59.7,4(67.5)

Article III.—CARNIVORA COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION[1]

By J. A. Allen[2]

Plates VI to LXXVIII, Text Figures 1 to 67, and Map

CONTENTS

[1]Scientific Results of the Congo Expedition. Mammalogy, No. 8.

[2]Dr. Allen died in 1921. This paper is now published essentially as Dr. Allen left it, except for certain necessary changes made by Mr. Lang and the addition of figures made under Mr. Lang's supervision. Mr. Lang's fieldnotes and other data will be published separately.—Editor.

INTRODUCTION

The Carnivora collected by Herbert Lang and James P. Chapin on The American Museum Congo Expedition,[1] number 588 specimens, of which 9 represent the Canidæ, 35 the Mustelidæ, 411 the Viverridæ, 13 the Hyænidæ, and 120 the Felidæ. The collection consists of 33 forms (29 species and 4 additional subspecies), with 2 genera and 8 forms new to science.

The comparative drawings of the skulls of the various genera were rendered possible through the interest and support of Professor Henry Fairfield Osborn, President of The American Museum of Natural History. They have been made in orthogon projection, thus insuring the greatest possible exactness in general comparison as well as in that of the component parts of the skull. Through the careful and painstaking work of Mrs. H. Ziska, who made these drawings under Mr. Lang's supervision, it was possible to attain a correctness which those who do not have the facilities to compare the actual skulls will appreciate.[2] Except where the contrary is indicated, the halftone illustrations of either living animals or of specimens in the flesh are from field photographs taken by Mr. Lang, those of skulls and skins, by Julius Kirschner; the colored plate of *Osbornictis* is by Mr. Richard Deckert.

In addition to the comparative material available in The American Museum of Natural History, much important material has been generously loaned by the authorities of the United States National Museum through the kindness of Mr. Gerrit S. Miller, Jr., Curator of Mammals, and is more fully accredited in the proper connection. I am also greatly indebted to Dr. T. S. Palmer, author of 'Index Generum Mammalium,' for transcripts from rare volumes, and for verification of references to works otherwise unavailable.

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[1]Preliminary notes on some of the carnivores of this collection were published by Dr. Allen, 1919, Journ. Mammalogy, I, No. 1, November, pp. 23–31.

[2]Notes by Mr. Lang concerning these skulls and other matters connected with the Carnivora collected by the Congo Expedition will be published later.—EDITOR.

SPECIES AND SUBSPECIES, WITH THEIR LOCALITIES AND NUMBER OF SPECIMENS FROM EACH LOCALITY

	Species and Subspecies	Localities	Specimens
		Canidæ	
1.	*Thos anthus soudanicus*	Bafuka 1, Faradje 4, Niangara 4	9
		Mustelidæ	
2.	*Mellivora capensis cottoni*	Niapu 2, Vankerckhovenville 1	3
3.	*Lutra maculicollis*	Avakubi 1, Faradje 5, Niapu 3	9
4.	*Aonyx capensis*	Avakubi 1, Faradje 21, Niapu 1	23
		Viverridæ	
5.	*Civettictis civetta orientalis*	Akenge 7, Avakubi 2, Faradje 1, Medje 6, Niangara 2, Niapu 14	32
6.	*Genetta pardina fieldiana*	Aba 1, Akenge 4, Avakubi 1, Faradje 18, Medje 17, Niangara 3, Niapu 1, Stanleyville 1	46
7.	*Genetta servalina*	Akenge 6, Bafuka 1, Faradje 9, Ibambi 1, Medje 7, Niangara 7, Niapu 23	54
8.	*Genetta stuhlmanni*	Lake Kivu 1	1
9.	*Genetta victoriæ*	Akenge 1, Medje 3, Niapu 24, unknown locality 2	30
10.	*Osbornictis piscivora*	Manamama (near Bafwabaka) 1, Niapu 1	2
11.	*Poiana richardsoni ochracea*	Akenge 1, Medje 2, Niapu 1	4
12.	*Nandinia binotata*	Akenge 15, Boyulu 1, Medje 20, Niangara 6, Niapu 30, Poko 1	73
13.	*Herpestes ichneumon parvidens*	Niangara 1	1
14.	*Herpestes ichneumon funestus*	Akenge 1, Faradje 2, Medje 3, Stanleyville 1	7
15.	*Galerella ochracea ochracea*	Faradje 8, Niangara 1	9
16.	*Helogale hirtula robusta*	Aba 2, Faradje 6, Niangara 1, Vankerckhovenville 1	10
17.	*Mungos gothneh*	Akenge 1, Faradje 19, Niangara 2	22
18.	*Crossarchus alexandri*	Akenge 17, Gamangui 3, Medje 1, Niapu 44, Poko 1	66
19.	*Ichneumia leucura ibeana*	Faradje 5, Niangara 3	8
20.	*Xenogale microdon*	Akenge 4, Avakubi 2, Medje 6, Niapu 4	16
21.	*Atilax robustus*	Faradje 4	4
22.	*Atilax macrodon*	Akenge 2, Medje 2, Niapu 13	17
23.	*Bdeogale nigripes*	Akenge 2, Niapu 7	9
		Hyænidæ	
24.	*Crocuta crocuta fortis*	Faradje 13	13

Felidæ

25.	*Leo leo azandicus*	Faradje 14, Vankerckhovenville 1	15
26.	*Panthera pardus chui*	Bafuka 1, Faradje 24, Garamba 3, Vankerckhovenville 1	29
27.	*Panthera pardus iturensis*	Akenge 6, Gamangui 2, Medje 3, Niapu 7, Poko 2	20
28.	*Leptailurus serval faradjius*	Faradje 14, Niangara 2	16
29.	*Leptailurus ogilbyi pantasticta*	Faradje 7	7
30.	*Leptailurus ogilbyi larseni*	Zambi 1	1
31.	*Profelis aurata cottoni*	Akenge 2, Avakubi 1, Medje 2, Niangara 1, Niapu 1	7
32.	*Felis ocreata rubida*	Faradje 15, Niangara 8, Poko 1	24
33.	*Felis ocreata ugandæ*	Garamba 1	1

List of Localities, with Names of the Species and Subspecies, and Number of Specimens Taken at Each Locality

Localities	Species and Subspecies	No. of Specimens	Totals
Aba	*Genetta pardina fieldiana*	1	
"	*Helogale hirtula robusta*	2	3
Akenge	*Civettictis civetta orientalis*	7	
"	*Genetta pardina fieldiana*	4	
"	*Genetta servalina*	6	
"	*Genetta victoriæ*	1	
"	*Poiana richardsoni ochracea*	1	
"	*Nandinia binotata*	15	
"	*Herpestes ichneumon funestus*	1	
"	*Mungos gothneh*	1	
"	*Crossarchus alexandri*	17	
"	*Xenogale microdon*	4	
"	*Atilax macrodon*	2	
"	*Bdeogale nigripes*	2	
"	*Panthera pardus iturensis*	6	
"	*Profelis aurata cottoni*	2	69
Avakubi	*Lutra maculicollis*	1	
"	*Aonyx capensis*	1	
"	*Civettictis civetta orientalis*	2	
"	*Genetta pardina fieldiana*	1	
"	*Xenogale microdon*	2	
"	*Profelis aurata cottoni*	1	8
Bafuka	*Thos anthus soudanicus*	1	
"	*Genetta servalina*	1	
"	*Panthera pardus chui*	1	3
Boyulu	*Nandinia binotata*	1	1
Faradje	*Thos anthus soudanicus*	4	
"	*Lutra maculicollis*	5	

Faradje	*Aonyx capensis*	21	
"	*Civettictis civetta orientalis*	1	
"	*Genetta pardina fieldiana*	18	
"	*Genetta servalina*	9	
"	*Herpestes ichneumon funestus*	2	
"	*Galerella ochracea ochracea*	8	
"	*Helogale hirtula robusta*	6	
"	*Mungos gothneh*	19	
"	*Ichneumia leucura ibeana*	5	
"	*Atilax robustus*	4	
"	*Crocuta crocuta fortis*	13	
"	*Leo leo azandicus*	14	
"	*Panthera pardus chui*	24	
"	*Leptailurus serval faradjius*	14	
"	*Leptailurus ogilbyi pantasticta*	7	
"	*Felis ocreata rubida*	15	189
Gamangui	*Crossarchus alexandri*	3	
"	*Panthera pardus iturensis*	2	5
Garamba	*Panthera pardus chui*	3	
"	*Felis ocreata ugandæ*	1	4
Ibambi	*Genetta servalina*	1	1
Lake Kivu	*Genetta stuhlmanni*	1	1
Manamama	*Osbornictis piscivora*	1	1
Medje	*Civettictis civetta orientalis*	6	
"	*Genetta pardina fieldiana*	17	
"	*Genetta servalina*	7	
"	*Genetta victoriæ*	3	
"	*Poiana richardsoni ochracea*	2	
"	*Nandinia binotata*	20	
"	*Herpestes ichneumon funestus*	3	
"	*Crossarchus alexandri*	1	
"	*Xenogale microdon*	6	
"	*Atilax macrodon*	2	
"	*Panthera pardus iturensis*	3	
"	*Profelis aurata cottoni*	2	72
Niangara	*Thos anthus soudanicus*	4	
"	*Civettictis civetta orientalis*	2	
"	*Genetta pardina fieldiana*	3	
"	*Genetta servalina*	7	
"	*Nandinia binotata*	6	
"	*Herpestes ichneumon parvidens*	1	
"	*Galerella ochracea ochracea*	1	
"	*Helogale hirtula robusta*	1	
"	*Mungos gothneh*	2	
"	*Ichneumia leucura ibeana*	3	
"	*Leptailurus serval faradjius*	2	
"	*Profelis aurata cottoni*	1	
"	*Felis ocreata rubida*	8	41

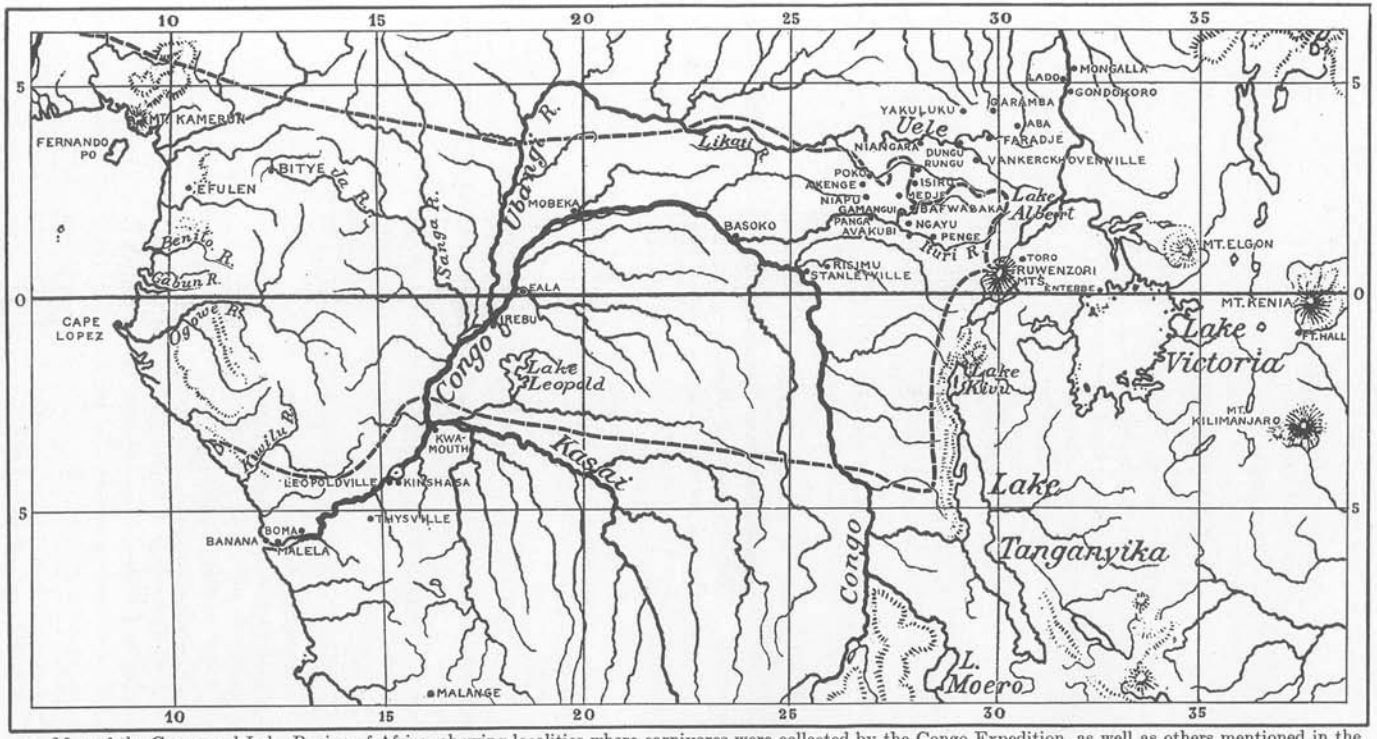
Niapu	*Mellivora capensis cottoni*	2	
"	*Lutra maculicollis*	3	
"	*Aonyx capensis*	1	
"	*Civettictis civetta orientalis*	14	
"	*Genetta pardina fieldiana*	1	
"	*Genetta servalina*	23	
"	*Genetta victoriæ*	24	
"	*Osbornictis piscivora*	1	
"	*Poiana richardsoni ochracea*	1	
"	*Nandinia binotata*	30	
"	*Crossarchus alexandri*	44	
"	*Xenogale microdon*	4	
"	*Atilax macrodon*	13	
"	*Bdeogale nigripes*	7	
"	*Panthera pardus iturensis*	7	
"	*Profelis aurata cottoni*	1	176
Poko	*Nandinia binotata*	1	
"	*Crossarchus alexandri*	1	
"	*Panthera pardus iturensis*	2	
"	*Felis ocreata rubida*	1	5
Stanleyville	*Genetta pardina fieldiana*	1	
"	*Herpestes ichneumon funestus*	1	2
Vankerckhovenville	*Mellivora capensis cottoni*	1	
"	*Helogale hirtula robusta*	1	
"	*Leo leo azandicus*	1	
"	*Panthera pardus chui*	1	4
Zambi	*Leptailurus ogilbyi larseni*	1	1
?	*Genetta victoriæ*	2	2

New Genera with Their Type Species

Micraonyx J. A. Allen. Type, *Lutra leptonyx* Horsfield = *Lutra cinerea* Illiger.
Osbornictis J. A. Allen. Type, *Osbornictis piscivora* J. A. Allen.
Xenogale J. A. Allen. Type, *Xenogale microdon* J. A. Allen.

New Species and Subspecies, with Their Type Localities

1. *Osbornictis piscivora* J. A. Allen. Niapu.
2. *Helogale hirtula robusta.* Faradje.
3. *Xenogale microdon.* J. A. Allen. Akenge.
4. *Atilax macrodon.* Niapu.
5. *Crocuta crocuta fortis.* Faradje.
6. *Leo leo azandicus.* Vankerckhovenville.
7. *Leo leo hollisteri.* Lime Springs, Sotik, British East Africa.
8. *Panthera pardus iturensis.* Niapu.
9. *Leptailurus serval faradjius.* Faradje.



Map of the Congo and Lake Region of Africa, showing localities where carnivores were collected by the Congo Expedition, as well as others mentioned in the present paper. The limits of the West African rain forest are indicated by a broken line.

General Summary

Families	Genera	Species and Subspecies	Specimens	Localities[1]
Canidæ	1	1	9	3
Mustelidæ	3	3	35	4
Viverridæ	14	19	411	16
Hyænidæ	1	1	13	1
Felidæ	5	9	120	13
	24	33	588	

CANIDÆ

Represented by only a single species, a jackal allied to a Sudan form.

THOS Oken

Thos OKEN, 1816, 'Lehrb. Naturg.,' Zool., Theil 3, Abth. 2, p. 1037. Type, by subsequent designation (Heller, 1914), *Thos vulgaris* Oken = *Canis aureus* Linnæus.

Thos anthus soudanicus (Thomas)

Plates VI; VII, Figure 1

Canis anthus soudanicus THOMAS, 1903, Proc. Zoöl. Soc. London, I, p. 295. Type locality, El Obeid, Kordofan. Skin and skull.

Represented by 9 specimens, 5 of which are immature, collected as follows:

Bafuka,[2] 1 (skull only, very old ♂), June 3, 1913.

Faradje, 4 (1 ♂, 2 ♀, adults, 1 subadult ♀), February 25, March 27, July 26, December 5, 1912.

Niangara, 4 (all nurslings), November 16–24, 1910.

Collectors' measurements of 3 adults (1 ♂, 2 ♀) from Faradje:

Cat. No.	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
52049	♂	970	650	320	157	—
52051	♀	920	620	300	140	—
52052	♀	930	630	300	140	73

The four specimens from Niangara (Pl. VII, fig. 1) are all in the first coat, with the milk dentition approaching full development. They have the upperparts nearly uniform dark brown, the fur basally pale buff, darker at the surface, the tips of the longest hairs blackish brown; ears blackish brown externally, especially the apical half, deep buffy internally; tail entirely dull brownish black. Under surface much

[1]The total number of localities at which carnivores were collected is 19.
[2]Sixty miles north of Niangara.

lighter than the back, pale brown, the tips of the hairs lighter; interramal area brownish black; foreneck pale buff. Limbs externally dark like the sides of the body, pale rufescent internally.

Measurements of Four Skulls of *Thos anthus soudanicus*

Cat. No.	Sex	Greatest Length	Condylobasal Length	Basal Length	Palatal Length	Zygomatic Breadth	Interorbital Breadth	Postorbital Breadth	Breadth Braincase	Mastoid Breadth	Breadth across p^4-p^4	Upper Tooth-row (c-m^2)	Length p^4
52057	♂[1]	156.5	153.8	148.5	84.2	80.0	26.6	26.7	50.2	48.0	44.9	71.0	13.3
52049	♂	149.0	145.5	137.5	78.0	77.7	24.0	29.8	49.4	48.3	46.5	63.1	12.8
52051	♀	136.6	134.2	127.3	70.0	63.2	19.2	24.8	47.8	45.7	40.5	60.3	12.4
52052	♀[2]	———	———	———	77.4	———	23.4	———	———	46.0	43.0	64.7	12.7

The adults agree well in coloration and dimensions with *T. anthus soudanicus* (Thomas), and geographical considerations favor their provisional reference to this form.

Hollister records[3] five forms of the genus *Thos* from British East Africa as represented in the collection of the United States National Museum. These five forms are referred to three species, as follows:

(1) *Thos adustus bweha* Heller, 6 specimens.
(2) *Thos adustus notatus* Heller, 4 specimens.
(3) *Thos aureus bea* Heller, 10 specimens.
(4) *Thos mesomelas elgonæ* Heller, 9 specimens.
(5) *Thos mesomelas mcmillani* Heller, 37 specimens.

His tabulated measurements of skulls are based on sixty-six adults, in all but ten of which the basal suture is closed; twenty-four are males, thirty-five are females, and of seven the sex is not indicated. As Hollister's tabulations are not summarized and the five forms seem to differ little in size, although representing three specific groups and five forms, it seemed worth while to compute the averages for four of the cranial measurements (condylobasal length, zygomatic breadth, mastoid breadth, and breadth at base of canines) as these form a fair comparative basis for general size. The results being of some interest are presented in the subjoined table. So far as these four cranial measurements are concerned, the two subspecies of *Thos adustus* are not distinguishable by size, the individual variation many times exceeding the slight average

[1]Bafuka, senile male.
[2]Very old; skull badly broken.
[3]1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 101–103.

difference. The same is true for *Thos aureus bea* and the two forms of *mesomelas*, as regards the condylobasal length, but they differ decidedly in respect to the breadth of the skull, the two forms of *mesomelas* agreeing well with each other and differing decidedly in this respect from *T. aureus bea*, in which, while the condylobasal length is less than in the *adustus* group, the zygomatic and mastoid breadths are practically in agreement. On the other hand, the rostral breadth is less. It would thus seem that the proportional differences of length to breadth may be of diagnostic importance.

The large series of *Thos mesomelas mcmillani* affords interesting evidence of the amount of sexual difference in the *Thos* group. In this form the average condylobasal length is quite appreciably less in the female (about 4.5 to 5 mm.) than in the male, but is far from definitive, since the larger females frequently exceed the smaller males in skulls of equal age.

Summary of Hollister's Measurements of Sixty-four Skulls of Five Subspecies of the Genus *Thos*

	No. of Spec.	Condylobasal Length	Zygomatic Breadth	Mastoid Breadth	Breadth at Base of Canines
Thos adustus bweha	6	149.0 (142-155)	80.0 (71-85)	50.0 (49-53)	26.3 (24.4-27.6)
" " *notatus*	4	148.5 (141-156)	78.0 (72-81)	49.3 (47-51)	26.4 (24.5-27.8)
Thos aureus bea	10	142.4 (139-147)	78.6 (75-80)	49.2 (47-51)	24.8 (23.9-26.0)
Thos mesomelas elgonæ	9	142.0 (136-144)	84.8 (82-90)	51.1 (50-53)	23.9 (22.9-26.1)
" " *mcmillani*	35	142.0 (134-153)	81.0 (74-89)	51.0 (41-55)	24.8 (22.6-26.7)
" " "	14 ♂	144.4 (139-153)	84.9 (80-89)	54.3 (51-55)	25.8 (24.4-26.7)
" " "	21 ♀	140.0 (134-149)	80.9 (77-86)	47.4 (49-54)	24.5 (22.6-25.9)

MUSTELIDÆ

Mustelinæ

The subfamily Mustelinæ is represented by only three specimens, referable to *Mellivora capensis cottoni* Lydekker. One is merely a flat skin, native-made and without skull, from Vankerckhovenville; the other two are skins with skulls (one of them with a complete skeleton), from Niapu.

MELLIVORA Storr

Mellivora STORR, 1780, 'Prod. Meth. Mamm.,' tab. A. Type by monotypy, *Viverra ratel* Sparrman = *Viverra capensis* Schreber, 1776, 'Säugthiere,' Pl. CXXV, text, 1777 III, p. 450. Original description and figure. "Vorgebirge der guten Hofnung."

Mellivora capensis cottoni Lydekker

Plate VII, Figure 2

Mellivora cottoni LYDEKKER, 1906, Proc. Zoöl. Soc. London, I, June 7, p. 112, Pl. VII (animal). Type locality, "eastern fringe of the Ituri Forest," near Mawambi. Melanistic.

Represented by 3 specimens, collected as follows:

Vankerckhovenville, 1 (imperfect, native-made skin without skull), November 1911.

Niapu, 2 (both old females; skins and skulls, skeleton of one of them), November 9, December 9, 1913.

Only one of the specimens, a senile female (Pl. VII, fig. 2), has field measurements, which are as follows: Total length, 870 mm.; head and body, 670; tail vertebræ, 200; hind foot, 120.

Two skulls (No. 51951, senile ♀, and No. 51952, ♀ adult): Upper edge of foramen magnum to front of incisors, 131.0, 131.0; condylobasal length, 133.5, 133.4; basal length, 123.5, 123.1; palatal length, 62.0, 62.5; zygomatic breadth, 73.1, 75.0; least interorbital breadth, 34.5, 36.0; least postorbital constriction, 30.5, 31.7; breadth of braincase, 62.0, 62.3; mastoid breadth, 76.2, 77.0; outside to outside of p^4-p^4, 43.8, 46.2; upper toothrow (c-m), 36.9, 37.2; greatest length of p^4, 12.9 (greatly worn), 14.1; least distance between temporal ridges anteriorly, 10.0, 15.8; do., posteriorly, 17.4, 32.3. Rarely do the skulls of two individuals of a species measure so nearly the same as in the present case; in ten out of fourteen measurements the difference is less than two millimeters. The greater difference across p^4-p^4 is really due to the excessively worn condition of the teeth in the senile specimen. The difference in the distance separating the temporal ridges is obviously due to difference in age.

These three specimens agree closely in coloration, the whitish mantle extending in two of them from between the eyes to a little behind the shoulders, fading gradually posteriorly into the black of the rest of the dorsal surface; in the other the mantle continues slightly further, reaching to about the middle of the back, with many scattered white hairs as far as the loins. In two the extreme tip of the tail is clear white; in the other the tip of the tail is wanting.

On the presumption that the *Mellivora capensis* group, which ranges from South Africa to Abyssinia in the east and westward across the continent to Senegal, is separable into a number of regional forms, for which nearly half a score of names have already been provided, the specimens here recorded are referred to *Mellivora cottoni* of Lydekker, the

type locality of which was not only in the Ituri Forest but only about a hundred and sixty miles from where the present examples were taken. The type specimen of *cottoni* was "entirely black," but the describer felt disinclined to consider it as "a mere individual melanism," as "the conditions prevalent in the great Ituri Forest are. . . . just the conditions which are conducive to the development of blackness in a species." Although the present specimens are far from being wholly black, they represent a dark form of the *M. capensis* group. Mr. Lang informs me that the specimens from Niapu were taken in the same kind of forest and general environment one finds in Mawambi, but the one from Vankerckhovenville, which lies in the savannah on the northern edge of the forest, is as dark as the darker specimen from Niapu.

Lutrinæ

The subfamily Lutrinæ is represented by two species, referable respectively to the genera *Lutra* and *Aonyx*. An investigation of the relationship of the African clawless otter to the East Indian small-clawed otter has shown the desirability of separating the two groups generically. The principal external and cranial differences are shown in the accompanying illustrations. This investigation became possible mainly through the loan of specimens of small-clawed otters of the East Indian Islands by the authorities of the United States National Museum.

LUTRA Brisson

Lutra BRISSON, 1762, 'Reg. Anim.,' Ed. 2, pp. 13, 201. Type, by tautonymy, *Mustela lutra* Linnæus. (Cf. Merriam, 1895, Science, N. Ser., I, April 5, p. 376, for fixation of type.)

Hydrogale GRAY, 1865, Proc. Zoöl. Soc. London, p. 131, fig. of skull (p. 132). Type, by monotypy, *Lutra maculicollis* Lichtenstein. Not *Hydrogale* Kaup, 1829, for a genus of Soricidæ.

Lutra maculicollis Lichtenstein

Plates VIII, XI; and Text Figures 1–3, 4A, 5A–A[1]

Lutra maculicollis LICHTENSTEIN, 1835, Arch. für Naturg., I, p. 89, Pl. II, fig. 1. "Aus dem Kafferlande."

Represented by 9 specimens, collected as follows:

Faradje, 5 (1 ♂ juvenile, 1 ♀ adult, 1 ♀ juvenile, and 2 native skins without skulls), February 28, March 8, 1911; January 7, June 23, 1913.

Niapu, 3 (2 ♂ adults, 1 ♀ adult), June 2, 1913; February 1, 1914.

Avakubi, 1 (native skin without skull), August 1915.

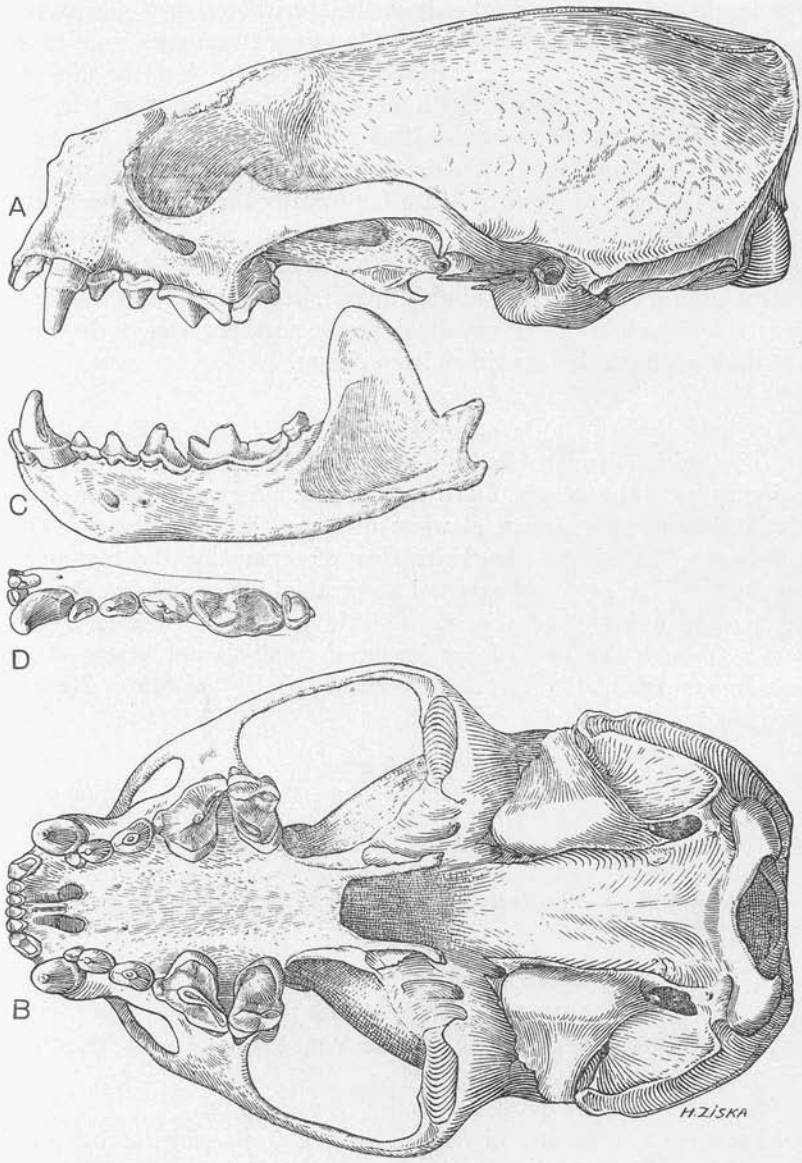


Fig. 1. *Lutra maculicollis*. Skull of adult male (No. 51828). A, lateral view; B, palatal view; C, lateral view of left mandible; D, crown view of left lower dentition. Natural size.

Collectors' Measurements of Four Adults of *Lutra maculicollis*

Cat. No.	Sex	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51827	♂	Niapu	1070	625	445	127	18
51828	♂	"	1035	600	435	125	17
51829	♀	"	950	595	355	108	16
51825	♀	Faradje	960	560	400	107	19

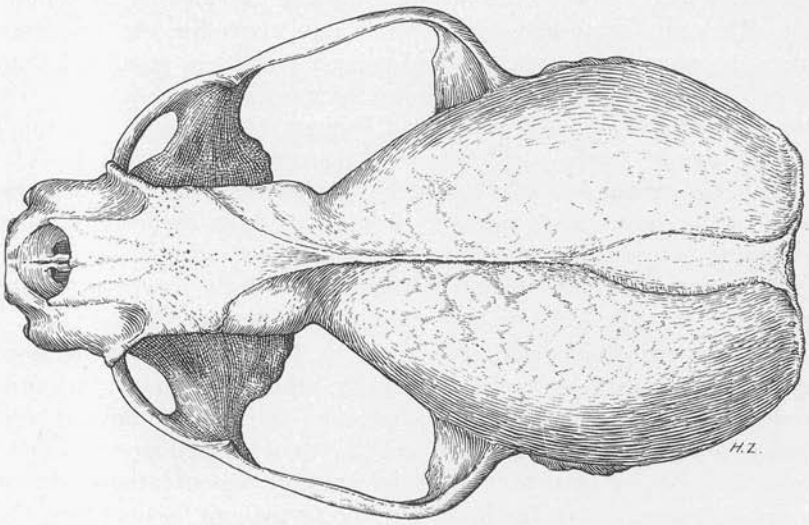


Fig. 2. *Lutra maculicollis.* Dorsal view of skull of adult male (No. 51828). Natural size.

Measurements of Four Adult Skulls of *Lutra maculicollis*

Cat. No.	Sex	Locality	Condylobasal Length	Palatal Length	Zygomatic Breadth	Interorbital Breadth	Breadth Braincase	Breadth at p^4	Breadth at Canines	Incisive Breadth	Upper Tooth-row (c-m^1)
51827	♂	Niapu	105.7	46.4	62.2	15.1	52.2	32.0	24.0	12.2	33.7
51828	♂	"	105.0	44.7	65.0	18.7	52.1	34.0	23.3	12.8	32.3
51829	♀	"	97.2	42.0	——	18.4	47.7	29.0	20.2	10.7	29.2
51825	♀	Faradje	102.5	44.1	55.9	13.8	43.8	28.9	20.2	11.4	31.0

In No. 51825 the teeth are not worn; in the other three skulls the teeth are slightly worn (Figs. 1 and 2).

As shown by the above measurements, the males considerably exceed the females in size.

A young skull (No. 51822, ♂, Faradje) has the full milk dentition (Fig. 3), namely I $\frac{3-3}{1-1}$, C $\frac{1-1}{1-1}$, P $\frac{4-4}{3-3}=\frac{16}{10}=26$. The two inner pairs of upper incisors are slender spicules, deflected outward (laterad); the outer incisors (di^3) are much larger than the middle ones, having a diameter of 0.8 of a millimeter; they are deflected inward (centrad), so as to meet the tip of di^2, the two teeth, as seen from the front, forming a V-shaped arch. In the lower jaw there are only two incisors, the middle pair. They are thread-like, rising about 1 mm. above the jaw, and curve outward (concave laterad), the mid-portion being less separated than either the base or tips. The excluded premolars are dp $\frac{2}{2}$, $\frac{3}{3}$, $\frac{4}{4}$. By dissection of the gum dp^1 was found beneath the surface, as a small conical tubercle, in the position of p^1 of the permanent dentition. The vestigial dp^1 on the left side was much smaller than the corresponding tooth on the right. They probably would have been absorbed without extrusion. There is no indication of the presence of a dp_1. In the upper jaw the position of both dp^1 and dp^2 is in line with the inner base of dp^3 and dp^4. The milk dentition thus closely resembles that of *Lutra lutra*.

In a somewhat older skull (No. 51826, ♀, Faradje) the upper incisors have been replaced by permanent teeth; the milk canines are still present behind their half-excluded successors; the vestigial dp^1 has been replaced by p^1; dp^2 has been shed and the tip of its successor is slightly above the alveolar plane; dp^3 and dp^4 are still present; the crown of m^1 is fully exposed. In the lower jaw the permanent incisors are fully developed, the permanent canines are about half grown, behind which their predecessors still remain; dp_2 has been shed and the tip of its successor protrudes in its place; dp_3 and dp_4 are still retained; both m_1 and m_2 can be seen through vacuities in the alveolar border.

The present series of nine specimens demonstrates a wide range of variation in color, especially in the white markings of the ventral surface, which vary greatly in extent, position, and outline, no two specimens being very closely similar. Frequently the white markings are nearly restricted to the foreneck and inguinal region, but in some specimens the white area of the foreneck extends forward to include the chin, and posteriorly to include the breast, and often encloses small irregular patches of brown. The white of the inguinal area may be limited to a few spots or form a confluent mass of white and brown markings. Two males from Niapu, both trapped the same night in the same pool, curiously happen to present, respectively, the extremes of variation shown by the

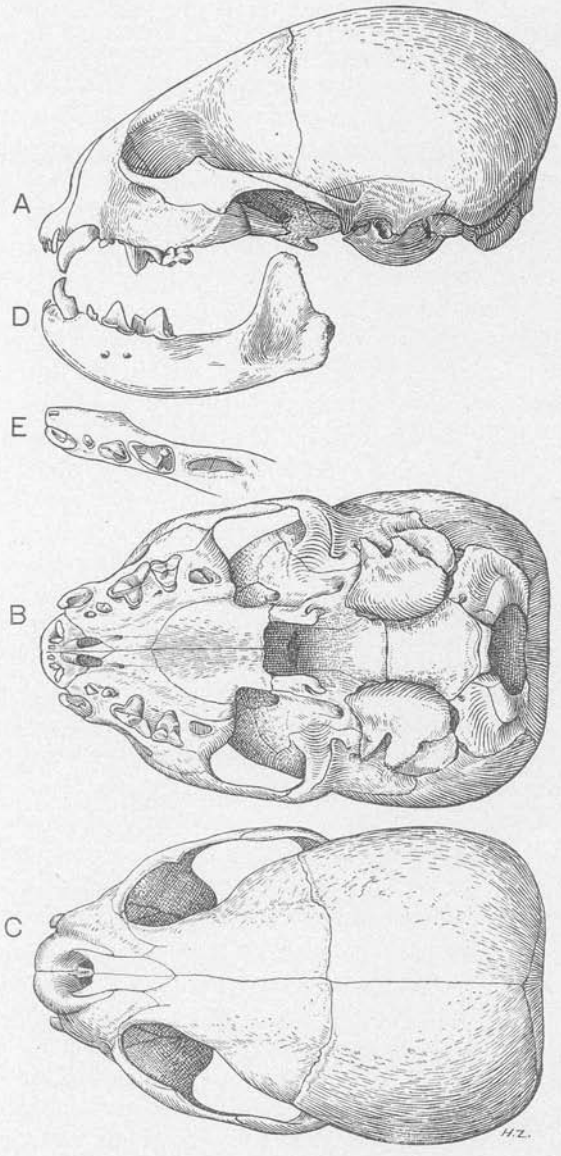


Fig. 3. *Lutra maculicollis*. Skull of juvenile male (No. 51822). A, lateral view; B, palatal view; C, dorsal view; D, lateral view of left mandible; E, crown view of left lower dentition. Natural size.

whole series. One of them has merely a few white streaks and spots on the foreneck and a few small spots of white in the inguinal region. The other has the entire foreneck, from the chin to and including the breast, white, varied with numerous irregular small streaks and spots of brown; the thoracic region is ventrally profusely streaked and spotted with white, while the lower abdominal and inguinal regions are white varied laterally with narrow streaks and isolated spots of brown. The other specimens of the series are variously intermediate (Pl. VIII, figs. 1 and 2).

The general coloration varies decidedly in tone in different specimens of the Faradje series through the varying intensity of the rufescent suffusion, while the three specimens from Niapu agree in presenting a slightly olivaceous tone, quite unlike that of any of the Faradje specimens. This may or may not be due to the different environment of the two localities, Niapu (Pl. XI) being in the rain forest district and Faradje in the bush veldt country. The color of the underfur also varies notably in specimens from the same locality, the basal portion being either clear white, silvery white, or cream-white, or even buff in different specimens, yet the color of the underfur is usually considered of some importance in diagnosis. Apically the underfur is narrowly tipped with dark brown, the amount varying individually.

At the beginning of the present century only two species of otter were recognized by leading authorities[1] as inhabiting Africa south of the Sahara, and both were referred to the genus *Lutra*, as, respectively, *Lutra capensis* Schinz and *Lutra maculicollis* Lichtenstein. Both were described from specimens obtained in Cape Colony. Since 1901, however, three other forms of this group have been described, but two of them are very unsatisfactorily defined. *Lutra concolor* Neumann,[2] from Adis Abeba, Abyssinia, was based on several skins, without skulls or measurements, which are described as being like specimens of *maculicollis* in size and color but lack all trace of white or yellow spots on the chin and throat. The name *Lutra concolor* is in any case preoccupied by *Lutra concolor* Rafinesque (1832) for a species of *Lutra* from "Garrow Hills, Assam, India."[3] *Lutra matschiei* Cabrera,[4] from Muni River, Gaboon, is unrecognizable from the description. *Lutra maculicollis nilotica* Thomas,[5] from the Upper Nile, was based on two skulls and three skins. The measurements given by him of an adult male and an adult female skull (condylobasal length, ♂ 113.5, ♀ 105) indicate a

[1] Thomas (1889), Flower and Lydekker (1891), Trouessart (1899).
[2] 1902, Sitzungsb. Ges. Naturf. Freunde Berlin, p. 55.
[3] Rafinesque, 1832, Atlantic Journal, I, No. 2, p. 62.
[4] 1903, Bol. Soc. Española Hist. Nat., III, p. 182.
[5] 1911, Ann. Mag. Nat. Hist., (8) VIII, p. 726.

larger form than that of the present Lang-Chapin collection from the Upper Congo, the two adult male skulls from the Congo only equaling the size of the female skull of *nilotica*. It therefore seems preferable, in the absence of comparable material from other localities, to leave the name of the Upper Congo form as above.

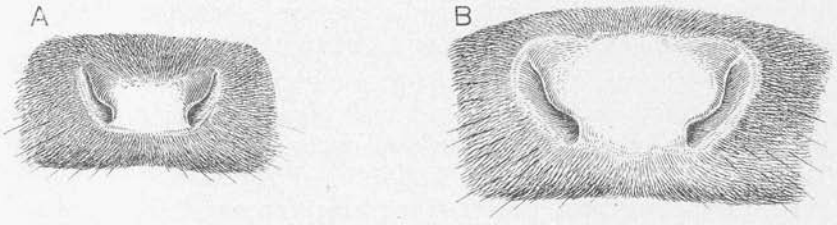


Fig. 4. Rhinarium. A, *Lutra maculicollis* (No. 51828); B, *Aonyx capensis* (No. 51847). Natural size.

Aonyx Lesson

Lutra (part), most authors prior to 1900.

Aonyx Lesson, 1827, 'Man. de Mammalogie,' p. 157. Type, by monotypy, *Aonyx delalandi* Lesson (1827) = *Lutra inunguis* F. Cuvier (1823) = *Lutra capensis* Schinz (1821).

Anahyster Murray, 1860, Proc. Roy. Phys. Soc. Edinburgh, II, p. 157. Type, by monotypy, *Anahyster calabarica* Murray, from Old Calabar, West Africa. Gray, 1865, Proc. Zoöl. Soc. London, p. 129. (As a subgenus of *Aonyx*; restricted to the clawless otters of Africa.)

Aonyx (part) Gray, 1865, Proc. Zoöl. Soc. London, p. 129. (Restricted to the Indian clawless otters.) Thomas, 1908, Ann. Mag. Nat. Hist., (8) I, p. 387. (Part; includes both the African and Indian species.)

The genus *Aonyx* Lesson was exclusively based on the so-called clawless otter of the Cape region of South Africa (*Lutra capensis* Schinz, renamed *Aonyx delalandi* by Lesson), of which the genus *Anahyster* Murray, based on a clawless otter from Old Calabar, is a synonym. Notwithstanding the great specialization of its type, *Aonyx* did not receive general recognition as a genus till the present century. G. R. Gray, in 1865 and later, recognized *Aonyx* as a full genus, but he combined with the *Aonyx capensis* group the clawless otters of southern Asia. More than this, he divided *Aonyx*, as he recognized it, into two groups and wrongly assigned his restricted *Aonyx* to the Asiatic species, adopting *Anahyster* for the African species, the only species originally included in *Aonyx*.

Lesson, the founder of *Aonyx*, proposed *Leptonyx* in 1842,[1] for the clawless otters of Asia, a name unfortunately doubly preoccupied, first for a genus of birds (Swainson 1821) and later for a genus of seals (Gray 1837). I hope to show in the present paper that both groups are entitled to full generic acceptance, according to standard modern opinion as to what constitutes generic differences among mammals. *Aonyx*, however, has hitherto stood for both groups, whenever used in either a generic or a subgeneric sense (as, in the latter, by Anderson in 1878[2]).

As of historic interest, and illustrative of the change of viewpoint respecting what characters in mammals should be recognized as of generic value during the last two decades, reference may be made to Thomas' review of the Lutrinæ in 1889[3] and his revised conclusions respecting the same group in 1908.[4] In his earlier paper all the land otters were referred to the genus *Lutra;* in 1908 the genera of land otters conceded as tenable were *Lutra*, *Pteronura* and *Aonyx*. In the first paper he decided that "The skull and dentition of *Aonyx* are wholly those of a true *Lutra*. . . ." In the second paper he says: "Since I wrote my paper on the arrangement of the otters in 1889, opinion has changed as to the value of the characters which should justify generic distinction between different groups, and I am now prepared to admit, with other authors, that the clawless otters (*Aonyx*) and the margined-tailed otter of Brazil (*Pteronura*) should be recognized as generically different from the ordinary otters of the genus *Lutra*. . . .so that their common non-possession of claws is evidently a genuine connecting character, and not a parallelism, as was formerly supposed to be the case." While the foot structure of the clawless otters of Africa and the small-clawed otters of Asia is similar (Figs. 5B-B[1], 5C-C[1]), the external and cranial characters, including the dentition, are widely different in the two groups (Pls. IX, X and Figs. 6–9). Yet the clawless Asiatic otters have been, and are still, referred to *Aonyx*, when not placed in *Lutra*, and, with one exception,[5] all the figures that I have seen purporting to give the cranial and dental characters of *Aonyx* have been based on the skulls of Asiatic forms. Hence a non-typical and, from my viewpoint, a non-

[1] 1842, 'Nouv. Tableau Règne Anim.,' Mamm., p. 72.

[2] Anderson, 1878, 'Anatom. and Zoolog. Researches Yunnan Exped.,' pp. 202 and 213, in reference especially to "*Lutra* (*Aonyx*) *leptonyx*."

[3] 1889, 'Preliminary Notes on the Characters and Synonymy of the different Species of Otter.' Proc. Zoöl. Soc. London, pp. 190–200.

[4] 1908, 'On certain African and S. American Otters.' Ann. Mag. Nat. Hist., (8) I, May, pp. 387–395.

[5] Blainville, 1839–1864, in his 'Ostéographie,' Atlas II, Section Mustela, Pl. VIII, figured a skull of *Aonyx* (*Lutra*) *inunguis* from South Africa, purchased in 1837 (see the list of plates for Mustela, p. 78 of text). He gives, however, only a view in profile, natural size, which fails to display its most important characteristics.

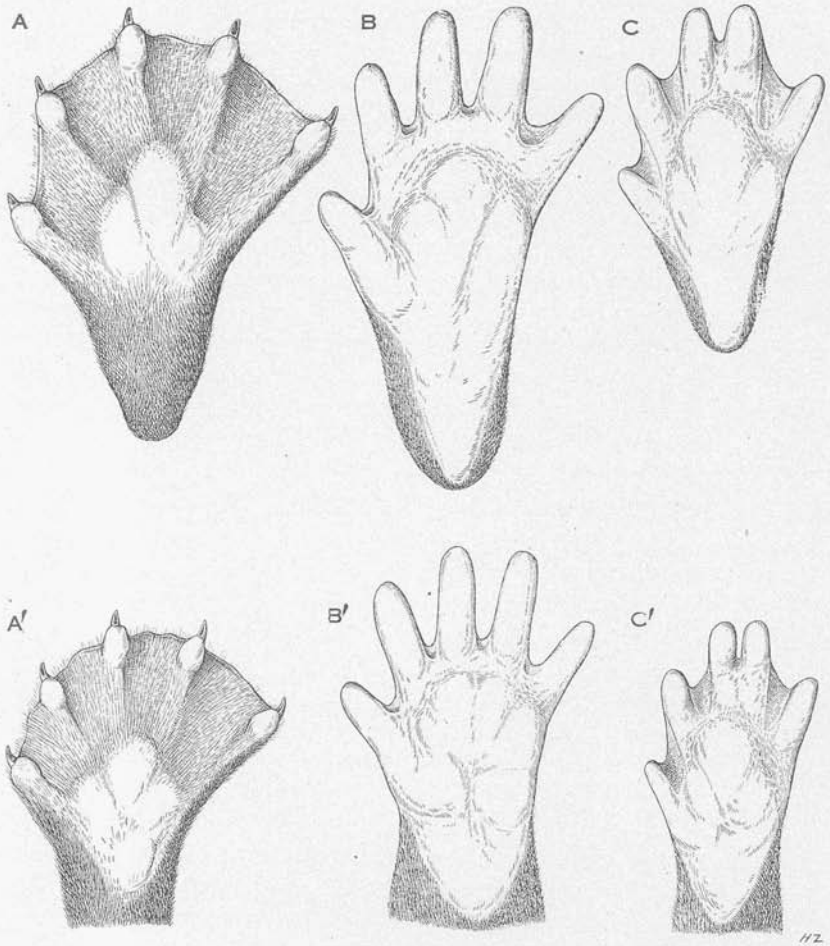


Fig. 5. Palmar surface of left fore foot and plantar surface of left hind foot. A, A′, *Lutra maculicollis* (No. 51825); B, B′, *Aonyx capensis* (Nos. 51849 and 51847); C, C′, *Micraonyx cinerea* (No. 29733). About two-thirds natural size.

congeneric form has been taken to typify *Aonyx*, so far as the literature of the group is concerned.[1]

Externally the *Aonyx capensis* group is distinguishable by its color pattern, its size, and by its foot structure, from all other otters, and especially from the Asiatic forms that have been referred to *Aonyx*.

[1]See, for example, the well-known figure in Flower and Lydekker's 'Mammals Living and Extinct,' 1891, p. 568, Fig. 261, of the "Palate of *Lutra cinerea*," reproduced from 'Palæontologia Indica.'

MICRAONYX J. A. Allen

Plate IX, Figure 1; and Text Figures 5 C-C[1], 6 and 7

Leptonyx (subgenus of *Lutra*) LESSON, 1842, 'Nouv. Tableau Règne Animal,' Mamm., p. 72. Type, by tautonymy, *Lutra leptonyx* HORSFIELD = *Lutra cinerea* Illiger.

Micraonyx J. A. ALLEN, 1919, Journal of Mammalogy, I, No. 1, November 28, p. 24. To replace *Leptonyx*, preoccupied.

The name *Leptonyx* is preoccupied by *Leptonyx* Swainson (1821) for a genus of birds, and by *Leptonyx* Gray (1837) for a genus of seals.

The differences between *Aonyx* and *Micraonyx* are quite marked, not only in external features (Pl. IX) but also in the skull and teeth (Figs. 6–9). They are here tabulated for convenient comparison.[1]

External Characters

Aonyx	*Micraonyx*
SIZE:—Large; total length of adults, 1200–1300 mm. (48–52 inches). Weight, 30 to 40 pounds (Lang).	Small; total length of adults about 560 mm. (22 inches). "Weight, 11 to 13 pounds" (Blanford).
TAIL:—Evenly tapering from base to tip, and heavily clothed with long soft hair, even on the apical portion. Length about 60% of length of head and body.	Very broad at base but rapidly decreasing in size to a slender tip; apical two-thirds very short-haired, becoming nearly bare towards the tip, especially on the ventral surface.
FEET:—Upper surface thinly haired in young animals, usually naked or nearly so in adults.	Upper surface well clothed with hairs, as in *Lutra*.
PADS:—Of palmar and plantar surfaces feebly developed, being small and not heavily thickened.	Pads of palmar and plantar surfaces heavily developed, covering the whole of the naked areas and greatly thickened.
TOES:—Slightly webbed at extreme base only (Figs. 5B-B').	Fully webbed (Figs. 5C-C'),
CLAWS:—Absent on fore feet, rudimentary on hind feet.	Slightly more developed than in *Aonyx*, but greatly reduced in comparison with those of *Lutra*.
COLORATION:—Body uniform dark brown, both above and below, from the shoulders posteriorly, with anteriorly a more or less profuse veiling of white-tipped hairs; foreneck to chin clear white or slightly yellowish white to base of pelage; sides of head and lips white, in continuation of the white area of the throat; a large squarish	Upperparts entirely uniform dark brown, without head-markings or white-tipped hairs; underparts somewhat paler, becoming whitish on sides of neck, cheeks, chin and throat. Ears like the head, without white edging. The coloration in general is thus similar to that of most of the species of *Lutra*.

[1]The statistics given below in tabular form are based, in the case of *Aonyx*, on averages of six adults for the external measurements, and on twelve adults for the skull and teeth, all from Faradje, Belgian Congo; in the case of *Micraonyx*, for external measurements on five adult specimens as given in the literature, and for the skull and teeth on six adult skulls and two with milk dentition from Java, Borneo, Sumatra, and Palawan, of which seven were received for examination from the United States National Museum through the kindness of Mr. Gerrit S. Miller, Jr., Curator of Mammals.

patch of dark brown between the eyes and nostrils, forming a conspicuous isolated spot in which the hairs are not tipped with white; a V-shaped whitish band from the rhinarium forms fairly well-defined superciliary streaks. Ears conspicuously edged on the apical border with white. There is thus a distinctive head-pattern of markings.

While the external differences are by no means insignificant, those of the skull and teeth are such as most taxonomers consider of high importance. Some of these differences have not escaped record,[1] but this fact has not directed to them the attention they deserve. While at first glance the skulls of *Aonyx* and *Micraonyx* appear to have many features in common, they differ greatly in proportions and in the relative size of corresponding teeth. In *Aonyx* the antorbital portion of the skull is heavily developed, being broad, with large incisors and canines, while the carnassials and molars are only moderately developed in proportion to the size of the skull; all these conditions are reversed in *Micraonyx*. In the latter the facial portion of the skull is narrow and weak, with small incisors and canines, while the carnassials and molars are enormously developed for the size of the skull, these teeth about equaling those of *Aonyx*, which has a skull fully three times the bulk of the skull of *Micraonyx*. This creates a vast difference in the relative breadth of the palatal space between the carnassials and molars of the maxillary series, which in *Micraonyx* is much less than the transverse breadth of m^1, while in *Aonyx* this space is one and a half times greater than the transverse breadth of m^1. These proportional differences are shown in the accompanying figures (Figs. 6 and 8, pp. 96, 102) and in the following tabulated summary.

Cranial Characters

Aonyx	*Micraonyx*
DENTITION:—P^1 uniformly present in 13 out of 14 adult skulls; absent on the right side only in the other.	P^1 nearly always absent, according to authors. P^2 relatively smaller but in about the same position as in *Aonyx*.[2]
SKULL:—Postorbital processes rudimentary.	Postorbital processes well developed, more so than in *Lutra*.

[1]See Blanford (1888, 'Mamm. of British India,' p. 188), who says: "Although it [*Lutra leptonyx*] does not differ in the same manner [from the common otters] as the type of *Aonyx* does, *L. leptonyx* has several peculiarities of its own not shown by its supposed ally. Its skull is peculiarly short and broad, with a differently shaped upper posterior molar, and its feet differ from those of other species, including *L. inunguis*, in the much greater proportional length of the third and fourth toes."

[2]Of the nine skulls available for examination p^1 is absent on both sides in six, present on the left side only in two, and on both sides (milk dentition) in one.

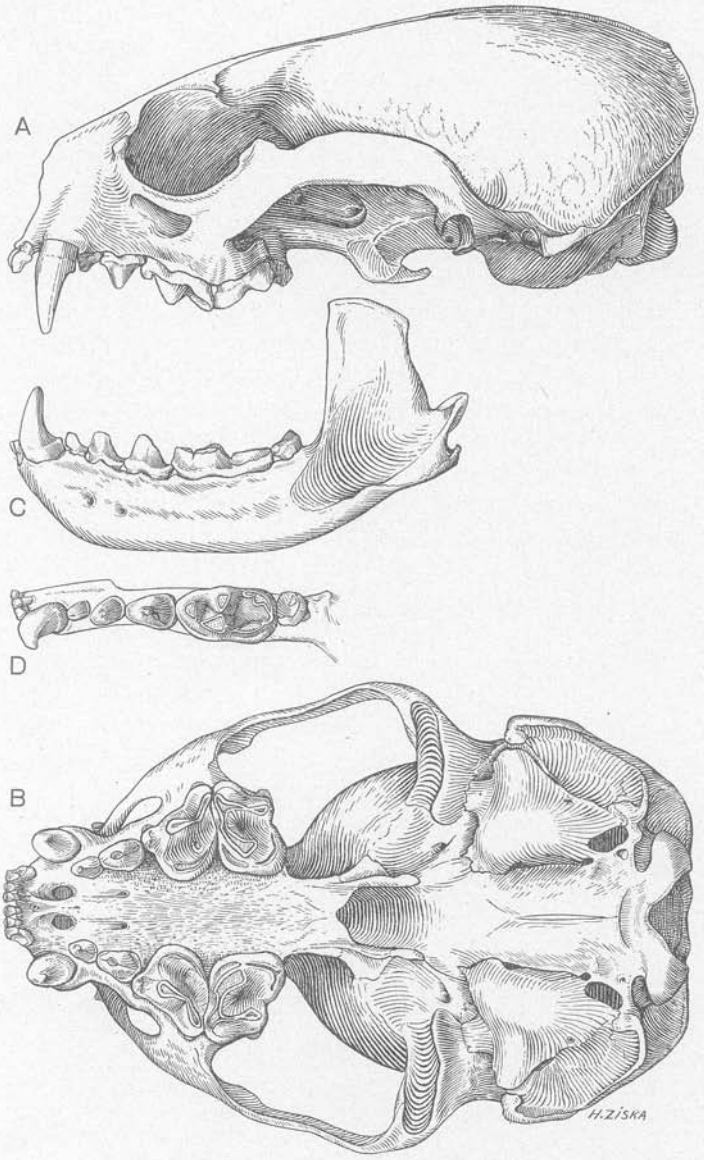


Fig. 6. *Micraonyx cinerea*. Skull of adult female (U. S. Nat. Mus. No. 34904). A, lateral view; B, palatal view; C, lateral view of left mandible; D, crown view of left lower dentition. Natural size.

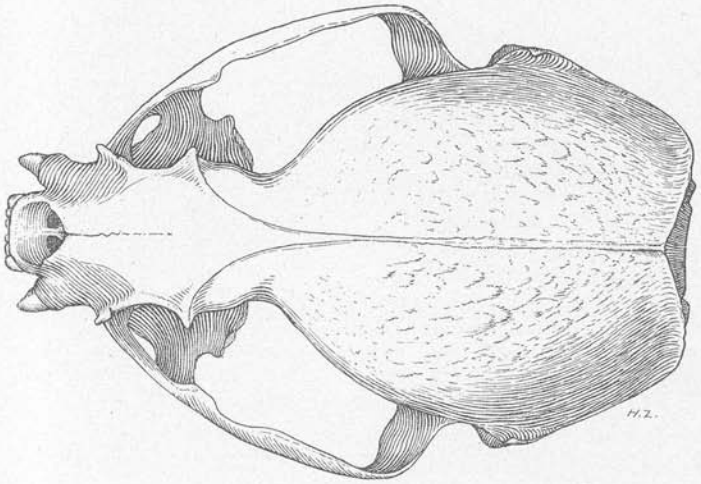


Fig. 7. *Micraonyx cinerea.* Dorsal view of skull of adult female (U. S. Nat. Mus. No. 34904). Natural size.

Aonyx	*Micraonyx*
Postorbital breadth greater than interorbital breadth.	Postorbital breadth less than interorbital breadth, the postorbital constriction as deep as in many species of *Lutra*.

Dental Measurements

Upper Toothrow

c-m^1, 38.8	c-m^1, 32.2
p^1-m^1, 33.0	p^2-m^1, 26.8
p^4, 10.9 × 10.5	p^4, 12.8 × 13.8
m^1, 10.2 × 12.5	m^1, 8.8 × 12.2

Lower Toothrow

c-m_2, 48.5	c-m_2, 37.6
p_2-m_2, 33.5	p_2-m_2, 27.0
m_1, 14.8 × 8.7	m_1, 13.4 × 8.0
m_2, 4.9 × 6.7	m_2, 4.9 × 6.3
Axis of m^1 oblique to the axis of the toothrow.	Axis of m^1 nearly transverse to the axis of the toothrow.

Skull

	Aonyx	*Micraonyx*	Ratio
Condylobasal Length	124.3	89.2	73
Zygomatic Breadth	91.5	61.7	66
Mastoid Breadth	89.2	53.9	60

Skull (Continued)

	Aonyx	*Micraonyx*	Ratio
Rostral Breadth (at base of upper incisors)	21.5	10.8	50
Breadth at Base of Upper Canines	35.5	21.9	62
Breadth, outside m^1-m^1	41.3	34.2	83
Breadth, outside p^4-p^4	39.3	33.1	84
Interorbital Breadth	30.0	18.0	60
Postorbital Constriction	34.6	15.6	45
Palatal Breadth between Crowns of m^1 and m^1 (1.6 the transverse breadth of m^1).	20.0	11.2	(slightly less than the transverse breadth of m^1).

SUMMARY OF DIFFERENTIATION OF *Micraonyx* IN COMPARISON WITH *Aonyx*.—One-third the size (bulk) of *Aonyx;* reduction of preorbital portion of skull and its general structure relatively weak, or more like that of *Lutra*, with at the same time enormous development of the carnassials and molars, which are about equal in size to those of *Aonyx*, which has a skull fully three times larger; palatal space between upper molars slightly less than breadth of one molar, in *Aonyx* almost the breadth of both molars; m^1 relatively broader, with the transverse axis of the tooth forming a right angle with the toothrow, while in *Aonyx* the transverse axis of m^1 forms an angle of about 45° with the axis of the toothrow; p^1 usually suppressed in *Micraonyx* and constantly present in *Aonyx;* tail broad at base, soon narrowing and gradually tapering to a point, the apical portion scantily furred, instead of gradually decreasing in size apically and heavily furred throughout, as in *Aonyx*, in which the tail is similar to the tail of the European and North American species of *Lutra*. In *Micraonyx* the tail is specialized quite as much as in *Pteronura*, but in a quite different way. Coloration wholly as in *Lutra*, highly specialized in *Aonyx*.

Specimens of *Micraonyx* Examined

The available material consists of three skins and nine skulls, three of the latter immature, with part of the milk dentition still present. Three of the eleven specimens examined are in the collection of The American Museum of Natural History; the others (all skulls) were borrowed from the United States National Museum, through the courtesy of the Curator of Mammals, Mr. Gerrit S. Miller, Jr.

No. 29733, ♂? adult, skin and skull, Palawan Island, Philippine Islands; also two skins (without skulls) from the same source.

No. 122840, ♂ adult, Karimon Island, Malacca Strait, May 28, 1903. Coll. Dr. W. L. Abbott.

No. 114465, ♀ adult, Tapanuli Bay, West Sumatra, March 27, 1902. Coll. Dr. W. L. Abbott.

No. 123068, ♂ juvenile (upper milk canines, dp^1, and dp_3 are still retained), Pulo Sebang, East Sumatra, July 31, 1903. Coll. Dr. W. L. Abbott.

No. 34904, ♀ adult, Kinabatangan River, Borneo, June 20, 1887. Coll. C. F. Adams.

No. 151879, ♀ adult, Pulo Laut, Southeast Borneo, December 26, 1907. Dr. W. L. Abbott.

No. 155324, ♂ adult, Depok, Java, July 22, 1909. Coll. William Palmer.

No. 154905, ♂ juvenile (upper milk canines, dp^2, dp^3, dp^4 and dp_3 are still retained), Buitenzorg, Java, March 21, 1909. Coll. William Palmer.

No. 154906, ♂ juvenile (milk dentition only), Buitenzorg, Java, March 26, 1909. Coll. William Palmer.

Three of the specimens (only one of which is adult) may be considered as practically topotypical of *Lutra leptonyx* Horsfield (=*L. cinerea* Illiger).

The localities of the six adult skulls are widely separated, there being one each from Palawan Island (Philippines), Karimon Island (Strait of Malacca), western Sumatra, eastern Sumatra, from two different parts of Borneo, and from eastern Java. They are thus insufficient to indicate any geographic differentiation, should such exist, as the range of variation seems no greater than might be expected in a large series from a single locality. The subjoined table indicates their strong general similarity.

Measurements of Six Adult Skulls of *Micraonyx cinerea* (Illiger)

Cat. No.[1]	Sex	Locality	Condylobasal Length	Zygomatic Breadth	Interorbital Breadth	Postorbital Constriction	Breadth Braincase	Mastoid Breadth	Postorbital Process	Breadth at Base of Incis.	Breadth Base of Canines
29733	♂?	Palawan	——	63.6	17.5	13.4	——	——	20.0	20.1	33.4
122840	♂	Malacca St.	91.4	61.2	19.7	13.6	48.8	54.4	29.0	24.3	37.1
114465	♀	W. Sumatra	88.7	61.7	17.0	14.4	48.0	54.9	25.6	21.7	32.0
34904	♀	N. E. Borneo	90.3	62.1	18.0	15.8	48.3	53.4	24.4	21.4	33.4
151879	♀	S. E. Borneo	84.6	58.6	17.2	16.4	43.7	52.0	24.1	20.8	34.5
155324	♂	E. Java	90.8	62.8	18.4	**14.7**	48.8	54.7	25.1	22.8	34.8
Average			**89.2**	**61.7**	**18.0**	——	**47.5**	**53.9**	**24.7**	**21.9**	**34.2**

[1]All U. S. Nat. Mus. except No. 29733.

Measurements of the Teeth of *Micraonyx cinerea* (same skulls)

Cat. No.	Sex	Upper Toothrow c-m¹	Lower Toothrow c-m₂	Length P⁴	Breadth P⁴	Length M¹	Breadth M¹	Length M₁	Breadth M₁	Length M₂	Breadth M₂
29733	♂?	32.0	37.0	10.7	11.3	9.0	11.2	13.0	7.9	4.6	6.3
122840	♂	31.3	40.2	12.8	13.8	9.5	13.5	15.0	8.8	5.7	7.2
114465	♀	29.4	34.7	9.2	9.2	7.8	11.7	11.1	6.8	4.1	4.9
34904	♀	32.7	37.6	11.2	8.8	8.6	12.5	13.0	7.6	4.4	5.8
151879	♀	31.5	37.5	11.0	10.0	8.5	12.0	13.4	7.9	4.6	6.2
155324	♂	33.3	37.6	11.1	11.5	8.4	11.8	12.7	7.6	5.0	6.3
Average[1]		**32.2**	**37.6**	**11.4**	**11.1**	**8.8**	**12.2**	**13.4**	**8.0**	**4.9**	**6.6**

Aonyx capensis (Schinz)

Plates IX, Figures 2, 3; X; XI; and Text Figures 4B, 5B-B′, 8–11

Lutra capensis Schinz, 1821, 'Cuv. Thierreich,' I, p. 214. Cape region, South Africa.

Represented by 23 specimens, collected as follows:

Faradje, 21 (15 skins with skulls, 2 with skeletons, and 6 native-made skins without skulls), January 20, 22, 1910; February 25, 28, March 1–16, April 6, May 5, 1911; August 12, 13, 1912; January 28, February 2, 7, 1913.

Niapu, 1 (skin and skull, old ♀), January 15, 1914.

Avakubi, 1 (native-made skin without skull), August 14, 1914.

Collectors' Measurements of Nine Specimens of *Aonyx capensis*

Cat. No.	Sex and Age	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51840	♂ yg. ad.	Faradje	1035	625	410	146	35
51846	♂ ad.	"	1356	796	560	150	35
51847	♂ yg. ad.	"	1090	655	445	146	34
51836	♀ ad.	Faradje	1170	770	400	140	35
51834	♀ ad.	"	1196	736	460	135	35
51837	♀ yg. ad.	"	1090	700	390	135	31
51838	♀ ad.	"	1155	715	440	132	32
51853	♀ old ad.	"	1360	830	530	145	35
51851	♀ ad.	Niapu	1225	720	505	145	32

[1]Five specimens, No. 114465 being excluded on account of extreme wear.

Measurements of Thirteen Skulls of *Aonyx capensis* (All are from Faradje except No. 51851, which is from Niapu)

Cat. No.	Sex and Age	Condylobasal Length	Palatal Length	Zygomatic Breadth	Interorbital Breadth	Postorbital Constriction	Breadth Braincase	Mastoid Breadth	Breadth across p^4-p^4	Upper Toothrow	
										P^1-m^1	C-m^1
51835	♂ juv.[1]	112.5	51.8	72.8	26.4	34.0	70.0	76.7	37.2	31.6	36.2
51840	♂ yg. ad.	121.0	58.0	82.7	28.4	37.0	73.0	82.2	38.7	33.1	39.7
51845	♂ old ad.	130.4	58.4	98.0	28.4	32.2	70.7	94.0	38.8	33.6	39.5
51846	♂ old ad.	124.4	58.3	99.7	33.3	34.4	70.6	87.5	41.0	33.7	37.9
51847	♂ yg. ad.	125.0	62.0	89.5	29.7	33.4	72.6	91.5	39.3	33.4	38.8
51836	♀ old ad.	125.7	60.0	94.0	28.4	32.6	70.8	84.0	40.2	33.5	39.2
51834	♀ ad.	116.8	54.0	88.3	30.5	37.8	69.9	86.8	37.9	31.3	36.7
51837	♀ ad.	120.0	54.5	84.6	27.0	——	70.3	86.9	39.2	32.9	38.8
51838	♀ ad.	136.7	63.2	93.1	30.5	33.5	73.8	92.6	——	35.3	40.2
51849	♀ yg. ad.	110.0	53.6	81.2	29.4	34.4	69.3	82.7	39.6	31.3	36.3
51850	♀ yg. ad.	108.5	54.0	75.9	26.7	——	70.6	76.5	37.7	30.3	37.0
51851	♀ old ad.	——	——	89.5	——	——	71.2	90.8	——	32.3	38.4
51853	♀ old ad.	129.7	62.2	95.8	33.5	36.4	69.5	90.0	40.2	32.2	38.8
Average[2]	**4 ♂**	**125.2**	**59.0**	**92.2**	**30.0**	**34.3**	**71.7**	**89.3**	**39.4**	**33.4**	**39.0**
"	**6 ♀**	**123.4**	**58.8**	**90.9**	**30.0**	**34.9**	**70.9**	**89.0**	**39.1**	**32.9**	**38.7**

Measurements[3] of the Two Posterior Teeth of Each Jaw of *Aonyx capensis* (Same specimens as in the preceding table)

Cat. No.	Sex	P^4 Length Breadth	M^1 Length Breadth	M_1 Length Breadth	M_2 Length Breadth
51835	♂	12.1×10.2	11.0×12.5	15.2×8.8	5.1×6.3
51840	♂	11.2×11.4	9.2×13.5	14.8×9.2	4.9×7.5
51845	♂	11.4×11.9	10.5×13.8	15.4×9.0	5.1×7.1
51846	♂	10.9×11.7	10.0×14.0	15.4×8.5	5.5×7.1
51847	♂	9.9×11.7	10.9×13.1	14.8×9.7	5.4×6.6
51836	♀	10.6×11.4	10.1×11.1	15.1×8.1	4.1×5.6
51834	♀	10.4× 9.2	11.0×13.8	13.8×7.8	4.3×6.4
51837	♀	10.8× 8.9	9.2×14.0	14.2×8.4	4.9×6.0
51838	♀	10.9× 9.8	11.2×10.5	15.4×9.5	4.7×6.3
51849	♀	11.9×10.0	9.9× 8.6	13.8×8.0	4.3×5.4
51850	♀	9.8× 9.2	9.2×12.2	15.4×8.9	4.8×7.2
51851	♀	11.5×——	9.8×11.6	14.5×8.4	4.4×6.2
51853	♀	10.7× 9.7	9.4×13.2	14.7×8.1	5.1×6.2
Average	**5 ♂**	**11.1×11.4**	**10.3×13.2**	**15.1×9.0**	**5.2×6.9**
"	**8 ♀**	**10.8× 9.7**	**10.0×11.9**	**14.6×8.4**	**4.6×6.4**

[1]In No. 51835 the canines are not fully developed and all the cranial sutures are still open. While the condylobasal length is recorded in the above table, the basal length was also taken for comparison, since "basal" was formerly taken instead of "condylobasal." The average difference was found to be about 12 mm. less for the basal length than for the condylobasal.

[2]These four males and six females are fairly comparable as to age, but not strictly so, the females apparently averaging slightly younger than the males.

[3]Length = greatest axial length of the tooth; breadth = greatest breadth transverse or at a right angle to the axial length.

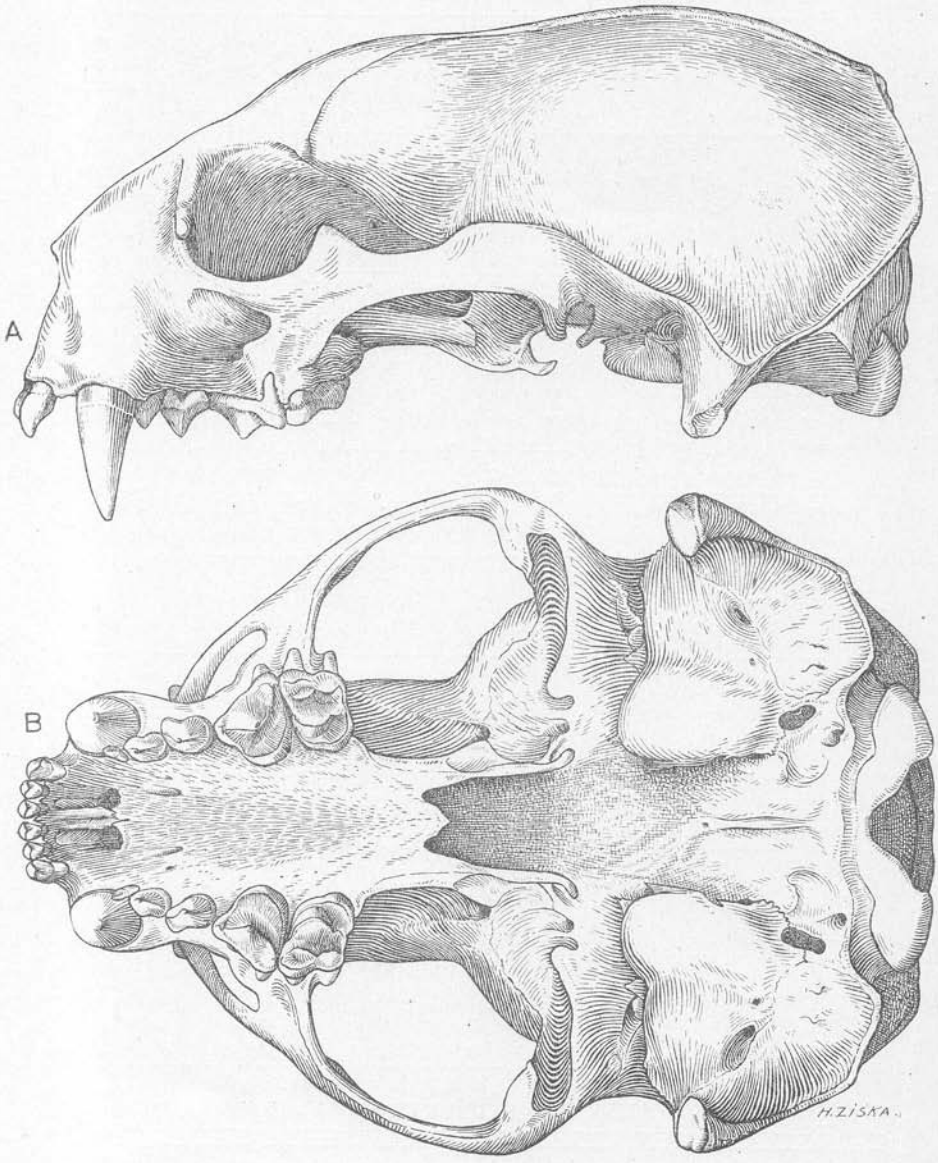


Fig. 8. *Aonyx capensis*. Skull of adult female (No. 51834). A, lateral view; B, palatal view. Natural size.

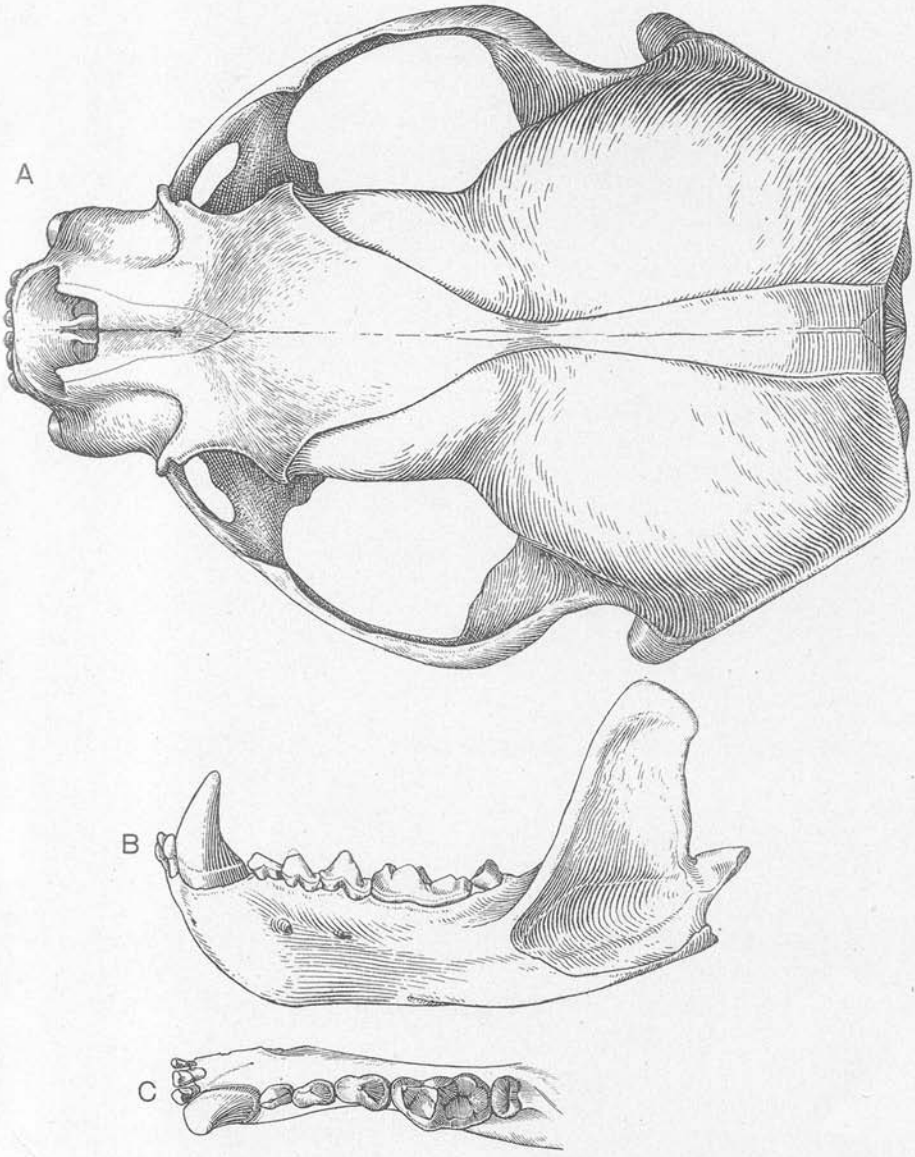


Fig. 9. *Aonyx capensis*. Skull of adult female (No. 51834). A, dorsal view; B, lateral view of left mandible; C, crown view of left lower dentition. Natural size.

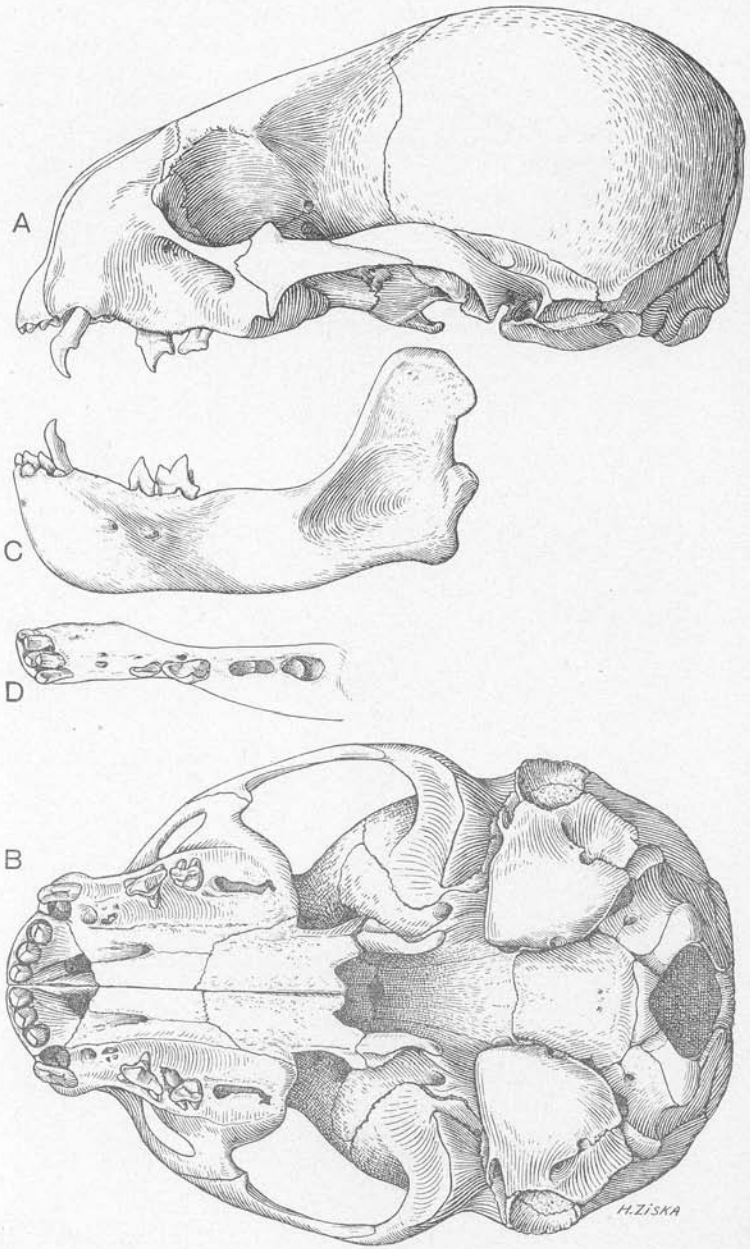


Fig. 10. *Aonyx capensis*. Skull of juvenile male (No. 51839). A, lateral view; B, palatal view; C, lateral view of left mandible; D, crown view of left lower dentition. Natural size.

As shown in the above tables of measurements, there is no appreciable sexual difference in size between males and females of comparable ages of *Aonyx capensis*. In both sexes there is a marked difference in size, due to age, between young adults with unworn teeth and old adults with strongly developed crests and worn teeth. The interorbital breadth varies greatly with age, as is of course usual in mammals, particularly in comparison with the breadth of the interorbital constriction, which

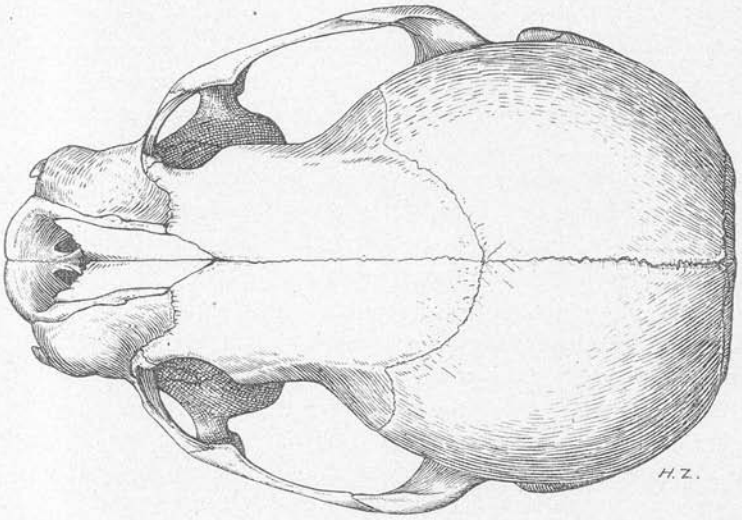


Fig. 11. *Aonyx capensis*. Dorsal view of skull of juvenile male (No. 51839). Natural size.

latter decreases with age, while the interorbital breadth increases. With increase in age the bones of the skull become thickened and roughened and the crests and processes more heavily developed, but in the present species these changes have no relation to sex, as shown by the present series.

A female (No. 51831, Faradje) is noteworthy for the presence of a supernumerary upper premolar, situated on the left side and internal to the toothrow opposite the front half of p^3. It is similar in form to p^2 but is slightly smaller than this tooth.

Two skulls still retain part of the milk dentition. In the younger (No. 51839, ♂) all the milk teeth have been shed except the canines and dp^3 and dp^4 (Fig. 10). The tips of the permanent incisors are exposed but rise only slightly above the alveoli; the tips of the canines are uncovered

but are still below the alveolar plane; m^1 can be seen through slight openings in the crown surface of the alveolus. In the other (No. 51848, ♂), a week or two older, only the deciduous canines and p^3 remain of the milk set. The permanent incisors have reached full development, the tips of the permanent canines and of p^2 and p_2 are well above the alveolar border; the crown surfaces of p^4, m^1, m_1 and m_2, are fully exposed. In this skull there is no evidence of p_1 in either jaw. It is of interest to note that in both of these young skulls the lower incisors are crowded, the second pair (i_2-i_2) have their insertion in a line posterior to that of the other four incisors and, slanting forward, wedge their crowns between those of the other incisors, approximating thus a straight crown surface. The lower incisors of *Aonyx* at this early stage of growth are in agreement in their mode of insertion with those of *Lutra*. With the expansion of the mandible by growth, the lower incisors arrange themselves, of course, in a straighter row, and in some are well spaced, each standing apart from the adjoining teeth (Fig. 9C, p. 103), while others retain the crowded feature.

The table of tooth measurements (p. 101) indicates the range of individual variation in the size and contour of the crowns of the last two permanent teeth in each jaw. It not only makes evident the amount of difference in these features that so readily attracts the eye, but also the fact that the largest skulls (see table of measurements of the skulls, p. 101) do not always have the largest teeth. (Compare skull and tooth dimensions of skulls Nos. 51835, 51845 among the males and Nos. 51837, 51853 among the females.) The amount of variation in length and breadth of crown, taking the series of skulls as a whole, is about 10% of the average dimensions.

The average coloration in the present series may be indicated as follows: Upper lips, top of the nose back to about the front of the eyes, and a narrow band over each eye to between the ears, white or yellowish white; a large squarish spot of dark brown on either side from nostril to eye; also a small spot of dark brown at the posterior canthus of each eye; top of head, neck, and shoulders whitish grizzled with brown, white prevailing in the unworn coat, the overhair being glistening white for the apical half, through which the brownish tips of the underfur are more or less visible; the white tips of the overhair gradually decrease in length from the middle of the back posteriorly so that brown is the prevailing tone, to which the whitish tips add a silvery glint in favorable light; upper lip, below the preorbital brown patch, white or yellowish white, as are the sides of the head below the eyes, the chin, throat, foreneck and

sides of the neck posteriorly to the pectoral region, the white extending to the base of the pelage, including the underfur; rest of underparts brown like the upperparts, with a less conspicuous mixture of white-tipped hairs; ears conspicuously edged with white on the apical border; tail and feet brown, like the lower back.

The chief variation in different individuals consists in the relative length, and hence conspicuousness, of the white hair-tips, which are longest in the freshly acquired coat, although they vary considerably in perfectly comparable specimens, being normally short in some and long in others. In most specimens the whitish sheen of the anterior half of the body is a striking feature when seen from the front with the head toward the light. The amount of white on the throat is more variable in extent and also in intensity. In one specimen the white on the throat and foreneck is restricted to the middle of the throat, but extends somewhat farther back on the sides of the neck; the white is also confined to the outer portion of the hairs, the basal half of the pelage being pale brown and not white as in most of the other specimens of the series, so that when seen with the head from the light the middle of the throat area appears pale brown with a whitish wash.

In several specimens there is a tendency to a dusky cross-band behind the chin, strongly developed in one specimen and incipient in others. In several specimens in greatly worn pelage the overhair is so much abraded that only the underfur remains over a wide space along the midline of the back, and elsewhere the usual white tipping of the overhairs has nearly disappeared. The pattern of the head-markings is constant, being modified only by the amount of white veiling the upper surface of the front and top of the head. The rhinarium is shown in Fig. 4B.

The African clawless otter was first described by Schinz in 1821 as *Lutra capensis*,[1] from a specimen obtained in Cape Colony. It was redescribed by F. Cuvier in 1823 as *Lutra inunguis*[2] from a skin and skeleton sent by Delaland from the Cape of Good Hope. In 1827 the species was generically separated by Lesson and renamed *Aonyx delalandi*.[3] Thus between 1820 and 1830 the species had received three specific names and had been referred to two genera. Notwithstanding its striking differences from the common otter of Europe, the type of the genus *Lutra*, it was currently referred by most authors for the next three-fourths of a century to the genus *Lutra*.

[1] 1821, 'Cuv. Thierreich,' I, p. 214.
[2] 1823, 'Dict. Sci. Nat.,' XXVII, p. 247.
[3] 1827, 'Man. de Mammalogie,' p. 157.

Besides the well-known early synonyms of *Aonyx capensis* (*inunguis* F. Cuvier, *delalandi* Lesson) and three practically indeterminable later described forms (*poensis* Waterhouse 1838, *calabaricus* Murray 1860, *lenoiri* Rochebrune 1888),[1] five others have been added since 1901. These are (1) *Lutra capensis meneleki* Thomas (1902),[2] from Abyssinia, characterized mainly by large size (skull, basal length 131 mm., zygomatic breadth 106 mm.), dark color and silvery underfur; (2) *Lutra capensis hindei* Thomas (1905)[3] from Fort Hall, Mount Kenya District, British East Africa, of small size (skull, basal length 118 mm., zygomatic breadth 94 mm.) but otherwise similar to the Cape and Abyssinia forms; (3) *Aonyx capensis angolæ* Thomas (1908),[4] from Coporole River, Angola (S. lat. 13°), without any strongly marked characters (skull, basal length 128 mm., zygomatic breadth 91.5 mm.); (4) *Aonyx capensis congica* Lönnberg (1910),[5] from the "Lower Congo," supposed to be especially distinguished by the small size of the teeth; (5) *Aonyx capensis helios* Heller (1913),[6] from the Sotik District, British East Africa, said to resemble closely *meneleki* of Abyssinia in coloration (skull, condylobasal length 127 mm., zygomatic breadth, 91 mm.), but body supposed to be smaller (as judged by the measurements of a tanned skin).

As these five forms appear to have been described in each case from a single specimen, without flesh measurements and in some instances from poorly prepared material, none of them can be said to rest on a very satisfactory basis. The differences in coloration indicated by the descriptions of these forms are more than covered by the range of variation in the present Lang-Chapin series of some twenty specimens from a single locality (Faradje), while the individual difference in size is more than covered by the twelve adults. The status of these various forms should be held more or less in abeyance until a good series from each type locality has been studied and compared. Under such circumstances, it seems better not to add another name to the list till the forms already described are better known, notwithstanding the known wide distribution of the *Aonyx capensis* group—from the Cape region of South Africa north to Abyssinia, the Congo Basin, and Guinea.

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[1] *Lutra poensis* was based on a skin without feet, from Fernando Po, which Gray stated in 1865 (Proc. Zoöl. Soc. London, p. 130) "is no longer to be found." Lönnberg, in 1910 (Arkiv f. Zool., VII, No. 9, p. 2), believed it to be referable to *Lutra maculicollis* rather than to *Aonyx*. He also stated (*loc. cit.*), on the authority of Trouessart, that there was no specimen of Rochebrune's *Lutra lenoiri* "in the museum in Paris and that the species in question must be regarded as purely imaginary." *Anahyster calabaricus*, Lönnberg also stated (*loc. cit.*), was based on a skull in which p^1 was abnormally absent, and must also be rejected.

[2] 1902, Proc. Zoöl. Soc. London, II, p. 309.

[3] 1905, Ann. Mag. Nat. Hist., (7) XV, p. 78.

[4] 1908, Ann. Mag. Nat. Hist., (8) I, p. 388.

[5] 1910, Arkiv för Zoologi, VII, No. 9, December, p. 3, figs. 1*a* and 2*a*.

[6] 1913, Smithsonian Misc. Coll., LXI, No. 19, November, p. 1.

VIVERRIDÆ

The family Viverridæ is here recognized as comprising two strongly differentiated subfamilies, Viverrinæ and Herpestinæ, which by some taxonomers are now given the rank of distinct families.[1]

Viverrinæ

The Viverrinæ are represented in the present Congo collection by five genera (*Civettictis*, *Genetta*, *Osbornictis*, *Poiana*, and *Nandinia*) and eight species. An interesting feature of the collection is a new piscivorous form of genet (*Osbornictis piscivora* J. A. Allen), of the size of *Genetta victoriæ* Thomas, from which however it differs widely in both external and cranial characters. The total number of specimens is 242, five of the species being represented by from 30 to 73 specimens each. Several of the species are each represented by from 20 to 30 specimens from single localities, thus affording satisfactory material for the study of age, sex, and individual variation.

CIVETTICTIS Pocock

Viverra LINNÆUS, 1758, 'Syst. Nat.,' 10th Ed., p. 43, part, and of authors prior to 1915. Type, by subsequent designation (Thomas 1911), *Viverra zibetha* Linnæus, of Bengal, India.

Civettictis POCOCK, 1915, Proc. Zoöl. Soc. London, I, March, p. 134. Type, by original designation, *Viverra civetta* Schreber.

Civettictis civetta orientalis (Matschie)

Plates XII, XIII; and Text Figures 12–15

Viverra civetta orientalis MATSCHIE, 1891, Arch. für Naturg., Bd. 1, pp. 352, 353. Bagamojo, Zanzibar.

Civettictis civetta THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 471. Medje (1), Poko (6 specimens).

Represented by 32 specimens (of which only 9 are fully adult), collected as follows:

Faradje, 1 (♂, flat skin, without skull or measurements), August 22, 1912.

Niangara, 2 (♀ juvenile), March 27, November 7, 1910.

Akenge, 7 (2 ♂ adult, 1 ♂ juvenile, 4 ♀ juvenile), October 4, 6, 9, 15, 16, 22, 24, 1913.

Niapu, 14 (8 ♂ adult—1 a skull only, 4 ♂ juvenile, 2 ♀ juvenile), August 25, 1910; October 24, November 25, December 7–26, 1913; January 4, 19, 1914.

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[1] R. I. Pocock, 1916, 'On the External Characters of the Mongooses (Mungotidæ).' Proc. Zoöl. Soc. London, I, pp. 349–374, Figs. 1–10.

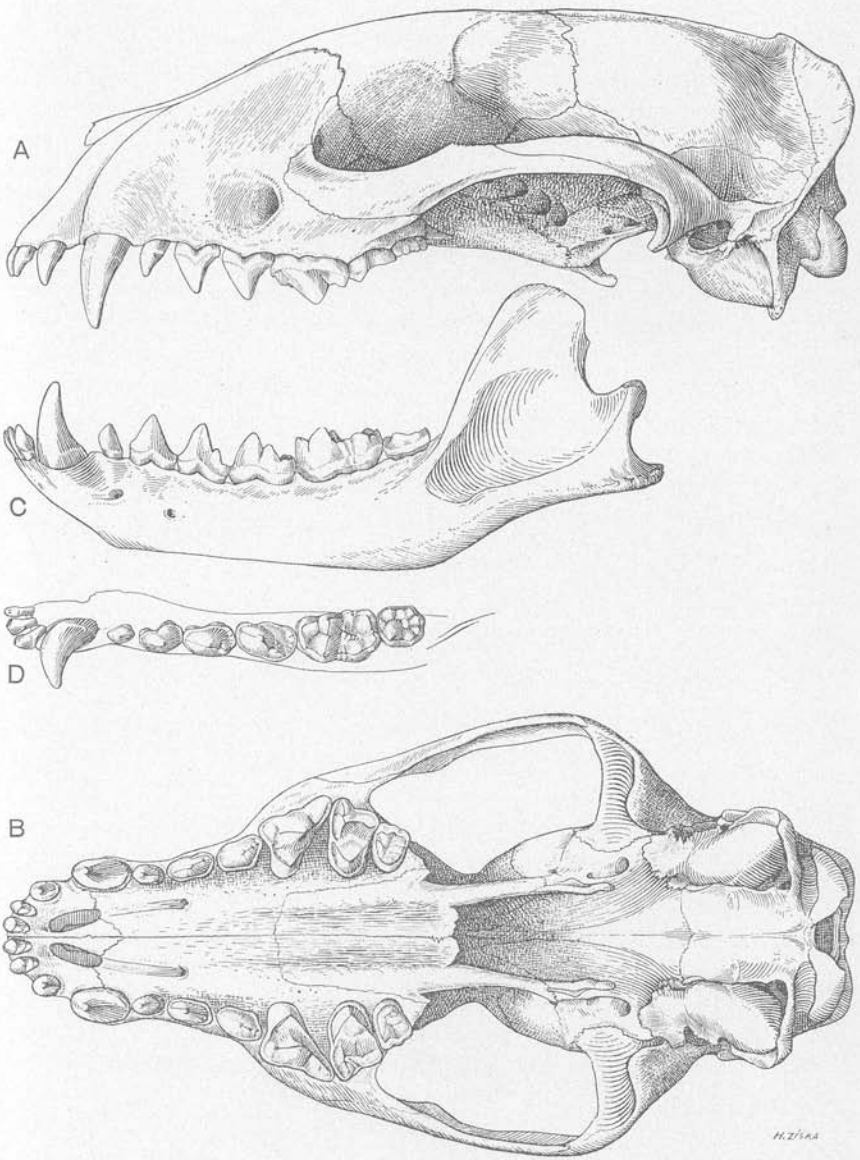

Fig. 12. *Civettictis civetta orientalis.* Skull of young adult male (No. 51818). A, lateral view; B, palatal view; C, lateral view of left mandible; D, crown view of left lower dentition. Four-fifths natural size.

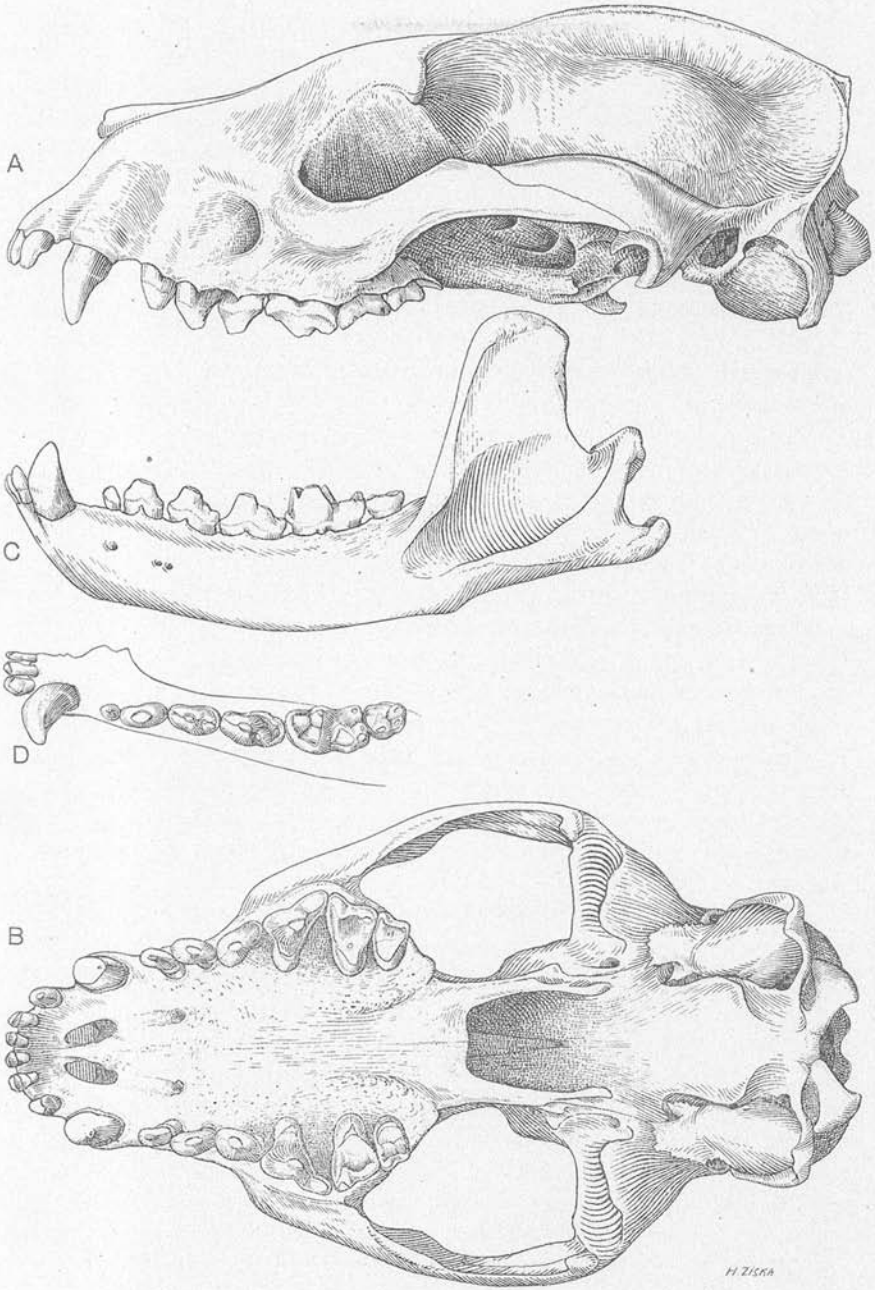

Fig. 13. *Civettictis civetta orientalis.* Skull of senile male (No. 51797). A, lateral view; B, palatal view; C, lateral view of left mandible; D, crown view of left lower dentition. Three-fourths natural size.

Medje, 6 (2 ♂, 3 ♀, 1 sex unknown, all juvenile), March 31, August 25, 29, 1910.

Avakubi, 2 (flat skins, without skulls or measurements), June 23, 1911.

About one-third (eleven) of the specimens are melanistic (Pl. XIII, fig. 1, upper specimen), seven being wholly deep black, and four others less intensely black, in which the normal light pattern is traceable through a veiling of brownish black. The ratio of melanism to the normal (Pl. XIII, fig. 1, lower specimen) is about the same for each locality represented, and is also equally common to both sexes, and to specimens of any age from nurslings to adults.

Of the nine fully adult specimens all are males; in the immature specimens the females are more nearly equal in number to the males.

Among the immature specimens seven have the milk dentition fully developed, but none of the permanent teeth has pierced the gum. As the skulls of specimens at this stage vary considerably in size it is evident that a little time elapses between the full development of the milk teeth and the appearance of the permanent teeth. A younger stage is represented by skulls in which the milk teeth are all fully developed except the first premolars (dp^1 and dp_1), which can be seen through a minute opening in the alveoli but are still below the alveolar plane. In a still younger stage only the incisors and canines are present, which are quite well developed before the cheek-teeth appear. The incisors are the first teeth to be renewed, in one skull the middle pair having been replaced by their permanent successors before the permanent molars had pierced the gum.

In the non-melanistic specimens there is a wide range of variation in coloration between the lightest and darkest. In the lightest (No. 51811, ♂ adult, Niapu; Pl. XII), the dorsal black band of lengthened hairs (dorsal crest) is reduced at the withers to a breadth of 15 mm., and increases to about 35 mm. at the loins, where it is broadest. The area of the light ground color over the greater part of the body is twice as great as that of the black spots and streaks; the white spots on the proximal half of the tail number five on each side, decreasing in size apically, and extending to beyond the middle of the tail, with a sixth spot on the right side beyond the paired ones without a corresponding one on the left; a few white hairs indicate an incipient seventh spot. In another specimen (No. 51802, ♀ adult, Niapu) the dorsal black crest is better developed, the black and white markings approach equality in area, and the white spots on the basal half of the tail are reduced to four pairs, with indications of a fifth.

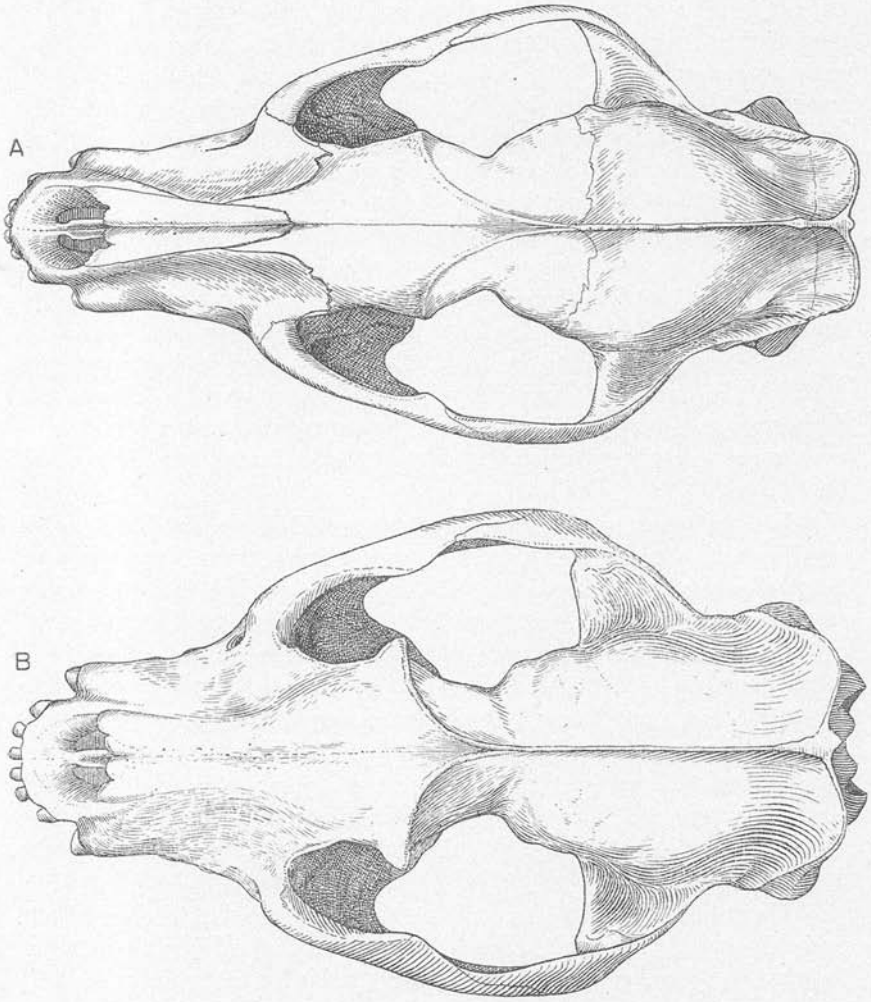

Fig. 14. *Civettictis civetta orientalis*. Comparative dorsal views of skulls. A, young adult male (No. 51818), four-fifths natural size; B, senile male (No. 51797), three-fourths natural size. [(See Figs. 12 and 13.)

In the dark non-melanistic specimens from Niapu the dorsal black band has a breadth of 40–60 mm. and the other black markings exceed twice the area of the light interspaces; the white spots on the basal part of the tail vary in different specimens from two to four pairs. An extreme example of the dark phase (aside from the wholly melanistic specimens) is a young female (No. 51813, Niapu, the milk dentition fully developed except dp_1 but the molars still enclosed in the jaw) in fresh unworn pelage, in which the dorsal crest-hairs are very long and cover the whole breadth of the nape, forming a band varying in breadth from 50–60 mm. from the head posteriorly to about the end of the proximal third of the tail; the white ground color on either side of the dorsal band of black is reduced to less than one-fourth of the area of the black spots, so that in general effect the dominant color of the body is black. The rest of the series (excluding those entirely black) is variously intermediate between the light and dark extremes, the greater part inclining to the darker phase. In very dark specimens the foreneck is black, while in very light specimens the white of the sides of the neck meets on the median line.

The condition of the dorsal crest is exceedingly variable; in some specimens it is practically absent, in others irregular and patchy, very little developed in the region of the nape and withers where in other specimens it is most conspicuous. A young female from Niapu (No. 51813), as noted above, exceeds all the others in the prominence of the dorsal crest, and although less than half grown has the pelage very long and full, and its contrasting deep black and clear white coloration renders it one of the most beautiful and striking specimens of the whole series.

Young specimens in the soft first pelage resemble the adults of their respective color phases in the pattern of markings, but the colors are less intense, the black being brownish black and the markings are less sharply defined.

The following table of cranial measurements includes seven skulls from Niapu and two from Akenge. Three skulls of the Niapu series have the cusps of the cheek-teeth slightly worn, being from specimens of early middle-aged individuals. The oldest skull of the seven from Niapu is also the smallest. The single female skull, in which the teeth show no wear, is above the average size of the males, and one of the three largest of the series.

The variation in cranial characters due to age in two male skulls from Akenge is shown in Figs. 12–14. No. 51818 (Figs. 12 and 14A) is a young male in which the permanent dentition is fully developed but the

Collectors' Measurements of Seven Adult Males of *Civettictis civetta orientalis*

Cat. No.	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51805	Niapu	1295	830	465	150	55
51803	"	1240	850	390	135	57
51808	"	1360	840	520	140	50
51809	"	1255	785	470	133	50
51810	"	1280	850	430	132	52
51811	"	1350	845	505	140	55
51797	Akenge	1350	870	480	143	56
Average	**7♂**	**1304**	**840**	**466**	**139**	**54**

Measurements of Nine Adult Skulls of *Civettictis civetta orientalis*

Cat. No.	Sex	Locality	Condylobasal Length	Palatal Length	Zygomatic Breadth	Interorbital Breadth	Postorbital Constr.	Breadth at P^4	P^1-M^2	P_1-M_2	C-M^2
51805	♂	Niapu	155.0	82.3	78.5	29.5	23.8	49.5	50.6	55.0	61.0
51803	♂	"	143.8	75.0	73.8	29.0	21.2	46.1	45.1	51.6	54.8
51808	♂	"	150.6	79.4	75.8	27.8	18.6	45.8	49.3	53.3	58.9
51809	♂	"	145.4	80.8	88.2	29.7	21.9	49.8	51.0	56.0	61.5
51810	♂	"	143.5	77.8	76.7	29.8	21.6	48.0	47.6	52.8	56.6
51811	♂	"	148.0	79.4	79.3	32.8	——	51.0	51.2	54.7	61.6
51815	♂	"	154.0	83.4	80.4	32.9	25.5	49.4	48.4	54.8	60.2
51797	♂	Akenge	151.7	85.0	86.0	31.6	21.0	51.3	46.8	60.0	60.0
51818	♂	"	142.8	76.8	73.5	26.5	22.2	47.7	48.8	54.6	57.9
Average	**9♂**		**149.4**	**80.0**	**79.1**	**29.6**	**22.0**	**48.6**	**48.8**	**54.8**	**59.2**
Minimum	"		142.8	75.0	73.5	26.5	18.6	45.8	45.1	51.6	54.8
Maximum	"		155.0	85.0	88.2	32.9	25.5	51.3	51.2	60.0	61.6

teeth show no trace of wear and the sutures of the skull are still open, even the fronto-parietal, the first to disappear, being still distinct. This skull is of average size for young adults. No. 51797 (Figs. 13 and 14B) is a senile male, in which the canines and molars are greatly worn, the sutures of the skull, except the maxillo-nasal and malar, are wholly obliterated by synostosis, the sagittal and lambdoid crests are enormously developed, and the zygomatic arches and skull walls greatly thickened by excessive osseous deposition due to advanced age. Several of the middle-aged specimens equal or exceed it in both external and cranial measurements. There is nothing to indicate that the animal

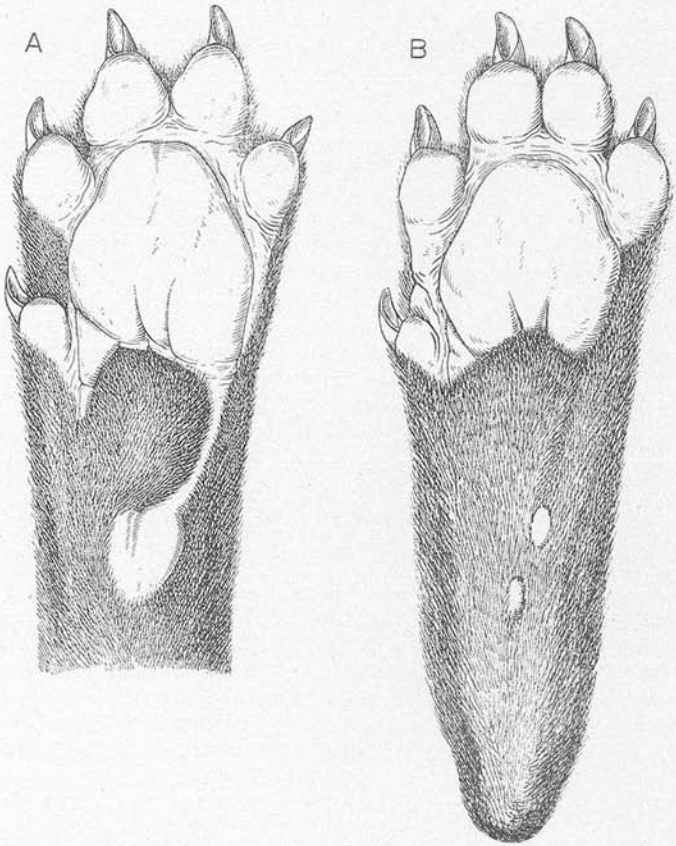

Fig. 15. *Civettictis civetta orientalis* (No. 51803). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

had become decrepit from age, although suffering from a fracture of the left ramus at the junction p_2-p_3, which had formed a suppurating wound.

The purpose of these figures is twofold: (1) to illustrate the skull and dentition of this interesting form, not previously so well figured; (2) to show the wide range of variation due to age between skulls of males of the same species taken at the same locality. The lesson to be derived therefrom is obvious.

The question of the proper designation of the civet of the Upper Congo is at present difficult to settle, and the final decision must be left for the future to determine. The reference of the present Congo series to Matschie's *Viverra civetta orientalis* is wholly provisional.

The *Civettictis civetta* of current nomenclature is clearly a composite group, embracing apparently several more or less well-marked geographical forms. Hence it is necessary to determine, as a first step in the investigation, to which of these forms the original name *Viverra civetta* should be restricted. This fortunately is not difficult, since the primary basis of the name is the Civette of Buffon and Daubenton,[1] the original description and plate of which were based on a spirit specimen obtained in Guinea. Schreber's *Viverra civetta*[2] should be construed as based primarily on the description and figure of Buffon and Daubenton's Civette, Schreber's plate of *Viverra civetta* being a well executed and duly accredited copy of Buffon and Daubenton's plate. His description of *V. civetta* appears to have been taken from a specimen from an unknown locality, which may or may not (probably not) have been referable to the Guinea form. As the specimen was without indicated locality, and the brief description is indeterminate, it seems proper to restrict the name *civetta* to the original "Civette de Guinée," to which the name *civetta* obviously refers and was intended to designate. In fact, in Schreber's list of the plates of Theil 3, as well as on the plate, he ascribes the name *Viverra civetta* to Buffon ("Viverra civetta BUFF.") citing "Buff. IX. tab. 34" for the original of the plate.

The *Viverra poortmanni* of Pucheran was described briefly in 1855[3] and elaborately, with a colored figure, a few years later.[4] The later description is based on the original type, an immature spirits specimen, 754 mm. in total length, with only the milk dentition. The colored plate is from a live adult in the Paris Menagerie, which he states had been living there since 1851, but the locality of its origin is not stated, although probably the Gaboon.[5] Thus the type, and probably the figured specimen of *V. poortmanni*, were doubtless from the same district (French Guinea). Pucheran's description and figure are strikingly in accord in all essential features with Buffon and Daubenton's description and figure of the Civette. In this connection Pucheran compares his Gaboon specimen with five others in the Paris Museum, all from unknown localities. He found them to be so variable in coloration that only two were similar in their external characters, the others differing greatly *inter se*, to which

[1] Civette [de Guinée] Buffon and Daubenton, 1761, 'Hist. Nat.,' IX, pp. 333–342 (also pp. 299–315 *passim*), Pls. XXXIV, XXXV. Guinée.—"C'est la civette de Guinée, car nous sommes sûrs que celle que nous avons eue avoit été envoyée vivante de Guinée . . . " (*loc. cit.*, p. 302).

[2] *Viverra civetta* Schreber, 1777, 'Säugthiere,' III, pp. 418, 587, Pl. CXI (from Buffon, as above).

[3] *Viverra poortmanni* Pucheran, 1855, Rev. et Mag. de Zool., (2) VII, Juin, p. 304.—This description is a brief diagnosis, as follows: "Simillima Viverræ Civettæ, sed major, vittâque oculari nigra nasum non transeunte," followed by the statement, "Du Gabon. Envoyé au Musée de Paris par Aubry Lecomte."

[4] *Viverra poortmanni* Pucheran, 1858–1861, Arch. du Mus. d'Hist. nat., X, pp. 109–115, Pl. IX.

[5] "Ce dernier a été figuré pour la collection des vélins de la Bibliothèque du Muséum, et c'est cette figure, presentant tous les caractères attribués par nous à l'espèce en question, que nous avons fait reproduire pour l'annexer à notre travail actuel" (*loc. cit.*, p. 109).

fact he directs the attention of zoölogists as a matter demanding further investigation. He relied, in separating the Congo form from the common civet, upon a character he believed to be constant, namely, the limitation of the black of the cheeks to the region of the eyes, leaving the top of the nose yellowish white, whereas in all the other specimens the black cheek-patches were broadly confluent across the nose. His plate agrees in this respect with Buffon's, a resemblance which he acknowledges, but finding certain discrepancies between Daubenton's and Schreber's descriptions he raises the question as to which of the two should be taken as the basis of the name *Viverra civetta*.[1] He decides in favor of Schreber, ignoring the fact that Buffon's plate unquestionably (as he admits) displays the character on which his *poortmanni* essentially rests, that the type of Buffon's civette and the type of *poortmanni* came from practically the same place, and that Schreber's plate, "si semblable à celle de Buffon," was a copy of Buffon's, and that the specific designation *civetta* was a Latin rendering of Buffon's name *civette*. It is hence evident that *Viverra poortmanni* Pucheran should be construed as a synonym of *Viverra civetta* Schreber.

The only other described form of the *civetta*, so far as I am aware, is Matschie's *Viverra civetta orientalis*, described in 1891,[2] from Bagamojo, Zanzibar, to which the author later referred specimens from other parts of the coast region of German East Africa.[3] This form is readily distinguishable from *Civettictis civetta civetta* of the equatorial west coast of Africa by the face pattern alone, the black of the cheeks in *orientalis* uniting above to form a continuous broad band across the nose. In this respect the present large series of specimens from the Rain Forest of the Upper Congo agrees with *orientalis*. It is hardly probable, however, that they will prove to be quite the same. The description of *orientalis* seems to imply that the coast form of German East Africa is paler than the form from the Rain Forest belt of the Upper Congo, as would be expected from the differences in environment. In view, however, of the wide range of variation in color of the Congo series, indicated above, the alleged characters of *orientalis*, aside from the face pattern, fail to be diagnostic. The extent to which the two forms differ can be determined only by comparison of adequate series from the two regions. At this writing no specimens from the type region of *orientalis* are available for examination.

[1] He also points out a discrepancy between Daubenton's description and plate, through an obvious lapsus, "les chaufrein" being given as black like the cheeks, etc., instead of whitish as represented in the plate.

[2] *Viverra civetta orientalis* Matschie, 1891, Arch. für Naturg., Bd. I, pp. 352, 353.

[3] Matschie, 1895, 'Die Säugethiere Deutsch-Ost-Afrikas,' p. 72, Fig. 40.

GENETTA Oken

Genetta OKEN, 1816, 'Lehrb. Naturg.,' Theil 3, Abth. 2, p. 1010. Type, by tautonymy, *Viverra genetta* Linnæus.

Genetta pardina fieldiana Du Chaillu

Plates XIV, Figure 1; XV, Figure 2; and Text Figures 16, 20A

Genetta pardina I. GEOFFROY, 1832, Mag. de Zool., Cl. I, Pl. VIII and related text. Interior of Senegal. In part, as recognized by various later authors.

Genetta fieldiana DU CHAILLU, 1860, Proc. Boston Soc. Nat. Hist., VII, November (1859–1861), p. 302. Interior of Gaboon.

? Genetta stuhlmanni THOMAS (not of Matschie), 1915, Ann. Mag. Nat. Hist., (8) XVI, p. 472. Medje (3), Poko (7 specimens).

The present form differs from *G. stuhlmanni* Matschie, with authentic specimens of which it has been compared, in having the dark markings of the upperparts narrower and more confluent and lighter colored (much less blackish) feet (Pl. XIV, fig. 1).

Represented by 46 specimens, of which 24 are adult and 22 are immature, collected as follows:

Aba, 1 (♀ nearly adult), December 15, 1911.

Faradje, 18 (6 ♂, 12 ♀–9 adult, 9 juvenile), March 5–29, 1911; April 29, December 22, 1912.

Niangara, 3 (♀, all juvenile), December 18, 1910.

Akenge, 4 (all ♂, 2 adult, 2 juvenile), October 9, 14, 19, 24, 1913.

Niapu, 1 (♂ adult), January 9, 1914.

Medje, 17 (10 ♂, 7 ♀), January 25, April 8, 26, May 28, June 26, 28, July 10, 12, 14, 26, August 10, 30, September 22, 26, October 10, 1910.

Avakubi, 1 (♀ juvenile), October 31, 1909.

Stanleyville, 1 (♂ adult), August 6, 1909.

Only about one-third of the specimens are fully adult, another third are subadult, and the other third retain the milk dentition, varying in age from those in the woolly first pelage and in which the milk teeth are just beginning to pierce the gum to those in which the milk teeth are fully mature.

Collectors' measurements of 13 adults (9 males, 4 females), of which 7 are from Medje, 3 from Faradje, and 1 each from Niapu, Akenge, and Stanleyville.

		Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
9	♂	887(835–945)	455(400–510)	470(370–475)	86(75–95)	40(38–42)
4	♀	862(845–870)	457(425–490)	406(380–420)	85(all 85)	40(all 40)

Measurements of Ten Adult Skulls of *Genetta pardina fieldiana* (Mainly from Medje and Faradje)

Cat. No.	Sex and Age	Condylo-incisive Length	Palatal Length	Palatal Breadth at p^4	Maxillary Toothrow p^1-m^2	Zygomatic Breadth	Least Interorbital Breadth	Least Postorbital Breadth	Breadth Braincase
[1]51710	♂ ad.	86.8	39.6	26.4	28.1	42.3	11.3	7.5	28.5
[1]51523	♂ ad.	92.0	42.3	27.9	30.1	46.0	13.2	7.9	30.8
[1]51712	♂ ad.	85.1	38.4	25.9	27.1	41.2	11.6	11.0	28.8
[3]51709	♂ yg. ad.	92.1	43.0	25.9	28.6	44.2	13.1	11.6	30.0
[2]51533	♂ old ad.	82.2	39.1	23.6	28.1	44.4	12.9	8.8	29.4
[4]51541	♂ old ad.	89.5	41.6	26.5	27.1	44.4	12.2	11.0	30.2
[2]51536	♂ ad.	78.3	36.7	21.7	24.0	37.6	11.4	10.4	29.0
Average	**7 ♂**	**86.5**	**40.1**	**25.4**	**27.6**	**42.9**	**12.3**	**9.7**	**29.5**
Minimum		78.3	36.7	21.7	24.0	37.6	11.3	7.5	28.5
Maximum		92.1	43.0	27.9	30.1	46.0	13.2	11.6	30.8
[1]51518	♀ old ad.	86.6	40.5	27.3	26.3	44.2	12.1	10.6	30.7
[2]51532	♀ ad.	79.1	36.5	23.5	26.4	40.4	11.1	10.6	28.2
[2]51529	♀ ad.	82.3	37.6	25.1	27.1	39.2	12.6	12.1	28.4

Among the large number of specimens representing the present species are young of various stages which illustrate the changes in coloration from nurslings to mature individuals.

Young in the first woolly coat, with the milk teeth still enclosed in the gum, have the ground color of the upperparts dark ash-gray and the markings dull black. The underparts are uniform creamy white, with the fur so short that it does not fully conceal the skin. The light tail-rings are clear white on the ventral side but on the dorsal are of the same gray tone as the ground color of the upperparts; the intervening dark rings are also similar in color to the dark bands and spots of the dorsal area. This stage is represented by five specimens, which have a total length of about 270 to 285 mm. In two others (total length about 300 to 330 mm.) the pelage is a little longer, and the dark markings are a little blacker. In three others somewhat farther advanced (total length 360 to 390 mm.) the coloration is still similar to that of the early stages, but the pelage is less woolly through replacement or by lengthening of the overlying hair, and the black markings are in stronger contrast with the ground color. In the largest of the three the ground color is beginning to assume a distinctly buffy tone, and the light tail-rings are nearly as clear white above as below.

[1]Medje. [2]Faradje. [3]Stanleyville. [4]Niapu.

In the next stage available, represented by six half-grown specimens (total length 415 to about 450 mm., with one 475 mm. long), the pelage appears to have been nearly (in the younger) or fully (in the older ones) renewed, the dull gray of the ground color having been replaced by deep buff, and in some of them there is a mixture of rufous hairs in the otherwise intensely black markings of the upperparts. In the older specimens of this group the adult coloration has been fully acquired without, however, any modification of the pattern. The milk dentition has become mature, except that the first premolar has not pierced the gum, and there is no visible indication of the first molar (Nos. 51068 and 51516). The change from the gray early stage to the condition of maturity is thus very gradual and occurs with evidence of its acquisition by a progressive change and not by a single abrupt transition. Neither in the younger stages is there a marked individuality in specimens of the same age, as occurs so markedly among adults.

This species, like its congeners, presents, when adult, a wide range of purely individual variation, not only in size and coloration but in cranial characters and in the teeth, especially in the size and form of m^2. The variations in size, both externally and in the skull, are indicated in a general way in the measurements given above. In coloration the variation from the norm is toward, on the one hand, an extreme gray phase with blackish markings, on the other, a rufous phase with deep brownish buff instead of a gray ground color and dark brown markings (black strongly mixed with rufous). The dark tail-rings are black or blackish in both; the light tail-rings are much lighter in the gray extreme than in the rufous extreme, being white or whitish in the former and strongly suffused above with pale rufous in the latter. The light tail-rings are usually seven, but vary in number from six to eight, besides the terminal half ring, broken by the black of the upper side of the apical portion of the tail. The light rings are usually much broader on the sides and under surface of the tail than on the mid-dorsal line, where in some specimens they are nearly obsolete, especially beyond the fourth from the base. The light rings are occasionally as wide as the adjoining dark ones, but usually somewhat narrower, and frequently only about half the breadth of the dark ones. The black tail-tip varies in extent (measured from the last full light ring on the dorsal side) from 70 to 150 mm. (in one specimen 220 mm.).

The more prominent markings are a heavy continuous dark stripe on either side of the neck from the top of the head to just behind the forearms (Pls. XIV, fig. 1 and XV, fig. 2), and a median dark, broad, solid

dorsal band from the shoulders to the base of the tail. This band is often intensely black, but more commonly with a mixture of rufous, depending upon the degree of erythrism characterizing the general coloration. This is further emphasized by the hairs composing it being longer than the adjoining pelage.

Fig. 16. *Genetta pardina fieldiana* (No. 51541). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

The color of the underparts varies in correlation with that of the sides and back, being dingy gray in specimens having the ground color of the upperparts clear gray, and yellowish buff in those with rufous upperparts. In both types the dusky blotches on the chest vary greatly in number, size, and distinctness in different specimens.

In general the color pattern resembles that of *G. stuhlmanni* Matschie, but in the latter the dark markings are broader and more conspicuous, being less confluent and more sharply outlined; the fore and hind limbs, and the feet especially, are much darker.

It is unnecessary to describe in detail the irregularities in the size, number of rows and the arrangement of the spots on the sides of the

body, since they are more or less different in each specimen, and often different on the two sides of the same specimen. Neither is it necessary to more than note that the relative width of the light and dark tail-rings is exceedingly unstable and hence has no taxonomic value. Yet such inconstant features were once made the basis of an elaborate synopsis of the species of the genus *Genetta*,[1] noteworthy mainly for its puerility

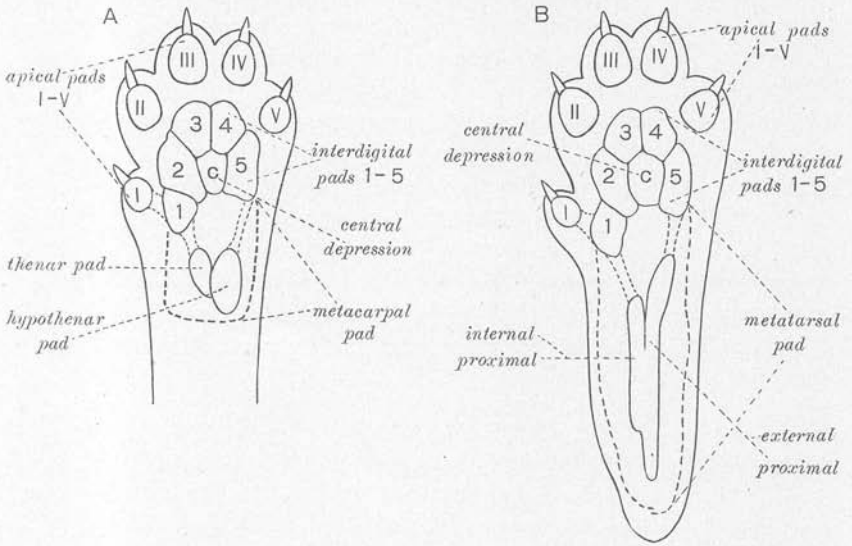

Fig. 17. Diagrams of: A, palmar surface of left fore foot; and B, plantar surface of left hind foot as found in genets.

Though in general outline the diagrams represent the footpads of *Genetta victoriæ*, they are applicable to practically all the carnivores.

and pernicious results. In the introductory comment to a six-page table for the determination of the species the author gives a list of the twenty-four species previously indicated, only one of which (a case where a species was intentionally renamed) is relegated to synonymy, while ten new ones are added (besides two others indicated but not named). While some of the new forms are doubtless tenable, and can be identified from the brief indications of their characters, others are hopelessly indeterminable without recourse to the specimens on which they were based. In discussing individual and geographical variation he formulates several generalizations: (1) That the color and arrangement of the spots

[1]1902, 'Ueber die individuellen und geographischen Abänderungen der Ginsterkatzen.' By Paul Matschie. Verhandl. V. Internat. Zool. Congress., pp. 1128–1144, 1 col. pl.

does not vary during the life of the same individual after the first renewal of the pelage (contrary to his previous belief), although there may be a variation in tone, correlated with season. (2) That there is a marked sexual variation, females having a lighter ground color and darker markings than males. This conclusion is shown to be erroneous by the large series, representing three species, collected by the American Museum Congo Expedition. On assorting the specimens into series on the basis of sex, it is found, in the case of each species, that the specimens having a light ground color and dark markings are about equally divided between the sexes, the specimens with a grayish ground color and black streaks and spots being as frequently males as females. (3) He qualifies this later by admitting that the color of the dorsal bands and spots varies less in some forms than in others and must therefore be used with discretion as a distinctive character. (4) "Ich unterscheide jetzt 34 Arten von Ginsterkatzen [*Genetta*], deren Verbreitungsgebiete nur in gewissen Gegenden etwas übereinander greifen." He finds, however (very naturally), that the darkest species, with the greatest number of spots, live in forested regions and the lightest in open or desert countries.[1]

The genet recorded above as *Genetta pardina fieldiana* is of course referable to the "*pardina* group," but the type specimen of I. Geoffroy's *Genetta pardina* was a living specimen in the Paris zoölogical gardens said to have been received from the interior of Senegal, and although his description and colored plate point to a genet of the general character of the present species, it is hardly proper, on general principles, to apply unqualifiedly the name to the Upper Congo form of the group. The earliest name for any member of the group is *Genetta poensis* Waterhouse (1838), but the insular character of the type locality again renders the name unsatisfactory in the present connection without confirmation by material from Fernando Po, which is unfortunately not available.[2] *Genetta fieldiana* Du Chaillu (1860), from the interior of Gaboon, which

[1]The following remarks by Hollister, published some three months after my studies of this group were prepared for publication, are confirmatory of the above criticisms of Matschie's worthless key to the species of *Genetta*. Hollister says: "The characters given by Matschie, in his key to the species [of *Genetta*], to separate *dongalana* from *neumanni* are all absolutely valueless; the relative breadth of the light and dark rings on the tail differs in specimens collected the same day in the same camp and is greatly changed temporarily by renewal from the old long coat into fresh hair. This is well shown by our material [11 specimens]. The numbers of dark and light rings on the tail are easily miscounted, and two persons will frequently count them differently on the same skin, owing to the obscurity of the dark basal rings, which may or may not be counted."—1918, U. S. Nat. Mus. Bull. 99, pt. 1, p 117, under *Genetta dongalana neumanni*

[2]Pocock's comment on the type of *Genetta poensis* (1907, Proc. Zoöl. Soc. London, II, pp. 1039–1041) seems to indicate that *G. poensis* is not really referable to the *pardina* group, and that the type locality was probably not Fernando Po; in his opinion, the type of *G. poensis* Waterhouse and the other material treated in the paper in which *poensis* was described came "from Lower Nigeria or thereabouts." He further states that *G. poensis* has not been recorded from that island since the publication of the original description.

unquestionably refers to an animal of the *pardina* type, is therefore provisionally accepted instead of any of the various later names based on specimens from the Congo coast region. While the color pattern resembles in a general way that of *G. stuhlmanni* Matschie, direct comparison with practically topotype material of *stuhlmanni* leads me to believe that the present Congo series is not satisfactorily referable to *stuhlmanni*, although the gray phase of the Congo series referred to above indicates near relationship.

Genetta servalina Pucheran

Plates XIV, Figure 2; XV, Figure 1; and Text Figures 18, 19, 20B

Genetta servalina PUCHERAN, 1855, Rev. Mag. Zool., (2) VII, p. 154; 1858, Arch. Mus. Paris, X, p. 115, Pl. x. Type locality, Gaboon.

Genetta bettoni THOMAS (not of Thomas 1902), 1915, Ann. Mag. Nat. Hist., (8) XVI, p. 472. Moera (1), Medje (1), Poko (2 specimens).

Differs from *Genetta bettoni* Thomas (based on a specimen from the Mau district, altitude 7600 feet, British East Africa, in much larger size and somewhat different coloration. (Compared with a series of eight specimens of *bettoni* from near the type locality of that species.)

Represented by 54 specimens (29 ♂, 24 ♀, 1 sex unknown, of which 32 are adult and 22 juvenile), collected as follows:

Bafuka,[1] 1 (♂ adult), March 15, 1913.

Faradje, 9 (6 ♂, 3 ♀, all juvenile), March 14, 22, 29, 1911.

Niangara, 7 (4 ♂, 3 ♀–5 juvenile), November 16, 20, December 18, 21, 1910.

Akenge, 6 (2 ♂, 4 ♀ – 5 adult, 1 juvenile), October 9–27, 1913.

Niapu, 23 (10 ♂, 12 ♀, 1 sex unknown—21 adult, 2 juvenile), November 19, 28, December 2–25, 1913; January 8, 18, 19, 1914.

Medje, 7 (6 ♂, 1 ♀), January 19, April 9, May 29, June 6, July 26, October 14, 1910.

Ibambi,[2] 1 (♀ juvenile), May 8, 1910.

Collectors' measurements of 8 adult males and 10 adult females from Niapu:

		Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
8	♂	966(910–1040)	489(464–531)	475(440–520)	92.5(87–97)	40.6(38–45)
10	♀	920(900– 950)	485(460–500)	446(410–480)	88.7(85–93)	40.6(40–42)

[1]Sixty miles north of Niangara.
[2]Near Medje.

Measurements of Six Adult Male and Eight Adult Female Skulls of *Genetta servalina* from Niapu

Cat. No.	Sex	Condylo-incisive Length	Palatal Length	Palatal Breadth outside to outside p^4	Maxillary Toothrow (p^1-m^2)	Zygomatic Breadth	Least Interorbital Breadth	Least Postorbital Breadth	Breadth Braincase
51559	♂	92.4	44.9	26.2	29.2	43.8	13.1	14.4	31.5
51562	♂	91.5	44.3	25.5	29.3	46.0	13.0	13.2	30.3
51967	♂	87.4	42.7	23 4	28.5	40.5	13.1	13.6	29.0
51571	♂	87.9	43.1	24.9	28.2	43.5	13.5	14.2	29.5
51573	♂	94.7	46.0	25.3	29.8	44.9	12.7	14.1	30.9
51576	♂	89.2	——	——	26.6	——	11.5	13.5	30.2
Average	**6♂**	**90.2**	**44.2**	**25.1**	**28.6**	**43.4**	**12.8**	**13.8**	**30.2**
Minimum	"	87.4	42.7	23.4	26.6	40.5	11.5	13.2	29.0
Maximum	"	94.7	46.0	26.2	29.8	46.0	13.5	14.4	31.5
51558	♀	89.2	40.6	25.0	29.2	42.5	12.5	14.8	29.6
51560	♀	87.7	41.5	26.5	28.7	43.0	13.0	13.5	29.5
51561	♀	88.5	43.4	23.6	27.1	43.4	12.7	14.4	30.7
51566	♀	90.2	46.2	25.7	29.5	41.7	11.7	11.5	30.6
51568	♀	90.4	44.6	24.6	28.4	42.0	11.6	12.2	30.9
51570	♀	85.8	40.9	25.4	27.0	43.4	13.0	13.8	29.3
51474	♀	88.4	42.8	25.1	27.8	46.4	12.2	15.4	31.0
51577	♀	86.8	42.7	24.6	27.8	39.6	12.0	12.9	30.2
Average	**8♀**	**88.4**	**42.8**	**25.1**	**28.4**	**42.7**	**12.4**	**13.3**	**30.2**
Minimum	"	85.8	40.6	23.6	27.0	39.6	11.6	11.5	29.3
Maximum	"	90.4	46.2	26.5	29.5	46.4	13.0	15.4	31.0

The collectors' measurements of three adults from Medje are of interest in respect to individual variation, the largest of the three being the younger of the two males, while the female, long past middle age, is the smallest adult female in the total series of twelve skulls of the present species. The collectors' measurements of these three specimens and of two adults from Akenge (those of three others from this locality are not available) are appended, as follows:

Cat. No.	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51542	Medje	♂	944	490	450	87	—
51543	"	♂	975	510	465	92	46
51546	"	♀	840	445	395	80	42
51553	Akenge	♀	910	465	445	90	40
51556	"	♀	975	490	485	95	41

Measurements of Eight Adult Skulls of *Genetta servalina* from Medje and Akenge

Cat. No.	Locality	Sex	Condylo-incisive Length	Palatal Length	Palatal Breadth (across p^4)	Maxillary Toothrow (p^1-m^1)	Zygomatic Breadth	Least Interorbital Breadth	Least Postorbital Breadth	Breadth Braincase
51542	Medje	♂	89.1	43.4	26.3	28.9	45.0	13.7	11.5	29.9
51543	"	♂	91.3	45.3	24.2	29.2	40.7	12.5	13.1	31.2
51546	"	♀	81.3	37.8	24.1	24.4	42.1	11.1	12.2	29.5
51554	Akenge	♂	90.0	43.4	27.6	28.8	48.9	14.5	13.8	29.9
51555	"	♂	89.0	41.5	25.9	28.7	47.2	13.6	13.9	29.5
51552	"	♀	90.2	44.8	26.5	29.5	45.5	13.4	14.3	30.5
51553	"	♀	87.4	41.2	25.6	28.1	41.2	12.6	12.6	30.4
51556	"	♀	89.3	46.0	26.9	29.8	41.3	12.4	13.7	30.3
Average		**4♂**	**89.8**	**43.4**	**26.0**	**28.4**	**45.5**	**13.6**	**13.3**	**30.2**
"		**4♀**	**87.5**	**42.2**	**25.8**	**27.9**	**42.5**	**12.4**	**13.2**	**30.2**

No. 51567 (adult ♂) from Niapu has a supernumerary molar (m^3) on each side of the upper jaw, with normal dentition in the lower jaw. The additional m^3 has normal position at the end of the toothrow, as shown in Fig. 18. Thomas has recorded similar cases in specimens of *Herpestes gracilis* and *Crossarchus zebra*.[1]

The profuse broad, deep, black markings of the upperparts, narrowly separated by the lighter ground color, the large number and narrowness of the light tail-rings, the dark brown feet and inside of the limbs, and the heavy spotting of the underparts, are the prominent features of the present form (Pl. XIV, fig. 2). It is of course variable in respect to all of them. As in other genets, the ground color varies from gray to ochraceous buff, the prevailing tone being rich deep buff, which in high-colored specimens tinges also the usually nearly clear white annulations of the tail. In the lighter specimens the ground color of the underparts is a dingy gray washed faintly with buff; in the darker specimens it is rather strong buff, deepening in extreme specimens to dingy ochraceous. The light yellowish spot on the upper surface of the hind foot, especially mentioned in the description of the type of *servalina*, is a mark common to most genets, and is of an exceedingly variable character, conspicuously developed in some individuals of the present series and obsolete in others, and often is also faintly indicated on the forefeet. The dark parts of the feet also vary in different specimens from pale brown to blackish.

[1] 1882, Proc. Zoöl. Soc. London, pp. 61, 62.

The light annulations of the tail are usually complete rings, but occasionally the last apical ring is not quite closed above, and is also sometimes a double ring as seen from above, being divided into two by the intrusion of black. The light rings, counted from below, usually are ten in number, but almost as frequently eleven occur, and in exceptional cases they vary to nine or twelve. Thus by actual count of twenty-nine specimens fifteen had ten white rings, ten had eleven, two had twelve, and two others only nine. The extreme tip of the tail is brown for about an inch, varying in different specimens from light wood-brown to blackish brown, the light tip being preceded by a black ring. The white

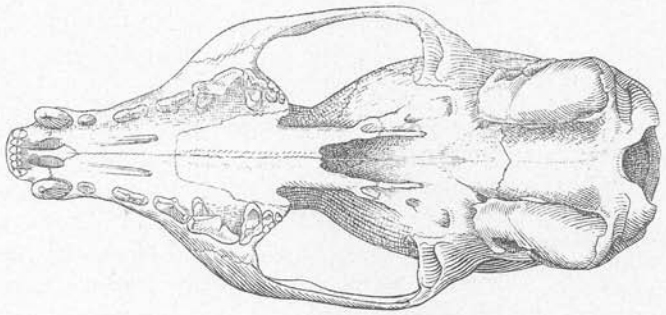

Fig. 18. *Genetta servalina*. Palatal view of skull of adult male (No. 51567), showing a supernumerary molar (m^3) on each side of upper jaw. Natural size.

rings are of nearly uniform width, their breadth varying from about one-third to one-half the breadth of the intervening black rings, varying slightly in this respect in different specimens, and in color from clear white to faintly yellowish white.

This species is provisionally referred to *G. servalina* of Pucheran, whose description and colored figure are quite in agreement with the present series. Furthermore, it seems, in view of the color variations in the present series, safe to assume that Pucheran's *G. aubryana* is merely the light or grayish phase of his *G. servalina*, the types of both being from the same locality and collector (Gaboon, Aubry Lecomte).[1] It is probable that a direct comparison of the present series with a similar series from the Gaboon would show the need of a distinctive name for the Upper Congo form. That the latter is not referable to *G. bettoni*

[1]In this connection see Lönnberg on the "Genets of the *Genetta servalina*-group" (1917, Kungl. Sven. Vet. Ak. Handl., LVIII, No. 2, September 1, pp. 56–60), in which *G. servalina*, *G. aubryana*, *G. bettoni*, etc., are considered, mainly on the basis of the literature of the group. For a specimen from Masisi, near Lake Kivu, and two specimens from Beni, one a young male, he provisionally proposes the name *Genetta servalina intensa* (*loc. cit.*, p. 59, in text), on account of their "more pronounced pattern" of color markings.

Thomas, from the high plateau region of British East Africa, is made evident by direct comparison with a series of eight specimens from near the type locality of *bettoni*. While there is in general effect a resemblance in coloration, there is a marked difference in certain details, *bettoni* having only nine light tail-rings instead of ten or eleven, as in *servalina*. In general coloration *bettoni* is decidedly darker, especially on the feet and underparts, and the ground color is a deeper and more intense

Fig. 19. *Genetta servalina* (No. 51559). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

ochraceous, equaled by only a few of the most intensely colored specimens of the Congo series. Also, in general effect, the markings appear broader and the ground color between them more restricted. The difference in size also is especially noteworthy, as shown by the following comparative measurements. The eight specimens of the *bettoni* series were collected on the Rainsford expedition of the American Museum in 1913, on the Nzoia Plateau at altitudes of 6000 to 7000 feet, British East Africa. The external measurements were taken by Jenness Richardson, a well-trained collector, from the specimens in the flesh, and the specimens reached the Museum in exceptionally fine condition.

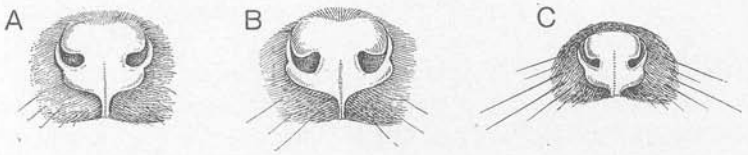

Fig. 20. Rhinarium. A, *Genetta pardina fieldiana* (No. 51538); B, *Genetta servalina* (No. 51559); C, *Poiana richardsoni ochracea* (No. 51439). All natural size.

		Total Length	Tail Vertebræ	Hind Foot
Congo Series:	8 ♂	966 (910–1040)	475 (440–520)	92.5 (87–97)
" "	10 ♀	920 (900– 950)	446 (410–480)	88.7 (85–93)
Nzoia Series:	5 ♂	835 (800– 855)	379 (361–400)	81.0 (76–85)
" "	3 ♀	801 (793– 800)	365 (359–368)	76.0 (73–79)

The principal measurements of the skulls of the *bettoni* series are as follows:

Measurements of Five Adult Male and Three Adult Female Skulls of *Genetta bettoni* from Nzoia Plateau, British East Africa (Same specimens as above)

Cat. No.	Sex and Age	Condylo-incisive Length	Palatal Length	Palatal Breadth at p^1	Maxillary Toothrow p^1-m^2	Zygomatic Breadth	Least Interorbital Breadth	Least Postorbital Breadth	Braincase Breadth
36014	♂ ad.	82.7	40.7	23.6	27.2	40.8	11.7	12.9	29.2
36015	♂ "	81.6	40.4	23.4	25.4	40.2	12.0	13.4	29.7
36016	♂ "	78.6	38.9	21.6	24.5	40.0	11.8	11.9	28.5
36017	♂ "	81.1	40.8	21.4	25.3	37.9	12.1	13.5	29.2
36020	♂ "	80.6	38.7	23.5	25.9	40.7	12.1	12.6	29.4
36013	♀ "	80.6	37.2	21.1	24.4	37.1	11.3	13.4	28.9
36018	♀ "	78.5	38.2	——	25.2	39.8	10.9	10.8	29.4
36019	♀ "	78.8	37.6	21.6	24.1	38.0	11.7	11.8	28.9
Average	**5 ♂**	**80.9**	**36.5**	**22.4**	**25.5**	**39.5**	**11.9**	**12.9**	**29.2**
Minimum	"	78.6	37.2	21.1	24.4	37.1	11.3	11.9	28.5
Maximum	"	82.7	40.8	23.6	27.2	40.8	12.1	13.5	29.7
Congo Specimens: Averages and Extremes	**6 ♂**	**90.2**	**44.2**	**25.1**	**28.6**	**43.4**	**12.8**	**13.8**	**30.2**
	"	87.4	42.7	23.4	26.6	40.5	11.5	13.2	29.0
	"	94.7	46.0	26.2	29.8	46.0	13.5	14.4	31.5
	8 ♀	**88.4**	**42.8**	**25.1**	**28.4**	**42.7**	**12.4**	**13.3**	**30.2**
	"	85.8	40.6	23.6	27.0	39.6	11.6	11.5	29.3
	"	90.4	46.2	26.5	29.5	46.4	13.0	15.4	31.0

The difference in size between the Congo and *G. bettoni* series indicates that they have no very close relationship, and, considering the geographical conditions of their respective habitats, may well be regarded as specifically separable. In external measurements *bettoni* averages one-seventh smaller than the Congo form, while the skull of *bettoni* is one-third less massive, with a correspondingly striking reduction in the size of the teeth. In features other than size the skulls differ but little in structural details.

Genetta stuhlmanni Matschie

Genetta pardina MATSCHIE, 1895, 'Säugethiere Deutsch-Ost-Afrikas,' pp. 73, 146. Part.

Genetta stuhlmanni MATSCHIE, 1902, Verhandl. V. Internat. Zool. Congress., p. 1142. Bukoba, Uganda.

Represented by one specimen, skin and skull, collected and kindly presented to the Congo Expedition by Dr. J. Bequaert. It was taken near Lake Kivu.

This specimen is from the type region of the species. The ground color of the upperparts is gray, with a faint buffy tone on the flanks. The spots and bands are intense black and very broad without any mixture of rufous hairs. The light tail-bands are narrow, only about half as wide as the intervening black rings; they number only four, are strongly defined on the ventral side of the tail, but only obscurely indicated above. The apical two-thirds of the tail is wholly black, except for a slight indication of a fifth light ring on the lower surface. The foreneck is gray, the rest of the ventral area washed with buffy, strongest laterally.

This specimen differs strikingly from the large Congo series recorded above as *G. pardina fieldiana*, even from the gray specimens of that series, in the greater breadth and intense blackness of the dark spots and bands. It strongly resembles the gray style of *stuhlmanni* from British East Africa, its long black tail-tip being probably merely an individual peculiarity.

Genetta victoriæ Thomas

Plates XVI; XVII, Figure 1; and Text Figures 17, 22, 23 C–D, 24B, 25B, 27, 28B and D, 29B and D, 30B, 31B, 32B, 33B

Genetta victoriæ THOMAS, 1901, Proc. Zoöl. Soc. London, II, p. 87, Pl. v (colored). Type locality, "Entebbe, Uganda" (=Congo Forest, Semliki River). Type, a skin without skull.

Genetta victoriæ THOMAS AND WROUGHTON, 1910, Trans. Zoöl. Soc. London, XIX, pt. 5, March, p. 494. Avakubi, 1 specimen, flat skin without skull.

Genetta victoriæ THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 471. Moera (1), Mawambi (1), Peli-Peli (near Stanleyville) (1 specimen), Belgian Congo.

Represented by 30 specimens (21 adult, mostly males) collected as follows:

Akenge, 1 (♂ adult), September 29, 1913.

Medje, 3 (1 ♂ adult, 2 native-made skins, without skulls), April 10, 1910.

Niapu, 24 (19 ♂, 5 ♀), November 13–30, December 1–31, 1913; January 5, 23, 1914.

Also 2 native-made skins, without field data or skulls.

Collectors' measurements of 18 adults (13 males, 5 females) from Niapu:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
13 ♂	1017(983–1060)	573(560–600)	444(425–480)	101(100–105)	48.0(45.52)
5 ♀	1019(965–1060)	573(550–595)	448(415–490)	100(98–103)	46.8(45.50)

Genetta victoriæ was originally based on a single specimen collected by Sir Harry Johnston in the Congo Forest, on the Semliki River,[1] a skin without skull or field measurements. Three specimens have since been recorded (*loc. cit., supra*) from the Belgian Congo, but without comment. The present series of thirty specimens was collected mainly (twenty-four specimens) at Niapu with six from neighboring localities; as always in the case of our Congo Expedition mammals, they carry full field data and are in excellent condition. It has seemed desirable therefore to make liberal use of this magnificent material, representing the largest and handsomest, as well as one of the least known, species of the genus *Genetta*.[2]

The Niapu specimens are nearly all adult (none retains the milk dentition) and by singular chance the males outnumber the females more than three to one. They were all collected in November and December, 1913, except two, taken the following January. They thus form an excellent series for illustrating the normal range of individual variation in the species.

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[1]Sir Harry states (1902, 'The Uganda Protectorate,' I, p. 205): "I am sure that this north-eastern portion of the Congo Forest contains many strange or little-known mammals, birds, and insects. Besides the okapi. . . .we obtained the skin of a remarkable new genet-cat. This I took at the time to be a civet. . . . but it turns out on examination to be a large new species of genet. It was named by Mr. Oldfield Thomas *Genetta victoriæ*. This genet was obtained from a very dense part of the forest [on the Semliki River]." Hence not at Entebbe, situated far to the eastward in Uganda, on the northern shore of Lake Victoria, the type locality given in the original description.

[2]The skull is figured on pp. 137-138 (Figs. 22, 23C-D, and 24B) in comparison with the type skull of the new genus *Osbornictis* on pp. 136, 138 (Figs. 21, 23 A-B, and 24 A.

Measurements of Fifteen Adult Male and Four Adult Female Skulls of *Genetta victoriæ* from Niapu

Cat. No.	Sex	Condylo-incisive Length	Palatal Length	Palatal Breadth across p^4	Maxillary Toothrow (p^1-m^2)	Zygomatic Breadth	Least Interorbital Breadth	Least Postorbital Breadth	Breadth Braincase
51413	♂	115.4	56.4	34.0	37.5	——	18.7	14.9	36.2
51415	♂	111.8	53.1	32.1	35.6	58.5	17.7	16.8	34.9
51416	♂	109.4	52.8	30.9	36.4	54.9	17.4	15.6	33.2
51418	♂	110.6	54.1	34.3	38.1	54.3	17.2	15.6	35.1
51419	♂	111.8	53.2	31.2	36.2	53.6	17.6	14.6	34.7
51420	♂	111.8	54.9	32.8	36.4	56.5	16.1	14.3	35.7
51421	♂	108.8	52.3	32.0	37.0	51.0	16.6	14.8	34.1
51425	♂	110.0	53.5	31.1	35.0	——	17.6	14.1	33.1
51426	♂	108.1	53.3	32.7	36.4	——	17.4	——	35.0
51430	♂	108.6	54.5	31.6	34.6	55.5	16.3	15.0	34.2
51431	♂	110.0	51.8	32.8	34.6	——	18.2	15.5	33.7
51432	♂	110.2	53.0	33.0	36.4	56.7	18.0	14.6	34.1
51414	♂	112.3	54.7	32.7	36.3	57.1	18.0	14.6	34.2
51422	♂	108.7	53.9	32.5	37.4	56.5	18.1	14.5	33.2
51424	♂	112.4	50.7	33.1	38.6	56.0	17.8	15.2	34.3
Average	**15♂**	**110.6**	**53.5**	**32.4**	**36.4**	**55.5**	**17.5**	**15.0**	**34.7**
Minimum	"	108.1	50.7	30.9	34.6	51.0	16.1	14.1	33.1
Maximum	"	115.4	56.4	34.3	38.6	58.5	18.7	16.8	36.2
51411	♀	109.7	52.1	32.0	32.0	54.5	17.2	14.0	33.9
51412	♀	107.5	53.4	32.3	32.3	54.3	17.3	15.1	34.2
51423	♀	——	53.4	33.2	33.2	——	16.8	12.5	——
51427	♀	105.6	49.2	32.5	32.5	52.3	17.0	15.3	32.2
Average	**4♀**	**107.6**	**52.0**	**32.5**	**32.5**	**53.7**	**17.1**	**14.2**	**33.4**
Minimum	"	105.6	49.2	32.0	32.0	52.3	16.8	12.5	32.2
Maximum	"	109.6	53.4	33.2	33.2	54.5	17.3	15.3	34.2

The tabulated measurements of the skulls show considerable variation in size, the total length ranging in adult males from 108.1 to 115.4 mm., and the zygomatic breadth ranging from 51.0 to 58.5 mm., all other dimensions varying proportionally. In one young adult (dentition mature), m^2 is unusually large and is inserted obliquely to the axis of m^1, instead of parallel with it, on both sides of the jaw. There are no skulls sufficiently young to show the milk dentition.

Half to two-thirds grown young have a much lighter or more grayish ground color than adults with the general effect of a greater prevalence of black, below as well as above, a condition that prevails, as already noted, in other Congo forms of *Genetta*.

The ground color varies in different specimens from yellowish white to ochraceous; it is palest on the ventral surface, being nearly white (or white with a faint yellowish wash) on the foreneck and pectoral region, where the black spots are more widely separated than elsewhere, while on the belly the black spotting greatly exceeds in area the light ground color. On the upperparts the intensely black markings considerably exceed the light interspaces, and on the middle of the back black occupies, in many specimens, a broad area in which the ground color is so restricted as to be almost entirely concealed by the profusion of black hairs, so that in general effect black greatly predominates. In other specimens the whole back is merely mottled with closely-set black spots, with enough of the ground color left to lend an ochraceous suffusion to the whole dorsal area, giving to the black markings considerable individuality. The ochraceous tone is deepest along the middle of the back, lessening in intensity on the flanks, and gradually merging into the much paler ventral surface. The pale bands on the tail, especially the proximal three or four, are more or less strongly suffused with pale yellow, the apical ones being clear white. They are usually complete rings but some are broken dorsally by black. The number varies from five to eight (Pl. XVI), but usually is either six or seven (in fifteen specimens six, in thirteen specimens seven, while one has eight and another five). In one specimen, with thick long pelage, the first four are half rings, broadly broken dorsally by black; the next two are narrow but complete, while the apical one (the seventh in this case) is so narrow as to be almost obsolete. The light rings vary in width from about one-fifth to about one-third of the breadth of the intervening black spaces. The limbs, both fore and hind, are intense black, usually paling to dark brown on the feet.

The pelage is long and thick, and when unworn the hairs on the back have a length of 30 to 40 mm., and on the tail often attain a length of 50 mm. The intensity of the broad black bands and the sharp definition of the black spots in a tawny setting render this species one of the most beautiful of mammals, especially in exceptionally high-colored examples with deep ochraceous mid-dorsal ground color.

An interesting feature, in addition to its striking coloration, its thick tail, and large size, which so markedly distinguish it from its congeners, is the presence of a nuchal crest, occasionally extending posteriorly as far as the middle of the back, but usually not beyond the shoulders. This crest is not a simple broad line of black but is composite, consisting of a narrow median line of the ochraceous ground color flanked on either side by a narrow line of black, and outside of these by two wider

bands of the ground color. The hair of the outer ochraceous bands is longer and more rigid than that of the three narrower middle bands, and is directed inward and close over and more or less conceals the three middle bands; the five bands collectively form the crest and fully occupy the space between the broad black neck bands, present in most species of the genus. In "made-up" or "stuffed" skins the nuchal crest is not usually conspicuous but can be readily detected once attention has been directed to its presence, nor can its composite character be always easily made out from such material. In soft-tanned skins its whole structure and relations are perfectly evident. While what looks like a low nuchal crest is more or less obvious in most of the specimens, I did not at first give it serious attention, supposing it to be due to displacement of the pelage in the preparation of the skin, or perhaps to a fold in the skin, till my attention was especially directed to it by Mr. Lang as a distinctive feature of the species.

OSBORNICTIS J. A. Allen[1]

Osbornictis J. A. ALLEN, 1919, Journ. Mammalogy, I, No. 1, November 28, p. 25. Type, by original designation, *Osbornictis piscivora* J. A. Allen.

Skull long and lightly built; dentition of generally frailer appearance than in *Genetta victoriæ* (Figs. 23, 24), canines more curved and slender, greater diastemata between premolars, pm 2 and 3 with high trenchant central cusps, molars greatly reduced. Sagittal and lambdoid crests and postorbital processes highly developed (Figs. 21A and C). Rhinarium small, without a median sulcus. Soles and palms bare, not furred as in *Genetta* and allied genera. Color of upper side of body nearly uniform chestnut-brown; head-markings white; tail black; wholly without the black spots and bands so characteristic of the other Viverrinæ (Pl. XVIII). Habits piscivorous.

The type of *Osbornictis* agrees closely in size with *Genetta victoriæ*, the largest of the genets, with which the principal comparisons have been made.

The accompanying comparative figures of the skulls, rhinaria, and feet, render easily appreciable the important morphological differences. Attention, however, may be called to some of the cranial peculiarities of *Osbornictis* in comparison with *Genetta*, as: (1) the short extension of the premaxillæ in front of the canines (Figs. 21, 22, 23); (2) the greater lateral expansion of the braincase (Figs. 21C, 22C); (3) the great development of the postorbital processes; (4) the heavy structure and high arching of the zygomata (Figs. 21A, 22A); (5) the extreme narrowness of the palatal region (Figs. 21B, 22B); (6) the great reduction in size of the teeth and compensating increase in length of the diastemata

[1]Named for Professor Henry Fairfield Osborn, President of The American Museum of Natural History, whose interest in the American Museum Congo Expedition contributed greatly to its success in the field and later to the early publication of its scientific results.

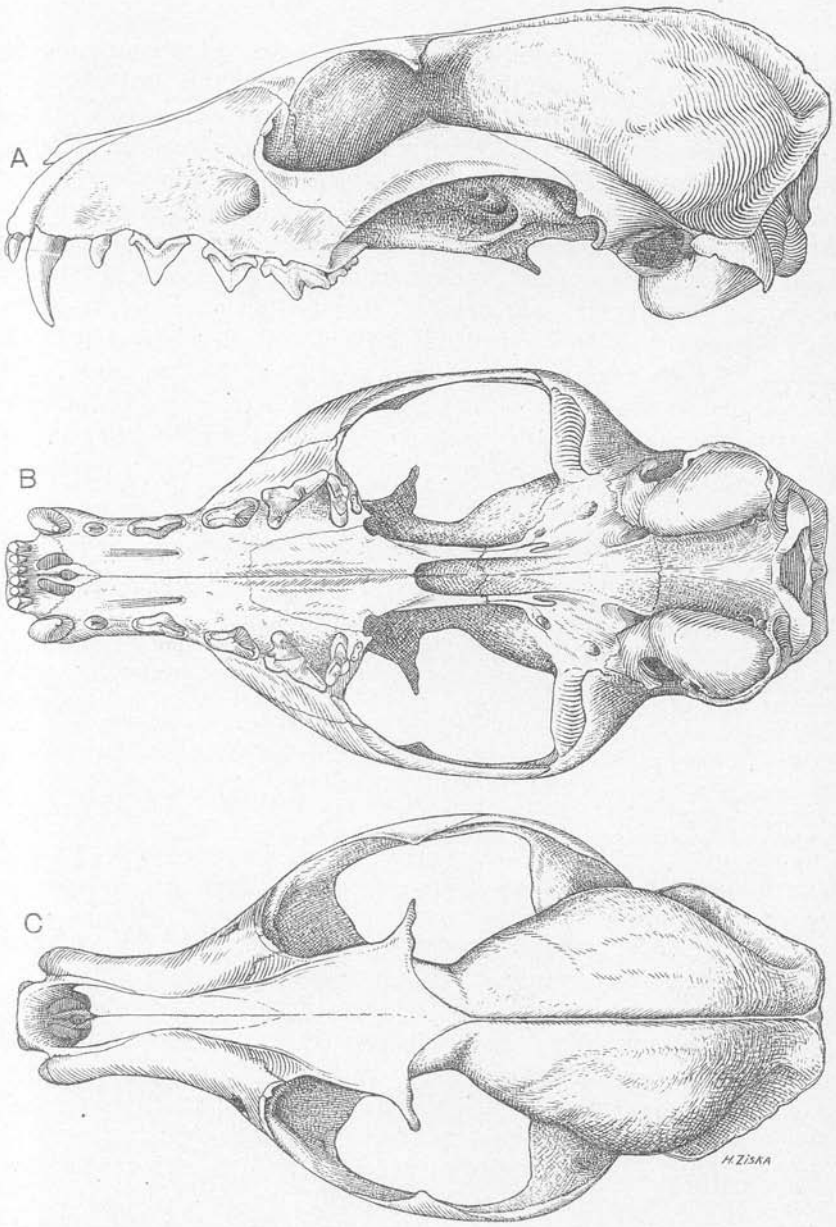

Fig. 21. *Osbornictis piscivora*. Type skull, adult male (No. 51514). A, lateral view; B, palatal view; C, dorsal view. Natural size.

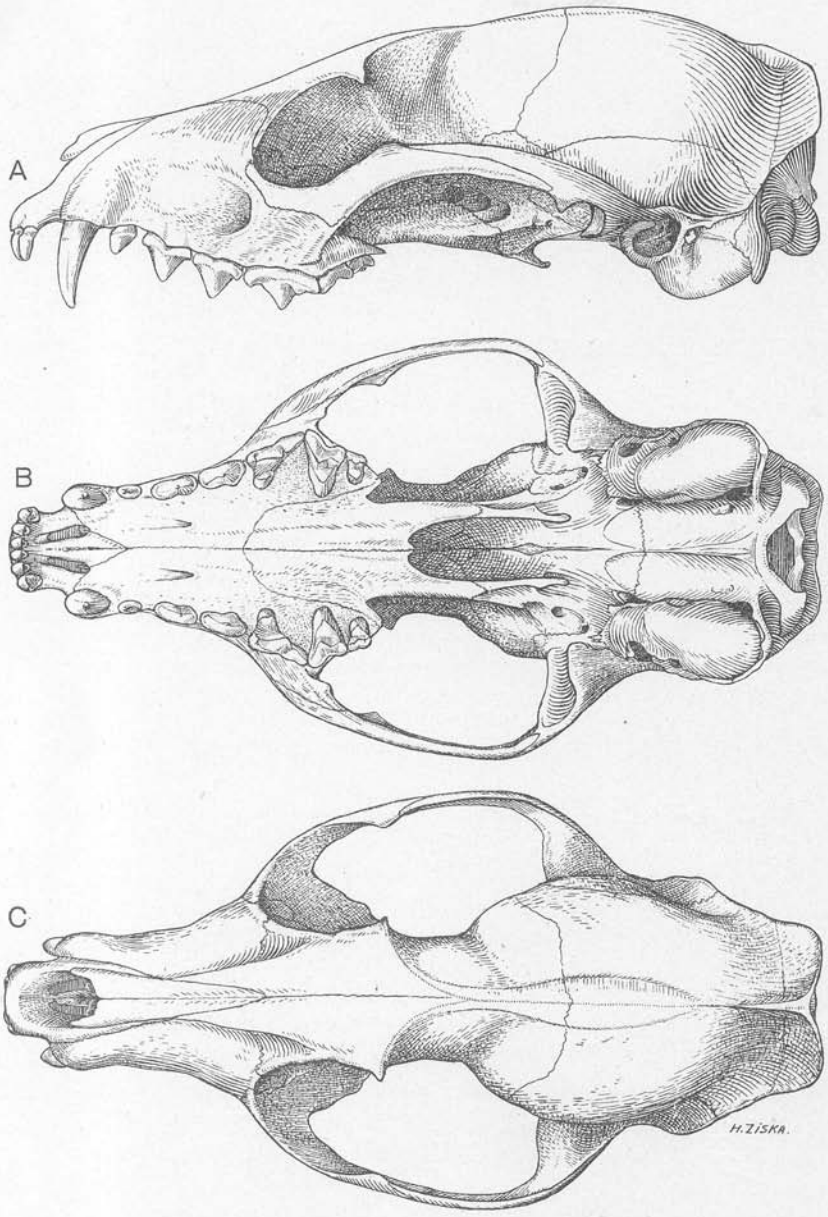

Fig. 22. *Genetta victoriæ*. Skull of adult male (No. 51430). A, lateral view; B, palatal view; C, dorsal view. Natural size.

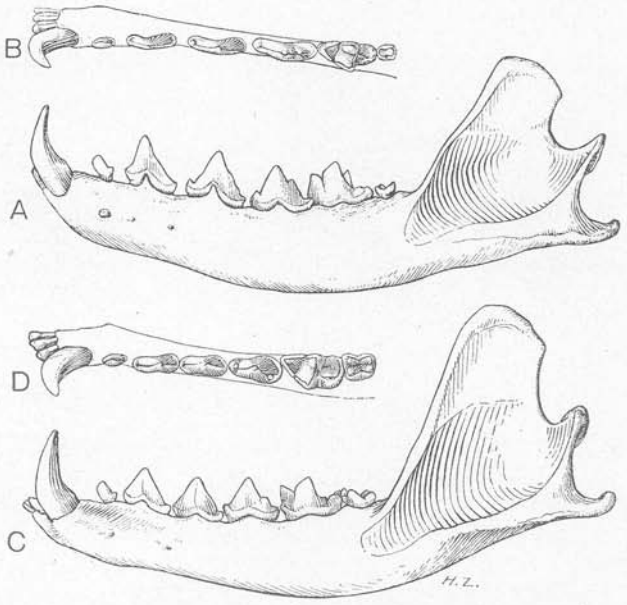

Fig. 23. A, lateral view of left mandible of *Osbornictis piscivora* (Type, No. 51514); B, crown view of left lower dentition of same; C, lateral view of left mandible of *Genetta victoriæ* (No. 51430); D, crown view of left lower dentition of same. Natural size.

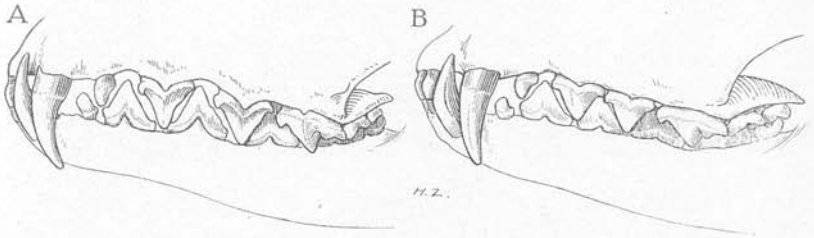

Fig. 24. Left half of dentition in occlusion. A, *Osbornictis piscivora* (Type No. 51514); B, *Genetta victoriæ*. Natural size.

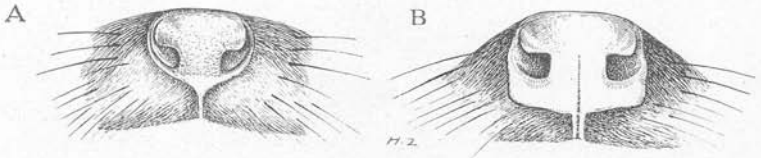

Fig. 25. Rhinarium. A, *Osbornictis piscivora* (Type, No. 51514); B, *Genetta victoriæ*. Natural size.

Fig. 26

Fig. 27

Fig. 26. *Osbornictis piscivora* (Type, No. 51514). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.
Fig. 27. *Genetta victoriæ* (No. 51419). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

(Figs. 21A-B, 22A-B, 23, 24); (7) slenderness of mandible and reduced size of coronoid process (Figs. 23A and C). Further may be noted (8) the small size of the rhinarium and absence of a median sulcus (Figs. 25A and B); (9) the naked palms and soles (Figs. 26 and 27); and (10) the abbreviated rostrum—adaptive characters correlated with piscivorous habits, further specialized in the Lutrinæ.

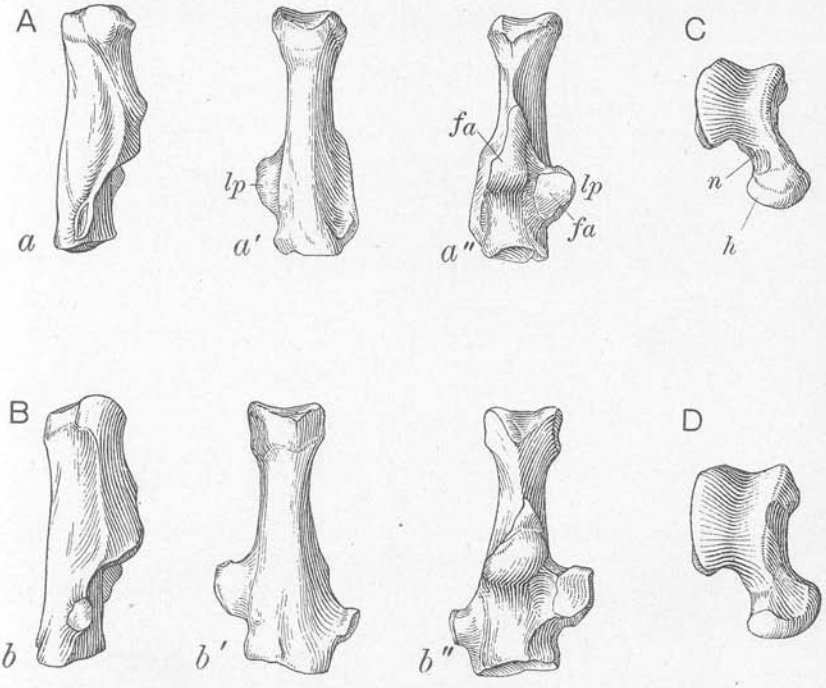

Fig. 28. Comparative views of right calcaneum of: A, *Osbornictis piscivora* (*a*, external lateral view; *a'*, plantar surface; *a''*, dorsal surface); and B, *Genetta victoriæ* (*b*, external lateral view; *b'*, plantar surface; *b''*, dorsal surface). Comparative views of dorsal surface of right astragalus of: C, *Osbornictis piscivora;* and D, *Genetta victoriæ*. ×¾.

fa, facet for articulation with astragalus; *h*, head; *lp*, lesser process; *n*, neck.

Osbornictis piscivora J. A. Allen

Plates XVIII, XIX; and Text Figures 21, 23A and B, 24A, 25A, 26, 28A and C, 29A and C, 30A, 31A, 32A, 33A

Osbornictis piscivora J. A. Allen, 1919, Journ. Mammalogy, I, No. 1, November 28, p. 25.

Type, No. 51514, ♂ adult, Niapu, Belgian Congo, December 1, 1913; Herbert Lang and James P. Chapin, American Museum Congo Expedition. Orig. No. 2147. Skin and complete skeleton.

External measurements about as in *Genetta victoriæ* Thomas, but soles and palms naked (Fig. 26), and coloration radically different; skull lighter built, dentition weaker, but generally sharper-edged (Figs. 21A, 23).

Upperparts of body uniform dark chestnut-brown (Pl. XVIII), with much darker median dorsal stripe; the chestnut-brown, in reduced intensity, extends over the underparts from the pectoral region to the base of the tail, lightening to dull red mesially with a slight mixture of whitish hairs along the midline of abdomen; head

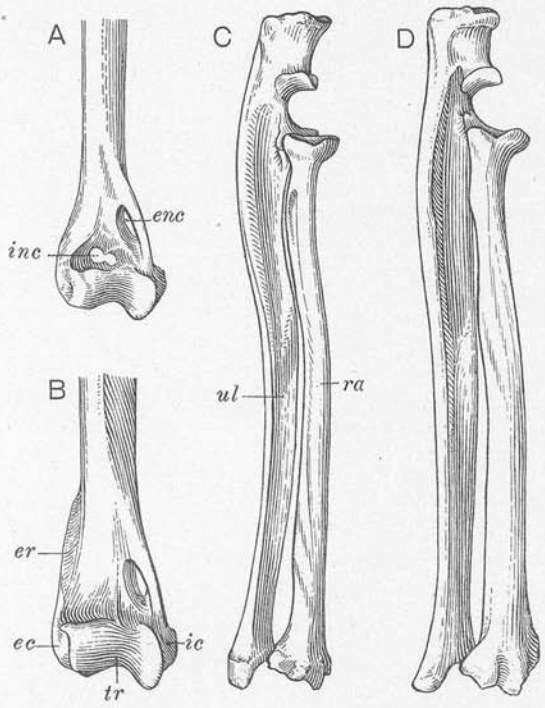

Fig. 29. A, Anterior view of distal portion of right humerus of *Osbornictis piscivora* (Type, No. 51514); B, the same of *Genetta victoriæ* (No. 51406); C, external view of right radius and ulna of *O. piscivora;* D, the same of *G. victoriæ*. Natural size.

ec, external condyle; *enc*, entepicondylar foramen; *er*, ectocondylar ridge; *ic*, internal condyle; *inc*, intercondylar foramen; *ra*, radius; *tr*, trochlea; *ul*, ulna.

from muzzle posteriorly, and laterally to the eyes, pale fuscous brown with a tinge of reddish, broken by a pair of elongated spots of clear white between the eyes divided by a narrow fuscous band, and a narrower, more indistinct posterior pair between the anterior base of the ears; a narrow dark eye-ring; front and sides of muzzle and sides of head below eyes whitish, intensified to a clear white spot just below the anterior two-thirds of each eye; ears exteriorly blackish, which color extends mesad over the lateral third on each side of the crown; ears nearly naked internally and edged with long whitish hairs; chin and throat white, passing into brownish posteriorly with

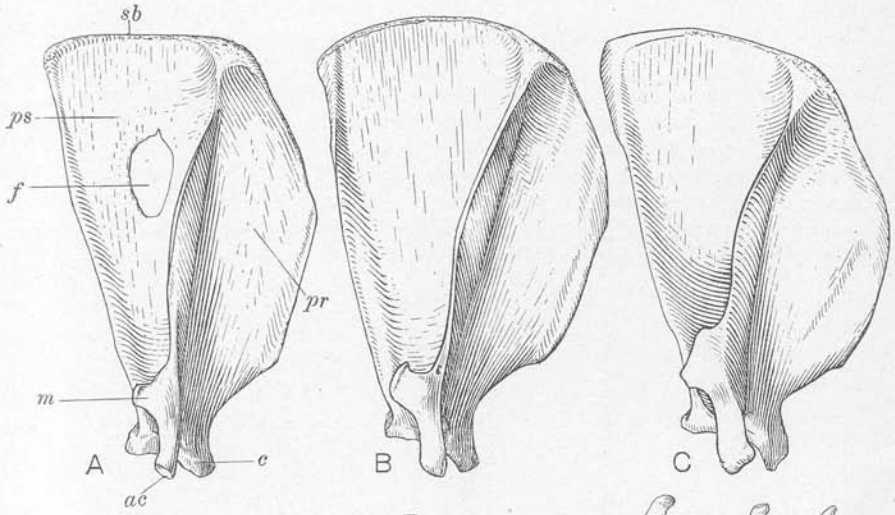

Fig. 30

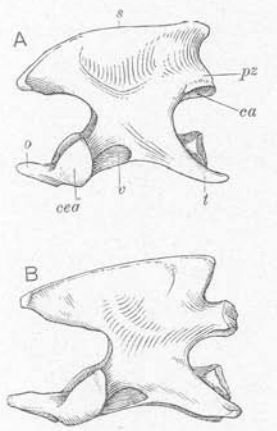

Fig. 31

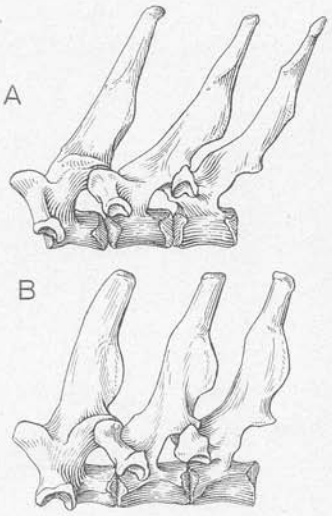

Fig. 32

Fig. 30. External view of right scapula of: A, *Osbornictis piscivora* (Type, No. 51514; terrestrial; piscivorous); B, *Genetta victoriæ* (No. 51406; partly terrestrial, partly arboreal; carnivorous); and C, *Nandinia binotata* (No. 51469; chiefly arboreal, excellent climber; carnivorous and partly vegetable feeder). Natural size.

ac, acromion; *c*, coracoid; *f*, fenestra; *m*, metacromion; *pr*, prescapular fossa; *ps*, postscapular fossa; *sb*, suprascapular border.

Fig. 31. Left lateral view of axis. A, *Osbornictis piscivora* (Type, No. 51514); and B, *Genetta victoriæ* (No. 51406). Natural size.

ca, caudal articular surface; *cea*, cephalic articular surface; *o*, odontoid process; *pz*, postzygapophysis; *s*, spinous process; *t*, transverse process; *v*, vertebrarterial canal.

Fig. 32. Left lateral view of first three dorsal vertebræ. A, *Osbornictis piscivora* (Type, No. 51514); B, *Genetta victoriæ* (No. 51406). Natural size.

scattered whitish hairs on the foreneck; tail entirely without annulations, heavily clothed with long black hairs, 45–50 mm. in length, the heavy underfur pale brownish gray, about 25–30 mm. in length; fore and hind limbs dark, slightly rufescent brown, passing into blackish brown on upper surface of feet.

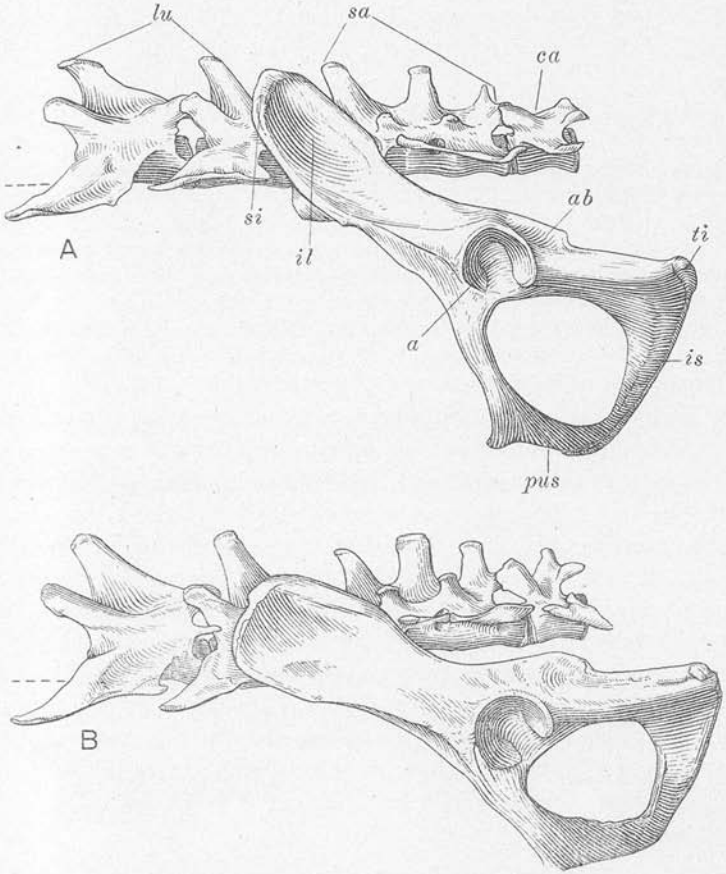

Fig. 33. Left lateral view of pelvic region with the last lumbar, the sacral and the first caudal vertebræ in place. A, *Osbornictis piscivora* (Type, No. 51514); B, *Genetta victoriæ* (No. 51406). Natural size.

a, acetabulum; *ab*, acetabular border; *ca*, first caudal vertebra; *il*, iliac surface; *is*, ischial region; *lu*, last lumbar vertebræ; *pus*, pubic symphysis; *sa*, sacral vertebræ; *si*, suprailiac border; *ti*, tuberosity f ischium.

Rhinarium (Fig. 25A) similar in contour to that of *Genetta victoriæ* (Fig. 25B), but about one-half smaller. Soles and palms (Fig. 26) naked, the pads not enclosed nor separated by dense fur, as in *Genetta* (Fig. 27) and *Civettictis* (Fig. 15), with the carpal pad greatly elongated as in *Viverricula*. Pelage long and dense, that of the tail especially so, its tail equal in size to that of the most heavy-tailed examples of *G. victoriæ*.

Represented by the adult male type (skin and complete skeleton) and an imperfect native-made skin (without skull, feet, or tail), from neighborhood of Bafwabaka, similar to the type in coloration, length of body, and in head-markings, except that the latter are yellowish through staining instead of white.

Collectors' measurements : Total length, 910 mm. (about the average for *G. victoriæ*); head and body, 495; tail vertebræ, 415; hind foot, 90; ear, 41.

Skull, greatest length, 108.8 (113.7)[1]; condyloincisive length, 105 (110); palatal length, 51.9 (52.9); maxillary toothrow (p^1-m^2), 36.8 (36.0); zygomatic breadth, 54.5 (56.8); least interorbital breadth, 15.4 (18.2); least postorbital breadth, 13.1 (14.2); across postorbital processes, 30.6 (24.8); breadth of braincase, 35 (33.8); palatal breadth (outside to outside of posterior edge of p^4), 28.6 (32.9); breadth of rostrum at p^1, 16.2 (17.9); breadth of mesopterygoid fossa, outside, 8.1 (12); incisive breadth (base of incisors), 8.0 (10.2); breadth at base of canines, 16.8 (19); greatest (oblique) length of p^4, 10.1 (10.7); greatest breadth of p^4, 5.2 (6.2); greatest breadth (transverse) of m^1, 7.1 (8.9); m^2, 2.3×1.1 (5.0×3.1); length of mandibular ramus (symphysis to posterior border of condyle), 75 (75); angle to coronoid, 25.4 (28.8); length of toothrow p_1-m_2, 40.3 (39); m_2, length 2.7× width 2.4 (5.1×3.9).

It is similar in skeletal characters to *Genetta victoriæ*, except that the bones are slenderer. The linear measurements of the limb bones are practically the same in *Osbornictis* and *G. victoriæ* in adult male skeletons of comparable ages, but the bones are far more massive in the latter, or about one-third heavier (Fig. 29). The same is true of the ribs and vertebræ (Figs. 31, 32, 33). The scapula (Fig. 30), atlas and pelvis (Fig. 33) are especially weak in *Osbornictis* in comparison with *G. victoriæ*. The scapula of *Osbornictis* is light and thin with large vacuities in both the pre- and postscapular fossæ, with translucent adjoining areas due to the thinness of the bone. The zygapophyses of the atlas also have similar translucent areas. *Osbornictis* has twelve pairs of ribs and twenty-five caudal vertebræ, *G. victoriæ* thirteen pairs of ribs and twenty-six caudal vertebræ. The number might vary, however, in other individuals of either species.

POIANA Gray

Poiana GRAY, 1864, Proc. Zoöl. Soc. London, p. 520, figs. (p. 521, skull). Type, by monotypy, *Linsang richardsoni* Gerrard.

Poiana richardsoni ochracea Thomas and Wroughton

Plates XVII, Figure 2; XX, Figure 1; and Text Figures 20C, 34, 35

Poiana richardsoni ochracea THOMAS AND WROUGHTON, 1907, Ann. Mag. Nat. Hist., (7) XIX, May, p. 372. Type locality, near Yambuya, Aruwimi River, Belgian Congo. Type a flat skin without skull.

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[1]The measurements in parentheses are of a large male of corresponding age (No. 51432) of *Genetta victoriæ*, for comparison.

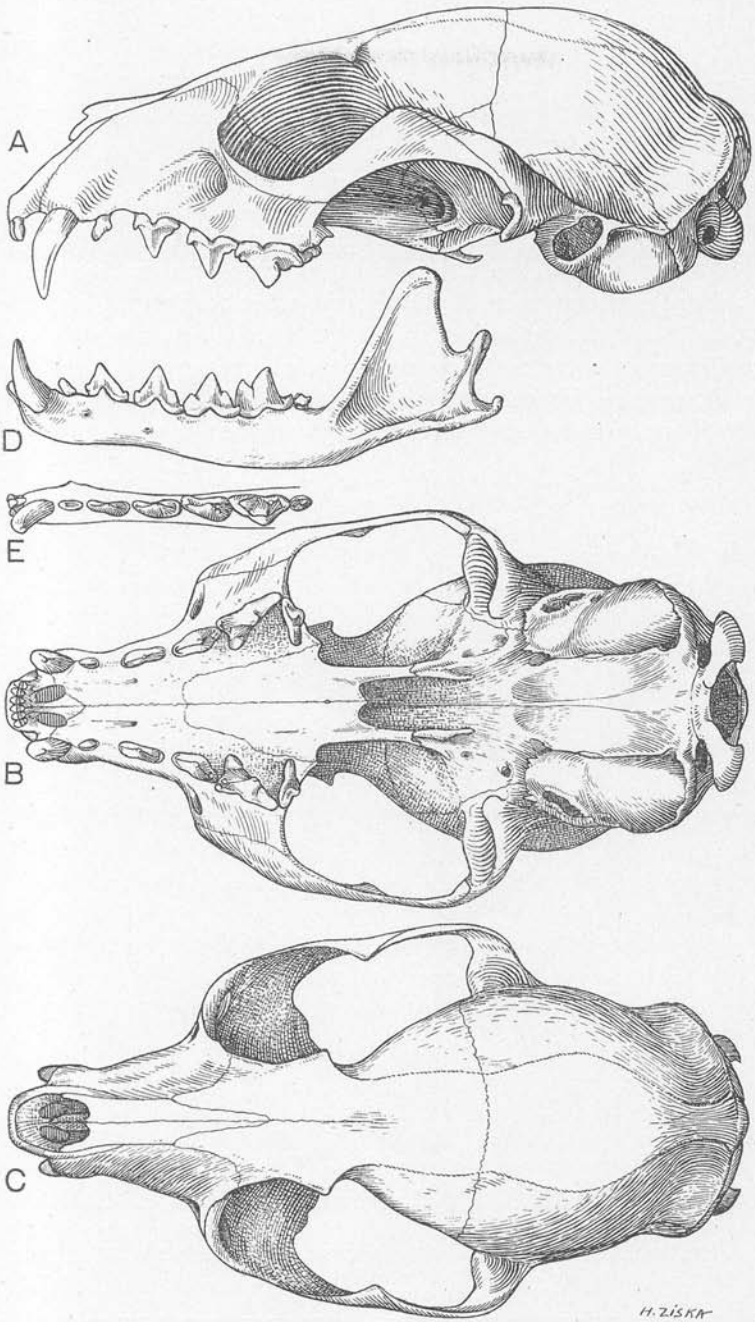

Fig. 34. *Poiana richardsoni ochracea.* Skull of subadult male (No. 51439). A, lateral view; B, palatal view; C, dorsal view; D, lateral view of left mandible; E, crown view of left lower dentition. × ¾.

Represented by four males, taken as follows:

Akenge, 1; October 25, 1913.

Niapu, 1; November 11, 1914.

Medje, 2; March 8, 1910; April 3, 1914.

The Niapu specimen is young, still retaining the entire milk dentition, but the crown of the first molar is breaking through the gum. One of the Medje specimens is fully adult; the other has acquired the permanent dentition, but the canines are only half-grown, and the milk canines are still present at the posterior base of their successors. The skull of the Akenge specimen is figured (Fig. 34).

Collectors' measurements of the 4 specimens:

Cat. No.	Sex and Age	Locality	Total Length	Head and Body	Tail	Hind Foot	Ear
51438	♂ adult	Medje	712	332	380	64	36
51441	♂ juvenile[1]	"	685	330	355	61	36
51440	♂ juvenile[2]	Niapu	588	288	300	53	31
51439	♂ juvenile[3]	Akenge	695	321	374	62	33

Fig. 35. *Poiana richardsoni ochracea* (No. 51439). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

The two skulls from Medje measure as follows: Condyloincisive length, ♂ adult 65.2, ♂ subadult 62.7; palatal length, 31.7, 28.7;

[1]Full permanent dentition present, but milk canines not shed.
[2]Milk dentition fully present, first molar breaking through the gum.
[3]Subadult.

maxillary toothrow (p^1-m^1), 19.4, 19.2; palatal breadth (outside to outside of p^4), 18.5, 18.0; zygomatic breadth, 34.1, 31.3; least interorbital breadth, 10.3, 8.4; least postorbital breadth, 13.9, 11.3; greatest breadth of braincase, 24.5, 23.7.

These four specimens agree well in coloration with the description of the type of *ochracea*, a flat skin without skull, from Yambuya, Aruwimi River,[1] stated by Pocock[2] in 1907 to be the only known specimen of the subspecies. They vary somewhat in coloration, the two from Medje and the Niapu specimen having the ground color much deeper and more rusty yellow than the specimen from Akenge (Pls. XVII, fig. 2 and XX, fig. 1).

NANDINIA Gray

Nandinia GRAY, 1843, 'List of Specimens Mamm. Brit. Mus.,' pp. xx, 54; 1864, Proc. Zoöl. Soc. London, p. 529. Type, by monotypy, *Viverra binotata* Gray.

Nandinia binotata (Gray)

Plates XX, Figure 2; XXI; and Text Figures 30C, 36–38

Viverra binotata GRAY (ex Reinwardt, Ms.), 1830, 'Spic. Zoöl.,' II, p. 9. Type locality, Ashanti, Africa.

Nandinia binotata GRAY, 1843, 'List of Specimens Mamm. Brit. Mus.,' p. 54; 1864, Proc. Zoöl. Soc. London, p. 530.

Nandinia binotata THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Medje (2), Poko (9 specimens).

Represented by 73 specimens (30 ♂, 43 ♀, of which 59 are adult and 14 juvenile), collected as follows:

Niangara, 6 (1 ♂, 5 ♀), November 9–21, December 8, 9, 1910; May 14, 1913.

Poko, 1 (♀ adult), August 29, 1913.

Akenge, 15 (7 ♂, 8 ♀), September 30, October 3–31, 1913.

Niapu, 30 (13 ♂, 17 ♀), November 1–30, December 1–28, 1913; January 2, 22, 1914.

Medje, 20 (8 ♂, 12 ♀), January 24, March 9, 17, April 1, May 1–19, June 8, August 19, 22, September 10, 15, 23, 29, 1910.

Boyulu,[3] 1 (♂ adult), September 22, 1909.

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[1] "A flat skin, obtained from a native who was wearing it on a belt and was going to make a pouch of it for holding pipe and tobacco. We noticed that it was a new skin to us, and exchanged it for a few pinches of salt."—Note by R. B. Woosnam, the collector of the specimen, in Thomas and Wroughton's report on the mammals of the Ruwenzori Expedition (1910, Trans. Zoöl. Soc. London, XIX, pt. 5, March, p. 495).

[2] 1907, Proc. Zoöl. Soc. London, II, May, p. 1044.

[3] About 45 miles southwest of Avakubi.

Collectors' measurements of 18 adult specimens (7 males, 11 females) from Niapu:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	1081(1035–1110)	510(475–570)	570(535–610)	92(84–100)	38.4(37–40)
♀	1014(965–1092)	480(440–515)	544(520–590)	88(82– 96)	36.4(35–39)

Collectors' measurements of 12 adult specimens from Akenge and of 11 from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot
7 ♂, Akenge:	1026(920–1135)	483(450–530)	542(465–617)	95.3(90–102)
5 ♀, "	1024(980–1100)	491(465–537)	529(494–563)	93.6(88– 97)
3 ♂, Medje:	1051(1032–1060)	492(467–515)	562(545–575)	92.7(90– 98)
8 ♀, "	1038(970–1100)	481(440–510)	556(530–600)	92.0(90– 95)

Measurements of Eight Adult Male and Ten Adult Female Skulls of *Nandinia binotata* from Niapu

Cat. No.	Sex and Age	Condylo-incisive Length	Palatal Length	Palatal Breadth (outside to outside of p^4)	Maxillary Toothrow (p^1-m^2)	Zygomatic Breadth	Tip to tip of Postorbital Proc.	Breadth Braincase
51487	♂ old	100.9	46.4	32.6	29.4	60.0	28.0	33.8
51491	♂ "	96.7	44.7	29.4	28.2	52.8	23.2	32.3
51497	♂ "	100.5	45.7	30.0	30.0	56.0	27.6	33.3
51504	♂ "	97.4	45.7	28.7	27.9	53.6	30.2	31.5
51506	♂ ad.	94.6	45.4	27.7	28.5	53.8	26.7	31.9
51507	♂ old	105.1	48.7	32.1	30.6	59.8	28.2	32.2
51508	♂ ad.	97.6	43.9	30.6	27.8	58.7	——	32.1
51512	♂ old	100.0	48.0	31.6	28.8	58.6	30.8	31.7
Average	**8 ♂**	**99.1**	**46.1**	**29.1**	**28.9**	**56.8**	**27.5**	**32.4**
Minimum	"	94.6	43.9	27.7	27.8	52.8	23.2	31.5
Maximum	"	105.1	48.7	32.6	30.6	60.0	30.8	33.8
51492	♀ ad.	99.4	42.2	28.0	26.5	50.8	24.4	31.0
51493	♀ old	92.0	41.6	29.7	27.5	50.8	25.7	30.4
51494	♀ "	96.8	45.7	29.2	29.3	53.7	30.4	29.6
51495	♀ "	91.3	43.1	30.6	27.9	52.3	28.7	31.8
51500	♀ ad.	93.5	43.4	29.3	27.5	50.0	23.1	30.4
51501	♀ old	98.7	47.3	30.5	30.0	52.9	27.3	29.8
51505	♀ ad.	97.4	43.9	29.5	27.0	51.9	26.9	32.0
51509	♀ "	95.7	45.2	27.8	28.0	——	——	30.8
51510	♀ "	91.2	41.5	30.2	27.7	52.9	28.9	32.5
51513	♀ old	93.7	43.7	29.0	28.1	54.2	28.0	31.8
Average	**10 ♀**	**95.0**	**43.8**	**29.4**	**28.0**	**52.2**	**27.0**	**31.0**
Minimum	" "	91.2	41.5	27.8	26.5	50.0	23.1	29.6
Maximum	" "	99.4	47.3	30.6	30.0	54.2	30.4	32.5

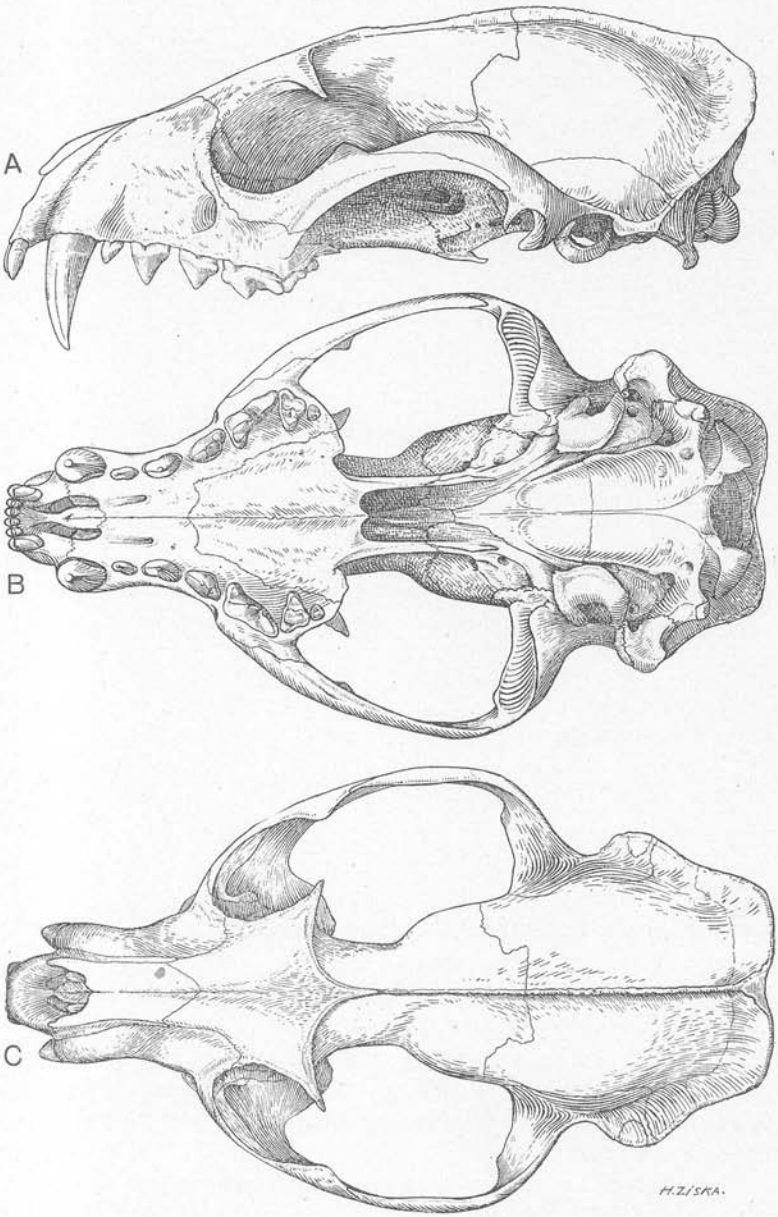

Fig. 36. *Nandinia binotata*. Skull of adult male (No. 51512). A, lateral view; B, palatal view; C, dorsal view. Natural size.

Measurements of ten adult skulls from Akenge and of six from Medje:

	Condylobasal Length	Zygomatic Breadth
4 ♂, Akenge:	97.1 (93.5–102.5)	55.9 (50.7–62.6)
6 ♀, "	95.8 (92.6– 98.7)	51.2 (47.2–56.2)
2 ♂, Medje:	101.3 (94.9–107.6)	55.3 (54.9–55.7)
4 ♀, "	93.2 (90.6– 94.7)	56.5 (49.0–53.9)

Males average slightly larger than females but, as the range of individual variation is twice that of the average sexual difference, size cannot be taken as diagnostic of sex.

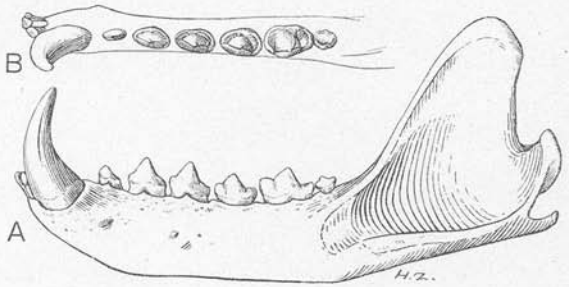

Fig. 37. *Nandinia binotata.* Adult male (No. 51512). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

The small peg-like m^2 is often absent in specimens past middle age, one or both (usually both) having been lost in about 50 per cent of the older skulls, in most instances leaving no indication of its former presence.

A series of ten young skulls shows that the first premolars do not appear above the gums till the milk teeth are fully mature, and have no successors, being permanent teeth. Quite an interval elapses after the maturity of the deciduous dentition before the first molar shows any indication of breaking the alveolus. The postorbital processes, and coincidently of course the postorbital constriction, take form before any of the deciduous premolars are through the gum, whereas in *Genetta* these features are not indicated till about the time the milk teeth have reached full development.

Skulls in which only mature milk teeth are present have a total length of about 67 to 70 mm., a zygomatic breadth of 36 to 38 mm., and a breadth of braincase of 29 to 30 mm. Those in which the first milk premolars are piercing the gum have a total length of about 10 mm. less (56–58 mm.), with other dimensions proportionate, while those in which

the first molars (m^1 m_1) are breaking through the gum are about 10 mm. longer than the first mentioned, the skull length increasing from about 56 mm. to about 80 mm. during the development of the milk teeth.

The present collection of nearly seventy-five specimens, representing three localities by series of fifteen, twenty and thirty each, shows that there is a wide range of individual variation in coloration in *Nandinia* as well as in the genets, especially among adults. Young in the nursling stage—in the woolly first coat with the milk teeth still enclosed in the gum—indicate less difference in coloration between the first and later pelages than is the case with some of the genets. The pattern is like that of adults but the black markings are duller and less sharply defined and the ground color is much paler, being grizzled pale brown varied conspicuously with whitish-tipped hairs above and with pale fulvous below—not dull, dingy gray, as in the *Genetta pardina* group. The light tail-rings, however, are not very unlike those in adults, being pale rusty-buff, and are similarly variable in number and character. The pair of light shoulder spots is present but less prominent and paler than in older specimens (Pls. XX, fig. 2 and XXI, fig. 2). The series of fourteen young, ranging in age from nurslings to subadult, present a very uniform general tone of coloration, the underparts being yellowish-washed and the ground color of the upperparts varying from grayish brown to pale reddish brown or "wood brown." The range of variation is, in general effect, much less than among adults. They merge in coloration into the series of adults without break in the transition at any stage.

The extreme phases in adults are, for the ground color of the upperparts, gray faintly suffused with pale buff to ochraceous tawny, and for the underparts from pale ochraceous buff to dull tawny olive. In the former the light shoulder spots are pale yellowish white, in the latter rich ochraceous buff. The black neck-bands vary greatly in breadth and distinctness; the median one is usually broad and heavy, much broader than the lateral ones, but sometimes is reduced to a narrow line; the lateral bands are sometimes nearly as broad and heavy as the median band, but often are very narrow, irregular or more or less broken, and inconspicuous (Pl. XXI, fig. 1). In none are the neck-bands wholly absent, as in *N. gerrardi* Thomas.

The black annulations on the tail are exceedingly unstable as to number, the completeness of the rings, and distances apart. For the proximal fourth of the tail they are often reduced to pairs of lateral spots, but occasionally these spots are joined dorsally and ventrally and thus form complete rings. On the middle of the tail the rings are usually

complete but vary in width, sometimes being more than half as broad as the brown interspaces; often they have the character of partly coalesced double or even triple rings. Rarely they are rather evenly distributed from the base to near the tip of the tail, and vary in number in different specimens from about twelve to fifteen. On the apical third of the tail the rings are usually nearly obsolete or very irregular and lose their

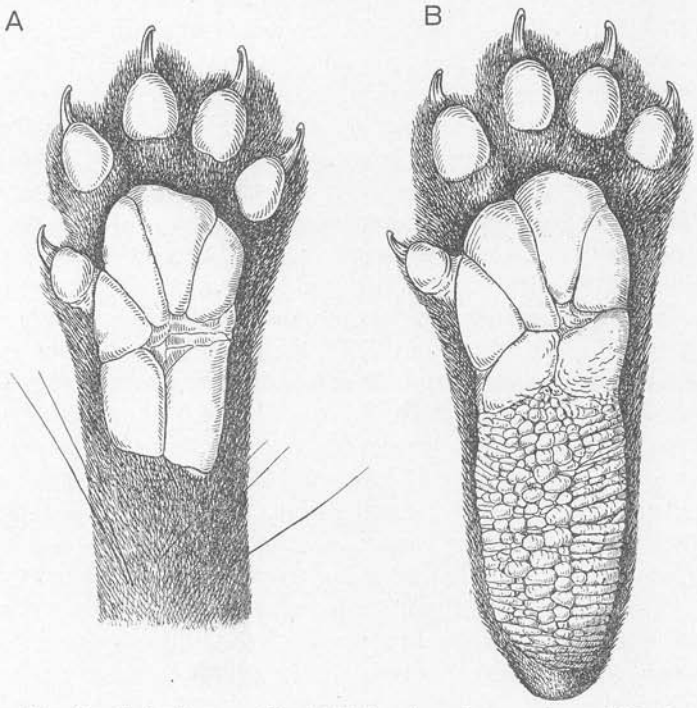

Fig. 38. *Nandinia binotata* (No. 51504). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

distinctness as rings, forming irregular spots and blotches rather than annulations. The irregularities are so great that their number and character fail to be of diagnostic value.

Nandinia binotata arborea Heller proves on comparison with the Congo series to be surprisingly different, through its pale general coloration, both above and below, the relative indistinctness and reduced size of the dark markings and much heavier tail. It seems to form a distinctly intermediate stage between *N. binotata* and *N. gerrardi*, but not intimately related to either.

Herpestinæ[1]

The Herpestinæ are represented in the present Congo Collection by nine genera (*Herpestes, Galerella, Helogale, Mungos, Crossarchus, Ichneumia, Xenogale, Atilax* and *Bdeogale*) and ten species. Of these, one genus and three forms are new. The total number of specimens is 169.

On taking up the study of the large collection of mongooses obtained by The American Museum Congo Expedition, it soon became evident that a number of complicated questions of nomenclature required careful consideration, as well as others of a taxonomic character. As in some instances several generic groups are involved in a single inquiry, it has seemed better to present the results collectively as introductory matter than to scatter them at intervals through the systematic list of the species. It has also seemed desirable to present not only the results, but to indicate rather fully the premises on which the conclusions rest, even at the risk of incurring the charge of prolixity. Heretofore results of such investigations have often been given without much information as to how they were obtained. A notable case is that of the substitution, about a decade since, of *Mungos* for *Herpestes*, and the abrupt relegation of the latter to synonymy.

Our most serious nomenclatural problems usually have their origin in the methods and imperfect knowledge of the pioneers in natural history, and the carelessness of subsequent compilers, striking examples of which are shown below, notably in the confusion of the two totally different Vansires, the first described by Buffon and Daubenton (1765), the second by F. Cuvier (1826). The genera especially considered below, from a nomenclatural point of view, are *Mungos, Herpestes, Atilax*, and *Ariela;* from a taxonomic point, *Crossarchus* and *Galerella*. Also the specific names *mungo* and *fasciatus*, and the notorious composite known in the literature of mammalogy as "*Mustela galera* Erxl."

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[1]Pocock, in 1916, in a paper entitled 'On the External Characters of the Mongooses (Mungotidæ)' raised the mongoose group to the rank of a family, Mungotidæ (1916, Proc. Zoöl. Soc. London, I, pp. 349–374, Figs. 1–10) without giving his reasons for this action. In 1919, in his paper 'The Classification of the Mongooses (Mungotidæ),' he took occasion (1919, Ann. Mag. Nat. Hist., (9) III, June, pp. 515–524) to do this, as well as for his giving generic rank to *Atilax, Ichneumia*, and *Ariela* in his former paper. While he may be quite justified in assigning family rank to the mongooses, I prefer for the present to consider them a strongly specialized subfamily of the Viverridæ. There nevertheless remains a nomenclatural point to be considered. A few months after Pocock's last cited paper appeared I published my note, written some two years before, on 'The Generic Names *Mungos* and *Herpestes*' (1919, Journ. Mammalogy, I, No. 1, November 28, pp. 27–31), showing that both names were tenable, since although *Mungos* was the earlier name it in no sense replaces *Herpestes*. Pocock, in defending his new family name Mungotidæ says (*loc. cit.*, p. 515, footnote): "But since *Herpestes*, being preoccupied, no longer stands for the typical mongooses, *Mungos* is used instead. Similarly, Mungotinæ has taken the place of Herpestinæ." For my part I cannot see why the name Herpestinæ, dating from Gray, 1869, should give place to Mungotinæ, dating from Pocock, 1916.

La Mangouste of Buffon and Daubenton[1]

The introduction of the name Mangouste into natural history literature dates from the publication of Volume XIII of Buffon's 'Histoire naturelle, générale et particuliére, avec la description du Cabinet du Roi,' in 1765. The generalities of the subject were written by Buffon and the descriptions of the species by Daubenton, who doubtless was the supervisor of the preparation of the plates. In the present instance all the then known animals now called mongooses were included under "La Mangouste" by Buffon,[2] who believed there was only one species, and that the different kinds recognized by previous authors were merely varieties of it. The name mangouste was invented by Buffon, who thus explains its etymology in a footnote to the title of the article: "Mangouste, mot dérivé de *Mangutia*, nom de cet animal aux Indes." Buffon's contribution of ten pages of text is a summary and criticism of what had been written by previous authors about these animals; Daubenton's two pages contain a very good description of the banded mongoose of Africa, based on a stuffed skin; the accompanying plate, he states, was made from a living specimen received from M. le Chevalier d'Arcy, but no indication is given as to where this or any of the several other specimens he mentions having seen were obtained. On Daubenton's contribution hinges the settlement of various important questions of nomenclature.

Linnæus, in the 1758 edition of his 'Systema Naturæ' (I, p. 43) instituted the genus *Viverra*, with five species, belonging to the two families Viverridæ and Mustelidæ of later authors, of which three species pertain to the former and two to the latter. All the five species were composite, but they have since been resolved into their specific elements and the original names in each case conserved for one of them. All the references to mongooses were originally placed under the first species, *Viverra ichneumon*, based primarily on the ichneumon of Egypt, for which this specific name is properly retained. No material change was made in the 1766 edition of this work (I, p. 63), all the citations being the same as in the 1758 edition, except that the question was raised as to whether the *mungo* of India might not be a different species from the Egyptian *ichneumon*.[3]

The next work of nomenclatural importance in this connection is Gmelin's edition of the Linnean 'Systema Naturæ,' the first volume of

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[1]This discussion was published in part under the caption 'The Generic Names *Mungos* and *Herpestes*,' 1919, Journ. Mammalogy, I, No. 1, November 28, pp. 27–31.

[2]*Loc. cit.*, XIII, pp. 150–159 (by Buffon), pp. 160–162, Pl. XIX (by Daubenton).

[3]"Mungo β *simillima minor, glauca; an specie diversa?*"

which, containing the mammals, was published in 1788, in which (pp.84–86) five species of mongoose were recognized, the second of which, *Viverra mungo*, is the only one especially related to the present discussion. *Viverra mungo*, although composite, was primarily based on the banded mongoose of Africa, although its habitat is given as India,[1] and references to various Asiatic species are included in the citations of authors under this name. As no diagnosis is given by which the species can be recognized it must be determined by the first identifiable reference. The first, it happens, is "Schreber Säugthiere, III. p. 430. t. CXVI. A. CXVI. B." Schreber's plate CXVI is an accredited copy of Buffon's figure of "La Mangouste."[2] Buffon and Daubenton supposed that their specimens came from India, but as already stated, no definite place of origin is given for any of the several specimens mentioned by them. Hence for many years Buffon's "La Mangouste" was believed to be an Indian species. For nearly a century, however, it has been recognized that Daubenton's plate and description were really based on the banded mongoose of Africa, currently known in technical literature as *Crossarchus fasciatus* (Desmarest).

In 1803 E. Geoffroy, in his 'Catalogue des Mammifères du Museum nationale d'Histoire naturelle' (Paris), redescribed "La Mangouste" of Buffon and Daubenton *from the specimen which served as the basis of the original description*, under the designation "La Mangouste de l'Inde. *Ichneumon mungo*," giving the distinctive characters as "Pelage varié de roux et de noir, par zones transversales; queue pointue; pieds pentadactyles." Among his citations are "La Mangouste, Buff. Daub. t. 13, pp. 150–160, pl. 19"; "*Viverra mungo*, Schreber, tabl. 116"; "*Viverra mungo*, Lin. Gmel., p. 84, pl. 7." Then follows a detailed description, the "patrie" ("Les indes orientales"), the number of the specimen in the catalogue of the Museum ("No. CCXXIV"), followed by the remark: "Individu qui a servi de sujet pour la descript. précédente, et celle de Buffon." The identity of the original La Mangouste is thus thoroughly established.

Desmarest (1820, 'Mammalogie,' I, p. 211) gave essentially the same description, based doubtless on the original type-specimen, under the names "Mangouste à bandes, *Herpestes mungo*." Three years later (1823, 'Dict. Sci. Nat.,' XXIX, p. 58) he changed the technical name to *Herpestes fasciatus*, because the name *mungo* was not "classical." He

[1] "Habitat in Bengala, Persia, aliisque Asiæ calidioribus plagis."

[2] Die Manguste. Tab. CXVI. CXVI. B. The first reference is "*Viverra Ichneumon β.* Linn. syst. Ed. 12]. p. 63." Plate CXVI is accredited in the list of plates (p. 587) as from "Buffon XIII. t. 19."

repeats the geographical error: "La mangouste à bandes est particuliére à l'Inde." Fischer (1829, 'Syn. Mamm.,' p. 163), six years later, under *Mangusta mungo*, says: "Hab. in India orientali." In fact, the real habitat of La Mangouste, alias Mangouste à bandes, was first made known by Ogilby in 1835, when in an account of a collection of mammals collected in Gambia (1835, Proc. Zoöl. Soc. London, p. 101), he says: "Mr. Rendall has brought over specimens of two *Herpestes*, one of which, the *Herpestes Mongos* of Linnæus, very well figured and described by Buffon (Hist. Nat., tom. xiii. tab. 19), deserves to be noticed, for the purpose of correcting the habitat of the species, which, upon Buffon's authority, has hitherto been given as India, but which Mr. Rendall's specimens clearly show to be the west coast of Africa. The mistake originally arose from Buffon's having identified the *Mangouste à bandes*, the species at present under consideration, with the *Mongos* of Kæmpfer, unquestionably an Indian species (the *Herpestes griseus* of authors), and still commonly called by that name in Upper India, where many natives and Europeans keep it in a semidomestic state, for the purpose of destroying vermin. . . ."

Thomas, in 1882, in his important paper 'On the African Mungooses' (Proc. Zoöl. Soc. London, pp. 59–93, Pl. III) said, under *Crossarchus fasciatus* (*loc. cit.*, p. 91): "This species by its locality, and not *C. zebra*, no doubt represents the early-known '*Viverra mungo*,' which was said to come from the 'East Indies.' No cross-striped Mungooses, however, are known from India, and the original specimens must have been obtained from the Cape. All the specimens with exact localities that I have seen come from the eastern parts of the Colony, and none from the western; so that we may suppose that its true range is very similar to that of *Herpestes pulverulentus*. Probably, however, tame examples were sometimes brought down to Capetown, where they would be seen by the earlier travelers." Thomas was so fully convinced that the *Viverra mungo* Gmelin is the *Crossarchus fasciatus* of later writers that he felt called upon to explain in a footnote his reason for ignoring the rule of priority in this case and accepting *fasciatus* instead of *mungo*, as follows: "This name [*mungo*] is so utterly barbarous, and that of *H. fasciatus* so well known, that I think we are justified in ignoring it and using Desmarest's classical and appropriate term" (*loc. cit.*, footnote to p. 90).

The status of *Viverra mungo* (=La Mangouste of Buffon and Daubenton) has a vital bearing on the correct application of the generic name *Mungos*, revived by Wroughton[1] in 1907 to replace *Herpestes*

[1]1907, Ann. Mag. Nat. Hist., (7) XX, pp. 110–121.

Illiger (1811), and for this reason has been presented in perhaps needlessly full historic detail. It also has an equally important bearing on the specific name of the "Common Mongoose" of India. Wroughton used *Mungos* for a group of small African mongooses to which I have applied *Galerella* Gray (p. 175).

The Generic Name *Mungos* Geoffroy and Cuvier

The genus *Mungos*, like many of the early genera of post-Linnean origin, was introduced rather informally and without much detail by E. Geoffroy and G. Cuvier in their 'Mémoire sur une nouvelle division des Mammifères' in the 'Magasin Encyclopédique' in 1795 (II). This memoir is stated by the authors to be merely a sketch or outline to be amplified later, with some of the genera presented provisionally. The higher groups are only briefly characterized, and their content indicated by an enumeration of the genera, designated only by vernacular names, followed by technical names in parentheses, of the species respectively referred to them. The following are examples from the Plantigrades (*loc. cit.*, p. 184): ". . . les ours (*ursus*, L.); les ratons (*ursus lotor*, L.); les coatis (*viverrae nasua, narica, tetradactila et vulpecula*, L.); les blaireaux (*ursus meles*, etc.); . . . les mangoustes (*viverra ichneumon et mungos*); . . . ." This is followed by a tabular classification of the orders and genera. The classification of the Plantigrades (p. 187) is as follows:

"Ordre III. PLANTIGRADES. Dcigts onguiculés; trois sortes de dents; point de pouces séparés; plante entière appuyée."

The ten genera referred to this order follow in a single column, the vernacular name standing first and the technical equivalent following it in parenthesis, thus:

"Ours (*Ursus*).	Coati (*Nasua*).
Raton (*Lotor*).	Kincajou (*Potos*).
Glouton (*Gulo*).	Taupe (*Talpa*).
Blaireaux (*Taxus*).	Musaraigne (*Sorex*).
Mangouste (*Mungos*).	Hérisson (*Erinaceus*)."

In the preceding enumeration four of these genera are credited to Linnæus; two (*Gulo*, *Nasua*) date from Storr (1780); the other four (*Lotor*, *Taxus*, *Mungos*, *Potos*) first appear here, but two of them are antedated by names given by Storr (*Lotor* by *Procyon*, *Taxus* by *Meles*), leaving two, *Mungos* and *Potos*, both in current use. *Potos* was monotypic, with "*Viverra caudivolvula*, L." as type. *Mungos* contained two species, *Viverra ichneumon* Linnæus and *Viverra mungo* Gmelin. *Viverra*

mungo is therefore automatically the genotye of *Mungos*. Furthermore, *Viverra mungo* is not a species of *Herpestes* Illiger (type, *Viverra ichneumon* Linnæus, by several "subsequent designations"), it being noncongeneric with the genotype of *Herpestes*.

As already shown in the discussion of "La Mangouste" of Buffon and Daubenton, it is the banded mongoose of Africa, the *Crossarchus fasciatus* of current nomenclature, which should henceforth bear the name *Mungos mungo* (Gmelin). *Ariela* Gray (1864) is a synonym of *Mungos*, having been especially founded for the South African banded mongoose (*Ichneumon tænionotus* A. Smith) under a misapprehension of its real characters. *Mungos* of Gray (1864, Proc. Zoöl. Soc. London, pp. 575–577), it singularly happens, is essentially the *Mungos* of Geoffroy and Cuvier, although Gray evidently knew nothing of the *Mungos* of these earlier French authors, this agreement being apparently a coincidence. Under his *Mungos fasciatus* Gray placed *Herpestes mungo* Desmarest, thus rendering this species, under modern rules, automatically the genotype of his genus *Mungos*.

The restoration of *Mungos* to its proper place in nomenclature need not in the least disturb the stability of *Crossarchus* F. Cuvier (1825), which has, by monotypy, *Crossarchus obscurus* F. Cuvier as its genotype, for which and later described allied forms it should be retained. As thus restricted *Crossarchus* forms a group very different from the banded mongooses for which *Mungos* is available and to which it should be restricted. Gray showed good judgment in separating the two groups generically. Attention has recently been called to the generic distinctness of these groups by Pocock, he adopting for the banded mongooses Gray's unavailable name *Ariela*.[1] He also calls attention to the fact that the inclusion of the two groups under *Crossarchus* was due to erroneous information concerning the structure of the anal glands. Before meeting with Pocock's paper I had become strongly impressed with their incongruity and their evident generic distinctness.

The Generic Name *Herpestes* Illiger

Herpestes Illiger (1811), type,[2] *Viverra ichneumon* Linnæus, after almost universal employ for three-fourths of a century, was hastily and, as it now appears, needlessly displaced in 1907[3] by *Mungos* Geoffroy and

[1] On the severance of *Ariela* Gray (=*Mungos, s.s.*) from *Crossarchus* see Pocock, 1916, Proc. Zoöl. Soc. London, p. 350 and figures on pp. 353, 356, 360, 369.

[2] By subsequent designation (Anderson, 1878, 'Anat. Zool. Res. Exped. Yunnan,' I, p. 171· Thomas, 1882, Proc. Zoöl. Soc. London, p. 63.

[3] Cf. Thomas, Ann. Mag. Nat. Hist., (7) XIX, p. 119, footnote.

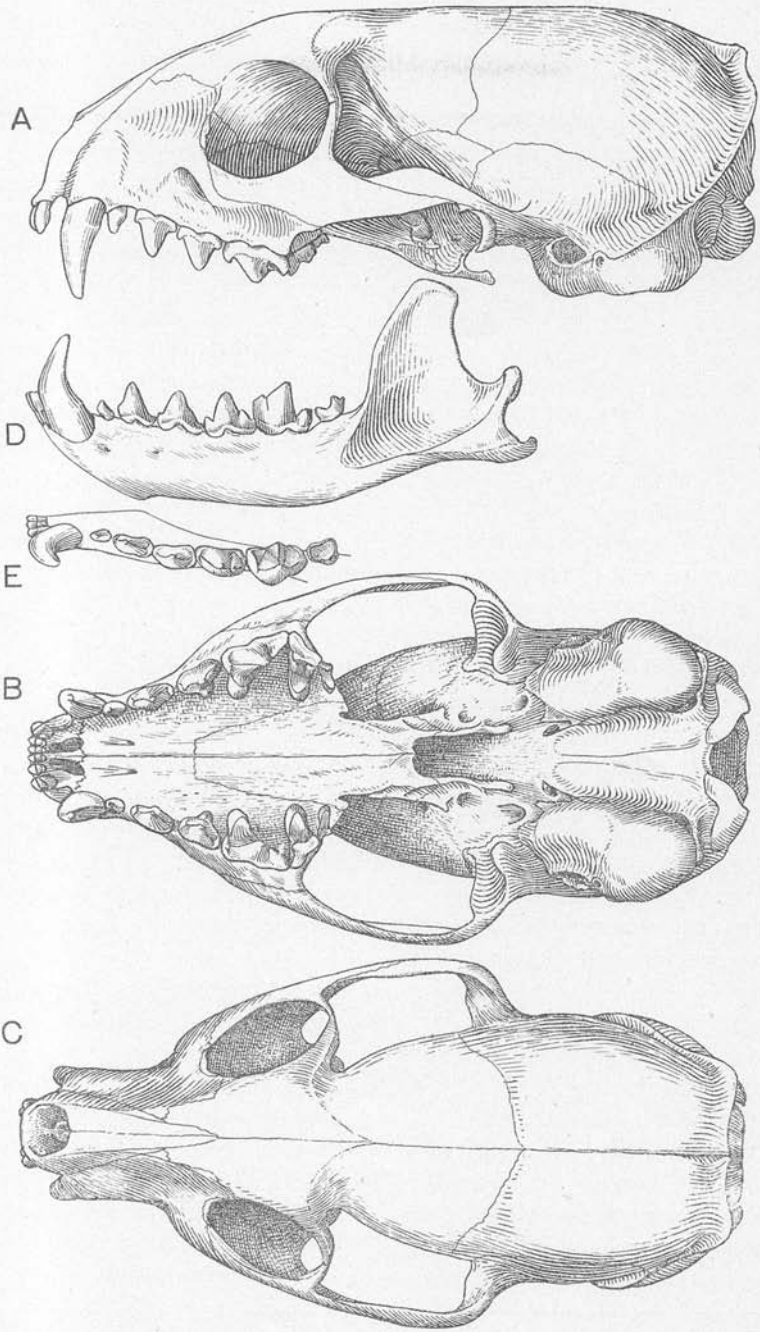

Fig. 39. *Calogale nyula*. Skull of adult male (No. 10431; Jamaica). A, lateral view; B, palatal view; C, dorsal view; D, lateral view of left mandible; E, crown view of left lower dentition. × ⅔.

Cuvier and immediately the latter became current for the greater part of the mongooses of both Africa and Asia. It should now be returned to its time-honored place in nomenclature, through the allocation of *Mungos* to its proper station.

The Technical Name of the "Common Mongoose of India"

Text Figures 39 and 40

J. E. Gray in 1864 (Proc. Zoöl. Soc. London, pp. 560–565) removed most of the small mongooses of both Africa and Asia from the genus *Herpestes* and divided them into several new generic groups that require consideration in connection with the determination of the proper specific, as well as the generic, name of the so-called "Common Mongoose of India." These genera, in the order of page precedence, are *Calogale* (p. 560), *Galerella* (p. 564), and *Calictis* (p. 564). The last two are monotypic, rendering the genotype of each automatically determinable, that for *Galerella* being *Herpestes ochraceus* Gray (1848), and that of *Calictis* being *Herpestes smithi* Gray (1837). *Galerella* is therefore available for the weasel-like mongooses of Africa, and has no bearing on the nomenclatural status of the "common mongoose" group of India. *Calogale* is a heterogeneous association of both African and Indian species, the former belonging in *Galerella*. Of the fourteen species originally included in *Calogale*, four are Indian, nine African, the other from an unknown locality. The genotype of *Calogale* is *Herpestes nepalensis* Gray, by designation of Thomas in 1882 (Proc. Zoöl. Soc. London, p. 63). As *Calogale* has precedence of four pages over *Calictis*, and as their genotypes are congeneric, *Calogale* is the generic name available for the "common mongoose" group of India.

As already shown (*supra*, pp. 157, 158), not only is *Mungos* untenable as a genus name for any Indian mongoose, but also the species name *mungo* is equally a misnomer when applied in the same connection, it belonging unquestionably to the banded mongoose group of Africa.

Prior to 1915 the species name *griseus*[1] was usually applied to the "common mongoose" of India, in which year *mungo* (ex Gmelin) was adopted in its place by Wroughton[2] in an article entitled 'The Common Indian Mongoose,' in which he says: "The oldest specific name for this animal is '*mungo*.' In Report No. 1,[3] I erroneously stated that Gmelin gave no type-locality for the species, but this was a mistake, for in his

[1]Ex *Ichneumon griseus* E. Geoffroy, 1813, 'Descrip. de l'Egypte, Hist. Nat.,' II, p. 138. Also of Desmarest (1818, ex Geoffroy), and of later authors generally.
[2]1915, Journ. Bombay Nat. Hist. Soc., XXIV, No. 1, September 20, pp. 50–54.
[3]1912, 'Mammal Survey of India,' Journ. Bombay Nat. Hist. Soc., XXI, p. 401.

Syst. Nat., p. 84, 1787, he writes 'Habitat in Bengala, Persia, aliisque Asiae callidioribus plagis.' The specimens in the Bengal, Bihar, Orissa collection of the Mammal Survey are therefore topotypes, and at last we have a firm foundation for dealing with the species." In view of the history of the case as set forth in the preceding pages of this article, this statement is, to put it mildly, a bit surprising, especially in view of Thomas' admissions in 1882 (see above p. 156), and the fact that the name *Viverra mungo* had been correctly assigned to the banded mongoose group of Africa for over a century, and the error in its originally assigned "habitat" had been known for three-fourths of a century. As already shown (*supra*, p. 156), the barbarous character of the name *mungo* alone prevented Thomas, in 1882, from giving the name its rightful priority over *fasciatus*.

In commenting on the case Wroughton adds: "The names *nems*, *edwardsi*, and *griseus* are supported by descriptions too vague to indicate more than that the animal was the large mongoose of India." In his synonymy of *Viverra mungo* Gmelin, Wroughton included four names, of one of which (*Mangusta nyula* Hodgson, April 1836) he says: "Three cotypes of *M. nyula* are in the National Collection and agree entirely with these specimens from Bihar, Orissa." *M. nyula* is the only species among the four cited under *Mungos mungo* that is not rated as either indeterminable or as a synonym of *nyula;* hence logically *nyula* should replace *mungo* as the earliest identifiable specific name for the group, which should stand as *Calogale* (or *Herpestes*) *nyula* (Hodgson). This does not conflict with the recognition of *Herpestes nepalensis* Gray, of later date (October 1837), as genotype of *Calogale* unless the two species should prove to be the same, in which case of course the genotype will bear the earlier name of *nyula*.[1] It may be noted that Thomas has nominated a lectotype for *Viverra* (*Mangusta*) *nyula* (Hodgson) from the cotypes of this species in the British Museum (cf. 1918, Journ. Bombay Nat. Hist. Soc., XXV, January 15, p. 370.

When Gray published his revision of the mongooses in 1864 he was evidently greatly handicapped by the scantiness of his material and by its poor quality, no mention being made in many cases of the skull of the forms he recognized. This may also explain his singular allocations of some of the small mongooses of Africa and India, particularly of those he associated under *Calogale*, and his retention of *Herpestes griseus* (auct.) and other allied forms in *Herpestes*. Under *Calogale* he noted, however, the close resemblance of both *nyula* and *nepalensis* to "*griseus*."

[1]Respecting the status of *Herpestes nepalensis* Gray, see Wroughton, 1917, Journ. Bombay Nat. Hist. Soc., XXV, March 30, p. 68.

Neither *Calogale* nor *Galerella* was recognized by subsequent authors until Matschie adopted *Calogale* as a full genus, without discussion or explanation, in 1914[1] for the African group referred below to *Galerella* (pp. 175, 182). In this paper Matschie not only reinstated nearly all of the previously described forms of this group which had been rejected by Wroughton and Thomas as synonyms but added thirteen new ones, many of them based on single specimens, and apparently with little regard for geographical considerations, and quite in agreement with his adoption of *Calogale* instead of *Galerella* for the African group.

Calogale, as here restricted, is much more nearly related to *Herpestes* than to *Galerella,* the "common" mongooses of India being a reduced type of the ichneumons of Africa, resembling them in pelage, which is

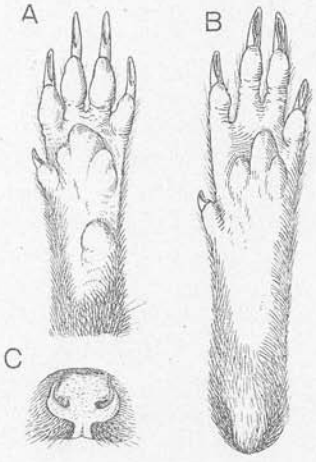

Fig. 40. *Calogale nyula* (No. 10431). A, palmar surface of left fore foot; B, plantar surface of left hind foot; C, rhinarium. Natural size.

long and coarse in both, and also in external form, but differing in important details of cranial structure (Figs. 39, 41, 42, 45), especially of the postpalatal region and in the form of the bullæ. Taxonomers will differ respecting the rank that should be assigned to *Calogale.* For those who give it generic value, the proper name for the Indian mongoose formerly known as *Herpestes griseus* should be *Calogale nyula* (Hodgson), and for those who reject *Calogale* as a full genus, it should be *Herpestes nyula* (Hodgson), with of course trinominals for the various subspecies of the group.

[1]1914, 'Einige Hermelin-Mangusten von Ost- und Mittelafrika,' von Paul Matschie. Sitzungsb. Ges. Naturf. Freunde Berlin, No. 10, December, pp. 435–457.

The Vansire of Buffon and the *Mustela galera* of Schreber and Erxleben

The "Vansire" of Buffon and Daubenton (1765, 'Hist. Nat.,' XIII, pp. 167–170, Pl. XXI) and the technical name *Mustela galera* of Schreber (1777, 'Säugthiere,' III, Pl. CXXXV, and Erxleben (1777, 'Syst. Reg. Anim.,' p. 453) have primarily the same basis.[1] The animal described as the Vansire is said to have been brought from Madagascar, and was identified by Buffon and Daubenton with the "Vondsira" of Flacourt, mentioned briefly in his 'Histoire de la grande île de Madagascar' about a century before. The name "Vohang-sira" transmitted by Poivre to these authors was modified by them to "Vansire" for greater facility of pronunciation. Later I. Geoffroy Saint-Hilaire (1839, Mag. de Zool., Mamm., pp. 28, 29 of the text to Pls. XIV and XVII) gave a satisfactory explanation of the several forms of this word as used by the natives of the environs of Tamatave, who applied it to species of the old *Galidictis* group. Besides this, the description of the Vansire by Buffon and Daubenton suggests this application of the name, especially in respect to size, coloration, and the number of cheek-teeth, namely six on each side in the upper jaw and five on each side in the lower jaw, making a total of thirty-eight teeth in all. As said by Mivart in 1882 (Proc. Zoöl. Soc. London, p. 189): "It appears that it is a species of this genus [*Hemigalidia* Mivart = *Salanoia* Gray] which is the Vansire of Buffon (Hist. Nat. xiii. p. 167, pl. 21), as had it been *Galidia* the black-ringed tail would surely have been indicated."

Yet the name Vansire of Buffon and the technical name *Mustela galera* of Erxleben were early transferred exclusively to an African mongoose, under the belief that while the animal originally described by Buffon and Daubenton as the Vansire may have been brought, as stated by them, from Madagascar,[2] it came originally from Africa and that in reality it was an African species. This is the so-called Water Mongoose, or Marsh Mongoose, of West and South Africa (*Herpestes paludinosus* G. Cuvier), for which the name *Viverra* (or more commonly *Herpestes*) *galera* was in nearly universal use down to about 1908. In 1882 Thomas expressed the then prevalent belief respecting the Vondsira of Flacourt and the Vansire of Buffon as follows: ". . . . Its reputed occur-

[1]Erxleben cites Schreber's Plate CXXXV, which preceded the text in publication, while Schreber, in his text, cites Erxleben's *Mustela galera*. The specific name *galera* is therefore to be credited to Schreber. While Schreber's legend for Plate CXXXV is "*Mustela galera* Brown," Schreber, in his list of the plates of Volume III of the 'Säugthiere' credits it to Buffon ("Buff. XIII. t. 21").

[2]Eleven years later, however, Buffon (1776, 'Hist. Nat.,' Suppl., III, pp. 173, 174) made the following reference to the Vansire: "Le Vansire est, comme nous l'avons dit, un animal de Madagascar & de l'intérieur de l'Afrique. . . . ." It was also probably on this basis that Erxleben gave: "Habitat in Guinea et Madagascar" for his *Mustela galera*. Desmarest, in 1828 ('Dict. des Sci. Nat.,' LVI, p. 487), however, defined Vansire as: "Nom specifique d'une mangouste de Madagascar et de l'Isle-de-France."

rence in Madagascar caused Dr. Gray and others to believe that there were two species, the one in Africa being naturally supposed to be distinct; but now, as no other specimens have since occurred in Madagascar, we are justified in concluding that Flacourt only saw an introduced specimen, and that it is not indigenous to that island" (1882, Proc. Zoöl. Soc. London, p. 73). In a footnote to a preceding page (p. 60) of the same paper, he had already said: "Prof. Milne-Edwards informs me that, in his opinion, 'Le Vansire' (*Herpestes galera*), usually said to have originally come from Madagascar, was certainly not obtained there, no other collectors having met with it in that island since."

A quarter of a century later (in 1908) Thomas had abandoned this earlier view respecting the pertinency of the name *galera* to the "Marsh-Mungoose." In a joint paper with Wroughton on a collection of mammals from Portuguese South Africa[1] these authors (*loc. cit.*, p. 167) say: "The name *galera* has hitherto been supposed to date from Erxleben,[2] whose primary basis for the name was the 'Galera' of Brown's 'Jamaica,'[3] which is no doubt the Marsh-Mungoose. But unfortunately Schreber's plate[4] of '*Mustela galera* Brown,' is one year earlier, and instead of being really based on Brown's Mungoose, is a mere coloured copy of Buffon's figure[5] of the 'Vansire' of Madagascar, which, as Gray suggested in 1864,[6] is certainly the animal usually known as *Galidia elegans* I. Geoff. Consequently this latter must bear the name of *Galidia galera* Schreber, and another name be found for the Marsh-Mungoose." After discussing various other names with reference to their possible application to the Marsh Mongoose these authors say: "Then follows the 'Vansire' (*Atilax vansire*) of Geoffroy and F. Cuvier,[7] which is undoubtedly the Marsh-Mungoose, but though the figure and description [also the generic name *Atilax*] date from 1826, the technical name [*Atilax vansire*] was only given to the animal on the appearance of the General Index in 1842. Before this latter date there was published G. Cuvier's name *Herpestes paludinosus*,[8] which antedated Smith's *Mangusta urinatrix*[9] by one month, and appears to be the tenable title of the animal under consideration."

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[1] 1908, 'List of Mammals obtained by Mr. Grant on the Gorongoza Mountains, Portuguese S. E. Africa.' By Oldfield Thomas and R. C. Wroughton. Proc. Zoöl. Soc. London, I, pp. 164–173.
[2] "Syst. R. A., p. 453, 1777."
[3] "P. 485, Pl. XLIX, 1756."
[4] "Säug. iii. pl. 135, 1776 (quoted by Erxleben)."
[5] "Hist. Nat. XIII, p. 167, Pl. XXI, 1765."
[6] "P. Z. S. 1864, p. 523."
[7] "H. N. Mamm. III., p. 198, 1826."
[8] "Règne Anim. (2) i, p. 158, April 1829."
[9] "Zoöl. Journ., IV. p. 437, May 1829."

Although Thomas and Wroughton so positively identify the Vansire of Buffon with *Galidia elegans* I. Geoffroy, there seems good reason to question this assignment of Buffon's Vansire. Geoffroy himself, in his discussion of the names Vondsira of Flacourt, Vounsira and Vontsira sent to him by his collectors Bernier and Goudot in Madagascar, admitted their practical identity, as applied by the natives to small viverrine carnivores, with the name Vohang-sira transmitted to Buffon by Poivre, from which (as stated above) the describers formed the name Vansire, Geoffroy adding: "Cette identité de noms confirme l'opinion que j'ai émise plus haut sur les rapports intimes du Vansire de Buffon et de Daubenton (mais non des auteurs modernes) avec les Galidies."[1] But he does not affirm that he believes the Vansire to be identical with his *Galidia elegans*, which Thomas and Wroughton so positively state should be called *Galidia galera*.

The Vansire was evidently described with particularity by Daubenton, and the figure of the animal agrees with the description. *Galidia elegans*, as noted by Mivart in 1882,[2] has the tail conspicuously ringed with black, while no such feature is indicated in the figure or the description of the Vansire. *Galidia elegans* has the general coloration of the body "d'un rouge marron foncé," and the tail "colorée par grands anneaux alternativement noirs et de la couleur générale du pelage." The Vansire is said to have all parts of the body uniform dark brown, and the accompanying figure shows no indication of rings on the tail. There are said to be twelve cheek-teeth in the upper jaw and ten in the lower, the whole number of teeth being 38. This conforms numerically with the dentition of *Galidia elegans*. It also agrees with that of *Salanoia* (= *Hemigalidia* Mivart). The Vansire further agrees with the *Salanoia* group in having the tail non-annulated and uniform in color with the back; it is also much shorter than the head and body[3] instead of nearly as long, as is the case in *Galidia elegans*.

Recently Pocock[4] has protested vigorously against the assumption that the Vansire of Buffon and Daubenton was later described as *Galidia elegans* by Geoffroy, and that the name of the type-species of *Galidia* must be changed to *Galidia galera* (Schreber). He concludes: "The familiar specific name of this animal [Geoffroy's *Galidia elegans*] must, therefore, in my opinion, be allowed to stand, and the Vansire of Buffon,

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[1] 1839, Mag. de Zool., Mamm., p. 29, Pls. XVII-XIX.
[2] 1882, Proc. Zoöl. Soc. London, p. 189.
[3] The length of the head and body is given by Daubenton for the Vansire as 13 inches, and the length of the tail as 7 inches.
[4] Pocock, R. I., 1915, 'Note on the Specific Name of the Type-species of *Galidia*.' Ann. Mag. Nat. Hist., (8) XVI, August, pp. 123-124.

with *galera* attached to it, be relegated to the limbo of mammalian species unidentifiable at the present time." With this conclusion I am heartily in accord, the main facts of the case being as follows:

(1) The Vansire of Buffon and Daubenton was based on a stuffed skin, containing the bones of the feet and the skull, received, as stated by the authors, from Madagascar.

(2) The animal was of small size (length of head and body 13 inches, of the tail 7 inches).

(3) Although so small, it was evidently adult; the premolar-molar formula was $\frac{4-2}{3-2}=11$, and the whole number of teeth 38.

(4) The name (*Vohang-sira*) under which it was received (modified to *Vansire* by its describers) indicates the correctness of the alleged origin of the animal, *Vohang-sira* having been shown by Geoffroy (*loc. cit.*) to be applied (with slight variations of the name) by the natives of Tamatave, Madagascar, to several small viverrine mammals of that region.

(5) The general characters of the Vansire, as given by the describers, indicate that it cannot be properly identified as *Galidia elegans*, but, on the other hand, agrees closely with members of the nearly allied genus *Salanoia*.

(6) Hence it has no near relationship to any form of African mongoose, and especially not with the large, heavily-built Marsh Mongoose, which has a premolar-molar formula of $\frac{3-2}{3-2}$, and only 36 teeth, the proper specific designation of which is *paludinosus* of G. Cuvier (1829) and not *galera* of Schreber (1776).

(7) The technical name *Mustela galera*, based on the *Vansire* of Buffon and Daubenton, is specifically unidentifiable, and hence nomenclatorially unavailable.

It may be added further that the genus *Galera* of Browne (1756 and 1789, 'Civil and Nat. Hist. Jamaica,' p. 485), aside from other grounds of untenability previously stated by me,[1] is not available under Opinion 5 of the "International Commission on Zoölogical Nomenclature," the 1789 edition being a literal reprint, so far as the text is concerned, of the edition of 1756.

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[1] 1908, 'The Generic Name *Galera* Browne,' Bull. Amer. Mus. Nat. Hist., XXIV, September 11, pp. 586–589.

In this note several misprints may be here corrected as follows: Page 588, line 6 from top, for Browne's read Buffon's; same page, last line, for p. 154 read p. 73. Also, p. 589, last sentence, in view of the above summary change to the effect that "*Galera* Browne, 1789 (type *Mustela galera* Erxl.)" s unavailable and cannot supersede either *Atilax* F. Cuvier or *Herpestes* Illiger, as there implied.

The Vansire of F. Cuvier

The Vansire of F. Cuvier (1826, 'Hist. Nat. Mamm.,' livr. 54, June) is indeterminable from the original description. He begins his account of it with the assumption that it is the same animal as the Vansire of Buffon and Daubenton, which, as shown above, is now conceded to be an indeterminate viverrid of Madagascar, from which country the original specimen was correctly said to have come. His article is, in substance, as follows.

Naturalists heretofore have had a very imperfect knowledge of this species. Buffon gave us the first account of it; and he had only a stuffed skin, in which he found the skull and the bones of the feet. It is this skin that he has figured, and no other figure of the Vansire has been given as we do not agree with Buffon that the animal figured by Seba under the name *Mustela javanica* (I, p. 77, No. 4, tab. 48, fig. 4) was the Vansire. M. Geoffroi [sic] Saint-Hilaire has also spoken of the Vansire, and from individuals that had lived in the Paris menagerie, but only to show its relation to the Ichneumon, from which it had before been separated and placed with the martens. . . . Nevertheless we find in the observations of Buffon and of Geoffroi sufficient indications to show that the Vansire and Ichneumons do not differ more from each other than do well characterized species of Ichneumons. Indeed d'Aubenton has informed us that the Vansire has a less number of cheek-teeth ("machelières") than the Ichneumons, and Geoffroi has expressly said that the braincase is more swollen and wider, and that the jugal and orbital processes are shorter and do not meet to complete the orbit. Now, the form of the head ("de la tête") of the individual which we have before us ("sous les yeux") is entirely in agreement with these indications, as can be seen by the figure we give [a plate of the animal, not of the skull] in comparison with those we have already given of different species of Ichneumon. As to the rest, these animals differ only in the organs of the senses ("ces animaux ne différent point par les organes des sens"); but the digits ("doigts"), which in the Ichneumons are joined together by a membrane, are on the contrary entirely free in the Vansire, and in walking they spread apart. As to the organs of generation, the male which we describe has the testicles free, we perceive near these parts no trace of a pocket ("poche"), and the penis, of which the gland appears to form two hemispheres, is directed forward.

All parts of the body are clothed with a pelage of brown, nearly black, which takes a slight yellowish tint on a small part of the sides of the lower jaw. This pelage is composed of woolly hairs, very thick and brown, and of silky hairs, rather few in comparison with the first and entirely black except on the muzzle and neck, where they have an apical ring of whitish or brown. The nose ("mufle") is flesh color and the eyes are clear chestnut. It has a length of eighteen inches from the end of the nose to the base of the tail, which has a length of twelve inches.

The Vansire is then sufficiently provided with characters of more than specific import to distinguish it from the Ichneumons. It consequently presents the type of a new group in this family, so natural and already so rich, and which was so small when, under the name *Viverra*, it comprised all those carnivores whose relationships were not determined. We would give to this group the name Atylace, *Atilax*, in consideration of the entire absence of an anal pouch.

From the above translation of F. Cuvier's account of his Vansire the following points may be noted:

(1) Cuvier believed that his Vansire was unquestionably the same species as the Vansire described and figured by Buffon and Daubenton, which he supposed he was redescribing and refiguring.

(2) In all probability his specimen, the type of his Vansire, was a menagerie specimen still in the flesh.

(3) No information was given as to its "patrie" or probable geographic origin.

(4) The external characters given are insufficient for its specific identification.

(5) It must have been a rather small specimen[1] (he says it was a male), if, as subsequent authors have supposed, it be referable to the Marsh Mongoose of South Africa.

(6) His statement about the absence of the anal pouch ("toute absence de poche à l'anus"), is evidently due to oversight, as this character is developed in the entire group and especially so in the Marsh Mongoose (see footnote, p. 169).

(7) No reference whatever is made to the dentition of the type specimen; it is possible to infer, from his allusion to Daubenton's statement to the effect that the Vansire had fewer cheek-teeth than are found in the Ichneumons, that his Vansire also had fewer.

(8) He cites Geoffroy to the effect that the skull of the Vansire is broader than that of Ichneumons, and that the orbit is not a complete ring of bone as in Ichneumons. This statement does not apparently have any necessary relation to the type specimen of his Vansire, the skull of which he gives no intimation of having examined.

(9) Digits free, or unconnected by a membrane, a character of the Marsh Mongoose group, and the only one which renders it certain that Cuvier's Vansire is referable to that group.[2]

(10) No other characters are indicated (the size and coloration not being diagnostic) by which Cuvier's Vansire can be identified, and the species is therefore specifically indeterminable from the original description.

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[1]Head and body "dix-huit pouces," tail "douze pouces," or approximately 457 mm. and 305 mm., making a total length of 762 mm., or a little more than one-half that of an adult Marsh Mongoose. Sclater (1900, 'The Fauna of South Africa,' Mamm. I, p. 64) gives for head and body (mounted specimen) 24 inches, tail 13 inches, or 610 mm. and 330 mm. respectively, and therefore a total length of 940 mm.

[2]Pocock (1916, Proc. Zoöl. Soc. London, p. 363) says: "The absence of the interdigital webs in this [Marsh] Mongoose constitute, in my opinion, a valid reason for resuscitating the genus *Atilax* (text-fig. 5, C, D)." Pocock consistently recognized *Atilax* as a full genus throughout his important paper here cited on the external characters of the mongooses.

(11) It is to be further noted that the original account contains no technical specific name for the Vansire, although the group name *Atilax* is based on it.

The Genus *Atilax* F. Cuvier

The genus *Atilax*, as explained above, was proposed by F. Cuvier in 1826, at the end of the description of his Vansire, which is the only species he referred to it, and which is therefore the genotype. The description of the Vansire includes only two tangible characters, (1) digits unconnected by a membrane, and (2) absence of the anal glands found in all other species of Mongoose. The latter, however, proves to be without foundation,[1] so that the unwebbed condition of the toes is the only character furnished by the original description. This, however, is a definitive character of high importance, and serves to identify beyond doubt the group to which the name *Atilax* belongs. Three years later, however, the author formally introduced the genus *Atilax* into his system of classification, in his article 'Zoologie = Mammalogie' (1829, 'Dict. Sci. Nat.,' LIX, pp. 357–519) as Genus 21 of his Order III, "Les Carnivores" (*loc. cit.*, p. 456), separating it from "Les Mangoustes" (*Herpestes* Illiger) by "Les Genettes" (*Genetta* G. Cuvier). His diagnosis contains all the essential characters of the group, plus the original error respecting the absence of the anal glands, as follows:

21. Genre

Les Atilax; *Atilax*, Fréd. Cuv.

Ces animaux, qui ont toujours été réunis aux mangoustes, ont pour caractères deux fausses molaires de moins que ces derniers aux deux mâchoires; des doigts entièrement libres, la verge dirigée en avant, et enfin ils sont privés de toute poche anale.

Ils sont en outre remarquables par la grande largeur de leur boîte cérébrale et la brièveté de leur museau.

On n'en connoît encore qu'une espèce, qui est de l'ancien monde.

The valid characters of the group are (1) premolars $\frac{3}{3}-\frac{3}{3}$, instead of $\frac{4}{4}-\frac{4}{4}$ as in *Herpestes;* (2) toes entirely free or unwebbed which is not the case in any other closely allied genus; (3) the great breadth of the braincase and the shortness of the rostrum.

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[1] R. I. Pocock, in a recent paper 'On the External Characters of the Mongooses (Mungotidæ),' (1916, Proc. Zoöl. Soc. London, pp. 349–374, Figs. 1–10), says (*loc. cit.*, p. 366): "The presence of a glandular anal sac in Mongooses has long been known; but its invariable occurrence within the group has been disputed. I have found it without exception in all the specimens I have examined, even in those belonging to species in which its existence has been denied. Cuvier, for example, said that the Marsh-Mongoose, which he named *Atilax vansire* (St. Hilaire & Cuvier, Hist. Nat. Mamm. ii, pt. 54, pl. 198, 1826) is without it. It happens, on the contrary, to be rather exceptionally well developed in that form (Fig. 9, B, C)."

Atilax is still monotypic, has no definite geographic area of distribution, and the genotype is without a technical specific name. Yet this Vansire became, through erroneous citation by later authors, "*Atilax vansire* F. Cuv., Mamm. livr. 54, 1826" cited in the literature for three-fourths of a century without challenge, usually as a synonym of the composite and technically intangible "*Mustela galera* Erxleben." It has been stated,[1] however, that the author supplied no technical name for the species till it was entered in the general index to the 'Histoire naturelle des Mammifères,' issued on the completion of the work in 1842, where it is said to appear as *Atilax vansire*. I find an earlier citation of the name, however, by J. B. Fischer in his 'Synop. Mamm.,' 1829, p. 166, where he gives this reference: "*Atilax Vansire* Planch. du Dict. des Sc. nat. fasc. 51" which would imply a still earlier date of publication, 1828 or earlier. But Fischer's reference is not to the Vansire of F. Cuvier but to the Vansire of Buffon. It is given under his *Mustela galera*, the reference in full being "*Atilax Vansire* Planch. du Dict. des Sc. nat. fasc. 51. Voang shira Madagasc." As, however, the name *Atilax vansire* was not adopted by Fischer, it has no nomenclatural status.[2]

Notwithstanding F. Cuvier's clear definition of *Atilax* in 1829, the genus failed to receive further recognition till formally adopted by J. E. Gray in 1864 (Proc. Zoöl. Soc. London, pp. 508 and 556–560) in his 'A Revision of the Genera and Species of Viverrine Animals (Viverridæ),' under the emended form *Athylax*. References to it (as *Athylax*) during the previous thirty years were merely incidental, and often display surprising ignorance of its real characters and relationships.[3]

De Blainville, in his 'Ostéographie des Mammifères,' II, Des Viverras, Pl. v (1842), figured two skulls of *Mangusta* (=*Herpestes*), one with the legend "*Mangusta paludinosa*" (=*Herpestes paludinosus* G. Cuvier), the other with the legend "*Mangusta* (*Athylax*) *galera*."

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[1] "Then follows the 'Vansire' (*Atilax vansire*) of Geoffroy and F. Cuvier, which is undoubtedly the Marsh-Mungoose, but though the figure and description date from 1826, the technical name was only given to the animal on the appearance of the General Index in 1842." Thomas and Wroughton, 1908, Proc. Zoöl. Soc. London, p. 167.

[2] I am unable to consult the plates of the 'Dict. des Sci. Nat.,' for verification of the reference given by Fischer, but Dr. T. S. Palmer has kindly furnished me with the desired information regarding it. He writes that the plate is unmarked, "but according to the Table in Introduction it is No. 40, to accompany text in Vol. 29 [1823], p. 62, Cahier 51." The article on page 62, Vol. 29, is by Desmarest and not by F. Cuvier, and refers exclusively to the Vansire of Buffon and not to the Vansire of Cuvier, which was not published till 1826. Dr. Palmer adds: "Vansire is *not* a specific name in this volume."

[3] Thus, in 1839, I. Geoffroy St. Hilaire, in his notice of two new genera of carnivorous mammals (1839, Mag. de Zool., Mamm., p. 24 of text to Pls. XVII–XIX), in referring to "*Cryptocropta* [sic] Bennett and *Athylax* F. Cuvier," says: "Ces deux genres, en effet, sont indiqués comme étant de Madagascar, et ils sont incomplètement connus." This reference to *Athylax* shows that the vansire of F. Cuvier was here confused with the vansire of Buffon.

In 1828, Desmarest, in Vol. LVI of the 'Dict. Sci. Nat.,' p. 487, thus defines vansire: "Vansire. (Mamm.). Nom spécifique d'une mangouste de Madagascar et de l'Isle-de-France. (Desm.)." The vansire of F. Cuvier is the later described mangouste "grande des marais du Cap. (*H. paludinosus*)" of G. Cuvier (1829), while the vansire described and figured by Buffon and Daubenton is the banded mongoose, the *Crossarchus fasciatus* of current nomenclature. (See above, p. 155.)

The latter is mentioned in the accompanying text (p. 49) as "Un très-vieil individu du *M. galera*, type du genre *Athylax*," and subsequent authors[1] have accepted the statement as authoritative. I came to the conclusion that the two skulls figured by De Blainville were not congeneric, and consequently that Cuvier's Vansire had been wrongly identified as referable to the Marsh Mongoose. Further research, however, made it clear that the type specimen of Cuvier's Vansire probably was not full grown, and that its skull could not have been the skull figured by De Blainville as "type du genre *Athylax*"— a very old, heavily ossified skull that had apparently lost the molars of both jaws through age, while a first premolar was present in both jaws, giving a premolar formula of $\frac{4}{4}-\frac{4}{4}$, and consequently 40 teeth instead of 36. The general form of the skull is different from that of the figure of the skull of *Mangusta paludinosa* on the same plate. It seemed to me certain that the skull figured as that of the type of "*Athylax*" must have been a very old skull of some species of *Ichneumia*, and that therefore *Atilax* was to be construed as a synonym of that genus. A subsequent study of the description of Cuvier's Vansire at once showed that an animal of the size of the specimen described could not have had a skull of the magnitude of the one figured by De Blainville.

While the description of the Vansire contains nothing by which the type can be identified specifically, and while the main character of *Atilax* is a myth, enough can be gathered from the description as a whole to convince one that the type specimen, and consequently *Atilax*, would warrant its reference to the Marsh Mongoose group. The author's later formal diagnosis of *Atilax* renders it certain that it can be referred to no other generic group of mongooses.

The several forms of *Atilax* (whether species or merely subspecies) agree in essentials with G. Cuvier's *Herpestes paludinosus* (1829), the first form to receive a technical specific designation, and this may be taken as the genotype, since various writers have identified the Cuvierian vansire with this species; or, more technically expressed: *Atilax* F. Cuvier, genotype (by monotypy), Vansire F. Cuvier = *Herpestes paludinosus* G. Cuvier. The dental formula and the unwebbed feet, aside from other external and cranial characters, seem sufficiently to separate it from *Herpestes* (as represented by the type form). In its general character the skull of *Atilax* resembles that of *Ichneumia*, from which it differs

[1]Gray (1864, Proc. Zoöl. Soc. London, p. 557) says, under his *Athylax vansire*: "The skull of the animal figured by F. Cuvier is engraved in De Blainv. Ostéogr. t. 5." He further says: "According to De Blainville's figure, the skull is more solid and stronger than that of *A. paludinosus*."

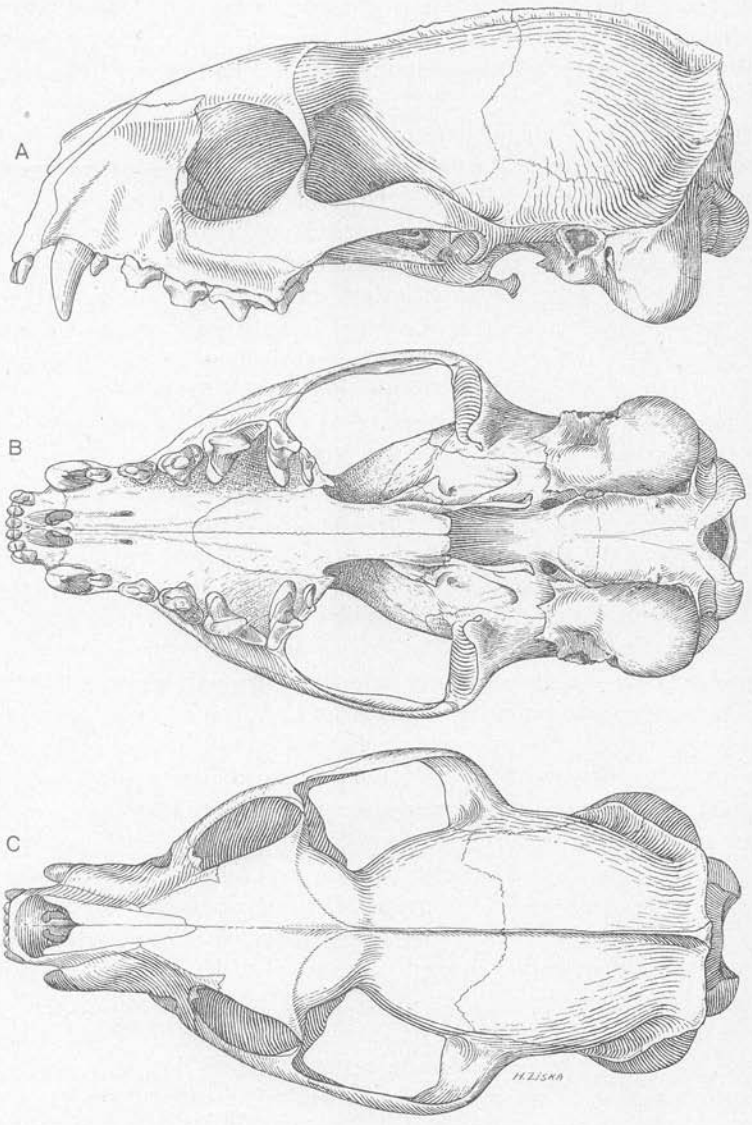

Fig. 41. *Herpestes ichneumon parvidens.* Skull of adult male (No. 51590). A, lateral view; B, palatal view; C, dorsal view. Natural size.

especially in its dental formula and in the naked instead of furred palmar and plantar surfaces of its unwebbed feet.

HERPESTES Illiger

Herpestes ILLIGER, 1811, 'Prodr. Syst. Mamm. et Avium,' p. 135, here spelled *Herpertes*, corrected in list of errata (p. 302) to *Herpestes*. Type, by subsequent designation (Anderson, 1878), *Viverra ichneumon* Linnæus.

Herpestes ichneumon parvidens (Lönnberg)

Text Figures 41, 42, 44A

Mungos ichneumon parvidens LÖNNBERG, 1908, Arkiv f. Zool., IV, No. 16, April 29, p. 3. Type locality, Mukimbungu, Belgian Congo.

A single specimen, an old male, collected at Niangara, Belgian Congo, November 29, 1910, is provisionally referred to this form.

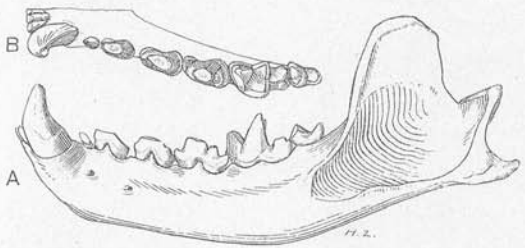

Fig. 42. *Herpestes ichneumon parvidens*. Adult male (No. 51590). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

Collectors' measurements: Total length, 990 mm.; head and body, 545; tail vertebræ, 435; hind foot, 100.

Skull, condylobasal length, 97.0; zygomatic breadth, 49.0; least interorbital breadth, 15.3; postorbital breadth, 15.2; breadth across auditory bullæ, 36.6; length of auditory bullæ, 19.5; greatest breadth of auditory bullæ, 11.8; depth from plane of basisphenoid, 10.5; palatal breadth at base of incisors, 9.7; palatal breadth at base of canines, 16.7; palatal breadth at outer base of p^4, 29.0; least breadth of palatal tube, 7.1; length of palatal tube, 17.2; front of canine to posterior border of m^2, 35.5; upper premolar-molar series (p^1-m^2), 29.7; oblique length of p^4, 10, transverse breadth at front border, 6.2; mandible (symphysis to end of angular process, 67.4; height at condyle, 20.0; height at coronoid, 13.2; lower toothrow, 39.5; premolar-molar series, 32.5. The skull is that of an old male, with the sutures closed, the orbit closed, and the sagittal and lambdoid crests strongly developed.

especially in its dental formula and in the naked instead of furred palmar and plantar surfaces of its unwebbed feet.

HERPESTES Illiger

Herpestes ILLIGER, 1811, 'Prodr. Syst. Mamm. et Avium,' p. 135, here spelled *Herpertes*, corrected in list of errata (p. 302) to *Herpestes*. Type, by subsequent designation (Anderson, 1878), *Viverra ichneumon* Linnæus.

Herpestes ichneumon parvidens (Lönnberg)

Text Figures 41, 42, 44A

Mungos ichneumon parvidens LÖNNBERG, 1908, Arkiv f. Zool., IV, No. 16, April 29, p. 3. Type locality, Mukimbungu, Belgian Congo.

A single specimen, an old male, collected at Niangara, Belgian Congo, November 29, 1910, is provisionally referred to this form.

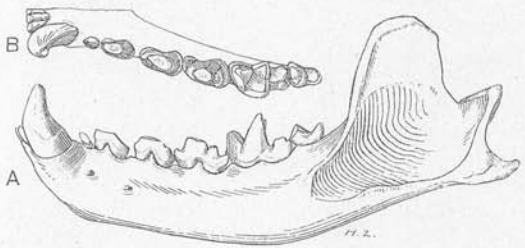

Fig. 42. *Herpestes ichneumon parvidens*. Adult male (No. 51590). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

Collectors' measurements: Total length, 990 mm.; head and body, 545; tail vertebræ, 435; hind foot, 100.

Skull, condylobasal length, 97.0; zygomatic breadth, 49.0; least interorbital breadth, 15.3; postorbital breadth, 15.2; breadth across auditory bullæ, 36.6; length of auditory bullæ, 19.5; greatest breadth of auditory bullæ, 11.8; depth from plane of basisphenoid, 10.5; palatal breadth at base of incisors, 9.7; palatal breadth at base of canines, 16.7; palatal breadth at outer base of p^4, 29.0; least breadth of palatal tube, 7.1; length of palatal tube, 17.2; front of canine to posterior border of m^2, 35.5; upper premolar-molar series (p^1-m^2), 29.7; oblique length of p^4, 10, transverse breadth at front border, 6.2; mandible (symphysis to end of angular process, 67.4; height at condyle, 20.0; height at coronoid, 13.2; lower toothrow, 39.5; premolar-molar series, 32.5. The skull is that of an old male, with the sutures closed, the orbit closed, and the sagittal and lambdoid crests strongly developed.

This specimen is provisionally referred as above. Compared with an old female from Medje the pelage and coloration are similar in both, but the skull of the Niangara specimen (Figs. 41 and 42) is narrower and slenderer throughout, being less robust, with correspondingly weaker dentition, the palatal tube about one-fourth narrower, while the bullæ are more inflated, being about one-third larger than in the Medje specimen, referred provisionally below to *Herpestes ichneumon funestus* (Osgood).

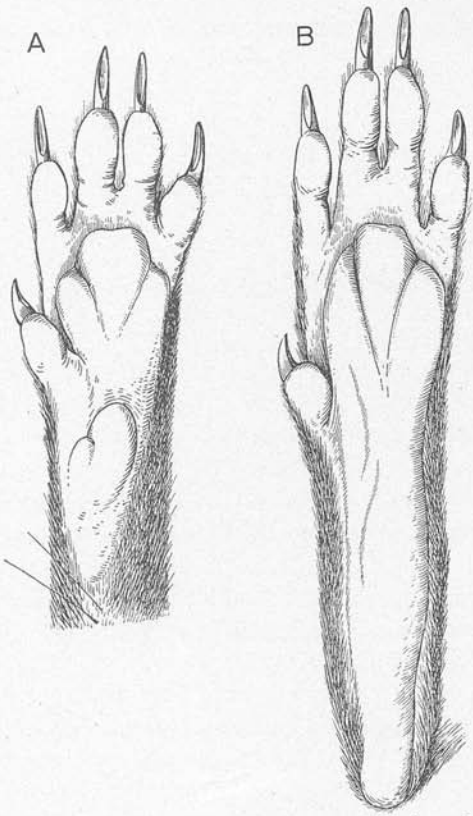

Fig. 43. *Herpestes ichneumon funestus* (No. 51591). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

Herpestes ichneumon funestus (Osgood)

Plates XXII; XXIII, Figure 1; and Text Figure 43

Mungos ichneumon funestus Osgood, 1910, Field Mus. Nat. Hist., Zoöl. Ser. X, No. 3, April 7, p. 17. Type locality, Naivasha, British East Africa.

Represented by 7 specimens (5 of which are immature), collected as follows:

Faradje, 2 (1 ♂ adult, native skin without skull, 1 ♀ juvenile), March 9, 1912; January 14, 1913.

Akenge, 1 (♀ juvenile), October 25, 1913.

Medje, 3 (1 ♂ subadult, 1 ♀ adult, 1 ♀ juvenile), January 11, 21, 1910; June 25, 1914.

Stanleyville, 1 (♂ juvenile), August 27, 1909.

Collectors' measurements of an old female (No. 51588) from Medje: Total length, 960 mm.; head and body, 510; tail vertebræ, 450; hind foot, 90.

Skull (same specimen), condylobasal length, 97.2; zygomatic breadth, 47.6; postorbital breadth, 16.1; length of palatal tube, 14.3; least breadth of palatal tube, 18.6; palatal breadth at base of incisors, 7.8; palatal breadth at outer base of p^4, 10.5; oblique length of p^4, 10.2, breadth of p^4 at front border, 6.1.

These specimens represent two phases of coloration, a dark and a light; both are represented by adult and half-grown specimens (Pls. XXII and XXIII, fig. 1), taken at Medje. The two specimens from Faradje are both very light colored, much lighter even than the light one from Medje. It is quite probable that a larger amount of material would show that two forms are represented in the present series, a light one in the veldt region, a dark one in the rain forest. For the present the series as a whole is provisionally referred as above, as all of the 7 specimens except 2 are immature, with only the milk dentition, and the skull of one of the adults is lacking.

GALERELLA Gray

Galerella GRAY, 1864, Proc. Zoöl. Soc. London, p. 564. Type, by monotypy, *Herpestes ochraceus* Gray.

It seems surprising that in spite of well-marked morphological differences the *Herpestes sanguineus-melanurus-ochraceus* groups and their near allies have so long failed of due recognition, and have been almost universally referred to *Herpestes* (=*Mongos* of recent authors), notwithstanding their many divergences from that group (genotype, *Herpestes ichneumon*). The inconsistency of the inclusion of *Galerella* in *Herpestes* has recently been noted by Pocock (1916, Proc. Zoöl. Soc. London, I, p. 350, footnote), but he failed to give *Galerella* generic rank, although he mentioned some of its distinctive features, and its resemblance in certain characters to *Cynictis*. In his later paper[1] *Galerella*

[1] "The Classification of the Mongooses (*Mungotidæ*)," 1919, Ann. Mag. Nat. Hist., (9) III, June, pp. 515–524.

is not mentioned, but in a footnote under *Mungos* (p. 523) he says: "I suspect this genus will prove to be divisible into three or more genera when better known."

In 1907, R. C. Wroughton, in his paper 'On the African Mungooses usually referred to the *Herpestes gracilis* Group' (Ann. Mag. Nat. Hist., (7) XX, pp. 110–121) gave "a list of the names already given to members of this section," twenty-three in number. In his revision of the group eleven of these were relegated to synonymy, leaving twelve which he considered entitled to recognition, to which he added four forms as new subspecies, making sixteen forms. During the period 1908–1916, or in the nine years following the publication of Wroughton's review of the group, ten new forms were added (some as full species, others as subspecies), increasing the total number of forms to twenty-six. It is still, however, a compact group, all the forms being narrowly restricted to a common standard as regards size, details of structure, character of pelage and pattern of coloration. The geographic range of this, the *Galerella*, group extends from Abyssinia, Somaliland and southern Sudan southward over eastern and central Africa to the Cape region, and thence northward in western Africa to Nigeria and the Gold Coast.[1]

In general features *Herpestes* and *Galerella* are about as diverse as two genera can well be and be referable to the same subfamily. Compared with mongooses of the *H. ichneumon* type (Pl. XXIII, fig. 1), the species of *Galerella* (Pl. XXIII, figs. 2-4) are diminutive in size, slender in structure, with short, fine, close-lying pelage, a narrow tail, only slightly broader proximally than toward the tip; the premolars are $\frac{4}{3}-\frac{4}{3}$, and the number of teeth 38, as against premolars $\frac{4}{4}-\frac{4}{4}$ and 40 teeth in *Herpestes*. There are also other important cranial differences, particularly in the form of the auditory bullæ. In typical species of *Herpestes* the general size is near the maximum of the Herpestinæ[2]; the overhair is long, coarse and harsh; the tail is very thick, full proximally and tapering to a thin point. In *Galerella* the limbs are short and the feet small and comparatively weak, the pollex and hallux greatly reduced, the nails short and weak, the soles furred for nearly the proximal half (Fig. 46), and the tail is narrow and distichous. In *Herpestes* these conditions are reversed, the limbs being long and strong, the soles entirely naked (Fig. 43). In *Galerella* (Fig. 45 A and B) the auditory bullæ have the chambers subequally developed, the posterior

[1]Does not occur in the Western Forest Province.—H. L.

[2]The linear measurements of *H. ichneumon* are nearly twice greater than in *Galerella*, and its mass about five times larger. In this connection see the present author on size as a group character in the American Sciuridæ (1915, Bull. Amer. Mus. Nat. Hist., XXXIV, pp. 160–166, Figs. 1–10).

being but little larger than the anterior, while in *Herpestes* (Fig. 41 A and B) the anterior chamber is small and the posterior enormously expanded, these two genera presenting nearly the extreme phases of divergence of the bullæ among the mongooses. Yet no one appears to have hitherto had the temerity to give Gray's genus *Galerella* even subgeneric recognition.

There is a superficial resemblance in certain characters between *Galerella* (Pl. XXIII, figs. 2-4) and *Helogale* (Pl. XXIV, fig. 1), but the latter is far more herpestine than the former. The members of both are of small size in comparison with the forms of *Herpestes*, *Ichneumia*, *Atilax*, *Xenogale*, and *Bdeogale*, but the general size is much less in *Helogale* than in *Galerella*, and the tail is also relatively much thicker, shorter and rounded at the base. *Helogale* has short but strong limbs, broad feet, the toes all heavily developed and armed with powerful claws (Fig. 48), as well befits a burrowing type, which *Helogale* exemplifies. The skull characters, however, are quite similar except that *Helogale* (Fig. 47) has lost the first premolar in both jaws while *Galerella* (Fig. 45) retains the first upper premolar.

It has been customary since early days to consider the presence or absence of the first premolar, in one or even in both jaws, as of no taxonomic importance, and when absent in adults to presume it may have been present in the milk dentition. In my own experience I have almost invariably found that its presence or absence in nearly allied groups is accompanied by other features of differentiation of more or less importance. Also that when the first premolar is absent in the permanent dentition it is also absent in the preceding milk dentition. In the case of *Herpestes* (auct.) the premolar formula has usually been given as $\frac{4}{4}-\frac{4}{4}$, without indication that there are normal departures therefrom, even when *Herpestes* included *Atilax* (premolars uniformly $\frac{3}{3}-\frac{3}{3}$) and *Galerella* (premolars uniformly $\frac{4}{3}-\frac{4}{3}$). In the descriptions of the forms of these groups there is rarely any reference to the number of premolars. For instance, in the preparation of the present paper I have had occasion to look up the original descriptions of every species and subspecies of the *Galerella* group, and have found no reference to the number of premolars. The material I chanced to have at hand at the outset of this investigation represented only a single species (the type of the genus) of which I had nine skulls, only one of which had four lower premolars. Later I obtained further material, representing four additional species and subspecies. Of thirty skulls now in hand twenty-eight have three lower molars only, one has p_1 on both sides of the lower jaw, and one other has

p_1 on the left side only, and it stands internal to the toothrow at the antero-internal border of p_2. This material represents one-fifth of the forms currently recognized. There is therefore some significance in the practically uniform absence of p_1 in the *Galerella* group.

As bearing on size as a character in *Galerella* the following statistics are presented. The first series is a compilation of the measurements of the type specimen as given in the original descriptions of the currently

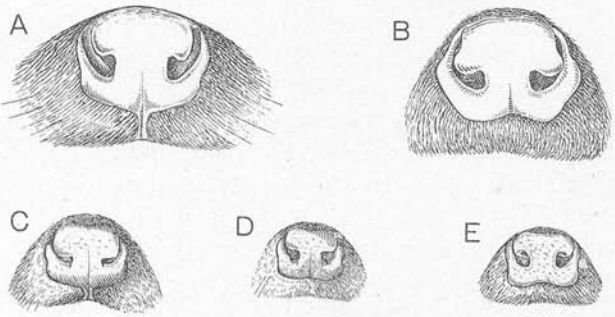

Fig. 44. Rhinarium. A, *Herpestes ichneumon parvidens* (No. 51590); B, *Crossarchus alexandri* (No. 51667); C, *Galerella ochracea ochracea* (No. 51108); D, *Helogale hirtula robusta* (No. 51101); E, *Mungos gothneh* (No. 51112). Natural size.

recognized species and subspecies. Then follow measurements of small series of specimens of *G. ochracea*, *G. sanguinea rendilis*, *G. s. orestes*, and *G. s. ibeæ* which have passed through my hands. Of these, the external measurements were made by the collectors from specimens in the flesh; the skull measurements were made by me. The measurements of *Helogale hirtula robusta* and of *Herpestes ichneumon* are added for convenient comparison with those of the *Galerella* forms.

Measurements of twenty-four species and subspecies of *Galerella*, compiled from the original descriptions:

Head and Body	Tail Vertebræ	Hind Foot (mostly s. u.)	Skull (Condylobasal Length)
308(250–350)	269(240–325)	56(46–64)	64(57–68)

These external measurements were in many cases (doubtless in the majority) based on dry skins; in a few instances they are stated to have been taken from specimens in the flesh. The wide range between extremes of the external measurements is largely due to this cause, and to some extent discredits the averages. The extremes in the skull

length are much less and should be taken as a more nearly correct indication of the range in size in the forms of *Galerella*, which on this basis is shown to be small.

Measurements of *Galerella ochracea*, *G. sanguinea rendilis*, *G. s. orestes*, *G. s. ibeæ*, *Helogale hirtula robusta*, and *Herpestes ichneumon*

	External Measurements			
	No. of Specimens	Head and Body	Tail Vertebræ	Hind Foot (c. u.)
Galerella ochracea	7	270(245–290)	245(228–270)	55.4(50– 57)
G. sanguinea rendilis	3	311(285–333)	293(280–315)	57.3(55– 60)
G. s. orestes	5	335(312–340)	291(277–300)	65.0(62– 71)
G. s. ibeæ	4	335(320–330)	318(303–326)	62.0(58– 65)
Helogale hirtula robusta	7	265(248–286)	175(160–220)	57.0(52– 61)
Herpestes ichneumon group	6	545(533–570)	463(435–489)	97.0(91–100)

	Skull	
	No. of Specimens	Condylobasal Length
G. ochracea	6	58.5 (56.6– 60.5)
G. s. rendilis	4	64.0 (60.0– 67.5)
G. s. orestes	6	64.3 (62.0– 67.0)
G. s. ibeæ	8	65.2 (64.0– 67.0)
H. h. robusta	7	55.9 (53.4– 58.1)
Herpestes ichneumon group	6	105.4 (100.0–110.0)

Galerella ochracea ochracea (Gray)

Plate XXIII, Figures 2–4; and Text Figures 44C–46

Herpestes ochraceus Gray, 1848, Proc. Zoöl. Soc. London, p. 138. Type locality, Abyssinia.

Represented by 9 specimens, 7 of which are adult and 2 nurslings, collected as follows:

Niangara, 1 (♂ adult), November 10, 1910.

Faradje, 8 (4 ♂ adults, 2 ♀ adults, 2 nurslings), February 20, 28, March 19, October 9, 1911; August 19, 1912; January 9, February 7, 1913.

The seven adult specimens (including one alcoholic and one skeleton) conform to a general type of a minutely grizzled pattern of coloration, but they vary greatly individually in the resulting tone, ranging in general effect from isabella to tawny. The extremes are represented by

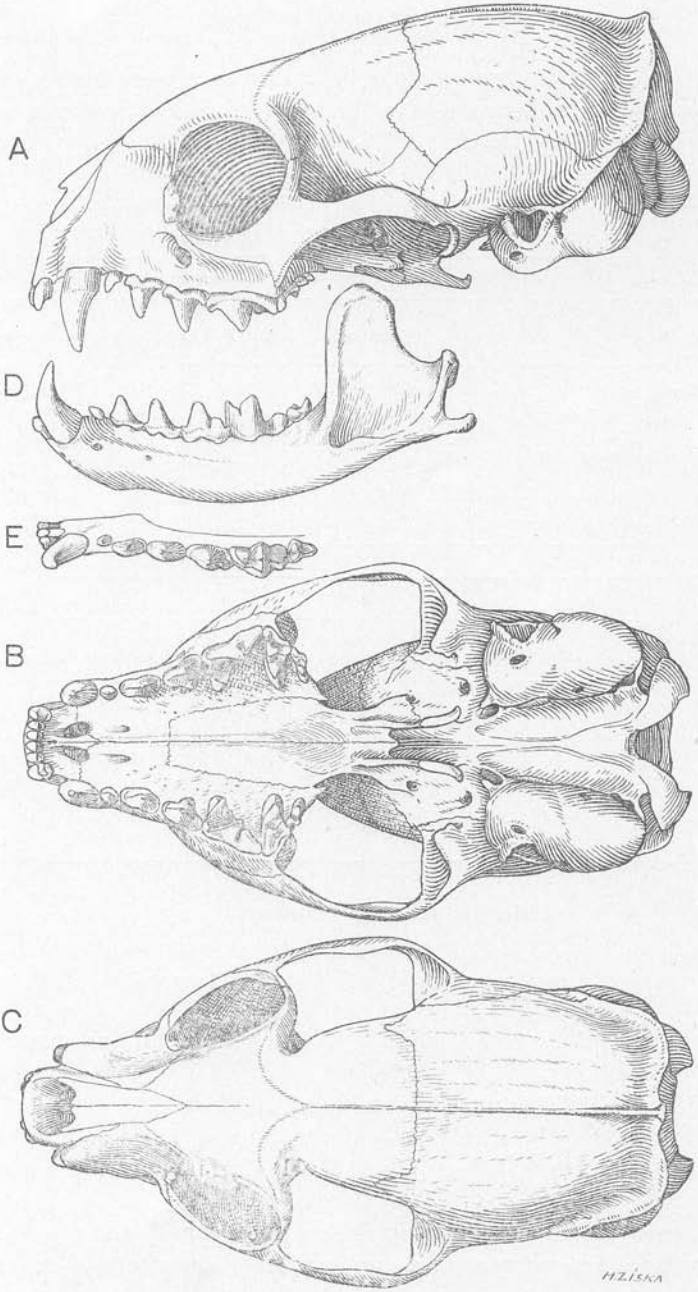

Fig. 45. *Galerella ochracea ochracea.* Skull of adult male (No. 51108). A, lateral view; B, palatal view; C, dorsal view; D, lateral view of left mandible; E, crown view of left lower dentition. × ¾.

two specimens from Faradje, both old males, one of which was taken March 19, the other October 9. The March specimen is pale ochraceous finely grizzled with dusky, the hairs individually of the upperparts being annulated subapically with pale yellowish and black and tipped with pale yellowish; the soft underfur is ochraceous slightly darkened at the extreme base. The ochraceous underfur shows strongly through the short, close-lying, fine, soft overhair, whose subapical black ring forms the contrasting dusky surface grizzle. The head is slightly darker than the back and the light tips of the hairs are whitish, giving a grayish effect.

Fig. 46. *Galerella ochracea ochracea* (No. 51108). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

The tail above is like the back, with a broad, intensely black tip, preceded by a broad subapical zone of ochraceous only slightly grizzled with black. The under surface of the tail, from about the basal third to the black tip, is deep tawny ochraceous, increasing in intensity apically. The underparts are uniform deep ochraceous from the throat posteriorly, and the hairs are without annulations. The October specimen is dusky above, the hairs individually with annulations of black and pale buff and minute whitish tips. The underfur is less in quantity, pale brownish buff, darker at the extreme base, and scarcely shows at the surface of the overhair. The underparts are darker and duller and more dingy in tone. The tail shows increased intensity of ochraceous subapically. These two phases appear to be, at least in part, seasonal, as the October specimen has a shorter and more worn pelage. This supposition is strengthened by the

pelage condition and coloration of other specimens taken respectively at corresponding dates.

The darkest specimen of all was taken at Niangara in November. In this the head is conspicuously gray, particularly on the sides and throat. The underfur of the upperparts is plumbeous for the basal half, pale buffy apically, and is not visible through the overhair. The tail subapically shows very little increase of fulvous, while the midline of the tail below is scarcely different in color from its lateral borders. The other specimens are variously intermediate between the above described extremes.

The two nurslings, in soft woolly pelage, have the same color pattern as the adults, and are practically indistinguishable in coloration, aside from the different effect imparted by the softness of the juvenile pelage.

Measurements of Seven Adults of *Galerella ochracea ochracea*

			External Measurements					Skull		
Cat. No.	Sex	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Condylo-basal Length	Zygomatic Breadth	Maxillary Toothrow (p^1-m^2)
51106	♂	Niangara	480	245	235	50	25	57.7	27.0	17.9
51108	♂	Faradje	540	285	255	57	27	59.2	30.5	17.5
51109	♂	"	495	255	240	54	24	56.6	27.6	17.2
51184	♂	"	532	289	243	54	22	——	——	——
51119	♂	"	560	290	270	54	23	60.5	30.1	18.2
51107	♀	"	524	277	247	54	22	59.7	27.0	18.1
51176	♀	"	507	279	228	55	21	57.4	27.8	17.1
Average 7 adults (5♂, 2♀)			**520**	**274**	**245**	**54.4**	**23.4**	**58.5**	**28.3**	**17.7**
Minimum			480	245	228	50	21	56.6	27.0	17.1
Maximum			560	290	270	57	27	60.5	30.5	18.2

The subjoined table of measurements indicates the range of variation in external measurements and in the principal measurements of the skull. Those of the skull agree closely with the measurements given by Pocock (1907, Ann. Mag. Nat. Hist., (7) XX, pp. 112, 113) for the *Herpestes ochraceus* group; the external measurements, taken from specimens in the flesh by the collectors, greatly exceed those given by Pocock from dry skins.

The variation in coloration, usually present in series of specimens of any of the forms of *Galerella*, leads one to suspect that when adequate material of each of the score or more forms now recognized is brought

together for critical revision, many of them will be found to have no real basis.

The premolar formula in eight of the nine skulls available for examination is $\frac{4}{3}-\frac{4}{3}$; in the other skull, $\frac{4}{4}-\frac{4}{4}$, there being a minute p_1 on both sides in the lower jaw (Figs. 45 D, E).

HELOGALE Gray

Helogale GRAY, 1861, Proc. Zoöl. Soc. London, p. 308 (skull figured). Type, by monotypy, *Herpestes parvulus* Sundevall.

Helogale hirtula robusta, new subspecies

Plate XXIV, Figure 1; and Text Figures 44D, 47, 48

Type, No. 51104, ♂ adult, Faradje, Belgian Congo, March 9, 1911; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1485.

A large form of the *Helogale hirtula* group.

Type:—Dark brown above, finely grizzled with yellowish gray; head distinctly darker than back, the hairs minutely tipped with whitish; posterior half of back suffused with fulvous, due to the broad apical zone of the underfur showing more or less through the stiff overhair, the long hairs banded subapically with one or two zones of black, the extreme tips pale buff; tail above uniform with back; underparts nearly uniform pale sepia (varying in different specimens from bister to sayal brown), the extreme tips of the hairs lighter, on the throat tending to grayish; under surface of tail with a broad median fulvous band, extending from the base for the proximal half to two-thirds (in some specimens nearly to the tip, in others almost obsolete); digits of both fore and hind feet black (varying in different specimens from brownish black to intense black).

Collectors' measurements of the type: Total length, 460 mm.; head and body, 251; tail vertebræ, 209; hind foot, 59; ear, 23. (See subjoined table for measurements of additional specimens.)

Skull (type): Condylobasal length, 56.4; zygomatic breadth, 28.7; interorbital breadth, 9.8; postorbital breadth, 10.4; breadth of braincase, 25.6; length of nasals, 11.5; upper toothrow (p^2-m^2), 15.2 (with canine, 19.6); length of p^4 (inner side), 5.5, greatest transverse breadth, 3.6; transverse breadth of m^1, 4.4; length of palate, 26.6; palatal breadth (at outer edge of junction of p^4 and m^1), 18.

Represented by 10 specimens (8 males, 2 females), taken as follows:

Aba, 2 (old ♂), December 20, 1911.

Faradje, 6, including 1 skeleton (5 ♂ adults, 1 ♀ subadult), February 25–March 9, 31, 1911.

Niangara, 1 (old ♀), April 20, 1913.

Vankerckhovenville, 1 (very old ♂), August 4, 1911.

All are adult except a female from Faradje, in which the dentition is not fully developed (upper canines just in sight and milk canines still functional). The Aba and Vankerckhovenville specimens are very old, with greatly worn teeth, and the largest of the series. As indicated in

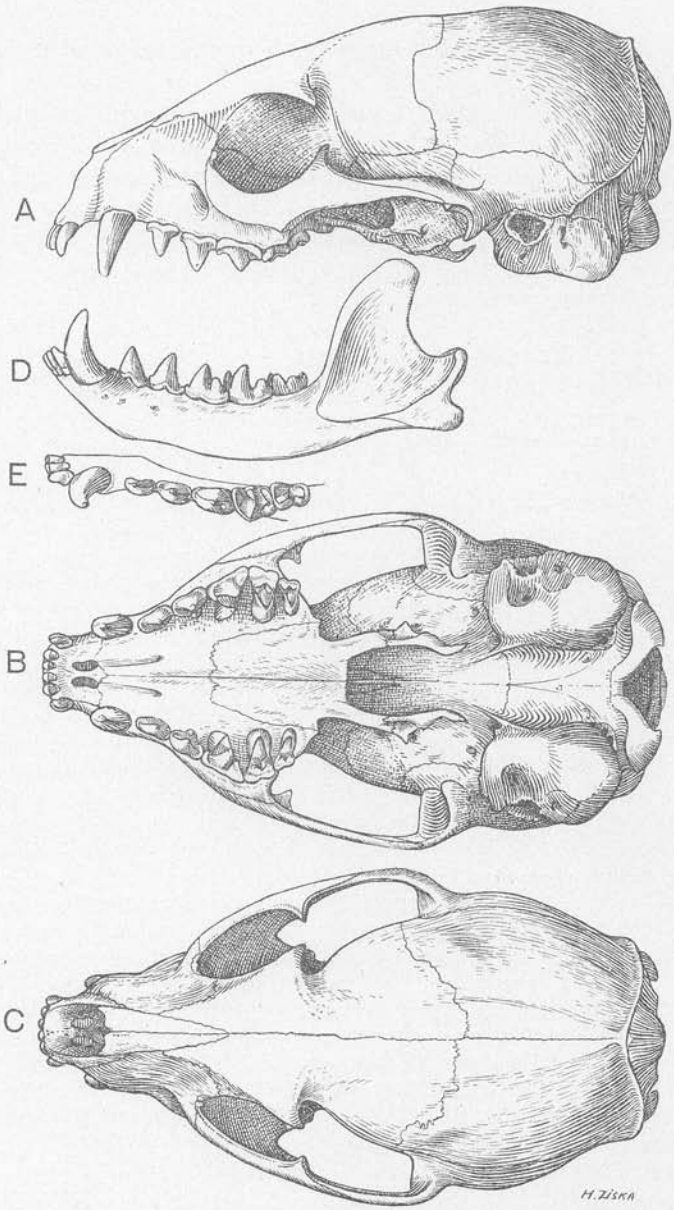

Fig. 47. *Helogale hirtula robusta.* Skull of adult male (No. 51101). A, lateral view; B, palatal view; C, dorsal view; D, lateral view of left mandible; E, crown view of left lower dentition. × ¾.

the above description of the type, the series presents a considerable range of individual variation in color, some being darker than others with scarcely any fulvous suffusion of the underfur, while the fulvous suffusion is very strong in others, forming a striking feature of the coloration. The extremes, however, completely intergrade, and are represented by specimens taken at the same locality at practically the same date.

Fig. 48. *Helogale hirtula robusta* (No. 51101). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

Helogale hirtula robusta is of course nearly allied (particularly the fulvous phase) to *H. hirtula lutescens* Thomas, from Lake Rudolph, and also (the dark phase) to *H. hirtula ahlselli* Lönnberg, from the Guaso Nyiro district. A compilation of the measurements of the seventeen previously described forms of *Helogale* indicates that *robusta* is the largest of all thus far described, in both external and cranial measurements, although the type of *H. hirtula powelli* (skull length 54.5 mm.), from Italian Somaliland, approaches the average of *robusta* (55.9, with a maximum of 58.1). The subjoined table gives the range of the measurements of the *robusta* series, in which, while all are adult, the smaller specimens have the teeth unworn but in the larger ones the teeth are nearly worn down to the roots.

It is worthy of note that one of the Faradje specimens (No. 51090) has a supernumerary premolar, p^1 being fully developed on both sides, but p_1 is absent in the lower jaw, as usual.

Measurements of Nine Adults of *Helogale hirtula robusta*

			External Measurements					Skull		
Cat. No.	Sex and Age	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Condylo-incisive Length	Zygomatic Breadth	Upper Toothrow
51090	♂ ad.	Faradje	—	—	—	—	—	53.4	28.0	15.5
51101	♂ "	"	429	248	181	52	23	53.5	28.7	13.6
51102	♂ "	"	483	286	197	55	23	—	—	—
51103	♂ "	"	432	249	183	54	23	53.8	28.2	14.0
51104[1]	♂ "	"	460	251	209	59	23	56.3	28.7	14.8
51105	♂ old	Vankerckhoven-ville	422	262	160	56	23	56.8	—	14.5
51118	♂ "	Aba	505	285	220	61	25	57.8	31.5	14.5
51789	♂ "	"	—	—	—	—	—	58.1	32.6	15.2
51608	♀ "	Niangara	490	278	212	60	22	—	—	—
Average			**460**	**265**	**195**	**57**	**23**	**55.9**	**29.6**	**14.6**
Minimum			422	248	160	52	22	53.4	28.0	13.6
Maximum			505	286	220	61	25	58.1	32.6	15.5

Mungos Geoffroy and Cuvier

Mungos Geoffroy and Cuvier, 1795, 'Mag. Encyclop.,' II, pp. 184, 187. Type, by tautonymy, *Viverra mungo* Gmelin.

Mungos Gray, 1864, Proc. Zoöl. Soc. London, p. 575. Type, by tautonymy, *Herpestes mungo* Desmarest = *Mungos fasciatus* Gray. Not *Mungos* Ogilby, 1835.

Crossarchus (part), of most recent authors, not of F. Cuvier.

Ariela Gray, 1864, Proc. Zoöl. Soc. London, p. 565. Type, by monotypy, *Herpestes tænionotus* A. Smith.

Ariela Pocock, 1916, Proc. Zoöl. Soc. London, p. 349; 1919, Ann. Mag. Nat. Hist., (9) III, p. 523.

Mungos[2] **gothneh** (Heuglin and Fitzinger)

Plate XXIV, Figures 2–4; and Text Figures 44E, 49–51

Herpestes gothneh Heuglin and Fitzinger, 1866, Sitzungsb. Math. Naturw. Cl. Ak. Wiss. Wien, LIV, 1, p. 560. Kordofan.

Crossarchus gothneh Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Poko (4 specimens).

Represented by 22 specimens, mostly immature, collected as follows:

Niangara, 2 (adult, ♂ and ♀), November 30, December 16, 1910.

[1]Type.

[2]The reasons for using *Mungos* in place of *Crossarchus* in the present connection are given in a preceding article (pp. 157, 158).

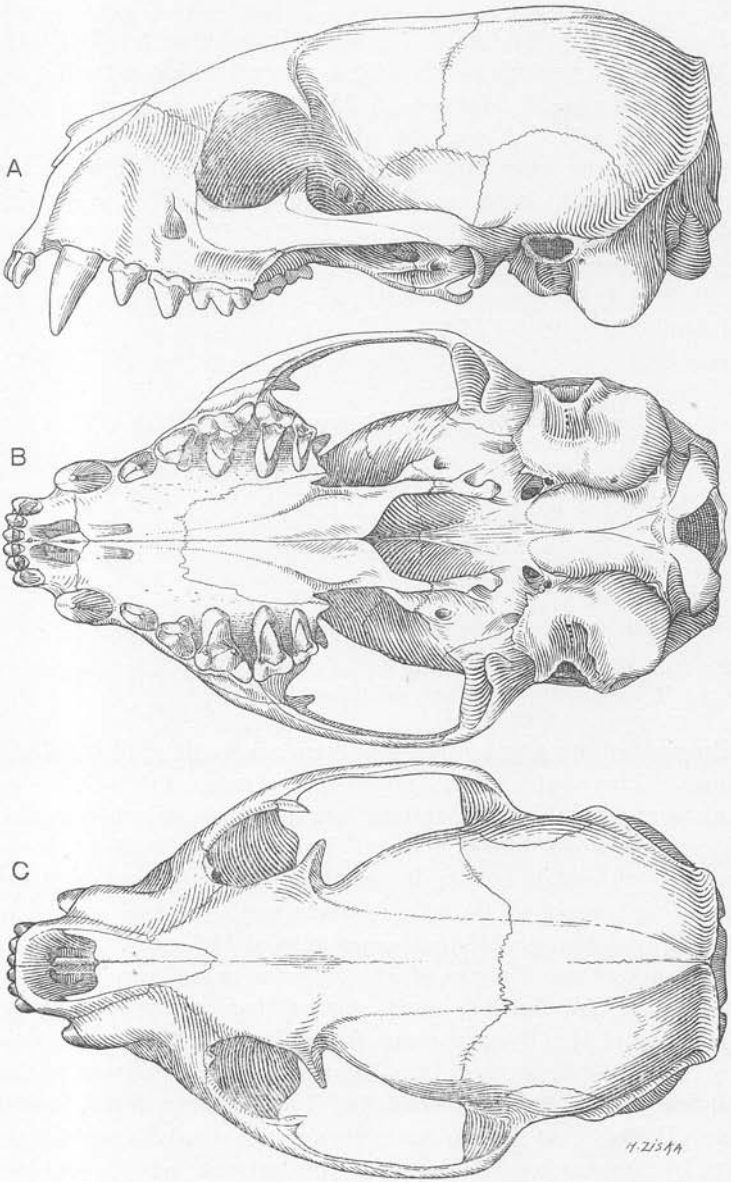

Fig. 49. *Mungos gothneh*. Skull of adult female (No. 51112). A, lateral view; B, palatal view; C, dorsal view. × ⅔.

Faradje, 19 (2 ♂ adult, 2 ♀ adult, 2 juvenile with fully developed milk dentition, 2 juvenile with partly developed milk dentition, 11 nurslings), February 11–24, March 4–18, May 8, 1911; January 19, 1912.

Akenge, 1 (♂ adult, skin and skeleton), October 3, 1913.

Collectors' measurements of 5 adults (2 ♂, 3 ♀): Total length, 519 mm. (490–553); head and body, 316 (305–333); tail vertebræ, 200 (173–228); hind foot, 68 (61–73); ear, 23 (21–25).

Measurements of 6 adult skulls (3 ♂, 3 ♀): Condyloincisive length, 62.5 (61.4–64.3); zygomatic breadth, 35.2 (32.2–37.0); maxillary toothrow (p^2–m^2), 16.8 (16.1–17.7).

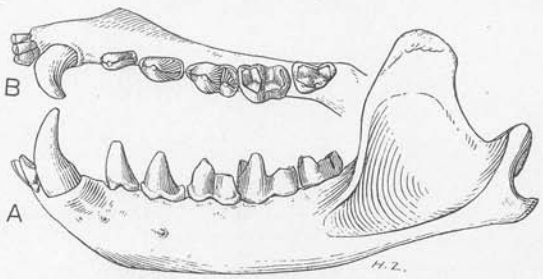

Fig. 50. *Mungos gothneh*. Adult female (No. 51112). A, lateral view of left mandible; B, crown view of left lower dentition. × ¾.

Only about one-third of the specimens are adult; fully one-half are nurslings. The adults are all quite similar in coloration; the young specimens resemble them in pattern but the tones are much duller and the dorsal bands less sharply defined. Three of the immature specimens are marked with white below; in two there is a small oval patch on the middle of the breast, in the other a short median streak on the belly, suggesting near relationship to *Mungos zebra* of Abyssinia.

The present small series of adults seems to indicate that *Mungos gothneh* (Pl. XXIV, fig. 4) is much smaller than any of the more eastern members of the *Mungos* group, from Natal to the Red Sea, judging by the statistics of size I have been able to glean from published descriptions. The South African and East African forms, north to northern British East Africa, have an average condylobasal length of skull of 73 mm. against 62.5 mm. for the present series from northeastern Belgian Congo (maxima, respectively, 75.5 and 64.3); and a zygomatic breadth of 40 mm. against 35 mm. (maxima, respectively, 43 and 37), with corresponding differences in external measurements. Abyssinian and Somaliland forms appear to be intermediate in size be-

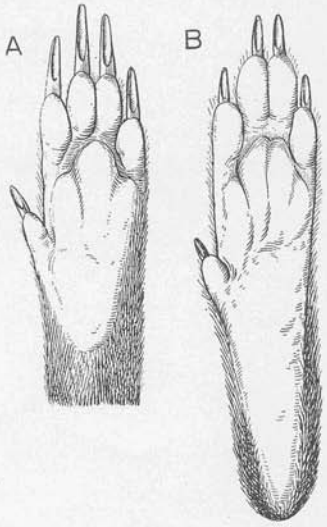

Fig. 51. *Mungos gothneh* (No. 51112). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

tween East African and Northeast Congo specimens, the latter here provisionally referred to Heuglin and Fitzinger's *Herpestes gothneh*.

CROSSARCHUS F. Cuvier

Crossarchus F. CUVIER, 1825, 'Hist. Nat. Mamm.,' V, livr. 47, February. Type, by monotypy, *Crossarchus obscurus* F. Cuvier.

Crossarchus alexandri Thomas and Wroughton

Plate XXV; and Text Figures 44B, 52–54

Crossarchus alexandri THOMAS AND WROUGHTON, 1907, Ann. Mag. Nat. Hist., (7) XIX, May, p. 373. Type locality, Banzyville, Ubangi, Belgian Congo. Five specimens.

Crossarchus alexandri THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Mawambi (2), Moera (1), Poko (1 specimen).

Represented by 66 specimens (48 adult, 18 immature), collected as follows:

Poko, 1 (♂), August 23, 1910.

Akenge, 17 (2 ♂, 5 ♀, 4 subadults, 6 nurslings), September 16, October 1–30, 1913.

Niapu, 44 (19 ♂, 25 ♀, all adult but 6), November 14–27, December 1–31, 1913; January 3, 15, 1914.

Medje, 1 (♀ adult), July 15, 1910.

Gamangui, 3 (♂ all adult), February 8, 16, 22, 1910.

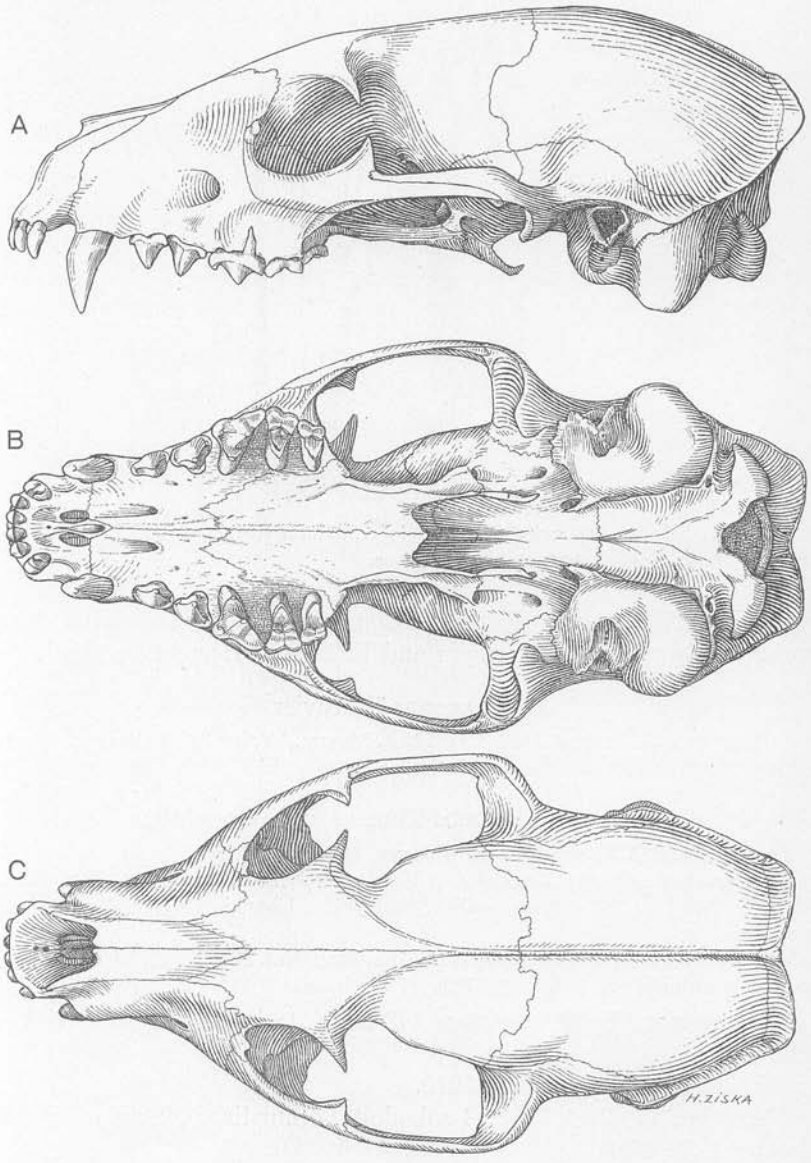

Fig. 52. *Crossarchus alexandri*. Skull of adult male (No. 51696). A, lateral view; B, palatal view; C, dorsal view. ×5/4.

Forty-eight specimens of this series of sixty-six are fully adult (Pl. XXV). Of the eighteen more or less immature four are subadult (permanent dentition fully developed but unworn, but skull and general size of animal show immaturity); in three others all the permanent teeth are present, but the canines are only about one-half to two-thirds grown; in five the entire milk dentition only is present, none of the permanent teeth being in sight; while in two others, in addition to the milk teeth, the first, or both first and second molars are in sight; these last are nurslings, in hich the incisors are only half-way up and the points only of the larger cusps of the cheek-teeth are visible in the cleaned skull, but probably had not pierced the gum.

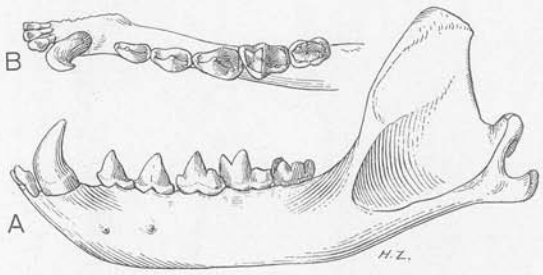

Fig. 53. *Crossarchus alexandri.* Adult male (No. 51696). A, lateral view of left mandible; B, crown view of left lower dentition. × ¾.

No. 51095, a male, is the only specimen in which the first phase of the natal pelage is shown. In this the incisors are about half up and the canines and highest cusps of the cheek-teeth are breaking the alveoli. This is the youngest specimen of the series, and the entire upperparts, from the shoulders posteriorly, including the outer border of the ventral area and the proximal half of the tail, are thinly veiled by long silvery white hairs, through which the short brown underfur is more or less visible; the underparts, from the throat posteriorly, are dark brown with a faint reddish tone; the edge of the lips from below the eyes posteriorly, and the chin and fore part of the throat, are yellowish white, as in adults; the top of the head is faintly grayish. The occipito-nuchal crest, so conspicuous a feature in most adults, is already prominent, forming a tuft of lengthened hairs, those of the nape directed forward, and those of the crown inward.

No. 51099, a young male with the entire milk dentition well developed but with no permanent teeth in sight, is still in the brown woolly first coat, but the pelage, especially of the upperparts, has greatly in-

creased in length from the earlier stage, and the veil of white hairs has disappeared. The underfur is yellowish gray basally, and annulated subapically with black and tipped with yellowish. The face-and-head pattern remains unchanged. This stage is represented by a series of five specimens, all approximately of the same age.

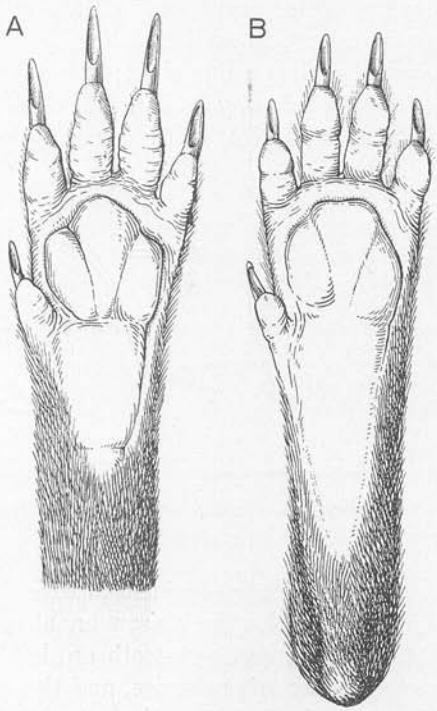

Fig. 54. *Crossarchus alexandri* (No. 51667). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

In the next stage represented, consisting of eight specimens, the natal woolly coat has been replaced by the mature pelage of adults, although some of the series are less than half-grown. No. 51660 has still the entire milk dentition, with no permanent teeth in sight, but the pelage differs in no way in texture or coloration from that of adults. The top of the head is marked by a whirl of lengthened brown hair, which passes into a conspicuous, erect nuchal crest extending to the shoulders, the hairs of which are about 50 mm. in length, or twice the length of the adjoining neck hairs on either side. They only about equal, however, the length of the pelage of the dorsal area, the coarseness and length of which

Measurements of Thirty Adult Specimens of *Crossarchus alexandri*

			Collectors' Measurements					Skull		
Cat. No.	Sex	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Condylo-basal Length	Zygomatic Breadth	Upper Cheek-teeth
51659	♂	Niapu	666	376	290	83	25	——	——	——
51661	♂	"	672	387	285	85	27	81.6	40.8	21.0
51662	♂	"	705	410	295	89	26	83.4	43.4	21.8
51666	♂	"	675	408	267	82	27	——	——	——
51667	♂	"	715	415	300	90	27	——	——	20.8
51671	♂	"	660	390	270	82	—	81.0	38.4	20.8
51674	♂	"	700	410	290	86	25	82.6	42.6	21.6
51686	♂	"	680	415	265	85	26	81.6	41.0	20.5
51688	♂	"	686	399	287	87	28	84.9	41.8	21.2
51689	♂	"	755	437	318	86	26	81.2	41.0	21.4
51691	♂	"	690	410	280	85	24	83.6	40.7	21.8
51695	♂	"	690	425	265	80	25	83.3	40.5	20.8
51696	♂	"	690	430	260	87	25	80.1	41.5	20.8
51697	♂	"	663	420	243	91	25	85.1	38.2	22.1
Average	**14** ♂		**695**	**409**	**280**	**85**	**26**	**82.6**	**40.9**	**21.2**
Minimum	"		660	376	243	80	24	80.1	38.2	20.5
Maximum	"		755	437	318	91	28	85.1	43.4	22.1
51655	♀	Niapu	705	412	293	87	—	——	——	——
51661	♀	"	672	387	285	85	27	81.6	40.8	21.0
51663	♀	"	690	423	267	89	27	83.4	42.2	21.7
51665	♀	"	695	395	300	85	27	——	——	——
51668	♀	"	725	415	310	90	27	86.8	41.8	21.8
51671	♀	"	660	390	270	82	—	81.0	38.4	20.8
51675	♀	"	680	395	285	85	25	78.9	39.7	20.6
51677	♀	"	645	375	270	86	26	81.5	38.6	21.8
51678	♀	"	705	420	285	88	27	——	——	——
51679	♀	"	——	——	——	—	—	83.4	39.0	21.6
51680	♀	"	685	390	295	85	27	83.0	40.7	21.6
51682	♀	"	705	410	295	85	28	82.9	40.6	21.4
51690	♀	"	675	380	295	84	27	79.8	38.0	20.5
51693	♀	"	700	415	285	87	30	81.8	40.5	21.8
51694	♀	"	680	435	245	85	26	82.3	41.0	20.0
51698	♀	"	680	400	280	84	26	——	——	——
Average	**16** ♀		**687**	**403**	**284**	**86**	**27**	**82.7**	**40.3**	**21.2**
Minimum	"		645	375	245	82	25	78.9	38.0	20.0
Maximum	"		725	435	310	90	30	86.8	42.2	21.8

are striking features of the species. This crest, Mr. Lang informs me, is a conspicuous feature of the animal in life.

Messrs. Thomas and Wroughton, in their description of this fine species, refer to the variability of the animal, "both in colour and in the condition of its pelage, though this latter may be a question of season." They cite a young example which is "absolutely without the long hairs characteristic of two of the Alexander-Gosling specimens, while a third is in an intermediate condition." Thus three of the five specimens examined by these authors were in abnormal pelage. In the present series of nearly sixty specimens old enough to be in adult pelage only one is in abnormal pelage, in which the animal is clad only in its coat of underfur, as in the young specimen cited by Thomas and Wroughton. The adults are exceptionally uniform in coloration and in condition of pelage. A few specimens differ from the average in darker coloration, in consequence of the extreme shortness of the light hair-tips above and their almost entire absence on the midline below. They are fully connected by intermediates with the average condition. The darker general tone thus imparted is a purely individual feature, unconnected with season. Nearly all were taken during the months of October, November, and December.

The preceding table of measurements of exclusively fully adult specimens indicates the range of variation to be expected in a large series from a single locality.

ICHNEUMIA I. Geoffroy

Lasiopus I. GEOFFROY, 1835, in Gervais, 'Résumé des leçons de Mammalogie, professées au Museum de Paris, l'année 1835,' I, p. 37. Type, by monotypy, *Herpestes albicaudus* G. Cuvier. Preoccupied by *Lasiopus* Dejean (1833) in Coleoptera.

Ichneumia I. GEOFFROY, 1837, Ann. Sci. Nat., Paris, (2) VIII, October, p. 251; 1839, Mag. de Zool., pp. 3 and 13 of text to Pls. XI-XVI. New name to replace *Lasiopus*, preoccupied.

Similar in size, character of pelage, and most cranial characters to typical forms of *Herpestes*, and with the same dental formula (teeth 40), but soles of feet furred instead of bare, frontal region of skull more elevated and expanded, the dentition much heavier, especially p^4 and the molars of both jaws.

Ichneumia leucura ibeana (Thomas)

Plate XXVI; and Text Figures 55–57

Herpestes albicaudus ibeanus THOMAS, 1904, Ann. Mag. Nat. Hist., (7) XIII, June, p. 409. Type locality, Athi-ya-Maui, Mombasa-Uganda Railway, British East Africa.

? *Mungos albicauda* THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Poko (1 specimen).

Ichneumia albicauda ibeana HOLLISTER, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, p. 130.

Represented by 8 specimens (5 adult, 3 immature), collected as follows:

Faradje, 5 (2 skins with skulls, 3 skins without skulls, all adult), April 15, December 31, 1911; February 17, 1913.

Niangara, 3 (2 ♂ subadult, 1 nursling), April 19, June 5, 1913.

Collectors' measurements of 3 adult males from Faradje:

Cat. No.	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51594	960	560	400	120	40
51595	990	580	410	120	43
51596	1080	620	460	130	40

Only two of the skulls of these specimens are available for measurement—Nos. 51594 and 51595. No. 51594 is very old, with the teeth greatly worn, the orbits closed, and the cranial sutures wholly obliterated; in No. 51595 (Figs. 55 and 56) the teeth are unworn, the orbits not fully closed, and all the cranial sutures open except the median frontal and parietal. Greatest length (No. 51594) 111.2, (No. 51595) 106.0; condylobasal length, 110.8, 107.8; palatal length, 62.0, 63.0; zygomatic breadth, 57.5, 55.5; breadth at p^4, 36.5, 33.0; least interorbital breadth, 21.3, 20.0; postorbital constriction, 22.2, 21.0; breadth of braincase, 36.3, 33.9; upper cheek-teeth (c-m^2), 43.3, 39.0; p^1-m^2, 35.2, 32.5; length of p^4, 10.0, 9.6; greatest transverse breadth of p^4, 7.0, 6.8; m^1, 5.8×9.0, 6.0×8.5; m^2, 4.3×7.6, 4.3×7.3.

Although the five Faradje specimens are all adult and the three from Niangara are all immature, they seem unquestionably referable to the same form, although not satisfactorily comparable, owing to difference in age. The five Faradje specimens vary greatly individually in the amount of white in the tail. In one the apical half is white; in another only the apical third is white; in a third the tail is merely grizzled with white; in the other two the tail is superficially blackish, the hairs having only narrow subapical and subbasal zones of white, not evident at the surface except ventrally. The two semi-adult Niangara specimens have the apical half of the tail clear white (Pl. XXVI, fig. 1).

One of the Niangara specimens is a nursling (probably about two or three weeks old) in first pelage. The ventral surface is thinly clothed and dark brown; the rest of the body, the limbs (except the toes), and

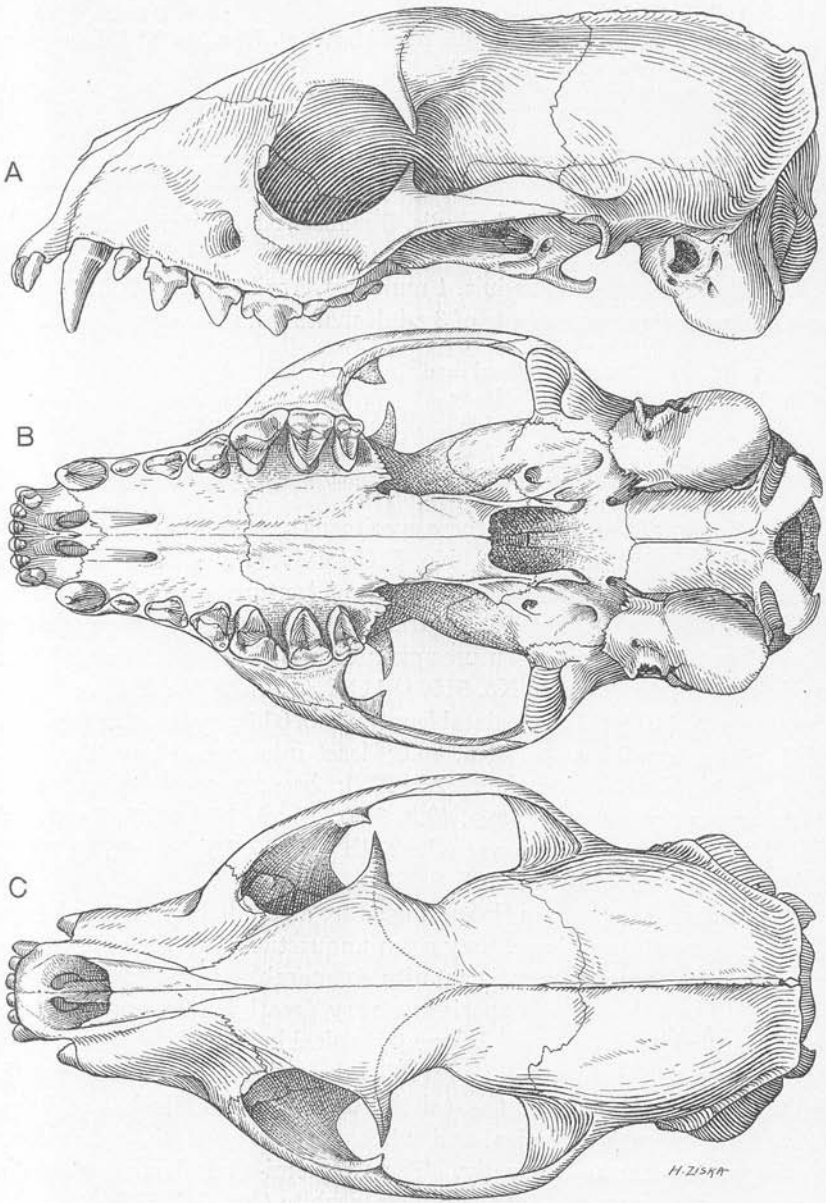

Fig. 55. *Ichneumia leucura ibeana.* Skull of adult male (No. 51595). A, lateral view; B, palatal view; C, dorsal view. Natural size.

the tail (except the tip) are pale buff, the hairs dusky at base, the dusky portion showing at the surface on the middle of the back, thus giving in places a dingy effect; the nose is blackish, passing into dark brown on the forehead and sides of the head; the toes and tip of the tail are also blackish.

The skulls of the specimens from Faradje agree in all essential details with a series of four skulls from the Athi district, British East Africa. In general coloration both the Faradje and Niangara specimens are

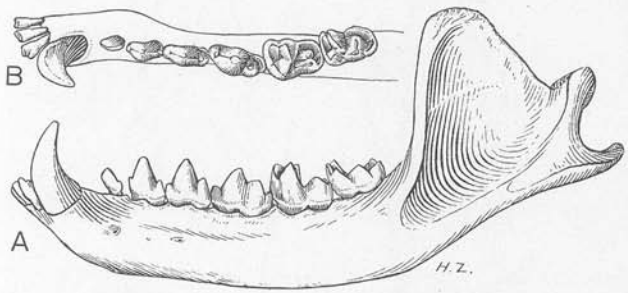

Fig. 56. *Ichneumia leucura ibeana.* Adult male (No. 51595). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

much darker than the series of *Herpestes albicaudus ibeanus* Thomas, to which subspecies they are referred with much reservation, as not only are they much darker but the geographical conditions of the two regions point to their probable subspecific differentiation. As, however, the type locality of I. Geoffroy's *Ichneumon albescens* is Sennar, the Faradje form may be referable to *albescens*, a point indeterminable without Sennar specimens for comparison.

Geoffroy's *I. albescens* has usually been synonymized with the Abyssinian *leucurus* of Ehrenberg, and the latter with *albicaudus* of G. Cuvier from Senegal. As it does not appear to me probable, on geographic as well as on other grounds, that *leucurus* and *albicaudus* can be specifically identical, I prefer to employ *leucurus* for the eastern group. It may be noted that, with few exceptions, it has been customary heretofore to refer all forms of *Ichneumia*, from Cape Colony to Abyssinia, Sudan, northern Angola and Senegal, to Cuvier's *albicaudus*.

XENOGALE J. A. Allen

Xenogale J. A. ALLEN, 1919, Journ. Mammalogy, I, No. 1, November 28, p. 26. Type, by original designation, *Xenogale microdon.*

Toes 5–5; soles and palms furred; dental formula, relative size and general structure of the teeth as in *Herpestes* (*s.s.*); skull relatively short and broad, postpalatal region especially so; postorbital constriction deep and close behind the postorbital processes; braincase short, proportioned about as in *Ichneumia*, very different in form from the braincase of *Herpestes;* tail short and thick, as in *Ichneumia* and *Atilax*, in contrast with the long slender tail of *Herpestes*, in which the heavily haired portion is restricted to the basal third.

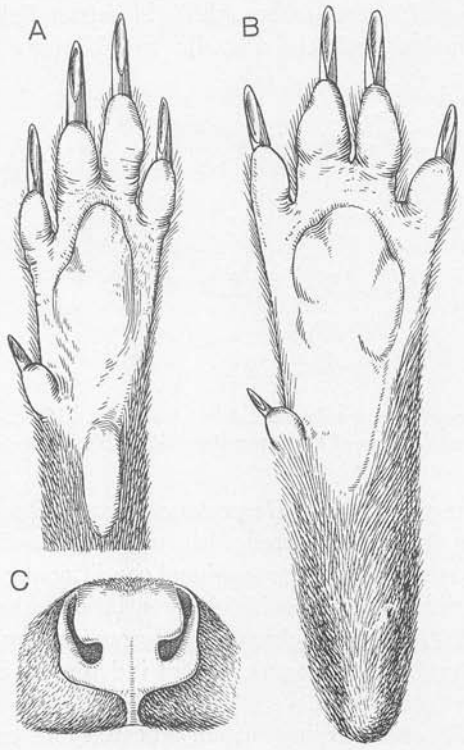

Fig. 57. *Ichneumia leucura ibeana* (No. 51595). A, palmar surface of left fore foot; B, plantar surface of left hind foot; C, rhinarium. Natural size.

Xenogale presents a singular combination of characters. Externally it strongly resembles *Atilax*, particularly in the texture and coloration of the pelage, and in the field was mistaken for *Atilax macrodon*, but in cranial characters and in dentition the two forms present little similarity. It resembles *Ichneumia* in external form, in its long heavy overhair, and in having the palms and soles furred, thus differing in this latter respect from both *Herpestes* and *Atilax*. It has the light and rather weak dentition of *Herpestes*, but the skull is relatively much shorter, broader

and heavier than in the latter, with the postpalatal region correspondingly shorter and wider (Figs. 41, 58). The short, thick tail also contrasts strongly with the attenuate tail of *Herpestes*.

Xenogale microdon J. A. Allen

Plate XXVII; and Text Figures 58–60, 61A-B

Xenogale microdon J. A. ALLEN, 1919, Journ. Mammalogy, I, No. 1, Novembe 28, p. 27.

Type, No. 51625, ♂ adult, Niapu, Belgian Congo, December 4, 1913; Herbert Lang and James P. Chapin, American Museum Congo Expedition. Orig. No. 2194.

A small-toothed form with a general external resemblance to the *Atilax* group.

Upperparts of body with the overhair black broadly annulated with rufous, giving a grizzled effect of deep black and ochraceous orange; the individual hairs are light at base passing into black, the outer half black ringed and tipped with ochraceous or wholly black; underfur pale buff, darker at extreme base; tail like the back at base, becoming lighter apically without distinctive change (either to black or w hite) at tip, the hairs individually buff at base, broadly ringed with black near the mi ddle and subapically ringed with whitish; limbs uniform brownish black to intense black (in different individuals); head distinctly lighter than body, the hairs short and conspicuously tipped with whitish, giving a grizzled, grayish effect; ventral area similar to the back but more suffused with rufous which prevails over the black; foreneck from the axillar line to lower part of the throat blackish, the hairs conspicuously tipped with whitish, giving a grizzled effect; chin, sides of head and top of nose with a brownish tone, the hairs extremely short; palms and soles[1] as in *Ichneumia*.

Collectors' measurements of type: Total length, 895 mm.; head and body, 510; tail vertebræ, 385; hind foot, 105; ear, 36.

Skull of type, greatest length, 107.0; condylobasal length, 105.0; basal length, 100.0; zygomatic breadth, 59.0; postorbital constriction, 18.9; width of braincase, 38.5; mastoid breadth, 41.0; across p^4-p^4, 34.5; palatal length, 60.0; upper toothrow (c-m^2), 38.2; length of p^4 outside, 10.7.

The type is an old male with strongly developed sagittal and lambdoidal crests and slightly worn teeth (Figs. 58 and 59). The tail appears to have been slightly mutilated at the tip in life, and thus the total length and tail length given above are less than the normal.

This species is represented by 16 specimens (9 adults, 7 nurslings), collected in the Rain Forest region, as follows:

Akenge, 4 (all ♂, 3 adult, 1 subadult), October 14, 22, 1913.

Niapu, 4 (1 ♂, 3 ♀, all adult), November 10, December 4, 1913; January 17, 1914.

Medje, 6 (1 ♀ adult, 5 nurslings), March 10, October 5, 1910.

Avakubi, 2 (nurslings), November 27, 1909.

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[1]In the original description (*loc. cit.*, p. 27, third line from bottom of the technical description), "palms and soles bare as in *Ichneumia*" should read "palms and soles as in *Ichneumia*."

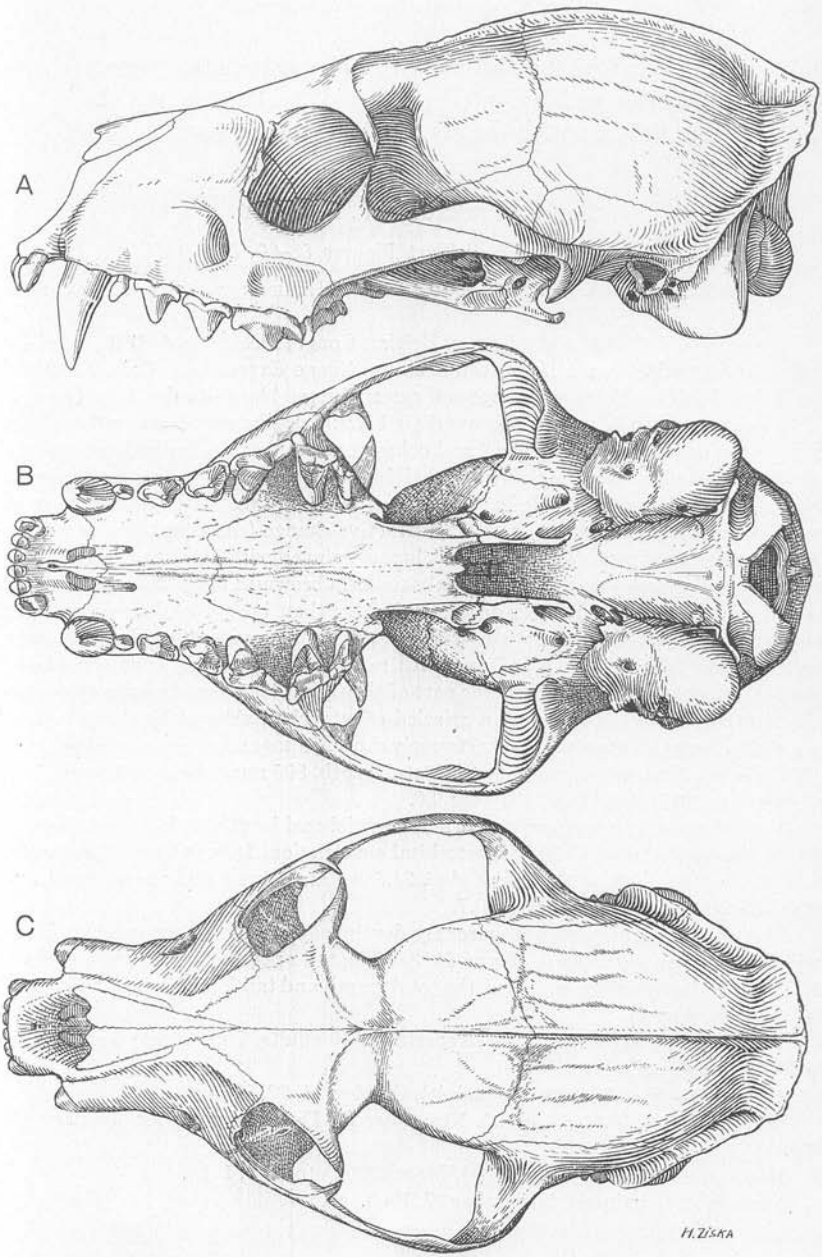

Fig. 58. *Xenogale microdon.* Type skull, adult male (No. 51625). A, lateral view; B, palatal view; C, dorsal view. Natural size.

The seven nurslings (two from Avakubi, a locality otherwise unrepresented in this series, and five from Medje, represented also by an adult female) differ markedly in coloration from the Niangara *Ichneumia* nursling, being very much darker throughout. They are also all several weeks older, with the soft juvenile pelage considerably more developed. Making due allowance for the difference in age and the consequent greater length of the pelage, the present series obviously represents a much darker form, the pelage being everywhere dull drab-brown with the extreme tips of the hairs light buffy, scantily veiling and lightening superficially the general dark tone. The front of the head to somewhat posterior to the eyes is blackish, as are the feet except for a few light-tipped hairs.

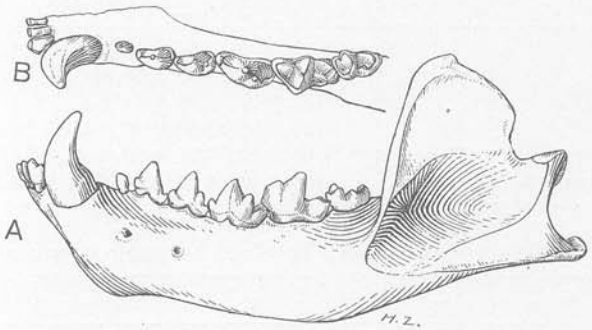

Fig. 59. *Xenogale microdon.* Type, adult male (No. 51625). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

Three of the Medje specimens are from the same litter, but in one interesting feature they are remarkably individualistic. In one the hair of the upperparts lies smoothly and is all directed backward, being thus wholly normal in position. In another the hair posterior to the shoulders also is normal in position except for a conspicuous hair-whirl at the left hip. The other has the hair of the whole dorsal area abnormally disposed from the head posteriorly. Anteriorly is a semicircular whirl, convex posteriorly, extending from the base of the right ear to the base of the left ear, the hairs forming a crest, those of the right side of the nape and across the front of the shoulders being reversed, or directed forward and to the left over a broad area. From this broad transverse whirl or crest, a median spinal crest extends down the back to the hips and then turns sharply to the left and ends at the base of the tail. There is a third and very large transverse crest over the left scapula region

External Measurements of *Xenogale microdon*

Cat. No.	Sex	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
51621	♂	Akenge	1010	585	425	100	38
51625[1]	♂	Niapu	895	510	385	105	36
51624	♀	"	990	565	425	100	34
51637	♀	"	813	443	370	100	38
Average			**927**	**526**	**401**	**101**	**36.5**

Measurements of Five Skulls of *Xenogale microdon*

Cat. No.	Sex and Age	Locality	Greatest Length	Condylobasal Length	Palatal Length	Zygomatic Breadth	Least Interorbital Breadth	Postorbital Constriction	Breadth Braincase	Breadth across p^4
51616	♂[2]	Akenge	97.5	96.8	52.0	46.2	17.7	19.7	36.3	32.0
51621	♂ ad.	"	114.6	110.6	63.7	56.8	——	16.6	38.0	34.7
51624	♀ "	Niapu	107.0	105.9	56.5	54.4	20.7	15.7	37.6	31.6
51625[1]	♂ "	"	107.0	105.0	60.0	59.0	20.6	18.9	38.5	34.5
51637	♀ "	"	105.7	102.6	54.4	53.4	22.3	18.3	36.2	32.8
Average	**4 ad. (2♂, 2♀)**		**106.4**	**106.4**	**58.4**	**56.4**	**21.2**	**17.5**	**37.6**	**33.4**

Measurements of Upper Teeth of *Xenogale microdon*

Cat. No.	Sex and Age	c-m^2	p^1-m^2	p^4	m^1	m^2
51616	♂[2]	36.4	29.2	10.6×6.5	4.7× 9.7	3.2×6.0
51621	♂ ad.	40.6	33.1	9.5×5.7	5.0×10.2	3.1×6.4
51624	♀ "	38.8	30.9	9.8×5.9	5.2× 9.0	2.8×6.0
51625[1]	♂ "	38.2	31.1	10.7×6.4	5.6× 9.5	3.0×6.4
51637	♀ "	36.0	30.1	10.1×5.6	5.0× 8.9	3.0×5.7
Average 4 ad. (2♂, 2♀)		**38.4**	**31.3**	**10.0×5.9**	**5.2× 9.4**	**3.0×6.1**

Measurements of Lower Teeth of *Xenogale microdon*

Cat. No.	Sex and Age	c-m_2	p_1-m_2	p_4	m_1	m_2	Length of m_1 and m_2
51616	♂[2]	40.8	34.4	7.1×3.9	9.4×4.8	5.6×3.8	15.4
51621	♂ ad.	46.5	36.8	7.5×3.8	9.5×4.7	5.8×4.0	15.7
51624	♀ "	43.9	35.7	7.5×3.8	9.4×4.5	5.4×3.8	14.7
51625[1]	♂ "	48.8	35.9	7.7×3.6	9.2×4.8	6.1×4.0	15.1
51637	♀ "	42.1	35.0	7.5×3.7	9.1×4.6	5.4×3.6	14.5
Average 4 ad. (2♂, 2♀)		**45.3**	**35.8**	**7.5×3.7**	**9.3×4.6**	**5.7×3.8**	**15.0**

[1]Type.

[2]Sutures of skull still distinct, but permanent teeth all fully developed except canines, the tips of which are excluded for 2 to 4 mm., but the milk canines are still functional and firmly implanted behind their successors.

formed by the reversed or anteriorly directed hairs behind the shoulder. There is a faint duplication of this on the right shoulder where the hairs are also directed forward. It is evident that this arrangement of the hair of the upperparts could not have been produced by any manipulation of the skin in its preparation as a specimen, and I am assured by Mr. Lang, who kept the specimens alive for observation, that this astonishing arrangement of the hair was the same in life as it is in the made-up specimens.

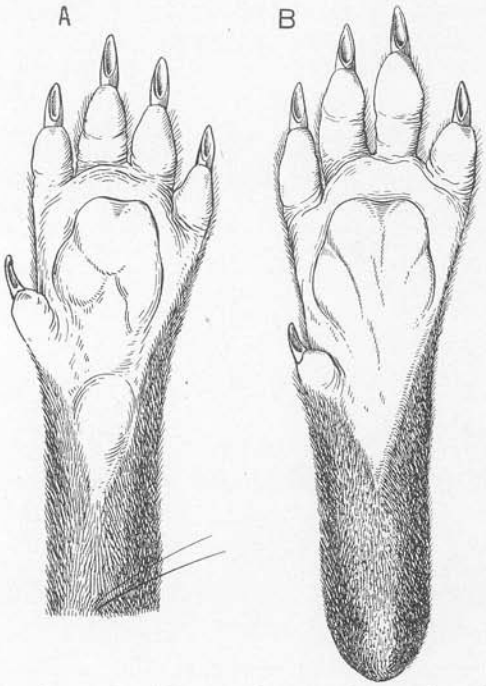

Fig. 60. *Xenogale microdon* (No. 51637). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

ATILAX F. Cuvier

Herpestes (part) of most earlier authors; *Mungos* (part) of most authors since 1907.[1]

Atilax F. CUVIER, 1826, 'Hist. Nat. Mamm.,' livr. 54, June. (Cf. *antea*, pp. 169, 173). Type, by monotypy, the Vansire of F. Cuvier = *Herpestes paludinosus* G. Cuvier.

Atilax POCOCK, 1916, Proc. Zoöl. Soc. London, p. 350, and pp. 349–374, passim, with text figs. of ear, vibrissæ, rhinarium, feet and anal glands. HOLLISTER, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, p. 126.

[1]Cf. Thomas, 1907, Ann. Mag. Nat. Hist., (7) XIX, January, p. 119, footnote.

Athylax GRAY, 1864, Proc. Zoöl. Soc. London, p. 556.

Genotype (by monotypy), Vansire, F. Cuvier (not of Buffon and Daubenton) = "*Atilax vansire* F. Cuvier" auct. = *Herpestes paludinosus* G. Cuvier. (See above, pp. 167, 173, for a historical account of F. Cuvier's Vansire and the genus *Atilax*.)

Skull relatively broad, short and heavily ossified; zygomatic breadth about 60 per cent of the condylobasal length; frontal region elevated and expanded (as in *Ichneumia*); postorbital constriction deep; palatal tube long and narrow, its width about 65 per cent of the length (about 86 per cent in *Herpestes* and *Ichneumia*); teeth heavily developed; premolars $\frac{3-3}{3-3}$, teeth 36 (premolars $\frac{4-4}{4-4}$ and teeth 40 in *Herpestes* and *Ichneumia*). Pelage soft, thick and long; palmar and plantar surfaces of feet naked as in *Herpestes* (furred in *Ichneumia* and *Bdeogale*). Toes free (not joined by membranes as in *Herpestes*, *Ichneumia* and *Bdeogale*).

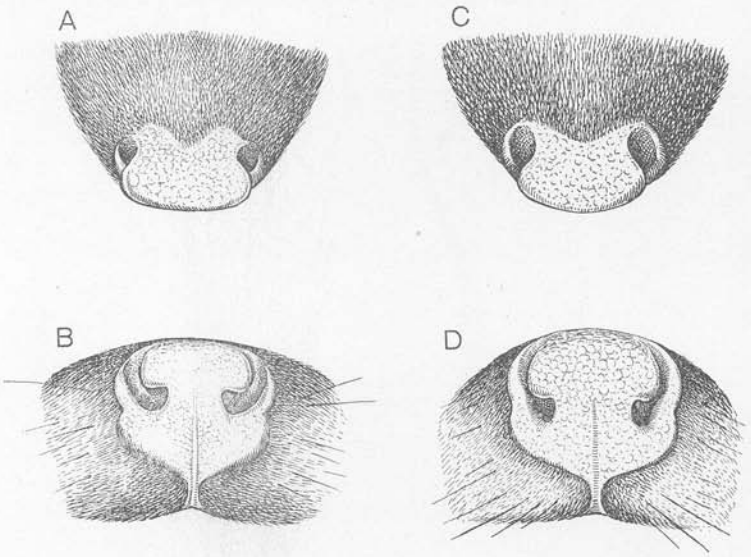

Fig. 61. Rhinarium. A, dorsal view of *Xenogale microdon* (No. 51637); B, front view of same; C, dorsal view of *Atilax macrodon* (type, No. 51629); D, front view of same. Natural size.

Atilax is the proper generic designation of the *Herpestes paludinosus* group of mongooses, which ranges throughout the greater part of Africa south of the Sahara. The half dozen forms at present recognized have heretofore usually been referred to *Herpestes* (= *Mungos* auct. recent., not *Mungos* Geoffroy and G. Cuvier), most of them as subspecies of *H. paludinosus* G. Cuvier. The forms of *Atilax* appear to vary but little in size, the condylobasal length of the skull, according to descriptions, ranging from 102 to 115 mm. The number of premolars appears to be

practically constant; in a series of twenty-one skulls in the present Congo collection there is not an exception to the premolar formula of $\frac{3}{3}-\frac{3}{3}$.

Atilax robustus Gray

Plate XXVIII, Figure 1

Athylax robustus Gray, 1864, Proc. Zoöl. Soc. London, pp. 558–560, text figs. of skull, p. 559 (palatal and lateral views). Type locality, White Nile, Africa.

Herpestes galera var. *robustus* Thomas, 1882, Proc. Zoöl. Soc. London, pp. 72–74 (part). Gray's type of *robustus* only.

Represented by 4 specimens, an adult male (Pl. XXVIII, fig. 1) and female, a half-grown male, and a nursling, all taken at Faradje, April 22, 1911; March 8, December 26, 1912; January 23, 1913.

These specimens agree well with the original description of the type of *robustus* ("brown, very minutely punctured"), being nearly uniform reddish brown both above and below, passing into grayish brown on head and neck, and slightly darker on the middle of the back than on the sides and underparts. The long overhair is subapically annulated broadly with black and white, with conspicuously long reddish tips, which give the prevailing reddish brown tone to the pelage.

Collectors' measurements of the two adults: Total length, ♂ 870, ♀ 860; head and body, 530, 520; tail vertebræ, 340, 340; hind foot, 110, 108; ear, 34, 33.

Skull, total length, ♂ 102.2; zygomatic breadth, 62; upper tooth-row (p^2-m^2), 29.

The type locality of *Athylax robustus* Gray is "White Nile," without further specification. Faradje is near the border of the White Nile drainage, and this species was the only *Atilax* there taken. On the other hand, no individuals of this species were found at the Ituri localities where the dark form described below was common (Pl. XXIX).

Atilax macrodon, new species

Plates XXVIII, Figure 2; XXIX; and Text Figures 61C-D, 62–64

Type, No. 51629, ♂ adult, Niapu, Belgian Congo, December 15, 1913; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 2294.

General color above blackish brown, darkest along middle of back; tail black; sides and underparts browner, with a faint rufous tone; head lighter, with a more or less grayish tone, due to the extreme tips of the hairs being whitish or pale yellowish. The overhair of the middle of the back, from the shoulders to the base of the tail, and also the tail hairs are long, stiff, and entirely black; on the head, sides of the neck and the foreneck the hairs are short, rigid, and minutely tipped with pale rufous, giving a general brownish effect, as is also the case with the long hairs of the flanks

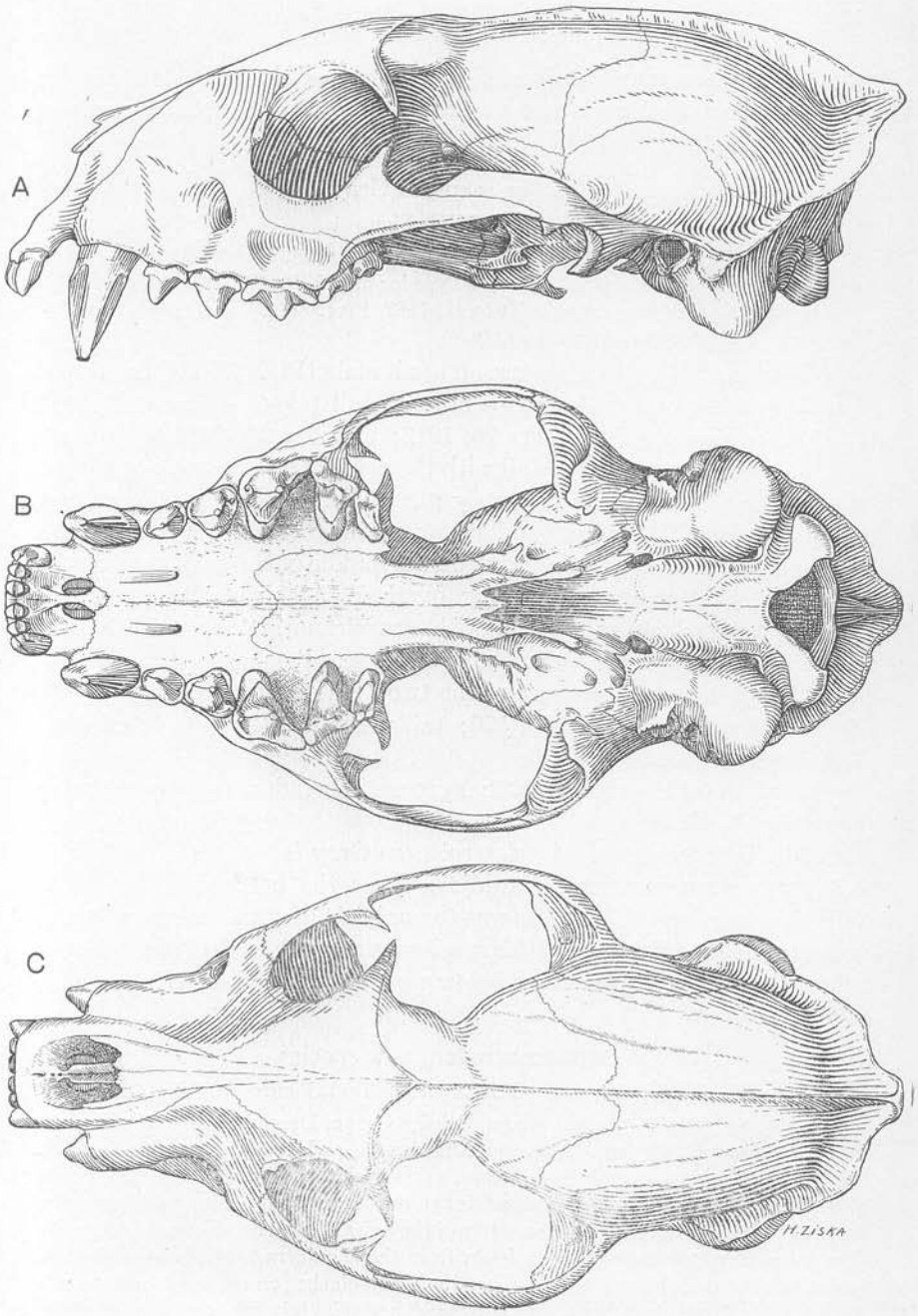

Fig. 62. *Atilax macrodon*. Type skull, adult male (No. 51629). A, lateral view; B, palatal view; C, dorsal view. Natural size.

and ventral area. Underfur thick; brownish gray. In many specimens the minute tipping of the hairs is much lighter on the head and sides of the neck, producing a grayish rather than rufous effect. Fore limbs dark brown; hind limbs darker, becoming nearly black on the feet.

Seen at a little distance or in a dull light the general color effect is dull brownish black, varying in some specimens to black; on close inspection or in strong direct light the minute rufous tipping of the hairs gives a slight rufous tone to the flanks and underparts and in exceptional specimens also to the back.

Collectors' measurements of the type: Total length, 855 mm.; head and body, 525; tail vertebræ, 330; hind foot (c. u.), 112 (s. u. 107); ear, 34.

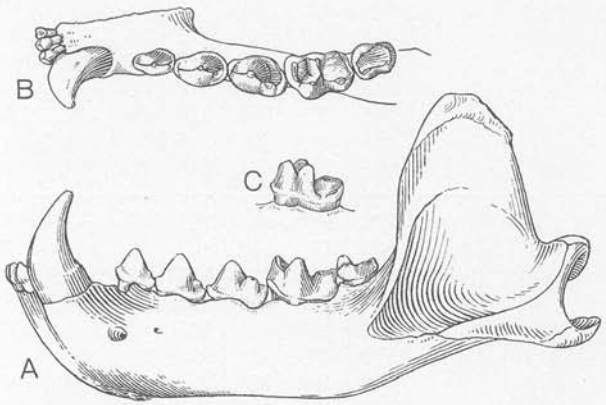

Fig. 63. *Atilax macrodon.* Type, adult male (No. 51629). A, lateral view of left mandible; B, crown view of left lower dentition; C, lingual view of first lower molar. Natural size.

Skull (type; Figs. 62 and 63), total length, 116.8; condylobasal length, 108.8; palatal length, 66.1; zygomatic breadth, 60; breadth at base of canines, 26.4; breadth at base of incisors, 14.6; interorbital breadth, 21.7; tip to tip of postorbital processes, 37.4; postorbital constriction, 15.0; breadth of braincase, 38.4; mastoid breadth, 41.8; outside breadth of palatal tube, 10.5; length of palatal tube (to tip of pterygoids), 26.5; upper toothrow (including canine), 40.7; upper toothrow (p^2-m^2) 31.2; p^4, outside length, 10.2, oblique inside length, 12.2, greatest transverse diameter, 8.6; length of mandible (symphysis to tip of angular process), 75.8; height, angle to condyle, 14.6; height of coronoid process (at posterior border) 36.4; length of toothrow (p_2-m_2), 35.4; toothrow (including canine), 47.1; m_1, 9.8×6.3; m_2, 6.1×5.5.

Represented by 17 specimens (9 males, 12 females, all but 3 adult), collected as follows:

Akenge, 2 (1 ♂, 1 ♀, both adult), October 15, 29, 1913.

Medje, 2 (♂ juvenile), August 31, October 10, 1910.

Niapu, 13 (4 ♂, 9 ♀, all adult but 1), December 6–30, 1913; January 3, March 3, 1914.

Measurements of Twelve Adult Specimens of *Atilax macrodon*

			Collectors' Measurements					Skull		
Cat. No.	Sex	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Condylo-basal Length	Zygomatic Breadth	Upper Cheek-teeth
51619	♂	Akenge	850	500	350	115	35	105.4	58.5	29.8
51625	♂	Niapu	895	510	385	105	36	105.6	59.3	29.1
51626	♂	"	845	510	335	108	36	106.5	60.6	29.7
51627	♂	"	855	510	345	118	34	104.5	61.7	29.3
51629[1]	♂	"	855	525	330	112	34	108.3	59.9	31.4
51630	♂	"	845	490	355	115	35	——	——	——
Average	**6**	♂	**858**	**508**	**350**	**112**	**35**	**106.1**	**60.0**	**29.9**
Minimum	"		845	490	330	105	34	104.5	58.5	29.1
Maximum	"		895	525	385	118	36	108.3	61.7	31.4
51623	♀	Akenge	790	485	305	105	32	——	——	——
51631	♀	Niapu	850	450	400	115	33	103.0	59.4	28.5
51633	♀	"	830	510	320	109	38	104.1	59.1	28.9
51634	♀	"	860	493	367	112	38	103.8	61.7	28.3
51635	♀	"	890	525	375	115	32	107.6	61.8	29.8
51636	♀	"	870	488	382	122	35	109.6	61.5	29.0
Average	**6**	♀	**848**	**492**	**358**	**113**	**34**	**105.6**	**60.7**	**28.9**
Minimum	"		790	450	305	105	32	103.0	59.1	28.3
Maximum	"		890	525	400	122	38	109.6	61.8	29.8

The adult specimens are very uniform in coloration; immature specimens (Pl. XXVIII, fig. 2) are usually darker than adults. The cranial differences present nothing noteworthy; in none is there a trace of p^1. In three very young skulls the milk dentition is still present. The orbital ring is complete in one skull and nearly closed in another; usually the posterior third is open. The soles of the hind feet are uniformly naked to the heel, not "sometimes with the posterior third hairy," as has been said to be the case in some specimens of *A. robustus* (Fig. 64B).

Thomas has listed[2] a single specimen from Poko (near Niapu), in the Christy collection, as *Mungos paludinosus* G. Cuvier, which should probably be referred to the present species, as no other species was met with west of Faradje by the American Museum Congo Expedition.

Atilax macrodon belongs unquestionably to the *Herpestes paludinosus* group, but it is much larger and darker than typical *paludinosus*.

[1]Type.
[2]1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472.

Mungos paludinosus mordax Thomas, from near Lake Nyasa, based on a skull, is obviously much larger (condylobasal length of skull 115 mm., the average for *macrodon* being about 105 mm.). *Mungos paludinosus rubellus* Thomas and Wroughton, from Portuguese East Africa, and *M. p. rubescens* Hollister, from German and British East Africa, are both much smaller, and both are red forms. *Athylax robustus* Gray,

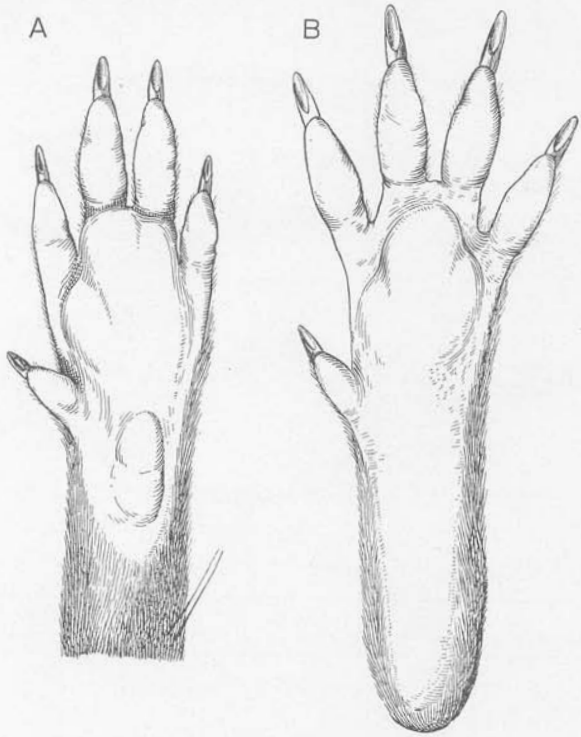

Fig. 64. *Atilax macrodon* (Type, No. 51629). A, palmar surface of left fore foot; B, plantar surface of left hind foot. Natural size.

from the "White Nile" region is also much larger than *macrodon*, the condyloincisive length, as given by Thomas,[1] being 114.8 mm. (4.55 inches = length from premaxillæ to most posterior point of occipital condyles), and apparently much different in coloration, although two quite distinct forms are evidently covered by the description, which says: "General colour either grizzled reddish brown and white, or dark

[1] 1882, Proc. Zoöl. Soc. London, p. 73.

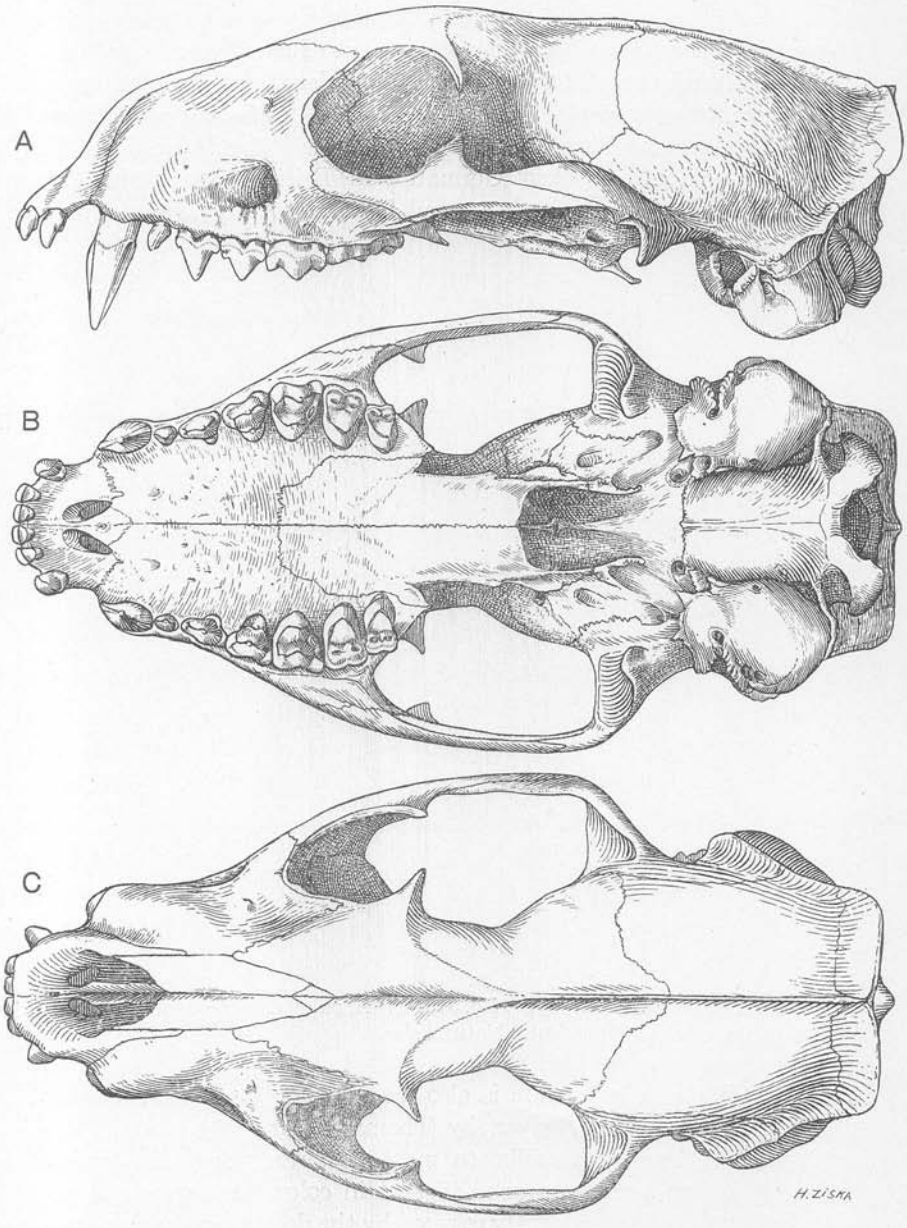

Fig. 65. *Bdeogale nigripes*. Skull of adult female (No. 51582). A, lateral view; B, palatal view; C, dorsal view. Natural size.

blackish brown without annulations." The first alternative seems to agree best with Gray's original description, and also with the specimens from Faradje referred above to *robustus*. That the Faradje specimens differ radically from the Niapu series seems beyond question, the Faradje specimens being nearly uniform reddish brown, including the tail, with all the long hairs broadly tipped with red, and broadly annulated with white about midway their length, while in *macrodon* the long hairs of the back and tail are usually entirely black (some of them minutely tipped with rufous in exceptional specimens), with the general effect of blackish instead of rufous.

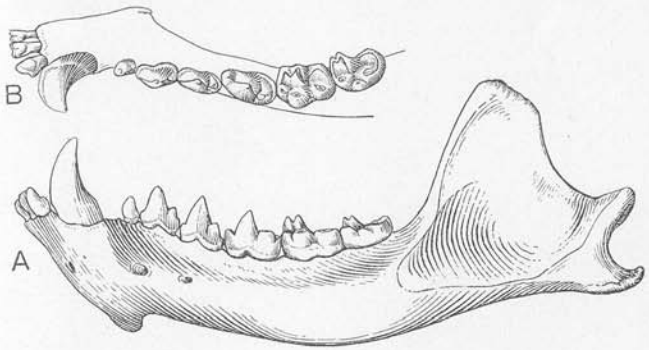

Fig. 66. *Bdeogale nigripes*. Adult female (No. 51582). A, lateral view of left mandible; B, crown view of left lower dentition. Natural size.

Bdeogale Peters

Bdeogale Peters, 1852, Monatsb. K. Preuss. Ak. Wiss. Berlin, p. 81; 1852, 'Reise nach Mossambique,' Zool. I, p. 119, Pls. xxvii-xxviii. Type, by subsequent designation (Thomas, 1882), *Bdeogale crassicauda* Peters.

Bdeogale nigripes Pucheran

Plates XXX, XXXI; and Text Figures 65–67

Bdeogale nigripes Pucheran, 1855, Rev. Mag. Zool., (2) VII, p. 111; 1858, Arch. Mus. Hist. Nat. Paris, X, pp. 120–124. Gaboon, West Africa.

Bdeogale nigripes Pousargues, 1897, Bull. Mus. Hist. Nat., III, pp. 202–205 (skull figured).

Bdeogale nigripes Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Zambo, Belgian Congo (1 specimen).

Represented by 9 specimens, collected as follows:

Akenge, 2 (1 ♂ adult, 1 ♀ juvenile), September 30, October 8, 1913.

Niapu, 7 (1 ♂ adult, 1 ♂ juvenile, 3 ♀ adult, 2 ♀ subadult), November 20–26, December 12, 17, 1913.

These specimens show considerable variation in color regardless of age, and a much greater range due to age, as the adults and subadults when laid out in series might well be taken for different species. The younger specimens, except one, have acquired the permanent dentition,

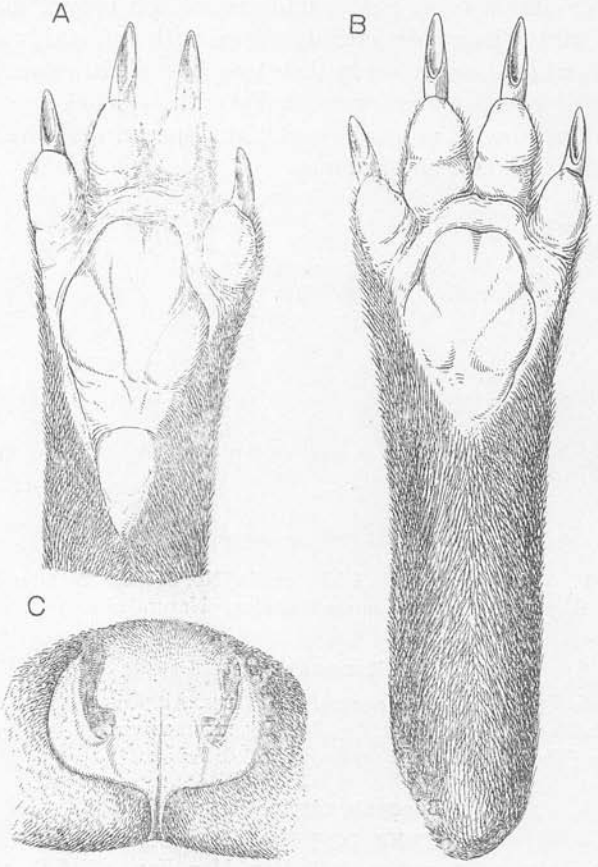

Fig. 67. *Bdeogale nigripes* (No. 51581). A, palmar surface of left fore foot; B, plantar surface of left hind foot; C, rhinarium. Natural size.

but the permanent canines are not fully up and the milk canines are still in place behind them; the skull sutures are still distinct. In other words, three of the four young specimens are "young adults," of nearly mature size. Just such specimens as these, as regards maturity, are often utilized as types of "new species" when older material is not available. They are, however, about one-eighth smaller than old adults, have uni-

formly whiter tails, much lighter coloration both above and below, and much longer and softer pelage, the white tips of the overhair being much longer than in adults, yet the coat is not in the least suggestive of the soft woolly first pelage. The adults have in every instance a very short close-lying coat, only about half the length of the pelage of the subadult series. The dark areas below are also much paler and much more restricted in area in the young adults than in the older specimens (Pl. XXX).

The color variation in adults consists in a lighter or darker tone of the upperparts in different individuals, while below the darker ones are brownish black from the lower foreneck to the base of the tail, except for a large light pre-anal patch of lengthened yellowish hair; those with the upperparts lighter have the dark color of the lower surfaces restricted largely to the lower foreneck and pectoral region and more posteriorly to a narrow median band.

The subjoined table of measurements illustrates the variation in size and especially its relation to age, while the photographs reproduced in Plates XXX and XXXI indicate the difference in color and texture of the pelage.

Measurements of *Bdeogale nigripes*

			External Measurements					Skull		
Cat. No.	Sex and Age	Locality	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Condylo-basal Length	Zygomatic Breadth	Upper Cheek-teeth
51581	♂ ad.	Akenge	1015	630	385	112	35	112.3	62.0	35.5
51585	♂ "	Niapu	950	605	345	115	37	——	——	——
51582	♀ "	"	990	615	375	103	36	115.5	59.1	32.2
51583	♀ "	"	967	597	370	108	33	118.1	——	32.6
51586	♀ "	"	935	565	370	105	37	112.6	57.7	32.5
Average	**5 ad.**									
	(2 ♂, 3 ♀)		**975**	**600**	**369**	**107**	**35.6**	**114.6**	**59.6**	**33.2**
Minimum			935	565	345	103	33	112.3	57.7	32.2
Maximum			1015	630	385	115	37	118.1	62.0	35.5
51580	♀ subad.	Akenge	820	480	340	105	32	103.7	50.0	30.1
51587	♀ "	Niapu	885	530	355	110	33	106.5	51.7	32.0
51706	♀ "	"	825	500	325	109	33	——	——	——
51584	♂ juv.	"	595	365	230	85	38	——	——	——

HYÆNIDÆ

Thirteen specimens of *Crocuta*, all collected at a single locality, are the only examples of this family obtained by The American Museum Congo Expedition.

CROCUTA Kaup

Crocuta KAUP, 1828, Oken's Isis, XXI, Heft 11, p. 1145. Type, by tautonymy and monotypy, *Hyæna crocuta* (Erxleben), the only species definitely mentioned.

Crocotta KAUP, 1829, Ent. Gesch. u. Natürl. Syst. Europ. Thierwelt, I, p. 74. An emendation of *Crocuta* Kaup, 1828.

Crocuta crocuta fortis, new subspecies

Plates XXXII–XXXIV; XXXV, Figures 1, 3; XXXVI, Figure 1

Type, No. 52068, ♀ adult, Faradje, northeastern Belgian Congo, February 5, 1913; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1222.

Coloration exceedingly variable and hence not diagnostic; size much larger than in any hitherto described form of *Crocuta*. Condylobasal length of skull (average of nine specimens) 250 mm., as against an average of 232 mm. in both *C. c. germinans* (twenty-six specimens from western British East Africa) and *C. c. fisi* (twelve specimens from eastern British East Africa); zygomatic breadth (average of same series) 181 mm., as against 162 and 163, respectively, for *germinans* and *fisi*. This difference appears to hold good for all other described forms of *C. crocuta*, so far as the few published cranial measurements indicate. All the other cranial measurements are proportionately greater, the minimum for *fortis* being often only a little less than the maximum for *germinans* and *fisi*. (For comparative average, minimum, and maximum cranial measurements of these three forms, see table on p. 219.) The few available external measurements of *fortis* taken from animals in the flesh are consistent with the cranial measurements, as shown by the following:

Comparative External Measurements of *Crocuta crocuta fortis*, *C. c. germinans*, and *C. c. fisi*

	Number of Specimens	Total Length	Head and Body	Tail Vertebræ	Hind Foot
C. c. fortis	2 ♀	1665	1340	325	257
C. c. germinans	12 ♂, 9 ♀	1501	1209	292	230
C. c. fisi	5 ♂, 2 ♀	1475	1191	284	230

Crocuta c. fortis is represented by thirteen specimens, all collected at Faradje, May 10, 1911 to February 5, 1913. There are six skins, taken as follows: two in February, two in August, and one each in September and December. The series includes five adult skins with skulls, one adult skin without skull, one complete skeleton, and six skulls without skins, of which three are immature.

The six adult skins vary greatly individually in color and markings. In two of them the ground color is grayish in general effect, in two others reddish, while the other two are intermediate between the grayish and reddish phases. No. 52062, a slightly immature male, is pale buffy white (decidedly gray in general effect in certain lights); the spots are large and deep black (Pl. XXXII, fig. 2). In No. 52061 (sex not indicated) the general tone is slightly more buffy than in 52062, and the spots are much smaller and more numerous, but also deep black. No. 52068 (the type of *fortis*, an adult female) is slightly buffy in general tone, and the spots on the body are small and brownish black; those on the shoulders and thighs are smaller, more sharply defined and deep black, in contrast with those of the sides and back. No. 52063 (sex not indicated) is ochraceous buff, the body spots of medium size and dull black, those of shoulders and thighs deep black. No. 52064 (adult female) is pale ferruginous in general tone; the body spots are large and black (Pl. XXXII, fig. 1). No. 52059 (adult male) has the ground color strongly reddish; the spots are brown, pale, and not sharply defined on the sides and shoulders, much darker on the thighs and lower back.

The individual color variations in this series of *fortis* agree closely with those of *germinans* from British East Africa as recorded by Roosevelt and Heller,[1] and later by Hollister.[2]

The table of measurements (p. 219) shows that nine adult skulls of *fortis* (the sex of four of them is not known) vary as much individually as do the twenty-six skulls of *germinans*, listed by Hollister (*loc. cit.*, pp. 146–149), from Sotik, Loita Plains, Guaso Ngishu Plateau, and the Mount Kenia region. They average, however, considerably larger in nearly all dimensions. They also differ from skulls of *germinans*, as represented by specimens from Kabalolot Hill (Sotik), Elmenteita, and Kijabe, with which they have been compared, in the shape and size of the auditory bullæ, which are relatively larger, much more swollen, and very different in the anterior portion, which is much more expanded and less tapering than in *germinans* (Pl. XXXV). The posterior border of the palatal floor (Pl. XXXIII) is much more deeply incised and more V-shaped than in *germinans*, in which the posterior border is less deeply and more evenly convex forward. This feature is somewhat variable in both series and thus would not always prove diagnostic. In six of the nine adult skulls of *fortis* the palatal border is deeply incised, in two moderately so, in the other shallow and evenly hollowed, as in *germinans*.

[1] 1914, 'Life Histories of African Game Animals,' I, p. 261.
[2] 1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, pp. 143–144.

The difference in the size and shape of the auditory bullæ between the two forms is practically constant and strongly marked. Another difference is seen in the form of the braincase, and although slight appears to be of great constancy. In *fortis* the sides of the braincase slope uniformly in an even plane from the upper border of the sagittal crest nearly to the parieto-squamosal suture, while in *germinans* this surface of the braincase is distinctly convex (Pl. XXXVI, figs. 1 and 2).

The usual range of individual variation in other features of the skull is present and calls for no special comment. The manner of insertion of p^2 is, however, markedly variable. In six of the nine adult skulls of *fortis* the long axis of this tooth scarcely deviates from the axis of the toothrow (Pl. XXXIV, fig. 1); in two other skulls it is highly oblique (Pl. XXXIV, fig. 2); in the other skull on the left side it is oblique to the trend of the toothrow, while on the right side it is normal in position. This sporadic obliquity of p^2 is so common in carnivores as not to require particular mention except that it has sometimes been considered as having diagnostic value. Whether it has the importance ascribed to it by Hollister[1] in the case of *Hyæna hyæna bergeri* and *H. dubia* seems uncertain. In his two skulls of *dubia* p^2 stands straight with the axis of the toothrow, and in the eleven skulls of *bergeri* it has an oblique position. As this feature is the chief alleged difference between the skulls of the two forms, the examination of a larger series of skulls of *dubia* from this point of view seems desirable.

The accompanying table of comparative cranial measurements of *C. c. germinans*, *C. c. fisi*, and *C. c. fortis* is based, in the case of *germinans* and *fisi*, on Hollister's tables (*loc. cit.*, pp. 146–149), and, in the case of *fortis*, on the table here given (p. 219). The series of skulls of the three forms are strictly comparable in respect to age and sex. The twenty-six skulls of *germinans* include fourteen males and twelve females; of the twelve skulls of *fisi* eight are males and four are females; the nine of *fortis* are probably about equally divided as to sex, although the sex is not indicated for four of them. It is well known, however, that there is no appreciable sexual difference in size in the spotted hyenas.

Not many published measurements of skulls of the other described forms of *Crocuta* are available for comparison. Matschie, in his well-known paper on the hyenas,[2] has given the basilar length of most of the twenty-one skulls then in the Berlin Museum, but a considerable number of the specimens were immature. Reducing his "Basilarlänge" to

[1] 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 140, 143, Pl. III.
[2] 1900, 'Geographische Formen der Hyaenen.' Sitzungsb. Ges. Naturf. Freunde Berlin, pp. 18–58.

condylobasal length,[1] ten of the eleven adult skulls give an average condylobasal length of 238 mm., and a zygomatic breadth of 164 mm. These results are within a few millimeters of the same measurements for twenty-six skulls of *germinans* from British East Africa as published by Hollister (*loc. cit.*). The range of variation in these ten skulls is more than covered by Hollister's series of *germinans*. The other (or eleventh) skull of the Matschie series is his type of *germinans* from Lake Rukwa, of which the basilar length is given as 236 mm., and the zygomatic breadth as 196 mm.; obviously the latter is a misprint, possibly for 169 mm. In this case the type skull of *germinans* would be larger than the average of the British East Africa series but within the range of normal individual variation.

Before the large series of spotted hyenas brought together by the Roosevelt and the Rainey African expeditions were assembled at the United States National Museum, it was customary to regard marked variations in color and markings in these animals as indicative of specific diversity. During the period from 1900 to 1914, fourteen forms of the genus *Crocuta* were described, thirteen of them being given the rank of species. Nine forms are East African, the other five are from Southwest and West Africa, based often on single specimens, sometimes immature examples. They were usually founded on features of coloration or on slight variations in cranial characters, now known to have no distinctive value. Some of them will doubtless prove to represent recognizable geographic phases, but in most cases their real status and distinctive characters are yet to be established. These alleged forms, with their type localities, follow.

The East African forms are:

1900. *Hyæna (Crocotta) germinans* Matschie. Lake Rukwa, German East Africa.
1905. *Hyæna (Crocuta) leontiewi* Satunin. "Abyssinia."
1908. *Crocotta kibonotensis* Lönnberg. Kibonoto steppe, Kilimanjaro.
1908. *Crocotta panganensis* Lönnberg. Kibonoto, Kilimanjaro.
1910. *Crocuta nyasæ* Cabrera. South Nyasaland.
1910. *Crocuta thomasi* Cabrera. Ankole, Uganda.
1911. *Crocuta nzoyæ* Cabrera. Uasingishu, Nzoya River, British East Africa.
1911. *Crocuta rufopicta* Cabrera. Odweina, British Somali.
1914. *Crocuta crocuta fisi* Heller. Merelle Waterholes, Marsabit Road, British East Africa.

The Southwest and West African species are:

1900. *Hyæna (Crocotta) gariepensis* Matschie. Gariep, Orange River district ("Bambusbergen im Oranje-Gebiet").

[1] In Faradje specimens the condylobasal length is 12 to 15 mm. greater than the basilar length as defined by Matschie.

1900. *Hyæna (Crocotta) wissmanni* Matschie. Epukiro.
1900. *Hyæna (Crocotta) noltei* Matschie. Yoko, Cameroon.
1900. *Hyæna (Crocotta) thierryi* Matschie. Sansanne Mangu, North Togo.
1900. *Hyæna (Crocotta) togoensis* Matschie. Kratyi, Togo.

Hollister has already called attention to this unsatisfactory condition of affairs in the *Crocuta* group in no uncertain terms, as follows:

> Numerous forms of the spotted hyena from many parts of Africa have been named by various authors. Most of these species have been based on color differences observed in very small series, or even between single examples of two supposed races. Great stress has been laid on the wide difference between gray, buff, and red examples, and on the color of the spots—black, brown, or red. Minor differences in the skulls have also been represented to be of specific importance. The splendid series of *carefully sexed* skins and skulls of these animals assembled in the United States National Museum by the Smithsonian and the Rainey expeditions has made possible a careful study of individual variation in a large number of specimens from the same region, and a comparison of suitable series from different localities. The results quite discredit many characters which have been considered as of primary importance in distinguishing species. Within a single series of specimens from the Sotik region, for example, are extremes of red and gray types, brown and black spotted types, spotted and unspotted shouldered examples, and remarkable variations in shape and size of the skull. Of more importance, however, are the numerous examples, showing every degree of variation between extremes in all these characteristics.

Hollister has found reason to discredit Cabrera's *Crocuta nzoyæ*, based on a single specimen, a series of topotypes having become available for comparison with series collected in the Southern Guaso Nyiro and Sotik, both series containing "specimens bridging in every particular all variations in color and markings between red and gray types, between blackish and light brown spotted types, and between any extremes in shape and size of skull and teeth." Lönnberg's *Crocotta kibonotensis* and *Crocotta panganensis* (both from slightly separated localities in the Kilimanjaro district) are discredited, as is also Cabrera's *Crocuta thomasi* from Ankole.

While the kind of work here under stricture should not be too severely condemned, in consideration of the fact that a decade or two ago no large series of specimens from single localities of any of the larger mammals of Africa were available for study, and that there was consequently no way of ascertaining the amount and character of the purely individual variation to be expected and allowed for, it is certainly to be hoped that broader views will prevail in the immediate future, so much material from single localities is now available for careful examination. The large series of specimens of many forms of Carnivora, and also of other orders of mammals, collected at single localities by the American Museum Congo Expedition, throw much light on the subject of

Measurements of Nine Skulls of *Crocuta crocuta fortis*, from Faradje, Belgian Congo

Cat. No.	Sex	Greatest Length	Condylobasal Length	Zygomatic Breadth	Mastoid Breadth	Interorbital Breadth	Postorbital Constriction	Breadth at Base Canines	Greatest Length Nasals	Upper Toothrow c-m	Lower Toothrow c-m	Upper Carnassial	Condition of Basal Suture
52059	♂	292	258	183	106	58.0	47.5	63.4	66.0	102.8	111.4	35.5×19.4	Closed
52068[1]	♀	291	252	191	108	58.5	46.0	65.7	63.4	101.8	110.8	38.0×21.5	"
52063	—	286	253	179	105	58.7	45.4	67.6	66.6	102.5	110.9	38.2×19.7	"
52065	—	288	257	184	108	58.6	51.2	65.0	——	101.8	111.2	37.6×21.0	"
52066	—	284	249	182	105	59.0	43.0	63.5	54.2	103.0	111.0	35.0×19.1	"
52064	♀	280	252	177	102	58.7	49.0	63.8	56.6	105.4	112.0	38.1×21.0	"
52069	—	278	245	180	102	58.0	48.5	63.9	67.7	95.0	108.0	35.5×19.3	"
52097	♀	275	242	178	100	54.8	48.3	60.0	58.0	100.6	109.4	37.4×22.5	"
52060	♂	270	242	174	102	55.0	44.0	61.0	61.0	99.5	105.4	35.9×18.9	Open
Average		**283**	**250**	**181**	**104**	**57.7**	**47.0**	**63.8**	**61.7**	**101.4**	**110.0**	**36.8×20.3**	

Comparative Measurements of Skulls of *Crocuta crocuta germinans*,[2] *C. c. fisi*[2] and *C. c. fortis*

Subspecies	No. of Skulls		Condylobasal Length	Zygomatic Breadth	Mastoid Breadth	Interorbital Breadth	Postorbital Constriction	Breadth at Canines	Length Nasals	Upper Toothrow	Lower Toothrow	Upper Carnassial
C. c. germinans	26	**Average**	**232**	**162**	**94**	**53**	**42.5**	**59**	**57**	**97**	**105**	**35.0×20.2**
" " "		Minimum	221	147	90	48	37	54	47	94	101	32.7×17.9
" " "		Maximum	254	174	100	60	49	65	67	106	113	37.6×21.7
C. c. fisi	12	**Average**	**232**	**163**	**97**	**55**	**46**	**59**	**56**	**97**	**104**	**34.9×19.0**
" " "		Minimum	225	156	91	50	40	56	50	94	101	32.0×17.9
" " "		Maximum	242	175	99	60	48	61	67	101	109	37.1×21.3
C. c. fortis	9	**Average**	**250**	**181**	**104**	**58**	**47**	**64**	**62**	**101**	**110**	**36.8×20.3**
" " "		Minimum	242	174	100	55	43	60	54	95	105	35.0×18.9
" " "		Maximum	258	191	108	59	51	67	67	105	112	38.2×22.5

[1]Type.
[2]Based on Hollister's published measurements (1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 146–149.)

individual variation, and the comment thereon in the present series of papers on Congo mammals in relation to its bearing upon the conceptions of "species" held in earlier days, should not be considered as unkind or personal criticism of authors who had no other method of making known their discoveries and of thus contributing, in a way, important faunistic and morphological information.

FELIDÆ

The cats obtained by The American Museum Congo Expedition are represented by one hundred and twenty specimens, referable to the genera *Leo*, *Panthera*, *Leptailurus*, *Profelis*, and *Felis;* the cheetahs (*Acinonyx*) and caracals (*Caracal*) are unrepresented. They were mainly collected at or near Faradje in the veldt region of northeastern Belgian Congo. In several instances single forms are represented by fairly large series from the same locality, as in the case of the lions, leopards and servals. Thus considerable material is for the first time available for the study of individual differentiation in African Felidæ. While the collections from British East Africa in the United States National Museum at Washington include large series that are properly referable to the same regional form they usually represent a number of localities. Hollister's report[1] on this rich material contains numerous tables of detailed measurements, particularly of skulls and dentition, that have proved of great assistance in connection with this study of the cats of the Congo Collection. The accompanying large series of photographic illustrations of individual color variation, particularly in the leopards and servals, it is hoped will prove of interest to specialists of these groups.

LEO Oken

Leo OKEN, 1816, 'Lehrb. Naturg.,' Th. 3, Abth. 2, p. 1070. Type, by tautonymy, *Felis leo* Linnæus.

The name *Leo* has been employed generically by various authors during the last half century, independently of each other and probably in ignorance of Oken's earlier use of the name, for the lion group exclusively, notably by J. E. Gray in 1867 and 1869.

The well-marked differences, both external and cranial, that characterize the lion group in contradistinction to all other cats are too well known to require recapitulation. These differences are strongly marked in comparison with the leopard group, with which some authors associate the lions under the generic designation *Panthera*, while others still adhere to the old method of grouping all cats under *Felis*, with the

[1] 1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, pp. 150–180, Pls. XLI-LV.

domestic cat as genotype; others exclude from *Felis* only the cheetahs and lynxes. This diversity of action is explainable only on the principle of personal equation in judging how much differentiation is required as basis of a generic group.

Type Locality of *Felis leo* Linnæus

No definite type locality appears to have been assigned for *Felis leo* Linnæus, the "habitat" of which was given by the author as "Africa," the lions of Asia being thus not involved in the determination of a type region. Thomas, in 1911, in his paper on 'The Mammals of the Tenth Edition of Linnæus; an Attempt to fix the Types of the Genera and the exact Bases and Localities of the Species,'[1] says justly (p. 135): "No type locality available" (that is, on the basis of the original description). A type locality therefore must be determined on other grounds from consideration of the dozen more or less currently recognized African forms of the original *Felis leo*. Of first importance in such consideration is the geographical area from which the lions known to pre-Linnean writers would most naturally have come. This was evidently the Mediterranean coast region of Africa, from the time of Pliny to Linnæus, and even much later it was the main source of supply of lions for the menageries of Europe, especially of France.[2]

Fortunately a definite locality is given for the specimens on which the description and drawings of F. Cuvier's Lion de Barbarie were based.[3] Their geographical origin is thus stated: "Ce Lion[4] fut pris dans un piége, entre Constantine et Bonne, en 1795, âgé d'un an environ, avec une femelle de la même portée; et le bey de la première de ces villes fit présent de ces deux animaux au gouvernement français d'alors." From Lacépède we further learn: "C'est dans un bois voisin de Constantine, près de la côte septentrionale d'Afrique, que commença la captivité de ces deux Lions. Un an après, le citoyen Félix Cassal, l'un des gardiens de la ménagerie du Muséum, qui à cette époque voyageait en Barbarie, par ordre du gouvernement, pour y acheter des animaux rares et intéressants, parvint à les acquérir pour le Muséum, et avant peu de mois il les conduisit à Paris."[5]

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[1]Proc. Zoöl. Soc. London, I, March, pp. 120-158.
[2]Cf. Cuvier and Geoffory. 1819, 'Hist. Nat. Mamm.,' I, livr. 9, Août, p. 2 (at bottom).
[3]1819, 'Hist. Nat. Mamm.,' I, livr. 11, Octobre, p. 1.
[4]The male, so well delineated by Maréchal. Maréchal's drawing was first published (uncolored) by Lacépède and G. Cuvier in the work entitled 'La Ménagerie du Muséum national d'histoire naturelle' (La Lionne, p. 5) in 1801 and republished by F. Cuvier (*loc. cit.*) in 1819. The other specimens figured and described are also from the same source.
[5]Lacépède, 1801, 'La Ménagerie du Muséum national d'histoire naturelle,' (La Lionne), p. 5.

Fitzinger in 1868, in the first part of his revision of the Felidæ,[1] restricted *Felis leo* Linnæus to the Barbary lion (his *Leo barbarus*), the only citation of *Felis leo* Linnæus being placed (*loc. cit.*, pp. 432–436) under this subspecies (*Felis leo barbarus*). The other citations given by him under this race appear to be pertinent. The reference of primary importance is to F. Cuvier and Geoffroy's Lion de Barbarie, figured and described, as shown above, from specimens captured near Constantine on the coast of Algeria. This regional form of the African lion had become in 1829 the sole basis of J. B. Fischer's *Felis leo*, α *barbarus*,[2] and has since been recognized as a race or variety of *Felis leo* Linnæus by various authors.[3] It seems clear that it may be properly considered as the type form of *Felis leo* and stand as *Leo leo leo* (Linnæus). On this basis I designate as type locality for the Linnean *Felis leo* the Barbary coast region of Africa, or, more explicitly, Constantine, Algeria.

African Forms of Lions

It is generally agreed by taxonomers that the lions of Asia and Africa are merely geographic forms of a single specific type. This is an obvious result of the absence of any marked physical barrier separating northeastern Africa from southwestern Asia.

About a dozen specific or subspecific names have been proposed for the lions of Africa. Several of these are merely replacement names for *leo* of Linnæus, bestowed without nomenclatural reason, as *africanus* Jardine (1834), *gambianus* Gray (nom. nud., 1843), *nobilis* Gray (1867), and do not require further consideration. The following additional names were given to supposed subspecies. They are here listed in

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[1]Fitzinger, L. J., 1868, 'Revision der zur natürlichen Familie der Katzen (Feles) gehörigen Formen.' Sitzungsb. Ak. Wiss. Wien, LVIII, Abth. 1, pp. 421–519.

[2]1829, 'Synop. Mamm.,' p. 197.

[3]Hollister, in 1910 (Proc. Biol. Soc. Washington, XXIII, September 2, p. 123) called attention to three names given by J. N. von Meyer to "races" of lions in a thesis for the degree of doctor of medicine at the University of Vienna in 1826. The title-page of Meyer's work is in Latin, the text in German. The title (in part) is: 'Dissertatio/inauguralis anatomico-medica/de/Genere Felium/ . . . .[= 11 lines] Joannes Nep. nobilis de Meyer. . . . .' /The date of presentation is August 5, 1826. The author's dedication to his father occupies three unpaged leaves, dated "Wien am 12. July 1826." This is followed by the text of the thesis (pp. 1–62, with one plate and an explanatory text page). A "Naturhistorischer Theil" occupies pages 1 to 19, followed by the "Anatomischer Theil," pages 20–62. Under the subheading "Löwen (Felis Leo)" we find on page 6 the following:

"Nach der Verschiedenheit der Mähne und der Farbe setzte man drey Racen fest:

(1) Die Barbarische (barbaricus), bey welcher sich die Mähne längs der Mitte des Bauches bis an Hinterfüsse hinzieht.

(2) die Persische (persicus), welcher diese verlängerte Mähne fehlt; und

(3) die Senegalische (senegalensis), welche sich von der Persischen nur durch eine höhere Farbe und die gleichfarbige Halsmähne unterscheidet."

There is no further reference to these races in this brochure.

As stated by Hollister, the names of these races "have heretofore dated from Fischer's 'Synopsis Mammalium,' 1829," except that Fischer used *barbarus* instead of *barbaricus* for the Barbary lion. Although Fischer's names have a much better basis than Meyer's, they are three years later than Meyer's. Fischer's diagnoses are short, but they are diagnostic, while Meyer's are not, and have further a solid basis through citations of F. Cuvier's Lion de Barbarie for *barbarus* and the same author's Lion du Sénégal for *senegalensis*, and of Temminck for *persicus*.

chronological sequence, with indication of their respective type localities and bases. Most of them will doubtless prove available for regional forms but several of the East African designations will probably be found to be superfluous.

1758. **Leo leo leo** (Linnæus). *Felis leo* Linnæus, 'Syst. Nat.,' 10th Ed., I, p. 41. "Africa." Type locality, by subsequent designation (*supra*, p. 222), Constantine, Algeria.

1826. *Felis leo*, race 1, *barbaricus* Meyer, 'Dissert. anatom.-med. de Genere Felium,' p. 6. Without definite type locality. (*Supra*, p. 222, footnote No. 3.)

1829. *Felis leo*, α. *barbarus* Fischer, 'Synop. Mamm.,' p. 197. Based on F. Cuvier's Lion de Barbarie, from Constantine, Algeria. Hence = *Felis leo* (*s.s.*).

1826. **Leo leo senegalensis** (Meyer). *Felis leo*, race 3, *senegalensis* Meyer, 'Dissert. anatom.-med. de Genere Felium,' p. 6. The only indication of the type region is the name *senegalensis*.

1829. *Felis leo*, β. *senegalensis* Fischer, 'Synop. Mamm.,' p. 197. Based on F. Cuvier's Lion du Sénégal, without definite type locality. The name *Felis leo senegalensis* preoccupies *Felis senegalensis* Lesson, 1839, for a servaline cat.

1830. *Felis leo*, ε. *capensis* Fischer, 'Synop. Mamm.,' addenda, p. 565. Based on *Felis leo*, var. b, the "South African Lion" of Griffith's 'Anim. Kingd.,' V, 1827, p. 163; *idem*, II, Pl. facing p. 428. The name *Felis leo capensis* is preoccupied by *Felis capensis* Forster, 1781, for the South African serval.

1858. **Leo leo melanochaitus** Ham. Smith. *Leo melanochaitus* Ham. Smith, 'Introd. to Mamm.,' in Jardine's 'Naturalists' Library,' XV, 2d Ed., p. 177, Pl. x. "The Black Maned Lion of the Cape . . . . figured in Griffith's Vertebrated Animals . . . . Habitat the Cape." The plate is a republication in color of the plate in Vol. II of Griffith's 'Anim. Kingd.' Hence *Leo melanochaitus* Smith has the same basis as *Felis leo capensis* of Fischer, 1830, as cited above, and will thus be the proper designation of the Cape race of the lion. (Cf. Hollister, 1910, Proc. Biol. Soc. Washington, XXIII, September 2, p. 123.)

1891. **Leo leo somaliensis** (Noack). *Felis leo* var. *somaliensis* Noack, Jahrb. Hamburg. Wiss. Anst., IX, Hälft 1, p. 120. "Somaliland." No definite type locality indicated. Described from young animals in the Berlin Zoölogical Gardens. Its status as a regional form is not as yet satisfactorily established.

1900. **Leo leo massaicus** (Neumann). *Felis leo massaicus* Neumann, Zool. Jahrb., Syst., XIII, October, p. 550. Type locality, Kibaya, Massai Land, German East Africa.

1900. **Leo leo kamptzi** (Matschie). *Felis leo kamptzi* Matschie, Sitzungsb. Ges. Naturf. Freunde Berlin, p. 92. Type locality, Yoko, Sanaga, Cameroon.

1908. *Felis leo sabakiensis* Lönnberg, in Sjöstedt's 'Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro-Meru, 1905–1906,' p. 22. Type locality, Kibonoto, Kilimanjaro. Type an adult female. Considered by Hollister (1918, U. S. Nat. Mus. Bull. 99, pt. 1, p. 156) as not separable from *Felis leo massaicus* Neumann.

1913. *Felis leo roosevelti* Heller, Smithsonian Misc. Coll., LXI, No. 19, November 8, p. 2. Type locality, as given by Heller, "highlands of Abyssinia near Addis Ababa." Addis Ababa is discredited by Hollister (*loc. cit.*, 1918, p. 165) as the true type locality, and he considered the status of subspecies *roosevelti* as "greatly in doubt." The type, a captive specimen, was "presented by King Menelik of Abyssinia to President Roosevelt in 1904," and in March of that year was deposited in the National Zoölogical Park in Washington, where it died November 14, 1906. Hollister further states that "there is every chance that the lion was brought to the Emperor as a kitten by some of his subjects living in some far-distant corner of Abyssinia. . . . All the characters used in separating the race. . . . are those common to specimens of *massaica* reared in captivity, and it might be argued that since the type specimen of *roosevelti* might well have originally been captured within the habitat of *massaica* the name should be placed in the synonymy of the latter form." He appears, however, not to have been then ready to make this assignment, as he gives *roosevelti* provisional recognition.

1913. **Leo leo nyanzæ** (Heller). *Felis leo nyanzæ* Heller, Smithsonian Misc. Coll., LXI, No. 19, November 8, p. 4. Type locality, Kampala, north shore of Lake Victoria Nyanza, Uganda. Type, a flat skin, without skull.

1913. **Leo leo bleyenberghi** (Lönnberg). *Felis leo bleyenberghi* Lönnberg, Rev. Zool. Africaine, III, fasc. 2, December, p. 273. Type locality, Katanga, Belgian Congo.

Leo leo azandicus, new subspecies

Plates XXXVII to XL

Type, No. 52084, ♂ adult, Vankerckhovenville, northeastern Belgian Congo, April 18, 1912; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1061.

Slightly larger in cranial and dental measurements than either *L. l. nyanzæ* or *L. l. massaicus*, to which it is closely related, especially to *nyanzæ*. General coloration much as in *nyanzæ* but much paler, the general tone above varying from pale buff to cream-buff instead of "ochraceous tawny," and underparts correspondingly paler; it is strikingly different from the general grayish tone of typical *massaicus*.

Type.—Pelage very short, only about 8–10 mm. in length on most of the upperparts, or about as in typical *massaicus* from near Lake Nyanza. General coloration above "warm buff" (Ridgway, 1912), darkening on sides of head and neck to "cinnamon buff," and over the mid-dorsal area, from the shoulders posteriorly, to "clay color," paler on the flanks; underparts "light buff," whitish medially; fore limbs externally pale orange-yellow, much paler internally; hind limbs (including thighs) externally grayish, with a slight buffy tone, gradually passing into "pale buff" internally; tail proximally grayish slightly suffused with pale buff, the hairs minutely tipped with blackish, the black tips increasing in length on the middle third of the tail, passing thence gradually into a long terminal brownish-black tuft; soles brownish black, the long dark hairs extending upward between the toes and encircling the claws, proximal to which is a narrow band of pale buffy white; dark ear spot of lengthened hair intense black. The mane is well developed, forming a narrow median crest (longest hairs 120 to 150 mm. in length) extending from between

the ears posteriorly to the shoulders, spreading laterally to the sides of the head and neck to the foreneck, chest, and sides of shoulders (longest hairs on shoulders 150 to 200 mm. in length). The hairs of the median crest are pale buff grizzled with blackish, the latter prevailing; on sides of neck and foreneck entirely warm buff; lower foreneck, chest and shoulders darkened with a profusion of blackish-tipped hairs. There is no ventral crest. The type has a better developed mane (Pl. XXXVII) than any of the five other male skins, in two of which it is reduced nearly to obsolescence.

Two of these five adult males agree very closely in coloration with the type; and two others are paler, one of them very much paler. Four of the five adult females are indistinguishable in color features from the male type, although the mid-region of the back is slightly darker than in males through slightly greater length of the blackish tips of the hairs. The other female is much paler than average males. Two of the three young specimens are darker than the adults.

The smallest of three young specimens, a nursling in the first soft coat (total length 650 mm., the teeth still enclosed in the gum), has the pelage long and more or less woolly, with sparse long fine overhair. This specimen is much paler than the other two, which are considerably older. The coloration is much paler than in adults, the upperparts being pale buff with a slight intermixture of long blackish hairs. The underparts are pale buffy white, strongest on the foreneck, palest posteriorly. The crown, from between the eyes to the nape, is blotched with small dusky brown spots; there is a median dorsal line, from the shoulders to the tail, formed of small disconnected blackish spots; the fore limbs are externally thickly marked with small spots of dull brown; the hind limbs are more heavily marked with still darker spots; the lower back and proximal half of the tail are also obscurely spotted with pale brown.

Another young specimen (No. 52071, milk dentition fully developed and four of the upper incisors and p^4 already replaced by permanent teeth) is much larger and several months older. In this the pelage is long and full; the upperparts are in general ochraceous buff, with many of the hairs conspicuously tipped with black, especially along the median line, and hence darker and more highly colored than any of the adults. The hairs of the dorsal area are about 80 to 90 mm. in length, with a narrow median crest in which the hairs have a length of 120 to 125 mm. The spotting on the head and limbs is similar to that of the nursling.

The third young specimen (without skull) is intermediate in age and size between the two above described, and is likewise intermediate in features of coloration. The pelage is longer and softer, with much more woolly underfur, the pelage of the upperparts averaging 225 to 250 mm. in length.

The two older of these three immature specimens are much more richly colored than any of the adults, and darker in general effect in consequence of the greater length of the black tipping of the hair.

The spotting of the limbs, crown and flanks, so conspicuous in the young, is scarcely distinguishable in adult males and usually reduced almost to obsolescence in adult females, varying more or less individually in both sexes.

Collectors' measurements of type: Total length, 2860 mm.; head and body, 1830; tail vertebræ, 1030; hind foot, 400.

Skull measurements of the type (Pls. XXXIX–XL): Greatest length, 375; condylobasal length, 335; zygomatic breadth, 245; interorbital breadth, 77.5; breadth at base of canines, 99; breadth at p^4, 133.4; length of nasals (middle), 93.8; length of lower jaw, 243; length of upper toothrow (including canine), 115.5; length of lower toothrow (including canine), 135.4; upper carnassial, 40.5×20.1; upper molar, 11.1×6.2. (For measurements see Tables D and I, pp. 237, 242.)

Represented by 15 specimens, all adult but 3, 14 of them from Faradje, collected as follows:

Faradje, 14 (1 skin without skull and 1 skull without skin, 7 specimens with flesh measurements), February 11, 1911–December 27, 1913.

Vankerckhovenville, 1 (skin, skull, and flesh measurements), April 18, 1912.

Each month of the year is represented by one or more specimens except March and October.

As shown by the subjoined tables of the available external measurements of Congo and East African wild-killed lions (Tables A, B, C, pp. 235-236) the Congo series is not distinguishable by size from *Leo leo nyanzæ*, nor is the latter separable on this basis from *L. l. massaicus*. The series are too small to be fully satisfactory, but as they consist of specimens strictly comparable as to age, and were all measured in the flesh by trained collectors, they are assumed to be reasonably indicative.

Comparison of Cranial and Dental Characters of Congo and East African Lions

CRANIAL.—The cranial measurements of these specimens (Tables D, E, F, G, the latter a comparative summary of D, E, and F), comprising a larger number of individuals than are available for external

measurements, especially of females,[1] are based exclusively on skulls of old adults, in which the sphenoidal sutures are wholly obliterated, thus eliminating the element of immaturity. While the data thus obtained are not distinctively diagnostic they possess especial interest from the viewpoint of individuality. Unfortunately the series are, respectively, too limited for establishing a norm for the three regional forms involved as regards males, but this may be assumed as closely approximated in the case of the females, particularly of *nyanzæ* and *massaicus*.

The principal cranial measurements (see comparative summary, Table G, p. 240) of seven old male skulls of *azandicus* indicate that the greatest average length of the skull is 6 mm. more than in four comparable skulls of *nyanzæ* and 11 mm. more than in nine comparable skulls of *massaicus*. The breadth of the skull is correspondingly greater in *azandicus*, the zygomatic breadth being 7 mm. more than in *nyanzæ* and 8 mm. more than in *massaicus*; the mastoid breadth is 3 mm. more than in *nyanzæ* and 4 mm. more than in *massaicus*. In five old female skulls of *azandicus* the greatest length of the skull averages 1 mm. more than in ten comparable female skulls of *nyanzæ* and 2 mm. more than in thirteen comparable skulls of *massaicus*. While these differences are small and of little diagnostic value, the extremes (maxima and minima) are consistently in agreement with the averages. It is also to be noted that one of the male skulls, and one of the female skulls of *azandicus* are so far below the normal in size as to be properly considered as dwarfs, particularly the small female, and thus tend to reduce the average as given above for this form.

The relative proportion of zygomatic breadth to greatest length of skull in the males of the three forms differs only by a little less than one per cent, and in the females the divergence is about as slight. In *azandicus* (7 males, 5 females) the percentage of zygomatic breadth to greatest length is in males 67.2, in females 67.7; in *nyanzæ* (4 males, 10 females), for males 66.4, for females 66.2; in *massaicus* (9 males, 13 females), respectively 67.0 and 66.1. These statistics indicate a relatively wider skull for *azandicus*, the difference between females of *azandicus* and *nyanzæ*, its nearest geographical ally, being about 1.5 per cent and between *azandicus* and *massaicus* about 1.6 per cent. The breadth at

[1] In this tabulation the measurements given by Hollister (1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 166–169) have been utilized, but only the skulls indicated in his tables as having the "basal suture obliterated" have been admitted, in order that the measurements may be strictly comparable in age with the Congo series of twelve skulls, all of which are old adults with the sphenoidal sutures entirely obliterated by ankylosis. Hollister's skulls of *massaicus* include four of individuals reared in captivity. These are included in my tables (Table F, *b*, p. 239) but are excluded from the averages and extremes because they are so obviously abnormal. For special comment on these skulls see p. 234.

the interorbital constriction is also slightly greater in *azandicus* than in either *nyanzæ* or *massaicus*.

DENTAL.—The teeth (Tables I–L, pp. 242–246), like the principal measurements of the skull, present no differences by which specimens of *azandicus* can be distinguished with certainty from those of *nyanzæ* or *massaicus*. On the whole the dentition of *azandicus* is slightly heavier than in either of the others, but not more so than would be expected from the slightly greater size of the skull. The toothrows of both jaws, however, are disproportionately longer in *azandicus*, and the upper canine is a little heavier, in both males and females.[1] As in cranial measurements, *massaicus* is also the smallest of the three forms in most of the dental measurements.

Comparison of *Leo leo azandicus* with Uganda and British East Africa Lions

Leo leo azandicus is nearest geographically to *Felis leo nyanzæ* Heller,[2] at present an imperfectly known form. The latter was based on two specimens, the type, a flat skin of an adult male (without skull) from Kampala, Uganda, and a paratype (skin and skull) from Mulema, Uganda. Three other specimens are mentioned later by Heller[3] as examined by him in the British Museum, namely, "two lionesses from Mulema and one lioness from Ankole." The male from Mulema is stated by Heller to be "quite identical with the type in color and may be taken as representing the race [*nyanzæ*] here described." The cranial characters are based on this Mulema specimen. The range of the race is given as "Uganda and the Nile Valley from the German border northward to the Sobat and the Bahr-el-Ghazal drainages, east as far as Mount Elgon and the western shore of the Victoria Nyanza, and west to the Congo-Nile watershed; limits of range unknown" (Roosevelt and Heller, *loc. cit.*, p. 226). On the accompanying distribution map of the East African races of lions (*loc. cit.*, p. 227) the range of the Uganda lion is depicted in accordance with this statement, obviously in large degree hypothetical.

Hollister, in his 'East African Mammals in the United States National Museum' (1918, U. S. Nat. Mus. Bull. 99, part 1, August 16, pp. 156 and 164), greatly extended its range to the eastward, he referring to it part of the range of *massaicus* as defined by Roosevelt and Heller. Hollister says (*loc. cit.*, p. 156): ". . . . the excellent series of speci-

[1] If the dwarfish female (No. 52073) is excluded in computing the average.
[2] 1913, Smithsonian Misc. Coll., LXI, No. 19, November 8, pp. 4–5.
[3] 1914, Roosevelt and Heller, 'Life Histories of African Game Animals,' I, p. 228.

mens now preserved in the United States National Museum proves that the lions of the Southern Guaso Nyiro and Sotik are separable from the Nairobi, Kapiti Plains, and Kilimanjaro animals, and are better placed with the form described by Heller from the northern shore of Victoria Nyanza, *Felis leo nyanzæ.*" While agreeing with Hollister that these specimens are separable from *massaicus*, I would not assign them to the *nyanzæ* form, for reasons presently to be given.

Through the kindness of Mr. Gerrit S. Miller, Jr., Curator of Mammals at the United States National Museum, the type specimen of *nyanzæ* and eleven of the specimens from British East Africa referred by Hollister to *nyanzæ*, and listed under this form in his tables of measurements (namely, four males from Lime Springs, Sotik; three females from Loita Plains; four females from South Guaso Nyiro River) have been sent to me for examination. From these specimens it appears probable that Hollister's conception of *nyanzæ* was based not so much on the type specimen of this form as upon the Sotik, Loita Plains, and Southern Nyiro specimens. This is especially indicated by his reference to the pelage, as he says: "The Uganda lion. . . .is a darker, richer colored, and longer-haired animal than the lion of the Kapiti Plains and Kilimanjaro regions" (*loc. cit.*, p. 164). The type specimen of *nyanzæ* is short-haired, like the *azandicus* series and typical *massaicus* from the Kapiti Plains and the Kilimanjaro district, while the Sotik, Loita Plains, and Southern Guaso Nyiro River specimens are long-haired, the pelage being not only twice the length of that of *massaicus* but much heavier in consequence of its greater length. It therefore seems desirable to recognize the Sotik, Loita Plains, and Southern Guaso Nyiro lions as a well-marked race intermediate between the East African *massaicus* and the Uganda *nyanzæ*, characterized by the differences of pelage and coloration pointed out by Hollister as separating his "*nyanzæ*" from typical *massaicus*. This race, in view of Hollister's important researches on the mammals of East Africa, may be fittingly named as follows.

Leo leo hollisteri, new subspecies

Felis leo nyanzæ HOLLISTER, 1918, U. S. Nat. Mus. Bull. 99, part 1, August 16, pp. 163–164, 166–169 (part; not *Felis leo nyanzæ* Heller).

Type, U. S. Nat. Mus. No. 181568, ♂ adult (skin and skull), Lime Springs, Sotik, British East Africa, April 18, 1911; E. Heller, Rainey African Expedition. Orig. No. 2054.

General coloration above paler, and pelage much longer and thicker, than in either *nyanzæ* or *massaicus;* more buffy and less gray than in *massaicus*. Ventral surface and inside of limbs much lighter or more whitish (pale creamy white) than in either *massaicus*, *nyanzæ*, or *azandicus*.

Range, as now known, the eastern drainage of Victoria Nyanza.

As Hollister has stated (*loc. cit.*, p. 156), there are "no reliable characters by which the skulls of the two races [*massaicus* and *nyanzæ*] may be distinguished." While there is a slight average difference in size it is not diagnostic, the large amount of purely individual variation exceeding the average differences, not only in size but in details of structure.

Hollister believed (*loc. cit.*, p. 164) that the type skin of *nyanzæ* had been "considerably darkened by stain, apparently from red soil and also from some native tanning process. This [he says] has reddened all the lighter parts on the face, head, and limbs." On a first hasty inspection of the skin I accepted Hollister's view that the reddened areas were the result of staining, but a later, more careful, examination convinced me that this assumption is not warranted, although it appears to have influenced him in referring the Sotik and other British East Africa specimens to *nyanzæ*. The redder markings on the limbs are perfectly symmetrical in form, size and position, while there is no suggestion of similar reddening on the lighter colored ventral edges of the skin, or elsewhere on the body or on the head, as there most likely would be were these ruddy areas of accidental or artificial production. Both hind feet present exactly the same pattern of interdigital narrow streaks of intensified color extending for several inches proximally from the junction of the toes, while the thickened and slightly lengthened reddish hair on the "heel," divided mesially in skinning, fit together to form an elongated symmetrical brownish patch on the posterior aspect of the tarsus, a differentiation of color and texture common in the Felidæ. Incipient interdigital streaks of deepened color on the hind feet are often present in other forms of lions, but usually less developed than in the type skin of *nyanzæ*. The anterior surface of the forefeet is considerably darkened in comparison with the feet of the allied races (*massaicus, hollisteri, azandicus*), not by staining or discoloration but as a normal condition. The same is true also of the "darkened" areas of the face and head.

The four geographic races of lions it is here sought to establish undoubtedly completely intergrade geographically. The extremes are *Leo leo azandicus* of the savannah district of northeastern Belgian Congo and *L. l. massaicus* of British and German East Africa, east of the Victoria Nyanza drainage system. They are not only widely separated geographically and environmentally, but differ appreciably in size and so strikingly in coloration that if one had to deal with them separately, or without the connecting intermediates, it might seem reasonable to consider them as specifically separable.

L. l. nyanzæ is at present imperfectly known as to its average characters and range. Its relatively intense coloration, combined with a special environment to which it seems obviously due, renders it necessary to give it recognition till material is available for a final determination of its status.

L. l. hollisteri is intermediate in coloration and geographically between *nyanzæ* and *massaicus*, but presents marked differences in character of pelage and in coloration from either. Its separation from *massaicus* was made by Hollister in his revision of the East African forms of lions.

The leading features of these four forms of lions may be presented in brief synopsis as follows:

Pelage very short.

Size largest; coloration pale buff. Savannah district of northeastern Belgian Congo..... *azandicus.*

Size medium (?); coloration "tawny ochraceous." Northern and probably western borders of Victoria Nyanza..... *nyanzæ.*

Size smallest; coloration decidedly grayish. British and German East Africa, eastward from the Victoria Nyanza drainage..... *massaicus.*

Pelage much longer.

Size medium; coloration between that of *azandicus* and *nyanzæ*. Eastern drainage of the Victoria Nyanza basin..... *hollisteri.*

As a further distinction it may be noted that the ventral surface and the inside of limbs are creamy white in *hollisteri*, pale buff in *azandicus*, deep buff in *nyanzæ*, and pale grayish buff in *massaicus*.

No material is available for a comparison of *Leo l. azandicus* with the West African forms, to which it is probably more nearly related than to any of the East African races. The West African forms are *Leo leo senegalensis* of the coast region of Senegal and *L. l. kamptzi* of the Cameroon coast region. On geographical grounds it is fair to assume that neither of them is racially identical with *azandicus*. *L. l. bleyenberghi*,[1] of southeastern Belgian Congo, also requires comparison with *azandicus*, although the type districts of the two are separated by nearly one thousand miles of latitude. No material, however, for such comparison is at hand.

[1]The type locality of *Felis leo bleyenberghi* Lönnberg is Katanga, near the Rhodesia border of Belgian Congo (1913, Rev. Zool. Africaine, III, fasc. 2, p. 273). Later Lönnberg (1917, Kungl. Sven. Vetensk. Ak. Handl., Stockholm, LVIII, No. 2, April, pp. 47–49) referred to this subspecies three specimens from Kabare, Rutshuru, and Beni, in the Lake Kivu–Lake Albert Edward district.

Individual and Sexual Variation in the Skull and Teeth of Wild-Killed African Lions

The accompanying measurements (Tables A to M[1]) are intended in part as a record of not only the average relative size of series of skulls and of the teeth of three regional forms of African lions but also data illustrative of individual variation and, incidentally, of sexual variation. Hollister has already called attention to the fact that individual variation is much greater in females than in males. In his 'East African Mammals in the United States National Museum'[2] he says of *Leo leo massaicus:* "Skulls and teeth of females vary much more than do those of males. The range of variation in size of the teeth in lionesses from one locality is startling. There is great variation in the shape and size of the auditory bullæ in skulls from one locality." Under *L. l. nyanzæ* (*loc. cit.*, p. 164) he adds: "There is the same great variation in size of skull and teeth in the lioness as in *massaica.*"

SKULL.—In Table H (p. 241) the range of variation is given for a few of the principal measurements of seven male and five female skulls (all from the same locality except one) of *Leo leo azandicus;* of four male and ten female skulls of *L. l. nyanzæ* (based on measurements published by Hollister); and of nine male and thirteen female skulls of *L. l. massaicus* (in part from Hollister). The difference between the largest and smallest specimen for both sexes of each form is given in millimeters (see upper section of the Table) and also in percentages (see lower section of the Table), the latter based on the respective averages for each form. The variation in the total length of skull in males ranges from 15 mm. in *nyanzæ* (based on only four skulls) to 36 mm. in *massaicus* (based on nine skulls). Doubtless a much greater range would be shown by larger series. The percentage of variation ranges from 4 to 10. This difference is two times greater than that between the averages of the three forms, based on the same specimens.

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[1]Tables of Measurements

Table A. External measurements of *Leo leo azandicus* (p. 235).
" B. " " " " " " *nyanzæ* (p. 236).
" C. " " " " " " *massaicus* (p. 236).
" D. Cranial measurements of *Leo leo azandicus* (p. 237).
" E. " " " " " " *nyanzæ* (p. 238).
" F. " " " " " " *massaicus* (pp. 238-239).
" G. Comparative summary of Tables D, E, F (p. 240).
" H. Amount and percentage of cranial variation for the three forms, based on Tables D–G (p. 241).
" I. Dental measurements of *Leo leo azandicus* (p. 242).
" J. " " " " " " *nyanzæ* (p. 243).
" K. " " " " " " *massaicus* (pp. 244-245).
" L. Comparative summary of Tables I, J, K (p. 246).
" M. Amount and percentage of dental variation for the three forms, based on Tables I–L (p. 247).

[2]1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, p. 157.

The average per cent of variation in total length of skull in the females of the same forms (five skulls in the case of *azandicus*, ten for *nyanzæ*, thirteen for *massaicus*) is much greater than in males, not only relatively but absolutely, although the female skulls are nearly one-fourth smaller. This is especially true of the breadth of the skull, the percentage of variation in the zygomatic breadth of males being about 6.5 and in females about 14, with about the same proportionate divergence in the breadth at the base of the canines, at the interorbital constriction, and in the mastoid breadth. At most of these points the percentage of individual variation in females is about twice that of males. It is also much greater in females of *nyanzæ* than in females of either of the other two forms. Exceptional divergences from the averages occur in individuals of both sexes in each of the three forms.

TEETH.—The teeth of African lions are extremely variable in both size and form in both sexes. The upper carnassial in seven males of *Leol. azandicus* varies 4.5 mm. in length and 2.2 mm. in greatest breadth, giving a percentage of variation of about, respectively, 12 and 11. In five males of *nyanzæ* the percentage, respectively, is 14 and 11; in nine skulls of *massaicus*, 12 for the length and 18.8 for the breadth. In female skulls the breadth of the upper carnassial is much more variable than the length, the percentage for length in five female *azandicus* being 4.9, while the percentage for breadth is 13.4. In ten females of *nyanzæ* these percentages are respectively 9.9 and 15.7; in thirteen females of *massaicus*, they are 8.5 and 13. The upper carnassial in females is relatively shorter and broader than in males, and more variable in both size and form.

The lower molar varies about equally in both sexes, the percentage of variation ranging from about 10.9 in *massaicus* to about 19.9 in *nyanzæ*.

The vestigial upper molar is the most variable of all the teeth in both size and form, the percentage of variation in both length and breadth, in *azandicus* and *massaicus*, being respectively 25 to 27 for the axial and transverse dimensions.

The upper canine is also extremely variable in size in both sexes, but much more so in females than in males.

These statistics indicate that cranial and dental characters are not so stable a basis for the discrimination of regional forms as has been often assumed, and emphasizes the fact that, like color characters and general size, they may often prove misleading, especially when a supposed new form of a plastic group is based on a single specimen, since it may or may

not (most likely the latter) represent the norm of the locality from which it was received. It is well to remember that the extremes of a large series from a single locality often differ much more from each other than the average difference between well-grounded regional forms.

Sexual Difference in Size in Lions

Female lions, as indicated by the few trustworthy external measurements available (Tables A-C), are about one-sixth smaller than males, in the three regional forms here under consideration. On the basis of greatest length and zygomatic breadth of the skull approximately he same sexual ratio of variation in size is shown. This is less than in African leopards, in which females are about one-fifth smaller than males.

Abnormality of Park-Reared Lions

Hollister has given an admirable exposition of the striking effect of life in the unnatural environment of captivity upon lions,[1] which should receive the closest study by all specialists in mammalogy. For purpose of comparison his cranial measurements of four lions (two males and two females) reared to full maturity in captivity, and whose complete life history is fully known, are included in the tables of measurements of *Leo leo massaicus* (Table F, *b*, p. 239). He has shown that park-reared specimens differ markedly from wild-killed individuals, not only in coloration but in size and in important cranial features, indicating clearly that such material is "valueless for systematic work." It is also highly misleading, and the many forms (species and subspecies) which have been based on such material are thus wholly discredited, especially in the larger Felidæ, among which many forms have been thus founded. Hollister has shown in much detail the parts of the skull most affected, and given as an explanation the great change in habits compelled by life in captivity. He says (Bulletin 99, p. 158): "The most conspicuous peculiarities of the McMillan lion skulls [skulls of *massaicus* brought alive to Washington as cubs from near Nairobi] and of other zoo-reared lions as well [including the four only known specimens of *Felis leo roosevelti* Heller], are the greater (relative and actual) zygomatic breadth, the large rostra, and the great distance across the base of the skull at the mastoids. While actually measuring less in condylobasal or greatest

[1]Hollister, N., 1917, 'Some Effects of Environment and Habit on Captive Lions.' Proc. U. S. Nat. Mus., LIII, June 1, pp. 177–193, Pls. XXII–XXV. Abstract given under *Felis leo massaica* in his 'East African Mammals in the United States National Museum.' 1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, pp. 157–161, Pls. LII–LV.

length than many of the wild *massaica* skulls of equal age, they have a far greater zygomatic breadth than any, averaging about 30 millimeters more in males, and 20 millimeters more in females." He also says (*loc. cit.*, p. 161): "In the case of the McMillan lions the capacity [of the braincase] is about 50 cubic centimeters less in males and about 40 less in females, than in wild-killed examples of equal age from the same locality."

An indication of the general striking cranial differences between wild-killed and park-reared lions of the *massaicus* type is afforded by the ratio of the zygomatic breadth to the greatest length of the skull, which is as follows: average for wild-killed males, 66.8; for two park-reared males, 74.4. The average for wild-killed females is 66.4; for two park-reared females, 82.2.

Table A.—External Measurements of *Leo leo azandicus* from Northeastern Belgian Congo

Cat. No.	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot
52077	Faradje	♂	2730	1760	970	390
52078	"	♂	2780	1830	950	395
52084[1]	Vankerckhovenville	♂	2860	1830	1030	400
Average		**3 ♂**	**2790**	**1807**	**983**	**395**
52074	Faradje	♀	2330	1530	800	330
52075	"	♀	2400	1560	840	310
52073	"	♀	2240	1440	800	325
52080	"	♀	2430	1480	950	330
Average		**4 ♀**	**2350**	**1503**	**848**	**324**

[1]Type.

Table B.—External Measurements of *Leo leo nyanzæ* from British East Africa (From Hollister, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 168, 169)

U. S. Nat. Mus. No.	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot
181569	Lime Springs, Sotik	♂	2740	1760	980	355
181570	" " "	♂	——	1730	——	355
181573	Kabalolot Hill	♂	2730	1720	1010	370
181577	Telek River	♂	2749	1835	914	375
162913	S. Guaso Nyiro R.	♂	2980	1950	1030	385
Average		**5 ♂**	**2799**	**1799**	**984**	**368**
181589	Loita Plains	♀	2380	1470	910	310
181590	" "	♀	2360	1520	840	315
181592	" "	♀	2550	1590	960	360
181578	Telek River	♀	2410	1490	920	335
181583	" "	♀	2551	1575	976	325
Average		**5 ♀**	**2450**	**1529**	**921**	**329**

Table C.—External Measurements of *Leo leo massaicus*[1] from British East Africa (From Hollister, *loc. cit.*)

U. S. Nat. Mus. No.	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot
161914	Wami Hill	♀	2380	1560	820	325
197137	Nairobi	♀	2134	1410	724	305
199524	"	♀	2422	1621	801	336
Average		**3 ♀**	**2312**	**1530**	**782**	**322**

[1]No external measurements of males available.

Table D.—Cranial Measurements of Twelve Adults of *Leo leo azandicus* from Northeastern Belgian Congo

Cat. No.	Locality	Sex	Greatest Length	Condylobasal Length	Basal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Postorbital Constriction	Mastoid Breadth	Breadth Mesopterygoid Fossa	Breadth across p^4-p^4	Length Nasals		Length Mandible
													Middle	Outside	
52072	Faradje	♂	380	—	330	246	99.0	74.8	62.6	141.4	48.5	128.7	89.6	115.3	253
52084[1]	Vankerckhovenville	♂	375	335	315	245	99.0	77.5	64.3	134.3	51.7	133.4	93.8	111.5	243
52078	Faradje	♂	370	325	315	250	98.2	79.5	67.4	142.5	51.4	133.3	97.9	119.2	243
52082	"	♂	368	335	320	255	96.9	78.5	66.0	139.6	48.7	129.0	106.0	118.5	250
52079	"	♂	365	—	312	240	95.0	66.5	64.5	138.3	49.8	127.0	88.7	114.0	245
52077	"	♂	360	323	310	253	95.4	73.5	68.2	141.3	48.5	124.6	95.6	119.0	237
52076	"	♂	355	—	297	243	91.0	72.7	63.7	132.7	51.7	128.2	87.2	107.6	238
Average		**7 ♂**	**369**	**330**	**314**	**248**	**96.4**	**74.7**	**65.2**	**138.6**	**50.0**	**129.2**	**94.1**	**115.0**	**244**
52081	Faradje	♀	305	270	260	210	85.5	61.8	60.1	115.8	—	121.8	68.5	85.3	203
52075	"	♀	305	265	250	210	85.2	63.0	53.0	126.8	46.3	119.5	67.8	85.5	204
52074	"	♀	300	265	250	203	81.0	56.0	62.4	117.7	45.5	114.5	73.3	92.8	202
52080	"	♀	295	267	252	184	75.0	60.4	58.2	112.5	38.4	118.2	59.5	76.2	198
52073	"	♀	280	260	245	197	77.5	67.1	65.0	112.0	44.3	100.5	66.0	78.5	196
Average		**5 ♀**	**297**	**265**	**251**	**201**	**80.8**	**61.7**	**59.7**	**117.0**	**43.6**	**114.9**	**67.0**	**83.7**	**201**

[1]Type.

Table E.—Cranial Measurements of Fourteen Adults of *Leo leo nyanzæ* from British East Africa (From Hollister, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 166, 167)

U. S. Nat. Mus. No.	Locality	Sex	Greatest Length	Condylobasal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Mastoid Breadth	Greatest Length Nasals	Length Mandible
181571	Lime Springs, Sotik	♂	368	324	243	98	71	135	114	255
181577	Telek River	♂	356	318	235	93	70	132	103	245
162913	S. Guaso Nyiro R.	♂	371	329	251	98	74	144	106	255
162919	Njoro Osolali	♂	356	321	235	92	66	132	104	242
Average		4 ♂	**363**	**323**	**241**	**95**	**70**	**136**	**107**	**249**
Paratype[1]	Mulema, Uganda	♂	363	324	230	—	74	—	116	237
181589	Loita Plains	♀	296	269	202	80	62	117	87	208
181572	Kabalolot Hill	♀	291	266	187	81	62	109	92	207
181930	" "	♀	300	264	206	84	61	115	92	206
181578	Telek River	♀	284	256	180	75	58	105	85	196
181583	" "	♀	309	278	202	86	63	117	98	211
162916	Njoro Osolali	♀	313	281	204	88	66	123	93	212
162914	S. Guaso Nyiro R.	♀	277	254	185	75	56	113	79	199
162915	" "	♀	299	268	203	84	54	118	89	205
162917	" "	♀	302	272	196	80	60	115	89	208
162918	" "	♀	285	261	198	89	55	113	87	203
Average		10 ♀	**296**	**267**	**196**	**82**	**60**	**115**	**89**	**206**

Table F, *a*.—Cranial Measurements of Seven Adults of *Leo leo massaicus* from Vicinity of Lake Naivasha, British East Africa (Specimens Collected and Presented by Paul J. Rainey to The American Museum of Natural History)

Cat. No.	Locality	Sex	Greatest Length	Condylobasal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Mastoid Breadth	Greatest Length Nasals	Length Mandible
30242	Near Lake Naivasha	♂	363	312	233	93.3	68.0	137.5	101.7	238
30247	" " "	♂	355	315	245	95.3	71.0	133.7	93.0	238
30244	" " "	♂	357	310	235	92.7	73.4	136.1	104.0	238
30248	" " "	♂	——	——	248	93.2	76.0	——	107.8	250
36420	" " "	♂	354	313	240	92.8	68.2	133.3	106.0	239
Average		5 ♂	**357**	**312**	**240**	**93.5**	**71.3**	**135.2**	**102.5**	**241**
30243	Near Lake Naivasha	♀	298	270	195	89.6	59.5	117.5	66.6	197
30245	" " "	♀	300	265	196	78.0	59.6	115.0	88.5	200

[1]From Heller, 1913, Smithsonian Misc. Coll., LXI, No. 19, November 8, p. 5.

Table F, *b*.—Cranial Measurements of Nineteen Adults of *Leo leo massaicus* from British East Africa (From Hollister, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 166, 167)

U. S. Nat. Mus. No.	Locality	Sex	Greatest Length	Condylobasal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Mastoid Breadth	Greatest Length Nasals	Length Mandible
174742	Mt. Kilimanjaro	♂	351	318	241	94	68	132	104	241
182297	Kapiti Station	♂	373	322	248	100	71	135	110	257
155443	Nairobi	♂	373	335	234	92	70	135	118	256
163328	Laikipia Plat.	♂	337	316	233	92	75	133	107	235
Average	(Wild-killed)	**4 ♂**	**358**	**323**	**239**	**95.0**	**71**	**134**	**110**	**247**
197944[1]	Nairobi	♂	345	309	261	96	78	146	97	248
199707[1]	"	♂	363	325	264	104	80	152	101	260
174744	Mt. Kilimanjaro	♀	301	270	195	79	60	116	88	207
182308	Ulu Station	♀	290	259	195	80	58	115	90	202
182293	Kapiti Station	♀	294	264	203	81	63	120	86	203
182324	" "	♀	299	266	185	78	57	111	90	200
182326	" "	♀	299	267	204	80	60	117	91	210
182421	" "	♀	292	262	192	76	58	119	88	203
182423	" "	♀	282	254	180	74	54	112	80	198
161914	Wami Hill	♀	291	258	192	77	58	114	86	196
163109	Laikipia Plat.	♀	295	269	195	81	67	112	97	212
163329	" "	♀	307	273	193	81	60	115	100	209
163108	N. Guaso Nyiro R.	♀	298	264	195	81	64	112	93	200
Average	(Wild-killed)	**11 ♀**	**295**	**264**	**194**	**79**	**60**	**114**	**90**	**204**
197137[1]	Nairobi	♀	291	265	209	81	59	120	89	200
199524[1]	"	♀	300	265	224	84	64	119	87	206

[1]Raised in captivity and abnormal. Excluded from the averages and extremes.

Table G.—Comparative Summary of Cranial Measurements of Adult Lions from Northeastern Belgian Congo and British East Africa, all Strictly Comparable as to Age (Based on Tables D, E, and F)

Regional Form	Sex	No. of Specimens		Greatest Length	Condylobasal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Mastoid Breadth	Greatest Length Nasals	Length Mandible
Leo leo azandicus	♂	7	Average	369	330	248	96	75	139	115	244
" " *nyanzæ*	♂	4	"	363	323	241	95	70	136	107	249
" " *massaicus*	♂	9	"	358	318	240	94	71	135	106	244
Leo leo azandicus	♂	7	Minimum	355	323	240	91	67	133	108	237
" " *nyanzæ*	♂	4	"	356	318	235	92	66	132	103	242
" " *massaicus*	♂	9	"	337	310	233	92	60	132	102	238
Leo leo azandicus	♂	7	Maximum	380	335	255	99	80	143	119	253
" " *nyanzæ*	♂	4	"	371	329	251	98	74	144	114	255
" " *massaicus*	♂	9	"	373	335	248	100	75	137	118	257
Leo leo azandicus	♀	5	Average	297	265	201	81	62	117	84	201
" " *nyanzæ*	♀	10	"	296	267	196	82	60	115	89	206
" " *massaicus*	♀	13	"	295	264	195	80	60	115	88	203
Leo leo azandicus	♀	5	Minimum	280	260	184	75	56	112	76	196
" " *nyanzæ*	♀	10	"	277	254	180	75	54	105	85	196
" " *massaicus*	♀	13	"	282	254	180	74	54	111	86	196
Leo leo azandicus	♀	5	Maximum	305	270	210	86	67	127	93	204
" " *nyanzæ*	♀	10	"	313	281	206	89	66	123	98	212
" " *massaicus*	♀	13	"	307	273	204	81	67	120	100	212

Table H.—Amount and Percentage of Variation in Cranial Measurements of Adult Lions from Northeastern Belgian Congo, and from British East Africa (Based on Tables D–G)

Regional Form	Sex	No. of Specimens	Greatest Length	Condylo-basal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Mastoid Breadth	Greatest Length Nasals	Length Mandible
Amount of Variation (in millimeters)										
Leo leo azandicus	♂	7	25	12	15	8	13	10	11	16
" " *nyanzæ*	♂	4	15	11	16	6	8	12	11	13
" " *massaicus*	♂	9	36	25	15	8	15	5	16	19
Leo leo azandicus	♀	5	25	10	26	11	11	15	17	8
" " *nyanzæ*	♀	10	36	27	26	14	12	18	13	16
" " *massaicus*	♀	13	25	19	24	7	13	9	14	16
Percentage of Variation (based on averages)										
Leo leo azandicus	♂	7	6.8	3.7	6.0	8.3	17.3	7.2	9.5	6.5
" " *nyanzæ*	♂	4	4.1	3.4	6.6	6.3	11.0	8.8	10.0	5.2
" " *massaicus*	♂	9	10.0	7.8	6.3	8.5	21.1	3.7	15.0	7.8
Leo leo azandicus	♀	5	8.4	3.7	12.9	13.6	17.7	12.8	20.2	3.9
" " *nyanzæ*	♀	10	12.2	10.1	13.2	17.0	20.0	15.6	14.6	7.8
" " *massaicus*	♀	13	8.4	7.2	12.3	8.7	21.7	7.9	15.9	7.8

Table I.—Dental Measurements of Twelve Adults of *Leo leo azandicus* from Northeastern Belgian Congo

Cat. No.	Locality	Sex	Upper Toothrow c-p^4 (inclusive)	Lower Toothrow c-m_1	Upper Canine, length at alv. border	p^2-p^4	p_3-m_1	p^3-p^4	Upper Carnassial	Upper Molar	Length of m_1
52072	Faradje	♂	115.2	132.7	28.9	78.5	76.8	68.7	39.5×18.7	11.1×5.7	29.6
52084[1]	Vankerckhovenville	♂	115.5	135.4	27.6	79.3	75.2	67.1	40.5×20.1	11.1×6.2	30.4
52078	Faradje	♂	118.1	138.3	28.6	73.5	74.3	61.1	36.0×17.9	13.0×6.4	27.6
52082	"	♂	111.7	132.2	28.3	76.8	72.7	61.8	37.4×18.7	11.4×5.7	28.7
52079	"	♂	111.5	132.2	28.5	77.1	72.3	63.8	37.4×18.4	12.5×6.2	28.4
52077	"	♂	118.8	128.7	27.4	75.6	75.2	64.5	38.7×19.0	11.7×6.2	28.4
52076	"	♂	109.5	127.6	25.1	72.0	72.2	58.2	36.1×18.3	10.5×4.8	26.2
Average		**7 ♂**	**114.3**	**132.5**	**27.8**	**76.1**	**74.1**	**63.6**	**37.9×18.7**	**11.6×5.9**	**28.4**
52081	Faradje	♀	97.1	113.3	23.4	69.7	67.5	59.5	35.3×16.8	11.5×6.3	27.8
52075	"	♀	99.2	114.4	24.8	66.4	64.3	56.5	34.4×17.6	11.0×4.8	24.5
52074	"	♀	97.1	111.5	25.0	68.9	67.5	58.7	35.5×16.8	9.6×5.0	26.4
52080	"	♀	93.2	117.7	21.8	65.8	67.2	56.2	33.9×19.2	10.1×5.2	25.0
52073	"	♀	92.0	109.2	22.0	65.5	62.8	54.7	33.8×19.0	9.2×4.1	24.2
Average		**5 ♀**	**95.7**	**113.2**	**23.4**	**67.3**	**65.9**	**57.1**	**34.6×17.9**	**10.3×5.1**	**25.6**

[1]Type.

Table J.—Dental Measurements of Fifteen Adults of *Leo leo nyansæ* from British East Africa (From Hollister, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 166–169)

U. S. Nat. Mus. No.	Locality	Sex	Upper Toothrow c-p^4 (inclusive)	Lower Toothrow c-m_1	Upper Canine, length at alv. border	Upper Carnassial	Length of m_1
181571	Lime Springs, Sotik	♂	108	125	27.9	40.8×19.5	30.6
181574	Kabalolot Hill	♂	106	118	24.3	35.3×17.4	24.9
181577	Telek River	♂	109	125	26.1	37.3×18.8	28.8
162913	S. Guaso Nyiro R.	♂	114	132	26.7	37.9×19.4	28.2
162919	Njoro Osolali	♂	111	128	27.5	39.7×18.5	30.6
Average		**5♂**	**109.6**	**125.6**	**26.5**	**38.2×18.7**	**28.6**
181589	Loita Plains	♀	95	109	21.3	33.0×15.3	25.0
181572	Kabalolot Hill	♀	98	111	22.5	35.3×16.4	25.5
181930	" "	♀	99	111	23.3	34.4×16.4	25.1
181578	Telek River	♀	94	107	21.3	34.5×16.4	25.2
181583	" "	♀	99	115	22.8	32.8×15.8	25.2
162916	Njoro Osolali	♀	102	113	22.8	36.2×17.8	25.5
162914	S. Guaso Nyiro R.	♀	94	114	19.6	———	22.7
162915	" "	♀	95	110	23.0	34.4×17.9	25.7
162917	" "	♀	98	111	20.4	33.0×16.5	23.4
162918	" "	♀	94	106	21.2	35.7×17.1	24.9
Average		**10♀**	**96.8**	**110.7**	**21.8**	**34.4×16.6**	**24.8**

Table K, *a*.—Dental Measurements of Seven Adults of *Leo leo massaicus* from Vicinity of Lake Naivasha, British East Africa (Specimens Collected and Presented by Paul J. Rainey to The American Museum of Natural History)

Cat. No.	Locality	Sex	Upper Toothrow c-p⁴ (inclusive)	Lower Toothrow c-m₁	Upper Canine, length at alv. border	Length of Upper Carnassial	Upper Molar	Length of m₁
30242	Near Lake Naivasha	♂	106.8	123.3	28.5	35.8	10.6×6.5	25.7
30247	" " "	♂	103.5	121.8	27.6	36.3	10.2×5.0	27.5
30244	" " "	♂	107.0	121.2	27.7	37.0	12.4×5.5	26.0
30248	" " "	♂	107.4	128.0	26.6	37.1	10.7×5.5	26.8
36420	" " "	♂	112.0	124.5	26.6	37.8	11.8×5.3	28.0
Average		**5 ♂**	**107.3**	**123.8**	**27.4**	**36.8**	**11.1×5.6**	**26.8**
30243	Near Lake Naivasha	♀	93.3	109.2	20.3	35.0	11.3×4.5	26.0
30245	" " "	♀	93.6	107.0	22.0	34.0	11.0×4.7	24.6

Table K, *b*.—Dental Measurements of Nineteen Adults of *Leo leo massaicus* from British East Africa (From Hollister, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 166–169)

U. S. Nat. Mus. No.	Locality	Sex	Upper Toothrow c-p⁴ (inclusive)	Lower Toothrow c-m₁	Upper Canine, length at alv. border	Upper Carnassial	Length of m₁
174742	Mount Kilimanjaro	♂	109	126	26.2	35.4×16.4	25.6
182297	Kapiti Station	♂	112	128	27.8	40.0×19.9	28.6
155443	Nairobi	♂	116	133	27.8	39.3×18.9	28.8
163328	Laikipia Plat.	♂	112	127	24.4	38.0×19.1	27.7
Average	(Wild-killed)	**4** ♂	**112.1**	**129**	**26.6**	**38.2×18.6**	**27.7**
197944[1]	Nairobi	♂	108	127	23.0	35.8×18.1	28.2
199707[1]	"	♂	113	131	25.2	37.9×19.7	27.6
174744	Mount Kilimanjaro	♀	94	108	21.8	34.0×16.2	24.2
182308	Ulu Station	♀	93	110	23.6	35.4×17.7	25.1
182293	Kapiti Station	♀	96	108	21.9	35.2×17.1	25.3
182324	" "	♀	94	108	20.9	33.9×16.8	25.3
182326	" "	♀	95	108	19.4	33.2×15.5	23.9
182421	" "	♀	93	106	21.9	32.5×16.3	23.3
182423	" "	♀	91	105	21.2	33.1×17.0	24.6
161914	Wami Hill	♀	91	104	21.7	33.4×15.6	24.2
163109	Laikipia Plat.	♀	98	115	23.5	33.2×17.5	25.1
163329	" "	♀	99	115	21.2	33.9×17.4	25.9
163108	N. Guaso Nyiro R.	♀	98	112	22.8	35.0×17.3	25.6
Average	(Wild-killed)	**11** ♀	**94.8**	**109**	**21.8**	**33.9×16.8**	**24.8**
197137[1]	Nairobi	♀	93	105	19.1	33.6×15.2	23.8
199524[1]	"	♀	92	104	19.2	32.5×15.4	22.9

[1]Reared in captivity. Added for comparison but excluded in computing the averages.

Table L.—Comparative Summary of Dental Measurements of Adult Lions from Northeastern Belgian Congo and British East Africa (Based on Tables I, J and K)

Regional Form	Sex	No. of Specimens		Upper Toothrow c-p⁴ (inclusive)	Lower Toothrow c-m₁	Upper Canine, length at alv. border	Upper Carnassial	Length of m₁
Leo leo azandicus	♂	7	Average	114.3	132.5	27.8	37.9×18.7	28.4
" " *nyanzæ*	♂	5	"	109.6	125.6	26.5	38.2×18.7	28.6
" " *massaicus*	♂	9	"	109.5	125.9	27.0	37.4×18.6	27.2
Leo leo azandicus	♂	7	Minimum	109.5	127.6	25.1	36.0×17.9	26.2
" " *nyanzæ*	♂	5	"	106.0	118.0	24.3	35.3×17.4	24.9
" " *massaicus*	♂	9	"	103.5	121.2	24.4	35.4×16.4	25.6
Leo leo azandicus	♂	7	Maximum	118.8	138.3	28.9	40.5×20.1	30.4
" " *nyanzæ*	♂	5	"	114.0	132.0	27.9	40.8×19.5	30.6
" " *massaicus*	♂	9	"	116.0	133.0	28.5	40.0×19.9	28.8
Leo leo azandicus	♀	5	Average	95.7	113.2	23.4	34.6×17.9	25.6
" " *nyanzæ*	♀	10	"	96.8	110.7	21.8	34.4×16.6	24.8
" " *massaicus*	♀	13	"	94.5	108.9	21.8	33.9×16.8	24.8
Leo leo azandicus	♀	5	Minimum	92.0	109.2	21.8	33.8×16.8	24.2
" " *nyanzæ*	♀	10	"	94.0	106.0	19.6	32.8×15.3	22.7
" " *massaicus*	♀	13	"	91.0	104.0	19.4	32.5×15.5	23.3
Leo leo azandicus	♀	5	Maximum	99.2	117.7	25.0	35.5×19.2	27.8
" " *nyanzæ*	♀	10	"	102.0	115.0	23.3	36.2×17.9	25.7
" " *massaicus*	♀	13	"	99.0	115.0	23.6	35.4×17.7	26.0

Table M.—Amount and Percentage of Variation in Dental Measurements of Adult Lions from Northeastern Belgian Congo, and British East Africa (Based on Tables I–L)

Regional Form	Sex	No. of Specimens	Upper Toothrow c-p^4 (inclusive)	Lower Toothrow c-m_1	Upper Canine, length at alv. border	Upper Carnassial	Length of m_1
Amount of Variation (in millimeters)							
Leo leo azandicus	♂	7	9.3	10.7	3.8	4.5×2.2	4.2
" " *nyanzæ*	♂	5	8.0	14.0	3.6	5.5×2.1	5.7
" " *massaicus*	♂	9	12.5	11.8	4.1	4.6×3.5	3.2
Leo leo azandicus	♀	5	7.2	8.5	3.2	1.7×2.4	3.6
" " *nyanzæ*	♀	10	8.0	9.0	3.7	3.4×2.6	3.0
" " *massaicus*	♀	13	8.0	11.0	4.2	2.9×2.2	2.7
Percentage of Variation (based on averages)							
Leo leo azandicus	♂	7	8.1	8.5	13.6	11.9×11.7	14.7
" " *nyanzæ*	♂	5	7.3	11.1	13.6	14.4×11.2	19.9
" " *massaicus*	♂	9	11.4	9.3	15.2	12.3×18.8	11.7
Leo leo azandicus	♀	5	7.5	7.5	13.7	4.9×13.4	14.1
" " *nyanzæ*	♀	10	8.3	8.1	16.9	9.9×15.7	12.1
" " *massaicus*	♀	13	8.4	10.1	19.2	8.5×13.1	10.9

PANTHERA Oken

Panthera OKEN, 1816, 'Lehrb. Naturg.,' Th. 3, Abth. 2, p. 1052. · Type, by tautonymy, *P.[anthera] vulgaris* Oken = *Felis panthera* Schreber (plate name) = *Felis pardus* Linnæus.

The leopards of both Africa and Asia, as at present understood, form a group of subspecies of *Felis pardus* Linnæus, differing from all other felines sufficiently to be accorded the rank of a full genus, in the opinion of several of the earlier as well as recent taxonomers, while others hold to the old view that lions, tigers and leopards are congeners of the domestic cat. It is necessary to consider only the African forms in the present connection. The genus is represented in North and South America by the *Felis onca* group.

Nomenclature and Type Localities of African Leopards

The name commonly accepted for the leopard group is of course *Felis pardus* Linnæus (1758). The most that can be said for it is that it was probably intended to designate the pard or panther of pre-Linnean authors. The slight diagnosis, aided by the principle of exclusion, is open to this interpretation. As has been repeatedly noted by commentators, and especially by Thomas,[1] "Habitat in Indiis" gives no basis for a type locality, and Linnæus' citations of authors afford no assistance. His first reference is to edition six of his 'Syst. Nat.,' (p. 4, No. 3), where he cites Ray, 'Quadr.,' p. 166, and 'Alp. Aegypt.,' p. 237, neither of which bears on the matter of a type locality. To quote Thomas (*loc. cit.*, p. 135): "Ray gives no indication of locality, but passing to Alpinus we find an account of Leopards seen at Cairo and Alexandria alive in captivity. The account is, no doubt, partly based on Hunting Leopards (*Cynælurus*), but, none the less, may be accepted as giving for the type locality: Egypt." The objections to this ruling are (1) that the leopards seen in captivity by Alpinus at Cairo and Alexandria must have come either from some point far up the Nile[2] or from Arabia; (2) they may more probably have been hunting leopards than true leopards; (3) Linnæus' *Felis pardus* was in all probability a composite of both, and included also the Mexican jaguar. If the name had any other origin than Linnæus it would under modern standards have been long since ruled out as indeterminate. If it is to be retained on the basis

[1]Thomas, Oldfield, 1911, 'The Mammals of the Tenth Edition of Linnæus: an Attempt to fix the Types of the Genera and the exact Bases and Localities of the Species.' Proc. Zoöl. Soc. London, I, pp. 120–158. See also Cabrera, 1910, Bol. Soc. Española Hist. Nat., Madrid, X, pp. 422–427; idem, 1918, XVIII, pp. 472–482, Pls. XVI-XVII.

[2]"Il, n'y point de lions, ni de Tigres, ni de léopards en Égypte."—Mascrier, 1740, 'Descript. de l'Égypte,' II, p. 125, as quoted by Buffon.

that it has primary relation to panthers and leopards, as known to pre-Linnean writers, its type locality should be restricted on the basis of the first author who gave an intelligent description of the species based on specimens from a known locality. The first authors to make this contribution were Buffon and Daubenton, three years after the publication of Linnæus' tenth edition of his 'Systema Naturæ.'[1] Buffon says (*loc. cit.*), p. 151: "La première espèce de ce genre, & qui se trouve dans l'ancien continent, est la grande panthère que nous appelerons simplement *Panthère* (pl. xi & xii), qui étoit connue des Grecs sous le nom de *Pardalis*, des anciens Latins sous celui de *Panthera*, ensuite sous le nom de *Pardus*, & des Latins modernes sous celui de *Leopardus*." These names are all cited from Gesner (1620, 'Hist. Anim. Quadr.,' 2d. Ed., I, p. 824) by Linnæus (1758, 'Syst. Nat.,' 10th Ed., I, p. 41) and form his second reference under his *Felis pardus*.

In respect to the source of his material Buffon says: "La panthère que nous decrivons ici & deux autres de la même espèce, qui étoient en même temps à la ménagerie du Roi, sont venues de la Barbarie: la régence d'Alger fit présent à Sa Majesté des deux premières, il y a dix ou douze ans; la troisième a été achetée pour le Roi, d'un Juif d'Alger" (*loc. cit.*, p. 160). The description of the external form, by Daubenton, is from a male (figured, Plate XI); the account of the color and markings is from a female (figured, Plate XII). Each of the three animals enumerated by Buffon is mentioned individually by Daubenton in his description.

Following a well established custom in designating a type locality for a composite species when none was originally indicated, I designate Algeria as the type locality of *Felis pardus* (*s.s.*) Linnæus, on the basis of La Panthère of Buffon and Daubenton, and thus establish a starting point for the nomenclature for the leopards of Africa.

Schreber's plate bearing the name "*Felis panthera* Buff." (1775, 'Säugthiere,' Pl. XCIX) is an acknowledged copy of Buffon's Plate XII (cf. 1777, 'Säugthiere,' III, p. 586), and is therefore a synonym of *Felis pardus* Linnæus, and was so treated in the later published text (1777, 'Säugthiere,' III, pp. 384, 385).

Erxleben's *Felis pardus* (1777, 'Syst. Reg. Anim.,' p. 505) without his references to Buffon and Schreber would be as geographically indeterminate as Linnæus'.

The name *Felis leopardus* of nomenclators also has its basis in Buffon and Daubenton's "Le Léopard" (*loc. cit.*, pp. 153–154, 168–171,

[1]Buffon and Daubenton, 1761, 'Hist. Nat.,' IX, pp. 151–172 (Buffon), pp. 173–178 (Daubenton), Pls. XI, XII.

189–200, Pl. XIV). The leopard is informally described in the section of the text devoted to the "Description de la partie du Cabinet qui a rapport à l'Historie Naturelle du Tigre, de la Panthère, de l'Once et du Léopard" which enumerates or describes various skins, skeletons and anatomical preparations, mainly of the leopard. The description of the leopard is captioned "La peau d'un léopard" (pp. 190–192), with a reference to Plate XIV where the animal is figured. There is also a figure of the skeleton (Pl. XVII). The description of the animal is detailed but affords no information as to the original source of the specimen described, nor of any of the leopard material mentioned. Buffon, however, gives the following (*loc. cit.*, pp. 153–154): "La troisième espèce, dont les Anciens ne sont aucune mention, est un animal du Sénégal, de la Guinée & des autres pays méridionaux que les Anciens n'avoient pas découverts: nous l'appellerons Léopard (pl. xiv) qui est le nom qu'on a mal-à-propos appliqué à la grande panthère, & que nous employerons, comme l'ont fait plusieurs Voyageurs, pour désigner l'animal du Sénégal, dont il est ici question. Il est un peu plus grand que l'once, mais beaucoup moins que le panthère. . . ." A further comparison with the panther is given (*loc. cit.*, pp. 168–171), in part as follows: "Le léopard a les mêmes mœurs & le même naturel que la panthère; & je ne vois nulle part qu'on l'ait apprivoisé comme l'once; ni que les nègres du Sénégal & de Guinée où il est très-commun, s'en soient jamais servis pour la chasse. . . . Ce Léopard du Sénégal ou de Guinée, auquel nous avons appliqué particulièrement le nom de *Léopard*, est probablement l'animal que l'on appelle à Congo *Engoi*. . . ."

As Buffon's *leopard* is the basis of the systematic name *Felis leopardus*, which originated with Schreber[1] and was adopted by Erxleben,[2] the type region of *Felis leopardus* is Senegal, on the authority of Buffon. This has been distinctly recognized by various later authors; many others have given it a range coextensive with that of *Felis pardus*, both species having been assigned to Asia as well as to Africa.[3]

Griffith, in 1827, published a drawing made by Hamilton Smith from "one of the several Felinæ, called Panthers, now in the Paris Museum." This drawing is the basis of Griffith's "Panther of the Ancients",[4]

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[1]1775, 'Säugthiere,' Pl. CI (copied from Buffon), carrying the plate legend "*Felis leopardus* Buff."; idem, 1777, III, p. 387.

[2]1777, 'Syst. Reg. Anim.,' p. 509.

[3]Two authors may be cited in illustration: Jardine (1834, 'Nat. Hist. Felinæ,' pp. 267–268) says of *Felis leopardus*: "Inhabits India and Africa. Most abundant, perhaps, in the former. Form slender and elegant. Distinctions between this and the last [*Felis pardus*] not yet well defined."

Matschie as late as 1895 (Sitzungsb. Ges. Naturf. Freunde Berlin, pp. 198–199) assigned his *Leopardus pardus leopardus* to his "Westafrikanisches Gebiet."

[4]1827, 'Cuvier's Animal Kingdom,' II, p. 466 and facing plate.

to which in Volume V of the same work (*loc. cit.*, V, p. 165, No. 424) he gave the technical name "*F.*[*elis*] *Pardus Antiquorum*," "Hamilton Smith, MSS.," and added: "Habitat?" Some four years later Sykes[1] said of the leopard of Dukhun, India: "It exactly resembles the animal figured as the *Panther of the ancients* in Mr. Griffiths's Translation of the 'Règne Animal'." Doubtless for this reason Fitzinger assigned Griffith's name, although clearly indeterminate, to his "Der indische Panther (*Panthera antiquorum*)."[2] Several later authors have also accepted this assignment.

In 1832, Ehrenberg described[3] a pale form of leopard from Arabia as "*Felis, Pardus* Linné?, *Nimr*" from two skins, "I. arabicæ," "II. habessinicæ." The first, from Arabia, served as the principal basis of his description, of his detailed table of measurements, and of his plate (Pl. XVII), which is inscribed, "*Felis nimr.* ex Arabia felici." The other specimen, from Abyssinia, was in poor condition. He states regarding the localities of his specimens: "In Arabia felici Syria et Habessinia pelles eas vidi, quas supra descripsi." He mentions having seen a wild leopard in Nubia as it was running at a distance of one hundred paces. The type locality of *Felis nimr* Ehrenberg is thus Arabia; not Nubia, nor Dongola,[4] nor even Abyssinia, as usually supposed.

In 1869 Fitzinger adopted[5] the name *Felis nimr* Ehrenberg for the leopard of East Africa, his "Der ostafrikanische Panther (*Panthera nimr*)," giving its range as "Ost-und Süd-Afrika und der mittlere Theil von West-Asien. In Afrika ist diese Form von Nubien durch Sennaar, Kordofan, Abyssinien, die Habab-, Danakil- und Somàli-Länder bis an das Cap der guten Hoffnung verbreitet, in Asien durch das peträische Arabien, Syrien und Armenien bis nach Persien und in die Tartarei, wo sie noch am Südrande des Aral-See's getroffen wird. Nördlich reicht sic bis an den Kaukasus." Later Matschie also made use[6] of the name *nimr* for the East African leopards collectively.

Felis leopardus var. *melanotica* Günther,[7] although founded on a melanistic phase from Grahamstown, Cape Colony, is available for the form of the Cape region, which differs in size and character of pelage from the more northern tropical forms.

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[1] 1831, Proc. Zoöl. Soc. London, August, p. 102.
[2] 1868 (1869), Sitzungsb. Ak. Wiss. Wien, LVIII, Abth. 1, pp. 466–468.
[3] 'Symb. Phys.,' Dec. II, Pl. XVII and accompanying text (unpaged).
[4] De Winton states: "Ehrenberg separated the African leopard from the Asiatic form, and the distinguishing subspecific name *nimr*, which he bestowed upon the former, is generally applied to this race with solid spots on the shoulders. It is mentioned as occurring in the Province of Dongola." (W. E. de Winton in Anderson's 'Zool. of Egypt,' Mamm., 1902, p. 183.)
[5] 1868 (1869), Sitzungsb. Ak. Wiss. Wien, LVIII, Abth. 1, pp. 461–466.
[6] 1895, 'Säugethiere Deutsch-Ost-Afrikas,' p. 69.
[7] 1885, Proc. Zoöl. Soc. London, p. 243, Pl. XVI; idem, 1886, p. 203, with text figure.

In 1900 Neumann proposed[1] the name *Felis leopardus suahelicus* (Pls. XLII and XLIII) to replace *Felis* (*Leopardus*) *nimr* Matschie (*loc. cit.*), claiming that the large-spotted form of leopard of East Africa had not previously been named. He gave no description and indicated no type locality, the name *suahelicus* being a substitute name for the form Matschie had designated as *nimr*. He mentions having received skins of this form from various localities in German East Africa, from Ugogo to Uganda. On this account Hollister, in 1918,[2] said: "Type locality may be restricted to some point in northeastern German East Africa." I here further restrict it to the Lake Manyara district, north Ugogo, one of the first localities mentioned by Neumann as one of the sources of his material.

Five other supposed forms of leopards have been described during the last eighteen years from that portion of Africa east of the Upper Nile region between northern Somaliland and northern German East Africa, making seven East African forms in all, while South Africa has only one (not yet generally recognized) and West Africa has also two, the *Panthera pardus leopardus* of Senegal and *Panthera pardus reichenowi* of Cameroon. They are listed in chronological sequence, with their respective type localities.

Forms of African Leopards

1758. *Panthera pardus pardus* (Linnæus). (*Felis pardus* Linnæus.) Algeria. (See above, pp. 248–249.)

1775. *Panthera pardus leopardus* (Schreber). (*Felis leopardus* Schreber.) Senegal. (See above, pp. 249–250.)

1832. *Panthera pardus nimr* (Ehrenberg). (*Felis nimr* Ehrenberg.) Arabia. (See above, p. 251.)

1885. *Panthera pardus melanotica* (Günther). (*Felis leopardus* var. *melanotica* Günther.) Grahamstown, Cape Colony. (See above, p. 251.)

1900. *Panthera pardus suahelica* (Neumann). (*Felis leopardus suahelicus* Neumann.) Lake Manyara district, northeastern German East Africa. (See above, p. 252.)

1904. *Panthera pardus nanopardus* (Thomas). (*Felis pardus nanopardus* Thomas.) Forty miles west of Gorahai, Somaliland. (Ann. Mag. Nat. Hist., (7) XIV, p. 94.)

1906. *Panthera pardus ruwenzorii* (Camerano). (*Felis pardus ruwenzorii* Camerano.) Bujungolo, Ruwenzori. (Bol. Mus. Zool. Anat., Torino, XXI, No. 545, p. 1.)

1913. *Panthera pardus fortis* (Heller). (*Felis pardus fortis* Heller.) Loita Plains, Southern Guaso Nyiro District, British East Africa. (Smithsonian Misc. Coll., LXI, No. 19, p. 5.)

[1] 1900, Zool. Jahrb., Abt. Syst., XIII, p. 551.
[2] 1918, U. S. Nat. Mus. Bull. 99, pt. 1, August 16, p. 171.

1913. *Panthera pardus chui* (Heller). (*Felis pardus chui* Heller.) Gondokoro, northern Uganda. (Smithsonian Misc. Coll., LXI, No. 19, p. 6.)

1917. *Panthera pardus centralis* (Lönnberg). (*Felis pardus centralis* Lönnberg.) Kabara, Lake Albert Edward. (Kungl. Sven. Vet. Ak. Handl., Stockholm, LVIII, No. 2, p. 49.)

1918. *Panthera pardus reichenowi* Cabrera. Yoko, Cameroon. (Bol. Soc. Esp. Hist. Nat., Madrid, XVIII, p. 481.)

Many early writers in describing the leopard, whether from Africa or Asia, referred in some detail to its variability in markings and general color tones, and also in size, with little or no information as to the exact geographical sources of their material, thus giving no clue as to whether these differentiations were merely individual or due to environment. Recent describers of what they assume to be regional forms have given detailed descriptions of their type specimens, placing great importance upon features, both cranial and external, which are within the normal range of purely individual variation. In fact, no large series of leopards from a single locality has been available for study until those collected by the American Museum Congo Expedition were received. These prove to be so widely variable in both size and coloration that alleged characters derived from single specimens are not necessarily to be taken as representing the norm of the localities where they were obtained. The character of a local form can only be established by examination of a large series of specimens, and its value determined only by their comparison with similar series from the type localities of neighboring forms, as *ruwenzorii* with *chui* and *centralis*, all described from the western border of Uganda, and all from localities with faunal affiliations with East Africa.

The material in hand (some fifty specimens) obtained by the American Museum Congo Expedition is separable into two series on geographical grounds, the one coming from the savannah or bush veldt district of northeastern Belgian Congo, the other from the Ituri Rain Forest district. The two series show an appreciable average difference, apparently in size as well as coloration. The first is believed to be referable to the form already described by Heller under the name *chui* from Gondokoro, a locality of similar environment and near the district where the bush veldt series was obtained. The other is recognized as subspecifically separable, for which no previous name appears to be applicable.

Both series show a wide range of individual color variation, which it seems desirable to present graphically by photographic illustrations, while tables of measurements serve to demonstrate variations in size, particularly of the skull and teeth.

Panthera pardus chui (Heller)

Plates XLI, Figures 1, 2; XLIV–LIV

Felis pardus chui HELLER, 1913, Smithsonian Misc. Coll., LXI, No. 19, November 8, p. 6. Gondokoro, northern Uganda (type), and Rhino Camp, Lado Enclave (cotype).

Felis pardus chui HOLLISTER, 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 170, 172-173. Same specimens.

Represented by 29 specimens (13 skins with skulls, 10 skins without skulls, 6 skulls without skins), nearly all adult, collected at the following localities:

Bafuka,[1] 1 (skin without skull), February 28, 1911.

Garamba, 3 (1 skin with skull and 2 separate skulls), July 20–22, 1912.

Faradje, 24 (12 skins with skulls, 8 skins without skulls, 4 skulls without skins), February 8–June 9, 1911; July 21–August 8, 1912; January 18–February 24, 1913.

Vankerckhovenville, 1 (skin without skull), March 1, 1911.

Collectors' measurements of 7 adult males and 1 adult female from Faradje; also 1 adult female from Garamba:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear[2]
♂	2155(2030–2420)	1252(1160–1398)	931(896–1022)	263(235–295)	85(84–86)
♀	1890	1110	780	235	73
♀	1850[3]	1085	765	220	—

The leopards of the Faradje district, like leopards everywhere, present a wide range of purely individual variation, as shown by the fourteen male examples from Faradje. The ground color of the upperparts[4] varies from pale buffy white to cinnamon-buff, usually of the latter type. The black markings vary in different specimens from well-defined rosettes to solid black spots, or form broken rings enclosing a slight touch or a well-developed spot of the ground color; often the rings are narrow, broken in front and usually laterally, by the ground color. The proportionate area of the black markings to the ground color varies from more than twice to less than one-half. The ground color of the ventral area is usually clear white but in some specimens shows a faint yellowish tone.

On the basis of single specimens at least five distinct types or styles of coloration can be selected which, if received from different localities,

[1]Sixty miles north of Niangara.
[2]Measurements of the ear include only four males and one female.
[3]From Garamba.
[4]The ground color is, of course, deepest over the mid-dorsal region, paling gradually toward the flanks.

might easily be regarded as representing local or "regional" forms but which, taken with the rest of the series, can be considered as merely phases of individual differentiation. It is therefore evident that forms described from a single specimen may or may not fairly represent the average of their respective localities, with the chances strongly against such representation. It is hence evident that a supposed regional form, to have much taxonomic significance, must be supported by a considerable series of specimens instead of a single example, as has been often the case in the founding of subspecies in the leopard group. While an individual may not be able to "change his spots" his brothers and sisters and cousins may present very different patterns and tones of coloration, a fact it seems hard for describers to recognize, not alone in the case of leopards but in many other groups of mammals. The accompanying photographic illustrations (Pls. XLI, fig. 2 and XLIV–LIV) serve to show variations in pattern but of course fail to indicate beyond a slight degree the variations in color tones.

The accompanying tables of cranial[1] and dental measurements (pp. 258–259) indicate a wide range in size. All the tabulated skulls are adult, ranging from young adults with the sutures only partly closed to the senile stage. In eight of the thirteen males the basal sutures are wholly obliterated, one (No. 52010) being in an advanced stage of senility. It is not, however, the largest of the series, the total length of the skull being 30 mm. below the maximum. The greatest length ranges, in male skulls with the basal sutures wholly obliterated, and all collected at Faradje, from 230 mm. to 282 mm. In five others from the same locality in which the basal sutures are wholly open or merely beginning to close, the total length ranges from 231 mm. to 247 mm. The variations in other dimensions are approximately coördinate, but present numerous discrepancies. Thus in old male skulls some of the transverse measurements are not proportionate to those of length in the same skull. In skull No. 52020, the greatest length is 282 mm., the mastoid breadth 108, and the least breadth of the mesopterygoid fossa 26.7; in No. 52017 the greatest length is 267 mm., the mastoid breadth 101.5, and the least breadth of the mesopterygoid fossa 28, the latter the maximum for the entire series of thirteen skulls. The length of the upper toothrow and the size of the carnassial are not always proportionate to the size of the skull.

It is of interest to note also that p^1 is present in one or both sides of the jaw in three of the Faradje skulls. In No. 52018 only the alveoli

[1]Some authors give only one measurement for the length of the skull, which may be either greatest length, basal length, or condylobasal (=condyloincisive) length. For convenience of comparison with previous records, all three are here given.

remain to indicate the presence of p^1 on both sides, the teeth having been lost in the preparation of the skull. In No. 52019 p^1 (about one-third of the size of p^2) is present on the right side and absent on the left, with no indication that it was ever present on the left. In No. 52020 p^1 is present on both sides, and about half as large as p^2, which is below normal in size.

The present series of twenty-four leopards from Faradje, three from Garamba, and one each from Bafuka and Vankerckhovenville, northeastern Belgian Congo, are provisionally referred to *Felis pardus chui* Heller, for the following reasons: They were all taken within about 100 to 150 miles east of the type locality (Gondokoro) of *chui* in similar environment; they agree in size with this form and, allowing for individual variation, also in coloration. The average cranial measurements of thirteen adult males are practically the same as the measurements of the type and topotype of *chui*, both old males, they varying only about 3 mm. in any of the principal dimensions (as tabulated by Hollister, *loc. cit.*, pp. 172, 173) from the average of the Faradje series. On the other hand, the average cranial measurements of six adult males of *Felis pardus suahelica* (as also tabulated by Hollister) from British East Africa are about 12 per cent smaller than the males of the Faradje series; while six adult females of *suahelica* are about 5 per cent smaller than the five females from Faradje and Garamba.

Other names that should be considered in this connection are *Felis pardus fortis* Heller, *Felis pardus ruwenzorii* Camerano, and *Felis pardus centralis* Lönnberg, each being based on a single specimen from, respectively, Loita Plains, British East Africa; Bujungolo, Ruwenzori; and Kabara, Lake Albert Edward.

F. p. fortis is described "as a large race which attains the maximum, the skull exceeding in length that of any other African or Asiatic race. The skull is further distinguishable by its narrowness, the small size of the tympanic bullæ and the absence of the first upper premolar. . . . Male skulls of *suahilica* [sic] differ in their much smaller size, the largest being seven-eighths of an inch less in length than the type of *fortis*. . . . ." Reference to Hollister's tables of measurements shows the total skull length of *fortis* as 260 mm., and the corresponding measurement of the largest male skull of *suahelica* as 238 mm., or 22 mm. less. To show how little this difference may signify, it may be stated that the three largest old male skulls from Faradje have a total length, respectively, of 282, 279, and 267 mm., while three other adult male skulls of the same series, in which the sutures are wholly obliterated (except of

course those of the nasals and the naso-maxillary-intermaxillary region which never disappear) have, respectively, the total length 252, 250, and 241 mm. These six skulls from Faradje represent the extremes of the series, with those of the interval between filling in the difference by slightly graduated stages. The type of *fortis*, however, is thus referred to by Hollister (*loc. cit.*, p. 175): "In size, color, skull, and dental characters this specimen differs widely from all other leopards in the collection. A case of very exceptional individual variation is here represented or else the animal belongs to a species quite distinct from the common leopard which is found in all the surrounding country." While disparaging the importance attributed by Heller to the dental peculiarities of the type, Hollister appears to accept the latter alternative, as he gives *fortis* the rank of a full species. On geographical grounds, however, *fortis* need not be further considered in the present connection.

Felis pardus ruwenzorii Camerano (1906) and *Felis pardus centralis* Lönnberg (1917) are both from localities faunally British East African in their relationships. Although *ruwenzorii* is elaborately described, the principal comparisons are made with the small pale form of the arid environment of Eritrea and Abyssinia, probably *Felis pardus nanopardus* Thomas. Its closest relationship is evidently with *Felis leopardus suahelicus* Neumann (1900) of British East Africa and northeastern German East Africa. The skull of the type specimen, a male, agrees in size with the average of adult males of *suahelica*. In view of the now known wide range of individual color variation in leopards, the elaborate description of the markings of the type have little significance, since other specimens from the type locality would most likely differ greatly from the type. It seems, therefore, necessary to leave *ruwenzorii* in abeyance pending further evidence regarding its status as a recognizable local form.

Felis pardus centralis is another case which may well be left for consideration till more evidence is available. Its type locality is very near that of *ruwenzorii*. Our knowledge of this form rests on the adult male type, although two other specimens in milk dentition from a near-by locality "must be supposed to belong to the same race" as the type.

Cranial Measurements of Seventeen Adults of *Panthera pardus chui* (8 old males, 4 old females, 5 young adult males) from Northeastern Belgian Congo

Cat. No.	Locality	Sex	Greatest Length	Condylobasal Length	Basal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Postorbital Constriction	Breadth Braincase	Mastoid Breadth	Breadth Mesopterygoid Fossa	Breadth across p^4-p^4	Length Nasals		Condition Basal Sutures
														Middle	Outside	
52020	Faradje	♂	282	246	233	168	65.6	48.0	44.0	89.3	108.2	26.7	88.4	65.4	82.3	Obliterated
52022	"	♂	279	243	228	165	64.2	47.6	47.7	82.0	104.5	26.7	88.2	64.8	85.7	"
52017	"	♂	267	239	224	153	58.2	45.2	43.3	79.3	101.5	28.0	——	67.8	79.3	"
52016	Garamba	♂	255	225	212	163	63.3	44.3	37.3	76.7	101.0	26.8	87.7	66.5	79.4	"
52040	"	♂	250	223	211	——	60.0	43.7	43.4	75.2	97.4	27.0	83.4	61.7	65.1	"
52010[1]	Faradje	♂	252	232	220	159	58.3	43.0	42.0	76.2	97.2	26.2	82.6	60.0	78.6	"
52008	"	♂	241	213	200	152	61.3	41.3	38.2	74.5	97.6	27.0	88.8	60.0	73.2	"
52013[2]	"	♂	230	213	201	144	55.1	37.4	38.5	71.8	90.5	24.3	78.1	57.2	66.4	"
Average		**7 ♂**	**261**	**232**	**218**	**160**	**61.6**	**44.7**	**42.3**	**79.0**	**101.0**	**26.9**	**86.6**	**63.5**	**77.7**	
52005	Faradje	♀	203	185	172	127	48.0	34.6	38.7	69.7	82.9	21.6	72.6	50.2	63.2	Obliterated
52009	"	♀	201	184	173	125	49.3	37.6	41.2	70.0	81.8	23.4	75.5	51.0	62.1	"
52024	"	♀	197	179	167	128	51.5	32.7	41.3	72.3	83.7	22.0	75.0	50.2	61.2	"
52039	Garamba	♀	195	179	167	122	46.2	34.4	38.1	70.4	74.9	22.8	68.8	45.4	58.8	"
Average		**4 ♀**	**199**	**182**	**170**	**126**	**48.8**	**34.8**	**39.8**	**70.6**	**80.8**	**22.5**	**72.9**	**49.2**	**61.3**	"
52004	Faradje	♂	247	215	201	142	59.9	40.3	41.3	75.5	99.6	27.4	82.6	64.2	77.4	Open
52012	"	♂	240	214	201	140	56.5	38.5	41.4	71.5	95.0	26.6	82.0	56.8	71.2	"
52023	"	♂	234	207	191	142	56.1	37.8	38.9	77.1	99.3	26.3	83.6	59.1	72.3	"
52006	"	♂	231	207	192	141	55.8	37.5	38.4	75.1	94.4	24.9	79.5	57.1	71.0	"
52018[3]	"	♂	231	210	194	135	54.1	40.6	43.6	72.0	95.0	24.6	83.6	61.9	73.7	"
Average		**5 ♂**	**237**	**211**	**196**	**140**	**56.5**	**38.9**	**40.7**	**74.2**	**96.7**	**26.0**	**82.3**	**59.8**	**73.1**	

[1]Senile; oldest of the series.
[2]This is a dwarf and is exlcuded from the averages.
[3]Youngest of the series.

Dental Measurements of Seventeen Adults of *Panthera pardus chui* from Northeastern Belgian Congo

Cat. No.	Locality	Sex	Upper Toothrow c-p⁴	Lower Toothrow c-m₁	Upper Canine, length at alv. border	p²-p⁴	p₃-m₁	p³ + p⁴	Upper Carnassial	Length m₁	Condition Basal Sutures
52020	Faradje	♂	83.1	84.5	20.4	54.3	53.7	49.3	26.7×14.4	20.3	Obliterated
52022	"	♂	79.7	91.4	18.9	52.7	53.2	45.0	26.4×13.8	20.3	"
52017	"	♂	80.9	——	18.5	53.4	54.3	47.8	27.8×14.1	20.0	"
52016	Garamba	♂	74.9	87.7	19.7	50.9	53.1	44.0	25.1×13.7	20.0	"
52040	"	♂	78.2	87.4	17.3	54.8	49.2	46.4	27.5×13.6	19.1	"
52010	Faradje	♂	75.2	85.2	18.3	51.9	49.1	42.0	25.3×12.3	19.1	"
52004	"	♂	74.1	87.3	17.8	50.6	52.1	42.8	24.8×13.8	19.1	Open
52008	"	♂	75.5	85.6	16.9	42.5	47.7	42.5	24.7×13.5	18.2	Closed
52012	"	♂	72.3	82.4	17.2	50.2	50.3	42.3	24.2×13.3	18.7	Open
52023	"	♂	72.5	82.7	16.4	51.7	47.2	41.7	23.8×12.5	18.3	"
52013	"	♂	73.0	84.0	19.7	49.5	46.2	40.2	24.4×12.6	18.0	Closed
52006	"	♂	72.0	83.6	16.6	50.2	49.6	43.5	25.9×12.7	19.0	Open
52018	"	♂	74.6	81.0	15.7	50.7	47.8	43.6	25.3×12.6	18.5	"
Average		**13** ♂	**75.8**	**85.2**	**17.9**	**51.0**	**50.3**	**43.9**	**25.5×13.3**	**19.1**	
52005	Faradje	♀	66.0	73.4	13.4	46.2	——	40.2	23.9×11.6	17.3	Obliterated
52009	"	♀	64.5	73.0	13.8	45.0	43.5	39.6	23.5×11.4	16.5	"
52024	"	♀	65.0	72.8	13.7	46.8	43.8	40.2	24.8×12.3	17.8	"
52039	Garamba	♀	62.0	71.8	12.8	44.8	42.7	38.3	23.0×10.7	16.0	"
Average		**4** ♀	**64.4**	**72.8**	**13.4**	**45.7**	**43.3**	**39.6**	**23.8×11.5**	**16.9**	

Panthera pardus ituriensis, new subspecies

Plates XLI, Figure 3; LV–LXIV

Type, No. 52025, ♂ adult, Niapu, Belgian Congo, November 24, 1913; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 2049.

Similar to *Panthera pardus chui* but smaller and darker in general coloration, pelage shorter and thinner.

Collectors' measurements of type: Total length, 2120 mm.; head and body, 1285; tail vertebræ, 835; hind foot, 245; ear, 75.

Skull (type): Greatest length, 255; condylobasal length, 232; basal length, 215; zygomatic breadth, 158; breadth at base of canines, 63.8; postorbital constriction, 42.3; mastoid breadth, 102; breadth across p⁴-p⁴, 84.6. The type specimen is the largest and oldest of the series but is much smaller than corresponding skulls of the *chui* series, as is shown by the tabulated measurements of the *chui* and *ituriensis* series (cf. pp. 258, 262).

Represented by 20 specimens (16 skins with skulls, 1 skin without skull, 3 skulls without skins), collected as follows:

Poko, 2 (skulls only), August 7, 1913.

Akenge, 6 (skins with skulls, 4 immature), September 16–October 22, 1913.

Niapu, 7 (6 skins with skulls—3 immature, 1 skin without skull), November 24, December 16–31, 1913; January 8, February 11, 1914.

Medje, 3 (3 skins with skulls, 2 immature), August 10, 1910; March 26 and June 4, 1914.

Gamangui, 2 (1 skin and 2 skulls), February 6, 1910.

Collectors' measurements of 3 adult males and 1 adult female:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	1970(1790–2120)	1155(1025–1285)	800(765–835)	242(220–260)	72(70–75)
♀	1690	910	780	205	65

Panthera pardus iturensis is intermediate in cranial measurements between *P. p. suahelica* (on the basis of Hollister's measurements, *loc. cit.*, p. 172) and *P. p. chui* (on the basis of Faradje and Garamba specimens), the average greatest length of five old male skulls of *suahelica* being 226 mm., of five similar skulls of *iturensis* 239 mm., and of seven similar skulls of *chui* from the Faradje district 261 mm. Larger series might change this ratio but probably not materially.

The same amount and kind of individual variation in the size and form of the markings and in the tone of the ground color occurs in *iturensis* (Pls. XLI, fig. 3 and LV–LXIV) as has been indicated above for *chui*, and is also present in *suahelica*, but the coloration averages much darker and the pelage is distinctly shorter and thinner than in *chui* or *suahelica*, in conformity with the differing environments of the three forms.

The type locality of *Panthera pardus leopardus* (Schreber), as already shown (*antea*, p. 250), is Senegal, and hence not only far remote from the Ituri Rain Forest region but in a very different environment. There is no material available from Senegal for comparison with the present series, but geographic considerations seem to render it unnecessary to discuss in detail the relationship of *leopardus* to the present form.

The recently described *Panthera pardus reichenowi* Cabrera[1] is in a different category. The type, a skin and skull, from Yoko, Cameroon, is fully adult, and believed by the author to be a male. If the skull and skin belong to the same animal, there is a strange discrepancy between the size of the skull and the dimensions of the skin; the skull, as shown by Cabrera's measurements, is of the size of an average female skull of the West African leopards as represented in the Gaboon and in the Ituri Forest, while the measurements given of the skin (head and

[1] 1918, Bol. Soc. Española Hist. Nat., Madrid, XVIII, December, p. 481.

[2] "Cabeza y cuerpo, 126 mm. [probably an error for 126 cm.]; cola, 78; pie posterior, 16." The latter must be a lapsus or typographical error for 26 cm., as 260 mm. is about the average length of the hind foot in the adult male leopards from the Upper Congo, and about 250 mm. for the smaller *P. p. suahelica* of East Africa.

body 1260 mm.[2]) equal the average measurements of fully adult males in the present Congo series. It is my firm conviction that the skull is that of a female, for which evidence is given below. The author says of the skin (*loc. cit.*, p. 482): "En la piel no se observa indicio ninguno de las mamas, y en cambio parece haber bajo la raiz de la cola algún residuo de escroto."

Cabrera gives a table of measurements of three skulls referred by him to *reichenowi* and of five skulls identified by him as those of *leopardus*, in part from Pocock's paper 'On the Skulls of Leopards.'[1] The two tables in combination afford measurements of four skulls from Cette Cama, Gaboon, and four from the coast of Guinea, making eight in addition to the type of *reichenowi* from Cameroon. The sex is not given positively for any of them. Pocock's smallest of his four skulls from Cette Cama he indicates as "♀?", and is referred by Cabrera to *reichenowi*. The literature shows that from the beginning of the history of leopards there has been a belief, particularly among travelers and sportsmen, that two kinds of leopards, a large one and a small one, occur together in many localities. Pocock, in referring to the small Cette Cama specimen, says: "This skull lends support to the oft-repeated statements of sportsmen that two kinds of Leopards, larger ones called Panthers and smaller ones called Leopards, occur in the same localities." Two of the three large ones recorded by Pocock are from the same locality as *leopardus*. The largest of Pocock's Cette Cama leopard skulls (total length 282 mm.) just equals the size of the largest male leopard skull from Faradje, these two being the largest leopard skulls thus far recorded. Evidently two kinds of leopards do occur at the same localities, a large one and a small one; the large one, so far as authentic records of adults show, is male, and the small one as invariably female. The supposed male type skull of *reichenowi* agrees in measurements with four skulls known to be females from the Ituri Forest, but is slightly smaller than known female skulls from Faradje. The average total length of the three skulls tabulated by Cabrera as *reichenowi* varies but one millimeter from the average of four female skulls from the Ituri Forest. On the other hand, the three larger skulls of the four from Cette Cama of which Pocock gives measurements average 274 mm. in total length, as against 276 mm. for the three largest male skulls of the Faradje series. Cabrera gives the length of head and body of the type skin of *reichenowi* as "126 mm." (doubtless a misprint for 126 cm.); the flesh measurements of

[1] 1909, Proc. Zoöl. Soc. London, pp. 204, 209, Figs. 22, 23.

Cranial Measurements of Ten Adults of *Panthera pardus iturensis*

Cat. No.	Locality	Sex	Greatest Length	Condylobasal Length	Basal Length	Zygomatic Breadth	Breadth at Base Canines	Interorbital Constriction	Postorbital Constriction	Breadth Braincase	Mastoid Breadth	Breadth Mesopterygoid Fossa	Breadth across p^4-p^4	Length Nasals		Condition Basal Sutures
														Middle	Outside	
52025[1]	Niapu	♂	255	232	215	158	63.8	43.3	42.3	77.0	102.0	26.7	84.6	67.0	78.5	Obliterated
52044	Gamangui	♂	250	227	212	150	59.8	42.7	43.4	79.3	95.6	26.8	85.7	63.0	73.1	"
52042	Poko	♂	246	—	—	161	61.2	40.8	40.6	76.4	99.1	26.8	86.0	57.8	73.2	"
52032	Medje	♂	220	191	—	—	54.6	39.1	41.0	—	—	—	80.0	52.0	67.5	"
52043	Gamangui	♂	225	204	201	138	55.2	35.6	37.0	75.0	93.6	27.2	82.5	—	—	Open
Average		**5 ♂**	**239**	**214**	**207**	**152**	**58.9**	**40.3**	**40.9**	**76.9**	**97.6**	**26.9**	**83.8**	**59.9**	**73.1**	
52041	Poko	♀	193	170	159	119	45.0	30.6	39.0	65.6	76.2	22.0	70.0	45.3	57.8	Obliterated
52033	Akenge	♀	191	171	159	124	46.3	31.2	40.6	72.5	76.8	23.2	71.9	42.2	52.8	"
52035	"	♀	176	161	150	115	43.8	28.4	41.4	66.0	—	20.0	69.8	43.2	53.5	"
52030	Niapu	♀	186	162	152	124	45.8	32.1	42.2	70.0	77.9	21.8	67.7	44.7	55.7	"
52026	"	♀	185	168	158	—	44.0	29.3	38.7	72.4	77.7	22.1	70.0	46.4	55.0	"
Average		**5 ♀**	**186**	**166**	**155**	**121**	**45.0**	**30.3**	**40.4**	**69.3**	**77.2**	**21.8**	**69.9**	**44.4**	**55.0**	

[1]Type.

head and body for seven adult males from Faradje average 1252 mm. Hence the opinion expressed above that the type skull and type skin of *reichenowi* came from different animals, the skull from a female, the skin (provisionally identified as male) from a male. Obviously further evidence is necessary before *reichenowi* can be considered as a satisfactorily established subspecies.

Dental Measurements of Ten Old Specimens of *Panthera pardus iturensis*

Cat. No.	Locality	Sex	Upper Toothrow c-p⁴ (inclusive)	Lower Toothrow c-m₁	Upper Canine, length at alv. border	p²-p⁴	p₃-m₁	p³+p⁴	Upper Carnassial	Length of m₁	Condition Basal Sutures
52025[1]	Niapu	♂	79.0	88.7	20.8	52.7	51.9	45.5	26.6×14.8	19.8	Obliterated
52044	Gamangui	♂	80.5	89.3	19.0	54.0	49.7	47.0	27.2×14.2	20.2	"
52042	Poko	♂	76.4	86.4	19.0	52.4	50.6	45.4	26.6×14.9	19.4	"
52032	Medje	♂	70.5	79.4	16.5	41.5	51.6	42.6	24.6×13.4	18.6	"
52043	Gamangui	♂	70.4	84.5	16.3	51.4	49.2	44.0	26.2×14.1	17.9	Open
Average		**5♂**	**75.4**	**85.7**	**18.3**	**50.4**	**50.6**	**44.9**	**26.2×14.3**	**19.2**	
52041	Poko	♀	62.0	67.5	12.3	40.0	40.8	37.3	22.2×12.0	15.0	Obliterated
52033	Akenge	♀	61.5	66.1	11.8	40.0	41.7	39.7	24.3×11.9	16.2	"
52035	"	♀	56.9	63.0	12.3	39.3	38.3	36.2	22.7×11.0	16.2	"
52030	Niapu	♀	58.2	68.9	13.6	42.1	41.1	34.5	22.5×11.3	16.0	"
52026	"	♀	59.8	66.1	13.2	45.3	43.0	39.0	23.2×11.4	17.0	"
Average		**5♀**	**59.7**	**66.3**	**12.6**	**41.3**	**41.0**	**37.3**	**23.0×11.5**	**16.1**	

[1]Type

Comparative Summary of Cranial and Dental Measurements of *Panthera pardus chui, P. p. iturensis, P. p. suahelica,* and *P. p. fortis*[1]

	Sex	No. of Specimens		Greatest Length	Condylobasal Length	Zygomatic Breadth	Mastoid Breadth	Breadth at Base Canines	Upper Toothrow (c-p⁴)	Upper Carnassial
chui	♂	7	Average	261	232	160	101.0	61.6	76.8	26.2×13.9
ituriensis	♂	5	"	239	214	152	97.6	58.9	75.4	26.2×14.3
suahelica	♂	5	"	226	203	152	90.0	56.0	70.5	25.0×12.9
fortis	♂	1	"	260	236	157	104.0	64.0	81.0	26.8×15.4
chui	♂	7	Minimum	241	213	152	97.2	58.2	74.9	25.1×12.3
iturensis	♂	5	"	220	191	—	93.6	54.6	70.4	24.6×13.4
suahelica	♂	5	"	218	200	138	85.0	50.0	67.0	24.6×12.6
chui	♂	7	Maximum	282	246	168	108.2	65.6	83.1	27.8×13.5
iturensis	♂	5	"	255	232	161	102.0	63.8	80.5	27.2×14.9
suahelica	♂	5	"	238	217	150	95.0	58.0	74.0	26.0×13.6
chui	♀	4	Average	199	182	126	80.8	48.8	64.4	23.8×11.5
iturensis	♀	5	"	186	166	121	77.2	45.0	59.7	23.0×11.5
suahelica	♀	6	"	192	175	121	75.7	46.2	63.6	22.7×11.5
chui	♀	4	Minimum	195	179	122	74.9	46.2	62.0	23.0×10.7
iturensis	♀	5	"	176	161	115	76.2	43.8	56.9	22.5×11.0
suahelica	♀	6	"	182	167	110	72.0	46.7	59.0	21.5×11.1
chui	♀	4	Maximum	203	185	128	83.7	51.5	66.0	24.8×12.3
iturensis	♀	5	"	193	170	124	77.9	46.3	62.0	24.3×12.0
suahelica	♀	6	"	198	180	126	79.0	50.0	63.0	24.3×12.7

LEPTAILURUS Severtzow

Leptailurus (subgenus of *Felis*) SEVERTZOW, 1858, Rev. Mag. Zool., (2) X, September, pp. 389, 390. Type, by monotypy, *Felis serval* Schreber.

Leptailurus POCOCK, 1917, Ann. Mag. Nat. Hist., (8) XX, November, pp. 337, 349. Same type, Allen, 1919, Bull. Amer. Mus. Nat. Hist., XLI, September 22, p. 338.

"*Galeopardus* Heugl." FITZINGER, 1866, Sitzungsb. Ak. Wiss. Wien, LIV, Abth. 1, p. 557. Type, by monotypy, *Felis serval* Schreber.

Serval (subgenus of *Felis*) GRAY, 1867, Proc. Zoöl. Soc. London, p. 272. Type, by tautonymy, *Felis serval* Schreber.

[1]The specimens are all perfectly comparable in respect to age, the basal (sphenoidal) sutures in all the skulls having become obliterated through complete ankylosis.

The genus *Leptailurus* comprises two species, each represented by several regional forms. Its distribution includes the greater part of Africa south of the Sahara.

In 1907 Pocock[1] held the opinion that the servals were separable into two species, *Felis serval* and *F. servalina*, on the basis of the diverse styles of color markings characterizing respectively the serval and the servaline cats, and submitted evidence in support of this view. In 1917, however, in his paper on 'The Classification of existing Felidæ,'[2] he said, under the genus *Leptailurus* (*loc. cit.*, p. 337): "One species only, with several local races," to which he added in a footnote the following: "Two species have been admitted, namely, *serval* and *servalina*. These, however, are now known to be merely varieties, the species being dimorphic in pattern (P. Z. S. 1915, i, p. 154), the two types of pattern symbolized by the names being found in the same litter." Twenty specimens collected at Faradje by the American Museum Congo Expedition represent both types. As this large series gives no indication of intergradation, I turned to the reference given by Pocock for the details of what seemed a startling discovery, and found the following, here transcribed in full: "Mr. Guy Aylmer, F. Z. S., exhibited some skins of mammals from Sierra Leone, including those of a Serval (*Felis capensis*) and of a Servaline Cat (*F. servalina*), and stated that a native had brought him two kittens, almost certainly from the same litter, one being spotted like the Serval and the other obscurely speckled like the Servaline Cat. This he regarded as proof that the differences between the Servals and Servaline Cats are of no systematic importance." To me Mr. Aylmer's statement is not evidence but merely the supposition of a native that the two young cats in question were "almost certainly from the same litter"! Further comment on this astonishing discovery seems unnecessary until it has been confirmed by unquestionable evidence.

It may be recalled, however, that Pocock in his paper 'On English Domestic Cats,' published in 1907,[3] in discussing color and color patterns in breeds of domestic cats, said (*loc. cit.*, pp. 145–146): "On the other hand, notwithstanding individual and local variations, the pattern formed by spots or stripes in existing species of *Felis* is on the whole constant. . . .*Nor, so far as I am aware, is there any reason to suppose that dimorphism in pattern ever occurs or has ever occurred in any species of the genus* Felis."[4] This strong statement accords with my own experi-

[1] 1907, Proc. Zoöl. Soc. London, II, pp. 656–677, Pl. XXXVIII, Figs. 175–178.
[2] 1917, Ann. Mag. Nat. Hist., (8) XX, November, pp. 329–350.
[3] 1907, Proc. Zoöl. Soc. London, I, pp. 143–168, Pls. VIII-X, and Fig. 60.
[4] Italicized in the original.

ence in respect to dimorphism in mammals, where pattern remains while color may become radically changed, as in melanism, in erythrism, and in partial albinism.

Note on *Felis serval* Schreber

Felis serval Schreber[1] was based primarily on Buffon and Daubenton's 'Le Serval,' Schreber's plate of *Felis serval* being an excellent and acknowledged copy of Buffon's (1765, 'Hist. Nat.,' XIII, Pl. XXXIV), colored from the Buffon-Daubenton description (*loc. cit.*, pp. 233-238). Schreber's plate (Pl. CVIII) was published so much in advance of the text of Theil III of the 'Säugthiere' that it was available for citation by Erxleben in his 'Systema Regni Animalis' (p. 523), published under the date of 1777, whose *Felis serval* is based essentially on Buffon and Daubenton's plate and Schreber's copy of it, his various subsidiary references being technically indeterminate and consequently non-pertinent, including Perrault's Chat-Pard,[2] from which Daubenton (*loc. cit.*) took his measurements of Le Serval and also his anatomical observations.

The basis of Buffon and Daubenton's account of Le Serval was a living animal that was kept for some years in the Royal Menagerie at Versailles, under the name Chat-tigre, but being too ferocious to be handled was described and figured as seen through the bars of its cage. It was from an unknown source but supposed to be the animal known to the Portuguese in India as Serval.[3] This surmise is obviously the basis of Schreber's assignment of it to the mountainous regions of the East Indies and Tibet, and of Erxleben's "Habitat in silvis montosis Indiæ, in arboribus degens." Schreber, on the basis of Kolbe, adds, "vielleicht auch am Vorgebirge der guten Hofnung." It is admitted, even by authors who would discard Schreber's *Felis serval* for a later name, that Buffon and Daubenton's Le Serval is identifiable beyond doubt with the Tiger-cat of Cape Good Hope, later redescribed and figured by Forster as *Felis capensis*. As Buffon says that it seemed to him that the serval of "Malabar & des Indes" is the same animal as "le chat-tigre du Sénégal & du cap de Bonne-espérance," quoting Kolbe as his authority for the Cape of Good Hope reference, it seems reasonable to assume the Cape region of South Africa as the type locality of *Felis serval* Schreber.

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[1] 1776, 'Säugthiere,' Pl. CVIII; *op. cit.*, 1777, Theil III, p. 407.

[2] Perrault, 1733, 'Mém. Hist. Nat. Animaux,' Mem. Ac Sci., Paris, for 1666-1669, III, pt. 1, pp. 108-116, Pl. XIII (animal), Pl. XIV (anatomy).

[3] "*Serval*, nom que les Portugais habitués dans l'Inde, ont donné à cet animal" (Buffon, *loc. cit.*, p. 233, footnote).

Felis capensis Forster, as we know from his own account,[1] was described and drawn from a wounded animal brought alive in a basket to his apartment at Capetown, which, he states, was thought to be about eight or nine months old and "had already very nearly, if not quite, attained its full growth." It had been taken when quite young, and its kind was said to live "in mountainous and woody tracts" in the interior. It seems therefore best, in the interest of nomenclature, to consider *Felis capensis* Forster (1781) a synonym of *Felis serval* Schreber (1776) and Erxleben (1777).

Leptailurus serval faradjius, new subspecies

Plates LXV–LXX; LXXIV, Figure 1

Type, No. 51990, ♂ adult, skin and skull, Faradje, northeastern Belgian Congo, November 26, 1912; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1170. (Pls. LXV and LXVI.)

In ground color and markings intermediate between the rich rufo-fulvous forms of the West African coast regions and the pale forms of the Sudan and British East Africa. General tone above ochraceous buff, varying but little in a considerable series of specimens; black markings sharply defined, of medium size, the dorsal lines narrow, the body spots about twice as long as wide, becoming broader and shorter on the shoulders and thighs; underparts and inside of limbs white, the former with small, the latter with large spots of black; tail irregularly blotched and ringed with black basally, the apical third or half with well-defined annulations of black (Pls. LXVII-LXVIII).

Size and cranial characters not distinctive, but apparently somewhat smaller than *L. serval hindei* of British East Africa.

Collectors' measurements of type: Total length, 1102 mm.; head and body, 847; tail vertebræ, 265; hind foot, 180; ear, 82.

Skull (type): Greatest length, 120.0; condylobasal length, 107.7; basal length, 101.0; zygomatic breadth, 81.2; least interorbital breadth, 20.8; postorbital constriction, 29.8; mastoid breadth, 48.0; breadth across p^4-p^4, 46.7; breadth of braincase, 49.8; length of upper cheek-teeth (c-m), 37.6; length of p^4, 13.7. (For skull of type, see Pls. LXIX and LXX.)

Compared with skulls of *hindei* from British East Africa, the condylobasal length is 10 mm. less, and the zygomatic breadth 6 to 10 mm. less.

Represented by 16 specimens, mostly immature, about one-half of them skins without skulls (in part native-made) collected as follows:

Niangara, 2 (♂ and ♀, both young), November 14, 1910.

Faradje, 14 (7 adult, 7 immature), February 18–November 26, 1911; January 6–June 19, August 13, October 24–29, November 26, December 3, 1912.

Nine of the sixteen specimens are young, ranging in age from four nurslings in first pelage and one in which the milk dentition is fully developed to others half to two-thirds grown. The seven adults include three skins with skulls, of which one is a

[1]Forster, John Reinhold, 1781, 'Natural History and Description of the Tyger-cat of the Cape of Good Hope.' Philos. Trans. Roy. Soc. London, LXXI, pt. 1, pp. 4–6, Pl. 1 (animal).

deep black melano with the normal color pattern barely distinguishable; the other four adults are native-made skins without skulls.

The only material available for direct comparison with the present series consists of five examples of *L. serval kempi* (Wroughton) the nearest geographical form of this group (Pl. LXXI). These differ from the Congo specimens in the strikingly paler tone of the ground color, coarser markings, and somewhat larger size, although in this respect the difference is not strongly marked.[1] The type localities of the subspecies of *Leptailurus serval* are all so remote from Faradje that geographical considerations imply the probability of the Congo series belonging to a different and thus far unnamed regional form.

The young in first pelage differ greatly from adults in coloration. The first coat is long and soft, wholly unspotted on the upperparts and very indistinctly spotted on the ventral surface. The sides of the body are uniform brown, varying in different specimens from pale sandy brown to dark brown; the median dorsal area, from nape to the base of the tail, forms a broad blackish brown band, spreading laterally on the nape to the base of the ears; the ears are intense black externally with a whitish cross-bar, and distinctly black-tufted, the inside heavily clothed with long white or yellowish white hairs. The facial pattern is as in adults but less sharply defined. Chin, pectoral and inguinal areas and inside of limbs whitish; foreneck faintly buffy; inside of limbs with indistinct blackish blotches, and there are indistinct dusky rings on the tail. In the youngest of the series, in which the teeth have not pierced the gums (total external length about 340 mm., greatest length of skull 50, breadth of braincase 30), the whole body, below as well as above, is unspotted, but dark bands of very short hair are forming on the inside of the limbs. In three others, still in the first woolly coat, the lower throat, pectoral and ventral areas, sides of body and inside of limbs show slight dusky spots, due to the incoming of short black hairs, without further change in the general coloration. In an older specimen, with the milk teeth breaking through or partly developed (total length 360 mm., greatest length of skull 58, breadth of braincase 47) the first coat has been wholly replaced and the color tones and markings are the same as in adults, showing that the change is completed as soon as the second pelage has fully replaced the natal dress.

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[1]Two of the Congo specimens have also been compared in respect to size with the measurements given by Wroughton (1910, Ann. Mag. Nat. Hist., (8) V, pp. 205, 206) of the types of his *Felis capensis hindei*, *F. c. kempi* and *F. c. beiræ*, and by Hollister (1918, U. S. Nat. Mus. Bull. 99, pt. 1, p. 177, eight specimens), and with five specimens in this Museum from the type region of *kempi*.

The described forms of the *Leptailurus serval* group are:

1776. *Felis serval* Schreber, 1776, 'Säugthiere,' Pl. CVIII; *op. cit.*, 1777, Theil III, p. 407. Cape region of South Africa. (*Supra*, p. 266.)

1781. *Felis capensis* Forster, Philos. Trans. Roy. Soc. London, LXXI, pt. 1, pp. 4–6, Pl. I. Near Capetown, South Africa. = *Felis serval* Schreber. (*Supra*, pp. 266-267.)

1820. *Felis galeopardus* Desmarest, 'Mamm.,' I, p. 227. Based on Le Serval of F. Cuvier, from an unknown locality. Unidentifiable. (*Infra*, p. 269.)

1839. *Felis senegalensis* Lesson, 'Mag. de Zool.,' Mamm., Pl. x, and accompanying text. · "Les bords du fleuve Sénégal." Name preoccupied by *Felis senegalensis* Meyer (1826) for the Senegal lion. Replaced by Cabrera (1910, Bol. Soc. Española Hist. Nat., Madrid, X, pp. 426-427) by *Felis serval pococki* nom. nov. (*Infra*, p. 269.)

1893. *Felis* (*Serval*) *togoensis* Matschie, Sitzungsb. Ges. Naturf. Freunde Berlin, No. 3, März, p. 109. Bismarckburg, Togo, West Africa.

1898. *Felis* (*Serval*) *togoensis niger* Lönnberg, Zool. Jahrb. Abt. Syst., X, p. 571. Name preoccupied by *Felis nigra* Erxleben; replaced by *Felis serval lönnbergi* Cabrera, *loc. cit.*, p. 427.

1910. *Felis capensis hindei* Wroughton, Ann. Mag. Nat. Hist., (8) V, February, p. 205. Machakos, British East Africa.

1910. *Felis capensis kempi* Wroughton, idem, p. 206. Kirui, Mount Elgon, British East Africa.

1910. *Felis capensis beiræ* Wroughton, idem, p. 206. Beira, Portuguese East Africa.

1914. *Felis capensis phillipsi* G. M. Allen, Bull. Mus. Comp. Zoöl., Cambridge, Mass., LVIII, No. 7, July, p. 337. El Garef, Blue Nile, Sudan

1920. *Felis serval kivuensis* Lönnberg, Rev. Zool. Africaine, VII, fasc. 3, p. 242. "Kivu district."

Note on *Felis galeopardus* Desmarest

Felis galeopardus Desmarest (1820, 'Mamm.,' I, p. 227) has been given precedence by some authors over *Felis senegalensis* Lesson (1839) without good reason, for *Felis galeopardus* is unidentifiable, its sole basis being "Le Serval" of F. Cuvier (1818, 'Hist. Nat. Mamm.,' I, livr. 1, December), the geographical source of the living specimen on which it was based being unknown. Desmarest himself says, "Habit. Inconnues"; and F. Cuvier says: "Le Serval que nous avons possédé était un jeune mâle, remarquable par sa douceur et sa gentillesse; . . . . Il était arrivé par un bâtiment à Brest, mais celui qui en avait fait l'acquisition avait négligé de s'informer dans quelle partie du monde il avait été pris." The description and figure of Cuvier's Le Serval are in strong contrast with Lesson's description and figure of *Felis senegalensis*, the former having the ground color very pale and the markings sparse and small, while the latter has the ground color deep (rufo-fulvous) and the markings heavy and coarse. Therefore, to substitute *galeopardus* for

senegalensis, simply because it has priority, as was done by Matschie in 1893 (*loc. cit.*) and by Wroughton in 1910 (*loc. cit.*) is wholly indefensible. *Felis galeopardus* Desmarest is indeterminate and therefore unavailable.[1]

Leptailurus ogilbyi[2] pantasticta (Pocock)

Plates LXXII, LXXIII

[*Felis servalina*] *pantasticta* Pocock, 1907, Proc. Zoöl. Soc. London, II, pp. 665, 666, Pl. xxxviii, fig. 3. Entebbe, Uganda.

[*Felis servalina*] *poliotricha* Pocock, idem. Monbuttu (=Niangara, Belgian Congo).

Represented by seven specimens, all from Faradje, and all but one native-made skins, without skulls. The single made-up skin (No. 51984) is without field measurements but has a good skull. It is a youngish adult female, with most of the cranial sutures open, but has the sagittal and lambdoid crests quite strongly developed. The skull measures: Greatest length, 114.4 mm.; condylobasal length, 109.2; basal length, 102.8; zygomatic breadth, 82.5; interorbital breadth, 23.5; postorbital constriction, 33.0; breadth of braincase, 58.7; length of upper toothrow (c-m), 36.3; length of p^4 on outer side, 13.8.

The general style of markings is quite uniform throughout the series, although in some specimens they are a little finer than in others, and the tone of the ground color is also a little lighter, yet the range of variation is quite limited, in comparison with individual variation in other forms of spotted cats. The extremes of variation are shown on Pls. LXXII and LXXIII, in comparison with the extremes of the series of the *serval* type from the same locality (Pls. LXVII–LXVIII).

In the Congo series of these two types there is no intergradation in the strikingly different patterns of markings. As the servaline type is represented by seven specimens, and the serval type by ten, all comparable as to sex, age and season, and all from the same locality, this constancy of coloration seems to fully confirm Pocock's opinion expressed in 1907[3] that *Felis serval* and *F. servalina*(=*ogilbyi*) should be regarded as fully segregated species and not dichromatic variants of a single species. Their ranges, while overlapping to a considerable extent, are far from

[1]Since writing the above I have found that Pocock in 1907 (Proc. Zoöl. Soc. London, II, p. 667) had reached the same conclusion. It seems worth while, perhaps, to let the above stand as an independent confirmation of his contention of twelve years ago, especially as Wroughton has since (in 1910) expressed an opposite opinion.

As noted above (p. 269) there is an earlier *Felis senegalensis* Meyer, given to the Senegal lion in 1826, which invalidates the name *Felis senegalensis* Lesson, but this has no bearing on the case of *Felis galeopardus* Desmarest as an alternative name for *Felis senegalensis* Lesson, which has been appropriately replaced by *pococki*.

[2]Cabrera has shown (1910, Bol. Soc. Española Hist. Nat. Madrid, X, p. 426) that the name *Felis servalina* Ogilby (1839) is preoccupied by *Felis servalina* Jardine (1834, 'Nat. Hist. Felinæ,' p. 272) for an Indian species, and has replaced Ogilby's name with *Felis ogilbyi* Schinz (1844, 'Synop. Mamm.,' I, p. 469), a substitute name for Ogilby's *Felis servalina*.

[3]1907, Proc. Zoöl. Soc. London, II, pp. 662–666, Pl. xxxviii.

being identical. So far as available records go, it is evident that the range of the serval group extends over practically the whole of Africa south of the Sahara, while the servaline group appears to be unrecorded from the greater part of South Africa and British East Africa, regions where the serval is of well-known occurrence. In addition to the eight specimens of the serval type in the United States National Museum (which I have seen), are five collected by the Tjader and Rainsford Expeditions of this Museum, all of which represent the *hindei* type.

The specimens of the serval and servaline types from Faradje and Niangara throw much light on questions raised by Pocock in 1907 regarding the relationships and distribution of these interesting and little-known groups of cats. As stated by him in his general review of the case (*loc. cit.*, p. 663), the only difference apparent between the two groups is the striking difference in their respective patterns of markings. He concludes that the available evidence seems "in favor of regarding *F. servalina* as a valid species." Referring to its known distribution, he says it "appears to coincide very closely with that of many West African animals like the Chimpanzee, *Felis aurata* and others." In the British Museum, he says, there are skins from Senegal, Sierra Leone, Monbuttu and Entebbe, and various points near and in Angola. "These localities," he adds, "suggest that *F. servalina* occurs on the fringe of the West African forest-region. How far it extends into the heart of that area is a matter for conjecture. . . .That *F. serval* and *F. servalina* have been recorded from the same country is indisputable; but, so far as I am aware, there is as yet no convincing evidence that the two forms are found side by side on the same spot. . . .This is clearly a question about which more evidence is required before a correct opinion can with certainty be arrived at; but as a working hypothesis it may be assumed that *F. servalina* inhabits the triangular area, or at all events the fringe of that area, whose angles are situated, broadly speaking, at Sierra Leone, Angola, and Uganda; and that the Serval is distributed in the countries lying to the north, east, and south of that area."

Pocock closes his discussion with diagnoses of four subspecies of the servaline group, of which three are proposed as new. These four forms, with their type localities, are:

1. Subspecies *servalina* Ogilby; type locality, Sierra Leone.
2. " *pantasticta*, nov.; Entebbe, Uganda.
3. " *poliotricha*, nov.; Monbuttu (Niangara of recent maps).
4. " *lipostícta*, nov.; Mombasa. "It is possible", he adds "that this specimen was not actually caught at Mombasa. Since Mombasa. however, was

the port of shipment, it is probable that the Cat came from British East Africa, perhaps from some place on the Mombasa to Uganda Railway."[1]

The Serval and Servaline Cats

The present Congo series of the serval and the servaline cats answers conclusively some of the questions on which Pocock expressed the urgent need of further information. First, it proves that the two species do occur together at the same localities, both having been taken at Faradje, in one instance on the same day. Second, that in a series of seven specimens of one and ten of the other, taken at the same locality, there are no intermediates. Third, that both occur abundantly in northeastern Belgian Congo, some 300 miles northwest of Entebbe. This, with the restriction of the servaline type to tropical West Africa, and the extension of the serval type over East and South Africa should apparently settle negatively the question of their supposed relationship as dimorphic forms of a single species.

I have given preference to Pocock's name *pantasticta* for the Faradje form because (1) it has page precedence over *poliotricha,* and (2) because the description (see especially Pocock's tabulation of characters on p. 666) agrees better with the Faradje specimens, notwithstanding the fact that the type locality of *poliotricha* (Monbuttu = Niangara) is nearer Faradje than is the type locality (Entebbe) of *pantasticta.* For this reason also *poliotricha* is provisionally referred to *pantasticta.*

Leptailurus ogilbyi larseni (Thomas)

Felis servalina larseni THOMAS, 1913, Ann. Mag. Nat. Hist., (8) XII, July, p. 91. Type locality, "Near Bembe," Congo district of North Angola. Skin without skull.

Represented by one specimen, about two-thirds grown, native-made skin without skull, Zambi, Lower Congo, July 1915.

Mr. Lang informs me that he saw a second specimen evidently adult, in the hands of a native, who declined to part with it. The one obtained appears fully to confirm this form, which is strikingly different from any other form of the servaline group thus far described.

The described forms of the servaline (*Leptailurus ogilbyi*) group are:

1839. *Felis servalina* Ogilby, Proc. Zoöl. Soc. London, p. 94. Sierra Leone. Based on an imperfect skin without skull. Name preoccupied by *Felis servalina* Jardine (1834) for an Indian cat; replaced by *Felis ogilbyi* Schinz (1844, 'Synop. Mamm.,' I, p. 469. Cf. Cabrera, *op. cit.*, p. 426).

[1] It is further stated that the type was immature, retaining part of the milk dentition, and had been received alive at the Zoölogical Society's Gardens, where it survived about three weeks. It had probably passed most of its life in captivity. Under these circumstances it is difficult to regard this alleged subspecies as properly founded. Aside from the immaturity of the type, the type locality is in doubt, and almost certainly is not Mombasa. The alternative apparently is that it came from Uganda, and hence from the type region of the same author's subspecies *pantasticta.*

1907. [*Felis servalina*] *pantasticta* Pocock, Proc. Zoöl. Soc. London, II, June 18, pp. 665–666. Entebbe, Uganda.

1907. [*Felis servalina*] *poliotricha* Pocock, idem, pp. 665, 666. Monbuttu. Doubtfully distinct from *pantasticta*. (*Supra*, p. 272.)

1907. [*Felis servalina*] *liposticta* Pocock, idem, p. 666. Type locality given as "Mombasa," but probably the type came from a long distance to the interior. Doubtfully distinct from the same author's *F. s. pantasticta*. Type immature, retaining part of milk dentition; reared in confinement. (*Supra*, pp. 271-272.)

1913. *Felis servalina larseni* Thomas, Ann. Mag. Nat. Hist., (8) XII, July, p. 91. Near Bembe, Congo district of North Angola. Skin without skull.

[Since this article was prepared for publication (in October, 1918) a paper by Lönnberg[1] has appeared containing a discussion of the serval and servaline cats (*loc. cit.*, pp. 236–243). His observations and conclusions are based on ten specimens of the servaline group, nearly all from different localities, for the most part geographically widely separated. His allocation of these specimens is (to put it mildly) at least surprising. He accepts Pocock's three forms (*pantasticta, poliotricha, liposticta*) as all valid. He refers to *pantasticta* (type locality, Entebbe) specimens from Lower Congo (Kisantu and Mukimbungu) and from southeastern Belgian Congo (Bukama and Kasongo, Upper Lualaba); to *liposticta* (alleged type locality, Mombasa), specimens from Kisantu, Lower Congo; to *poliotricha*, a specimen from Kasongo, southeastern Belgian Congo. His conclusions are thus stated:

If these facts are considered from a zoogeographical point of view, the following conclusions may be drawn:

F. s. pantasticta is distributed from Lower Congo to Katanga in South East, and Entebbe Uganda (Pocock) in North East;

F. s. poliotricha from *Monbuttu* (Pocock) to Kasongo;

F. s. liposticta from Lower Congo to Mombasa (! ?), or, if this locality, as is most probable, is erroneous, let us substitute Uganda (?);

F. s. Larseni from Northern Angola and Lower Congo over the districts of Lake Leopold II and Kasai to Bangweolo.

He further ventures "to propose that *liposticta* and *Larseni* are identical. The type of *liposticta* was a young animal, and my specimen of the same from Lower Congo is also rather youngish. It appears thus . . . . that the somewhat more spotted *liposticta* is the young of *Larseni*" [!]. He further says, after recalling that "colour phases are of a common occurrence" among cats, "it does not appear impossible that even *Felis servalina pantasticta* and *F. s. lipositicta* (*Larseni*) only represent different phases of the same animal." In short, it may be said that these sweeping

[1]1920, 'Remarks on some Congo Mammals.' Rev. Zool. Africaine, VII, fasc. 3, pp. 236–248.

generalizations rest on a pretty feeble basis of material and are not in accord with the "zoogeographical point of view" of the case.

Lönnberg closes his remarks on the serval and servaline cats with the description (*loc. cit.*, p. 242) of a new subspecies of the serval group, based on a single specimen (sex not stated) from the "Kivu district," which he calls *Felis serval kivuensis*. He says it "is recognized on its large black spots, its great size and large teeth." He considers it as "probably the largest known race" of the serval group, which his measurements of the skull seem to confirm (greatest length 135.5 mm., with the other measurements proportionate). It hence appears to differ from my *Leptailurus serval faradjius* described above (p. 267), which is the smallest of the group thus far indicated (greatest length of skull 120 mm.).]

PROFELIS Severtzow

Profelis SEVERTZOW, 1858, Rev. Mag. Zool., Paris, (2) X, pp. 386, 390. Type, by monotypy, *Felis celidogaster* Temminck = *Felis aurata* Temminck.

Profelis POCOCK, 1917, Ann. Mag. Nat. Hist., (8) XX, November, pp. 340, 350. Same type.

Chrysailurus SEVERTZOW, *loc. cit.*, pp. 389, 390. Type, by monotypy, *Felis neglecta* Gray = *Felis celidogaster* Temminck.

Profelis aurata cottoni (Lydekker)

Plates LXXIV, Figure 2; LXXV

Felis chrysothrix cottoni LYDEKKER, 1906, Proc. Zoöl. Soc. London, II, December 11, pp. 992, 994, Pl. LXX, fig. 1. Type locality, Ituri Forest, Belgian Congo. "Dark smoky-grey" phase. One specimen, skin.

Felis aurata aurata (= *chysothrix* + *rutila* + *cottoni*) POCOCK, 1907, Proc. Zoöl. Soc. London, II, p. 660, Fig. 175, skull (part). *Felis chrysothrix cottoni* LYDEKKER, only.

Profelis aurata POCOCK, 1917, Ann. Mag. Nat. Hist., (8) XX, November, p. 340 (part).

Represented by seven specimens, of which two are native-made, without skulls, collected as follows:

Niangara, 1 (native-made skin without skull).

Akenge, 2 (♂ and ♀, both slightly immature), September 28 and October 20, 1913.

Niapu, 1 (♀ adult), November 21, 1913.

Medje, 2 (1 ♂ with skeleton and 1 ♀), February 28 and August 24, 1910.

Avakubi, 1 (native-made skin without skull).

Collectors' measurements of an adult male (No. 51994) from Medje: Total length, 1160 mm.; head and body, 790; tail, 370; hind foot, 193;

ear, 60. Two adult females (No. 51993, Medje, Pl. LXXIV, fig. 2; No. 51998, Niapu): Total length, 960 (Medje), 1010 (Niapu); head and body, 660. 725; tail, 300, 285; hind foot, 165, 170; ear,—, 55.

Measurements of Three Adult Skulls of *Profelis aurata cottoni*

Cat. No.	Sex	Greatest Length	Condylobasal Length	Basal Length	Zygomatic Breadth	Interorbital Constriction	Postorbital Constriction	Postorbital Processes	Breadth across p^4-p^4	Breadth Braincase	Upper Toothrow	Length p^4
51994	♂	146.2	134.0	125.2	93.0	25.5	26.8	51.6	50.7	55.4	46.4	16.0
51993	♀	127.5	107.3	103.0	77.1	21.2	27.7	44.6	45.6	50.5	37.9	15.0
51998	♀	126.8	114.0	106.8	77.1	20.3	27.1	45.4	45.6	50.0	39.6	15.2

Of the seven specimens, two (from Akenge) are in the red phase, three in the dark gray phase, one in a lighter gray phase, and one (No. 51995, Niangara) intermediate between the dark brown and the red phase. The last mentioned is yellowish brown above, darker along midline of back, and more fulvous on the sides, where it is distinctly spotted with dusky. Both of the red specimens and two of the dark gray ones are wholly without dusky spotting except on the ventral surface. One of the gray specimens (No. 51998, ♀, Niapu; Pl. LXXV) has a small rufous V-shaped mark on the withers and a very small round rufous spot on the left hip, suggesting the possibility of alternative red and gray pelages in the same individual, as some previous writers on the group have assumed. The specimen in light gray pelage (No. 51999, Avakubi, native-made skin) has the lateral lower two-thirds of the body very distinctly spotted with blackish.

As this series was collected within a comparatively small area, it tends to confirm the statement of other observers (cf. Pocock, *loc. cit.*, pp. 658–660) that "red and grey individuals occur side by side in the same localities"— a parallel instance of dichromatism shown by the American jaguarondi cats, *Herpailurus yaguarondi* (Lacépède).

It is almost needless to add that the "*Felis aurata*" group cannot be satisfactorily understood until large series of specimens from several widely separated localities have been carefully compared. The present indications are that not only specimens in the red and in the gray pelages occur together, but that gray individuals with the upperparts unspotted occur at the same localities with others in which the lower flanks at least are more or less distinctly spotted, showing an unquestionable community of origin, but it is hard to believe that there are not a number of

fairly well-marked regional forms. For this reason *cottoni* is tentatively recognized as a nameable northeastern form of a group that has a vast range in tropical West Africa.

Felis Linnæus

Felis Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 41. Type, by tautonymy, *Felis catus* Linnæus.

Catus Fitzinger, 1855, 'Wissen. Nat. Säug.,' Wien, I, p. 265. Type, by tautonymy, *Felis catus* Linnæus.

Catolynx Severtzow, 1858, Rev. Mag. Zool., Paris, (2) X, September, pp. 385, 390. Type, by subsequent designation (Pocock, 1917), *Felis catus* Linnæus.

Felis ocreata rubida Schwann

Plates LXXVI to LXXVIII

Felis ocreata rubida Schwann, 1904, Ann. Mag. Nat. Hist., (7) XIII, June, pp. 422, 426. Monbuttu (=Niangara). Skin and skull.

Represented by 24 specimens, of which about one-fourth are immature, another fourth native-made skins without skulls, collected as follows:

Niangara, 8 (all immature), November 24, December 20, 1910; April 7, 1913.

Faradje, 15 (8 skins with skulls, nearly all adult, and 7 native-made skins without skulls), February 22–November 19, 1911; October 5, 1912.

Poko, 1 (skin, juvenile, without skull), August 4, 1911.

As indicated above, the large series representing this form is, with one exception, from two localities, Niangara and Faradje. The Niangara series of eight (topotypes) are all very young, ranging in age from nurslings without functional teeth to one specimen which has the milk teeth fully developed but no indication of the permanent set. This (No. 51954, ♀) has acquired the second pelage and has the adult color tones and markings. The other seven illustrate the gradual acquisition of the adult pattern and coloration. In the youngest of the series (No. 51061, ♀) the only teeth visible in the prepared skull are the upper incisors, which apparently had not cut the gum. The upperparts are pale cinnamon, the markings faintly indicated. There is a broad dusky brown nape patch, and the outer surface of the ear is black, increasing apically to intense glossy black. The facial markings are sharply defined yellowish white and dark reddish brown. The throat and the pectoral and inguinal areas are whitish without spots; the prepectoral bands, the spots of the ventral area, the dark bars on the limbs, and the dark rings on the apical half of the tail are distinctly indicated, strongest on the inside of the limbs

and on the tail. This is practically the condition of the rest of the series, the distinctness of the markings gradually increasing with the increase in size and age of the animal. Also the long hairs that fringe the ears are gradually lost, and shorter rufescent hairs replace the intensely black hairs of the outer side. There is a gap in the series from the stage when the principal cusps of the milk dentition have become excluded to the stage reached by the specimen first mentioned, in which the milk teeth have reached full development and the adult pelage has been fully acquired.

In this series of juveniles there is a considerable range of individual variation in the tone of the ground color, which varies in different specimens from dingy gray to cinnamon. Only one, however, represents the gray phase, in which the general tone is dingy gray, the others varying from pale to deep cinnamon. Also one is albinistic, the anterior half of the ventral area being pure white to the base of the hairs, the white area also including the fore and hind limbs, with an extension upward on the body in front of the shoulders.

The Faradje series consists of thirteen adults (Pl. LXXVI, fig. 3) and two half-grown young (Pl. LXXVI, figs. 1 and 2). The single immature specimen from Poko is similar to the half-grown specimens from Faradje. Of these sixteen specimens nine are from freshly killed animals and seven are native-prepared skins, the latter without, of course, skulls or flesh measurements, but valuable as illustrating individual variation in color and markings, and helping to show the uncertain basis of forms founded on single specimens. While the entire series is unquestionably referable to *rubida* of the *ocreata* group, it presents a wide range of color variation irrespective of age or sex.

The Faradje specimens may be divided into two extremes, one distinctly gray, the other rufescent, which intergrade through intermediate stages. In extreme specimens of the gray phase the general effect is distinctly gray, with a dark brown median dorsal band extending from the forehead to the base of the tail. The sides of the body, between the median dark band and the ventral area, are marked with deep brown transverse bands composed of confluent or (in different specimens) more or less confluent spots. In some specimens there is a tendency in the spots near the median line of the back to an elongate form, with the length much greater than the breadth. The ventral surface varies from cream-white to pale fulvous, spotted and blotched with a much darker tone. In the other extreme the general effect is rufescent, although the light tips of the hairs give a slight grayish tone, while the cross bands

and median dorsal stripes are pale rufous cinnamon, the underparts are deep fulvous. The greater part of the series is intermediate, but some four or five of the specimens can readily be referred to the gray end of the series and a rather less number to the rufescent phase. Of the fifteen Faradje specimens three of the gray series are albinistic, having white feet and areas of white on the body, while one is whitish gray throughout the whole upperparts and limbs and has white underfur, a fact that may have a bearing on the tendency to grayness.[1] (See Pls. LXXVII–LXXVIII for photographic illustrations of color variation.)

Another striking feature of individual variation is the color of the underfur. On the median dorsal area the underfur in adults varies in different individuals from pale plumbeous at base, and fulvous apically to nearly uniform blackish or dusky. The basal third or half in most specimens (including juveniles) is more or less plumbeous, the apical portion fulvous (light or deep fulvous) in different specimens. In some the whole underfur, except the extreme base, is fulvous, in others dark plumbeous, or even blackish. The underfur is usually much shorter and different in color in the same individual over the shoulders from that of the middle and lower back where the pelage is much longer.

In regard to size, the present series of specimens which have available measurements is too small to form a basis for generalization, but it may be noted that the three females are larger in both external and cranial dimensions than the two males. It would seem that males do not always exceed the females of their species in size, and that size alone is not a trustworthy criterion for the determination of sex in all cats.

Felis ocreata ugandæ Schwann

Felis ocreata ugandæ Schwann, 1904, Ann. Mag. Nat. Hist., (7) XIII, June, p. 424. Mulema, Uganda. Alt. 5000 feet. Two specimens, skins with skulls.

Represented by 1 specimen, as follows:

Garamba, 1 (adult ♂, skin and skeleton), May 20, 1912.

This specimen agrees well in size and coloration with the description of *F. o. ugandæ*, being larger and darker than any of the large series of *F. o. rubida*, and is from farther north and distinctly in the Sudan district and the Nile drainage.

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[1]One of the albinistic specimens has all the feet white and a large white spot on the lower throat; another has the hind feet, the whole of the fore limbs, and the greater part of the ventral surface white, also a large white spot on each hip, a band of white over the back of the neck, with a posterior extension over the shoulder to the thoracic region on the right side, and a broad upward extension on the left side, nearly to the median line behind the shoulder. The third specimen has a diffuse whiteness everywhere, giving a whitish effect to the dorsal aspect, the white underfur showing through the blackish tips of the overhair. All the limbs and the ventral area are creamy white.

As shown below in the table of measurements for *F. o. rubida*, the specimen here referred to *ugandæ* considerably exceeds the measurements of the *rubida* series, and agrees very closely with those given by Hollister[1] for Heller's *F. o. nandæ*, the type locality of which is not far from the type locality of *ugandæ*. In all probability *nandæ* and *ugandæ* are to be referred to the same regional form.

Collectors' Measurements of Five Specimens of *Felis ocreata rubida* and One of *F. o. ugandæ*

	Cat. No.	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
Felis ocreata rubida	51958	Faradje	♀	775	475	300	128	56
	51959	"	♀	825	523	302	127	59
	51971	"	♀	800	485	315	128	52
	51960	"	♂	710	415	295	125	56
	51957[2]	"	♂ juv.	738	442	296	122	58
Felis ocreata ugandæ	51970	Garamba	♂	900	555	345	133	—

Measurements of Six Skulls of *Felis ocreata rubida* and One of *F. o. ugandæ*

	Cat. No.	Sex	Greatest Length	Condylobasal Length	Basal Length	Zygomatic Breadth	Interorbital Constriction	Postorbital Constriction	Breadth Braincase	Mastoid Breadth	Breadth across p^1-p^4	Upper Toothrow	Length p^4
F. rubida	51958	♀	84.6	80.9	74.3	59.4	15.5	31.7	40.5	38.8	35.5	27.6	11.0
	51959	♀	91.1	84.0	77.9	61.7	16.5	30.6	42.0	41.7	35.7	28.5	11.3
	51971	♀	86.4	79.2	72.7	60.2	14.9	35.5	43.9	38.1	33.7	27.3	10.3
	51960	♂	82.7	77.9	71.4	56.5	14.4	32.8	41.6	38.8	35.2	28.4	10.7
	51967	♂	90.4	85.4	78.1	62.5	15.4	32.9	42.6	40.5	36.5	30.0	10.9
	51957[2]	♂ juv.	83.1	77.5	71.5	59.1	14.8	31.5	43.3	40.0	36.0	28.2	10.9
F. ugandæ	51970[3]	♂	102.0	93.0	85.6	67.3	16.6	29.7	43.9	44.1	36.8	31.8	11.8

Type Locality and Authority for *Felis caracal* Schreber

Schreber's Plate cx[4] is legended "*Felis caracal* Buff.," and carries the same designation in the list of plates (*loc. cit.*, p. 587), but instead of

[1] 1918, U. S. Nat. Mus. Bull. 99, pt. 1, pp. 178–179.
[2] With permanent teeth, but premolars not fully up.
[3] From Garamba.
[4] 1776, 'Säugthiere,' Pl. cx; *op. cit.*, 1777, III, pp. 413, 587.

being accredited to Buffon, as in cases where Schreber's plates are copies of Buffon's, it is indicated as original ("Eigne Zeichnung"). A comparison of the two plates shows that they have little in common. According to Sherborn,[1] the plate was issued before July 1776, and the text it illustrates not till sometime in 1777. Although Schreber cites Buffon, his description, like his illustration, is based on a specimen from the "Vorgebirge," Cape of Good Hope, received from Hauptmann Bodenschaz. The *Felis caracal* of Schreber has thus no dependence upon Le Caracal of Buffon, but a wholly independent basis, and a widely different type locality, notwithstanding his citation of Buffon in his references and accrediting the name *Felis caracal* to Buffon on his Plate CX, doubtless as an act of courtesy for his use in a technical sense of Buffon's vernacular name caracal.

In 1776 P. L. S. Müller, in the supplement volume of his 'Natursystems' (p. 30, No. 15) also, and independently, gave the name *Felis caracal*, the date of publication being practically synchronous with that of the *Felis caracal* of Schreber, both having the year date 1776. Müller's name was based exclusively on Buffon's caracal. He gives, however, an erroneous type locality as he says "Das Vaterland ist Arabien," not however without mitigating circumstances. Buffon, in his first account of "Le Caracal" says: "Cet animal est commun en Barbarie, en Arabie & dans tous les pays qu' habitent le lion, la panthère & l'once. . . ,"[2] Later, however, in connection with Bruce's inedited note on "le caracal de Nubie,"[3] he compares the Nubian caracal with "celui de Barbarie, dont nous avons donné la figure (tome IX, planche XXIV)," thus establishing the type region of his original specimen, which without much risk of error may be definitely assigned as the vicinity of Constantine, Algiers, whence so many of the carnivores received alive for exhibition in the Royal Menagerie of Versailles at that time were derived. As stated in the original account of Buffon's "Caracal de Barbarie," the description and plate were based on a living animal, of a very ferocious disposition, kept in a dark cage, and thus not able to be very carefully studied. Three years later it died, and Daubenton[4] then gave a new description of its external characters, with detailed measurements, and also of its anatomy, stating it to be the individual figured in Buffon's plate XXIV. No reference, however, is here made to its geographic origin.

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[1] 1891, Proc. Zoöl. Soc. London, p. 588.
[2] 1761, 'Hist. Nat.,' IX, p. 262, Pl. XXIV.
[3] 1776, 'Hist. Nat.,' Suppl., III, p. 232.
[4] 1764, Buffon's 'Hist. Nat.,' XII, pp. 442–449.

It is thus evident that *Felis caracal* Schreber and *Felis caracal* Müller relate to quite different geographical forms, the home of the first being the Cape of Good Hope region, that of the other the opposite end of the African continent or Barbary. If the name is accepted from Schreber's Plate cx, published in the early part of the year 1776, as is customary in similar cases, it may be accepted as having priority over Müller's, unless an earlier date can be demonstrated for Müller's publication of the name, thus establishing the type locality of *Felis caracal* Schreber as Table Mountain, near Cape Town, South Africa. Müller's name *Felis caracal*, under the above ruling, is untenable, and should be replaced by *Felis berberorum* Matschie (1892), the type locality of which is given as Staonely, near Constantine, Algeria, near the probable original source of Buffon's Le Caracal and, as shown above, the type locality of *Felis caracal* Müller. The correct name of the "le caracal de Barbarie" of Buffon is therefore *Caracal caracal berberorum* (Matschie).

The name *Felis caracal* has also been ascribed to Gueldenstaedt, published also in 1776.[1] His name as cited by Schreber appears in the form of a binomial, but examination of Gueldenstaedt's text shows that this was due to Schreber's rendering and is not the form employed by Gueldenstaedt, as already shown by Matschie,[2] who quotes Gueldenstaedt's name and diagnosis, as follows: "Caracal: Felis auriculis apice barbatis, extus nigris; capite, corpore et cauda unicoloribus fuscentibrunneis." It was based on Buffon's Le Caracal. The name ascribed by Schreber to this author, as said above, is Schreber's and not Gueldenstaedt's, and has thus no nomenclatural status.

The *Felis caracal*, γ *nubicus* Fischer (1829) was obviously based on Buffon's "le caracal de Nubie" and, on the basis of Bruce's inedited note on which it is founded, the type locality is Meroe, Nubia. This form should stand of course as *Caracal caracal nubicus* (Fischer).

[1] 1776, Novi Comm. Acad. Sci. imp. Petropolitanæ, XX (for 1775), p. 500.
[2] 1912, Sitzungsb. Ges. Naturf. Freunde Berlin, p. 57. See also Allen, 1920, Journ. Mamm., I, No. 2, February, p. 90.