest loving animal. It is, however, found as well in the xerophilous forest edging to the steppe as all through the primeval forest up to the bamboo. It occurred usually in small bands about half a dozen or a dozen in number but old males were often seen single. In the forenoon they were sometimes observed resting on a branch of some big tree, or even basking in the sun on a branch or on a fallen tree. As a rule, however, they occurred in the thick forest, and fled with great speed at the approach of the hunter, jumping from tree to tree. Sometimes they took refuge to a very high tree and felt safe there hiding behind the branches or among the foliage.

¹ In similar cases it is just as difficult, if not more, to see a »Kima», or a »Tumbili» (conf. below) than a »Mbega» (= Guereza).

² It has recently been proved that the proper name of this genus ought to be *Lasiopyga* if a strict priority should rule. As such a change would create great confusion I cannot for the present accept this ELLIOT's proposal especially as *Cercopithecus* should not be rejected but moved to *Midas*.

³ Conf. Proc. Zool. Soc. London 1902 p. 144.

Among the differences between this species and *C. albotoquatus*, NEUMANN¹ mentions the »red anal region» of the latter. In consequence of this Pocock² states that in skins from »the Kedong» Escarpment» (probable the same as the present Escarpment railroad station), and such from Boromo »a considerable quantity of brownish red hair» is to be found at the sides of the ischial callosities, while in specimens from Nairobi this is less well developed. Pocock appears therefore to be in doubt whether »more than one species is here involved». The present material appears to throw light on this question. In four fine old males from the forest at Escarpment station the red of the ischial and anal regions is absent except in the specimen with the shortest canines and smallest skull which thus may be assumed to be the youngest, although it is fully adult. In a younger female from the same locality the red is well developed in the region mentioned. The same is the case with all the specimens from Nairobi, although it is least abundant in the two oldest females, and best developed in a quite young animal in which the first molar has not yet appeared. In this latter the red hair of the anal region extend even to the root of the tail. To judge from these facts the presence of red hair in the anal and ischial regions of this species evidently is a juvenile characteristic which, more or less completely, is lost during the ontogenetic development when the animals reach full maturity or old age. This accounts for the seeming irregularity in its development. There is also very little probability that two allied species of *Cercopithecus* should live the one at Escarpment and on Kenia, and the other in the forests near Nairobi.

There is a great difference in size between males and females of this species. This may be seen from the following measurements:

	Greatest length	Basicranial length	Condylbasal length
Adult male from Escarpment	116 mm.	88,5 mm.	95,5 mm.
» » » »	115 »	79,0 »	95,0 »
» » » »	114 »	82,0 »	92,0 »
» female from Nairobi	99 »	70,8 »	77,3 »
» » » »	98 »	70,0 »	77,0 »
» » » »	97 »	68,0 »	76,4 »

DOLLMAN has named a female specimen from Nairobi *Cercopithecus kolbi nubilus*.³ This is said to be distinguished by its »much duller colour of the dorsal surface lighter under parts, and less conspicuous white collar». All these characteristics are rather variable. I have in this collection specimens from Nairobi which are just as bright in their colours as specimens from Escarpment and Kenia which, however, as living at a higher altitude have a somewhat thicker and longer fur. Some of the

¹ Proc. Zool. Soc. London 1902 Vol. II pl. 1 p. 144.

² Proc. Zool. Soc. London 1907 p. 703.

³ Ann. & Mag. Nat. Hist. Ser. 8. Vol. V. 1910 p. 202.

specimens from Nairobi are even more reddish on the back than some of the specimens from Escarpment, for instance. The under parts have about the same colour. The white collar is just as well developed in good specimens from Nairobi as in specimens of corresponding age and sex from Escarpment, and the difference in the length of the fur is not so great as it will appear from DOLLMAN's description. Good females from Nairobi have the hair on the middle of the back averaging from 45 to 55 mm., and in females from Escarpment it is not much longer. In male specimens the fur is somewhat longer in both localities.

That much is admitted that there may be seen a certain difference in the length and thickness of the fur between specimens of this species obtained at Nairobi (5300 feet above the sea level), and such from Escarpment (about 8,000 feet above the sea), or from Kenia at high altitudes. But this difference is not of specific, subspecific or racial importance because all three localities belong practically to the same group of forests, and there are all kinds of intermediate localities where all degrees of intermediate development of the fur can be found in direct correspondence to the climatic conditions at every different place.¹ It is even quite probable that such a little difference in density and length of the fur may change individually. If for instance a specimen moved from the forests on the lower slopes to a higher altitude with a cooler climate this same individual would without doubt develop a thicker fur. This is only in accordance with the well known fact, that an animal, for instance an antelope of some kind, transferred from Africa to some zoological Garden in Europe will in the latter place develop a thicker fur.

Specimens from the forests at Meru boma are similar to those from Nairobi of corresponding sex and age.

I have not seen any specimens in which the ear tufts have been banded as shall be the case in the subspecies *hindei* described by Pocock from »Tutha in the Kenia district, 8000 ft. altitude.»² This altitude is about the same as that of the Escarpment.

From the »Kima» of Kilimanjaro which I have described³ under the name *Cercopithecus albogularis kibonotensis* this species is easily distinguished by several characteristics. Above all the white of the throat is much less extended in the Kilimanjaro Monkey, in which it does not reach so far down on the neck, and still less up on the sides of the neck. Its hindlegs are much blacker than in *C. kolbi* in which latter they are speckled so that their general colour appears to be dark grey. The

¹ In this case the different climatic conditions and their results on the animals stand in connection with differences in vertical distribution. But quite analogous things can be found in certain countries for instance our own, as results of different horizontal distribution. Take a Squirrel or a Fox caught in January in Scania, and compare it with a corresponding specimen caught in Upland at the same time of the year, and the difference in fur will be greater even than between the Nairobi and Kenia monkeys, but nobody regards them as belonging to different races as all intermediate conditions are to be found. If the comparison is extended to animals from Lapland the result will be still more striking.

² Proc. Zool. Soc. 1897 p. 704.

³ Mammals: in Wiss. Ergebn. Schw. Zool. Exp. Kilimandjaro Meru 1905—1906 von Y. SJÖSTEDT. Upsala 1908.

white ear tufts of *C. kolbi* are also an easily recognized characteristic. The two species evidently substitute each other in their different areas of distribution.

*Cercopithecus pygerythrus*¹ *luteus* (ELLIOT).

C. centralis luteus ELLIOT Smithsonian. Misc. Coll. Vol. 56, n:o 7 Washington 1910.

The specimens which I refer to this race were collected partly at Kanyakeni situated one days march south of Meru boma (3 specimens) ²⁹/₁, at the latter place (1 specimen) ²²/₃, and at Guaso Nyiri below Chanler Falls (1 specimen) ⁶/₃ 1911. These specimens are similar inter se, and I think they ought to be regarded as identical with ELLIOT's monkey from »Wambugu, southwest of Mount Kenia», although my localities are on the northeastern side of that mountain, and although the distinguishing characteristics are not so sharply developed as in ELLIOT's type specimens.

The author quoted says that the monkey which he has given the subspecific name *luteus* is »somewhat similar to *C. c. Johnstoni*, from the south of Mount Kilimanjaro but differs altogether in its buff underparts and inner side of limbs», the corresponding parts of *Johnstoni* being »grayish white».

In my specimens the »buffish» of the under parts is well developed only in one of the specimens from Kanyakeni in the interbrachial portion of the breast. In the others the »buffish» is only represented as a slight tinge of the white which is best seen by direct comparison with Kilimanjaro specimens. Such a direct comparison also proves that the specimens of the Kenia district are more brightly ochraceous buff on the upper parts, and this colour extends further backwards than in the specimens from Kilimanjaro. Thus the hair on the upper parts of the hind legs, and on the basal parts of the tail are partly ringed with this colour in the former, while the corresponding parts in the latter are almost entirely grey without any buff rings.

The type specimens of ELLIOT's Monkey are said to have »feet iron grey». This is, however, probably to be regarded as a juvenile (or perhaps feminine) characteristic, as only one of my specimens a young female from Guaso Nyiri has grey feet. The others being adult males have black feet.

As ELLIOT's specimens were »young adults, females» the following dimensions of adult male skulls may be of value:

Total length	105 mm.	109 mm.	109 mm.
Occipito-nasal length	85 »	88 »	90 »
Basicranial	71 »	73,5 »	75 »
Zygomatic width	69 »	70 »	72,5 »
Length of upper molar series .	24,5 »	25 »	24,5 »

The scrotum is in the living specimens beautifully turquoise-blue. Since the above was written HOLLISTER has described² a Monkey from the south side of Lake

¹ Conf. CABRERA: Specif. Names of cert. Primates. Ann. & Mag. Nat. Hist. Ser. 8 Vol. VI p. 617.

² Smitson. Misc. Coll. Vol. 59 n:o 3 Washington 1912.

Naivasha, British East Africa, under the name of *Lasiopyga pygerythra callida*. As this race is said to have »less yellow in coloration of back» it can hardly need further comparison with the present specimens. The feet are said to be black even in the young specimens.

This monkey is the »Tumbili» of British East Africa. In its habits it is entirely different from the Kima. The Tumbili does not live in thick forest but belongs to more open ground. It is seen in the thornbush as well as on the acacia steppe and runs much on the ground, sometimes rather far from any trees. The thin forest belts which often fringes the East African rivers appears to be the regular home of the Tumbili and to them they return and take refuge in the highest trees if any danger threatens them.

Sometimes they appear to have certain routes which they know of and use when they seek safety. At Guaso Nyiri below Chanler Falls I had once seen a band of Tumbilis run down from the thornbush to the trees at the river side, but when I came there they had disappeared. A few days later I observed them almost in the same place again, and I ran as quickly as possible with my gunbearers to intercept them. It appeared almost certain that we should succeed because there were only a few trees on our side of the river. When we came nearer, however, I saw the last of the Tumbilis take a flying leap from a tree on a small island to the opposite side, and thence they continued to travel with great speed along the river on the opposite side. An examination of the conditions revealed how the Tumbilis had reached safety. A tree had fallen from the north bank and lay across a branch of the river forming a bridge to the western end of a small narrow island. At the eastern end of the same a big tree leaned over towards the southern side so that from its crown the monkeys could make a long leap and get hold of the branches of a tree on the southern side. This accounted for the mysterious disappearance the first time, and explained also why the Tumbilis ran down to the river at the same place the second time. This was evidently a, to them, well known route which they had used before. Only a young female which remained on the island, possibly not daring to make the last long leap across the southern branch of the river, could be added to the collections. The Tumbilis occurred usually in small flocks but several times single Tumbilis were seen in the interior of the thornbush, sometimes far from any other water than that in the holes dug by the Rendiles, as at Njoro and Thera, in otherwise dry riverbeds.

¹ HOLLISTER has recently (Smithson. Misc. coll. Vol. 56 No 2. Washington 1910, p. 11) described a monkey of the *patas*-group from Brit. E. Africa under the name of *Erythrocebus whitei*. The type locality of this species is »Nzoia River, Guas Ngishu Plateau». MATSCHIE described 1905 a monkey from Ikoma and belonging to this group under the name of *E. baumstarki*. Although I have not myself seen any red monkey during my expedition to Brit. E. Africa I think it worth mentioning that I heard stated by Dr. WALSH that he had shot a red monkey which according to the description must have been a member of the *patas*-group. This happened not far from Ulu station of the Uganda railroad in April 1911. Dr. W. observed it running at a long distance and shot at it believing it to be a Cheetah, and he confessed to be very astonished to see this strange-looking animal when he had killed it. The occurrence of a monkey of this group as far south-east as Ulu appears rather interesting, but as I have not seen the specimen I cannot tell whether it belongs to any of the species mentioned above.

At Meru boma I succeeded in shooting a fine male Tumbili just as it intended to make a raid in a shamba with *Pennisetum*.

***Papio anubis* subsp.?**

(Conf. ANDERSSON: Zool. of Egypt. Mammalia p. 34.)

Dark Baboons of the *anubis*-group were seen by me for the first time at Mc Naughtons farm not far from Nairobi, where they were said to do much damage in the farm, and especially destroy the crop of sweet potatoes and potatoes.

Similar Baboons were also common around Escarpment station where the Kikuyus complained of their ravages in the shambas. In both these places they occurred in herds which took their refuge to thick bush and forest as soon as they suspected any danger. The angry bark of the old males warned the herd to continue the flight. Now and then a big male was seen at some safe distance ascend a small tree or a stump to look round, but they always jumped down and ran away in good time. They avoided very carefully to come within range for the shotgun which was the only weapon I had with me then. They are also very tenacious of life, and although a fullgrown male was shot full in the chest with SSG at either of these localities mentioned both dragged themselves away in the bushes and were lost. On account of this bad luck I cannot dare to say anything more about the Baboons of Nairobi and Escarpment except that they certainly belong to this group of the genus, as was proved by the general darkness of their fur, by their black faces, and purplish brown colour of the naked parts around the callosities which details I observed with full certainty with my field glass. It is, however, quite possible or even probable, that they belong to the same race as the Baboons of the Guaso Nyiri district, described below.

***Papio anubis furax* (ELLIOT).**

ELLIOT: Ann. & Mag. Nat. Hist. Ser. 8. Vol. 20 p. 499.

In the work »Zoology of Egypt», Mammalia, ANDERSON has proved that the oldest specific name given to a blackfaced, dark »green» Baboon with purple-brown callosities is *anubis* FISCHER 1830. Of this group a number of so called species have been described, but at least a part of these are only comparatively slight modifications of the *anubis*-type and do not deserve, according to my opinion, to be regarded as possessing higher rank than that of geographic subspecies. This is also the case with some Baboons which I shot in the thornbush north of Guaso Nyiri. In their general colouration some of them agree quite well with ANDERSON's plate (op. cit. Pl. IV) of *Papio anubis* from Abyssinia = *Papio doguera* PUCHERAN. The skulls of my specimens are, however, smaller than the skulls of Abyssinian Baboons according to the measurements recorded by ANDERSON (l. c. p. 40). They agree with regard to their

size better with the specimens described from Baringo and Nandi by ELLIOT under the name of *P. furax*. But strange to say there are to be seen among the skulls from Guaso Nyiri not only such differences which can be explained as due to individual variation but also others which appear to be of more importance. The differences between the skulls of different ages are fully shown by the dimensions of the skulls *a* and *b* as recorded in the accompanying table of measurements. These two specimens (Pl. I fig. 4 & Pl. II figs. 1 & 2) were shot in the same place and out of the same herd on the north bank of Guaso Nyiri some distance below Chanler Falls. Specimen *a* is a very old male (Pl. II fig. 1) with the canines worn off to the same level as the other teeth which all of them are strongly worn, and the lower incisors have even disappeared. Specimen *b* is a fully adult male (Pl. I fig. 4, Pl. II fig. 2) in its prime of life. Its formidable canines are about 40 mm., and the molars are very little worn but the incisors somewhat more. It is evident that the differences between skulls *a* and *b* are due to age, and a comparison of their dimensions reveals the differences which are connected with increasing age.

Specimen *c* is a rather old male (Pl. I figs 2 & 3) with incisors as well as molars strongly worn. The canines are also worn down to a length of about 33 mm. Specimen *c* is intermediate in age between *a* and *b*, and thus if a dimension in *c* is intermediate between the corresponding ones of *a* and *b*, this is evidently a dimension which alters with increasing age. A fine example of this is the distance between the last molar and the posterior border of the palate. But there are other dimensions of this skull *c* which are not intermediate between those of *a* and *b*, nor similar to either of them, and the differences thus exhibited by skull *c* appear to be of more importance than the others.

These differences in dimensions indicate that specimen *c* has a shorter muzzle so that the distance from the mesial point of the superciliary ridge to the lip of the premaxillary is considerably shorter than in specimens *a* and *b*. The nasals (if measured in a straight line) are also shorter in the former than in the two latter (conf. the table). The shortness of these measurements is, however, partly due to the fact that the orbits are more abruptly raised in *c* (Pl. I fig. 3) than in *a* and *b* (Pl. I fig. 4) and the facial surface of the orbital walls forms almost a right angle to the flat upper surface of the muzzle in *c*, while the same angle is somewhat more obtuse, and the profile on a level with the orbits more slanting backwards in *a* and *b*. But the muzzle is really shorter in *c* than in *a* and *b* as is proved by comparing the respective distances from the middle of the lower border of the orbit to the tip of the nasals (conf. the table). Skull *c* is also considerably broader across the orbits than skulls *a* and *b*. This is due to the great breadth of the facial surface of the outer walls of the orbits in *c*, because the inside distance between the lateral walls of the orbits is even a little shorter than in *a* and *b*.

Although these cranial differences are not very great, they appear to be of importance, especially as they are supported by differences in the colouration of the fur as well. Specimens *c* and *d* which were shot on the north bank of Guaso Nyiri above Chanler Falls and only about one, or one and a half days march to the east

of the crossing of the Marsabit-road, are decidedly more brown and less ochraceous than specimens *a* and *b*.

Specimens *c* and *d* agree nearly with regard to their colour with ELLIOT's description of *P. furax* from Baringo and Nandi. The general colour tends to seal brown and the rings of the hair are decidedly paler than in the other specimens. The tail appears to be rather short, about 44 cm. (without hair) in the male.

It must nevertheless be admitted that the difference is not very great, at most of subspecific value, and, perhaps, I should not have been inclined to go even so far if not other members of the fauna as well had proved to be different above and below Chanler Falls. There are thus different races of *Rhynchotragus* and *Procapra* (*Heterohyrax*) in the corresponding two localities (conf. below).

There ought also to be said a few words in explanation of the degradation of *P. furax* to a subspecies. This has been done, because some of the cranial characteristics especially enumerated by ELLIOT have been proved by the present material to be variable. ELLIOT says that the rostrum is »broader» in *furax* than in *doguera*. This measurement increases considerably with age and is 7½ mm. larger in *a* than in *b*, although even the latter is fully adult, and both hail from the same herd. It is true that these specimens are not real *P. furax* but very near relatives and standing, as will be seen later on, between that race and *doguera*, and then the same laws for changes with age may refer to *furax* as well. The distance between the last molar and the posterior border of the palate is also very much increased with age as can be seen from the table of measurements. The pit on the side of the upper jaw is very different in the specimens *a* and *b* being much more pronounced in the latter which proves that this is not a specific character. The zygomatic width is often rather variable and apt to increase with age when the musculature is more powerfully developed.

Considering all these facts I think it is most suitable to regard *furax* only as a geographic subspecies of *P. anubis*.

	N. of Guaso Nyiri			
	Chanler Falls			
	below		above	
	<i>a.</i> ♂	<i>b.</i> ♂	<i>c.</i> ♂	<i>d.</i> ♀
	very old	ad.	ad.	semiad.
Total length	211 mm.	201 mm	201,5 mm.	152 mm.
Occipitonasal length	169,5 »	161 »	160 »	120 »
Basicranial »	147 »	142 »	146 »	105 »
Zygomatic width	121,5 »	115 »	117 »	94 »
Palatal length (inside between median incisors)	93 »	83 »	88 »	62 »
Width of braincase	86 »	79 »	83 »	73 »
Least postorbital width	58 »	54 »	53 »	52 »
Interorbital width	12 »	10 »	11 »	11,4 »
Length of nasals	76 »	72 »	64 »	41 »

	N. of Guaso Nyiri			
	Chanler Falls			
	below		above	
	a. ♂	b. ♂	c. ♂	d. ♀
	very old	ad.	ad.	semiad.
Length of upper molar series	48,5 mm.	52,7 mm.	48 mm.	47 mm.
Width of snout across first premolar	54 »	51 »	51 »	40 »
Length of lower molar series	65 »	61 »	61 »	51 »
Distance from mesial point of superciliary ridge to tip of pre-maxillary	138 »	128 »	119 »	83 »
Distance between outer brims of the orbital walls at the middle of the orbit	87 »	86 »	93,7 »	70 »
Distance from middle of lower border of orbit to tip of nasals	65 »	64 »	58 »	36 »
Distance between last molar and posterior border of palate	30 »	14 »	23 »	—
Width of palate between last molars	30 »	24,7 »	28,5 »	24 »
Width of the flat area of the muzzle halfway between orbits and tips of nasals	45 »	37,5 »	41,5 »	—
Breadth of facial surface of the lateral wall of the orbit at the middle of the orbit	11 »	11 »	16 »	—

***Papio anubis doguera* PUCHERAN.**

ANDERSON: Zoology of Egypt, Mammalia, Pl. IV & VII.

The Abyssinian member of the *anubis*-group of Baboons was called *doguera* by PUCHERAN¹ and the whole description was: »*major, brunneo olivaceus; manibus anticis nigro irroratis.*» Later authors have added to this description. MATSCHIE determined certain Baboons in the museums in Munich and Frankfort² to be *Papio doguera*, and ANDERSON published soon afterwards in »Zoology of Egypt, Mammalia» a fine coloured plate of the Munich specimen and figures of the skull, as well as numerous cranial measurements.³ Thanks to this it is possible to conceive a clear opinion about this Baboon.

The specimens termed in the above table of measurements *a* and *b*, and, as is already mentioned, shot at Guaso Nyiri below Chanler Falls resemble very closely with regard to their colour ANDERSON's plate quoted. The older is even more ochraceous yellow than the younger and thus more unlike *P. a. furax*. Length of the hair on the back above the shoulders 10 1/2—13 cm., further back above the hind-quarters 4—5 cm.

In general proportions the skulls of my two specimens (Pl. I fig. 4, Pl. II fig. 1 & 2) also resemble the figures in ANDERSON's work of the skull of the Munich specimen regarded as *P. doguera*, especially if regard is paid to the fact that this

¹ Rev. et Mag. Zool. 1856. p. 96.

² Sitz.-ber. Ges. Naturf. Fr. Berlin 1898. p. 80.

³ L. c. Pl. IV & VII, and p. 40.

skull is about intermediate in age between the two skulls of this collection. But if the measurements recorded on the accompanying table above are directly compared with those in ANDERSON'S table of measurements (l. c. p. 40, specimens 1 and 4) it will be seen that the former as a rule are somewhat smaller. If due regard is paid to the changes which are connected with increasing age (conf. above) this difference in size appears to indicate among other things a somewhat shorter snout and less width of the facial parts in the specimens from Guaso Nyiri. It is not excluded that such differences are due to individual variation as the material for comparison is not great and I have therefore used the same subspecific name for my specimens as for the Abyssinian representatives of the *anubis*-group.

These Baboons lived in numerous herds in the thornbush country north of Guaso Nyiri. Sometimes they inhabited high and steep rocks and had their stronghold among gigantic blocks to which they took their refuge when danger threatened. In other places they fled into the dense thornbush in similar cases. In localities where there were no rocks suitable as night quarters the Baboons used to ascend some of the trees growing near the river and sleep in them, and it seemed as if the same trees were used night after night. The reason why a tree is selected for night quarter is evidently because it affords protection against attacks from Leopards. If a man approached the tree the Baboons bounded to the ground and ran into the thick bush as quick as possible. This happened even if it was so late at night that the sun had set, as I observed myself once when it was so dark that I could not see to aim and shoot. Before they ascended the tree for the night they used to drink their fill in the river. I found that the Baboons in the thornbush north of Guaso Nyiri fed largely on a fruit which had a plum-like appearance. Their ventricles were filled with masticated bits of such »plums» and the cheek pouches contained intact fruits of the same kind. They were green, of the size of an olive and contained a stone like that of a plum. It was, however, no plum as the leaves of the bush which I saw once or twice in early development (otherwise the branches were naked) were pinnate. When not fully ripe it had a very strongly adstringent taste but in fully ripe condition it had a sweetish and not unpleasantly aromatic flavor, something reminding about italian vermouth.

Prosimiæ.

Nycticebidæ.

Galago (*Otolemur*) *kikuyuensis* LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8 Vol. IX p. 64.

In the year 1905 MATSCHIE¹ characterised the groups or subgenera within the genus *Galago* typically represented by *G. agisymbanus*, viz. *Otolemur*, and by *G.*

¹ Sitz.-ber. Ges. Naturf. Freunde Berlin 1905, p. 277.

garnetti, viz. *Otogale*, in the following way: In *Otolemur* the orbit is much broader than the distance between the gnathion and the anterior margin of *foramen infra-orbitale*. In *Otogale* these distances are about equal. In *Otolemur* the nasals are at least as long as the distance between the gnathion and the anterior brim of the orbit, in *Otogale* shorter. In *Otolemur* the ears are shorter, in *Otogale* longer than the hands. In *Otolemur* the ears are much shorter than two thirds the length of the head, in *Otogale* about equal to this latter dimension.

According to this definition the subgenus *Otolemur* included at the time mentioned the following species: *O. agisymbanus*, *lasiotis*, *panganiensis*, and *badius*, while *Otogale* embraced *O. garnetti*, *crassicaudatus*, *monteiroi*, and *kirki*.

The present species is evidently a member of the subgenus *Otolemur* the diameter of the orbit measuring 17 mm. while the distance between the gnathion and the anterior margin of *foramen infraorbitale* is 14,5 mm. The length of the nasals is 19 mm. while the length of the preorbital portion of the skull is 18,3 mm. The ears are short and naked. General colour (Pl. IV fig. 1) of the upper parts pale greyish brown, somewhat darker on head and upper neck, outside of limbs more chamois. Throat and lower side of neck pale with an ochre yellow tinge or similar to »maize yellow» n:o 2 according to »Répertoire de couleurs». Inside of fore limbs and under parts of body dirty white, inside of hind limbs more brownish. Hands and feet dark brown inclining to blackish. Tail rather dark brown above, gradually darkening to blackish brown towards the distal third, pale snuff brown on the lower side. The fur on the back very soft, 23—25 mm. dark slate-coloured for the greater part with broad subterminal rings similar to »chamois» n:o 1 (Répert. de coul.) and with dark brown tips which in the majority of the hair is short, but in the longer hair are longer than the chamois-coloured rings.

Total length about 62 cm. Tail about equal to head and body in length.

Greatest length of skull	61 mm.
Basicranial length	49 »
Greatest zygomatic breadth	41 »
Palatal length	23 »
Length of upper molar series	19,5 »

These skull measurements agree closely with those recorded by ELLIOT for a species described by him under the name *Galago hindei*.¹ This species which has been collected at Kitui, Athi River, Brit. East Africa, must, however, in other respects differ rather widely from the one now described. The total length of *G. hindei* is said to be about 57,5 cm., and the tail is indicated to be 37 cm. It must thus have a very short body, only about 20½ cm., and it is certainly much shorter than the tail which is stated to be »very long», »almost white (»above pale wood brown, beneath whitish»). The hands of *G. hindei* are also said to be »like head» viz. pale wood brown washed with darker brown.

Otolemur panganiensis MATSCHIE from the Kilimanjaro district has the tail considerably longer than head and body and a much larger skull attaining a maximum

¹ Ann. & Mag. Nat. Hist. Ser. 7, Vol. XX 1907, p. 186.

length of 75 mm. and a basicranial length varying between 58 and 62,5 mm. *O. badius* from Ugalla, German East Africa, is dark reddish brown. *O. lasiotis* from Mombasa has hairy ears and white tail. *O. agisymbanus* from Zanzibar appears to be a smaller animal than the one now described with the length of body 20 $\frac{1}{2}$ cm., head 5 cm., and tail 22 cm., according to the original description¹ by COQUEREL.

The type specimen of *Galago (Otolemur) kikuyuensis* was shot in the forest near Escarpment station at an altitude said to be 8,000 feet, the 7th of Jan. 1910. It was an adult male. I found it in the evening when it had already become so dark that it only with difficulty could be seen against the sky. Although I tried to secure some more specimens walking through the forest in the evenings before and after sunset, I did not succeed. My gunbearer saw once a second specimen jump from a tree to another, and we heard the »Komba's» chattering scream now and then in the evening, that was all. One night part of a *Dendrohyrax* which I had shot in the evening before but which remained hanging on a branch, was eaten, and my »boys» who brought it down in the morning said that it was the »Komba's» work.

Galago gallarum THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1901, Ser. 7, Vol. VIII, p. 27.

This beautiful little Galago is not uncommon in the dry thornbush country north of Guaso Nyiri, and it may be seen astir and moving about in the bushes even in broad daylight. The first specimen was observed by the present author in the bushes bordering the dry bed of a small rivulet at Njoro ²⁴/₂. It was not shy at all, but I had no shotgun and was just trying to stalk a Giraffe at that moment, so I had to leave it alone. About 3 weeks later when we were camping north of Guaso Nyiri below Chanler Falls I saw another specimen which jumped up from the lower branches of a bush to the top of the same where it stared at us. This specimen was secured. The same day ¹²/₂ the negroes accompanying Mr. CUNNINGHAME stoned another specimen which also was preserved. The following day I found not less than 3 specimens in a horribly spiny acacia bush, in which they moved with great dexterity, although it appeared almost impossible to evade the sharp spines. Two were shot in the bush and the third on the ground where it tried to run away with long jumps.

The description published by THOMAS (l. c.) corresponds almost in all details with my specimens. As I unfortunately have no access to RIDGWAY's nomenclature of colours I do not know exactly what his »ecru drab» is like. When my specimens were alive climbing and jumping in the bushes they gave the impression of being light grey with light ochre-yellow, or perhaps better honey-yellow hind legs. When made into skins the reddish fawn or vinaceous cinnamon below the tips of the hair shines through in some places and in others the black terminal rings of the hair form

¹ Rev. et Mag. de Zool. 2 Ser., T. XI Paris 1859, p. 459.

a blackish cloud. The tail darkens gradually from pale grey at the base to black at the end. In younger specimens the tail is more or less brown especially in its apical half, but it also will appear that the black in the outer part of the tail fades into brown before it is shed, for some specimens have new hair with fresh colour on the basal half of the tail and the old hair of the apical half more or less brown.

The length of the tail varies in adult animals from 27 to 29 $\frac{1}{2}$ cm. without hair, in the younger it is about 25.

Total length of skull in an old male specimen with worn teeth 45 mm.; condylobasal length 39,3 mm.; basicranial length 34 mm.; zygomatic breadth of skull 32,4 mm.; length of tooth row from front of canine to back of m^3 15,4 mm; length of parietal suture 19 mm.; breadth of braincase 23,5 mm.; length of nasals mesially 12,5 mm.

The total length of the skull of a younger animal is 42,5 mm. but the tooth-row has, of course, the same length as in the old animal.

G. gallarum is an easily recognized species as already pointed out by THOMAS. Since *G. gallarum* was described, DOLLMAN has named another Galago from Somaliland (»Fafan 35 miles east of Harrar») *G. dunni*.¹ The latter has, however, a larger skull, and has no fawn or drab colour.

Another more northern relative is *Galago teng* (SUNDEVALL). By mistake the type locality of this species is said to be: »Mombasa, Taita», in TROUESSART's »Catalogus Mammalium». SUNDEVALL writes about this: »Habitat in Sennaar et Kordofan, circa Bahr el Abiad», and these words are quoted directly from the collector himself Dr. HEDENBORG.

A direct comparison between a male skull of *G. gallarum* of this collection and the skull of the male type specimen of *G. teng* proves the latter to be rather more slenderly built. *G. teng* has the posterior half of the nasals narrowed (but a little widened again at the end), and the cavities on the sides of the snout more pronounced than in *G. gallarum*. The least interorbital breadth is only 5,2 mm. in *G. teng*, while the same measurement is 6,2 mm. in *G. gallarum*. The latter has more outstanding orbits, and much heavier and broader zygomatic arches already in young specimens. On the other hand the tooth row is about 1 mm. longer in *Galago teng*.

Galago teng has no drab or fawn colour in its fur and resembles in this respect *G. dunni*. Another resemblance between these two is the shape of the nasals as described above for *G. teng* and by DOLLMAN for *G. dunni*. It appears thus probable that *G. dunni* may be a subspecies of *G. teng*.

¹ Ann. & Mag. Nat. Hist. 1910 Ser. 8, Vol. V p. 92.

Chiroptera.

Pteropodidæ.

Epomophorus wahlbergi SUNDEVALL.

K. ANDERSEN: Cat. Chiropt. B. M. 1912, p. 526.

This Fruit-eating Bat was only observed once viz. at the upper Luazomela river where it flows down to the acaciasteppe one days march north of Meru boma. A small »colony» consisting of a male and three females were found hanging in a large bush with yellow flowers in a grove of big yellow-barked acacias. They were picked down with the specimen gun, and two of the females carried young, measuring about 6 cm. from vertex of head to vent the 20th of March 1911.

This species appears to be distributed from South Africa to East Africa as far north as to Mount Kenia. The present locality is thus, as far as is known, its northern limit. Since this was written I have had the pleasure of receiving a paper¹ from G. M. ALLEN in which he records »*E. neumanni*» from a locality probably very near the one where I collected mine.

Nycteridæ.

Lavia frons frons (GEOFFROY) and **L. f. affinis** ANDERSEN & WROUGHTON.

ANDERSEN & WROUGHTON: Ann. & Mag. Nat. Hist. Ser. 7, Vol. 19, 1907, p. 138.

A single male was shot in a patch of thornbush at Lekundu river, just south of Guaso Nyiri ⁸/₂ 1911. This specimen has a cranial length of 25,8 mm. and the length of the upper tooth row is 9,5 mm. To judge from the measurements of these parts quoted by ANDERSEN and WROUGHTON (l. c. p. 139) this specimen should belong to the larger race *Lavia frons frons* (GEOFFROY).

North of Guaso Nyiri below Chanler Falls I shot a pair of this kind of bats in the thornbush ¹⁰/₃ 1911. The upper tooth rows of these two specimens measure only 8,7 and 8,8 mm. resp. This should according to the authors quoted indicate that these specimens belong to the northern smaller race *Lavia frons affinis* ANDERSEN WROUGHTON. The length of the forearm in the female is 56 mm. thus a measurement which can be found in both races. In the male the corresponding bones have been broken by the shot. The size of the ear of the specimens from the northern and southern sides of Guaso Nyiri is also different being smaller in the former. The dimensions of the different phalanges of the fingers etc. are also smaller in the specimens from the northern side of Guaso Nyiri than in the one from Lekundu. Although it is difficult to pass a definite judgement on so little material, it appears

¹ G. M. ALLEN: Bats from British East Africa. Bull. Mus. Comp. Zool. Vol. LIV N:o 9, p. 322.

probable that the small northern race extends southwards to Guaso Nyiri and in that region meets the larger southern race, perhaps both blend together there.

This bat is found hanging in the leafless bushes, quite exposed to the sun-rays as it seems, and flies away when one approaches finding its way quite well in broad daylight. The wings of the flying bat appear rather rich yellow and the body light greyish blue. When shot and more closely examined the fluffy fur looks pale lead-grey with a rather strong greenish tinge. The wings of the dead animal discolour soon.

***Nycteris hispida* (SCHREBER).**

DOBSON: Cat. of Chiroptera B. M. p. 162.

A specimen of this kind was caught at Njoro, north of Guaso Nyiri in the thornbush country ¹⁸/₂ 1911. It appeared to be common there and was seen flying at sunrise and sundown among the palms fringing a dry river bed.

On the acacia steppe on the southern side of Guaso Nyiri small Bats were seen flying after dusk but as I could not secure any specimens I do not know which species they represented but refer to G. M. ALLEN's paper quoted above in which several Bats from the same district are mentioned.

Insectivora.

Erinaceidæ.

***Erinaceus hindei* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist. 1910 Ser. 8, Vol. V.

Remains of Hedgehogs in the shape of the dry skin of their bodies were a very common thing in the thornbush north of Guaso Nyiri, but I did not see any living specimens. They were probably sleeping over the dry season. The skins found were undoubtedly remains of such specimens which had killed and eaten by some foe, either Jackals, or perhaps more probably *Bubo lacteus*.

As it was impossible to determine such remains without a rich material for comparison I took the liberty of sending a specimen to British Museum, and had the pleasure of receiving a reply from Mr. G. DOLLMAN, in which he informed me that it was quite similar to *Erinaceus hindei* THOMAS. This species was originally described from Kitui and Machakos but afterwards also collected at Guaso Nyiri. It is according to THOMAS »closely allied to *E. albiventris*» of northern Africa.

Macroscelidæ.

Elephantulus pulcher rendilis n. sp.

The specimens of »Jumping Shrews» collected north of Guaso Nyiri in the thornbush appear to be closely related to *E. pulcher* THOMAS.¹ The small differences will be discussed further below.

To judge from the locality and considering other components of the fauna of the thornbush I almost expected to meet there some of the somewhat more northern forms, but the following comparison with the descriptions prove this to be excluded, even if there is a great affinity to some of them. *E. boranus*² THOMAS differs in having »basal halves of belly-hairs dark slaty; line of demarcation indistinct». In the present specimens the hairs of the lower side of the body are entirely white, although towards the sides near the line of demarcation grey, and finally slaty, basal parts appear, but even there not by far extending half way up the hair; the line of demarcation is sharp. *E. boranus* is also apparently more richly coloured above as THOMAS speaks about its back being »a deeper chestnut» — — —.

The Abyssinian *E. peasei* THOMAS³ is larger than the present specimens (»hind foot s. u. 35»; »Greatest length of skull 38») and »the bases of the hair everywhere slaty grey», and the white of the lower surface not sharply defined.

E. somalicus THOMAS⁴ is said to be similar to *E. peasei* but paler in colour. In this respect as well as in the somewhat smaller dimensions it appears to approach my specimens, but the slaty bases of the belly-hairs give a distinguishing characteristic.

E. dundasi DOLLMAN⁵ from Lake Baringo has also slate grey bases to the belly-hairs, rather longer nasals and longer upper tooth-row.

E. phæus HELLER⁶ from Sotik has »hair every where dark slate at base». Its skull appears to be longer but its upper tooth-row comparatively shorter than in my specimens.

E. revoili HUET⁷ from Somaliland appears to have larger hind foot (40 mm.), and longer tooth-row (20 mm) in addition to its different colour.

E. delicatus DOLLMAN⁸ quite recently described from »Orr Valley, Mt. Nyiro», is said to have »underparts white, hairs almost white to roots, the extreme bases of the hairs alone being greyish». In this respect the race mentioned resembles my specimens more than the others do. But *E. delicatus* has a longer skull (37 mm.), longer nasals (15 mm.), longer palate etc.

¹ Ann. & Mag. Nat. Hist. Ser. 6. Vol. XIII p. 69.

² Proc. Zool. Soc. London 1900. p. 802.

³ Ann. & Mag. Ser. 7 Vol. VIII. p. 154.

⁴ L. c. p. 255.

⁵ Ann. & Mag. Nat. Hist. Ser. 8 Vol. V.

⁶ Smithsonian. Misc. Coll. Washington 1910. Vol. 56 n:o 15 p. 8.

⁷ Mission Revoil aux Pays Comalis, Faune et Flore. Mamm. 1882 p. 5.

⁸ Ann. & Mag. Nat. Hist. Ser. 8. Vol. VIII.

K. Sv. Vet. Akad. Handl. Band. 48. N:o 5.

It is quite probable that several of these forms are closely related and only ought to be regarded as geographic races or subspecies. Considering my own specimens I think it most suitable to regard them as a subspecies of *E. pulcher* with which they agree in the general pattern of eye-markings and dimensions of skull. The latter fact is fully proven by comparing the measurements of THOMAS' type-specimen, which was female, with the corresponding ones of a female skull in my collection (conf. below).

General colour of back rather light brown, produced by buff thinly overlaid with black tips to the hairs. Sides of body much paler and more greyish, resembling »pale ecru» (Rép. des couleurs 66,4) with scattered black hair which hardly alter the colour. Behind the ears a buff-coloured patch without black. Forehead coloured like the back but a little paler and more greyish gradually merging into the pale yellowish grey of the sides of the snout. A narrow dark mesial streak extends along the proboscis where it is blackish, up on the back of the snout, where it is umber brown, but disappears before it reaches the level of the eye in the brownish of the forehead. A white ring round the eye extending backwards to below the ear. The postero-inferior mark, which interrupts the white ring, is fawn-coloured, in some specimens a little mixed with black (»nearly black» in *E. pulcher*). Sometimes this dark mark is continued all around the white eye-ring as a fawn-coloured band, sometimes this is less sharply pronounced. Below the postero-inferior dark eye-marking the colour of the flanks extends nearly to the gape. Lips, chin and the entire under side white with sharp line of demarcation. The hairs of the upper parts and flanks are dark slaty basally, but the white hairs of the lower parts are entirely white, except perhaps those nearest the line of demarcation toward the flanks (conf. above). Hands and feet white. Tail brown above, whitish below.

	♂	♀
Greatest length of skull	35,0 mm.	33,7 mm.
Condylolncisive length	33,2 »	31,7 »
Greatest breadth	20,0 »	20,0 »
Length of nasals	13,5 »	12,1 »
Interorbital width	6,5 »	6,0 »
Length of upper tooth row . . .	18,1 »	17,2 »
Length of head and body about .	12,0 cm.	

The maximum length of the tail is 13 cm. in a male, but in females it appears to be shorter, about 11 cm. Hind foot s. u. about 31,5 mm. in males, a little less in some females. The gland in the sternal region is well conspicuous.

As can be seen from this description the most important differences between the typical *E. pulcher* and my specimens is that the former has the bases of the hairs of the under surface grey and the »postero-inferior interruption» of the white ring around the eye »nearly black». These differences are evidently only of subspecific value. Without access to material. I cannot say if or how many of the other races in the adjoining countries deserve the rank of species. It appears almost pro-

bable as mentioned above that at least some of them could be joined with others as subspecies. HELLER says for instance about his species *E. phæus* that it is »closely allied to *pulcher*».

I obtained 5 specimens of the race described above in the thornbush country north of Guaso Nyiri, partly not far from a waterplace called Thera, partly below Chanler Falls. These specimens were all of them secured with the shotgun while running through the bushes. In spite of their large eyes which give them the appearance of being nocturnal in habits, these animals are seen moving about in full daylight under a glaring sun. Only single specimens were seen. When scared they ran through the bushes to all appearance like a mouse, and I did not see them deserve the name »Jumping Shrew. They were not very shy and did as a rule not run very long each time.

Soricidæ.

Sylvisorex sorelloides LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8 Vol. IX p. 67.

This very interesting long-tailed Shrew was caught on the acacia-steppe near Itiolu river, a tributary to Guaso Nyiri from its southern side. With regard to its very long and almost rat-like tail and general proportions it appears to resemble *S. sorella* THOMAS¹ described from the Masuku Plateau, Nyasaland. It differs by this characteristic very markedly as well from *S. lunaris* THOMAS and *S. granti* THOMAS from Ruwenzori, as from *S. mundus* OSGOOD from Kijabe, which all have the tail shorter than, or at the most subequal with the length of head and body.

The general colour above is dark brown (Pl. III fig. 1). The fur is rather long (about 5 mm.) and soft but not very dense. It is dark plumbeous basally with long brown tips, something between »raw umber» (n:o 301) and »brownish drab» (n:o 302, Répert. de Coul.), somewhat paler more greyish on the flanks. The lower side is whitish by long white tips to the hair which are plumbeous grey basally. The line of demarcation between the colours of the upper and lower sides is not very sharply defined. Hands and feet very slender, hairy. Fingers whitish except the fifth and the lateral side of the fourth which are brown. The corresponding parts of the hands as well are whitish resp. brown. On the hind limbs only the two inner toes and the corresponding parts of the feet are light. The tail is very long and slender, quite murine in appearance, scaly and annelated, but at the same time covered with a great number of short hair, which, however, do not conceal the annulation. The tail is brown above and distinctly paler below. It has no longer bristles at all.

The snout of the freshly caught animal was strikingly long and slender, almost cylindrical in shape and almost cleft at the end. The vibrissæ are numerous.

¹ Proc. Zool. Soc. London 1897 p. 930.

The lateral musk-glands are strongly developed and emit even in the dried state of the skin a quite strong odour of musk.

Length of head and body of the dry specimen about 67 mm.; length of tail 84 mm.; length of hindfoot resp. 15 mm. without, 16 mm. with claws.

Condylar-incisive length of skull 18,4 mm. The greatest breadth of the skull cannot be ascertained because it is partly broken on the right side behind, but it is probably about 8 mm. Interorbital width 4,3 mm., palate length to gnathion 7,5 mm., length of maxillary series of teeth 8 mm.

The anterior incisors have the posterior cusp pointed but not very high, not reaching half the height of the anterior margin of the succeeding tooth. First unicuspid rather large and sharply pointed. The second unicuspid does not reach half the height of the first, and it is also a little lower than the third. The third overlaps the second so that, if the teeth are seen from the coronal surface, the latter tooth looks smaller than it really is. But if seen from the lateral side it shows its real dimensions better and proves to be as well much higher as even broader than the fourth. The latter is much the smallest in the series, and it does not reach more than half the height of the third unicuspid.

The relative size of the second and fourth unicuspid teeth as described above forms an important distinguishing characteristic from *Sylvisorex sorella* THOMAS with which this species, no doubt, is closely related. In *S. sorella* the second unicuspid evidently is much smaller than in the present species as it is said¹ to be subequal with the fourth, and both are only »about half the height» of the third, while in the present species there is as much difference in height between the fourth and the second unicuspid as between the second and the third.

The last upper molar of *S. sorella* is said to be of »squarish form». In this species it is more triangular than square in outline.

The long-tailed Shrew from Liberia which MILLER has named *Myosorex muricauda*,² but which THOMAS placed in the genus *Sylvisorex* when creating this,³ differs decidedly from the present species in having only 3 unicuspid teeth in the upper jaw, and in having no »trace of scales or annulation» on the tail. The latter organ is also shorter than in *S. sorella* and *sorelloides*.

***Crocidura martiensseni* NEUMANN.**

NEUMANN: Zool. Jahrb. Abth. Syst. Bd. 6, 1900 p. 544.

A specimen of Giant Shrew was caught ²⁸/₁ 1911 in the Meru country not far outside the forests of north-eastern Kenia. The dimensions of this specimen are as follows viz. head and body (dry specimen) 136 mm., tail 89 mm., and hind feet about 23 mm. with claws, 21 without claws. These measurements agree rather

¹ Proc. Zool. Soc. London 1897 p. 931.

² Proc. Acad. Washington 1900. Vol. II p. 645.

³ Proc. Zool. Soc. London 1904 Vol. II p. 190.

closely with NEUMANN's short communication about *Crocidura martiensseni* from Usambara and Kilimanjaro. The same is also the case with the dark brown colouration.

NEUMANN has, however, not given any cranial measurements of his type, and I have therefore written to Professor MATSCHIE and asked for information, and the result of his kind communication is recorded below for comparison with my specimen.

	Kenia spec.	Type according to MATSCHIE.
Condyllo-incisive length	32,1 mm.	33,3 mm.
Greatest breadth of skull	13,2 »	13,2 »
Interorbital breadth	5,9 »	5,9 »
Length of maxillary series of teeth	14,6 »	15,1 »

Concerning the colour of *C. martiensseni* which NEUMANN shortly has stated to be »dunkelbraun» MATSCHIE kindly has communicated the following which is of value as it gives information for the future about the appearance of this Giant Shrew. »*Cr. martiensseni* ist auf der Oberseite gleich der Terre d'Ombrie brûlée, umbra gebrannt Taf. 304 n:o 2, und auf der Unterseite dunkelgrau, stark umbrabraun (Taf. 304,1) überflogen. — — — Alle Haarspitzen der Unterseite, oder vielmehr die obere Hälfte jedes Haares, sind hell umbrabraun, die Wurzelhälfte grau.»

This description suits my specimen quite well except that it is darker above, closer to darkest sample of burnt umber (Rép. de Couleurs) 304 n:o 4 than to n:o 2. This may, however, be of less importance. The Usambara specimen has also a little longer skull and dental series as can be seen from the measurements recorded above but other cranial dimensions are alike. For the present it is impossible to say whether these small discrepancies in colour and length of skull is of racial importance. I hardly believe that, and prefer to name my specimen as above.

Crocidura flavescens nyansæ NEUMANN (l. c. p. 544) is »dull cinnamon-coloured» and thus still paler. *C. doriana* appears also to be paler as DOBSON¹ terms it »light reddish brown above» and it is also smaller.

The lateral gland of my specimen is well developed and is situated nearer to the groin than to the axilla.

***Crocidura fumosa* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist. 1904, Ser. 7 Vol. XIV p. 238.

Specimens of the Dusky Shrew were collected at several localities as at Blue Post, Kagio, Embu boma, the native village Kanyakeni south of Meru boma, and at the latter place in the more or less cultivated country, but also in the lower forest-

¹ Ann. Mus. Civico Genova 1887, Ser. 2:a, Vol. IV p. 565.

region on the eastern slopes of Kenia. It is thus perhaps the most common Shrew in the district mentioned.

It has also been found on Kilimanjaro, and a subspecies is described by THOMAS from Ruwenzori.

***Crocidura turba* DOLLMAN.**

DOLLMAN: Ann. & Mag. Nat. Hist. Ser. 8 Vol. V. p. 176.

This Shrew was collected as well on the acacia steppe south of Guaso Nyiri and at Luazomela and Lekundu rivers as on Kenia in the forest at an altitude of 2450 m. It is thus a rather common species. DOLLMAN has kindly compared some of my specimens »with the type specimen of *C. turba* and a long series of *turba*» which recently has been received in British Museum from East Africa, and he has stated the correctness of my determination.

C. turba resembles *C. monax* but the great number of long hair on the tail of the former makes it easy to recognize from the latter, in which the tail is »almost bristleless» according to THOMAS.

***Crocidura hindei* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist. 1904 Ser. 7 Vol. XIV p. 237.

A specimen of this Shrew was trapped at Juja farm ¹⁹/₁ 1911.

***Crocidura hildegardæ* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist. 1904, Ser. 7. Vol. XIV p. 240.

A specimen of this small Shrew was caught at a native village Kazere one days march from Meru boma at the base of Kenia ²⁵/₂, and another at the village of Kutu south of Embu boma ²⁴/₁ 1911. This latter place is not very far north of the type locality, Fort Hall. A third specimen from Blue Post (²¹/₁), south of Fort Hall, is a little less brown, and the lateral gland is more pronounced. I felt therefore rather uncertain about its identity but Mr. GUY DOLLMAN has kindly after comparison ascertained this.

Carnivora.

Canidæ.

Canis mesomelas SCHREBER.

DE WINTON: Proc. Zool. Soc. London, 1899 p. 539.

North of Guaso Nyiri this Jackal was evidently common in the thornbush country. The specimens which I saw in Febr. and March had remarkably bright colours, the rufous of the hindquarters and flanks appeared especially clear when they ran away through the bushes.

I had expected to find a small race of the Black-backed Jackal in this country because NOACK has described¹ from Somaliland a small variety which he has called *Canis mesomelas schmidtii*. This was, however, not the case. The specimens which I saw were not small. The females are smaller than the males, but a young adult female measured from snout to vent 72 cm., and the tail was 34 cm. without hair.

In the accompanying table of measurements the dimensions of 9 skulls of *Canis mesomelas* from different parts of Africa² have been recorded. From this

	"Caffraria" = Natal ♂ (?)	Damaraland ♂ (old)	Damaraland ♀	Be-Kuena, Brit. Bechuanaland	Leitokitok, Kiliman- jaro. Germ. E. Afr. ♀	N. of Guaso Nyiri Brit. E. Afr. ♀	Gheleb ³ , Eritrea ♀	Type of <i>C. mesome- las schmidtii</i>	B. E. A. ♀	South Sotik ♂	Leikipia ♂ (quoted from ALLEN)	Leikipia ♂ (quoted from ALLEN)	Average of six spe- cimens of different sexes according to ALLEN
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Maximum length of skull	165	165	149	156	152	147	150	—	150	150	153	143	148,4
Basiscranial length of skull	150	150	137	144	137	137,5	136	129	137	138	—	—	—
Zygomatic width " "	85	86	81	83,5	86	83	87	79	84	83	87	82	84,6
Greatest width of brain-case	54	52	51	51	52	53	54	49	51	51	—	—	—
Greatest length of nasals	64	70	56	64	54	51	51	42	51	53	—	—	—
Distance from hind margin of m ² to front surface of i ¹	88	89	81	85	81	80	79	—	79	79	—	—	—
Distance from orbit to tip of premaxillary	71	72	64	69	62	61	61	—	60	62	—	—	—
Least interorbital breadth	28	30	28	27,3	27,5	30	28	—	28,5	26	29	29	29,3
Distance between tips of postorbital process	44,5	47	44	44	43	46	46	—	44	43	—	—	—
Length of p ⁴	18	—	16,5	17,3	16,5	17	16,5	—	17	17	16,3	15	15,8
" " m ¹ laterally	12,3	—	11,3	12,2	11,9	11,9	11,4	—	11,2	11,1	—	—	—

the superior size of the males in South Africa is quite apparent. On the other hand it is plainly seen that the female skulls from Damaraland, Kilimanjaro, Sotik, the Guaso Nyiri district, and Eritrea agree very closely in size so that there cannot be based any racial difference on the size as far as the Black-backed Jackals of these

¹ Zool. Anz. Bd. XX. 1897, p. 519.

² I am indebted to Mr. R. J. CUNNINGHAME for two skulls from South Sotik.

³ This skull has been obtained from Rev. Mr. K. G. RODEN.

countries are concerned. J. A. ALLEN has communicated¹ measurements of 6 skulls from Leikipia, Brit. East Africa. These agree also with the measurements of the material of this museum. DE WINTON mentions (l. c. p. 540) that he has observed that »specimens from south of the Zambesi — — — are rather larger, and the facial part of the skull appears slightly longer in proportion than those obtained from the north of that river». The measurements of the present material do not support this except for southern males. It must, however, be borne in mind that male members of the genus *Canis* often vary a great deal, and some specimens may be bigger than the average. As I only have one male skull from East Africa, and that one is not very old, I cannot say whether the southern males of this species generally are larger in size or not. The measurements of NOACK's type specimen of *C. mesomelas schmidtii* are of course decidedly smaller than the corresponding ones of any of the *mesomelas* skulls in this museum, even than those of females from Eritrea, and the Guaso Nyiri district. In consequence of this it must be assumed either that *C. mesomelas schmidtii* is a race with very restricted habitat in Somaliland, or that the type specimen to which this name was given was a dwarfed individual.

NOACK has also indicated that his *C. mesomelas schmidtii* differs from the typical race with regard to the dentition. This difference is said (l. c. p. 620) to consist therein that in *C. m. schmidtii* no lateral cusps (»Nebenzacken») are to be found on pm^2 and pm^3 which is said to be the case in the true *C. mesomelas*. This is, however, a very variable characteristic. The small cusps are sometimes present sometimes absent even in southern specimens. In the specimen from Guaso Nyiri the additional cusp of pm^3 is very well developed. In a similar way pm^4 of *C. m. schmidtii* is said to have only one lateral cusp, while there are two in the true *C. mesomelas*. The latter is the case in all my material.

With regard to colour I cannot find any important differences between specimens from Eritrea and Guaso Nyiri on one side, and those from Damaraland on the other, except that the former perhaps are a little brighter, and that in the latter the dark line below the eye is only faintly developed, whereas it is distinct in the northern specimens. The presence of this dark line in specimens of this Jackal from the Cape Colony has been stated by DE WINTON (l. c. 540), and as mentioned above it can be traced in specimens from Damaraland. There are thus new and more constant characteristic needed before any distinction can be made between the East resp. Northeast-African Black-backed Jackals and the South-African ones.² The type of *C. mesomelas schmidtii* NOACK is excluded from this, but more material of the same kind is evidently needed before the racial distinctness of *C. mesomelas schmidtii* can be said to be fully proved when there are larger and typical Black-backed Jackals to be found as well in Eritrea as in the country north of Guaso Nyiri.

¹ Bull. American Museum XXVI p. 172. New York 1909.

² O. NEUMANN has recorded the Black-backed Jackal of East Africa as »*Canis mesomelas schmidtii* NOACK» (Zool. Jahrb. Bd. 13, 1900, p. 550) without giving any reason for doing so.

Canis adustus* SUNDEVALL.Canis lateralis* SCLATER — DE WINTON, Proc. Zool. Soc. London 1899, p. 541.*Canis adustus* SUNDEVALL — LÖNNBERG, Mammals p. 14 in Sjöstedt's Kilimanjaro-Meru Expedition. Uppsala 1908.

In the steppe country round Nairobi this species appeared to be common and it was hunted there with hounds. I had the pleasure of receiving from Mr. SETH-SMITH a skull from Ruiru river. A skull was also picked up by Mr. A. JANSSON near the road between Embu boma and Kutu.

The basicranial length of SUNDEVALL's types of *Canis adustus* is 154 mm. in the male and 144 mm. in the female.

In a female specimen from Nairobi the same measurement is 147 mm., in another from Ruiru river 146 mm. and in the picked up skull which is fully adult but young 140 mm. The skulls agree in other respects as well with that of the female type.

We did not with certainty observe this Jackal further north than at the place where the skull was picked up, as mentioned above.

Jackals were seen at a distance on the acacia steppe south of Guaso Nyiri and also heard ›barking› there during the nights, but I had no opportunity of stating whether they belonged to this species or possibly to *C. variegatus*.

***Otocyon megalotis virgatus* MILLER.**

GERRIT S. MILLER: Smithson. Misc. Coll. 1909, Vol. 52, Pt. 4, N:o 1883, p. 485.

A male specimen from the Athi plains agrees with MILLER's description. The teeth are also smaller than those of the southern *O. megalotis* but hardly in such a high degree as it will appear from CABRERA's measurements,¹ because the dimensions of the teeth are rather variable in these animals. The transversal diameter for instance of m¹ is in the present specimen 6,7 mm., of m² 6,5 (6,7) mm. and of m³ 6,2 mm., and these measurements are even larger than the corresponding ones of a female of *O. megalotis* from ›Caffraria›, but smaller than those of a male from the latter locality. This characteristic thus holds good only if specimens of the same sex are compared. If this is done the difference in other dimensions as well is prominent. The distance from the orbit to the tip of the premaxillary is in the southern male specimen 50 mm. but only 46 in the northern, and so on. Considering all, however, I hardly think that the East African race deserves higher rank than that of a geographic subspecies.

¹ Ann. & Mag. Nat. Hist. 1910, Ser. 8, Vol. VI, p. 463.

Hyenidæ.

Crocotta panganensis LÖNNBERG.

LÖNNBERG: Mammals p. 18, in SJÖSTEDT's Kilimandjaro Meru Exp. 1908.

We had bad luck with Spotted Hyenas because our steel-traps were too weak, and they wrenched themselves free again. But after my return home Mr. R. J. CUNNINGHAME kindly sent me a skull of a male Spotted Hyena from South Sotik, British East Afrika. The skin had unfortunately been lost. This skull proves to be of the broad type, according to CABRERA's¹ division of the species, the breadth across the upper carnassials being even greater than the length of the lower tooth-row exclusive of incisors. The ratio between zygomatic breadth and condyloincisive length is 72 %. The palatal opening is very broad (conf. table of measurements below).

It is of course difficult to base the identification of a Spotted Hyena on a skull only but this skull resembles rather closely that of the type of *C. panganensis*.² Most of the small differences may be explained as individual variation or as due to difference in age. The upper carnassial tooth of the skull from the Sotik is considerably smaller than that of the type of *C. panganensis*, but a young cotype of the latter has almost as small carnassial.

Basal length of skull	223	mm.
Condyloincisive length	238	»
Greatest zygomatic breadth	172	»
Least interorbital width	53	»
Distance between upper ends of <i>foramina infraorbitalia</i>	57	»
Least postorbital width of skull	40	»
Width of palatal opening at <i>sutura palatopterygoidea</i>	30	»
Distance between outer sides of outer upper incisors	36	»
Distance between the <i>bullæ</i> at the foramen at the middle of the inner side	28	»
Breadth across upper carnassials ³	107	»
Length of upper carnassial	34	»
Length of p ^s	21	»
Length of lower carnassial	26	»
Length of upper tooth row exclusive of incisors	97,5	»
Length of lower tooth row exclusive of incisors	104	»

¹ Proc. Zool. Soc. London 1910, p. 95.

² I take this opportunity to correct an unfortunate misprint in my paper quoted above. In the table of measurements l. c. p. 19 is written »Basilar length of skull 249 mm.», shall be 229 mm.

³ This measurement corresponds to that of the type of *C. panganensis*, but that quoted in the table of measurements of this species (l. c. p. 19) »distance between upper carnassial teeth at their posterior end 91,3 mm.», is another measurement taken as quoted at the extreme ends of these teeth!

Hyæna schillingsi MATSCHIE.

MATSCHIE: Sitzber. naturf. Freunde. Berlin 1900, p. 55.

A specimen of Striped Hyena from the Kedong Valley procured for comparisons sake from Mr. KLEIN at Nairobi agrees perfectly as well in colour as in pattern with MATSCHIE's description of the type and with a specimen from the Kilimanjaro district. Especially the two broad stripes over the hind quarters is a good distinguishing characteristic from the following race. The type locality of this species is the plains around Kilimanjaro but it is evidently widely distributed over the Masai steppe, while the following race takes its place further north.

Hyæna schillingsi rendilis LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8, Vol. IX, p. 64.

With regard to the dimensions of the skull this Hyena closely resembles the Striped Hyena of the Kilimanjaro district named *Hyæna schillingsi* MATSCHIE.¹ The width of the palatal opening between the *suturæ palatopterygoideæ* is even somewhat narrower (conf. the accompanying table of measurements) than in *H. schillingsi* and *H. hienomelas bergeri* MATSCHIE in which two races this measurement is narrower than in all other described races of Striped Hyenas, in which it at least amounts to 21 mm. according to MATSCHIE.² *H. hienomelas bergeri* differs from this new race in the same points as from *H. schillingsi* viz. by greater interorbital breadth, greater length of the posterior portion of the head, and the direction of the postorbital processes as set forth by the author quoted.

The dimensions of two skulls of *H. s. rendilis* are recorded in the accompanying table of measurements together with those of a typical *H. schillingsi* from Kilimanjaro.

	<i>Hyæna</i> from north of Guaso Nyiri		<i>Hyæna schillingsi</i> from Kili- manjaro
	♂	♀	
	mm.	mm.	mm.
Greatest length of skull	234	197	228
Basicranial length	200	173	195
Zygomatic breadth of skull	148,5	117	144
Least interorbital breadth	48,5	38	44,5
Least breadth of skull behind postorbital processes	38	36	34
Greatest breadth of skull in the occipital region	81	73	79
Breadth of skull across canines	50	45	51
Breadth of skull across anterior lateral cusp of p ⁴	83	73	83
Distance between bullæ at <i>foramina lacera media</i>	22,5	22	21

¹ Sitzber. Naturf. Fr. Berlin 1900, p. 55.² ibidem Berlin 1910, p. 365.

	<i>Hyena</i> from north of Guaso Nyiri		<i>Hyena schillingsi</i> from Kili- manjaro
	♂	♀	
	mm.	mm.	mm.
Distance between <i>foramina infraorbitalia</i>	46	41,5	47
Width of palatal opening at <i>sut. palatopterygoidea</i>	17,5	16,5	18
Breadth of both nasals in front	22	20	20,5
Distance from posterior palatal margin mesially to end of <i>proc. pterygoideus</i>	44	38	47
Distance from posterior palatal margin to <i>foramen magnum</i> mesially	89	75	89
Length of palate	105	94	101
Length of <i>p⁴</i>	30	30	30

It is chiefly with regard to its colouration that this *Hyena* differs from its relative at Kilimanjaro. It is generally of a much paler hue. The snout is less dark, and the forehead is pure grey without any such brownish tint as in *H. schillingsi*. The sides of the neck from below the ears and backwards are almost pure white. The black longitudinal stripe on either side of the mane on the upper neck, which is strongly developed in *H. schillingsi*, is much less conspicuous in the new race and is not continuous but more or less broken up in a series of short streaks. The mane itself is very much lighter than in *H. schillingsi*, in which the general colour of the mane, when not erected, is dark brown which is produced by the long blackish brown tips and the brown rings on the individual hairs. In this race again the dark, brown tips do not by far cover the pale brownish to whitish ground colour. The single hairs of the mane are coloured in such a way that the base is almost white for about 4—5 cm., then follows a 5—7 cm. broad zone of very pale brownish, then again 2—3 cm. whitish and finally the dark maroon brown tips 4—6 cm. but in consequence of the great thinness of the latter compared with the middle and basal portions of the hairs they do not cover much with their dark colour. A probably important difference from *H. schillingsi* is that in the latter there are often, if not always, several short brown rings alternating with pale in the middle portion of the hair, while in the present race as described above it is only one broad and much paler brownish ring. The tail of the new race is very pale because the dark tips of the hairs are very short and give hardly any impression of dark colour except at the apical end, and the general colour of the hair is buffish white. The general colour of the sides of the body is whitish. The black stripes over the shoulders and hind quarters are decidedly narrower than in *H. schillingsi*. The same is also the case with the transverse stripes on the flanks, although they perhaps stand out more boldly in consequence of the lightness of the ground colour. In *H. schillingsi* there are two broad black stripes running from the dorsal crest down over the hind quarters, but in the present race there are three such stripes, although much narrower. The middle one of these stripes is less strongly marked than the anterior and posterior. The stripes on the sides of the body are not very sharply defined but have a certain tendency to join to a network or dissolve into spots. The stripes across the legs

are not so strongly marked as in *H. schillingsi* and are, especially in the older specimen, more broken up into spots. The ground colour of the legs is paler than in *H. schillingsi*. The hind legs of the older specimen is pale ashy grey without any brownish tint in strong contrast to a *H. schillingsi* of similar age. The feet are pale earth brown. The chin is blackish and the large black patch on the under side of the neck is also present but the interspace between these two areas is light hoary grey, not brownish grey as in *H. schillingsi*.

From this description may be seen that almost every part of the body is differently coloured to the corresponding part of *H. schillingsi*, and sometimes the pattern as well is somewhat different. This difference is of course not very deep-going, but on the other hand sufficient to prove the existence of a separate geographic race. Only two specimens have been at my disposal but as one of them is a young adult female and the other a male, and both are closely alike I think the reliability of the description is warranted by this.

The specimens mentioned were caught in the thornbush country north of Guaso Nyiri where Striped Hyenas appeared to be rather common but by no means easy to catch.

In Nairobi I had the opportunity of seeing three skulls of *Proteles* from »Northern Guaso Nyiri» but unfortunately we had no opportunity of securing any specimens ourselves.

Viverridæ.

Genetta dongolana HEMPR. & EHRENB.

HEMPRICHT & EHRENBURG: Symb. Phys. 1832, I, 2.

When reviewing the Genets in the year 1902 MATSCHIE¹ divided the species with shaggy tail and black marks on the hind legs in two groups one with »Sohlen der Vorderfüsse schwarz», and the other with »Sohlen der Vorderfüsse nur wenig dunkler als deren Oberseite». In either of these groups one species from North Eastern Africa is recorded viz. in the latter the Nubian Genet, *Genetta dongolana* HEMPR. & EHRENB., and in the former a »Weissfüssige Genette, *G. spec. von Harar in Nordostafrika*». The latter was shortly afterwards named »*G. hararensis*» by NEUMANN² who, however, did not add anything of value to MATSCHIE's notes in his »key». In the »Zoology of Egypt» by ANDERSON and DE WINTON a Genet from Suakin is carefully described under the name of »*Genetta dongolana* HEMPR. & EHRENB.»³ but this specimen is said to have »the under surface of the fore feet black». By

¹ Verh. d. V. Internat. Zoologenkongress. Nachtr., p. 1128—1144. Berlin 1902.

² Sitzber. Naturf. Freunde. Berlin 1902, p. 183.

³ L. c. Mammalia, p. 188.

this statement it is made probable that the specimen from Suakin belongs to the same race as the type specimen of »*G. hararensis*». This is the more probable as I have obtained from a somewhat intermediate locality viz. Gheleb in Eritrea two specimens of Genets with shaggy tail and extensive black markings on the hind legs, collected by Rev. Mr. K. G. RODÉN, which have the under surface of the fore feet quite black in one, and blackish in the other. Then remains the question whether these specimens can be referred to *G. dongolana* HEMPR. & EHRENB. or if »*G. hararensis*» constitutes a constant geographic subspecies distributed along the coast districts of the Red Sea. More than a subspecies it certainly cannot be. MATSCHIE has undoubtedly had access to the type of *G. dongolana* HEMPR. & EHRENB., and it must therefore be assumed that this type has »Sohlen der Vorderfüsse nur wenig dunkler als deren Oberseite». The question is then whether this characteristic is constant or not. That the degree of darkness is variable is already proved by the two Genets from Gheleb, Eritrea as mentioned above. It is still more proved by two Genets of this group caught by this Expedition in the dry thornbush country north of Guaso Nyiri below Chanler Falls. They were trapped from the same camp resp. $^{12}/_3$ and $^{15}/_3$ 1911, and both are adult males. In one of these the under side of the fore feet is quite black on the outer side becoming gradually blackish grey and lighter grey towards the inner side and the tip of the middle finger. In the other specimen there is a black stripe along the outer side of the under surface of the fore feet but the hair around the pads of the finger tips are quite light.

It appears thus probable that in one and the same race of Genet the lower surface of the fore feet can be black or blackish in some specimens, and hardly darker than the upper surface in some other specimens.

According to MATSCHIE there are also some differences with regard to the pattern of the tail-marks between *G. dongolana*, and »*G. hararensis*». The former is said to have 10 dark rings, and the light rings in front of the tail-tip are broader than the dark ones (MATSCHIE l. c. p. 1140), whereas the type of »*hararensis*» has 8 dark rings and the light rings in front of the tail-tip narrower than the dark ones (l. c. 1139). The Genet from Suakin described in the »Zoology of Egypt» is said to have »eight black bars alternating with broad pale areas» — —but the artist has represented it on the plate with 10 black rings and the white rings broader than the black. The tail on the plate is thus of true *dongolana*-type according to MATSCHIE, the description has too small number of black rings.

The two Genets from Gheleb, Eritrea, have both of them 10 dark rings, although the last in one is rather slightly developed. In one of them all light rings are broader than the dark except that the second black ring from the tip is somewhat shorter than the light ring behind it. In the other specimen the second, third, and fourth black rings from the tip are a little shorter or narrower than the light rings behind them respectively, otherwise the light rings are broader than the dark.

In one of the specimens from Guaso Nyiri the black rings are narrower than the white except that the fourth ring from the end is somewhat narrower than the white behind it. In the other specimen from the same place the second black ring

from the end is decidedly longer than the white ring behind it, the third, and fourth black rings are subequal with, or a little broader than the white rings behind them, otherwise the white rings are broader than the black.

From these facts it appears evident that the relative dimensions of the black and white rings are not constant in these Genets, and consequently no specific characteristics can be based on them.

The type of »*G. hararensis*» is said to have »Hinterseite des Unterarms dunkelgrau mit hellen Haarspitzen», while *G. dongolana* shall have »Hinterseite des Unterarms fast so hell wie die Vorderseite» (MATSCHIE l. c. p. 1139).

ANDERSON's Genet from Suakin is said to have »the outer posterior surface of the fore limbs more or less black, with greyish hairs intermixed».

This is exactly the case with one of the specimens from Eritrea, in the other the posterior side of the fore limbs is not quite so dark.

In one of the specimens from Guaso Nyiri the hind surface of the fore limbs is darker than the front-side, although not so dark as in the paler of the Eritrea specimens. In the other specimen from Guaso Nyiri there is no perceptible difference in colour between the front- and hind-surface of the fore limbs. This characteristic is accordingly variable as well.

Under such circumstances it appears impossible to distinguish with certainty any different geographic races of this group of Genets from North Eastern Africa until much richer material has been obtained.

It must, however, be remarked that NEUMANN has added still more to the confusion by creating still another name¹ »*Genetta guardafuensis*» for a Genet from Eastern Somaliland, and as usual he has not given any description still less any measurements of the animal or its skull. He has simply stated that this so called species is »sehr ähnlich der *Genetta felina* THUNB. vom Cap aber durch kleinere und rötliche — bei jener stets schwarze — Fleckung unterschieden». This cannot be called a description,² especially when the subject belongs to such difficult genus as *Genetta*. To judge from the locality it might be possible that this »*G. guardafuensis*» belongs to the same geographic race as the Genet from Guaso Nyiri if it really is a separate race. If the statement of NEUMANN, however, that »*G. guardafuensis*» is quite similar to *G. felina* in other respects than the single characteristic mentioned, is correct *G. guardafuensis* should have the posterior surface of the fore limbs black and then it would differ from the Guaso Nyiri Genet.

The only thing NEUMANN has added to MATSCHIE's notes on »*G. hararensis*» is that he terms the hind surface of the fore limbs »black» (»schwarze Färbung») while MATSCHIE used the word »dunkelgrau», and that he says that this Genet possesses a »schwarzen Mittelfleck» on the chin. Such a black spot on the chin is not present

¹ l. c. p. 183.

² Everybody who has worked with East African mammals has often been confronted with the difficulty to guess what NEUMANN has meant with the numerous names he has so abundantly published, as a rule, with very insufficient and unsatisfactory descriptions, hardly ever with cranial measurements. Such things are very annoying and the knowledge about the fauna is certainly not promoted by such superficial proceedings.

in the Genets from Eritrea nor in the specimens from Guaso Nyiri. The latter have, however, the lower lips dark, and in one of them the whole chin has a dark shade. It is thus possible that this chin mark is not a constant characteristic.

Considering all I think the best thing for the present is to regard the Genets from Guaso Nyiri as belonging to the species *Genetta dongolana*. In such details as has not been already discussed they agree very well with the description published in »Zoology of Egypt» except that the »five narrow rufous lines on the back of the neck» are not so sharply defined, and much mixed with black tips to the hair.

The ground colour of the body is greyish white and the spots are rufous buff mixed with black. Five longitudinal series of spots can be discerned, the two uppermost of which have a tendency to become more or less confluent into stripes. The black crest is sharply defined, the length of its hair is about 5 cm., and twice as long as the other hair.

To prove the resemblance with regard to the cranial dimensions the measurements of the Suakin specimen recorded in »Zoology of Egypt» have been quoted side by side with the corresponding ones of the Guaso Nyiri specimens of this collection in the following table of measurements.

	Anderson's specimen from Suakin	Specimens from Guaso Nyiri, B. E. A., below Chanler Falls	
		♂ ¹	♂
	mm.	mm.	mm.
Condylobasal length of skull	—	—	85,5
Basal length	81	—	81,3
Zygomatic breadth	43	43,7	46
Palatal length	40	44,4	41,8
Breadth between tips of p ¹	9,5	10	11,6
Breadth outside p ⁴	26	28	27,5
Narrowest interorbital breadth	12,7	14	13,5
Breadth of braincase	30	29,3	28,8
Length of nasals (middle line)	15,3	18,8	15,6
Outside length of p ⁴	9,5	8,6	9

On the whole these skulls agree pretty well but the variability is proved to be rather great as is seen from the differences between the two male skulls from Guaso Nyiri for instance with regard to the length of the nasals. The difference in the length of the palate (2,6 mm.) in the two skulls from Guaso Nyiri is chiefly due to the difference in length of the skulls themselves. The length of palate is a little more than half the length of the skull, and if the difference in basal length of the skulls is about 4 or 5 mm., 2,6 mm. is only a natural difference in the palatal dimensions.

¹ This skull is between 4 and 5 mm. longer than the other from Guaso Nyiri but it is a little broken posteriorly so that the exact basicranial length cannot be recorded.

The skulls of the specimens from Eritrea are similar to those measured as above, but being both females they are a little smaller.

***Genetta suahelica* MATSCHIE.**

MATSCHIE: Verh. d. V. Internat. Zool. Kongr. Nachtr., p. 1143.

A specimen trapped at Meru boma $1\frac{1}{2}$ 1911 agrees quite closely with specimens collected at Kilimanjaro but is rather small. The specimens from Kilimanjaro vary a great deal in size, and the specimen from Meru boma is similar to the smaller of them.

Two young Genet kittens bought from the natives at Meru boma belong presumably to this species as well. We tried to raise these young animals but did not succeed. They could not eat even finely chopped meat, because they had no teeth, although they had a length of head and body amounting to about 23 cm. (+ tail 17 cm.), and a basicranial length of 45 mm.

I have also seen specimens from Kismayu evidently belonging to this species.

***Genetta stuhlmanni* MATSCHIE.**

MATSCHIE: Verh. d. V. Internat. Zool. Kongr. Nachtr., p. 1142.

A Genet trapped in bush at Embu boma $2\frac{6}{1}$, and another caught just within the edge of the primeval forest on the eastern slopes of Kenia $27\frac{1}{1}$ near a small river Kitwai, one days march from Embu boma belong to the same species and, as far as I can make out, to the one named as above.

The black spots which partly have a rufescent tinge in the middle are arranged in four longitudinal series. The spots in the upper three series are larger than those in the fourth. The dorsal stripe is intensely black and well developed from behind the shoulders and backwards. Eight light rings on the tail can be traced, at least on the lower side, but the outer 3 or 4 tend to become obsolete so that a considerable portion of the tail appears black. The fore legs and the frontside of the hind legs have about the same colour as the body, but the posterior surface of the hind legs are brownish black.

These Genets are rather small, and have much smaller skulls than *Genetta suahelica*. The nasals are also shorter as the following measurements indicate, but on the other hand the interorbital region is broader than in *G. suahelica*. For comparison with the latter the comparatively small specimen from Meru boma has been used.

	<i>Genetta suahelica</i> from Meru boma	<i>Genetta stuhlmanni</i>	
		Skull from Embu boma	Skull from E. Kenia ♂
	mm.	mm.	mm.
Condylobasal length	87,5	80,5	80,5
Basicranial length	82	76	76
Zygomatic breadth	41	44,5	40
Interorbital breadth	11	13	11,7
Length of nasals mesially	17,3	14	15
Front of canine to back of m ²	32,5	30,9	31,1
Longest diameter of p ⁴	8,3	8,4	8,5
Length of palate to gnathion	41,5	—	38,3

The name *Genetta stuhlmanni* has been based by MATSCHIE on material from Bukoba, and Mengo in Uganda. The skull has not been described, as far as I know, and the description (l. c.) is not very detailed, but I think that the identification above is correct. It is then of interest to see that a Genet which geographically belongs to the Central Lake district extends its distribution to the eastern slopes of Kenia and there meets the more eastern *G. suahelica*, and this zoogeographical fact is in accordance with several others in other groups of animals as well.

***Mungos sanguineus rendilis* n. subsp.**

It is connected with a considerable difficulty to ascertain to which race a specimen of small African Mongoose with black tail-tip belongs in consequence of the great variability of these animals. Some years ago a synopsis of this 'Herpestes gracilis group' was worked out by WROUGHTON.¹ In this the author quoted recognizes 6 species, and a number of subspecies which are divided in two groups according to size as expressed by the length of the hind foot. The next subdivisions are based on the shape of the skull and the colour. Now it appeared comparatively easy to use this key, but in certain instances difficulties arise. This is for example the case with the small Mongooses from the thornbush-country north of Guaso Nyiri. The length of the hind feet in the male specimens from this locality is about 56—57 mm. (without claws) which ought to refer them rather to the larger *M. sanguineus* group, but in adult (even old) females from the same locality the same dimension is only between 51 and 52 mm. (without claws). This measurement agrees thus nearer with the corresponding one of the *M. ochraceus* group. In addition to this the brain case as well of male as female skulls from the locality mentioned is rather strongly inflated anteriorly, and the postorbital constriction is sudden. The skulls resemble thus in this respect the *M. ochraceus* group according to WROUGHTON. As a conclusion of these facts it must be admitted that the limits between the *M. ochraceus*

¹ Ann. & Mag. Nat. Hist. 1907, Ser. 7, Vol. XX, p. 110.

and the *M. sanguineus* groups are not very sharp. The race which is to be described now, as it cannot be identified with any known form, appears to be intermediate, and its subspecific name is added to the species name *sanguineus* which is much older than *ochraceus*.

Upper parts of the whole animal grizzled, the hair being broadly annulated with buffish white, sometimes more inclining to ochraceous, and dark brown to blackish. The annulation of the hair tends to produce about 2 mm. broad, somewhat wavy, blackish transverse stripes which are visible on the posterior two thirds of the body, and sometimes as far forward as above the shoulders. The pale bands between these look broader than the black in consequence of the arrangement of the hair, although on the single hairs the dark rings are broader than the light. The hairs are about 13—15 mm. on the anterior, 15—17 mm. on the posterior parts of the back, single hairs being somewhat longer. Each hair has three alternating light and dark rings, the base being light, and the tip dark. The head is more finely, and the tail more coarsely grizzled. The hair of the latter has 4 or 5 pale rings the last of which often reaches the tip. The legs are grizzled, but the fingers are more or less uniform buff. The lower side is different in different specimens. A fully adult but not old male is uniform rather rufous buff all over the lower surface and on the inside of the hind legs, but the chin and lower neck is somewhat grizzled separated by a uniformly buff-coloured patch on the throat. In another male and a female, both old, the whole of the lower neck is grizzled, and the middle of the thoracic region is also grizzled. The ventral region and the inside of the legs which are uniformly coloured are dull buff. The general arrangement of the grizzled areas is similar to these latter specimens in a young male but the colour is still duller, pale greyish buff. The black tip to the tail is longest in the old male, about 13 cm. to the tip of the hairs, in the others it is only 7 cm. The hair of the tail is from 30 to 40 mm. The dimensions of the four specimens show some variability especially with regard to the length of the tail:

♂ old	length of head and body about	27 ¹ / ₂ cm.	of tail without hair	32	cm.
♂ adult	»	»	»	28 ¹ / ₂	»
♀ old	»	»	»	29	»
♂ young	»	»	»	27	»

	Old skulls with the nasal sutures obliterated (conf. Pl. II, fig. 3)	
	♂	♀
	mm.	mm.
Condylbasal length of skull	64	61
Basicranial length	61,5	57,5
Zygomatic breadth	33	29,5
Distance between outer sides of p ⁴ posteriorly	20,8	19,8
Distance from frontside of c to hindsurface of m ¹	22,2	21,6
Greatest diameter of p ⁴	7,1	7,2
Greatest diameter of m ¹	6	5,8
Least interorbital breadth	12,6	11,4
Least breadth at postorbital constriction	8,5	10

This Mongoose is probably nearly related to *M. s. ibeæ* but it is smaller, the length of the hind foot of the latter being 60 mm., to maximum 57 mm. in the present subspecies. With regard to the colour the Mongoose from the thornbush country north of Guaso Nyiri evidently is paler than its relative in the Kikuyu country. The skull is also smaller in the present subspecies than in *M. s. ibeæ*.

Perhaps there is also a close relationship between this Mongoose and *M. s. gracilis*, but the latter has a larger hind foot, longer tail and smaller skull. The colour is perfectly different as well. There is in these specimens from Guaso Nyiri no likeness whatever in colour with RÜPPELL's figure of *Herpestes gracilis*,¹ nor can they be termed »gelbgrau» (RÜPPELL l. c. p. 29), nor »pinkish drab» (WROUGHTON l. c. p. 111 & 116).

In spite of these differences there is no doubt that *gracilis*, *ibeæ* and the present specimens only represent geographical modifications of the same animal. This Mongoose was rather common in the thornbush along the northern bank of Guaso Nyiri below Chanler Falls.

Just south of Fort Hall in a place where high grass grew on both sides of the road I saw during the march at four different opportunities small Mongooses run across the road beyond range for the shotgun. As Fort Hall is the type locality of *Mungos gracilis ibeæ* WROUGHTON there can be no doubt that these animals belonged to the species mentioned which accordingly must be common there. A couple of times a glimpse of similar animals was seen in shambas near Kutu and at some other localities.

***Mungos sanguineus orestes* HELLER.**

HELLER: Smiths. Misc. Coll. Vol. 56 N:o 17 p. 15. Washington 1911.

A specimen closely agreeing with HELLER's description of the type specimen from Kenia of this Mongoose was caught at Meru boma $1\frac{1}{2}$ 1911. The measurements of the skull as well agree with those recorded for the type.

With regard to the shape of the anteriorly swollen braincase this Mongoose appears to be perhaps more nearly related to the *ochraceus*-group, although it is of large size, but all these Mongooses with black-tipped tail may most suitably be regarded as geographic races of one and the same type.

The type-locality of *M. s. orestes* is the »west slope of Mt. Kenia, altitude 8,500 feet». It was thus of interest to find it at Meru boma viz. at the northeastern corner of the forest region the centre of which is Mount Kenia. It forms thus evidently a race adapted to these dark forests with their greater humidity which explains the melanistic tendency in its coloration.

Its nearest relative may be *M. s. proteus* THOMAS from Ruwenzori which also is a dark Forest Mongoose.

¹ Taf. 8 fig. 2 in »Neue Wirbeltiere zu der Fauna von Abyssinien gehörig». Frankfurt a. M. 1835.

Mungos paludinosus conf. mitis THOMAS & WROUGHTON.

THOMAS: Proc. Zool. Soc. London 1902 p. 309.

A specimen from Nairobi has a dark rufous general colour produced by tan-coloured (Rép. de Couleurs 317.2) rings and tips to the black hairs. The feet are black.

With regard to the colour this specimen is rather similar to some specimens of *M. p. robustus* from Kilimanjaro, but with regard to cranial characteristics especially the smallness of the teeth and the bulla it approaches more closely to the Abyssinian *M. p. mitis* described by THOMAS 1902. This is proved by the following measurements:

	Nairobi ♂	<i>M. p. mitis</i> (THOMAS)
	mm.	mm.
Basal length of skull	93	95
Condylolincisive length	100	100
Zygomatic breadth	57	62,5
Interorbital breadth	20	21
Breadth of braincase	38,5	38
Mastoid breadth	40	40,5
Palate length from gnathion	57,5	56
Breadth of posterior palate	9 ¹	8
Greatest horizontal diameter of p. ⁴	11,6	10,8
» » » m. ¹	9,5	9,1
» » » m. ²	6	5,8
» » » p ₄	8	7,5
» » » m ₁	9,2	8,6
» » » m ₂	6	5,9

The corresponding measurements of the teeth of a *M. p. robustus* from Kilimanjaro are:

p ⁴	12,4 mm.	p ₄	8,2 mm.
m ¹	11,0 »	m ₁	10,0 »
m ²	6,8 »	m ₂	6,7 »

It is thus especially the molars which are much smaller than in *M. p. robustus* and agree with those of *M. p. mitis*.

As characteristic of the latter THOMAS has stated that the bullæ are »much lower and less prominent» than in the former. In the present specimen the distance in a straight line from the bony ledge above the bulla and to the middle of its ventral surface is about 11 mm., but in a specimen of *M. p. robustus* from Kilimanjaro it is about 14 mm. It appears thus as if this specimen in this respect as well

¹ The posterior palatal surface is only 7,3 mm. broad.

should agree with *M. p. mitis*, and it is probably a connecting link between the latter and *M. p. robustus*. More can hardly be said for the present when only one specimen is available.

Ichneumia albicaudus ibeanus THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1904 Ser. 7, Vol. XIII, p. 409.

The White-tailed Mongoose appeared to be not uncommon round Nairobi. It was often trapped in the section inhabited by hindooes and natives. I saw several living specimens in captivity. An immature male was obtained from Kikuyu.

Helogale hirtula ahlSELLI LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8, Vol. IX, p. 64.

Body and tail all over coarsely grizzled with ochre yellow, sometimes more buff, and black producing an olive brown general colouration. The yellowish sub-terminal rings about 3 mm. (Pl. V fig. 1). Head very dark grey produced by a fine whitish sprinkling on black ground colour, head and back are thus very differently coloured. Lower parts grizzled like the upper parts but duller, thus assuming a more brownish general tint. In two specimens out of three the fingers and toes tend to become pure black, in the third they are grizzled like the other parts. The extreme tip of the tail is sometimes more or less uniform rufous buff. The length of the hair of the back is generally 12—14 mm. but single hairs become 18 mm. or more. The not visible underfur is buffish. Length of head and body 250—260 mm. length of tail 180 to 200 mm. length of hind foot 54—56 mm. with claws, without 48—50 mm. (skin measurements). One specimen measured in flesh had head and body about 24 cm. and the tail about 18 cm.

	♂	♂
	mm.	mm.
Condylbasal length of skull	52,5	52,8
Basicranial length	49	49
Zygomatic breadth	33,3	32,2
Interorbital breadth	12,9	12,1
Greatest width of brancase above meatus audit.	24	23
Length of palate	27,5	26,3
Greatest diameter of p ⁴	6,1	6,4
» » m ²	4,5	4,5
Front of canine to back of m ²	18,8	18,5
Breadth between outer corners of p ⁴	19,5	19,5

There is no real cusp on the inner side of p^3 . The transversal diameter of m_1 is about 2,8 mm. its length is about 4 mm. The shape of the skull is shown on Pl. II figs 4 and 5.

In the year 1902 OLDFIELD THOMAS¹ reviewed the then known species of *Helogale*. According to this review and later on printed descriptions the hitherto known races differ from the one described above in the following points.

Helogale undulata PETERS is a much more rufous animal especially with rufous face, and »subtus undique rufus» as PETERS says.² The feet are also rufous. A pointed interior cusp to p^3 is present. *Helogale atkinsoni* THOMAS has »face, crown and back uniformly grizzled grey. (»Finely ticked».) Under surface dull greyish brown. Feet grizzled greyish proximally, fulvous on digits». It appears to be smaller than the present species the basal length of the skull being 41,7 mm. greatest diameter of p^4 5,1 mm.; breadth between outer corners of p^4 16 mm.³ Length of hind foot 41 mm. *Helogale victorina* THOMAS is »pale grizzled grey suffused with ochraceous yellow. Muzzle fulvous. Crown like back. Under surface from chin to anus dull buffy yellow, hands and feet also buffy yellow.» Tail buffy below. Greatest diameter of p^4 5,5 mm.⁴ *Helogale varia* THOMAS »General colour above finely speckled yellowish or buffy grey passing gradually below into deep buffy without speckling.» »A small patch on each side of muzzle running back to surround the eye brown or brownish rufous.» »Greatest diameter of p^4 5,2 mm.⁵ *Helogale hirtula* THOMAS. Hairs on the back 18—20 mm. General colour as in *H. atkinsoni* but more coarsely grizzled. Head and back appear, however, to be of the same colour to judge from the description. The rings of the hair said to be »white». »Under surface as in *H. atkinsoni* except that the belly has a more strongly marked tendency to rufous.»⁶ Diameter of p^4 5,9 mm.

Helogale macmillani THOMAS »General colour above between broccoli brown and Mars brown» — — — »finely ticked with minute buffy specks» — — — »less than 1 mm. in length». »Under surface near Prout's brown with scarcely any speckling.» — »Upper surface of hands russet.» »Front of canine to back of m^2 15,6 mm.⁷

Helogale parvula (SUNDEVALL). The small South African species is so much smaller and darker and geographically so distant from the present species that no nearer comparison between them is needed, neither with the allied *H. brunnula* THOMAS & SCHWANN from Transvaal which latter is uniform brown finely ticked with buffy whitish.

It may be quite clear from this review that the *Helogale* described above differs from all other species of this genus hitherto described. In spite, however, of the differences such as the general colour, the great length of the fur, the rufous-

¹ Proc. Zool. Soc. London 1902 p. 119.

² Reise nach Mossambique. Zool. Säugeth. p. 114.

³ Ann. & Mag. Nat. Hist. Ser. 6, Vol. 20, 1897, p. 378—379.

⁴ Proc. Zool. Soc. London 1902 p. 120.

⁵ L. c. p. 119.

⁶ Ann. & Mag. Nat. Hist. Ser. 7, Vol. XIV, p. 98.

⁷ Ann. & Mag. Nat. Hist. Ser. 7, Vol. XVIII, p. 300.

ness of the lower side etc. in *H. hirtula*, it is probably the nearest ally of this race, and I prefer to regard the present form as a subspecies of *H. hirtula*, which I name *H. h. ahlSELLi* for my friend Mr. RUDOLF AHLSELL who kindly and generously has assisted my expedition to Brit. East Africa.

The characteristics common to both *H. hirtula* and the new race are the following: the large size of the teeth in which the new race is superior even to *H. hirtula*; the presence of black hair at the claws, even if this is not quite constant; scantiness of the hair around the eye.

H. hirtula has been described from »Gabridehari, 60 miles west of Gerlogobi», Somaliland. This is rather far to the northeast from the place where this new race has been found, viz. in the thornbush country north of Guaso Nyiri at Njoro (about 1° N. lat.), and below Chanler Falls.

H. hirtula ahlSELLi is a rather common animal in that country. It lives in holes in the ground and takes also often its refuge into old termite hills. It appears to live in small colonies, and more than once I observed such a colony to my great astonishment in the same place where a colony of Ground Squirrels had their burrows. When running the *Helogale* looks, if seen from some distance, rather like a dark Ground Squirrel. They sit also sometimes upright on the haunches as such. As soon as danger approaches the animals disappear at once in their holes, and even wounded specimens are apt to reach the burrows, if not killed on the spot. I succeeded in shooting three old males.

Since the above was written THOMAS has described three more species and subspecies of *Helogale*.¹ Of these *H. vetula* from Lamu is »finely grizzled grey» and much smaller. »Hind foot 44 mm. *H. percivali* has the »head between burnt umber and vandyke-brown» which is completely different from the present race. It is also smaller. *H. hirtula lutescens* from Lake Rudolf is perhaps the closest relative to the present but it is somewhat smaller and appears also to differ in colour to judge from the description.

Felidæ.

Felis leo sabakiensis LÖNNBERG.

LÖNNBERG: Mammals in: Sjöstedts Kilimandjaro-Meru Expedition Upsala 1908, p. 22.

After having examined skulls of Lions obtained at Nairobi HOLLISTER has arrived to the conclusions² that they represented the same race which the present author a few years ago described from the Kilimanjaro district. Not having had any opportunity of shooting Lions near Nairobi I cannot add anything to HOLLISTER's communication except that I can confirm his statement about the variability of the colour of these animals as I saw several skins brought in to Nairobi. The amount of black in the mane of the males varies for instance a great deal.

¹ Ann. & Mag. Nat. Hist. Ser. 8, Vol. VIII, p. 724—725.

² Smithsonian Misc. Coll. Vol. 56 n:o 2. Washington 1910, p. 11.

When speaking about Lions Dr. S. L. HINDE, Provincial Commissioner in Mombasa, told me that these animals on the Athi plains formerly were much more diurnal in their habits than they are now. It was then a common sight to see Lions move about, and even catch their prey in broad daylight. The black in the mane of a crouching Lion resembled the scattered black stones on these plains.

Lions are still rather common on the plains and come sometimes rather close to Nairobi, where a gentleman was severely mauled by a Lioness last winter 1910—11. Several such accidents happen every year and end not seldom with the death of the victim. As His Excellency, Governor JACKSON told me the Lion hardly ever kills a man outright on the spot, even if the wounds afterwards prove fatal. Lionesses with small cubs may attack without provocation, otherwise it is only wounded animals, and such as have been pursued by hunters mounted on horseback and find that they cannot escape that become dangerous. It is the rule in British East Africa that a wounded Lion charges furiously, but there are exceptions even from that rule. One of the last days of my stay in Nairobi I heard from the Game Warden Mr. WOOSNAM that he had the day before pursued a wounded Lion in a papyrus-thicket¹, but it tried to escape until the last moment. When not wounded the Lions as a rule try to escape as quietly as Jackals as I observed a couple of times myself.

When there is abundance of big game the Lions do not often attack cattle. That they appear to be especially fond of Ostrich meat has been mentioned in my paper on the birds collected by this Expedition.

On the acacia steppe near Itiolu river I saw $\frac{5}{2}$ the remains of a fullgrown Oryx on which 5 Lions (2 females and 3 grown up cubs) had fed. These remains consisted of the head, the vertebral column with short stumps of the ribs, the pelvis, 3 of the legs, and pieces of the lungs. The ears and the nasal cartilages (as well as the cartilages of other parts) were completely gnawed away. The skin was also eaten except a big piece on the forehead. 65 paces from the place where these remains were found the Oryx had been killed, and there the missing foreleg had been left together with the stomach. It appears as if the Lions always use to remove the stomach and intestines of the prey soon after it is killed, and scratch sand and earth over them if the ground is such that it can be done. This has been observed by others as well as by myself. Sometimes the Lion appears to condescend to prey on rather small animals. On the southern side of Guaso Nyiri I found one day the remains of a Porcupine which my experienced gunbearer said had been killed and eaten by a »Simba».

How far north the distribution of this race extends I cannot say, but it is probable that it inhabits the steppe country even to the northeast of Kenia. A Lioness shot by Mr. Å. SJÖGREN near Itiolu river, a tributary from the south to Guaso Nyiri measured in total length 244 cm. 83 cm. of which was the length of the tail.

Lions are not uncommon on the acacia steppe south of Guaso Nyiri.

¹ A proceeding which is almost beyond the limits of bravery even for an experienced sportsman!

Felis leo somaliensis NOACK.

NOACK: Mitt. Naturhist. Mus. Hamburg IX Jahrg. 1891, p. 48.

North of Guaso Nyiri in the thornbush country I had the opportunity of shooting a male Lion with rather strongly worn incisors $^{11}/_3$ 1911. This specimen belongs evidently to the Somali-race. Its general colour is pale yellowish grey, whitish below. The lips and chin are whitish. There is a whitish spot above and below the eye. Most of the whiskers are pure white but some of the smaller on the upper lip are black. With the exception of the parts mentioned the face is sprinkled with dark brown. The mane is short the hair averaging about 10 cm., and it does not extend backwards beyond the neck. It is pale buff around the ears and on the sides of the fore-neck, forming a blackish brown crest along the upper neck and shading into dull brown on the sides of the hind neck. Along the back is a fine sprinkling of black, and on the posterior surface of the lower hams a blackish ill-defined streak. There are no spots except some few small ones on the inside of the hind legs. On the feet a few indistinct whitish stripes are seen. The tail is more sprinkled with black on the upper side than the back, and this increases to the short black tuft.

The length of head and body of this Lion was about 180 cm. measured in a straight line, and the tail without hair 82 cm. These measurements agree nearly with those recorded by MATSCHIE.

The dimensions of the skull are as follows:

Maximum length of skull	336	mm.
Condylobasal length	308	»
Basal length	287,5	»
Zygomatic breadth	218	»
Interorbital breadth	72,5	»
Least postorbital width	61	»
Width of platal opening at <i>ant. palatopterygoidea</i>	32	»
Distance between bullæ in front	28	»
» » tips of postorbital processes	98,3	»
Length of p ⁴	35	»

The Somali Lion is perhaps the smallest race of its kind, and it may therefore be of interest to compare its skull with that of the largest race of Lion, *F. leo capensis* (FISCH), and for this purpose I have selected a fine male specimen shot by the famous Swedish explorer J. F. WAHLBERG in »Caffraria interiore» 1845. The maximum length of this skull is 395 mm., its condylobasal length 340 mm. and its basal length 32,1 mm. Already by comparing these measurements with those above the remarkable difference in size is clearly understood, and also that the occipital crest extends further backwards beyond the condyles in the South African Lion (55 mm.) than in the Somali Lion (28 mm.) Even in male skulls of *F. leo sabakiensis*, which I saw in Nairobi, the occipital crest appeared more developed than in *F. leo*

somaliensis. If the occipital crests are not counted in, the difference in length between the South African and the Somali skull is 32 cm. (viz. the difference between their condylobasal measurements). The zygomatic breadth of the South African is 251 mm. The difference with regard to this dimension is thus about equal to the difference in condylobasal length. The interorbital breadth, on the other hand, is in spite of other dimensions even a little smaller in the South African (71,5 mm.) than in the Somali Lion, but the least postorbital width is larger in the former viz. 68 mm. The same is also the case with the width of the palatal opening at *sutura palatopterygoidea* viz. 40 mm., and the distance between the bullæ in front viz. 31 mm., although in a smaller degree in the latter case. The distance between the tips of the postorbital processes is 112 mm. in the South African Lion, thus larger than in the other, and naturally enough this is also the case with the length of p^4 which amounts to 40 mm.

The nasals are very different in the two races, those of the South African Lion being much longer measuring mesially 102 mm. against 80 mm. in the Somali animal. The greatest combined breadth of the nasals in front is resp. 71 mm. and 59 mm.

The length of the lower jaw from the back of the condyle to the anterior surface at the symphysis is in the South African Lion 257 mm., and in the Somali Lion 231 mm.

The former has thus more powerful jaws and in connection with this a stronger musculature which again has caused a stronger development of crests and bones on which these muscles are inserted.

The Somali Lion is apparently a »Bush-Lion» and this may account for the scantiness of its mane (Pl. VI fig. 1), such an ornament being decidedly not useful for an animal living in thick bush as it must get entangled in the thorns and twigs. The bush does not offer such an abundance of big game as the open plains, and this is perhaps the explanation of the inferior size of this race. It is, however, bold enough to prey even on big animals if it gets an opportunity. One day when we were camping at Guaso Nyiri below Chanler Falls one of our native gunbearers reported that he had found the remains of a female Giraffe which had apparently been killed by Lions when it came down to the river to drink. This seemed very strange and I went to the spot the following day. The remains consisted, however, then only of the skull and the picked bones left by the Hyenas and Vultures so that it was impossible to find out anything about how the animal had been killed. It is possible that the Lion(s) had sprung on the Giraffe when it stooped to drink, and it may be possible that it was sick or had been wounded before. The male specimen which I shot had a remarkably big belly and was much infested with ticks of the species *Rhipicephalus armatus*. It was nevertheless in very good condition and contained a great deal of fat which is highly appreciated by the natives.

The carcase of a Rhinoceros is sure to attract the Lions, and this is known to some sportsmen much to the injury of the Rhinos!

It was said that the »Bush-Lion» which lived on the mainland opposite Mombasa, in the thick bush there, was mane-less. It is thus possible that the Somali Lion extends its distribution as far southwards in the districts covered with thick bush.

Felis pardus LIN.

Unfortunately there was very little opportunity during the whole expedition to gain any direct knowledge about the Leopards of British East Africa, although these animals are by no means uncommon. No specimen was shot. Only once I saw with my own eyes a Leopard, and then I had no weapon. This happened in the thornbush country near the water place Njoro north of Guaso Nyiri ^{24/2} 1911. Mr CUNNINGHAME and I were returning to the camp in the afternoon, and we were walking along a game path. CUNNINGHAME went a few steps in front of me and had already passed the thornbush from which the Leopard jumped out, hardly two metres from the path on which we were going. My gunbearer had unfortunately stopped behind for a moment, and the animal thus disappeared with long leaps unmolested as CUNNINGHAME unfortunately missed with snap shot. I had only time to state that it was a large specimen with a rich rufous colouring, although one could have expected to find a pale form in this arid country.

The characteristic hoarse gnarling sound with intervals (somewhat similar to that produced »by sawing a piece of thin wood with a coarse toothed saw» as Pocock says)¹ was heard during the nights now and then at Njoro and on the acacia steppe at Lekiundu river.

In the forests of Kenia as well the Leopards are common. I heard from an Englishman who had a grant to collect rubber on the eastern slopes of Kenia, that the Leopards within short time had snatched away three dogs from him. In other places as well I heard similar accounts proving how fond the Leopards are of dogmeat.

It is generally believed that there are two kinds of Leopards in British East Africa a large and a small race. It is also spoken about a small-spotted and a large-spotted race. Although I have not got material to express a definite opinion I think it must be observed that the difference in size partly can be explained by the great difference between the sexes, the males being much larger than the females. The condylobasal length of an old male Leopard from Gheleb, Eritrea (received from Rev. K. G. RODÉN) is, for instance, 192 mm. while the same measurement in females from the same locality (also received from the same gentleman) is from 167 to 175 mm. Partly the difference in size also may be due to the greater or less abundance of food. The Provincial Commissioner Dr. HINDE has drawn my attention to the fact that according to his experience the Leopards in the forests and at the edge of the forests were larger than those of the open plains, and he regarded this to be due to the greater quantity of food which was available to the former than to the latter.

¹ Proc. Zool. Soc. London 1907 p. 677.

As regards the pattern it is a fact that as well small-spotted as large-spotted Leopards occur in Brit. East Africa. I have seen skins of both kinds there, and

Fig. 2. A large-spotted Leopard from Brit. East Africa.

the Swedish ethnographer K. G. LINDBLOM, Phil. Cand., has sent home four skins with both patterns. It is difficult to form any opinion concerning the value of these two patterns. The large skins appear to have larger spots than the small skins.

Thus the big male specimen from Eritrea mentioned above has larger spots than the smaller females without, however, directly deserving the name »large-spotted». The large-spotted skins (conf. Fig. 2) sent home by LINDBLOM are larger than the

Fig. 3. A small-spotted Leopard from Brit. East Africa.

small-spotted ones (Fig. 3). The number of the spots counted transversely at the middle of the body appears to be about equal in both. The size of the spots may accordingly in East African Leopards stand in connection with the size of the animal only and thus be without value as a racial characteristic.

A skin of a Leopard from Kismayu sent home by Rev. Mr. ENGBAHL is comparatively small and has small spots.

In a similar way as the spots are different in size in Leopards from the same country the ground colour as well is found to be very variable. In a skin from Machakos the ground colour of the back is (perhaps a little more rufous than) »tan» (Rép. des Couleurs 317,¹) fading gradually down to »yellowish buff» (Rép. des Couleurs 310,²) on the lower flanks while the centre of the rosettes even there is »bistre» (Rép. des Couleurs 328,¹). In another skin of a similar pattern, and which looks quite fresh (not faded), also from Brit. East Africa and probably from no distant locality as it also has been sent home by Mr. LINDBLOM, the darkest ground colour of the back is »yellowish buff» (Rép. des Couleurs 310,²) fading to creamy white on the flanks where the centre of the rosettes is pale »yellowish buff» (Rép. des Couleurs 310,¹). The difference between these two skins is thus very striking, and the individual variation very great.

The four skins from Eritrea are less rufous than the most bright-coloured from British East Africa but not so pale as the palest from there.

As it is difficult to decide whether there is one or two varieties of Leopards in East Africa it is uncertain what name is to be applied to East African Leopards. Following MATSCHIE I have once called¹ a Leopard from Kilimanjaro »*Felis pardus nimr* (HEMPR. & EHRENB.)». This was, however, a mistake as the name »nimr» originally had been given to a much paler animal which is said to have been — — — »flavescente albida, dorso medio levius fulvescente, ocellis e macularum nigrarum quaternarum quinarumve annulis in medio tantum corpore notata, areolis annulorum fulvescentibus» — — —. The coloured plate in HEMPRICHT & EHRENBURG's »Symbolæ Physicæ» show a Leopard »Ex Arabia felici» and it is much paler even than the palest specimens from Eritrea and the palest from East Africa. I suppose therefore that the name »nimr» cannot be used for any African Leopard.

In the year 1900 O. NEUMANN created a new name »*Felis leopardus suahelicus*»,² because »die grossgefleckte ostafrikanische Form des Leoparden hatte bisher noch keinen Namen»(!). Not a single word of description is added, and such a proceeding of naming an animal without any diagnose ought to be repudiated. The difficulty of finding out what this »*F. l. suahelicus*» is meant to be is the greater as no certain type locality is indicated but four different places are enumerated so widely distant as Tanga and Uganda. It is thus no wonder that LYDEKKER when figuring³ the skin of a large-spotted Leopard from Uganda is quite uncertain whether it is identical with »*suahelicus*», or not. LYDEKKER's specimen proves to have an unusually short tail. From Ruwenzori CAMERANO has described a large-spotted Leopard and given it the name of *F. p. ruwenzori*. This one has a short tail, and if this characteristic proves constant LYDEKKER's specimen may be counted to this race. From

¹ Wiss. Ergebn. d. Schwed. Zool. Exp. Kilimandjaro-Meru 1905—1906 unter Leitung von Prof. Dr. YNGVE SJÖSTEDT. 2. Mammals, p. 23.

² Zool. Jahrb. Abth. Syst., Bd. 13, Hft. 6, p. 551.

³ Proc. Zool. Soc. London 1907, p. 784.

my material, however, it will appear as if the big large-spotted skins had a comparatively short tail independent of from which locality they have originated. Thus if the tail is laid forward along the middle of the back it reaches with the tip to above the shoulders as well in the big and comparatively large-spotted skin from Eritrea as in the two big and large-spotted skins from British East Africa. On the other hand in the smaller and small-spotted skins the tail is, as a rule, longer and when laid as above it reaches usually further forward with the tip to the middle of the upper neck, but there are exceptions from this rule so that in some small-spotted specimens as well the tail is comparatively short.

From this discussion it is apparent that the question about eventually two races of Leopards in British East Africa cannot be solved for the present. More material is needed and especially material with indication of sex and age. It is of course then also impossible to say now which subspecific name ought to be applied to this or these Leopards.

The small Leopard of Somaliland has been called *F. p. nanopardus* by THOMAS.¹ The flat skin of the type specimen, an old female, is only 1070 mm. and none of my skins is so small, nor is there any with so short tail as 580 mm. as that of the female *nanopardus*.

I wish at this opportunity to draw attention to the fact that it is very easy to ascertain whether the tail of a Leopard is complete or intact at the tip, because every such tail is provided with a spur or nail at the extreme end, homologous with that at the end of a Lions tail about which so much has been spoken (conf. Fig. 4 a & b).

Fig. 4. The spur at the tip of the tail of an East African Leopard. a dorsal view; b from the right side. Three times enlarged.

***Felis capensis hindei* WROUGHTON.**

WROUGHTON: Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, p. 205.

A specimen from the bush steppe near Thika river and not far from Blue Post appears to agree with WROUGHTON's description of this race of Serval. The present specimen is, however, a little longer, head and body measuring about 84 cm, and its tail is somewhat shorter, about 26 cm. without hair. But as it is a female its skull is not large, and the measurements of the same agree with those recorded by WROUGHTON.

¹ Ann. & Mag. Nat. Hist. 1904, Ser. 7, Vol. XIV, p. 94.

	♀ from Thika river	WROUGHTON'S specimen ♂
	mm.	mm.
Greatest length of skull	114	120
Basilar length	95,5	97
Zygomatic breadth	76	81
Combined length of p ³ and p ⁴	20	22
Length of upper carnassial	13	13
Breadth of upper carnassial	5	6
Length of lower molar	9,5	9,5
Length of bullæ	22	23

A skull of a male Serval from Natal in this museum has larger dimensions even than WROUGHTON's type specimen of the present race. The basicranial length of the Natal specimen is about 107 mm., zygomatic breadth 88 mm., combined length of p³ and p⁴ 23 mm., length of bullæ 27 mm. The last dimension is the most striking.

WROUGHTON's type was from Machakos, Brit. East Africa, but other specimens are recorded in Brit. Museum from Aberdare Range. The place where the present specimen was collected is situated some distance north of the type locality. The range of the subspecies extends, however, also southwards to the Kilimanjaro district which is proved by a skin obtained by SJÖSTEDT from natives in that country and which displays the same general pattern of colouration as the specimen from Thika river.

The latter specimen was observed in the forenoon ²⁰/₁ 1911 skulking through long grass but was betrayed by its long ears visible above the grass. Mr. Å. SJÖGREN and I started to go on either side of it so as to intercept it, and the former got the opportunity of shooting it.

The geographical distribution of the different races of Serval are imperfectly known as yet. The following contribution to the knowledge of this may therefore deserve to be published. Some short time ago I had the pleasure of receiving from Mr. A. SANDBERG a skin and a skull of a female Serval obtained near Pweto (Mpueto) in Belgian Congo at the northern end of Lake Mweru. This Serval agrees with regard to colour and pattern very closely with *Felis capensis beiræ* WROUGHTON¹ from Beira, Portuguese East Africa. The skull as well as the teeth are smaller than the corresponding parts of the type of *F. c. beiræ* as the following comparison indicates but this is possibly due to difference in sex.

¹ Described in the same paper as *F. c. hindei*.

	WROUGHTON'S type of <i>F. c. beiræ</i>	SANDBERG'S female specimen from Pweto
	mm.	mm.
Greatest length of skull	128	118
Basilar length	108	99,5
Zygomatic breadth	91	74,5
Combined length of p ³ and p ⁴	26	23,5
Length and breadth of upper carnassial	16 × 8	14,5 × 6,8
Length of lower molar	12,3	11,7
Bullæ	26,5	25,2

As the differences between the sexes of *F. c. hindei* are not so great (conf. above) as between these skulls referred to *F. c. beiræ* it is possible that when more material is available the Serval of Pweto will prove to be a small-headed and small-toothed subspecies of its own, although very closely allied to *F. c. beiræ*. The interesting thing is, however, that a small-spotted and pale Serval occupies a district, Beira—Lake Mweru, which separates the native country of the large-spotted *F. c. hindei* (Brit. and Germ. E. Afr.) from the South African home of *F. c. capensis*, which also is comparatively large-spotted.

***Felis ocreata* GMELIN subsp.?**

At Juja farm when looking for small birds I saw one evening a Wild Cat in rather high grass but owing to the small shot in my gun I failed to kill it. Mrs. MC MILLAN told me that the wild Cats interbred with the domesticated Cats at Juja farm.

A glimpse of a Wild Cat was also seen in high grass at Kagio between Fort Hall and Embu boma.

Mr. HAMPSON of Nairobi showed me two skins of Wild Cats trapped at Escarpment.

This species is thus probably to be found in suitable localities a little everywhere in Brit. East Africa but difficult to obtain. Without material for comparison it is impossible for me to say to which subspecies the Wild Cat of Brit. East Africa belongs,¹ but Pocock has expressed as a supposition that a Cat caught at Nyiri near Fort Hall (not in Uganda!) belongs to the race *F. o. ugandæ* SCHWANN (conf. Proc. Zool. Soc. London 1907, p. 668).

¹ In this connection I am able to add a little to the knowledge about *Felis ocreata mellandi* SCHWANN (Ann. & Mag. Nat. Hist. ser. 7, Vol. XIII, p. 423) of which a very fine male specimen has been presented to this Museum by Mr. A. SANDBERG of Bulawayo. This specimen corresponds fully with SCHWANN's description (l. c.) as far as it reaches, except that the underfur on the median line is not »dark brown or black» as is stated in the »key» (l. c. p. 426). It is black on the nape and fore-head but not on the body anywhere. It is there mostly dull cinnamon buff but in some places, as above the shoulders dull greyish brown. As SCHWANN's specimens were mutilated with regard to their tails I may state that the tail is rather long, measuring in the tanned

***Felis caracal nubica* (FITZINGER) MATSCHIE.**

MATSCHIE: Säugethiere Deutsch-Ost-Afrikas. Berlin 1895, p. 67.

I did not see any living Caracal during the expedition but in Nairobi I saw two skins from the Kedong valley and purchased one of them for the sake of evidence, although it was not in good condition, but there was a skull to it, the measurements of which are given below:

Greatest length of skull	114 mm.
Basicranial length	96 »
Zygomatic breadth	77 »
Greatest length of nasals (laterally)	27 »
Least interorbital width	23 »
Breadth across postorbital processes	46 »
Least postorbital width	33 »
Combined length of p ³ and p ⁴	23,5 »
Length of p ⁴	14,2 »
Length of bullæ	24 »

As I do not have sufficient material for comparison I can neither confirm nor contradict MATSCHIE's views about the East African Caracal but have to leave that to the future. His description of the colouration agrees with the present specimen which, although fully adult, displays quite visible spots on the lower side.

***Cynælurus jubatus guttatus* (HERMANN).**

MATSCHIE: Die Säugethiere Deutsch-Ost-Afrikas, p. 70.

Cheetahs were observed a few times in different localities. In January I saw one at a great distance running with great speed over the steppe not far from Nairobi. South of Guaso Nyiri I saw a specimen in high grass which hid the body, and in spite of its small head it looked like a Lioness. A male specimen was shot ⁸/₂ near Lekundu river, south of Guaso Nyiri, by Mr. Å. SJÖGREN who permitted me to keep the skull for the collection. The dimensions of this skull are as follows:

skin 36¹/₂ cm. It has a black tip and two subterminal black rings well developed, and traces of others. As the skull of this race is unknown the following measurements may be given.

Total length of skull	105 mm.
Condylbasal length	95 »
Basicranial length	88,5 »
Zygomatic width	75 »
Width of brain-case	49 »
Least interorbital width	19 »
Length of nasal mesially	23 »
Fossa lacrymalis to tip of nasal laterally	20 »
Greatest length of bulla	23,5 »
Front of canine to back of pm ³	32,4 »
Length of pm ³	12,6 »

Condylobasal length	160 mm.
Basal length	151 »
Zygomatic breadth	130,5 »
Interorbital breadth	43,5 »
Least postorbital breadth	57 »
Distance between postorbital processes	80 »
Length of nasals mesially	44 »
Greatest combined breadth of nasals in front	33 »
Length of p ⁴	21,6 »
Distance between bullæ in front	20,5 »
Width of palatal opening at <i>sut. palatopterygoidea</i>	13,4 »

This skull offers the strange anomaly that p⁴ and m¹ are entirely missing on the right side, and there is no trace of any alveole, nor of any healed wound on the jaw bone so that this defect is evidently inborn.

The Cheetah in question was infested with ticks of the species *Rhipicephalus armatus* which never have been found on this animal before.¹

Glires.

Sciuridæ.

Heliosciurus keniaë NEUMANN.

NEUMANN: Sitzber. Ges. Nat. Freunde. Berlin 1902, p. 176.

In the journal quoted O. NEUMANN has shortly described a Squirrel from Kenia without giving any measurements of the animal or its skull. It is thus chiefly for geographical reasons that two Squirrels obtained 28th of Jan. in the primeval forest on the eastern slopes of Kenia are referred to this species. Five more Squirrels shot in the forest at Meru boma and a sixth from a forest two hours march to the north of the latter locality are quite similar to those from the Kenia forest. The general colour of the upper parts is very dark olive brown. The hairs are black with shiny black tips, a subterminal dull yellowish white ring, and a lower whitish ring which often has a more or less strong tint of fawn. The underfur is richly developed, long and reaching the level of the lower light ring. The underfur is broadly tipped with fawn (in some specimens more ochraceous, in some others more reddish which blends together with the lower light ring of the hair. Basally the underfur is black. The lower side is dark brown and the hairs are ringed with fawn, sometimes with yellowish tan colour (»Rép. de Couleurs» 315). In some specimens hairs with whitish rings are found mesially and on the inside of the hind legs, but even in such specimens the majority of the hairs are ringed with fawn or yellowish. From the throat a white patch extends to between the fore legs. This white mark which NEUMANN

¹ Conf. L. G. NEUMANN: Ixodides. Ark. f. Zool. Bd. 7, n:o 24, p. 6. Stockholm 1912.

has mentioned as existing in the single specimen on which he based the name is present in all my specimens.¹ Around the eyes a more or less defined fawn coloured ring is to be seen. The sides of the head is otherwise nearly similar in colour to the lower parts. The hair of the tail is black with white tips and three yellow rings. The colour of these rings is, when the tail is in fresh pelage, most similar to »Mars yellow» (»Rép. de Couleurs», 316), sometimes more yellowish tan, sometimes inclining to fawn. The tip of the tail looks almost black because the white tips to the hair are absent there and the light rings more or less reduced in number. The upper one is absent, and sometimes the two others as well.

The length of the skins (head and body) is 22—25 cm.

The length of the tail varies from 22 to 26,5 cm.

The length of the hind foot is about 48—50 mm. without claws.

The maximum length of the skulls varies from 52,5 to 55 mm. 54 being the usual size of old specimens.

	♂	♀	♀
	mm.	mm.	mm.
Maximum length of skull	54,2	52,5	55
Condylolncisive length of skull	47,2	47,1	48,5
Zygomatic width of skull	31	30,7	31,8
Least interorbital width of skull	16,7	16	17,7
Length of upper molar series	10	10,2	10
Length of diastema	11,3	11	12
Width of palate between premolars	7,5	7	7,7
Length of palate	21,4	21,6	23

All these specimens are fully adult with worn molars. They are from the forests near Meru boma. The specimens from Kenia have the same dimensions.

As the dark fur indicates, this Squirrel is an inhabitant of the dark and thick forest. Often two or three specimens were found in company, and at least once it was stated that both were adult females. They appear thus to be sociable independently of sex.

Paraxerus jacksoni (DE WINTON).

DE WINTON: Ann. & Mag. Nat. Hist., Ser. 6, Vol. XIX, 1897, p. 574.

and

Paraxerus jacksoni capitis THOMAS.

THOMAS: Ann. & Mag. Nat. Hist., Ser. 8, Vol. IV, 1909, p. 105.

The type specimen of *P. jacksoni* is stated to be from Kikuyu, while the type of *P. j. capitis* is from Nairobi Forest. I have collected six specimens from the

¹ Mr. R. B. WOOSNAM showed me a pair of dark Squirrels shot near Escarpment which had no such white throat mark. As they otherwise resembled the Kenia Squirrel it is probable that they only represented a melanistic phase of the same.

surroundings of Nairobi which thus must represent the latter subspecies. It is a little doubtful which exact locality is meant with »Kikuyu». Nairobi is also situated in the typical Kikuyu country. A little to the northwest of Nairobi a railroad station is named »Kikuyu», and somewhat still further northwest Escarpment station is situated which sometimes is called Kikuyu Escarpment. Nairobi lies at an altitude of a little more than 5000 feet, and Escarpment at about 8000 feet. At the latter place I collected two specimens of similar Squirrels. If there was any difference between the Scrub Squirrels of Nairobi and those of Kikuyu this difference ought to be still more pronounced in the corresponding animals from Escarpment, as Kikuyu with regard to geographical situation and altitude is intermediate between the two other places.

According to THOMAS *P. j. capitis* shall be paler on the body than *P. jacksoni* »and on the extremities ochraceous replaced by buffy, and buff by whitish». In the subspecies the under surface is said to be »soiled whitish or creamy white, the corresponding part in true *jacksoni* cream-buff or buff».

When comparing my specimens from Nairobi and those from Escarpment, I cannot find any perceptible difference in the colour of the upper parts of the darkest specimens from Nairobi and those from Escarpment, and in a similar way the extremities are just as richly coloured in some of the Nairobi specimens as in the others. The lower surface of the Nairobi specimens is, as a rule, paler and more whitish than corresponding parts of the Escarpment specimens but in some of the former it is distinctly buffy, and the difference from the latter in colour is then very slight if any at all. Considering the great variation in colour among Squirrels and the considerable bleaching of the fur to which they are subjected, as also is pointed out by THOMAS (l. c. p. 106), I do not believe it possible to maintain *P. j. capitis* as a different race on account of any difference in colour. It remains then to see if any other distinguishing characteristic can be found. DE WINTON states the length of the tail of *P. jacksoni* to be 155 mm., while THOMAS gives the same measurement of *P. j. capitis* as 187 mm. The longest tail of my two Escarpment specimens is about 15 cm., but in some of the Nairobi specimens it is very little more, and it seems hardly possible to base a subspecies on such small differences in length of such a variable organ.

From a geographical and topographical point of view there is no reason to suspect the presence of different Scrub Squirrels at Nairobi and any other place in the Kikuyu country.

These little Squirrels are on the move even in the middle of the day. They were usually found in bush, sometimes outside, sometimes in the middle of the thick and dark forest. Seldom they were observed in trees and then not in very high trees. At Escarpment station I shot my specimens among the remaining dry tops and branches of big cedars which had been cut down. When moving among the green foliage these Squirrels look quite greenish and are not easily seen. Their colour can certainly be called protective. When they are quietly running along a branch

in the dim light in thick bush they look more like an indistinct greenish shadow than a living animal and disappear very quickly out of sight.

***Paraxerus jacksoni kahari* (HELLER).**

HELLER: Smiths. Miss. Coll., Vol. 56, 1911, N:o 17, p. 2.

Five specimens of Scrub Squirrels were collected in the neighbourhood of Meru boma and the native village Kanyakeni, where they mostly were found in the shambas, which were surrounded by hedges and contained small trees planted to support the yams-vines. These specimens looked when alive very much like those collected around Nairobi. A closer examination reveals, however, that the Meru Scrub Squirrel which HELLER recently has named *P. kahari* has a considerably smaller skull, with shorter, less constricted preorbital region, narrower occipital region, shorter diastema and so on.

For comparison a few measurements of a skull from Nairobi and another of similar age from Meru boma are given:

	Nairobi	Meru boma
	mm.	mm.
Maximum length	43,8	40,7
Condylolincisive length	39,1	36,4
Zygomatic width	25,2	23,7
Least interorbital width	11,5	11,3
Length of upper molar series	7,5	7,3
Length of nasals	12	11
From behind postorbital process to anterior end of nasal suture .	24,2	22,1

***Xerus rutilus dabagala* (HEUGLIN).**

HEUGLIN: Nov. Act. Acad. Leop. Car. Nat. Cur., T. XXVIII, p. 4, Tab. 2.

or: ***Xerus rutilus rufifrons* (DOLLMAN).**

DOLLMAN: Ann. & Mag. Nat. Hist. 1911, Ser. 8, Vol. VII, p. 518.

On the southern side of Guaso Nyiri I observed Ground Squirrels in a patch of thornbush, but I could not obtain any specimens there. On the northern side of the same river they were more common, and I collected eight specimens at Njoro and other places, even below Chanler Falls.

My specimens agree with the description of *X. rufifrons* which DOLLMAN has based on specimens obtained in the same localities in which short time afterwards I collected some of mine. But, of course, there is some variation in colour even among specimens caught at exactly the same place. Some specimens are entirely pinkish brown (conf. below) all over back and sides with hardly any blackish sprinkling at all visible, not even on the back of the head, and with no difference whatever

between a dorsal area and the flanks. Such specimens agree very closely in colour with HEUGLIN's *Xerus dabagala* which, I suppose, is only a geographic race of *X. rutilus* as well, and, of course, closely related to this race, if different at all. DOLLMAN states (l. c.) that the skull of his *Xerus rufifrons* is »similar to that of *X. dabagala*», which makes the identity of these two still more plausible. The author quoted points out, however, some differences between *X. dabagala* and *X. d. rufifrons* which ought to be discussed. The first of these is that the back of the head of the latter is »slightly darker than rest of dorsal surface and speckled with bright yellow and orange-red», while according to DOLLMAN the head of *X. dabagala* should be »greyish brown». But the latter colouration of the head of *X. dabagala* is not mentioned in VON HEUGLIN's original description, nor displayed in the coloured figure of the type.¹ »Muzzle and forehead bright orange-red (tan colour n:o 2, 'Répertoire de Couleurs')» — — DOLLMAN writes about *X. rufifrons*, and then he adds: »The orange-rufous tint is much brighter and more vivid than in *X. dabagala*, where the muzzle is more the colour of the flanks». In one of my specimens from Njoro the colour of the muzzle and the forehead agrees perfectly with DOLLMAN's description and the colour-sample quoted, but in the others this is less apparent and the colour of the parts mentioned is more brick-red, especially on the forehead, even if the colour of the muzzle tends more or less to »orange rufous». In some specimens the general colour of the forehead is similar to that of the flanks, although the latter are sprinkled with white and therefore look paler. The general ground colour of my specimens lies between »Salmon flesh» (Rép. de Couleurs N:o 138, 4) and »Red ochre» (l. c. N:o 332, 1). In some specimens it is very close to the first, in some others to the latter. This ground colour is modified by the white tips of the hairs. In some specimens the colour of the median dorsal area, to different breadth in different specimens, has another colour, viz. speckled or grizzled with blackish and yellow. An examination of the hairs, which produce the colour of this dorsal area, proves that they are coloured according to a different pattern than the salmon flesh — red ochre and white-tipped hairs of the flanks of the same specimens. They are ringed in such a way that the tip is black, or dark brown then follows an ochre-yellow ring, and then again a black or dark brown ring. The dark tip is of different length, often quite short and it may then be broken or worn off and missing.

As these black and yellow-ringed hairs occupy an area of different extension in different specimens, and sometimes are absent, or at least mixed with the red ochre and white-tipped hairs it appears probable that they are the remains of another pelage which is to be shed, and has been fully shed in such specimens with uniform red ochre and white-tipped pelage.

DOLLMAN says that the bright orange-yellow (maize-yellow) »sides of muzzle, face and neck» of his *X. rufifrons* is »strikingly different from the white face and neck of *X. dabagala*». HEUGLIN says, however, about *X. dabagala* — — »rostri apice lateribusque gulæ in flavidum vergentibus», and this is also displayed by the coloured

¹ Nov. Act. Acad. Leop. Car. Nat. Cur., Tom XXVIII, p. 4, Tab. 2, fig. 3.

plate. In my specimens the colour of the parts mentioned varies from the palest maize-yellow to rather pronounced orange-yellow. Sometimes this yellow tinge extends all over the throat, but oftener the latter is white in the middle.

Considering the variation I think it is difficult to maintain any difference between *X. dabagala* and *rufifrons*.

The cranial measurements agree with those recorded by DOLLMAN in the largest specimens, but some fully adult are a little smaller.

	♀	♂	♂
	mm.	mm.	mm.
Greatest length of skull	52	52	54,7
Condylbasal » » »	47,7	47,2	51
Condylbasilar » » »	42,4	42,3	45
Zygomatic width	—	30	29,2
Interorbital »	14,2	15,7	15,5
Length of nasals	17	17,7	17
Widt of palate inside m. ¹	7	7	7,3
Length of upper cheekteeth	9,4	10	10,3

These Ground Squirrels lived in colonies and are rather shy. Their general colour agreed very well with the reddish gravel, and in the glare of the sun it was not easy to follow their movements with the eye, when they had been disturbed and ran for their holes. The vegetation around the colonies was always very scanty because the Squirrels had eaten almost everything palatable to them. The locality of a colony could therefore be detected already before any burrows had been seen. Sometimes a colony of *Helogale* was found at the same place.

Myoxidæ.

Graphiurus parvus dollmani OSGOOD.

OSGOOD: Field. Mus. Nat. Hist. Zool. Ser. Vol. X n:o 3, 1910, p. 15.

A specimen caught at Kutu (between Fort Hall and Embu boma) ^{24/1} 1911 agrees with regard to dimensions and colour with OSGOOD's description except that the blackish area around the eye is only little developed and not well defined. The skull is unfortunately broken so that all skull characters cannot be verified, but those about which information can be obtained are in accordance with the description of the type which is from Ulu Kenya Hills, British East Africa.

Muridæ.

Otomys irroratus elgonis WROUGHTON.

WROUGHTON: Ann. & Mag. Nat. Hist. Ser. 8, Vol. V, 207.

One male and three females of this Rat were trapped on the eastern side of Kenia partly at an altitude of 2,500 m. around a glade in the primeval forest, partly at an altitude of 2,700 m. among a vegetation of tall plants of different kinds on a hill which rose a little above the mixed forest and bamboo region. The temperature at this latter place was rather low, about + 2° C in the early morning, but the very rich fur of this species appears to give it full protection. About half of the visible portion of the upper incisors and the molars in both jaws (but not the lower incisors) are blackened probably by the food.

I believed at first that these specimens belonged to *O. i. tropicalis* THOMAS described from Kenia, but a closer examination of the skulls revealed that their dimensions agreed better with WROUGHTON's subspecies. Especially striking appeared to me the interorbital breadth which in my specimens is 4,5 mm., in the type of *O. i. elgonis* 4,6 mm, but in the type of *O. i. tropicalis* only 3,3 mm. Other dimensions as well agree with WROUGHTON's description of *O. i. elgonis*. The frontal crests are not strongly developed.

Otomys angoniensis elassodon OSGOOD.

OSGOOD: Field Mus. Nat. Hist. Zool. Ser. Vol. X no 2, p. 10.

Five Specimens which fully agree with regard to their measurements and skull characters with OSGOOD's description (l. c.) were collected at Kagio at Kutu (between Fort Hall and Embu boma) $\frac{23-25}{1}$, and at Guaso Nyiri on its southern side near Lekundu river and also near the ford on the Marsabit road. The type locality is Naivasha but it has also been recorded from »Rumruti, Laikipia plateau». My localities prove that it is to be found to the north and east of Kenia as well.

One or two of my specimens are a little paler and might with regard to colouration approach *O. nyikæ canescens* OSGOOD (l. c. p. 10), but the cranial measurements of these specimens as well, agree better with those of the other race as quoted above.

Dendromys insignis.

THOMAS: Ann. & Mag. Nat. Hist. Ser. 7, Vol. XII, p. 341.

An old male with nearly worn out teeth of this pretty Tree-mouse was trapped near Escarpment station among bush in the forest $\frac{12}{1}$ 1911. This specimen agrees very well with regard to size and colour with THOMAS' description (l. c.) of the type from Nandi. Specimens obtained at the native village Kazere northeast of Kenia

²⁵/₈, and near Kutu ²⁹/₈ are decidedly more greyish so that I was rather doubtful whether they belonged to the same race. They were therefore sent to British Museum for comparison and their identity was kindly confirmed by Mr. DOLLMAN. In the Kazere specimen the black dorsal stripe is also narrower than in the others. This may depend upon the fact that this one is comparatively young, although adult, but the variability in colour of this species appears to be rather great.

Thamnomys oblitus OSGOOD.

OSGOOD: Field Mus. Nat. Hist., Zool. Ser. 1910, Vol X n:o 3, p. 16.

A specimen of this kind was caught ¹⁹/₈ on the acacia steppe at Lekundu river south of Guaso Nyiri. Mr. GUY DOLLMAN has kindly examined the specimen and communicated the result.

This species has been described on a single specimen from Voi, Brit. East Africa. It is thus of interest to state that it extends northwards to the steppe country just south of Guaso Nyiri.

Epimys rattus LINNÆUS.

A series of this Rat was collected at Nairobi, where it was common. They were all of the blackish variety.

Epimys medicatus WROUGHTON.

WROUGHTON: Ann. & Mag. Nat. Hist., 1909, Ser. 8, Vol. IV, p. 540.

This species appears to be the common big Rat at Meru boma. Several specimens were trapped there as well when we passed on our way northward the first days of Febr. as when we were on our way back in the end of March.

One of my specimens has been compared with the type in British Museum by Mr. GUY DOLLMAN.

This species was originally described from Mumias, Brit. East Africa, but has afterwards been recorded from Rumruti and Baringo. Meru boma is, however, as yet the easternmost locality of the species.

Epimys hindei THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1902, Ser. 7, Vol. IX, p. 218.

A specimen of this Rat was caught near Ruiru river ³/₄ 1911. The type was described from Machakos, and the ROOSEVELT Expedition found it on the Athi and Kapiti plains. It has also been recorded from Kibonoto, Kilimanjaro by the present

author on material collected by SJÖSTEDT. THOMAS regards it as »most closely allied to the peculiar Nyasan *M. nyikæ*». As I did not find it further north it is probably confined to the typical East African steppe s. str.

***Epimys effectus* DOLLMAN.**

DOLLMAN: Ann. & Mag. Nat. Hist. 1911, Ser. 8, Vol. VII, p. 524.

A very large series of specimens of this Rat had been collected, especially from Meru boma, but also from the native village Kanyakeni in the Meru country south of the boma and further at Kutu, Kagio, Fort Hall and Punda Melia. To the north of Meru boma at upper Luazomela river some young rats were caught at a place where natives had made a clearing and built some huts, and these young specimens belong probably to this species as well.

There is a considerable amount of variation in this species with regard to colour. Some specimens are rich buff or tan-coloured on the sides, more or less overlaid with dark brown or black on the back. The specimens of this colour pattern are white on the ventral surface with a sharp line of demarkation between the white and the bright buff of the flanks. Other specimens are dark brown on the back, greyish brown on the sides, more or less suffused with dull buff; and the lower surface of these specimens does not show a single white hair but is dark slaty, or blackish grey with dull buffish tips to the hair. Between the two extremes thus described there are many intergrading links, but the intermediate ones are less common so that it may be spoken of a white-bellied and a dark-bellied phase. Both may occur at the same locality, but at Meru boma the dark phase was more common.

To make sure about the identity I sent a representative of either phase to British Museum where the author of the species kindly examined them and signed both with the name *effectus*.

The juvenile pelage of *E. effectus* is, as DOLLMAN has stated, ashy grey, but it is darker on the back, inclining to blackish, and a buffish wash of the sides appears sometimes in rather early stages.

In the Meru country this Rat appears to live chiefly in and around the native villages as a »house-rat». It is of interest that at least at Meru boma it occurs together with *Epimys medicatus*.

In one of the specimens from Punda Melia the skull is anomalous as the last molar of the upper jaw is missing, but in the lower jaw it is present.

***Epimys panya* HELLER.**

HELLER: Smithson. Misc. Coll. 1910, Vol. 56 no 9, p. 2.

The type-locality of this Rat has been stated to be Juja farm or the Athi plains. At this same locality I obtained a topotype. Specimens which without

hesitation may be referred to the same species were also caught at Fort Hall, at Ruiru river, at a village about 2 days march south of Meru boma etc. I am less sure about the identity of some Rats from Kagio because it is not easy to distinguish this species from young *E. effectus*.

***Epimys jacksoni* DE WINTON.**

DE WINTON: Ann. & Mag. Nat. Hist. 1897, Ser. 6, Vol. XX, p. 318.

Specimens of this long-tailed Rat were collected in the lower forest region of Kenia, and a little outside the same between Embu boma and Meru boma the last days of January. Some of these specimens are decidedly much larger than DE WINTON's type from Ntebbe,¹ but after comparison with the collections in British Museum Mr. DOLLMAN has stated the identity.

The dimensions of my three largest specimens are:

♂	Head and body	118 mm.,	tail 153 mm.
♂	» » »	115 »	» 140 »
♀	» » »	116 »	» 142 »

Length of hind-foot about 26 mm. with claws, a little more than 24 without them.

This Forest Rat has also been found on Kilimanjaro (LÖNNBERG), and south of Tanganyika (DOLLMAN). On Ruwenzori lives a closely allied subspecies.

***Epimys denniæ* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist. 1906, Ser. 7, Vol. XVIII, p. 144.

A specimen which well agrees with THOMAS' description was caught in the mixed bamboo and forest belt of Kenia at an altitude of 2,700 m. A younger and darker specimen trapped at the same locality may also be referred to this species in spite of the difference in colour, which may be due to its age.

This species was originally described from Ruwenzori, and THOMAS compared it with *E. carillus* from northern Angola, Pungo Andongo, and with *E. alleni* from West Africa and Congo. This is of interest because it proves the western affinities of this Forest Rat.

¹ THOMAS has, however, declared this one to be young. Ann. & Mag. Nat. Hist. 1906, Ser. 7, Vol. XVIII, p. 145.

Zelotomys hildegardeæ (THOMAS).

THOMAS: Ann. & Mag. Nat. Hist. 1902, Ser. 7, Vol. IX, p. 219.

OSGOOD: Field Mus. Nat. Hist. Zool. Ser., Vol. X n:o 2, p. 7.

A specimen of this interesting Rat was caught at Juja farm ¹⁹/₁ 1911. Its tail is whitish almost all around. In another specimen from Ruiru river the tail is greyish above.

The species was originally described on specimens from Machakos and Kitui. It is thus one of the endemic forms of East Africa s. str.

Leggada bella THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1910, Ser. 8, Vol. V, p. 87.

This little Mouse was trapped at Punda Melia ²²/₁ 1911.

Leggada triton THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1909, Ser. 8, Vol. IV, p. 548.

This dark little Mouse was first caught ²⁵/₃ in three specimens at a place called Kazere situated outside the Kenia forest on partly cultivated ground, 2,125 m. above the sea. Two more specimens were trapped resp. in the upper forest region of Kenia at an altitude of 2,700 m., and a little lower down, or at an altitude of 2,450 m. At our first camp on the way back outside the forest at a place situated in the cultivated region not very far from Kutu and at an altitude of 2,000 m. four more specimens were trapped. These were rather young specimens with not worn molars, and the total length of their skulls was only about 21 mm. but the condylo-basal length from 19,5 to 20 mm. These measurements agree better with HELLER's *Leggada* [*triton*] *naivashæ* but I think this is dependent on the youth of the specimens. Those from Kazere had worn teeth and were considerably larger with a condylobasal length of 21,2 to 21,7 mm.

THOMAS compares this species especially with the western *L. musculoides*.

Leggada triton murilla THOMAS.

THOMAS: Ann. & Mag. Nat. 1910, Ser. 8, Vol. V, p. 91.

A specimen caught at Blue Post Jan. 21 1911 is conspicuously paler than the Pigmy Mice trapped in the Kenia forests and at higher altitudes in the cultivated country so that I think it right to refer it to the subspecies *murilla*. The lower parts of this specimen is also more purely white than corresponding parts of the forest specimens. It is, however, probable that intergrading links may be found.

***Cricetomys gambianus kenyensis* OSGOOD.**

OSGOOD: Field Mus. Nat. Hist. Zool. Ser. Vol. X, n:o 2 1910., p. 9.

Two specimens of this Giant Rat were trapped in the primeval forest on the slopes of Kenia, the first near Kitwai river one days march from Embu boma ²⁷/₁, the other one days march further north. The skull measurements of the somewhat larger male specimen agree quite well with those of the type (l. c.) which also was a male obtained from the southern side of Kenia. The female is a little smaller, although its teeth are more worn and indicate a more advanced age. It was caught in a hollow log.

***Lophuromys aquilus zena* (DOLLMAN).**

TRUE: Proc. U. S. Nat. Mus. Vol. XV, 1892, p. 460.

DOLLMAN: Ann. & Mag. Nat. Hist. Ser. 8, Vol. IV 1909, p. 550.

This easily recognizable rat was collected in eighteen specimens at the following localities: Escarpment, »8,000 feet»; Kenia, 2,700 m.; Kenia, 2,500 m.; Kenia, 2,450 m.; in shambas not far from Embu boma 2,000 m.; at Embu boma; at Kutu south of Embu boma; at Meru boma »about 5,300 feet», and somewhat south of the last place. It was trapped as well high up on Kenia at an open place in the bamboo-region at an altitude of 2,700 m. where the climate was rather harsh,¹ as lower down in the cultivated region. It does not seem, however, to descend to the real low and hot country.

A remarkable fact is that such a great number of specimens of this kind have mutilated tails, viz. 7 out of 18. Of these 4 are entirely without tail, and in 3 the distal portion of the tail is missing. In all seven this had happened before the animal was trapped so that the wound was entirely healed. It may also be remembered in this connection that TRUE's type specimen had the tail somewhat mutilated, and the only specimen collected by SJÖSTEDT had the tail mutilated as well. This proves that it is quite a common occurrence in this species that its tail is lost entirely or partly. It is evident that this might be caused either by foes of other kinds, or when the animals fight with members of their own species. The latter appears perhaps less probable, partly because males and females have lost their tails in nearly equal number and partly because the tail must be lost when the rat is pursued, not when it is fighting. It appears thus more probable that the tail is lost to a pursuing foe of some kind. It is also evident that this partial loss must be of considerable importance to the species as such a great percentage of specimens survive in a mutilated state. In spite of the fact that the lost parts do not appear to be reproduced in this case, it is evidently a kind of autotomy that takes place to the benefit of the species.

¹ + 1,5° C. was observed in the evening and + 2 C° in the morning at sunrise.

² L. c. and Ann. & Mag. Nat. Hist. ser 8, Vol. VII, p. 529.

DOLLMAN has named the race occurring on the Aberdare Range and on Kenia *L. zena*.² The difference from the typical *L. aquilus* from Kilimanjaro appears to be very small. More than subspecific rank can impossibly be admitted to *L. zena*, and intermediate links may be found. The author quoted has also described an allied form (*L. rubecula*) from Elgon.

***Saccostomus mearnsi* HELLER.**

HELLER: Smiths. Misc. Coll. Vol. 1910, 54 p. (n:o 1924) p. 3.

A specimen of this interesting Rat was trapped $4\frac{1}{2}$ at Luazomela river, a tributary from the south to Guaso Nyiri. It agrees with HELLER's description and figures of the skull. The only difference appears to be that the nasal region of my specimen is slightly narrower, but as it is a female, and the type is recorded to be a male, such a little difference might easily be explained as a sexual variation.

***Acomys ablutus* DOLLMAN.**

DOLLMAN: Ann. & Mag. Nat. Hist. Ser. 8, Vol. VIII, p. 127.

Four specimens of this comparatively short-tailed Spiny Mouse were caught not quite a week later than DOLLMAN's type viz. $5\frac{1}{2}$ — $7\frac{1}{2}$ 1911 at our camp near Lekundu river not much south of Guaso Nyiri. This place is situated not far from the type locality »Nyama Yango».

Three of my specimens have a little larger skulls than DOLLMAN's type viz. measuring in total length 23,2 mm. (♂), 23,4 mm. (♀) and 23,5 mm (♀).

The last of these has:

Condylolincisive length	21,7 mm.
Zygomatic width	11,3 »
Least interorbital breadth	4,3 »
Width of braincase	10,7 »
Length of nasals	9,5 »
Length of upper molar series	3,7 (3,8) mm.

These measurements except the last are somewhat larger than those recorded by DOLLMAN, and it is thus probable that his type specimen was not quite fullgrown.

It appears uncertain whether this Spiny Mouse should be regarded to be anything more than a geographic, less rufous subspecies of *A. wilsoni* THOMAS.

The country where my specimens were caught is a stony acacia-steppe but at least one of the specimens was trapped among reeds near the little river.

¹ »Nyama Yango» = »my meat», was the name among the natives of the late A. H. NEUMANN, and his old camp is, undoubtedly, the place meant in DOLLMAN's paper.

Acomys percivali DOLLMAN.

DOLLMAN: Ann. & Mag. Nat. Hist., Ser. 8, Vol. VIII. p. 126.

Fourteen specimens of this dark slate-coloured Spiny Mouse were collected north of Guaso Nyiri at the water place Njoro, and below Chanler Falls. Some of the specimens were damaged by the ants and many destroyed. The same was the case with the following species. As soon as the mice had been killed in the traps, the ants devoured their nose, feet, ears etc. so that many specimens had to be thrown away.

The dimensions of my specimens agree on the whole with the measurements recorded by DOLLMAN. Some of my specimens have, however, the tail measuring as much as 90 mm. The dimensions of the skulls are perhaps generally a little smaller than those recorded by DOLLMAN as may be seen from the following table of measurements for which only skulls with worn teeth have been used:

	♂	♂	♀	♀
	mm.	mm.	mm.	mm.
Greatest length	27,3	26,3	26,3	25,3
Condylolncisive length	24,6	23,5	24,2	22,8
Zygomatic breadth	12,7	12,3	12,3	11,4
Interorbital breadth	4,4	4,2	4,4	4,4

None of my specimens exhibits any rufous phase, but some are darker than the others.

This species is evidently common in the thornbush country north of Guaso Nyiri below Chanler Falls.

Acomys kempi DOLLMAN.

DOLLMAN: Ann. & Mag. Nat. Hist., Ser. 8, Vol. VIII. p. 125.

Fourteen specimens of this bright-coloured Spiny Mouse were collected in Febr. and March 1911 at various localities on the northern side of Guaso Nyiri from a place not much east of the ford on the Marsabit road, and to some distance below Chanler Falls in the east, and northwards as far as at the water place of the Rendiles called Njoro. The type locality recorded by DOLLMAN (l. c.) is included in this area. Some of my specimens have been damaged by the small but extremely voracious ants of this thornbush-country, which entirely spoiled several more specimens of this mouse as well as others. Those which I have preserved in a good state prove that the variation of the length of the tail is much greater than DOLLMAN could observe on his two specimens. It varies in adult specimens from less than 90 mm. to 107 mm. The length of head and body recorded appears to be rather too great.

The skull measurements of my specimens agree on the whole quite well with DOLLMAN's, but are not seldom a little smaller proving that his type specimen was perhaps a little larger than the common average. The difference in size between DOLLMAN's *A. kempi*, and his *A. pulchellus* with regard to the dimensions of the skulls disappears thus completely in fully adult specimens, but the differences in exterior characteristics appear to hold good, at least with regard to such specimens which I have obtained of *A. pulchellus*.

From *A. ignitus* this species is said to differ by its far paler colour, longer tail, and very much smaller skull with less inflated bullæ.¹ Of these characteristics the length of tail evidently is variable.

***Acomys pulchellus* DOLLMAN.**

DOLLMAN: Ann. & Mag. Nat. Hist. 1911, Ser. 8, Vol. VIII, p. 127.

This was the comparatively least numerous of the *Acomys* on the northern side of Guaso Nyiri. I have only three specimens in the collection saved from the ants. All these are comparatively young and therefore the colour does not fully agree with DOLLMAN's description of the type, but the author quoted has kindly stated the identity. In my specimens the upper parts of the head and the anterior part of the back is slate grey. The posterior part of the back is dull buff, sprinkled and washed with slaty. The flanks and sides of the head are pale snuff brown (Rép. de Couleurs, 303, almost paler than shade n:o 1 on the plate). The lower parts are white, sharply marked off from the flanks. This may represent the colouration of the not yet fully mature animals.

***Dasymys savannus* HELLER.**

HELLER: Smithsonian. Misc. Coll., 1911, Vol. 56, No 17, p. 14.

A specimen of this kind was trapped near Itiolu river south of Guaso Nyiri ⁴/₂ 1911. The type locality is stated to be Fort Hall.

HELLER regards this species to be most nearly related to *D. masonæ* from South Africa.

***Arvicanthis abyssinicus nairobiæ* (ALLEN).**

ALLEN: Bull. Amer. Mus. Nat. Hist. 1909, Vol. XXVI, Art. XII, p. 168.

A specimen of this race was trapped at Juja farm ¹⁹/₁ 1911.

¹ DOLLMAN l. c.

***Arvicanthis abyssinicus præceps* WROUGHTON.**

WROUGHTON: Ann. & Mag. Nat. Hist., 1909, Ser. 8, Vol. IV, p. 538.

A specimen caught at Fort Hall ³¹/₈ 1911 has been sent to British Museum for examination, and Mr. GUY DOLLMAN has kindly communicated that it is identical with WROUGHTON's subspecies described from Naivasha under the name quoted above. This variety has also been recorded from Baringo and Rumruti on the Laikipia plateau, and from Nandi by DOLLMAN¹, but not east of Kenia before this.

***Arvicanthis somalicus reptans* (DOLLMAN).**

DOLLMAN: Ann. & Mag. Nat. Hist., 1911, Ser. 8, Vol. VIII, p. 129 & 352.

A series of nine specimens of this race were collected around our camp at Lekundu river only a short distance from Nyama Yango, the type-locality recorded by DOLLMAN, and only a few days later viz. 8—9 Febr. 1911. Three more specimens were caught on the southern side of Guaso Nyiri at the ford on the Marsabit road 11—13 Febr. 1911. The latter specimens are darker than those from Lekundu river and have less buff on the sides and on the face. The lower side of one is also considerably darker. This is, however, undoubtedly only individual variation. The variability is also in other respects evidently a little greater than is expressed by DOLLMAN (l. c.). The greatest length of the skull of my biggest male specimen from Lekundu is 30,3 mm. Condylolincisive length 28,2 mm. but zygomatic breadth only 15 mm.; interorbital constriction 4,7 mm., length of nasals 11 mm. etc. as recorded by DOLLMAN.

I suppose that this race is to be regarded as a southern representative of *A. somalicus*, which also is in accordance with the occurrence of other representatives of the Somalifauna in the country round Guaso Nyiri.

***Arvicanthis pulchellus massaicus* (PAGENSTECHER).**

PAGENSTECHER: Jahrb. Hamburg. wiss. Anst., 1884, p. 45.

This Striped Rat was found to be common in the Kikuyu and Meru countries and was collected in 19 specimens at the following localities between Nairobi and Meru boma enumerated from south to north, Blue Post, Punda Melia, Kagio, Kutu, Embu boma, in the forest on eastern Kenia, in shambas 2000 m. above the sea, at Kazere, and another place not far southwest of Meru boma, and finally at the latter place itself. It was as a rule found in or near »shambas», or in places which had been formerly cultivated. Only once it was found in the forest of Kenia, and never on the acacia-steppe north of Meru, or in the thornbush north of Guaso Nyiri.

¹ Ann. & Mag. Nat. Hist. 1911, Ser. 8, Vol. VIII, p. 348.

THOMAS has recently described¹ a new subspecies, *Arvicanthis pulchellus ardens*, from Kilimanjaro which is said to differ from *A. p. massaicus* in their »brown ground colour, buffy stripes, and strongly buffy feet» (l. c. p. 314). I have therefore compared specimens from Kilimanjaro with my own from British East Africa. The former have decidedly more buffy hind feet, but with regard to the general colour of other parts I cannot see any remarkable difference. My specimens from the localities mentioned above are just as brown as those from Kilimanjaro.

***Arvicanthis pumilio diminutus* THOMAS.**

THOMAS: Proc. Zool. Soc., London 1892, p. 551.

The only locality where this pretty Mouse was trapped (in 3 specimens) was at Escarpment station.

In one of the specimens the fulvous suffusion of the lower side is stronger than in the others.

Lophiomyidæ.

***Lophiomys ibeanus* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist., 1910, Ser. 8, Vol. VI, p. 223.

When passing the place called Blue Post at Thika river the 2^d of April 1911, I had the pleasure of seeing a living specimen of this rare and strange-looking rodent in the possession of Mr. HENDERSON, then in charge of the hotel there. Some few days later when Mr. HENDERSON was on his way home to England the *Lophiomys* died in Nairobi, and he then kindly presented the animal to me because he had heard me express my interest in it. This specimen had been caught at Mau Escarpment, as I was informed. According to THOMAS (l. c.) this place should be the type-locality for *L. ibeanus ibeanus*. The present specimen appears, however, to be larger than the typical race is said to be. The upper length of the skull from tip of nasals to back of interparietal is 64,2 mm. (60 in *L. ibeanus ibeanus* and 62 in *L. i. hindei* according to THOMAS), and the greatest breadth of the skull is 42,3 mm. (38,5 in *L. i. ibeanus*, and 42,5 in *L. i. hindei*). The upper molar series measures, however, only 13,5 mm. and the length of the palatine foramina is only about 11 mm. In consequence of these dimensions, and because the premaxillæ are heavily granulated, I think, this specimen must be referred to *L. ibeanus*, and not to the somewhat larger Abyssinian *L. bozasi*, although the frontal region of the skull is somewhat concave as it is said to be in the latter. The great size of the skull is, however striking, the more so as the specimen, although adult, cannot be very old, because the sutures on the top of the skull are quite conspicuous, and it is a female just as the types as well of *L. i. ibeanus* as of its subspecies *hindei*. The length of the alcoholic, skinned specimen from occiput to root of tail is 25 cm. and the length of the tail is 19 cm.

¹ Ann. & Mag. Nat. Hist., Ser. 8, Vol. VI, p. 313.

Considering that the difference in the size of the skull between this specimen and that of the type of *L. i. hindei* is just as great as between the latter and *L. i. ibeanus*, although all are of the same sex and adult, it appears probable that these animals vary considerably in size individually. In such a case it appears hardly possible to maintain *L. i. hindei* as a subspecies as it only differs in size.

Pocock has quite recently¹ discussed the peculiar arrangement and coloration of the hair of *Lophiomya* and arrived at the plausible conclusion that the black and white pattern »must make the animal conspicuous in the dusk». Pocock regarded thus *Lophiomya* as a »selfadvertiser», and believed it to be protected by »a most peculiar but indescribable smell», which the author quoted had felt emitted from the specimen examined by him. To this may be mentioned that the living animal seen by me did not produce any perceptible odour, nor did my taxidermist Mr. A. JANSSON perceive any such when he skinned the dead animal. The skin has a somewhat musky smell but by far not so strong as that of many Shrews for instance. The body preserved in alcohol has no peculiar smell.

Mr. HENDERSON's specimen was quite tame (which perhaps explains that it did not affect our olfactory organs). He could handle it just as he liked, and he lifted and carried it by getting hold of the long hair of its back. When put on a table for instance it slowly walked a round without any attempt to slip away, and it did not try to bite.

It was fed on carrots, while in the possession of Mr. HENDERSON, and it appeared to like that diet.

Spalacidae.

Tachyoryctes splendens ibeanus THOMAS.

THOMAS: Proc. Zool. Soc., London 1900, p. 179.

This Mole-rat is rather common at Nairobi where several specimens were obtained. One specimen was also caught among grass at a small dry rivulet on the open plains some distance north east of Nairobi. Especially the blackish young, or half grown young animals were often seen among the vegetation at the road side even in daytime.

When compared with the Mole-rats caught at Meru boma the specimens from the neighbourhood of Nairobi are easily recognized on the shape of the nasals which are rather evenly tapering backwards, as is well illustrated by THOMAS' figure of the type (l. c. p. 180). The same bones of the Meru specimens are comparatively broader behind and do not taper so much. A skull of the latter kind was therefore sent to British Museum for comparison, and Mr. GUY DOLLMAN kindly replied that a long series of specimens from Kenia and the Igambi Hills exhibited »a considerable variation in the form of the nasals». In consequence of this the *Tachyoryctes* of Meru boma as well must be considered to be *splendens ibeanus*.

¹ Proc. Zool. Soc., 1911, p. 946—948.

A series of eleven specimens from this locality display a rather great variation with regard to colour as well. The young are, of course, black, but the adult have sometimes hardly any black at all on the head, and sometimes an old specimen with well developed crests on the skull has the entire head black. There is also a nearly albinistic specimen in the collection. This one is whitish ash-coloured with pale buffish tips to some of the hairs.

Around Meru boma these Mole-rats were very common in the shambas.

Bathyergidæ.

Heterocephalus glaber progrediens n. sp.

This peculiar Naked Rat was observed in the thornbush country north of Guaso Nyiri, and four specimens were captured. When one sees this quaint and naked being the first impression is that it is the newborn young of some large rodent. The nakedness, blindness, comparatively small feet but big head make it look like a foetus. But the ferociousness with which it at once bites anybody or anything that touches it, soon takes away the belief in its youth and harmlessness. It lives entirely under the ground, and its burrows appear to be long but mostly situated rather near the surface. Here and there the burrow has openings through which the earth is thrown out rapidly in thin squirts. The result of this is small hills which DRAKE-BROCKMAN very properly with regard to their appearance compares with ›miniature volcanoes‹. Often quite a number of such little hills are situated near each other in rows along the burrows. It appears most probable that the animals do most of the digging with their powerful incisors as the feet look very weak. The throwing out of the earth is of course effected with the hind feet, which are especially adapted for that. The outer appearance of these peculiar animals has been repeatedly described by RÜPPEL,² OLDFIELD THOMAS,³ PARONA & CATTANEO⁴ etc.

One of my specimens is figured Pl. III, fig. 2, and the head of the same, a little enlarged, is seen on the same plate fig. 3 from its anterior end. These two figures show the arrangement of the hair and bristles on the head and body, while the peculiar fringes on the feet are elucidated by fig. 4 which shows a hind foot seen from above, twice enlarged.

In the interior of the mouth as well some scattered bristle-like hairs are found on the insides of the cheeks in front of the molars as may be seen on Pl. III, fig. 5. In this figure as well the structure of the palate is shown. It differs from that of *Fornarina phillipsi* THOMAS in having only two pair of palate-ridges, the anterior pair of which is confluent, while *Fornarina* to judge from the figure communicated by THOMAS (l. c. Pl. LIV, fig. 2) has four.

¹ The Mammals of Somaliland, London 1910, p. 137.

² Mus. Senckenb. Abh., Bd. III, Frankfurt 1845, p. 99—101.

³ Proc. Zool. Soc., London 1885, p. 845—849.

⁴ Ann. Mus. Civ. Genoa, Ser. 2, Vol. XIII, p. 419—445.

The dimensions of my largest and next smallest specimens are as follows:

Length of head and body	105 mm.	86 mm.
» » tail	39 »	36 »
» » hind foot	20 »	19 »
» » forearm and hand	27,5 »	23,5 »
» » head	about 33 »	23 »
Distance from muzzle to ear	22,5 »	17,6 »
» » » eye	12,5 »	9,2 »
» » eye to ear	10,5 »	8,1 »
Skull:		
Occiput to tip of nasal	23 »	18,4 »
» » » incisors	28,2 »	22,1 »
Condylbasal length	26 »	20,6 »
Condyle to incisor tip	27,8 »	22 »
Greatest breadth	20,2 »	15 »
Least width behind orbits	6 »	5,7 »
Mastoid breadth	13 »	12 »
Length of nasals	9,2 »	6,6 »
Combined breadth of nasals in front	4,5 »	3,7 »
Combined breadth of upper incisors	3,3 »	2,4 »
Diastema	10 »	7,5 »
Length of upper molar series	3,3 »	3,4 »
Length of palate	13,6 »	11,7 »

As these figures indicate there is a considerable difference in size between the specimens collected. This stands of course in connection with difference in age, but even the smaller and younger of these two specimens measured above has a plainly developed lambdoid crest. Both have three molariform teeth on either side of both jaws. As all my specimens are collected in the same locality there cannot, of course, be any doubt about their representing the same species. But it is not quite so easy to tell at once which. *Fornarina* is, of course, excluded in consequence of the number of cheek teeth. Of the three species of *Heterocephalus* described, one, viz. *H. ansorgei* THOMAS,¹ is very much smaller, if the type has been fullgrown, and its cheek-teeth are smaller. *H. dunni* THOMAS² which is a large species, is said to have a ›short low coronoid› on the lower jaw as *Fornarina*, and also the zygomatic ›very boldly expanded as much anteriorly as posteriorly› — — — In my specimens the coronoid is high and slender, very different from the type exhibited by *Fornarina*. The shape of the zygomatic arches is probably something intermediate between that exhibited by *H. glaber* as represented by RÜPPEL's figure³, and *H. dunni* as described by THOMAS (l. c.). It is thus comparatively more bowed out in its anterior portion than in the former species, but the zygoma is conspicuously more expanded behind than in front.

¹ Proc. Zool. Soc., London 1903, p. 336.

² Ann. & Mag. Nat. Hist., Ser. 8, Vol. IV, 1909, p. 109.

³ Mus. Senckenb. Abhandl., Bd. III, Frankfurt 1845, Taf. X, Fig. 3 a, b, c.

In the smaller and younger specimen the ascending processes of the premaxillaries extend further backward beyond the end of the nasals, but in the largest (= oldest) specimen the nasals reach about as far back as the premaxillaries. The former condition prevails in *Fornarina* which thus in this respect represents a more juvenile stage than *Heterocephalus*.

If RÜPPELL'S figure of the skull of *H. glaber* is correct my specimens differ widely from that species with regard to the situation of the palatine foramina which in the former are situated chiefly in front of a line drawn across the palate as a continuation of the pheripheric contour of the zygomatic arches. In my specimens these foramina are situated behind such a line in the same way as in *Fornarina* according to THOMAS' figure¹ of the latter. But, although the situation of these foramina thus far is alike in my specimens and in *Fornarina*, there is another quite important difference between them. In the latter, according to THOMAS' figure, the suture between the premaxillary and the maxillary extends across the palate at the anterior end of the palatine foramina, but in my specimens the corresponding suture is seen at the posterior end of the foramina in question. These foramina are also very small in my specimens their length being about 1,5 mm.

Concerning *H. dunni* THOMAS writes as follows: »Incisors enormously thick and large, far heavier than in any other member of the group.» — — — »combined breadth of upper incisors 3,0». — — — In my largest specimen the incisors are still larger and heavier measuring as much as 3,3 mm. As the type of *H. dunni* is said to be old and the length of its head and body is about 10 mm. more than that of my biggest specimen this difference in the combined breadth of the upper incisors appears to be of importance. The size of the incisors in *H. glaber* appears to be rather constant and not increase much with age, because THOMAS says that the study of immature and old specimens of that species has shown to him »that no such development of the incisors occurs in old age in that animal». That is, the incisors do not increase in size with age so that they become so big as those of *H. dunni*. In the present specimens on the other hand, a very striking increase in size of these teeth takes place. In the smallest and youngest of my specimens the combined breadth of both incisors is only 2,1 mm., in the next 2,4 mm., in the third 2,8 mm., and in the biggest 3,3 mm. If only one of these younger and smaller specimens, and the biggest had been collected, it would have appeared rather probable that these specimens represented two different races, a small and a large, because the dissimilarity is so very obvious and even the smaller looks rather adult thanks to its lambdoid crest. With the intergradation exhibited by all four specimens it is impossible to believe in such a theory, and the gradual development of the incisors is quite clear. But then, when nothing of that kind of development is to be seen in *H. glaber* as quoted above, these specimens cannot be referred to that species. Other differences from the same, in addition to different shape of the zygomata and the situation and size of the palatine foramina, are the greater length of the nasals, the longer diastema and the greater occipitonasal length of the skull.

¹ l. c. Pl. LIV, fig. 4.

From *H. dunni* the largest of my specimens, which with regard to size and age comes nearest to the type of the species quoted, differs in the following points in addition to those already mentioned above. The skull of my specimen is larger in all dimensions. For comparison may especially be mentioned:

	<i>H. dunni</i>	<i>H. from</i> Guaso Nyiri
	mm.	mm.
Condylbasal length	23	26
Least width behind orbits	5,5	6
Combined breadth of upper incisors	3,0	3,3
Diastema	7,7	10
Length of upper toothseries	2,9	3,3

Considering these facts it does not appear possible to identify my specimen with any of the three species of *Heterocephalus* described, but as they undoubtedly all are nearly allied I prefer to use the new name which must be given only in a subspecific sense.

The cheek-teeth of the type of this new *Heterocephalus glaber progreiens* are quite simple in the upper jaw. In the lower jaw remains of a lateral enamel-fold is seen on the first and last of these teeth on one side. In the younger specimen the two anterior teeth of the upper jaw show a deep lateral fold which, however, in the anterior tooth by wearing already is detached from the outer enamel-layer and appears as an inner central ring of enamel. In the middle tooth the lateral connection of this fold still is open as in RÜPPELL's type of *H. glaber*. The third posterior tooth is not yet so much worn as to show the pattern. All the three cheek-teeth of the lower jaw have a deep fold as well on the lateral as the median side which meet in the middle of the tooth. The fold of the lateral side of the first tooth is, however, on the verge of disappearing.

Pedetidæ.

Pedetes surdaster THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1902, Ser. 7, Vol. IX, p. 440.

This species was said to be not uncommon on the plains outside Nairobi, but as I did not do much collecting on the steppe, I did not obtain any specimen myself. A fine specimen was, however, presented to me by Mr. HOBLEY.

Hystriidæ.

Hystrix galeata THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1893, Ser. 6, Vol. XI, p. 230.

The African Porcupines can naturally be divided in two groups according to the different development of the nasals, viz. a comparatively northern, the *cristata-*

galeata-group with long nasals which as a rule have a great relative breadth also in front, and the southern *africæ-australis*-group with shorter nasals which are much narrower in front than behind.

The Porcupines obtained by this Expedition belong, as could be expected, to the former group and to *Hystrix galeata*, which species, however, has been subdivided into some geographical subspecies by the present writer¹ and FERD. MÜLLER.² Of these subspecies *H. g. ambigua* LÖNNBERG is easily recognized on the shape and proportions of its nasals, the breadth of which at the front end of the nasopremaxillary suture is only 57 % of their breadth at the posterior end of the same suture etc.

FERD. MÜLLER has named not less than three new subspecies of *H. galeata*. In doing so he lays great stress on the fact that the skull of the type of *H. galeata* THOMAS (which was a young or semiadult specimen in which the last molar is not yet in use) has greater posterior interorbital width (at rudimentary postorbital processes) than anterior interorbital width (at edge of lacrymals). MÜLLER regards this as such a valuable characteristic that he divides the subspecies of *H. galeata* »in 2 Gruppen» — — »einmal in solche, deren grösste Frontalbreite hinten, an dem rudimentären processus postorbitalis liegt, und sodann in solche bei denen die Breite der Frontalia vorne, an der Wurzel des Lacrymale, am grössten ist.» To the first group belongs (the type of) *Hystrix galeata* THOMAS, to the second the already mentioned *H. g. ambigua*, and MÜLLER's »*H. g. conradsi*», »*H. g. lademanni*», and »*H. g. lönnbergi*». Concerning the three latter not much information is given. *H. g. conradsi* is said to have the width of processus nasalis præmaxillaris 12—14 mm., and the thickness of arcus zygomaticus maxillaris 3,5—4 mm., while the corresponding measurements of *H. g. lademanni* are 16—16,5 and 7 mm. respectively. With regard to *H. g. lönnbergi* the reader obtains no other information than about those points by which it differs from *H. g. ambigua*, but not how it is to be distinguished from *H. g. conradsi*, and *H. g. lademanni*, while the difference from the typical *H. galeata* shall consist in the anterior interorbital breadth being smaller than the posterior.

The question is now whether these interorbital measurements and the relation between them is constant or not? That the interorbital measurements themselves are not constant is easily ascertained by examination of some *Hystrix galeata*-skulls of different age. It appears also almost certain that the anterior interorbital width increases more with age than the posterior to judge from the general development of the skulls. In two specimens from Kilimanjaro, for instance, the anterior measurement is in the younger 69 mm. and in the older 75 mm. while the posterior measurements are resp. 67,7 and 71,5 mm. The difference between the two dimensions is thus in the younger only 1,3 mm. but in the older 3,5 mm.³ It appears therefore probable that in still younger skulls this difference may decrease still more, or even be inverted.

The variability of these dimensions has also been very plainly proved by FERD. MÜLLER himself concerning the by him described *H. stegmanni*.³ The difference

¹ Mammals. Schwed. Zool. Exp. nach dem Kilimandjaro und Meru. Upsala 1908, p. 29.

² Sitzber. Ges. Naturforsch. Freunde. Berlin 1910 p. 314—315.

³ Arch. f. Naturgesch. 76 Jahrg. 1910. Bd. I, p. 182.

between the anterior and posterior interorbital width of this latter Porcupine is in the two largest of 11 skulls 4 and 5 mm. It decreases in the smaller (younger) skulls, although irregularly, and is in them 1 or 2 mm. In one of the smaller skulls both dimensions are alike and in one of the rather young, although not one of the youngest, the condition is inverted so that the anterior interorbital dimension even is 3 mm. smaller than the posterior.

Considering all these facts it is difficult to believe that the eventual geographic races of *Hystrix galeata* can be divided in two groups by such an uncertain and variable character as the relation between the anterior and posterior interorbital measurements. It appears rather to have only relative value even as a subspecific character. FERD. MÜLLER's foundation of *H. g. lönnbergi* is thus, I regret to say, as yet not at all proved, and the Porcupines of Kilimanjaro which according to my opinion represent *H. galeata* must still be regarded to do so.

The type locality of the species is Lamu. THOMAS described¹ afterwards a specimen from Ntebbe. This was an old female the skull of which I have had the opportunity of seeing in Brit. Museum. The breadth of this skull across the post-orbital processes is 71,5 mm., exactly the same as in a Kilimanjaro specimen in this museum. Two other specimens of *H. galeata* in Brit. Museum from Fort Hall which both are fully adult, one of them may even be termed old, have the same dimensions resp. 65 and 63 mm. but at least the latter is a male and that sex is often smaller among the Porcupines.

On the acacia steppe northeast of Kenia between the tributaries to Guaso Nyiri, Luazomela and Itiolu rivers I obtained a Porcupine. A skull of another from »Northern Guaso Nyiri» was bought in Nairobi from a hunter returning from the locality mentioned. Both these specimens are of male sex, and both are fully mature. According to my opinion they represent *H. galeata* as the following measurements compared with those of some other skulls appear to confirm.

	N. Guaso Nyiri	Itiolu river	Fort Hall (Brit. Mus.)	Ntebbe (Brit. Mus.)	Kilimanjaro	Havash Abyssinia (Brit. Mus.)	Eritrea
	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Basiscranial length of skull	149	153	—	156	148	155	145
Distance from occipital crest to tip of premaxillaries	155	157	161	169	161	169	151
Length of parietal suture	33	28	31	37	34	33,5	29
» » frontal »	29	36,5	35	27	31	32	31
» » nasals	97	96,5	96	102	96	106	99
Combined breadth of nasals at anterior end of nasopremaxillary suture	40	44	41	41,5	45	39	40
» » » » posterior » » » » »	55	65	58	60	65	63	58
Interorbital width at upper edge of lacrymals	67,5	80	—	—	—	—	70
» » » postorbital processes	66	73	65	66,5	71,5	72,5	70,5

¹ Proc. Zool. Soc. London 1901, p. 87.

These measurements indicate a very great individual variation in several respects. The most puzzling is perhaps the great difference in the relation between the parietal and frontal bones. In the Itiolu-specimen, for instance, the parietal is extremely short and the frontal extremely long, and in the Ntebbe-specimen the opposite condition prevails. But a comparison shows that the Fort Hall-, the Kilimanjaro-, and the Northern Guaso Nyiri specimens with increasing resp. decreasing measurements gradually fill up the gap. A greater amount of material would no doubt prove this still better, but at the same time how very difficult it is to base new species and subspecies of Porcupines on cranial measurements.

This variability is due to the comparatively long time during which each individual Porcupine continues to grow, and the great changes to which the skull is subjected during its growth. The factors at work are the development and extension more and more backwards of the air sinuses, and the development of the musculature which causes an increased growth and transformation of those parts of the skull with which it stands in connection. Through the influence of the musculature (*m. temporalis*) the parietal area is expanded and the lambdoid crest, so to say, moved backwards more in some specimens than in others.

Both my specimens have the for *H. galeata* typical great height of the skull measuring from the palate between the first molars resp. 76 and 77 mm. The nasal processes of the premaxillaries are also as in the typical *H. galeata* very broad measuring at the middle of the nasopremaxillary suture resp. 18,5 and 20 mm. The maxillary portion of the zygomatic arch is inflated by the continuation of the air sinuses into it, and its least width amounts therefore to about 15 mm.

With the great dimensions of the skull of *H. galeata* a considerable bodily size is united. My specimen from Itiolu river measured when freshly killed 80 cm. from snout to vent in a straight line.

The Porcupines are rather common in certain parts of Brit. East Africa. In the surroundings of Nairobi its scratchings in the earth, and excrements were often observed. Now and then a dropped quill was found. At Escarpment station the Kikuyus complained about the damage the Porcupines did in the »shambas» chiefly on the potato-crop. But although I promised a high reward, the natives said they could not catch any. In consequence of their nocturnal life and their habit of remaining in their burrows over daytime Porcupines are very seldom seen. His Excellency Governor F. J. JACKSON told me that during 16 years residence in East Africa he had not seen any living Porcupine.

The specimen which was caught by this expedition (Pl. VI fig. 2) on the grass-steppe between Luazomela and Itiolu rivers had evidently intended to sleep over the day under an acacia-bush from which it ran out when some of the »boys» of the safari passed. It was then chased and clubbed. One day when stalking Buffaloes in a thornbush-patch south of Guaso Nyiri not far from the ford on the Marsabit-road I ran across the remains, mostly quills, of a Porcupine which evidently had been eaten by some carnivorous animal. My gunbearers declared with great certainty that it was the doing of a »Simba» = Lion.

***Hystrix galeata somalensis* n. subsp.**

A couple of years ago I had the opportunity of studying with the kind permission of my friend OLDFIELD THOMAS the material of Porcupines in British Museum Nat. Hist. I found then among other things that in Somaliland is to be found a Porcupine which is much smaller than *H. galeata* of the surrounding countries, British East Africa, Abyssinia, and Eritrea. This small Somali Porcupine is represented in British Museum by two specimens both of which are old viz. a male (n:o 6, 5, 4, 9) and a female (n:o 6, 5, 4, 10) from Burao.

The measurements of these specimens are as follows:

	♂	♀
	mm.	mm.
Basicranial length	125	132
Distance from occipital crest to tip of premaxillary	138	149
Parietal length mesially	33	32
Frontal " "	24	32
Nasal " "	85	87
Combined breadth of nasals at posterior end of nasopremaxillary suture . . .	56	63
" " " " " anterior " " " "	35	38
Width across postorbital processes	61	68

These measurements prove that, taken as a whole, the skull of the Somali Porcupine even when fullgrown and old is smaller than the smallest male and semiadult skulls of *H. galeata*, and it thus deserves to be regarded as a separate race.

In the thornbush country north of Guaso Nyiri where the fauna also in many other respects resembles that of Somaliland proper, I was fortunate enough to obtain a Porcupine which our native guide speared not far from the waterplace called Njoro, situated about 1° N. lat. This was an adult but not old female in which the last molar is in use but not much worn. The premolar has not yet been changed. Although the posterior portion of the skull has been broken by the spear it is quite clear that this specimen belongs to the same race as those from Burao in British museum, as the following measurements indicate.

Length of nasals mesially 83 mm.
 Combined breadth of nasals at posterior end of nasopremaxillary suture . 54 »
 " " " " " anterior " " " " . 34,5 »

The length of the nasals is thus in all these three specimens measured shorter than the minimum in any adult *H. galeata*. The combined posterior width of the nasals lies within the limits of variation for *H. galeata*, but the combined breadth of the same bones anteriorly is smaller than in the species mentioned. It approaches by this *H. africae-australis* to some degree without, however, reaching the same but

being intermediate between that species and *H. galeata*. This can be illustrated by the following figures based on my own measurements. In *H. africæ-australis* the anterior breadth of both nasals are from 52 to 60 % of the posterior breadth of the same bones. In the Somalirace the same relation is 60 to 63 % but in *H. galeata* above 70 %.

The nasal process of the Somali Porcupine is very broad and resembles that of *H. galeata*. It measures in my specimen fully 17 mm. The maxillary portion of the zygomatic arch is inflated by the air-sinuses and measures about 15 mm. across. The distance from lacrymale to the zygomatic suture is about 12 mm.

The upper incisors appear to be narrower than in *H. galeata* so that their combined breadth above the cutting-edge only measures 10 mm., while the same measurement in the *H. galeata* specimens of this expedition is resp. 12 and 13 mm.¹

With regard to exterior characteristics the differences between the Somali race and typical *H. galeata* are not very great. The latter appears, however, to judge from a comparison with four specimens to have more white in the crest, longer white tips to the quills of the rump, and the quills round the tail with the white dominating unlike *H. g. somalensis* in which the white tips to the quills of the back are decidedly shorter, and broad black rings to be seen also on the quills around the tail.

The specimen of *H. g. somalensis* obtained at Njoro was by chance found above the ground. It ran out from below a thornbush where it had intended to sleep over the day.

Leporidae.

Lepus victoriæ THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 1893, Ser. 6, Vol. XII, p. 268.

This species is probably common in the neighbourhood of Nairobi, but as also the following species is found there it is difficult to say which of the two species is most numerous. I obtained specimens at a farm managed by Mr. HAMPSON some distance northwest of Nairobi.

A young Hare caught at Juja farm ¹⁸/₁ is also referred to this species.

They were usually found in open places under isolated or small groups of bushes or patches of plants. Old termite hills which had fallen down and were overgrown with coarse plants, a common feature in the landscape, were favourite places for the hares. They sit rather close and run with great speed.

Lepus crawshayi DE WINTON.

DE WINTON: Proc. Zool. Soc. London 1899 p. 416.

Specimens of this Hare were obtained not far from Nairobi on a grassy plain near the Limuru road, and on a steppe with rich growth of grass near Rooruka river.

¹ In not yet adult specimens of *H. galeata* I have seen this measurement only amounting to about 11 mm. but never so small as 10.

Hares were seen many times in the neighbourhood of Nairobi, at Juja farm, Blue Post, Kutu etc. but, as observed above, when specimens were not shot it is difficult to say to which species a running Hare belonged, although the difference in colour is considerable.

In addition to the difference of the pelage between these two Hares, the characteristics of the upper incisors pointed out by DE WINTON are very useful for distinguishing the two species. The combined breadth of the incisors at the cutting edge of *L. crawshayi* is only 5 mm. but in *L. victoriæ* the same dimension is fully 6 mm. In the former the grooves are quite filled up with cement so that the surface of the teeth looks flat. The cheek-teeth of *L. crawshayi* as well are smaller the length of the whole series measured at the worn surface of the crowns being about 12,2 mm. whereas the same dimension in *L. victoriæ* is 13,2—13,3 mm.

***Lepus somalensis* HEUGLIN.**

HEUGLIN: Nov. Act. Acad. Leop. Car. Nat. Cur. 1861, Bd 82, p. 5.

The first locality where I made acquaintance with the long-eared Somali-Hare was in some dry thornbush-patches on the acacia steppe around Lekundu river. When the expedition had crossed Guaso Nyiri to its northern side this Hare was found to be common in the thornbush which occupied the whole country there. They usually sat under acacia bushes and could often be seen at some distance, especially if they had raised their long ears. They were not shy, but did not sit so close as for instance *L. victoriæ* and *L. crawshayi*. On the other hand they did not develop such a speed as the two latter species. Sometimes a *Lepus somalensis* only comparatively slowly went away a little bit, if not too much scared.

The sexes appear to be of similar size. Out of my series of ten specimens the upper length of the skull, from occiput to tip of nasals, is 87 mm. in one male, 86,5 mm. in two females but 86 mm. in two other old males and an old female. The others are somewhat younger and therefore smaller, but the variation in size of adult specimens does not appear to be great.

Other measurements of a male and a female skull are as follows:

	♂	♀
	mm.	mm.
Condylolncisive length	77	77
Zygomatic breadth	39	39,8
Oblique length of nasals	35,5	37,5
Breadth of braincase	29	28,7
Diastema	23,5	24,5
Length of palate to inside of incisors	31	33,5
» » palatal foramina	21,3	23,3
» » molar series basally	15	15
Combined breadth of incisors at cutting edge	5,5	5,6

The length of the dry hind foot without claws is about $10\frac{1}{2}$ —11 cm. and the length of the dry ears $13\frac{1}{2}$ —14 cm.

Hyracoidea.

Procaviidæ.

Procavia brucei borana LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8, Vol. IX, p. 66.

This race of Hyrax belongs like its geographical neighbour *P. pumila rudolfi* THOMAS to the *Heterohyrax*-group, but it differs strikingly from it as well with regard to the colour of the fur as especially with regard to the shape and dimensions of the skull. Its fur is also longer. The average length of the hair appears to be in the present specimen about 16 mm. but it is an old female with somewhat worn fur. Many hairs attain a greater length, not counting the great number of long black bristles which are scattered all over the body, but especially numerous on the posterior part of the rump. The general colour of the back is umber brown, grizzled with whitish rings and blackish tips to the hair. The not visible parts of the underfur is basally smoke grey to pale slate grey, different in different places, externally dull cinnamon. The flanks are paler and more greyish than the back. The dorsal spot is large, its colour is cinnamon n:o 4 according to 'Repertoire de couleurs'. The face is much darker than the back, blackish brown. The superciliary band creamy white, and the lips white. The back of the ears grizzled of greyish white and broad dark brown tips to the hair. The sides of the neck are pale brownish grey, grizzled with blackish brown tips and rings to the hair. The underfur of these parts is whitish. The under side is creamy white, with a slight buffish tinge which is a little more pronounced between the fore limbs and in the anal region. Feet very pale yellowish grey with some longer dark brown hair.

Length of head and body about 42 cm.

Length of hind foot about 53 mm. Both these measurements are taken from the type which is an old female, stage VIII according to THOMAS' terminology.

If the skull of this Hyrax is laid at the side of that of *P. pumila rudolfi* THOMAS the difference is found to be very striking. The former is much more elongate, and, in spite of its much greater length, its width as well across the zygomatic arches as across the postorbital processes is not larger than the same of fullgrown specimens of *P. p. rudolfi*. The superciliary portion of the frontals is gradually raised a little towards the free margin over the orbit so that the forehead becomes somewhat concave. The nasals are comparatively long, rather broad posteriorly, but suddenly narrowed and provided with parallel side contours in more than half of the anterior part. The whole preorbital region of the skull is longer as well, as the tables of measurements indicate if compared.

	♀ stage VIII
Greatest length of skull	74 mm.
Condylbasal length of skull	71 »
Basicranial length	66 »
Zygomatic breadth	39,5 »
Length of nasals mesially	16 »
Combined breadth of both nasals posteriorly	17,5 »
» » » » » anteriorly	6 »
Length of diastema	10 »
» » upper molar series	28,3 »
Breadth of m ¹	5,4 »
Length of m ¹	4,6 »
Breadth across postorbital processes	30 »
Distance from orbit to tip or premaxillary	22,5 »

These measurements agree approximately with those of *P. brucei somalica* but are much smaller than those of *P. brucei hindei* WROUGHTON¹ described from the Kikuyu country. The present specimen is, however, probably related to the latter race because it shows exactly the same structure of the hind margin of the palate with »a pair of protuberances» just as described by WROUGHTON (l. c. p. 108). As the type of *P. brucei hindei* also was an old female in stage VIII the measurements recorded in WROUGHTON's diagnose are directly comparable with those above. If such a comparison is made it will be found that the skull of my type specimen is 9 mm. (more than 10 %!) shorter and 8 mm. narrower than the corresponding measurements of *P. b. hindei*, which discrepancy appears to be too great for allowing identification. The smaller size of the skull, of the present race makes itself known in all other dimensions as well, but the narrowness of the nasals anteriorly (6 mm. against 8 in *P. b. hindei*) is especially striking as it amounts to one fourth of the measurement of the larger race.

With regard to the colour this *P. b. borana* also differs in several respects from *P. b. hindei*. The dorsal spot of the latter is for instance »cream-buff».

The Hyrax described above appears to be smaller than other geographic races of *Procavia brucei* except *somalica* which, however, is geographically separated from this one by *P. pumila* and its subspecies *P. b. rudolfi*. The shortness of the description of *P. b. somalica* prevents me from pointing out other differences, but as WROUGHTON undoubtedly had access to skulls of *P. b. somalica* as well, when he described *P. b. hindei*, and then pointed out the »curious palatal character» (as described above) of this latter animal this character probably represents one of the differences.

In the year 1901 NEUMANN described a Hyrax of the *Heterohyrax*-group from »Kaffa, Gimirra and Bimeschc» under the name *Procavia thomasi*.² As his description

¹ Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, p. 107, 1910.

² Sitzber. Naturf. Freunde, Berlin 1901, p. 240.

chiefly consists of a comparison of the then new form, and *P. valida* (!) it gives comparatively little information about *Procavia thomasi*, and there are no skull measurements. I have therefore written to Professor MATSCHIE and asked him to kindly provide me with some skull measurements and some notes about the shape of the nasals and the condition of the posterior palate. Professor MATSCHIE kindly replied and gave the following information which proves that *Procavia thomasi* is quite distinct from *P. brucei borana*. As his notes may be of use for other authors I take the pleasure of publishing them here. »Die Nasalen [of *Procavia thomasi*] sind nicht plötzlich verschmälert, aber bei dem ♂ in der Mitte stark eingezogen. Am hinteren Gaumenrand sehe ich keine Höcker neben dem medianen Processus.»

The greatest length of the skull of a female in stage VIII from Gimirro is 82,4 mm., in a male and two females stage VII it varies from 86 to 89 mm. The basal length in the three latter is from 71 to 76,4 mm. The length of the nasals mesially is 17,7 in the oldest female, in the others 18,1 to 19,4 mm. The breadth of the nasals posteriorly is from 16 to 17,6, and in front 7,5 to 7,8 mm. The length of the molar series is 30,4 to 31,5 mm., of the diastema 10,3 to 11,7 mm.

These measurements indicate that *P. thomasi* is larger than *P. b. borana*.

The type specimen of the latter was shot in the afternoon ¹⁸/₂ 1911 when running along a rocky ledge in a small ravine just north of Guaso Nyiri about one days march to the east from the Marsabit road. Its distribution extends probably chiefly westwards from the locality mentioned because further east (below Chanler Falls and at Njoro) its place is occupied by a still smaller Hyrax.

***Procavia pumila rudolfi* THOMAS.**

THOMAS: Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, 1910, p. 202.

In the thornbush country north of Guaso Nyiri rocks of varying sizes from a small mountain to a rocklet are numerous, and as they are always very much weather-worn and full of cracks and crevices they offer very good dwellings for Hyraxes. They are also very often inhabited by such. At Njoro and in the thornbush country below Chanler Falls this small race is very common.

It is to great extent diurnal in its habits. If one carefully approaches some rocks inhabited by this species one may be sure of seeing several Hyraxes running about, or lying basking on the ledges. Others may be seen running back to shelter from the thornbush. When frightened they disappear, of course, at once, and even wounded specimens are lost if they are not killed on the spot. Only once I saw some of these animals run down from an acacia growing near their rocky refuge, and Mr. R. J. CUNNINGHAME told me that he one day had seen a Hyrax of this small kind with great dexterity move about in a frightfully spiny bush.

The colour of the fur agrees with THOMAS' description (l. c.) but some of my six specimens are darker and the dorsal spot varies from buff to rufous.

As THOMAS only has had an immature male at his disposal it appears of interest to communicate some cranial measurements.

	Stage VI ¹				Stage VIII	
	♀	♀	♂	♀	♀	♂
Craniobasal length	53,5	56	55,5	54,5	57	60
Condylbasal length	57,5	60	60	59	60,5	65,5
Greatest breadth	33,5	36,5	35	34,5	37,5	39,5
Upper tooth-row from front of p ¹ to back of m ²	23,5	24	22	22,5	22,5	22,5
Length of nasals mesially	11,5	13,5	12,5	13	13	14,5
Combined breadth of nasale posteriorly	14	15,5	14	14	14	16
Breadth across postorbital processes	25	27	26	26	27	30
Length of diastema	7	7	7,4	6,5	6,8	6,9
Distance from orbit to tip of premaxillary	17,3	17,8	18,5	19	18,3	19,5

These measurements prove that this little Hyrax is not far from fullgrown when it reaches stage VI according to THOMAS' terminology.²

In the fully adult specimens the hind margin of the palate is somewhat raised and swollen along either side, and this ridge ends in a kind of protuberance on either side of the central process fully separated from the same by a notch. This condition reminds about that described by WROUGHTON on the skull of the much larger *Procavia brucei hindei*.³ (Concerning *P. b. borana*, conf. above.) The nasals are short and broad, evenly tapering in front, not suddenly constricted and then with parallel margins as in the other Hyrax which also was found north of Guaso Nyiri but above Chanler Falls viz. *Procavia brucei borana*, which has been described above.

The fact that two small representatives of the *Heterohyrax* group are found so near each other without being separated by any physical geographical obstacle is of interest, the more so as analogous cases were found among the Baboons (conf. above) and Dik-diks (conf. below).

***Procavia (Dendrohyrax) crawshayi* THOMAS.**

THOMAS: Proc. Zool. Soc., London 1900, p. 178.

An adult male (stage VIII according to THOMAS' terminology) was shot in the forest near Escarpment station. The colour of this specimen agrees exactly with the description of the type except that the belly is not 'deep buffy' but buffish white. The lower side of the neck is more buffy. The head is perhaps also darker than that of the type specimen as the black in the grizzled parts is dominating over the whitish.

Condylbasal length of skull	90 mm.
Craniobasal length of skull	85,5 »
Greatest breadth of skull	47 »

¹ The first of these stand between stage V and VI as m² is in use but m³ not yet on a level with the bone.

² Proc. Zool. Soc., London 1892, p. 53.

³ Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, p. 108.

Length of nasals mesially	22 mm.
Greatest breadth of nasals	17 "
Length of molar series	35 "
Greatest length of m ¹	5,5 "

The »Perere» as the Hyraxes are named in Kisuahili were very common near Escarpment station but as they are entirely nocturnal I only saw this specimen just before sunset one evening, and although I walked through the forest every evening as long as I stayed there trying to obtain some more it was without success. In night-time they made an awful noise, especially about 9 o'clock, and produced very strong creaking and grating sounds, and now and then some ghastly screams, but they were then impossible to detect among the foliage and branches of the trees. We heard »Perere» as well in the forest of Kenia, and one day on an open place I saw at some distance a young specimen scramble down a small tree and disappear in the bushes.

Proboscidea.

Elephantidæ.

Elephas africanus cavendishi LYDEKKER.

LYDEKKER: Proc. Zool. Soc., London 1907, p. 395.

The African Elephant has during the last years been subdivided in a number of subspecies. The material on which this proceeding has been based has not been very rich depending upon the bulkiness and the difficulty of procuring it. It has been principally the shape of the ear which has given the characteristics used for the separation of the subspecies. An Elephant (Pl. VI, figs 3 & 4) which I shot ¹⁸/₂ 1911 at the waterplace called Njoro in the thornbush country north of Guaso Nyiri and Chanler Falls is in this respect most similar to LYDEKKER's *Elephas africanus cavendishi*. The type locality of this race is »the Lake Rudolph district» and this stands in good correspondence with other faunistic features of the country where I obtained my specimen.

The great transverse diameter of the ear is an especially prominent characteristic of *E. a. cavendishi*. This measurement was in LYDEKKER's type 87,5 cm. and in my specimen somewhat more still viz. 100 cm. from the posterior margin to the fold at the ear-opening. As can be seen on the photo (Pl. VI, fig. 3) the ear-lappet is well developed, but hardly so long as in the Aberdare Elephant (*E. a. peeli*).

The following measurements were taken on the just dead animal:

Distance in a straight line from anus to fold at ear-opening	300 cm.
Distance from this fold to posterior corner of eye	52 "
Distance from posterior corner of eye to the place where the tusk projects free from the surrounding gum	52 "
Distance from the latter place to the end of the trunk	225 "

Girth of trunk 70 cm. from the tusk	90 cm.
» » » 50 cm. further down	73 »
» » » 50 » » »	53 »
» » » at the end	40 »
Height of animal at the sacral region	290 »
Breadth of sole of hind foot	30 »
Length » » » »	52 »

The height at the shoulders could not be measured because I could not straighten the forelegs of the animal.

The iris was 23 mm. and the pupil 11 mm.

Twelve centimetres above the posterior corner of the eye the orifice of a gland opened with a duct about wide enough to admit a common lead pencil. But it was almost plugged with a number of broken thorns of acacias and similar small twigs. I heard from CUNNINGHAME that the Elephants, so to say, perspire from this gland sometimes so that a dark and damp spot is seen on the forehead round the orifice. A similar statement has also been made by F. C. SELOUS¹ who observes that such a wetting of the skin around the gland always appears »after a run in the hot sun».

In the Indian Elephant the corresponding gland has been regarded as a scent gland which principally works at the rutting season.

As I have material of this gland preserved I hope to be able at another opportunity to publish some notes of its structure which may give some information about its function.

This Elephant was a middle aged and medium sized animal, a herd bull so to say. The testes contained ripe sperms which have been described by G. RETZIUS.² They proved to be even comparatively speaking very small, »ungefähr von der Grösse derjenigen des Menschen, welche schon an sich als klein zu betrachten sind» (l. c. p. 3).

The propagation of the Elephants at this place appeared to be normal as the females seen were accompanied by young. Once about a dozen female Elephants with »calves» of varying size passed our camp. At another opportunity SJÖGREN and CUNNINGHAME came unawares near two females with small young. The Elephants charged with a squeal and CUNNINGHAME had to shoot one of them in self defense. To judge from the spoor the bulls went mostly single or by twos. Some tracks indicated animals which were larger than the one shot by me.

When one sees the leafless dry thornbush it does not look inviting to any animal, and it appears impossible that such animals as Elephants shall be able to find their food there. The question is near at hand, what can they feed on? If one follows a fresh spoor of an Elephant it is soon seen that he is not very particular in this respect. Sometimes he has twisted off the top of a bush and put in his mouth chewing it all but dropping pieces of twigs now and then. Sometimes he has torn off a branch of an acacia (those with greenish yellow bark appear to be preferred) thick as an arm, and it all wanders the same way under the powerful

¹ Conf. LYDEKKER: The Game Animals of Africa, p. 16.

² Biol. Untersuchungen N. F., Bd. XVI, p. 3.

molar apparatus. The nuts of the doum palms are often eaten, but he does not appear to be able to crush them as they are found in great number whole in the droppings. Sometimes comparatively big trees are uprooted and pushed down to give the Elephants access to the branches. An acacia of as large size as these trees attain in the thornbush and which has been broken down by Elephants is shown on Pl. VII, fig. 1. It happens at such occasions that the Elephants break, their tusks and a big piece of ivory was found by one of our boys. A rather big Elephant with only one tusk was seen by CUNNINGHAME at Njoro.

The Elephants probably did not drink but every second night at Njoro to judge from the spoors at the waterholes, but it might be possible that they knew more than one water-place so that they alternately visited different pools. It appears, however, certain that they can provide themselves with so much water that it lasts for more than one day. I make this conclusion in consequence of an observation on the Elephant which was shot at Njoro. It was killed about 12 at noon and had probably not drunk since the evening before as it took us between 5 and 6 hours to follow the spoor and the Elephant had walked slowly hither and thither feeding, and was resting under an acacia when we first saw him. Nevertheless its ventricle was found to contain great quantities of water which was as pure as the water in the pool from which it originated. The water in the ventricle was not mixed with the food material, although the Elephant as already mentioned had been feeding almost all the way from the water hole to the place where it was shot. This fact that the water contained in the ventricle can be kept in some way or other without mixing with the food material explains that they can »put the tips of their trunks into their mouths, and drawing about a bucket full of water from their stomachs, squirt it over their shoulders» (SELOUS as quoted by LYDEKKER l. c. p. 15).

The Rendiles told us that the Elephants probably would remain near the waterholes at Njoro during the dry season but go away when the rains begun.

It has been repeatedly stated by sportsmen that the eye-sight of the Elephants is weak. I had the good opportunity of verifying this myself. The locality where we found my Elephant was covered with scattered bushes most of which were only about 120 cm. in height. We were thus well visible over the tops of these bushes, especially to an eye situated so high above the ground as that of an Elephant, but he did not see us, although we did not crouch except when we moved. And it was no difficulty to reach within about 70 m. from him.

It has been stated in the literature by A. H. NEUMANN, and perhaps by others as well, that the right tusk »is almost always more worn than its fellow». I can make the same statement about my own specimen. Its right tusk is more worn and somewhat chipped at the end, while the left is intact (Pl. IV, fig. 3). An Elephant skull in this museum from Cameroon, thus probably of *Elephas afr. cyclotis*, has the right tusk badly broken while the left is in good condition. This is, no doubt, a result of the same agency, viz. the propensity of the Elephants to use the right tusk more than the left. Although this is not a rule without exceptions (e. g. a South African Elephant in this museum has both its tusks just as perfect), it is of interest

because it is evidently something analogous to the preponderant use of the right side of the head in Giraffes as set forth at another place in this memoir, and also to the right-handedness of man.

In the primeval forest of Kenia Elephants are to be found but whether of the same race or not is uncertain. These forest Elephants may belong to the Aberdare race (*E. a. peeli*). When passing through the forest region between Embu and Meru we saw tracks of Elephants several times, and on the way back we were so close to them that we heard them break branches etc. At an open place in the forest at an altitude of 2,500 m. the Elephants appeared to have a favourite resort between two small rivulets. There were spoors everywhere and at two different places around some water holes the probably alkaline earth had evidently been dug up by the Elephants with their tusks as the marks plainly showed. Close above this place rose a hill so steep that it was connected with difficulty for a man to ascend it, but the numerous Elephant tracks proved that these animals often passed up and down there. The »steps» in these tracks were often 80 to 100 cm. high above the next.

The Elephants ascend on Kenia to, and even above the bamboo region as the spoors indicate. At an altitude of 2,700 m. where the temperature at sunrise only was + 1° C. the Elephant spoors were numerous. These animals are thus not so susceptible to a low temperature as is generally believed. But when the rainy season sets in, I was told, that the Elephants descend to the shambas in the cultivated region. »They do not like the dripping from the trees.»

In the Kenia forest I saw in several places the ingeniously arranged pitfalls in which the Wandorobbos catch Elephants. They were dug in the paths of the animals and often with great cunning, between two big trees, in a curve of the path etc. to make it more difficult for the Elephants to avoid them. They were deep but so narrow that if an Elephant fell into such a pitfall he should be jammed in by his great weight so tightly between the walls that he could not move, and thus not be able to work his way out again.

Perissodactyla.

Rhinocerotidæ.

Rhinoceros (*Diceros*) *bicornis* LIN.

The Rhinoceroses were formerly common over great parts of British East Africa, but it is now exterminated, or nearly so, near all settled districts and roads along which there is any regular traffic, or where too often hunting parties are going in search of game. I saw, however, several on the acacia steppe south of Guaso Nyiri, and in the dry thornbush country north of this river they were found to be rather

numerous in certain localities as well as on the southern side of the river below Chanler Falls. In the dry country there numerous game paths lead to the river, and in the dust of these paths the spoor of Rhinoceroses were a regular feature. Probably many of these paths were just the products of the more or less regular walk of the Rhinos between their pasture-lands and the water. In day-time the Rhinoceroses are very seldom found near the river. As a rule they are met with at a distance of from 5 to 8 kilometres, perhaps more, from the water. Their chief food appeared to be a low scrub. They were found not only on the flat country, but sometimes on the mountain slopes in the bush among rocks and boulders where one hardly could imagine that such a bulky and clumsy-looking animal would be able to find its way.

Here and there along the paths of these animals such places are seen where they are used to deposit their droppings and then scatter them. Such places are usually situated at a bush which as a rule has been broken and kicked to pieces, and a big hole is scooped up in the ground. It is sometimes stated in the literature that the scattering of the dung is done with the horn. Although I never have seen a Rhino at work it appears to me quite clear that at least most of it is done with the feet to judge from the deep furrows radiating from the hole and which exactly fit to the breadth of feet and in which even toe marks may be seen.

It is very difficult to explain how such a habit could have originated and become fixed, for it can impossibly be in any way useful to the animal now and thus be explained by natural selection. It might, however, be an inheritance.

The propagation of the Rhinoceros is, of course, slow, as usually is the case with such big animals, and it takes a long time before they reach full development. The fact that female Rhinoceroses often were seen in company with their not far from fullgrown young proves that several years pass between each period of gravidity, or parturition. On the other hand it is evident that the female Rhinoceroses in the districts visited do not suffer from barrenness because as a rule they were accompanied by a more or less grown up young. Sexual maturity is reached before the last molar has cut the gum as can be concluded from the fact that this tooth was not fully developed in a female which Mr. SJÖGREN shot south of Guaso Nyiri and which was followed by a good sized calf. On the other hand, a male Rhinoceros (Pl. VII, fig. 2) with only six cheek-teeth in use had comparatively very small testicles in which no ripe sperms were found, and it was thus not yet sexually mature. This animal measured from snout to vent in a straight line about 255 cm. (about 8½ English feet) or 295 cm. along the dorsal line. Its exact age is difficult to tell but it was probably several years old. It had like all other Rhinoceroses observed at close quarters numerous scars and ulcers (conf. the fig.) along the flanks. If those are obtained when the animals fight inter se or not is impossible to say, but it is most probable because hardly any other animal would dare to attack them, and the skin is too hard and thick to be deeply scratched by the thornbush. The Rhinoceroses were found to be infested by ticks of the species *Hyalomma aegyptium* (L.),

Amblyomma hebraeum (KOCH) and *Dermacentor rhinocerotis* (DE GEER).¹ In the ventricle were found a few larvæ of some *Oestridæ* but they were too young to be determined according to Prof. SJÖSTEDT.

The Rhinos in the Guaso Nyiri district had all, as far as could be observed, small horns, the front horn measured along the anterior curve in those shot only about 36—40 cm.

According to several observers the Black Rhinoceros of the Somali countries shall be smaller than those in other parts of Africa, and a subspecific name »*somaliensis*» was created in the year 1900 by Count J. POTOCKI. DRAKE-BROCKMAN in his book about »the Mammals of Somaliland»² says »It has been said that it [the Rhinoceros of Somaliland] is smaller than the East African variety, but this is possibly due to the poorness of its food supply during certain seasons of the year in Somaliland. The horns certainly seldom grow to any great length» — — — (l. c. p. 106). The Rhinoceroses north of Guaso Nyiri in the thornbush country live under analogous conditions and they were certainly poor. The ribs could be traced through the skin (Pl. VII fig. 2).

Quite recently LYDEKKER has compared two skulls of DRAKE-BROCKMAN'S Rhinoceroses from Somaliland with a skull from »East Africa» and found³ that the former »differ by the narrower form of the whole upper surface, both at the interparietal constriction and at the orbital expansion». The figures of the Somali skull at the side of the East African skull show a striking difference in breadth. Only two measurements of the breadth of these skulls are recorded, viz. the »breadth at orbits» and the »zygomatic width», in LYDEKKER'S paper. For comparison the same measurements of two South African, two East African, and two skulls from Guaso Nyiri are recorded in the accompanying table of measurements. From this can be seen that LYDEKKER'S East African skull must have been unusually broad as none of the 6 skulls now measured attain the same orbital breadth, nor zygomatic width.

	LYDEKKER'S specimens		Guaso Nyiri		SJÖSTEDT'S from Kilimanjaro	»East Afr.»	WAHLBERG'S from »Caffraria»	SPARRMAN'S from Cape
	Somali	East Afr.						
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Length of upper aspect	57,5	55,5	56,5	54,5	56,5	57	56	55,5
Breadth at orbits	23,0	27,5	23,5	21,7	24,3	26	25,5	22,3
Zygomatic width	29,5	35,6	32,3	31	32	33,4	32,3	34
Least width of skull at the postorbital constriction	—	—	11,8	11,4	11,8	12,2	11,3	11,7
Width of across anterior horn boss . .	—	—	13	11,6	13,3	14,5	13	13

LYDEKKER'S East African skull is thus beyond the average in these respects and accordingly, as this table of measurements indicates, the differences between *somaliensis* and other Black Rhinoceroses are not so great as will appear from

¹ Conf. L. G. NEUMANN: Ixodides. Ark. f. Zoologi Bd. 7 n:o 24 p. 4 Uppsala 1912.

² London 1910.

³ Proc. Zool. Soc. London 1911 p. 958—960.

his communication. Specimens with smaller orbital breadth than this *somaliensis* skull can evidently be found in different parts of Africa, and the zygomatic measurement is very variable.

The least width of the skulls at the postorbital constriction appears to be rather constant in the specimens measured by the present author, but unfortunately LYDEKKER has not given this measurement, nor that for the width across the anterior horn boss which latter is more variable in size. The exact condition of *somaliensis* in these two respects cannot be stated but the specimens from Guaso Nyiri do not appear to differ essentially from skulls from other parts of the continent. To judge from the present material there is thus no pronounced racial difference between the Rhinoceroses at Guaso Nyiri and those in East and South Africa.

There are, however, individual differences which appear very striking at the first look but prove to be less important when considered more closely. The breadth of the anterior end of the mandible is in South African specimens usually 5 to 5½ cm., and in the Guaso Nyiri skulls from 4 to nearly 5 cm. but in a skull from Kili-manjaro it is very broad, measuring 6,2 cm. and containing rudiments of four incisors. Such a thing has, however, only interest for the study of the individual variation but is then of importance.

It appears rather uncertain how long time this interesting remnant of a past fauna will be allowed to exist. The danger for extermination is the greater as the Rhinoceros is a slow breeder. It certainly has diminished rapidly in some districts, and it is deplorable that so many of these huge beasts are killed without reason. The Rhinoceroses have a bad reputation and this causes the death of many of their kind. »He is irritable, nervous, inquisitive, and churlish; unwary and wanting intelligence; unsympathetic as the dry, arid districts in which he lives», says F. VAUGHAN KIRBY in »The Great and small Game of Africa» (p. 37) about the Black Rhinoceros. With my little experience I cannot say anything against these attributes, but the three first of them he shares to some degree with not a few of them that speak ill about him, and, worse still, act accordingly.

It is much spoken of charging Rhinos, and it is, of course, an undeniable fact, as I have experienced myself, that some Rhinos do charge viciously. But it is by far the smallest number of them that are wicked. The greatest number flee at once when they get the wind of, or hear a man. Some may perhaps advance compelled by curiosity when they with their very bad eye-sight cannot make out what it is that has disturbed them. Others may, when they have been scared and rush away in the direction in which they happen to be headed, run so that they pass in proximity of man, and then it almost looks as if they intended to charge, although they are entirely innocent. Such incidents are, however, sometimes counted together with the real charges and the Rhinos are therefore by some people, who have witnessed real attacks, and by a number of nervous persons regarded to be much worse than they really are. Unfortunately some people also give vent to their hatred and shoot down the Rhinos in such a way that it must be termed wanton destruction and be most seriously condemned.

It is wonderful how often some people are »charged» by Rhinos, and in some cases it is no doubt a bona fide belief, and some people may perhaps have had worse luck with those creatures than others, or the Rhinos may be more fierce in some districts.

But on the other hand it is very easy to produce an effect which looks as if a Rhinoceros charged. A man approaches such an animal from its lee side and then he sends a native around to the windside. As soon as the Rhino perceives the taint it starts. If it runs up wind it charges the native, if in any other direction it charges somebody else!

Two Rhinoceroses are allowed on a license, and the charging ones are not counted. With the great number of sportsmen now visiting British East Africa two Rhinoceroses on each license is too much, and a not too small a fee ought to be paid for the killing of every charging Rhinoceros as well. I suspect that the number of such »bad brutes» would not be so great then as it is reported to be now. It may appear hard that one should be obliged to pay for the killing of a charging dangerous beast, but those people who visit East Africa solely for the purpose of shooting and bringing home »trophies» can no doubt afford to pay something for saving their lives, if need be.

In settled districts and such with a lively traffic the Rhinoceroses may be a troublesome nuisance, especially if they are numerous. But there are vast stretches of land in British East Africa, as well dry steppe as arid thornbush country, which never can produce any kind of crops, and where at most nomadic tribes may be able to feed their flocks. There the Rhinoceroses do no harm, and there, at least, they may be allowed to remain in reasonable number.

Although my experience about the Rhinoceros of East Africa, naturally enough, is not very great I think it may be opportune to mention as examples the behaviour of some of the Rhinos observed.

The 4th of Febr. we were going with our safari from Luazomela to Itiolu river across the open steppe. The wind blew transversely across our path from right to left. A female Rhinoceros with her calf seen on our left at a long distance, more than a kilometre, started to run like mad with raised tail as soon as the taint from the safari reached her. The calf followed close after her. A little later the same day a Rhinoceros was observed asleep under an acacia about, or rather less than 100 metres from our path. The safari was ordered to pass silently, but the Rhinoceros heard something and rose. As its visual power was not strong enough to give any information about what was going on, and it could not smell anything against the wind it laid down again quietly since it had tried to stare at us for a while. Similar incidents of both kinds were repeated several times during the expedition. In the thornbush north of Guasy Nyiri one day the grown up calf fled first and the mother followed, since they had stared at us a while.

Another day in the same country I passed a Rhinoceros with a nearly fullgrown calf at a distance of about thirty metres under the wind, and they did not perceive anything. At another opportunity I had shot a big Baboon on the slopes of a

mountain in the thornbush country. After the report of the shot we heard a couple of Rhinoceroses snorting in the bushes close behind us, but we did not see them. As we were on march I wanted the Baboon skinned at once so that the boys should not need to carry the heavy body. My gunbearers drove then the Rhinoceroses away by throwing some stones at them so that they should not disturb the skimmers.

When we were camping at the water-holes at Njoro I went out as usual in the morning the 21st of Febr. to collect zoological material and had shot some small birds when a porter came running to me and said something about a »faru» (Rhino) which was about to kill the »nyumbis» (mules) and threatened the camp. I returned speedily and saw a Rhinoceros most peacefully browsing close to our mules on the other side of the dry river-bed at which we had our camp. The boys were of course very excited and wanted me to shoot. As the Rhinoceros had only small horns I did not want to shoot it, hoping to get a better specimen for the collection at another opportunity. I told the boys that, but said that if they wanted me to stay at the camp and protect them I would wait there till the Rhinoceros had walked away. When the boys found that they could not entice me to shoot, the »faru» suddenly lost all its dangerous qualities, and two negroes at once ran across the dry river-bed and drove away the Rhinoceros by shouting and throwing sticks at him, and he trotted off through the bushes with full speed.

A comparatively long experience of a similar kind proved to me that at least the greatest number of these animals, if not all, were rather good-natured, but by and by I learned to know that not all had the same kind disposition. One day when we were marching from a water-place Thera in the thornbush to Guaso Nyiri I went about half an hour in front of the safari with my gunbearers and an askari as guide. We followed a game path, and the wind blew across from left to right. Suddenly we perceived a Rhinoceros lying under an acacia to the right of our path. We were thus not able to pass without his noticing us. We stopped then and my gunbearer, Kongoni, advanced cautiously to the left of the path. As soon as the Rhino got wind of Kongoni he jumped to his feet and with a »locomotive snort» (as VAUGHAN KIRBY says) he went for the boy with full speed. When the askari, who also had advanced a little on the left side of the path, saw this, he shot (and hit the ground several metres from the Rhino). The Rhino changed then direction about 45 degrees towards the askari. I took then a step to be clear of a bush and be ready to shoot. The Rhino saw this movement, changed again his direction about 45 degrees and came towards me, but a bullet in his neck at rather close quarters made him swerve off. This was plainly a very deliberate charge, and the interesting thing is that the Rhino changed direction twice when he saw a new adversary.

A few days later, an afternoon when I was returning to our camp at Guaso Nyiri below Chanler Falls we found a Rhino lying close to the game path which we were following. The thornbush was rather thick there, and it would have been troublesome to make a detour around him. I tried therefore to drive him off by shouting at him. He started to his feet with a snort and as we were near him

he saw us and charged. I had thus to shoot, and he dropped on his knees stone-dead for a 9,3 mm. mauser bullet between the shoulder and the neck.

Thus, of all Rhinoceroses I had the opportunity of seeing only two charged, and the notes above may prove that it is not by far the rule that these animals are so bad-tempered as their reputation makes them.

Equidæ.

Equus burchelli böhmi MATSCHIE.

MATSCHIE: Sitz.-ber. Ges. Naturf. Freunde Berlin 1892, p. 131.

(*Equus burchelli grantii* DE WINTON.

DE WINTON: Ann. & Mag. Nat. Hist. 1896, Ser. 6, Vol. XVII, p. 319.)

This Zebra is common on the plains around Nairobi where not too heavily decimated by the settlers. At a place called Punda Melia, south of Fort Hall, which just has received its name (which means »zebra») from the former abundance of Zebras there, I saw only a single such animal on our way north, and six when we returned. On the acacia steppe north of Meru boma at Luazomela, Itiolu, and Lekundu rivers the Zebras were numerous, and at the latter locality they were often found in mixed herds with the large Grévy's Zebra without apparent rivalry. On the Athi plains they often are associated with Coke's Hartebeest and Gnu, at the northern acacia steppe with Oryx Antelopes.

North of Guaso Nyiri in the thornbush country I did not see any Zebras, but Mr. CUNNINGHAME told me that he had seen three one day. Although the Zebras occasionally cross this river — perhaps when scared by Lions, or if some other danger threatens them — it appears to constitute the northern limit of their distribution in this part of East Africa.

At a certain distance when the stripes are no longer conspicuous, a Zebra looks either very light grey almost white, or nearly black according to the different shade of light in which it stands. But a couple of the uppermost white stripes across the hind quarters shine much more brightly white than the others.

A considerable variation in the colour pattern of the Zebras of British East Africa has already been proved by J. A. ALLEN.¹ The same author has also stated the presence of shadow stripes in some specimens, even if they as a rule are absent. The difference between *E. b. grantii* DE WINTON and *E. b. böhmi* MATSCHIE appears thus to be very slight if any as already once before has been pointed out by the present writer,² and MATSCHIE's name is the older.

¹ Bull. American Mus. Nat. Hist. New York, Vol. XXVI, Art. XII, p. 160—165, figs 3—10.

² Mammals p. 32 in Wiss. Ergeb. d. Schwed. Zool. Exp. Kilimanjaro Meru von Y. SJÖSTEDT.

***Equus grevyi* OUSTALET.**

OUSTALET: La Nature 1882 X An. II semestre, p. 12.

(*Equus grevyi faurei* MATSCHIE?)

MATSCHIE: Sitz.-ber. d. Ges. Naturforsch. Freunde. Berlin 1898 p. 170 & 180.)

It is rather uncertain, as well if the subspecific name »*faurei*» can be maintained, as, if this should be the case, by which characteristics the race provided with that name shall be distinguished. When the name was given MATSCHIE wrote as follows: »Wahrscheinlich wird *E. faurei* mit weisser Schwanzspitze sich von *E. grevyi* mit schwarzer Schwanzspitze gut unterscheiden und letzteres die Somali-Länder, ersteres die von mir als Rudolf-See-Gebiet zusammengefassten Gegenden bewohnen, zu welchen auch Schoa und das südliche Abyssinien zu rechnen ist.» At my request whether he later had obtained any more material, and whether he perhaps could add any more characteristics by which these two races could be separated MATSCHIE kindly replied that this was not the case. At the same time, however, he wrote: »Bei *E. grevyi* sind die dunklen Binden auf den Halsseiten hinter dem Kinn ungefähr so breit wie die hellen, bei *faurei* sind die weissen Binden etwa halb so breit wie die schwarzen.»

According to these two characteristics — the white tail-tuft and the relative breadth of the black stripes on the sides of the neck — the following figures in the literature among others belong to »*E. g. faurei*»:

- Proc. Zool. Soc. London 1899 p. 714 & p. 825 (SCLATER);
 Atti R. Accad. delle Scienze, Torino Vol. XXXVII (CAMERANO) figs. 1—5;
 Proc. Zool. Soc. London 1900 p. 553 & p. 554 (RIDGWAY);
 The Game Animals of Africa, 1908 p. 49 & 51 (LYDEKKER).

On the other hand the typical *Equus grevyi* would be represented by OUSTALET's two figures accompanying his first description of the species in »La Nature» Vol. X. 1882, and by SCLATER's figure in Proc. Zool. Soc. London 1882 p. 721. Concerning the origin of the specimen of *Equus grevyi* OUSTALET gives the following information: »Ce Zèbre qui a été capturé dans cette région de l'Afrique orientale qu'on appelle le pays des Gallas» — — — »Il a été offert en présent par S. M. Ménélek, roi de Choa à M. le Président de la République» — — —. The latter figure as well has been prepared from a photograph of an animal which »had been sent alive by King Menelek of Shoa to the President of the French Republic» — — — and the figure in the same »Proceedings» for 1899 p. 713 which should belong to *E. grevyi faurei* represents likewise »a fine female specimen of Grévy's Zebra presented to the President of the French Republic by the Emperor Menelek, and received — — — in September 1898». These three specimens have thus a similar origin, in spite of their different appearance, as all of them have come from King Menelik's dominions, pre-

sumably Shoa, and this makes the question about the two supposed races rather doubtful.

If there were two races of *E. grevyi* they must, of course, have a different geographical distribution and »*E. g. faurei*» should inhabit Southern Abessinians, Shoa and the region about Lake Rudolph southwards to Guaso Nyiri according to MATSCHIE's opinion, while the typical *E. grevyi* should belong to Somaliland. Against this speak the facts already recorded that the late King MENELIK has sent as well specimens with broad black stripes on the neck (presumably *E. g. faurei*) as such with narrow stripes (the type of *E. grevyi* and another similar specimen) to Europe. Likewise speaks against the same supposition the fact that a skin sent by MENGES to HAGENBECK from Berbera, thus from Somaliland, has broad black stripes on the neck (as »*E. g. faurei*»). This can be stated on the figure published by SCLATER in Proc. Zool. Soc. London 1890 p. 413.

The confusion is still more increased when one reads in DRAKE BROCKMAN's book »The Mammals of Somaliland»¹ about Grevy's Zebra. »This is a small and dark Zebra. The black stripes being broad and very close together give it the appearance in the distance of a black pony.»

The Grévy's Zebras are, of course, the largest in the group. And those which I have had the opportunity of seeing, — and they can be counted in many hundreds, — never gave the impression of being black. On the contrary when the distance was so great that the stripes could not be discerned, the black and white blended together into a soft, pale, almost silvery grey. — On the other hand the common East-African Zebra (*E. granti*») sometimes and in certain shades of light looked quite black in a distance, but in other shades of light almost pure white. This was especially striking when a little flock was seen together, and some were standing so that they looked black and others white, but after a while they changed position and then also at the same time colour. The effect of the stripes of these two animals is thus considerably different when they are seen at some distance. They were always easily seen. In his above quoted book »The Game Animals of Africa» LYDEKKER speaks about »two races or subspecies of Grévy's Zebra». The Somali race is mentioned under the name of »*E. grevyi berberensis*» which has been given by Pocock² 1902, but has been omitted in TROUESSART's »Catalogus Mammalium, Quinquennale Supplementum» 1899—1904. The type is said to be from Duhri, Ogadain and shot by Capt. SWAYNE. In this race the stripes are said to be dark brown and the interspaces washed with ochre-brown and very noticeably darker than the white of the belly (Pocock l. c. p. 308). Such a description appears to suit a young specimen, but an animal coloured like that would probably look, darker than a normally coloured Grévy's Zebra.

In a description of *Equus grevyi* Pocock writes³ — — »this species is quite peculiar for the minute size of those bare patches of skin above the knee on

¹ London 1910.

² Ann. & Mag. Nat. Hist. 1902 Ser. 7, Vol. X, p. 308.

³ Ann. & Mag. Nat. Hist. 1897 Ser. 6, Vol. XX, p. 48.

the fore legs, which in England are spoken of as warts or chestnuts.» And a little further below, on the next page in the diagnose the author quoted expresses himself as follows: »Warts on fore legs very small». Although the »warts» are smaller than those of the Zebras of the *burchelli* group, such a general statement as this must, however, be taken cum grano salis as will be seen from the following measurements of these organs in my specimens. In one of them, an old stallion, they may be termed small as the diameter of the wart on one foreleg is only 8 mm. in diameter, but on the other it is 12 mm. In the next specimen the wart is 15×8 on one side and 18×14 on the other. In a third specimen it is 29×17 on one side and 32×18 on the other, and in a fourth about 34×18 on both sides. In these latter cases the warts hardly can be termed »minute». The great variability in size displayed in these specimens is quite remarkable because, in spite of the fact that these organs probably must be regarded as rudiments, their relative size, presence or absence has been regarded as a very important characteristic, a view which to some degree now must be modified.

The ergots are always very large in my specimens of Grévy's Zebra and have a diameter measuring from 30 to 40 mm.

As has been stated in the literature, the mane of the young foal of Grévy's Zebra is continued as a crest all along the back to the root of the tail. This disappears with age, and in the old individuals there is nothing left of this juvenile crest on the back. But in a young adult stallion remains of this crest are to be found. The hairs of the black stripe on the posterior back (but not anteriorly) attain a length of about 4 cm. and are thus strikingly longer than the very short hair of other parts.

The collection now described contains two fine stallions and a mare of Grévy's Zebra from the southern side of Guaso Nyiri near Lekundu river and a stallion from the thornbush country north of Guaso Nyiri at the water-place of the Rendiles called Njoro. All these specimens are alike in having the upper or dorsal portion of the tail-tuft more or less white and the under or ventral portion black. The black stripes on the sides of the neck are much broader than the white. These characteristics are thus in accordance with those given for »*E. g. faurei*», and I have therefore mentioned this name but with hesitation, as I do not know, if it really belongs to a different race, or if it simply is synonymous with *E. grevyi*. The latter is the more probable as the type-specimens for both names have a similar origin, as far as is known, and the eventual difference in geographical distribution is as yet only hypothetical.

The measurements of a male (Conf. Pl. VIII Figs. 1, 2 & 3) and a female skull of Grévy's Zebra from this collection are given in the following table:

	South of Guaso Nyiri	
	♂ ad.	♀ ad.
	mm.	mm.
Basal length	547	547
Condylolncisive length	578	580
Greatest breadth of skull	210	217
» » » brain-case	102	111
Least interorbital breadth	143	132
Greatest length of nasals	291	293
» breadth of nasals behind	127	122
Breadth of nasals at anterior end of naso-premaxillary suture	57	48
Distance from orbit to tip of premaxillary	365	366
Length of upper molar series	186	183
Greatest breadth of premaxillaries in front	71	67
Length of palate mesially	282	271

The canines are strongly developed in the stallions, in the mare they are small but present as well in the upper as in the lower jaw. A small p^1 is present on the left side of the upper jaw of the old mare, and in a young stallion in which the last molar has not yet cut the gum the p^1 is present on both sides. It appears thus probable that these teeth are normally developed in all specimens but being functionless soon fall out.

A young stallion from Njoro with a condylolncisive length of 585 mm. has a skull which is even larger than that measured above, although this was a very fine middle-aged specimen, among the largest in the herd, and considerably bigger than an old stallion shot at the same time. In this young stallion from Njoro the permanent dentition is not yet fully developed. The condition of the dentition is as follows.

Upper jaw: i^1 in use and worn.

i^2 just cutting the gum.

di^3 in use.

c in a level with the jaw bone.

p^1 , p^2 , p^3 in use.

p^4 not yet fully in a level with the other teeth.

m^1 , m^2 in use.

m^3 just appearing.

Lower jaw: i_1 in use and worn

i_2 just visible on the left side, on the right di_2 still in use.

di_3 in use.

c the upper edge not yet at the upper surface of the jaw bone.

p_2 , p_3 in use.

dp_4 in use.

m_1 , m_2 in use.

m_3 just appearing.

A Horse with such a dentition would be between 3 $\frac{1}{2}$ and 4 years. It is possible that this specimen is not quite as old, but the relative order for the succession of the teeth appear to be the same in Grévy's Zebra as in a Horse. The same appears also to hold good for Böhm's Zebra as the dentition of such a skull in a somewhat earlier stage is as follows:

Upper jaw: i^1 , di^2 , di^3 , dc , p^2 , p^3 , dp^4 , $(p^4)^1$, m^1 , m^2 (m^3).

Lower jaw: i , di_2 (i_2), di_3 , dc , p_2 , p_3 , dp_4 , m_1 , m_2 , (m_3).

There is a rather striking difference of type between the skulls of the Grévy's Zebras (Pl. VIII Figs 1, 2 & 3) and those of the *burchelli* series from South Africa. The former have a much longer and comparatively more slender skull, while that of the latter is comparatively short and broad. The condyloincisive length of a skull of an old male *E. b. antiquorum* is for instance only about 530 mm., but its greatest breadth is fully 223 mm., thus more than the corresponding measurement of the longer skull of the Grévy's stallion (conf. table of measurements above). The greatest breadth of the skull is with other words only 36 % of the condyloincisive length in *E. grevyi* but 42 % in *E. b. antiquorum*. The least interorbital breadth of the latter is 156, that of the former 143 mm. thus resp. 29 and 24 % of the condyloincisive length of skull. The difference in length between the skulls of *E. grevyi* and *E. b. antiquorum* is chiefly due to the prolongation of the facial portion of the former, for the distance from the anterior brim of the orbit to the posterior surface of the occipital condyle is practically the same in both. On the other hand the distance from the anterior brim of the orbit to the tip of the premaxillaries is resp. 365 and 336 mm. In correspondence herewith the length of the palate mesially is resp. 372 and 352 mm. The different length of the molar series is also very striking. It measures in the *E. grevyi* stallion 186 mm. but in the *E. burchelli antiquorum* 151 mm. In spite of its length the facial portion of the skull of *E. grevyi* is comparatively more slender as well in breadth as in height. The width of the skull just in front of the orbit is in *E. grevyi* 185 mm., but in *E. b. antiquorum* 197 mm. The latter skull is, however, more suddenly narrowed so that it measures 132 mm. across the anterior margin of m^1 while the same measurement of *E. grevyi* is 138 mm., and the width at the base of i^3 is in *E. b. antiquorum* 63 and in *E. grevyi* 71 mm. The height of the skull expressed by measuring the distance between *sutura nasalis* and the alveolar margin of p^4 is 137 mm. in the former and only 131 mm. in *E. grevyi*.

The East African members of the *E. burchelli* series are considerably smaller than *E. b. antiquorum*. Their skulls are neither so broad, nor so heavy as those of their southern relatives. They are, however, comparatively broader than the skull of Grévy's Zebra. Thus the greatest breadth of *E. b. granti* is 39 % (perhaps sometimes 40), and the least postorbital width 27 % of the condyloincisive length of the skull.

¹ On one side p^4 just cutting the gum.

On the acacia steppe north of Meru boma we met with the first Grévy's Zebras between Itiolu and Lekundu rivers. They were rather common there in herds varying in number. On the march between the rivers mentioned I saw a mixed herd of the common or Grant's zebras and Grévy's zebras. The animals were grazing quite peacefully together, and it was evident that the two species did not take any more notice of each other than either species would have done, if the other had been Oryx-antelopes or any other kind of non related animals. It is thus evident that these two species are physiologically so distant that they have no feeling of relationship and rivalry, otherwise the stallions of the larger species hardly would have tolerated those of the smaller in the same intimately mixed herd.

Round our camp at Lekundu river »Kanganis», as these zebras are called by the natives, were rather numerous, and two fine stallions were shot there the first afternoon. When we were returning to camp with the skins and skeletons of these specimens after sunset I heard for the first time the peculiar cry of the Kangani, and I confess it was the most uncanny sound I ever heard in Africa (Lions, Leopards, Hyenas etc. not forgotten). It has nothing at all in common with the rather melodious bark of the zebras, but reminds more about the braying of an ass. It is very difficult to describe it starts like a grunt and is continued into a kind of long drawn out howl or scream variegated with grunts and shriller sounds. It is nothing equine about this cry, and one cannot imagine that this ghastly performance is produced by the beautiful Kangani.

The Kanganis were mostly seen on the quite open steppe, often in company with Oryx-antelopes. As a rule they were not very shy, and often it was not connected with much difficulty to come within range. Sometimes, however, they behaved quite differently and galopped away like mad as soon as they perceived any human being, even if they had not got the wind of him.¹

In the thornbush country north of Guaso Nyiri the Kanganis were not so numerous as on the steppe. Single specimens were also oftener seen there. They lived chiefly in such places where the thornbush was not very thick, and where some open places more or less covered with grass could be found.

The 18th of March when we again had crossed Guaso Nyiri to the southern side I saw on the steppe several Kangani mares accompanied by young foals which still were fawn-coloured. ROOSEVELT found young foals with the Kanganis in the latter part of Sept. which thus indicates irregular breeding-habits.

The hoofs of the Kangani are broad and horse-like. RIDGWAY² offers as an explanation of this the theory that »it is not a mountain animal, but always keeps rather to the low and often swampy ground». The localities where I had the opportunity of studying this animal were never swampy. It is possible, however, that in some places on the southern side of Guaso Nyiri the dust of the dry season will turn into mud in the rainy. In certain localities the steppe, especially near Itiolu

¹ ROOSEVELT »found the Kangani even more wary and difficult to shoot than the oryx». (»African Game Trails», p. 293.)

² Proc. Zool. Soc. London, 1909, p. 563.

river, consists of so soft ground that a walking man sinks down over his ankles, but I never saw any Kanganis in such places. On the southern side of Guaso Nyiri they were mostly seen in places where the soil was firm, sometimes with a layer of dry dust on top in which they now and then were seen rolling like horses. In many localities of wide extension the plains were thickly strewn with black, sharp-edged stones of volcanic origin, and even in such places the Kanganis were fully at home. The soil of the thornbush country on the northern side of the river mentioned consists of hard-packed gravel with a great amount of quartz pebbles. My experience is thus that the Kangani prefers hard ground.

The appearance of the hoofs of old specimens testifies that. The present author can fully confirm by own experience A. H. NEUMANN'S statement in »Great and Small Game of Africa» (p. 89): »In stony country the soles of an old Grevy's hoofs are sometimes worn almost quite flat, frog and all.» To this may be added that considerable pieces may be broken from the sides of the hoofs and, although this heals up again, the unevenness of the sides of the hoofs proves the hard usage they have been subjected to among the sharp stones.

Considering the altitude I have only three observations which can be referred to the habitat of the Kanganis. Our camp at Lekundu river was according to the barometer 1150 m., Njoro about 750 m. above the sea level, and our camp below Chanler Falls at about the same altitude as the latter.

Artiodactyla.

Suidæ.

Potamochoerus choeropotamus keniaë LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist., Ser. 8, Vol. IX, p. 66.

It is connected with great difficulties to obtain adult Bush-Pigs as they are nocturnal in their habits, and in day-time are hidden in the densest thickets that can be found, and where it is impossible to penetrate noiselessly as well as to see more than a few metres ahead. Fresh spoors were seen not far from Nairobi, in the forests on Kenia, and also at Meru boma, and a couple of times I even was near enough to hear when the pigs rushed away through the bushes but none was ever seen. In steppe and dry thornbush country they are not to be found, there the Wart-hogs take their place.

From Mr. KLEIN of Nairobi I obtained a couple of Bush Pigs which had been killed not far from the place mentioned. They are both fully adult specimens, and resemble each other in colour.

The whole head of an old sow (Pl. IX) including even the chin and lower jaw, is white, partly dirty white, with entirely black ears with rather long tufts, a black patch above either eye, and a black streak above the white whiskers. The head of

a somewhat younger sow is similar, the black patches at the eyes are less pronounced, but on the other hand, a blackish band, grizzled with white, running between the anterior corners of the eyes is more conspicuous than in the former. A well developed dorsal crest runs from between the ears backwards along the neck, over the withers, and to the middle of the back where it appears to cease abruptly. This crest consists of basally black bristles with long white tips which are dominant in the older, but are shorter in the younger so that the black of the crest in that specimen is seen everywhere among the white tips. On the sacral region again, in front of the root of the tail long black bristles with white tips form a bit of a crest. In this sacral crest there are very few white tips to the bristles in the old specimen. In the younger their number is greater, but they are not by far as numerous as above the withers. The sides of the back are rich rufous, much mixed with black in the old, duller rufous and with the black dominant in the younger sow. Sides of neck, chest, shoulders, hams, feet, and lower side shiny black in both specimens. Tuft of tail black.

The general colouration of these animals, and the length of the bristles indicate that they belong to the *P. chæropotamus* group. But the nearly complete absence of black or dark on the forehead as well as on and around the snout, the white chin, and the abrupted dorsal crest appear to make this race quite distinct from the hitherto described forms.¹ In some respects it approaches to *P. intermedius* from Uganda. In *P. ch. nyasæ*, and *johnstoni* the snout is more or less completely black above and below, and in other races there is a broad black ring around the snout, and the chin is black, even if the greater part of the face is pale.

These distinguishing characteristics are supported by others derived from the skull. The dimensions of the two skulls from Nairobi are recorded in the table of measurements below. It may be seen from this that the measurements of the boar(?) skull (conf. Pl. X) nearly agree with the corresponding measurements of the skull of an adult boar of Bush Pig from Kenia kept in British Museum Nat. Hist. where it bears the N:o 4, 11, 5, 17. The measurements of this latter skull have been recorded in my previous paper on the genus *Potamochoerus*.² In the boar skull of this collection the width of the parietal flat area is 8,3 % of the upper mesial length of the skull, and the same percentage for the specimen in British Museum Nat. Hist. is 8,5 %. The present female skull has this area somewhat broader, but such a discrepancy between the skulls of different sexes is found among other races as well. By this relative dimension of the parietal flat area the boar skulls of this race are very easily distinguished not only from the small and very narrow-headed Kilimanjaro race, *P. ch. dæmonis*, and the likewise narrow-headed *P. ch. nyasæ*, but at the same time also from the large- and broad-headed *P. ch. johnstoni*. The southernmost

¹ Conf. LÖNNBERG: Contributions to the knowledge of the genus *Potamochoerus*. Ark. f. Zool., Bd. 7, N:o 6, Uppsala & Stockholm 1910.

² Ark. f. Zool., Bd. 7, N:o 6, Stockholm 1910, p. 16 & 17. As I have not been able to read the proofs of this paper sufficiently because it was printed during my absence, there are unfortunately several misprints. Among other things it ought to be corrected that the type of *P. ch. dæmonis*, of course, is the specimen of Brit. Mus. not that of Berlin.

	♂ Kenia Brit. Mus. 4, 11, 5, 17	♂(?) Nairobi B. E. A.	♀ Nairobi B. E. A.	♀ Gheleh, Eritrea
	mm.	mm.	mm.	mm.
Upper mesial length from occipital crest to tip of nasals	361	349	332	348
Width of parietal flat area	31	29	40	48
Greatest width at lambdoid crest	86	77	60	98
Distance from postorbital process to lambdoid crest	98	89	92	97
Greatest zygomatic width	170	177	162	161
Width at postorbital processes	102	106	109	101
Least interorbital width	69	79	78	72
Distance from orbit to front end of naso-premaxillary suture . .	203	193	179	191
Distance from hind surface of m ³ to tip of premaxillary	—	212	199	212
Length of m ³	33,5	33	33	32
Least width of skull between lambdoid crest and zygomatic arch	63	59	53	64
Least width of nasal surface of skull between the orbit and the apophyses above the canines	—	56	43	51
Width across upper ends of the canine apophyses	—	91	—	—
Width of nasal region on a level with anterior margin of canine alveoles	—	34	35	38

representatives of *P. chæropotamus* have a much broader parietal area amounting to about 12 % of the upper length of the skull, while the somewhat more northern race *P. ch. maschona* has a narrower parietal area (amounting to about 6 %) than the Kenia Bush Pig. In some respects the skull of this latter strongly reminds about the West African Bush Pigs of the *P. porcus* group, especially by the great breadth of the posterior nasal region (Pl. X, fig. 3) between the orbits and the canine apophyses when compared with the anterior nasal portion in front of the apophyses mentioned. The nasal surface is flat especially in its posterior two thirds. The canine apophyses are very strongly developed in the boar(?) skull (Pl. X, fig. 1 & 3), their shortest anteroposterior diameter being 37 mm., and, although they hardly reach the level of the nasal surface they are very broadly ankylosed with the lateral exostoses of the snout so as to form a canal on the side of the upper jaw. This is the more striking as the animal to judge from the condition of the teeth (Pl. X, fig. 2) is not very old. Such a coossification between the canine apophyses and the lateral exostoses of the snout I have seen in, and also described from boar skulls of the *P. porcus* group, but I have not seen it in other members of the *P. chæropotamus* group than this one so that I do not know if it is a common occurrence there, which appears, however, hardly probable.

The anterior portion of the zygomatic arch in the boar skull (Pl. X, figs 2 & 3) of the Kenia race forms a right angle towards the longitudinal axis of the skull, and at the same time the anterior bony wall formed by this arch stands nearly vertically. In the sow the latter is more sloping, but comparatively less than generally is the rule in the *P. chæropotamus* group.

The race of Bush Pig described above has been named the Kenia race because it evidently inhabits the forests of the Kenia plateau. On the northern side of this plateau the dry Somali-Galla countries are situated, and on the southern side the open East African steppe. Both these surrounding countries do not offer suitable conditions of life for Bush Pigs, and the Kenia race appears thus to live in a certain isolation which may account for its differentiation. The geographically nearest race in the south east is *P. ch. daemonis* (MAJOR) of Kilimanjaro which is easily recognized on its smallness and very narrow parietal area.¹ In the north the Abyssinian *P. hassama* (HEUGLIN) is a rather distant neighbour. This latter race is chiefly known from the first description,² but FORSYTH MAJOR has also published some notes and two figures of a skull. He points out as for this race especially typical characteristics the low canine apophysis, and »the elongation of the hinder part of the skull backwards from the postorbital processes of the frontals».³ These characteristics are also plainly shown in MAJOR's figures, and prove the distinctness in these respects of the Abyssinian race from the one from Kenia. The present author has not had any opportunity of examining any boar skull from Abyssinia, but an evidently female-looking skull has been obtained for this museum from Gheleb, Eritrea, through the kindness of Mr. K. G. RODÉN. The measurements of this skull have been recorded in the table above, side by side of those of the sow skull from Nairobi. From this may be seen that the posterior portion of the skull is broader with regard to several dimensions in the Abyssinian than in the Kenia specimen. The former is also somewhat longer with regard to its postorbital extension, although this is less striking than in MAJOR's figure of the boar skull. The nasals are more vaulted than in the Kenia specimen, and the anterior part of the zygomatic arch is much more gradually sloping towards the facial portion.

The colour of the Abyssinian race is very different from that of the Kenia race. Two skins of *P. hassama* male and female obtained by Mr. K. G. RODÉN at Gheleb have the snout and the upper part of the head behind the interocular region whitish. The whiskers and a streak below the eye are also white, the remaining part of the head blackish brown. Chin mixed with whitish. Ears, shoulders, hams, and feet blackish brown. Back and sides pale rufous somewhat mixed with blackish in the boar, still paler, partly buffish in the sow. The dorsal crest which does not extend over the posterior back, is whitish with hardly any, or few black bases to the bristles.

Two little pigs of *P. hassama* from the same locality are pale rufous somewhat mixed with black. A whitish crest is developed over the withers and anterior portion of the back. Preocular region of head above and below blackish brown; ears and feet of the same colour which extends more or less up the legs.

P. hassama is thus in all ages much paler than *P. ch. kenia* which latter with regard to its very dark colouration of the body more resembles *P. ch. daemonis*.

¹ Conf. LÖNNBERG l. c. p. 27.

² Verh. d. K. Leop. Carol. Akad. d. Naturwiss., Bd. XXX, pt. II Nachtr., p. 7.

³ Proc. Soc., London 1897, p. 369.

Hylochoerus meinertzhageni THOMAS.

THOMAS: Proc. Zool. Soc., 1904, p. 193.

When the Expedition passed through the upper forest belt of northeastern Kenia where clumps of bamboo were mixed with the trees at an altitude of approximately 2,700 m. a skull of an old and very big boar of Forest-Pig was picked up by Mr. JANSSON, and close to it a few minutes later one of the boys found the lower jaw as well. It was no doubt a specimen which had been trapped by the Wandorobbos in one of their ingenious pitfalls, of which quite a number was seen during the march. The tusks and incisors were missing, probably broken out by the wild huntsmen, but otherwise the skull (Pl. XI) was complete with exception of the extreme tips of the nasals and the prenasal bone. In this region spoors and droppings of Forest-Pig were very numerous, the latter closely resembling those of domestic Hogs, although larger. In some places the Forest-Pigs had rooted up the ground,¹ and it appears that these animals are quite common in this belt of mixed bamboo and forest on the upper slopes of Kenia even on its northeastern side. I was also told by Mr. & Mrs. SANDBACK BAKER of Nairobi who kindly presented me a skull of an adult but not old sow of this species, that formerly these pigs had been found in the lower forest regions as well, but their regular haunts are no doubt the lower bamboo and upper forest region. The type of *Hylochoerus meinertzhageni* was obtained from Nandi, and from the same region MAURICE DE ROTHSCHILD and H. NEUVILLE have described several specimens of both sexes.² These authors describe their specimens, and figure the head of a sow (l. c. p. 144) with »deux taches blanches ou d'un blanc jaunâtre, l'une à la commissure des lèvres, l'autre au dessous de l'oreille, à l'articulation de la mâchoire» (l. c. p. 146). In an adult sow of Forest-Pig, obtained through ROWLAND WARD from Mau, these whitish spots are entirely absent. The bunches of bristles mentioned by the authors quoted as forming the spots are well developed, but are entirely black. In a similar way the specimen from Mau has not a single whitish bristle on its lower side, whereas ROTHSCHILD and NEUVILLE write about the specimens from Nandi »la gorge, la poitrine, le ventre et les parties internes des membres, en un mot toutes les parties inféro-internes de la peau sont parsemées de soies blanches» (l. c. p. 147). It is of course impossible to say whether these differences are constant or not, and in the male specimen figured by the authors quoted (l. c. Pl. I) these spots are not visible. Unfortunately I have not had the opportunity of seeing any skin of Forest-Pig from Kenia. C. W. WOODHOUSE says about the Forest-Pig of Mau: »there is usually a white tuft of hair in the sow and young on the horizontal tubercle of the face, and this remains in the boar as a few

¹ C. W. WOODHOUSE (conf. below when writing about the habits of the Forest-Pig of Mau says that it does not root. It is thus possible that the »rootings» seen by me were products of Bush-Pigs, although there were spoors and droppings of Forest-Pigs at the place.

² Bull. Soc. Philom. Paris, Sér. 9, T. VIII, 1906, p. 141.

³ The Journal of the East Afr. and Uganda Nat. Hist. Soc., Vol. II, No 3. p. 43. 1911.

scattered white hair.³ Compared with other statements above this proves the variability in the amount of white and its presence, or even absence.

	Old male from Kenia	♀ from Mau	♀ from Kenia
Greatest length of skull mesially to tip of nasals	465 ¹	408	367
Basiscranial length	407	359	325
Distance from posterior border of palate to tip of premaxillaries	310	262	236
Length of nasals	suture abolished	243	207
Greatest width of nasals	49	47	40
Distance from anterior brim of orbit to tip of premaxillaries	317	280	246
" " tip of postorbital process to lambdoid crest	115	98	87
Greatest zygomatic width	267	200	175
Least interorbital width	107	92	81
Width across postorbital processes	146	124	104
Width of parietal flat area	122	98	73
Least width of skull behind canines	77	67	67
Height from basion to top of occipital crest	138	122	113
Breadth across sockets of canines	152	120	100
Least width of palate between m ²	35	38	37
Basal diameter of canine	45?	33	21
Horizontal length of mp ⁴	—	12,5	12,5
" " " m ^{1 2}	—	16,5	18,5
" " " m ^{2 2}	—	25,3	26,5
" " " m ³ (visible parts)	43	38	33,5
Length of lower jaw	363	—	304
Breadth across symphysis at base of canines	114	101	94
Least breadth of lower jaw across diastema	85	77	73
Horizontal length of p ₄	16	13,5	11,5
" " " m ₁ ²	15,5	17	18
" " " m ₂ ²	24,5	25	28 5
" " " m ₃ (visible parts)	51	42	40

The dimensions of the three skulls of Forest-Pig which I have had for comparison are recorded in the accompanying table of measurements. The general proportions agree approximately with other specimens described before. The dimensions of the female skull from Mau resemble rather closely those of THOMAS' type which was a young adult boar.

The zygomatic arch of the big boar skull is very strongly thickened and has a very rugged surface which corresponds to the enormous wart with which these animals are provided, and which is homologous with the wart below the eye in the Wart-hog.

In one respect viz. with regard to the shape of the nasals my two specimens from Kenia are more alike inter se than either of them resembles the specimen from

¹ Approximately, tips of nasals broken!

² The length of the anterior molars is diminished with the increasing age of the animal.

Mau, although the former belong to different sexes and are of different age. This likeness consists therein that the nasals are shorter so that their posterior end is considerably in front of the anterior suture between the *lacrimale* and *maxillare*. At the same time the posterior half of the nasals is flatter, especially opposite *foramen infraorbitale* than in the specimen from Mau. In the latter the nasals extend further backwards so that their posterior ends are on a level with the anterior suture between *lacrimale* and *maxillare*. The posterior half of the nasals are rather strongly vaulted in the specimen from Mau so that the distance from the alveolar brim opposite *foramen infraorbitale* to the median nasal suture is 85 mm., whereas the same measurement in the very much bigger boar-skull from Kenia is only 82 mm., and in the female skull from Kenia hardly 73 mm. Whether this is a racial characteristic, or individual variation cannot be decided on the present material. The agreement of the Kenia specimens, although they are of different sex, is, however, worthy of being pointed out.

Considering the dentition it is of interest to note that in the female skull from Mau dp^4 on the right side has fallen out and given place to a comparatively small p^4 , while on the other side dp^4 is still in use. This is in accordance with observations made by ROTHCHILD and NEUVILLE (l. c. p. 153). In the female skull from Kenia dp^4 on both sides are still retained but the tooth is on the verge of being pushed out with the roots partly resorbed, especially posteriorly on the outer side.

In the Mau specimen the dentition is, or has been more complete even than in the somewhat younger specimen from Kenia. In the former there are open alveoles in front of p^3 for p^2 which has, however, fallen out probably after the death of the animal. In the lower jaw there are in front of p_4 two small open alveoles which probably have belonged to dp_3 . On the right side there is in addition to this a rudimentary but not very small tooth sunk in the jaw. Its length is about 8 mm., and its breadth 6 mm. As it is situated much nearer (distance 24 mm.) the canine than the alveoles of the presumed dp_3 (distance 40 mm.), it must be considered to be dp_1 .

In the female Kenia-specimen there is only a very small alveole somewhat in front of p^3 , and nothing in front of p_4 in the lower jaw.

The Mau-specimen is well provided with incisors as well. About 10 mm. behind i^1 a tooth is situated which appears too strongly developed to be a milk-tooth and which as I presume ought to be regarded as i^2 . Its cutting edge has a length of fully 7 mm., and its basal parts are stout as well.

In the lower jaw on the right side there is a quite strongly developed tooth behind i_2 . Its crown has a length of 11,5 mm., and a thickness of nearly 5 mm. It differs very considerably in its shape from the slender di_3 of a *Hylochærus* as figured by ROTHCHILD and NEUVILLE (l. c. Pl. 7), and I must consider this tooth to be i_3 . MATSCHIE has also found i_3 in a specimen of his *Hylochærus ituriensis*.¹ On

¹ Ann. du Mus. du Congo. Zool., Ser. V, Etudes sur la Faune Mamm. du Congo, T. 1, Fasc. 1.

the other side of the jaw this tooth appears to have been broken and resorbed as there is a mark in the jaw bone.

The female specimen from Kenia has also had on one side of the lower jaw a well developed i_3 to judge from the size of the alveole, but on the other side there is only a trace of an alveole.

These observations prove that there is a considerable variation with regard to the development of the dentition of *Hylochærus*, but this variation is probably individual.

The following measurements of different bones of the skeleton from Mau agree as a rule, more closely with the corresponding measurements recorded by ROTHSCILD and NEUVILLE for their greatest boar from Nandi than with those of the biggest sow (conf. l. c. p. 160—163). This appears to indicate that the Forest-Pigs attain a greater size on the Mau mountains than in the Nandi forest. The same is probably also the case with the Forest-Pigs of Kenia as the old boar skull picked up there by this expedition is larger than those from Nandi.

Length of scapula	233 mm.
Breadth at upper end of scapula	151 "
Least breadth of scapula	40 "
Greatest length of humerus	271 "
Length from caput to lower condyles	233 "
Greatest breadth at lower end of humerus	60 "
" " " upper " " "	95 "
Greatest length of radius	183 "
" breadth at upper end of radius	45 "
" " " lower " " "	51 "
Least " of diaphyse " "	26 "
Greatest length of ulna	255 "
" " " olecranon from upper edge of sigmoid cavity	88 "
" " " femur	276 "
Distance from caput to inner lower condyle	276 "
" between lateral surfaces of lower condyles	70 "
Greatest anteroposterior diameter at lower end of femur	79 "
Diameter of <i>caput femoris</i>	36 "
Greatest length of tibia	228 "
" transverse upper diameter of tibia	68 "
" " lower " " "	39 "
" distance from <i>ala ilii</i> to <i>tubcr ischii</i>	297 "
" width of pelvis across <i>alæ ilii</i>	300 "
" " each <i>ala ilii</i>	144 "
" " across acubular region	173 "
" length of 3d metacarpal	87 "
" " 4th "	85 "
" " 3d metatarsal	82 "
" " 4th "	87 "
" " calcaneus	107 "
" anteroposterior diameter of calcaneus	39 "

Greatest transverse diameter of calcaneus	30 mm.
» length of astragalus	53 »
» breadth of »	36 »
» thickness of »	30 »

M. DE ROTHSCHILD has criticised (l. c. 142) reports about the Forest Pig in which this animal has been compared in size with a zebra. The latter animal stands of course higher on the legs but in bulk and weight of body an old boar of Forest-Pig may not be very much smaller.

***Phacochærus delamerei* LÖNNBERG.**

LÖNNBERG: Proc. Zool. Soc. London 1908, p. 940.

When the present author named this new species of Wart-hog and based the description on two skulls in British Museum Nat. Hist. it was not known with full certainty where these skulls had been collected, but it was presumed that they were from Somaliland. Last spring (1911) when I had the pleasure of meeting the donor of the skulls mentioned, Lord DELAMERE in Nairobi, he told me that they probably were from the country north of Guaso Nyiri which by the present expedition has been proved to be inhabited by a fauna agreeing with that of the Somaliland to great extent.

Wart-hogs were by no means numerous in those parts of the Guaso Nyiri district which I visited. I saw only once a sow with two half-grown pigs in the thornbush-country near the water-place Njoro. I shot this sow through the chest, but she escaped in the bushes, although severely wounded and very much bleeding.

Some time later Mr. Å. SJÖGREN shot an old sow of the same kind on the northern side of Guaso Nyiri and allowed me to keep the head for the collection of the Expedition. This specimen measured about 112 cm. from snout to vent and about 65 cm. in height at withers. The skull of this female (Pl. XII) exhibits the characteristics which the present author has pointed out as typical for *Phacochærus delamerei* (l. c. p. 938). There are no incisors in the upper jaw, and the premaxillaries are so very thin that they could not possibly hold any alveoles for incisors just as in the type specimens. In the lower jaw four rudimentary incisors are to be seen. The nasals are rather flat, not forming any ridge behind. The shortness of the postorbital portion of the skull is quite striking (Pl. XII). The length of this portion is only 11,3 % of the upper length of the skull (resp. 10,5 % and 10,9 % in the type specimens in British Museum Nat. Hist. The width of the parietal flat area is a little greater than the length of the postorbital portion of the skull. It is 12,9 % of the upper length of the skull thus a little more than in the types viz. 11,9 %, and 11,5 %. The interorbital width is 36,6 % of the length of head. This is a little more than in the types viz. resp. 33,0 %, and 34,7 % but this difference is not great enough to speak against the identity with *Ph. delamerei* especially as other important characteristics fully agree. It is thus stated that this species inhabits the thornbush country north of Guaso Nyiri and may from there extend towards Somaliland.

The following measurements of the skull of this specimen are recorded for comparison with other species.

Length of skull mesially from occipital crest to tip of premaxillaries	325 mm.
Basicranial length	263 »
Width of parietal flat area	42 »
Least interorbital width	119 »
Greatest zygomatic width	197 »
Length of the postorbital portion of the skull	36 »

From these measurements may be seen, as well as from the percentages quoted above, how widely *Ph. delamerei* differs both from the broad-headed *Ph. massaicus*, and the long-headed *Ph. æliani*.

When speaking about this last species I take the opportunity of discussing a question about the identity of *Ph. æliani* CRETZSCHMAR, and *Ph. haroia* EHRENBURG, which I have not been able to settle before, but for the solving of which I have now received some material. The Swedish Missionary Rev. Mr. K. RODÉN has kindly procured a fine skull of a Wart-hog boar from Gheleb in Eritrea. This place is situated only about 75 kilometres northwest from Arkiko which is the type locality of *Ph. haroia*. It appears thus most probable that the same kind of Wart-hog shall be found at these two not very distant localities.

The male skull from Gheleb measures mesially from occipital crest to tip of nasals 391 mm. and has thus very nearly the same length (viz. 388 mm.) as an Abyssinian skull of *Ph. æliani* in Brit. Mus. Nat. Hist. The length of the postorbital portion of both skulls is the same viz. 60 mm. The width of the parietal flat area is a little greater in the skull from Gheleb viz. 32 mm., but it can nevertheless be termed narrow as it is only about 8,3 % of the length of the skull. The interorbital width measures 123 mm. that is about 31,4 % of the upper length of the skull, while the same percentage for the Abyssinian skull is nearly the same viz. 31,7 %. There can thus be no doubt that the Wart-hog from Gheleb is identical with the Abyssinian *Ph. æliani*, and accordingly it may be concluded that *Ph. haroia* is fully synonymous with *Ph. æliani*.

For future comparison a few measurements of a female skull of *Ph. æliani* from Gheleb may be added:

Length of skull mesially from occipital crest to tip of premaxillaries	335 mm.
Width of parietal flat area	33 »
Least interorbital width	103 »
Length of postorbital portion of skull	55 »

The parietal flat area is thus in the female a little broader than in the male.

Phacochoerus africanus subsp.

Wart-hogs are or have been not uncommon on the plains around Nairobi. As I, however, had very little opportunity of shooting there, I did not obtain any ma-

terial. It could be expected that the Wart-hogs of these plains should belong to *Phacochærus massaicus* LÖNNBERG this is, however, not the case. I had the opportunity of measuring the skull of an adult boar which had been sent to Mr. KLEIN for mounting. The upper mesial length of this skull from the tip of the nasals to the occipital ridge was about 427 mm.; the interorbital breadth 127 mm.; the width of the parietal flat area 43 mm.; and the distance from the occipital crest to a transverse line through the middle of the orbits 75 mm. These measurements prove that the difference from *Ph. massaicus* is very considerable. The postorbital region is rather long in both, viz. 14 % of the length of the head in *Ph. massaicus*,¹ and 15 % in the Nairobi skull, but the posterior region of the skull is much narrower in the latter. This is proved by the fact that the interorbital breadth is only 29 % of the length of the skull, against 38,8 % in *Ph. massaicus*, and the width of the parietal flat area is only 10 % against 14,5 % in *Ph. massaicus*. In this respect the Nairobi Warthog is intermediate between *Ph. massaicus* and *Ph. africanus æliani* in which latter the interorbital breadth is 31,7 %, and the width of the parietal flat area is 6,8 %. This intermediate stage of the Nairobi Warthog appear to indicate its racial distinctness, but for lack of material I cannot express any definite opinion.

During my stay near Escarpment station in the beginning of January 1911 I bought a quite young pig of Wart-hog from the Kedong valley which a Kikuyu brought to my camp.

Hippopotamidæ.

Hippopotamus amphibius LIN.

Below Chanler Falls the river Guaso Nyiri was inhabited² by Hippopotamuses. Spoors were seen now and then on the sand-banks in the river and also on dry land, but the animals were not very numerous in that portion of the river along which I passed. This appears to be quite natural because the river is during the dry season in most places so shallow that the water would not cover a fullgrown Hippopotamus, and in addition to this, there is hardly any vegetation on which such animals could feed. At two occasions, however, I had a very good opportunity of watching such animals. The first time this happened, a »Kiboko» had passed close to the camp just before sunrise. I got information about this and hurried after it. Some little distance above the camp it entered the river again, and when the sun had risen it was found to have taken its refuge to a place where the river was running rather swiftly and with strong current through a narrow cañon, where the water accordingly was deep. I sat watching it on a rock opposite, and it lifted its snout regularly to breathe. When I saw that it was an immature specimen I did not want to shoot it as it would have been »wanton destruction», and too much of that kind is to be

¹ Conf. LÖNNBERG: Proc. Zool. Soc. London 1908 p. 937.

² Once or twice spoors were also seen above these falls.

seen in Africa now-a-days. The other time I found a Hippopotamus in a small but deep pool at the side of the river. This specimen was evidently a fullgrown cow, but as it had a small calf I did not care to shoot that time either.

Mr. SJÖGREN had shot some Hippopotamuses at that same place, and one of them was a gravid¹ but only semiadult female with the last molar not yet developed. This was the largest Hippo which I saw at Guaso Nyiri, and it was certainly small. It is therefore possible that a dwarfed race lives in this river. If this is the case, it ought to be protected because its distribution cannot be very great even if there are better conditions of life for a Hippopotamus in the Lorian Swamp than in Guaso Nyiri itself.

Giraffidæ.

Giraffa camelopardalis reticulata DE WINTON.

DE WINTON: Ann. & Mag. Nat. Hist. 1899 Ser. 7, Vol. IV, p. 212.

On the acacia steppe south of Guaso Nyiri Giraffes were seen now and then sometimes single, sometimes in small flocks. The 11th of February I saw for instance near the crossing of the Marsabit road 8 giraffes all cows and young animals. As the acacias were leaf-less they had not much to eat and appeared therefore to be restless, travelling all the time from a group of trees to another. They were also very shy here. When we had crossed to the northern side of Guaso Nyiri and turned to the east a couple of days march the Giraffes became more numerous. The 15th of Febr. I saw first seven, four of which were adult with the typical *reticulata*-pattern and colouring. The younger animals were less dark, more reddish-looking because the spots were more reddish brown, and the light interspaces broader and more yellowish than in the adult or old animals. Later on the same day I had the pleasure of counting 14 of these splendid animals at one time.

Around the water-place of the Rendiles called Njoro Giraffes were not uncommon. From the top of a rock I counted for instance one day at the same time 6 in one direction, probably cows and immature animals, in another 2 cows and a calf, and in a third 2 bulls and a cow. The animals were, however, extremely wary at this place, and I got no opportunity of securing a specimen. When we had come further east and were camping some distance below Chanler Falls, the Giraffes were found to be still more common and less shy. I shot a very fine bull the first morning without any difficulty, and afterwards hardly a single day passed without that I saw Giraffes, often at rather close quarters. One day I shot a Gerenuk not 100 m. from a young bull Giraffe which stood resting under a cactus-euphorbia, but he did not move before we carried the body of the Gerenuk to the tree because we wanted the shade for the skinning work. At another opportunity I came quite close to a Giraffe which just wanted to drink out of the river in the afternoon. One of

¹ Some parts of this foetus were saved.

the Giraffes which I saw more than once had no tail tuft, and the tail was mutilated probably by some carnivorous animal. That a Giraffe was killed by Lions near our camp below Chanler Falls has been mentioned above (p. 75). Otherwise I suppose that the fullgrown Giraffes have hardly any other enemies than man. The hide-hunting has been successfully stopped, I believe, by the regulation that 5 £ must be paid for the license permitting one Giraffe to be killed. Fortunately for the species its head and horns are not very suitable as »trophies», and therefore I hope that these beautiful and interesting animals shall be able to live long in the arid thorn-bush country, north of Guaso Nyiri where certainly no settlers can expect to raise any crops on the gravel. And as the Giraffes browse in the tops of the acacias they cannot be said to compete about the food with the camels, cattle and sheep of the nomades. It does not therefore appear to be any reasonable cause for that they should be exterminated, and for the present the stock is good, I am glad to say.

The Giraffes feed chiefly in the morning and in the afternoon. During the heat of the day they are often seen standing motionless under some acacia or euphorbia asleep.¹ It is easy to perceive even in a distance whether a Giraffe standing under a tree really is asleep, or not. If it is, the neck is not held so straight up as in a walking or browsing animal but it slopes forward very much in an analogous manner (although of course not so low!) as a sleeping or tired horse lets its head hang. It appears as if the long neck almost should upset the balance of the animal when its upper contour line is a straight continuation of that of the sloping back, but this is not so. Such an attitude evidently relieves and rests the musculature of the neck. The adult bulls which have a much heavier skull than the cows and the young animals have, in correspondence to this, a much thicker neck than the latter. This is so conspicuous that it can be seen already at a considerable distance. The adult animals are, as already mentioned, darker than the young. That is, the dark areas are more strongly pigmented but the light net-work is white. A result of this is that the old animals usually look darker, but in certain shades of light they may shine rather whitish, just as Grant's zebras sometimes look whitish sometimes blackish. The young animals have red spots on a yellow ground colour which forms comparatively broader interspaces than the white net-work of the adult. The effect of this is that the young animals look reddish, and the same appears to be the case with some apparently fullgrown cows as well. But there is a certain amount of variation to be seen. The 28th of Febr. 1911 I saw two Giraffe cows near Thera which had comparatively small but very dark spots with broad whitish interspaces between. The bull in their company was more of the *reticulata*-type. There is thus no doubt that transitional stages between the »netted» and the »blotched» Giraffes occur.

The Giraffes are very easily seen, even when they stand motionless, at a long distance, if not covered by trees or bushes, and I must confess that I never could detect anything protective in their colouration. The young and the adult are also

¹ That is their habits during normal conditions but as mentioned above, if food is scanty during the dry season the Giraffes are more restless and may be seen travelling all day.

so different in colour that if either was protectively coloured the other could hardly be so.

The pattern of the Giraffe can thus hardly be said to be protective and a result of natural selection for that purpose. The present writer must agree with ROOSEVELT when he says — — — »save under wholly exceptional circumstances no brute or human foe of the giraffe could possibly fail to see the huge creature if fairly close by; and at a distance the pattern of the coloration would be lost. The giraffe owes nothing to concealment; its coloration has not the slightest concealing effect so far as its foes are concerned.»

But if the pattern of colouration of the Giraffe cannot be explained as protective some other explanation must be tried. A comparative study of the different races of Giraffe and their young ones may perhaps give a hint for the understanding of the origin of the pattern. In the young Giraffes there is less difference in colour between the spots or blotches and the ground colour, and the interspaces between the spots are comparatively broader than in the adult. In some races of Giraffe (e. g. *G. c. tippelskirchi*) the spots of both sexes are irregular with jagged contour, more or less star-like in shape. In other races (e. g. *G. c. rothschildi*) it is only the females which have irregular, jagged and star-like blotches which are »reddish chestnut in colour upon a light orange-fawn ground» (LYDEKKER), while the males have large and very dark-coloured spots, »showing a tendency to split up into stars, as indicated by lighter tripartite radiating lines in the larger ones and the light interspaces yellowish fawn forming narrow network-lines on the body» — — —.¹ Still another type is the one displayed by *G. c. reticulata* in which the ground colour of the fully adult animals is reduced to a white net-work of comparatively narrow lines between large dark areas.

It is a generally accepted rule that the colour of the young, when it is different from that of the adult, and does not show any distinct secondary adaptation, represents a recapitulation of a phylogenetically earlier stage of development. It is also a general rule among mammals, and certainly not least among ruminants that the old males represent the latest and most specialised type. Considering this and the facts about the colouration of Giraffes as stated above, it appears more than probable that the pattern of these animals has been gradually developed in such a way as the ontogeny of several races indicates. The first stage has thus had comparatively indistinct or ill-defined blotches which have not been very much darker than the reddish or yellowish red ground colour. In the next stage the blotches have deepened in colour, but their outlines are still indistinct, or at least irregular and jagged. The darkening of the spots has been very well described by THOMAS for the race which some few years later was named *G. c. rothschildi* by LYDEKKER. THOMAS writes:² »The blotches in young specimens are reddish fawn, darkening in the centre to deep blackish brown, and this darkening spreads outwards in old specimens, until the blotches are wholly blackish.» A few lines further below THOMAS also points

¹ LYDEKKER: Proc. Zool. Soc. London 1904 p. 210.

² Proc. Zool. Soc. London 1911, p. 475.

out that »the darkening of the centres of the blotches» as well as »their total blackening» has been repeatedly observed in the Southern Giraffe. Some races like *G. c. tippelskirchi* of German East Africa, and *G. c. wardi* of Northern Transvaal remain in the stage with star-like spots, and it is of interest to note that such a stage is found as well among the Giraffes with a well developed frontal horn (*tippelskirchi*), as among those with the frontal horn rudimentary (*G. c. wardi*). In a later stage of development the blotches become more compact and larger. This is effected by deposition of more pigment in the periphery of the spots especially in the interspaces between the irregular processes of the star-like blotches. Finally an increase in size takes place by the confluence and combination of several adjoining blotches into larger dark areas. That these latter really have originated in such a way as described is proved by the fact that remnants of the formerly existing light interspaces between the primary constituents often can be seen in the shape of radiating light streaks here and there. It is such remnants of former light interspaces between primary spots which are described by LYDEKKER¹ as »lighter tripartite radiating lines in the larger» spots of *G. c. rothschildi*. It is thus not »a tendency to split up into stars» as the author quoted says, which makes itself known by these radiating lines, but exactly the opposite, a confluence of spots into larger areas. Even in *G. c. reticulata*, which represents the last stage in this series of development of pattern, similar light streaks radially cutting into a large dark area may be seen (conf. Pl. VII, fig. 3), although comparatively rarely. A good proof for the confluence of primary spots into larger dark areas is given by the fact that very often such areas show not one but several such dark centres which are commonly seen in the primary spots or blotches. Very good illustrations to this are to be found in LYDEKKER's paper in Proc. Zool. Soc. London 1904 Vol. I, for instance Pl. XII *G. c. rothschildi* ♂, Pl. XV fig. 1 the neck of *G. c. cottoni*, and Pl. XVI *G. c. capensis* ♂.

There appears to be no doubt whatever that the development of the pattern of the Giraffes has taken place in such a way as I have tried to set forth above. The cause of this development is, however, more difficult to indicate. It has already been stated that it cannot have been natural selection for protective purposes.

It is a very common thing among Ruminants that the adult are darker than the young, and especially the bulls have a tendency to blacken with age. It is also a fact that some of the most specialised types among the larger ruminants in the adult stage of both sexes are quite strongly pigmented. It is thus only in accordance with a general rule among Ruminants that the adult bull Giraffes are darker than the young and immature. It appears also to be in agreement with the conditions prevailing in other groups that this general darkening which from the beginning only was found in the old males by and by extends to both sexes. But if the starting point is something like a young *G. c. tippelskirchi* with comparatively pale and jagged star-like spots, and an increase in the pigmentation takes place with the darkening spreading from the centre of the spots it is quite natural that a pattern similar to that of *G. c. reticulata* will be a final result.

¹ L. c. 1904, p. 210.

I have now tried to show that the development of the pattern of the Giraffes as it has reached its present maximum in the *reticulata*-type is analogous with other phenomena among the Ruminants, if it is only assumed that the original pattern was spotted.

Nothing is known, of course, about the colour or pattern of the ancestors of the Giraffes, but it does not appear at all improbable that they might have had the pigment more or less concentrated round certain centres on an otherwise somewhat paler ground colour. It is not needed to assume that these ancestral types should have had a sharply defined spotted pattern. It is quite sufficient if they from the beginning had had such rosettes of accumulated pigment as for instance often are seen in red domestic cattle in Sweden as well of native as of Ayreshire breeds. This is mentioned only as an analogy, but also because such a pattern appears to the present writer as a probable starting point in the development from a comparatively more or less uniform to a spotted coat. A concentration of the pigment at and around these centres would probably result in a blotched pattern.

It is, of course, also possible that the first blotched pattern was developed as the result of broken up longitudinal stripes which may have been present in the early ancestors of the Giraffes, and of which the stripes on the hind quarters and legs of the Okapi may be the only remnants saved up to the present date. The occurrence of longitudinal stripes in the first coat of the young Ungulata belonging to several widely distant groups (f. i. Tapirs, Pigs, Deer etc.) appears to indicate that this was the primitive pattern of the ancestral Ungulata.

The specimen of *G. c. reticulata* which I shot on the northern side of Guaso Nyiri below Chanler Falls was a splendid old bull with worn teeth and probably at the height of its development. As can be seen from the photos of the skull (Pl. XIII fig. 1) the azygous frontal horn is strongly developed. It rises from a broad conical base and continues in a thick cylindrical portion which is rounded and truncate at the end like the main pair of horns. The basal portion of the azygous horn is studded with small exostoses in front and on both sides but those of the right side are larger (Pl. XIII, fig. 2). In front of this horn on the posterior portion of the nasals is a somewhat bigger boss, which lies entirely on the right side of the mesial line (Pl. XIII fig. 2). This skull is, however, by far not so dextral in its development as that of a bull of *G. c. tippelskirchi* MATSCHIE from Kilimanjaro described by the present author at another opportunity.¹ The right of the main pair of horns is basally a little thicker than the left, and the thickened basal portion extends forwards nearer to the orbit than on the left side (Pl. XIII fig. 2). The roof of the right orbit is provided with a small boss but is otherwise hardly thicker than that of the left. The posterior or occipital pair of horns are not so typically developed as in old males of the Baringo Giraffe, but there is an osseous thickening on either side, and that of the right is the stouter, and it extends about 5 mm. further laterally than the left. It is thus evident that this race is »right-headed»,

¹ »Mammals» (p. 35—37) in SJÖGREN's Wiss. Ergeb. Kilimandjaro Meru Exped.

or that it prefers to use the right side of the head when butting, but in less degree than for instance *G. c. tippelskirchi*,¹ and *G. c. cottoni*.² A skull of an old bull Giraffe from the Sotik, which I saw in Nairobi and which, I suppose, represented *G. c. tippelskirchi*, had the occipital exostoses and those above the orbit much bigger on the right than on the left side; the right main horn was thicker than the left; and the nasal exostoses were chiefly situated on the right side of the median line. These facts indicates that »right-headedness» is a common feature among Giraffes.

The dimensions of the skull of *G. c. reticulata* are seen in the following table of measurements. If this skull is compared with a skull of *G. c. tippelskirchi* from Kilimanjaro it will be seen that the main pair of horns and the azygous frontal horn are much better developed in *G. c. reticulata*.

	<i>G. c. reticulata</i> ♂ from Guaso Nyiri	<i>G. c. tippelskirchi</i> from Kilimanjaro
	mm.	mm.
Condylbasal length	597	633
Basal length	570	607
Greatest breadth	267	307
Distance from gnathion to anterior end of nasopremaxillary suture . . .	151	168
» » » to orbit	379	397
» » orbit to hind surface of occipital condyle	223	234
» » gnathion to anterior premolar	245	258
Length of upper molar series	149	153
Breadth of skull across hind end of nasopremaxillary suture	88	98
Height of skull at the same place	89	109
Breadth across bases of main pair of horns	227	212

But on the other hand the nasal exostoses and the supraorbital bosses are much more strongly developed in *G. c. tippelskirchi* which results in giving it a greater breadth of the skull across the orbit. And the nasal portion of the skull is as well higher as broader than in *reticulata* as the measurements prove.

The sperms of the Giraffe have been described for the first time from prepa- rates of this specimen of *G. c. reticulata* by G. RETZIUS.³

This Giraffe was infested by a great number of ticks around the anal opening and around the base of the scrotal sack where the skin is thin. They proved to belong to the species *Hyalomma aegyptium* (L.)⁴

¹ Conf. my above quoted paper on this subject.

² According to LYDEKKER.

³ GUSTAF RETZIUS: Biol. Untersuchungen N. F. Bd. XVI. Stockholm 1911.

⁴ Conf. L. G. NEUMANN: Ark. f. Zoologi. Stockholm. Bd. 7 n:o 24.

Bovidæ.

Bubalis cokei (GÜNTHER).

SCLATER & THOMAS: Book of Antelopes, Vol. I, p. 27.

The »Kongoni» as Coke's Hartebeest usually is called in Brit. East Africa, is the commonest Antelope on the great plains along the Uganda railroad in the southern game reserve, and around Nairobi it is still common, although its numbers are diminished where the country has been settled. At Jūja farm Kongonis were abundant on the open plains. It does not appear to extend its distribution north of Tana river, at least not in the interior of the country. It was not seen on the acacia steppe south of Guaso Nyiri, although its companion on the Athi plains, Grant's Zebra, was common there.

In the »Book of Antelopes» it is quoted from GEDGE concerning this species: »The cows calve during the latter part of November and December» — — —. It is very possible that some of the cows calve at that time, and some calves which I saw in the beginning of April appeared to be a few mouths old, while calves seen from the train in the southern game reserve ²⁴/₁₂ 1910 looked to be more than a month old. But ROOSEVELT's observation¹ on the Athi plains where he says that he found »new-born wildebeest and hartebeest~calves, and others several months old» in the month of May is more in accordance with my own experience. I shot for scientific purpose two Kongoni cows the 11th of April and both those contained foetuses which were covered with hair and nearly full-grown. The majority of the cows appeared at that time to be in the last stages of gravidity. But as already mentioned there were also calves which probably had been borne some months earlier their number was, however, less than that of the gravid cows. I saw only once a Kongoni cow with twins.

The dimensions of a male and female skull from Nairobi are as follows:

	♂ ad.	♀ old.
	mm.	mm.
Greatest length of skull	420	438
Basiscranial length	340	378
Greatest breadth	136	141
Least interorbital breadth	86	92
Greatest length of nasals	191	186
Width of nasals in front	30	34
Length of upper molar series	89	86

As can be seen the measurements of this cow are larger than those of the bull which may depend upon the fact that the cow was unusually big, and the bull only

¹ »African Game Trails», p. 292.

an average specimen. In the »Book of Antelopes» the basal length of the skull of this species is stated to be »14 inches» viz. 355 mm. and the greatest breadth to 5,2 viz. 131 mm.

The behaviour of the Kongonis, how they have their sentinels standing on termite hills and so on, has been repeatedly described. They are always wary and sometimes very shy, but show at the same time a certain amount of curiosity. It has been much spoken about the tenacity of life of this Hartebeest. If hit in the right place I think, however, that they succumb as quickly for the bullet from a modern rifle as any other antelope of that size.

The Kongonis look sometimes more yellowish sometimes more reddish, but it may depend upon the light.

The specimens which I shot on the plains near Nairobi were infested with ticks of the species *Rhipicephalus pulchellus*.

Connochætus albojubatus THOMAS.

SCLATER & THOMAS: Book of Antelopes, Vol. 1, p. 105.

Mr. W. N. MC MILLAN of Juja farm kindly granted a fine bull Wildebeest to be shot for the collections ¹⁹/₁ 1911. There was quite a number of this species on the plains belonging to his farm, but on our way further north we did not see any more so that I suppose that Tana river is the northern boundary line of this species east of Kenia.

The habits and behaviour of this animal has been repeatedly described, and I have nothing of value to add. It is strange to see how big and entirely black this Gnu looks at some distance. When they run with lowered heads they remind in a very striking manner of Bisons in spite of the in reality great difference in size.

The specimen shot was greatly infested with ticks chiefly *Rhipicephalus pulchellus*.

The dimensions of this skull agrees closely with the corresponding ones of the typical skull viz.

Basiscranial length	398 mm.
Greatest breadth of skull	182 »
Distance from orbit to tip of premaxillary	295 »

Cephalophus harveyi keniaë LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. 1912, Ser. 8, Vol. IX, p. 65.

Harvey's Duiker has been recorded from Dar es Salaam, Tanga, the Kilimanjaro district, and Southern Somaliland. It could then be expected that the red Forest-Duiker of the Kenia district would prove to belong to this species. Since I had succeeded in obtaining a specimen myself I found that there appears to be some

differences which are quite easily seen between this animal and *Cephalophus harveyi* according to the descriptions found in the literature. My specimen may be described as follows:

Fur close, fine and glossy with the hairs of the back measuring 20—27 mm.¹ General colour rich chestnut red, fading below to rufous. The black blaze on the forehead extends from the muffle to the coronal tuft; on the nose it is about 17 mm., but widens to twice that in the interocular region. The greater and central portion of the tuft is mahogany, but the lateral parts are rufous. Eye-brows and sides of the face rufous. The black central stripe is continued on the nape behind the mahogany-coloured tuft and is then dissolved in the mixed black and chestnut red of the upper neck which extends to above the shoulders. Chin dusky anteriorly, but behind this part it is whitish, gradually blending into the buff throat and rufous lower neck. Ears white inside and blackish outside, behind them a nearly naked black area on either side of the black stripe of the nape. Fore legs glossy brownish black. Hind legs rufous to chestnut red but from above the hocks and down to the hoofs glossy brownish black. The tail has basally the colour of the back, on the posterior half some whitish hair are mixed in, and the terminal well developed tuft is proximally black, terminally white, with some rufous hairs mixed in. An ill-defined dark brown streak extends over the chest mesially but disappears near the navel.

The hoofs measure about 37—38 mm. in total length.

The type locality of *Cephalophus harveyi* is Kilimanjaro, and the type-specimen has been pictured in »Book of Antelopes» (Vol. 1, Pl. XVII). The Kenia specimen differs a great deal from this coloured plate quoted, especially by its mahogany, not black, coronal tuft, and much darker legs and feet. When TRUE communicated a description² of this Duiker from Kilimanjaro he stated that the tuft is »black», and the forelegs are said to be »entirely dusky». This description evidently agrees with the type specimen in British Museum, because it is termed »excellent» by the authors of the »Book of Antelopes». In the year 1903 THOMAS described *C. ignifer* from Eldoma Ravine and stated then that *C. harveyi* had »no chestnut coronal tuft». LYDEKKER emphasizes again in his book »The Game Animals of Africa»³, as THOMAS before, that Harveys Duiker is distinguished from *Cephalophus ignifer* »by the black forehead and the absence of chestnut in the head-tuft». The tail of the typical specimen of *Cephalophus harveyi* as represented on the plate in »Book of Antelopes» is quite unlike this organ in the present specimen. This may, however, be due to an error committed by the artist, because the Natal Duiker on Pl. XVI of the same work has been pictured with a tail equally hairy along its whole length, although, as I have stated on typical specimens from Natal in this museum, the tail of the Natal Duiker is thin basally and carrying a terminal tuft, just as this organ is represented in *C. nigrifrons*, and *C. ogilbyi* on Pl. XVIII of the work quoted.

¹ It is quite probable that specimens living at a higher altitude on Kenia will prove to have somewhat longer hair.

² Proc. U. S. Nat. Mus., Washington 1892, Vol. XV, p. 476.

³ London 1908, p. 153.

The question is now whether the other differences between typical *C. harveyi* and the present specimen which have been referred to are constant or not. If they are constant, they evidently characterize a local race which then ought to be termed *C. h. keniae*.

The dimensions of the skull of my specimen, an adult female may be seen from the following table of measurements:

Total length of skull	171 mm.
Condylobasal length	163 »
Basiscranial length	151 »
Zygomatic width	77 »
Distance from anterior brim of orbit to tip of premaxillary	88 »
Length of nasals	58 »
Interorbital width	42 »
Length of upper molar series	(48,5) 49 »
Length of palate from mesial notch	88 »
Bullæ	11 × 19 »

These dimensions differ somewhat from those recorded by TRUE (l. c. p. 476) for an adult male skull of *C. harveyi* from Taveta, but this difference may be due to the larger size of the buck than the female. The mesial notch of the palate in the present specimen extends to about the middle of m^2 , and the lateral notches to the front of m^3 .

The red Forest Duikers of different parts of Africa are evidently closely allied and, at least partly, only geographical races of one and the same type substituting each other. This is seen not only in the general colouration, but also in the shape and dimensions of the skulls, although, as THOMAS has proved, the western *C. nigrifrons* and *C. claudi* have longer preorbital portions of their skulls. The present specimen approaches in some respects *C. ignifer* THOMAS¹ of Eldoma Ravine and may be regarded as connecting that race with *C. harveyi*. *C. ignifer* differs from the present race in having: »inner side of forearms, inguinal region, and inner side of thighs white»,¹ while there is nothing white there in *C. h. keniae*. The broad black blaze of the latter appears also to be a good characteristic, while in *C. ignifer* the forehead is »mixed rufous and black».

Red Forest Duikers are not uncommon in the thick forests at Nairobi where I secured the specimen described above, and I saw and shot another specimen in a forest two hours march north of Meru boma but lost that one, because it was impossible to follow the blood track in the darkness of the forest. In consequence of its habits of living in thick woods with rich undergrowth it is seldom seen and difficult to obtain, in the dense cover where only twilight prevails. But if it moves over a place where the daylight penetrates its chestnut red coat at once attracts the eye.

¹ THOMAS: Proc. Zool. Soc., London 1903, p. 226.

Cephalophus abyssinicus hindei WROUGHTON.

WROUGHTON: Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, 1910, p. 273.

A fine male Duiker shot at Punda Melia ¹/₄ 1911 agrees with WROUGHTON's description (l. c.). It can be added that the present specimen has a blackish spot on either side of the white chin.

As WROUGHTON had a young male as type, and in addition to that a skull of an old male, the following measurements of my specimen may be of value for comparison.

Greatest length of skull	167 mm.
Condylobasal length	158 »
Basicranial length	146 »
Greatest width of skull	74,7 »
Length of nasals	60 »
Length of palate (mesially)	82,5 »
Length of upper molar series	47 »
Muzzle in front of premolars	50 »
Length of horn in straight line	110 »

This Antelope appears to be fond of high grass in which it can hide. It was observed at Kagio, Kutu, and on the steppe near Rooruka river in addition to the locality mentioned, and is probably common. Those seen by me were always single.

A young kid was found in a bush near Blue Post ²⁰/₁ 1911.

Rhaphicerus neumanni MATSCHIE.

MATSCHIE: Die Säugethiere Deutsch Ost-Afrikas, p. 120.

This little Antelope is not uncommon in bush-steppe and perhaps also in grass-steppe, although I have less experience of the latter kind of landscape.

A gravid female was shot in bush-steppe not far from Thika River and Blue Post 20 Jan. 1911.

Nesotragus moschatus VON DÜBEN.

SCLATER & THOMAS: Book of Antelopes, Vol. II, p. 51

Strange to say the little »Sunii» does not appear to be recorded in the scientific literature further in land than from the Kilimanjaro district except that J. A. ALLEN recently has mentioned a specimen from the Kijabe. In his book »The Game Animals of Africa» (London 1908) LYDEKKER says that its distribution on the mainland is »from Kilimanjaro to Mozambique». ¹ I found it to be very common in the

¹ l. c. p. 186.

forests around Nairobi, and even so far north as in the forests at Meru boma. In the forests of Kenia I saw heaps of its droppings a little everywhere and found the remains of its skull at a Wandorobbo fire-place at an altitude of about 2,700 m.¹

I have compared skins and skulls of the 6 specimens which my license permitted me to shoot with VON DÜBEN's type specimens, kept in this museum, and also with some specimens from Kilimanjaro. With regard to the colour there is a certain variation, some specimens being more reddish others more dark, chestnut brown. The darkest specimen in my collection is a female shot at Meru boma. It agrees in colour best with a male from Kilimanjaro.

With regard to the skulls there is a considerable variation in the degree of development of the nasal process of the premaxillary. In VON DÜBEN's type this process is short and pointed, and separated from the anterior end of the lacrymale by an interspace of about 7 mm. along which the maxillary and the nasal form a suture with each other. In all specimens of my collection the nasal process of the premaxillary is more strongly developed and extends rather broadly backwards so that it meets the upper anterior end of the lacrymale and fully separates the maxillary and the nasal from each other. I believed at first that this should be a racial characteristic, but when examining the Kilimanjaro specimens I found them to be intermediate. They have the interspace between the tip of the nasal process of the premaxillary and the anterior end of the lacrymale shorter than in the type, and the suture between the maxillary and the nasal accordingly much shortened. In one of the Kilimanjaro specimens this distance is almost completely reduced. In consequence of this intermediate stage all specimens are retained under the original name.

The size, shape and situation of the premaxillo-maxillary vacuities are subjected to a great variation in my material. They are sometimes large sometimes small, in some specimens only the upper posterior end is left, and in one of the bucks it is practically obliterated as only a small opening entirely situated in the maxillary is left.

The female type is an old specimen, and this is probably the reason why it is broader than my female skulls, because my best buck has a broader skull than the other male skulls. The differences with regard to these dimensions are therefore not of racial value.

The »Suni» was chiefly found in forests with a rich undergrowth of bushes and it was often very dark in its haunts. The first specimen was shot in a thicket, where my gunbearer had detected it, but it was so dark that I only could see the flickering movements of its light tail, and had to aim at that without knowing whether the body was to the right or left of the visible object. The Suni appears to know that it is well protected in this kind of thickets and does not move far when it has been disturbed. It has the same habit as some other antelopes to deliver its excrements in a certain place and, in spite of the small size of the animal, large heaps of its droppings are often found in the woods.

¹ I saw also a specimen on the Mombasa island.

Rhynchotragus guentheri wroughtoni DRAKE-BROCKMAN.

DRAKE-BROCKMAN: Ann. & Mag. Nat. Hist., Ser. 8. Vol. IV, p. 51.

When the expedition had crossed Guaso Nyiri to the northern side at the ford on the Marsabit road Dik-diks were found to be rather common in the thornbush. On the first and second days march towards the east from the ford mentioned I shot five specimens of a greyish looking Dik-dik with very short nasals and a well developed proboscis (Pl. XIV, fig. 1), evidently belonging to the *Rhynchotragus guentheri* group. This group which is characterised by the »tips of nasals about level with the back of the middle premolar» includes *Rh. guentheri* THOMAS with the subspecies *Rh. g. smithi* THOMAS and *Rh. g. wroughtoni* DRAKE-BROCKMAN, and *Rh. nasoguttatus* LÖNNBERG. My specimens from the northern side of Guaso Nyiri appear to differ rather strongly from all these, among other characteristics by their extremely short nasals which do not attain a maximum length of more than about 10 mm., and often less. The premaxillaries are very short and do not reach more than about half way to the nasals. In *Rh. guentheri*, as THOMAS kindly has written to me, there is a small discontinuous remnant of the nasal process of the premaxillary left which reaches the nasal suture, but nothing like this can be seen in my specimens. The maxillaries again extend upwards in front of the lacrymale in the shape of a 4 to 6 mm. broad band which forms a suture of a similar breadth with the nasals. The lacrymale is thus entirely excluded from the margin of the anterior nasal opening. In the fig. of the skull of *Rh. guentheri* in Proc. Zool. Soc., London 1894, p. 324¹ the lacrymale excludes the maxillary from the nasals and I took this for an important difference, but THOMAS has in a letter kindly informed me that this figure is not quite correct. In reality the maxillary reaches the nasal with a short suture in *Rh. guentheri*. The discrepancy in this respect is thus not very important, but the difference in length of the nasals prove completely the distinctness of my specimens from *Rh. guentheri*. The length of these bones is in the latter species 17—17,5 mm., but in my specimens from 8 to 10,3 mm. In addition to this there are also differences in colour which will be mentioned below.

Rh. g. smithi THOMAS was described² on a head skin and a skull from Lake Stephanie. This skull resembles, according to a communication from the author quoted, with regard to the shortness of the premaxillary and the broad suture between maxillary and the nasal the skulls of my specimens. But *Rh. g. smithi* differs markedly from the latter with regard to size. Although the type skull is of a male, all its dimensions are larger even than those of my biggest female skull, in spite of the fact that in these animals, as is well known, the females are always larger than the males. Compared with my male skulls the basicranial length of *Rh. g. smithi* is about 9 %

¹ Reproduced in Book of Antelopes, Vol. II, p. 90.

² Proc. Zool. Soc., London 1900, p. 804.

larger, and other measurements in proportion. The nasals of *Rh. g. smithi* are also longer measuring 14,5 mm.¹

The connection between the maxillary and the nasal by a vertical and somewhat thickened process in front of the lacrymale as described above for the Dik-dik from Guaso Nyiri tends to give more stability to the anterior portion of the skull for the support of the movable proboscis. In this respect the Guaso Nyiri race resembles *Rh. nasoguttatus* from Lake Baringo.² The shape and size of the premaxillaries and the shape of the anterior nasal opening are, however, different in the two Dik-diks mentioned. In the white-spotted species the anterior nasal opening is nearly parallel-sided so that there is not much difference in its width at the naso-maxillary suture (8,5 mm.) and at the posterior end of the premaxillaries (7 mm.), while in the Guaso Nyiri Dik-dik the upper posterior dimension (11—12 mm.) is very considerably larger than the lower anterior (6—7 mm.). The premaxillaries are much stouter and more expanded at the anterior end in *Rh. nasoguttatus* than in my specimens from Guaso Nyiri. The nasals are also longer in the former. With regard to the colour of the fur there is no trace of white spots neither on the nose and face, nor on the feet of the present specimens. The sides of the body are less suffused with yellowish than in *Rh. nasoguttatus*, and the hind quarters are almost pure grizzled grey. Even on the back there is a less yellowish tinge in these specimens.³ The general colour of the back and upper sides is comparatively dark, grizzled by yellowish buff to buffish white subterminal rings, and dark brown to black tips to the hairs. The same dark colour is also found below the pale rings but the concealed parts are dark smoky grey. The neck is paler and more coarsely grizzled grey, because the subterminal rings are broader and almost pure white. The lower flanks are paler than the back and of another colour which is a little different in different specimens. The dark tips to the hair are there so thin that they do not influence the colour. The rings are white, and the colour just below the rings is sometimes the palest shade of »dark fawn» (Rép. de Couleurs N:o 307), sometimes more reddish similar to »dead leaf» (Rép. de Couleurs N:o 321. 1) but in other examples more greyish; the concealed parts of the hair are here the palest shade of smoke grey inclining to whitish.

¹ The skull of *Rh. thomasi* has not been described by NEUMANN, and it is thus uncertain whether it belongs to this group or to the *Rh. kirki* group as the describing author says. Its colour is different as will be mentioned below.

² When writing about this latter Dik-dik in his book: »The Game animals of Africa» (London 1908, p. 194) LYDEKKER is doubtful whether the white spots on the nose of this animal form a constant characteristic. I am fortunate with regard to this to quote the Game Warden of Brit. E. Africa Mr. R. B. WOOSNAM, who told me as an interesting fact that in the Lake Baringo district every Dik-dik shot, proved to have white spots on its nose. Mr. WOOSNAM did not know then that I had described this animal. — In Sitz.-ber. d. Ges. Naturforsch. Freunde, Berlin 1910, p. 351, Dr. A. BERGER writes: »Am Baringo See fanden wir dieses merkwürdige Tier [*Rhynchotragus nasoguttatus* LÖNNB.] sehr häufig in der steinigen Dornbuschsteppe.» — DRAKE-BROCKMAN (Proc. Zool. Soc. London, 1911, p. 978) has found white spots on the nose »in a large proportion of the Dik-diks in Somaliland», and he believes this not to be constant there. Even if *Rh. nasoguttatus* should not always be provided with such spots it is plainly characterized by its cranial dimensions, colour etc. It may also be remembered that when it was described and named nothing had been mentioned before about white spots on Dik-diks, and the name was thus fully justified.

³ If *Rh. thomasi* should belong to this group it is entirely different in colour as NEUMANN says about it: »das ganze Fell mehr einfarbig rotgelb aussehend» than *Rh. hindei*.

The belly and under parts generally are pure white, sometimes with sharp limitation, sometimes with a narrow pale isabelline band bordering the lower flanks. The throat is also white but the lower side of the neck is like its sides grizzled, although with still more white. The face and muzzle »buff» (Rép. de Couleurs 309. 3), the sides of the head like the neck. A white eyebrow-mark is present. The crest of the males is black with broad whitish subterminal rings on the anterior, and rufous buff rings on the posterior hairs. In the females the crest is much shorter, and its posterior portion consists of rufous hairs with long black tips. There is thus a considerable difference between the sexes with regard to the crest as well. The feet are a little paler buff than the face.

With regard to the pure white of the lower side these specimens agree with *Rh. guentheri wroughtoni* DRAKE-BROCKMAN but differ from *Rh. guentheri* in which, according to the author quoted¹, »the yellow grizzling fades somewhat gradually into the pale pinkish buff of the chest and abdomen». It is thus also with regard to the colour easy to distinguish these specimens from *Rh. guentheri*, but it is more difficult to express any opinion about their relation to *Rh. g. wroughtoni* a single specimen of which has been shortly described from the »foot hills of Mt. Akul Kassim, Wabi River Gallaland, Abyssinia within 20 miles west of Sheikh Hussein». To make sure about the identity I took the liberty of sending one of my specimens to Brit. Museum for comparison with the type of this subspecies, and Mr GUY DOLLMAN kindly replied that »the colour is exactly the same, both as regards pattern and tint».

With regard to cranial measurements the type of *Rh. g. wroughtoni* is similar to the present specimens except that it has considerably longer nasals viz 13 mm. But DOLLMAN's comparison settles the question. It is therefore to be assumed that the type specimen of *Rh. g. wroughtoni* had unusually long nasals and that these bones vary in length more than hitherto has been known. DRAKE-BROCKMAN has said that the ears of *Rh. g. wroughtoni* are longer and broader than in other species except *Rh. cavendishi*, but exact measurements are not given for either of these. The length of the ear of the specimens from Guaso Nyiri is about 94 mm. and the length of the opening of the ear-conch is about 73 mm. The latter measurement is about similar to that of *Rh. nasoguttatus*.

DRAKE-BROCKMAN's description is rather short, and I have therefore discussed these specimens somewhat fully to show the variability of the species and make it better known for the future. For the same purpose the accompanying table of measurements of five skulls has been prepared. The type locality of DRAKE-BROCKMAN's subspecies is situated very far from the one where my specimens have been collected and this appeared to begin with to speak against the identity as the Dik-diks often have a rather restricted habitat.

¹ Ann. & Mag. Nat. Hist. Ser. 8 Vol. IV, p. 51.

	♂	♂	♀	♀	♀
	mm.	mm.	mm.	mm.	mm.
Total length	108	107	115	111	110,5
Condylbasal length	101	100,5	109,5	104	103
Basicranial "	94	94	102,5	97	96
Zygomatic width	54,5	54,5	54	53	55,5
Posterior brim of orbit to gnathion	80	79	84	81	81
" " " " " anterior alveolar edge	54	54	57	55	57
Length of nasals	8,5	—	10	8	10,3
Tip of nasals to gnathion	45	—	50	48,5	43,5
Length of upper molar series	37	34,5	38	37	35,5
Length of horn	67	65	—	—	—

This grey Dik-dik was rather common in the thornbush in the localities mentioned especially on rocky hill-sides. It occurred as other species in pairs. When I had shot the first pair of this kind ¹³/₂ 1911 one days march to the east of the Marsabitroad I wrote in my diary: »The two Dikdiks shot to day have a soft and long, rather tapire-like nose (Conf. Pl. XIV fig. 1), just as the *nasoguttatus* mounted in the museum in Stockholm. They look rather long-legged when they do not run fast. When first started the make some stiff jumps (like several other antelopes) before they begin to run. Sometimes they stop soon and look round.»

Rhynchotragus cavendishi minor LÖNNBERG.

LÖNNBERG: Ann. & Mag. Nat. Hist. Ser. 8, Vol. IX, p. 65.

When the Expedition had passed eastwards to below Chanler Falls another Dik-dik was met with. This one was more yellowish in colour, and its nasals were not so short as in the grey species seen a few days before. It belonged evidently to the *Rhynchotragus kirki* group. To this group can be counted *Rh. kirki* GÜNTHER, *Rh. k. hindei* THOMAS, *Rh. cavendishi* THOMAS, *Rh. thomasi* NEUMANN, and *Rh. damarensis* GÜNTHER. For geographical reasons as well as for differences with regard to the skull the last mentioned species does not need to be compared with the present specimens. When describing *Rh. thomasi* NEUMANN has, as usual, not cared to give any skull measurements but only described the colour of the animal.¹ As this is said to be »rotgelb» it cannot be regarded to resemble my specimens at all. *Rh. cavendishi* THOMAS is a large species with the basicranial length in the male type-specimen 104 mm. thus very much more than in the present specimens (conf. table of measurements), and other dimensions differ in similar proportions. In some respects, however, my specimens resemble *Rh. cavendishi* viz. in the development of the premaxillaries which are said to reach the nasals, »articulating broadly» with them, and

¹ Sitz.-ber. d. Naturf. Freunde, Berlin 1905, p. 89.

with regard to the comparatively long nasals. In *Rh. kirki* GÜNTHER again the nasals are very much shorter than those of the present specimens, hardly measuring $\frac{2}{3}$ as much in length, and it has slender premaxillaries, »their ascending process sometimes ending just above the anterior tooth, and sometimes rising nearly or quite to meet the nasals.»¹ The shape and size of the premaxillaries is also shown by GÜNTHER's figure of the skull of *Rh. kirki*. This is quite a considerable difference, in spite of the variability, from the condition found in the present specimens in which the premaxillaries are gradually widened so that their suture with the nasals amounts to 6—8 mm. It is also unlike the condition in *Rh. k. hindei* THOMAS about which the describing author says: »premaxillæ just touching nasals above».² It is evident that the broad connection between the premaxillary and the nasal gives a greater firmness to the anterior portion of the skull which serves to support the proboscis than in such forms in which no such connection is to be found. The solidness of this portion of the skull is still more increased in my specimens from Guaso Nyiri by the premaxillaries being somewhat thickened when compared with the thin transparent lamina of the maxillary and the lacrymale which form the lateral wall of the nasal cavity.

Considering the structure of the anterior portion of the skull it appears suitable to regard these my Dikdiks as forming a subspecies of *Rh. cavendishi* which in consequence of its small size may be named *minor*.

The general colour above is a grizzled yellowish grey produced by buffish yellow subterminal rings and dark brown tips to the hair, which basally are greyish brown. The middle of the back is more brownish. The neck looks paler greyish, and less yellowish because the subterminal rings are there dirty whitish. The flanks are less grizzled and paler than the back, about sand-coloured, sometimes more, sometimes less suffused with buffish. Surroundings of the tail and posterior parts of hams pure ashy grey. Lower parts suffused with buff, only the middle of the belly and inside of hams being pure white. Lower neck pale yellowish grey, throat white in the middle, suffused with buff on the sides. Legs and middle of the face fulvous buff, sides of face paler almost sandy. A white spot around the eye. Anterior shorter portion of crest ringed with buffish white and dark brown, but the greater posterior portion dull fulvous buff with hardly conspicuous dark tips to some of the hairs. Ears sand-coloured on the outside, white within, with a black line along the upper half of the outer margin as well on the outer as on the inner side.

³ The females have a smaller crest the hairs of which are very broadly tipped with black.

¹ Book of Antelopes, Vol. 2, p. 83 and p. 85 fig. 29.

² Ann. & Mag. Nat. Hist. Ser. 7, Vol. X, p. 243.

	<i>a</i>	<i>b</i>	<i>c</i> var.!	<i>d</i> ¹ ♀ young
	♂	♂	♂	
	mm.	mm.	mm.	mm.
Total length	108,5	105,5	98,5	100
Condylobasal length	102	98	92	95
Basicranial "	94	92	85	88
Zygomatic width	54	50	50	47
Posterior brim of orbit to gnathion	76	77	73	72,5
" " " " " anterior alveolar edge	53	51,8	50,5	51,5
Length of nasals	21,5	23	15,3	19,5
Tip of nasals to gnathion	30	30	30,5	30
Length of upper molar series	35	34	33	—
Breadth across posterior orbital walls	55	51,5	49	47,5
Distance between outer sides of horn cores basally	42	40	36,5	—
Combined breadth of nasals	15	16	15	15

The cranial measurements of this race are recorded in the accompanying table of measurements. As can be seen from the same, one of the skulls measured (termed »*c* ♂» in the table) is very much smaller than the two typical males (*a*, *b*), in spite of the fact that it is fully adult. The skull *c* looks also very different when compared with the others especially because the distance between the horns is smaller and the nasals shorter. I am, however, inclined to regard it as an individual aberration, a dwarf, because the skin is quite like the other male skins except that the tuft is smaller and the black tips to the hairs of its posterior portion a little more conspicuous than in the typical males. But it is not excluded that it represents a smaller but related race as it was found at another locality, although not much distant.

This small buck was shot at Njoro a watering place belonging to the Rendiles about 2 days march north of Guaso Nyiri (²³/₂ 1911). In the same neighbourhood a female Dikdik was also shot, but this was unfortunately so young that its dimensions are of little value.

These Dikdiks were common in the thornbush country north of Guaso Nyiri below Chanler Falls. In habits they resembled the other species. A few times I heard them produce a kind of whistling sound like »i i», and a snort when they were started.

***Kobus ellipsiprymnus canescens* n. subsp.**

The specimen on which OGILBY based the specific name *ellipsiprymnus* was brought from South Africa, although the exact locality hardly is known with certainty.² All Waterbucks with a white line across the rump have afterwards been

¹ The milk-molars still remain, and m³ is cutting the gum.

² Conf. W. L. SCLATER: Mammals of South Africa. Vol. I, p. 187—188.

referred to this species until MATSCHIE recently created two subspecific names *K. c. pallidus* from Shebelli, Somaliland, and *K. c. thikæ* from Thika river, Brit. East Africa. The first of these names is based on two immature specimens; It is thus uncertain whether the characteristics quoted by MATSCHIE are constant. These are: »The ground-colour is not a mixture of grey and russet brown but very light brown without any reddish tint. The white eye-stripe reaches only 2,5 cm. beyond the eye in front» — — —. The light colour may stand in correspondence with the youth of the specimens. If the second characteristic is constant, it distinguishes *K. c. pallidus* from my specimens from Guaso Nyiri. The white eye-markings are also much larger in the latter which hardly can be explained by their greater age.

The Thika-race, based upon an adult buck from Thika river, is said to be characterized by its »tief dunkelbraune Färbung und dadurch dass die Hüftbinde auf der Mitte des Hinterrückens unterbrochen ist». The last of these characteristics does not need to be constant in a race of Waterbucks, as can be judged from the fact that in one of my bucks from below Chanler Falls, and in the cow shot near the crossing of the Marsabit road on the northern side of Guaso Nyiri such an interruption of the rump-band takes place, but not in the other buck, although it was shot at exactly the same place as the first. Concerning the description of the colour of *K. e. thikæ* there are also several discrepancies from my specimens. One of these is that in *K. e. thikæ* »auf der Mitte der Brust befindet sich ein grosser weisser Fleck». No such marking is to be found in my specimens. The latter appear also to be less dark, especially on throat and chest, which are said to be »warm-sepia-farbig oder russfarbig (Rép. de Couleurs 305. 1) mit grau gemischt» in the Thika-race, while the corresponding parts of my specimens rather deserve to be termed pale smoke grey somewhat tinged with brown (conf. below). As it could have been suspected that such a white spot on the breast as that mentioned in the description of *K. e. thikæ* might be an individual variation, I took the liberty of writing of Prof. MATSCHIE and asking him about this. But in his reply he declined the possibility mentioned saying: »Dass die breite weisse Stelle auf der Brust meines *Kobus ellipsiprymnus thikæ* individuell sein sollte, glaube ich nicht; so etwas als Variation habe ich noch nicht gefunden.» Concerning the colour of throat and chest in *K. e. thikæ* the author also kindly gave the following explanation: »Die Kehle und Brust sind sehr dunkel, die Warm-Sepia-Farbe herrscht vor, der Rücken ist nur rötlicher.» Since MATSCHIE this way had still more sharply defined the characteristics of the Thika Waterbuck I must state that my specimens from Guaso Nyiri cannot be counted to the Thika race as I had expected. The following description proves more fully the differences. The back is grizzled, the ground colour being hoary or whitish grey overlaid with »warm sepia» (Rép des Couleurs» 305. 2). The warm sepia colour dominates over the hoary on the rump, and also, although less markedly, above the shoulders. Towards the sides the warm sepia fades more and more and is replaced by »otter brown» (»Rép. de Couleurs 354) beginning with darker shades and finally passing to the lightest on the lower flanks where the light grey wholly dominates. The under parts are whitish with an

»otter brown» tinge. The shoulders and hams are thinly overlaid with »warm sepia» passing into »otter brown». The ground colour of the upper neck is hoary grey rather thickly overlaid with »warm sepia» (395. 1). The face is »warm sepia» (305. 2) paler and mixed with hoary grey; on the sides the forehead is »burnt umber» (Rép. de Couleurs, 304. 2) somewhat mixed with »warm sepia». The ears are the palest shade of »dark fawn» (Rép. de Couleurs, 307. 1) fading to whitish towards the outer margin of the basal half, but inclining to »warm sepia» on the upper margin and the tip, white inside. The white eye-mark is well developed, fully 3 cm. broad and extending about 7—8 cm. in front of the eye. A broad white band around the muffle. The chin is white beyond the angle of the mouth. The interramial space between the white chin and the white throat spot is whitish, tinged with »otter brown». The lateral angles of the white throat spot do not reach the base of the ears. The lower side of the neck smoke grey, the hoary grey being tinted with brown. Nothing white on the chest. The white rump band is about 3 cm. broad and interrupted dorsally in the middle for about $2\frac{1}{2}$ cm. in one of the bucks. The tail is warm sepia above and on the tuft, white below. The fore legs below the »knee» are »warm sepia» (305. 2) in front, »chocolate» (343. 2) on the sides and behind; the white band around the hoofs and false hoofs is narrow. The hind legs below the tarsal joint are »dark fawn» (307. 4) in front, more blackish behind.

The cow is generally paler, the »warm sepia» tint on the back of the buck being substituted by a corresponding tint of »brownish drab» (302), and the colour of the lower legs nearest to »raw umber» (301).

In addition to what has been already mentioned concerning the colour of the neck and the breast it may be concluded from this description that the Waterbucks from Guaso Nyiri (Pl. XIV fig. 2) are considerably paler than the Thika race. The back of the latter is said to be »rötlich sepiafarbig», but there is no reddish tint in the former. The Thika race has »die Körperseiten nur ganz wenig mit grau getönt», while there is more grey than sepia on the corresponding parts of the Guaso Nyiri specimens. In the Thika race »die Weichen sind heller, sehr hell umbrabraun (Rep. de Couleurs 301. 1 aber etwas grauer)» in the Guaso Nyiri specimens there is no trace of »raw umber» on the lower flanks. The ears are also much paler in the Guaso Nyiri race.

It appears also to be paler than the typical South African race, which at the same time is considerably larger as can be seen from the cranial measurements recorded below.

	»Caffraria» Inholuba	Brit. E. Afr.	Guaso Nyiri
	♂	♂	♂
Basiscranial length	380	340	330
Condylbasal length	400	358	355
Greatest breadth	178	158	157
Distance from orbit to tip of premaxillaries	245	220	225
» » occipital condyle to front margin of orbit . .	204	183	176
Length of nasals	156	144	156
» » upper molar series	108	101	106

The length of the horns of my two Waterbucks is, measured along the anterior curve, about 57—58 cm., and two other bucks shot for trophies by Mr. SJÖGREN near the same place had exactly the same length of the horns so that this measurement appears to be the »normal» at Guaso Nyiri below Chanler Falls, but the spread of the horns varies considerably. It was in these four bucks about $22\frac{1}{2}$, $27\frac{1}{2}$, 29, and 32 cm.

The measurements of the typical skull of *K. e. thikæ* is a little larger than the Guaso Nyiri skulls the basal length being 349 mm. according to MATSCHIE (l. c. p. 411), and the greatest breadth 162 mm. The distance between the posterior surface of the occipital condyle and the anterior margin of the orbit is in MATSCHIE's type specimen 185 mm. »also nur 23 mm. länger als die grösste Breite des Schädels». MATSCHIE lays much stress upon the great breadth of the skull of *K. e. thikæ*, and he appears to regard this as a typical characteristic of that animal. If a comparison is made between the basal length of the skull and its greatest breadth, the latter measurement is found to be 46 % of the former according to MATSCHIE's measurements of *K. e. thikæ*. In a similar way the corresponding percentages for the skulls of my two Waterbucks from Guaso Nyiri prove to be resp. 46, and 47, and the difference between the greatest breadth of the skull and the distance between the occipital condyle and the front margin of the orbit is resp. 25 and 19 mm. But this great relative breadth of the skull is nothing characteristic of the northern Waterbucks of the *ellipsiprymnus* group alone. The measurements of a skull of a Waterbuck from South Africa recorded above show that the breadth of the same is 46 % of the basal length there as well. These proportions are thus alike in southern as well as in northern specimens.

To judge from MATSCHIE's measurements of the typical skull of *K. e. thikæ* it appears to be a little larger than my two skulls from Guaso Nyiri but the difference is not great and might easily be individual. For the present no other cranial differences of importance can be pointed out, and it is thus rather uncertain whether the differences in colour and pattern justify the creation of a different subspecies for the Waterbucks of the Guaso Nyiri district. Against MATSCHIE's formal declaration it is, however, difficult for the present to identify his very dark *K. e. thikæ* with my pale specimens from Guaso Nyiri, and although unwillingly I have felt myself compelled to give them a separate name until the question can be fully solved by more material.

The paleness of the Waterbucks along Guaso Nyiri appears to reach its extreme in some individuals at and near the Lorian Swamp, where I heard that »white Waterbucks» had been repeatedly observed. Such a one is reported in Proc. Zool. Soc. London 1905 II p. 297, and in »The Field» the »white Waterbucks» from this locality have been mentioned more than once, and it has been stated that the eyes of these white specimens are »of the normal colour, not pink».¹ This makes this white variation to something more than the common pathological pink-eyed albino which now and then occurs among many different species of mammals.

¹ Conf. also the Extract in The Journal of the East Africa and Uganda Nat. Hist. Soc. Vol. II, N:o 3, p. 75.

Waterbucks were seen near Lekundu river, and on both sides of Guaso Nyiri from the ford on the Marsabit road to some distance below Chanler Falls. Often 5 to 8 or more cows and immature animals were seen together but no buck. At other opportunities single bucks, or a few bucks in company were observed or a buck with some few cows. They were always found near the river, but often on very bad and stony ground. They were not very shy. When first observed close to the river they usually took their refuge to higher ground and trotted up on stony hills with great dexterity. The grey fur harmonized completely with the grey, leaf-less bush but they were, of course, very easily seen as they did not try to hide and their contour-lines always betrayed them. They have a more deer-like and stately carriage than any other antelope, because they hold head and neck high.

Redunca sp.

At two different opportunities not far from Nairobi I saw a Reedbuck, but it was on private ground where I had no right to shoot, so that I could not ascertain which species it represented.

***Æpyceros melampus rendilis* n. subsp.**

In the thornbush country north of Guaso Nyiri I collected the material of Impala Antelopes which I was entitled to by my licence viz. 4 specimens and selected two good bucks (Pl. XIV fig. 3), a young buck with still almost straight horns (Pl. XIV fig. 4) (m³ not yet up), and a female. When I had come home and compared my material with specimens from Kilimanjaro (collected by SJÖSTEDT) which must be regarded as representing *Æ. m. suara* MATSCHIE I found that the difference in colour is quite conspicuous. My specimens are irrespective of age and sex alike and much darker than the Kilimanjaro specimens which display a much redder general colouring.

The general colour of the back of the Guaso Nyiri race is »fawn» (Rep. de Couleurs 308. 4 in ♂, 308. 3 in ♀), and darkens in the bucks on the posterior back to »madder brown» (Rep. de Coul. 334. 4). In contrast to this the colour of the Kilimanjaro specimens is the same shade as »dead leaf» (Rép. de Coul. 321. 3 & 4) but brighter. The line of demarcation in the Guaso Nyiri specimens is quite sharp, and the colour of the sides is »dark fawn» (Rép. de Col. 307. 1), while the colour of corresponding parts in the Kilimanjaro specimens is »buff» (Rép. de Coul. 309. 1). The white above the eye, on the chin and throat is similar in both races. Below and in front of the eye, below the continuation of the white eyebrow-stripe there is in the Guaso Nyiri specimens a blackish, not sharply defined but well visible patch which I have not seen in a buck from Kilimanjaro, but which may be faintly traced in a ewe from the same place. (The authors of the »Book of Antelopes» say that this patch »is never present in northern» specimens, and it may thus be of some importance.) The black

patch on the crown is present in both races. The colour of the face is fawn with a dusky blaze in the Guaso Nyiri race (Pl. XIV fig. 3), more bright rufous in the Kilimanjaro specimens. The colour of the outside of the ears is »dark fawn» in my specimens, »buff» in those from Kilimanjaro, the terminal portion is black in both. The mesial dark dorsal streak is in consequence of the general dark colour not very apparent before it becomes black on the rump, and it is continued on the tail, where it, however, is concealed in the bucks by the long white hairs on the terminal portion of this organ. The black stripes on the buttocks, and the black tufts on the hind legs are developed as usual. The black spots as well on fore as hind legs in the place where the lateral hoofs are situated in other antelopes, and the black spot on the heel are perhaps more pronounced than in the Kilimanjaro race.

These differences in colour between the Impalas from Guaso Nyiri and Kilimanjaro are also supported by cranial differences as the following measurements indicate.

	Guaso Nyiri			Kilimanjaro	
	♀	♂	♂ ¹	♂	♀
	mm.	mm.	mm.	mm.	mm.
Basicranial length	245	254	257	—	242
Condylbasal length	262	274	272	—	258
Greatest breadth	108	114	118	—	104
Interorbital breadth	71	74	79	72	71
Greatest length of nasals	87	100	99	81	83
Greatest breadth of nasals	35	33	33	29	29
Breadth of nasals at the end of the nasopremaxillary suture	21	24	24	20	20
Distance from orbit to tip of premaxillary	162	169	170	159	160
Length of upper molar series	81	78	80	76	71

The length of the horns of my two Impala bucks, which are to be regarded as good average specimens, measure about 73 and 66 cm. along the front curve and the distance from tip to tip is resp. 43 and 53 cm.¹

The Impalas of German East Africa appear to be smaller with shorter and especially narrower nasals. The difference is not very great, but I think it is the best proceeding to name the Impala of the thornbush country north of Guaso Nyiri as a separate geographic race which is called *rendilis* after the nomadic tribe inhabiting this country. Concerning the colour it could almost have been expected that the inhabitants of this arid region should have been paler instead of being rather darker.

¹ The spread of the horns is, as is well known, very variable, and sometimes one of the tips is nearer the median line than the other. A good example of this was an Impala which I saw in Nairobi and which probably was from Sotik. The spread of this was not less than 68 cm., but the tip of the right horn was only about 25 cm. from the median line. — Some ultramodern zoologists would probably term such a specimen a hybrid!

In the thornbush country the Impalas occurred in small flocks usually counting from 7—8 to about 15. As has been observed at other localities as well, such a flock sometimes consists of a good buck and a number of females and young bucks which not yet have fully developed horns, sometimes there are no adult buck at all to be seen in the flock, and sometimes 7—8 adult bucks live together without having a single female or young buck in company. It is more seldom single bucks wander alone or only two in company. When we were camping at Guaso Nyiri the Impalas were as a rule seen near the river, and at the water-places Njoro and Thera as well they lived not far from the water-holes. When not on the move their favourite haunts appeared to be the bushes fringing the dry beds and ravines of the small rivulets and water-courses. There the Impalas have a good cover. Often some evergreen bushes grow in such localities, and these may be the only green food available during the dry season in this country.

When alarmed they warn the others with a sharp sniff or whistling snort and make some wonderful bounds high above the bushes before they start on their regular flight in a certain direction with full speed. It is evident that they make these high leaps out of curiosity and to try to find out from where and from whom the danger threatens.

On the acaciasteppe south of Guaso Nyiri Impalas were seen in bushes near Lekundu river, but as I did not shoot any specimen there I cannot tell whether they were of the same race as those of the thornbush.

***Gazella thomsoni* GÜNTHER.**

SCLATER & THOMAS: Book of Antelopes, Vol. 3, p. 171.

The beautiful little »Tommies» are still common on the plains around Nairobi and at Juja farm. Unlike the Grant gazelles they do not extend their distribution much further north east. Like the Kongoni and the White-bearded Gnu they were non existent on the acacia-steppe south of Guaso Nyiri. They belong thus to the East African fauna in a restricted sense.

Where they are not pursued the Tommies are the most confiding of the antelopes of the plains, but where they are often shot at, they become very shy and run for their lives even at very long distances, and long before they are within range for a rifle.

***Gazella granti* BROOKE.**

SCLATER & THOMAS: Book of Antelopes, Vol. III, p. 179.

Not less than six subspecies of Grants Gazelle have been named and these have been reviewed not long ago in LYDEKKER's book on the »Game Animals of Africa» (1908). The variability of the species is, however, great and, although some of the races appear to be well defined, it is sometimes rather difficult to form a

definite opinion about certain specimens. For instance, a typical head of *G. g. robertsi* is very easy to recognize on its horns the tips of which point outwards and backward and thus have a great spread. Horns of *G. g. robertsi* about which there could be no mistake I saw brought from Sotik. On the other hand it is not uncommon that a dispute arises whether a certain pair of horns shall be regarded as *G. g. granti*, or *G. g. robertsi*, and I remember that I have been in uncertainty myself about this when once called to settle a controversy on such a matter. This proves that there are intermediate links between these races.

The Grant Gazelle of the Athi plains near Nairobi, and in the southern Game-reserve belongs to the typical *G. g. granti*, while *G. g. petersi* with more parallel horns, and the colour of the back reaching the root of the tail is found at lower Tana and Sabaki rivers, thus nearer the coast.

G. g. notata is said to live in the country »from the highlands southwards and south-eastwards of Lake Rudolf to the Guaso Nyiro-valley and Mount Kenya» (LYDEKKER l. c. p. 262). Judging from this I expected to find the race mentioned in the country round Guaso Nyiri. This was, however, not the case. The characteristic of *G. g. notata*, from which also the name is derived, is that it shall have the body-markings »much intensified». »Dark and light lateral bands much longer and broader, the former nearly black and reaching forwards on to the shoulder, and backwards nearly to the white rump-mark; the latter pale buff, and succeeded above by a second dark band, lighter than the main lateral band, but distinctly darker than the centre of the back. This second dark band united with the other behind the posterior end of the light band. Pygal band black and very strongly defined» (SCLATER & THOMAS l. c. p. 191). The Grant Gazelles on the acacia-steppe at Lekundu river near but south of Guaso Nyiri had, however, no such appearance, nor their congeners in the thornbush on the northern side of the latter river. Instead of having intense markings they were very pale all over, and the markings obsolete. There are two such subspecies described viz *G. g. brighti* THOMAS, and *G. g. lacuum* NEUMANN. The former which LYDEKKER terms the Lado race is said to inhabit the country between Lake Rudolph and Lado. The latter the Abaya race is from the surroundings of Lake Abaya, or »vom Zuai-See bis zum Gandjule-See». *G. g. brighti*¹ is fully described and characterized by its pale colour and absence of dark lateral bands in all specimens of any age. This race has also comparatively short horns and a »growth-boss» at their anterior bases retained into adult life. About *G. g. lacuum* it is much more difficult to get any clear idea. It is said to be somewhat smaller than *G. g. granti* and provided with straight horns. The dark lateral band is said to be conspicuous in young animals, and present but indistinct in old females. The dark pygal band is said to be less developed than in *G. g. granti* and the white rump-patch smaller. The horns shall be longer than in *G. g. brighti*.

Considering all it appears most likely that my specimens are more nearly related to the race named *G. g. lacuum* than to any other but, although in the following I

¹ Proc. Zool. Soc., London 1900, p. 805.

am going to use this name, I do not think that it signifies at all a form other races sharply defined form, but most probably such a one which merges gradually as well into *G. g. granti* on one hand as into *G. g. brighti* on the other.

Gazella granti lacuum NEUMANN.

NEUMANN: Sitz. ber. Ges. naturf. Freunde, Berlin 1906, p. 243.

The Grant Gazelles on the acacia steppe south of Guaso Nyiri around Lekiundu river do not differ much from the typical *G. g. granti* except that they are paler and the dark spot on the muzzle of the bucks is smaller and less pronounced. The dark pygal band is present but not very sharply defined and sometimes it can hardly be traced (Pl. XIV, fig. 5). In the females the markings as usual are better developed but even in some of them the lateral band is on the verge of disappearing, or quite obsolete. On the northern side of Guaso Nyiri the Grant-gazelles were still paler. The nasal spots of the bucks are often only a faint dusky cloud, and the dark pygal band is practically absent, even if the hairs at that place are a shade darker. In some small herds one or two females were seen with lateral bands, in other herds not a single animal with lateral bands could be detected. This was for instance the case at the water-place Njoro and these animals thus approach *G. g. brighti*, but the horns were longer measuring in a buck shot at that place about 55 cm. along the anterior curves and with a basal circumference of 15,5 cm. Equally pale bucks were shot near Chanler Falls, and the best of them¹ carried horns measuring 63 cm. and with a basal circumference of 17,3 cm. These large horns and their shape which is rather similar to that in true *G. g. granti* prove that these specimens are not identical with *G. g. brighti*. The spread of the horns is as usual among Grant-Gazelles variable. In the specimen from Njoro (Pl. XV, fig. 1) the distance from tip to tip is about 29½ cm. but in those from Chanler Falls only about 19 cm. On the two Lekiundu bucks the same dimension was resp. 23½ and 16 cm.

With regard to the size of the white rump-patch I cannot find any perceptible difference between these animals and typical Grant Gazelles from Kilimanjaro.

Generally speaking these Gazelles are somewhat smaller than the typical race, and the measurements of the skulls as can be seen on the accompanying table agree nearly with those recorded by THOMAS² for the type of *G. g. brighti*. But even the measurements have in this case only relative value, and do not constitute with full certainty distinguishing characteristics. This I have ascertained myself as I have measured skulls of adult bucks of *G. g. granti* from Kilimanjaro which have a shorter condylobasal length than the average of my specimens from Guaso Nyiri, although others were about 20 mm. longer. The smallest of my specimens is the one from Njoro which, however, was a fully adult animal in good condition. This may stand

¹ The females in company with this buck had dark lateral bands according to Mr. CUNNINGHAME's observation.

² Proc. Zool. Soc., London 1900, p. 805.

in connection with the fact that in this arid region food must be scarce for these animals. The buck killed there had chiefly fed on the leaves of an evergreen bush which grew at a dry river-bed.

The first two bucks killed at Lekundu river (Pl. XIV, fig. 5) measured both of them when freshly killed 170 cm. in a straight line from the muzzle to the tip of the tail, and the length of the tail corresponded to 26 cm. out of that. The paler bucks from Chanler Falls were certainly not smaller, although I have no body measurements of them. The buck from Njoro again which, as already mentioned, was my smallest specimen has the basal length of its skull about 12 mm. shorter than the type of *G. g. brighti*.

	Lekiundu river S. of Guaso Nyiri				Njoro	N. of Guaso Nyiri near Chanler Falls	
	♀	♀	♂	♂	♂	♂	♂
	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Condylobasal length of skull	222	221	—	252	242	255	254
Basal length of skull	206	205	—	238	228	236	238
Greatest breadth of skull	99	99	107	107	108	107	108
Distance from orbit to tip of premaxillaries . . .	126	118	137	128	129	136	137
Least interorbital width	53	56	66	66	63	65	62
Length of nasals	51	51	74	56	54	54	67
Upper molar series	76	74	73	79	79	82	79

A study of the cranial measurements recorded above shows that, with the exception of the specimen from Njoro, the other bucks are very much alike. The greatest variation is found in the length of the nasals. One of the bucks from Lekundu has long nasals 74 mm., one of those from Chanler Falls has also comparatively long nasals 67 mm., but in the others they must be termed short. Skulls of the typical Grant Gazelle from Kilimanjaro, often have rather long nasals measuring more than 70 mm. It might thus appear possible that this should be a characteristic of the typical race, and shorter nasals on the other hand of the smaller more northern races. Some of my specimens are then intermediate in this respect as well. But it must be remembered that the variation in this respect is rather great even among the typical Grant Gazelles, and that fullgrown bucks of the latter race may be found with the nasals measuring only little more than 60 mm.

Short nasals stand in connection with a movable muzzle, and for a browsing ruminant such an organ is of importance. The Grant Gazelles of the open plains are grazers, but those of the thorn-bush are at least partly browsers. This may account for the difference in the length of the nasals in different races if constant.

It may be concluded from this that intergrading links between the typical *G. g. granti* of the steppes of Central East Africa, and the paler and smaller races *G. g. brighti* and *G. g. lacuum* of the arid regions further north can be found so that no sharp limits can be drawn between them. The, as it seems, still incompletely known

Banded Grant Gazelle, *G. g. notata* is probably an inhabitant only of somewhat higher altitudes, the Loroghi mountains etc., and does not descend on the hot and arid plains, resp. thornbush country. Its longer fur and richer colouration speaks for such a theory.

HOLLISTER has recently recorded¹ this race from the Laikipia plateau and also given the measurement of a skull which had a condylobasal length of 260 mm., thus larger than that of the pale race described above, but the author quoted says »there appear to be no constant cranial characters by which skulls without horns» of this and the typical race can be separated. The horns are different, however, he says, »spreading but little at the points». The distance between the points is recorded to be 16 cm., thus the same as in one of my specimens from Lekundu. There is thus in this respect as well intergrading specimens to be found.

The Grant gazelles are rather common on the acacia steppe south of Guaso Nyiri. They occurred usually in small flocks, but single as well bucks as females are often seen. In the thornbush on the northern side of the river they were less numerous. In consequence of their pale colour and short, smooth fur they appeared quite white in some shades of light.

Lithocranius walleri (BROOKE).

SCLATER & THOMAS: Book of Antelopes Vol. III, p. 229.

The type locality of the species is said to be the Tsavo plains east of Kilimanjaro. The specimens from Somaliland which already then were known to be larger, were named »*Lithocranius sclateri*» by O. NEUMANN.² The distinguishing characteristics are said to be, in addition to the difference in size, as follows: The typical *L. walleri* is said to be »redder» (»röther») than the Somali-race. It shall have black knee-tufts (»schwarze Kniebüschel») and »das weisse der Unterseite bildet an den Seiten des Schwanzes einen undeutlichen breiten Fleck». On the other hand, the Somali-race is said to have »braune Kniebüschel, und das weisse der Unterseite zieht sich seitlich des Schwanzes als feine weisse Linie aufwärts».

Looking at my three specimens from the northern side of Guaso Nyiri I find that the upper central parts of the knee-tufts are black, but the lower and lateral parts are rufous. It is thus difficult to know whether this characteristic shall indicate *L. walleri*, or *L. sclateri*. The white along the posterior edge of the hams extends as a fine line to the root of the tail, where it expands to a maximum breadth of about 1 cm. in the doe, about 2 cm. in the buck. It is difficult to know what NEUMANN means with his words »einen undeutlichen breiten Fleck», which should be characteristic of *L. walleri*, but it appears most probable that my specimens in this respect as well are intermediate, between the northern and southern races. The name »*sclateri*» can thus only be regarded to have subspecific value.

¹ Smithson. Misc. Coll. Washington 1910, Vol. 56, p. 7.

² Sitzber. naturf. Freunde. Berlin 1899, p. 19.

The horns of my old buck are well developed, although no records they measure along the front curve about 31 cm. with a basal circumference of $13\frac{1}{2}$ cm., and a distance between the tips of $6\frac{1}{2}$ cm.

Concerning the skull NEUMANN says that the nasals and premaxillaries of the typical *L. walleri* are much shorter than those of *L. sclateri*. Fortunately in this case he gives the dimensions of these bones in two specimens of *L. walleri*, and one *L. sclateri*. These measurements which are quoted below are said to be derived from old male skulls as also is the case with mine.

	<i>L. sclateri</i> ♂ from Berbera (NEUMANN)	My specimen from Guaso Nyiri	<i>L. walleri</i> ♂ from Pangani (NEUMANN)	<i>L. walleri</i> from Kibaya
	mm.	mm.	mm.	mm.
Length of premaxillary	66	60	55	57
Length of nasals	74	61	49	54
Length of upper molar series	56	52	46	51

From this may be seen that my specimen occupies an intermediate position between *L. walleri* and *L. sclateri* with regard to these measurements as well which thus confirms the supposition expressed above concerning the subspecific value only of *L. sclateri*.

For the benefit of a future comparison of other cranial dimensions as well, of specimens from different localities the following measurements of my adult specimens from Guaso Nyiri are recorded.

	♂	♀
	mm.	mm.
Greatest length of skull (occiput to tip of premaxillary)	229	209
Condylbasal length of skull	219	198
Basicranial " " "	206	182
Greatest breadth " "	96	87
Least interorbital breadth	67,5	54
Distance from orbit to tip of premaxillary	106	98
" " " " occiput	107	95
Length of upper molar series	52	50

If BROOKE's figure of a male skull of the typical *L. walleri*¹ is correct, the distance between the proximal end of the premaxillary and the nasal is considerably greater than is the case in my specimen in which this distance is only 7 mm. which, of course, stands in connection with the somewhat longer premaxillary in this intermediate form.

The skull of the Gerenuk displays several very interesting peculiarities to which I will pay attention at another opportunity.

¹ Reproduced in »Book of Antelopes» l. c., p. 231.

The first Gerenuks were seen by this expedition among scattered groups of bushes, and in patches of thornbush on the steppe around Lekundu river south of Guaso Nyiri. In the thornbush country north of the latter river the Gerenuks were common. They were usually seen in small families from three to about seven, but sometimes also single. Good bucks, which are very much larger than the does and the young bucks, are by far not numerous compared with the other specimens. Sometimes I did not see a good buck for several days, although not a day passed without that a good many Gerenuks of small size were observed. The best buck which I saw and succeeded to shoot was single. The habits of these peculiar antelopes have been repeatedly and correctly described (conf. the quotations in the »Book of Antelopes», and in LYDEKKER'S »The Game Animals of Africa», etc.). The Gerenuks are wary, and in some places even shy, so that they do not admit the shooter at a shorter range than about 300 m., and as they, as a rule, only show their long narrow necks they are then by no means an easy target. In the thicker thornbush north of Guaso Nyiri they were less shy, and to a certain extent even curious. In the grey and leaf-less thornbush the stalking sportsman or naturalist often sees at some distance two or three vertical rufous streaks; that is the erect necks of some Gerenuks which stare for some moments at the intruder in their dominion. If they are within reasonable range it is time to shoot, although the bodies are entirely hidden and the necks narrow. But if one moves to continue the stalk the Gerenuks dive down with their necks below the bushes and disappear. As a rule they do not go straight away, but oftener their »long crouching trot» carries them obliquely towards one side or the other. If the sportsman sees the direction, and the thornbush is not too thick, they may often be intercepted by making a short cut because, as a rule, they do not go very far before the rufous necks appear again behind some bush. This may be repeated a couple of times before they disappear completely, or it has been ascertained that there is no good buck in the little flock.

The Gerenuk is in a marvelous manner adapted to the life in the thornbush. Its slender form enables it to slink through narrow openings in the bush, and its sleek coat does not catch in the thorns. The skin is rather thin, except on the neck of the buck where it is thick, but of a soft and elastic, almost rubber-like consistency, unlike other antelope skins.

The Gerenuk is a browser feeding on the leaves, tender shoots, and, during the dry season at least, to great extent on the berries of the different kinds of bushes. Their long and slender legs, long and narrow necks, long, hairy and movable lips enable them to reach high up in the bushes, especially when they rise on the hind legs as they often do. I have had the pleasure of seeing that myself, and I am thus able to testify that the figure reproduced on p. 232 in Vol. III of »Book of Antelopes» depicts two very characteristic attitudes of this interesting animal. There is a very striking analogy in the shape, not only of the neck and head, but also of the lips between a Giraffe and a Gerenuk. Thanks to this wonderful adaptation the Gerenuk is able to sustain itself on such dainty material in this barren-looking desert as the thornbush appears to be during the dry season, that its intestinal canal, as I

intend to describe at another opportunity, can be, and is more simply built than in any other antelope of, or above its size.

The Gerenuks which I shot had their stomachs filled with green leaves and a kind of berries which were of the size of pease and grew erect on the branches of a thorny bush. In the centre was a hard seed, and between that and the skin a white or transparent aromatic and resinous substance.

***Oryx beisa annectens* (HOLLISTER).**

HOLLISTER: Smithsonian. Misc. Coll. Washington 1910, Vol. 56, nr. 2, p. 7.

HOLLISTER has recently described (l. c.) the Oryx-Antelope of the Laikipia Plateau as a new species under the name of *Oryx annectens*. The distinguishing characteristics with regard to the colour are said to be »lateral stripe narrower» than in the true *Oryx beisa* »and head markings somewhat approaching those of *O. callotis*».

The four specimens of *Oryx* which I was allowed to shoot on my license were obtained south of Guaso Nyiri river near its tributary Lekundu river and near the ford on the Marsabit road. These specimens differ from the typical *Oryx beisa* and agree better with HOLLISTER's *O. annectens*, but the characteristics are to some extent variable, as will be set forth below, so that I can only admit subspecific rank to »*O. annectens*».

HOLLISTER's type of »*O. annectens*» is said to have the lateral stripes »reduced to narrow streaks from 8 mm. wide in the middle to 10 mm. wide near the posterior end». In my specimens as well it is often only 8 mm. wide in the middle but widens posteriorly in one specimen to 20, in another to 25, in the third to 20, resp. 25 on the other side, and in the fourth to 25 and 30 mm. resp.

My specimens are thus not so widely different from the typical *O. beisa* as HOLLISTER's type of *O. annectens*, although the difference still is perceptible. The situation of the lateral stripe with regard to the general colouring of the body is as described by HOLLISTER.

The markings of the head appear, however, to offer better characteristics. The stripe through the eye extends higher up to the top of the head, and is also prolonged downwards so that it joins the black throat stripe in all four specimens (only in one of HOLLISTER's specimens). This reminds about the pattern of the head of *Oryx gazella*, and the same is also the case with the broadening of the facial black patch and its extension downwards on the sides of the face so as to actually coalesce with the confluent eye stripe and throat stripe, which takes place in one of my specimens.¹ In two others the distance between the lateral tip of the facial patch, and the eye stripe is reduced to 20—25 mm., in the fourth it is a little more, viz. 30 mm., but scattered black hairs tend to bridge over this interspace in all three specimens.

¹ The same pattern is beautifully illustrated by a photo of an Oryx bull by ROOSEVELT in his »African Game Trails», p. 270. This specimen appears to have been killed to the north west of Kenia.

The dorsal stripe is quite absent in one of the specimens, in another it is rather weakly represented on the posterior portion of the back, in a third it extends from the middle of the back to the sacral region, and in the fourth from above the shoulders to the loins.

The black marking on the cannon-bone is only slightly developed on the fore legs, in some instances there is only a black shadow streak, in others it deserves the name of a black spot but not very large. On the hind legs below the hocks one of my specimens is shaded with black on the outside down to the false hoofs. Another has a rather big black blotch $15 \times 4\frac{1}{2}$ cm. on the outside of the cannon bone below the hocks. In the two others this portion of the hind leg is only more or less faintly shaded with black. This variability is of interest especially as these markings remind about the condition of other species.

The following cranial measurements of my specimens prove my best bull to be larger than HOLLISTER's type, but not to such a degree as to cause any doubt as to the racial identity.

	♂	♀	♀	♀
	mm.	mm.	mm.	mm.
Condylbasal length	376	379	372	349
Greatest breadth of skull	152	156	152	145
From orbit to tip of premaxillary	240	241	232	223
Least interorbital breadth	104	107	107	103
Length of nasals	159	159	133	131
Length of upper molar series	107	108	98	105
Length of horns	785	870	820	810
Spread at points	215	200	223	220

All these specimens are fully adult specimens with rather strongly worn teeth. The smallest and the biggest cow were in company when shot. The individual variation in size is thus rather great, as usually is the case with those animals the growth of which is continued through several seasons which are apt to offer different conditions of life. With regard to animals which live in such a country as these Oryx Antelopes do, this fact is quite easy to understand, because a long and severe drought, which is nothing rare there, may make the pasture extremely scanty and of bad quality. This naturally results in starvation for the antelopes, and a stunted growth of the young animals, while those which grow up during a period of favourable rains get abundance of food.

We met with Oryx Antelopes of this kind on the acacia steppe round the tributaries Luazomela, Itiolu, and Lekundu rivers to Guaso Nyiri. In some places they were quite numerous in this country. They were also seen on the northern side of Guaso Nyiri but were not so numerous in the thornbush there as on the steppe on the southern side.

They occur sometimes single or two or three together, oftener in small herds containing from five to a dozen or more. If the animals are common in a locality

they join to big herds. The largest herd I counted south of Guaso Nyiri in February numbered 43 individuals, but returning over the same steppe in March since green grass had been developed I counted about 90 in one herd ($19/3$ 1911) not far from the ford on the Marsabit road. The Oryxes associate often with Zebras, Grant zebras at the southern range of their distribution, but with Grevy zebras nearer Guaso Nyiri and north of this river. Sometimes the herds are mixed in subequal numbers but in other cases a single Oryx can be seen among Zebras, or the opposite.

The Oryx Antelopes were seen grazing in the morning, and towards evening. Later in the forenoon and about noon they are usually standing quiet, often selecting the shade of an acacia, if such are to be found, or with the head, and as much as possible of the body, under some big bush. In the thornbush country north of Guaso Nyiri grows a kind of funnel-shaped, flat-topped acacia-bushes which are much liked by the animals for the shade they give in this hot country. The Oryxes are fond of standing to rest under these, and they are then not so shy as usual. One day for instance I came across about a dozen fine animals with very long horns — one of them had only one horn, the other being quite broken away — standing under such bushes about 60 metres from me and my gunbearers. They allowed us for several minutes to stand in full view of them discussing the length of their horns and admiring their beauty before they leisurely trotted off through the thornbush unmolested.

As a rule the Oryxes are very shy and wary, sometimes extremely so. It happens sometimes that they appear smitten by some inexplicable terror and gallop away at very long distances kilometres away. In other cases it is no difficulty to approach them to a distance of about a couple of hundred metres. If their curiosity is aroused they may exceptionally stand and stare even if the dangerous object is not very far from them. One day when Mr. CUNNINGHAME and I were stalking (in vain) a Giraffe and were lying down behind a low ridge to wait for a good opportunity to continue our work, a very fine Oryx bull passed about 40—50 metres from us. When he saw us he stopped and looked at us. He did not mind that I sat up, produced my Zeiss-glass and examined him most carefully. For minutes he stood there, although nothing was hiding us from him; C. and I were talking about him, he made a few steps now and then, stopped again, and finally continued his walk. So different can the behaviour of wild animals be.

In some shades of light the general colour of the Oryx blends very well together with the dry grass and the leaf-less bushes, but of course there cannot be spoken about protective colouration in such a case as this. I found often that the straight black horns was the first thing of an Oryx that was observed by the human eye.

The Oryxes are commonly preyed upon by Lions in these regions as was proved by ›kills‹ found.

ROOSEVELT found very young Oryx-calves in September and assumes this month to be the regular calving-time of this species. As the calves which I saw in February were rather well grown, this observation may be confirmed, but the number of calves seen by me was comparatively small. The 12th of March I saw a quite young calf

with his mother, and another Oryx in the thornbush below Chanler Falls. This proves that the calving season is not quite regular.

Tragelaphus haywoodi THOMAS. (?)

THOMAS: Proc. Zool. Soc. London 1905, p. 181.

Unfortunately I did not succeed in obtaining any Bushbuck when I visited such places as Escarpment, and Meru boma where antelopes of this kind were to be found. In the dry country, where we spent most of the time collecting, no Bushbucks live. Twice the natives brought Bushbuck-skins for sale but as they were very badly mutilated I did not care to buy them. The first time this happened near Escarpment station. That skin was dark without any stripes only with some few spots. The second skin of Bushbuck was shown to me some distance south of Meru boma. It was about chocolate-brown with one faint transverse stripe, and some few spots which also were rather faintly developed.

To judge from the locality, at least the latter skin, and probably the first as well, ought to have belonged to the Kenia race of Bushbucks which THOMAS has named as above. THOMAS type which was from Nyiri, a locality intermediate between these two, had, however; »three inconspicuous transverse whitish stripes on each side. No longitudinal bands, but a few white spots on the sides of the rump». The number of transverse stripes is thus variable in the Bushbucks of the Kenia district.

Boocercus¹ eurycerus isaaci THOMAS.

THOMAS: Ann. & Mag. Nat. Hist. 7 Ser. Vol. 10, 1902, p. 309.

At Meru boma I bought a pair of Bongo horns from a native. The animal had been caught in a pitfall somewhat to the southwest of Meru boma, and as far as I could make out, in the upper forest region on the northeastern side of Kenia. Length along the front curve nearly 79 cm.; in a straight line 69 mm.; basal circumference $29\frac{1}{8}$ cm.; from tip to tip 29 cm.; greatest spread (outside) nearly 44 cm. As only a part of the skull remains the only measurement of value to be recorded is the least interorbital width which is 108 mm.

I saw also the skin of this animal, but it was very mutilated and in a bad state so that I did not care to buy that. It was dark chestnut red with 12 white flank stripes. The dorsal stripe was mixed black and white.

About the end of March when the expedition passed through the mixed bamboo and forestregion on the eastern side of Kenia spoors and droppings of Bongo were seen at an altitude of about 2,700, in the same tract where the *Hylochærus* appeared

¹ Although THOMAS plainly has stated that he has given this name in consequence of the bovine tail of the Bongo several authors wrongly spell *Boocercus* (!) as if the name referred to the horns!

to be common. From a zoogeographical point of view it is of interest to note that these two typical forest animals extend so far (north)east.

Concerning the habits of the Bongo I am indebted to Lord DELAMERE for the following notes: The Bongo lives in herds which may count up to 20, yes even sometimes 30 individuals, to judge from the spoor. They move up and down the mountain sides at certain seasons to escape the Wandorobbos. The latter live during the dry season at, or above the forest line to get honey from the bees. The Bongo is then lower down in the forest. In the rainy season the Wandorobbos move down, and the Bongo up. The Wandorobbos pursue the Bongo sometimes with barking dogs, and the Bongo makes a stand against the dogs. The Bongo feeds exclusively on leaves and branches, never on grass. It seldom if ever goes outside the forest. If it happens to come to an open grass-covered spot in the forest it passes straight across without stopping to feed. When browsing the Bongo walks along all the time, never standing still, but it rests lying in some very dense thicket for some hours for instance from 10 a. m. to 3 p. m., or something like that. When browsing it makes rather much noise breaking branches and twigs.

Taurotragus oryx pattersonianus LYDEKKER.

LYDEKKER: Nov. Zool. Vol. 14, 1907 p. 325.

The Eland is rather rare in those parts of British East Africa where I had the opportunity of studying the fauna. Only twice during the whole expedition I had the pleasure of seeing these splendid animals. The first time was on the steppe between Luazomela and Itiolu rivers. A small herd consisting of four cows and a fine »blue» bull got wind of the safari at a very long distance and ran away with greatest possible speed in a great curve up the wind, so that I could only watch them through my Zeiss-glass. The second time was (3 March) on the northern side of Guaso Nyiri not far from Chanler Falls. A small flock was observed. I did not see any bull among them (but he might have been hidden among the bushes). The animals were very wary this time too, but I got the opportunity of killing a fine cow (Pl. XV fig. 2) at a comparatively long range. Two other cows which were in its company were not scared by the shot, but stopped and looked round, and could then have been shot with greater ease than the first if I had wanted them. These Elands were found in a place where the thornbushes were low and scattered. As the contents of the stomach proved, they feed as well on grass as on leaves and twigs.

The colour of my specimen (Pl. XV fig. 2) agrees with that which LYDEKKER has stated for the type specimen with the differences which are due to difference in sex. The »incomplete white chevron» is present, but not quite as broad as in LYDEKKER's figure. The black stripe running in the middle line of the forehead of the bull is merely indicated in the cow, but the lower part of the face is dark brown. The forehead and the posterior part of the back have the same colour, a pale but

clear rufous fawn. A mesial black stripe extends along the back to above the withers. It is broader and of a purer black behind, getting browner anteriorly, and finally from the withers and forward along the neck continued in a dull fawn crest. The sides of the head and the neck are light grey, tinged more or less with »pale ecru» (Rép. de Coul. n:o 66,4). The back of the ears pale sandy grey, basally on the outside whitish grey, but the upper half of the outer margin blackish with the duskiness encroaching on the upper posterior surface. The extreme tip is white. There are four white stripes, 5 to 9 cm. apart, across the body in the shoulder region and behind the same. One of these is, however, rather faintly developed. The body colour fades gradually from the back downwards on the sides to pale buff, and finally to white on the lower side. The hams and hind legs are pale ecru. The fore legs more buffish in front and whitish behind with a big black mark situated above the »knee» on the posterior outside, just as is shown on the plate XCVIII in »Book of Antelopes» for the typical Eland. A continuous black band encircles the hoofs and false hoofs as well on the fore as hind legs. This band is about 2 cm. broad, and on the fore leg it sends up a mesial streak in front so as to divide the Tragelaphine white spot above the hoofs in two. On the hind feet again this white mark above the hoofs is undivided. The tail is buff-coloured but with black tuft. In the centre of the lower surface of the body is a large blackish patch with longitudinal extension but not reaching far forward on the chest.

This description has been made out rather detailed because it does not appear to be known how the cow of Patterson's Eland looks, and even the characteristics of the buck appear to be partly unknown as the type-specimen was not complete. As late as in »The Field» newspaper for Nov. 25 1911 Pocock says: »assuming that Patterson's race of the common eland has the feet coloured like Livingstone's eland» — — —. The colour of the feet of Patterson's Eland was thus not known then, but it is of interest to find (conf. above) that it is so essentially Tragelaphine.

Another passage from Pocock's above quoted discussion of the colour of the different races of Elands may be fully rendered: »Other points of interest noticed in the Senegambian example were the colouring of the ear, which was black behind in its distal third, with a small white tip, and the presence of a broad black band, also observed in the Soudanese animal, extending along the chest and belly.» A comparison with the description above proves that these markings are present in my specimen of Patterson's Eland as well, which thus shows some signs of affinity with the two mentioned races, although it differs in many other respects.

The dimensions of the skull of this specimen are as follows:

Condylobasal length	413 mm.
Basicranial »	383 »
Greatest breadth	177 »
Interorbital breadth at upper incisures	100 »
Length of nasals	177 »
Brim of orbit to tip of premaxillary	248 »
Length of upper molar series	131,5 »
Length of horns	57 »

The animal was in good condition with the other teeth moderately worn, but the first premolar is very much worn down and appears to indicate a phylogenetic reduction of that tooth.

***Buffelus caffer raddiffei* THOMAS.**

THOMAS: Proc. Zool. Soc. London 1904, p. 371 & 464.

The splendid Buffaloes of those parts of British East Africa where I had the opportunity of collecting my zoological material belong apparently to the same race which THOMAS described from Uganda under the name above.

The first Buffaloes observed by this expedition were seen between Luazomela and Itiolu rivers. The »safari» went across an open grass steppe, but several hundred metres to our left was a thick and extensive thornbush patch in which the Buffaloes were completely hidden. When we had advanced so that the wind blowing across our path and towards the thornbush patch reached the Buffaloes they broke out on the further side of their hiding place in a heavy gallop, their big black bodies surrounded with clouds of dust.

Next time we found Buffaloes on the southern side of Guaso Nyiri near the crossing of the Marsabit road. At this locality as well their covert consisted of thornbush of different kind among which a certain large funnel-shaped and flattopped acacia-bush was most prominent. It appeared striking to me to find Buffaloes in such a dry place as this, as in my mind I mostly had associated these animals with swamps, reed beds, and water. The water was, of course, not far off in the Guaso Nyiri river and some of its tributaries, but there was not a green straw of any kind to be seen. The soil was so dry that a cloud of dust arose when the Buffaloes moved. I got the opportunity of stalking and shooting a fine cow $1\frac{1}{2}$ 1911 in this thornbush. When found she stood resting with her head close under one of the funnel shaped acacias. Her height in straight line at the shoulders was 138 cm. and the distance from muffle to vent 225 cm. The shape and direction of the horns may be seen from the accompanying figures (fig. 5 a & b).

On the northern side of Guaso Nyiri Buffaloes live here and there in the thornbush, especially below Chanler Falls. Some distance below this place I had — the opportunity of shooting a magnificent herd bull in its best stage of development before the tips of the horns had begun to be worn off. It measured from the root of the tail to the posterior margin of the horn bosses 223 cm. Its height above the shoulders was 150 cm. The palms of the horns were quite close together, as can be seen from the fig. (Pl. XV fig. 3), when the animal just was shot, but in drying they have shrunk apart. Their width across is in a dry state 27 cm. The greatest width outside is 104 cm., inside 93 cm. Distance between the tips 80 cm. The horns of the African Buffaloes vary even in the same herd, some are more widely laid out some are more strongly curved. The difference in appearance in different stages of age is very striking. When the horns have attained a

certain stage of growth, their tips are more and more removed from the mesial line by the growth of the core and the horny sheath. Since the horns have reached their maximum of development again the distance between the inward directed tips is increased by wearing. The smooth tips then by and by become shorter and more blunt. I have seen old specimens in which the tips were entirely worn off so that the ends of the horns were quite truncate.

Characteristics entirely based on the shape of the horns must thus be carefully considered before they are accepted.

Fig. 5 a. *Buffelus caffer raddcliffei* ♀.

All specimens seen by me were covered with hair and looked quite black when alive. A closer examination proves, however, that only head, neck, fore-quarters, back, tail-tuft, a band above the hoofs, and the front side of the legs are quite black. The remaining parts, especially the hind quarters, are dark brown. On the »knees» of the forelegs is a pad of long rather pale brown hair for the protection of the skin when the animals kneel down. Mesially along the posterior part of the upper neck and the anterior part of the back to the whirl behind the shoulders the hairs are bristle-like and attain a length of about 12 cm., but they are not numerous enough to form a conspicuous crest.

I did not see any quite young calves. The smallest were about half grown and had already the colour of the adult.

On the northern side of Guaso Nyiri the Buffaloes had their well beaten tracks along which they went to the water, but they did not appear to use the same every night. Their pasture-lands were mostly situated at some distance from the river. The herd out of which I shot the bull was found about 6—7 kilometres from the river, and at another opportunity I saw a couple of bulls at a still greater distance from the water. During the hottest hours they usually stand resting under some acacia or a big thornbush, but I have also seen them wandering about and grazing about 1 o'clock at noon. They feed on the coarse grass which grows here and there in the thornbush. When they rest they hold the forehead almost horizontal and the large fringed ears droop below the bases of the horns.

Fig. 5 b. *Buffelus caffer raddcliffei* ♀.

When badly wounded they give vent to a grunting bellow¹ and even since they have fallen and lie dying they continue with short intervals to utter a kind of moaning bellows at one time melancholic and wild. Their tenacity of life is well known. I shot my specimens with a soft nose 9,3 mm. Mauser bullet, the cow had received two bullets through her chest so that she bled freely on both sides but staggered any way against me ready to charge when she dropped for the third in the brain. The bull got the upper end of the left humerus smashed and the bullet continued into his heart, but he tried to gallop away when a bullet from behind dropped him. The cows of the herd collected then around him evidently bent on a charge but were turned off by some quickly repeated shot from a shot gun.

The Buffaloes, especially the cow, were infested with numerous ticks of the species *Amblyomma hebraeum* KOCH² which although widely distributed in East Africa has not been found on this host before.

¹ Some natives told me that it was a sure sign that the Buffalo was severely wounded if he grunted that way. If he was silent after the shot, it was »no good» they said.

² Conf. L. G. NEUMANN: Ark. f. Zoologi. Stockholm. Bd. 7, n:o 24.

The bulk of a Buffalo bull is quite amazing, and few animals give such an impression of powerful strength as he does. One is therefore quite astonished to see the comparative slenderness of its short leg-bones.

In the following table of measurements a comparison can be made between the dimensions of the skulls of the bull and the cow from Guaso Nyiri as well as with the corresponding measurements of a skull of the true *Buffelus caffer* from »Caffraria».

	North of Guaso Nyiri		»Caffraria»
	♂	♀	♂
	mm.	mm.	mm.
Condylobasal length	503	491	—
Basal length	469	461	479
Greatest breadth of skull across orbits	242	222	269
Least interorbital width	149	138	169
Mastoid breadth	285	239	298
Distance from orbit to tip of premaxillary	246	272	273
Length of nasals	184	194	193
Breadth of nasals	68	55	71
Length of upper molar series	131	135	126
Greatest breadth across premaxillaries	115	100	114

The latter is a little superior in most dimensions. The most striking feature in the skull of my Buffalo bull is the shortness of its preorbital region. This may, however, be an individual variation as the corresponding dimension of the cow is longer and almost equal to that of the South African. The length of the nasals stands in direct correspondence with the preorbital length generally in these specimens.

Orycteropus afer subsp.

(Conf. LYDEKKER: The Game Animals of Africa. London 1908, p. 466.)

In the neighbourhood of Nairobi *Orycteropus* was not uncommon, and well known to the natives under the name »Manga». In consequence of its nocturnal habits and because it always spends the days in its deep burrows, it is never seen, and specimens can hardly ever be procured. I saw many times its scratchings and diggings which sometimes may be obnoxious. The termites often make their dwellings in the roads which are made of hard-packed red clay which appears firm as brick. But in spite of this hardness the Manga with its powerful claws is able to break up the road and make deep holes in the same to reach its favourite food, the white ants. One evening in Jan. 1911 I rode with Mr. HAMPSON along the road to his farm and found it without fault, but the following morning when we passed the same way the Manga had done lots of damage and broken up the road in several

places, making big holes which we had to avoid with our mules. Similar things were observed at other opportunities as well, but I could not obtain any specimens.

Mr. KLEIN sent me, however, later a broken and somewhat weather worn skull which enables me to give some morphological notes about this animal.

Distance from anterior margin of <i>foramen magnum</i> to tip of nasal (premaxillary missing)	177 mm.
Distance from anterior margin of <i>foramen magnum</i> to posterior margin of palatina	64 »
Greatest zygomatic breadth	75 »
Least width behind postorbital processes	43 »
Width across tips of postorbital processes	61 »
Least interorbital breadth	57,5 »
Length of frontal suture	61 »
Greatest length of nasals	77 »

The general shape of this skull differs in several respects from the same of *Orycteropus aethiopicus* SUNDEVALL. The skull from British East Africa has the anterior two thirds of the frontals and the posterior portion of the nasals strongly inflated so that their lateral parts bulge up rather high above their median portion. A deep concavity is thus formed mesially on the forehead, while the forehead of *O. aethiopicus* is almost flat, evenly rounded off at the sides. In *O. afer* there is a slight tendency to inflation on the sides, and a median concavity, but by far not so pronounced as in the present specimen. The frontal region is, probably in connection with this, somewhat longer in the present specimen than in the two other species mentioned. The length of *sutura frontalis* is in this specimen 61, but in subequal skulls of *O. aethiopicus* and *afer* resp. about 54 and 52 mm.; on the other hand it will appear that the nasals of the two latter were correspondingly somewhat larger. The bulging of the frontals as mentioned above stands, of course, in connection with an increase of the nasal cavity. In consequence of this the vertical height of the skull from the palatal surface between the last two teeth, and to a place in the middle of the frontal bone measures 52,3 mm. in the present specimen, but only 49 mm. in *O. aethiopicus*. *O. afer* again is nearly equal to the present race. Another result of the same thing is that the forehead of the present specimen becomes much broader than in the two other species the interorbital breadth measuring 57,5 mm., while the same dimension in *O. afer* is 53,5 and in *O. aethiopicus* only about 50 mm.

The tear-duct is in the present species as well as in both the others pierced near the zygomatic suture, but the *jugale* overlaps the *lacrymale* so that the foramen is not so near the lower border of the tear-bone as it appears to be at a superficial examination.

The postorbital processes are well developed and curved downwards.

The width of the snout at the maxillary-premaxillary suture is about 30 mm. in the present specimen as well as in *O. afer*, but only 27 mm. in *O. aethiopicus*. The latter has thus a much slenderer snout which is also more suddenly narrowed than in the two others.

In *O. afer* and *O. aethiopicus* the *parietale* is almost flat, and its profile-contour is only very little, if at all, curved, but in the present specimen the contour line of

the *parietale* forms a very distinct curve so that the posterior portion of the bone slopes quite conspicuously towards the *occipitale*. The parietal is also narrower in its posterior portion than in the other two species so that its least width behind (a little in front of *sutura lambdoidea*) is only 40 mm. while the same dimension is 48,3 mm. in *O. æthiopicus*, and 49 mm. in *O. afer*.

The number of teeth is, of course, of less importance in an *Orycteropus* as the variability in this respect is rather great. The present specimen has 6 teeth in the upper and resp. 6, and 5 teeth in the lower jaw.

With regard to the shape of the lower jaw this skull is most similar to *O. afer*, because the *processus coronoideus* of *O. æthiopicus* is much higher.

On the whole this skull from Brit. East Africa shows more affinity with the South African *O. afer* than with the Abyssinian *O. æthiopicus*, but it differs conspicuously from both and represents without doubt a separate subspecies.

MATSCHIE has described a race named by him *O. wertheri* from Bagamoyo hinterland, but the skull of that race does not appear to be known yet as MATSCHIE had stated in a letter to the present author.

In the year 1908 LYDEKKER named (conf. l. c. above) »the Somali ant-bear» »*O. a. somalicus*». No description of this animal was, however, given. The only communications about it are that it is »rather smaller but closely allied» to the Abyssinian race, viz. *O. æthiopicus*, and that »the basal diameter of a skull in the British Museum is »7 ⁵/₈ inches». It is evidently quite impossible to identify a species on such a scanty communication, and it had been better not to give any name when no diagnose was added.¹ As a matter of fact the present specimen from British East Africa is more allied to the southern *O. afer* than to *O. æthiopicus* and not smaller than the latter, but from a zoogeographical point of view it could be expected that the same race occurred in Brit. East Africa as in Somaliland. Therefore I took the liberty of writing to my friend Mr. LYDEKKER and asked for further communication about his »*O. a. somalicus*». He then kindly replied: »As regards the Somali ant-bear I find that the anterior portion of the frontals and the base of the nasals is distinctly convex, with a hollow median line between the convexities». This indicates thus a resemblance in shape of skulls between the present specimen and the Somali race, and I was therefore inclined to use the name *O. a. somalicus*. Later, however, LYDEKKER added in another letter the information that the type skull of his *O. a. somalicus* has a »minimum postorbital breadth» of 54 mm. and this proves that the specimen from Nairobi cannot be referred to *O. a. somalicus* as its minimum postorbital breadth is only 43 mm. In this respect the difference between the present specimen and »*O. a. somalicus*» is even greater than that between the former and *O. afer* in which I have found this measurement to be about 47 mm.

¹ DRAKE-BROCKMAN when writing about »the Mammals of Somaliland» has not accepted LYDEKKER's name but called the »Antbear» of that country *O. æthiopicus* SUND.»

Appendix.

The domesticated mammals in the Kikuyu country were Goats, Sheep and Cattle. The latter was a small breed of humped cattle with short horns. The Sheep were different in colour, some were brown, some brown and white and so on, and provided with a short, rounded fat-tail. They were hornless and hairy. The Goats had short horns or were hornless. Their colour was very variable white, greyish brown, black and so on.

In the Meru country the cattle was a small breed of humped cattle with short horns, or without such appendages. The Sheep were brown, black, black and white etc. all hairy and without horns, and the Goats similar to those of the Kikuyus.

The nomadic tribes on the northern side of Guaso Nyiri have also Camels. The Rendiles at Njoro had very great numbers of Camels. Their Sheep of which they also had great herds were all white with black head (conf. Pl. XV fig. 4) They were all hornless, some had cylindrical normal tails, and others had short fat-tails. The Goats had short horns and had variable colour as brown, black, white etc. (Pl. XV fig. 4).

The 28th of Febr. near Thera I met in the thornbush a Rendile (or Samburu) with a large herd of cattle all of which were of the humped race, but otherwise very much varying in colour and other characteristics. Some had short horns, and some very long horns reminding about Uganda cattle. But in a third lot the horns were hanging loose in the skin. This man had also donkeys.

The next day I met a Samburu with a large herd of Sheep and Goats. The greatest number of the former were white, or white with black head, others were brown with the skin of the neck hanging loose, and provided with fat-tail. The Goats were mostly white, or greyish brown with small horns.

The Samburus had also dogs with erect ears and strongly curved tail. In their size and appearance they resembled the »Grey Dogs» from Jämtland and northern Sweden, but they were red in colour (some also white).

Pl. I.

- Fig. 1. Skull of an old male of *Colobus abyssinicus kikuyuensis* LÖNNBERG (type) from Escarpment, British East Africa.
- Fig. 2. Skull of *Papio anubis furax* ELLIOTT from the northern side of Guaso Nyiri, frontal view.
- Fig. 3. The same as fig. 2; lateral view.
- Fig. 4. Skull of *Papio anubis doguera* PUCH & SCHIMP. from the northern side of Guaso Nyiri below Chanler Falls; lateral view.

Pl. II.

- Fig. 1. Skull of an old *Papio anubis doguera* PUCH. & SCHIMP. from the northern side of Guaso Nyiri below Chanler Falls; frontal view.
- Fig. 2. Frontal view of the same skull as represented by Pl. I, fig. 4.
- Fig. 3. Skull of a male *Mungos sanguineus rendilis* LÖNNBERG; lateral view.
- Fig. 4. Skull of *Helogale hirtula ahlSELLI* LÖNNBERG, seen from above.
- Fig. 5. The same as fig. 4, lateral view.

Pl. III.

- Fig. 1. *Myosorex sorelloides* LÖNNBERG from Itiolu river Brit. East Africa. Nat. size.
- Fig. 2. *Heterocephalus glaber progrediens* LÖNNBERG from the northern bank of Guaso Nyiri. Nat. size.
- Fig. 3. Head of the same anterior view. 1 1/2 nat. size.
- Fig. 4. Hindfoot of the same to show the hair fringes. Twice enlarged.
- Fig. 5. Palate of the same three times enlarged to show hair on the inside of the mouth, the structure, of the palate and the teeth.

Pl. IV.

- Fig. 1. *Galago (Otolemur) kikuyuensis* LÖNNBERG (from a photo of the mounted type specimen) from the forest at Escarpment station.

Pl. V.

- Fig. 1. *Helogale hirtula ahlSELLI* LÖNNBERG (from a photo of the mounted type specimen) from the thornbush north of Guaso Nyiri.

Pl. VI.

- Fig. 1. *Felis leo somaliensis* NOACK from the thornbush north of Guaso Nyiri.
Fig. 2. *Hystrix galeata* THOMAS from the steppe near Itiolu river.
Fig. 3. *Elephas africanus cavendishi* LYDEKKER, ♂, from Njoro, north of Guaso Nyiri.
Fig. 4. Posterior aspect of the same.

Pl. VII.

- Fig. 1. An acacia uprooted and broken down by Elephants in the thornbush country between Njoro and Thera north of Guaso Nyiri.
Fig. 2. A Rhinoceros from the thornbush country north of Guaso Nyiri showing ulcers on the side, and marks of the ribs.
Fig. 3. *Giraffa camelopardalis reticulata* DE WINTON from the thornbush country north of Guaso Nyiri.

Pl. VIII.

- Fig. 1. Skull of a stallion of *Equus grevyi* OUSTALET from Lekundu river. Lateral view.
Fig. 2. The same. Upper view.
Fig. 3. The same. Palatal view.

Pl. IX.

- Fig. 1. *Potamochoerus chæropotamus keniaë* LÖNNBERG, ♀ ad., from the neighbourhood of Nairobi Brit. E. Africa.

Pl. X.

- Fig. 1. Skull of *Potamochoerus chærotamus keniaë* LÖNNBERG, ♂ ad. Lateral view. The tusks the upper of which were a little malformed have been removed.
Fig. 2. The same, palatal view.
Fig. 3. The same, upper view.

Pl. XI.

- Fig. 1. Skull of *Hylochoerus meinertzhageni* THOMAS, old boar. Lateral view.
Fig. 2. The same, upper view.

Pl. XII.

- Fig. 1. Skull of *Phacochoerus delameri* LÖNNBERG, ♀ ad. Lateral view.
Fig. 2. The same upper view.

Pl. XIII.

- Fig. 1. Skull of *Giraffa camelopardalis reticulata* DE WINTON, ♂ ad. Lateral view.
Fig. 2. The same upper view.

Pl. XIV.

- Fig. 1. *Rhynotragus quentheri wroughtoni* DRAKE-BROCKMAN from the thornbush north of Guaso Nyiri to show the tapir-like snout.
Fig. 2. *Cobus ellipsiprymnus canescens* n. subsp. ♂ ad. from Guaso Nyiri below Chanler Falls. The light rump band shows broader on the photo than in reality.
Fig. 3. *Apyceros melampus rendilis* n. subsp. ♂ ad. from the thornbush north of Guaso Nyiri.
Fig. 4. Young male of the same race with straight horns, from Thera.
Fig. 5. Grants Gazelle ♂ ad. of the pale race from Lekundu river south of Guaso Nyiri.

Pl. XV.

- Fig. 1. Grant's Gazelle ♂ ad from Njoro.
Fig. 2. Cow of Patterson's Eland from the northern side of Guaso Nyiri.
Fig. 3. *Buffelus caffer radcliffei* THOMAS ♂ ad. from the northern side of Guaso Nyiri.
Fig. 4. Sheep and goats belonging to the Rendiles in the dry riverbed at Njoro.

Tryckt den 26 juni 1912.

Fig. 4

Fig. 1.

Fig. 3

Fig. 2.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 1.

Sylvisorex sorelloides. LÖNNB.

Fig. 3.

Fig. 5.

Fig. 4.

Fig. 2.

Heterocephalus glaber progrediens. LÖNNB.

Cederquists Graf. A.-B., Sthlm.

Galago (Otolemur) kikuyuensis. LÖNNB.

Helogale hirtula ahlsvelli. LÖNNB.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 3.

Fig. 2.

Fig. 1.

Potamochoerus chæropotamus keniaë. LÖNNB. ♀

Fig. 3.

Fig. 2.

Fig. 1.

Fig. 2.

Fig. 1.

Fig. 2.

Fig. 1.

Fig. 2.

Fig. 1.

Fig. 1.

Fig. 3.

g. 2.

Fig. 5.

Fig. 4.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

ANATOMICAL NOTES ON MAMMALS

OBTAINED IN BRITISH EAST AFRICA

BY

THE SWEDISH ZOOLOGICAL EXPEDITION

1911

I

BY

EINAR LÖNNBERG

(WITH TWO PLATES AND THREE TEXTFIGURES)

UPPSALA & STOCKHOLM. ALMQVIST & WIKSELLS BOKTRYCKERI-A.-B.

BERLIN
R. FRIEDLÄNDER & SOHN
11 CARLSTRASSE

LONDON
WILLIAM WESLEY & SON
28 ESSEX STREET. STRAND

PARIS
LIBRAIRIE C. KLINCKSIECK
11 RUE DE LILLE

KUNGL. SVENSKA VETENSKAPSAKADEMIENS HANDLINGAR. Band 49. N:o 7.

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BY

EINAR LÖNNBERG

(WITH TWO PLATES AND THREE TEXTFIGURES)

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It is connected with great difficulties to do systematic and anatomical work at the same time during an expedition in a tropical country when the collecting and the observation in the field has to be attended to in the first rank. The big game animals are also too bulky to allow the preservation of much anatomical material in such localities where everything must be carried by natives for months. When a big animal has been shot, perhaps several hours from the camp, it is often impossible even to remove the viscera from the spot where the animal has fallen. I had therefore as a rule to confine myself in such cases to a short examination of the morphological anatomy and make a few notes about this. But such notes as well must necessarily be incomplete when any dissection, or even handling of the viscera without any accessories to facilitate the work is difficult, and the merciless rays of the glaring equatorial sun strike the operator who usually has walked many hours or the greater part of the day before his endeavours have been crowned with success.

The following short notes are partly based on such observations in the field; partly on preserved material which I was able to bring home. Although they of necessity are fragmentary, I hope that they may not be without a certain interest because they contribute to the knowledge of the morphology of some African mammals which partly have not been studied in this respect before.

I take the pleasure of dedicating these unpretending notes to the splendid investigator and anatomist GUSTAF RETZIUS who has done so much for the promotion of the anatomical science.

Anatomical notes on Ruminants.

Buffelus caffer radcliffei THOMAS.

The cow of this species had 15 palatal ridges the 13 anterior of which were crenulated. In the bull the (15 or) 14 ridges in front of the interspace between the first premolars are crenulated, especially the 7 or 8 foremost. Behind these there are 3 more pair of ridges which are smooth and less sharply defined. The hindmost of these is on a level with the last premolar (conf. Pl. 1, Fig. 1).

The number and arrangement of these ridges is thus on the whole in agreement with the condition found in the Common Ox as has been beautifully illustrated by G. RETZIUS,¹ although his figure represents the palate of a calf so that the situation with regard to the permanent teeth is not seen.

The *papillæ fungiformes* are scattered over the basal portion of the tongue. In the cow I did not see but two series of *papillæ vallatæ* on either side. They contained 6 + 6 and 4 + 7 such papillæ respectively. In the bull there were three somewhat oblique and irregular rows of *papillæ vallatæ* on either side. The outermost of these contained 9 papillæ on both sides of the tongue while the other rows only consisted of resp. 3, 4, 5 and 6 papillæ. This irregularity appears somewhat strange but even in common cattle the number of *papillæ vallatæ* is variable from 10 to 17 on either side according to ELLENBERGER and BAUM.²

The paunch of the African Buffalo is enormous and extends into the pelvic region, but the abomasus is small.

The spleen is rather thin and elongate, of approximately the same shape as in common cattle, but larger. This organ measured in the Buffalo cow 70 × 30 cm., and in the bull 60 × 17½ cm. According to ELLENBERGER & BAUM this organ has a breadth of 10—15 cm., and a length of 40—50 cm. in common cattle. The spleen of the Buffalo is thus much larger.

The liver of the Buffalo cow had a maximum transversal length of about 50 cm., and its width was about 23 cm. In the bull the corresponding measurements were 62 cm. and 25 cm. The left lobe was 25 × 19 cm. *Lobus caudatus* had a breadth of 7 cm. The Spigelian lobe was only present as a broad rounding which does not project. The gallbladder extended in both sexes free beyond the edge of the liver.

The colic spiral consisted of 5 coils, viz 2½ in each direction, and, like the same organ of the common Ox, it had no peripheric coil. The absence of this latter is a very important characteristic which unites all the members of the Taurine, or Bovine group s. str. of *Bovidæ*, from the pseudo-primitive Anoa to *Bos taurus*, in opposition to all other Ruminants, not only those belonging to *Bovidæ*, but also to the members of *Cervidæ* and *Giraffidæ* as well. This peripheric coil of the colon has evidently the function of desiccating the fæces. The African Buffalo in which this coil is wanting has therefore soft and loose excrements, quite similar to those of *Bos taurus*, while the Giraffes, the Deer, the Antelopes, and the Sheep and Goats have hard and dry, more or less bean-shaped droppings. The fact that the Bovine group s. str. is unlike, not only the other *Cavicornia* in this respect, but also differs from *Cervicornia* by the same characteristic, proves that the peripheric coil must have been present in the ancestors of all the enumerated modern Ruminants, and that its absence in the Bovine group is due to a secondary reduction. The question is then: what has been the cause of such a reduction? The effect which the presence of the

¹ Biol. Untersuch. N. F. Bd. XIII, Taf. XXXVIII, Fig. 1.

² Handbuch d. vergl. Anatomie d. Haustiere, 11:te Aufl.

peripheric coil has on the fæces proves that the fluid contained in the non-digested remains of the food-material is reabsorbed in this portion of the colon. If this fluid (= water) can be used again by the organism, it must be useful for an animal which lives in a country where the watersupply is scarce, to have such a peripheric coil with the function mentioned. On the other hand it is not necessary for an animal which has a rich watersupply. Some of the present members of the Bovine group are decidedly water-loving. It is possible or even probable that their ancestors have had similar habits in such a decided degree that the peripheric colic coil could be reduced as being no longer useful because no saving of the water was needed, and in such a case the reabsorbtion of the water in the colon would only be an unnecessary work for the organism.

The kidneys of the African Buffalo are strongly lobulated (conf. Pl. 1, Fig. 2). The kidney of the bull measured 19 cm. in length by 9 in breadth. About 25 lobules can be discerned on the surface of the organ.

The lobulation of the kidney is another characteristic indicating the affinity of this animal with the Common Ox. Since I have had the opportunity of seeing African Buffaloes in their natural conditions and of studying their habits as well as their internal anatomy I am perfectly convinced about the very close relationship between these animals and the other members of the Bovine group, especially with the Asiatic Buffaloes.

Among the modern Ruminants, as far as I know, lobulated kidneys are met with only in the subfamily *Bovinae*.

Otherwise this peculiar structure of the kidney appears in several different groups of mammals. The subdivision of the kidney in small lobules reaches its extreme in the Whales especially, the *Mystacoceti*. Lobulated kidneys are also found in the Otters, Sea-Otter¹ and Bears² and, although of a somewhat modified type,³ in the Seals as well. It is thus with the exception of the Bears⁴ (and *Bovinae*) animals with aquatic habits which have these organs lobulated. CUVIER put the lobulation of the kidneys of the aquatic animals in connection with the breathing at irregular intervals of these animals when they were diving, and attributed to the hibernation of the Bears a similar effect. It has, however, been pointed out before this that other hibernating animals have not been influenced in a similar way with regard to their kidneys by this habit. It may also be added that all Bears do not hibernate.

¹ STELLER counted 106 small renculi in *Lutax lutris*.

² In the family *Procyonidae* the kidneys are not lobulated even in the foetal stage as I have stated by examining a foetus of *Nasua*.

³ Conf. GERHARDT: Zur Morphologie der Säugetierniere. Verh. d. Deutsch. Zool. Ges. Basel 1911, p. 267.

⁴ Among the present Bears it is only one viz. the Polar Bear which has real aquatic habits, even if the Bears of Alaska, Kamtschatka etc. are clever in fishing, and all Bears are good swimmers. But it is quite possible or even probable, that their ancestors have been somewhat more water-loving without being real water-animals. They might have lived in swamps and moist places at the borders of lakes etc. Some features of the morphology of the Bears may be explained by such an origin, as their plantigrade feet, their heavy and clumsy bodily structure etc.

With regard to the aquatic animals another explanation might be tried. It is clear that such animals which exclusively, or at least chiefly, obtain their food from the water, and often even may swallow it below the surface, are apt to get a considerable quantity of water into the alimentary canal, and certainly more than is needed for the digestion. This surplus of water must be removed so that it shall not hamper the digestion, and this must at least chiefly take place by absorption into the circulatory system and secretion through the kidneys. It appears thus as if the latter organs of such an aquatic animal should be obliged to secrete comparatively more fluid than those of a strictly terrestrial mammal. If this should be the cause of the development of lobulated kidneys, the presence of such in *Bovinae* might be explained as an inheritance from the ancestors which might have acquired that characteristic at the same period as they lost the peripheric colic coil, as is mentioned above.¹

It must, however, be admitted that it is difficult to conceive that such an increased activity required from the kidneys of aquatic animals should in any way be facilitated by the lobulation of these organs. The secretive power of the kidneys depends, of course, upon the condition and quality of the discerning epithelium, and this can hardly be influenced by the lobulation, as it seems.

Against the connection between aquatic habits and lobulation of the kidneys speaks also, as it will appear at first, the fact that these organs are not lobulated in the now living *Sirenia* in spite of their partaking of their food below the surface of the water. In his valuable manual² »Die Säugetiere» WEBER says (l. c. p. 737) about this: »Die Nieren sind bei *Halicore* glatt, bei *Manatus* oberflächlich gelappt, aber niemals in *Renculi* verteilt wie bei *Cetaceen*.» In a foetus of *Trichechus inunguis* which I have examined, the kidneys were comparatively very large, but had a smooth surface. Quite recently RIHA³ has described the kidneys of *Halicore*, and proved that it has a peculiar structure with the urether dividing in two longitudinal branches running from the *hilus* in either direction. — It is this which OWEN has termed »a single pelvis» into which »several lateral ridges» extend. — The cortical substance of these kidneys form an exteriorly smooth and continuous layer, but the medullary substance is divided by — to quote RIHA — »senkrecht auf die Nierenachse stehenden, bindegewebigen Quersepten, welche sich erst in der Rindensubstanz auflösen. Auf diese Weise ragen die Pyramiden mit freier Papille und freier Seitenwand in den Nierengang». This interior subdivision by septa of connective tissue proves that the kidney of *Halicore* really is not such a simple organ as it looks superficially. It might be assumed that it originally has been a lobulated kidney which secondarily has become more compact by partial fusion of the *renculi*, but from a physiological point of view it appears to be almost equivalent to a lobulated kidney. There is a fact which speaks rather strongly for the assumption that the kidney of the *Sirenia*

¹ It needs perhaps to be emphasized that I do not mean by this that the ancestors of *Bovinae* were real water-animals, far from that, but they may have lived to great extent in and at swamps and found their food chiefly in such places.

² Jena 1904.

³ Zeitschr. f. Morph. u. Anthropol. Bd. XIII. Hft. 3.

originally has been lobulated. This fact is that *Rhytina* had a lobulated kidney. Thanks to STELLER's description¹ of the anatomy of this peculiar animal, which so sadly and within so short time became entirely exterminated, we have fortunately good knowledge about the morphology of its kidneys. The author quoted says that the kidneys of *Rhytina* were enveloped in a very firm capsule (»einer sehr festen Haut«), but when this had been removed, very many small renculi (»sehr viele kleine Niergen«) were seen just as in the Seal or the Sea-Otter, although they, of course, were larger in the Sea Cow.

Concluding from this it appears rather probable that the kidney of *Halicore* can be regarded as an in its peripheral parts consolidated, originally lobulated kidney. At the same time the hypothesis that among the mammals there is a certain connection between aquatic life and lobulated kidneys gains in probability, although at present it is difficult to explain the *causa efficiens* by means of our present knowledge.

Connochætes albojubatus THOMAS.

The viscera of a bull of this species, shot at Juja farm, proved to be very similar, even with regard to dimensions to the corresponding parts of the White-tailed Gnu which I had the opportunity of describing eleven years ago.² The paunch of *C. albojubatus* measured about 50×64 cm., that of *C. gnu* 48×63 cm. The dimensions of the reticulum in the former were 26×16 cm., and the corresponding ones of the latter $25\frac{1}{2} \times 18$ cm. The quadriplicate psalterium of the White-bearded Gnu proved a little larger, viz. 19×17 cm., than that of the White-tailed species, viz. $19\frac{1}{2} \times 13$ cm., which also is quadriplicate.

The colon of *C. albojubatus* had $2\frac{1}{2}$ centripetal and 2 centrifugal spiral coils in addition to the centrifugal peripheric coils which is the same condition as found in the White-tailed Gnu (conf. l. c. Pl. 3, Fig. 1).

When dissecting the specimen of the latter species I found the gallbladder to be very large and to extend broadly beyond the edge of the liver (conf. l. c. Pl. 3, Fig. 2). This appeared almost pathological, and I was inclined to attribute it to the fact that the animal had lived in captivity. I was therefore very much astonished to find quite the same condition prevailing in the wild Gnu bull of the Athi plains.

The spleen of *C. albojubatus* has also the same elongate and characteristic shape, as described from *C. gnu*, and which differs so much from that of most other Antelopes. The dimensions of the spleen of the former was 38×11 cm., and those of the latter $37 \times 12\frac{1}{2}$ cm. (at one end, 15 cm. at the other).

This resemblance, even with regard to the exact measurements, between specimens of the two species is very striking, the more so as one was a female which had lived in captivity, and the other a wild bull. It proves that these characteristics are very constant in the Gnus, and that both species in the wild and natural condition must have very similar habits.

¹ GEORG WILHELM STELLERS ausführliche Beschreibung von sonderbaren Meerthieren. Halle 1753, p. 87.

² K. Vet. Akad. Handl. Bd. 35. N:o 3, p. 48—57.

A foetus of Kongoni or Coke's Hartebeest (*Bubalis cokei*) had 16 pairs of partly alternating palatal folds which were feebly crenulated, and behind them faint traces of two more were seen. The number of folds is thus smaller than in the Gnu,¹ but greater than in the common Ox.

On the anterior half of the tongue small *papillæ fungiformes* are scattered among the small scale-like *papillæ filiformes*. On the posterior portion of the tongue the *papillæ fungiformes* are larger, but only found laterally among the conical *papillæ filiformes*, not in the central portion where the latter form broad warts. On either side of the base of the tongue there is an irregular partly double row of about 8—9 *papillæ vallatæ*. This number is quite small compared with that of the common Ox but almost similar to that of the Gnu,² and several other Antelopes as mentioned in this paper.

Cephalophus harveyi keniae

possessed about 14 palatal folds which were feebly crenulated. The hindmost was situated on a level with the second premolar.

The *papillæ vallatæ* of the tongue were arranged in two irregular rows on either side. Their number was 10 to 12 on either side, and they did not differ much from the nearest large *papillæ fungiformes*.

The *lobus caudatus* of the liver was three-sided, and *lobus Spigelii* rounded.

The gall-bladder was absent. GARROD stated already 1877 the absence of the gall-bladder in two small members of this genus viz. *Cephalophus maxwelli* and *C. pygmaeus* (= *monticola*). In the year 1903 the present author had the opportunity of making a similar statement about *C. melanorhæus* and *C. ogilbyi*, and 1909 *C. natalensis* was added. Now this species, and the following, viz. *C. abyssinicus hindei* have been found to present the same characteristic, and it is thus probable that all members of this genus in its broadest sense³ (or at least all the small and medium-sized species) are without gall-bladder. This is a rather remarkable fact, the more so as a well developed gall-bladder is present in other small Antelopes as *Neotragus*, *Rhaphicerus* etc.

The colic spiral of this Red Forest Duiker is rather simple, and all the coils lie in the same plane. Two coils run in a centripetal direction, and one and a half in a centrifugal direction. This condition is found to be more simple than in the foetus which has half a coil more in each direction. These facts prove a simplification of the colic spiral of this species during the ontogenetic development, which indicates that a change in the diet has taken place, and that the ancestors of this animal subsisted on coarser and less easily digested food. A similar condition, viz. that the foetus has a more complicated colic spiral than the adult, has been stated by the present author⁴ in *Cephalophus melanorhæus*.

¹ LÖNNBERG: K. Vet. Akad. Handl. Bd. 35. N:o 3, p. 48.

² l. c. p. 50.

³ Thus »*Guevei*, *Cephalophus* and *Sylvicapra*» according to some authors.

⁴ Nov. Act. Reg. Soc. Sc. Uppsala 1903, p. 27.

About a buck of *Cephalophus abyssinicus hindei*, shot $\frac{1}{4}$ at Punda Melia, I made the following short notes. The psalterium is very small. There is no gall-bladder and *lobus quadratus* of the liver is three-sided. The spleen is triangular in outline. The colic spiral consists of $1\frac{1}{2}$ centripetal and 2 centrifugal coils. These facts were also verified on a young specimen.

This latter had a triangular *papilla incisiva* with the point forward, and the base somewhat convex. There were about 15 palatal folds which were distinctly crenulated, except the two or three innermost. The *papillæ fungiformes* were scattered over the whole upper surface of the tongue, except on the middle of the posterior portion, but they were also found on the lower side near the margin. The *papillæ vallatæ* amounted to 17—18 on either side arranged in irregular double rows.

Concerning the Suni Antelope (*Nesotragus moschatus*) the following notes were made in the field. *Papilla incisiva* is pear-shaped. Not counting the folds surrounding this papilla and two small, almost rudimentary folds nearest behind the same, there are 12 palatal folds which increase considerably in breadth posteriorly. The crenulation of the hind-margin is not much pronounced even on the anterior folds and decreases still more on the posterior ones.

The tongue is covered with *papillæ filiformes* among which only a few *papillæ fungiformes* are scattered. The former increase in size on the posterior portion of the tongue and become wart-like on the central part.

Five well developed *papillæ vallatæ* are arranged in a row on either side of the tongue, and this row is directly continued into a series of *papillæ fungiformes*. Another series of the latter kind of papillæ is directed obliquely towards the base of the tongue and forms an acute angle with the first mentioned series.

The paunch and the reticulum are comparatively large, and the divisions of the former sharply pronounced. The psalterium is about 50 mm. in length with triplicate arrangement of the folds.

The liver is transversely situated. Its maximum transversal breadth is 133 mm. and the maximum vertical diameter of *lobus sinister* about 65 mm. A large three-sided *lobus quadratus* caps the right kidney. The gall-bladder is quite well developed, although it could be suspected that *Nesotragus* should agree with *Cephalophus* in this respect, but that is not the case.

The colon has a well developed *ansa proximalis* and forms $1\frac{1}{2}$ centripetal, and 2 centrifugal coils in the spiral.

The kidney is about $3\frac{1}{2}$ cm. and has a smooth surface. It has only one longitudinal papilla.

Some notes on the genital organs of this and some other Antelopes will be found below.

In *Rhaphiceros neumanni* the colic spiral is very simple as it does not display more than one centripetal and one and a half centrifugal coils. An *ansa proximalis* is present but not much developed.

The viscera of a couple of specimens of *Rhynchotragus guentheri wroughtoni* shot

north of Guaso Nyiri ¹³/₂ 1911 were preserved and enable me thus to give the following notes.

The paunch is not, even comparatively speaking, large. The width across both sacks is about 12 cm. and the length of either of the subequal sacks is a little more than 11 cm. The dorsal sack is much broader than the ventral, especially if the fundus ends are compared. The fissure between the latter does not appear to be more than about 2 cm. deep, but this depends upon the fact that their walls are connected, and if this connection is removed the fissure is found to be fully $4\frac{1}{2}$ cm. even exteriorly. The exterior sculpture of the paunch is not very pronounced. On the right side the longitudinal furrow, the posterior transversal furrow (*sulcus coronarius caudalis ventralis*) of the ventral sack, and the anterior transversal furrow are well developed. On the left side the longitudinal furrow is most visible. The interior of the paunch is densely clothed with flat, tongue-like papillæ which are larger in the dorsal sack.

The contents of the paunch consist of remains of leaves and beans of acacias, the latter swallowed whole, although measuring 14×13 mm.

The reticulum measures about 6×5 cm. The cells of the reticulum which generally have a diameter of 6—8 mm. are bordered by very low septa which more resemble rows of somewhat enlarged papillæ with confluent bases than real septa.

The kidney-shaped psalterium measures 54 mm. in length, 37 mm. in height and 24 mm. in thickness. Compared to the size of the animal this organ is thus quite large, and its longest diameter is not much less than that of the reticulum. The size of the psalterium of this species is quite remarkable, if it is considered that the same organ in the much larger Indian Blackbuck (*Antilope cervicapra*) is $45 \times 30 \times 25$ mm., in *Cephalophus ogilbyi* 60×30 mm.,¹ in *C. natalensis* 54×35 mm. in *Rhaphicerus campestris* 35×20 mm.² In such a small species as *Cephalophus melanorheus* the dimensions of the psalterium are 25×15 mm.³ But in all the species enumerated the reticulum has nearly, or sometimes more than, twice as long diameter as the longest diameter of the psalterium. These facts appear to indicate that the functions of the reticulum and the psalterium are different with regard to their importance to the species mentioned above and to *Rhynchotragus guentheri wroughtoni*.

The psalterium of the latter has about 7 strongly developed primary folds. The secondary folds are low, and tertiary folds are only found as slight traces in a few loculi. The folds are beset with sharply pointed papillæ and extend through the greatest part of the lumen of the organ. It is thus evidently a comparatively powerful organ for grinding and triturating the food-material to facilitate the digestion. The great development of this organ stands probably in connection with the occurrence of this Dikdik in a dry region where during a long time of the year tender vegetable food is not to be obtained. The presence in the ventricle of the acacia-beans mentioned above may also give an explanation of the function of this organ.

¹ LÖNNBERG: Nova Acta Reg. Soc. Sc. Upsala. Ser: III. 1903, p. 4 & 19.

² Idem: Ark. f. Zoologi. Bd. 5. N:o 10. 1909, p. 11 & 12.

³ Idem: 1903, p. 17.

The abomasus has about 7—8 large folds and some smaller folds between. Especially in the posterior portion these folds are strongly undulated. The plicated tract of the abomasus is comparatively long measuring about 9 cm., but even the remaining about $2\frac{1}{2}$ cm. of the organ are not devoid of plicæ, and there are also some transversally arranged ones. The abomasus of this species is thus well provided with folds.

The spleen is oval 65×48 mm. It is quite thin at the free edge, but thick towards the attached side. In this respect, although not in shape, it resembles the same organ of *Cephalophus melanorheus* as figured by the present author.¹

The liver is divided in two main lobes the right of which is considerably larger, 78×66 mm. while the left measures 76×45 mm. The Spigelian lobe is rounded, but not prominent. *Lobus quadratus* is three-sided, somewhat curved and sickle-shaped. It caps the kidney.

It is an interesting fact that the gallbladder is very small almost rudimentary in the specimens examined. In this respect *Rhynchotragus* approaches the genus *Cephalophus* among the Antelopes in which the gall-bladder is missing. Some years ago BEDDARD described the anatomy of *Madoqua phillipsi*,² but he does not mention anything about the liver and gall-bladder so that it is thus uncertain whether *Madoqua* in this respect differs from *Rhynchotragus* or not.

The duodenal loop is quite short only measuring 3 cm. The length of the small intestine is about 360 cm.

The cæcum is long, measuring about 14 cm., and it is wider towards the blind end. The entire length of the large intestine (not counting the cæcum) is about 145 cm.

After a short but broad *ansa proximalis* the colon enters the spiral. The latter is different in the two specimens examined. In one which may be regarded as normal there is $1\frac{1}{2}$ centripetal and two centrifugal coils so that the arrangement is similar to the diagram of *Cephalophus maxwelli* communicated by BEDDARD.³ In the other specimen the end of the colic loop, representing the last half centripetal and the first half centrifugal coil, has not the regular situation but is so to say bent backwards to the cæcal side and has become attached to the mesentery between the recurrent limb of the first centripetal coil and the second centripetal coil. This is, however, most probably an individual anomaly.

BEDDARD has pointed out (l. c. p. 182—184) that the colic spirals of the Ruminants may be referred to two different types. In one of these the centripetal and centrifugal coils are equal in number, and the limb of the spiral which forms the cæcal side of the terminal portion is the centripetal spiral. In the other the centrifugal spiral is half a coil longer, and the limb of the spiral which forms the cæcal side of the terminal portion is the outgoing spiral. With other words in the first case the last centripetal half coil is bent back upon the preceding centripetal half-

¹ Nov. Acta Reg. Soc. Sc. Upsala 1903. Pl. I, fig. 6.

² Proc. Zool. Soc. London 1909, p. 188 and following.

³ l. c. p. 183.

coil, but in the other the first centrifugal half-coil is bent back on the following centrifugal half-coil. BEDDARD thinks that »there is no common basal form from which might arise either type of spiral». According to him the difference between these two types of colic spirals is thus very fundamental. This appears, however, hardly possible when of nearly related forms one displays the first and another the second type as for instance *Cephalophus dorsalis* and *C. maxwelli* according to BEDDARD, and *Madoqua philippi* (according to BEDDARD) and *Rhynchotragus guentheri wroughtoni* (as described above). Even if in the former case the animals should not be so closely related as is generally supposed, they cannot stand very widely apart genetically speaking. The same is also the case with *Madoqua* and *Rhynchotragus*. They cannot have very remote common ancestors. »What is wanted», BEDDARD says, »is a simple spiral of a negative character which with further growth might evolve into either type.» Such a primitive form is found in the foetus. In a foetus of this *Rhynchotragus* I have found the colic spiral consist of $1\frac{1}{2}$ centripetal and $1\frac{1}{2}$ centrifugal coils.

The kidney of this Dik-dik is short and simple being provided with only a single papilla in the calyx.

A buck of *Gazella granti* had $2\frac{1}{2}$ centripetal, and 2 centrifugal colic coils.

In a foetus of the same species there can be seen 13 alternating pairs of palatal folds, the three posterior are, however, rather faintly developed.

An Impala buck (*Æpyceros melampus rendilis*) from Guaso Nyiri was found to have a roundish *papilla incisiva* and behind the same about 18 pair of crenulated palatal folds which extended to the interspace between the last premolars.

The *papillæ vallatæ* were about 12 on either side in two somewhat irregular rows. The *papillæ fungiformes* were scattered on the sides of the tongue.

The colon had 3 centripetal, and $2\frac{1}{2}$ centrifugal coils.

The Gerenuk (*Lithocranius walleri*) has long hairy lips very similar in appearance to those of the Giraffe. The comparatively very long palate is provided with not less than 23 palatal folds which are only little crenulated. They extend backwards to opposite the second premolar. A simple row of 6 to 9 *papillæ vallatæ* parallel to the edge of the tongue is seen on either side. Some of them are, however, similar to the neighbouring *papillæ fungiformes*.

The paunch of the Gerenuks which I shot contained leaves and some small resinous fruits, or berries which grew on a bush.

The *psalterium* was small and contained only a single system of folds. This organ is thus very simple, almost less complicated than in the small Duikers¹ (*Cephalophus*).

The liver of an adult male Gerenuk measured 19×11 cm. The left lobe had a breadth of 9 cm. *Lobus caudatus* was three-sided and capped the kidney. The Spigelian lobe was rounded, thus of the »oviform» type. The gall-bladder was small and did not reach the free edge of the liver.

¹ Conf. LÖNNBERG: Material for the Study of Ruminants. Nova Acta Reg. Soc. Sc. Upsala. Ser. III. 1903, p. 18 & 19.

The spleen was about elliptical measuring $15\frac{1}{2}$ cm. in length by 9 cm. in breadth. It differed thus considerably in shape from the triangular spleen of *Ovis*, *Capra*, *Antilope*, *Cephalophus* etc.

The colon was very little complicated. After a short *ansa proximalis* follow $1\frac{1}{2}$ centripetal, and $1\frac{1}{2}$ centrifugal coils before the peripheric coil in connection with the jejunum is formed.

The whole of the digestive apparatus is thus very simple in the Gerenuk, and this stands evidently in connection with the remarkable adaptation of this animal which enables it to secure tender leaves, berries etc., and thus obtain food-material which is comparatively easily digested in spite of the aridity and general barrenness of its native country, at least during a great part of the year. ♦

Fig. 1. Diagram of the colic spiral of *Lithocranius walleri*.

A Waterbuck (*Cobus ellipsiprymnus canescens* LÖNNBERG) had a *papilla incisiva* which was rounded behind and situated on a broad anterior callosity of the palate. Behind this a narrow palatal fold extended across the whole palate, but the following 8 on one side, and 9 on the other, alternated and occupied only half the breadth of the palate, although those of the left side extended somewhat across the mesial line. These were all crenulated. Between the anterior premolars a last continuous and arcuate fold extended across the whole palate. The tongue was provided with about a dozen *papillæ vallatæ* on each side arranged in two rows. *Papillæ fungiformes* were rather numerous on the upper surface on the tongue as well.

The *psalterium* was triplicate.

The dimensions of the liver were 31×21 cm., and both the main lobes were of about equal size. *Lobus caudatus* capped the kidney and *lobus Spigelii* was tongue-shaped.

The spleen was exactly twice as long as broad, $42\frac{1}{2} \times 21$ cm., rounded at both ends, one of which was a little broader than the other.

The colon formed an *ansa proximalis* before it entered the spiral which consisted only of $1\frac{1}{2}$ centripetal and 1 centrifugal coil after which it, in connection with the jejunum, made a peripheric coil.

The kidney was exteriorly smooth but consisted of several pyramides.

An Eland (*Taurotragus oryx pattersonianus*) had, according to notes made in the field, the papillæ of the paunch broad and large. The contents of the ventricle were as well leaves and twigs as grass. The *psalterium* was triplicate with slight indications of a fourth series.

The dimensions of the liver were about 52×25 cm. The breadth of the two main lobes was about 21 and 26 cm. resp. *Lobus caudatus* is large and broad, about tongue-shaped with the dimensions 15×9 cm. The gallbladder is large hanging entirely outside the edge of the liver, about 10 cm. from the main fissure.

The spleen is thin about tongue-shaped in outline with the dimensions 39×13 cm. Its shape may thus be termed almost taurine, and it differs widely from the triangular spleen of the Ovine group and of some Antelopes (e. g. *Antilope*, *Cephalophus* etc.), or the short elliptic primitive shape.

The colic spiral consisted of $3\frac{1}{2}$ coils in either direction. It is thus well developed which was to be expected in such a large animal which, at least partly, must be contented with coarse food.

The kidney was quite smooth without any trace of exterior lobulation.

The Somali Giraffe (*Giraffa c. reticulata*) has a pentagonal *papilla incisiva* with the base anteriorly, and the opposite angle behind. On the sides of this papilla and close behind the same the palatal folds are irregular and divided into irregular lobes or flat warts. Further behind, however, the palatal folds soon become plainly developed. Already the third behind the *papilla incisiva* is rather evident, and from the fourth and backwards they become gradually broader and longer. They have all of them a lobulated posterior margin. These lobules are broad and thick on the anterior folds, but become more pointed and thinner behind. About 15 folds can be discerned, the 10 anterior of which may be said to have thick and short lobules, although the change to those with thin, pointed ones is gradual. Between the 10 anterior folds one, or sometimes two rows, of larger or smaller papillæ are intercalated. The five posterior pairs of folds are more distant from each other, partly as much as 2 cm., obliquely arranged, almost alternating, with sharply pointed lobules. Those of the last palatal fold end just in front of the foremost premolar. The anterior portion is partly, the posterior entirely pigmented.

The conical papillæ covering the inside of the buccal tract are very large. On

a level with the five posterior palatal folds they measure 2 cm. in length but decrease in size and number opposite the beginning of the molar series.

The anterior portion of the tongue is twice as long as the posterior and very densely covered with conical papillæ. At the edge of the lower side of the anterior portion as well as on the lateral surfaces of the basal portion *papillæ fungiformes* are seen.

Fig. 2. Palate of *Giraffa camelopardalis reticulata*.

The dimensions of the liver of this Giraffe-bull were 50×32 to 28 cm. *Lobus caudatus* was rather small but overlaps the kidney. No gall-bladder was developed.

The spleen was rather elongate, very different in shape from the broadly oval spleen of a Giraffe which I have had the opportunity of examining in the Zoological Museum of Upsala and which I always have considered as normal and therefore used for comparison in my various papers on Ruminants.¹ The length of the spleen of

¹ f. i. »On the soft Anatomy of the Muskox (*Ovibos moschatus*), Proc. Zool. Soc. London 1900.

this Somali Giraffe was 50 cm., and its breadth at the middle where it is widest was 18 cm. but it tapered towards both ends.

The cæcum was very long and had the fundus-end rather pointed. Ten half-coils were counted across the colic spiral.

The male organ of some Ruminants.

The structure of this organ has been described from quite a number of *Artiodactyla* by GARROD, GERHARDT and the present author.¹ In the following I am, however, able to add some notes on this organ of some species which have not been known in this respect before and among them are also certain species of particular interest as African Buffalo, *Oryx* and *Lithocranius*.

In the subfamily *Bovinae* this organ is described from the common Ox, from the Yak (LÖNNBERG 1909), and from Anoa (LÖNNBERG 1903). In *Buffelus caffer radcliffei* the penis is decidedly taurine in its appearance (Pl. 1, Fig. 5) with *processus urethralis* reduced to complete absence. The urethra opens with a comparatively wide orifice on the lower side of the tip of the male organ which gradually tapers towards the end. The swelling, or cushion which as a rule is found chiefly on the right side of the penis-end is strongly developed and extends from the right side all over to the left with increasing thickness, and ends there rather abruptly as the figure shows (conf. Pl. 1, Fig. 5). Anteriorly, however, this cushion tapers as well as the penis itself, and the whole organ is therefore somewhat more pointed than that of *Poephagus*, but not so compressed from the sides.

The male organ of *Connochætes albojubatus* is very simple in its structure. It is somewhat compressed from the sides, tapers a little, but ends with a blunt point. There is no swelling, or cushion around the penis-end, and there is no *processus urethralis* whatever (conf. Pl. 1, Fig. 6). The urethra curves upwards on the left side about a centimetre from the tip, and its slit-like orifice opens about 3 mm. behind the tip. The upper end of the opening is on a level with the upper contour of the organ. This curving upwards of the urethra on the left side is thus the only remnant of the original spiral twist of this organ exhibited by more primitive *Artiodactyla*. On the whole the penis of the Gnu can be said to be of taurine type, but more simple even than that by the absence of any swelling. It agrees better still with GARROD's figure² of »*Damalis pygarga*», although the *papilla urethræ* shown by the latter is still more reduced in the White-bearded Gnu. In the figure quoted no terminal swelling, or cushion is to be seen, and the absence of such a one may therefore be characteristic to the subfamily *Bubalidinae* which thus has gone further in reduction of this organ even than *Bovinae* in which the cushion is retained.

¹ References to the principal literature are found in a paper by LÖNNBERG in Ark. f. Zoologi. Bd. 5. N:o 10. Stockholm & Uppsala 1909.

² Proc. Zool. Soc. 1877, p. 11, Fig. 22.

In the subfamily *Cephalophinae* the *processus urethralis* usually is of considerable length extending a great deal beyond the tip of the penis as already GARROD stated about *Cephalophus maxwelli*, and the present author about *C. melanorheus* (1903) and *C. natalensis* (1909).

In a specimen of *C. (Sylvicapra) grimmia* I found the *processus urethralis* to be quite short.¹ Unless this specimen was anomalous the species mentioned is quite unlike *C. (S.) abyssinica hindei* of which species I had the opportunity of obtaining a specimen myself at Punda Melia, British East Africa. In the penis of the latter the spiral twisting is very pronounced, the cushion well developed, and the *processus urethralis* very long, thread-like and extending fully 16 mm. beyond the end of the penis. The male organ of this Duiker exhibits thus a very primitive form.

For the subfamily *Neotraginae* I have only one additional statement to make viz. concerning the little Suni Antelope (*Nesotragus moschatus*). Its male organ is somewhat spirally twisted but, like the same organ of *N. livingstonianus*, it has no urethral prolongation.² As *Rhaphicerus*, as well, does not have its urethra prolonged beyond the tip of the penis this may be the usual condition in this subfamily, although GARROD's description of *Ourebia nigricaudata* proves that in some cases the reduction of the urethral prolongation is less complete. In all cases the organ is slender, and the cushion is only little, or not at all developed.

The shape of the penis of *Kobus defassa* and *Redunca arundinum* have been described before (resp. 1903 and 1909). At this opportunity may be mentioned that in *Kobus ellipsiprymnus canescens* this organ is very similar to the same of *K. defassa*.³ It is entirely black pigmented. The cushion is strongly developed and bent down at the tip. The urethra curves abruptly to the left and from below upwards. *Processus urethralis* has a length of about 24 mm.

The penis of *Aepyceros melampus* (subsp. *rendilis*) is very simple. It does not taper gradually towards the tip but ends bluntly. In one specimen the tip is rounded off, in the other a little more conical. The swelling, or cushion is only little developed and not abruptly prominent. It is chiefly visible on the right side and there more pronounced near the lower than the upper surface. The urethra is not turned over to the left as usual but projects almost in the median line and bends there upwards. The free portion which rather deserves the name *papilla* than *processus urethralis* is only about 5 mm. in length (conf. Pl. 1, Fig. 7).

In the Gerenuk (*Lithocranius walleri*) the penis is slender. The end which is sparsely mottled with dark pigment is surrounded with a cushion which does not rise abruptly over the surface of the organ but constitutes its blunt end. The urethra is comparatively wide and appears to be quite straight, while the cushioned penis-end itself is a little turned to the right and projects about 2 mm. beyond the truncate end of the urethra (Pl. 1, Fig. 8). The latter is not attached to the penis all the way to the orifice, but the last two millimeters are independent and form a kind

¹ Conf. l. c. 1909. Pl. 3, Fig. 2.

² For a figure of the latter see Ark. f. Zoologi. Bd. 5. N:o 10. Pl. 4, Fig. 4.

³ Conf. LÖNNBERG 1903 l. c. Pl. 1, Fig. 4.

of *papilla urethralis* which, however, rests in a groove on the lower side of the organ. The reduction of *processus urethralis* is thus complete, but if it is assumed that a similar reduction would take place in an organ shaped like that of a Gazelle (e. g. *G. rufina* as figured by the present writer¹) the result would be exactly such as now has been described and figured (Pl. 1, Fig. 8) for the Gerenuk. Although the penis-end of the Gazelles and the Gerenuk at the first look appear to differ, this difference is not at all fundamental, nor does it speak against the affinity of these animals.

Such a shape of the male organ as that found in the Impala might also as a result of reduction and simplification easily be derived from the type exhibited by the Gazelles. This organ does accordingly not support Pocock's view that the Impala should form a separate subfamily² of its own which the author quoted places between *Cervicaprinæ* and *Tragelaphinæ*. It is readily admitted that a characteristic resulting from reduction is no strong proof of relationship, but a comparison of the male organ of the Impala with that of a Waterbuck or a Bushbuck on one hand, and with that of a Gazelle on the other will plainly show that while a derivation from the latter is quite easy to understand, a derivation from the Waterbuck is difficult and from a Bushbuck hardly possible.

From the subfamily *Hippotraginæ* already GARROD has described the male organ of one of its representatives viz. *Addax*. The corresponding organ of a specimen of *Oryx beisa annectens* obtained by the present author is very similar. The organ is compressed from the sides and tapers somewhat in front (Pl. 1, Fig. 9). The spiral twisting is very pronounced. The urethral portion which is thick, 5—6 mm. in diameter ascends from the lower side obliquely forward to the upper on the left side. It is sunk in a corresponding groove to which it is attached until it reaches the upper surface. It continues then, bending over towards the right side, still resting in the groove but free, and extends forward beyond the tip of the other portion of the penis which is formed by the cushion. The latter is on the left side seen in front of the ascending urethral portion. The distal free part of the urethral portion tapers gradually to its free end, but it does not become filiform, measuring as a minimum a little less than 3 mm. at the orifice. The distance from the extreme tip of the cushion below the free urethral portion and to the orifice of the latter is about 11—12 mm. The type of male organ found in *Hippotraginæ* as represented by *Addax* and *Hippotragus* is thus, as can be judged from this, more primitive and less reduced from the original Traguline, resp. Suine type than in other *Cavicornia*.

Before our knowledge about the male organ of the *Ruminantia* comprised as many different species as now, it has been suggested that there should perhaps be some correlation between the size and bulk of the animal, and the shape of its penis. Against such a supposition the present author has pointed out (1909) that even in quite small antelopes like *Nesotragus* the shape of this organ can be of 'bovine' type. The presence of a penis type like that described above in such a big antelope as *Oryx* gives a further proof that no such correlation exists.

¹ Nova Acta Reg. Soc. Sc. Upsala 1903. Pl. 1, Fig. 3.

² Proc. Zool. Soc. 1900, p. 918.

Finally it may be mentioned that the male organ of a Somali Giraffe (*Giraffa camelopardalis reticulata*), as could be expected, closely resembles the figure of the same organ of »the Giraffe» (probably the Nubian) which GARROD has communicated in Proc. Zool. Soc. 1877, p. 11, Fig. 23. The *processus urethralis* is perhaps comparatively a little more slender.

The structure of the uterus of some Antelopes.

A few years ago the present author had the opportunity of stating¹ that GARROD's division of the Ruminants according to the structure of the uterus into two groups viz. *Oligocotyledontophora* comprising *Cervidæ*, and *Polycotyledontophora* including *Bovidæ* and *Giraffidæ*,² was not upheld by certain facts obtained from the dissection of some Antelopes. *Redunca arundinum* was found to possess only about 18 cotyledons in either cornu disposed in two rows. *Cephalophus ogilbyi* had also a smaller number of cotyledons than the *Polycotyledontophora*, according to GARROD, ought to have.

To this may now be added some new facts. *Gazella granti* has about 60 cotyledons in either cornu where they are disposed in four rows.

In a gravid specimen of Impala (*Aepyceros*) the two cornua were very different inter se. The right cornu, which contained the foetus and which already was strongly distended by the same, was provided with a little more than 40 cotyledons in four rows. As these rows partly were a little irregular the exact number of each is not quite easy to tell, but there appeared to be about 12 cotyledons in each of two of the rows and about 9 in each of the two others. The other cornu was also enlarged because the foetal membranes extended into it as well, and it partook thus in the nutrition of the foetus. The number of cotyledons was 12 disposed in four rows of 3 each. They were subequal and of large size.

A gravid female of Suni Antelope (*Nesotragus moschatus*) shot at Meru boma ¹/₂ 1911 had comparatively few cotyledons. The right cornu, in which the foetus was situated, had 17 cotyledons of comparatively large size and arranged in four rows, containing resp. 4, 5, 4 and 4 cotyledons. The other (left) cornu did not contain but 6 cotyledons in all, in connection with the foetal membranes. They were arranged in two longitudinal series of 3 each. The middle one of either series was much the largest, and the one nearest to the oviduct the smallest.

A specimen of WROUGHTON's Dik-dik (*Rhynchotragus guentheri wroughtoni*) shot ¹⁴/₂ on the northern bank of Guaso Nyiri was gravid and displayed quite interesting conditions of the uterus. The right cornu, in which the foetus was developed, had a great number of cotyledons about 56, but they were not regularly arranged. A lateral, rather regular series of cotyledons could be discerned, and in another place one, or two rows of cotyledons could be seen, but the greater number was partly

¹ Contrib. to the knowledge of the Anatomy of Ruminants. Ark. f. Zool. Bd. 5. N:o 10. 1909, p. 9.

² When WEBER wrote the valuable manual »Die Säugetiere» (Jena, 1901) he held the same opinion as GARROD writing: »die Zahl der Kotyledonen ist aber eine geringe bei Cervidæ, eine grosse bei Cavicornia und den Giraffen» (l. c. p. 666).

scattered, partly crowded in groups without any order. The foetal membranes entered into the other (left) cornu as well, and 15 cotyledons arranged in four rows could be counted there. One of these rows was rather suppressed consisting only of 3 somewhat smaller cotyledons.

In another specimen of the same kind of Dik-dik with a bigger foetus the arrangement of the cotyledons was much more regular. Four rows could very plainly be discerned in the right cornu, which contained the foetus, even if there were some cotyledons scattered outside the regular series. 57 cotyledons were counted in this cornu. In the other (left) cornu the strongly enlarged 15 cotyledons completely filled the lumen, and they were so crowded that it was difficult to discern any regular rows. The foetal membranes extended into this cornu as well so that it plainly contributed to the nutrition of the foetus.

In still another specimen of Dik-dik the condition of the uterus was found to be somewhat different. In the right gravid cornu the arrangement of the cotyledons was irregular, although on both sides there was a tendency of their forming series. The number of cotyledons amounted to about 38—40, perhaps not fully as many. In the other (left) cornu as well, the cotyledons were enlarged and in connection with the foetal membranes. They were regularly arranged in four rows and also there about 38 in all. The fact that in this specimen as well as in one of the others the cotyledons of the gravid cornu were not regularly arranged in rows may be explained as a result of unequal growth when the cornu became expanded by the foetus. It is more strange that the non gravid cornu contained as many cotyledons as the gravid one when this was not the case in the two other specimens. It might perhaps be guessed that this has been caused by the simultaneous pregnancy of both cornua at the first conception and their equal development as a result of this, while in the two others one cornu (the right) has become gravid, and in consequence of this only that has been especially enlarged. For such an explanation may speak the fact that the combined number of both cornua is pretty similar in both cases about 76 and about 72. But another explanation may be quite as probable, and this will be set forth below.

A gravid specimen of Red Forest Duiker (*Cephalophus harveyi keniae*) shot near Nairobi in March had 18 rather large cotyledons in the right cornu which contained the foetus. They sat partly at some distance from each other, but 4 rows could be discerned with resp. 4, 4, 4 and 5 cotyledons. The other left cornu had only half the number (9) of cotyledons which appeared to form three series with resp. 4, 2 and 3. This small number of cotyledons corresponds with the condition found by the present author in *Cephalophus ogilbyi*¹ in which the cornu containing the foetus had 22 and the other only 8 cotyledons.

The gravid uterus of an Eland cow (*Taurotragus oryx pattersonianus*) had a great number of cotyledons in the long right cornu which contained the foetus. About 53 could very plainly be counted, and they were arranged in four rows of resp. 15, 12, 12 and 14 cotyledons. The other cornu is also long and occupied by the foetal

¹ Ark. f. Zool. Bd. 5. N:o 10, p. 10. 1909.

membranes which stand in connection with the cotyledons there as well. The latter are almost as numerous as in the cornu with the foetus. They are arranged in four rows consisting of resp. 12, 10, 9 and 11 cotyledons.

To obtain a review of our present knowledge about the structure of the uterus of the *Cavicornia* as far as the number and arrangement of the cotyledons are concerned the accompanying table has been prepared from the literature and these investigations.

	Number of cotyledons		
	in gravid cornu	in non gravid cornu	total
<i>Bovidae: Bovinae: Bos taurus</i> (fide FRANCE) . . .	40—56 (65) in four rows	40—56 in four rows	80—112 (130)
<i>Caprinae: Ovis aries</i> (fide ELLENBERGER & BAUM)	44—48 in four rows	44—48 in four rows	88—96
<i>Capra hircus</i> " "		Similar to <i>Ovis</i>	
<i>Rupicaprinae: Rupicapra rupicapra</i> (GARROD) . .		»As in <i>Ovis</i> »	
<i>Tragelaphinae: Taurotragus oryx pattersonianus</i>	53 in four rows	42 in four rows	95
<i>Antilopinae: Gazella granti</i>	about 60 in four rows	about 60 in four rows	about 120
<i>Epyceros melampus</i>	about 40 in four rows	12 in four rows	52
<i>Cervicaprinae: Redunca arundinum</i> (LÖNNBERG 1909)	18 in two rows	about 14	about 32
<i>Neotraginae: Nesotragus moschatus</i>	17 in four rows	6	23
<i>Rhynchotragus guentheri wroughtoni</i>	in 2 specimens: 56—57 in four rows in 1 specimen: about 38 rather irregular	15 in four rows	71—72
<i>Cephalophinae: Cephalophus ogilbyi</i> (LÖNNBERG 1903)	22 in four rows	8 in three rows	30
<i>Cephalophus harveyi keniae</i> . . .	18 in four rows	9 in three rows	27
<i>Bubalidinae: Connochaetes gnu</i> (LÖNNBERG 1901)	about 70 in five rows	about 70 in five rows	about 140
<i>Damaliscus pygarga</i> (fide GARROD)		very many	

If the domesticated animals are excepted, only a small number of specimens have been examined with regard to the present question, in most cases only single individuals of each species. It is therefore, of course, not possible to draw any general conclusions from so few facts, except that GARROD's statement about the *Cavicornia* being »*Polycotyledonalia*» is not supported. The number of cotyledons varies very considerably within the group from a total number of about 140 in the White-tailed Gnu to only 23 in the Suni or Zanzibar Antelope. The total number of cotyledons does not stand in any direct relation to the size of the animal. The small Dik-dik has, for instance, a greater number, not only than the Duikers (*Cephalophus ogilbyi* and *C. harveyi keniae*), but also than the Reedbuck and the Impala; and the Grant's Gazelle has more than the Eland. But on the other hand the largest antelopes have, as far as is known, as a rule, a at least comparatively large number (conf. Eland and Gnu) of cotyledons.

With regard to the number of rows in which the cotyledons are arranged *Redunca* occupies an isolated position with only two rows. *Connochætes* has five, and all the others four.

With regard to the number of cotyledons found in each cornu of the uterus two different types can be discerned. In one the number is subequal in both cornua as in Eland, Grant's Gazelle, Reedbuck, and White-tailed Gnu. In the other type the number of cotyledons in one cornu is twice, or more than twice, as large as in the other. This condition has been found in Impala, Suni Antelope, Wroughton's Dik-dik (in the greater number of cases), Ogilby's Duiker, and the Red Forest Duiker. When this latter condition prevails it is, of course, the gravid cornu which contains the greater number of cotyledons. The question arises now whether such a condition with unequal number of cotyledons in the two cornua is a constant character, or not. Against its being constant speaks the fact that in one Dik-dik out of three the number was equal, in the two others unequal, but on the other hand in four other additional species the number was found to be unequal. If the latter condition should be normal and constant in some species of Antelopes, it could be concluded that in such species only one cornu, viz. the one with the greater number of cotyledons would be normally pregnant. This appears perhaps at first somewhat strange but this impression will disappear if the observed facts are studied more closely. All Antelopes of which I have obtained gravid specimens for this investigation — even those with a subequal number of cotyledons in both cornua — have had the foetus in the right cornu. The same was after reexamination also found to be the case with a *Cephalophus ogilbyi* and a *Redunca arundinum*. This proves that among Antelopes generally it is at least more usual that the right cornu becomes gravid than the left. For the same may also speak that in a not gravid Grant's Gazelle the right cornu was larger than the left. In ELLENBERGER and MÜLLER's manual it is stated that in common cattle in 60 percent of cases it is the right uterine cornu which contains the foetus, although in these animals both cornua have a subequal number of cotyledons. The prevalence of the right cornu, as mentioned above, stands naturally in connection with the fact that in Ruminants it is less pressure (from the paunch) and more space for the growth of the gravid uterus on the right than on the left side of the abdominal cavity. Considering all this, it does not appear at all impossible that in some species it has become quite a constant feature that only the right cornu is the one in which the foetus normally is developed, and as a result of this, the functions of the left are diminished, and the number of its cotyledons consequently reduced.

If this hypothese is correct the above mentioned specimen of *Rhynchotragus guentheri wroughtoni* with a subequal number of cotyledons in both cornua would exhibit rather an anomaly for the species, although it represents the original state of affairs. Such an anomaly would then be explained by assuming that in this individual the left cornu contrary to the rule had been impregnated at the first conception, and consequently developed when the animal for the first time became gravid.

In later periods of gravidity the right cornu, as usual, has become impregnated as the condition in which it was found proved.

Since it had been stated that in several species of antelopes the right uterine cornu evidently has overtaken the chief function, and the left, even if it still contributes to the nourishing of the foetus, has become to a certain degree reduced, it appeared to be of interest to investigate whether this reduction also has been extended to other parts of the genital apparatus. For that purpose the ovaries of some antelopes were measured and the following results obtained.

	Left ovary	Right ovary
Pattersons Eland	13 × 15 mm.	16 × 18½ mm.
Grant's Gazello	12 × 10 "	12 × 11 "
Impala	12 × 16 "	13 × 13 "
Wroughton's Dik-dik	8 × 6 "	8 × 5 "
	6 × 5 "	7 × 5 "
Ogilby's Duiker	13 × 8 "	12 × 11 "
Kenia Duiker	12 × 8½ "	10 × 6 "

As can be seen from this, these measurements do not give any satisfactory proof that the left ovary has been subjected to any reduction.

Notes on the anatomy of the Warthog.

On a pig of Warthog (*Phacochoerus* sp.) obtained near Escarpment station, Brit. East Africa the following observations have been made. The specimen measured about 36 cm. from snout to vent, but had, in spite of its small size, the intestinal canal entirely filled with vegetable matter, and no trace of any milk could be detected. It will appear from this that these pigs suck only for a comparatively short period of their early youth.

The general arrangement of the palatal folds of this animal is somewhat similar to that of the domestic Pig as figured by G. RETZIUS.¹ The number of folds or pairs of folds is about 23. They are not perfectly transverse as in the domestic Pig. In the anterior portion of the palate each fold is curved with the convexity on the front side, and with the lateral and mesial ends curved backwards. The posterior folds become gradually straight, but they are a little obliquely arranged so that the lateral end is behind the level of the mesial end. The three hindmost folds are not continuous but formed by a series of papillæ.

The *papillæ filiformes* of the tongue are minute, except at the base of the organ behind *papillæ vallatæ* where they are large and conical. The *papillæ fungiformes* are very numerous and scattered over the whole of the upper surface of the tongue

¹ Biol. Untersuch. N. F. Bd. XIII. Taf. XXXVII.

except on a central area, just as in the domestic Pig. On the anterior portion they are very small, but increase in size laterally and behind. They are especially densely crowded along the margin at the middle of the tongue¹ and extend on the posterior portion also to the lateral surfaces. There is one large *papilla vallata* on either side of the base of the tongue, just as in the Pig, and in this region a number of comparatively big *papillæ fungiformes* are found as well. On the lateral surface of the base of the tongue a *papilla foliata* is found. It presents five slits on one side, on the other it is more irregular.

The salivary glands are similar to those of the domestic Pig.

The large epiglottis was at the dissection found to rest on top of *velum palatinum*. At the back of the beginning of the oesophagus is a comparatively wide *bursa pharyngea* as has been found in *Sus* and *Babirussa*, and which thus appears to be characteristic of *Suidæ*.

The larynx is comparatively large, and compressed from the sides so that the thyreoid cartilage is provided with a distinct ventral keel. There is no *foramen thyreodeum* and no *cornu anterius*. The cricoid is broad behind, and especially its anterior portion is thick, but it becomes gradually thinner in its posterior parts. The arytenoids are united by rather long santorinian cartilages. Both upper and lower vocal cords are well developed and directed obliquely downward. The slit between them opens into a *ventriculus Morgagni* which, just as OWEN² describes for the domesticated Pig, »is continued upward into an oblong flattened sacculus».

The division of the lungs is similar to GARSON's description of the condition found in *Porcula*. Not counting the azygos lobe between the heart and the diaphragm there are three lobes on the right lung as also OWEN has found in the Warthog. The foremost of these is subdivided, and the anterior portion hooks around to the left side in front of the heart, the right auricle of which it covers. The left lung has two lobes the anterior of which is subdivided in an anterior longitudinal and a posterior dorsiventral portion.

The *thyreoidea* is a solid bean-shaped body which is compressed from the sides.

When the abdominal cavity is opened, the colic coils are seen to occupy the greatest space. The ventricle and the spleen are visible on the left side behind the diaphragm and the liver on the right side. The coils of the small intestine lie in the hindmost portion of the abdominal cavity and on the right side.

The ventricle, although distended with vegetable matter, appears to be comparatively small. At *cardia* is a rather thick valve. The recurved pouch at the left end of the ventricle is well defined by the deep fold, or septum which extends into the lumen of the ventricle from the oesophageal side. The walls of the ventricle are rather thin except in the pyloric portion in which there are also some longitudinal folds. One of these, situated on the side of the lesser curvature is thicker than the

¹ Something similar has been stated by GARSON (Proc. Zool. Soc. London 1883, p. 414) in *Porcula* as he says that the fungiform papillæ »are aggregated in a row along either side of the tongue». *Papillæ foliata* are not mentioned in the description quoted.

² Comp. Anatomy of Vertebrates III, p. 594.

others and corresponds to the »oval protuberance» in *Sus* (OWEN) and the »oval pad» in *Porcula* (GARSON), but it is about three times as long as broad. Together with the strong *sphincter pylori* it has, of course, the function of occluding the pylorus from the small intestine which in its beginning portion is very wide.

The spleen is not so narrow as in *Sus*. It is about three times as long as broad. The left or lateral end is narrowed to a blunt point; the mesial, or right, end which generally is a little broader, is somewhat curved forward, and it tapers less. The parietal surface of the spleen is flat, but the visceral surface is broadly keeled so that the organ has a triangular section. This keel fits in between the ventricle and the coils of the colon; and the pointed left end of the spleen fits in between the ventricle and the anterior end of the left kidney.

The liver is divided in four main lobes; the two central lobes are subequal, or the right perhaps a little larger. The left lateral lobe is broader, but thinner than the right lateral. The caudate lobe caps the right kidney which makes such an impression upon it that it might nearly be termed forked, and the ventral prong of this fork is quite thin and pointed. This lobe is thus more complex than in *Sus*.

The gall-bladder is well developed, and its fundus end nearly reaches the margin.

Vena cava passes through the substance of the liver (unlike the condition found in *Porcula* according to GARSON).

The small intestine runs from the pyloric tract backwards on the right side and is partly attached to the ventral surface of the right kidney which it passes. The posterior end of the loop is firmly attached to the rectum in the sacral region. It returns then forward on the left side of the root of the mesentery on the median side of the left kidney and reaches the pyloric tract again where it is connected as well with the commencement of the duodenum as with the colon. The continuation of the small intestine from this point is laid into numerous coils on the right side of the abdominal cavity which are seemingly irregular, but, if they are more closely examined, these coils are found to run chiefly transversely to the axis of the body in the anterior portion and then more longitudinally. In consequence of the shortness of the mesentery the intestine is, however, forced to form many curves and bend in different directions. The small intestine has everywhere a rather wide lumen.

The cæcum is situated just in front of the pelvis, with the blind end directed towards the right side in the groin. The small intestine enters from the right on the anterior surface of the cæcum with which its terminal portion is connected with a mesentery. The cæcum is sacculated three or four times on its ventral surface (Pl. 2, Fig. 1). It is rather short but wide, somewhat tapering towards the blind end so that the general shape is bluntly conical. A band of muscular fibres is seen on the, when in situ, dorsal side, and others partly radiating on the anterior side which is directed towards the colic spiral and the coils of the ileum. The small intestine protrudes with a tubular mouthpiece deeply into the lumen of the cæcum (Pl. 2, Fig. 2), and transverse folds extend from this tube in both directions across about a third of the lumen of the cæcum. On the colic side of these folds and the protruding end of the ileum a large and wide pocket opens into the lumen of the

cæcum (Pl. 2, Fig. 2), and the walls of this pocket are partly attached to the terminal piece of the ileum on its mesial side. The opening of the ileum is directed obliquely against the colon, but the passage from the cæcum to the colon is very effectively occluded by not less than three constrictions which each of them only leave a narrow opening (Pl. 2, Fig. 2). Between these three constrictions the lumen widens very considerably so that wide pockets are formed between the narrow passages. At the latter the mucosa is laid in longitudinal folds by which the lumen is still better closed. These pockets and constrictions correspond to colic haustra which have become more strongly developed and specialised. The colon forms a spiral the coils of which are quite closely connected and pressed to each other (Pl. 2, Fig. 1) but which in consequence of the large size of its constituents is very big. From the cæcal tract the colon runs forwards on the left side below the kidney to behind the ventricle. From there it returns backwards on the right side and becomes visible on the (ventral) surface of the spiral near the cæcal tract when the first coil is nearly complete. In the second coil the forward ascending limb also soon disappears below other coils¹ and the only superficially visible portion of this coil as well, is behind, just before the second round is completed. The third and last centripetal coil has an altogether superficial situation. The same is the case with the first and second centrifugal coils (the latter is the most peripheric) but the forward on the right side ascending limb of the third centrifugal coil disappears below the surface and completes its turn with rapidly diminished diameter. A fourth and a fifth centrifugal coils with still smaller diameter encircle the root of the mesentery before the large intestine runs backwards as rectum. From this description and the figure communicated (Pl. 2, Fig. 1) it may be seen that the colic spiral of the Warthog is flatter and wider than that of *Sus* and it may be regarded as enlarged and more specialised which also is born out by its structure in details.²

The colon of this young Warthog is very strongly sacculated, and the folds between the *haustra* very often cut off the greater part of the lumen of the organ. This sacculatation is well developed on all the centripetal coils, and also on the three and a half first centrifugal coils. In consequence of this arrangement the contents of the large intestine can be retarded in their passage through the organ and retained as long time as is necessary for the digestive process.

The dentition of the Warthog is more specialised than in any other member of the family *Suidæ* and adapted to grind coarse vegetable matter. The development of the colon as described above is evidently also an adaptation to the same kind of a diet. As the stomach is comparatively small it is probably of comparatively less importance for the digestion. The small intestine is wide to facilitate the passage of the coarse food-material, but it is not especially elongated. It is thus chiefly entrusted to the colic portion of the intestine to prepare the food in such a way that its di-

¹ if seen from the ventral surface.

² I have regarded the point where the star-mark is seen in the Fig. 1 (Pl. 2) as the turning point of the spiral, but it is quite a matter of taste to remove this point half a turn further upward in the figure. According to the situation of the coils the turning point appeared, however, to be at the place mentioned.

gestible parts can be utilised. With its numerous folds which increase the working surface and which at the same time are able to retard the passage of the food the large intestine forms a kind of chemical laboratory.

The kidney of *Phacochærus* has already by GERHARDT¹ been stated to resemble that of *Sus* and to have several calyces and papillæ. On a longitudinal section through the left kidney of this specimen five independent papillæ are seen. The exterior surface is smooth.

The male organ of this specimen is thin and simple. It does not show any spiral twist at the end as in the domestic Pig. The urethra projects only as a short papilla beyond the other part of the penis. It is possible that this organ is not as yet fully developed in such a young specimen, but on the other hand it must be remembered that among the Antelopes the general structure of the penis is already to be recognized in foetal specimens. It will thus appear as if the penis of *Phacochærus* had been subjected to a certain reduction when compared with that of *Sus*. It is of interest to find that such a reduction has taken place in the most specialised member of the *Suidæ* in an analogous manner as the same organ has become simplified in the most specialised members of the *Bovidæ*.

When BEDDARD some years ago² gave an account about the azygos veins in mammals he also described the condition of this vein found in *Phacochærus æthiopicus*.³ He found there »a long azygos vein on the left side. This vein started with an affluent from the intercostal space between ribs 5 and 6.» In the present specimen as is shown by the accompanying figure (Fig. 3) the first affluent comes from the intercostal space between ribs 3 and 4. From the next intercostal space no affluent was seen to come, so that the second affluent comes from the intercostal space between ribs 5 and 6, and then from every following on the left side. Opposite the intercostal space between ribs 9 and 10 an affluent is seen to come from the right side across the aorta on its ventral side.

Fig. 3. Diagram showing azygos vein of a young *Phacochærus* from Brit. East Africa. Ao aorta, Va vena azygos side of a young *Phacochærus*, 2, 3 etc. number of ribs.

¹ Zur Morph. d. Säugetierrniere, Verh. d. Deutsch. Zool. Ges. 1911, p. 265.

² Proc. Zool. Soc. London 1907.

³ l. c. p. 189.

The structure of the palate of some Carnivora.

Some years ago G. RETZIUS described and illustrated with beautiful plates¹ the structure of the palate of several *Carnivora* representing different families. According to these figures *Canidæ* and *Felidæ* are rather different not only with regard to the general shape of the palate but also with regard to its structure. In the domestic Cat for instance there is a number of small papillæ more or less arranged in series between the palatal folds while such papillæ are less pronounced if present in the members of the Dog family. A similar difference makes itself often known in other members of the respective families as well. The palate of a Somali Lion is figured in Pl. 1, Fig. 3. It is very similar to that of a Cat apart from the difference in size. In the interspace between the canines a transverse fold is seen and in front of that a couple of arcuate indistinct folds which are more or less absent in the Cat. Behind the transverse fold the Lion has 7 well developed arcuate folds, the Cat only 6. Behind the last of these there are in the Somali Lion traces of two more transverse folds, while the Cat shows only one such. The anterior folds of the Somali Lion are arranged with narrower interspaces than the posterior. As well behind as in front of the arcuate folds a series of small papillæ is to be seen parallel to the fold, and sometimes there are also some such papillæ scattered in between. In the Cat the series of papillæ behind the fold is better developed than the anterior, although both are present and also scattered papillæ. Similar small scattered papillæ occur in many other mammals belonging to different groups as Marsupials, Dasypodids, Insectivora² etc. FREUND has quite recently³ described and figured the palate of a Lion (subspecies not mentioned). His results are, of course, similar to those recorded above, but there are also some differences. In his specimen the two foremost folds are confluent laterally. There is also, as it appears, only one rudimentary fold behind.

The palate of the Black-backed Jackal (*Canis mesomelas*) resembles that of a Fox. The former has 11 palatal folds which are arranged as follows. The first pair runs between i³, the second between c. The following are arcuate and their lateral ends are opposite p¹ in the third fold, opposite p² in the fourth, opposite p³ in the fifth. The sixth ends at the anterior part of p⁴, the seventh further behind at the same tooth, the eighth at the anterior part of the heel of m¹, the ninth at the inside of the same heel anteriorly, the tenth at the middle of the same. The eleventh fold is short and incomplete, it runs between m². The four posterior of these folds are interrupted in the middle.

The anterior palatal folds carry papillæ and there are also scattered papillæ between the folds.

The palate of *Otocyon megalotis virgatus* is represented in Pl. 1, Fig. 4. The folds are well developed and each of them appears almost double because there is a

¹ Biol. Untersuch. N. F. Bd. XIII. Stockholm 1906.

² Conf. RETZIUS l. c. Pl. XXXV, Pl. XXXVI, Pl. XLI.

³ Zeitschr. f. Morph. u. Anthropol. Bd. XIII. Hft. 3.

series of closely set small papillæ forming an edge along the anterior side of each fold, but separated from the same. There are also scattered papillæ elsewhere in the palate. Eleven folds in all can be discerned. The first in front of the canines is least developed. The following five are arcuate but with the forward directed convexity gradually lessened. These five folds run respectively between the canines and the premolars (p^1 to p^4). The next three folds have a tendency to be interrupted in the median line and thus form pairs of arcuate folds. The tenth fold consists of two short transverse folds opposite to m^2 . The eleventh fold is continuous but also straight and transverse and situated opposite the interspace between m^2 and m^3 . Behind the last fold there are numerous small papillæ scattered on the palatal surface. Such papillæ are thus very numerous in this species which perhaps stands in connection with its to great extent insectivorous diet.

The male organ of *Rhinoceros bicornis*.

Among the *Artiodactyla* the very variable shape of the male organ can be traced back to a common type from which all the numerous modifications¹ can be derived by reduction of different portions, or some other alterations. It appears a little more difficult to decide whether a common type may be found from which the male organ of all the recent *Perissodactyla* may be derived. When reviewing our present knowledge about this organ among the vertebrates, especially the *Amniota* GERHARDT² points out as common characteristics to the male organs of all *Perissodactyla*: »Bedeutende Länge und Dicke des ganzen Organs, starke Entwicklung der Glans und Fehlen eines Septums samt Penisknochen.» The last two characteristics are negative and shared by others as well.

Of the three families of *Perissodactyla* which have survived to the present time it is in the first rank *Rhinocerotidae* which will be considered at this opportunity. The genus *Rhinoceros* of the present time has been divided in three subgenera viz. *Dicerorhinus*, *Diceros* and *Rhinoceros* s. str. The male organ of a member of the first and last of these subgenera has been described and figured before. That of *Diceros bicornis* is to be described below, and its appearance is shown on Pl. II, Fig. 3 (dorsal view) and Fig. 4 (lateral view). OWEN described the male organ of *Rhinoceros unicornis* already 1852.³ He drew attention to the peculiar fact that »the apex is not simple, but resembles a mushroom on a thick peduncle projecting from an excavation at the end of the glans with a thin wall or border, like a second prepuce» — — —; and further that »on each side of the base of the glans, and rather towards its under³ part, there is a longitudinal ridge or lobe three inches and a half in length and eight lines in basal thickness» — — —.

¹ The *Tylopoda* might, however, form an exception, but I do not know their male organ from my own experience.

² Ergebnisse u. Fortschr. d. Zoologie. Bd. 1. Hft. 2. Jena 1908.

³ Trans. Zool. Soc. London. Vol. IV. Part 2. Pl. 9. This description is also repeated with more details in OWEN's »Anatomy of Vertebrates» III, p. 663 & 664.

⁴ ought to be »upper»!

In the year 1881 FORBES described¹ the same organ of *Dicerorhinus sumatrensis*. With regard to the peculiar 'mushroom- or trumpet-shaped expansion' at the apex of the penis this species agrees with *Rh. unicornis*. But the lateral lobes are very different in shape in the two animals. FORBES describes those of *D. sumatrensis* as 'two large oblong-oval lobes, of the same colour and substance as the rest of the glans, which are free for the greater part of their length, and only attached to the rest of the glans at their bases. The lobes lie on the side of the dorsum of the penis, and are closely approximated at their bases' — — —.

The male organ of *Diceros bicornis* (conf. Pl. II, Figs. 3 & 4) is of the same general type as the same of the two other species mentioned above, and it is proved by this that all three subgenera of *Rhinoceros* are rather alike in this respect, although as a comparison shows there are specific differences to be found.

The mushroom-, or trumpet-shaped organ at the apex has an oval disc with a vertical diameter of about 20, and a horizontal of $13\frac{1}{2}$ mm. in the present specimen. The upper lobe is larger than the lower so that the distance from the lower edge to the orifice of the urethra is only 7 mm. The peduncle of the disc is oval in section with a vertical diameter of 13 and a horizontal of 9 mm. close behind the expansion, but it increases gradually in thickness proximally. The terminal excavation or fossa from the centre of which the just described mushroom-shaped appendix projects, is deep and has high, rather thin-edged borders which form a kind of collar. Laterally the height of this collar is about 17 mm. Ventrally it is somewhat broader still, and curved down as a lip. All the way from the distal margin of this lip to its base, and then up on the peduncle to the mushroom-like appendix runs in the median line a small but distinct raphe. Dorsally in the median line the peduncle is connected with the collar by means of a thick frenum which, however, unlike the ventral raphe, does not extend on the peduncle itself beyond the direct connection. On the dorsal surface of the penis above this frenum, thus on the dorsal surface of the collar, there is a broad ridge which terminates just behind the edge of the collar with a rounded knob which appears to have a thickened epiderm. Probably this knob represents the end of *corpus cavernosum penis*.

The two lateral lobes are very different in shape from those of the other two species. They are nearly triangular in outline with straight vertical anterior contour, somewhat curved upper contour and they sit on a long base (conf. Pl. II, Figs. 3 & 4). Their anterior border is about 75 mm. behind the edge of the collar in the present specimen. And the length of their base is about 58 mm. When the organ is at rest the lobes are laid around the dorsal surface so that their borders meet mesially and dorsally. They are a little thinner at their anterior border, but the average is about 6—7 mm. in this stage.

Basally on the ventral side of the penis-end between the same and the prepuce there is a short but strong frenum and from this extends in the median line on the ventral side a raphe which is continued to the lower lip of the collar and corresponds

¹ Trans. Zool. Soc. London. Vol. XI. Part 4, p. 107. Pl. XX.

to the raphe on the inner side of this lip and on the peduncle of the mushroom-like appendage as described above.

The presence of the frenum is of importance because OWEN (l. c. p. 50) has stated that there is no frenum between the prepuce and the penis in the Indian Rhinoceros.

Since it now has been shown that the members of *Rhinocerotidae* probably all of them have a penis with a similar structure it remains to find out whether the same organ of the two other families of *Perissodactyla* can be derived from such a type, or at least from an ancestral type which can be assumed as common to all three.

OWEN states that in the Sumatran Tapir the base of the glans has an upper lobe as well as one on each side, beyond which it is continued forward contracting, but terminates in a truncate surface on the middle of which the urethra opens.¹ The lateral of these lobes can no doubt be homologised with those of the Rhinoceroses, and this must be regarded as an important correspondence. The truncate shape of the anterior end is also a likeness, although the Tapir has no mushroom-like appendage in front. This may have become reduced in the ancestors of the Tapir, or independently developed in the Rhinoceroses.

The homologisation of the different parts of this organ of the Rhinoceroses, and of the Indian Tapir is still more facilitated by POELMAN's description² and figure of the conditions found in the latter species. The author quoted says: »Le gland — — — son extrémité libre est plutôt aplatie, et à la partie inférieure de celle-ci, au fond d'une fossette, se trouve l'orifice de l'urètre.» This »fossette» is no doubt to be regarded as homologous with the apical groove of the glans of the Rhinoceroses, although the appendage is missing. POELMAN's figure (l. c. Pl. II) presents »trois espèces de crêtes ou de bourrelets aplatis — — —». These are evidently the same as those mentioned by OWEN, as quoted above. An examination of POELMAN's figure (l. c. Pl. II) convinces one that the two lateral of these lobes evidently must be quite homologous with those in a corresponding situation on the male organ of the Rhinoceroses.³

In the Horse there are no lobes on the male organ, but such lobes may have been present and become reduced already among the ancestors of the Horse. But the *corpus penis* of the Horse ends, according to ELLENBERGER and BAUM,⁴ with three apices in front. The middle one of these is long and pointed, and it serves to support the glans. The lateral ones are termed »kurz und stumpf». The hypothesis is near at hand that these lateral apices may have formerly stood in connection with lateral lobes of the penis of such a kind as those found in the Rhinoceroses.

¹ Mém. de l'Acad. R. Belgique. T. XXVII, p. 17 & Pl. II.

² These lateral lobes of the male organ appear to be developed in comparatively late ontogenetical stages, for PARKER remarks (Proc. Zool. Soc. London 1882, p. 773) that he did not find them in a young Indian Tapir. This is very remarkable as the presence of such lobes must be phylogenetically very old when two families like *Rhinocerotidae* and *Tapiridae* are provided with such. I have seen myself the lobes in question strongly developed in a living Tapir.

³ Anatomy of Vertebrates III, p. 664.

⁴ Handbuch d. vergl. Anat. d. Haustiere. 11:te Aufl., p. 553.

It is difficult to prove such a thing, but the possibility does not appear to be excluded. There is, however, another great resemblance between the male organ of the Horses and Rhinoceroses and that is that both are provided with a deep groove (*fossa glandis*) at the truncate end of the glans, and from this groove the *processus urethræ* projects. The latter has in the Rhinoceroses a more complicated shape with its mushroom-like dilatation at the apex and the thickness of its peduncle etc., but there appears to be no doubt about the homology.

Considering all there is such a great agreement in shape and structure between the male organs of the families *Rhinocerotidæ*, *Tapiridæ*, and *Equidæ* that they evidently can be derived from a common type which ought to have been thick and truncate, provided with a terminal fossa or groove from the bottom of which an urethral appendage probably arose, and with a pair of lateral lobes at the base of the glans. There is thus an equal conformity in the Perissodactyline series as that which has been proved before in the Artiodactyline with regard to this organ.

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Plate I.

- Fig. 1. Palate of *Buffelus caffer radcliffei* THOMAS, to show the arrangement of the folds. Strongly diminished.
 Fig. 2. Dorsal view of a kidney of *Buffelus caffer radcliffei* THOMAS, to show the lobulation. $\frac{1}{2}$ nat. size.
 Fig. 3. Palate of *Felis leo somaliensis* NOACK. ♂.
 Fig. 4. Palate of *Otocyon megalotis virgatus* MILLER.
 Fig. 5. End of male organ of *Buffelus caffer radcliffei* THOMAS. Nat. size.
 Fig. 6. End of male organ of *Connochætes albojubatus* THOMAS. Nat. size.
 Fig. 7. End of male organ of *Æpyceros melampus rendilis* LÖNNBERG. Nat. size.
 Fig. 8. End of male organ of *Lithocranius walleri* BROOKE. Nat. size.
 Fig. 9. End of male organ of *Oryx beisa annectens* HOLLISTER. Nat. size.

Plate II.

- Fig. 1. Colic spiral and cæcum (*c*) of a young *Phacochærus* pig from the Kedong Valley, Brit. East Africa. *i* small intestine. 1 end of first centripetal coil, 2 end of second centripetal coil, 3 near the end of third centripetal coil. * turning point of spinal. I end of first centrifugal coil, II end of second centrifugal coil, III first portion of third centrifugal coil before it disappears under the other coils.
 Fig. 2. Longitudinal section through cæcum (*c*), and adjoining parts of the small intestine (*i*), and the colon (*co*) of a young *Phacochærus* pig from the Kedong Valley, Brit. East Africa.
 Fig. 3. Dorsal view of the male organ of a *Rhinoceros bicornis* from the northern side of Guaso Nyiri, Brit. East Africa.
 Fig. 4. Lateral view of the same.

Tryckt den 3 september 1912.

Uppsala 1912. Almqvist & Wiksells Boktryckeri-A.-B.

KUNGL. SVENSKA VETENSKAPSAKADEMIENS HANDLINGAR. Band 58. N:o 2.

MAMMALS COLLECTED IN CENTRAL AFRICA BY CAPTAIN E. ARRHENIUS

BY

EINAR LÖNNBERG

WITH 12 PLATES AND 11 FIGURES IN THE TEXT

READ APRIL 25TH 1917

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W W

During a long sojourn in the easternmost parts of Belgian Congo Captain ELIAS ARRHENIUS has collected the extremely valuable material of mammals on which this memoir is based, and at his return home he most generously presented the same to the R. Swedish Natural History Museum. For this magnificent gift I beg to publicly express my great gratitude on behalf of the Museum.

The localities at which Captain ARRHENIUS has collected this material are the following:

Rutshuru: the station itself is situated a little to the east (perhaps about 12 km. to judge from a map) of Rutshuru River, about half way between Lake Albert Edward and Lake Kivu. There are partly open plains, but also forests on mountains. Such a mountain forest, in which Chimpanzees were collected, is situated about 5 hours march from Rutshuru station. Another forest is mentioned in the diary with the following words: »la Shasha-rivière — petit forêt». *Colobus occidentalis* was found there. Another forest, in which Duikers, Baboons and Leopards were obtained, is mentioned as »montagne et forêt Kabwe».

Kasindi near the northern end of Lake Albert Edward.

Beni: the station is situated about 60 km. north of the shore of Lake Albert Edward and surrounded by the great forest. Very many forest animals of different kinds were collected here, some of them at a distance of a couple of days march to the west of Beni.

The volcano Mikenno among the Virunga mountains about 30 km. north east from Kissenji which is situated at the northeastern shore of Lake Kivu. In the bamboo-forest of Mikenno Gorillas were collected.

Masisi: a station situated not far from Lake Kivu. At this place many forest-animals as Monkeys, Squirrels, Duikers etc. were collected.

All these localities are situated in the Central African Lake District, or on the frontier to the great West African Forest-region. In consequence of this it must be expected from a zoogeographical point of view that the greatest number of the mammals from these localities ought to belong to the West African fauna, or at least to be so to say of western type and have their nearest relatives in West-Africa. This is also the case. There are, however, as can be seen from the list below, also certain mammals representing species which are pretty evenly distributed over the greater part of the African continent, even if they have developed a greater or less number of subspecies. The presence of such mammals in a district does not give the fauna any certain zoogeographical stamp in the

same degree as some others. If they are represented by endemic subspecies they indicate, however, that the fauna has in consequence of certain natural conditions developed independently from that of neighbouring districts. The Central African Lake district has proved with regard to its bird life to form to some extent a zoogeographical province, although it has much in common with other parts of Africa. Although the present collection is not so complete that it can be regarded as fully representative — the small mammals are to great extent lacking — it gives, however, much good information about the composed nature of the mammalian fauna of these parts of Africa and also about the presence of many endemic forms, which partly have been described before, partly now are introduced into the scientific literature. These facts indicate that the district in question also with regard to its mammals, as well as with regard to its birds, forms a zoogeographical province.

The mammals of the present collection which show more affinities with the fauna of the great East-South-African subregion have mostly been collected at Rutshuru which, of course, depends upon the fact that the natural conditions there exhibit some likeness to those of East Africa with partly open plains and less thick forests. The Tumbili-monkey (*Cercopithecus pygerythrus centralis*) and the Baboon (*Papio tessellatus*) are good examples of such East African types, although as subspecies both appear to be endemic in the Lake district.

Characteristic animals for a more or less open country are also Lion, Serval, Cat (*Felis ocreata*), Jackal (*Canis adustus*), Warthog, Cape Buffalo (*B. caffer radcliffei*), Korrigum (*D. korrigum ugandæ*), Bushduiker (*Sylvicapra grimmia lutea*) etc. which also partly have developed endemic races in this district.

A direct affinity with the South African fauna is presented by *Poecilogale albinnucha doggetti*, but even in this case an endemic subspecies is met with.

The forest animals are mostly of western type, although some genera like *Colobus* and *Cercocebus* extend right across the tropical parts of the continent from west to east.

Many of these western animals are at, or near their eastern frontier in this district as for instance the Gorilla, the Chimpanzee, several forest Duikers etc.

A *Perodictius* has also been found some years ago on Mt. Elgon, but otherwise the new species of this genus described below appears to be the most eastern representative of this genus.

The find of an *Idiurus* in the Kivu district is also very remarkable as this genus formerly was known from Cameroon. This eastern *Idiurus* is not, however, quite identical with the formerly described species. In this respect analogies are also found among other forest animals f. i. among the Duikers which often to some degree differ from their westernmost relatives. It is also interesting to find that sometimes it is difficult or impossible to see any difference between mammals from the forests at Beni and Rutshuru and even at Masisi, but in other cases there has been developed separate races at one or both of the latter localities.

List of mammals collected by Captain E. Arrhenius.

<i>Gorilla beringei mikenensis</i> n. subsp.	Mikeno
<i>Anthropopithecus</i> cf. <i>cottoni</i> MATSCHIE	Rutshuru
<i>Colobus occidentalis</i> ROCHEBRUNE	Rutshuru, Beni
» <i>elliotti</i> DOLLMAN	Beni
<i>Cercopithecus schmidti enkamer</i> MATSCHIE	Beni, Rutshuru & Masisi
» <i>pygerythrus centralis</i> NEUMANN	Rutshuru
» <i>leucampyx schubotzi</i> MATSCHIE	Beni, Rutshuru
» <i>kandti</i> MATSCHIE	Kisenji
<i>Cercocebus albigena ituricus</i> MATSCHIE	Beni, Rutshuru
<i>Papio tessellatus</i> ELLIOT	Rutshuru
<i>Perodictius arrhenii</i> n. sp.	Masisi
<i>Hemigalago demidoffi medius</i> THOMAS	»
<i>Rousettus leachi</i> A. SMITH	»
<i>Hypsignathus monstrosus</i> H. ALLEN	?
<i>Micropterus pusillus</i> PETERS	?
<i>Potamogale velox argens</i> THOMAS	Masisi
<i>Felis leo bleyenberghi</i> LÖNNBERG	Kabare, Rutshuru, Beni
» <i>pardus centralis</i> n. subsp.	Rutshuru (& Kabare)
» <i>ocreata</i> GMELIN	Rutshuru
» <i>serval</i> ERXLEBEN	»
<i>Civettictis civetta</i> SCHREBER	Masisi
<i>Genetta servalina intensa</i> n. subsp.	Masisi & Beni
» <i>stuhlmanni</i> MATSCHIE	Masisi, Rutshuru
<i>Nandinia binotata</i> GRAY	Masisi
<i>Mungos ichneumon centralis</i> n. subsp.	Beni
» <i>paludinosus</i> cf. <i>rubescens</i> HOLLISTER	Rutshuru
<i>Crossarchus zebroides</i> LÖNNBERG	Kasindi
<i>Poecilogale albinucha doggetti</i> THOMAS & SCHWANN	Rutshuru
<i>Canis adustus</i> SUNDEVALL	?
<i>Anomalurus jacksoni fortior</i> n. subsp.	Masisi, Beni
» <i>pusillus</i> THOMAS	Masisi
<i>Idiurus zenkeri kivuensis</i> n. subsp.	»
<i>Aethosciurus ruwenzorii vulcanicus</i> THOMAS	»
<i>Heliosciurus rufobrachiatu semlikii</i> THOMAS	Beni
» » <i>arrhenii</i> n. subsp.	Masisi
» » <i>pascha</i> SCHWANN	Rutshuru
<i>Protoxerus stangeri centricola</i> THOMAS	Beni, Masisi
<i>Paraxerus böhmi emini</i> MATSCHIE	Beni
» <i>alexandri</i> THOMAS & WROUGHTON	»
<i>Funisciurus carruthersi</i> THOMAS & WROUGHTON	Masisi
» <i>akka</i> DE WINTON	»

<i>Graphiurus soleatus</i> THOMAS & WROUGHTON	Masisi
<i>Oenomys bachante unyori</i> THOMAS	»
<i>Cricetomys gambianus emini</i> WROUGHTON	»
» » <i>kivuensis</i> n. subsp.	»
» » <i>proparator</i> WROUGHTON	Beni
» sp.	Masisi
» <i>microtis</i> n. sp.	»
<i>Thryonomys rutshuricus</i> n. sp.	Rutshuru
<i>Dendrohyrax dorsalis</i> FRASER	Beni
<i>Elephas africanus cottoni</i> LYDEKKER	Rutshuru
<i>Buffelus caffer radcliffei</i> THOMAS	»
<i>Damaliscus korrigum ugandæ</i> BLAINE	»
<i>Cephalophus weynsi</i> THOMAS	Beni
» » <i>rutshuricus</i> n. sp.	Rutshuru
» ? <i>johnstoni</i> THOMAS	Beni
» <i>claudi mixtus</i> n. subsp.	»
» <i>leucogaster</i> GRAY	»
» <i>castaneus arrhenii</i> n. subsp.	»
» <i>melanorheus æquatorialis</i> MATSCHIE	»
<i>Sylvicapra grimmia lutea</i> DOLLMAN	»
<i>Hylarnus harrisoni</i> THOMAS	Beni, Masisi
<i>Kobus defassa</i> forma <i>dianæ</i> MATSCHIE	Rutshuru
<i>Adenota kob thomasi</i> SCLATER	»
<i>Redunca arrundinum</i> BODDAERT	?
» <i>redunca wardi</i> THOMAS	Rutshuru
<i>Tragelaphus dianæ</i> forma <i>sassæ</i> MATSCHIE	»
<i>Okapia johnstoni</i> SCLATER	Beni
<i>Phacochærus africanus centralis</i> n. subsp.	Lake Albert Edward
<i>Potamochærus intermedius arrhenii</i> n. subsp.	
<i>Manis tetradactyla</i> LIN.	Beni
» <i>tricuspis</i> RAFINESQUE	?

The collection contains as this list shows more than 70 different kinds of mammals. Out of this number not less than 16 appear to differ so much from their nearest relatives known from other localities that I have been obliged to distinguish them with new names. This is a further proof of the well known fact that the mammalian fauna of Africa is extremely rich, and that it has developed a remarkably great number of local, or geographical races. Although thus the mammals of a certain genus inhabiting a certain locality often very plainly differ from the corresponding ones of another locality, they do not, however, as a rule differ much inter se, nor vary very much at one and the same locality. Capt. ARRHENIUS has, however, by this very valuable collection in several instances brought to light a remarkably great individual variation among certain mammals, which is the better apparent, because he has been fortunate enough to obtain good series of

specimens, without which it would have been impossible to form any definite opinion in such a difficult matter. In some instances a similar variation has been reported upon before. For instance, LORENZ VON LIBURNAU has written about the colour variation among the red *Colobus*-monkeys which he has named *C. variabilis*, and which variation also is to be seen in this collection. It is also well known to every mammologist, who has worked with African mammals, that among certain kinds of mammals the colour, and to some extent even the pattern, may be subjected to a considerable variation, as for instance is the case among Genets and Bushbucks. But this is not a very common occurrence, and in most cases the skulls offer very good and fairly constant characteristics. In the following memoir I have been able to prove that the variation of the cranial dimensions and other characteristics among some mammals from the Central African Lake district is extraordinarily great. Such facts as are described below concerning the Chimpanzees, some of the Guenons, the Giant Rats (*Cricetomys*) etc. offer undoubtedly a valuable contribution to the knowledge about the individual variation among the mammals. It is among other things of interest to find that the cranial characteristics of some *Primates* are so very variable.

Of some of the species represented in the collection there are specimens of different age and sex so that a fairly good general view of the ratio of growth and development with increasing age can be obtained, and this is recorded by means of tables of measurements and descriptive notes. To a certain extent it is also illustrated by the accompanying plates.

The capacity of the brain cavity has also been measured, especially for the *Primates*, but also for some of the other species. Now and then morphological notes have been added. It would have been fortunate, if this part of the work could have been further extended, but as the author has been very heavily pressed with much labour of different kinds it has been connected with many difficulties to find time to get it ready even to its present form.

***Gorilla beringei mikenensis* n. subsp.**

- N:o 164, 1 old male 14th of May 1914 in the bamboo-forest on the volcano Mikenno, Virunga mountains (Pl. I, fig. 1).
 N:o 165, 1 semiadult male, last molar not quite fully developed, occipital and sagittal crests not developed, the same locality and date.
 N:o 166, 1 young male with milk-dentition and the first molar, the same locality and date.
 N:o 167, 1 adult female, the same locality and date.
 N:o 168, 1 young female with milk-dentition and first molar, the same locality and date.
 N:o 39, 1 young female, second molar just cutting the gum, in the bamboo-forest at the foot of the volcano Mikenno, 27th of Dec. 1913 (Pl. I, fig. 2).
 N:o 40, 1 young male, second molar developed, the same locality and date as n:o 39 (Pl. I, fig. 2).

The naked parts of all are black. The scattered hairs of the upper lip of the old male are black. The hairs on the crown are black, but partly with subbasal paler rings,

or basal parts which give a brownish appearance, somewhat like burnt umber, when the fur is parted. On the sides of the face there are about $8\frac{1}{2}$ cm. long black whiskers, the hairs of which are basally greyish. These whiskers are directed downwards and forwards. The dense beard on the chin is about $5\frac{1}{2}$ cm., black but with a brownish tint to the basal parts of the hairs. The lower neck is sparingly haired and the chest to great extent naked. The arms are black with very long hairs, about 15—16 cm. near the shoulder, about 14 cm. at the elbow, about 9 cm. on the back of the carpus then gradually diminishing in length but still very thick to the base of the fingers. The upper back is black, but much grizzled by means of whitish tips and rings to the hair. Across the middle of the back a broad belt of silky greyish white on which area the hair is short, rather thin and adpressed. On the lower back the hair is somewhat longer again, but not more than about 4 cm., black and grizzled with white tips. On the hams the fur is longer, about $8\frac{1}{2}$ cm., shaggier, black, grizzled with whitish tips, which latter appear to be more numerous along the anterior part of the outer side of the thigh so that a light band is formed there. The lower part of the leg is much less grizzled. The belly is black.

The semiadult male (n:o 165) with the last molar not yet fully developed is entirely black, without any grizzling and without the slightest trace of greyish white belt across the back. This belt is thus a token of full maturity. The hair of the middle of the back is about $5\frac{1}{2}$ cm., further down a little longer, at the elbow about 14 cm.

The adult female is black with a slight brownish tint on the sides and lower back in some shades of light. On the upper neck some hairs have pale rings without that this influences the general colour. Around the ischiadic region and on the hams the fur looks at closer inspection finely ticked with greyish brown, but this is produced by the broken and partly split ends of the hairs, a result of wearing. There are no regular or distinct ischiadic callosities, but in the place of such there is a bare patch on either side, and the skin of these is, in counteraction to the rubbing and wearing, thickened and the horny layer has a tendency of peeling off in flakes. It may be said to be ischiadic callosities in being. In the old male there is no trace of such a bare place, but in the semiadult male the hair is worn off on two symmetrically situated small spots in the ischiadic region corresponding to these patches in the female. The young male and female (n:o 40 & 39) are also quite black, but as in the adult female the ischiadic region is finely ticked with brownish by means of broken and split hairs. It is of interest to note that the male has no worn ischiadic patch, but in the female there is a pair of such ones which are very conspicuous, although not quite bare.

The quite young animals (n:o 166 & 168) with milk-dentition and the first molar developed are also black, but tending to »reddish black» (DAUTHÉNAY: Rep. de Coul. n:o 344, 1), or even »warm sepia» (l. c. n:o 305, 1) on the belly. Of very great interest is the fact that both these infant Gorillas are provided with a small patch of white hair around the anal opening, just like young Chimpanzees. This feature is thus of phylogenetic importance.

The length of the skin of the old male measures from the upper lip to the vent 132 cm.; the corresponding measurement for the adult female is 104 cm. The distance between the finger-tips of the old male when the skin is spread out is 237 cm.

The Mikeno Gorilla is thus somewhat smaller than *Gorilla graueri* MATSCHIE in which the length of the skin of the old male type measured as above is 142 cm.¹

	N:o 164 ♂ old	N:o 165 ♂ semiad.	N:o 167 ♀ ad.	N:o 40 ♂ jüv.	N:o 39 ♀ jüv.	N:o 168 ♀ pull.	N:o 166 ♂ pull.
Greatest length of skull	310,5 mm. ²	260,4 mm	—	223 mm.	219,5 mm.	186 mm.	181,5 mm.
Occipitonasal length	235,3 »	198,8 »	—	183 »	176 »	154 »	154 »
Occipital crest to front of superciliary ridge . .	187,5 »	174,3 »	165,5 mm.	156 »	156,5 »	139,5 »	139,4 »
Basal length	231 »	193 »	—	154 »	141,7 »	119 »	118,5 »
Condylbasal length	255 »	212 »	—	172 »	161,6 »	135 »	137 »
Zygomatic breadth	184,5 »	168,5 »	147,3 »	132,3 »	131,4 »	105 »	103,5 »
Least postorbital width	65 »	77,4 »	66,2 »	66,2 »	68,7 »	68,8 »	72 »
Breadth of brain case	110,5 »	119 »	107 »	102 »	106,7 »	105 »	105,3 »
Breadth of planum nuchala	165 »	148 »	134,5 »	118 »	121 »	—	—
Height of planum nuchala from <i>foramen magnum</i>	102,5 »	69 »	64 »	61,3 »	52 »	47,7 »	42,5 »
Breadth across middle of orbits	144 »	133 »	114 »	103,5 »	101,5 »	86 »	85,5 »
Inner height of orbit	40 »	36 »	38,8 »	37,2 »	35,5 »	36,2 »	32,3 »
» breadth of orbit	40,5 »	37,2 »	35,8 »	33,6 »	33,2 »	34,3 »	31,8 »
Least interorbital width	31,9 »	25,3 »	23,5 »	16,7 »	15,5 »	7,3 »	11,6 »
Median length of nasals	(70?) »	(25,4 »)	—	55 »	51,8 »	40 »	35,5 »
Breadth across alveoles of canines	79 »	72,5 »	—	55 »	54,3 »	44,4 »	48,5 »
Length of palate mesially	137 »	116,5 »	—	93 »	82,3 »	66,5 »	70 »
Distance from palatal arch to <i>foramen magnum</i> .	96 »	81,5 »	76,5 »	58,4 »	58,8 »	50 »	47 »
» » » » » occiput	194 »	160 »	152 »	136,5 »	135 »	118 »	112 »
Breadth across <i>p</i> ¹	73,8 »	75,2 »	—	55 »	53,7 »	48,8 »	49,8 »
» insida <i>p</i> ¹	44,4 »	42,9 »	—	33,5 »	31 »	27 »	27 »
» » <i>m</i> ⁸	38,3 »	31,5 »	—	—	—	—	—
Length of upper molar series	72,5 »	71,6 »	67 »	—	—	—	—
» » <i>m</i> ¹	15 »	15 »	15 »	16 »	15,7 »	16,2 »	16 »
Breadth of <i>m</i> ¹	17 »	16 »	15,5 »	17 »	16,9 »	17,3 »	16,7 »
Length of <i>m</i> ²	17,2 »	17,8 »	15,5 »	17,7 »	—	—	—
Breadth of <i>m</i> ²	18,1 »	17,2 »	16,2 »	17,3 »	—	—	—
Length of <i>m</i> ³	17,2 »	17,5 »	15 »	—	—	—	—
Breadth of <i>m</i> ³	17,8 »	16,6 »	15,5 »	—	—	—	—
Length of lower molar series	83,3 »	79,9 »	75 »	—	—	—	—
Combined alveolar breadth of upper permanent incisors	45 »	42 »	—	—	—	—	—
Thickness of <i>arcus superciliaris</i> above middle of the orbit	17,3 l, 19,7 r.,	9,7 »	9,7 »	9,2 »	9,4 »	—	—
Length of condyli occipitales	23,2 »	—	18,5 »	—	—	—	—

The measurement in the above table give many interesting hints about the ratio of growth of the Gorilla skulls. A comparison between the skulls n:o 164 (Pl. II, figs 1 & 2, Pl. III, fig. 1) and n:o 156 (Pl. III, fig. 2, Pl. IV, fig. 1) reveal analogous facts as the skins of the same specimens viz. that the characters of maturity are late in their appearance,

¹ Sitz.ber. Ges. Naturf. Freunde Berlin, 1914, p. 324.

² Or, if the incisors are included, 318 mm.

but probably, when the time comes, develop rather suddenly. As pointed out above the skin of the semiadult male n:o 165 shows no sign of the particular colour of the adult male, although the animal is so old that the third molars of the lower jaw are fully developed, and in the upper jaw m^3 is up on the right side, but cutting the gum on the left. In a similar way the skull n:o 165 lacks many features of the adult. The eyebrow ridges (Pl. IV, fig. 1) are not thicker than those of the adult female, and the orbital walls generally are much less thick than in the old male. The crests, which are so very characteristic for the skull of the adult male Gorilla, are entirely lacking in the semiadult (Pl. III, fig. 2). The development of the musculature of the jaws has not reached further than that a broad median space on top of the skull is left free (Pl. IV, fig. 1). At *sutura coronalis* (which still is open) for instance the distance between the lineas of insertion for *musculi temporales* is 23,5 mm. broad. The absence of the crests causes that the *planum nuchale* has not yet received its definite shape and size. *Laminae pterygoideae* are not yet developed as in the adult which also stands in correspondence with the juvenile stage of the musculature. For the same reason the breadth of *ramus adscendens* of the lower jaw is only 64 mm. against 80 mm. in the old male, and *ramus horizontalis* below m_1 is only 34 mm. in the former, against 43,5 mm. in the latter, and so on. Other differences in the dimensions are expressed in the table of measurements.

The brain-case of these Gorillas appears to attain its definite size, or at least its width at a comparatively early period as this measurement is almost as great in the young animals as in the old, especially if it is taken into account that the walls are thickened with age. The anterior portion of the skull grows more than the posterior, and the postorbital constriction becomes more pronounced with age, which stands in connection with the much increasing musculature of the jaws which needs more and more space. During this development the frontal grows forward. In the youngest male skull (n:o 166, Pl. IV, figs 2 & 3) the distance between *sutura coronalis* and the front of the eyebrow-ridge measures in the median line 67,5 mm., in the skull n:o 40 the same measurement is 75,5 mm., and in the semiadult (n:o 165) 88 mm. The above mentioned increase of the postorbital constriction with age in connection with the growth of the musculature of the jaws is quite analogous to the corresponding proceedings in the development of the skulls of f. i. baboons and carnivorous animals. The very long and narrow palate of these Gorillas, more than in other species, (Pl. II, fig. 2) also remind strongly about the same parts of Baboons, so that there might be spoken about a certain analogy in the development of the jaws of these animals. In a young Baboon¹ with milk-dentition the length of the palate is less than a third of the length of the skull, in a somewhat older animal with the first molar developed the length of the palate is contained $2\frac{3}{5}$ times in the length of the skull, and in the adult the same relation is $2\frac{2}{11}$ times. In the young Gorilla (n:o 166) with only first molar developed the length of the palate is contained about $2\frac{2}{5}$ times in the length of the skull, in the male with the second molar developed (n:o 40) about $2\frac{1}{3}$ times, and in the old one (n:o 164) not quite $2\frac{1}{5}$ times. These relations are thus pretty similar. If the length of the palate of these Gorillas is compared with the condylobasal length the former measurement is found to be 51 % of the

¹ *Papio tessellatus* cf. below.

latter in n:o 166, but amounts to 54 % in n:o 40, and about the same, or 53,7 % in the old male (n:o 164). The relation between these two dimensions is thus fairly constant, which means that there is about the same relative growth of the palate and the whole base of the skull.

Although the palate of these Gorillas with regard to length and narrowness — inside m^2 it is even narrower than in some Baboons — much reminds about the same organ of the Baboons, the Gorillas are by far not so prognathous or »dogfaced» as the Baboons. This depends upon the fact that in the latter the whole molar series is situated well in front of the anterior root of the zygoma, but in the Gorillas the posterior portion of the molar series with m^2 and m^3 , and in young animals even m^1 , is pushed back below and behind the root of the zygoma (Pl. III, fig. 1 & 2, Pl. IV fig. 2). By this and in consequence of the size of the molars and their roots the upper jaw and the palate become placed, not on a level with the base of the skull as in the Baboons, but at a considerably lower plane. A consequence of this is that *ramus adscendens* of the lower jaw must be much higher in the Gorillas to reach its place of articulation. In fact the vertical height of the lower jaw through the condyle is considerably longer than the length of the whole *ramus horizontalis* (Pl. III, fig. 1).

The interorbital space increases in thickness very considerably so that it is nearly three times as thick in the old male (Pl. II, fig. 1) as in the young male (n:o 166, Pl. IV, fig. 3) which has only the first molar developed. This increase is not, however, effected by enlargement of the nasals, but by the *processus nasales* of the maxillary. The nasals on the contrary are subjected to a relative diminution with age. In the youngest of the present specimens (Pl. IV, fig. 3) the nasals have at their anterior end, roughly speaking, the shape of a broad triangle which extends its base¹ along the upper margin of the nasal opening and at either corner meets the ends of the premaxillaries. The combined breadth of the nasals is here about 18 mm. This triangular portions tapers very quickly in the lower part of the interorbital region to a narrow shaft of a breadth hardly amounting to 2 mm. About the middle of the interorbital region the nasals are again enlarged to a rhomboidal piece without mesial suture and with a maximum breadth between the lateral angles of 6 mm. At the upper end this rhomboidal piece is again narrowed to a shaft, but this does not quite reach to the *arcus superciliaris*.

The condition of the nasals of the young female n:o 168 is similar.

In the specimens n:os 39 (♀) and 40 (♂) the general shape of the nasals is similar, only the size of the bones has increased, and the shaft-like process above the widened rhomboidal portion has been lengthened, so that it now extends through and reaches the upper frontal surface of *arcus superciliaris*. The mesial nasal suture is still partly open in the triangular lower portion and below the rhomboidal expansion. The greatest combined breadth of the nasals in the triangular portion is in n:o 40 about 26 mm., that of the shaft not quite 3 mm., that of the rhomboidal expansion 7,5 mm., and above the same 2,3 mm. The whole length from the mesial tip at the free margin to the posterior end is about 55 mm.

¹ This base is not a straight line, but has a projecting tip in the middle which, however, does not alter the general shape.

In the semiadult male n:o 165 the conditions (Pl. IV, fig. 1) have altered considerably. The triangular portion of the nasals is almost as before, but at either basal corner the nasals have pushed somewhat forward on top of the premaxillaries so that they more completely surround the upper end of the nasal opening. Their breadth there is nearly the same as in n:o 40 viz. 26,3, but about 24 mm. behind the free basal margin the nasals appear to end in a sharp point. The shaft-like process has thus dwindled away and is broken off. In the place where the rhomboidal expansion ought to have been and above the same to the eyebrow-ridge is a confusion of sutures. It is thus apparent that the posterior parts of the nasals have been encroached upon, partly by the inter-orbital parts of the maxillaries, and partly by the frontals so that they have been so to say partly broken up in small pieces, partly entirely suppressed.

The skull of the adult female has unfortunately been so badly damaged by the shot that almost the whole facial region has been torn away, but the interorbital region is left. There the part of the nasals which has been termed the shaft is well defined with sutures from the surrounding parts of the maxillaries which extend into the orbits, and this portion of the nasals form a prominent sharp ridge. At the narrowest place of this ridge the nasals measure only 4 mm. The portion which corresponds to the rhomboidal expansion in the young animals can still be discerned, and even above the same remains of the nasals can be followed to the eyebrow-ridge, although the sutures on the sides are irregular.

In the old male (Pl. II, fig. 1) there are no sutures to be seen in the nasal region. The extension of the nasals may thus only be conjectured. The anterior triangular portion is thickened and broadened and, although all sutures have disappeared, the combined anterior width may be estimated to about 40 mm. The triangular portion is continued backwards and upwards into a distinct nasal ridge, but this is broader (about 9,5 mm.) and more rounded off than in the female. In the place where the rhomboidal expansion of the nasals is found in the young, the nasal ridge merges into an irregular thickening of the bone which continues up to the eyebrow-ridge.

In the young Gorilla n:o 166 there is a small piece of bone 21 mm. long and 13 mm. broad intercalated between the supraoccipital and both parietals. In the young n:o 168 there is a similar piece of bone about 13×12 mm., but in this case at the anterior end of the parietal suture between the parietals and the already unified frontal. These are no doubt individual anomalies.

The dentition of the young male n:o 166 (Pl. IV, fig. 4) is as follows:

$$\frac{di^1, di^2, dc, dp^1, dp^2, m^1}{di_1, di_2, dc, dp_1, dp_2, m_1}$$

but inside the incisors and canines there are holes in the bone through which the permanent teeth are to come up. m^2 and m_2 are also partly formed and to be seen in their cavities in the bone. It is of interest to note the great length of the root of dc of the lower jaw, as it measures about 25 mm. in length and is open at the end.

The dentition of the young female n:o 168 is quite similar, but there is in the lower jaw also a hole in the bone inside of dp_1 .

In the young female n:o 39 i^1 are developed and in function. In the lower jaw i_1 have come up, but they are still obliquely crowded and may thus hardly have come into function. m^2 and i^2 are just cutting the gum. The same is the condition of the lower jaw, but the anterior end of m_2 has reached further than i_2 . The calcified germs of m_3 and m^3 are also to be seen in their resp. cavities through holes in the bone. There is also a hole in the bone inside dp_3 .

In the young male n:o 40 m^2 and m_2 are fully developed and in use. The same is also the case with regard to i^2 , but it appears to have been in function a somewhat longer time on the left, than on the right side. In the lower jaw i_2 is on the right side fully developed and functioning, but on the left it has not yet reached the level of the jaw bone. This stands evidently in connection with the narrowness of the jaw which has not space for the simultaneous development of both i_2 . In this jaw the interspace on the left side between i_1 and dc is not broader than between i_2 and dc on the right side, although di_2 on the left side has fully disappeared. There are rather large holes in the bone inside dc , dp_1 , and dp_2 in the lower jaw, but in the upper they are rather small except at the canines.

From these facts may be concluded that the canines probably come as number five of the permanent set, and that the permanent premolars in the lower jaw develop somewhat earlier than those of the upper.

In the semiadult male n:o 165 all teeth are in function except m^3 on the left side and the posterior part of its fellow. The third upper molars are thus the last of the whole set.

In the old male with worn teeth (Pl. II & Pl. III, fig. 1) the lower incisors and canines are more worn than the upper. The left upper canine has been broken off and the right lower, one is completely broken out and the jaw bone has healed so that the alveole has filled up. This mutilation has probably happened in some fight with a rival.

From the easternmost frontier of the geographical area of the Gorillas two different forms have been described, which both distinguish themselves from the western Gorillas by their great palatal length and their long black fur. These are *Gorilla beringei* MATSCHIE¹ from the volcano Kirunga ya Sabinyo north of Lake Kivu, German East-Africa, and *Gorilla graueri* MATSCHIE northwest from Boko at the western shore of Tanganyika.² As the first of these localities appears to be not so very far distant from the volcano Mikenno among the Virunga mountains, where the Gorillas of the present collection have been collected, it could almost be expected that they should belong to the species named *G. beringei*. Undoubtedly they are closely related to the same, but there are also important differences to be found, if for instance the dimensions of the old male skull of the collection are compared with the corresponding ones of the adult male *G. beringei*.

If this comparison had been confined to an examination of the present material and a comparison of its measurements with those recorded by ELLIOT in his »Review of the Primates» I would have been completely led astray. Fortunately I knew, however, that this work has to be handled with care, and that it is best not to rely too much on the

¹ Sitz.ber. Ges. Naturf. Freunde, Berlin 1903.

² Sitz.ber. Ges. Naturf. Freunde, Berlin 1914.

statements of the same. The author just quoted says (l. c. III, p. 222) concerning *Gorilla beringei*: »Skull: total length 320» (mm.). Everybody used to read zoological works would of course take this to mean that the distance from gnathion to occiput measured in a straight line is 320 mm. The dimension quoted appeared, however, compared with others to be rather great and thus to be suspected. I took therefore the liberty of writing to Professor MATSCHIE who very kindly gave the following very important information: »Der Typus von *beringei* ist allerdings 320 mm. lang, wenn man den Schädel von der Kaufläche der Incisivi mit dem Bandmasse über den Scheitel hinweg bis zur Protuberantia occipitalis externa misst (!); aber mit dem Taster erhält man einschliesslich der Incisivi 286 mm. vom Gnathion aus 280 mm. und zwar auf der linken Seite — — — bei der Protuberantia 276 mm.» By this method of measuring without informing the reader about the same ELLIOT's statement is extremely confusing.

Thus instead of being larger than the skull of the Mikeno Gorilla as could have expected that of *G. beringei* is considerably smaller as the following comparison proves.

	<i>Mikeno Gorilla</i> ♂ ad.	<i>G. beringei</i> ♂ ad.
Total length of skull	310,5 mm.	276 mm.
Basal length (Hensel)	231 »	196 ¹ »
Condylbasal length	255 »	217 ² »

This difference is thus very great and can hardly be explained by the fact that the type of *G. beringei* is a little younger. According to a communication in a letter from MATSCHIE it has the basal suture open but »das Gebiss ist vollständig im Gebrauch, auch füllen die Eckzähne ihre Alveolen aus». The length of the palate is in *G. beringei* (fide ELLIOT) 116 mm., but in the Mikeno Gorilla not less than 137 mm., and the latter appears thus to have the longest palate of all known Gorillas. In spite of this length of the palate in the latter, it has the distance from the palatal arch to the occiput 194 mm., while the same measurement (fide ELLIOT) in *G. beringei* is only 173 mm. The length of the upper molar series is in the latter 68 mm. (fide ELLIOT), but in the Mikeno Gorilla 72,5 mm.³ The nasals of *G. beringei* are at the broadest place narrower than the nasal opening, and in the original description MATSCHIE says: »die Nasalen sind breit und verjüngen sich ganz allmählich gegen den freien Rand hin». As can be seen from the description above the anterior end of the nasals occupy the whole upper margin of the nasal opening in the Mikeno Gorilla. They are thus not narrowed in front and considerably broader than in *G. beringei*. The eyebrow-ridge is much thicker, about twice as thick in the Mikeno Gorilla as in *G. beringei*. According to MATSCHIE the greatest breadth of the occiput of *G. beringei* is 145 mm. and *planum nuchale* is 32 mm. broader than high. As is to be seen from the above table of measurements the breadth of the *planum nuchale* of the Mikeno Gorilla is 165 and it is 62,5 mm. broader than high.

¹ Fide ELLIOT.

² Communicated by MATSCHIE.

³ In this connection it ought to be noted that ELLIOT has recorded the length of *m*¹ in *G. beringei* to 17 mm., but according to a communication from MATSCHIE it is only 15 mm.

Through correspondence with MATSCHIE I have also had the pleasure of receiving information concerning the shape of the *jugale* in *G. beringei*. In the latter is the posterior angle between the horizontal ramus of *jugale* and its *ramus frontalis* almost right, while it is much smaller in the adult Mikenno Gorilla. (Cf. the figure plate III.) As the same angle in the younger Mikenno Gorillas comes nearer to a right angle than in the old, *G. beringei* represents in this respect a more juvenile stage.

According to MATSCHIE there is an angular ridge between the inner surface of the lateral wall of the orbit and the facial or front surface of *ramus frontalis* of *jugale*, and these two surfaces stand in a right angle to each other.¹ In the Mikenno Gorillas (and in this respect young and old are alike) on the other hand the interior surface of the orbit is quite smoothly rounded off and passes gradually into the semicylindrical facial surface of *ramus frontalis* of *jugale* (Pl. II, fig. 1). *G. graueri* MATSCHIE appears to more nearly resemble the Mikenno Gorilla in this latter respect, but otherwise these two differ very much from each other as will be shown further below.

With regard to the colour of the fur the adult Mikenno Gorilla ♂ differs from *G. beringei* by the absence of »red» as well at the tips as at the bases of the hairs of the head, neck, and legs. From *G. graueri* the Mikenno Gorilla differs by its greater dimensions in many respects. Although the total length of the skull of the former is almost similar, or 312,5 mm, its condylobasal length is maximum 223 mm. against 255 mm in the Mikenno Gorilla, and in a similar way the basal length is resp. 201 to maximum 210, and 231 mm; the width of *planum nuchale* resp. 151, maximum 154, and 165, mm.; the palate length resp. 128 (maximum), and 137 mm., the distance from palatal arch to occipital crest resp. 187 and 194 mm.

I am indebted to Professor MATSCHIE for several of these measurements of *G. graueri*, which have not been published before. They are based on a material of three adult specimens. The same author has at the same time kindly communicated that in *G. graueri* »die Reihe der Schneidezähne im bleibenden Gebisse höchstens 4,2 cm. breit; die Gelenkhöcker am Hinterhaupte bei den ♂ 2,4 cm. bei den ♀ 2,1 cm. lang». In the Mikenno Gorilla the series of upper incisors has a length of 4,5 cm. basally, and the length of *Condylus occipitales* measures in ♂ 2,32 cm., and in ♀ 1,85 cm.

Considering the differences recorded above and the fact that the Gorillas are rather stationary and now live isolated in the upper parts of the mountain forests, chiefly in the bamboo region — at least this is the case with the Mikenno Gorilla — it appears probable that this isolation has brought about a certain differentiation between the different tribes. Therefore, I cannot identify this Gorilla with any of the known eastern forms, but regard it as a separate subspecies which may be called *Gorilla beringei mikenensis*.

The capacity of the brain-cavity of these Gorillas from Mikenno has been measured by means of hemp seed, since *fissura orbitalis* etc. has been closed with a little cotton, and the following results have been obtained:

The young female with milk-dentition (n:o 168)	417 ccm.
The adult female (n:o 167)	435 »

¹ — — — »die Aussenwand der Orbita steht zur Fazialfläche des Ramus im rechten Winkel» (MATSCHIE).

The young male with milk-dentition (n:o 166)	470 ccm.
» » » » m^1 and m_1 (n:o 40)	465 »
The semiadult male (n:o 165)	597 »
The old male (n:o 164)	585 »

These measurements prove in the first rank that the female brain is much smaller than the male one which, of course, at least partly stands in direct relation to the difference in bodily size of the two sexes. Nevertheless it is of great interest to find that the young male in milk-dentition, which has not yet by far attained so great bulk as the adult female¹, already is her considerably superior with regard to the volume of the brain-cavity. It is also rather astonishing to find that the young female Gorilla still in milk-dentition² has a brain-cavity which is nearly as great as that of the adult female, or 94 % of the same, although the difference in size between the specimens is considerable. This fact appears to indicate that the brain of the female Gorilla grows to nearly its definite size pretty early, but then comes to a standstill.

The brain-cavity of the young male Gorilla in milk-dentition and that of the young male with the first molars developed³ is practically the same. That the latter even is a little smaller is no doubt a case of individual variation without importance. During the period of life in which the second and third molars come to full development the brain of the male Gorilla, unlike that of the female, appears to be subjected to vigorous increase in size, as may be concluded from the fact that the brain of the semiadult male is so very much larger than that of the younger specimens. The capacity of the brain-cavity of the younger males is only 79 %, or less of that of the semiadult. But in that semiadult stage the brain of the male Gorilla appears to have attained its full size. Whether it actually decreases again with age as the above measurements appear to indicate, or not, is difficult to decide, as the difference in this direction, expressed above, may be due only to individual variation. The growth of the Gorilla brain is, as it will appear, periodical.

The female Gorilla child n:o 168 and the male n:o 166 appear to be of almost the same age to judge from the development of the teeth and the skull, although the female skin is larger, and this specimen thus is older. The brain capacity of the female is, however, only about 88 % of that of the male, which fact thus proves that the superiority of the males in this respect is pronounced at a rather early period, and it is increased still more with age as is shown above.

SELENKA has in his valuable memoir »Menschenaffen (Anthropomorphæ), Studien über Entwicklung und Schädelbau»⁴ published measurements of the capacity of the brain-cavity of 48 female and 50 male Gorillas, all adult. In the females the capacity varies according to SELENKA between 380 and 530 ccm. with an average volume of 450 ccm. The female Mikenos Gorilla has thus a brain cavity which is somewhat below the average. According to the same author the capacity of the brain-cavity of the male Gorillas varies between 420 and 590 ccm. with an average of 510 ccm. The male Mikenos Gorillas reach

¹ The length of the skin from upper lip to vent is about 57 cm. in the former but 104 cm. in the latter.

² Length of the skin measured as above 67 cm.

³ Length of the skin about 86 cm.

⁴ Wiesbaden 1898—1900.

thus in this respect to, or even above the maximum and stand high above the average.¹ A result of this is that the difference between the male and female brain-capacity, which in the Mikenos Gorillas is about 150—162 ccm., is very much greater in this race than the average which is put to only 60 ccm. by SELENKA.

According to Captain E. ARRHENIUS the Gorillas are rather numerous on the volcano Mikenos. At one opportunity he met with a band of about 30. They are, however, very shy and live in such localities where it is extremely difficult for a man to penetrate.

Fig. 1. The Volcano Mikenos, where the Gorillas live. The summit is covered with snow.

Capt. ARRHENIUS and his men had to crawl on all four in single file through the thickets of bamboo, and it was therefore difficult for him to get space enough to shoot when he struck the band of Gorillas. He saw once a large male who hurried away on his hind legs with a big pole in his hand. When disturbed the Gorillas are said to take their refuge higher up on the mountain in still more inaccessible places.

Captain ARRHENIUS wrote in a letter about the occasion when he surprised the band that they made a tremendous noise — »they barked, screamed and babbled».

Captain ARRHENIUS has further given the following information concerning the Gorillas of Mikenos, which are called »Ingagi» by the natives in the language »kiniaruanda». They live in bands consisting of 20—30 individuals, and do not remain more than about a month at the same place. When they have eaten up what they can find in one tract of

¹ The capacity of an old Gorilla skull from Cameroon in this Museum is 560 ccm.

the forest they leave for another. They feed on »ibizengozengo» and »ibitoke b'ingano». The latter means young shoots of bamboo. The Gorilla makes a kind of nest (»buriri») among the bamboo and puts on top of this slender twigs of bamboo (»ubusaza»).

The natives are more afraid of the Chimpanzee than of the Gorilla, because the former is apt to attack a man without offence, the latter not. If, however, the Gorilla has been attacked, it defends itself bravely and tries to tear its foe to pieces with its teeth. The natives hunt the Gorillas to obtain their skin which they use for wrapping up their copper thread etc., or for revenging some relative. Thus when a man from Sangana had been killed by a Gorilla his family killed five Gorillas in revenge. The natives hunt Gorillas with the aid of dogs. The dog bites the Gorilla and returns to his master who waits for the Gorilla with the spear ready. He throws the spear at the Gorilla and runs away. The dog repeats the manœuvre, until the animal is killed. The natives do not eat the meat of Gorillas, nor that of Chimpanzees.

Anthropopithecus cf. cottoni MATSCHIE.

The valuable material of Chimpanzees which Captain ARRHENIUS has brought home consists of the following specimens:

- N:o 70, 1 ♂, old. »Forêt dans le montagne près de Rutshuru (5 heures), fevrier 8, 1914. Il a fallu trois coups de mauser pour l'abattre; il a voulu attaquer. La femelle blessée s'est enfuite avec un jeune.»
- N:o 73, 1 ♂, young, with milk-dentition and first molar; »forêt dans le montagne près de Rutshuru le 24/2 1914». This is according to Capt. ARRHENIUS's mark in his list identical with the young animal observed together with the old male killed 8/2 1914.
- N:o 160, ♀ ad., skull, skeleton and foetus, Rutshuru, March 1914.
- N:o 161, ♀ ad., Rutshuru, 8 of April 1914.
- N:o 162, young female with milk-dentition, belonging to the adult female just mentioned and taken together with her.
- N:o 163, ♂ ad., Rutshuru, 9 of May 1914.
- N:o 178, ♀ ad., Rutshuru, 15th of July 1914.
- N:o 179, ♀ young, child of the foregoing, with milk-dentition.
- N:o 181, ♀ ad., Rutshuru, 1/8 1914.
- N:o 224, ♀ ad., »Rutshuru, voir (70), Dec. 12, 1914».

Thus the whole series is collected at Rutshuru probably at the same locality. Especially it appears probable that the last, n:o 224, is killed at the same place as the first because ARRHENIUS has written »voir (70)» in his list under that number, and this remark, I think, must be understood as referring to the locality, where n:o 70 had been shot. This is of interest, because among the adult animals these two are most dissimilar inter se, but on the whole the variation is very great as will be shown below.

The young ones have a completely black pelage, but the chin is greyish white and there is a white patch above and surrounding the anal opening. The colour of the naked

face is reddish brown, the colour of the dry skin somewhat resembling the palest shade of »brownish drab» (DAUTHÉNAVY, Rep. de Coul. 302, 1), or in other places a light shade of »burnt umber» (l. c. 304, 1 & 2). The ears have also a similar tint. It is of course difficult to say whether this corresponds to the colour of the living animal, or not, but evidently it has had a light brownish face, perhaps with a russet tinge.

The old animals have the naked parts much darker, so that at the first look they appear to be quite black in the face. One of the specimens, n:o 224, is really quite black all over the face and on the ears. In two others, n:s 161 & 181, the face is quite black, but on the cheeks the colour might perhaps be termed »reddish black» (DAUTHÉNAVY 344, 2). In n:s 178 & 163 the cheeks are still somewhat paler, some kind of russet brown, or a pale shade of »brownish drab» (302, 1) spotted with black. The brown is there also more or less found around the eyes. In the oldest male, n:o 70, the brown dominates, only the centre of the face being black, and the cheeks and the crown brown, mottled with black.

In the young animals only the face is naked, already the fore-head a little above the eyes being sparingly beset with black hairs. All the adult animals display baldness in various degrees and differ by this characteristic from *Anthropopithecus adolfi-friderici* MATSCHIE from the Bugoje-forest northeast of Lake Kivu about which MATSCHIE says:¹ »Eine Stirnglatze ist nicht vorhanden.» In the female 224 and the male 163 there is a triangular bald patch with the base at the eyebrows and extending with the point about 6 ½ cm. backwards from a line connecting the corner of the eyes. In the female 161 this patch is a little broader and more irregular, but does not extend further back. In the females 181 & 178 the bald patch is both broader and about 1 cm. longer so that it reaches to the level of the ears. In the male n:o 70 the bald area is still larger, extending broadly about 10 ½ cm. from the line through the corner of the eyes. The baldness increases evidently with age, n:o 178 being the oldest female and n:o 70 the oldest male.

In the young ones the black hairs surrounding the face are very long so that about 8—8 ½ cm. long whiskers are formed on the sides of the face, almost concealing the ears, behind which there are also equally long and broad tufts, standing out 8—9 cm. from the nape. On the crown the hair only grows to a length of about 2 ½ cm. and is not laid in any particular direction, nor erect. The whiskers begin at the sides of the forehead and cover from there the buccal region. They are standing out straight laterally in their upper parts, but become gradually more and more directed forwards and downwards and thus merge into the much thinner, black beard which is directed forward from behind the greyish white chin, the hair of which latter is short. The hairs on the neck below the ears are also very long and directed forward so as to support the whiskers from behind. The hair of the upper back is about 7—8, on the lower 5—6 cm. The white hair above the vent about 5 ½, below the same about 3 ½ cm. The fur is comparatively soft, but not at all woolly or silky.

In the adult specimens the same general arrangement of the hairs may be recognized, but it is by far not so conspicuous, because the hairs around the face are not at all elongate, or at least not in same degree as in the young ones. In the old male (70) the hairs of

¹ Ann. Soc. roy. Zool. et Malac. de Belgique, t. XLVII, 1912.

the nape, corresponding to the postauricular tufts of the young, are only about 6 cm., and in the other male (163) they are still shorter, about $4\frac{1}{2}$ cm. and do not reach beyond the margin of even the dry ear. The length of the hairs forming the side whiskers is only about 3 cm., and they are not standing out, but chiefly directed downwards. On the whole throat from below the ears, except on the grey chin, the $2\frac{1}{2}$ —3 cm. long hair is directed forwards forming a kind of stubby beard.

In two of the females (161 & 181) the hair behind the ears, and on the nape attains a length of about $6\frac{1}{2}$ —7 cm., in the others it is partly shorter. On the whole, however, the postauricular tufts, and the fur of the nape and the neck appear better developed in the females than in the male n:o 163. The side whiskers, although present and of the same general arrangement, are somewhat less pronounced in the females, but the forward directed hairs of the throat, which to a certain degree form a beard behind the chin, are present, but softer than in the males. The hair on the crown around the bald patch is shorter than elsewhere.

The length of the hair on the middle of the back is in the females n:s 161, 181 & 224 about 6—7 cm., in the oldest male (70) and female (178) about 5 cm., and in the male n:o 163 only about $3\frac{1}{2}$ cm., but the fur of the last one is perhaps more dense than in the others. The shortness of the fur of this male appears rather remarkable. It is possible that it depends upon the season, but it was shot in May and a female shot a month earlier had long fur, and the same was the case with another collected in July.

With increasing age the fur of some parts appears to become scantier than in the young animals not only on the head, but also on the throat. This is especially conspicuous on the old male in which also the hind neck is almost bare, only with scattered hairs.

The colour is also gradually changed with age, the adult not being quite black as the young. The female n:o 224 forms, however, an exception because, although it is by no means the youngest among the adult, it is practically black all over. Even among the sparingly scattered hairs on the chin there are at least as many black as whitish ones. On other parts of the body if a closer inspection should reveal brownish tips of some hairs it is as a rule the broken and faded ends of black hairs. Next in general blackness comes the female n:o 161. Its head has a decided brownish tint which approaches DAUTHÉNAY's »warm sepia» without being quite identical with the same. The beard on the throat is paler and somewhat more greyish brown, the scattered hairs on the chin are whitish grey. The arms and hands are quite black, but the back is overlaid with a brownish tint produced by brown tips to some hairs, the hind legs are similar, though with less brownish. A great number of these brownish hair-tips, but not all, belong to old, broken and faded hairs.

The female n:o 181 is pretty similar, but is more greyish brown on the lower back and on the hind legs.

The old female n:o 178 has the short hairs on the upper parts of the head light brownish grey, the whiskers dark brown, the arms and upper back black mixed with brownish tips. From the middle of the back the colour gradually fades more and more so that in the pelvic region it is a rather pale brownish grey. The hind legs are darker brownish grey. The breast and belly are blackish brown.

The male n:o 163 is very dark. Its head, arms, breast, and upper back are almost black, grizzled with light brownish tips to a number of the hairs (least on the arms). On the lower back these light tips dominate so that it is quite overlaid with brownish grey. The same is also the case with the hind legs, although not quite in the same degree.

The old male (n:o 70) has the remaining hairs on the upper side of the head partly grey, partly blackish. The whiskers are in their upper portion blackish, in their lower brownish grey. The arms and upper back are blackish, but mixed with whitish grey hairs. The colour of the back becomes gradually paler towards the pelvic region and is there very pale brownish grey, in some lights it might be termed isabelline grey. The upper parts of the thighs are like the middle back, but the greater portion of the hind legs is just as pale as the lower back. In the old specimens where the pale brownish grey colour dominates on some parts of the body the hairs themselves are to great extent pale horn-coloured, unlike the condition in other specimens which only are more or less grizzled with brownish. In the latter as already has been mentioned the brownish tint is produced at least partly by the faded broken and often split ends of the hairs. Whether the pale ends of the hairs are intact or broken they are somewhat shiny by which the effect produced by them is greater than it otherwise should have been.

The description thus given proves that the fur and its colour is rather variable in these Chimpanzees. Partly this variation is explained by the difference in age, the old ones gradually becoming more bald-headed and more pale brownish grey on the lower back and the hind legs. The almost complete blackness of the rather old female n:o 224, and the shortness of the fur of the male n:o 163 appear, however, without accordance with other facts and indicate a strange variability which is also displayed by the skulls as will be set forth below.

All the adult specimens are provided with very well developed ischiadic callosities. These are largest in the old ones, f. i. 7×4 cm. in the old male, $6,5 \times 3,5$ cm. in the oldest female. In the least old female (n:o 181) the dimensions of these callosities are about $4,5 \times 2,3$ cm. The callosities are so thoroughly developed that they can be seen very plainly from the inner side of the skin as well. In the young animal with milk-dentition the callosities can hardly be more than traced on the skin.

The length of the skin of the old male (70) measures from upper lip to opening about 93 cm. The same measurement of the other male is about 91; that of the largest female (181) about 89. The other female skins have this dimension about 83—84 cm.

The ears are small, basally at the insertion measuring from about 35 to 40 mm. on the skins and probably the longest diameter from one free lobe to another does not much, if at all, exceed 50 mm.

These skin measurements prove that this Chimpanzee is smaller than *Anthropopithecus pурсchei* MATSCHIE from the forest between Lake Kivu and Lake Luhondo, German East Africa. The same fact is corroborated by the cranial measurements below. *A. pурсchei* has a cranial length to gnathion of 205 mm. *A. pурсchei* is also said to be »ohne Stirnglatze».

A. cottoni MATSCHIE has been described from specimens which had not reached maturity and is thus insufficiently known. As the description of *cottoni*, as far as it is

known, does not disagree with the present specimens in any important point, I have used this name for the Chimpanzees of Rutshuru especially as the type locality of *cottoni*, »Sassa-Fluss, südöstlich des Albert-Edward Sees», is not geographically very distant from Rutshuru.

Cranial dimensions of adult Chimpanzees from Rutshuru.

	♂ n:o 70	♂ n:o 163	♀ n:o 160	♀ n:o 161	♀ n:o 178	♀ n:o 181	♀ n:o 224
Total length of skull	197,5 mm	186 mm.	184,6 mm.	186 mm.	179,5 mm.	189 mm.	177 mm.
Occipitonasal length	151 »	141,8 »	139,5 »	141 »	136 »	143,5 »	134,8 »
Basal length	135,5 »	131,5 »	—	129 »	125 »	129 »	123,5 »
Condylbasal length	150,5 »	145 »	142,3 »	144,6 »	141,5 »	143,5 »	137,5 »
Zygomatic breadth	123,5 »	131 »	123,2 »	113 »	121 »	117,5 »	—
Least postorbital breadth	69,7 »	65 »	69 »	66,6 »	67,5 »	71 »	66,5 »
Breadth of brain-case	100 »	100 »	100 »	92,4 »	96,5 »	98,5 »	93,7 »
Breadth across alveoles of canines	58,4 »	65,5 »	54 »	50 »	51 »	51,7 »	51,2 »
» » outside of <i>m</i> ⁸	54,7 »	53,6 »	58 »	51,3 »	55 »	52,3 »	55,3 »
Length of palate mesially	75,8 »	78,4 »	—	73,7 »	71 »	71,8 »	69,5 »
» » upper molar series	46,3 »	43,1 »	44,5 »	43,5 »	39 »	44,8 »	40,1 » ²
» » » true molars	31,7 »	29,5 »	30,5 »	30,2 »	26,3 »	30 »	28,2 »
» » lower molar series	51,5 »	48,2 »	49,5 » ¹	51 »	43 » ¹	51 »	44,8 (44) »
» » » true molars	34 (33,4) »	31,7 »	32,7 » ¹	34 »	28,4 » ¹	33,7 »	30,1 »
Breadth across orbits	98,5 »	103,7 »	100,1 »	94,3 »	90,2 »	101 »	—
Least interorbital width	18,8 »	19,8 »	14,2 »	16 »	13 »	18,3 »	11,6 »
Height of orbit inside	27,2 »	32 »	37,7 »	28,8 »	37,4 »	32,7 »	32 »
Width » » »	32,3 »	31 »	35,5 »	32,7 »	32 »	32,7 »	33,2 »
Breadth of <i>m</i> ⁸	11 »	10,8 »	11,2 »	11,2 »	9,5 »	9,8 »	9,7 »

The measurements recorded above show a very considerable variation chiefly with regard to the orbits, interorbital space and the teeth.

The shape of the orbits influences the superciliary ridge which in all is very pronounced, but with differently arched outline. In the ♂ n:o 70 (Pl. V, fig. 1) it forms an even arch with no concavity above the interorbital space. The ♀ n:o 181 shows almost the same condition, but in the ♂ n:o 163 there is a slight depression above the interorbital region, or perhaps more correctly the superciliary arch above each orbit is independently a little more elevated than mesially. In the ♀ n:o 161 (Pl. V, fig. 3) about the same condition prevails, but in the females n:s 178, 224, and 160 (Pl. V, fig. 4) the arches above the orbits are considerably raised, and in the last the mesial concavity amounts to nearly 4 mm. which does not sound much, but nevertheless gives a quite strikingly different aspect of these skulls, effected by the simultaneous raising of the eyebrow ridges with a mesial concavity between them and the increased height of the orbits. This enlargement of the orbits is, however, only produced by the raising of the superciliary ridges, and therefore the upper portion of these orbits looks very shallow.

¹ Not counting extra anomalous molar.

² Premolars wanting, thus approximately from alveoles.

It is also of interest to note that the skulls with raised eyebrow-ridges (thus 178, 224, and 160) at the same time have a considerably narrower interorbital septum than the others. There appears consequently to exist a correspondence between these characteristics.

The variation with regard to the teeth is of two different kinds viz. partly an evidently individual anomaly conspicuous by the presence of supernumerary molars, and partly a variation in size of the molars. The former anomaly, although interesting in itself, cannot, of course, be of any taxonomic value, but will be described further below, the latter again exhibits differences which are analogous to such as often are used for distinguishing different races, or even species.

If the measurements of the molars of the females as recorded in the table are examined, we find at the first look that two females viz. n:o 178 (Pl. VI, fig. 2) and n:o 224 (Pl. VI, fig. 4 a) have much smaller molars than the others (f. i. Pl. VI, fig. 4 b). These two females have somewhat smaller skulls and have also a narrow interorbital space and the superciliary ridge raised above each orbit but with a mesial concavity. There is, however, a third female (n:o 160) with such superciliary ridge, very large orbits and comparatively narrow interorbital space, and that one has large molars. There is thus no certain correlation between small molars on one hand, and a doubly arched superciliary ridge and a narrow interorbital septum on the other hand. Nor do the characters mentioned stand in correlation to the colour of the fur as one of the small-toothed, n:o 224, is the blackest, and the other, n:o 178, is the greyest among the females.

In the two males as well the molars are considerably different in size. But in this case the small-toothed specimen (163) has at least not narrower interorbital space than the large-toothed. Thus, although the differences in certain cases, for instance with regard to the breadth of the interorbital space, and the size of the molars, certainly are great enough to appear to be of distinguishing value between different races the lack of correspondence, as set forth above, upsets every attempt of separating these specimens in two racial groups, as for instance a large-toothed and a small-toothed.¹ In spite of all differences it appears impossible for the present but to regard all as individual variations of one and the same race. This is of very high interest as very seldom wild mammals from one and the same place vary in such a remarkable degree.

If not the molars generally, but one of them is compared in the different specimens a similar result is obtained. It is best to use m^3 for this comparison as it is most variable and at the same time it is smaller than the first and second true molars. A look at the table of measurements above, in which the breadth of m^3 is recorded, proves that this dimension varies not a little. The greatest interest is, however, connected with the fact that this variation appears to be rather independent of the size of the other molars. Thus the female n:o 181 is decidedly large-toothed, but its m^3 are among the smallest. The general shape, and the number and size of the cusps are also variable characteristics, but seemingly independent of others. The normal outline of the crown of m^3 is, of course, more or less square, but in n:o 181 it is rounded. Normally there ought to be four cusps,

¹ Such an animal as n:o 160 could in such a case only be explained as a hybrid!

two outer and two inner, but their development is variable. Especially the posterior inner cusp is often reduced in size, or even lacking. This is so irregular that the same animal may have four cusps on one, but only three on the other side, and this may happen in large-toothed as well as in small-toothed specimens.

The size of p^1 is variable as well. In the small-toothed female n:o 178 its greatest transverse diameter is 8,5 mm. on one side, 8,8 mm. on the other; in the large-toothed female n:o 160 it is resp. 9 and 9,2 mm.; in n:o 181 about 9,8 mm., and in n:o 161 resp. 10 and 10,4 mm.; in the male n:o 70 the same dimension is 11,4 mm., and in the male n:o 163 only 9,2 mm.

The lower jaw is also extremely variable in shape. In the old male, n:o 70, the distance from the upper edge between both i_1 to the knob at the posterior margin of the symphysis measures 41,2 mm. and in the other male, n:o 163, 42,4 mm., but in the females the difference can be greater as in the two large-toothed females, n:o 160 and 161, where it is resp. 45 and 41,6 mm., and in the two small-toothed females resp. 40,3 and 39 mm. The height of *ramus horizontalis* is in the others generally about 26 mm., or a little more, but in the small-toothed n:o 178 it is 28, and in the other small-toothed n:o 224 only 22,4 mm.

The variability extends, however, also to many other parts than those recorded in the table, or mentioned above.

Foramen magnum is for instance in some specimens large, in others small, in some oval, in others round (quite circular in n:o 224), or even heart-shaped (n:o 178). In correlation to the width of *foramen magnum* the breadth across *condyli occipitales* is very different in different specimens. It is smallest in the old male n:o 70 viz. 37 mm., and in the large-toothed female n:o 161 viz. 37,4 mm. In the other male n:o 163 it is 39 mm. In the small-toothed females n:o 178 and 224 it is resp. 38,4 and 39,3 mm., and in the large-toothed females n:o 160 and 181 resp. 39,2 and 44 mm.

Strange to say variation with regard to supernumerary molars appears to be a less rare occurrence among the Anthropoid Apes than could be expected. BATESON has in his book »Materials for the Study of Variation»¹ recorded not less than four Chimpanzees with supernumerary molars, which in three of the cases were situated in the upper, and in one in the lower jaw. Among 8 full-grown Westafrican skulls now in the collections of the R. Nat. Hist. Museum one has a quite small m^4 on the left side. The present author has also at earlier opportunities seen supernumerary molars in Chimpanzee skulls from Debundscha, Cameroon. In the series of 7 fully adult Chimpanzee skulls which Captain ARRHENIUS has brought home from Rutshuru not less than 2 present such an anomaly, viz. the numbers 160 (Pl. VI, fig. 3) and 178 (Pl. VI, fig 2). Both these are females, and it is of interest to note that the former is large-toothed the latter comparatively small-toothed (conf. above).

N:o 160 has a supernumerary molar as well in the upper as in the lower jaw. That of the upper jaw is, however, more teratological as it is situated laterally of the molar series outside of m^2 of the left side, which has been pushed inwards a little but is of nor-

¹ London 1894.

mal size. It has already during lifetime had the greater part of its crown broken, or worn off, but it clings to the jaw bone by means of two roots. The supernumerary molar of the lower jaw is m_4 of the left side, situated in a continuous series with the other molars (Pl. VI, fig. 3). Its crown is nearly square measuring 9 mm. in length by 8,8 in breadth, and has four cusps, the anterior pair of which is somewhat greater and connected by a ridge.

The skull n:o 178 has a well developed m_4 on either side of the lower jaw (Pl. VI, fig. 2). These are, however, smaller than the ordinary molars, measuring $7,2 \times 6,7$ mm. They have only three cusps each, and these are on the right m_4 subequal, but on the left the outer of the anterior pair is dominating, and much larger than the others. As these supernumerary molars are somewhat worn, especially the large cusp on the left side, it is evident that they have been in use working against m^3 when the lower jaw moved.

SELENKA has in a very interesting paper »Die Rassen und der Zahnwechsel des Orang Utan»¹ recorded many important facts also concerning supernumerary molars which he has found in 20 % of 194 adult skulls of Orangs. Some of his statements appear to refer to these Chimpanzees as well, viz. that supernumerary molars are more often found in the lower jaw than in the upper, and more often on the left than on the right side, but this may be mere coincidence as it is not corroborated by BATESON's records.

SELENKA regards the fourth molars of the Anthropoid Apes as »Neubildungen» and concerning the cause of their appearance he utters as follows. »So gewagt es im allgemeinen ist, die Entstehung eines Organs auf die Wirkung mechanischer Zug- und Druckkräfte zurückzuführen, so dürfen solche Erklärungsversuche doch nicht von der Hand gewiesen werden, wenn sie sich auf blosse Modificationen vorhandener Organanlagen beziehen. In diesem Sinne scheint es erlaubt, die Veranlassung zur Entstehung neuer Zähne in der zunehmenden Verlängerung der Kiefer zu suchen. Die Vergrößerung der Kaumuskeln bewirkt eine Vergrößerung ihrer Ansatzflächen am Kiefer, und die auffallende Verlängerung des horizontalen Astes des Unterkiefers, welche gegen Schluss des Zahnwechsels stattfindet, wird auch das Hinterende der Zahnleiste in Mitleidenschaft ziehen können und derselben Gelegenheit bieten, die ihr innewohnende Fähigkeit zu entfalten, nämlich Zahnkeime zu entwickeln.» The explanation thus offered appears to be plausible.

The capacity of the brain-cavity of the Chimpanzee skulls of the present collection has been measured by means of hemp-seed after closing *fissura orbitalis* etc. with a little cotton, and the following results have been obtained by this.

A young female with milk-dentition (n:o 179)	296 ccm.
The adult female n:o 178	335 »
» » » » 224	345 »
» » » » 161	348 »
» » » » 160	400 »
» » » » 181	400 »
» » male » 163	383 »
» » » » 70	427 »

¹ Sitz.ber. d. Kgl. Akad. d. Wiss. Berlin, 1896, p. 381—392.

From this table can be seen that with regard to the capacity of the brain-cavity these Chimpanzees can be arranged in two groups one with smaller, and one with larger brain. One of these groups comprises three females and a male, the other two females and a male. The difference in volume of the brain-cavity is with regard to the females more than 50 ccm., and with regard to the males about 44 ccm., thus in both cases quite considerable. The question presents itself then again, is this difference due to racial distinction, or not? For the elucidation of this it is necessary to investigate, if there exists any correlation between this difference in brain-capacity and the variation of other characteristics which has been discussed above. Such an investigation is facilitated by the table of measurements above. From this we learn that two of the small-brained females (n:o 178 & 224) have small teeth, but this is not at all the case with the third (161). The first two of these small-brained females have raised eyebrow-ridges and thus comparatively high orbits, the third again (n:o 161) (Pl. V, fig. 3) has the superciliary arch very little raised and therefore comparatively low orbits. On the other hand especially one of the large-brained females (n:o 160, Pl. V, fig. 4) has raised eyebrow-ridges and very large orbits.

The breadth and shape of the palate is also very different in the different specimens. Two of the small-brained ones (n:o 178 & 224) have a comparatively broad and flat palate with a width inside m^2 of about 36,5 mm., but the third (n:o 161) has the narrowest and most vaulted palate of all with a width inside m^2 of 28 mm. On the other hand the corresponding measurement of one of the large-brained females (n:o 181) is 34,5 mm, but in the other (n:o 160) it is 37,5 mm. The old large-brained and large-toothed male has the palatal breadth inside of m^2 34 mm.; in the comparatively small-toothed and small-brained male the same dimension is almost similar or 34,5 mm. In such a case it is evidently impossible to use this character for dividing the present material of Chimpanzees in two racial groups. The longest palate measuring 73,7 mm. is found in one of the small-brained (n:o 161), but also the shortest palate, 69,5 mm, belongs to a small-brained specimen (n:o 224).

The greatest width of the interorbital septum is found in one of the large-brained (n:o 181) with 18,3 mm., and one of the small-brained (n:o 161) with 16 mm., next comes in this respect a large-brained (n:o 160) with 14,2 mm., then again two small-brained (n:o 178 & 224) with resp. 13 and 11,6 mm.

This complete irregularity of the variable characteristics makes it plainly difficult to attribute any racial value to the differences in the size of the brain-cavity as expressed above. This does not exclude that in other cases a difference with regard to the capacity of the brain-cavity may be of racial value as SELENKA has proved to be the case with the Orangs.

Among the collections of the R. Nat. Hist. Museum there are, however, some other Chimpanzee skulls which appear to indicate a considerable variability among these animals even with regard to the brain-case and its capacity. To prove this the following cubic measurements may be quoted concerning some Chimpanzee skulls collected at Cape Debundscha, Cameroon. They are all from the same locality. The male, at least, belongs to the *Anthropopithecus calvus* group. To the female skulls there are no skins,

but two other skins from Debundscha belong also to the *calvus* group, and it is therefore most probable that all three skulls represent the same race.

Old female from Debundscha	385	ccm.
» » » » 	460	»
» male » » 	323	»

These cubic measurements are very striking, because the brain-cavity of the male¹ is much smaller than that of the females, and its capacity is even below the minimum — 350 ccm. — for male Chimpanzee skulls according to SELENKA. On the other hand the largest female has a capacity which is above the maximum — 450 ccm. for female Chimpanzee skulls according to the same authority, and not far from the maximum even for male skulls (480 ccm.).²

The small-brained female Chimpanzees from Rutshuru have a capacity of the brain-case which is not much above the minimum — 320 ccm. — according to SELENKA, but the large-brained are above the average — 390 ccm. — in this respect. The largest of the males is also above the average for males, or 420 ccm.

The average difference in capacity between male and female Chimpanzee skulls SELENKA puts to 30 ccm. Broadly speaking a similar difference in capacity exists between the largest male and the large-brained females on one hand, and between the smaller male and the small-brained females on the other.

As quoted from Captain ARRHENIUS's notes the old male Chimpanzee was ready to attack when shot. The natives also fear the Chimpanzee, which is called »Impundu» in the Kiniaruanda language, and say that he often will attack a man. They say also that the Chimpanzees use sticks or branches for fighting, how true this might be is uncertain. The Chimpanzees of this region make nests in the crown of high trees, just as is known about such apes from other places.

Colobus occidentalis ROCHEBRUNE.

A very fine series partly from Rutshuru, and partly from Beni. Of those from the former place eight are males in different stages of age, four are females, and one quite young (♀). All these specimens are signed »la Shasha rivière — petit forêt», and with exception of one male shot ¹⁶/₂ 1914, the others have been collected ²⁷—²⁸/₂ 1914. The three specimens from Beni are all males shot in January 1914.

The latter are larger than the others, their skulls measuring resp. 119, 122 and 124 mm. in total length, while none of the male skulls from Rutshuru attains a greater length than 115 mm. Otherwise no distinct difference is to be seen. Both in specimens from Rutshuru and from Beni there is some variation with regard to the extension of the white on the sides of the head as in some almost the whole ear is surrounded by white except at the upper margin, while in others the greater part of the ear is implanted in the dark

¹ This Chimpanzee was, however, regarded by the donor Mr. G. WALDAU as an unusually small individual.

² For further comparison may be mentioned that the capacity of a female Chimpanzee skull from Kribi Cameroon is about 373 cc, and that of another also female (possibly *A. vellerosus*) from Ya River, Cameroon, is 360 cc.

area. This variation appears, however, to be independent of locality. It is not impossible that the *Colobus* monkeys living near Rutshuru, in consequence of less favorable alimentary conditions there, constitute a somewhat smaller, less well nourished race than those in the great forest at Beni, but undoubtedly analogous conditions are to be found in other localities as well. The quite young specimen of this collection, mentioned above has already the colour pattern of the adult, although the white mantle fringe is very scantily developed. On the back the under fur is greyish. The length of head and body of this skin is 335 mm.

In spite of the somewhat greater dimensions of the skulls from Beni, as mentioned above, the capacity of the brain-cavity is fully as large in those from Shasha, Rutshuru. The capacity of three male skulls from Beni is resp. 77, 78 and 80 ccm., while the same of two skulls from Rutshuru have this measurement resp. 79 and 81 ccm., thus practically the same.

It might be possible that the subspecies *Colobus occidentalis rutshuricus*, which LORENZ has established¹, might be maintained in consequence of the somewhat smaller dimensions of the skull as mentioned above. The characteristics of the tail, however, which LORENZ quotes do not hold good.

The second race, which LORENZ has named *C. occ. ituricus*², from Mawambi is said to differ from *C. occidentalis* ROCHEBRUNE »durch das Fehlen einer längeren Schwanzquaste». This might partly be individual, partly seasonal. The long hairs of the tuft of the tail may be worn off. Among the males from Beni in the present collection one has the white hairs so much worn that they hardly form any tuft, the others have very well developed tufts.

***Colobus ellioti* DOLLMAN.**

2 ♂♂ (n:o 202 & 203), 1 ♀ (n:o 204), from the forest about two days west of Beni, Aug., Sept. 1914; 2 ♂♂ ad. (n:o 239 & 242), 1 ♂ juv. (n:o 241), from Beni, Jan. 1914.

Dir. LORENZ VON LIBURNAU had received a series of more than 30 specimens of red *Colobi* from the Ituri forest, and on this material he based a species which he named »*Colobus variabilis*» in consequence of its great variability. This took place in the year 1914.³ In the same year Prof. MATSCHIE named a red *Colobus* from Ituri between Irumu and Beni *Piliocolobus ellioti melanochir*. It appears rather possible that the latter is included in the former. Two of the specimens recorded above, n:o 241 & 242, agree with MATSCHIE's *melanochir* with regard to their »Büschel silbergrauer Haare hinter den Ohren» and the whitish grey lower side, but at the same time they agree in some respects with LORENZ's group »d» of *variabilis*, which also is said to have »verlängertes Haar hinter den Ohren silbergrau». The crown of the head behind the black frontal band is »fawn» (DAUTHÉNAY, Rep. de Coul. 308, 3 & 4). The shoulders and upper parts of the arms are a little paler (308, 2 & 1). The nape is darker than the crown, inclining to

¹ Anz. d. K. Akad. d. Wiss. Wien, Jahrg. LI, 1914, p. 508.

² l. c.

³ Anz. d. K. Akad. d. Wiss. Wien, Jahrg. LI, 1914, p. 383.

»madder brown». The upper back is much mixed with black. The middle of the back »reddish black» (344, 3 & 4) on the sacral region fading to smoky blackish which gradually on the thighs and hind legs passes into a colour between »slate» (362) and »smoke grey» (363), but somewhat darker than either. The sides of the head are in the older specimen light grey with a shade of »reddish salmon», in front partly overlaid with blackish hairs. (In the younger specimen the same parts are a pale shade of »fawn».) The throat and the inner side of the arms are smoke grey; the lower side of the body silky whitish grey, inside of hind legs pale grey. Hands and feet smoky black; tail almost pure black.

The third specimen (n:o 239) shot at the same time is partly similar, but darker. The hairs behind the ears are smoke grey. The sides of the head exhibit the palest shade of »dark fawn» (307) mixed with black. The back is »chocolate» (343, 3; or RIDGWAY's: »Prouts brown») overlaid strongly with black in the middle parts, but dominating on the sacral region and from there shading into the somewhat paler (343, 2) hind legs. Hands, feet, and tail black. Lower side of body smoke grey.

One of the males (n:o 202) collected in Aug., Sept. 1914 is rather similar, but the colour of its head, nape and shoulders is more saturated, something between »maroon» (341, 4) and »madder brown» (334, 4). The sides of the head is a pale shade of »burnt umber» (304, 1). The back is »carob brown» (342, 2—4). Otherwise like n:o 239.

The remaining male (n:o 203) is the reddest of all, and most resembling *C. ellioti* DOLLMAN, but differs from the original description of the same by its black hands, and grey, instead of buff, under parts. Head behind black frontal band »madder brown». Nape, shoulders and anterior back »mahogany» (335, 4); on the middle of the back the colour passes into »carob brown» (342, 2) which gradually becomes somewhat paler posteriorly (342, 1) and ends abruptly just above the black tail. Arms almost »Indian chestnut red» (333, 4) dark smoky grey on the inside; hands black. Hind legs »warm sepia» (305, 1); feet black. Lower side of body from the throat backwards rather dark smoke grey, paler on the breast. The hair-tufts behind the ear are dark smoky grey in their lower portion, but blend gradually into the colour of the nape. The sides of the head are something between the palest shades of »madder brown» (334, 1) and »red ochre» (332, 1), only little mixed with black in front. The hairs are also as usual paler (in this case somewhat buffish) towards the tips.

The female (n:o 204) has the crown of the head, behind the narrow black band, »fawn» (308, 2—3). The upper parts of the arms are also »fawn», but a little paler (308, 1—2). The shoulders are much mixed with black, and the whole of the upper side from the upper neck to the tip of the tail is black, perhaps with a reddish shade on the neck. The outer sides of the hind legs is dark smoky blackish grey, darker than RIDGWAY's »fuscous». The inside of the limbs and the lower side of the body are smoke grey, palest on the breast.

These descriptions prove that not two specimens are fully alike.

The question is then to decide, of how great importance these differences are, and whether more than one race is represented by these specimens. It is extremely difficult to have this question settled. It might, however, be assumed that the two

specimens, n:o 241 & 242, which have the palest silvery grey ear tufts, and the lower back smoky blackish without any additional reddish or brownish tint (neither »carob brown», nor »chocolate») might represent a separate race, and that the other ones, in which the ear tufts were darker (»smoke grey»), and in which the reddish or brownish shade of the back extends to the root of the tail, another race. The two first mentioned specimens have also the hind legs without brown.

The red male n:o 203 has, of course, a different and striking appearance, but it seems very difficult to separate it for instance from n:o 202 on account of its colour, only because it is more vividly red.

If thus n:os 241 & 242 should be separated from the rest, the question is not, however, solved. It remains to decide, how they are to be named. It has already been pointed out that they resemble MATSCHIE's *melanochir* with regard to the colour of the ear-tufts. But MATSCHIE stated plainly that his *melanochir* is provided with »karobbenbraunem Rücken», and this does not suit in this case. In a similar way the specimens of all the groups into which LORENZ VON LIBURNAU has divided his »*variabilis*» appear to have more or less reddish or brownish tints on the lower back, and on the hind legs. If the colour presented decisive characteristics, these two specimens could not be referred to »*melanochir*», nor to »*variabilis*».

It is, however, extremely difficult to believe that so many different species and subspecies of red *Colobi* should live in the forest near Beni, and it appears thus most probable that *variabilis* and *melanochir*, and perhaps also *elliotti* and *multicolor* are only colour phases of one and the same species, or perhaps do these names apply to different herds or bands of monkeys. This cannot be satisfactorily elucidated before more material with more exact and more complete information concerning the animals and their mode of life is obtained. Are for instance all individuals of the same sex and age in the same band of these red *Colobi* quite alike? Are all specimens which live in the same tract of the forest similar? Before these questions and some others are answered, it is difficult to decide what is racial difference, or not.

The type locality of *variabilis* is Moera about 20 kilometres north of Beni, as I am told.

The type specimen of *elliotti* was collected much further southwest, viz. »90 kilometres west of the south end of Lake Albert Edward».

MATSCHIE's *melanochir* on the other hand is collected north of Beni, on the way between that place and Irumu.

Finally LORENZ has described a *Colobus multicolor* from Mawambi at Ituri about 140 km. northwest from Beni. This *multicolor* has the sacral region »dunkel schwarzbraun», and the »Schenkel aussen zunächst schwarzbraun, weiter unten lehm Braun». In having these parts without reddish *multicolor* offers some likeness with the above described n:os 241 & 242, but otherwise the difference is great. *C. multicolor* has f. i. the tail reddish brown, the ear-tufts »kastanienbraun, schwarz gerändert» etc.

The skull of the type of *C. elliotti* was lost. LORENZ has not published cranial measurements of »*C. variabilis*» and »*multicolor*». The measurements, which are recorded below, of the skulls of the four adult male skulls of this collection agree on the whole quite well

as well inter se as with those of *melanochir* which MATSCHIE has published. The skull of the reddest specimen (n:o 203) is the largest (Pl. VI, fig. 5), but in is also the oldest with *sutura coronalis* obliterated. — All four specimens are fully adult with well developed *crista sagittalis* and long canines. With this skull the type skull of *melanochir* agrees in total and basal length as well as in several other respects except zygomatic breadth, in which respect *melanochir* more resembles the smaller specimens of this collection. The skull dimensions do not support any hypothese about racial difference.

	♂ N:o 242	♂ N:o 239	♂ N:o 202	♂ N:o 203
Greatest length of skull	112 mm.	107,5 mm.	109 mm.	115 mm.
Condylar-basal length	88,3 »	85,5 »	88 »	90 »
Basal length	77 »	77 »	77 »	79,3 »
Zygomatic breadth	80,7 »	83,5 »	82,3 »	90,4 »
Breadth of brain-case	56 »	56,3 »	58,2 »	60,5 »
Least interorbital width	11,1 »	10,2 »	11 »	12,2 »
Width of skull across <i>meatus auditorius</i> . .	61,6 »	63,2 »	63,3 »	65,2 »
» » <i>planum nuchale</i>	64,6 »	65,1 »	65,6 »	66,2 »
Breadth across outside of <i>m</i> ¹	33 »	33,5 »	32,5 »	35 »
Length of upper molar series	30 »	29,6 »	30 »	29,5 »
Palate length to tip of spine	39,2 »	40,2 »	40 »	44 »
Brain capacity	70 ccm.	69 ccm.	80 ccm.	80 ccm.

The difference in brain capacity between these specimens is comparatively very great.

The anterior root of the zygoma is in all situated above the anterior half of *m*² (Pl. VI, fig. 5), even in the young male. The latter is just getting its first permanent premolars, which are cutting the gum. Its *dp*² are still in place, but are in the act of being pushed away by *p*², the crown of which is already visible. The small milk-canines are still in place. The last molar is just below the gum in both jaws. In the lower jaw none of the milk premolars has fallen out as yet.

It is very remarkable that the capacity of the brain cavity of this young animal is about 88 ccm., thus more than the maximum of the adult males. It may also be remembered that this young male is to judge from the colour of the skin most nearly related to the male n:o 242, which has a comparatively small brain.

Since the above already was put in print I have had the pleasure of receiving a letter from my friend Director LORENZ VON LIBURNAU in which he kindly communicates that since he has received still more material from Beni, Mawambi, Moera etc., he is convinced that *Colobus variabilis* is identical with *C. ellioti*, and that this also is the case with *C. melanochir*.

This is thus fully in accordance with the opinion which I have expressed above.

The extremely great variability of these red *Colobi*, as set forth in LORENZ's paper as well as in this one, and the fact that *Colobus ellioti* was described on insufficient

material, has caused the confusion, which now, as it may be hoped, is removed. On the other hand, however, this great variation is of deep interest, and it ought to be considered in connection with several other striking proofs of variation which are elucidated in this paper.

***Cercopithecus schmidti enkamer* MATSCHIE.**

1 ♂, 2 ♀♀ from Rutshuru, ²⁵/₉, 1913; 2 ♂♂, 2 ♀♀ *ibid.*, ²⁸/₉, 1913; 2 ♂♂ *ibid.*, ¹⁴/₁, 1914; ♂ ♀ from the forest at Masisi in the Kivu district, Febr. 1914; 1 ♀ from Beni, Aug. Sept., 1914.

All these specimens show the characteristics by which according to MATSCHIE the subspecies *enkamer* differs from the typical *schmidti*, viz. — — »die Aussenseite der Unterschenkel hell bestäubt, der Schwanz auch dicht über dem Anus tief grau» — — —. Only one of the specimens from Rutshuru has the basal under parts of the tail light grey as shall be the case in *C. schmidti sassæ* MATSCHIE (viz. ♀ n:o 22). As this specimen has been shot the same day as other specimens with normal colour at the root of the tail this may be only an individual aberration. The colour of the specimens of this collection is on the whole essentially alike, although presenting variation. The male (but not the female) from Masisi has very long black tips of the hairs of the upper parts of the head, so that the crown looks almost black when the hairs are laid down. It is uncertain, however, if this is more than an individual variation. The same is probably also the best interpretation of the fact that this specimen has a brighter shade of yellow in the rings on the hairs of the crown than the other ones, even than the female from the same place. These rings are somewhat different in shade in the different specimens perhaps palest in the female from Beni.

There are still some other differences in shades of colour, but they appear to be individual as well. The light sprinkling on the arms is somewhat more or less pronounced in different specimens from the same locality and of the same sex. The darkest hind legs with least sprinkling are found in the male from Masisi and the female from Beni, thus in those from the most distant localities, but some of the other specimens are almost as dark.

The colour of the tail is rather variable; in some instances it may perhaps have faded. Often the tail of the females as well as also the same of several males is »fawn» (DAUTHÉNAY: Rép. de Coul. 308) with a lighter shade of this colour below and on the sides darker above. Some males have the tail bright rust-red (Rép. 318, 1 & 2). The female from Beni has the darkest red tail resembling a light shade of »mahogany» (335) on the sides and almost »madder brown» (334) above. In some of the females from Rutshuru the tail is more dusky above than in other specimens, but I am inclined to regard all these variations in colour as wholly individual.

In the year 1914 LORENZ VON LIBURNAU named some Guenons from »Wabembe im Nordwesten des Tanganyikasees» »*Lasyopyga schmidti montana*».¹ The distinguishing characteristics of this supposed new race should consist in the following: »Behaarung

¹ Anz. d. K. Akad. d. Wiss. Wien 1914 Jahrg. LI, p. 357.

an der Innenseite und an dem Rande der Ohren nicht weiss, sondern rötlich-ocker; Schwanz an der Unterseite ohne Weiss.» A single specimen from Rutshuru is said to hardly differ from those from Wabembe. If the present specimens are examined with regard to the colour of the hairs on the ear the following is found. One of the males from Rutshuru has a rather pale »reddish-ochre» tint on the tips of the hairs of the inside of the ear. In another male the same may be traced. In one of the females a similar condition is found, but in a still paler shade. In the male from Masisi the tips of these hairs are slightly stained in a similar way, but in the female it is hardly discernible. In the other specimens the hairs in question are white or whitish. This characteristic appears thus to be subjected to variation and is not alone sufficient for distinguishing a subspecies.

Other specimens from the Ituri forest at Beni and Mawambi the author just quoted has named »*Lasyopyga schmidtii ituriensis*». As, however, MATSCHIE's subspecies *Cerco-pithecus schmidtii enkamer* has been collected at the same locality, »*ituriensis*» and »*enkamer*» without doubt are identical. As MATSCHIE has given his name two years previously,¹ it must have priority before the other. The name *ituriensis* must thus give place to *enkamer*. It remains, however, to decide whether LORENZ's subspecies *montanus*, can be maintained, or with other words if the specimens from Rutshuru are racially distinct from such ones from Beni. As the present collection only contains one specimen from the latter locality it is very difficult to express any decisive opinion in this matter. The only conspicuous difference between the present Beni specimen and the other ones is the above mentioned aberrant colour of the tail. It is, however, uncertain, whether such a difference in colour of this organ is constant, or not, the more so as the colour of the tail is very variable in specimens from Rutshuru, although none of them has just this colour. The variability of the colour of these Guenons in other respects as well has been set forth above as f. i. with regard to the hairs on the ears, the hind legs, the shade of the yellow rings on the hairs of the crown etc. It appears therefore difficult to base a subspecies on the characteristic mentioned when the variation in colour is so common.

LORENZ found the fur of the specimens from Wabembe $\frac{1}{2}$ to 1 cm. longer than that of the Ituri specimens. In the present male specimens from Rutshuru the fur is longer than in the male from Masisi, but in the females from these localities it is about as long as in the female from Beni, or about 4 cm. in all females.

It is, however, not only the shades of colour which vary among these animals. The same is the case with the dimensions of the skulls as the following table of measurements proves, although in reality the differences are much more apparent to the eye at a direct comparison of the skulls (Pl. VIII) than the figures of the table show. A comparison of the general dimensions of these skulls with those recorded by MATSCHIE (l. c. p. 30) for his original specimens of *enkamer* prove, that the latter lie within the limits of variation expressed below.

It is of interest to note, that the large male n:o 23 (Pl. VIII, figs 1 a & 2 a) has been shot the same day, ²⁸/₁₀, 1913, as the small male n:o 25 (Pl. VIII, figs. 1 b & 2 b) and the

¹ Ann. de la Soc. r. Zoologique et Malacologique de Belgique, Tome XLVII (1912), p. 29.

two small females, n:o 22 & n:o 24. These specimens may thus have been shot out of the same band, but certainly in the same tract.

	Masisi	R u t s h u r u					
	♂ (N:o 100)	♂ (N:o 23)	♂ (N:o 25)	♀ (N:o 17)	♀ (N:o 19)	♀ (N:o 22) ¹	♀ (N:o 24)
Total length of skull	94,8 mm.	99 mm.	92 mm.	95 mm.	98,7 mm.	92 mm.	81,5 mm.
Condylbasal length of skull	74,5 »	79 »	71,7 »	74,5 »	79 »	69,5 »	61,4 »
Zygomatic width	64,6 »	64 »	61,8 »	62 »	65 »	61,2 »	55,5 »
Breadth across m^1	31 »	29,8 »	30 »	31,5 »	29,5 »	27,7 »	26,5 »
Length of upper molar series	21,6 »	23,7 »	21 »	24 »	25,2 »	20 »	19,6 »
Greatest transverse diameter of m^2 . . .	5,1 »	5,7 »	5,5 »	5,5 »	5,7 »	5 »	4,7 »
Palatal length from gnathion to hind margin of lateral incisure	29,5 »	34 »	32 »	37,7 »	34,7 »	29 »	25,8 »
Capacity of the brain-cavity	about 56 ccm.	60 ccm.	55 ccm.	61,5 ccm.	58 ccm.	60 ccm.	51 ccm.

The dimensions of the brain-case of this species proves thus to be of about the same size in some females as in the males, contrary to the usual condition among the Guenons. Compared with the other considerably larger species this one seems to have a big brain. The shape and size of the orbits and of the nasal aperture is very variable as can be seen on comparing figs. 2 *a* & *b*, and figs. 4 *a* & *b* of Pl. VIII.

The smaller males have also a shorter molar series than the larger females. The shortness of the molar series of some specimens appears sometimes to depend more upon the smallness of the premolars than that of the molars. Thus in the male n:o 25 the true molars measure 15,2 mm. and those of the male n:o 23 15,6 mm. In other cases all the teeth are diminished in size, f. i. the female n:o 24 (Pl. VIII, fig. 5 *b*) has the series of true molars only measuring 13,5 mm., while the same measurement of the female n:o 19 (Pl. VIII, fig. 5 *a*) is 17,7 mm. But the female n:o 24 ought probably to be regarded as a dwarfed specimen.

The degree of prognathousness is also rather variable in these skulls, and some of them have a much more steep profile (cf. Pl. VIII, fig. 1 *a* & *b* and fig. 3 *a* & *b*) than some others. The anterior root of the zygoma is usually situated opposite the middle of m^3 , but in the female n:o 17 it is placed further back above the posterior end of m^2 .

It must also be stated that the variations in colour mentioned above do not stand in correlation to the characteristics of the skull. It is true that the small-headed and small-toothed female n:o 22 has the root of the tail rather light grey below, and that the male n:o 25 are lighter at the same place than the male n:o 23, and that the former has smaller head than the latter. But the female n:o 24 which has the smallest head and smallest teeth, has the tail as dark below as any of the large-headed specimens. In a similar way the big-toothed male n:o 23 and ditto female n:o 19 have a slight reddish tint to the hairs in the ear, but the same shade of colour is in the corresponding place better developed in the small-toothed male n:o 18 (upper molar series 21,3 mm.), and in all other specimens this shade is absent, if the skulls are small or large.

¹ Very old, teeth much worn.

As a conclusion from this it might be suggested that MATSCHIE's *Cercopithecus schmidtii sassæ*, which has been established on only one female specimen, may be a somewhat aberrant specimen of the same kind as *enkamer*. The type of *C. s. sassæ* appears to have cranial dimensions very nearly agreeing with those of the female n:o 24 of this collection (cf. above).

Cercopithecus pygerythrus centralis NEUMANN.

1 ♂ ad., 1 ♂ juv. $\frac{5}{10}$ 1913, Rutshuru; ♂, ♀ ad. $\frac{7}{1}$ 1913, ibid.; 1 ♂ ad. $\frac{7}{10}$, ibid.

This race is generally less brightly coloured than its East African allies, and the black on the chin and around the corners of the mouth somewhat more broadly developed. Head and neck are usually darker than the back, and the black is in most cases (only one exception among these 5 specimens) dominating over the buff rings. It appears thus less suitable when ELLIOT begins his description with the expression: »Top of head buff.» The hands become black at an early age, at least in the males, already when the first molar is developed. In the same stage the feet of the male are only spotted with black, and in the adult females they are, even when the teeth have become pretty well worn, tinged with blackish brown, but in the adult males the feet are quite black. The colours of the female are generally duller than those of the male. The colour of the tail is variable. Often it is much mixed with black on the upper side, especially towards the end; in other cases it is rather pale even at the end. The rufous at the root of the tail and on the scrotal tract is well developed even in the young male, but in one of the adult males it is hardly visible at the latter place. In the adult female the rufous is seen as well at the root of the tail as below the callosities.

	♂ ad.	♂ ad.	♂ ad.	♀ ad.
Total length of skull	99 mm.	104,5 mm.	104 mm.	91,4 mm.
Occipitonasal length	86 »	90 »	86,5 »	81,2 »
Basal length	71 »	70 »	73 »	62,8 »
Zygomatic width	—	74 »	70 »	—
Least postorbital width	42,8 »	44,5 »	43,3 »	40,3 »
Width of brain-case	54,3 »	56 »	56 »	—
Length of nasals	15,2 »	16 »	15 »	14 »
Upper molar series	26,2 »	24,6 »	25,2 »	20,6 »

The capacity of the brain-cavity is about 68 ccm. in an adult male, but in a young male with only first molar developed about 50 ccm.

C. p. centralis takes in the Central Lake district undoubtedly the same biological place as the »Tumbili» monkeys in East Africa inhabiting dry forests, acacia-groves, gallery forests at the rivers of the steppe country etc.

***Cercopithecus leucampyx schubotzi* MATSCHIE.**

♂ ♀ $\frac{18}{9}$, ♂ ad., ♀ semiad. $\frac{8}{12}$ 1913, Rutshuru; ♂ pull., ♀ juv., Beni, Aug., Sept. 1914; 1 ♂ old, *ibid.* Dec. 1914.

This race is, of course, very nearly related to *C. l. carruthersi* Pocock, but the latter is said to be »darker» on the belly than on the back, and that is not the case with the present specimens. On the other hand the adult males differ somewhat from MATSCHIE's description of *C. l. schubotzi* when the author quoted says — — — »die Gegend zwischen den Schultern nicht wesentlich dunkler — — — als der Rücken» — —, for in the present specimens of adult males the area between the shoulders is black, sparingly ringed with whitish, thus darker than the back. In this respect, they resemble ELLIOT's »*Lasiopyga princeps*», but differ again from that one by the colour of the hind legs, which is only little darker than that of the back. In *Cercopithecus princeps* the thighs are said to be black »faintly speckled with white», and the legs beneath the knees only »very slightly so». *C. princeps* is also said to have the area between the shoulders »jet black».¹

The black band across the chest is more or less ticked with whitish rings in the adult males of the present collection; in the females it is blackish grey. The black of the distal portion of the tail has greater extension in the adult males than in the females and young.

The specimens from Beni and Rutshuru are similar in colour.

The old male from Beni with much worn teeth has the largest skull with a greatest length of 115,5 mm. The corresponding dimension of the two male skulls from Rutshuru is resp. 108,7 and 109 mm. Both are fully adult, but the molars are not yet much worn. The zygomatic breadth is resp. 75,7, 74,5 and 72 mm.; length of upper molar series resp. 28,3, 26,8, and 26,7 mm.

The capacity of the brain-cavity is about 70 ccm. in one, only about 67 ccm. in another adult male. In a quite young male with milk-dentition it is about 52 ccm.

This dark monkey appears to play biologically the same parts in the dense and ever-green forests of the Central Lake-district as the »Kima»-monkeys, i. e. the various races of the *albigularis*-group do in East Africa.

***Cercopithecus kandti* MATSCHIE.**

1 ♂ $\frac{30}{6}$; ♀ 1914, Kisenji, German East Africa.

These two specimens Capt. ARRHENIUS received as a present from a German officer.

The female is fully as, or perhaps still more brightly coloured than the male. Especially is to be noted that the deep red of the anal region extends more over the basal portion of the tail in the female than in the male.

¹ The three mentioned races termed *carruthersi*, *princeps* and *schubotzi* are very nearly related, and it appears uncertain whether they can be distinguished by constant characteristics, if a great material was compared.

As the skull of this species appears to be undescribed, the type being a skin without skull, the following measurements of a fully adult, but not very old (parietal sutures still open) male skull are communicated.

Greatest length	117,3 mm.
Occipitonasal length	97,8 »
Basal length	88 »
Zygomatic breadth	78,6 »
Breadth of brain-case	59,3 »
Least postorbital width	42,5 »
Interorbital width	7,7 »
Breadth across middle of orbits	60 »
Length of nasals mesially	20,5 »
Palatal length	40 »
Greatest breadth of <i>planum nuchale</i>	60,6 »
Length of upper molar series	28,5 »
» » lower » »	33,5 »
» » upper canine	21 »

The capacity of the brain-cavity of this skull is about 76 ccm.

Cercocebus (Lophocebus).

This group is characterized by its crested head and long hair, but when ELLIOT in his monograph (Vol. II, p. 266) adds »zygomatic arch (jugal), below alveolar border of molars» this is evidently a characteristic which only holds good at most for some of the members of the group as already pointed out by SCHWARZ 1910.

Cercocebus (Lophocebus) albigena ituricus¹ MATSCHIE.

7 specimens, viz. 1 old ♂, 2 adult ♀♀, a young ♂ and 1 young ♀ from Beni, Jan. 1914, and an adult ♀ and a young ♂ from Rutshuru, ¹²/₁₂ 1913.

A member of the *albigena*-group with quite short-haired cheeks, a strongly developed brow-fringe and a large occipital tuft or crest.

In the old ♂ the general colour of body, head, limbs, feet and tail is jet black with the following exceptions. The short and sparsely set hairs on the sides of the head and on the throat are light or whitish grey (but the chin is black). The long and soft hair behind the ears, on the nape behind the parieto-occipital crest (which itself consists of black hair of normal texture), on the hind neck, and over the shoulders (where it is less soft and wooly) has a general colour which is most similar to »warm sepia» (DAUTHÉNAY: 305, 2). Towards the tips of the soft tufts behind the ears the colour fades to a paler tint, almost similar to »otter-brown» (DAUTHÉNAY: 354, 4). Some of the long hairs

¹ This species has in Zoological Record for 1913 erroneously been recorded under *Colobus*(!) and may thus easily be overlooked.

above the shoulders are provided with whitish rings 2—3 mm. in breadth, but with broader dark interspaces. These rings are too few to produce a real grizzled appearance.

The length of the hairs of the brow-fringe is 5—6,5 cm. The length of the hairs of the parieto-occipital crest is 5—7 cm., the longest hair being found on the occiput. The tufts behind the ears, and the long soft hairs on the neck attain a length of about 10 cm. The black hair of the upper back is generally 8 cm., but individual hairs reach a length of 13 cm., or even more.

The colour of the females is similar, but the »warm sepia» is somewhat paler on the long soft hairs at the ears, hind neck etc. The white rings on the hairs at the shoulders are still fewer than in the male and are entirely absent in one of the females from the Beni forest. In two of the females the colour of the lower side tends to assume a »reddish black» (DAUTHÉNAY: 344, 2) colour, or a dark shade of »warm sepia», and in some of them there is a slight tint of this colour on the thighs as well.

The three immature specimens are similar to the females. They have no light rings on the hairs at the shoulders.

The hairs of the females are partly less long than the corresponding ones of the male. The brow-fringe is about 5—6 cm. The tufts at the ears, and the long soft mane on the hind neck are less developed.

The colour of these specimens agrees with that of MATSCHIE's *Cercocebus albigena ituricus*, which appears to be the darkest of the known races of the *albigena*-group with the exception of LYDEKKER's *johnstoni* which originally was said to be entirely black, or, as ELLIOT adds¹ about the type (a young animal), »shoulders and under parts tinged with red». Afterwards it has been believed that the fullgrown *C. a. johnstoni* should have mane and a short mantle of a brownish tint, which ELLIOT terms »Prout's brown with a purplish tinge». Such a colour description does not in any case suit the present specimens. Besides MATSCHIE² has proved that his *ituricus* in no stage is entirely black, and this is confirmed by the conformity in colouration of the present specimens. The author just quoted has also pointed out that when reviewing the races of *Cercocebus* belonging to this group SCHWARZ has confused at least two different forms under the name of *johnstoni* viz. the Uganda Mangabey, which has a chocolate coloured mane and is smaller in size, and the Ituri form which is larger. MATSCHIE has named the former *C. a. ugandæ*, the latter *C. a. ituricus*.

With regard to the characteristics of the skull (cf. Pl. XII, fig. 1 & 2) there appears to be some confusion yet. When describing the skull of »*C. a. johnstoni*» SCHWARZ writes³ as follows: »Der untere Rand des Jochbogens liegt meist etwa in gleicher Höhe mit dem Alveolarrande». ELLIOT in his »Monograph» has gone so far as to declare⁴ as a characteristic of the whole subgenus »zygomatic arch (jugal), below alveolar border of molars». He does not appear to have observed that this statement stands in opposition to a quotation from SCHWARZ concerning *Cercocebus albigena zenkeri* which he renders a couple of

¹ Review of Primates II, p. 268.

² Rev. Zool. Afric. 1913, p. 208—210.

³ Sitz.ber. Ges. Naturforsch. Freunde, Berlin 1910.

⁴ l. c. II p. 266.

pages¹ further below, viz: »Der untere Rand des Jochbogens erscheint in der Seitenansicht etwa in der Höhe der Zahnwurzel der Molaren» — —.

In all the present seven specimens the lower margin of the zygomatic arch is well above the alveolar margin of the molars, the distance varying from 9—10 mm. in the adult (Pl. XII, fig. 1) to 6 mm. in some immature specimens.

As MATSCHIE had not mentioned anything about this in his description of *C. a. ituricus* I took the liberty of writing to him and asked about the condition of the zygomatic arch in the Ituri race. He kindly replied that it was as in other members of *Cercocebus* »6—10 mm. über der Höhe des Alveolarrandes». This question is thus settled, and in this respect the present specimens agree with the types.

The dimensions of some skulls in this collection are recorded below.

The upper molar series of this Mangabey is lighty and evenly arched as in »*C. a. johnstoni*» unlike *C. a. zenkeri* fide SCHWARZ. The palatal roof is also shaped about in the same way as SCHWARZ has described that of »*C. a. johnstoni*» viz. »im Querschnitt fast rechteckig mit dem Knick am oberen Wurzelende der Molaren».

	♂ old, Beni	♀, Rutshuru	♀ old, Beni
Greatest length of skull	126,6 mm.	115 mm.	116,5 mm.
Basal length of skull	95,5 »	76 »	—
Condylbasal length of skull	101 »	84 »	95 »
Nasion—gnathion	57 »	47 »	53 »
Nasion—inion	90 »	79 »	84 »
Palate length	53 (49,6) »	—	48 (43,5) »
Palate breadth inside canines	21 »	20 »	20 »
Length of nasals	30 »	21,5 »	21 » ²
Breadth of nasals	9,3 »	7 »	—
Zygomatic (greatest) width	82,6 »	71 »	75,5 »
Least postorbital width	47 »	43 »	42,9 »
Breadth across the orbits	66,8 »	56 »	62 »
Width of brain-case	63,3 »	61 »	58,5 »
Mastoid breadth	71,8 »	62 »	65 »
Breadth across canines	34 »	29,5 »	32,4 »
Back of m^3 to front of c (alveolar)	37,1 »	35 »	37,4 »
Back of m_2 to front of c (alveolar)	40,6 »	39 »	41,2 »
Length of upper molars only	29 »	29,5 »	28,5 »
Greatest transverse diameter of m^2	7 »	6,6 »	6,2 » ³
Length of m_2	7,5 »	7,1 »	7,2 »
Length of m_3	7,8 »	8 »	8 »
Gnathion to hind margin of jugale	53,6 »	43 »	52,6 »

} another
♀ with
unworn
teeth

¹ l. c. p. 269.

² In another female 24,5 mm.

³ In a young but adult female this diameter of the unworn tooth is 6,9 mm.

Papio tessellatus ELLIOT.

1 ♂ ad., 1 ♂ semiad., 1 ♂ juv. $\frac{5}{8}$; 1 ♀ ad. $\frac{3}{8}$; 1 ♀ ad. $\frac{10}{8}$; 1 ♂ pull. $\frac{7}{8}$ 1913, Rutshuru; 1 ♂ ad. killed in a forest near Rutshuru $\frac{25}{2}$ 1914; 1 ♂ ad. killed in »forêt et montagne Kabwe, Rutshuru $\frac{29}{3}$ 1914.

Named »Kabula» in kisuahili.

The Baboons which constitute this very interesting and valuable series have been collected not very far from the type locality (Mulema, Nkole, Uganda) of *Papio tessellatum* (!) ELLIOT. This Baboon has later been stated from Kagera as well, according to HECK.¹ It could therefore be expected that the Baboons of Rutshuru should belong to this race. The cranial measurements of ELLIOT's type (»a very large animal») agree quite well with the corresponding ones of the adult males in this collection as the accompanying table of measurements indicates, but the colour of the Nkole Baboon as described by ELLIOT differs from that of the present specimens to some degree. He says: »Hairs throughout on head, neck and body seal brown, with a broad subterminal band of a darkish cream color and tips black». This description suits the female and semiadult specimens of this series with the exception that the colour of the subterminal rings of the hairs on the hind quarters exhibit a brighter shade than »cream» and approach more to »ochraceous buff» of RIDGWAY's nomenclature. This is still more the case with regard to the males in which only the rings on the head and neck might be termed »darkish cream coloured», but on the back and hind quarters the corresponding parts tend more to »ochraceous buff» or even »antimony yellow». On the outer side of the arms and legs the colour of the pale rings dominates. The hands and feet of the adult males are black with some sprinkling of the light rings visible. In the females and young males the hands are black, in the former somewhat mixed with brownish. The feet of the young males are mixed brownish black and »buffy brown», and those of the females still paler as they also are more or less mixed with the colour of the legs derived from the pale rings of the hairs.

The quite young animal, which is the palest of all, has the hands blotched with black, but the feet only dark brown at the toes.

The »checkered appearance», about which ELLIOT speaks, is less visible in the old males than in the females. In the latter and in the young males the black tips to the hairs also form black blotches on the crown of the head.

The tail of this Baboon is rather short measuring in an adult male 41,5 cm. without hair, or with the hairs 49 cm. In the adult female it is only 31,5 cm. with the about 3 cm. long hairs at the tip.

The above mentioned differences in colour between these adult specimens and ELLIOT's type of *P. tessellatus* are probably due to the latter having the originally ochraceous and yellow rings faded.

In the adult male skulls from Rutshuru the nasals are as ELLIOT describes them in the type: »rounded and raised above the plane of the rostrum (Pl. VII, fig. 4). The

¹ BREHM's Tierleben, Säugetiere, Bd. IV.

small process on the frontal ridge over each orbit near end of nasals», about which the author quoted speaks, is also present, but it is nothing characteristic to this race of Baboons, nor to Baboons as for instance a similar process can be seen in *Cercocebus* skulls as well (cf. Pl. XII, fig. 2).

	♂ ad.	♂ semiad. ¹	♂ juv. ²	♂ pull. ³	♀ ad.	♂ ad. ⁴
Total length	216 mm.	171 mm.	143,6 mm.	117,3 mm.	164,5 mm.	210 mm.
Occipitonasal length mesially	175 »	141 »	123 »	107,4 »	137,5 »	172 »
Basal length	155 »	119 »	92,6 »	66 »	111 »	154 »
Zygomatic width	129 »	101 »	90 »	74,3 »	100 »	121 »
Palatal length (inside between median incisors)	99 »	73 »	55 »	38 »	70 »	95 »
Breadth of brain-case	81 »	83 »	74,5 »	71,6 »	78 »	85,5 »
Least postorbital width	58 »	59,5 »	54,7 »	53,6 »	59 »	57,7 »
Interorbital width	14 »	8 »	6,8 »	4,7 »	9,3 »	11,9 »
Length of nasals mesially	70 »	53 »	38,3 »	33,3 »	59 »	72 »
Width of snout across first premolar	57,5 »	45 »	40,6 »	32,2 »	40,4 »	52 »
Distance from mesial point of superciliary ridge to tip of premaxillary	135 »	102 »	74,8 »	61 »	106,6 »	133,5 »
Distance from the same point as above and the occiput (without crest)	105 »	104 »	97 »	90 »	101 »	106 »
Distance between outer brims of the orbital walls on a level with the middle of the orbit	95 »	74,5 »	67,5 »	53,3 »	74,3 »	91 »
Distance from lower border of orbit to mesial tip of nasals	67,3 »	43 »	29 »	21 »	46,3 »	65 »
Width of upper surface of muzzle halfway between orbits and tip of nasals	45 »	41 »	33 »	23,8 »	34 »	41 »
Width of palate between last molars	31 »	—	—	—	25 »	29,5 »
Length of upper molar series	53 »	—	—	—	49 »	54,6 »
Length of lower molar series	62 »	—	—	—	56 »	—

The nasals of the females and the young animals are anteriorly flat and not raised. (cf. Pl. VII). In the females the lateral parts of the snout are not swollen, nor forming elevated ridges. In the males on the other hand this masculine characteristic begins to show at a very early period. Already in the quite young male with only milk-dentition a swelling or inflation is apparent in the upper anterior portion of the maxillary (Pl. VII, fig. 1). In the young male with the first molar developed this inflation is still larger, but it is yet evenly rounded off (Pl. VII, fig. 2). In the semiadult with the second molar developed the swellings are already very large (Pl. VII, fig. 3); there is a deep and broad pit on the sides of the maxillary above the roots of the molars, and the upper surface of the rostrum displays longitudinal grooves between the elevated nasals and the lateral swellings. The latter have, however, still a smooth surface and are broadly rounded off on the sides. Finally in the adult (Pl. VII, fig. 4) the rostrum gets its definite shape; the

¹ Last molar not yet visible, *c* not much higher than first premolar.

² Only first molar developed, *dc* present.

³ Only milk-dentition.

⁴ From Hoima, Uganda.

nasals form a median rounded ridge, on either side bordered by a broad shallow groove, on the outside of which the now compact lateral ridges rise as a crowning of the vertical side walls of the maxillary. The whole upper surface of the snout ridges has gotten an uneven and rugged appearance, and the compactness of the bones indicates their value as protective armature.

The nasals are very different in shape at different ages. In the young animal with only milk-dentition the anterior portion of the nasals, which already are fully anchylosed without any visible mesial suture, is broadly triangular measuring 11 mm. in breadth at the nasal opening, or not much less than in the old male. This triangular portion has about the same length as breadth, but the nasals are then produced backwards as very narrow linear strips of bone, only measuring about 2 mm. together in the interorbital region. These posterior narrow parts of the nasals are not yet coossified but show an open mesial suture. This suture has already disappeared in the next stage with the first molar developed. At the same time the shape has altered so that the nasals do not any longer form a broad anterior triangle with a narrow posterior shaft, but they taper more gradually backwards, because the middle and posterior portions have grown somewhat in breadth. The development of these bones has continued in the same direction in the next stage with the second molar developed. In the fully adult male the greatest anterior breadth of the nasals is 13,8 mm. and 28 mm. from the anterior end it is still 12 mm. On a level with the centre of the orbit it is 6,4 mm. These measurements compared with those indicating the length of these bones, and which are recorded in the table above, show the gradual transformation of the nasals. With the increasing breadth of the posterior parts of the nasals they are also thickened, and at the same time rising above the surrounding bones. It has already been stated that the nasals of the female are flat. In their general outline they resemble those of the semiadult male with the second molar developed.

With regard to the development of the skull at the different ages represented it can be concluded from several of the series of measurements in the table that it is chiefly the facial portion which grows, while the brain-case increases less in size (cf. Pl. VII). The breadth of the brain-case of the young male with milk-dentition is already fully 88 % of that of the adult male. In a similar way there is only a difference of about 4 mm. between the least postorbital width of the young with milk-dentition and that of the adult male. The length of the brain-case is not so easy to measure exactly, but if this is attempted by taking the distance from the mesial point of the superciliary ridge to the occiput (not counting the occipital crest of the adult) we find that this dimension of the young with milk-dentition represents nearly 77 % of the whole length of the skull, and it is 85,7 % of the length of the brain-case of the adult male, which in the same measures less than half the total length of the skull. If the skull with the first molar developed is compared in this respect with the adult, we find that the corresponding percentage is not less than 92,3 %. To fully estimate this it must be remembered that the total length of the skull of the young animal with milk-dentition is only 56,9 % of that of the adult, and the total length of the skull with the first molar developed is 66,4 % of the adult.

Quite opposite relative conditions are found if such measurements as express the

dimensions of the facial portion of the skull are compared. Thus the palatal length of the young with milk-dentition is less than a third of the length of the whole skull, and only 38,3 % of the corresponding palatal measurement of the adult. In the skull with the first molar developed the rostral portion has increased so much that the palatal length is contained only $2\frac{3}{5}$ times in the length of the skull, and if compared with the palatal length of the adult the percentage is 55,5 %. In the semiadult skull with the second molar developed the palatal length is contained about $2\frac{1}{3}$ times in the length of the skull, and it represents 73,7 % of the palatal length of the adult. The rostral portion of the skull thus increases in length pari passu with the development of the dentition. From the beginning the general shape of the skull of the young Baboon with milk-dentition is very similar to that of f. i. an adult *Cercocebus*-skull. It is first with the fuller development of the permanent dentition that it becomes »dog-faced».

This development of the dog-like shape of the skull appears to increase most rapidly at the age when the second molar grows up. This can be found by comparing fig. 2 and fig. 3 of Pl. VII and by the following relative measurements. The length of the face, measured from the mesial point of the superciliary ridge to the tip of the premaxillary, is in the young Baboon with milk-dentition only 52 % of the total length of the skull, and in the young Baboon with the first molar fully developed the relation is the same, viz. up to that time the different portions of the skull have grown in practically the same proportions. In the semiadult Baboon again with the second molar developed the length of the face measured as above is not less than 59,6 % of the total length of the skull, and in the adult it is 62 %.

The final modelling of the male skull follows first after the development of second molar at the same time as the canines attain their full size, the third molars develop, and the animal reaches maturity. With the development of the dentition the musculature of the jaws increases very strongly which in a high degree influences the bones. The zygomatic arches are widened and strengthened (cf. Pl. VII, fig. 3 & 4), and at the same time also the walls of the orbit etc. The interorbital wall grows to almost the double thickness. The preorbital portion of the nasals increases with about 50 percent as compared with the semiadult, and so on, which all can be concluded from the recorded measurements.

The skull of the adult female (Pl. VII, fig. 5) is in general shape rather similar to that of the semiadult male (Pl. VII, fig. 3) with the second molar developed, in spite of the fact that the snout of the female is narrower and has no swollen lateral ridges etc. as the male. This likeness is probably due to an analogous development of the musculature of the jaws in the female and the semiadult male. The female has no very large canines, and those of the male in the stage mentioned have not yet developed to greater size than those of the female. The armature of both is thus similar and much less powerful than that of the adult male. The zygomatic width is therefore almost alike, the same is still more the case with the width across the middle of the orbit. The difference in palatal length is only 3 mm. in favour of the semiadult male. The length of the face from the mesial point of the supraorbital ridge to the tip of the premaxillary is only about 4 mm. longer in the adult female than in the semiadult male.

The dimensions of the brain-case of the female as expressed by the measurements of the greatest width, the least postorbital width and the distance between the supra-orbital ridge and the occiput (without crest) are very similar to those of the adult and semiadult males, although the latter are a little greater than those of the female.

The capacity of the brain cavity is in the young Baboon with milk-dentition about . . .	144 ccm.
The same of the young male with first molar developed is about	155 »
The same of the semiadult male with second molar developed is about	185 »
The same of the adult male is about	185 »
The same of the adult female is about	172 »

Judging from external measurements of the skull it is rather surprising to find that it is so much difference in volume between the brain-cavity of the adult male and that of the female. It appears probably that this is due to the male brain-cavity being wider behind in its occipital portion than that of the female. To prove this with exact measurements is difficult without cutting the skulls, and this material is too precious for that. As it has been stated above the adult female and the semiadult male (with second molar developed) skulls represent in several respects the same morphological stage because the latter has not yet attained the great massiveness of the bones found in the adult male. It may therefore be assumed that in both the breadth of the squama occipitalis stands in the same relationship to the width of respective brain-cavities the wall of which it forms. As the greatest breadth of the planum nuchale in the female skull is 74 mm., and that of the semiadult male is 85 mm., it may be concluded that the posterior portion of the male brain-cavity is in a corresponding degree wider than that of the female. This may be the explanation of the difference in volume of the brain-cavities as recorded above.

With regard to the stages of development of the dentition of the young Baboons of this collection the following communications can be made. In the youngest skull only the complete milk-dentition is present.

In the next youngest skull, characterized by the presence of the first molars, the permanent upper incisors are present, but the lateral pair has not attained full height. In the lower jaw the median pair of permanent incisors have attained full size, but the lateral pair are cutting the gum. The milk-canines and milk-molars are present in both jaws.

In the semiadult skull with the second molars developed no milk teeth are left; the permanent incisors and premolars are fully developed, but the canines of the lower jaw have not quite reached the height of the first premolar; and those of the upper jaw are still shorter.

Papio tessellatus ELLIOT is of course nothing more than a geographical subspecies of the same group of dark Baboons as *P. doguera*, *furax* etc. How far it is distributed in its typical form is not yet known. I am, however, able to state that already at Hoima in the Uganda Protectorate the dark Baboons of this group are somewhat different. This can be done because my friend Prof. Dr. ROB. E. FRIES has kindly permitted me to examine and measure the skull of an adult male Baboon which he shot some years

ago at the place mentioned. The measurements of this are recorded to the right in the table above. From this can be seen that the Hoima Baboon is a little smaller in most dimensions, although these differences are of minor importance. The most conspicuous difference is that the Hoima Baboon has the nasals flat in front, and only little raised behind in which respects it resembles *P. furax*. The lateral walls of the rostrum are less vertical, and the pits above the roots of the molars are less deep, even than in the semia-dult *tessellatus*.

Although it thus appears to be racial differences between this Baboon and *P. tessellatus*, I prefer to leave it unnamed until more material has been obtained.

***Perodictius arrhenii* n. sp.**

A male specimen collected near Masisi, a place situated three days west of Lake Kivu, Febr. 1914.

General colour brown, representing a shade between »snuff brown» (DAUTHÉNAY 303) and »dark fawn» (DAUTHÉNAY 307, 2). This general colour is more or less overlaid with blackish on the back. This black shade gradually increases from the lower back towards the interscapular region, where a marbled or mottled appearance is produced in which the black almost predominates. On the forehead, the region around the ears and on the upper arms the blackish is rather strongly represented as well by long black tips to the hairs. The basal parts of the fur is dark grey, or slaty gray. Especially on the middle of the back and on the upper back there is a great number of hoary-tipped hairs which in certain shades of light produce a frosty appearance. The long and thin, bristle-hairs (sensitive!), which project far above the fur, are especially numerous on the upper back, neck, head and shoulder-region, and they are all white. The outer side of the limbs are similar to the adjoining parts of the back, thus the upper arms are rather strongly overlaid with blackish, but the thighs not. The tail has the colour of the back, but is dusky at the tip. The inside of the hind limbs, and the genital and anal regions are buffy. The inside of the forelimbs, and the throat are a light shade of snuff-brown, or a little more buffish. The rest of the lower parts are whitish grey, especially in the middle with a buffish tint. The hands and feet are »raw umber» (DAUTHÉNAY 301) darkening to »sepia» (DAUTHÉNAY 300) on fingers and toes.

By this colour the present specimen differs very plainly from the grey *P. ibeanus* from Elgon. *P. ju-ju* of Southern Nigeria appears also to be very different in colour being described as »drab-grey», and with the »bristle-hairs practically absent». ¹ *P. edwardsi* from Gaboon is said by DE WINTON² to be »dull greyish» and »characterized by its — — short tail». The latter characteristic is mentioned in connection with the description by the author quoted of *P. batesi* (from Benito River) which is said to have the length of the tail 40 mm., and it is said to be »as short as or shorter than that of *P. edwardsi*». The tail of the latter cannot thus in any case be much longer than 40 mm. As the length of the same organ in the present specimen is fully 70 mm. (without hairs) it thus differs

¹ THOMAS: Ann. & Mag. Nat. Hist., Ser. 8, Vol. V, p. 351—352, 1910.

² Ann. & Mag. Nat. Hist., Ser. 7, Vol. IX, p. 48, 1902.

widely from these two species. As *P. batesi* is described as »rufous almost red-mahogany» it is also very different in colour. In a specimen from Mukimbungu, Lower Congo, which I regard to be *P. batesi*, the bristle hairs are black, unlike those in the new species. *P. faustus* which THOMAS has originally described¹ from »Irneti Bompona, R. Maringa, Central Congo» and quite recently² also mentioned from Medje and Poko, Upper Congo, is also provided with a very short tail, »shorter than usual», viz. 38 mm. With regard to the colour *P. faustus* reminds about the present species by the presence of a »large number of hoary-tipped hairs intermingled with the general fur on the body behind the shoulders» — —. »Of the thin outer hairs projecting beyond the wool-hairs perhaps half are blackish and half hoary-tipped.» This partial resemblance cannot, however, lead to identification with this Potto from Masisi as the molars of both species are so widely different. THOMAS writes regarding *P. faustus* about this: »anterior molar (m^1) smaller than m^2 ; m^3 unusually large, little smaller than m^2 and fully as large as m^1 . Small lower premolars low, not exceeding m_1 in height» — —. In ARRHENIUS's Potto m^1 is a little smaller than m^2 , but much larger than m^3 (cf. below), and small lower premolars plainly exceeding m_1 in height.

Dimensions of ARRHENIUS's Potto: Head and body (skin) 395 mm; tail 70 mm; hind foot 76 mm.

Skull:

Upper length, occiput to tip of nasals	62,8 mm.
Basal length	60 »
Condylolincisive length	64 »
Least interorbital width	10 »
Zygomatic breadth	45,6 »
Length of nasals (uncertain, suture obsolete)	16 »
Palate length	25,3 »
Breadth of brain-case	31,5 »
Upper cheek-teeth series	18 »
Molars only	9 »
Transverse diameter of m^1	3,7 »
» » » m^2	3,8 »
» » » m^3	3,2 »

The length of m^1 and m^2 is practically the same or about 3,5 mm., but the inner heel of m^1 is a little narrower than that of m^2 . The length of m^3 is about 2,3 mm.

Length of lower jaw	45 mm.
Lower series of cheek-teeth	15,5 »
Molars only	10 »

The formula of m^3 should thus be for this species $2,3 \times 3,2$, while it is for *P. faustus* $3,4 \times 4,7$ according to THOMAS (l. c. p. 427).

DE WINTON has not published any cranial measurements of his *P. batesi*, and the figures quoted by ELLIOT for the type of this species are unfortunately very uncertain

¹ Ann. & Mag. Hist., Ser. 8, Vol. VI, p. 426—427, 1910.

² » » » » » » » XVI p. 467, 1915.

as there at least in two cases must be grave misprints, viz. when the zygomatic breadth is put to »21» (or less than the breadth of the brain-case), and the length of the mandible to »29» mm. If the figure indicating the length of the palate of *P. batesi*, viz. 20 mm., is correctly given by ELLIOT this dimension is very much smaller than in the present species, which thus appears to be fully distinct.

If the Potto from Mukimbungu, Lower Congo, really is, as I presume, *P. batesi* there appears to be another difference in dimensions between these two Pottos. The breadth across the outer side of m^2 is in *P. arrhenii* only 21 mm., but in *P. batesi* 24,3 mm. This stands in connection with the fact that the molars of the latter are very much larger. The transverse diameter of m^2 and m^3 is thus in the specimen from Mukimbungu resp. 4,7 and 5,1 mm.

Hemigalago demidoffi medius THOMAS.

One specimen from Masisi, 3 days west of Lake Kivu, Febr. 1914.

The skull is unfortunately broken, but I think the identification is correct.

Rousettus leachi A. SMITH.

A female from Masisi, Febr. 1914.

Hypsignathus monstrosus H. ALLEN.

One specimen without skull.

Micropteropus pusillus PETERS.

One specimen without exact locality.

Potamogale velox argens THOMAS.

One specimen from Masisi, Febr. 1914. The condylobasal length of the skull of this specimen is only 61,5 mm. against 66 mm. in the type, but otherwise the correspondence is satisfactory. The locality mentioned appears to be among the easternmost for this chiefly western type.

Felis leo bleyenberghi LÖNNBERG.

1 ♂ ad., Kabare, $^{21}/_2$ 1913; 1 young specimen, Rutshuru, $^{9}/_8$ 1913; 1 ad. but young ♂, Beni $^{31}/_{12}$ 1914.

Some years ago the present author had the pleasure of describing a small-headed race of Lion from Katanga, representatives of which were kept in the Congo Museum at Tervueren.¹ The Lions collected by Capt. ARRHENIUS appear to belong to this same

¹ Rev. Zool. Africaine, Vol. III, fasc. 2, 1913.

race distinguished by its small head, and by the mane being confined to the neck, no extending over the shoulders. The dimensions of the skull from Kabare and another which is older and probably from Rutshuru (in the private possession of the present writer) are as follows.

Fig. 2. *Felis leo bleyenberghi* LÖNNBERG shot by Capt. E. ARRHENIUS at Rutshuru.

	♂ Kabare	♂ Rutshuru
Greatest length of skull	349 mm.	348,5 mm.
Condyllo-incisive length of skull	311 »	312 »
Basal length of skull	294 »	294 »
Zygomatic breadth	215 »	224 »
Width across upper carnassials	120,5 »	125,5 »
Breadth across foremost premolars	—	86 »
Width of choanæ a little behind palatal border .	33,5 »	38 »
Distance between heels of upper carnassials . .	79 »	79 »
Interorbital breadth	68,2 »	71,6 »
Width across postorbital processes	110 »	101 »
Least postorbital width	67 »	65 »
Breadth of bulla	30,2 »	31 »
Length of bulla	50,5 »	52,6 »
Length of upper carnassial	37 »	37,4 »
Length of nasals	92,5 »	94,2 »
Combined breadth of nasals in front	59,2 »	62,3 »

HELLER has named a Lion from Uganda *Felis leo nyanzæ*. The cranial measurements, which he has communicated, indicate a comparatively small-headed race, most dimensions are, however, larger than those of *Felis leo bleyenberghi*. With regard to the colour

the specimens of the present collection are intermediate between the very pale typical Katanga Lion, which I described as being »pale yellowish grey, sand-coloured, more yellowish than 'putty colour' (DAUTHÉNAY 311)», and the »ochraceous-tawny» and »ochraceous» Uganda Lion, as HELLER describes the latter. It appears probable that both these comparatively small-headed races of Lion gradually merge into each other in the country west of Victoria Nyanza. The type locality of *F. l. nyanzæ* is situated north of this lake.

The measurements above prove a great correspondence in dimensions between these two skulls, and at the same time that they are similar to the type of the Katanga Lion, which latter, however, is a little broader. This difference is not great. Unlike the condition found in NEUMANN's *massaicus*-race the distance between the bullæ is less broad than the breadth of the choanæ.

The specimen from Beni has not yet attained full size, and therefore it does not admit a direct comparison. As far as can be seen, it does not differ except in such juvenile characteristics as are still retained, f. i. the spots on the belly and on the hind legs are more conspicuous.

The young specimen from Rutshuru has still its milk-dentition. The greatest length of the skull is 178 mm. The »milk carnassial» dp^3 has a length of 24 mm. The lower canines have on their inner side a well developed cusp against which di^3 works. The spots on the legs and on the belly are well conspicuous. On the hind legs they are partly dark brown, but small, only about 1 cm.

***Felis pardus centralis* n. subsp.**

Three young specimens with milk-dentition collected at Rutshuru resp. $\frac{6}{3}$, $\frac{9}{4}$, and $\frac{2}{10}$, 1913. A fine male from Kabare at Lake Albert Edward killed $\frac{19}{5}$, 1914.

The »milk-carnassial» of one of these young Leopards measured 16 mm. in length, in another 18 mm., which probably is due to difference in sex.

The skin of the adult male Leopard from Kabare is very beautiful and striking with regard to its pattern. The rosette-spots are large, in the shape of somewhat irregular rings often with 1—3, sometimes even 4 small black spots in the centre. The pattern reminds thus in a high degree about that of a Jaguar. Thanks to the large size of the rosettes the ground colour only forms a reticulate system, which is very pale. From white on the belly it shades gradually through the palest shade of »Maize yellow» (DAUTHÉNAY, Rep. de Coul. 36, 1) on the flanks to »yellowish buff» (l. c. 310, 2 & 3) on the back. The centre of the rings have as usual a more saturated colour beginning with »Maize yellow» (36, 3 & 4) down on the lower flanks and gradually reaching »yellowish buff» (310, 3 & 4) on the back. The ground colour of the nose and upper parts of the head is »Maize yellow» (36, 4), on the sides of the neck a lighter shade of the same tint, but on the upper neck »yellowish buff» (310, 3). The ground colour of the throat is white, extending up on the sides of the head almost to below the eyes with a light shade of »Maize yellow». The legs are similar. From this may be concluded that the ground colour all over is very light. The spots on the head are solid, very small on the interorbital region (5—

7 mm.), not much larger on the lips, but on the crown 12—20 mm. From the nape along the upper neck is mesially a row of rather small, elongate spots, and on either side of these

Fig. 3. *Felis pardus centralis* from Kabaro.

a row of larger black spots, several of which have a small buff centre. On the back above the shoulders the mesial row may be traced, and on the sides of the same the nearest spots as well are solid and elongate. On the middle of the back the mesial series is less conspicuous as such, especially as some of the spots become annulate with buff centres, but the black of the rings is then always broader than in the lateral rings. On the posterior back the mesial series and its accompanying side rows become well visible again, the former with solid spots, the latter with small buff centres, but broadly black. At the base of the tail this pattern is dissolved into narrow elongate spots which are irregularly crowded into transverse series counting about 7—8 spots. On the apical third of the tail these become confluent into irregular transverse spots, or bands separated from each other by narrow white rings. The pattern of the shoulders is very indefinite. It is made up of small spots which often become confluent into many transverse bands, and sometimes form small rings. The sides of the body are entirely covered with the large (mostly 5—7 cm.) rings, already mentioned, which often have central spots. The spots on the lower parts and the legs are solid, although partly grouped into rosettes.

The pattern of this Leopard differs chiefly from that of other African Leopards by its large, partly Jaguar-like rings.

CAMERANO has described¹ a Leopard from Ruwenzori, named by him *Felis pardus ruwenzorii*. In some respects this animal resembles the present one, but there are also several differences. The author quoted describes the general colour of his subspecies as

¹ Il Ruwenzori, Relazione scientifica, Vol. I.

»terra ombra naturale chiara» and in another place as »brunastre con tendenza — — all'olivastro», which appears to differ considerably from the general colour of the Leopard from Kabare. To judge from CAMERANO's figure the rings on the flanks are much heavier, black with comparatively small centres. Also in other places the black spots or rosettes are heavier, and the spots on the tail are roundish. As Leopards vary a great deal individually this difference may perhaps not be fundamental, but for the present they appear to exclude an identification. On the other hand this Museum received in the year 1905 the skin of a very large Leopard which Lieutenant KARL ERIKSSON had collected in the interior of Belgian Congo. This skin is more similar to that from Kabare, and has large ring-like rosettes some of which have, as in the Jaguar, central spots, sometimes even 4 such in a ring.

The length of the unstretched softened skin from Kabare is from snout to vent 150 cm., and the length of the tail is 84 cm. If the latter is laid forward over the back, it does not reach the shoulders, and it is thus short. It is, however, not so short as in the Ruwenzori Leopard in which it only measures 68 cm. according to CAMERANO. In the latter subspecies the end of the tail has longer hairs on its distal fourth so that it almost appears somewhat bushy on the figure. The Leopard from Kabare has also longer hairs (26—28 mm.) on the distal part of the tail than at the proximal (15—16 mm.), but this appears less pronounced. — It must here be kept in mind, that all Leopards have the hairs on the distal portion of the tail longer than on the proximal parts, although it often is little visible.

The young Leopards from Rutshuru must be supposed to belong to the same race as the one from Kabare, and it is therefore of interest to state that even in such young specimens the rings are quite well developed and defined all over the flanks, which appears rather early, but it proves that this pattern is fairly constant in these parts of Africa.

The skull of the Kabare Leopard indicates an adult, but not very old animal, because the basal suture is still open. Considering this the dimensions of the skull prove

Fig. 4. A piece of skin from the left flank of *Felis pardus centralis*.

that it belongs to a large race, all measurements being, as is shown below, larger than those of the Ruwenzori Leopard which has the total length of the skull 224 mm. On the other hand the measurements are smaller than those which have been recorded by Pocock for some West-African Leopard skulls, the total length of which varies between 278,¹ and 262,5 mm.

A Leopard »from the Loita Plains, Southern Guaso Nyiro district, British East Africa» described by HELLER under the name *Felis pardus fortis*¹ has also a very large skull with the greatest length amounting to 260 mm.,² and also other dimensions greater than those of the present specimen from Kabare. *F. p. fortis* is, however, very different. It is described as having »numerous small rosetted spots, the central color of which is not differentiated in shade from the general ground color». Unlike the Leopard from Kabare *F. p. fortis* has no upper first premolar, and its bullæ are much smaller not rising to the level of the mastoid process.

Another Leopard, from Gondokoro, also described by HELLER (in the same paper as the foregoing) under the name of *Felis pardus chui* is also a large animal with the greatest length of the skull 243 mm. It is said to have »widely isolated spots», »more extensive white surface to the underside of the tail» (than *suahilica*). It has smaller upper carnassial, but broader pterygoid fossa than the Leopard from Kabare, the skull measurements of which are recorded below.

	♂ from Kabare	♂ from Inner Congo
Total length of skull	233 mm.	239 mm.
Condyllo-incisive length	210 »	219 »
Basal length	196 »	205 »
Zygomatic breadth	141,5 »	147,6 »
Length of nasals mesially	54 »	—
Combined breadth of nasals anteriorly	35,5 »	—
Breadth of brain case	77,7 »	75 »
Breadth of mesopterygoid fossa	23,5 »	2 ,5 »
Interorbital width	39 »	38,6 »
Length of palate mesially	103 »	104 »
Length of <i>p</i> ²	18 »	18,2 »
Length of <i>p</i> ³	26 »	26 »
Distance between bullæ	21 »	21 »
Breadth of bullæ	21 »	21,5 »

The capacity of the brain cavity of the Leopard from Kabare is 170 ccm. and that of the Congo Leopard about 165 ccm. In the table above are at the side of the measurements of the Kabare skull also recorded the corresponding ones of a male Leopard skull from Inner Belgian Congo which has been presented by Lieutenant KARL ERIKSSON, and which closely resembles this one.

¹ Smithsonian. Misc. Coll., Vol. 61, n:o 19, Washington 1913.

² In »Life Histories of African Game Animals» by ROOSEWELT & HELLER the same leopard is said to be from the »Mau highlands of British East Africa».

A further comparison between these measurements and those recorded by Pocock¹ for the skulls from Sette Kama, Gaboon, proves that there are several important differences. In the present skull from Kabare the breadth of the bulla is equal to the distance between both bullæ (the same is practically the case with the other Congo-skulls as well), but in the Gaboon Leopards the former measurement is greater and always more than 25 mm. Pocock appears also to lay much stress on the shape and breadth of the mesopterygoid fossa. He calls that of the Gaboon Leopards narrow with almost parallel sides.² The by him published figure and the recorded measurements prove this.

The breadth of the mesopterygoid fossa in the skulls from Gaboon varies between 14 and 18,7 mm. This narrowness is decidedly in contrast with the broadness of the same dimension in the Kabare skull. The skull presented by Lieutenant ERIKSSON, and which is from the interior of the Congo forest, is also much broader in this respect than the specimens from Sette Kama. Pocock has also at the same time pointed out that »the anterior border of the fossa is at all events as a rule produced backwards into a sharply pointed angle in Asiatic Leopards, whereas in African Leopards it is generally at least markedly straighter, sometimes indeed slightly notched». To this I must say that unfortunately the shape of the posterior border of the palate, or as Pocock prefers to name it, the anterior border of fossa mesopterygoidea, is not constant neither in Asiatic, nor in African Leopards. To prove this I may mention that among three male Leopard skulls (all adult), which Count NILS GYL-DENSTOLPE has brought home from Siam, one has this border forming a backwards projecting angle, in the second it is straight, and in the third² it is decidedly concave. Further among Leopard skulls from Eritrea collected at Gheleb by the Swedish Missionary, Pastor K. RODÉN one has a prominent mesial point on this border, but in another it is notched and so on. This variability reduces also the importance of the difference with regard to the posterior palatal border which exists in the Kabare skull and the one presented by Lieutenant ERIKSSON. In the latter this border is almost straight, although somewhat irregular, in the former it has a comparatively broad mesial process which is notched at the end (fig. 5).

Fig. 5. Palatal view of skull of *Felis pardus centralis* u. subsp.

¹ Proc. Zool. Soc. 1909, p. 204—209.

² From the Nan province.

The fact remains, however, that in the interior of Congo lives a race of Leopards which have large ring-like rosettes, partly provided with 1—4 small spots in the centre, broad choanæ (more than 20 mm.) and the interspace between the bullæ about equal to the breadth of the bulla. This race is, as it seems, well defined from the Leopards of the west coast districts in Gaboon with regard to their skulls as described by Pocock, who has considered them to represent SCHREBER's *leopardus* and thus named them *Felis pardus leopardus*. SCHREBER describes his »*leopardus*» from Africa and says: »Insonderheit bewohnt er die Westküste, von Senegal an bis zum Vorgebirge der Guten Hoffnung, häufig». From a geographical point of view there is thus nothing prohibiting that the Gaboon Leopards are named »*leopardus* SCHREB.». This is, however, not sufficient. It must also be considered, how SCHREBER describes the animal to which he gives this name. He says¹ about it: »Die Länge des Körpers nicht viel über vier, des Schwanzes zweien bis drittelhalb Fuss», and he adds »kleiner als der Panther». The picture of the animal named »*Felis leopardus*» shows comparatively small spots, while the picture of SCHREBER's »*Felis panthera*» which is said to be larger displays large annular spots on the sides of the body. The latter, or the »Panther» is said to be at home as well in Africa as in Asia. It can be concluded from this that SCHREBER believed it possible to distinguish 1:o a large Leopard, »*F. panthera*», with broad annular spots living as well in Africa as in Asia, and 2:o a smaller Leopard, »*F. pardus*», with smaller rosette-like spots inhabiting Western Africa from Senegal to Cape. With the exception of the distribution this SCHREBER's opinion is in accordance with that of many sportsmen, who speak of a small and small-spotted »Leopard», and a large and great spotted »Panther». As Pocock's Leopard skulls from Gaboon were very large, indeed exceeding in length the then known record for such skulls, it is evidently erroneous to regard them as belonging to the race which SCHREBER himself declares to be the smaller.

Pocock also quotes ERXLEBEN as authority for a »*Felis Leopardus*» from West Africa. It is also true that ERXLEBEN says:² »Habitat in Guinea et propinquis terris», but he quotes SCHREBER's *Felis leopardus* as identical, and the measurements which he records for »*Felis Leopardus*» are also the same as SCHREBER's for the same animal. On the other hand ERXLEBEN's measurements recorded for his »*Felis pardus*» which is identical with SCHREBER's »*F. panthera*», are much larger. Thus also by ERXLEBEN the specific name »*leopardus*» is given to the smaller of two recognized kinds of Leopards. It is accordingly inappropriate to use this name for the largest, or at least one of the largest known races of African Leopards, as Pocock has done.

Felis pardus leopardus SCHREBER must be reserved for a comparatively small African Leopard with small closely set spots forming rosettes (»*maculis parvis nigris in circulos dispositis maximeque approximatis*»), while *Felis pardus panthera* SCHREBER (= »*F. Pardus*» ERXLEBEN, nec »*F. Panthera*» ERXLEBEN) is a large Leopard with ring-formed spots with black spots in the centre (»*maculis nigris e minoribus quatuor vel quinque in annulum dispositis — — centris nigris*»). SCHREBER considered his *F. panthera* to live as well in Africa as in Asia, but Africa is mentioned in the first rank.

¹ SCHREBER, Säuget. III, p. 388.

² Systema Regni Animalis, Classis I, Mammalia. Lipsiæ MDCCLXXVII.

It is thus justifiable to use this name also for an African Leopard with SCHREBER as authority. ERXLEBEN's »*Felis Panthera*» is on the other hand something quite different as it is identical with SCHREBER's »*Felis Vncia*». Therefore it cannot be approved when TROUESSART in his »Supplementum» to »Catalogus Mammalium» calls the Indian Leopard »*Felis pardus panthera*».

Before the two old racial names »*panthera*» and »*leopardus*» are definitely placed, if it is possible, our knowledge about African Leopards must become considerably widened and more satisfactory. Among the numerous skins of Leopards which I have seen from Eritrea, East and South Africa none has had such distinctly annular spots with small spots in the centre as these two skins from inner Congo and the Lake Albert Edward district, and I do not doubt that they constitute a separate geographic race. Although it agrees well enough with SCHREBER's short diagnose of his »*Panthera*» it does not seem probable that the author quoted at that early time could have obtained his type from the centre of Africa. Partly therefore, and partly because the name »*panthera*» has been used in so many different meanings I have thought it better to give a new name which at one time alludes to the geographical origin, and also to the remarkable pattern described above.

In Proc. Zool. Soc. London, 1907 (p. 783—5) LYDEKKER has described and figured the skin of a large-spotted Leopard from Uganda. He refers this to »*F. pardus suahelica* NEUM.» It is, however, very doubtful what NEUMANN has meant by this name. It is only said to be given to »die grossgefleckte ostafrikanische Form des Leoparden», because that one »hatte bisher noch keinen Namen».¹ This is, however, hardly any description, and nothing more is said for the recognition of the Leopard with this new name. Neither has NEUMANN indicated any type-locality as he says:² »Der Leopard ist an geeigneten Stellen an der Küste wie im Inneren überall häufig.» Further he mentions localities as distant as Tanga and Uganda. LYDEKKER's large-spotted Leopard from Uganda appears to be identical with CAMERANO's *Felis pardus ruwenzorii* to judge from the figures of both. The rings in both are broad and compact with a comparatively less broad central space. As CAMERANO had given the name »*ruwenzorii*» before LYDEKKER accepted NEUMANN's name »*suahelica*» for the Uganda Leopard, the latter name cannot on LYDEKKER's authority be used for the Uganda Leopard, and on NEUMANN's, as set forth above, still less.

LYDEKKER believed to find some Jaguar-like features in the Uganda Leopard, but as shown above and corroborated by the figures this is much more the case with *F. pardus centralis*.

***Felis ocreata* GMEL.**

A young specimen without skull. It can not therefore be ascertained to which subspecies it may belong.

¹ Zool. Jahrb., Abt. Syst. Geogr. etc., Bd. 13, Jena 1900, p. 551.

² l. c. p. 552.

Felis serval ERXL.

There are three Servals in the collection. Two of these are rather young and there is no skull to the third, which is a large one. It is thus difficult to decide to which subspecies these specimens may belong. They may be regarded as comparatively large-spotted, but the spots are perhaps not quite so large as in *hindei*. Including the dorsal stripes and rows there are about 17 series of spots in the large specimen. The black cross-bands on the arms and on the throat are strongly developed, and the blackness of the feet is also intense.

Civettictis civetta SCHREBER.

1 ♂ semiadult from Masisi 1914. It is a rather dark specimen with the spots partly confluent to transverse bars.

Genets of the *Genetta servalina*-group.

Four specimens in the present collection belong to the above group. They have short-haired tails with the light rings narrower than the black and from nine to eleven in number; both hind and fore feet blackish brown, the chin light-coloured; the dark spots of the body everywhere solid, not ring-shaped and so on.

By these characteristics they are distinguished from related Genets from Western and Central Africa. *G. angolensis* BOGAGE has the chin black and only 3 or 4 pale tail-rings. It represents, however, as MATSCHIE has suggested, possibly a melanistic aberration. *G. dubia* MATSCHIE has a short tail with only 6 pale rings; *G. poensis* WATERHOUSE, the type² of which appears to be somewhat melanistic, has the pale tail-rings reduced to lateral patches. The comparison is difficult to make, but *G. poensis* appears to be more small-spotted³ than the present specimens. POUSARGUE has identified a Genet from Mayumba with *G. poensis*, and his description of this specimen agrees on the whole quite well with three specimens, which the R. Swedish Nat. Hist. Museum has received from Debundscha, Cameroon, although the pale tail rings of the latter are more developed. A striking characteristic common to POUSARGUE's specimen and those from Cameroon consists in the narrowness of the dark longitudinal streaks of the upper neck.

G. johnstoni as described and figured by Pocock⁴ displays also a pattern different from that of Capt. ARRHENIUS's Genets. In the former »the spots of the two uppermost rows coalesce wholly or mostly into definite longitudinal stripes», while the corresponding spots of the latter are very distinct. In *G. johnstoni* the (3) upper rows of spots »differ from the spinal stripe in colour, since they consist of black and red hairs intermixed»,

¹ In accordance with MATSCHIE's key (Verh. d. V. Internat. Zool. Congr. Berlin 1901).

² As figured by Pocock, Proc. Zool. Soc. London 1907.

³ MATSCHIE (l. c.) suspects *G. poensis* to be identical with *G. pardina* IS. GEOFF., but POUSARGUE (Ann. Sc. Nat. Zool., 8 Sér., T. 3, Paris, 1896) has pointed out that the latter has ring-shaped spots, while those of the former are solid, more numerous and close set. *G. pardina* has the feet »gris jaunâtre», whereas in *G. poensis* they are blackish brown.

⁴ Proc. Zool. Soc. London, 1909, p. 1041.

while the spinal stripe is always black. The same Genet has also not more than seven pale rings.

G. victoriae THOMAS might be excluded from the present comparison, because it has only six white rings on its comparatively bushy tail (with hairs 25—30 mm. in length).

G. bettoni THOMAS differs plainly from the Genets of the present collection by having the »spots on the anterior half of the body between the withers and loins» — — »replaced by irregular rings, black, with fawn-coloured centres».¹ In addition to this its hind limbs are greyish brown, and its skull much smaller.

G. genettoides TEMMINCK has only five partly incomplete tail rings.

It remains thus among these Genets with dark feet, and narrow pale rings on their short-haired tails only *G. servalina* and *G. aubryana* PUCH., and these two are evidently, as already POUSARGUE has pointed out, very closely related, or perhaps not specially different. As especially characteristic to both, the author quoted lays stress upon a fact which PUCHERAN already in the original descriptions² has set forth, viz. that neither of these »species» has a continuous black dorsal stripe. About *G. servalina* PUCHERAN says: »Le dos ne présente pas de raie noire continue», and concerning *G. aubryana* he expresses the same thing by saying that the median spots of the back »ne sont point réunies pour former une véritable bande». This characteristic can be observed in the four Genets now in question, and their general pattern agrees essentially with PUCHERAN's description. *G. servalina* and *aubryana* differ from each other, however, in another respect, viz. with regard to the markings of the tail. The former has narrower white rings, and the tip of the tail black (only with a small white spot on the lower side of the extreme tip in a female), the latter has somewhat broader white rings (but nevertheless narrower than the black), and the tip as well broadly pale. With regard to these patterns of the tail Capt. ARRHENIUS's Genets represent both types:

G. servalina-type: 1 ♂, Masisi, near Kivu, Febr. 1914; 1 ♀ ad. and 1 ♂ juv., Beni, Aug.—Sept., 1914.

G. aubryana-type: 1 ♂, Masisi, near Kivu, Febr. 1914. The three first mentioned specimens are, in spite of difference in sex and age, so alike as three animals of this kind can be. The Genet-markings of the head are very distinct, especially in the old male. The smallest anterior vibrissæ are black, the others black at the base, but for the most part white. A black stripe runs mesially from the snout on the forehead surrounded on the sides by broad grizzled whitish bands. From the black upper lip runs a black band over and through the eye, bifurcating above the posterior half of the eye to include a white spot. Below the black lower eye-lid is a large white spot. From the space between the ears four black stripes run along the upper neck, the median pair is narrower and sometimes broken. Outside of these four stripes, on either side of the neck, runs a broad black stripe consisting of confluent spots, the foremost spot behind the ear usually, and often some of the spots in front of the shoulders being isolated. At the withers a narrow mesial black stripe (or series of linear black spots) appears between the median pair of neck stripes, and the latter become somewhat broader and dissolve partly into series

¹ Another difference is that *G. bettoni* has »the light mark on the sides of the muzzle less distinct than usual».

² Arch. du Muséum d'hist. nat., Paris, T. X, 1858—61.

of spots. The just mentioned unpaired narrow mesial stripe (or series of spots) can be followed about half way to the loins. On the posterior back it is substituted by a much broader (mostly 10—12 mm.) black band formed by confluent spots which only in the youngest specimen are partly isolated. The outer pair of upper neck stripes bifurcates at the shoulders into two longitudinal series of roundish (on the posterior back elongate sometimes rectangular) black spots. Below these are still some series of smaller spots so that at the middle of the body about six series of spots may be counted on either side of the median line. On the back and the sides the spots are well defined from each other in front and behind, although the interspaces are narrow, but especially in the male they have a great tendency to coalesce in a vertical direction so that irregular transverse bands are formed by the confluence of 2—3, or even 4—5 spots. The ground colour is very light yellowish grey (not much darker than DAUTHÉNAY's »stone colour»; 312, 4) with a shade of fawn on the middle of the back, and on the face. This latter shade is more pronounced in the female and the young animal. On the cheeks there are some small black spots. Chin and throat greyish white, with a slight buffish suffusion in the female and young. Across the lower neck about four transverse series of black spots are to be seen; the foremost of these, which is situated about halfway between head and chest, is most conspicuous and forms an almost continuous cross bar in the males. Interbrachial space blackish grey with some scattered black spots. The belly is lighter by means of whitish tips to the basally dark smoky grey hairs. The frontside of the fore legs is grey with black spots, the inner side of the same and the feet blackish brown. The hind legs and feet are blackish brown to the same extent, but there may be a greyish spot on the upper side of the latter. The tail is black with 9, in the adult male 10 narrow white rings with a breadth on the dorsal side of about 5—8 mm., on the ventral side they are somewhat broader. In this number of rings is not counted the similar band just above the root of the tail. The tip of the tail is black, but in the female as mentioned above, there is a small white spot just underneath the tip, and in the male the corresponding spot is not quite black, but pale brownish. Length of fur on the back 15—18 mm., at the base of the tail not longer, but in the sacral region of the male about 20 mm.

The specimen of »*aubryana*-type» is rather similar, but differs in the following points. The head and back is provided with a rather strong tint of fawn, and isabelline on the sides. This makes the head markings somewhat less prominent. The median pair of stripes of the upper neck is narrower and more broken up in small spots. The median stripe of the posterior back is narrower and less defined. The spots on the whole body are comparatively smaller (but about as numerous), separated by somewhat broader interspaces and show less if any tendency to become confluent. The lower parts have an isabelline tint; the interbrachial space is less dark, and the lower neck does not show any definite transverse arrangement of the spots. The tail is black with 10 white rings, which are considerably broader than in the other specimens, from 12 to 20 mm. on the upper side, broader below. The tip is pale, although not pure white as the rings, but pale brownish at the extreme end, and more whitish subterminally on the lower side. These differences do not appear very important, but might partly, f. i. the

buffish or isabelline tint, the pronounced isolation of the spots etc., be regarded as retained juvenile characteristics, although it at the same time must be admitted that the much younger male specimen from Beni is more like the adult specimens described above. As a white resp. pale brownish spot is present below the tip of the tail of the adult *servalina* specimens described above, and also in the corresponding place in PUCHERAN's type, it appears that not too much stress can be laid on the fact that the *aubryana*-like specimen has the tip of this organ pale. In both cases the white spot and the pale tip may represent the remains of a pale ring. This is the more probably as the pale rings always are broader on the lower side, and thus the last remnant of such a ring is naturally to be found on the lower side of the organ. PUCHERAN has also expressed a similar interpretation saying about *G. servalina*.¹ — — »L'extrémité caudal est noirâtre; cette couleur se fond en dessus avec celle du dernier anneau; en dessous, elle en est séparée par une tache blanchâtre, vestige d'un anneau incomplet» — —. It will thus appear as if the difference between typical *servaline* and *aubryana* should not be very fundamental. In any case I cannot regard the young male from Masisi as representing but the same species as the others, although individually somewhat different.

Another question is whether the adult specimens described above is fully identical with PUCHERAN's *Genetta servalina*, or whether it possibly represents a geographical race, as there are some small discrepancies to be noted. One of these is the strongly developed »teinte rousse», which PUCHERAN regards characteristic for *G. servalina*, but I cannot admit great importance to this as it, no doubt, is subjected to individual variation. More stress might be laid on such differences in pattern as the presence of a continuous black mesial stripe along the posterior portion of the back and the decidedly striped upper neck etc. The comparative size of the spots is also different. In the present specimens the largest spots are found in the second row from the median line, while PUCHERAN says that the spots next to that line are smallest, and those on the abdomen largest. POUSARGUE confirms this and speaks also about the great irregularity of the spots of the back and sides, »et l'on y chercherait vainement — — une orientation suivant des lignes longitudinales parallèles». Such a statement has no application on the present specimens in which longitudinal series of spots may be quite well discerned.

Although I am not fully convinced that the differences enumerated are important enough for the creating of a separate subspecies. I think, however, that to avoid confusion it is the best proceeding to give the Genet from Beni and Masisi a separate name *Genetta servalina intensa* (in consequence of its more pronounced pattern). Such a proceeding appears also to be strengthened by the measurements recorded below.

The skins are not so carefully made that their measurements can be admitted to have more than approximate value, but the dimensions of the two adult specimens may nevertheless be communicated:

	♂	♀
Head and body	58 mm.	54,5 mm.
Tail	41,5 »	43,5 »
Hind foot	79 »	75 »
Ear (dry!)	33 »	33 »

¹ l. c. p. 117.

The small size of the dry hind foot is especially noteworthy, because THOMAS & WROUGHTON¹ have indicated the length of that member of a female *G. servalina* from Gaboon to be 101 mm. The above measurements of the hind feet agree better with those of *G. bettoni* according to the authors quoted. But in addition to the differences from this species in colour and pattern, as already discussed, the great size of the skull proves the difference. The greatest length of the female skull is 88,5, and that of the male 92,2 mm. Condylbasal length of the former 86,6, of the latter 88,6 mm.; basal length resp. 81,7 and 83,5 mm.; zygomatic breadth 38,6, and 42,5 mm.; interorbital width 11,9, and 13,5 mm. Outer diameter of p^4 7,8 mm. as well in male as female, its longest diameter in the male 8,7 mm.; transverse diameter of m^1 in the same 7 mm. Length of palate 41 mm., length of bulla 18 mm. Length of p^4 6,4 mm.; of m_1 7,1 mm. (in *G. bettoni* 6 mm. according to THOMAS).

When describing the mammals of the Ruwenzori-Expedition² OLDFIELD THOMAS and B. C. WROUGHTON give some notes on specimens of *G. bettoni*. They mention there also the difference in size between the upper carnassial of the female and male of this Genet, the length on the outer side of this tooth being in three females from 6,9 to 7,3 mm., but in a male 8,1 mm. As similar observations has been made on other Genets, f. i. *G. stuhlmanni*, it appears noteworthy that in male and female of the Genet now described this tooth has similar dimensions.

Genetta stuhlmanni MATSCHIE.

Two male specimens from Masisi (three days west of Lake Kivu), Febr. 1914. One male from Rutshuru, Dec. 3, 1914.

Both the former, one of which is young, are somewhat paler than the Rutshuru specimen which appears most typical. On the whole the adult specimens agree very well with my specimens from the Kenia district, which proves that this species is fully recognizable at both ends of its area of distribution.

Nandinia binotata GRAY.

A young female from Masisi near Kivu, Febr. 1914, and an adult female.

Both these have a well marked pattern with spots and stripes sharply defined. In the young the pair of dorsal spots are white, in the adult buff. The specimens are thus as could be expected of the typical western form and differing from the Kavirondo race described by HELLER³ 1913. It is thus probable that all Nandinias to the west of the Great Lake region are of the main form, and that on the eastern side of the same, in the drier climate the pattern more and more fades out to the *gerrardi* form of Nyasaland and Kilimanjaro. The latter place from which I recorded it in the year 1908 appears to be the most eastern locality where this genus has been found.

¹ Trans. Zool. Soc. London, Vol. XIX, part 5, p. 495.

² Trans. Zool. Soc. London, Vol. XIX, part 5.

³ Smithsonian Misc. Coll., Vol. 61, no 13.

Mungos ichneumon centralis n. subsp.

A female specimen from Beni, Aug.—Sept. 1914, and another specimen which unfortunately is not labeled. The former appears, to judge from the size to be rather young.

These specimens differ to some degree as well from East, as from West African specimens in this museum. The back is grizzled with 3—5 mm. broad white rings to the otherwise black hairs, but on the flanks the colour is very different, isabelline brown. This is effected by the there buffish white parts of the hairs occupying a much broader space, than is the case on the back (especially the whitish tips are very long), and partly by the fading of the narrowed dark rings to brownish, and finally by the shining through of the under fur, which in the smaller specimen is a pale shade of »buff» (DAUTHÉNAY, Rép. de Coul. 309, 1), in the older more resembling cinnamon. On the neck there is a strikingly sharp line of demarcation between the median dorsal band of grizzled black and white, and the paler sides where the black has partly faded to brown, and the light rings on the hairs dominate at the same time as the under fur shines through. Such a pattern is not to be seen in the specimens of *M. i. parvidens* LÖNNB. from Lower Congo which geographically ought to be the next neighbour. On the other hand the bright colour of the under fur is common both to the present specimens and *M. i. parvidens*. On the back of the former it may be termed cinnamon, a little duller on the anterior back, brighter and more inclining to rufous on the posterior back. This is very much in contrast to the colour of the under fur of East African specimens (in this museum) which is more brown, resembling raw umber, or snuff brown. *Mungos ichneumon* of Egypt again appears to have its under fur very richly coloured as it is described in »Zoology of Egypt» as »brick-red with dark sootbrown bases — — graduating to yellow and buff on the neck».

The under fur of the present specimens is also much more strongly developed than that in specimens from Lower Congo and those from East Africa in this museum. On the lower back it attains a length of about 23 mm., on the anterior back it is somewhat shorter. The hairs are in the former place 60—70 mm. and in the latter 45—50 mm. On the basal portion of the tail the hairs attain a length of 90—120 mm. The fur is thus generally much longer than in *M. i. parvidens*. Just below the terminal black tuft the tail of the older specimen for fully 6 cm. is clothed with elongated pure white hairs which surround the black terminal tuft. In the younger specimen this white portion is not developed, but the hairs have long white tips. On the intermediate short-haired portion of the tail the dark rings of the hairs are very pale, and the whole looks rather uniform isabelline brown (similar to the colour of the flanks), but sharply defined from the above mentioned subterminal white.

The strong development of the fur of these specimens, if compared with their relatives from Lower Congo, undoubtedly stands in correspondence with a somewhat harsher climate of their native country, as there are many analogies to such a condition to be found elsewhere. This characteristic alone appears thus not sufficient to distinguish these specimens as representatives of a different geographic race, but taken together with the different colour as described above I think that it forms reason enough for doing so.

Mungos paludinosus conf. rubescens HOLLISTER.

Two specimens probably from Rutshuru, only one of them with a skull.

As the fauna at the locality mentioned chiefly is of a West African type it appeared to be of interest to compare these specimens in the first rank with western specimens of the Marsh Mongoose group. The investigation showed then very soon that the affinities were not to be found in the west, but as complete descriptions of some western representatives of this group of Mongooses may prove to be of value at future studies, I have decided to publish the following notes, the more so as I have been able to receive some direct knowledge about TEMMINCK's »*Herpestes pluto*». The relation of this form to the Cameroon Marsh Mongoose has been rather obscure to me hitherto, but the information, which I have now been able to obtain, may be useful to others, and is thus included.

The following measurements indicate the dimensions of the type-skulls of TEMMINCK's »*Herpestes pluto*», which the present author has had the pleasure of measuring thanks to the great kindness of the director of the Rijks Museum van Natuurlijke Historie in Leiden, Dr. E. D. VAN OORT.

	♂	♀ (?)
Greatest length	108,5 mm.	107 mm.
Condylolncisive length	98,7 »	97,2 »
Basal length	93,0 »	91,5 »
Zygomatic breadth	58,6 »	—
Interorbital breadth	18,7 »	19 »
Least postorbital breadth	15,8 »	17,6 »
Distance from orbit to gnathion	32,3 »	32,0 »
Palatal length from gnathion	59,7 »	—
Palate breadth outside p^4 (posteriorly)	36,4 »	34 »
Combined breadth of upper incisors	12,6 »	13,7 »
p^3	6,5 × 5,1 »	6,2 × 5,3 »
Longest diameter of p^4	11,7 »	11 »
Length on outer side of p^4	9,8 »	9,3 »
Transverse diameter of p^4	8,2 »	8,2 »
m^1	10 × 7 »	9,5 × 6,7 »
m^2	6 × 3 »	6 × 3 »
Back of m^2 to front of canine	36,8 »	37,3 »
Length of lower jaw	70 »	—

It is especially noteworthy that very small p^1 are present only in one of the specimens which is signed »♀». In the other there is no trace of p^1 and the diastema is short. Both specimens are fully adult with well developed *crista sagittalis*. The upper canines of both specimens are provided with well developed sharp knife-like edges as well in front as behind, and these edges are by a fluting or groove both on the inner and the outer side separated from the central cone of the tooth. Thanks to this the upper canines look very broad when viewed from the side, their greatest antero-posterior diameter in the male amounting to 7 mm.

The type specimens of TEMMINCK's *Herpestes pluto* are all mounted and could therefore, of course, not be sent, especially during the now prevailing conditions, but Dr. VAN OORT kindly sent me »den Bälgen eines Liberia-Exemplares, welches ganz mit den Typen von der Goldküste übereinstimmt». This accordance is also corroborated by the shape of the upper canines of the Liberia specimen which have the same anterior and posterior edges, and flutings as TEMMINCK's types. p^1 is present on both sides.

The general colour of this Liberia Mongoose is dark brown, somewhat darker than the darkest shade of DAUTHÉNAY's »chocolate» (Rép. de Coul. 343, 4). The legs and feet have this colour quite uniform. On the body it is somewhat modified by the underfur which shines through and has a lighter colour similar to DAUTHÉNAY's »burnt umber» (304, 1). The long hairs are also provided with small buffish rings partly subterminal, but partly on the proximal portion of the hairs as well, the latter do not, however, differ from the former. On the neck these rings are more numerous and still more so on the head, where the rings become more whitish and produce a more grizzled appearance. The throat is snuff brown, the upper side and tip of tail black.

In the R. Swedish Nat. Hist. Museum are kept some Marsh Mongooses collected by my friend, Mr. GUNNAR LINNELL at Cape Debundsha, Cameroon. These present a somewhat different type from that of TEMMINCK's *pluto* so that they cannot be referred to that race. The following measurements indicate the cranial dimensions of two specimens, to judge from the size, presumably male and female.

	♂	♀ (?) old.
Greatest length	117 mm.	108,8 mm.
Condylolncisive length	110 »	103,5 » ¹
Basal length	103 »	96 » ¹
Zygomatic breadth	55,6 »	54,5 »
Interorbital breadth	21,5 »	23 »
Least postorbital breadth	15 »	17 »
Length of nasals	24 »	—
Distance from orbit to gnathion	40 »	36 » ¹
Palatal length from gnathion	60,2 »	56,5 » ¹
Palate breadth outside p^4 (posteriorly)	35,2 »	33,8 »
Combined breadth of upper incisors	13 »	—
p^8	6,5×4,2 »	6,4×4,2 »
Longest diameter of p^4	10,9 »	11,2 »
Length on outer side of p^4	9,8 »	9,4 »
Transverse diameter of p^4	7 »	7,1 »
m^1	9,2×7 »	9,6×6,3 »
m^2	6,1×3,7 »	6,4×3,7 »
Back of m^2 to front of canine	40 »	38 »
Length of lower jaw	76 »	—

A small p^1 is present on both sides in the male skull, in the presumed female it is present on one side, but has probably been lost on the other side as the diastema is

¹ The animal has apparently in lifetime lost the upper incisors except one of the lateral ones, and the alveoles are abolished. This measurement is therefore possibly a little too short.

rather wide. Both specimens have a well developed *crista sagittalis*, and the presumed female is old with obliterated sutures. The upper canines are keeled in front and behind, but by far not provided with such trenchant edges as TEMMINCK's *pluto*. The greatest antero-posterior diameter is 6 mm., and the whole tooth considerably more slender than in *pluto*.

From the measurements may be seen that the Cameroon Marsh Mongoose has a longer skull, but smaller carnassial and m^1 than *pluto*, especially the inner heel of the latter is much broader in *pluto*. The teeth of the lower jaw are also smaller than in *pluto*. The transverse diameter of m_1 of *pluto* ♂ is 6,2 mm., while that of the Cameroon Mongoose is 5,5 mm. The transverse diameter of p_3 is in the former 5 mm., in the latter 4,4 mm. and so on.

The Cameroon Mongoose has a small p_1 present in both specimens, but neither of the *pluto* specimens is provided with such teeth in the lower jaw.

The colour of the Marsh Mongoose from Cameroon is also different. The long hairs are black with short subterminal rings of a buffish colour and very broad subbasal whitish rings which are concealed. The animals therefore look very dark. The colour of the under fur is brown most similar to »sepia» (DAUTHÉNAVY: Rép. de Coul. 300, 1—2). The head is grizzled by whitish rings on the blackish hairs. On the throat the rings are broader, more numerous and with a yellowish tinge. The limbs and feet are shiny brownish black. The tail is black, the long hairs without subterminal rings, but with the broad subbasal whitish rings which, however, are entirely concealed. The Marsh Mongoose from Debundsha, Cameroon, is thus so much different from TEMMINCK's *pluto* as well with regard to colour and pattern as to the skull, especially the teeth, so that it must be regarded as a different race. I suspected then that it might be identical with *Mungos naso* DE WINTON.¹ The journal, in which this has been described was, however, impossible to obtain in this country, and even my endeavours to secure it from abroad failed. Finally I took the liberty of sending a skull of our Cameroon Marsh Mongoose to Mr. OLDFIELD THOMAS who kindly has compared it with *M. naso* and found it identical with the same. According to my opinion *naso* must, although well distinct, rank as a subspecies to *paludinosus*, and the above description may serve to facilitate its identification in the future as the original diagnose appears difficult to obtain.

The skull of the Marsh Mongoose collected by Captain ARRHENIUS appears to have belonged to a female specimen, because the *crista sagittalis* is not very strongly developed, although the animal has entirely obsolete sutures and worn teeth. Its dimensions are as follows:

	Mongoose from Rutshuru ♀	
Greatest length	107,6	mm.
Condylolncisive length	99	»
Basal length	93	»
Zygomatic breadth	58	»
Interorbital breadth	18,2	»
Least postorbital breadth	18	»

¹ Bull. Liverpool Mus. III, 1901.

	Mongoose from Rutshuru ♀ (?)
Distance of orbit to gnathion	31,5 »
Palate breadth outside p^4 (posteriorly)	35 »
Combined breadth of upper incisors	13 »
Palate length from gnathion	56 »
p^4	$7,3 \times 6,4$ »
Longest diameter of p^4	12 »
Length on outer side of p^4	9,8 »
Transverse diameter of p^4	8,7 »
m^1	$10,7 \times 7,5$ »
m^2	$6,3 \times 3,3$ »
Back of m^2 to front of canine	36,8 »
Length of lower jaw	70 »

There is no trace of any p^1 , nor of p_1 . The other premolars are comparatively large and heavy, much larger than those of *M. n. naso*. The upper canines are sharply edged on their posterior side, less so on the frontside.

The Rutshuru Marsh Mongooses looks reddish brown, this colour being produced by more or less rich rufous, fawn to rust red subterminal rings to the black long hairs which also sometimes have a whitish ring subbasally, or near the middle. The latter are concealed and also much less broad than in the Cameroon Mongoose. The underfur has a brownish colour like raw umber, but basally darker and more greyish. The head is grizzled with light rings to the dark hairs which are whitish on the sides of the head, more yellowish on top. The throat is yellowish grey, or somewhat ochraceous. Legs and feet brownish black. The tail is basally much mixed with rust red like the back, towards the tip the black predominates.

Length of the skin from snout to vent 565 mm. Tail without hair 295 mm. Hind foot (s. u.) about 88 mm. in a dry state.

This Mongoose from Rutshuru is evidently nearly allied to *M. paludinosus rubescens* HOLLISTER of East Africa. Whether it is fully identical, or not, is very difficult to say when not more material is available, and the faculty of variation of these Marsh Mongooses is imperfectly known.

The brain-cavity of this Mongoose appears rather large as it holds about 32 ccm.

Crossarchus zebroides LÖNNB.

A female specimen from Kasindi $\frac{6}{7}$, 1913.

It might perhaps have been expected that the Banded Mongoose of this district should be the Ruwenzori race *C. fasciatus macrurus* THOMAS, but this is evidently not the case. The tail of the present specimen is rather less than half the length of head and body. In this respect as well as with regard to colour and cranial measurements it agrees with the specimens from Mukimbungu, Lower Kongo, described 1908 by the present author.

Whether a quite young animal in milk-dentition, which has been collected at Beni in Jan. 1914, belongs to this species, or not, is impossible to say. It might perhaps be a young *Crossarchus dybowskii* POUSARGUES about which the author quoted says: »Sa robe en effet ne présente aucune zébrure». This holds good for the present specimen, but it may depend on its youth, as well as its generally dull colour may be attributed to the same cause.

Poecilogale albinucha doggetti THOMAS & SCHWANN.

1 ♂ $\frac{1}{4}$, 1 ♂ juv. & 1 ♀ $\frac{6}{5}$, 1 ♀ $\frac{9}{12}$, 1 ♂ $\frac{31}{12}$ 1913, all from Rutshuru.

The length of the skull of the largest male is exactly as great as that of the type viz. 60,5 mm. The relative length of the stripes is, of course, somewhat variable. The lateral stripes are, however, in none of these specimens two thirds of the length of the median one, as is said to be the case in the type specimens of *doggetti*. The white of the chin is in most of these specimens confined to the lower lip, and the white »patch on the throat» of the type is also absent in these specimens. These small differences are, however, of minor importance, and I do not hesitate to refer the specimens from Rutshuru to *P. doggetti* THOMAS & SCHWANN, the more so as the type locality of that form »Burrumba, Ankole» (Nkole) is not very distant.

In consequence of the variability thus found, *P. doggetti* apparently differs from the typical *P. albinucha* only by its very much larger size, and such a characteristic does not seem to be of more than subspecific value. It is probably due simply to more favourable natural conditions, and above all to more abundance of food.

Canis adustus.

A very large native flat skin. Length of head and body 83 cm.; tail 33 cm. The lateral stripes are well marked, and the tail very black.

Anomalurus jacksoni fortior n. subsp.

Two male specimens from Masisi near Kivu, Febr. 1914, and one from the forest west of Beni.

These specimens appear to agree with DE WINTON's description of *A. jacksoni* from Uganda with regard to the colour pattern, but they differ in some other respects. The author quoted says for instance that in *A. jacksoni* the rigid adpressed hairs »on the upper sides of the wings» are »confined to a small space barely 2 inches [= 50 mm.] long from the point of the expanding process backwards». In the largest of the present specimens these adpressed black hairs occupy a strip along the margin of the membrane of about 100 mm. from the process.

The dimensions of the largest specimen from Masisi are also larger than those of *A. jacksoni*, the distance from snout to vent being in the dry specimen about 400 mm.

(to base of tail 450), and the length of the tail without hairs about 220 mm.; the length of the dry ear 33 mm. The subcaudal scales are about 15; the proximal ones very large, measuring 12—13 mm. in length, but the most distal ones only about 3 mm.

Greatest length of skull 60 mm.; greatest zygomatic breadth 41,5 mm.; least width of nasals 6 mm.; height of infraorbital foramen 7 mm.; basal length of skull 53,5 mm.; upper molar series 13,7 mm.; diastema 13,3 mm.; mandible inside of incisors to condyle 37 mm.; height of mandible to coronoid 22,5 mm.

These differences appear to indicate that at the localities mentioned above there is to be found a somewhat larger race than the typical one in Uganda. This is also in agreement with other similar facts, no doubt depending upon the fact that the conditions of life for the western forest animals already in Uganda are somewhat less favourable than in the upper Congo forests, through which circumstances a racial difference is produced.

Anomalurus pusillus THOMAS.

A female specimen from Masisi, Febr. 1914.

This specimen has a greater zygomatic width (32 mm.), but agrees otherwise with THOMAS's description.

Idiurus zenkeri kivuensis n. sp.

An adult and a young specimen from Masisi in the Kivu-district.

These specimens agree much more in their general characteristics with *Idiurus zenkeri* MATSCHIE than with *I. macrotis* MILLER. Especially the cranial dimensions differ from those of *I. macrotis*.

It was more difficult to decide, whether this *Idiurus* from the Kivu district could be regarded as identical with *I. zenkeri* from Cameroon, or not, although from a geographical point of view it did not appear much likely. To make sure about this I took the liberty of asking the author of the Cameroon species, Professor MATSCHIE, concerning the same, and I am very much indebted to him for valuable information concerning this matter.

The general colour of the upper parts of this *Idiurus* is »deep bistre» (DAUTHÉNAY, Rép. de Coul. 303, 1), because the tips of the fur has this colour, but basally it is dark fuscous grey which shines through here and there. The fur on the lateral membranes is dark brown, »sepia» (l. c. 300, 2), or perhaps better RIDGEWAY's »fuscous». On the interfemoral membrane the dark hairs are partly tipped with a pale shade of »deep bistre». The upper side of the fore-legs are like the back; that of the hind legs is darker, more like the interfemoral membrane in colour. Scattered over the back, but more numerous on the sacral region, on the sides and on the membrane there are to be seen very long and very slender whitish hairs which probably have a sensory function. The general fur on the back has a length of about 10 mm.

The chin is white. The lower side of the body is grey between »slate grey» (362, 1)

and »smoke grey» (363, 4). This grey is overlaid with a very pale shade of »deep bistre», produced by the tips of the hair. The lower side of the lateral membrane is paler than the upper, but darker than the belly. The hairs of the tail has about the same colour as the upper side of the membranes.

For comparison with this may be quoted the renewed description of the colour of *I. zenkeri* which Prof. MATSCHIE kindly has sent me in a letter, since the specimen had been better prepared and dried. »Der Rücken ist gelblich isabellfarbig, nur wenig gelber als Woodbrown in der Nomenclature of colours und hell föhrenholzbraun (Taf. 310, 1) bei OBERTHÜR und DAUTHÉNAY, Répertoire de Couleurs. Auf der Unterseite hat *I. zenkeri* eine deutliche gelbe Farbe, die ziemlich stark zwischen dem Grau hervortritt, ein helles Olivengelb, das an den Körperseiten ins gelblich Olivenfarbene übergeht. Nur auf der Brust ist das Grau etwas deutlicher.»

The *Idiurus* from Masisi is also larger than *I. zenkeri*. The hind foot of the former measures, claws included, 17,5 mm. and s. u. 16,5 mm., while in the original description of *I. zenkeri* we read: — — »Hinterfuss 15 [mm.]; — — —; Hinterfuss bis zur Vorderseite der vorderen Sohlenballenreihe 11» [mm.]. The latter measurement of the *Idiurus* from Masisi is in the present dry state 12 mm. while *I. zenkeri* was measured as an alcoholic specimen.

To judge from the skin the *Idiurus* from Masisi appears to have greater bodily size. The present adult specimen measures as skin about 95 mm. from snout to vent. The ear appears to have about the same proportions as in *I. zenkeri*.

The skull of the new form is also larger. It is unfortunately damaged as the occipital region behind *sutura lambdoidea* is missing, but without the same its length is 22 mm., that is just as much as the greatest length of the entire skull of *I. zenkeri*. According to a communication from MATSCHIE the distance from *sutura lambdoidea* to tip of nasals is only 19 mm.

It was of great interest to find that the genus *Idiurus* has a distribution which extends so far east as it hitherto was known only from Cameroon. This fact makes it probable that members of this genus inhabits the whole West African forest region.

***Aethosciurus ruwenzorii vulcanicus* THOMAS.**

2 ♂♂, 2 ♀♀ from Masisi near Kivu, Febr. 1914.

***Heliosciurus rufobrachiatatus semlikii* THOMAS.**

5 ♂♂, 2 ♀♀ from Beni, Aug., Sept. 1914; 1 ♀ *ibid.*, Jan. 1914.

***Heliosciurus rufobrachiatatus arrhenii* n. subsp.**

3 ♂♂, 3 ♀♀ from Masisi near Kivu, Febr. 1914.

These Squirrels resemble *H. r. semlikii* from Beni, but differ from the same in being considerably darker and larger. The back, especially its posterior portion is strongly

overlaid with long glistening black tips to the hairs, which almost completely cover the narrow light rings from view. The flanks and the head as well are darker and less grizzled than in the specimens from Beni so that the whole animal looks darker and not so brownish as *H. r. semlikii*. The tail has very long black hairs, and the pure white tips are not so numerous as in the Squirrels from Beni. The rufous around the snout and on the feet and legs is of a richer rufous shade, varying between DAUTHÉNAY's »burnt sienna» (Rép. de Coul. 320) and »indian chestnut red» (ibid. 333). Head and body (dry skin) about 31 cm., tail (without hair) about 30 cm., hind foot (s. u.) 55 mm.

	♂	♀
Greatest length of skull	58 mm.	58,2 mm.
Condylolincisive length of skull . . .	51,2 »	52 »
Zygomatic breadth	32,5 »	33,5 »
Nasals	18,5 »	19,2 »
Interorbital width	17 »	18 »
Upper molar series	11,1 »	10,9 »

The presence in the Kivu district of a darker race of this species than at Beni is an analogy to the from the Ruwenzori race differing *Aethosciurus ruwenzorii vulcanicus*, also found at Masisi.

***Heliosciurus rufobrachiatu* pasha SCHWANN.**

1 ♂ from Rutshuru, ²⁷/₆ 1914.

A specimen with the under parts dirty whitish, and the cranial measurements agreeing with those recorded by SCHWANN is referred to this species. It is very much smaller than the foregoing.

***Protoxerus stangeri centricola* THOMAS.**

1 ♂, 3 ♀♀ from Masisi, Febr. 1914; 3 ♂♂, 3 ♀♀ from Beni, Aug., Sept. 1914; 1 ♀ ibid., Jan. 1914.

In addition to these adult specimens the collection also contains a quite young male (from Masisi, Febr. 1914) in which the molars are not yet fully developed. This specimen is remarkable for its bright colours. The crown and anterior back is mixed black and ochre (DAUTHÉNAY, Rép. de Coul. 313). On the posterior back and on the hind legs the ochre colour dominates completely, so that hardly any black is visible. The hind feet are rust red (318). Fore limbs, sides of neck and face grizzled black and white. The line of demarkation hoary grey. Tail cylindrical, not bushy, ochre-coloured at the base, the remainder with long white tips to the hairs almost completely concealing the black basal parts. Length of head and body 23 ¹/₂ cm., tail 20 cm.

***Paraxerus böhmi emini* MATSCHIE.**

♂ ♀ from Masisi, Febr. 1914; 3 ♀♀, 2 ♂♂ from Beni, Aug., Sept. 1914. A young specimen which has lost its label.

Paraxerus alexandri THOMAS & WROUGHTON.

1 ♂, Beni, $\frac{1}{7}$ 1914; 1 ♂, 1 ♀ *ibid.*, Aug., Sept. 1914.

Funisciurus carruthersi THOMAS & WROUGHTON.

1 ♂, Masisi, Febr. 1914.

This rare species was first described on two specimens from Mubuka Valley, Ruwenzori. Some few years later THOMAS described a new subspecies which he named *F. c. tanganyikæ*,¹ because it was collected at »Usumbura, N. end of L. Tanganyika». The latter is said to be »more suffused with ochraceous» and have forearms and hind legs »strongly suffused with ochraceous». This is not the case with this specimen, but on the other hand it agrees with the subspecies from Usumbura in having the »tail-hairs washed terminally with whitish, far lighter than their basal rings, while in *carruthersi* both proximal and terminal rings are of the same yellowish colour». The pale colour of the tips, or subterminal rings of the tail-hairs may, however, be the result of bleaching, and even if this is not the case, the specimen from Masisi is at most intermediate between the typical *carruthersi* and *tanganyikæ*, although it has been collected nearer Lake Tanganyika than Eastern Ruwenzori.

Funisciurus akka DE WINTON.

4 ♂♂, 4♀♀ from Masisi, Febr. 1914.

Graphiurus soleatus THOMAS & WROUGHTON.

1 ♀, Masisi, Febr. 1914.

THOMAS has recently stated² the existence of two species of *Graphiurus* in Upper Congo viz. *G. christyi* DOLLM. and *G. lorraineus* DOLLM. from the Poko-district. The present specimen differs, however, from both by its larger ears, and by the same characteristic still more from *G. surdus* DOLLM., described from French Congo. From *G. lorraineus* it differs also by its larger and differently coloured hind feet etc.

The description³ of *G. soleatus* THOMAS & WROUGHTON from Ruwenzori fits on the other hand very well to the Masisi Dormouse. In fact the cranial measurements recorded by the authors mentioned, agree perfectly with the corresponding ones of the present specimen. The dimensions of ear and hind foot are also similar. On the other hand the length of head and body, as recorded by the authors quoted, is only 79 mm., while the skin of the present specimen measures about 11 cm., but it may be stretched, and the former measurement perhaps rather small. It appears rather improbable that the cranial and other measurements could be so similar, but the body dimensions so different.

¹ Ann. Mag. Nat. Hist. (8) Vol. IV, 1909, p. 477.

² Ann. Mag. Nat. Hist. (8) Vol. XVI, 1915, p. 474.

³ Trans. Zool. Soc., Vol. XIX, Part 5.

The tail of the present specimen is »clubshaped» and may thus have been broken.¹ It is only about 60 mm. without the long hairs. The general colour above is brownish grey (darker than RIDGWAY's »mouse gray»), but on the middle of the back is a large brown patch, something between RIDGWAY's »snuff brown» and »cinnamon brown». The animal has thus been in the act of shedding its pelage, and the two colours represented indicate evidently the limits between which the colour varies at different seasons of the year. It must thus be taken cum grano salis when some species of this genus are described as grey, and others as »bright buffish brown», because both colours are subjected to great change.

? *Oenomys bachante unyori* THOMAS (vel nova subsp.).

1 ♀ from Masisi, Febr. 1914.

This specimen is rather young with hardly worn molars, and it is possible that this may explain its small dimensions, but it is perhaps still more probable, that it may represent a different geographical subspecies, smaller and darker than the one the name of which is written above. As there is only this specimen at hand, no definite opinion can be expressed for the present. The upper parts of the head and anterior half of the back are grizzled dark brown and yellowish, the posterior back dark rufous. This colouration is to judge from the description darker than in *Oe. b. unyori*. The bright rust-red of the snout extends to the eyes, but is darker posteriorly. Ears rufous. Lower parts white, washed with buff. Outer side of hind limbs paler rufous than the back. Hind feet buffy, fore-feet mixed with brown. Inside of hind limbs orange buff, but rather pale. Head and body (skin) 15,5 cm.; tail 14 cm. (thus comparatively shorter than in *Oe. b. unyori*), hind foot (dry) s. u. 28 mm. Skull: greatest length 31,5 mm.; condyloincisive length 29 mm.; zygomatic breadth 14 mm.; interorbital breadth 4,7 mm.; nasals 7 mm.; palatal foramina 6 mm., upper molar series 6,4 mm. The anteorbital plate is vertical.

***Cricetomys*.**

Captain ARRHENIUS's collection contains a very interesting series of Giant Rats of this genus, viz. 10 specimens and an extra skull from Masisi, and a specimen from Beni. This series contains young and adult of both sexes, but even considering age and sex it is by no means uniform. Six of the specimens from Masisi,² and the one from Beni have a white belly with a sharp line of demarcation, one specimen from Masisi has a whitish belly, but no sharp line of demarcation, the remaining two specimens from Masisi are dark-bellied.

The first mentioned ought to belong to the *gambianus* group, to which quite a number of subspecies has been described from different parts of Africa. To the West African subregion belong: *C. g. poensis* OSGOOD from Fernando Po, *C. g. dolichops* OSGOOD from Gaboon, *C. g. dichrurus* OSGOOD from Southern Nigeria, *C. g. liberiae* OSGOOD from Liberia,

¹ Conf. THOMAS in Proc. Zool. Soc. II, 1905.

² A seventh is a young male about which it is uncertain to which group it ought to be referred.

C. g. emini WROUGHTON from Mombuttu, *C. g. proparator* WROUGHTON from Ruwenzori, and *C. g. olivæ* DOLLMAN from Northern Nigeria. It seems that among such a number of descriptions some would be applicable to these specimens. This appeared the more likely as THOMAS recently has referred Giant Rats from Upper Congo to two of the above mentioned subspecies viz. *C. g. emini* WROUGHTON and *C. g. dichrurus* OSGOOD. It could thus be expected that the above mentioned seven specimens possibly belonged to the subspecies just mentioned. A comparison with the original descriptions reveals, however, several differences, and it appears therefore the best plan to give a full description of two typical specimens (numbered 151 and 152 in Captain ARRHENIUS's collection), and then discuss the matter more fully. These two specimens (♀♀ ad.) selected are so similar inter se and with the others with regard to the colour that they can be described with the same words. The only exception is that one adult female among these six appears to have the fur somewhat more worn and a little more bleached than the others. The remaining four specimens are younger animals.

The two selected specimens may be described as follows.

Fur rather harsh, 12—13 mm. long on back, single hairs even reaching 15 mm. Colour of back very dark brown, most similar to DAUTHÉNAY's »warm sepia», but the hairs are very glossy. The fur is basally rather dark grey. On the flanks the colour changes rather abruptly to paler brown which on the lower flanks is rather light »cinnamon» (DAUTHÉNAY, Rép. de Coul. 323, 1). Between this colour and the pure white under parts is a very sharp line of demarcation. Upper parts of head and snout like the back, this colour surrounds the eyes; sides of head paler, like the upper parts of the flanks. A rather large white spot behind the vibrissæ (this spot is larger in »n:o 152» than in »n:o 151»). The upper parts of the hands and the feet very dark like the back, the outer, or sometimes both sides of the hands margined with white as also is the case with the inner side of the feet; fingers and toes white. The outer half, or less, of the tail whitish.

Length of head and body (skin) of a female with rather worn teeth about 38 ½ cm., tail about 37; hind foot 6,6 cm.

	♀ ¹ (molars little worn)	♀ ² (molars worn)
Skull: Greatest length	75 mm.	72,3 mm.
Condylbasal length	72 »	67,7 »
Zygomatic breadth	34,2 »	32 »
Nasals	31,7 »	29,2 »
Least interorbital breadth	11,4 »	11,4 »
Diastema	24 »	23,5 »
Palatal foramina	8 »	9 »
Upper molar series	12,5 »	10,7 »
Breadth of <i>m</i> ¹	3,9 »	3,2 »
Greatest breadth across the palate measured outside <i>m</i> ¹	15,0 »	13,3 »
Breadth of posterior choanæ	6,5 »	5,5 »

¹ N:o 151 in Capt. ARRHENIUS's collection.

² N:o 152 in Capt. ARRHENIUS's collection.

The difference in the cranial measurements of these two female specimens, which with regard to colour are so similar as possible, is very peculiar. It would be only natural that the dimensions of the molars were somewhat smaller in the older specimen (n:o 152) in which these teeth are more worn than in the younger (n:o 151), but the difference appears in this case far too great, if it is considered that in the oldest, small-toothed specimen the inner cusps of the upper molars are not yet obsolete by wearing. Another absolute proof that the different size of the molar series is not only due to difference in age is offered by the fact that the length of the upper molar series of two other specimens (n:o 155 & 158) the same kind only measures 104 mm., although the specimens in question are so young that the inner cusps hardly are worn at all, and the molar series thus absolutely not shortened by wearing. The different length of the molar series becomes by these facts of distinctive value. The upper incisors are also very much broader and stouter in the specimen (n:o 151) with the larger molars so that the combined breadth of both incisors just above the cutting edge amounts to 6 mm., while in the other specimen (n:o 152) it is 4,8 mm. In the latter they have the usual chisel-shape, but in the former they are much more transversely worn off, so that the edge is blunt. This latter fact may be due to individually different food, or gnawing on different material (conf. below). This specimen with large teeth has also a very thick preorbital portion of the skull the transverse diameter of the premaxillary region being 13 mm. which is much more than in any other of the present specimens. In the other female skull, the measurements of which are recorded above, the same dimension is 11 mm. The height of the skull at the anterior end of the palatal foramina is resp. 8,8 and 7,2 mm. In connection with the large teeth the musculature of the jaws must be well developed which also produces a very broad and heavy zygomatic arch. The antero-posterior length of the zygomatic plate measures 7,6 mm., while the same dimension in the small-toothed specimen is 6,3 mm. The posterior margin of the palate is in the small-toothed specimen more evenly rounded, but in the large-toothed somewhat angular or notched.

These differences in cranial structure and dimensions between these two *Cricetomys* skulls are so great, that it appears quite impossible to refer them to one and the same race in spite of the facts that they have been collected at the same place, and that the skins are so alike in colour, the only difference readily perceptible being that the white spot on the upper lip is a little smaller in the big-toothed specimen. The white terminal portion of the tail is also shorter in the same, but it is not excluded that the tail has been mutilated in lifetime.

OSGOOD has suggested¹ that »the small-toothed forms of West-Africa are distinct from the large-toothed ones of East and South Central Africa». This is a conclusion drawn from the fact that *C. g. emini* (a large-toothed form) is found at the same locality as *C. g. dichrurus* (a small-toothed form) in Northern Congo.

The question is now whether the present large-toothed animal can be referred to *C. g. emini*, or not. To judge from WROUGHTON's short description, the hairs of *C. g. emini* are »greyish white, with apical third brown». This is certainly a quite different colour than the one possessed by the present specimen. The cranial dimensions are also

¹ Ann. & Mag. Nat. Hist. (8) Vol. V, 1910, p. 281.

somewhat different. *C. g. emini* has not quite as large teeth as this one, but larger palatal foramina. It is, however, possible that the smaller size of the molars of the type is due to wearing, and the other characteristics variable, therefore I will not deny that this specimen may possibly belong to the race named *Cricetomys gambianus emini* WROUGHTON.¹

Still greater difficulties arise for the identification of the small-toothed specimens, which are five in number, not counting an extra skull. With regard to colour they agree on the whole very well with *C. g. dolichops* OSGOOD. The latter appears, however, to have a longer and differently shaped skull with a very elongate preorbital portion resulting in much longer nasals and diastema. The palatal foramina are very short in *dolichops*, only measuring 7,5 mm, although the type was an adult male.

From *C. g. dichrurus* OSGOOD, which also is small-toothed, the Masisi specimens differ sharply by their pure white belly. The type of *dichrurus* was an »adolescent female», and therefore the cranial measurements recorded by OSGOOD cannot be directly compared with those of a fully adult specimen such as that from which the above recorded dimensions have been taken. To throw some light on the gradual development of the skulls the following series of measurements is added.

	♀ »n:o 155»	♀ »n:o 158»	»n:o 153» ²
Greatest length of skull	58,2 mm.	62,5 mm.	70,3 mm.
Condylbasal length of skull	54,5 »	58,5 »	67,7 »
Zygomatic breadth	27 »	26,8 »	31,5 »
Nasals	22 »	22,2 »	28 »
Least interorbital breadth	9,8 »	9,4 »	10,2 »
Diastema	17,3 »	19 »	22 »
Palatal foramina	7 »	7,5 »	8,2 »
Upper molar series	10,4 »	10,4 »	11 »
Breadth of <i>m</i> ¹	3,2 »	3,2 »	3,5 »
Transverse diameter of preorbital portion	9 »	8,5 »	10,4 »

These measurements prove that the preorbital portion of the skull with nasals and diastema are even comparatively speaking shorter in the young than in the adult. OSGOOD's »adolescent female» of *dichrurus* has consequently not yet attained full size in this respect, and the diagnose must thus be read with regard to this fact. The thickness of the preorbital portion of the skull appears to increase rather irregularly, or to vary individually.

C. g. dichrurus is said to have »extremely small bullæ». The specimens of this collection prove that the bullæ of the small-toothed race certainly are less inflated than those of the large-toothed *emini*-group. »Extremely small» is, however, too strong an attribute for the bullæ of the specimens now in question.

¹ From *C. g. proparator* WROUGHTON it differs in having hands and feet dark, and less white on the tail, dark under fur etc.

² No skin!

Even if the cranial dimensions as far as is known and for reasons mentioned above do not give any sharp distinguishing characteristics I feel compelled to regard this small-toothed, white-bellied *Cricetomys* from Masisi as a new subspecies which I call:

Cricetomys gambianus kivuensis, because the type locality is situated only three days march from the Lake Kivu. As type I select n:o 152 of Captain ARRHENIUS's collection, an adult female, which has been described above as well to its colour as cranial dimensions.

Cricetomys sp.

The above mentioned *Cricetomys* specimen (»n:o 150» of the collection) from Masisi in which there is no sharp line of demarcation is a male belonging to the large-toothed group. With regard to its exterior it differs in the following points from the female (»n:o 151»), which in the above with doubts has been referred to *C. g. emini*. The line of demarcation is not sharply defined, and the under parts are not so pure white, but somewhat tinged with buffish except on the throat. The back is not quite so dark, and the cinnamon of the flanks is more developed. The small white spot on the upper lip is also tinged with light cinnamon. The dark and light portions of the tail are about equal in length. The upper parts of hands and feet as in the *emini*(?) female very dark, »warm sepia», but with light margins and white digits and toes.

The skulls have partly very similar dimensions:

	♂
Greatest length	75,2 mm.
Condylbasal length	71,8 »
Zygomatic breadth	34 »
Nasals	31,0 »
Least interorbital breadth	10,4 »
Diastema	24 »
Palatal foramina	8,4 »
Upper molar series	12,3 »
Breadth of m^1	3,8 »
Greatest breadth across the palate outside m^1 . .	14,3 »
Width of posterior choanæ	5,6 »

In other respects, however, the skulls of this male specimen and that of the female »*emini*» differ from each other. The preorbital portion of the former is more compressed so that its transverse diameter is only 11,5 mm. against 13 mm. in the latter.

	♂	♀ » <i>emini</i> »
Width across outer sides of m^1	14,3 mm.	15 mm.
» » » » m^2	13,0 »	14 »

The palate is thus broader in the female. The upper side of the skull looks very different in these two specimens. That of the female (»*emini*»?) appears much broader than the other. Its nasals are broader, almost equally broad for the greater part of their

length, whereas in the male they taper evenly to the posterior end. The raised lines on the frontals are erect and converge rather strongly in a forward direction so that in the anterior part of the frontals they are situated entirely on the upper surface, remote from the lateral wall of the skull, which in the anterior part of the orbit is rounded off towards the roof of the skull. In the female («*emini*»?) the corresponding raised lines form almost horizontal crests protruding rooflike over the lateral wall of the skull.

The fronto-parietal suture is in the male straight and quite transverse, in the female it is semicircular, but this is no doubt a variable characteristic. The shape of the interparietal appears also to vary a great deal in this genus, as I have observed on the material of *C. g. kivuensis*, where it is sometimes more, sometimes less broadly triangular, or even somewhat rounded off on the anterior side. The relative size seems, however, to be about the same within the racial limits. For this reason it may be mentioned that in the male skull, now described, the interparietal bone is comparatively very small, measuring 4,7 mm. in length by 6 in breadth. In the «*emini*» female the same dimensions are 5,8 and 9 mm.

This comparison proves that, although a number of cranial dimensions are very similar, or almost identical, these two specimens in other respects present so great differences, that it is impossible to unite them within the same subspecies. There are thus to be found, as far as can be understood from the present material, not only a small-toothed and a large-toothed race of light-bellied *Cricetomys*-forms in the same district at Masisi, but there are even two different large-toothed forms. The great faculty of variation displayed by the genus *Cricetomys* is illustrated by these facts. Although I do not think that this specimen can be referred to any described subspecies I refrain for the present to name it, because only one specimen is available.

***Cricetomys gambianus* preparator WROUGHTON.**

1 ♀ from Beni collected $\frac{6}{7}$ 1913.

This specimen agrees on the whole very well with WROUGHTON's description with regard to colour and cranial characteristics. The differences may chiefly be due to individual, or perhaps seasonal differences. These differences are as follows. The fur is not 15, but hardly more than 12—13 mm. long, single hairs perhaps a little longer. It is grey not greyish white at the base. The hind feet are not entirely white, but brown in the middle of the upper side. The length of the hind foot of this dry specimen is not quite 68 mm.

The cranial measurements do not present any difficulties for the identification.

Greatest length of skull	76,7 mm.
Basilar " " "	64 »
Condylolncisive length of skull	72 »
Zygomatic breadth of skull	32,5 »
Nasals	31,2 »
Palatal foramina	8 »
Diastema	24 »
Interorbital breadth	11,3 »
Upper molar series	11,3 »
Greatest breadth of <i>m</i> ¹	3,4 »

The fact that the premaxillary suture cuts the palatal foramina at their posterior extremity appears to be a good characteristic, as it is not found in any of the other specimens of the present collection.

***Cricetomys microtis* n. sp.**

2 ♀♀ from Masisi, Febr. 1913.

A dark-bellied Giant Rat with large skull and medium-sized molars.

Colour on the back very dark brown, similar to DAUTHÉNAY's »warm sepia» (Rép. de Coul. 305, 4). The fur is dense, rather harsh; on the posterior back, where it is longest, the average length is 15 and many hairs even 17 mm. It is dark grey at the base. Towards the sides the colour is more greyish brown, because pale »snuff brown» (Rép. de Coul. 303, 1) hairs are mixed with dark brown, the latter become gradually less numerous on the flanks so that the colour there is lighter greyish brown. There is no line of demarcation towards the under side, which is grey with whitish tips to the hairs. Hands and feet dark brown, »warm sepia» in the middle, somewhat paler on the sides, and on the toes and fingers. Only the distal third of the tail light coloured. On the upper lip behind the black vibrissæ is a greyish spot.

Head and body of an adult female about 42 cm. (measured on the dry specimen); tail about 38 cm.; hind foot (dry) about 70 mm.; ear (softened and stretched to natural shape!) 25 mm.

The other female has a somewhat more worn and bleached pelage, and it is therefore partly paler except where the new hairs are developed.

The dimensions of two skulls both of fully adult females are as follows:

	♂	♀
Skull: Greatest length	77 mm.	74 mm.
Condylbasal length	73,5 »	71,2 »
Condylloinsive length	71,3 »	69,6 »
Zygomatic breadth	34,4 »	32,7 »
Nasals	32,3 »	29,6 »
Least interorbital breadth	10,3 »	10,5 »
Diastema	24 »	25,0 »
Palatal foramina	9,1 »	9 »
Upper molar series	11,5 »	10,5 »
Breadth of m^1	3,5 »	3,6 »
Greatest breadth of palate measured outside m^1	14 »	13,7 »
Height of skull at anterior end of palatal foramina	14 »	13,8 »

In most respects these measurements agree, but there are also discrepancies. The longer diastema in the smaller skull corresponds with its shorter molar series.

Another difference which is rather striking consists in the fact that the larger skull in which the upper incisors are worn rather blunt, has much broader and more massive

upper incisors than the other skull, the combined breadth of both at the lower edge being in the former 5,4 mm., in the latter 4,5 mm. The antero-posterior diameter of an upper incisor above the worn surface is in the former case 4 mm., in the latter only 3,2 mm. This proves that the difference in size is not confined to one dimension only. The difference is, however, probably not fundamental, but due to the more intensive wearing of the larger teeth caused by gnawing on some hard material. The incisors of these animals appear during their continuous growth to become larger with age as in the series of *C. g. kivuensis* the younger animals have narrower incisors than the older. But if this is the case, a very intensive wearing of the incisors by gnawing on hard material may in one individual at an earlier age produce broader and stouter incisors than in average individuals, which have not subjected their incisors to the same degree of wearing. Consequently two individuals of the same age may have incisors of different size due to difference in wearing.

The frontal processes of the premaxillary extend rather far backwards, almost as far as the nasals. The raised lines on the frontals are well developed, vertical and not converging at their anterior ends. The interparietal is rather small, measuring about 9 mm. transversally, and about 5 mm. longitudinally. Bullæ rather small.

The great variability of these Giant Rats makes it rather risky to create new forms, but in this case it appears evident that a rather well defined species has been found. It is easily recognized on its comparatively very small and rounded ears, its general colouration etc. The dark-bellied *C. ansorgei* THOMAS from Angola has much larger ears (47 mm.), and larger molars (length of upper molars 12,1 mm.), and it appears also to be much paler (»drab brown»). *Cricetomys gambianus elgonis* THOMAS has also much longer ears (42 mm.) and fingers and toes white and »tail dark for about one third its length».

***Thryonomys rutshuricus* n. sp.**

Two specimens from Rutshuru (one ♂, the other unsexed; skin somewhat mutilated), 18th of June 1914.

This new species is very easily recognized on its big skull and on its very short tail which latter measures only about 75 mm. from anus to tip. Its length is thus contained more than six, or practically seven times in the length of the head and body, which is about 520 mm., and the tail is shorter than the greatest length of the skull, which is 99,5 mm. (with a basal length of 85,5 mm.).

For comparison may be mentioned that in *Th. swinderianus* TEMMINCK, or perhaps more correctly, in the specimens recorded in the literature under this probably collective name, the length of the tail is stated to be contained from hardly more than two, to at most four times in the length of the head and body.

In VON HEUGLIN's »*Aulacodus semipalmatus*» the tail is about half the length of the body (= head and body), »von halber Körperlänge».¹

¹ Verh. d. K. Leop. Akad. d. Naturf. 1864, p. 7.

In the adult »*Aulacodus calamophagus*», according to POUSARGUES,¹ the length of head and body is 60 cm., while the tail measures 21 cm., and in a young animal of the same kind the corresponding dimensions are 47 cm. and 18,5 cm.

In the type specimen of *Thryonomys sclateri* THOMAS from the Nyika plateau, the tail unfortunately was mutilated, but its remaining length amounted to 110 mm. It is thus already by this distinct enough, but still better by its small skull which only had a basal length of 69 mm.²

Concerning *Thryonomys gregorianus* THOMAS it is not with full certainty known how long tail it has, but as from the same »region» in which the skull, on which this species was based, a short-tailed *Thryonomys* skin has been obtained, it is probable that this belonged to *Th. gregorianus*. It should then have a tail »scarcely longer than the hind foot» (THOMAS l. c. 1897). *Thryonomys gregorianus* has, however, a very much smaller skull with the basal length only amounting to 72,7 mm. It can thus not be identical with the animal from Rutshuru.

It remains then *Thryonomys harrisoni* THOMAS & WROUGHTON from the Lado district. This species as well has been based on a skull together with an imperfect skin and nothing has been communicated about the length of its tail. The skull of *Th. harrisoni* is, however, much narrower than in the form from Rutshuru, the greatest breadth of the skull being in the former only 52 mm., in the latter at least 61,5 mm. In addition to this the postorbital process is »entirely absent» in *Th. harrisoni*, but pretty well developed in the Rutshuru form so that in the latter a very pronounced notch is produced between this process and the supplementary process on the squamosal.

Although plainly distinct from the species mentioned, the species from Rutshuru with regard to its upper incisors appears to be more allied to the *gregorianus* group than to *swinderianus*. The part of the incisor outside the outermost groove measures in the Rutshuru form about 2—2,3 mm., the following space to the second groove about 1,3 mm., and the third about 0,8 mm.; the fourth, or innermost is very narrow only about 0,3 (or 0,4) mm. These dimensions are a little variable, but the part of the tooth outside the outermost groove is plainly less than the remaining portion, although at the same time much broader than the next section.

The dimensions of the two skulls are recorded in the following tables. The larger which is known to have belonged to a complete male specimen is to be regarded as the type of the species.

The stiff and bristly hairs are as usual flattened and grooved on the upper surface. Their concealed parts are grey, the outer parts darken from brown to black towards the tips. The majority of the hairs are provided with buff subterminal rings. On the head and anterior part of the back these rings are less broad, and less numerous, their colour being »yellowish buff» (DAUTHÉNAY, 310, 2). On the posterior back they are broader and more dominating, and the colour richer, almost inclining to »ochre» (DAUTHÉNAY, 313). On the flanks they are much paler, yellowish white. Belly and throat »maize yellow» (DAUTHÉNAY, 36, 2 or 3). Lips and chin white, surrounded by maize yellow. In-

¹ Bull. Mus. d'hist. Nat. Paris, 1897, p. 160.

² Proc. Zool. Soc. 1897, p. 433.

side of hind legs maize yellow (36, 4). Anal region saturated yellowish buff (310, 4). The scaly tail is scantily beset with rather short hairs which are blackish above, whitish beneath, and do not cover the scales. The whiskers are mostly dark brown. The feet are covered with hair, mixed blackish and maize yellow.

		♂
Greatest length of skull . . .	95 mm.	99,5 mm.
Basal length of skull	80,5 "	85,5 "
Greatest breadth of skull	61,5 "	61,7 "
Length of nasals	30,0 "	36 "
" " frontals	29 "	27,0 "
Interorbital breadth	32,5 "	(?)28,2 "
Greatest width of rostrum posteriorly across premaxillaries	27,2 "	28 "
Posterior breadth of nasals	16 "	16 "
Upper molar series	16 "	16,5 "
Lower " "	17,6 "	17,7 "
Tip to tip of postorbital processes	36,2 "	36,2 "
Diastema	23 "	24 "
Palate length to "henselion"	39,0 "	42,5 "

Dendrohyrax dorsalis FRASER.

A fine specimen from Beni caught 6th of July 1913.

Whether a small young without dorsal spot belongs to this species, or not, is impossible to decide.

Elephas africanus cottoni LYDEKKER.

A foetus with a length between forehead and vent amounting to about 30,5 cm. (Pl. IX).

As has been pointed out before, also by the present author concerning *E. a. cyclotis* MATSCHIE, the Elephant foetus comparatively early assumes the shape of the fullgrown animal to such a degree that the racial characteristics become conspicuous. This holds good also in this case. The shape of the ear proves that this foetus belongs to the race which has been named as above. A comparison between the accompanying figure of the left ear of this foetus shows exactly the same shape as LYDEKKER's figure in Proc. Zool. Soc. London, 1907, I, p. 390, on which the author quoted based his diagnose of this race. The shape of the ear, especially the small size of the hanging lappet may also be seen on a photo of a male Elephant shot by Capt. E. ARRHENIUS.

The ear of *E. a. cottoni* is less oval than that of *E. a. cyclotis* MATSCHIE from Cameroon, but undoubtedly both are nearly allied. Both have another characteristic in common viz. four hoofs on the hind foot. The present author stated¹ the presence of a fourth

¹ Comptes Rend. du 6me Congrès Internat. de Zoologie, Berne 1904, p. 324.

hoof in the hind foot of the foetus of *E. a. cyclotis*. This foetus of *E. a. cottoni* exhibits the same feature as can be seen on the plate (Pl. IX).

Generally it is stated in the textbooks that the African Elephant unlike the Indian only has three hoofs on the hind foot. LYDEKKER says,¹ however, quite correctly, that there may be either three or four broad flat nails in the hind limb of the African Elephant. The presence of four hoofs in the hind feet is evidently a more primitive characteristic than the reduction of these organs to three. In a similar way the oval or rounded ears of the races *cyclotis* and *cottoni* must be regarded as representing a more primitive stage

Fig. 6. Left ear of foetus of *Elephas africanus cottoni* LYDEKKER.

than the ears of certain South- and East-African Elephant-races with much enlarged more or less pointed lappets which hang down far below the lower end of the line of insertion of the ear. Compared with other African Elephants the two races which belong to the West African region display thus at least two primitive features in common.

Judging from a skull of an Elephant killed at the south end of the Albert Nyanza LYDEKKER has expressed² the opinion that this Elephant, which the author quoted has named *Elephas africanus albertensis*, is »the most generalized representative» of African Elephants. The relation between *E. a. albertensis* and *E. a. cottoni* does not appear, however to be quite clear as the former name is based on the skull, the latter on the ear, and both may be identical, in which case *albertensis* has priority. As I have been obliged to base my classifying only on the ear I must for the present, however, use the name *cottoni*.

The general appearance of this foetus is well illustrated by Pl. IX.

It is not hairy except in four places, viz. on the proboscis, on the lower and upper lips, at the eye, and at the tip of the tail. On the proboscis the hairs are comparatively most numerous around the nasal opening. Along the ridge which on either side borders

¹ »The Game Animals of Africa.»

² Proc. Zool. Soc. London 1907, p. 403.

the posterior, proximally flat, distally concave posterior surface of the trunk there is a considerable number of hairs, but none on the posterior surface itself. On the anterior surface scattered hairs are found, chiefly growing in the transverse folds of the skin, which latter, however, extend across the lower surface, or posterior surface as well. On the proximal portion of the trunk the hairs are very few.

On the lower lip the hairs are, as the figure (Pl. IX) shows, very numerous. The greatest number of them are white, but some of the posterior ones are black. On the upper lip there are very few hairs, all small and black. The hairs at the eye form a longitudinal series on the upper eye-lid, but not at its margin, and four hairs on the lower eye-lid are also situated in a row about the middle of the lid. Thus they do not occupy the place of whiskers as is the case in the Indian Elephant foetus according to TOLDT J:r.¹ These hairs are comparatively long and apparently of sensory function.

At the tip of the tail the hairs grow on the narrow sides of the laterally flattened terminal portion. On the posterior side there are two rows of hairs, and one of these (the left) continues around the tip on the anterior edge of the tail-end. The other (the right) does not extend beyond the end of the tail. As K. TOLDT J:r describes in his interesting and carefully written memoir, »Über die äussere Körpergestalt eines Fetus von *Elephas Maximus*»,¹ the hairs do not grow single at the tail-end, but are arranged in small groups which in this case contain 2—4 hairs.

Otherwise the hairs are not developed as yet. The outer layer of epiderm is dark as usual, and has a tendency of peeling off in flakes. The hoofs or nails are lighter than the skin. The soles of the feet have already the peculiar structure which I could not help admiring when I saw it in the footprints of the Elephant which I had the good fortune of tracking in the northern wildernesses of British East Africa. It exhibits a very intricate, labyrinthic pattern of small winding and meandering furrows, which with narrow interspaces spin over the whole lower surface of the sole. It is rather difficult to describe this accurately, but the drawing of the foetus on the accompanying plate (Pl. IX) displays this pattern to some extent so that an idea of the same may be conceived. Undoubtedly this structure is of very great importance for the Elephant, as it prohibits him from slipping, when the elastic pads are stemmed against the ground by the weight of the animal.

BRAUER has stated² that already in a quite young (7,25 cm.) foetus of Elephant from Cameroon a »schon scharf hervortretende Perissodactylie» is to be seen and that the middle toe is much more strongly developed than the lateral. In this foetus as well the middle toe is largest both in front and behind. On the fore feet, however, the difference in size between the middle toe (the third) and the fourth is not great to judge from the size of the hoofs. The proportion of the hoofs is expressed by the following measurements of their breadth:

¹ Denkschr. d. Math. Naturwiss. Kl. d. K. Akad. d. Wiss. Wien 1913, Bd. XC.

² Sitzber. Ges. Naturf. Freunde, Berlin, 1910.

	Left fore-foot	Right fore-foot
I toe	5 mm.	5 mm.
II »	8 »	8,5 »
III »	11 »	11,5 »
IV »	10,7 »	10 »
V »	7 »	6,5 »

On the hind feet the perissodactylism is still better pronounced as follows:

	Left hind foot	Right hind foot
II	7 mm.	6,5 mm.
III	10,3 »	11 »
IV	8 »	7,6 »
V	4,5 »	5,1 »

The following dimensions of the foetus may be of interest for comparison with other ones:

Length of tail from anal opening	123 mm.
» » proboscis from mouth	141 »
Ear-opening to posterior margin of ear	73 »
Greatest vertical height of ear from flap	101 »

***Bubalus caffer radcliffei* THOMAS.**

3 skulls from Rutshuru.

The magnificent Buffaloes of the Rutshuru plains (fig. 6) belong very typically to the race named by THOMAS as above. The best skull, although not a record skull

Fig. 7. Buffaloes from Rutshuru shot by Captain ELIAS ARRHENIUS.

has somewhat larger horns than the type with a distance between the most distal points of their outer convexity of 1185 mm. The palms are not quite as broad as in the type being 260 mm. in a straight line. This bull is still in its prime with the molars not much worn. Length of molar series 147 mm.

Greatest breadth across orbits	255 mm.
Length of nasals	231 »
Least interorbital width	170 »
Orbit to tip of premaxillary	290 »
Greatest breadth across premaxillaries	114 »
Length of palate	319 »

These measurements are almost all of them larger than those of a Buffalo bull which I shot at Upper Guaso Nyiro in British East Africa, although that one was of the same general type and also must be referred to *B. c. radcliffei*. The difference is no doubt only due to the harder conditions of life for a big grazing animal in the dry country at Guaso Nyiro than at Rutshuru.

In their book »Life histories of African Game animals», Vol. I, ROOSEVELT and HELLER published a map (map 11 at p. 418) over the »distribution of the races of the African Buffalo». On this map the areas of distribution of the subspecies »*radcliffei*» and »*æquinoctialis*» are marked out. The western boundary line for the former race is there drawn well to the east of Rutshuru River and excludes thus the Rutshuru plains which are laid to the area of *æquinoctialis*. This is, however, evidently a mistake as the present collections prove (cfr. also the figure 7). The Buffaloes of the Rutshuru plains are true *radcliffei*. The horns of the skulls have a much more pronounced downward sweep proximally than the photo appears to indicate.

Damaliscus korrigum ugandæ BLAINE.

Two very fine specimens, male and female, from Rutshuru 26th of June 1914, and in addition to them a couple of skulls.

Both sexes are alike in colour.

Skull dimensions:	♂	♂	♀
Greatest length of skull	404 mm.	412 mm.	395 mm.
Condylbasal length of skull	386 »	396 »	381 »
Basal length of skull	365 »	375 »	359 »
Greatest breadth of skull	156 »	150 »	146 »
Length of upper molar series	90,7 ¹ »	99,5 »	95,5 »
Length of nasals		177 »	163 »
Length of palate		222 »	217 »
Orbit to gnathion		269,5 »	
Width of skull at first premolar		61 »	

The skulls of these specimens present an interesting feature with regard to their first premolars. This tooth has namely at its anterior end an appendix attached (Pl.

¹ Worn.

XII, fig. 3), which almost has the shape of such an accessory column as is to be found on the inside of the molars of certain Ruminants. This anterior column of the first premolar of these Antelopes is, however, not homologous with such accessory columns of the molars, but I consider it as a remaining rudiment corresponding to the anterior lobe of the tooth which is present in the milk-premolars, but usually entirely lost in the permanent premolar. In skulls of *Connochætes* and *Bubalis* which I have examined there is no such columnar appendix at the frontside of the first premolars, nor is there anything like that to be seen on the same teeth of a skull of *Damaliscus lunata*. This may thus be a characteristic of the *korrigum*.

Another striking characteristic of these skulls is found in the shape of the posterior choanæ (Pl. XII, fig. 3). This peculiarity consists therein that *laminæ pterygoideæ internæ* some way behind *hamuli pterygoidei* are very strongly convex in the middle on their inner, and concave on their outer side. By this bulging inwards of the middle of the pterygoid walls of the choanæ, although the free brims of the same are turned out to the same width as anteriorly, the passage through the choanæ must be much obstructed. At the narrowest place this passage between *laminæ pterygoideæ internæ* measures only 6 mm. and when in lifetime the bones are covered by the mucosa the interspace must be nearly blocked up. The inner breadth of the choanæ behind the palatal margin and to the *hamuli pterygoidei* is about 20—22 mm. The lower margins of *laminæ pterygoideæ internæ* have an interspace behind the *hamuli* of about 27 mm., but this interspace decreases gradually in a backward direction to 16,5 mm. *Laminæ pterygoideæ externæ* extend, however, beyond the *laminæ internæ* and form the free margin. The distance between these free brims is about 31—32 mm. from behind the *hamuli* and continues for some distance beyond the place where the narrowest constriction between *laminæ internæ* is situated, then it gradually diminishes to about 26,5 mm. and is 30 mm. at the posterior end of the choanæ. These measurements are from the largest of the male skulls the dimensions of which are recorded above.

In the skulls of *Connochætes* and *Bubalis* examined no such constriction of the choanæ has been observed, nor in *Damaliscus lunatus*, although the brim formed by *laminæ pterygoideæ externæ* may be more or less turned out. Especially in the latter this is the case in a considerable degree.

The question then readily presents itself: what purpose does this strange shape of the posterior choanæ serve? The reply to this appears most probable to be that the shaping of the choanæ is a secondary product without certain aim, but that the primary thing is the strengthening of the pterygoid bones which serve for the insertion of *musculi pterygoidei*. This purpose is fulfilled not only by these bones being remarkably thick and solid, but also by their greater extension. The area of the bones is namely increased both by the concavity of the pterygoid wall and the turned out brim. The combination of these two conditions give the bony pterygoid wall a more solid construction and thus more power of resistance against the pull of the *musculi pterygoidei*, when these contract themselves. As these muscles are of great importance for the grinding of the food it is easy to understand that an increase of them is of importance for the animal when it has to masticate coarse food. Thus increased exercise of these muscles has been needed

for grinding the food of the *korrigum*. The muscles have through this become gradually enlarged, and they have then secondarily influenced the growth and shape of the bones to which they are inserted.

***Cephalophus weynsi* THOMAS.**

An old female from the »montagne et forêt Kabwe, Rutshuru, le ²⁹/₃ 1914». An old female from Beni, Aug., Sept. 1914.

At Beni these Duikers were known under the name »Kurupa». There is not the slightest doubt that these two specimens correctly may be referred to the *C. weynsi* group, but on the other hand they are not quite identical, neither with regard to the pelage and its colour, nor with regard to cranial dimensions. It appears therefore most opportune to regard them as representing two different geographic races. The question is then to decide which one most probably ought to be taken as identical with the typical race, if any of them is. I am not quite certain about the last point, but there are several reasons, geographical as well as zoological, which make me inclined to regard the specimen from Beni as most likely nearest to or identical with the typical *C. weynsi*. The collecting locality near Beni lies somewhat west of that place and is situated in the great tropical Congo forest which extends to the Stanley Falls district, but on the other hand Kabwe at Rutshuru is a from the great Congo forest isolated mountain forest, which latter thus might be inhabited by somewhat aberrant forms. The description of *C. weynsi* as repeated by LYDEKKER¹ contains the statement: — »body-hair short and close» — and this suits the specimen from Beni much better than that from Kabwe. Still more important is that the basal length of the skull of the type of *C. weynsi* which still was young, »à prémolaires de lait en place» is recorded² to be 175 mm. which is almost identical with the same dimension (174,5 mm) of the old female from Beni, while that of the equally old female from Kabwe is only 166 mm. thus indicating a smaller race. It appears thus most suitable to distinguish the Duiker from the Kabwe forest with a third name as:

***Cephalophus weynsi rutshuricus* n. subsp.**

With regard to the colour of the head and neck this race resembles that of the *C. weynsi* in the great Congo forest as represented by the specimen from Beni, but it is generally darker. The neck is not quite so thin-haired as in the Beni-specimen, and its colour on the sides is somewhat more reddish brown. There are more black hairs on the anterior back and over the shoulders, than in the one from Beni, and behind the withers the colour shades from something between »madder brown» (DAUTHÉNAY, 334, 4) and »Indian chestnut red» (DAUTHÉNAY, 333, 4) on the back to »burnt sienna» (DAUTHÉNAY, 320, 1) on the hams and »brownish terra cotta» (322, 4) on the lower flanks, while the animal from Beni might be termed »rust red» (318, 1 & 2). The chest shows in both

¹ Catalogue of the Ungulate Mammals, Brit. Mus., Vol. II, p. 74.

² Ann. Mus. Congo, T. II, Fasc. 1, p. 15.

some dark shades in the middle without that any distinct ventral stripe, or patch is formed. All over the body the pelage is better developed and less close than in the Beni specimen. The legs and feet are darker in the specimen from Kabwe without, however, becoming black. Therefore the black stripe from the heel, as well as that of the front side of the tarsus¹ can be discerned in the dark brown general colour of the feet. The tail has basally the colour of the back, the tuft is black, mixed with white at the tip and on the lower side.

As far as these specimens mentioned above can be regarded as typical, it is very easy to distinguish the two races of *C. weynsi* already by their different colour.

The cranial differences may, however, be regarded as more important and those may be seen from the following table of measurements and the figs. 1 and 2 of Pl. X.

The horns of the specimen from Beni measure about 56 mm. (greatest diameter 17), those of the specimen from Kabwe 49—50 mm. (greatest diameter 16 mm). They are rather similar, with a bluntly conical tip followed by an indistinctly ringed portion on which more or less plainly about five transverse rugosities may be traced. The basal portion is somewhat depressed, or obliquely compressed. It has an uneven surface, but without rings.

At the same place and the same day (²⁹/₃ 1914) another specimen of Duiker was collected by Captain ARRHENIUS in the mountain-forest of Kabwe. This specimen which also is an old female differs so strongly with regard to colour from the one described above that at first I was inclined to believe it a representative of another race (perhaps *C. johnstoni* which is stated to be much darker than *weynsi*). A closer examination of the skulls of the two Kabwe Duikers revealed, however, that these with regard to their general appearance and dimensions were so alike that they could not be separated. This is very plainly proved by the following table of measurements. The only difference, which is worth mentioning, is that the length of the upper molar series is somewhat longer in the dark specimen. This is, however, very easily and naturally explained by the fact that the teeth in the first described specimen are more worn, indeed almost worn out, and therefore this dimension secondarily has become shortened. Judging from the likeness of the skulls I must thus refer the darker specimen as well to *C. weynsi rutshuricus*, and regard it as somewhat melanistic. This makes itself apparent by the general darkness which is produced by dark hairs mixed among the »red», or by black tips to some hairs. The whole of the fore quarters is thus a dark shiny brown, which gradually behind the shoulders is more and more enlivened by a sprinkling or grizzling with rufous. Thence it shades gradually from something like madder brown on the back, to a saturated rust red on the hams. Along the middle of the chest towards the navel is a broad band of »warm sepia» on the sides surrounded with a paler brown, somewhat similar to »burnt umber». The head and the legs are similar to the other specimen, only a little darker. The same is the case with the tail.

The horns of the melanistic specimen are of the same type as in the other, but more

¹ These stripes are present in a number of species of *Oephalophus* as f. i. *C. claudi*, *leucogaster*, *weynsi*, *johnstoni* etc.

depressed, and therefore with a greater transverse diameter amounting to 21 mm. basally at its maximum.

	♀ Beni ad.	♀ Kabwe ad.	♀ Kabwe ad. (melanistic)
Total length of skull	197 mm.	185,3 mm.	185 mm.
Basal » » »	174,5 »	166 »	164 »
Zygomatic breadth of skull	86 »	85 »	86,5 »
Breadth of brain-case	61 »	56,3 »	60 »
Distance from orbit to tip of premaxillary	107 »	96,5 »	96 »
Length of nasals	86 »	71,8 »	73 »
Least interorbital width	43,3 »	45 »	46,6 »
Greatest breadth of nasals (at lacrymal suture)	32,8 »	36 »	36,4 »
Width of nasals at nasi-premaxillary suture	18,4 »	21 »	24,5 »
Length of upper molar series (worn!)	50 »	47,5 »	54,5 »
Breadth of m^2	12,7 »	13,4 »	14,5 »

These measurements prove very plainly that *C. weynsi* from Beni has a considerably longer skull (Pl. X, fig. 1) with a more elongate rostrum than the Rutshuru race (fig. 2), while the latter is not only comparatively, but even absolutely broader in the nasal region. The nasals do not project mesially so far backwards in the Duikers from Kabwe as in that from Beni, nor are they so strongly produced forwards in their anterior end, but everywhere broader. These features prove that the Duikers from Kabwe are not simply smaller specimens of the same kind as that from Beni. Otherwise both skulls, of course, have a general resemblance. Characteristic to both is that the nasals are comparatively flat above, especially in the specimens from Kabwe, but that the central portion of the frontals, inside *foramina supraorbitalia* is rather strongly raised to form a pronounced convexity which in the specimen from Beni forms an almost roof-like ridge (Pl. X, fig. 1 & 2). The upper molar series are in both comparatively short, but the true molars broad.

On the lower jaw the angular flanges or lobes are very sharply set off (almost in a right angle) from, and extend about a centimeter below the lower contour line of *ramus horizontalis* (Pl. X). This great expansion of the angular portion of the lower jaw indicates that the diet of the animal requires a powerful development of the musculature of the jaws especially *m. masseter* and *m. pterygoideus internus*. The strongly worn condition of the molars, and the fact that the inner sides of the upper, and the outer sides of the lower molars are very much more worn down than the opposite sides prove that the food-material has needed an intense grinding activity before it became useful for digestion. Unfortunately nothing is known about the biology of these animals, but of all species of *Cephalophus* represented in this collection, *C. weynsi*, with its subspecies, appears to be the most specialized in this respect, and this as well as other structural features prove that the different species of this genus, although inhabiting the same districts must differ in a considerable degree with regard to their habits, diet etc.

? *Cephalophus johnstoni* THOMAS.

A young ♂ only with milk-dentition from Beni, Aug., Sept. 1914.

C. johnstoni was described¹ on a single young specimen from Toro, east of Ruwenzori, which still seems to be the only known in existence. The principal characteristics by which it should be distinct from *C. weynsi*, with which it shares the reversal of the hairs of the nape, should be its thicker fur, and much darker general colour. The first of these characteristics is found in this specimen as well, but as it is a juvenile feature, it does not prove very much. The second characteristic holds also good perhaps in too high a degree as the dark shining brown extends not only over the hind quarters, but also over the whole back almost to the root of the tail. The flanks and hams are not »deep reddish russet» but rather »burnt umber» (DAUTHÉNAY, 304, 1). With our present knowledge it is impossible to say, whether this is a perhaps somewhat melanistic young of *Cephalophus weynsi*, or of *C. johnstoni*.

***Cephalophus claudi mixtus* n. subsp.**

1 ♀ from Beni, Aug., Sept. 1914.

»En Kiswahili Bengela» Capt. ARRHENIUS has written in his diary.

There is no doubt about a close relationship existing between this Duiker from Beni and *C. claudi* THOMAS & WROUGHTON from Bambili, Welle Basin, but as there are several differences noted below which are the more important as the type of *C. claudi* also was an adult female, I think it most correct to distinguish this form with a third, subspecific name.

The general body colour is chestnut rufous on the fore quarters, gradually passing through »burnt sienna» (DAUTHÉNAY, 320, 2) on the posterior back to »rust red» (318, 1) on the hams. A broad black blaze on the face from the muffle, including the tuft and still extending over the nape some way on the upper neck, where it gradually dissolves in the black sprinkling, which is to be seen over the fore-quarters. On the sides of the black blaze above and behind the eye there are many white hairs. A rufous superciliary band borders sharply the black blaze. Another rufous band goes through the glandular region to below the eye; the upper lips browner. Chin pale rust red. Throat and sides of neck rufous much mixed with white hairs; many scattered white hairs are to be seen on the shoulders as well. White hairs are still more numerous on the flanks where they decidedly are in majority but mostly covered by the longer red hairs. From the chest to the navel a blackish median band. The fore-legs are brownish black to the elbow, where the dark colour gradually dissolves in the black sprinkling of the shoulders, and on the inner side of the fore-legs a stripe of the body colour extends to the carpal joint. The hind feet are only blackish a little above the hoofs, but there is a broad black patch on the heel, and from there a narrow dark stripe runs down on the posterior side of the foot to the lateral hoofs, and another similar, but shorter stripe is found on the outer part of the front-side of the lower metatarsus. The tail is similar to that of the typical *C. claudi*,

¹ Proc. Zool. Soc., London 1901, p. 89.

basally of the body colour, then with whitish hairs, and finally the outer half with a great black tuft, which at the tip and its lower side has a »tendency to show white«.

Total length of skull	182 mm.
Basal » » »	164 »
Zygomatic breadth of skull	77,7 »
Distance from orbit to tip of premaxillary . . .	96 »
Length of nasals	67 »
Interorbital breadth (least)	37 »
Length of upper molar series	51,8 »
Greatest breadth of m^3	13 »
Length of bullæ	24 »
Breadth of palate outside m^2	55 »

If these measurements are compared with those of the type of *C. claudi*¹ it is found that, although the total length of both is almost the same (resp. 182 and 185 mm.), the length of the rostrum (102) and the length of the nasals (75 mm.) of *C. claudi* is distinctly larger than those of the present specimen. The latter approaches in these respects somewhat to *C. nigrifrons*, which, however, is much different in colour. The geographical neighbour *C. rubidus* from Ruwenzori has still shorter rostrum (85 mm.), and nasals (60 mm.), and it is also different in colour. The molars are not broad, but nevertheless broader than in the nearest related forms *C. nigrifrons* and *C. rubidus*.

The narrowness of the skull of the present specimen, and the flatness of its upper surface appears to be a rather striking characteristic. Another is the truncate posterior end of the nasals (Pl. X, fig. 3), which only show a slight convexity in the middle of the suture with the frontals. The preorbital pit is very deep and large. The premaxillaries are rather broad at their upper end. The bullæ are large, but extremely thin-walled (like paper!). *Foramina incisiva* are very large, measuring 27,5 mm. in length by 6,5 in breadth. The prædental portion of the palate is very narrow and constricted, measuring only about 18 mm. in breadth, and with a narrow edge along the median suture. The median posterior palatal emargination extends further forwards than the lateral ones and reaches almost to a line through the middle of m^2 . The lower jaw is also very slender (Pl. X, fig. 3), the greatest height of *ramus horizontalis* below m_2 being only 20 mm. The whole structure of the skull appears to indicate an animal feeding on tender vegetable matter (leaves and young shoots). The upper molar series is almost straight along its inner contour line, but converging forwards so that the distance between the inner sides of m^3 is about 32 mm. but between p^1 about 20 mm.

The horns (Pl. X, fig. 3) are short and blunt, greatest length 36 mm., greatest transverse diameter 14 mm. They are much worn on the upper surface by branches and twigs, when the animal sneaks through the undergrowth. To such a life undoubtedly also the narrowness of the skull is an adaptation.

Cephalophus leucogaster GRAY.

A young male with only the first molar developed from Beni, Aug., Sept. 1914, and an adult female from the same locality, Jan. 1914.

¹ According to THOMAS & WROUGHTON in Ann. Mag. Nat. Hist. (7), Vol. 19, 1907, p. 386—387.

The knowledge about the skull of this Duiker appears to be rather imperfect. THOMAS has recorded¹ the basal length and greatest breadth of »le plus grand crâne» out of two belonging to an adult pair ♂ & ♀. The former of these measurements was 161 mm., the latter 83 mm. The skull of the adult female in this collection has the following dimensions:

Greatest length	189 mm.
Basal length	167,5 »
Zygomatic breadth	86,5 »
Breadth of brain-case	58 »
Interorbital width	46 »
Length of nasals	76 »
» » rostrum from orbits	96 »
» » upper molar series	56 »
Breadth of m^2	13,5 »
Length of bullæ	27 »
Breadth of palate outside m^2	60 »

This skull is evidently somewhat larger than THOMAS's largest specimen.

The nasals are pointed behind in such a degree that their posterior portion which is embraced by the *processus nasales* from the frontals forms a equilateral triangle. Their upper surface like the whole forehead is flat, very different from that of *C. c. castaneus*, *weynsi* etc. (cf. Pl. XI). The median posterior palatal emargination is narrow, but reaches much further forwards than the lateral ones. The premaxillaries reach the nasals (Pl. XI, fig. 1).

In the young skull from the same place (with a total length of only 154 mm.) the posterior suture of the nasals is rounded off, but the *processus nasales* from the frontals project on both sides in a similar degree as in the adult. The posterior choanæ stand more broadly open in the young than in the adult. The molar series of the adult ♀ is not much curved, the distance between the inner sides of m^3 being about 35 mm., and that between p^1 about 26 mm.

The horns (Pl. XI, fig. 1) are rather slender, conical and sharply pointed.² Their length in the adult female is 50 mm., and their greatest diameter near the base is 11 mm. They are not worn on their upper surface. From this fact and the colour of the animal it may be assumed that this animal does not live in the thick forest.

The description of the colour of this species in the literature is not very complete, and it is thus connected with great difficulty to decide whether the specimens from Beni are quite identical with the typical form from Gabun. The latter is described as »dull chestnut rufous», but since THOMAS had had the opportunity of seeing adult specimens he adds (l. c.) that they are »un peu plus bruns sur la région antérieure du corps que le type encore jeune». These latter specimens were, however, from the Stanley Falls district,

¹ Ann. Mus. du Congo, T. II Fasc. 1.

² This is in agreement with the description of the type specimen in »The Book of Antelopes». The horns of this Antelope are thus very different from those of *C. ogilbyi*, although KNOTTNERUS-MEYER unites both into one of his many genera and says about the same: »Die Hörner sind, besonders beim Männchen, dick und gross.» (Arch. f. Naturgesch. 1907).

and it is perhaps not certain that they are of quite the same race as the type from Gabun. The above quoted cranial measurements have made it probable that the *leucogaster*-Duiker living at Beni is larger than the one of the Stanley Falls district.

The adult specimen of the present collection does not differ much from the young one, but has a little brighter colours on the sides of the anterior part of the body. The scapular region may be described as »otterbrown» finely grizzled with rufous, behind this the sides are »fawn» (DAUTHENAY, 306, 1 & 2) which gradually becomes brighter, almost »rustred» (DAUTHENAY, 318, 2) on the hind quarters at the sides of the black dorsal band. Down on the hams the colour gradually becomes lighter (318, 1), and finally it appears most similar to RIDGWAY'S »pinkish cinnamon». A black band on the heel extends as a narrow dark streak to the outer of the lateral hoofs, and a similar dark streak is seen on the front side of the metatarsus.

THOMAS has kindly communicated in a letter that all specimens of *C. leucogaster* in the British Museum have a dark mark down the heel, and also that their fore-legs are a kind of pale ashy grey brown. Thus the colour pattern of these specimens appears to agree with the typical ones, and it depends then upon cranial dimensions, if *C. leucogaster* from Beni possibly constitutes a different race, which cannot be decided before adult skulls from the type locality have been described.

Cephalophus castaneus arrhenii n. subsp.

1 ♀ from Beni, Jan. 1914.

This specimen is no doubt related to *C. castaneus* THOMAS typically from Cameroon, but also described by the same author from Congo.¹ There are, however, differences as well with regard to cranial dimensions as in colour which are too great, and too important to permit an identification, the specimen of the present collection being much darker and much smaller, as may be seen from the following table of measurements.

	<i>C. c. arrhenii</i>		<i>C. castaneus</i>	
	♀ from Beni	♂ from Mukim-bungu	measurements recorded:	
			by SJÖSTEDT	by THOMAS
Greatest length of skull	175 mm.	205 mm.	—	—
Basal length	154,5 »	176,5 »	170 mm.	179 mm.
Zygomatic width	76 »	90 »	85 »	90 »
From orbit to tip of premaxillary	88 »	105 »	99 »	103 »
Upper molar series	54 »	59,6 »	56 »	59 »

The considerably greater dimensions of *C. castaneus* become perhaps still more conspicuous if some other measurements of skull dimensions are compared. For doing so I have unfortunately only an adult male skull of *C. castaneus* from Mukimbungu, Lower Congo, for comparison, while the present female skull from Beni is still comparatively young as it has not yet changed its milk-premolars, but the third molar is already

¹ Ann. d. Mus. du Congo, T. II, Fasc. I.

up in both jaws. Thus the increase in size between this stage and the fully adult cannot be expected to be very great, and therefore the measurements recorded below can be compared without being misleading.

	♀ Beni	♂ Mukim- bundu
Distance between alveolar margin of m^3 and orbit	24 mm.	32 mm.
Breadth across outside of m^1	52 »	61,5 »
Length of nasals	66 »	80 »
Greatest transverse diameter of m^1	10,2 »	15 »
» » » » m^2	10,3 »	16 »
» » » » m_1	6,4 »	9,4 »
» » » » m_3	6,5 »	10 »

The shape of the bones of the two skulls is in many cases very different. The anterior contour of the palatal bones of the skull from Beni forms an evenly curved arch extending forwards to a level with the anterior portion of m^1 , but in the *castaneus* from Mukimbundu it is a straight transverse (22 mm. long) line on a level with the anterior portion of m^2 , and the lateral sutures of the palatal bones form distinct angles with this anterior transverse suture. The posterior choanæ are much narrower in the larger skull measuring on a level with the posterior end of m^3 only 8,7 mm., but in the smaller female skull from Beni the same measurement is 14 mm. This depends upon the fact that in the former the pterygoid laminae stand vertically, in the latter they diverge towards their lower margin.

The shape of the nasals is also very different. In the *castaneus* skull the posterior ends of the nasals project with a blunt point backwards between the *processus nasales* of the frontals, which latter are broadly truncate and form an almost straight transverse suture with the lateral portions of the nasals (Pl. XI, fig. 2). In the female skull from Beni the nasals are rather broadly rounded behind, occupying almost the whole upper surface, but the *processus nasales* of the frontals extend forwards on both sides with sharp points which cut deeply into the nasals between their upper horizontal and lateral vertical portions (Pl. XI, fig. 3). The premaxillaries do not reach the nasals in *C. c. arrhenii* (cf. fig. 3).

The horns of *castaneus* from Mukimbundu are much longer (about 5,5 cm.) which, of course, as being a male characteristic is of no importance for this comparison, but they are smoother all over and quite circular in section. The short (2 ½ cm.) horns of the female from Beni are not only transversely more rugose, but display also longitudinal ridges, so that the section is not round. The female from Beni has also the horns more raised so that they form a distinct angle with the frontal plane (Pl. XI, fig. 3), while those of the *castaneus* buck slope evenly with the frontal plane (Pl. XI, fig. 2).

The angular flange of the mandible is much more sharply set off (Pl. XI, fig. 3) in *C. c. arrhenii* than in *C. castaneus* from Lower Congo (Pl. XI, fig. 2).

The colour of the specimen from Beni is much darker than that of the *castaneus* from Mukimbundu. The general chestnut colour proves at closer inspection to be thinly

overlaid with blackish which occupies the extreme tips of many hairs. The black dorsal band is very broad, and there is a still broader ventral black band, extending from the chest between the forelegs and ending a little in front of the teats. The lower flanks on the sides of this mesial black ventral band are a little paler, and less red than the upper parts of the sides. The feet are brown rather resembling »otterbrown» (DAUTHENAY, Rép. de Coul., 354, 4), but gradually darkening to black up on the legs. This black extends on the fore-legs a good deal above the elbow, but becomes thinner on the shoulders where it finally is represented only by black tips to the rufous hairs. A strip on the inner side of the fore-legs extending down to the carpal joint has the same pale colour as the lower flanks, sharply contrasted to the blackish brown of the outer side. On the hind legs there is no such pale colour stripe, the posterior side being black (almost) to the hoofs. The front side is dark »otter brown» to the tarsal joint, gradually blending into the black, which extends well up on the hams, where it shades off with black tips to the hairs. Along the posterior side of the hams is a pronounced blackish band produced by long black tips to the hairs. The upper side of the tail is black in continuation of the black dorsal band, the underside, and partly the tip is covered with white hair.

The colour of the head is about similar to the same in *castaneus*, only a little darker.

From this description it is apparent, that the specimen from Beni also with regard to its colour differs very plainly from the typical *castaneus*.

In the year 1914 E. SCHWARZ described¹ a Duiker of this group from the Welle district. According to the short diagnose that one (named) *C. dorsalis orientalis*, is »externally not distinguishable from the other forms of *C. dorsalis*», but its skull is said to be »much larger than in any of them». The cranial measurements recorded by SCHWARZ for his *C. d. orientalis* are almost identical with those tabled above for the *castaneus* form from Mukimbungu, and with those which have been quoted for THOMAS's Congo specimen similarly named. If thus *C. d. orientalis* proves to be a valid subspecies, not only the specimen from Mukimbungu, Lower Congo, referred to above, but also THOMAS's specimens from Congo, from which he quotes the above cited cranial measurements, must be regarded as belonging to SCHWARZ's subspecies. The last author says (l. c.): »There is a gradual increase in size and facial length in the local races of *C. dorsalis* from »the West-coast forms like *C. d. dorsalis*» which »are small and have a short rostrum» — — —. »*C. d. castaneus* from South Nigeria and the Western Cameroon» should then come next, and finally »the races of the Congo forest, as typified by *orientalis*» — — —. The »*orientalis*» has, to judge from measurements recorded in the literature (some of which are quoted above), the basal length of the skull only 6,5 to 9 mm. longer than the adult *castaneus* from Cameroon,² but it appears certainly to be larger. Its distribution extends as far as is known from Lower Congo (Mukimbungu) to the Welle district (fide SCHWARZ) and Stanley Falls (fide THOMAS). In the north-eastern part of the Congo forest it is substituted by the smaller and darker form described above. The members of this group of Duikers thus decrease very decidedly again in size without reducing, however, the com-

¹ Ann. & Mag. Nat. Hist. (8), Vol. 13, 1914, p. 35.

² Cf. the measurements quoted from SJÖSTEDT above.

parative dimensions of the snout. Thus they do not approach the typical *dorsalis*, and therefore it appears better to regard them as subspecies of *castaneus*.

Cephalophus melanorheus æquatorialis MATSCHIE.

2 ♂♂, ♀♀ Beni, Aug., Sept. 1914; 2 ♂♂, 1 ♀ *ibid.*, Jan. 1914.

»Boloko» is the native name of this little Duiker according to Capt. ARRHENIUS.

One of the above noted females has no horns, but the others are provided with such. The general colour of the back is different in different individuals. In some specimens it may be said that the posterior back is somewhat »in's röthlichgelbe spielend», as MATSCHIE described¹ the type from Chagwa, Uganda. Other specimens are »warm sepia» (DAUTHENAY, 305, 4) thus resembling *C. schusteri* MATSCHIE.

Sylvicapra grimmia lutea DOLLMAN?

Capt. ARRHENIUS's collection contains only a skull of this kind. This is very much larger than the skull of the East African Duiker, *S. g. hindei* as the following measurements indicate:

Total length of skull	181,5 mm.
Basal » » » 	160,5 »
Condylbasal length	172,5 »
Greatest breadth	77 »
Orbit to tip of premaxillary	97,3 »
Length of nasals	66,6 »
Least interorbital width	47,4 »
Length of palate	89,5 »
Upper molar series	55 »
Breadth across <i>m</i> ²	50 »
Breadth across outside of horn cores basally	42,6 »
Length of bulla	27 »

NEUMANN has named a subspecies from Kavirondo *Sylvicapra abyssinica nyansæ*, but he has only said that it is darker than the typical *abyssinica*, and not communicated a single skull measurement. It would thus have been impossible to make any comparison between this skull and NEUMANN's Kavirondo Duiker, if I had not had the pleasure of receiving some information about it from Professor MATSCHIE. He has kindly written that NEUMANN's Duiker is represented in the Berlin Museum by the posterior portion of the skull. The following measurements of the same, communicated by MATSCHIE, prove plainly the difference from the skull of the present collection: »Breite an den Hornzapfen 38 mm.; grösste Breite etwa 66 mm.»

From Mani, Lower Shari River, E. SCHWARZ has described² a Duiker, named by him *S. g. pallidior*. This race is said to be slightly larger than *S. g. abyssinica*, but the skull of an adult male of this race is according to the another quoted much smaller than

¹ Si z.ber. d. Ges. Naturforsch. Freunde, Berlin, 1892.

² Ann. & Mag. Nat. Hist. (8) 13, 1914, p. 36—37.

that of the present collection, viz. with a maximum length of only 168 mm., a basal length of 142 mm., orbit to muzzle 83,5 mm., length of nasals 53,3 mm. etc.

DOLLMAN's subspecies *lutea* from »N. E. Karamojo, Central Province, Uganda»¹ is described on an adult female as type. Unfortunately no adult male skull has been measured of this race, but it appears to be rather large as the greatest length of the female skull and some of its other dimensions are fully as great as, or more than those of a male *S. g. hindei*. To judge from these facts it appears probable that the skull in Capt. ARRHENIUS's collection can be referred to *S. g. lutea*.

ROOSEVELT's and HELLER's map over the »distribution of the races of bush duiker» may need some modification in consequence of this.

Hylarnus harrisoni THOMAS.

1 ♀ Beni, Aug., Sept. 1914; 1 ♀ Masisi, Febr. 1914.

The former is more vividly coloured than the latter which appears faded and apparently is in the act of shedding its old hairs. The tail is above like the back, white beneath.

The skull from Beni has a basal length of 94 mm. (the other is not quite fullgrown), distance from orbit to tip of premaxillary 47,5; length of nasals 33; greatest breadth of the same 23, length of upper molar series 31,8 mm. These measurements are somewhat smaller than those of the type, but this may be dependent on different sex, as probably the female is smaller.

Capt. ARRHENIUS has recorded in his diary that the specimen shot at Beni in the Kiswahili language was called »Songola». As this word, also spelt »Sungula», means a Hare it apparently has been used to signify the small size, and perhaps also the hornless condition of the animal.

Kobus defassa forma *dianæ* MATSCHIE.

2 male head-skins and skulls from Rutshuru, ²⁰/₆ 1914; 1 ♂, 1 ♀ complete and a male skull.

Although these specimens are from the same locality, as far as is known, they are not quite identical with regard to their colour and pattern. The two head-skins have the forehead »fawn», but the white mark above the eye is much better developed in one than in the other, and the one with smaller eye-spot has more black mixed in on the lower cheeks etc. The large white spot on the throat does not extend laterally as far as to the base of the ears. In the complete specimen the forehead is a little duller in colour, somewhat approaching »burnt umber» (Rép. de Coul., 304, 1) without, however, quite representing this colour. In this respect the specimen in question appears to resemble the specimens from Kasindi which MATSCHIE has named »*cottoni*», but it differs from those in having less white on the throat, so that this colour does not extend to the base of the ears. The colour of the body is in correspondence with MATSCHIE's descrip-

¹ Proc. Zool. Soc. London 1914, p. 318.

tion. The general colour of the female contains much more rufous brown than that of the male.

The length of the upper molar series varies between 110 and 97 mm. in the adult males; in the adult female it is 97 mm.

The tips of the horns are a little turned inwards, but in one of the bucks the right horn is as much turned outwards as the left is turned inwards, which is to be regarded as an individual anomaly.

Condylbasal length of skull	Length of horns along curve:		Length of horns in a straight line:		Tip to tip
	left	right	left	right	
413 mm.	853 mm.	830 mm.	770 mm.	763 mm.	492 mm.
382 »	790 »	778 »	695 »	698 »	512 »
404 »	841 »	848 »	720 »	760 »	522 »
397 »	845 »	828 »	770 »	745 »	628 »

When accepting and using above MATSCHIE's name *Kobus defassa dianæ* I only want to express that the specimens in the present collection most nearly agree with the specimens thus named by the author quoted. It does not appear probable that there really should live three different subspecies (in the usual meaning of this word) of Defassa Waterbuck not only at Lake Albert Edward, but even at one and the same place Kasindi. It is not denied by this that there are to be found certain groups, or herds of animals in each of which the individuals are alike, at the same time as they differ in one or several characters of less importance from those of another group or herd. I do not think, however, that each of these herds can be regarded as constituting a subspecies of its own, even if the sharp eye of a trained zoologist may be able to distinguish its members from the members of another herd. According to, as I suppose, the prevalent opinion among zoologists the word subspecies, as a rule, is taken as something identical with geographic race. These somewhat different Defassa Waterbucks do not represent different geographic races, but rather »family races». Such »races» are perhaps to be expected especially among polygamous animals among which even the individual characteristics of certain strong males may be inherited to a comparatively numerous offspring and transmitted through several generations. The result might be a herd, or group of animals which may be recognized on certain minor features from other individuals of the same species, but with different parentage.

As an analogy to this may be reminded about the fact that experienced stock-breeders often can distinguish cattle from different estates, although they are of quite the same race. The cause of this is evidently the same as set forth above, a certain male has put its stamp on the offspring, so that a recognizable »family race» has originated. Through inbreeding the distinguishing features may become more and more fixed. In the wild state isolation may strengthen the differences, but mixing with other animals of another herd abolish them. »Races» or groups of forms of this kind have thus not the stability which a subspecies ought to have. It is, of course, of interest to note such forms as referred to now, but, if they shall be named, it seems necessary to make a distinc-

tion between the name thus added and a real subspecific name. Such a distinction may be made by adding before the racial name a certain word like »tribus», or »forma».¹

Since the above was written I have had the opportunity of reading the observations on the variability of *Kobus defassa* made by A. DE CALONNE-BEAUFAICT² in the Welle district. The author quoted emphasizes the great variability of this Waterbuck according to age, but his statements do not contradict the opinion set forth above concerning the adult.

Adenota kob thomasi SCLATER.

Skin of a male foetus from Rutshuru, ¹⁵/₇ 1914. Three male skulls.

Redunca arundinum BODDAERT.

Two male skulls.

Redunca redunca wardi THOMAS.

A male skull and a frontlet, presumably from Rutshuru.

With regard to cranial measurements this skull is much larger than the typical *Redunca redunca*, and also larger in some dimensions than *Redunca bohor ugandæ* BLAINE.

	<i>Redunca</i> from Rutshuru	<i>R. b. ugandæ</i> fide BLAINE
Greatest length of skull	252,5 mm.	234 mm.
Basal length of skull	225,5 »	—
Occiput to tip of nasals	214,5 »	—
» » posterior end of nasals	132 »	124 »
Orbit to gnathion	140,0 »	128 »
Length of nasals	97 »	88 »
Greatest width across orbits	104 »	108 »
Least interorbital width	67 »	—
Vortical diameter of orbits	41 »	38 »
Alveolar edge of <i>m</i> ⁸ to upper brain of orbit . .	82 »	75 »
Zygomatic width	97,8 »	98 »
Length of palate	13,6 »	128 »
Upper molar series	56 »	56 »
<i>m</i> ²	12,5×10,5	13×12

If it is difficult to determine a skull with such dimensions as those recorded above as identical with *Redunca bohor ugandæ* BLAINE, the dimensions of which are quoted

¹ The Russian ichthyologist BERG uses the word »morpha» for races of fishes, but this appears less suitable as the words genus, species etc. are latin.

² Notes sur les phases de couleur chez *Cobus defassa* et *Bos caffer* de la région de l'Uelé, Revue zool. Africaine, Vol. IV, fasc. 2—3, Bruxelles 1916.

for comparison, it is still more impossible to make such an identification with regard to the shape of the horns. BLAINE describes¹ the horns of *R. redunca ugandæ* (or as he terms it *Cervicapra bohor ugandæ*) as »short and stout, without a pronounced hook forward at ends». The horns of both specimens collected by Capt. ARRHENIUS must on the contrary be said to be very strongly hooked forwards, and with the tips much turned inwards. This is of interest because BLAINE's race *R. r. ugandæ* is typical from Nkole, Uganda, and it could therefore from a geographical point of view have been expected to find this Reedbuck at Rutshuru rather than the more eastern *R. r. wardi*.

Two young Reedbuck calves in the collection from Rutshuru ⁸/₁₂ 1913 belong without doubt to the same race.

Tragelaphus dianæ forma sassæ MATSCHIE.

A young ♀, Rutshuru, ⁷/₈ 1913; ♀ ad., ibid., ²⁷/₂ 1914; 2 ♂♂ ad., ibid., ²⁸/₂ 1914; a male skull without skin (cf. fig. 8).

The colour of these specimens agree on the whole with MATSCHIE's description but it is, of course, as always in Bushbucks somewhat variable. The smaller and somewhat younger, but nevertheless adult buck (with permanent dentition in place) has less white markings and no transverse stripes. In the larger 4—5 such may be traced. The same has also a white mesial stripe along the blackish chest.

	♂ ad.	♀ ad.
Greatest length of skull	261 mm.	219,5 mm.
Condylobasal length of skull	253 mm.	207 »
Basal length of skull	236,3 »	190,5 »
Distance from orbit to tip of premaxillary. . .	133 »	108 »
Greatest breadth of skull	107 »	87,5 »
Least interorbital width	61,2 »	49 »
Greatest breadth of skull in front of orbit. . .	77 »	65,5 »
Length of nasals.	89,5 »	61 »
Upper molar series	68,5 »	63,5 »
Length of horns in a straight line	363,5 »	—

The measurements of the male skull appear to be a little greater than those recorded by MATSCHIE,² but with regard to the female the opposite is the case.

Okapia johnstoni SCLATER.

A young male and a young female both with milk-dentition from Beni 1914.

The male specimen is somewhat older so that the first molars in both jaws are developed, in the female they are just cutting the gum, but m_1 is a little more developed than m^1 and its anterior lobe has already become somewhat blackened by the food.

¹ Ann. & Mag. Nat. Hist. (8), Vol. XI, 1913.

² Sitz.ber. Naturf. Fr. Berlin. 1912.

An investigation of these skins proves that the lips and the snout of the Okapi are very different from those of the Giraffe. The lips of the former are not produced as in the latter, nor does the hairy covering of the lips extend to the inner surface. The black hairs of the upper lip are directed downwards. The lower margin is fringed or

Fig. 8. A Bush-buck shot by Captain ELIAS ARRHENIUS at Rutshuru.

bordered by a narrow band of whitish hairs, and with the same ceases the hairy covering quite abruptly so that the lower resp. inner surface of the upper lip is quite naked, and laterally the inside is beset with strong conical papillæ. At the end of the snout between the nostrils there is an oblong bare spot from which a vertical hair-less groove runs down

Fig. 9. Front view of snout of a young Okapi showing upper lip, nostrils and groove between the latter. (Diminished).

to the margin of the upper lip. The hairs at both sides of this groove are directed towards the same, and the fringes thus formed on both sides are continuous with the marginal whitish fringe of the lip mentioned above. The accompanying figure illustrates these arrangements and structures very plainly.

The hairs on the lower lip are in a corresponding manner directed towards its upper margin, where the hairy covering ceases just as abruptly as on the upper lip. In addition to the normal fur of these parts there are to be seen a great number of long black bristles with undoubtedly sensory function. These attain their strongest development on the chin and lower lip, but they are numerous on the upper lip as well (conf. the fig. 9).

The nostrils are partly hairy within at their borders.

With regard to colour and pattern this animal has been so fully described especially by FRAIPONT in his great monograph¹ that there is no need to comment further upon this. The dorsal mane, or crest extends in these young animals from the nape to the tail, but the hairs, of which it is composed, are considerably coarser on the fore-quarters than above the sacral region.

The structure of the upper lip and snout region of these Okapi calves, as described above, is very interesting as it illustrates in a very clear manner a stage of development which is intermediate between the more primitive condition found in the *Camelidæ* with their divided upper lip on one hand, and the various stages of a more or less developed muffle which among the *Cavicornia* reaches its culmen in the *Bovinae*. The mode of development is not difficult to understand. The cleft lip of the *Camelidæ* represents a primitive stage, which is repeated in the ontogeny of other *Ruminantia*. In the adult stage of the latter, however, the lateral portions of the upper lip have joined mesially in front and grown together. The above described vertical groove in the upper lip of the Okapi calves represents the remnants of this seem, or line of coalescence.² The inner side of the lip is, of course, lined with a continuation of the mucous covering of the mouth cavity, while the outer surface is protected by the ordinary skin. When in the foetal stage the lateral halves of the upper lips have grown forward so as to meet each other mesially, and the conrescence begins, the line of junction may get a somewhat variable situation in relation to the different coverings of the inner and outer surfaces of the lip. If the line of junction is situated just where both tissues meet the result will be that the whole anterior surface of the upper lip is covered with skin which develops hair just as the skin elsewhere, and thus no naked rhinarium is formed as is the case in the Giraffe, Reindeer, Muskox etc. If, however, the mucous lining of the mouth has grown forward so much that the junction of the lateral halves of the lip fall inside the anterior limit of this mucous tissue, the result will be something similar to the condition described above in the Okapi calves, viz. a bare mucous strip along the line of conrescence. As has been mentioned, this bare strip derived from, and forming a remnant of the mucous lining of the mouth cavity is a little broader at its upper end, that is just in the inner angle of the cleft between the lateral portions of the lip. It appears thus as if the mucous covering of the inside had a stronger tendency to grow out just there than along the edges below. If this has happened, and, accordingly, when the cleft in the lip is closed, only a portion of mucous tissue has remained exposed at the upper end of the seem, the result will be a small naked rhinarium, isolated far from the

¹ Ann. du Musée du Congo. Zool., Ser. III, T. 1, Bruxelles 1907.

² A homologous, although somewhat different groove in the upper lip is, of course, also found among the Sheep, several Antelopes etc.

lower edge of the otherwise hairy lip, a condition which is to be found very typically in the Elk, but in various degrees also in other Ruminants. Finally, if before the closing of the cleft in the lip, the mucous tissue has grown out over the anterior edges to such a degree that a considerable portion of the same has been left outside the line of concrescence, a large bare and moist muffle is formed, as in its fullest development it is found in *Bos*, but also in many other Ruminants.

Phacochoerus africanus centralis n. subsp.

The material of Warthogs in the present collection consists of and old female killed at Lake Albert Edward the 20th Dec. 1913, an old male probable from the same locality, and two boar-skulls and a skull of a sow.

The most striking feature of these Warthog skulls is their considerable size. In this respect they are not superseded by any *Phacochoerus* skull examined by the present author except by a skull of *Ph. africanus* from Cape Verd in Brit. Mus. Nat. Hist.¹ With regard to several details they display a certain individual variation which appears to be a rather common occurrence among Warthogs, but in general appearance and in relative dimensions they agree well enough as the measurements recorded below prove. Their racial identity ought accordingly not to be subjected to any doubt.

Four to six lower incisors are retained in all skulls, even in the oldest, and two upper.

	A old ² ♂	B ad. ³ ♂	C old ² ♂	D old ♀	E ad. ♀
Occiput to tip of nasals . . .	433,5 mm.	419 mm.	417 mm.	379,5 mm.	373,3 mm.
Least width of parietal flat area	58 » (13,3 %)	58,8 » (14,2 %)	46,4 » (11,1 %)	38 »	23 »
Length of postorbital portion of skull	48,7 » (11,1 %)	56,6 » (13,5 %)	50 » (11,9 %)	49 »	39 »
Greatest breadth of skull . . .	245 »	238 »	231 »	193,5 »	199 »
Interorbital width at middle of orbit above	142 » (32,7 %)	137 » (32,6 %)	132,3 » (31,6 %)	118,5 »	120 »
Least interorbital width . . .	140 »	135,6 »	131 »	116,5 »	118 »
From orbit to tip of nasals . .	343,5 » (79,2 %)	328 » (78,2 %)	327,5 » (78,3 %)	296 »	300 »
Basal length of skull.	329 »	321 »	321 »	307 »	294 »
Palatal length to end of premaxillaries	241 »	230 »	233 »	217 »	211 »

From the above measurements it may be found that the Warthog skulls of this collection nearly agree with *Ph. africanus* with regard to length. The postorbital portion of the skull is comparatively long varying from 11,1 to 14,2 % of the upper length of the skull. The breadth of the parietal flat area varies almost in a similar degree, or from 11,1 to 13,5 % of the upper length of the skull. These percentages are rather similar to

¹ Cf. LÖNNBERG, Proc. Zool. Soc. London, 1908, p. 936.

² Only last upper molar in use.

³ Two upper molars in use.

the same of *Ph. africanus* from Cape Verd (viz. 13,4 and 13,1). On the other hand the latter skull is narrower across the orbits, so that the breadth of the interorbital space is only 30 % of the upper length of the skull, while in the present specimens it measures from 31,6 to 32,7 %.

The Abyssinian *Ph. æliani* has a narrow parietal area (6—8 %) and is thus widely different.

Ph. africanus bufo HELLER from Lado is a name, which unfortunately has been established on so unsufficient material as an immature skull only. It seems, however, to bear a certain likeness to the present skulls as it probably belongs to a large race, and also because it has the premaxillaries extending 57 mm. beyond the base of the tusks. Presumably this measurement has been taken not from the teeth themselves, but from the frontside of their osseous sheaths, and then this dimension is quite as large in these skulls in Capt. ARRHENIUS's collection. The value of this characteristic appears, however, debatable as the same, like many other dimensions of Warthog skulls, is very variable. To prove this may be mentioned that in a skull of an old Warthog boar shot by H. R. H. Prince WILHELM during his expedition to Brit. E. Africa this dimension is 46 mm. but in another, somewhat younger, from the same source it is 57 mm. With our present knowledge it is thus impossible to say, whether these Warthogs from the neighbourhood of Rutshuru are identical with the Lado race, or not, but it does not appear very probable.

From Ketekma, Bagirmi, E. SCHWARZ has described¹ a Warthog under the name *Ph. æthiopicus fossor*. This one as well appears to be of a large race, although the author quoted has not recorded those dimensions which are most useful for skulls of this kind² so that a comparison is made difficult. He compares, however, himself his new race with »*Ph. a. æliani*» from Massaua, and says: »occiput shorter and broader», but just by these features *Ph. africanus africanus* differs from *Ph. a. æliani*. It is thus possible that the Bagirmi Warthog is very closely allied to *Ph. a. africanus*. In which relation *Ph. a. fossor* and *Ph. a. bufo* stand to each other is for the present impossible to tell. From a geographical point of view a close relationship does not appear to be excluded.³ From the same standpoint, on the other hand, there is not much likelihood that the Bagirmi and Rutshuru Warthogs should be identical, as the whole æquatorial forest extends between their habitats, but both are undoubtedly to count among the nearest relatives of *Ph. a. africanus* and well defined from other races as *æliani* and *massaicus*. To avoid confusion it seems the best way to distinguish mostly for geographical reasons the Warthog from Rutshuru and the neighbourhood of Lake Albert Edward as *Ph. a. centralis* until further and definite knowledge may be obtained about the range of variation of the true *Ph. africanus* and *Ph. a. fossor* which as yet are imperfectly known.

As already is mentioned above, and as also is to some extent expressed by the table of measurements, the three old boar skulls now considered are somewhat different

¹ Ann. & Mag. Nat. Hist. (8), Vol. 11, 1913, p. 265.

² On the other hand he has recorded the »length of upper tooth row» which is an extremely changeable dimension within the life time of the same individual.

³ Since the above was written, I have had the pleasure of receiving a letter from Dr. SCHWARZ, in which he says: »*Phacochoerus a. fossor* ist, wie Sie selbst richtig sagen, natürlich am nächsten mit *Ph. a. africanus* verwandt und unterscheidet sich davon und von HELLER's *bufo* (das wir hier [=Frankfurt a. M.] auch haben) durch das überaus flach gestellte Jugale.»

in details. The one signed »A.» has the broadest and flattest interorbital region with only little raised orbits. »C.» again has a strongly concave forehead with much raised orbits, and »B.» is intermediate in these respects. In a similar way »A.» has the nasal region very flat, while »C.» has it strongly convex, especially in its posterior portion. »B.» is intermediate in this respect as well, but is rather flat posteriorly. As »A.» and »C.» are both very old it is impossible to explain the differences as due to age, but it must be a result of individual variation.

The female skulls are, of course, as always is the case, smaller than those of the boars, but, as the above measurements prove, they are somewhat larger than the average in *Ph. massaicus* and still much larger than in *Ph. delamerei*. Like the skulls of the boars those of the sows display a considerable variation with regard to some dimensions.

With regard to colour the Warthogs appear all of them to be pretty similar. The present specimens have the long bristles of the dorsal mane black or blackish brown at the base, but with the distal parts bleached gradually through brown to pale yellowish, about straw colour at the extreme tips. The scattered bristles on the upper side of the head and snout, in the brush above the eyes, on the outside of the ear, upper parts of the body and the shoulders are black (but may fade to brownish by bleaching as is partly the case with the sow of this collection). The whiskers are larger in the female than in the male, white in both, as are also the hairs inside the ears. The scattered bristles on the throat, lower flanks and under side are white. The tail tuft is black. The fore-feet to a patch above the callosity of the »knee» thickly beset with black hair. On the hind feet these black hairs extend on the front side about half way up the metatarsus. In the sow even these hairs are bleached to brownish.

Potamochoerus.

The material of Bushpigs in Capt. ARRHENIUS's collection consists of a about semi-adult animal (second molar developed), a quite young pig, and the skull of an adult boar. The first of these Capt. ARRHENIUS held in captivity some time at Rutshuru. As could be expected it is most nearly allied to the Uganda Bushpig, *Potamochoerus intermedius* LÖNNBERG, but differs from the same so much with regard to the general colour of the body that it most probably represents a local race which I venture to name:

Potamochoerus intermedius arrhenii n. subsp.

The snout and face is chiefly white with scattered black bristles, a black spot at the warts and a black patch at the base of the whiskers which are mixed white and black. The black band between the eyes of the typical *P. intermedius* is merely indicated by some black bristles. The whole forehead and crown are white, a little mottled by the black bases of the bristles and some few black ones. The ears are sparsely hairy on the outer side, the inner side is in its terminal portion black, but with whitish upper margin, and part of the tuft white. The dorsal mane is strongly developed, white with black bases to the very long (about 17 cm.) bristles. The sides of the back are also chiefly white mixed with

black, the dominating colour being white, produced by 9—10 cm. long hairs among which are scattered a number of 15—19 cm. long black bristle-like hairs. On the lower flanks are also to be seen some few buffish bristle-hairs which perhaps are a reminiscence of a previous more juvenile dress. The feet, legs and parts of the shoulders and hams are black. The lower side is chiefly black with some whitish bristles mixed in.

This colour pattern must be regarded as the definitive one of the adult animal as the young pigs of the genus always use to be more or less rufous. Consequently this Bushpig is very different from the true *intermedius*, which has the back and the sides pale rufous, and from the races of *chaeropotamus* it differs by its white-margined and partly white-tufted ear. On the whole it may be said, that it is still more a connecting link to the *chaeropotamus*-series than the typical *intermedius* itself.

The measurements of the skull of the young *Potamochoerus intermedius arrhenii* are as follows:

Occiput to tip of nasals	310 mm.
Width of parietal flat area	38 »
Greatest width at lambdoid crest	77 »
Zygomatic width	138,5 »
Width across postorbital processes	96 »
Least interorbital width	67,8 »
Orbit to anterior end of naso-premaxillary suture	164,5 »

Of these measurements the great parietal width in such a comparatively young animal is especially striking. This is the more the case because SCHOUTEDEN¹ has found the same dimension in the true *Potamochoerus intermedius* LÖNNB. to be rather narrow viz. 17 mm. even in the adult. This fact appears to prove the distinctness of *P. i. arrhenii*.

The relation of this specimen to the old boar skull is on the other hand somewhat doubtful.

The measurements of the adult *Potamochoerus* skull in Capt. ARRHENIUS's collection are as follows:

Upper mesial length from occipital crest to tip of nasals	383 mm.
Least width of parietal flat area	41 »
Greatest width of lambdoid crest	92,5 »
From tip of postorbital process to lambdoid crest	97,8 »
Zygomatic width	181 »
Width across postorbital processes	103 »
Least interorbital width	75 »
Orbit to front end of naso-premaxillary suture	220 »
Hind surface of m^3 to tip of premaxillary	236 »
Length of m^3	35,5 »
Greatest width of m^3	23,6 »

The dimensions recorded above indicate evidently a very large animal with a comparatively broad parietal region. In both these respects it resembles *P. chaeropotamus*

¹ Revue Zool. Africaine, Vol. II, p. 140.

Fig. 10. A young *Potamochoerus* pig from Masisi showing the striped pattern.

Fig. 11. Palatal aspect of *Potamochoerus intermedius arrhenii*.

johnstoni MAJOR without that I think that it is identical with the race mentioned, which is perhaps still larger. Nevertheless, the present skull displays with its great breadth of the parietal area more resemblance to *P. ch. johnstoni* than to the true *P. intermedius*, to judge from the measurements of a skull of the latter communicated by SCHOUTEDEN.¹ The author quoted has as already has been mentioned recorded the breadth of parietal area in an adult *P. intermedius* to be only 17,5 mm., while the same dimension according to my own observations² on an adult and a semiadult *P. ch. johnstoni* (in Brit. Mus. Nat. Hist.) is resp. 44 and 41 mm.

For the present and until more material is available it appears best to leave the question about the identity of this skull open. It may, however, be mentioned that SCHOUTEDEN has referred a couple of Bushpigs from Kitalanga in the Katanga province to *P. ch. johnstoni* on account of their broad parietal region.

It might also be possible, that this big boar skull should belong to the race which just has been named *P. i. arrhenii*. For such a theory speaks the fact that both have a broad parietal area. The great difference otherwise in size should then be explained as due to differences in age and sex.

The small *Potamochoerus*-pig is collected at Masisi, three days west of Kivu the 4th of Febr. 1914. As it is from another locality it is not certain to which race of Bush-pig it may belong. It might even belong to some race of the *porcus*-series, because the ears have light margins, but as such partly are found also in *P. intermedius* and *P. i. arrhenii* it might be of the latter race. It has a very fine pattern of longitudinal stripes on the back (fig. 10). The general colour might be described as something between »rust red» (DAUTHENAY, 318, 1) and »Mars yellow» (l. c. 316, 4). In this colour three broad longitudinal black bands extend along the back from above the shoulders. At a closer inspection, however, it is found that each of these three broad black bands is divided by a narrow and sometimes faintly developed rufous stripe. The stripe which cuts the mesial black band corresponds evidently to the future dorsal crest, but it is only faintly developed at this age. Laterally from the three broad black bands one or two narrower black bands may be traced, but they are by far not so conspicuous and chiefly only on the hind quarters.

The head is dark, the forehead and crown being grizzled black and rufous. The surroundings around the eyes are rust red with a narrow black eye-brow stripe and a small whitish spot underneath the eye. The ears are black with yellowish margins on both sides. The snout is dark brown; the chin is black, and the throat is mixed rufous and white with a small central black spot. A white band along the lower cheeks corresponds to the future whiskers. The chest is white and in the middle the belly has the same colour, but laterally it is »Mars yellow» (316, 1). The fore-feet are brownish, the hind feet somewhat mixed with whitish, but mostly greyish brown. The tuft of the tail is partly yellow, partly black.

The dentition of this animal is very interesting. In the upper jaw the two median pairs of incisors have not yet cut the gum, but *id*₃ is long, slender and canine-like,

¹ Revue Zool. Africaine, Vol. II, p. 140.

² Ark. f. Zoologi, Bd. 7, n:o 6, p. 17.

similar to *cd*. In the lower jaw the median pair of incisors, are distinctly bilobed, any second pair is not visible, but *id*₃ are long and slender, although somewhat shorter than *dc*. The four pairs of milkmolars in both jaws are in the act of cutting the gum, but the foremost pair is very small, in the upper jaw quite rudimentary.

Palatal folds of *Potamochærus*:

As the skull of the young *P. intermedius arrhenii* had been dried with some of the soft parts adherent, and the soft palatal parts were preserved in such a state that the arrangement of the palatal folds could be very plainly seen, I have let prepare the accompanying sketch of the same (fig. 11). The palatal folds of the domestic Pig have been well described and beautifully figured by G. RÆTZIUS,¹ and the present author has given a short note about the same of a young pig of *Phacochoerus*.² In both the animals mentioned the number of folds, or pairs of folds, is about 23. In this *Potamochærus* there are 22 folds on each side, but due to some irregularity the real pairs can only be regarded to be 20 in number. In the domestic Pig all folds are nearly transverse, although the 6 posterior ones behind the level of *p*⁴ are lower and more irregular. In the Warthog the anterior folds are curved forward, the middle ones obliquely arranged, and the three last only formed by a series of papillæ. In *Potamochærus* as in the Warthog three different sets can be discerned. The 10 anterior pairs (instead of 17 in the domestic Pig) are (almost) transverse (except the foremost which are oblique), and this condition prevails about to the level of *p*². Then follows about 7 pairs which are obliquely arranged with the lateral ends behind the level of the mesial ends. The three hindmost pairs again are transverse but short. On the whole this arrangement is thus more similar to that of *Phacochoerus* than to that of *Sus*.

Manis tetradactyla LIN.

1 specimen from Beni, Jan. 1914.

Manis tricuspis RAFINESQUE.

A mutilated native skin with no locality.

¹ Biolog. Untersuch., N. F. XIII, Stockholm 1906, p. 133 & 134, Taf. XXXVII, fig. 3—5.

² K. Vet. Akad. Handl., Bd. 49, Stockholm 1912. N:o 7, p. 23.

Explanation of plates.¹

- Pl. I. Fig. 1. Adult male of *Gorilla beringei mikenensis* n. subsp. (n:o 164) shot by Capt. ELIAS ARRHENIUS on the volcano Mikenno, Virunga mountains, $\frac{14}{5}$ 1914.
Fig. 2. Immature male and female Gorillas of the same race (n:o 39 & 40) from the same locality, $\frac{27}{12}$ 1913.
- Pl. II. Fig. 1. Front view of the skull of old male *Gorilla beringei mikenensis* n. subsp. (n:o 164), diminished.
Fig. 2. Palatal view of the same, diminished.
- Pl. III. Fig. 1. Profile view of the skull of old male *Gorilla beringei mikenensis* n. subsp. (n:o 164), diminished.
Fig. 2. Profile view of the skull of semiadult male *Gorilla beringei mikenensis* n. subsp. (n:o 165), more diminished than fig. 1.
- Pl. IV. Fig. 1. Front view of the skull of semiadult male *Gorilla beringei mikenensis* n. subsp. (n:o 165), diminished.
Fig. 2. Profile view of the skull of young male Gorilla of the same species, with milk-dentition and first molars (n:o 166), diminished.
Fig. 3. Front view of the same as fig. 2, diminished.
Fig. 4. Palatal view of the same, diminished.
- Pl. V. Fig. 1. Front view of skull of old male *Anthropopithecus* cf. *cottoni* MATSCHIE (n:o 70) from Rutshuru, $\frac{8}{2}$ 1914, diminished.
Fig. 2. Profile view of the same.
Fig. 3. Front view of a female Chimpanzee skull (n:o 161) of the same race and from the same locality, with small orbits, diminished.
Fig. 4. Front view of a female Chimpanzee skull (n:o 160) of the same race and from the same locality, with large orbits.
- Pl. VI. Fig. 1. Palatal view of the skull of old male *Anthropopithecus* cf. *cottoni* MATSCHIE (n:o 70) from Rutshuru, diminished.
Fig. 2. Lower jaw of female n:o 178 of the same race of Chimpanzee from the same locality, to show supernumerary molars on both side, diminished.
Fig. 3. Lower jaw of female n:o 160 of the same race of Chimpanzee from the same locality, to show supernumerary molar on left side, diminished.
Fig. 4 a. Right molar series of lower jaw of female Chimpanzee n:o 224;
b. Left molar series of lower jaw of female Chimpanzee n:o 181.
These two figures have been photographed at the same time and on the same plate to prove the great variation in the size of the teeth.
Fig. 5. Profile view of skull of *Colobus ellioti* DOLLMAN, ♂ from Beni (n:o 203).
- Pl. VII. Fig. 1. Skull of young male of *Papio tessellatus* ELLIOT from Rutshuru, with only milk-dentition. $\frac{3}{4}$ nat. size.
Fig. 2. Skull of young male of the same species, with first molars developed. $\frac{3}{4}$ nat. size.
Fig. 3. Skull of semiadult male of the same species, last molar not yet visible. $\frac{7}{10}$ nat. size.
Fig. 4. Skull of adult male of the same species. $\frac{7}{10}$ nat. size.
Fig. 5. Skull of adult female of the same species. $\frac{7}{10}$ nat. size.
- Pl. VIII. Fig. 1 a (n:o 23) and b (n:o 25). Profile views of skulls of two male specimens of *Cercopithecus schmidtii enkamer* MATSCHIE shot the same day, $\frac{18}{9}$ 1913, at Rutshuru by Captain ELIAS ARRHENIUS. Both photographed on the same plate at the same exposure.
Fig. 2 a (n:o 23) and b (n:o 25). Front views of the same skulls as the foregoing. Both photographed on the same plate at the same exposure.
Fig. 3. a (n:o 19) and b (n:o 24). Profile views of two female skulls of *Cercopithecus schmidtii enkamer* MATSCHIE from Rutshuru. Both photographed on the same plate at the same exposure.

¹ The exact measurements of the figured skulls etc are to be found in the text.

- Fig. 4 *a* (n:o 19) and *b* (n:o 24). Front views of the same skulls as the foregoing. Both photographed on the same plate at the same exposure.
- Fig. 5 *a* (n:o 19) and *b* (n:o 24). Palatal views of the same specimens as above.
- Pl. IX. Fig. 1. Foetus of *Elephas africanus cottoni* LYDEKKER.
- Pl. X. Fig. 1. Profile view of a female skull of *Cephalophus weynsi* THOMAS from Beni.
- Fig. 2. Profile view of the female type skull of *Cephalophus weynsi rutshuricus* n. subsp. from Rutshuru.
- Fig. 3. Profile view of the female type skull of *Cephalus claudi mixtus* n. subsp. from Beni.
- Pl. XI. Fig. 1. Profile view of a female skull of *Cephalus leucogaster* GRAY from Beni.
- Fig. 2. Profile view of a skull of *Cephalophus castaneus* THOMAS from Mukimbungu, Lower Congo.
- Fig. 3. Profile view of the female type skull of *Cephalophus castaneus arrhenii* n. subsp. from Beni.
- Pl. XII. Fig. 1. Profile view of a male skull of *Cercocebus albigena ituricus* MATSCHIE from Beni.
- Fig. 2. Frontal view of the same skull.
- Fig. 3. Palatal view of a male skull of *Damaliscus korrigum ugandæ* BLAINE to show the shape of the choanæ and the first premolar.

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Fig. 1.

Fig. 2.

Cederquists Graf. A.-B., Stilm.

Fig. 1.

Fig. 2.

Fig. 1.

Fig. 2.

Fig. 1.

Fig. 4.

Fig. 2.

Fig. 3.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 2.

Fig. 3.

a

b

Fig. 4.

Fig. 1.

Fig. 5.

Fig. 1.

Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 1.

Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.

Fig. 2.

Fig. 3.