The Congo Expedition of The American Museum of Natural History

INTRODUCTION

BY HENRY FAIRFIELD OSBORN

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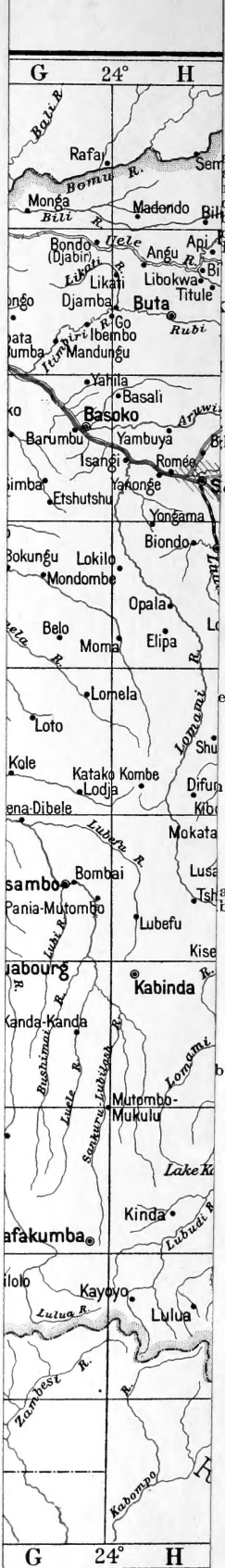


THE CONGO EXPEDITION

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

By Henry Fairfield Osborn

This expedition was planned with the cordial coöperation of the Belgian Government, and it seems appropriate to introduce the series of American Museum publications with a résumé of previous exploration and with a brief account of the large and important scientific work which has been accomplished under the auspices of the Belgian Government, as well as with a reference to the expeditions by explorers under other flags.

RÉSUMÉ OF PREVIOUS EXPLORATION AND PUBLICATION[1]

Earlier Period (1816–1890)

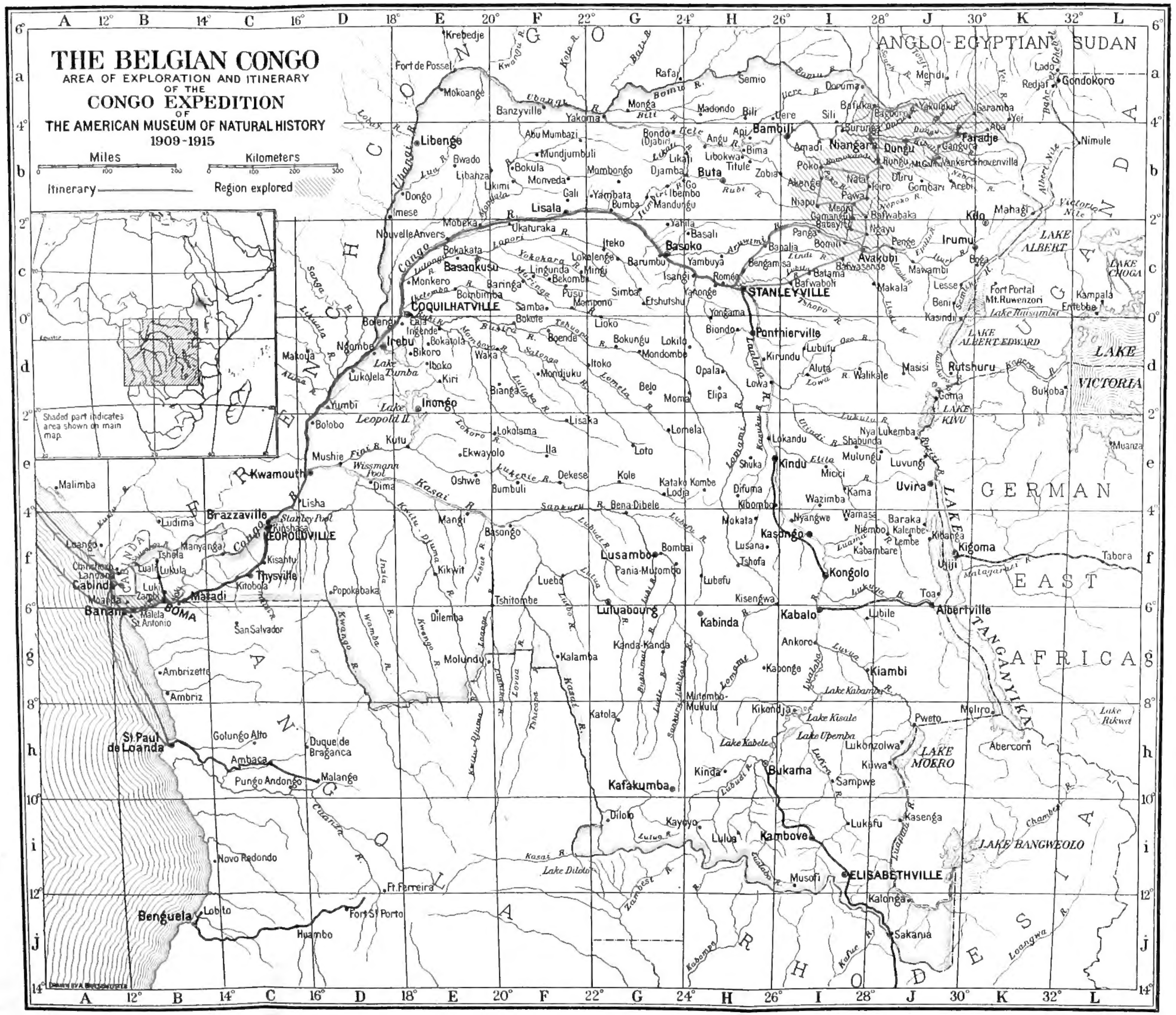
The scientific exploration of the Congo Basin dates from Captain J. K. Tuckey's ill-fated expedition to the mouth of the River Congo in 1816; most of the members of his party, including the botanist, Christian Smith, died of disease shortly after their arrival in Africa. The meagre results of this first attempt were chiefly botanical.

During the next sixty years progress was very slow, although it was a period of active geographical exploration, with which the following names are identified: R. F. Burton (1862–1863); G. Schweinfurth (1870); J. Monteiro (1873); the German Loango Expedition (P. Güssfeldt, H. Soyaux, E. Pechuel-Loesche, Bastian, 1873–1876); Fr. Naumann (1874); V. Lovett Cameron (1874); Pogge (1875–1884); W. Junker (1876–1883); H. M. Stanley (1876–1888); M. Buchner (1878–1880); A. von Mechow and E. Teusz (1880); H. von Wissmann (1880–1884); R. Böhm and P. Reichard (1880–1884); Casati (1880–1889); H. Johnston (1882–1883); Emin Pasha (1883); H. Capello and R. Ivens (1884); R. Büttner (1884–1886); and Emin Pasha and Fr. Stuhlmann (1890–1891). Owing to the material difficulties encountered at that time, data of scientific value could be gathered only incidentally, so that in 1890 our knowledge of the Congo Basin, its inhabitants and natural productions was still slight.

[1]This résumé was prepared at the request of President Osborn by Dr. Joseph Bequaert, January 2, 1919.

Aba	Kb
Abercorn	Kh
Abu Mumbasi	Fb
Aka R.	Ja
Akenge	Ib
Albert L.	Kc
Albert-Edward L.	Jd
Albert Nile	Kb
Albertville	Jg
Alima R.	CDd
Aluta	Id
Amadi	Ib
Ambaca	Ch
Ambris	Bg
Ambrizette	Bg
Angu	Hb
Ankoro	Ig
Api	Hb
Arebi	Jb
Aruwimi R.	Hc
Avakubi	Ic
Babeyru	Ic
Bafuka	Ia
Bafwabaka	Ib
Bafwaboli	Ic
Bafwasende	Ic
Bagboro	Ja
Bahr el Ghebel	Ka
Bali R.	Ga
Bambili	Ib
Banalia	Hc
Banana	Bg
Bangweolo L.	JKi
Banzyville	Fa
Baraka	Jf
Baringa	Fc
Barumbu	Gc
Basali	Hc
Basankusu	Ec
Basoko	Gc
Basongo	Ff
Batama	Ic
Bekombe	Fc
Belo	Gd
Bena-Dibele	Gf
Bengamisa	Hc
Benguela	Bj
Beni	Jc
Bianga	Fd
Bikoro	Ed
Bili	Ha
Bili R.	Ga
Bima	Hb
Biondo	Hd
Boende	Fd
Boga	Kc
Bokakata	Ec
Bokatola	Ed
Bokote	Fd
Bokula	Fb
Bokungu	Gd
Bolengi	Ed
Bolobo	De
Boma	Bf
Bombai	Gf
Bombimba	Ec
Bomili	Ic
Bomokandi R.	Ib
Bomu R.	GIa
Bondo (Djabir)	Gb
Brazzaville	Cf
Bukama	Hh
Bukoba	Kd
Bumba	Gb
Bumbuli	Fe
Bushimai R.	Gg
Busira R.	EFd
Buta	Hb
Bwado	Eb
Cabinda	Bf
Chambesi R.	Ki
Chinchozo	Bf
Choga L.	Lc
Coquilhatville	Ec
Cuanza R.	Di
Dekese	Fe

Difuma	He
Dilemba	Eg
Dilolo	Gi
Dilolo L.	Fi
Dima	De
(Djabir)	Gb
Djamba	Hb
Dongo	Eb
Doruma	Ia
Dungu	Jb
Dungu R.	Jb
Duque de Braganca	Dh
Duru	Jb
Duru R.	Jab
Eala	Ed
Ekwayolo	Ee
Elila R.	Ie
Elipa	Hd
Elisabethville	Ii
Entebbe	Lc
Epulu R.	Jc
Etshutshu	Gc
Faradje	Jb
Fini R.	De
Fort de Possel	Ea
Fort Ferreira	Di
Fort Portal	Kc
Fort St. Porto	Dj
Gaima Mt.	Jb
Gali	Fb
Gamangui	Ib
Gangura	Jb
Garamba	Ja
Go	Hb
Golungo Alto	Ch
Goma	Jd
Gombari	Jb
Gondokoro	Ka
Huambo	Cj
Ibembo	Gb
Iboko	Ed
Ikelemba R.	Ec
Ila	Fe
Imese	Db
Ingende	Ed
Inkisi R.	Cfg
Inongo	Ed
Insia R.	Df
Irebu	Dd
Irumu	Jc
Isangi	Hc
Isiro	Ib
Iteko	Gc
Itimbiri R.	Gb
Itoko	Gd
Ituri R.	Jc
Kabalo	Ig
Kabamba L.	Ig
Kabambare	If
Kabele L.	Hh
Kabinda	Hg
Kabompo R.	Hj
Kabonge	Hg
Kafakumba	Gh
Kafue R.	Ij
Kagera R.	Kd
Kalamba	Fg
Kalembe-Lembe	Jf
Kalonga	Jj
Kama	Ie
Kambove	Ii
Kampala	Lc
Kanda-Kanda	Gg
Kasai R.	EFe-h
Kasenga	Ji
Kasindi	Jd
Kasongo	If
Kasuku R.	He
Katako Kombe	He
Katola	Gh
Kayoyo	Hi
Kiambi	Ig
Kibali R.	Jb



Kibanga	Jf
Kibombo	He
Kigoma	Jf
Kikondja	Ih
Kikwit	Ef
Kilo	Kc
Kilwa	Jh
Kinda	Hh
Kindu	He
Kinshasa	Cf
Kiri	Ed
Kirundu	Hd
Kisale L.	Ih
Kisantu	Cf
Kisengwa	Hf
Kitobola	Cf
Kivu L.	Jde
Kole	Ge
Kongolo	If
Koto R.	Fa
Krebedje	Ea
Kuilu R.	ABe-f
Kutu	Ee
Kwamouth	De
Kwango R.	Dg
Kwangu R.	Fa
Kwengo R.	Eg
Kwilu-Djuma R.	Ef-h
Lado	Ka
Landana	Bf
Lenda R.	Jc
Leopold II L.	Ede
Leopoldville	Cf
Lesse	Jc
Libanza	Fb
Libenge	Eb
Libokwa	Hb
Likati	Gb
Likati R.	Gb
Likimi	Fb
Likuala R.	Dcd
Lindi R.	IJc
Lingunda	Fc
Lioko	Gd
Lisaka	Fe
Lisala	Fb
Lisha	De
Loange R.	Eg
Loango	Af
Loangwa R.	Kj
Lobay R.	Dab
Lobito	Bj
Lodja	Ge
Lokandu	He
Lokelenge	Gc
Lokilo	Hd
Lokolama	Fe
Lokoro R.	Ee
Lomami R.	He-g
Lomela	Ge
Lomela R.	Gd
Lopori R.	Fc
Loto	Ge
Lovua R.	Fg
Lowa	Hd
Lowa R.	Id
Lua R.	Eb
Lualaba R.	HId-i
Luali	Bf
Luama R.	If
Luapula R.	Ji
Lubefu	Hf
Lubefu R.	GHf
Lubi R.	Gf
Lubila R.	Ic
Lubile	Ig
Lubudi R.	FGf
Lubudi R.	Hh
Lubue R.	Ef
Lubutu	Id
Ludima	Bf
Luebo	Ff
Luebo R.	Ffg
Luele R.	Ggh
Lufira R.	Ih
Luilaka R.	Fd
Lukafu	Ii
Lukenie R.	Fe

Luki	Bf
Lukolela	Dd
Lukonzolwa	Jh
Lukuga R.	IJf
Lukula	Bf
Lukulu R.	IJc
Lulonga R.	Ec
Lulua	Hi
Lulua R.	Gfi
Luluabourg	Gf
Lusambo	Gf
Lusana	Hf
Lushika R.	Fg
Luvua R.	Ig
Luvungi	Je
Madondo	Ha
Mabagi	Kb
Makala	Ic
Makoua	Dd
Malagarazi R.	JKf
Malange	Dh
Malela	Bg
Malimba	Ae
Mandungu	Gb
Mangi	Ef
Manyanga	Cf
Maringa R.	Fc
Masisi	Jd
Matadi	Bf
Mawambi	Jc
Medje	Ib
Meridi	Ja
Micici	Ie
Mingi	Fc
Moanda	Bf
Mobeka	Ec
Moero L.	Jh
Mokata	Hf
Mokoange	Ea
Moliro	Kh
Molundu	Eg
Moma	Hd
Momboyo R.	EFd
Mompono	Fc
Monbongo	Gb
Mondjuku	Fd
Mondombe	Gd
Monga	Ga
Mongala R.	EFb
Monkero	Ec
Monveda	Fb
Muanza	Lc
Mulungu	Je
Mundjumbuli	Fb
Mushie	De
Musofi	Ii
Mutombo-Mukulu	Hgh
Nala	Ib
Nepoko R.	Jb
Ngayu	Ic
Ngombe	Dd
Niangara	Ib
Niapu	Ib
Niembo	Jf
Nimule	Lb
Noki	Bf
Nouvelle Anvers	Ec
Novo Redondo	Bi
Nya Lukemba	Je
Nyangwe	If
Nzoro R.	Jb
Opala	Hd
Oshwe	Ee
Oso R.	Id
Panga	Ic
Pania-Mutombo	Gf
Pawa	Ib
Penge	Jc
Poko	Ib
Poko R.	Ib
Ponthierville	Hd
Popokabaka	Df
Pungo Andongo	Ch
Pusu	Fc
Pweto	Jh

Rafai	Ga
Redjaf	Ka
Rikwa L.	Lh
Romée	Hc
Rubi R.	Hb
Ruisamba L.	Kc
Ruki R.	Ed
Rungu	Jb
Rutshuru	Jd
Rutshuru R.	Jd
Ruwenzori Mt.	JKc
Ruzizi R.	Je
Sakania	Jj
Salonga R.	Fd
Samba	Fc
Sampwe	Ih
San Salvador	Cg
Sanga R.	Dc
Sankuru-Lubilash R.	Ggh
Sankuru R.	Ff
Semio	Ha
Semliki R.	JKc
Shabunda	Ie
Shiloango R.	Bf
Shuka	He
Sili	Ia
Simba	Gc
Soueh R.	Ja
St. Antonio	Bg
St. Paul de Loanda	Bh
Stanley Pool	Cf
Stanleyville	Hc
Surunga	Ib
Tabora	Lf
Tanganyika L.	JKe-h
Thysville	Cf
Titule	Hb
Toa	Jf
Tonji R.	Ja
Tshela	Bf
Tshicapa R.	Fgh
Tshitombe	Ff
Tshofa	Hf
Tshopo R.	Ic
Tshuapa R.	Fd
Tumba L.	Ed
Ubangi R.	DGad
Uele R.	GHb
Uere	Ha
Uere R.	Ia
Ujiji	Jf
Ukaturaka	Fc
Ulindi R.	Ie
Upemba L.	Ih
Uvira	Je
Vankerckhovenville	Jb
Victoria L.	Ld
Victoria Nile	KLb
Waka	Fd
Walikale	Id
Wamasa	If
Wamba R.	Dg
Wazimba	Ie
Wissmann Pool	De
Yabila	Gc
Yakoma	Ga
Yakuluku	Ja
Yambata	Gb
Yambuya	Hc
Yanonge	Hc
Yei	Ka
Yei R.	Ka
Yokokara R.	Fc
Yongama	Hd
Yumbi	Dd
Zambesi R.	Gij
Zambi	Bf
Zobia	Hb

Modern Period (1890–1914)

As far as Central Africa is concerned this period of twenty-five years was one of great scientific activity, in which so many explorers and scientists of various nationalities participated that it is practically impossible to enumerate them all. Therefore the following account deals with only the most important contributions. Although it has been the constant policy of the Congo Free State and of the Belgian Colonial Office to aid the scientific labors of all investigators, up to the present by far the greater part of the work has been accomplished by the Belgians.

Belgian.—Bia-Franqui Expedition (J. Cornet and P. Briart, 1890–1893); Em. and Marc. Laurent (1893, 1895, 1903–1904); A. Dewèvre (1895–1896); A. Cabra and Fr. Michel (1896–1903); Ch. Lemaire (1899–1900); Commission on Sleeping Sickness (J. Rodhain, C. Pons, F. Vanden Branden, and J. Bequaert, 1910–1912); L. Stappers (1911–1912); E. Hutereau and J. Van der Gucht (1911–1912); A. Pilette (1912-1913); and J. Bequaert (1913–1915).

British.—J. E. Dutton and J. L. Todd (1903–1905); S. A. Neave (1904–1908); P. H. G. Powell-Cotton (1905–1906); Boyd Alexander and G. B. Gosling (1906); The Ruwenzori Expedition of the British Museum (R. B. Woosnam and A. G. F. Wollaston, 1906); S. and S. A. Neave (1907); E. Torday (1907–1909); C. Christy (1911–1914); and Rogers (1913–1914).

French.—Du Bourg de Bozas and Dr. Brumpt (1902); A. Chevalier (1902–1903 and 1912); and E. Gromier (1911).

German.—G. A. von Goetzen and W. von Prittwitz (1894); R. Schlechter (1899); L. Frobenius (1904–1906); S. Ledermann (1906–1908); A. F. Duke of Mecklenburg, H. Schubotz and J. Mildbraed (1907–1908); H. Schubotz (1911); and T. Kassner (1908).

Austrian.—T. Thonner (1896 and 1909); and F. Grauer (1908).

Italian.—Elena, Duchess of Aosta (1909).

Swedish.—A. v. Rosen and R. E. Fries (1911–1912); E. Arrhenius (1913-1915).

American.—Th. Roosevelt (1910).

Prior to the organization of the Congo Free State (1885), the Congo Basin was practically *terra incognita* from a scientific point of view. Only fragmentary data had been obtained by the earliest explorers, such as Tuckey, Schweinfurth, Pechuel Loesche, Cameron, Pogge, Capello, and Ivens. At about the time Stanley traced the course of the Congo River, King Leopold II conceived his far-sighted project of

opening up to civilization the interior of the "Dark Continent" and from the outset liberally encouraged scientific investigation. The Congo Section of the Brussels Exhibition of 1897 displayed the results of the work accomplished during the previous twenty years, and its collections formed the nucleus of the present Congo Museum at Tervueren, near Brussels, which therefore became the center of research in this field.

By 1914 the principal scientific achievements had been published in quarto form in the famous series of the "Annales du Musée du Congo," comprising by that time fifty-four parts, with about 4600 pages of text and 660 plates. Geology, zoology, botany, and ethnology are all well represented, and the excellence of most of the contributions, in both substance and illustration, is a fitting witness to the high standard set. In addition to these official reports, a literature of almost equal importance, although scattered in various journals, developed through the efforts of Belgian scientific societies and of the leaders in the colonization movement. Foremost among the Belgian contributors were G. Boulenger, J. Cornet, Ph. Dautzenberg, E. De Wildeman, L. Dollo, Th. Durand, J. Fraipont, Ch. Kerremans, Aug. Lameere, Em. Laurent, H. Schouteden, and C. Van Overbergh.

ORGANIZATION OF THE CONGO EXPEDITION OF THE AMERICAN MUSEUM

For many years the late President Morris K. Jesup had entertained the hope that an expedition from the American Museum might be sent to the Congo. Early in 1907, preliminary plans had been discussed with the Secretary General of the Congo Free State, Charles Liebrechts, the negotiations being carried on through the Consul General of the Congo Free State in Baltimore, James Gustavus Whiteley, and the Belgian Consul in New York, Pierre Mali, who was a personal friend of President Jesup. In May 1907, the Director of the Museum, Hermon Carey Bumpus, went to Brussels to confer with the Belgian authorities. King Leopold II generously gave his patronage to the project and graciously presented to the American Museum an ethnological collection from the Congo which now forms an important part of the African exhibits of the Museum.

The plan was taken up again by Henry Fairfield Osborn on assuming the Presidency of the American Museum, and late in the autumn of 1908, a Special Committee on the Congo Expedition was appointed, consisting of Messrs. John B. Trevor, *Chairman*, Hermon C. Bumpus,

James Gustavus Whiteley, Robert W. Goelet, Herbert L. Bridgman and Frank M. Chapman. The organization of this committee, and correspondence carried on by President Osborn, M. Carton de Wiart, Director Bumpus and others, gave definite form and impetus to the negotiations, which finally secured the sanction of the Belgian Government to the Museum's exploration of the Congo, and the project became a reality.

The following official letters were exchanged between the Belgian Government and the Director of The American Museum of Natural History.

Légation de Belgique,
Washington, April 2, 1909.

Dear Mr. Bumpus:

In consequence of the conversation between yourself and Mr. Whiteley, when he had the pleasure of meeting you in New York last January, Mr. Whiteley hastened to write to His Excellency, the Minister of Colonies at Brussels, in order to secure the coöperation of the Belgian Colonial Administration with the scientific expedition which the American Museum of Natural History proposes to send to the Belgian Congo.

On my own part I also wrote to His Excellency, the Minister of Foreign Affairs at Brussels, asking him to recommend the proposition which Mr. Whiteley had made to Mr. Renkin.

His Excellency, the Minister of Foreign Affairs, in reply to my letter, requests me, in the name of his Colleague, the Minister of Colonies, to make to the American Museum of Natural History the following proposition:

The Colonial Administration, desiring to encourage the success of the contemplated scientific expedition in the Congo, offers the American Museum the sum of 6,800 francs as a contribution to the expenses of transportation of the American mission in the territory of the Belgian Congo.

The Museum will engage, on its part, to give the Musée du Congo, in Belgium, a participation in the scientific results of the Mission, by sending it specimens of different species of animals which it has not at present in its collection, or which are needed to complete its collections.

The annexed list contains the names of the animals (mammals and birds) which the Museum desires.

His Excellency, the Minister of Colonies, will take pleasure in recommending the American scientists to the good offices of the Colonial authorities, but it will, of course, be understood that the American Museum will have to pay the cost of the maintenance and of the transport of the members of the Mission, and will also provide for all their needs.

I shall be very much obliged, my dear Mr. Bumpus, if you will be kind enough to let me know whether the American Museum accepts this proposition, and in the meantime I beg you to accept the assurance of my high regard.

(Signed) Baron Moncheur.[1]

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[1]Baron Ludovic Moncheur was elected by the Trustees to an Honorary Fellowship in the Museum on May 10, 1909.

New York City,
April 8, 1909.

To His Excellency Baron Moncheur,
Légation de Belgique,
Washington, D. C.

Dear Sir:

I am instructed by Henry Fairfield Osborn, President of the Board of Trustees of The American Museum of Natural History, to acknowledge the receipt of your most courteous favor of April second, conveying the information that through your kind intervention, and also through the instrumentality of the Honorable James Gustavus Whiteley, the attention of His Excellency the Minister of Colonies of the Kingdom of Belgium has been called to our desires concerning scientific work in the Belgian Colony of the Congo, and transmitting a most welcome series of propositions formulated by His Excellency the Minister of Foreign Affairs in the name of His Colleague the Minister of Colonies.

President Osborn wishes especially that the Colonial Administration of the Kingdom of Belgium should be informed that its desire to encourage the success of the contemplated scientific expedition is, in itself, the most important of those factors which will lead to this success. Moreover, he wishes me to say that the contribution of the Colonial Administration—generous, as unexpected—indicates an attitude towards scientific research which is most high-minded and which argues, for those having the affairs of the Colony of the Congo in charge, an administration of caution, of liberality and of wisdom.

The American Museum of Natural History will consider it a privilege to be permitted to share the scientific results of this Expedition to the Congo with the Musée du Congo, in Belgium, and to do everything in its power to develop the collections from the Congo, exhibited, and to be exhibited at Tervueren—indeed, the Trustees of the American Museum desire that they may do much more than is suggested by your formal list of desiderata.

With the utmost gratitude for your most efficient services, and confident that the combined efforts of the Colonial Administration of the Kingdom of Belgium and The American Museum of Natural History will result in the general promotion of science and thus redound to the benefit of all people, I am,

Very respectfully yours,

(Signed) Hermon Carey Bumpus,
Director.

It will be observed in the foregoing correspondence that the Government of Belgium contributed the sum of 6,800 francs ($1,329.13) towards the first year's expenses of field-work (estimated at $11,000) and that the Museum engaged to enrich the collections of the Belgian Colonial Museum at Tervueren. The instructions of the Belgian Government were carried out in a most courteous and obliging manner by the representatives of the Congo Colonial Administration throughout the duration of the expedition.

The expedition was at first financed to the extent of $10,000 through the individual contributions of several Trustees and other friends of the Museum, especially by Messrs. John B. Trevor, Charles Lanier, Cleveland H. Dodge, J. P. Morgan, Jr., William K. Vanderbilt, A. D. Juilliard, Robert W. Goelet, and William Rockefeller.

Mr. Herbert Lang[1] was chosen leader of the expedition and Mr. James P. Chapin of Columbia College volunteered to go as Assistant. At the end of the first year Messrs. Lang and Chapin reported the results, which were far beyond the original expectations, and requested an extension of time.

The expedition ultimately extended over a period of six years, in the course of which very full field reports were made by Mr. Lang from time to time. The total expenditures of the expedition for field work amounted to a very much larger sum than was originally contemplated, namely, $58,000, which was raised as follows:

Contribution by the Belgian Government, (6,800 francs)	$1,329.13
Subscriptions from the Trustees and other friends of the Museum	29,000.00
Appropriations from the Jesup Endowment Fund	27,670.87

It is interesting to recall that the late President Jesup was originally interested in the exploration of the Congo and that through his munificent bequest to the Museum he became the benefactor who made possible the continuation of this work. It is also through the Jesup Fund that the Museum is enabled to issue the series of publications projected.

NARRATIVE OF THE EXPEDITION

The Museum party left New York on May 8, 1909, for Antwerp, and, after receiving additional courtesies and assistance in Brussels, sailed for Boma, arriving there June 22, when the work of the expedition began, as told in the following narrative by Mr. Lang.

"At President Osborn's request the Expedition proceeded without delay to the most promising zoological regions, 1200 to 1500 miles inland, a fact that contributed as much to the success as did the general organization and excellent equipment. There, in the northeastern Belgian Congo, it was hoped we could secure for the proposed African

[1]Mr. Herbert Lang became connected with the American Museum staff in August 1903, and until 1906 worked upon the faunistic exhibits and habitat groups of North American birds. In 1906 he represented the Museum on the Tjäder Expedition to Africa, the expenses of which were chiefly borne by Mr. Samuel Thorne. In 1907–1908, he worked on the material collected by the Tjäder Expedition and in preparation for the Congo Expedition. During the years 1909–1915 he was in charge of the Congo Expedition. Upon his return he was assigned to the preparation, arrangement and description of the Congo collections as Assistant in Mammalogy. On February 3, 1919, he was appointed Assistant Curator, Department of Mammalogy.

Hall of the Museum the requisite material for habitat groups of the rare Okapi and square-lipped Rhinoceros before their extermination made this impossible On the journey up the Congo River from Leopoldville (July 12, 1909) occasional collecting familiarized us with the more common faunal types. Arriving at Stanleyville August 3, necessary preparations for the porterage and future disposition of loads were made. A month later, the Expedition, with a caravan of two hundred porters, started upon the overland journey through the Rain Forest to Avakubi, on the Ituri River, where, on September 30, we established our permanent base. During the next three months, spent in the vicinity of Avakubi, Ngayu, and Bafwabaka, the collections increased satisfactorily. Our greatest efforts, however, were devoted to training a staff of fifteen natives in various methods of collecting and adequately preserving the material gathered, a measure of utmost importance in regions where the destructive effects of the hot, moist climate had to be met. Such an arrangement later allowed us to give more time to a zoological survey, and on many side trips the preparation of collections could be accomplished with greater facility.

"From January to October 1910, with a base at Medje, we established at least forty camps in the uninhabited rain forest south of the Nepoko River. In October we could report that all necessary data and material for an Okapi group had been obtained. Water-color sketches, several hundred correlated photographs, accessories, including parts of trees, lianas, bushes, samples of soil, and leaf moulds, supplemented by a thorough study of the little-known life history, assured an ideal reproduction of such a group. The general collections also were successfully increased, and reached a total of 1054 mammals, 1885 birds, 829 reptiles and batrachians, 39 fishes, 15,000 invertebrates, and an ethnographical collection of over 700 specimens.

"The Museum authorities generously appropriated funds for a continuation of the work in the savannah country of the Upper Uele, where we established base camps at Niangara, Dungu, Faradje, Aba, Vankerckhovenville, Yakuluku and Garamba, from January 1911–July 1913. The square-lipped Rhinoceros proved fairly numerous here and we were fortunate in obtaining for a habitat group a bull with a 42-inch horn and a female with one 36.25 inches long, records from this region and the largest complete specimens ever collected for exhibition. Short hunting trips were made from Garamba into the Anglo-Egyptian Sudan, with the Sirdar's kind permission, and quite unexpectedly Giant Eland, the largest known antelope, furnished equally splendid material

for a similar group. The total results by February 1913 speak for themselves: 3227 mammals, 2244 reptiles and batrachians, 4488 birds, 1606 fishes, 40,000 invertebrates, and an ethnographical collection of 1900 items.

"From then on, the problem of transportation became our chief concern. Over two hundred loads were stored in Medje, the same number in Niangara, besides specimens for several hundred more in Avakubi. In Faradje alone over six hundred loads awaited removal to Stanleyville, the nearest shipping center, by a sixty-five days' march, more than half of which led through dense forest; river transit was out of the question since native dugouts could not be used for objects affected by water. Restrictive measures connected with sleeping sickness had closed the Nile route and the precarious condition of communication in the northeastern Uele made it necessary for the expedition to fashion from the raw material everything needed for packing purposes. Trees were cut, planks sawed, iron ore reduced, nails hammered, and ropes twisted, since the collections could be transferred with safety only when carefully packed in boxes or other well-made parcels. Furthermore, the work was necessarily slow, as the natives recruited in this region would not carry for more than six days, and in the forest only a couple of days, before returning to their respective villages, so that during five years' field work over 38,000 porters were engaged by the Congo Expedition. Then, too, caravans exceeding one hundred porters would have met with difficulties, especially in obtaining provisions.

"Under these circumstances Mr. Chapin chose to supervise the transportation of all collections to Stanleyville and we both left Faradje on February 19, 1913, he taking the direct road to Dungu, while I passed northward to Yakuluku and Bafuka, gathering during the next four months a valuable series of the rare Bongo as well as other material that increased the importance of our data on distribution. In the meantime, two hundred loads had been removed from Niangara, where I joined Mr. Chapin for a week, and on the first of July we parted company at Rungu for the next thirteen months, during which he directed the transfer of nearly 1200 loads to Stanleyville, meanwhile adding to the collections. I proceeded to Nala, Poko, and southward to Niapu, and secured many desiderata, chief among which were series of rare forest mammals. Certain gaps in the study of the Okapi were also filled in, and a calf, intended for the New York Zoological Society, was captured alive, but unfortunately succumbed later, owing to the lack of proper food. I forwarded the new collections together with those which had

been stored at Medje for three years, and on July 25 I met Mr. Chapin again near Avakubi. After vacating our base there we left the Ituri district on September 9, passed down the Aruwimi to Banalia by native canoe, proceeded thence by land to Bengamisa, and descended the Lindi River to Stanleyville. We arrived at the last-named place on September 30, after an absence of five years in regions where steam whistles, telegraphs, telephones, and motors were unknown, although Stanleyville, 1200 miles inland, was connected with Europe and the Cape by wireless, and under normal conditions steamers of 500 tons arrived every fortnight. We had traveled about 15,000 miles on foot without accident or sickness, although the unhealthy condition of the country caused the government to reduce the term for resident officials from three to two years.

"Mr. Chapin left Stanleyville for America on December 10, 1914 with the first large shipment of collections, and, passing through Liverpool and London, reached New York on March 31, 1915. I followed in May with the last of the fifty-four tons of material, but at Matadi marine transportation had been interrupted by the war, and not until late in August were all of the collections safely on their way to America. This delay gave an opportunity for a fruitful exploration of the Congo estuary, especially in the neighborhood of Zambi, Malela, Banana and St. Antonio. Leaving Banana for St. Paul de Loanda on September 14, I sailed for New York, via Lisbon, arriving November 12, 1915, after an absence of six years and a half.

"It is interesting to note that by 1909, the first year of the Congo Expedition, the Congo Free State had become a Belgian Colony and King Albert I, at that time heir to the throne and interested in the aspirations and welfare of his people, made a tour of inspection through the Congo Basin. At Stanleyville, September 1909, the Museum's expedition received important advice from various members of the royal advance party, headed by the Minister of Colonies, Jules Renkin. At Brussels, and throughout the Expeditions' travels in Africa, invaluable information and other assistance were given by the following Belgian dignitaries and officials: Prince Albert de Ligne (Attaché); Felix Fuchs, L. Henry (Governors General); M. Malfeyt, A. Lantonnois, A. De Meulemeester, L. Moulaert (Vice-governors); Ed. Kervyn (Director General); H. Droogmans, Mau. Van Damme (Colonial Secretaries); G. Bertrand, Ch. Delhaise, Mau. Siffer, E. Verdick (Commissioners); Ch. Smets (Judge); Dr. Van Campenhout, Dr. E. Etienne, and Dr. J. Rodhain.

"Henry Lane Wilson, American Ambassador to Belgium, and the American Consuls General, William H. Handley and Harry A. McBride, courteously represented and furthered the interests of the Expedition at various times."

ITINERARY OF THE CONGO EXPEDITION

1909	May 8	Leave New York	
	June 3	Leave Antwerp	
	June 22	Leave Boma	
	June 24–30	Matadi	
	July 1–12	Leopoldville	
	August 3–September 4	Stanleyville	
	September 12	Bafwaboli	
	September 24	Bafwasende	
	September 30–December 7	Avakubi	
	December 10–26	Ngayu	
	December 27–January 10, 1910	Bafwabaka	
1910	January 13–October 15	Medje	
	October 18	Pawa	
	October 23	Isiro	
	October 26	Nala	
	October 28	Rungu	
	November 1–January 20, 1911	Niangara and vicinity	
1911	January 25–30	Dungu	
1911–1913	February 6, 1911–February 19, 1913	Northeastern Uele—base at Faradje	
1911	July 12–18	Aba and vicinity	Chapin
	August 9–12	Vankerckhovenville	Chapin
	November 2–6	Yakuluku	Lang
	December 10–22	Aba and vicinity	Lang and Chapin
1912	March 10–16	Garamba	Lang
	April 7–24	Vankerckhovenville	Lang and Chapin
	May 4–July 24	Garamba	Lang and Chapin
1913	February 19	Faradje	Lang
	March 2–4	Yakuluku	
	March 12–24	Bafuka	
	June 14	Niangara	
	February 19	Faradje	Chapin
	February 24–March 1	Dungu	
	March 5	Niangara	
	June 14–21	Niangara	Lang and Chapin
	June 24–July 1	Rungu	

	July 6–10	Nala	Lang
	July 15–August 29	Poko	
	September 1–October 31	Akenge	
	November 2–February 20, 1914	Niapu	
1914	February 27–July 22	Medje	
1913	July 1	Rungu	Chapin
	July 5–15	Pawa	
	July 25	Bafwabaka	
	July 27	Ngayu	
	July 31–January 2, 1914	Avakubi	
1914	April 19	Penge	
	April 21	Epulu River	
	July 25–August 1	Babeyru	Lang and Chapin
	August 3	Ngayu	
	August 5–September 9	Avakubi	
	September 10	Bomili	
	September 12	Panga	
	September 22–25	Banalia	
	September 28	Bengamisa	
	September 30	Stanleyville	
	December 10	Left Stanleyville	Chapin
	December 20	Kinshasa	
	December 24	Matadi	
	December 29	Boma	
1915	March 14	Liverpool	
	March 31	New York	
	May 10	Left Stanleyville	Lang
	May 18–22	Kinshasa	
	May 22–31	Leopoldville	
	June 9–16	Matadi	
	June 17	Boma	
	June 17–July 2	Zambi	
	July 2–12	Malela	
	July 19–25	Banana	
	July 25–August 1	St. Antonio	
	August 6–September 14	Banana	
	September 15–October 1	St. Paul de Loanda	
	October 10–November 2	Lisbon	
	November 12	New York	

SUMMARY OF THE COLLECTIONS

The collections are chiefly zoological, representing nearly all branches of natural history of the region traversed. The following is

an estimate of the number of specimens which by the middle of November 1915 had reached the Museum safely, in spite of the unsettled conditions and difficulties of transportation due to the war.

Mammalogy	5800
Ornithology	6200
Herpetology	4800
Ichthyology	6000
Invertebrates	over 100,000

Palæontology was represented by only a few specimens referable to ichthyology.

Anthropology—3800 specimens were added to the collection already presented to the Museum by King Leopold II.

The illustrative material includes about 300 drawings, in water-color and ink, by Mr. Chapin, and a superb collection of 9890 photographs, the property of Mr. Lang, who has, however, placed them on permanent deposit in the Museum. The latter relate to the following subjects:

Anthropology	5461
Mammalogy	2155
Ornithology	512
Herpetology	365
Ichthyology	182
Invertebrate Zoology	294
Botany	483
Miscellaneous	438

The value of this collection is greatly enhanced by the detailed diaries, note-books, observations and measurements taken in the field. The records afford invaluable data for all the zoological and ethnological studies to be published.

PROJECT OF PUBLICATION

The publications at present contemplated are planned in four series, as follows:

1. Scientific Papers published in Bulletin form of the American Museum, of which at present twelve volumes are projected, under the title Zoology of the Belgian Congo. These papers will first be published in the Bulletin. They will then be issued in a special edition of 150 copies as separate volumes.

2. Memoirs of The American Museum of Natural History, of which the volume on the Okapi is in course of preparation.
3. Ethnological Albums, in which the principal anthropological results are to be brought together in three volumes.
4. Narrative of the Congo Expedition, in two volumes, by Herbert Lang and James Chapin.

The division of the scientific material already assigned is as follows.

Mammalogy.—J. A. Allen, N. Hollister, H. Lang, J. P. Chapin, Childs Frick.

Anatomical Studies.—H. von W. Schulte, C. Sharp, J. Kingsley.

Ornithology.—J. P. Chapin.

Herpetology.—K. P. Schmidt, G. K. Noble.

Ichthyology.—J. T. Nichols, L. Griscom, C. R. Eastman, L. Hussakof.

Invertebrate Zoology.

Vermes.—G. A. MacCallum.

Mollusca.—H. A. Pilsbry, J. Bequaert.

Crustacea.—M. J. Rathbun, H. A. Pilsbry, C. B. Wilson, W. G. Van Name.

Myriapoda.—R. V. Chamberlin.

Insects.

Lepidoptera.—W. J. Holland.

Coleoptera.—C. W. Leng, A. J. Mutchler.

Orthoptera.—J. A. G. Rehn.

Neuropteroids.—N. Banks, J. G. Needham.

Diptera.—J. Bequaert, C. P. Alexander, J. S. Hine.

Hymenoptera.—W. M. Wheeler, J. Bequaert, I. W. Bailey, J. C. Bradley, F. E. Lutz.

PROJECT OF INTERNATIONAL RESEARCH

In view of the international character of this exploration and of the generous coöperation of the Belgian Government, it is proposed to make the scientific results as well as the collections as effective as possible in the dissemination of knowledge regarding the natural history and resources of the Congo. Much of the zoological and botanical work will be of real value in relation to the future economic development of this great area of Africa.

The American Museum will begin by selecting, according to agreement, a duplicate collection for the Congo Museum at Tervueren, near Brussels, Belgium. This collection will include not only certain of the more important mammals, birds, and reptiles which are still needed

at Tervueren but also, so far as possible, paratypes of the new species described in the series of volumes which will be collectively known as THE ZOOLOGY OF THE BELGIAN CONGO. Thus the Congo Museum at Tervueren will be reinforced in the great work it has accomplished since 1897, the time of its establishment as a center of research in the zoology and ethnology of the Congo. The same principle will apply to the duplication of the American Museum photographs, observations, and records of various kinds which may not be published.

In other words, the American Museum will endeavor, so far as practicable, in every branch of science in which this expedition has engaged, to extend its duplicates and documents for the benefit of its sister institution in Belgium and for the dissemination of knowledge through the opportunities which the Congo Museum at Tervueren offers to the European students and investigators.

American Museum
of Natural History.
June 18, 1919.

PUBLICATIONS

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

MEMOIRS

Volume I. Zoology and Palæontology.
Volumes II-VIII. Anthropology.
Volume IX. Zoology and Palæontology.
Volumes X-XIV. Anthropology.

Volumes II, IV, V, VII, VIII, X-XIV, and an Ethnographical Album form Volumes I-X of the Memoirs of the Jesup North Pacific Expedition.

MEMOIRS—NEW SERIES

Volumes I and II. Zoology and Palæontology.
Volume III, part 1. Entomology.

BULLETIN

Volumes I-XXIV, XXV, parts 1 and 2, and XXVI-XXXIX.

ANTHROPOLOGICAL PAPERS

Volumes I-XI, XII, parts 1–5; XIII; XIV, parts 1 and 2; XV, part 1; XVI, parts 1–3; XVII, parts 1–4; XVIII, parts 1–5; XIX, parts 1–3; XX, part 1; XXI, part 1; XXII, parts 1–3; XXIII, parts 1–2; XXIV, parts 1–2; XXV, part 1; XXVI, part 1.

MONOGRAPHS

A Review of the Primates. By D. G. Elliot. 3 volumes.

Hitherto Unpublished Plates of Tertiary Mammals and Permian Vertebrates. By E. D. Cope and W. D. Matthew.

THE AMERICAN MUSEUM JOURNAL

Volumes I-XVIII. The Journal is a popular record of the progress of The American Museum of Natural History, issued monthly from October to May.

HANDBOOKS. Numbers 1–7.

GUIDE LEAFLETS. Numbers 1–48.

ANNUAL REPORTS. First (1869) to Fiftieth (1918).

A more detailed list, with prices, of these publications may be had upon application to the Librarian of the Museum.

Karen Koopstraal

(2)

Shrews Collected by the Congo Expedition of the American Museum.

By N. Hollister.

BULLETIN OF THE

AMERICAN MUSEUM OF NATURAL HISTORY,

Vol. XXXV, Art. XXXV, pp. 663-680.

Scientific Results of the Congo Expedition. Mammalogy, No. 1.

New York, October 21, 1916.

(*Continued from 3d page of cover.*)

VOL. XIII. ANTHROPOLOGY (not yet completed).
**Jesup North Pacific Expedition, Vol. IX.*

PART I.— The Yukaghir and the Yukaghirized Tungus. By Waldemar Jochelson. Pp. 1–133, pll. i–vii, 1 map, 1910. Price, $3.40.

VOL. XIV. ANTHROPOLOGY.
**Jesup North Pacific Expedition, Vol. X.*

PART I.— Kwakiutl Texts. Second Series. By Franz Boas and George Hunt. Pp. 1–269, 1906. Price, $2.80.

PART II.— Haida Texts. By John R. Swanton. Pp. 271–802. 1908. Price, $5.40.

MEMOIRS.

NEW SERIES, VOL. I.

PART I.— Crania of Tyranosaurus and Allosaurus. By Henry Fairfield Osborn, pp. 1–30, pll. i–iv and text figures 1–27. 1912.

PART II.— Integument of the Iguanodont Dinosaur Trachodon. By Henry Fairfield Osborn. Pp. 31–54, pll. v–x, and text figures 1–13. 1912. Parts I and II are issued under one cover. Price, $2.00.

PART III.— Craniometry of the Equidæ. By Henry Fairfield Osborn. Pp. 55–100, text figures 1–17. 1912. Price, 75 cents.

PART IV.— Orthogenetic and Other Variations in Muskoxen, with a Systematic Review of the Muskox Group, Recent and Extinct. By J. A. Allen. Pp. 103–226, pll. xi–xviii, text figures 1–45, 1913. Price, $2.50.

PART V.— The California Gray Whale (*Rhachianectes glaucus* Cope). By Roy C. Andrews. Pp. 229–287, pll. xix–xxvii, text figures 1–22. 1914. Price, $2.00.

PART VI.— The Sei Whale (*Balænoptera borealis* Lesson). By Roy C. Andrews and H. von. W. Schulte. Pp. 289–502, pll. xxvii–lvii, 1916. (In press.)

ETHNOGRAPHICAL ALBUM.

Jesup North Pacific Expedition.

Ethnographical Album of the North Pacific Coasts of America and Asia. Part 1, pp. 1–5, pll. 1–28. August, 1900. Sold by subscription, price, $6.00.

BULLETIN.

The matter in the 'Bulletin' consists of about 24 to 36 articles per volume, which relate about equally to Geology, Palæontology, Mammalogy, Ornithology, Entomology, and (in former volumes) Anthropology, except Vol. XI, which is restricted to a 'Catalogue of the Types and Figured Specimens in the Palæontological Collection of the Geological Department,' and Vols. XV, XVII, and XVIII, which relate wholly to Anthropology. Volume XXIII and the later volumes contain no anthropological matter, which is now issued separately as 'Anthropological Papers.'

Volume	I, 1881–86	Out of print	
"	II, 1887–90	Price,	$4.75
"	III, 1890–91	"	4.00
"	IV, 1892	"	4.00
"	V, 1893	"	4.00
"	VI, 1894	"	4.00
"	VII, 1895	"	4.00
"	VIII, 1896	"	4.00
"	IX, 1897	"	4.75
"	X, 1898	"	4.75
"	XI, 1898–1901	"	5.00
"	XII, 1899	"	4.00
"	XIII, 1900	"	4.00
"	XIV, 1901	"	4.00
"	XV, 1901–1907	"	5.00
"	XVI, 1902	"	5.00
"	XVII, Part I, 1902	"	1.50
"	" " II, "	"	.75
"	" " IV, 1905	Out of print	
"	" " IV, 1905	Price,	$ .75
"	XVII, " V, 1907	"	1.25
Volume	XVIII, Part I, 1902	Price,	$2.00
"	" " II, 1904	"	1.50
"	" " III, 1905	"	.50
"	" " IV, 1907	"	2.00
"	XIX, 1903	"	6.00
"	XX, 1904	"	5.00
"	XXI, 1905	"	5.00
"	XXII, 1906	"	6.00
"	XXIII, 1907	"	9.00
"	XXIV, 1908	"	6.00
"	XXV, Part I, 1908	"	1.50
"	XXVI, 1909	"	6.00
"	XXVII, 1910	"	5.00
"	XXVIII, 1910	"	4.00
"	XXIX, 1911	"	4.50
"	XXX, 1911	"	4.00
"	XXXI, 1912	"	4.00
"	XXXII, 1913	"	5.50
"	XXXIII, 1914	"	5.50
"	XXXIV, 1915	"	5.50

ANTHROPOLOGICAL PAPERS.

Vols. I–XVI, 1908–1916.

AMERICAN MUSEUM JOURNAL

The 'Journal' is a popular record of the progress of the American Museum of Natural History, issued monthly, from October to May inclusive. Price, $1.50 a year. Volumes I–XVI, 1900–1916.

*The Anatomy of the Common Squid. By Leonard Worcester Williams. Pp. 1–87, pll. i–iii, and 16 text figures. 1909.

*Chinese Pottery of the Han Dynasty. By Berthold Laufer. Pp. 1–339, pl. i–lxxv, and 55 text figures. 1909.

For sale at the Museum.

*Published by E. J. Brill, Leiden, Holland. Not on sale at the Museum. American Agent, G. E. Stechert, 129 West 20th Street, New York City.

59.9,33(67.5)

Article XXXV.—SHREWS COLLECTED BY THE CONGO EXPEDITION OF THE AMERICAN MUSEUM.[1]

By N. Hollister.

Plates VII–XI.

The shrews collected by Herbert Lang and James P. Chapin on the American Museum Congo Expedition number 177 specimens, of 15 species and 3 genera. Almost one half of the species are new. This is not altogether surprising when it is considered how few shrews have been described from the Congo as compared with other parts of Africa. It nevertheless seems remarkable that five of these new species should be members of the small group of "naked-tailed" *Crocidura* of which only about ten forms were heretofore known. Five forms of *Crocidura* which have been recorded from the general region are not represented in this collection. These are *Crocidura turba turba* Dollman, *C. t. tarella* Dollman, *C. poensis attila* Dollman, *C. boydi* Dollman, and *C. nigrofusca* Matschie. Races of *C. hildegardeæ* and *C. fumosa*, as well as representatives of several west coast species also might reasonably be expected.

Owing to their damaged condition, immaturity, or other circumstances, five specimens in the collection are not determinable and are not listed in the present paper.

Of the localities listed below, Garamba, Faradje, Niangara, and Nala are in the Uelle drainage. Medje, Gamangui, Bafwabaka, Babeyru, Ngayu, and Avakubi are in the Ituri valley. Lubila is situated on a branch of the Tshopo, in the Stanley Falls district.

1. **Crocidura nyansæ kivu** *Osgood.*

Plate X, Fig. 1.

1910. *Crocidura flavescens kivu* Osgood, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 5, p. 370. April. (Lake Kivu, Congo.)

Three specimens, including one in alcohol, from Avakubi; one specimen from Gamangui; and sixteen, including one in alcohol and one odd skull, from Medje.

Most of the skins in this series are in a pale, worn, and faded condition,

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

but some are in fresh pelage and show the dark body coloration and dark brownish feet characteristic of the race. The palest, most faded, specimens have the feet light colored, like the coat of the body. There is the variation in color usual in series of *Crocidura nyansæ nyansæ* and *C. n. kijabæ;* some of the skins have dark colored bellies while others have not. This seems to be individual variation and not a seasonal condition of pelage; the variation is found in young as well as in adult examples.

The collectors record three pairs of inguinal mammæ.

2. **Crocidura sururæ** *Heller.*

1910. *Crocidura sururæ* Heller, Smithsonian Misc. Coll., Vol. 56, No. 15, p. 2. December 23. (Rhino Camp, Lado.)

One skin and skull from Faradje and an alcoholic specimen from Garamba agree in all essential details with the type series of this species from Rhino Camp, Lado Enclave.

3. **Crocidura lutrella** *Heller.*

1910. *Crocidura lutrella* Heller, Smithsonian Misc. Coll., Vol. 56, No. 15, p. 4. December 23. (Rhino Camp, Lado.)

A single skin (without skull) from Faradje is evidently of this species. Compared with the type series from Lado Enclave, this specimen, which is in older pelage, has a more grayish, less buffy belly.

4. **Crocidura turba nilotica** *Heller.*

1910. *Crocidura nilotica* Heller, Smithsonian Misc. Coll., Vol. 56, No. 15, p. 3. December 23. (Rhino Camp, Lado.)

Three specimens, including two in alcohol, from Faradje are typical of this form. A single alcoholic specimen from Nala, from which the skull has been removed, is evidently of the same subspecies. It is browner than usual for *nilotica,* but is the only July specimen seen.

5. **Crocidura caliginea** sp. nov.

(Plate VII, Fig. 1; VIII, Figs. 1, 1*a*.)

Type, No. 48555, Amer. Mus. Nat. Hist., skin and skull of adult ♀ (teeth moderately worn and basal suture closed) collected at Medje, Belgian Congo, July 8, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2451.

A medium sized, very dark brown, dark bellied, small footed species, with thinly haired tail and with only a few long bristle hairs near base of tail.

Color.— Entire head and body, above and below, dark brown, near to clove brown; the upperparts very slightly brighter or more brownish, less smoky, than the belly; but there is no distinct line of demarcation nor noticeable difference in the shade of color above and below. The slightly brighter appearance of the back is due to a faint speckling in the hair of cinnamon or deep buff. Fur short and close, the undercolor deep neutral gray. Hands and feet brown, the digits yellowish. Tail blackish brown, slightly paler at base below, appearing naked but sparingly clothed with very short hairs; a very few longer hairs near base.

Skull and teeth.— Skull strongly built, with heavy maxillary processes. Braincase short, wider than long, with sharp, angular corners and straight sides. Teeth large; unicuspids from crown view very broad; third unicuspid distinctly larger than second, especially broader across crown; the teeth all crowded in the row and unicuspids overlapping. Upper last premolar (pm^4) long as wide. The teeth thus differ conspicuously from the type usual to the naked-tailed species of the *dolichura* group and most resemble those of the forms in the *turba* group.

Measurements of type.— Total length, 125; tail vertebræ, 54; hind foot, 12 (dry, without claws, 11.6); ear, 9. Skull: Condylo-incisive length, 21.3; condylo-basal length, 20.6; greatest breadth, 9.5; maxillary breadth, 6.9; least interorbital breadth, 4.4; mandible, 11.8. Teeth: Entire upper row, 10; front of pm^4 to back of m^2, 5.4; entire lower row, 9.3.

The combination of dark color above and below, absence of long hairs on tail except at base, small hind foot, short braincase, and large, roundish unicuspid teeth, makes this species easy to recognize among the other shrews known from the region. The species evidently belongs in that group which includes *poensis* and *batesi*, and is not related closely to the other bare-tailed species from Medje. It is represented only by the type specimen.

6. **Crocidura jacksoni denti** *Dollman.*

Plate X, Fig. 2.

1915. [*Crocidura*] *j*[*acksoni*] *denti* Dollman, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 15, p. 516. May. (Between Mawambi and Avakubi, Congo.)

Seventy-one specimens, including nine in alcohol, from localities as follows: Avakubi, 6; Babeyru, 1 in alcohol; Bafwabaka, 1; Faradje, 5; Gamangui, 2; Medje, 51; Nala, 3 in alcohol; Niangara, 2.

There are specimens in this fine series collected in nearly all the months of the year. As a consequence there is great diversity in color, the skins in the dark, fresh coat and those in the reddish stages of extreme wear contrasting greatly. Several very young examples show all the range of variation exhibited by the adults; the first juvenile coat evidently fades

very rapidly. Owing to the great diversity of color shown in this series, I have given these specimens special study in an endeavor to divide them into two or more species, but have failed in this effort and am forced to consider them all of one form. The skulls of the oldest males are naturally somewhat larger than those of younger males and females, but after all the range of variation is no greater than in several species of shrews from British East Africa, represented in the National Museum by equally large series.

There is also some variation in the relative size of the second and third unicuspid teeth. This character certainly is not always a reliable one in species of *Crocidura* which have these teeth normally somewhat of the same size.

Specimens from the Uelle drainage appear paler than the average skins from the Ituri, but the pelages are not strictly comparable and the difference is slight.

The collectors note three pairs of inguinal mammæ. One female collected at Bafwabaka, December 29, contained two large embryos.

7. **Crocidura bicolor** *Bocage.*

1890. *Crocidura bicolor* Bocage, Jorn. Sci. Acad. Lisboa, Ser. 2, Vol. I, p. 29. (Gambos, Angola.)

A single very immature alcoholic specimen, with skull removed, from Avakubi. It apparently represents a form very much like *C. b. woosnami* Dollman from Lake Ngami; but it would be useless to attempt an exact subspecific determination. There is a faint stripe of brownish along the upper side of the otherwise whitish tail; the white bristle hairs are rather inconspicuous; hands and feet whitish.

8. **Crocidura oritis** sp. nov.

(Plate VII, Fig. 2; VIII, Figs. 2, 2*a*.)

Type, No. 48510, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Avakubi, Ituri River, Belgian Congo, July 6, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2530.

Related to *Crocidura maurisca* Thomas, but averaging less blackish brown in color, the underparts less richly colored, and the feet less blackish. Size about as in *maurisca*, but hind foot larger and skull more robust, with heavier teeth. Tail with long bristles only at base as in *maurisca* and allies.

Color.— Type: Upperparts grayish brown, or dark hair brown, finely speckled

with lighter grayish; crown and face slightly darker, more blackish brown; underfur rather light slate gray. Hands and feet brownish buff, the feet darker along outer half from heel to toe. Tail uniformly dull blackish brown except near base below where there are a few lighter buffy hairs. Underparts mouse gray, uniformly colored from chin to tail except for an irregular wash of cinnamon buff. Side glands inconspicuous, about the color of the surrounding hair. No definite line of demarcation between color of upperparts and of belly, the two shades blending over the sides of the body.

Other specimens differ much in color from the type. A January skin from Medje matches the type most closely; an April skin is in very bleached pelage, with irregular patches of rusty red on the upperparts. Two other skins from Medje, June and September, are quite dark, more as in a very uniformly colored series of *maurisca* from the Victoria Nyanza region. These last two are, however, rather immature animals, with the basal suture still open.

Skull and teeth.— Skull larger than in *maurisca*, about the size of that of the closely related *C. littoralis* Heller from Butiaba, but slightly more robust in build and with wider maxillary processes, rostrum, and palate. Teeth essentially as in *littoralis* and *maurisca*, the unicuspids oval from crown view, with wide cingula and small cusps; last upper premolar, in unworn condition, longer than wide.

Measurements of type.— Total length, 159; tail vertebræ, 65; hind foot, 18 (dry, without claws, 16.6). Skull: Greatest length, 23.4; condylo-incisive length, 23.3, condylo-basal length, 22.6; greatest breadth, 10.2; maxillary breadth, 7.1; mandible, 12.1; upper tooth row, entire, 10.4; front of pm^4 to back of m^2, 5.3; lower tooth row, entire, 9.4.

This new species is based on five specimens, four from Medje and one from Avakubi. It is closely related to *maurisca* and *littoralis* but may be separated from either by the lighter color, greater maxillary breadth, and more robust teeth. The three forms, *maurisca*, *littoralis*, and *oritis*, probably form an intergrading chain of subspecies. They are readily distinguished from *Crocidura niobe* Thomas by the larger hind foot and the narrower unicuspid teeth.

9. **Crocidura latona** sp. nov.

(Plate VII, Fig. 3; VIII, Figs. 3, 3*a*.)

Type, No. 48610, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Medje, Belgian Congo, March 17, 1910, by Herbert Lang and James P. Chapin. Orig. No. 773.

Related to *Crocidura niobe* Thomas, but much more brownish (not gray) in color, and with underparts scarcely lighter in color than back. Size about as in *niobe*. Tail thinly haired and with long bristles only at base. Fur of back short.

Color.— Type: Upperparts rich, glossy bister, the nose darker; underfur narrowly brownish gray at base. Underparts only slightly lighter brown than the back and sides; lateral glands russet. Hands and feet buffy brown, very thinly haired

with brown. Tail above and below blackish brown, very slightly lighter at base below.

Skull and teeth.— Skull in size about as in *Crocidura niobe*, or slightly smaller; the general appearance much as in *maurisca* and *littoralis*, but decidedly smaller. Teeth distinctly of the *maurisca* and *littoralis* type (the unicuspids rather narrow with small cusps and large cingula) but second and third upper unicuspids wider and more inclined to be circular, as in *niobe*. Last upper premolar longer than wide.

Measurements of type.— Total length, 135; tail vertebræ, 59; hind foot, 14 (dry, without claws, 13.2); ear, 9. Skull: Condylo-incisive length, 19.8; condylo-basal length, 19.0; greatest breadth, 8.9; maxillary breadth, 6.1; mandible, 10.8; upper tooth row, entire, 8.7; front of pm^4 to back of m^2, 4.7; lower tooth row, entire, 8.2.

This species evidently is closely related to the Ruwenzori *Crocidura niobe*, but differs conspicuously from that species in its almost uniform dark brownish coloration, above and below. Besides the type there is a single skin, without skull, in the collection from Avakubi which is doubtless of the same form. It is an October specimen and is slightly more reddish brown than the type, with which it agrees in general dimensions.

10. **Crocidura ludia** sp. nov.

(Plate VII, Fig. 4; IX, Figs. 1, 1*a*.)

Type, No. 48566, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (teeth slightly worn and basal suture not closed) collected at Medje, Belgian Congo, May 16, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2366.

A small species related to *Crocidura muricauda* Miller and *C. dolichura* Peters, but coloration brownish, not gray, above and below. Tail shorter than in *dolichura* and skull smaller, with smaller teeth. Tail appearing naked but clothed with very short, inconspicuous hairs; a few longer bristles at extreme base.

Color.— Upperparts bister or mummy brown, uniformly colored from nose to tail; underfur smoke gray. Underparts hair brown, not conspicuously separated from color of sides and back. Feet very thinly haired, buff, with brown streak along outer side. Tail blackish brown above, lighter on basal third below.

Skull and teeth.— Skull like that of *Crocidura muricauda* but slightly larger, with greater interorbital breadth, wider, flatter braincase, and more slender rostrum; palate wider and shorter. Teeth slightly smaller than in *muricauda* or *dolichura*, but otherwise similar, with second and third unicuspids of about equal size or second rather smaller than third; unicuspids of the general *maurisca* type (oval in form, with small cusps and large cingula) though not so extreme as in *maurisca* or *littoralis;* last upper premolar longer than wide.

Measurements of type.— Total length, 120; tail vertebræ, 60; hind foot, 14 (dry, without claws, 12.7); ear, 9. Skull: Condylo-incisive length, 18.2; condylo-basal length, 17.5; greatest breadth, 8.2; maxillary breadth, 5.4; least interorbital breadth, 4.0; mandible, 9.2; upper tooth row, entire, 7.8; front of pm^4 to back of m^2, 4.0; lower tooth row, entire, 7.4.

Three specimens of this new species of *Crocidura* are in the collection — two from Medje and one from Ngayu. The topotype skin from Medje, a female, measures: Total length, 116; tail vertebræ, 53; hind foot, 12; ear, 9. The tail of the Ngayu skin is 57 millimeters in length. All agree almost precisely in coloration. The species apparently is close to *C. dolichura* but may be distinguished by its brown coloration and shorter tail.

The Liberian shrew described by Miller in 1900 as *Myosorex muricauda*[1] proves to be a species of *Crocidura*. It was transferred by Thomas[2] in 1904 from *Myosorex* to the genus *Sylvisorex*. Consequently Dollman does not include it in his recent revision of the African shrews of the genus *Crocidura*.[3] The species is closely related to *C. dolichura* and should have been placed between that species and *maurisca* in Dollman's synopsis. It is hard to understand how Thomas could have been misled by the excellent description and figures given by Miller.

11. **Crocidura polia** sp. nov.

(Plate VII, Fig. 5; IX, Figs. 2, 2*a*.)

Type, No. 48559, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Medje, Belgian Congo, July 1, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2442.

A small, grayish brown, long-tailed shrew with the general proportions of *C. dolichura* Peters, but with the tail heavily covered with short hairs which increase in numbers and length at the tip to form a distinct white brush. A few scattered longer bristle-hairs on basal third of tail. Skull and teeth much as in *dolichura*, *muricauda*, and *ludia*. Pelage moderately full, the hairs at middle of back about 3.5 millimeters in length.

Color.— Upperparts uniform grayish brown, or perhaps better described as pale fuscous with a faint sprinkling of silvery gray; sides and underparts distinctly lighter, more grayish, but not sharply marked from color of back; lateral glands drab. Hands and feet thinly coated with whitish hairs. Tail well coated with short hairs which increase in length and numbers on the terminal half and produce a distinct white pencil at tip; blackish brown above, slightly lighter below, especially at extremity, and tipped with white.

Skull and teeth.— The skull is remarkably like that of *Crocidura ludia*, just described above; is of about the same size and general shape, but has a slightly flatter braincase and less developed maxillary processes. It thus clearly shows the relationship with *dolichura* and *muricauda*. The teeth are essentially as in *ludia*

[1] Proc. Washington Acad. Sciences, Vol. 2, p. 645, December, 1900.
[2] Proc. Zool. Soc. London, 1904, p. 190.
[3] Ann. and Mag. Nat. Hist., Ser. 8, Vol. 15, pp. 508–527, May, 1915, et seq.

but the unicuspids are slightly less oval, more roundish, and pm^4 is slightly less lengthened, about as long as wide. Second and third unicuspids about of equal size but third overlaps second and appears larger from a view of the crown surface.

Measurements of type.— Total length, 130; tail vertebræ, 72; hind foot, 13; ear, 9. Skull: Condylo-incisive length, 18.2; condylo-basal length, 17.5; greatest breadth, 8.2; maxillary breadth, 5.2; least interorbital breadth, 3.8; mandible, 9.4; entire upper tooth row, 7.8; entire lower tooth row, 7.3.

The type and only specimen of this new species differs from all the African forms of *Crocidura* with which I am familiar by its combination of small size; long, hairy, penicillate tail, with longer bristle-hairs confined to near base and few in number; and teeth of the *dolichura* group type.

12. **Crocidura congobelgica** sp. nov.

(Plate VII, Fig. 6; IX, Figs. 3, 3*a*.)

Type, No. 48512, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (teeth little worn) collected at Lubila, near Bafwasende, Belgian Congo, September 20, 1909, by Herbert Lang and James P. Chapin. Orig. No. 122.

A small, unicolored, dark brown shrew with long, black, naked tail. General external appearance much as in *Crocidura latona*, but skull widely different, more as in *Crocidura lutrella*, with large maxillary processes and rounded unicuspid teeth, the second and third of about equal size. Tail nearly naked except for scattered short, close-lying hairs and a very few longer bristles at base.

Color.— Entire head and body, above and below, rich, glossy bister; the lower sides and belly only very slightly lighter colored than the back. The upperparts are very finely streaked with cinnamon buff. Underfur, above and below, pale smoke gray. Whiskers long, mixed black and white. Hands and feet very thinly clothed with brown hairs, darker along outer sides. Tail dull brownish black except near extreme base below where it is slightly lighter.

Skull and teeth.— The skull differs from those of other members of the naked-tailed group in its comparatively great maxillary width. From above it greatly resembles skulls of the otherwise very different *C. lutrella* Heller of Lado. The first upper unicuspid is relatively larger, oval in crown pattern, with well developed cingulum; second and third unicuspids about equal in size, the third squarely posterior to, and somewhat overlapping, the second. In unworn condition these show the small cusps and large cingula characteristic of the group. The last upper premolar differs from that of other members of the group in its lack of conspicuous posterior emargination, the median space between it and the first molar being very small; the length of this tooth is about equal to its breadth, instead of much greater as usual in the group. From the skull of *C. latona* (which species this one most resembles in color and external characters) the skull of *C. congobelgica* may be separated readily by its larger size, much wider palate, stronger maxillary processes, and considerably larger teeth.

Measurements of type, followed by dimensions of an older adult female from Medje: Total length, 133, —; tail vertebræ, 59, —; hind foot, 14, 13. Skulls (the

occiput of the type skull is damaged): Condylo-incisive length, —, 20.7; condylo-basal length, —, 20.0; greatest breadth, —, 9.1; maxillary breadth, 7.0, 6.9; least interorbital breadth, 4.3, 4.2; palatal length, 8.9, 8.8; mandible, 10.7, 11.2; entire upper tooth row, 9.1, 9.3; front of pm^4 to back of m^2, 5.0, 5.0; entire lower tooth row, 8.4, 8.8.

There are only two specimens of *Crocidura congobelgica* in the collection, the type from Lubila and a specimen from Medje. Owing to the fact that these skins so closely resemble skins of *C. latona*, above described, it was with some hesitation that I decided to recognize by name two distinct species. Skulls of the two animals are so very different that no other course seems open. Though both obviously belong to the same group of bare-tailed species, the skull of the old adult male *latona* is much smaller than a younger female skull of *congobelgica*, and the other characters, as given above, point to certain specific difference between the two forms. The peculiar coloration is found, so far as I am aware, only in this group of species, and the long, black, almost hairless tail further instantly separates the two species from other shrews of the same general size.

13. **Sylvisorex gemmeus irene** *Thomas.*

1915. *Sylvisorex gemmeus irene* Thomas, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 16, p. 151. August. (Kaganbah, Uganda.)

Eighteen specimens, including four young in alcohol, from Medje, and one specimen from Faradje.

Compared with skins of typical *gemmeus* from Lado, these specimens average considerably more brownish, less gray in color; but the forms are certainly very closely related and the skulls seem indistinguishable. The type locality of this subspecies is in southern Uganda, but Mr. Thomas has already recorded specimens from the Uelle and Ituri valleys.[1] The specimen listed above from Faradje is like those from Medje and shows no approach in color to the Lado form.

The collectors note three pairs of mammæ for this shrew. They found two large embryos in a female collected at Medje, January 18; and two medium sized embryos in a female from the same place on January 20.

[1] Ann. and Mag. Nat. Hist., Ser. 8, Vol. 16, pp. 151 and 471, August and December, 1915.

MEASUREMENTS OF SPECIMENS OF *Sylvisorex gemmeus irene* FROM MEDJE.

Museum Number	Sex	Total length	Tail vertebræ	Hind foot, with claws	Ear	Skull: Greatest length	Condylobasal length	Maxillary breadth	Greatest breadth	Mandible	Upper tooth row, entire	Lower tooth row, entire	Condition of teeth
48584	♂	153	85	16	9	18.1	17.4	5.3	7.7	9.3	7.9	7.3	moderately worn
48590	♂	136	73	15	9	17.8	17.3	5.5	7.8	9.1	7.8	7.3	"
48591	♂	155	83	15	9	17.8	17.1	5.4	7.8	9.0	7.6	7.2	"
48598	♂	147	81	15	8	17.5	16.8	5.3	7.6	8.9	7.4	6.8	little worn
48599	♂	143	73	14	10	—	—	5.5	—	9.2	7.4	6.7	moderately worn
48600	♂	146	82	15	9	—	—	5.8	8.0	9.5	7.9	7.3	"
48585	♀	137	73	15	9	17.3	16.6	5.4	7.4	8.8	7.4	6.8	"
48586	♀	142	80	14	9	—	—	5.6	—	—	7.8	6.9	"
48589	♀	138	74	15	8	17.3	16.5	5.4	7.5	8.8	7.7	7.0	"
48595	♀	141	76	14	8	17.8	17.3	5.4	7.5	9.0	7.7	6.9	"
48596	♀	141	75	15	9	17.3	16.7	5.4	7.7	8.9	7.4	6.8	"
48597	♀	151	83	14	8	17.5	16.8	5.7	7.8	8.6	7.5	6.8	"

14. **Sylvisorex oriundus** sp. nov.

(Plate VII, Fig. 7; IX, Figs. 4, 4*a*; XI, Fig. 1.)

Type, No. 48554, Amer. Mus. Nat. Hist., skin and skull of adult ♀ (teeth little worn) collected at Medje, Nava River, Belgian Congo, May 20, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2368.

A large, short tailed, short furred, dark bellied species related to *Sylvisorex morio* (Gray), but larger, with much larger hind foot.

Color.— Upperparts from nose to tip of tail dark olive brown, or, in certain lights, dark sepia; the underfur deep neutral gray. Lower sides and underparts slightly paler, dark grayish brown, very slightly lighter on throat. Tail slightly darker than body above, lighter brown on basal two-thirds below. Hands and feet light buffy brown, the ankles blackish.

Skull and teeth.— Skull larger than in *S. morio*, with longer tooth row. Compared with the figure of the dentition of the type specimen of *S. morio*,[1] the second upper unicuspid tooth is relatively much smaller; the front face of the large cusp of pm^4 is much less sloping, the heel of this tooth smaller, and the anterior cusp, though little worn, is not more than half the height of the last unicuspid. The whole dentition is,

[1] Dobson, Monog. Insect., pl. 25, fig. 2.

except for the small size of the anterior cusp on pm^4, and the presence of two conspicuous notches on the anterior mandibular tooth, exceedingly like that of the much smaller *S. johnstoni* (Dobson) as figured on plate 28 of the Monograph of the Insectivora.

Measurements of type.— Total length, 134; tail vertebræ, 62; hind foot, 18; ear, 8. The hind foot in the dry skin, without claws, measures 16. Skull and teeth: Condylo-incisive length, 20.5; condylo-basal length, 19.9; maxillary breadth, 5.9; least interorbital breadth, 4.2; mandible, 11.1; entire upper tooth row, 8.9; front of pm^4 to back of m^2, 4.4; entire lower tooth row, 8.4. The skull is badly damaged in the braincase, but has been repaired so that the measurements as given are virtually exact.

There is only a single specimen of this large *Sylvisorex* in the collection. From the other species found at Medje, *Sylvisorex gemmeus irene*, it is readily distinguished by its large size, short tail, and dark colored belly. Thomas has recorded *Sylvisorex morio* from Medje [1] on the basis of a single immature specimen. The species represented may be the one here described.

15. **Scutisorex congicus** *Thomas.*

Plate XI, Fig. 2.

1915. *Scutisorex congicus* Thomas, Ann. and Mag. Nat. Hist., Ser. 8, Vol. 16, p. 470. December. (Medje, Congo.)

Thirty-seven specimens from Medje and one from Bafwabaka.

This genus heretofore was known only from two examples, the type specimens of *Scutisorex somereni* and *S. congicus*, both described by Thomas since 1910. The Medje specimens are topotypes, the species *congicus* having been named from a specimen collected at that place by Dr. Cuthbert Christy in April, 1914.

There is considerable variation in color shown by the specimens in this series. On some skins there is very little rusty coloration while in others the entire body is suffused with buff and reddish brown. There is no very great variation in size among fully adult examples, as shown by the accompanying table of measurements. The lambdoid crests frequently project beyond the level of the condyles as described of *S. somereni*. The characters given by Thomas in separating this form from the Uganda species thus prove to be mostly individual differences. The two forms are doubtless very closely allied, but no specimen in the present series is quite so large as the type of *somereni*.

This series contains specimens of all ages from very young, showing the

[1] Ann. and Mag. Nat. Hist., Ser. 8, Vol. 16, p. 471, December, 1915.

milk dentition, to old adults. The collectors record the mammæ as two pairs of inguinal; and the stomach contents of one adult male as several caterpillars.

In making up the following table there were measured only specimens fully adult, the skulls with the basal sutures tightly closed.

MEASUREMENTS OF ADULT SPECIMENS OF *Scutisorex congicus* FROM MEDJE.

Museum Number	Sex	Total length	Tail vertebræ	Hind foot with claws	Ear	Skull: Condylobasal length	Greatest length	Greatest breadth	Maxillary breadth	Least interorbital breadth	Length of mandible	Upper tooth row, entire	Front of pm^4 to back of m^2	Lower tooth row
48453	♂	218	84	23	15	28.9	30.3	12.9	8.9	6.7	16.7	13.4	6.3	12.3
48455	♂	234	95	23	16	31.2	32.4	13.8	9.9	7.0	17.6	14.1	6.9	13.2
48458	♂	237	85	23	13	31.3	32.1	14.0	9.2	6.9	17.9	13.5	6.8	12.7
48462	♂	231	93	23	15	30.8	31.6	13.2	9.1	6.7	17.3	13.8	7.1	13.1
48464	♂	217	94	22	15	30.8	31.7	13.9	9.4	6.9	17.6	13.8	7.0	13.0
48465	♂	210	85	25	14	30.1	31.6	13.9	9.1	6.8	17.3	13.6	6.5	12.5
48473	♂	236	96	20	15	31.1	32.7	14.3	9.7	6.9	17.7	14.3	7.1	13.3
48474	♂	238	92	24	15	31.3	32.8	14.2	9.7	6.8	17.9	14.3	7.1	13.1
48487	♂	220	88	21	15	29.9	31.1	13.7	9.4	7.1	16.7	13.3	6.6	12.6
48488	♂	232	90	23	17	30.8	32.1	14.2	9.6	6.9	17.3	13.7	7.0	12.7
48451	♀	218	76	27	15	29.5	31.2	13.2	9.3	6.4	17.5	13.7	7.2	12.7
48471	♀	206	83	22	14	29.7	30.9	13.4	9.3	6.6	17.2	13.8	7.1	13.0
48480	♀	205	81	23	12	29.3	30.9	13.4	9.1	6.2	16.7	13.7	6.8	12.6
48482	♀	226	92	24	12	31.0	32.3	13.7	9.2	6.7	17.6	13.4	6.8	12.7
48486	♀	243	95	23	16	31.9	33.2	13.7	9.7	7.2	18.3	14.5	7.1	13.5
48503	♀	—	—	—	—	30.6	31.9	14.1	9.5	6.5	17.8	14.0	6.8	13.1

EXPLANATION OF PLATES.

Plate VII.

(Natural size.)

Fig. 1. *Crocidura caliginea.* Type. 48555.
2. *Crocidura oritis.* Type. 48510.
3. *Crocidura latona.* Type. 48610.
4. *Crocidura ludia.* Type. 48566.
5. *Crocidura polia.* Type. 48559.
6. *Crocidura congobelgica.* Type. 48512.
7. *Sylvisorex oriundus.* Type. 48554.

Plate VIII.

(Five times natural size.)

Figs. 1, 1a. *Crocidura caliginea.* Type. 48555.
2, 2a. *Crocidura oritis.* Type. 48510.
3, 3a. *Crocidura latona.* Type. 48610.

Plate IX.

(Five times natural size.)

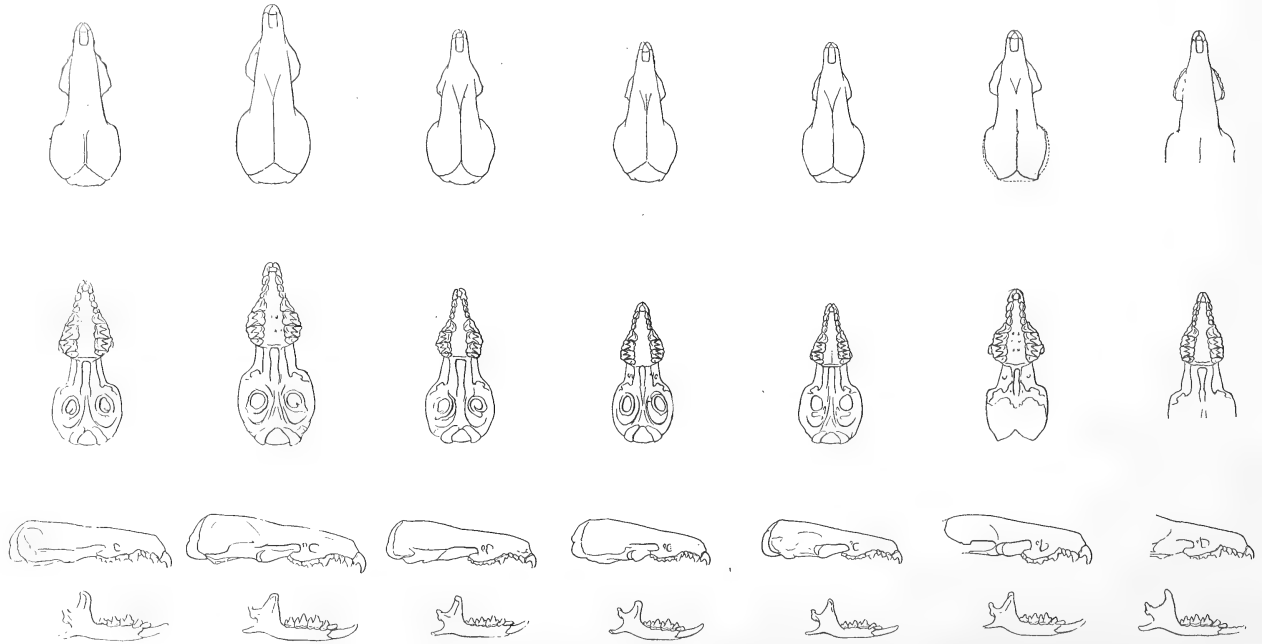
Figs. 1, 1a. *Crocidura ludia.* Type. 48566.
2, 2a. *Crocidura polia.* Type. 48559.
3, 3a. *Crocidura congobelgica.* Type. 48512.
4, 4a. *Sylvisorex oriundus.* Type. 58554.

Plate X.

Fig. 1. *Crocidura nyansæ kivu* Osgood. (About $\frac{3}{5}$ natural size.) ♂ ad., No. 48501. Medje, June 13, 1914. Photo by Herbert Lang.
2. *Crocidura jacksoni denti* Dollman. (Slightly reduced.) ♀ ad., No. 48520. Medje, May 28, 1914. Photo by Herbert Lang.

Plate XI.

Fig. 1. *Sylvisorex oriundus* Hollister. Type. (Almost natural size.) ♀ ad., No. 48554. Medje, May 20, 1914. Photo by Herbert Lang.
2. *Scutisorex congicus* Thomas. (About $\frac{1}{2}$ natural size.) ♂ ad., No. 48475. Medje, May 30, 1914. Photo by Herbert Lang.



1 2 3 4 5 6 7

Fig. 1. Crocidura caliginea.
" 2. " oritis.
" 3. " latona.
" 4. " ludia.
Fig. 5. Crocidura polia.
" 6. " congobelgica.
" 7. Sylvisorex oriundus.

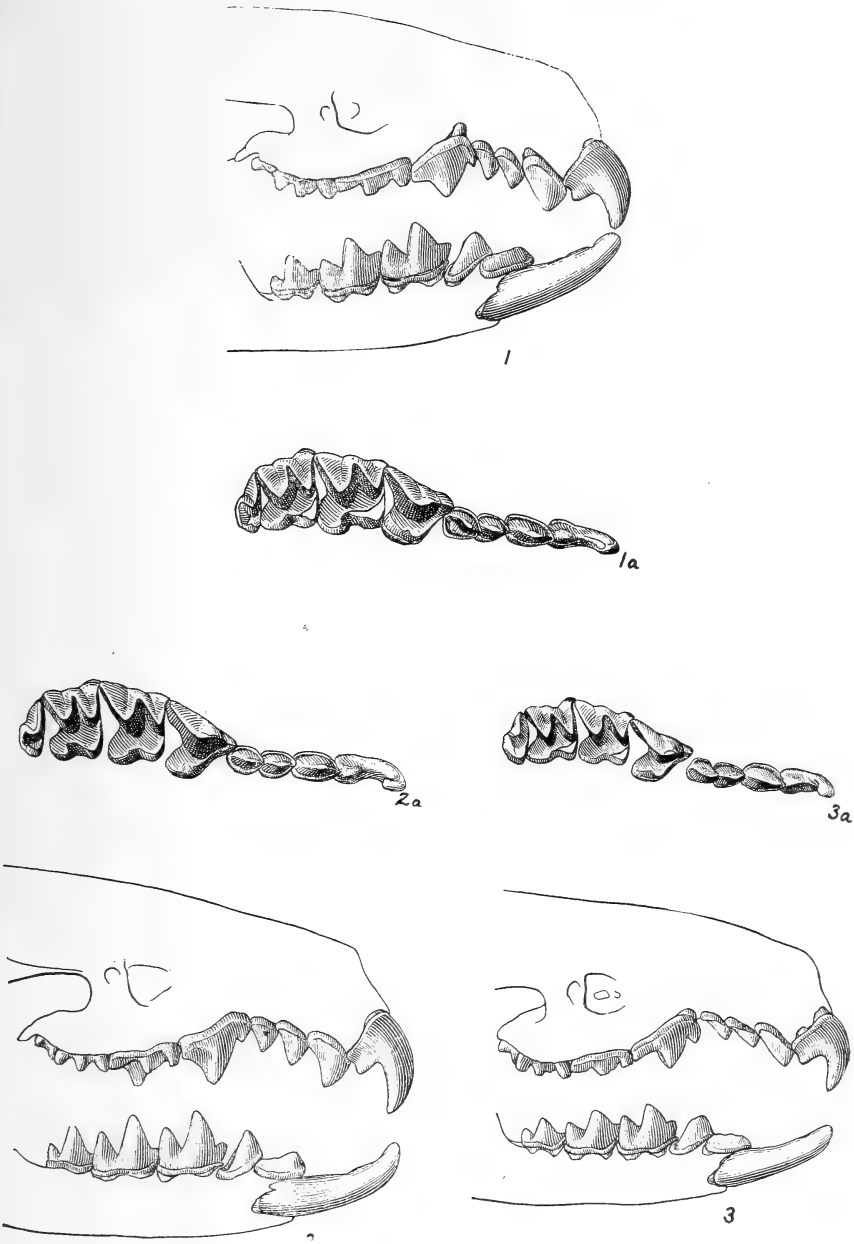
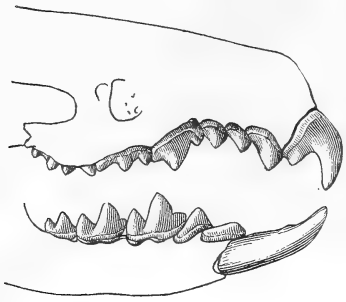
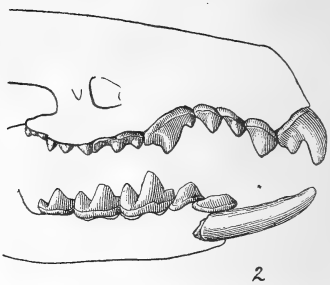
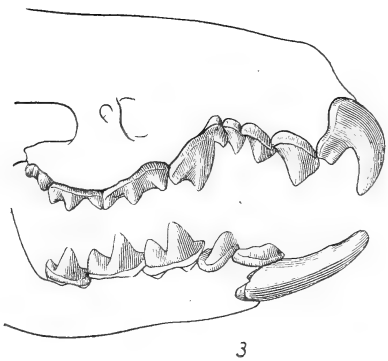


Fig. 1. Crocidura caliginea.
Fig. 2. " oritis.
Fig. 3. " latona.







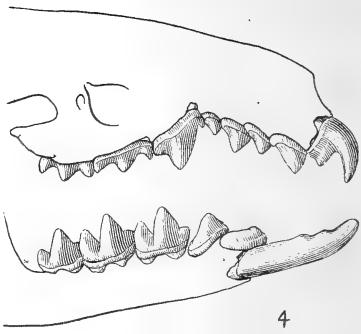


Fig. 1. Crocidura ludia
" 2. " polia.
Fig. 3. Crocidura congobelgica.
" 4. Sylvisorex oriundus.

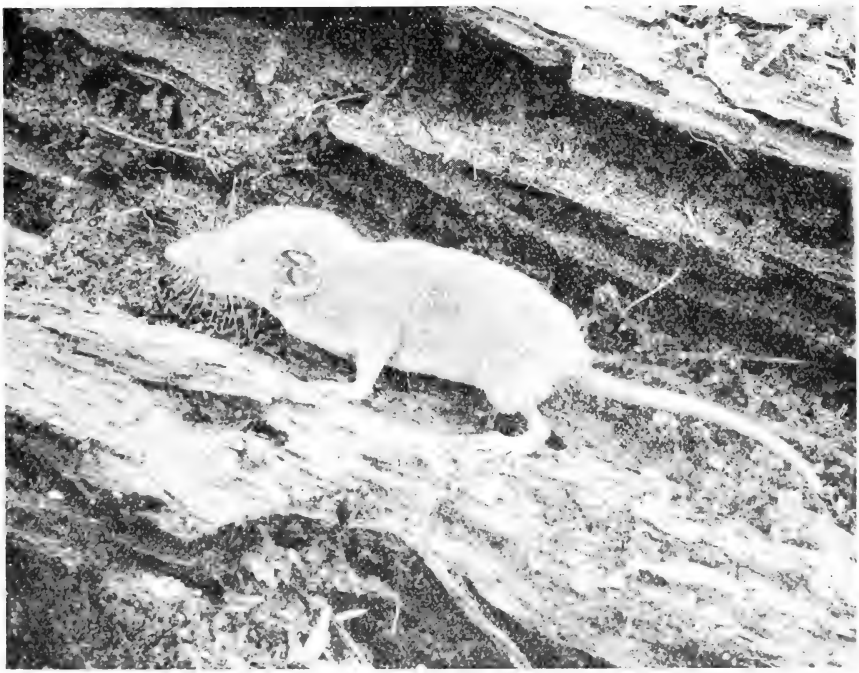


Fig. 1. *Crocidura nyansæ kivu* Osgood.
Fig. 2. *Crocidura jacksoni denti* Dollman.

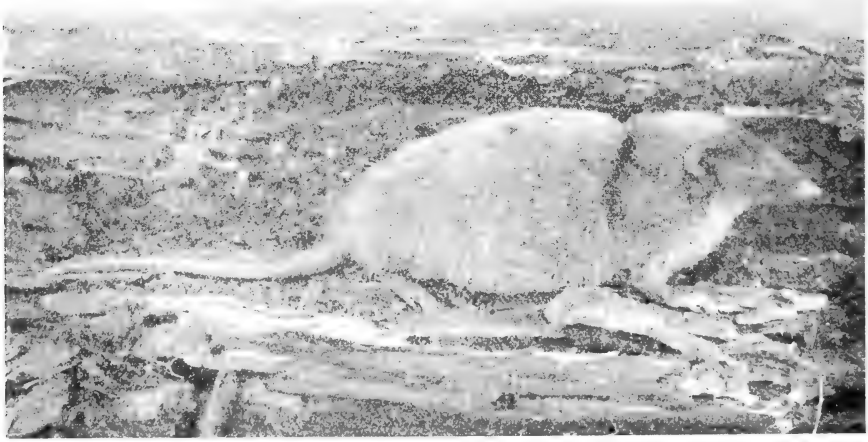


Fig. 1. *Sylvisorex oriundus* Hollister.
Fig. 2. *Scutisorex congicus* Thomas.

(*Continued from 4th page of cover.*)

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(Continued on 3d page of cover.)

Harry Hoogstraal

(3)

The American Museum Congo Expedition Collection of Insectivora

By the late J. A. Allen

BULLETIN

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

Vol. XLVII, Art. I, pp. 1–38.

New York

Issued July 20, 1922

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OF

The American Museum of Natural History

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DATES OF PUBLICATION OF SEPARATES

The edition of separates is 300 copies, of which about 100 are mailed on the date of issue, and the others placed on sale in the Library.

Art. I, July 20, 1922.
" II, October 27, 1922.
" III, April 11, 1924.
" IV, February 6, 1925.

LIST OF ILLUSTRATIONS

Plates

Text Figures

Maps

LIST OF NEW TAXONOMIC NAMES IN THIS VOLUME

Genera

Species and Subspecies

ERRATA

Page 233, line 16 from top, for *Leol. azandicus* read *Leo l. azandicus*.
" 264, line 2 of table, for *ituriensis* read *iturensis*.
" 287, line 1 from top, for 1625 read 1925.
" 328, footnote, lines 1 and 2, for synonym read homonym.
" 359, line 23 from bottom, for LXVII read XLVII.
" 477, line 14 from bottom, for Fsihego read *Fsihego*.
" 477, line 12 from bottom, for Matsche read Matschie.
" 481, line 19 from top, for *Fsihego ituricus* read *Fsihego ituriensis*.

TO THE MEMORY OF

JOEL ASAPH ALLEN

Eminent mammalogist and ornithologist, who, in addition to his duties as curator, for thirty-two years directed and edited the Bulletin and Memoirs of The American Museum of Natural History, this volume of his posthumous papers is dedicated.

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BULLETIN
OF
THE AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME XLVII, 1922

59.9,33(67.5)

Article I.—THE AMERICAN MUSEUM CONGO EXPEDITION COLLECTION OF INSECTIVORA[1]

BY THE LATE J. A. ALLEN[2]

PLATES I TO IV, AND 1 TEXT FIGURE

CONTENTS

[1]Scientific Results of The American Museum of Natural History Congo Expedition. Mammalogy, No. 5.

[2]This paper was in press at the time of Dr. Allen's death but the final proofs were not seen by him. —EDITOR.

INTRODUCTION

The collection of Insectivores obtained by the American Museum Congo Expedition[1] numbers about 377 specimens, of which 51 represent the Potamogalidæ, 140 the Macroscelididæ, 9 the Erinaceidæ, and 177 the Soricidæ. In the preparation of this paper the author has had the efficient coöperation of Mr. Herbert Lang, the leader of the American Museum Congo Expedition. The colored plate (Plate I), illustrating individual variation in coloration in *Rhynchocyon stuhlmanni claudi*, is by Charles R. Knight. The text illustrations are from excellent pen drawings by Mrs. Ziska.

In working up the material here recorded valuable assistance has been obtained through material loaned for comparison by the authorities of the United States National Museum, through the kindness of Mr. Gerrit S. Miller, Jr., Curator of Mammals, and from the Museum of Comparative Zoölogy at Harvard University, through the kindness of Director Samuel Henshaw and Dr. Glover M. Allen, Curator of Mammals.

The Soricidæ of the Congo Expedition were placed for determination in the hands of Mr. N. Hollister, Assistant Curator of Mammals at the United States National Museum, in 1916, he having then been for sometime engaged in a critical study of the African Soricinæ in the National Museum. His report on the shrews of the Congo Expedition was published in October 1916.[2]

---

[1]Supplemental Note on *Hipposideros langi* Allen (Bull. Amer. Mus. Nat. Hist., XXXVII, pp. 434–438, text figs. 4–6. September 29, 1917).

Since the publication of the paper on the Congo Expedition Collection of Bats, I have had an opportunity to compare, through the kindness of Mr. Gerrit S. Miller, Jr., Curator of Mammals in the United States National Museum, three skins and four skulls identified as *Hipposideros cyclops* (Temminck), from Efulen, Cameroon. While these specimens are not from the type region of *cyclops* (Boutry River, Gold Coast), it is interesting to note that they are uniformly and strikingly different in coloration from the series on which *langi* was based, indicating at least considerable plasticity in the *cyclops* group. In *langi* the whole head is yellowish brown, in strong contrast with the upperparts of the body, while in the Efulen specimens it is uniform in color with the back and the upperparts are also much darker than in *langi*. The measurements, both external and cranial, indicate slightly larger size for the Efulen form. While *langi*, as stated in the original designation, is a member of the *cyclops* group, it should evidently be recognized as a well-marked geographic race, under the designation *Hipposideros cyclops langi*, and the Efulen specimens as *H. cyclops micaceus* (de Winton; type locality "Como River, 75 miles from Gaboon"), with the description of which the Efulen specimens agree and with which the *langi* series does not agree. Whether or not *micaceus* is referable in a strict sense to true *cyclops* I have not the means at present for determining.

[2]'Shrews Collected by the Congo Expedition of the American Museum.' By N. Hollister. Bull. Amer. Mus. Nat. Hist., XXXV, pp. 663–680, Pls. VII–XI. October 21, 1916.

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
Akenge	*Rhynchocyon stuhlmanni claudi*	5	5
Avakubi	*Potamogale velox*	1	
"	*Rhynchocyon stuhlmanni stuhlmanni*	2	
"	*Crocidura nyansæ kivu*	3	
"	" *jacksoni denti*	6	
"	" *bicolor*	1	
"	" *oritis*	1	
"	" *latona*	1	15
Babeyru	*Crocidura jacksoni denti*	1	1
Bafwabaka	*Potamogale velox*	1	
"	*Crocidura jacksoni denti*	1	
"	*Scutisorex congicus*	2	4
Budongo Forest	*Rhynchocyon stuhlmanni stuhlmanni*	1	1
Faradje	*Potamogale velox*	2	
"	*Nasilio fuscipes*	21	
"	*Atelerix faradjius*	2	
"	" *langi*	6	
"	*Crocidura sururæ*	1	
"	" *lutrella*	1	
"	" *turba nilotica*	3	
"	" *jacksoni denti*	5	
"	*Sylvisorex gemmeus irene*	1	42
Gamangui	*Potamogale velox*	1	
"	*Crocidura nyansæ kivu*	1	
"	" *jacksoni denti*	2	4
Garamba	*Nasilio fuscipes*	1	
"	*Atelerix langi*	1	
"	*Crocidura sururæ*	1	3
Lubila	*Crocidura congobelgica*	1	1
Medje	*Potamogale velox*	30	
"	*Rhynchocyon stuhlmanni claudi*	20	
"	*Crocidura nyansæ kivu*	16	
"	" *caliginea*	1	
"	" *jacksoni denti*	51	
"	" *oritis*	4	
"	" *latona*	1	
"	" *ludia*	2	
"	" *polia*	1	
"	" *congobelgica*	1	
"	*Sylvisorex gemmeus irene*	18	
"	" *oriundus*	1	
"	*Scutisorex congicus*	42	188

Localities	Species and Subspecies	No. of Specimens	Totals
Nala	*Rhynchocyon stuhlmanni claudi*	1	
"	*Crocidura turba nilotica*	1	
"	" *jacksoni denti*	3	5
Ngayu	*Crocidura ludia*	1	1
Niangara	*Potamogale velox*	3	
"	*Nasilio fuscipes*	8	
"	*Crocidura jacksoni denti*	2	13
Niapu	*Potamogale velox*	13	
"	*Rhynchocyon stuhlmanni claudi*	79	92
Penge	*Rhynchocyon stuhlmanni stuhlmanni*	2	2

New Species and Subspecies, with Their Type Localities

1. *Atelerix faradjius* J. A. Allen. Faradje.
2. " *langi* J. A. Allen. Faradje.
3. *Crocidura caliginea* Hollister.[1] Medje.
4. " *oritis* Hollister.[1] Avakubi.
5. " *latona* Hollister.[1] Medje.
6. " *ludia* Hollister.[1] Medje.
7. " *polia* Hollister.[1] Medje.
8. " *congobelgica* Hollister.[1] Lubila.
9. *Sylvisorex oriundus* Hollister.[1] Medje.

General Summary

Families	Genera	Species and Subspecies	Specimens	Localities
Potamogalidæ	1	1	51	7
Erinaceidæ	1	2	9	2
Soricidæ	3	15	177	11
Macroscelididæ	2	3	140	10
	7	21	377	

POTAMOGALIDÆ

Potamogale velox Du Chaillu

Cynogale velox Du Chaillu, 1860, Proc. Boston Soc. Nat. Hist., VII (1859–61), November, pp. 361–363. Ogowe River, French Equatorial Africa. (*Potamogale* tentatively proposed on p. 363 in place of *Cynogale*.)

Mystomys velox Gray, 1861, Ann. Mag. Nat. Hist., (3) VIII, July, p. 61.

Mythomys velox Gray, 1861, Proc. Zool. Soc. London, p. 275. Believed to be a rodent.

Potamogale velox Du Chaillu, 1874, 'A Journey to Ashangoland,' p. 118. Further notes on the species, in defending himself against erroneous and unkind criticism.

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[1]Described 1916, Bull. Amer. Mus. Nat. Hist., XXXV.

Potamogale velox ALLMAN, 1866, Trans. Zool. Soc. London, VI (1869), pp. 1–16, Pl. I (animal), Pl. II (skeleton), text figs. 1–9 (hair, head, ear, feet, anal glands, and sexual organs). A spirit specimen (dentition not complete, lacking the last molar) from Old Calabar.

Potamogale allmani JENTINK, 1895, Notes Leyden Mus., XVI, p. 234. Based on Allman's (as above) detailed account and figures of an immature specimen from Old Calabar, having only 36 teeth.

Potamogale allmani GRANDIDIER, 1904, Bull. Mus. d'Hist. Nat. Paris, X, p. 51. Two immature specimens, each with only 36 teeth, provisionally referred to Jentink's "espèce incertaine," "si son existence réelle était démontrée." Of 9 specimens in the Paris Museum (3 of them without skulls) 6 were yellowish beneath and each of the skulls, so far as available, had 40 teeth. These were referred to *P. velox*.

Potamogale velox argens THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 470. Two specimens: Medje and Poko, Belgian Congo.

Represented by 51 specimens (with skulls and 7 skeletons), collected as follows:

Medje, 30 (19 males, 11 females): January 24, 25, March 2–31, April 10–17, May 9 and 13, August 31, and September 10, 1910; February 27, April 16, June 4, and July 18, 1914.

Bafwabaka, 1: January 9, 1910.

Gamangui, 1: February 20, 1910.

Niangara, 3: November 11–29, 1910; and June 20, 1913.

Faradje, 2: February 21 and May 22, 1911.

Avakubi, 1: December 9, 1913.

Niapu, 13 (10 males, 3 females): November 26–December 31, 1913.

The males number 36, the females 15. The number of fully adult specimens (of which measurements are given below) is 20 (16 males, 4 females). More than one half are immature, varying from those in which the third molar, or both the second and third molars, are undeveloped (number of teeth 32 or 36) to those with mature dentition (40 teeth).

In respect to seasonal distribution, one or more specimens were taken in each month of the year except October, but the greater part at two quite distinct seasons of the year—December and March (November 26–December 31, 13 specimens; March 2–31, 16 specimens). This would seem to afford opportunity for the study of the influence of season upon the coloration and character of the pelage, but unfortunately, this is not the case, since only the Niapu series (taken in December) and a few others were made up from fresh specimens while the greater part (including nearly all of the large series from Medje) were not made up till they were received at the Museum several years later, when it was found that the fatty matter left on the skins had stained the white underparts.

Collectors' measurements of 7 adult males and 3 adult females from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	575 (555–610)	310 (298–325)	267 (250–290)	43.0 (41–46)	21.5 (21–23)
♀	603 (600–610)	323 (310–339)	284 (280–290)	41.7 (41–43)	21.5 (21–22)

Skull, same specimens, condyloincisive length: ♂, 63.8 (61.1–65.9); ♀, 64 (63.6–64.3).

Collectors' measurements of 5 adult males and 1 adult female from Niapu:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	586 (542–610)	329 (297–347)	260 (245–273)	45 (43–48)	22 (22–22)
♀	585	330	255	41	21

Skull, same specimens, condyloincisive length: ♂, 65.5 (63.8–66.5); ♀, 63.5.

Collectors' measurements of 4 adult males from other localities (Bafwabaka 1, Gamangui 1, Niangara 2):

Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
565 (550–583)	294 (279–312)	268 (260–272)	43.5 (43–44)	21.3 (20–22)

Skull, same specimens, condyloincisive length: 64.8 (62.7–66.7).

The above statistics indicate that there is no distinctive sexual difference in size. The smallest skulls in each series are, as a rule, the youngest, or skulls with full mature dentition but in which the teeth are wholly unworn and the cranial sutures still distinct. There is no skull young enough to show the milk dentition. In several skulls in which the first molars are fully developed, the condyloincisive length is 50–51 mm.; in those in which the second molars are fully up but the third molar is still enclosed in the gum it ranges from 53–55 mm.; during the development of the third molar the skull length increases to about 60–61.5.

Potamogale velox argens was based on two specimens, one from Medje and one from Poko. As no type locality was definitely indicated, Medje, the first locality mentioned in the description, is here designated as the type locality. Hence the present series of 31 specimens from Medje are topotypes. Poko and Niapu are both near Medje. The Niapu series of 13 specimens is in fine condition, the underparts being unstained, and agrees in a general way with the brief description of *argens;* it shows, however, that the white area of the underside varies in extension upward on the sides and that the development of brown-tipped hairs along its upper border is also a variable feature. The fore limbs are sometimes "almost wholly in the whitish area" and sometimes wholly brown above in specimens from the same locality and collected on the same day, show-

ing this alleged distinction to be subject to a wide range of individuality. Specimens taken at approximately the same date vary greatly in the condition of the pelage in respect to wear, but, on the whole, December specimens, taken near the close of the dry season, appear more worn than those taken in March–May, the rainy period. But doubtless the season of moult varies in different individuals and, like the birth of the young, may extend over a considerable part of the year.

Only two forms of *Potamogale*, in addition to the original *P. velox* Du Chaillu, appear to have been distinguished. These are *P. allmani* Jentink (1895), based on Allman's detailed description (*loc. cit.*) of a specimen preserved in spirits from Old Calabar, published some twenty-six years before. The second, *P. velox argens* Thomas, was added in December 1915, on the basis of two specimens from the Upper Congo. The large series of specimens collected by the American Museum Congo Expedition demonstrates that the characters relied upon for the discrimination of these two forms are without value and, for this reason, are subjected to comment.

As shown in the collectors' field notes on this species the genus *Potamogale* has a wide geographic range, and hence might be expected to have developed local phases. It is not the purpose of these remarks to discredit such a reasonable probability but merely to show that the evidence presented for the two forms above cited is far from adequate. Unfortunately, little material is available for direct comparison with that from the Upper Congo region, but the latter emphatically shows the trivial nature of the distinctions offered by their describers for the recognition of *allmani* and *argens*. Reference has already been made (p. 5) to the stained condition of the underparts due to treatment of the skins before they were made up. Apropos of this, and in response to my inquiries, the collectors have informed me that "all living or freshly killed specimens they saw had pure white, lustrous fur on the under side, if not soiled by the reddish clay of these regions"; and they add that "some of their own skins from the same places, when unpacked, were yellowish, due to a difference in the method of preservation." They also state that they "noticed that in many old, flat skins or portions of them from the same localities, which they saw in the possession of Europeans and natives, the originally white area was always yellowish or brown." It is also well known that in museum specimens the white underside of mammals long stored are apt to turn yellowish from fatty matter retained in the skin, or from other causes, and therefore are unsatisfactory as standards of comparison with freshly collected material.

While *Potamogale* is a rather common animal in its native haunts, it is one of the rarest in collections and, when present, is doubtless not safely comparable with freshly killed specimens.

Potamogale allmani was proposed on the basis of two (in part hypothetical) distinctions: (1) the presence of 36 teeth (owing to the immaturity of the specimen) instead of 40; (2) the "brownish yellow" instead of white underparts, due to discoloration by the preservative. *P. velox argens* was described from two apparently normal specimens in which the white of the underparts reached "higher up on the sides" of the body and on to the under surface of the basal portion of the tail than in *P. velox,* which features a large amount of topotype material shows to be inconstant and merely individual. Consequently *allmani*[1] and *argens* cannot be considered as entitled to recognition.[2]

It is hardly necessary to add that many forms, species as well as subspecies, have a similarly unsatisfactory basis, as they rest on slight differences shown by single specimens, or on characters of trivial importance. Their confirmation, it is obvious, rests on a comparison of adequate series of topotype material with similar series of their near allies; and the author who would discard them without such resources would take great risks, notwithstanding his strong conviction that the forms in question are merely names.

ERINACEIDÆ

STATUS OF *Erinaceus albiventris* AND *E. pruneri* WAGNER

The *Erinaceidæ* are represented in the Lang-Chapin Congo Collection by nine specimens (skins with skulls), all from Faradje except a third-grown female from Garamba, a nearby locality. They comprise three adult females and six young, from one-third to one-half grown, and unquestionably represent two distinct species, differing in important cranial characters and in external features. Both belong to the section of the family in which the hind feet are four-toed. Owing, however, to the unsatisfactory original descriptions of the first-named members of this group, and to lack of proper material for direct comparison with the Lang-Chapin specimens, their determination has been difficult. Thanks to the authorities of the Museum of Comparative Zoölogy at Harvard University and of the United States National Museum at Washington, I have in hand 14 additional specimens of the group with 4-toed hind

[1] In respect to the status of *P. allmani*, cf. Leche, who in 1907 (Zoologica, XX, Heft 49, pp. 6 and 129, footnote 1) regarded it as only "ein jugendliches Individuum" of *P. velox*.

[2] See above (p. 5) the citation of Grandidier's paper on the Paris Museum series of *Potamogale*

feet, making 23 in all, representing five easily recognizable forms. While their relationships *inter se* are obvious, the names properly applicable to the two forms from Faradje have raised a serious question of nomenclature. One of them should apparently be referred to *E. albiventris* Wagner, as that name has of late been employed, but which of them should be so recognized is indeterminable. This raises the further and more fundamental question of the availability of this name, considered with relation to its origin and history.

As is well known, Wagner, in 1841, described as new two species of *Erinaceus* (*albiventris* and *pruneri*) on consecutive pages of the same work,[1] for neither of which was given a definite type locality. *Erinaceus albiventris*, the first in sequence of the two species, was based on a single specimen obtained from a dealer, who stated that it was found in a collection from India ("befand er sich unter einer Sendung indischer Thiere"), Wagner himself saying: "Die Heimath kann ich nicht genau bestimmen." The original description of the species was inadequate, merely indicating that it had, like many other species of *Erinaceus* now known, white underparts, parti-colored spines, and other features of no distinctive significance. In later references[2] to the species he stated that the hind feet have only four toes. This fixed the "Heimath" as Africa, inasmuch as no species of this genus having 4-toed hind feet are known to occur elsewhere. Fortunately, the type remained available for examination by later investigators, confirming its African origin. *Erinaceus albiventris* Wagner thus became a "blanket name" for all the African species of *Erinaceus* with 4-toed hind feet. Various forms of the group later became segregated, one after another, under distinctive names as species, and the name *albiventris*, by some authors, was restricted (apparently rather informally) to a Sudan form.[3]

Erinaceus pruneri Wagner, synchronous in publication with his *E. albiventris*, was based on specimens received from Dr. Franz Pruner, from a locality not definitely stated in the original description, nor in Wagner's later references to the species,[4] where he gives its distribution as "Sennaar, nach Sundevall auch am Senegal." It is to be noted that he synonymized (in 1842 and 1855) *E. heterodactylus* Sundevall, based on specimens from the Bahr el Abiad (White Nile), Sennaar, with his *E.*

[1]1841, 'Schreber's Säugthiere,' Suppl., II, pp. 22 and 23.
[2]1843, Wiegmann's Archiv für Naturg., IX, 2 Bd., p. 27; 1855, 'Schreber's Säugthiere,' Suppl., V, p. 587.
[3]Thomas and Wroughton, in describing their *Erinaceus spiculus*, from near Lake Chad, in 1907 (Ann. Mag. Nat. Hist., (7) XIX, p. 371), made comparison with "the Soudanese *albiventris*," and further state: "The nearest neighbors of *spiculus* are *albiventris*, Wagner, from the Soudan and *Adansoni*, Rochebrune, from Senegal."
[4]1855, 'Schreber's Säugthiere,' Suppl., V, p 587.

pruneri, a course followed by apparently nearly all subsequent authors. But not by all, since von Heuglin[1] in 1867 gave a list of the species of *Erinaceus* occurring in "Nordost Afrika" in which he included: "*Erinaceus pruneri* Wagner. Aus dem Sennaar." And Fitzinger[2] recognized it as not only distinct from *albiventris* but as the type and only species of his genus *Peroëchinus*. In the original description of *pruneri* it is stated merely that the specimens on which it was founded came in a collection of mammals sent by Dr. Pruner from "Kairo." It is known, however, that Dr. Pruner visited the Upper Nile region and there collected specimens of hedgehogs that were sent to Wagner,[3] among them those on which *pruneri* was originally based.

It may be noted further that Sundevall, about the same time (see below, p. 12), described his *Erinaceus heterodactylus*,[4] a species having 4-toed hind feet, based on specimens collected by Dr. Hedenborg in "Sennaar," and that this species has always been synonymized with *E. pruneri* by subsequent writers, both forms coming from "Sennaar." As both have been referred by most authors to *E. albiventris*, it may be that this fact has had an influence in the recognition of Sudan as the type region of *albiventris* (or, more definitely, Kordofan, in the case of *pruneri*).

To follow further the history of *E. albiventris*, from a geographic point of view, Fitzinger, in 1867,[5] gave its Vaterland as "nicht mit Sicherheit bekannt, wahrscheinlich aber Ost-Indien," and that of *pruneri* as Kordofan. Dobson, in 1882,[6] gave the range of *albiventris* as "Northern Tropical Africa (Senegambia, Sennaar)," and Anderson in 1895,[7] as extending from "Senegambia across Central Africa, southwards to Uganda and northwards to Somaliland." In 1902,[8] he stated: "The specimen upon which Wagner founded this species [*Erinaceus albiventris*] came, in all probability, from Senegambia,"[9] and adds: "The Nile Valley and East African specimens . . . may be more

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[1] 'Beitr. zur Fauna der Säuget. N. O. Afrika,' p. 22.
[2] 1867, Sitzungsb. math. nat. Cl. Akad. Wiss. Wien, LVI, p. 126.
[3] Cf. Anderson's 'Mammals of Egypt,' 1902, p. 162.
[4] 1841, Sven. Vet. Akad. Handl. Stockholm, (1842,) p. 227.
[5] Sitzungsb. math. nat. Cl. Akad. Wiss. Wien, LVI, p. 856.
[6] 'Monograph of the Insectivora,' p. 11.
[7] Proc. Zoöl. Soc. London, 1895, p. 420. Anderson included under *Erinaceus albiventris* *E. pruneri* Wagner, *E. heterodactylus* Sundevall, *E. adansoni* Rochebrune. He added: "This species [*albiventris*] has been obtained at the following localities: Senegal; Saint Louis; Cape Verd; Joal; MacCarthy's Island, River Gambia [collectively = range of *E. adansoni*]; Accra, Fantee; Porto Seguro, Togo; Gaboon; Kitui, Ukamba [type locality of *E. hindei* Thomas, 1907]; Tabora; Kasé; Kilima Njaro; Wakilomi, District of Maka; Central Somaliland; Sennaar [*E. heterodactylus*]; Kordofan [*E. pruneri*]; and region of Upper Nile."
[8] 'Mammals of Egypt,' p. 164.
[9] This statement, doubtless, was based on his personal examination of the type in the Munich Museum, as he states in another connection (1895, Proc. Zoöl. Soc. London, p. 414): "I may mention that I have examined all the Hedgehogs preserved in the Museums of Paris, Frankfort on the Main, Munich, Berlin, and London, and . . . some of the specimens described by Fitzinger in the Vienna Museum."

definitely registered as *Erinaceus albiventris* subsp. *pruneri*." Again he says, later on the same page, referring to *albiventris:* "This species is found to the south of Khartum," and "ranges into Somaliland and as far south as Kilima-nyaro." Within this region, since 1902, two forms (*E. hindei* Thomas and *E. albiventris sotikæ* Heller) in addition to *pruneri* have been recognized,[1] and two more are added in the present paper, both from Faradje, northeastern Belgian Congo.

As stated above (p. 9, footnote), Thomas and Wroughton in 1907, in describing their *Erinaceus spiculus*, referred to Sudanese specimens as typical of *E. albiventris*. In view of the complications of the case, it seems to me preferable to place *Erinaceus albiventris* permanently in the list of unidentifiable species, it having no type locality and being specifically unidentifiable from the original description, although the type appears to have been preserved in the Munich Museum.[2] Senegal (or Senegambia) and Sudan (or Sennaar), the rival suggested type regions, are far apart, with *E. adansoni* representing the former and *E. pruneri* the latter as well established species. Under this ruling the two forms from Faradje are described as new.

Atelerix Pomel

Since the foregoing was prepared for the press a paper by Oldfield Thomas, on 'The Generic Divisions of the Hedgehogs' (1918, Ann. Mag. Nat. Hist., (9) I, February, pp. 193–196) has appeared, respecting which a few notes are here appended. The old genus *Erinaceus* is divided by Thomas into five genera, which, with their designated genotypes, are as follows:

1. *Erinaceus* Linné, 1758. Genotype, *E. europæus* Linné.
2. *Æthechinus*, new genus. Genotype, *E. algirus* Duvernoy and Lereboullet.
3. *Atelerix* Pomel, 1848. Genotype, *E. albiventris* Wagner.
4. *Hemiechinus* Fitzinger, 1866. Genotype, *E. platyotis* Sundevall.
5. *Parechinus* Trouessart, 1879. Genotype, *E. micropus* Blyth.

Although each of these groups is represented in Africa, only *Atelerix* and *Æthechinus* come geographically within the scope of the present paper. *Atelerix* was proposed by Pomel (1848) as a subgenus of *Erinaceus*, with the statement "4 dactylus" as the entire diagnosis. No species was referred to it, and no geographic range was indicated for the

[1]Since this was written Thomas has added a third from Kilimanjaro as *Atelerix kilimanus* (1918, Ann. Mag. Nat. Hist., (9) I, March, p. 232.

[2]As stated above (p. 10, footnote), the type was probably critically studied by Anderson prior to 1895, together with the type of *pruneri*, leading to his assignment of the type locality of *albiventris* to Senegambia, and to his later recognition of *pruneri* as an eastern subspecies of *albiventris*.

group. Neither is it indicated whether "4 dactylus" refers to the hind feet or to the fore feet, or to all the feet. It happens, however, that only one species of hedgehog had at that time been characterized as 4-dactylus in the original description of the species. This was *Erinaceus heterodactylus* Sundevall (1841, Sven. Vet. Akad. Handl. Stockholm, p. 227), which is characterized as, among other distinctions, "Pedibus posticis 4 dactylis," which is doubtless the original source of Pomel's "4 dactylus." At about the same date (1841) Wagner described *Erinaceus albiventris* and *E. pruneri* on consecutive pages of the same work, without specifying this character for either species. The first of these (*E. albiventris*) I consider specifically unidentifiable, for reasons already given in the present paper. This is the species now designated by Thomas as the type of *Atelerix*. Wagner, two years later, in his 'Bericht über die Naturgeschichte der Säugthiere während des Jahres 1842' (1843, Arch. für Naturg., Bd. 2, p. 27), claimed priority for his *pruneri* over *heterodactylus* Sundevall, to which he referred the latter as a synonym. He says he received a separate of Sundevall's paper from the editor of the Archiv, and that the volume in which it was printed was issued later, but, as he fails to state when Sundevall's paper was received, or what date it bore, we are left in doubt as to which paper has priority of publication, the date of his own publication being "15. Mai 1841."

In his comment on Sundevall's paper he says that "*E. heterodactylus* Sund. mit meinem *E. Pruneri* identisch ist; auch der hintere Daumen geht diesem wie jenem ganz ab." He says further that he had assumed the absence of the hallux in *E. pruneri* and *E. albiventris* to be the result of an injury and for that reason did not mention it; but, inasmuch as Sundevall had found the same suppression in his *E. heterodactylus*, he now considered it an important character for his *E. pruneri* and *E. albiventris*, to be included in the diagnosis. It is accordingly so included in his later revision of the hedgehogs (1855, 'Schreber's Säugt.,' V, p. 587).

The question of what name the genotype of *Atelerix* should bear is thus somewhat complicated, depending upon priority of publication of the names *E. heterodactylus* Sundevall, under which the expression "4 dactylus" (the sole diagnosis of *Atelerix*) was first employed for a hedgehog, and which was first recognized as a character of *E. pruneri* some two years later. In any case, by the consensus of authorities both names refer to the same species. Furthermore, *Peroëchinus* Fitzinger (1866), without diagnosis, included only *E. pruneri* (with *E. heterodactylus* Sundevall as synonym), which is, therefore, the genotype of *Peroëchinus*. As *Peroëchinus* is a substitute name for, or at all events a pure synonym

of, *Atelerix*, it thus determines under the peculiar conditions of the case the genotype of the latter as *E. pruneri*. (Cf. 'Internat. Code Zoöl. Nomen.,' Art. 30, II, *f.*)

In Thomas's synopsis of the hedgehogs, the sole distinctive character of *Atelerix* is: "Hallux absent;" and, so far as I can find, this is the only distinction between *Atelerix* and his new genus *Æthechinus*, defined as: "Coronal parting broad, conspicuous. Posterior palatal shelf broad. Third incisor two-rooted." The last two characters, in comparison with *Erinaceus* (as restricted by Thomas), are both present in *Atelerix;* the first is of less importance, depending upon the stress to be laid upon the words "broad, conspicuous," since in *Atelerix* there is a distinct coronal parting, although less developed than in *Erinaceus europæus* and its near allies.

As shown below (p. 17), the absence of the hallux is not constant, and therefore not an important character, since in different individuals of the same litter of young it may be present or absent, although absent as a rule in a number of forms of the *pruneri* (*heterodactylus ?*)-*adansoni* group, which is distributed over a wide geographical area. I agree with Thomas that both *Atelerix* and *Æthechinus* are separable from *Erinaceus, sensu stricto,* but collectively rather than as two generic groups, for which the rule of priority demands the earlier name, *Atelerix.*

The forms referred to *Atelerix* by Thomas are:

1. *albiventris* =*Erinaceus albiventris* Wagner, 1841.
2. *adansoni* =*E. adansoni* Rochebrune, 1882.
3. *hindei* =*E. hindei* Thomas, 1910.
4. *spiculus* =*E. spiculus* Thomas and Wroughton, 1907.
5. *spinifex* =*Atelerix spinifex* Thomas, March, 1918.
6. *kilimanus* =*A. kilimanus* Thomas, March, 1918.

To which may be added:

7. *hindei sotikæ* =*E. sotikæ* Heller, 1910.
8. *faradjius* =*A. faradjius* (described below).
9. *langi* =*A. langi* (described below).

And *pruneri* =*Erinaceus pruneri* Wagner, 1841 (=?*E. heterodactylus* Sundevall, 1841), in place of "*albiventris*" as No. 1 of the above list, and also as type of *Atelerix* in place of *albiventris.*

Atelerix faradjius, new species

Type, No. 51006, ♀ ad., Faradje, northeastern Belgian Congo, July 7, 1911; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1660. Topotype (♀ very old), No. 51007.

Represented by two adult females from Faradje, of the so-called "*albiventris*" type.

General coloration of the upperparts strongly yellowish white superficially, the broad light tips of the spines being of this color and nearly concealing the dark subterminal zone. Head in front of eyes, including sides of nose, dull tawny-brown; also ears and feet the same in general effect; a broad frontal band, cheeks, sides of neck, sides of shoulders and forearms, thighs and hind legs, rump and whole underparts uniform dull yellowish white (possibly white slightly stained yellowish); upper surface of fore feet slightly clothed with yellowish-white hairs, hind feet more heavily clothed with longer yellowish-white hairs, through which the pale tawny color of the skin determines the general effect; tail similar in coloration to the feet. Spines broadly tipped (for about 4–5 mm.) with yellowish white (without darker tips); subapical band (about 5 mm.) dark tawny-brown, passing proximally into dull yellowish white on the basal half. Longest head spines about 17 mm. in length, body spines about 15 mm.

Collectors' measurements: total length (type), 249 mm.; head and body, 230; tail, 19; hind foot, 29; ear, 30. Topotype (very old female with greatly worn teeth): total length, 205; head and body, 180; tail, 25; hind foot, 26; ear, 30.

Skull measurements: condyloincisive length, (type) 45.1, (topotype) 43.6; length of nasals, 16.5, 15; palatal length (to front of premaxillæ) 25.4, 24.7; zygomatic breadth, 27.7, 26.3; interorbital breadth, 11.8, 11.5; breadth of braincase, 19.5, 19.9; postglenoid breadth, 22, 20; mastoid breadth, 15.5, 16.5; palatal breadth (outside to outside of m^1), 17.6, 16.8; breadth of rostrum at base of front incisor, 6, 5.4; breadth of palate at ridge behind m^3, 9.7, 8.5; tip to tip of alisphenoid processes, 11.2, 11.3; tip to tip of pterygoids, 6.1, 6.7; length of mesopterygoid fossa, 10.7, 10.2; breadth between pterygoids, 2.8, 2.7; length of upper toothrow (i^1–m^3), 21.5, 21.5; upper molars, 8.1, 8.1; lower toothrow (to tip of i^1), 9.7, 8.2; lower molars, 9.9, 9.8; length of mandible (front of symphysis to posterior border of condyle), 34.5, 34.2; depth, angle to coronoid, 17.7, 16.7.

The skull is large and heavy; the nasals are long and narrow, the premaxillæ greatly extended posteriorly, meeting the frontals and excluding contact of the maxillæ with the nasals; zygomatic arches narrow as in *A. pruneri;* mesopterygoid fossa very broad, the pterygoids and alisphenoids heavily developed and widespreading as in *A. hindei* (the reverse of what is seen in *A. pruneri*[1]); dentition heavy, as in *A. langi* and *A. hindei.*

The pattern of coloration is as in *A. pruneri,* differing from that of *langi* and *hindei* in having the space below the eye white instead of blackish. The spines are as in *pruneri*—short and fine instead of long and coarse, and those of the frontal border not conspicuously lengthened as in the *hindei* group. The general coloration of both spine-tips and hair is more yellowish and less clear white than in *pruneri;* the nose and basal color of the feet and ears is tawny instead of blackish as in *pruneri* and in *hindei.* This however may be subject to considerable variation through seasonal and other conditions.

[1]The specimen of *A. pruneri* here employed in comparison is No. 14446, Mus. Comp. Zoöl., a young adult male (teeth unworn), collected at Fazogli, Blue Nile, by Dr. G. M. Allen and recorded by him (Bull. Mus. Comp. Zoöl, LVIII, p. 342, July, 1914) as *Erinaceus albiventris pruneri.*

Atelerix langi, new species

Type, No. 51000, ♀ ad., Faradje, northeastern Belgian Congo, March 22, 1911; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 1544.

Represented by 7 specimens, the type, an old female, and her litter of five young (3 males and 2 females), about one-third grown, taken March 22, 1911, at Faradje, and another third-grown young collected at Garamba, May 1, 1912.

A dark-colored species, allied to *Erinaceus hindei* Thomas of British East Africa.

Type.—Upperparts dark brown, the spines over the greater part of the back uniform blackish brown from base nearly to tip, the extreme tips tending to lighter brown or even whitish; front of head, flanks and posterior margin of back lighter than the mid-dorsal area, the spines distinctly whitish-tipped, especially on the lower back where all are conspicuously whitish terminally. Ventral surface white, the white area extending along sides of body, shoulders and forearms, and joining the broad white frontal band between the eyes and base of the ears. A narrow line of dusky brown borders the white band in front, broadening laterally to include the cheeks below the eye and extending forward to the naked portion of the face, which, with the chin, is also dark brown. Upper surface of fore and hind feet dark brown, but much lighter than the cheeks. Ears and tail dull brown, the former nearly naked.

Young.—The five third-grown young differ uniformly from the adult type specimen in the dark markings of the face being more intensely black, in vivid contrast with the clear white frontal band. The upper surface of the feet is also deep blackish brown, as is also the tip of the inconspicuous tail. The spines of the dorsal area are all conspicuously and uniformly tipped with white, through which the blackish brown proximal portion of the spines is more or less visible. The young specimens have a tendency to a narrow blackish median area on the posterior part of the ventral surface, in some of them strongly developed. They agree strictly with the mother in the color pattern, but have the black on face and feet more intense and more sharply defined, and the white or whitish tips to the spines longer. The slightly younger specimen from Garamba is indistinguishable from the Faradje specimens in coloration and details of structure.

Collectors' measurements of the type: total length, 195 mm.; head and body, 175; tail, 20; hind foot, 28; ear, 21.

Skull: condyloincisive length, 43.3; length of nasals, 15.4; palatal length (to front of premaxillæ), 24.3; zygomatic breadth, 29.4; interorbital constriction, 11.7; breadth of braincase, 18.3; postglenoid breadth, 21.7; mastoid breadth, 14.7; palatal breadth (outside to outside of m^1), 17.9; breadth of rostrum at i^1, 6.6; breadth of palate at ridge behind m^3, 8.2; tip to tip of alisphenoid processes, 9.2; tip to tip of pterygoids, 5.4; length of mesopterygoid fossa, 10.5; breadth of fossa between pterygoids, 3; length of upper toothrow (i^1–m^3), 21.3; upper molars, 9; lower toothrow (tip of i_1–m_3), 20.2; lower molars, 10.2; length of mandible (front of symphysis to posterior border of condyle), 33.5; angle to condyle, 17.5.

In pattern of coloration *A. langi* agrees with *A. hindei*, in both the dark color of the face extending over the cheeks, which are white in *faradjius* and *pruneri;* indeed, the series of young specimens of *langi* are almost indistinguishable in external features from a corresponding

series of young *sotikæ* (a slightly differential form of *hindei*). The dorsal coloration in both is superficially dark brown in general effect but the single adult of *langi* is much darker than any of the four adults of *hindei* available for comparison,[1] while the white tipping of the spines is conspicuous and uniform in *hindei* and nearly absent in *langi*. The spines in *langi* are blackish brown from tip to base, lacking the light median band present in the *hindei* group. The interaural spines in both are much longer than those of the body, forming a decidedly lengthened frontal crest, absent in the *pruneri* ("*albiventris*") group.

The type skull agrees in general dimensions with those given for the type of *hindei*, but differs from it in the nasals being much longer; the short nasal border of the premaxillæ, with a naso-maxillary junction as long or longer than the nasal contact with the premaxillæ—quite the reverse of the conditions in *hindei*, in which the premaxillæ are "slanted backwards, touching the tips of the frontal processes and shutting off the maxillæ from the nasals." The postpalatal region is also much narrower, the pterygoid and alisphenoid processes weaker and much less everted, thus giving to this region a quite different aspect. All of the 6 young skulls (of which the type is the mother of 5 of them) agree with the type skull in the short naso-premaxillary suture and the long naso-maxillary suture, and the narrow postpalatal region and weak development of its processes.[2]

Of 12 skulls of the *hindei* group (5 of *hindei* and 7 of *sotikæ* [*E. albiventris sotikæ* Heller], the latter all from the Guaso Nyiro River) all but one have the nasal border of the premaxillæ extended posteriorly ("slanted backwards"), and in all but two they nearly or quite reach the frontal processes, the maxillæ not reaching the nasals or barely touching them for usually less than a millimetre.

The skull of the type of *hindei* (a female) appears to have been exceptionally large ("greatest length 44; zygomatic breadth 30 mm."), none of the four adult male skulls before me exceeding a total length of 43 mm., with an average of 42.1, and a maximum zygomatic breadth of 27.6, with an average of 26.7, although the teeth are worn and one (total skull length 41.7) is very old. The author's suggestion that when

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[1]The specimens of *hindei* available for comparison are: Nos. 16096 Mus. Comp. Zcöl., subadult ♂, Upper Ura River; 16097 Mus. Comp. Zoöl.; ad. ♀ (skin only); No. 161699 Nat. Mus., ad. ♂, Kapiti Plains; Nos. 164022 and 164023 Nat. Mus., both ad. ♀, Ulucania Hills; No. 182652 Nat. Mus., very old ♂ (teeth greatly worn), Lololokwi. All the localities are in British East Africa, not far from the type locality of *hindei* (Kitui, about 75 miles southeast of Mt. Kenia). The Mus. Comp. Zoöl. specimens (both *ex* Wulsin Coll.) are labeled *Erinaceus hindei*; the Nat. Mus. specimens, *Erinaceus albiventris hindei*.

[2]In respect to this latter feature comparison is made with skulls of *hindei* from the type region of the species.

males are available for examination they would prove to be larger than the type is thus not confirmed by the present material.

The hind feet in the type of *A. langi* show no vestige of a hallux. The slight taxonomic significance of its presence or absence in this genus is well indicated by the series of 6 young specimens of which the type of *langi* is the mother of 5. Of the 6 young ones 3 have a vestigial hallux and the other 3 are without it. It is also much more developed in one of the three in which it is present than in the other two. It is also present in one of the 3 young *sotikæ* specimens (No. 181441 Nat. Mus.), and absent in the other two and in 12 adults of the *hindei-sotikæ* series.

SORICIDÆ

As stated above (p. 2), the shrews of the Congo Expedition were early assigned to Mr. Hollister, of the United States National Museum, for determination, and his report on them was published in this Bulletin in October, 1916.[1] The following statement in respect to the extent and character of the collection is made in the introduction to his paper:

> The shrews collected by Herbert Lang and James P. Chapin on the American Museum Congo Expedition number 183 specimens, of 15 species and 3 genera. Almost one half of the species are new. This is not altogether surprising when it is considered how few shrews have been described from the Congo as compared with other parts of Africa. It nevertheless seems remarkable that five of these new species should be members of the small group of "naked-tailed" *Crocidura* of which only about ten forms were heretofore known. Five forms of *Crocidura* which have been recorded from the general region are not represented in this collection. These are *Crocidura turba turba* Dollman, *C. t. tarella* Dollman, *C. poensis attila* Dollman, *C. boydi* Dollman, and *C. nigrofusca* Matschie. Races of *C. hildegardeæ* and *C. fumosa*, as well as representatives of several west coast species also might reasonably be expected.

In order to complete the record of the Congo collection of insectivores, the shrews obtained are here listed, as determined by Mr. Hollister.

Crocidura nyansæ kivu Osgood

Plate IV

Crocidura nyansæ kivu HOLLISTER, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 663, Pl. x, fig. 1 (animal).

Crocidura nyansæ kivu ALLEN, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, pp. 769–774, figs. 1 and 2 (skull), figs. 5–8 (skeleton), Pl. XCII (animal, from photograph). Skull, skeleton, and external appearance, in comparison with *Scutisorex congicus*.

Specimens, 20: Avakubi, 3 (1 alcoholic); Gamangui, 1; Medje, 16.

[1] 'Shrews Collected by the Congo Expedition of the American Museum.' By N. Hollister, Bull. Amer. Mus. Nat. Hist., XXXV, pp. 663–680, Pls. VII–XI. October 21, 1916.

Crocidura sururæ Heller

Crocidura sururæ Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 664.

Specimens, 2: Faradje, 1 (skin and skull); Garamba, 1 (alcoholic).

Crocidura lutrella Heller

Crocidura lutrella Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 664.

Specimens, 1: Faradje (skin only).

Crocidura turba nilotica Heller

Crocidura turba nilotica Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV. p. 664.

Crocidura turba nilotica Allen, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, p. 784, Pls. lxxxix and xc (skiagraphs of skeleton, in comparison with skeleton of *Scutisorex congicus*).

Specimens, 4: Faradje, 3 (2 alcoholic); Nala, 1 (alcoholic).

Crocidura caliginea Hollister

Crocidura caliginea Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 664, Pl. vii, fig. 1 and Pl. viii, figs. 1, 1*a* (skull).

"Type, No. 48555, Amer. Mus. Nat. Hist., skin and skull of adult ♀ (teeth moderately worn and basal suture closed) collected at Medje, Belgian Congo, July 8, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2451."

Crocidura jacksoni denti Dollman

Plate II, Figure 1

Crocidura jacksoni denti Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 665, Pl. x, fig. 2.

Specimens, 71: Avakubi, 6; Babeyru, 1 (alcoholic); Bafwabaka, 1; Faradje, 5; Gamangui, 2; Medje, 51; Nala, 3 (alcoholic); Niangara, 2.

Crocidura bicolor Bocage

Crocidura bicolor Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 666.

Specimens, 1: Avakubi (alcoholic).

Crocidura oritis Hollister

Crocidura oritis Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 666, Pl. vii, fig. 2 and Pl. viii, figs. 2, 2*a* (skull).

"Type, No. 48510, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Avakubi, Ituri River, Belgian Congo, July 6, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2530."

This species is based on five specimens, four from Medje and one (the type) from Avakubi.

Crocidura latona Hollister

Crocidura latona Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 667, Pl. VII, fig. 3 and Pl. VIII, figs. 3, 3*a* (skull).

"Type, No. 48610, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Medje, Belgian Congo, March 17, 1910, by Herbert Lang and James P. Chapin. Orig. No. 773."

Besides the type there is a single skin without skull, from Avakubi.

Crocidura ludia Hollister

Crocidura ludia Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 668, Pl. VII, fig. 4 and Pl. IX, figs. 1, 1*a* (skull).

"Type, No. 48566, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (teeth slightly worn and basal suture not closed) collected at Medje, Belgian Congo, May 16, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2366."

There are three specimens of this species in the collection, two from Medje (one the type) and one from Ngayu.

Crocidura polia Hollister

Crocidura polia Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 669, Pl. VII, fig. 5 and Pl. IX, figs. 2, 2*a* (skull).

"Type, No. 48559, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (basal suture closed; teeth moderately worn) collected at Medje, Belgian Congo, July 1, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2442."

Crocidura congobelgica Hollister

Crocidura congobelgica Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 670, Pl. VII, fig. 6 and Pl. IX, figs. 3, 3*a* (skull).

"Type, No. 48512, Amer. Mus. Nat. Hist., skin and skull of adult ♂ (teeth little worn) collected at Lubila, near Bafwasende, Belgian Congo, September 20, 1909, by Herbert Lang and James P. Chapin. Orig. No. 122."

There are only two specimens of this species in the collection, the type from Lubila and a specimen from Medje.

Sylvisorex gemmeus irene Thomas

Sylvisorex gemmeus irene Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 671. Table of measurements of 12 specimens.

Specimens, 19: Medje, 18 (including 4 young in alcohol); Faradje, 1.

Sylvisorex oriundus Hollister

Plate II, Figure 2

Sylvisorex oriundus Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 672, Pl. vii, fig. 7 and Pl. ix, figs. 4, 4*a*; Pl. xi, fig. 1 (animal).

"Type, No. 48554, Amer. Mus. Nat. Hist., skin and skull of adult ♀ (teeth little worn) collected at Medje, Nava River, Belgian Congo, May 20, 1914, by Herbert Lang and James P. Chapin. Orig. No. 2368."

Scutisorex congicus Thomas

Plate III

Scutisorex congicus Hollister, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 673, Pl. xi, fig. 2 (animal). Table of measurements of 15 specimens.

Scutisorex congicus Allen, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, pp. 769–784, figs. 1–8, Pls. lxxxix–xcii. Skull and skeleton (Pl. xci, animal). *Scutisorex* raised to the rank of a subfamily Scutisoricinæ.

Scutisorex (congicus) Schulte, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, November 26, pp. 785–792. The lumbar vertebræ of *Scutisorex*.

Specimens, 44: Bafwabaka, 2 (skin and 1 complete skeleton); Medje, 42, including 1 in alcohol and 5 more or less complete skeletons.

The highly specialized vertebral column of *Scutisorex* has been made the subject of two special papers already published in this Bulletin (*loc. cit., supra*), one of them, by the author of the present paper, on the remarkable specialization of the vertebral column—unique, or without a known counterpart, in mammals—with numerous illustrations; the other, by Dr. H. von W. Schulte, on the lumbar vertebræ from the morphogenetic viewpoint. In order to emphasize the taxonomic importance of this surprising specialization the genus *Scutisorex* was raised to subfamily rank under the name Scutisoricinæ. To the first of these papers Mr. Lang contributed several pages of field notes.

Macroscelididæ

Rhynchocyon stuhlmanni stuhlmanni Matschie

Rhynchocyon stuhlmanni Matschie, 1893, Sitzber. Gesells. naturf. Freunde Berlin, pp. 66–68. Andundi, Semliki River, two specimens, adult and young.

Rhynchocyon stuhlmanni nudicaudata Lydekker, 1906, Proc. Zoöl. Soc. London, April 1907, p. 995. Mawambi district, Ituri Forest, Belgian Congo. One specimen.

Represented by 5 specimens: Penge, 2 (1 skin and skull; 1 alcoholic), April 21, 1914; Avakubi, 2, November 13, 1913, and May 22, 1914. All are females, of which 2 are adult and 1 with the milk dentition. Also a fœtus in alcohol.

The Museum Collection contains also an unsexed specimen of this form from the Budongo Forests, east of Lake Albert; February 1911.

The collectors' measurements of the two adults are: total length, 515 mm. (Penge), and 501 (Avakubi); head and body, 268, 259; tail, 247, 242; hind foot, 84, 84; ear, 30, 30. Skulls: total length, 69.5 (Penge), —(Avakubi); condyloincisive length, 62.3, 65; zygomatic breadth, 36, 35. They thus agree in measurements with average specimens of *R. s. claudi* from localities farther west, as recorded below (Tables 1–4, pp. 23–26).

This fact has, however, little significance since the range in size of adults of *R. s. claudi* covers all forms of the genus *Rhynchocyon* of which measurements have been published. In coloration they closely resemble extremely dark examples of *claudi*, from which they are not satisfactorily distinguishable. Placed at the end of the dark series of *claudi*, they completely merge with it. It seems preferable, however, to recognize them as a darker geographical race of the same specific group.

Rhynchocyon stuhlmanni nudicaudata Lydekker, however, based on a single specimen from the Mawambi district of the Ituri Forest, seems scarcely entitled to serious consideration. The description indicates that the type was not unlike the dark phase of the *R. stuhlmanni* group, with which the author was at the time wholly unacquainted except through the description of *stuhlmanni*. The "generally dark color and wholly white tail" are not distinctive in view of the variations shown, and described below, in the *claudi* series; nor are there any geographical reasons that would seem to require its recognition, the type locality of *nudicaudata* being less than fifty miles southeast from Penge, in the same environment as the latter, and represented in the present collection by specimens of *stuhlmanni*, while the type of *stuhlmanni* came from a locality equally near that of *nudicaudata*. The characters of naked ears and tail, dwelt upon as important distinctions, have no real significance, as such conditions are not infrequent in the *claudi* series; while a white tail, at least in dry skins, is a prevailing condition. The hairs of the tail are also so minute that they are often apparent only on very close inspection, giving the impression of a naked tail, especially in comparison with examples of the *cirnei* group, with which the author compared his specimen.

Rhynchocyon stuhlmanni claudi Thomas and Wroughton

Plate I; Text Figure 1

Rhynchocyon claudi Thomas and Wroughton, 1908, Ann. Mag. Nat. Hist., (7) XIX, May, p. 370. "Beritio, Welle River."

Rhynchocyon claudi Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, November, p. 470. Medje, 1 specimen; Poko, 12 specimens.

Represented by 105 specimens, of which 99 are skins with skulls; 6 fœtal and young specimens in alcohol, and several skeletons, collected as follows:

Medje, 20: May and August–October 1910; November 8, 1913; March 17–20, 1914.

Nala, 1 (alcoholic): July 1913.

Akenge, 5: September 29–October 19, 1913.

Niapu, 79: November 8–December 26, 1913.

The 99 specimens represented by skins and skulls consist of 56 males and 43 females, of which 76 are adult and 23 more or less immature. The latter range in age from one specimen in which the milk teeth had not pierced the gum to those with the deciduous dentition fully developed (a series of 11 specimens), and the other 12 specimens fully illustrate the transition from the deciduous to the permanent teeth. It has hence seemed desirable to utilize this abundant material for the illustration of the tooth development of this interesting genus of insectivores. (Text figure 1, stages 1 to 8.)

The large series of adults from Niapu (43 males, 25 females) affords the basis for a study of sex, age, and individual variation. In the following tables (Tables 1–3, pp. 23-25) the external measurements, carefully taken by the collectors before skinning, have been combined with three measurements of the skull (total length, condyloincisive length, and zygomatic breadth). Table 1 gives the measurements of the males, Table 2, of the females, and Table 3 is a summary of Tables 1 and 2. In these tables the specimens are arranged in four categories, according to age as indicated by the amount of wear shown by the teeth, the purpose being to determine the influence of age upon the general size of the animal after the permanent dentition has been fully acquired. Table 4 is designed to show the correlation of growth with the tooth development. Of the 18 specimens included in this table, 5 are from Medje and 13 from Niapu, those from Medje being indicated by an asterisk.

Sexual Variation

There is no appreciable difference in size or coloration due to sex. The average total length (tip of nose to end of tail) in 43 adult males is 515 mm., in 25 adult females, 516 mm. The average total length of the skull for the same specimens is, males 68.1, females 68.5; condyloincisive length, males 62.3, females 63.5; zygomatic breadth, males 36.3, females 36.2.

TABLE 1.—EXTERNAL AND CRANIAL MEASUREMENTS OF 43 ADULT MALES OF *Rhynchocyon s. claudi*, FROM NIAPU, BELGIAN CONGO

	External Measurements					Cranial Measurements			
Cat. No.	Total Length	Head and Body	Tail	Hind Foot	Ear	Total Length	Condylo-incisive Length	Zygom. Breadth	Condition of Teeth
49442	500	265	235	84	29	64.8	64.1	33.5	Unworn
49443	509	269	240	84	31	67.0	61.6	36.2	"
49444	505	265	240	86	31	67.3	62.1	35.7	"
49445	556	291	265	89	34	67.3	63.5	36.3	"
49446	480	260	220	81	31	65.6	60.7	35.7	"
49447	482	250	232	83	32	67.2	60.9	36.4	"
49448	531	286	245	86	33	66.1	61.4	34.8	"
49456	540	277	263	85	31	68.5	61.5	36.5	"
49458	555	303	252	87	31	——	——	35.6	"
49459	521	281	240	88	30	68.3	62.9	35.3	"
49461	504	277	252	90	31	67.1	63.6	37.5	"
49473	512	275	237	83	31	66.6	62.5	35.0	"
49474	458	260	——	83	31	62.2	61.4	36.9	"
49475	469	244	225	82	31	66.9	60.8	34.3	"
49477	522	273	249	88	31	66.7	60.7	34.4	"
49478	510	278	232	87	31	67.7	62.0	35.0	"
49489	465	242	223	83	30	66.1	61.2	33.6	"
49492	496	259	237	86	31	67.3	61.5	35.2	"
49495	512	270	242	87	30	68.5	62.5	35.6	"
49497	522	274	248	86	30	68.5	62.9	36.8	"
49506	502	259	243	87	31	68.5	63.3	36.0	"
49509	518	274	244	84	30	66.8	61.6	35.7	"
49512	502	267	235	87	30	69.2	62.0	36.6	"
49515	514	275	239	85	31	68.4	63.1	36.1	"
49527	516	262	254	86	29	66.3	62.2	36.3	"
49449	517	271	246	84	31	69.0	61.9	36.4	Slightly worn
49450	535	290	245	88	31	70.8	63.6	37.4	"
49462	527	275	252	90	31	68.3	62.4	36.9	"
49466	508	268	240	88	31	67.9	63.2	——	"
49471	532	279	253	86	33	67.9	62.4	36.5	"
49496	504	269	235	84	30	68.3	61.5	35.6	"
49451	512	266	246	83	33	70.5	63.3	36.2	Much worn
49452	535	287	248	89	31	66.7	63.6	38.0	"
49463	537	273	264	86	32	67.1	63.1	37.1	"
49482	510	267	243	84	32	68.4	62.1	36.3	"
49455	485	261	224	89	32	——	63.0	38.1	Greatly worn
49470	520	291	229	87	32	67.7	63.1	37.9	"
49476	522	273	249	88	31	69.2	62.7	37.2	"
49481	515	270	245	85	29	69.4	62.6	36.5	"
40491	505	270	235	83	29	67.9	61.6	36.3	"
49516	500	262	238	82	30	65.6	60.1	36.5	"
49524	530	274	256	91	32	69.2	65.0	37.5	"

TABLE 2.—EXTERNAL AND CRANIAL MEASUREMENTS OF 25 ADULT FEMALES OF *Rhynchocyon s. claudi* FROM NIAPU, BELGIAN CONGO

	External Measurements					Cranial Measurements			
Cat. No.	Total Length	Head and Body	Tail	Hind Foot	Ear	Occipito-nasal Length	Condylo-incisive Length	Zygom. Breadth	Condition of Teeth
49460	532	281	251	85	31	68.4	63.6	36.7	Unworn
49464	530	272	258	86	31	67.6	62.3	34.5	"
49479	529	271	258	85	32	67.6	61.8	34.3	"
49480	516	279	237	88	31	69.5	63.0	36.0	"
49485	525	266	259	84	30	67.9	63.3	36.1	"
49486	522	276	246	89	29	66.9	62.1	——	"
49487	523	274	249	87	32	68.0	63.5	36.5	"
49488	514	276	238	85	30	68.4	63.7	35.4	"
49490	535	283	252	84	29	66.1	62.2	36.6	"
49500	522	277	245	85	30	68.8	62.6	36.1	"
49504	517	262	255	85	31	68.8	63.6	34.2	"
49507	511	270	241	86	31	67.5	61.9	33.6	"
49511	530	277	253	87	30	70.6	63.3	36.7	"
49526	513	272	241	86	31	68.7	63.7	35.6	"
49502	512	271	241	86	31	67.6	62.5	35.8	Slightly worn
49508	492	255	237	81	31	66.4	61.3	35.4	"
49453	517	277	240	85	31	68.5	63.1	36.5	Much worn
49469	528	293	235	87	31	70.6	64.0	36.7	"
49483	539	294	245	86	31	69.6	63.6	35.3	"
49494	511	266	245	87	31	69.2	63.1	37.4	"
49501	540	292	248	87	31	68.0	63.5	37.0	"
49503	520	278	242	85	32	71.1	64.8	37.4	Greatly worn
49454	532	285	247	86	31	69.0	63.3	36.8	"
49472	505	272	233	83	32	68.8	61.8	35.7	"
49525	499	273	226	83	33	69.1	64.0	36.2	"

TABLE 3.—SUMMARY OF MEASUREMENTS OF 43 MALES AND 25 FEMALES GIVEN IN TABLES 1 AND 2

		External Measurements						Cranial Measurements		
Condition of Teeth		Sexand No. of Spec.	Total Length	Head and Body	Tail	Hind Foot	Ear	Total Length	Condylo-incisive Length	Zygom. Breadth
Unworn	Avg.	♂25	508.0	269.7	240.5	85.4	30.8	67.2	62.1	35.6
"	Min.	♂25	458	242	220	81	29	64.8	60.7	33.5
"	Max.	♂25	556	303	265	90	34	69.2	64.1	37.5
Slightly worn	Avg.	♂ 6	519.3	274.0	245.3	86.1	31.6	68.9	62.5	36.5
"	Min.	♂ 6	504	266	235	83	30	67.8	61.5	35.6
"	Max.	♂ 6	535	290	253	90	33	70.8	63.6	37.4
Much worn	Avg.	♂ 4	523.5	273.2	250.2	85.5	32.0	68.2	63.0	36.9
"	Min.	♂ 4	510	266	243	83	31	66.7	62.1	36.2
"	Max.	♂ 4	535	287	264	89	33	70.5	63.6	38.0
Greatly worn	Avg.	♂ 7	511.0	271.6	239.4	86.3	30.7	68.2	62.6	37.1
"	Min.	♂ 7	430	261	224	82	29	65.6	60.1	36.3
"	Max.	♂ 7	485	291	256	91	32	69.4	65.0	38.1
Unworn	Avg.	♀14	522.8	278.6	248.6	85.9	30.6	68.1	64.2	35.5
"	Min.	♀14	511	262	237	84	29	66.1	61.8	33.6
"	Max.	♀14	535	283	259	89	32	70.6	63.7	36.7
Slightly worn	Avg.	♀ 2	502.0	263.0	239.0	83.5	31.0	67.0	61.9	35.6
"	Min.	♀ 2	492	255	237	81	31	66.4	61.3	35.8
"	Max.	♀ 2	512	271	241	86	31	67.6	62.5	35.4
Much worn	Avg.	♀ 5	525.8	281.7	242.5	86.2	31.2	69.5	63.5	36.7
"	Min.	♀ 5	511	266	235	85	31	68.0	63.1	35.3
"	Max.	♀ 5	540	294	248	87	32	71.1	64.0	37.4
Greatly worn	Avg.	♀ 4	512.0	276.7	235.3	84.0	32.0	69.0	63.4	36.2
"	Min.	♀ 4	499	272	226	83	31	68.8	61.8	35.7
"	Max.	♀ 4	532	285	247	86	33	69.1	64.8	36.8

TABLE 4.—EXTERNAL AND CRANIAL MEASUREMENTS OF 12 IMMATURE SPECIMENS OF *Rhynchocyon stuhlmanni claudi* FROM NIAPU AND MEDJE,[1] BELGIAN CONGO

		External Measurements					Cranial Measurements			
	Cat. No.	Sex	Total Length	Head and Body	Tail	Hind Foot	Ear	Total Length	Condylo-incisive Length	Zygom. Breadth	Condition of Upper Teeth
	*49434	♂	170	51	119	52	15	39.6	36.4	——	Teeth not through gums.
	*49427	♀	332	174	158	68	20	47.0	41.4	——	Cusps of dp^2, ^{3}, ^{4}, canines and incisors just appearing.
	*49518	♀	368	181	187	73	23	51.0	44.5	——	Same as No. 49427.
	*49413	♀	382	196	186	75	25	53.5	50.3	——	Slightly more advanced than No. 49427.
	49523	♀	371	211	160	78	26	50.0	46.5	——	Entire milk set of 6 teeth fully developed.
	*49436	♀	440	227	213	82	27	58.8	——	——	Same as 49523.
Entire milk set present	49513	♂	423	223	200	81	26	57.6	52.3	29.7	Milk teeth only.
	49514	♀	463	238	225	80	28	60.4	54.9	29.2	
	49510	♀	470	242	228	80	28	62.1	56.3	31.2	
	49493	♂	457	231	226	82	28	65.2	57.8	31.3	
	49499	♀	455	247	245	85	30	66.1	60.1	34.1	
	49498	♀	483	243	240	82	30	63.6	57.5	32.6	Milk teeth+m^1 and p^1 half up.
	49465	♂	502	255	247	86	29	67.9	61.8	34.9	Milk teeth+m^1 fully up.
	49467	♂	502	274	228	87	31	66.3	60.7	34.9	
	49505	♀	502	261	241	—	30	66.7	61.6	33.3	Milk teeth + m^1 fully up and m^2 can be seen.
	49484	♀	515	268	247	86	30	65.8	60.7	34.4	Milk teeth + m^1, m^2 one-third up, and p^4, p^3, and p^2 can be seen under their milk predecessors.
	49468	♂	494	261	233	85	29	65.4	60.5	34.7	Same as No. 49484 in which, however, milk canines are still preserved.
	49488	♂	514	276	238	85	30	68.5	63.6	35.5	M^1, m^2, p^4, p^3 fully up, p^2 and canine seen beneath their milk predecessors.

[1]An asterisk (*) is prefixed to the catalogue number of those from Medje.

Age Variation

Coloration.—Coloration is only slightly affected by age. In young specimens in the first pelage, the tones are practically the same as in adults; the light and dark markings of the upperparts are not quite so sharply defined, but the pattern is strictly the same. In very old specimens the dorsal pelage has sometimes a more grayish cast than is usual in younger animals, due perhaps to less prompt renewal. As will be shown later, the wide variation in color seen in a series of specimens has no relation to sex or age.

Size.—Tables 1–4 have been compiled with special reference to the effect of age upon the general size of the animal and upon the size of the skull, since species and subspecies are sometimes based on adolescent specimens, and frequently on "young adults." Table 4 shows that in 6 specimens having only the full deciduous set of teeth the total length (tip of nose to end of tail vertebræ) ranges from about 440 to 460 mm. as compared with the average adult length of about 515 mm., and a condyloincisive length[1] of about 50 to 60 mm., as compared with about 63 mm. in middle-aged specimens. During the period of the replacement of the deciduous by the permanent teeth the size increases to about the minimum for adults, the total length averaging about 500 mm. and the condyloincisive length about 60 mm.

The average total length of the animal in 38 specimens (24 males, 14 females) with unworn teeth is 514 mm. (males 509, females 524); average condyloincisive length of skull, 62.3 (males 62.1, females 62.8).

In 8 specimens (6 males, 2 females) slightly more advanced in age (the teeth appreciably worn) the average total length is 516 mm. (males 520, females 501); condyloincisive length of skull, 62.3 (males 62.5, females 61.5). In this case the number of specimens is too small to be satisfactory, especially in relation to sex difference in size.

In 9 specimens (4 males, 5 females) still older (teeth much worn), the average total length is 524.4 mm. (males 523, females 527); condyloincisive length of skull, 63.27 (males 63.25, females 63.5). Again the series is too small for satisfactory results, but is not wholly without interest.

The old-age (senile) series is represented by 11 specimens (7 males, 4 females). The average total length is 512 mm. (males 511, females 514); condyloincisive length, 62.9 (males 62.6, females 63.5).

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[1]The condyloincisive length is a better standard than total length of skull, the ossification of the nasal cartilage being a variable element, sometimes terminating at or a little behind the tip of the premaxillæ but usually extending several millimeters beyond this point. Hence, total length and occipitonasal length are undesirable measurements for skulls of *Rhynchocyon*.

The results of the foregoing analysis of variation in size as affected by age and sex are collated in the following tabular résumé (Table 5).

The results derivable from the above tabulation would possess greater interest if the number of specimens in each of the six categories had comprised a more nearly equal number of specimens—if each had been as large as in Table 3. It seems safe to assume (1) that size is not diagnostic of sex, although the above statistics indicate a slight superiority

TABLE 5.—RELATION OF AGE AND SEX TO SIZE

Condition of Teeth	No. of Specimens	Total Length Animal	Condylo-incisive Length. Skull
1. Entire milk set only	6	451	56.3
2. Entire milk set plus $\frac{m^1}{m_1}$ more or less developed	5	501	60.5
3. Permanent set, unworn	38	514	62.3
	24 ♂	509	62.1
	14 ♀	524	62.8
4. Permanent set, slightly worn	8	516	62.3
	6 ♂	520	62.5
	2 ♀	501	61.5
5. Permanent set, much worn	9	524.4	63.27
	4 ♂	523	63.25
	5 ♀	527	63.5
6. Permanent set, greatly worn	11	512	62.9
	7 ♂	511	62.6
	4 ♀	514	63.5

for the females. The largest specimen of the entire series is a "young adult" male (No. 49445), with a total length of 556 mm., a tail length of 265, length of hind foot 89, and condyloincisive length 63.5, dimensions not reached by any female, except the skull length in a few old females, which again is exceeded by a few old males. (2) There is a slight increase in size, both externally and of the skull, in the old-age period, but insufficient to antagonize the selection of young adult specimens as types of new forms, since individualism in any age class more than bridges the differences that can properly be ascribed to age after approximate maturity is reached.

Individual Variation

Size.—As already noted incidentally above, the variation in total length (tip of nose to end of tail) in the series of 25 young males with unworn teeth from Niapu covers the entire range of variation in the whole series of the 68 adults from Niapu, all of which were taken within a period of about six weeks in November and December of the same year, and all within a radius of about six miles in strictly uniform environment. Leaving out of consideration a single specimen (No. 49474, ♂), obviously a dwarf, the average total length is 510 mm., the two extremes being 465 and 556, a difference of 91 mm., 17 per cent of the mean. Even this is exceeded in the old-age series of 7 males, where the range is 19.6 per cent. This illustration applies equally to length of tail, where the range of variation is 18.7 per cent of the mean, but not to hind foot and ear, where the range is respectively 10 and 2 per cent. It is also much less in the skull, in which the mean condyloincisive length in the 25 young adults in question is 62.1 mm., and the extremes 60.7 and 64.1, and the difference 3.4 mm., or only about one-half of 1 per cent. This, however, is nearly equal to the variation due to age, where the average condyloincisive length in the old-age series of 11 specimens is 62.9 mm. (minimum 60, maximum 65 mm.). The variation in zygomatic breadth parallels that of the skull length.

Coloration.—*Rhynchocyon s. claudi* may be said to have, in a general way, a light phase and a dark phase of coloration, but a large proportion of the specimens in the present large series are in such varying degrees intermediate that no line of demarcation can be even approximately assigned. As the extremes of light and dark specimens belong to the same sex and prove to have been taken on the same day at the same place, it must be assumed that this wide range of color variation is purely individual. Yet, should single specimens of the extremes of the light and dark types of coloration be received by a systematist from even the same locality, he might be pardoned for considering them as nameable forms. Some of the East African forms of *Rhynchocyon* have been found to be notably prone to melanism, but among the hundred examples of the *claudi* type collected by the American Museum Congo Expedition not one shows such tendency, notwithstanding the large amount of color variation they present.

The light or reddish phase (Plate I, upper figure) may be indicated as follows, beginning with the ventral area:

Chin, throat, fore neck and pectoral region entirely and nearly uniform buff, varying from pale buff to ochraceous buff (in different specimens), abruptly con-

stricted at axillæ and pectoral area to about the median third or fourth of thorax, thence expanding to cover the lower abdomen and inside of thighs, usually darkest on middle of breast and lighter on throat, middle of thorax and mid-lower abdomen. In extreme specimens this portion of the ventral surface has a decided rufous tone. Sides of head from base of rostrum, expanding upward to enclose the ears, sides of neck and sides of body to base of tail (encroaching deeply on sides of abdomen and nearly meeting over thorax), brownish rufous or chestnut slightly varied with black-tipped hairs. Top of head and mid-region of back to base of tail more varied with black-tipped hairs, which from the withers posteriorly take the form of four longitudinal blackish bands, which from middle of back to base of tail are broken by four or six transverse rows of whitish spots, which vary in tone (in different specimens) from clear white to pale buffy white. Over this area the general effect is that of alternating transverse rows of rather sharply defined black and white spots, about five of each being rather distinctly defined, with an additional posterior row of two white spots at the base of the tail, and an ill-defined anterior row of small, less distinct, whitish spots. There is also a tendency to an additional lateral row of indistinct or subobsolete whitish or pale buffy spots on each side of the usual four distinct median rows of spots. Counting all the rows of white or whitish spots they form six longitudinal rows, the outer rows separated from the others by dark chestnut instead of blackish intervals.

No. 49463, Niapu, November 24, 1913, adult ♂, and No. 49477, Niapu, December 1, 1913, adult ♂, may be taken as typical of the light or reddish phase. In general tone No. 49477 is lighter, with the dorsal spots clearer white, than No. 49463.

The dark phase (Plate I, lower figure) may be thus indicated:

Light portion of the underparts much paler, or faintly yellowish white; the sides of head, neck, and body dull dark brownish, almost without trace of rufous except around ears and on sides of neck; top of head and mid-region of back grizzled yellowish gray with most of the hairs broadly black-tipped; the back from the posterior part of thoracic region to base of tail with deep black predominating, the whitish spots reduced in size and usually rather clear white, and the longitudinal and transverse bands indistinct or blended into a black or blackish general ground color, the black most concentrated along the median line.

This phase is typically represented by No. 49487, Niapu, December 4, 1913, adult ♀. No. 49490, adult ♀, same locality and date, has more rufous suffusion on sides of neck, nape, and shoulders.

Each phase is typically represented by both males and females taken on consecutive days, or sometimes on the same day, at the same locality. Other specimens collected actually or approximately at the same date and place, equally representative of both sexes and strictly comparable as to age, fill every gradation between the two extremes. Hence the types of coloration above described can scarcely be considered as representing respectively a definable red and dark phase, but merely the extremes of a wide range of purely individual variation, shown in the accompanying colored plate.

Cranial Variations.—Matschie[1] and others apparently believe that the relative length of the frontal and nasal sutures is of specific value in *Rhynchocyon*. Specimens of *Rhynchocyon s. claudi* in our series show that the frontal suture may be as long as, or longer or shorter than, the nasal suture, and in some cases one of the nasals is fully 4 mm. shorter than the other. The following measurements[2] illustrate variations in specimens taken in the same locality at Niapu:

		Frontal Suture	Nasal Suture
No. 49445	♂	24 mm.	24 mm.
49479	♀	27.25 mm.	19 mm.
49443	♂	27 mm.	20 mm.
49459	♂	28 mm.	20.5 mm.
49448	♂	22 mm.	25 mm.

Rhynchocyon claudi Thomas and Wroughton was based originally on a specimen in the light or reddish phase of coloration from Beritio, near Angu, on the Uele River. Later a single specimen from Medje and twelve others from Poko were referred to this species by Thomas. The present collection contains 20 specimens taken at Medje, 5 collected at Akenge, and 79 at Niapu. The two last-named localities are within about thirty miles of Medje and Poko and have the same environment. There can be little doubt therefore of the correct reference of all these specimens to *R. s. claudi*.

Dentition of *Rhynchocyon*

Text Figure 1

The present large series of skulls of *Rhynchocyon s. claudi* affords material fully disclosing the character of the dentition of *Rhynchocyon* from its early stages to old age. In the youngest skull (No. 49434—see Table 4, p. 26) of the series the teeth are wholly enclosed in the gum; in a slightly older specimen (No. 49427) the tips of the principal cusps of the deciduous teeth (canines and premolars 2, 3, 4) have broken through. Other specimens, more advanced, show the gradual development of the milk teeth and the order of their displacement by permanent teeth. In a succeeding table (Table 5, p. 28) measurements are given to show the correlation of the size of the individual with tooth development, from the stage just prior to the appearance of any of the teeth

[1] 1893, Sitzber. Gesell. naturf. Freunde Berlin, p. 66.

[2] Other cranial variations are indicated in the tables of measurements and need not be especially emphasized, as they present no unusual features.

above the gum to full maturity of the permanent set. Several stages of development are also shown in the accompanying text figure (Stages 1–8).

Deciduous Dentition

The milk dentition, strictly construed, consists of 24 teeth: $I\frac{1-1}{3-3}$, $C\frac{1-1}{1-1}$, $P\frac{3-3}{3-3}=\frac{10}{14}=24$. The first premolar ($p\ \frac{1-1}{1-1}$) is not present till later and has no successor.

Upper or Maxillary Series.—The single upper incisor (i^3 by position) is a minute spicule inserted at the extreme posterior border of the premaxilla and has no successor. Although small and frail, it often persists through life, being frequently present in the senile stage. In 46 adult skulls, taken at random for the investigation of this point, 15 (33 per cent) were found to retain one or both upper incisors, both being present in 6 skulls and one in each of 9 skulls, most frequently on the right side. When these teeth are absent their alveoli often remain, indicating the recent presence of the teeth.

The canine is a small bicuspid tooth, with a slender-pointed central cusp, and a small slender-pointed posterior cusp, about one-third as high as the main cusp. The canine is shed at the same time as the premolars, but its successor is long in maturing, and, when fully developed, is long, slender, and saber-like. The second, third, and fourth premolars (dp^2, dp^3, dp^4) arise simultaneously. Dp^2 has a basal length slightly exceeding its height, with two pointed cusps, the anterior one considerably exceeding the other in size and height, and a low anterior and a low posterior cusplet, both arising from the cingulum. Dp^3 is subtriangular in basal outline, the anterior half narrow, the posterior broad, with a main central cusp, a smaller one behind it, and a still smaller one in front, on the cingulum. There is also a low, broad postero-internal cusp, and, behind this, a slight cusplet from the cingulum. Of these five cusps, three are external and two internal. Dp^4 is subquadrate and distinctly molariform, with four prominent cusps, the outer much higher than the inner, the four cusps collectively enclosing two deep basin-shaped cavities. There is also an anterior cusplet from the cingulum.

Lower or Mandibular Series.—The anterior four milk teeth in the lower jaw are all incisiform, similar in size and general form, and have their axes directed forward. The two middle teeth are tricuspid, the first and fourth bicuspid. They are separated from dp_2 by a long convex diastema. The first three incisiform teeth are shed singly at intervals. The three posterior milk premolars (dp_2, dp_3, dp_4) increase successively

in size, dp_2 being less than half the size of dp_3, and dp_3 is less than one-third the bulk of dp_4. Dp_2 has a high-pointed central cusp and a small, low, sharp-pointed one before and behind it, and a cusplet on the posterior cingulum. Dp_3 is similar in structure to dp_2, but is a much larger tooth. Dp_4 consists of two sections, each of which encloses a deep basin from the borders of which arise four cusps, of which two are antero-external, the other two internal, one of which is median and the other posterior. The medio-internal cusp is usually minutely bipointed when unworn.

The above conditions are represented, essentially or exactly, by 7 skulls (Nos. 49523, 49436, 49513, 49514, 49510, 49499, 49493, of Table 4).

Permanent Dentition

The permanent dentition comprises 36 teeth: $I\frac{1-1}{3-3}$, $C\frac{1-1}{1-1}$, $P\frac{4-4}{4-4}$, $M\frac{2-2}{2-2}=\frac{16}{20}=36$. In this enumeration the minute upper incisor is assigned as a permanent tooth, although, as already explained (p. 32), it is often absent in adults, though frequently persisting through life, and has no successor. The first premolar in both jaws has also no successor and is developed later than the other premolars which have successors.

Upper or Maxillary Series.—The canine is a long, slender, laterally compressed, 2-rooted tooth, with a conspicuous longitudinal groove on its antero-internal face. The first premolar (p^1) does not pierce the gum till the milk premolars (dp^2, dp^3, dp^4) are fully developed and functional, and has, as already said, no predecessor. It is a small unicuspid, 2-rooted tooth, about as long antero-posteriorly as high. It is separated from both the permanent canine and the permanent p^2 by diastemata nearly equal in length to the basal length of the tooth. P^2 and p^3 are similar in form to their respective predecessors, from which they differ mainly in larger size. P^4 is more completely molariform than dp^4, and differs from m^1 only in being larger and slightly more quadrate. M^1 is subquadrate, the anterior half of the tooth broader than the posterior half, with higher cusps, which are situated at the four corners of the tooth. M^2 is trigonal, with three cusps, and is about one-third the size of m^2. Thus, in the permanent dentition, the last three maxillary teeth are typically molariform and, on the basis of structure and position, would be classified as molars, but the first one of the three has a milk predecessor.

Lower or Mandibular Series.—The three permanent incisors all have bifid crowns, are close-set, directed obliquely forward, and differ from their predecessors mainly in their larger size. The canine is a small 2-rooted tooth, separated from i_3 and p_1 by slight diastemata. Its axis

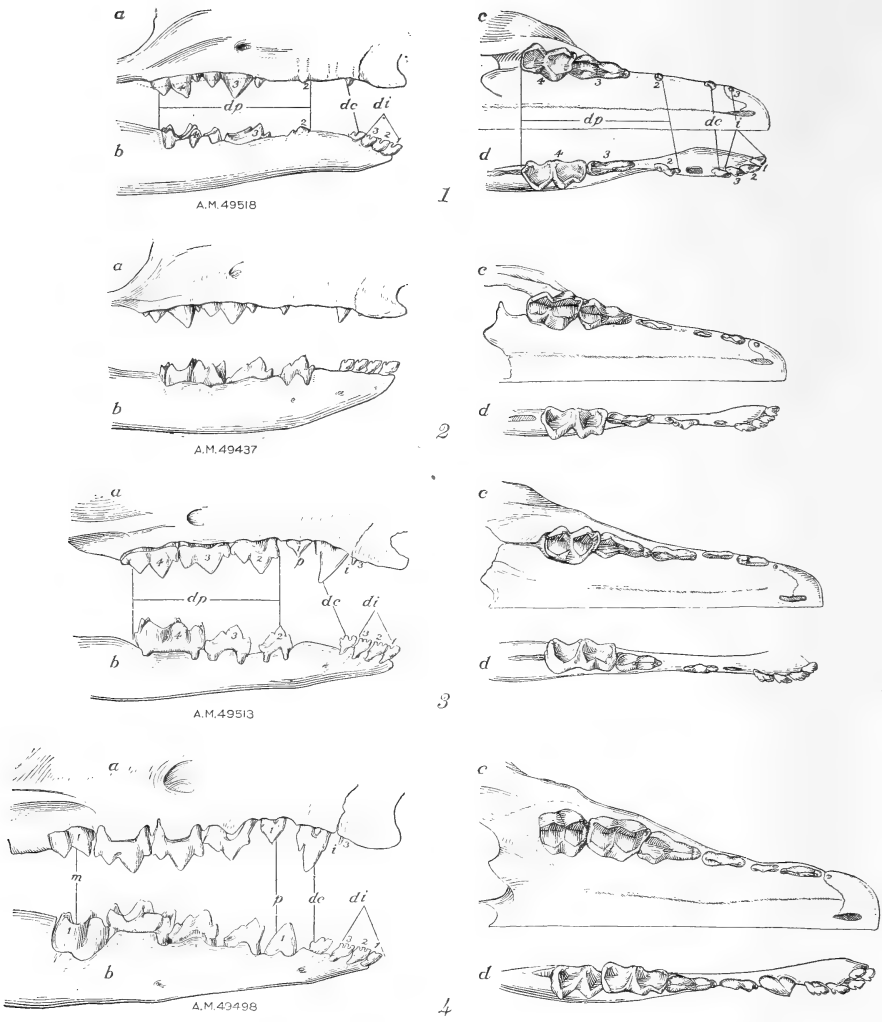
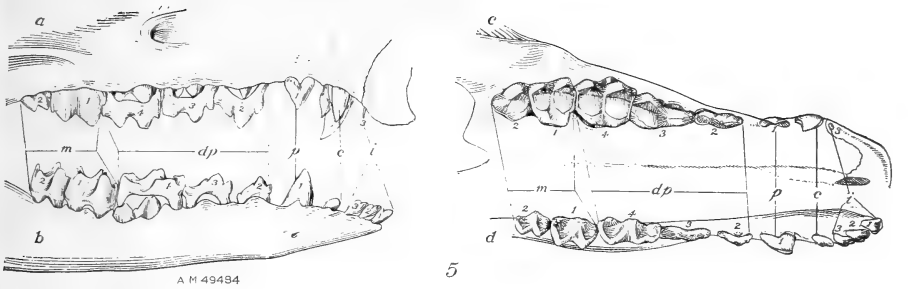


Fig. 1. Development of the dentition in *Rhynchocyon stuhlmanni claudi* Thomas. All $\times\frac{3}{2}$; *a* and *b*, side views; *c* and *d*, crown views. From specimens taken in the Belgian Congo by The American Museum of Natural History Congo Expedition, 1909–1915.

Stage 1. Milk teeth breaking through gums. No. 49518, ♀ juv., Medje, June 3, 1914.
Stage 2. Milk teeth more advanced; alveolus of p^1 fissured. No. 49437, ♀ juv., Medje, September 8, 1910.
Stage 3. Milk teeth fully developed, and p^1 nearly so; convex diastema where p_1 is forming beneath. No. 49513, ♂ juv., Niapu, December 17, 1913.
Stage 4. Upper milk dentition p^1, and crown of m^1 just through gum; lower jaw: milk teeth, p_1 well advanced, m_1 half up, and tip of permanent i_1 in sight. No. 49498, ♀ juv., Niapu, December 6, 1913.



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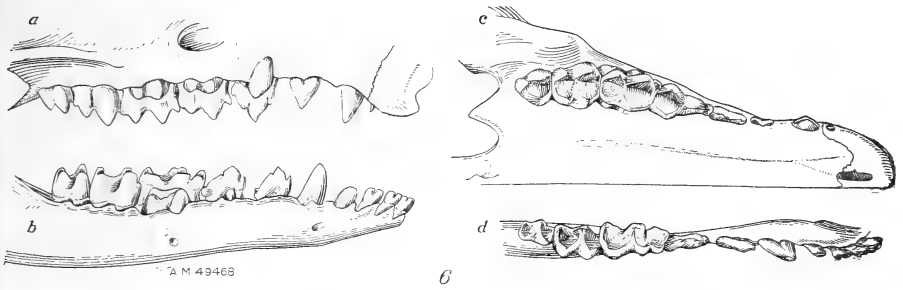

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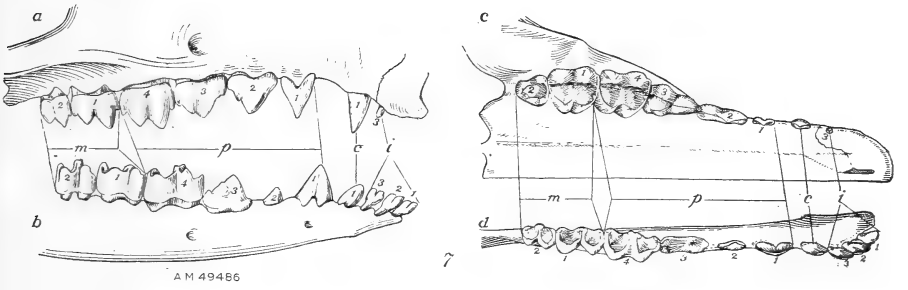

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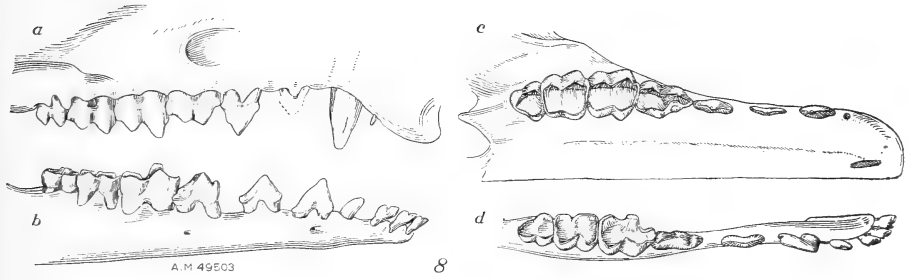

8

(Fig. 1 continued)

Stage 5. First molar fully up and second molar half up in both jaws; permanent premolars visible between the roots of their predecessors; permanent lower incisors and lower canine fully developed. No. 49484, ♀ juv., Niapu, December 4, 1913.

Stage 6. Slightly more mature, the molars being full-grown, but premolars of permanent set still covered by the milk teeth in both jaws; caniniform p_1 nearly mature; upper milk canine has been shed. No. 49468, ♂, Niapu, November 25, 1913.

Stage 7. Mature permanent dentition, but upper canine not fully grown. No. 49486, ♀, Niapu, December 6, 1913.

Stage 8. Senile stage to show wear of teeth. In old age the first premolar becomes greatly worn in both jaws, sometimes only the roots of p^1 remaining. No. 49503, old ♀, Niapu, December 8, 1913.

is directed forward, as is the case with the incisors, which it exceeds but little in size, its blunt-convex crown not rising above the crown surface of the incisors. P_1 is a 2-rooted unicuspid, perfectly caniniform in structure and function; its height is about twice its basal length, or about twice the height of p_2 and p_3, and it is a persistent tooth of the first set. P_2, p_3, and p_4 are respectively similar in structure to their predecessors but more massive. P_4 conforms in plan with the molars except in having an additional cusp on the interior border, making five cusps instead of four as in the molars. It is thus a slightly longer tooth than m_1. The median internal cusp, when the tooth is unworn, is usually minutely bipointed, as in its predecessor. M_1 and m_2 are similar in structure, but m_2 is only about half the size of m_1.

Development and Replacement of the Deciduous Teeth

The condition of the teeth, as seen in the cleaned skull at the stage when the crowns of the last three premolars in each jaw ($\frac{dp^2,\ dp^3,\ dp^4}{dp_2,\ dp_3,\ dp_4}$) are fully excluded and the teeth have become functionally effective (skull No. 49513), is as follows. The incisors and canines (both above and below) are, like the last three premolars, fully developed and functional; the extreme tip of p^1 is barely above the alveolar border and would be, in most cases at least, still covered by the gum; dp_2 is not visible but there is a narrow slit at the outer base of the convex diastema between the canine and dp_2; there is also a narrow opening in the alveoli of the future molars, in each jaw.

Upper Teeth.—Later (Fig. 1, Stage 4), after the skull has nearly doubled its size, p^1 attains its full development. P^1 persists without change except by wear, and, later in life, is the first tooth to become inefficient through excessive attrition. After considerable further increase in the size of the skull the crown of the first molar is excluded and, as soon as it has reached functional maturity, is followed by the second molar. Not, however, till m^2 has become fully functional is there any further change, when the crowns[1] of the permanent canine and the permanent premolars (p^2, p^3, p^4) can be seen between the roots of their predecessors, but it is considerably later before the milk premolars are finally shed and their successors are fully developed.

Lower Teeth.—The first change in the milk teeth of the mandible occurs coincidently with the breaking of the crown of m_1 through its alveolus and before the crown surface of the tooth is much above the

[1] In skull No. 49428 the crown of the right canine is double, consisting of two equal slender stiles in close contact.

alveolar border. At this stage (represented by No. 49499) the four incisiform teeth are still unchanged, but the tip of the caniniform p_1 is just above the alveolar plane, or practically at the same stage as m_1. At the next stage (represented by No. 49498, Fig. 1, Stage 4), m_1 is about two-thirds grown but not as yet at full height, and p_1 is evenly keeping pace with it in development. None of the other milk teeth shows any indication of approaching replacement. In skull No. 49428 this molar is fully developed, as is also p_1, but the milk premolars (p_2, p_3, p_4) are still firmly in place, with no trace of their successors between their roots. The first incisor (i_1), however, has been renewed, and the crowns of the successors of i_2 and i_3 can be seen pushing up at their inner bases, and the same condition is also true of the canine. It would seem, therefore, that the renewal of the milk incisiform series just precedes that of the milk premolars. In No. 49484 a somewhat later stage is shown, in which m_1 is not only fully mature but the crown of m_2 has reached about one-half its full height. In this skull (Fig. 1, Stage 5) the permanent canine has attained to about half the height of its predecessor, coming up at its outside base, and the crowns of the milk premolars can be seen between their roots, these four teeth, like the same teeth in the maxillary series, developing coincidently. The permanent incisors and the permanent canine are also now fully matured.

To complete the series of illustrations a figure of the unworn dentition of a youngish adult (Fig. 1, Stage 7) and of an old-age adult (Fig. 1, Stage 8) are here included.

Nasilio fuscipes (Thomas)

Macroscelides fuscipes Thomas, 1894, Ann. Mag. Nat. Hist., (6) XIII, January, p. 68. "N'doruma [Doruma], Niam-Niam country (about 5° N. and 27° 30′ E.)." Based on a young female "having still its milk-dentition in place."

Represented by 30 specimens (28 skins and skulls, 2 in alcohol), collected as follows:

Niangara, 8: November 18–December 19, 1910.

Faradje, 21: February 8, 1910; February 20–May 6 (mostly February 2–March 1), 1911; December 25, 1912; January 3–8, 1913.

Garamba, 1 (in alcohol): March 1912.

Males and females are equally represented. All are adult except 9, which are one-half to two-thirds grown, with the permanent dentition incomplete. These form a series showing all the stages of change from the deciduous to the permanent dentition, confirming Thomas's determination of the dental formula in *Macroscelides*.[1]

[1]1890, Proc. Zoöl. Soc. London, pp. 445, 446. Milk dentition of *Petrodromus* figured, p. 445.

The adult males have a short-haired, glandular pectoral area, the short hairs of which, and the longer enclosing pelage, are cream-color, due possibly to staining. In some males this area has an axial extent of 20 mm. or more and a breadth of 10 mm., thus forming a conspicuous feature of the ventral surface, but it is less developed in females.

The Niangara series, taken at the close of the rainy season, are rather brighter colored—more rufescent and less gray above—than those from Faradje collected some two or three months later. The difference is not wholly constant and may be seasonal, as some specimens of the Niangara series are indistinguishable in coloration from some of the Faradje specimens.

Collectors' measurements of 7 adult males and 10 adult females from Faradje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	204 (200–207)	115 (109–128)	91.3 (84–96)	29.3 (28–31)	21.0 (20–22)
♀	210 (201–224)	120 (114–129)	91.0 (85–99)	29.2 (28–30)	22.2 (20–23)

Skulls, 5 males, 9 females, Faradje series:

	Total Length	Zygomatic Breadth
♂	34.4 (34 –34.7)	17.1 (16.4–18.1)
♀	34.9 (36.6–36.4)	17.4 (16.6–18.1)

The minima are all from rather young adults, the maxima from obviously very old skulls. The females show a slightly larger average size than the males, both in external and cranial dimension.

These specimens agree satisfactorily with the description of the type of *fuscipes* when those corresponding with it in age ("a somewhat immature female. . . having still its milk dentition in place") are considered. Geographical conditions may be taken as confirmatory of this identification, the type locality (Doruma) of *fuscipes* being about 100 miles north of Niangara and some 160 miles west of Faradje and Garamba. These four localities, Mr. Lang assures me, are in regions of similar environment. The present series, if here correctly referred, shows that *Macroscelides fuscipes* Thomas belongs to the genus *Nasilio* Thomas and Schwann[1] (type *Macroscelides brachyrhynchus* A. Smith), the molars being $\frac{2}{3}$. The type of *fuscipes* was so young that it could give no hint of the number of the molars, but it is described as "most nearly allied to *M. brachyurus* Boc.," of which the author says: "Sa mâchoire inférieure porte chaque côté une molaire de plus, onze dents au lieu de dix."[2]

[1]1906, Proc. Zoöl. Soc. London, II, p. 578.
[2]Bocage, 1889, Journ. Sci. math. phys. nat. Acad. Madrid, (2) I, No. 1, p. 24, Marco.

PLATE I

Rhynchocyon stuhlmanni claudi Thomas and Wroughton. Two males, taken in the same locality within a week, showing an extreme light rufous and an extreme dark phase. Drawn by Charles R. Knight from skins, Amer. Mus. Nos. 49495 and 49477, Niapu, December 1 and 6, 1913.

PLATE II

Fig. 1. *Crocidura jacksoni denti* Dollman. Female adult, Amer. Mus. No. 48520, Medje, May 28, 1914.

Fig. 2. *Sylvisorex oriundus* Hollister. Type. Female adult, Amer. Mus. No. 48554, Medje, May 20, 1914. Photographs from specimens in the flesh. Both natural size.

PLATE III

Scutisorex congicus Thomas. Male adult, Amer. Mus. No. 48475, Medje, May 30, 1914. Photograph from specimen in the flesh. Natural size.

PLATE IV

Crocidura nyansæ kivu Osgood. Male adult, Amer. Mus. No. 48501, Medje, June 13, 1914. Photograph from specimen in the flesh. Natural size.

On *Dysithamnus mentalis* and its Allies. By W. E. Clyde Todd, 1916, Bulletin, XXXV, Art. 29, pp. 533–558, 4 text figures. 20c.

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Harry Hoogstraal

(4)

Sciuridæ, Anomaluridæ, and Idiuridæ Collected by the American Museum Congo Expedition

By the late J. A. Allen

BULLETIN

OF

THE AMERICAN MUSEUM OF NATURAL HISTORY

Vol. XLVII, Art. II, pp. 39–71.

New York

Issued October 27, 1922

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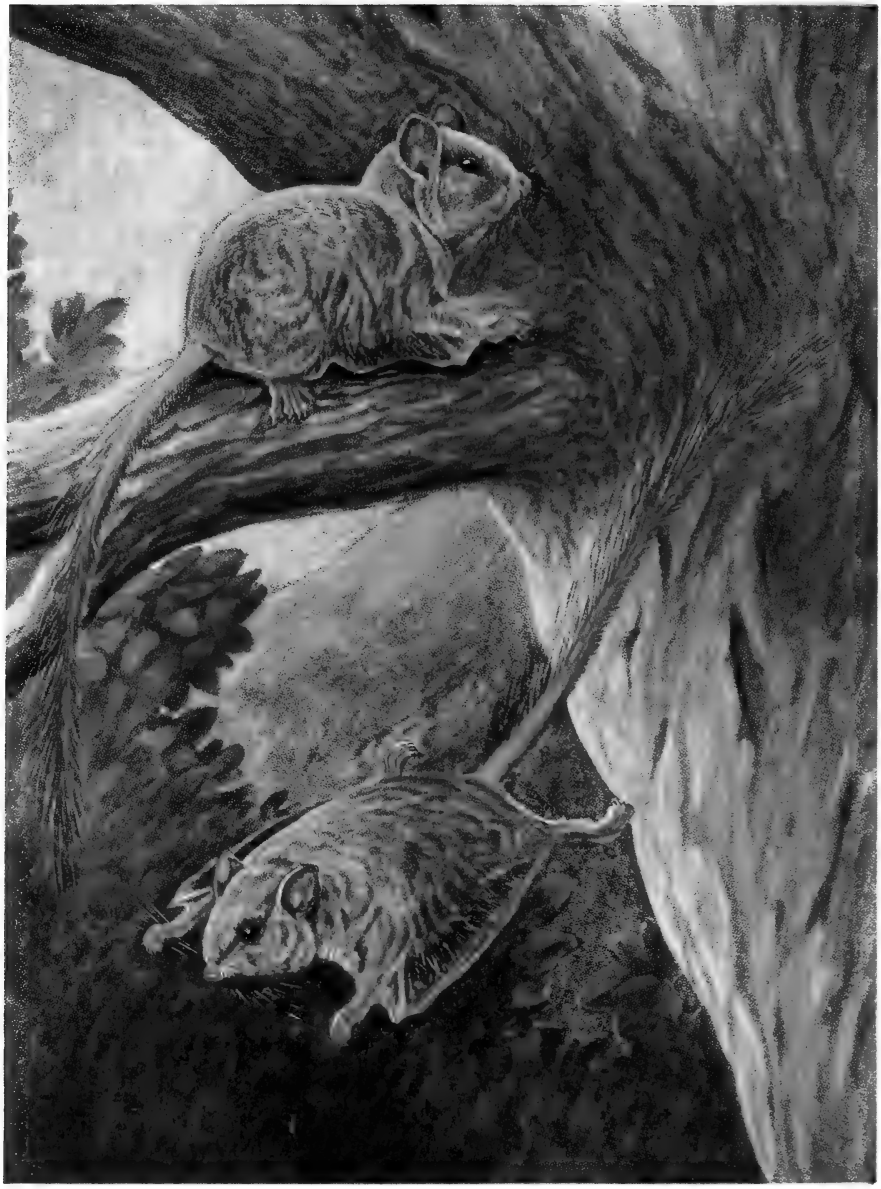

Drawn by Richard Deckert

Idiurus langi J. A. Allen. Medje
(About one-half natural size)

59.9,32(67.5)

Article II.—SCIURIDÆ, ANOMALURIDÆ, AND IDIURIDÆ COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION[1]

By the Late J. A. Allen[2]

Plate V

CONTENTS

INTRODUCTION

The Sciuridæ, Anomaluridæ and Idiuridæ of The American Museum of Natural History Congo Expedition, collected by Messrs. Herbert Lang and James P. Chapin during six years (1909–1915) of field work,

[1]Scientific Results of the Congo Expedition, Mammalogy, No. 6.
[2]After the author's demise the manuscript was arranged for publication by Herbert Lang.

number 480 specimens, representing 20 forms (16 species and 4 additional subspecies). The collection consists of many well-prepared skins with skulls, a number of skeletons, and a few specimens preserved in alcohol. The 315 specimens of Sciuridæ are referred to 14 forms (10 species and four additional subspecies), of which three subspecies are described as new. The 125 specimens of Anomaluridæ represent three genera and are referable to 3 forms, one of them new to science. The Idiuridæ are represented by 40 specimens of three quite different forms, two of which are here for the first time described. These far exceed the total number previously extant in all of the museums of the world, their nocturnal habits and secretive mode of life rendering their capture difficult.

This is a very valuable accession as The American Museum of Natural History had but little African material of this order previous to the reception of the Lang-Chapin Collection. Other museums of this country have generously placed at my disposal material for purposes of comparison. To Mr. Gerrit S. Miller, Jr., Curator of mammals in the United States National Museum, to Mr. Samuel Henshaw, Director, and to Dr. G. M. Allen, Curator of mammals, of the Museum of Comparative Zoölogy at Harvard University, I am indebted for the loan of many of their specimens.

The forms, and the number of specimens of each and their localities, are given in the subjoined lists.

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

	Species and Subspecies	Localities	Specimens
		Sciuridæ	
1.	*Æthosciurus poensis* (A. Smith)	Medje 2, Niapu 1	3
2.	*Heliosciurus rufobrachium pasha* (Schwann)	Faradje 2, Niangara 10	12
3.	*Heliosciurus rufobrachium medjianus*, new subspecies	Akenge 1, Avakubi 1, Bosobangi 1, Gamangui 1, Medje 23, Niapu 9	36
4.	*Heliosciurus rufobrachium rubricatus*, new subspecies	Avakubi 7, Bafwasende 1, Lubila 1	9
5.	*Heliosciurus multicolor lateris* Thomas	Aba 1	1
6.	*Funisciurus anerythrus anerythrus* (Thomas)	Avakubi 7, Gamangui 6, Medje 8, Ngayu 2, Niangara 5	28
7.	*Funisciurus anerythrus niapu*, new subspecies	Niapu 22, Stanleyville 2	24

	Species and Subspecies	Localities	Specimens
8.	*Funisciurus pyrropus akka* de Winton	Akenge 3, Avakubi 1, Boyulu 1, Gamangui 4, Medje 7, Niangara 3, Niapu 13	32
9.	*Funisciurus congicus congicus* (Kuhl)	Leopoldville 1	1
10.	*Tamiscus emini emini* (Stuhlmann)	Avakubi 6, Bafwabaka 7, Batama 1, Faradje 2, Gamangui 1, Medje 10, Ngayu 4, Niangara 5, Niapu 12, Pawa 1, Poko 1, Stanleyville 13	63
11.	*Tamiscus alexandri* (Thomas and Wroughton)	Avakubi 4, Faradje 3, Gamangui 5, Medje 2, Nala 1, Ngayu 2, Pawa 1, Rungu 1	19
12.	*Protoxerus stangeri centricola* (Thomas)	Akenge 5, Avakubi 5, Bafwabaka 2, Faradje 1, Gamangui 4, Kamunionge 1, Medje 6, Ngayu 7, Niangara 2, Niapu 20, Stanleyville 1	54
13.	*Protoxerus stangeri signatus* Thomas	Bolobo 1	1
14.	*Euxerus erythopus lacustris* (Thomas)	Faradje 21, Niangara 10, Rungu 1	32
	Anomaluridæ		
15.	*Anomalurus jacksoni jacksoni* de Winton	Akenge 7, Avakubi 2, Gamangui 1, Medje 28, Niapu 16, Panga 4	58
16.	*Anomalurella pusilla* (Thomas)	Akenge 4, Avakubi 1, Medje 36, Ngayu 2, Niapu 10	53
17.	*Anomalurops beecrofti chapini*, new subspecies	Akenge 1, Medje 12, Poko 1	14
	Idiuridæ		
18.	*Idiurus zenkeri zenkeri* Matschie	Avakubi 1, Medje 27, Niapu 2	30
19.	*Idiurus langi*, new species	Medje 6	6
20.	*Idiurus panga*, new species	Panga 4	4

LOCALITIES, SPECIES AND SUBSPECIES, AND NUMBER OF SPECIMENS TAKEN AT EACH LOCALITY

Localities	Species and Subspecies	Specimens	Totals
Aba	*Heliosciurus multicolor lateris* Thomas	1	1
Akenge	*Heliosciurus rufobrachium medjianus*, new subsp.	1	
"	*Funisciurus pyrropus akka* de Winton	3	
"	*Protoxerus stangeri centricola* (Thomas)	5	
"	*Anomalurus jacksoni jacksoni* de Winton	7	
"	*Anomalurella pusilla* (Thomas)	4	
"	*Anomalurops beecrofti chapini*, new subsp.	1	21
Avakubi	*Heliosciurus rufobrachium medjianus*, new subsp.	1	
"	*Heliosciurus rufobrachium rubricatus*, new subsp.	7	
"	*Funisciurus anerythrus anerythrus* (Thomas)	7	
"	*Funisciurus pyrropus akka* de Winton	1	
"	*Tamiscus emini emini* (Stuhlmann)	6	
"	*Tamiscus alexandri* (Thomas and Wroughton)	4	
"	*Protoxerus stangeri centricola* (Thomas)	5	
"	*Anomalurus jacksoni jacksoni* de Winton	2	
"	*Anomalurella pusilla* (Thomas)	1	
"	*Idiurus zenkeri zenkeri* Matschie	1	35
Bafwabaka	*Tamiscus emini emini* (Stuhlmann)	7	
"	*Protoxerus stangeri centricola* (Thomas)	2	9
Bafwasende	*Heliosciurus rufobrachium rubricatus*, new subsp.	1	1
Batama	*Tamiscus emini emini* (Stuhlmann)	1	1
Bolobo	*Protoxerus stangeri signatus* Thomas	1	1
Bosobangi	*Heliosciurus rufobrachium medjianus*, new subsp.	1	1
Boyulu	*Funisciurus pyrropus akka* de Winton	1	1
Faradje	*Heliosciurus rufobrachium pasha* (Schwann)	2	
"	*Tamiscus emini emini* (Stuhlmann)	2	
"	*Tamiscus alexandri* (Thomas and Wroughton)	3	
"	*Protoxerus stangeri centricola* (Thomas)	1	
"	*Euxerus erythopus lacustris* (Thomas)	21	29
Gamangui	*Heliosciurus rufobrachium medjianus*, new subsp.	1	
"	*Funisciurus anerythrus anerythrus* (Thomas)	6	
"	*Funisciurus pyrropus akka* de Winton	4	
"	*Tamiscus emini emini* (Stuhlmann)	1	
"	*Tamiscus alexandri* (Thomas and Wroughton)	5	
"	*Protoxerus stangeri centricola* (Thomas)	4	
"	*Anomalurus jacksoni jacksoni* de Winton	1	22
Kamunionge	*Protoxerus stangeri centricola* (Thomas)	1	1
Leopoldville	*Funisciurus congicus congicus* (Kuhl)	1	1
Lubila	*Heliosciurus rufobrachium rubricatus*, new subsp.	1	1
Medje	*Æthosciurus poensis* (A. Smith)	2	
"	*Heliosciurus rufobrachium medjianus*, new subsp.	23	
"	*Funisciurus anerythrus anerythrus* (Thomas)	8	
"	*Funisciurus pyrropus akka* de Winton	7	

Localities	Species and Subspecies	Specimens	Totals
Medje	*Tamiscus emini emini* (Stuhlmann)	10	
"	*Tamiscus alexandri* (Thomas and Wroughton)	2	
"	*Protoxerus stangeri centricola* (Thomas)	6	
"	*Anomalurus jacksoni jacksoni* de Winton	28	
"	*Anomalurella pusilla* (Thomas)	36	
"	*Anomalurops beecrofti chapini*, new subsp.	12	
"	*Idiurus zenkeri zenkeri* Matschie	27	
"	*Idiurus langi*, new sp.	6	167
Nala	*Tamiscus alexandri* (Thomas and Wroughton)	1	1
Ngayu	*Funisciurus anerythrus anerythrus* (Thomas)	2	
"	*Tamiscus emini emini* (Stuhlmann)	4	
"	*Tamiscus alexandri* (Thomas and Wroughton)	2	
"	*Protoxerus stangeri centricola* (Thomas)	7	
"	*Anomalurella pusilla* (Thomas)	2	17
Niangara	*Heliosciurus rufobrachium pasha* (Schwann)	10	
"	*Funisciurus anerythrus anerythrus* (Thomas)	5	
"	*Funisciurus pyrropus akka* de Winton	3	
"	*Tamiscus emini emini* (Stuhlmann)	5	
"	*Protoxerus stangeri centricola* (Thomas)	2	
"	*Euxerus erythopus lacustris* (Thomas)	10	35
Niapu	*Æthosciurus poensis* (A. Smith)	1	
"	*Heliosciurus rufobrachium medjianus*, new subsp.	9	
"	*Funisciurus anerythrus niapu*, new subsp.	22	
"	*Funisciurus pyrropus akka* de Winton	13	
"	*Tamiscus emini emini* (Stuhlmann)	12	
"	*Protoxerus stangeri centricola* (Thomas)	20	
"	*Anomalurus jacksoni jacksoni* de Winton	16	
"	*Anomalurella pusilla* (Thomas)	10	
"	*Idiurus zenkeri zenkeri* Matschie	2	105
Panga	*Anomalurus jacksoni jacksoni* de Winton	4	
"	*Idiurus panga*, new sp.	4	8
Pawa	*Tamiscus emini emini* (Stuhlmann)	1	
"	*Tamiscus alexandri* (Thomas and Wroughton)	1	2
Poko	*Tamiscus emini emini* (Stuhlmann)	1	
"	*Anomalurops beecrofti chapini*, new subsp.	1	2
Rungu	*Tamiscus alexandri* (Thomas and Wroughton)	1	
"	*Euxerus erythopus lacustris* (Thomas)	1	2
Stanleyville	*Funisciurus anerythrus niapu*, new subsp.	2	
"	*Tamiscus emini emini* (Stuhlmann)	13	
"	*Protoxerus stangeri centricola* (Thomas)	1	16

NEW SPECIES AND SUBSPECIES, WITH THEIR TYPE LOCALITIES

1. *Heliosciurus rufobrachium medjianus.* Medje
2. *Heliosciurus rufobrachium rubricatus.* Lubila
3. *Funisciurus anerythrus niapu.* Niapu
4. *Anomalurops beecrofti chapini.* Medje
5. *Idiurus langi.* Medje
6. *Idiurus panga.* Panga

GENERAL SUMMARY

Families	Genera	Species and Subspecies	Specimens	Localities[1]
Sciuridæ	6	14	315	23
Anomaluridæ	3	3	125	8
Idiuridæ	1	3	40	4
	10	20	480	

SCIURIDÆ

ÆTHOSCIURUS Thomas

Æthosciurus THOMAS, 1916, Ann. Mag. Nat. Hist., (8) XVII, March, p. 271. Genotype, by original designation, *Sciurus poensis* A. Smith.

Æthosciurus (subgenus of *Heliosciurus*) HOLLISTER, 1919, U. S. Nat. Mus. Bull. 99, part 2, May 16, p. 9.

Æthosciurus poensis (A. Smith)

Sciurus poensis A. SMITH, 1835, South African Quart. Journ., II, p. 64. Fernando Po (Gray).

Æthosciurus poensis THOMAS, 1916, Ann. Mag. Nat. Hist., (8) XVII, p. 271.

Three specimens: Medje, 2 (♂ and ♀ adult), January 24, 1909; Niapu, 1 (♂ adult), November 28, 1913.

Collectors' measurements of the Medje specimens: Total length, ♂ 322 mm., ♀ 337; head and body, ♂ 144, ♀ 152; tail vertebræ, ♂ 178, ♀ 185; hind foot, ♂ 35, ♀ 35; ear, ♂ 14, ♀ 14.

Skull, same specimens: Greatest length, ♂ 37.3, ♀ 38.2; zygomatic breadth, not measurable.

The Niapu specimen is a little smaller and less mature.

Entire pelage, including feet and tail, olivaceous gray, except ventral surface, which is washed with ochraceous medially, the color of the sides extending over the lateral third of the ventral area from axillæ to loins.

Compared with two specimens of *Æthosciurus poensis* (No. 8639, Kribi, Cameroon, and No. 15667, Mus. Comp. Zoöl., Lolodorf, Cameroon), with which they closely agree. Larger series from the two regions (Cameroon coast and Upper Congo) might indicate an appreciable average difference not indicated by the material now available.

[1]The total number of localities at which these forms were collected is 24.

Heliosciurus Trouessart

Heliosciurus (subgenus of *Sciurus*) Trouessart, 1880, Le Naturaliste, II, October, p. 292. Genotype, by subsequent designation (Thomas, 1909), *Sciurus gambianus* Ogilby. Trouessart originally designated *Sciurus annulatus* Desmarest as the type, but as this species is not positively identifiable Thomas has, with good reason, replaced it by *Sciurus gambianus* Ogilby.

The *Heliosciurus rufobrachium*[1] group is represented in the Lang-Chapin Collection by 57 specimens, collected in the region comprised between Avakubi and Bafwasende, south of the Ituri-Aruwimi River, northward to Niangara, on the Uele River, and eastward to Faradje. Three geographical areas are thus included—(1) the region south of the Ituri-Aruwimi covered with Rain Forest, (2) the forested area between the Ituri-Aruwimi and Bomokandi-Uele rivers, and (3) the Uele bush-veldt district to the north. The specimens from these districts, when arranged serially, show well-marked differences in coloration in correlation with the varying conditions of the districts, the extremes represented —the Avakubi specimens on the one hand and the Niangara-Faradje specimens on the other—being so widely different that, without the connecting series from intermediate points, they might readily be considered as possibly specifically separable, especially if represented by a single specimen or even by a small series of specimens. The specimens from the intermediate localities show, however, unmistakable intergradation between the two extreme geographic phases. The differences are primarily the amount and intensity of rufous on both fore and hind limbs and the color of the whole ventral area, particularly of the throat and inside of the limbs. Also the northern pale veldt form is distinctly smaller than either of the two forest forms. The main feature of differentiation is the steadily increasing erythrism of the ventral surface and limbs from the northern veldt country to the heavy Rain Forest south of the Ituri.

In the coloration of the upper surface there is little to distinguish the specimens from the three areas, although the Niangara and Faradje specimens average somewhat paler than those from farther south.

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[1]Mr. Lang has called my attention to the fact that *Sciurus rufobrachium* Waterhouse has nearly three months priority over *S. rufobrachiatus* of the same author and it should therefore be accepted in place of the latter. The species so long universally known as *Sciurus rufobrachiatus* was named *Sciurus rufobrachium* by Waterhouse in an incidental reference to it in a footnote to a paper in the 'Annals and Magazine of Natural History' (X, p. 202) published in November 1842, but in his formal description of the species (Proc. Zoöl. Soc. London for 1842, p. 128, published January 1843) he changed the name to *Sciurus rufobrachiatus*, without explanation or reference to the earlier name for the same species. Consequently the name *Sciurus rufobrachium* was used by just a few, Fitzinger (1867) being the last. All succeeding authors have either overlooked or ignored the earlier name till it was brought to light by Mr. Lang in the preparation of his paper on the bibliography and distribution of African members of this group.

It may be noted also that Waterhouse's *Sciurus leucogenys* has priority over his *Sciurus erythrogenys*, the two cases being parallel and dating from the same footnote.

Through individual variation in the general tone, specimens from either of the series can be selected which are mutually indistinguishable in the color of the upperparts. It is quite different, however, with the ventral surface. In the northern form (*H. r. pasha*) it is pale yellowish white, varying in different specimens from dull whitish to faintly yellowish on the median area from the throat to the anal region, with usually a large whiter pectoral area, the sides being darkened by the dark basal portion of the hairs showing through the superficial light tipping. The chin and throat are a little browner than the foreneck and breast, being sometimes dull yellowish brown, but rarely approaching rufous. The median portion of the extreme base of the under side of the tail has sometimes a slight rufous tone. The outer edge of the forearm and the upper surface of the manus vary from dark rufous to brownish rufous, but the inside of the forearm is pale like the ventral surface, usually without trace of rufous.

In specimens of the other extreme, taken south of the Ituri near Avakubi, the whole lower surface of the body has a strong rufous tone, the throat, foreneck, sides of breast, inguinal region, and entire inner surface of both fore and hind limbs are intense vivid rufous, as is also a conspicuous median patch at the base of the under side of the tail, and the upper surface of the fore and hind feet are also red. The median ventral area, from the chest to the lower abdomen, is pale rufous grizzled slightly with black.

The three forms may be characterized as follows.

1. Light northern form: Underparts superficially pale, the hair-tips whitish or pale yellowish, usually a rather distinct narrow median light band (often broadening at pectoral region) contrasting with a much darker and broader area on either side from axillæ to loins; throat and inside of limbs light, uniform in color with the central light portion of ventral surface, except wrists; outside of hind limbs like back; outer edge of forearm and upper surface of feet pale rufous. On hind limbs the brownish-rufous tone is usually restricted to upper surface of feet; in exceptionally erythric specimens it may extend to the lower leg and include the inner surface as well as the outer, thus forming a dull rufous band just above the ankle, and even extend up the inner side of the leg, with a similar extension of rufous on the inner surface of the lower forearm ..... *H. r. pasha* (Schwann).
2. Darker middle form: Underparts darker, nearly uniform except for a small sharply defined white pectoral area, the hairs ringed basally with black and buff-tipped; throat and inside of limbs pale or dull rufous, in contrast with abdominal region; outer surface of hind limbs like back; outer edge of fore limbs intense rufous, which encircles the lower forearms and lower legs and includes the upper surface of fore and hind feet.

   H. r. medjianus, new subspecies.

3. Darker southern form: Underparts medially strongly suffused with pale rufous, usually without trace of a whitish pectoral area; throat, sides of head below eyes, entire inner side of fore and hind limbs, and extreme posterior part of abdomen intense dark rufous; outer edge of fore limb, lower forearm in front and upper surface of fore and hind feet, wrists and ankles chestnut-rufous, which also extends to the median basal underside of tail.

H. r. rubricatus, new subspecies.

Average External and Cranial Measurements of *Heliosciurus rufobrachium pasha, medjianus*, and *rubricatus*

		External					Cranial	
	Number of Specimens	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear	Greatest Length	Zygomatic Breadth
H. r. pasha, Niangara	10	473	223	251	56.2	18.3	52.2	30.6
H. r. medji- Medje and	12	497	239	258	58.2	18.0	52.9	30.5
anus, Niapu	6	507	239	268	58.3	17.5	53.4	30.8
H. r. rubricatus, Avakubi	6	501	234	262	59.3	18.3	53.4	31.9

The relation of these three forms is so obviously geographic, and reflects so strikingly the effect of environment, it seems desirable to recognize these facts nomenclaturally, as follows.

Heliosciurus rufobrachium pasha (Schwann)

Sciurus rufobrachiatus pasha Schwann, 1904, Ann. Mag. Nat. Hist., (7) XIII, January, p. 72. Type locality, Bellima, Mombuttu, Belgian Congo.

Heliosciurus rufobrachiatus pasha Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473, (part). The Irumu specimen.

Represented by 12 specimens (7 males, 5 females), all adult, collected as follows:

Niangara, 10 (6 ♂, 4 ♀), November 9–20, 1910.

Faradje, 2 (♂, ♀), December 2, 1911.

The type locality of *Sciurus rufobrachium pasha* Schwann is given as "Bellima, Mombuttu," the type being an adult male collected by Emin Pasha, July 13, 1883. Bellima does not now exist, Mr. Lang informs me. It was long since abandoned by the natives. But its former site was about 25 miles southeast of the present Niangara. Hence the ten specimens in the Lang-Chapin Collection are practically topotypes, from which the two from Faradje are indistinguishable.

Collectors' measurements of the Niangara series (6 males, 4 females):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	478 (470–488)	223 (216–235)	250 (245–260)	57.3 (54–59)	18.7 (17–19)
♀	467 (455–479)	217 (215–227)	250 (242–257)	55.0 (53–56)	18.5 (17–20)

Skulls, same specimens:

	Greatest Length (=occipito-nasal length)	Zygomatic Breadth (=greatest breadth)
♂	52.4 (51.0–54.0)	30.3 (29.1–31.3)
♀	51.7 (49.2–55.7)	30.8 (28.8–32.0)

This form is readily distinguishable from those recorded below from localities more to the southward, including Medje, Niapu, and Avakubi, by its much paler general coloration and very much lighter underparts.

Heliosciurus rufobrachium medjianus, new subspecies

Heliosciurus rufobrachiatus pasha Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473, (part). The Medje and "Poko" specimens. "Poko"= south of Poko, in forest probably nearer Niapu than Poko.

Type, No. 50761, ♀ adult, Medje, Belgian Congo, January 17, 1910; Herbert Lang and James P. Chapin. Orig. No. 487.

Larger and darker than *H. r. pasha*, the underparts very much darker, the white tips of tail hairs much shorter, inside of limbs with much more rufous. Differs from *H. r. rubricatus* in lacking the strong rufous suffusion of the underparts and the intense rufous of inside of limbs, throat and anal region.

Collectors' measurements of type: Total length, 502 mm.; head and body, 224; tail vertebræ, 278; hind foot, 59; ear, 20.

Skull (type): Greatest length (=occipito-nasal length), 53.6; condyloincisive length, 49.3; least interorbital breadth, 15.8; tip to tip of postorbital processes, 23.7; postorbital breadth, 16.1; breadth of braincase, 22.2; zygomatic breadth, 30.7; length of nasals, 16.1; breadth of nasals anteriorly, 8.4, do. at posterior border, 5; length of maxillary toothrow, 10.

Represented by 36 specimens (of which 23 are topotypes), taken as follows:

Avakubi, north side of Ituri River toward Bosobangi, 1 (♂ adult), April 11, 1914.

Bosobangi, 1 (♀ adult), December 24, 1909.

Gamangui, 1 (♂ adult), February 7, 1910.

Medje, 23 (13 adult, 10 immature): 9 (6♂, 3♀, all adult), January 15–20, 1910; 10 (5♂, 5♀, all immature, ranging in age from nurslings to half-grown), April 10, August 3–September 14, 1910; 4 (2♂, 2♀, adults—1 ♂ complete skeleton), March 22, 1910; February 28, April 2, 6, 1914.

Niapu, 9 (7♂, 2♀, of which 6 are adult and 3 immature), November 14–December 8, 1913.

Akenge, 1 (♀ adult), October 16, 1913.

Collectors' measurements of 13 adults (8 ♂, 5 ♀) from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	497 (441–534)	241 (225–254)	256 (211–292)	58.4 (55–62)	18.5 (17–20)
♀	495 (475–502)	231 (224–238)	264 (246–278)	57.5 (56–59)	18.2 (17–20)

Skulls, same specimens:

	Greatest Length	Zygomatic Breadth
♂	53.0 (50.7–54.9)	30.7 (28.9–31.9)
♀	52.5 (51.4–53.6)	30.5 (29.4–31.6)

Collectors' measurements of 6 adult specimens (4 ♂, 2 ♀) from Niapu:

Total length, 507 (487–524); head and body, 239 (229–247); tail vertebræ 268 (255–280); hind foot, 58.3 (53–61); ear, 17.5 (17–18).

Skull (5 of the same specimens, 4 ♂, 1 ♀): Greatest length, 53.4 (52.4–54.2); zygomatic breadth, 31.0 (29.8–31.6).

Collectors' measurements of 4 specimens (2 ♂, 2 ♀) from other localities near Niapu (Bosobangi 2, Gamangui 1, Akenge 1):

Total length, 493 (452–542); head and body, 237 (225–251); tail vertebræ, 265 (248–291); hind foot, 54.5 (53–56); ear, 18 (16–19).

Skull (same specimens): Greatest length, 52.8 (51.9–53.9); zygomatic breadth, 30.3 (29.7–31.8).

The specimens from Niapu and other localities near Niapu agree closely in coloration and other features with the type series from Medje. The large series from Medje is especially interesting from the fact that it contains a large number of young specimens, ranging in age from nurslings to nearly half grown. Of six nurslings (the only teeth present are the incisors) one was taken April 10, and five August 3, 5, and 24, three of them being from the same litter. Four others are a week or two older (taken September 2, 9, 13, 14) with the first cheek-teeth just breaking through the gums. The coloration of these young specimens differs from that of adults of the same series in no material respect in either pattern or color. The pelage is, of course, much softer with more underfur, and the ventral surface is more heavily clothed, and hence the color areas are more sharply outlined. The hair of the dorsal surface differs from that of adults in the annulations being apparently narrower, an effect due probably to the shorter pelage. The hairs on the sides of the body are minutely tipped with whitish passing gradually into buffy or pale fulvous toward the midline of the back, as is the case with adults, so that the surface effect is exactly as in the latter. On the ventral surface the color areas are more sharply defined than in adults, owing to the thinner and less complete condition of the coat in the latter. All have the pectoral white patch indicated, and in nearly all it is pure white and forms a conspicuous mark, although varying greatly in size in different individuals. Those in which it is largest have also a small tuft of pure white soft hairs at the axillæ, which is obsolete in those that have the pectoral mark only slightly developed. The sides of the nose, chin, and upper throat are dull yellowish brown, becoming paler posteriorly. The inside of the fore and hind limbs is pale yellowish rufous,

which deepens on the lower hind limbs and anal region to a much darker tone, and is more or less strongly diffused over the basal portion of the underside of the tail. The mid-abdominal region (axillæ to loins) is a grizzle of dull brown and pale buffy, with a tendency to a lighter median line. The upper surface of the fore and hind feet is mixed dark rufous and black, the black basal portion of the hairs showing more or less at the surface.

Individual color variation in adults is due primarily to the amount of rufous suffusion present, varying from a strong rufous tone throughout the pelage to its almost entire absence. Specimens of either of these types, however, are exceptional. The specimen selected as type of *medjianus* represents the average condition. The extreme rufous examples strongly approach *rubricatus* and indicate intergradation between the two forms. The specimens recorded by Thomas from Medje and Poko as referable to *H. r. pasha* (*loc. cit.*) should doubtless be referred to *medjianus*, since these localities are in the type region of the latter.

Heliosciurus rufobrachium rubricatus, new subspecies

Type, No. 50748, ♂ adult, near the Lubila River, an affluent of the Tshopo River, about 50 miles southwest of Avakubi (south of the Ituri River), Belgian Congo, September 20, 1909; Herbert Lang and James P. Chapin, Orig. No. 123.

Similar to *H. r. medjianus* in size and color of upperparts; underparts more strongly suffused with rufous; inside of fore and hind limbs and anal region intense dark rufous; upper surface of feet, wrists and ankles, and median basal underside of tail chestnut-rufous.

Collectors' measurements of type: Total length, 552 mm.; head and body, 255; tail vertebræ, 297; hind foot, 61; ear, 19.

Skull (type): Greatest length (=occipito-nasal), 55.4; condyloincisive length, 51.2; least interorbital breadth, 16.7; tip to tip of postorbital processes, 25.6; postorbital breadth, 14.4; breadth of brain-case, 23.1; zygomatic breadth, 31.5; length of nasals, 17.6; breadth of nasals anteriorly, 8.3, do. at posterior border, 6.6; length of maxillary toothrow, 10.9.

Represented by 9 specimens, as follows:

Avakubi, 7 (3 ♂, 3 ♀, all adult, 1 in alcohol), October 1, 13, December 8, 1909, January 12, 24, June 22, and August 26, 1914.

Bafwasende (35 miles south of Avakubi), 1 (♂ adult), September 23, 1909.

Lubila, 1 (♂ adult), September 20, 1909.

Collectors' measurements of 6 specimens (3 ♂, 3 ♀) from Avakubi: Total length, 501 (482–525); head and body, 234 (226–253); tail vertebræ, 262 (251–279); hind foot, 59.3 (54–63); ear, 18.3 (17–20).

Skull (4 of same specimens—2 too much broken for measurement): Greatest length, 53.4 (52.4–54.8); zygomatic breadth, 31.9 (29.7–33.4).

The relation of the present form to *medjianus* has been indicated in the detailed comparison already given (pp. 45 to 47) of the three forms

of the *rufobrachium* group represented in the present collection. The differences that distinguish *medjianus* from *pasha* are greatly intensified in *rubricatus*, the northward range of which appears to be limited by the Ituri River.

Heliosciurus multicolor Group

Heliosciurus multicolor lateris Thomas

Heliosciurus multicolor lateris Thomas, 1909, Ann. Mag. Nat. Hist., (8) IV, August, p. 102. Type locality, Lado, Mongalla.

Represented by one specimen, subadult female, Aba, Belgian Congo, December 12, 1911.

Collectors' measurements: Total length, 390 mm.; head and body, 185; tail vertebræ, 205; hind foot, 45 (s. u. 42.5); ear, 15.

Skull: Greatest length, 45.4; condyloincisive length, 40.7; zygomatic breadth, 36.

Provisionally referred to this subspecies, with the description of which it well agrees.

Funisciurus Trouessart

Funisciurus (subgenus of *Sciurus*) Trouessart, 1880, Le Naturaliste, II, No. 37, October 1, p. 293. Genotype, by monotypy, *Sciurus isabella* Gray = *Funisciurus lemniscatus isabella* (Gray). A few weeks later (idem, 1880, II, No. 40, November 15, p. 315) he designated *Sciurus lemniscatus* LeConte as type of *Funisciurus*, on the assumption that *S. isabella* Gray was a strict synonym of the earlier *S. lemniscatus*.

Funisciurus anerythrus anerythrus (Thomas)

Sciurus pyrrhopus anerythrus Thomas, 1890, Proc. Zoöl. Soc. London, pp. 447, 448, Pl. xl, animal. Two specimens. Type locality, Buguera.

Funisciurus anerythrus Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473. Mawambi (1), Avakubi (1), Medje (6), Poko (15 specimens).

Represented by 28 specimens, taken at five localities, as follows:

Avakubi, 7 (2 ♂, 1 adult, 1 immature; 5 ♀, all adult), October 7, November 5, 24, 1909, February 11, April 8, 1914.

Ngayu, 2 (2 ♀—1 adult, 1 immature), December 17, 1909.

Gamangui, 6 (1 ♂, 5 ♀—2 ♀ immature), January 30, February 7, 15, 19, 1910.

Medje, 8 (3 ♂, 5 ♀—2 ♂, 2 ♀ immature), January 18–24, September 26, October 5, 1910, April 3, May 25, June 15, 1914.

Niangara, 5 (1 ♂ adult, 4 ♀—2 immature), November 7, 15, 20, 1910.

Collectors' measurements of 14 adult specimens (4 males, 10 females, all middle-aged to adult) from Ngayu, 1 (♀); Avakubi, 4 (1 ♂, 3 ♀); Gamangui, 4 (1 ♂, 3 ♀); Medje, 2 (1 ♂, 1 ♀); Niangara, 3 (1 ♂, 2 ♀).

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	355 (346–368)	186 (183–193)	165 (163–175)	46.5 (46–48)	18.0 (17–19)
♀	356 (348–365)	189 (181–195)	168 (160–183)	47.1 (45–49)	17.4 (16–19)

The above measurements indicate a slightly greater size for the females, as is the case also in *F. pyrropus akka* from about the same localities.

The underparts vary considerably in the amount of buffy or ochraceous wash on the ventral surface, independently of season or locality, the palest being nearly white and a few (four out of twenty-eight) closely approaching the average of the Niapu series of twenty-two described below.

Funisciurus anerythrus niapu, new subspecies

Type, No. 50877, ♂ adult, Niapu, Belgian Congo, November 9, 1913; Herbert Lang and James P. Chapin, Orig. No. 2120.

Similar to typical *anerythrus,* but underparts averaging much darker and more ochraceous, the ochraceous tips of the hairs being longer and brownish ochraceous, often wholly concealing the dark basal portion of the pelage.

Collectors' measurements of the type: Total length, 359 mm.; head and body, 190; tail vertebræ, 169; hind foot, 47; ear, 18.

Skull (type): Greatest length (=occipito-nasal), 45.7; condyloincisive length, 40.7; least interorbital breadth, 11.7; tip to tip of postorbital processes, 19.2; postorbital breadth, 16.1; breadth of brain-case, 20.1; zygomatic breadth, 25.5; length of nasals, 12.2; breadth of nasals anteriorly, 4.6, do. posteriorly, 5.9; length of maxillary toothrow, 8.1.

Represented by 24 specimens collected as follows:

Niapu, 22 (10 ♂, 12 ♀—3 ♂ and 4 ♀ immature) all collected November 9–30, 1913, except one taken at same locality a month later (December 25).

Stanleyville, 2 (♂, ♀ in alcohol), September 6, 1909, January 18, 1915.

Collectors' measurements of 13 adult specimens from Niapu (6 males, all adult; 7 females, of which 3 are young adults):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	356 (337–390)	195 (181–226)	162 (155–169)	45.7 (45–47)	17.3 (17–19)
♀	350 (340–364)	199 (178–205)	163 (157–165)	46.0 (45–47)	17.3 (16–18)

Skulls, same specimens:

	Greatest Length	Zygomatic Breadth
♂	46.5 (43.6–49.0)	25.7 (24.7–26.7)
♀	46.9 (44.9–49.7)	25.2 (24.4–26.3)

It is clearly evident that the marked difference in the coloration of the underparts, which alone distinguishes strongly the Niapu specimens from all of those from the other six localities to the eastward, is not seasonal rather than geographic, the fact being that the greater part of the adults from the other localities were taken at the same season (most of them during the same month) as those from Niapu. A series of five from

Niangara were all taken in November; five others from Avakubi were taken October 7 to November 24; five from Medje were also taken near the same season (September 26, October 5, and January 18–24). When laid out in two series, the specimens from Niapu in one and those from the other localities in the other, it is seen that only a few of the most heavily colored specimens from the eastern localities equal the palest of the Niapu series in either the extent or intensity of the ochraceous wash of the ventral surface. While a few of the lighter colored specimens in the Niapu series can be matched by a few of the darkest specimens in the other, and thus indicate intergradation, the average difference is striking, particularly when the palest specimens of the two series are compared. It seems desirable therefore to recognize the Niapu series in nomenclature as a saturate type of the group, especially since a pale form of *anerythrus* (*F. a. bandarum* Thomas) has been designated from the upper Shari River.

In the present connection it may be of interest to give the results of a comparison, especially in respect to size, of the *F. pyrropus akka* series of thirty-two specimens with the fifty-two of the *F. anerythrus* group, since both were collected at the same time at about the same localities. First it may be stated that the two forms of *anerythrus* show no difference in size, and the same is true also of the *akka* and *anerythrus* series, in either external or cranial measurements. Nor am I able to distinguish the skull of *akka* by any feature from the skull of *anerythrus*. In the coloration of the upperparts there is also a close resemblance, the chief distinction being the color of the lateral line, which is pale buffy in *akka* and white in *anerythrus*, often indistinct in both. The tail is also alike in both, on both surfaces. But the difference in the color of the outside of the limbs (including the upper surface of the feet) and the ventral surface is striking. In *anerythrus* the legs and feet externally and the sides and front of the head are brown with a dull cinnamon-rufous suffusion; in *akka* intense brownish rufous, particularly on the hind limbs and feet. In *anerythrus* the whole ventral surface and inside of limbs is heavily washed with ochraceous (ochre-yellow to ochraceous rufous), the basal third of the hairs pale plumbeous; in *akka* everywhere clear white to the base of the hairs.[1] As both *anerythrus* and *akka* live together abundantly at all localities from which either is represented in the

[1]The Niangara series, as might be expected, is the palest of all, but the Avakubi specimens merge with them; the palest specimen is an old male from Avakubi, taken October 7, which is white below with a slight buffy wash over the thoracic region.

present collection, with not a single intermediate in a joint series of eighty-four specimens, it is evident that their status is that of distinct species. Yet in measurements and proportions and in the coloration of the upperparts (front and sides of head and lateral line excluded) the two forms are practically indistinguishable. In respect to measurements, two series of adults, comprising 13 specimens of *niapu* and 14 of *akka*, afford the following data:

External Measurements

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
F. anerythrus niapu	345	184	161	45.9	17.4
F. pyrropus akka	345	186	159	46.7	17.5

Skull Measurements

	Greatest Length	Zygomatic Breadth
F. anerythrus niapu	47.4	25.2
F. pyrropus akka	46.8	24.2

The measurements and proportions are thus practically identical in the two forms, the averages in external measurements (taken from specimens in the flesh by the collectors) varying from 0 to 2 mm., and those of the skulls from 0.6 to 1 mm.

Funisciurus pyrropus akka de Winton

Sciurus pyrrhopus Thomas, 1888, Proc. Zoöl. Soc. London, p. 9. Two specimens. Type locality, Tingasi, Monbuttu, Belgian Congo.

Sciurus emini de Winton, 1895, Ann. Mag. Nat. Hist., (6) XVI, August, p. 197. Not *Sciurus emini* Stuhlmann, 1894.

Funisciurus akka de Winton, 1899, Ann. Mag. Nat. Hist., (7) IV, December, p. 357. To replace *Sciurus emini* de Winton, preoccupied.

Funisciurus akka Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473. Medje (4), Poko (7 specimens).

Represented by 32 specimens, taken at 7 localities, as follows:

Boyulu, 1 (♂ adult), September 22, 1909.

Avakubi, 1 (♂ adult), July 16, 1914.

Gamangui, 4 (3 ♂ adult, 1 ♀ immature), January 28, February 7, 18, 1910.

Medje, 7 (2 ♂, 5 ♀—4 immature), January 23, March 25, April 1, 4, September 4, 29, 1910, June 24, 1914.

Niapu, 13 (5 ♂, 8 ♀, all adult), November 12–30, December 27, 1913.

Akenge, 3 (1 ♂, 2 ♀), September 29, October 10, 11, 1913.

Niangara, 3 (1 ♂, 2 ♀, all adult), November 9, 10, 1910.

Collectors' measurements of 13 youngish adults from Niapu (5 males, 8 females):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	337 (317–355)	186 (176–201)	151 (141–159)	47.6 (47–48)	18.2 (18–19)
♀	349 (322–371)	189 (165–206)	160 (145–173)	47.6 (45–49)	17.5 (16–18)

Skulls, same specimens:

	Greatest Length	Zygomatic Breadth
♂	46.2 (45.4–48.1)	25.5 (24.7–26.2)
♀	45.7 (45.2–47.9)	25.4 (25.0–26.8)

Only three of the thirteen Niapu specimens of which measurements are given above are old adults (1 ♂, 2 ♀), as indicated by the condition of the teeth and sexual organs (scrotum present in the male, mammæ conspicuous in the females); in the other ten the dentition is complete but the teeth are unworn or only slightly worn, and no mammæ are distinguishable in the females. The measurements below of thirteen specimens from other localities (all that are available) include only adults of middle age or older, and thus average, as would be expected, larger than the Niapu series, which consists almost entirely of rather young adults.

Collectors' measurements of 13 specimens (6 males, 7 females, all middle aged or old) from other localities (Akenge, Avakubi, Boyulu, Ngayu, 1 each; Niangara, 2; Gamangui, 3; Medje, 4):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	335 (322–351)	190 (184–208)	148 (136–156)	48.5 (48–49)	18.7 (18–20)
♀	344 (317–340)	193 (187–202)	151 (130–161)	47.0 (46–48)	18.4 (18–20)

Skulls, same specimens:

	Greatest Length	Zygomatic Breadth
♂	47.5 (46.4–48.5)	25.7 (24.9–27.1)
♀	47.9 (46.4–48.5)	26.3 (24.9–26.7)

The above measurements of two series of specimens, totaling 11 males and 15 females, indicate that the females are slightly larger than the males, but the difference is too small to be diagnostic.

The thirty-two specimens of *F. p. akka* are exceedingly constant in coloration, season and age making very little difference in this respect. The underparts, including the inside of both fore and hind limbs, are pure white to the base of the fur. Immature and September-November adult specimens show a tendency to a faint pinkish wash on the inside of the hind limbs and (exceptionally—in two or three specimens only) on the middle of the belly. The pale buff lateral line running from the shoulder to the hip varies little in color, but is much better defined in

some specimens than in others, the posterior half occasionally becoming almost obsolete. The dark color of the back extends laterally to a little below the lateral line, which thus appears to be bordered along the lower side by a narrow dark band, the flanks being lighter and more suffused with yellowish than the dorsal area. The rufous of the outside of the limbs and upper surface of the feet varies considerably in tone, from light intense rufous to dull brownish rufous. The red on the sides and front of the head shares this variability of tone.

Fully adult specimens are also very constant in size, the chief variation being in the length of the tail, which may be somewhat shorter or longer than the normal length, thus contributing a variable element in the total length. The tail vertebræ are considerably shorter than the head and body, forming about 46 per cent of the total length, and about 84 per cent of the head and body length. The two pairs of mammæ are both inguinal.

Funisciurus p. akka differs from typical *pyrropus* in slightly smaller size and in the rufous of the limbs and head being less vivid and of a browner tone, but several specimens of the present series closely approach specimens of *pyrropus* from the Cameroon coast region.

Funisciurus congicus congicus (Kuhl)

Sciurus congicus Kuhl, 1820, Beitr. Zoöl., part 2, p. 66. Congo.

Represented by one specimen, adult male, Leopoldville, July 6, 1909.

Collectors' measurements: Total length, 320 mm.; head and body, 253; tail vertebræ, 167; hind foot, 39.

Skull: Greatest length, 39.1; zygomatic breadth, 26.

This specimen is referable to the *F. congicus* group, but whether it represents the typical form is not now determinable. It is evidently not *F. congicus interior* Thomas, from Inkongo.

Tamiscus Thomas

Tamiscus Thomas, 1918, Ann. Mag. Nat. Hist., (9) I, p. 33. Genotype, by original designation, *Sciurus emini* Stuhlmann.

Tamiscus (subgenus of *Paraxerus*) Hollister, 1919, U. S. Nat. Mus. Bull. 99, part 2, May 16, p. 14.

Tamiscus emini emini (Stuhlmann)

Sciurus emini Stuhlmann (*ex* Matschie Ms.), 1894, 'Mit Emin Pasha,' I, part 1, p. 320 (footnote), p. 321, fig. animal. Neumann, 1902, Sitzungsb. Ges. naturf. Fr. Berlin, p. 180; "Länder zwischen Albert Edward und Albert Nyansa und nordwestlich des Albert Nyansa bis Monbuttu."

Paraxerus boehmi emini THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473. Medje (4), Mawambi (4), Poko (9 specimens).

Tamiscus emini emini THOMAS, 1918, Ann. Mag. Nat. Hist., (9) I, January, p. 34.

Represented by 57 specimens (32 ♂, 25 ♀, of which 8 are immature, including 3 nurslings), from eleven localities, extending from Stanleyville to Faradje, as follows:

Stanleyville, 10 (6 ♂, 4 ♀, three of them immature), collected August 11–28, 1909.

Batama, near Stanleyville, 1 (♂ adult), September 16, 1909.

Avakubi, 6 (3 ♂, 3 ♀, all adult), October 8, 12, 13, 22, November 9, 1909, and January 22, 1914.

Ngayu, 3 (1 ♂, 2 ♀, all adult), December 16–24, 1909.

Bafwabaka, 7 (4 ♂, 3 ♀, all adult), December 28–31, 1909, and January 5, 7, 1910.

Medje, 10 (6 ♂, 4 ♀, of which 4 are immature, including 2 nurslings), January 15–20, 1910 (7, all adult but one), March 24, 1914 (a nursling), and September 4, 9, 1914 (both immature, 1 a nursling).

Gamangui, 1 (♀ adult), February 4, 1910.

Pawa, 1 (♂ adult), October 20, 1910.

Niangara, 5 (3 ♂, 2 ♀, all adult), November 7–15, 1910, and May 18, 1913.

Faradje, 1 (♂ adult), December 2, 1911.

Niapu, 12 (8 ♂, 4 ♀, all adult), November 14–25, 1913.

Collectors' Measurements of Thirty-five Adults

Locality	No. of Specimens	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
Stanleyville	7	284(271–300)	127(119–135)	158(150–170)	35.0(34–36)	13.0(12–14)
Avakubi	5	277(269–287)	125(122–128)	156(147–165)	34.5(33–37)	13.3(12–14)
Niapu	12	276(267–292)	127(120–137)	148(130–159)	32.6(31–35)	13.6(12–15)
Medje	6	282(275–283)	126(123–130)	154(152–158)	34.0(33–36)	13.6(13–14)
Niangara	5	275(252–294)	128(121–141)	149(141–156)	33.4(31–35)	13.0(12–14)

Skull Measurements (Thirty-three of the Specimens in Table Above)

Locality	No. of Specimens	Greatest Length	Zygomatic Breadth
Stanleyville	6	35.0 (34.3–35.9)	19.5 (19.1–19.7)
Avakubi	5	33.8 (33.1–34.8)	19.4 (19.1–19.7)
Niapu	12	34.4 (33.1–35.0)	19.1 (18.3–19.6)
Medje	5	34.2 (33.7–34.9)	19.3 (18.6–19.7)
Niangara	5	34.2 (32.9–34.9)	19.2 (18.5–19.8)

The discrepancies in the average size at the different localities given in the table is doubtless ascribable to differences in the average age of the specimens.

This large series, from a wide range of localities, is astonishingly uniform in coloration, Stanleyville and Niangara specimens being indistinguishable. Season and age appear to exert little influence on coloration of adults, excluding a few specimens in obviously worn pelage. In two nurslings the general coloration of the upperparts is slightly more yellowish than in adults and the black dorsal stripes are more sharply defined, owing to the shortness of the pelage.

Tamiscus alexandri (Thomas and Wroughton)

Funisciurus alexandri Thomas and Wroughton, 1907, Ann. Mag. Nat. Hist., (7) XIX, May, p. 376. Type locality, Gudima, Iri River, Upper Uele (2 specimens).

Paraxerus alexandri Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473. Medje (4), Poko (1 specimen).

Tamiscus alexandri Thomas, 1918, Ann. Mag. Nat. Hist., (9) I, January, p. 37.

Represented by 19 specimens (8♂, 11 ♀), from 8 localities (Avakubi to Faradje), collected as follows:

Avakubi, 4 (1 ♂, 3 ♀, 3 adult, 1 ♀ embryo in alcohol), November 23, 1913, and January 3, February 22, September 3, 1914.

Ngayu, 2 (♀, ♂, adult), December 22, 24, 1909.

Gamangui, 5 (1 ♂, 4 ♀), January 28, February 8–11, 1910.

Medje, 2 (♂, ♀), April 1, May 25, 1914.

Pawa, 1 (♂ adult), October 10, 1910.

Nala, 1 (♀ in alcohol), July 1913.

Rungu, 1 (♀ adult), October 28, 1910.

Faradje, 3 (♂, all adult), November 29, December 2, 1911.

Collectors' measurements of 4 adults (1 ♂, 3 ♀) from Gamangui: Total length, 215 (214–217); head and body, 105.5 (105–107); tail vertebræ, 110 (109–112); hind foot, 30 (29–31); ear, 14 (all 14).

Skulls of the same specimens and one other from same locality: Greatest length, 29.5 (29.3–29.9); zygomatic breadth, 17.8 (17.3–18.3).

Collector's measurements of 3 adult males from Faradje: Total length, 219 (212–226); head and body, 107 (104–109); tail vertebræ, 112.3 (108–117); hind foot, 29.7 (29–30); ear, 13 (12–14).

Skulls of the same specimens: Greatest length, 29.7 (29.5–29.9); zygomatic breadth, 17.9 (17.4–18.6).

Collectors' measurements of 9 specimens from other localities (Avakubi, 3; Pawa, 1; Rungu, 1; Medje, 2; Ngayu, 2): Total length, 217 (210–230); head and body, 104 (96–107); tail vertebræ, 112 (103–118); hind foot, 29.9 (29–31); ear, 13.5 (12–15).

Skulls, 8 of the same specimens: Greatest length, 28.9 (28.1–29.4); zygomatic breadth, 17.4 (16.9–17.7).

The middle of the back between the dark stripes is pale fulvous, yellower than the sides of body, bordered on each side by a black and a dull yellowish white stripe, and in many specimens indistinct traces of a short blackish stripe outside of the whitish one. In the November, December, January, and February specimens the black and white stripes are sharply defined but in April, May, and October they are usually much less distinct owing to fading and wear. The white border of the ears is at all times a conspicuous feature.

PROTOXERUS Major

Protoxerus (subgenus of *Xerus*) MAJOR, 1893, Proc. Zoöl. Soc. London, (June 1), p. 189, Pl. VIII, figs. 7, 8, Pl. IX, figs. 7, 8. Genotype, by subsequent designation (Thomas, 1897), *Sciurus stangeri* Waterhouse.

Protoxerus stangeri centricola (Thomas)

Sciurus stangeri centricola THOMAS, 1906, Ann. Mag. Nat. Hist., (7) XVIII, October, pp. 295, 297. Type locality, Katabi, Entebbe, Uganda (6 specimens).

Protoxerus stangeri centricola THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 473. Moera (3), Alimasi (2), Mawambi (2), "Poko"[1] (13 specimens), Belgian Congo.

Represented by 54 specimens (30 males, 24 females); all adult but 4; among them 2 skeletons and 2 alcoholic; taken as follows:

Stanleyville, 1 (♂), September 30, 1914.

Kamunionge, southeast of Bafwasende, 1 (♂), September 21, 1909.

Avakubi, 5 (1 ♂, 2 ♀), June 4, August 11, 26, 1914; (2 ♂, alcoholic), August 20, 24, 1914.

Ngayu, 7 (3 ♂, 4 ♀), December 11–23, 1909.

Bafwabaka, 2 (♂, ♀), December 30, 1909, and January 7, 1910.

Gamangui, 4 (3 ♂, 1 ♀), January 29, and February 8, 9, 20, 1910.

Medje, 6 (2 ♂, 4 ♀), January 20, 23, March 15, September 10, 15, 1910, and February 27, 1914.

Niapu, 20 (12 ♂, 8 ♀), November 14–30, December 2, 19, 1913, and January 2, 1914.

Akenge, 5 (2 ♂, 3 ♀), October 1–17, 1913.

Niangara, 2 (♂, ♀), November 12, 19, 1910.

Faradje, 1 (♂), November 30, 1911.

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[1]Mr. Lang believes that Dr. Christy's specimens recorded as from "Poko" were really taken in the forest belt, farther south, toward Niapu.

As indicated above, 20 of the 54 specimens were taken at Niapu, all but three during the last half of the month of November; all were adults in fresh pelage. Niapu is about 60 miles south of Poko, from which locality a large series collected by Dr. Christy has been referred by Thomas (*loc. cit.*, 1915, p. 473) to this subspecies.

Collectors' measurements of the Niapu series (12 males, 8 females):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	587 (551–628)	284 (271–309)	301 (270–350)	69.8 (65–75)	22.3 (21–24)
♀	591 (584–611)	283 (277–297)	307 (300–314)	69.8 (65–73)	22.0 (21–23)

Skulls, same specimens:

	Greatest Length (=occipito-nasal length)	Zygomatic Breadth (=greatest breadth)
♂	67.23 (64.8–68.7)	37.5 (35.8–38.5)
♀	66.6 (64.6–68.7)	37.6 (36.3–38.1)

Collectors' measurements of 15 adults (8 males, 7 females) from other localities (Avakubi 3, Bafwabaka 1, Stanleyville 1, Gamangui 3, Kamunionge 1, Medje 3, Ngayu 1, Niangara 2):

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	577 (557–590)	280 (261–296)	290 (277–314)	69.0 (68–71)	22.0 (21–24)
♀	586 (570–610)	290 (284–296)	292 (280–315)	68.4 (65–71)	21.7 (20–23)

Skulls, same specimens:

	Greatest Length (=occipito-nasal length)	Zygomatic Breadth (=greatest breadth)
♂	66.5 (64.6–67.0)	36.7 (35.5–37.8)
♀	66.2 (64.5–68.5)	36.8 (35.4–38.0)

The external measurements of the head, body, and tail[1] of the type of *centricola* (an old female from Entebbe), "taken on the skin," considerably exceed the averages given above, but the foot, allowing 5 or 6 mm. for the claws, is about equal to the smallest records of our specimens measured in the field, and the greatest length of the skull (66.5 mm.) differs less than a millimeter from the average of the 35 adult specimens from the Belgian Congo given above.

The coloration of this large series is rather uniform, half-grown specimens differing scarcely at all from the adults. A few of the latter, in somewhat worn pelage, are a little pale from evident bleaching. The extension of the gray of the dorsal region forward upon the head varies somewhat, in some specimens gray-tipped hairs covering the crown as far as the eyes, in others only as far as the front base of the ears.

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[1] "Head and body (overstretched) 310 mm.; tail, 330; hind foot, 61."

Protoxerus stangeri signatus Thomas

Protoxerus stangeri signatus Thomas, 1910, Ann. Mag. Nat. Hist., (8) V, January, p. 85. Type locality, Lodja, Upper Lukenie River, Belgian Congo.

A single specimen from Bolobo (skin without skull), presented to the Expedition by Dr. Gerling, is apparently referable to this form which, as indicated by the description based on the type specimen from Lodja, it closely resembles. The type locality is some 400 miles east of Bolobo. The differences from the series of *P. s. centricola* as recorded above are slight and it is here recognized mainly on geographical grounds.

Euxerus Thomas

Euxerus Thomas, 1909, Ann. Mag. Nat. Hist., (8) III, June, p. 473. Genotype, by original designation, *Sciurus erythopus* Geoffroy.

Euxerus erythopus lacustris (Thomas)

Xerus erythropus lacustris Thomas, 1905, Ann. Mag. Nat. Hist., (7) XV, April, p. 388. Masindi, Unyoro.

Euxerus erythropus lacustris Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 474. "Panga" (near Poko) (3), Poko (8 specimens).

Represented by 30 specimens, collected as follows:

Faradje, 20 (2 ♂ and 10 ♀ adults, 1 nursling, 7 one-fourth to one-third grown), February 20, 22, 26, March 4, 5, 14, 31, April 3, 11, 29, 30, May 27, June 29, September 3, 11, 1911, October 16, December 14, 1912, January 10, 12, 1913.

Niangara, 9 (2 adult, 7 immature, of which 5 are nurslings), November 12–28, December 22, 1910, and January 2, 1911.

Rungu, 1 (♂ adult), January 30, 1913.

Collectors' measurements of 11 adults (2 males, 9 females) from Faradje: Total length, 492 (474–515); head and body, 282 (259–297); tail vertebræ, 209 (189–230); hind foot, 72 (68–75); ear, 18.8 (18–20).

Skulls, same specimens: Greatest length, 65.1 (63.6–67.2); zygomatic breadth, 34.2 (33.7–34.6).

The three localities at which specimens were taken are all in the open districts of the savannah in the northeastern Belgian Congo.

Young specimens a few weeks old are similar in coloration to the adults, the pattern being the same, but a little lighter in tone, the light tips to the hairs of the upperparts, owing to the shortness of the pelage, concealing the darker basal portion. The tail, however, is externally white, the long white tips of the hairs usually wholly concealing the broad subapical black zone of the tail hairs. Later, as the animal increases in size, the black base of the hairs forms a narrow black median line on both

the upper and the lower surfaces of the tail; still later, in specimens one-third to half grown, both surfaces of the tail are grizzled black and white, with the sides and tip white, and the body pelage, in texture and coloration, has become like that of adults, the juvenal coat having been replaced by molt.

ANOMALURIDÆ

The one hundred and twenty-five specimens of Anomaluridæ represent three of the four superspecific groups of this family proposed by Matschie in 1914,[1] and are referable to three forms.

ANOMALURUS Waterhouse

Anomalurus WATERHOUSE, 1842, Ann. Mag. Nat. Hist., X, pp. 201, 202; 1842, Proc. Zoöl. Soc. London, (January 1843), pp. 124–127. Genotype, by monotypy (also by original designation), *Anomalurus fraseri* Waterhouse.

Aroæthrus WATERHOUSE, 1842, Proc. Zoöl. Soc. London, (January 1843), p. 124, footnote. Substitute name to replace *Anomalurus* Waterhouse in case the latter is found to be preoccupied.

Anomalurus, as restricted by Matschie (*loc. cit.*, 1914), includes about a dozen forms, the greater part of which are subspecies of *A. fraseri*.

Anomalurus jacksoni jacksoni de Winton

Anomalurus jacksoni DE WINTON, 1898, Ann. Mag. Nat. Hist., (7) I, March, p. 251. Ntebe (=Entebbe), Uganda.

Anomalurus jacksoni THOMAS, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Moera (1), Medje (2), Poko (5 specimens).

Represented by 58 specimens (25 males, 29 females, all adult but 3, including 4 in alcohol, 4 skeletons, and a skull), collected as follows:

Avakubi, 2 (♂, ♀ in alcohol), March 31, April 14, 1914.

Medje, 28 (12 ♂, 13 ♀; 2 in alcohol, 4 skeletons), January 20–24, March 6–21, April 9–26, May 2, August 1, 3, September 9, 16, October 6, 1910.

Gamangui, 1 (skull only), February 1, 1910.

Niapu, 16 (10 ♂, 6 ♀), November 12–18, December 2–19, 1913.

Akenge, 7 (♂, 6 ♀—1 ♀, embryo in alcohol), September 29–30, October 9, 11, 28, 31, 1913.

Panga, 4 (♂, 3 ♀), September 14–18, 1914.

Collectors' measurements of 16 adult specimens (9 ♂, 7 ♀) from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	549 (518–563)	317 (296–332)	237 (228–250)	61 (58–63)	38.5 (36–41)
♀	582 (559–621)	331 (319–342)	258 (240–280)	63 (62–65)	40.0 (39–41)

[1] 'Ein neuer *Anomalurus* von der Elfenbeinküste.' Von Paul Matschie. 1914, Sitzungsb. Ges. naturf. Freunde Berlin, No. 7, July, pp. 349–351. (1) *Anomalurus* Waterhouse, (2) *Anomalurodon*, (3) *Anomalurops*, (4) *Anomalurella*.

Skulls, same series:

	Occipito-nasal Length	Zygomatic Breadth
♂	55.6 (53.5–57.3)	36.9 (35.0–38.0)
♀	57.1 (53.5–58.8)	38.3 (35.0–39.8)

Collectors' measurements of 15 adult specimens (8 ♂, 7 ♀) from Niapu:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	559 (540–570)	313 (298–323)	248 (222–267)	60.4 (58–65)	37.6 (35–39)
♀	582 (554–628)	311 (301–344)	261 (252–284)	61.3 (62–64)	38.1 (36–40)

Skulls, same series:

	Occipito-nasal Length	Zygomatic Breadth
♂	56.3 (55.2–57.8)	37.5 (36.1–38.0)
♀	57.2 (56.0–58.9)	37.5 (36.8–38.4)

The three adults (1 ♂, 2 ♀) from Panga agree in proportions and measurements with the Medje and Niapu specimens. The single specimen from Avakubi is a young adult male.

In compiling the measurements given above only specimens in which the dentition was fully mature were used; but while the relative number with unworn teeth varies in the different categories, and tends to lower the average for the series when they predominate, this factor, in the present series, does not account for the slightly larger average size of the females in the above statistical summaries. In the discarded specimens the last molar was not fully developed, varying in different specimens from just breaking the alveolus to one-half to two-thirds full height, but still unpigmented. In such specimens the total length of the skull ranges from 50 to 53 mm., as against 55 to 58 mm. in adults.

Anomalurella Matschie

Anomalurella Matschie, 1914, Sitzungsb. Ges. naturf. Freunde Berlin, July, p. 351. Genotype, by original designation, *Anomalurus pusillus* Thomas.

Anomalurella pusilla (Thomas)

Anomalurus pusillus Thomas, 1887, Ann. Mag. Nat. Hist., (5) XX, December, p. 440; 1888, Proc. Zoöl. Soc. London, p. 8, Pl. I, animal. Bellima, 1 ♀ (type); Tingasi, 1 ♂.

Anomalurus pusillus Thomas, 1915, Ann. Mag. Nat. Hist., (8) XVI, December, p. 472. Moera (1), Medje (4), Poko (7 specimens).

Represented by 53 specimens (21 ♂, 29 ♀), of which 5 are immature (but none very young), 2 are skulls only, 4 skeletons, and 2 in alcohol, collected as follows:

Avakubi, 1 (♀), September 18, 1913.

Ngayu, 2 (2 ♀), December 17, 20, 1909.

Medje, 36 (12 ♂, 21 ♀—2 ♂, 2 ♀ immature, 2 skulls, 4 skeletons, 1 embryo in alcohol), January 16–26, March 8–26, April 4–27, May 14, June 30, August 18, October 7, 1910, March 23, June 25, 1914.

Niapu, 10 (7 ♂, 3 ♀), November 19, 24, 26, December 4–9, 16, 1913.

Akenge, 4 (2 ♂, 2 ♀), September 30, October 14, 16, 1913.

Collectors' measurements of 23 adults (7 ♂, 16 ♀) from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	371 (359–390)	227 (210–242)	144 (138–152)	43.0 (40–46)	29.8 (30–32)
♀	373 (357–401)	230 (212–246)	148 (141–157)	44.5 (40–47)	30.0 (30–32)

Skulls (10 ♂, 14 ♀), same series:

	Occipito-nasal Length	Zygomatic Breadth
♂	44.8 (43.6–46.6)	29.8 (28.0–30.9)
♀	45.2 (43.6–47.6)	29.9 (28.0–30.8)

Collectors' measurements of 9 adults (7 ♂, 2 ♀) from Niapu: Total length, 371 (353–382); head and body, 219 (213–227); tail vertebræ, 143 (130–147); hind foot, 43.7 (42–46); ear, 29.2 (28–30).

Skulls, same specimens: Occipito-nasal length, 45.1 (43.5–46.3); zygomatic breadth, 29.7 (28.3–30.2).

Very few of the specimens of the present series conform very closely in the coloration of the upperparts to the original description and accompanying colored plate of the species, of which it is said: "General colour above uniform dark grizzled gray, the tips of the hairs forming a terminal band of pale gray or olivaceous." In many specimens of the present series this "terminal band" is near ochraceous rufous, intensified in exceptional specimens to pale tawny. One specimen from Akenge may be noted as having the pelage of the back hazel for the terminal half or more of the hairs, recalling forcibly the dorsal region in *A. beldeni* Du Chaillu (=?*erythronotus* Milne-Edwards) but the red is browner. This specimen, however, is probably abnormal, as the new coat, coming in in patches, conforms to that of normal specimens.

Anomalurops Matschie

Anomalurops Matschie, 1914, Sitzungsb. Ges. naturf. Freunde Berlin, No. 7, July, p. 351. Genotype, by original designation, *Anomalurus beecrofti* Fraser.

This group includes six described forms, the greater part of which appear to be subspecies of *A. beecrofti*. The type locality of *A. beecrofti chapini*, described below, is far to the eastward of any previously known locality for the *beecrofti* group.

Anomalurops beecrofti chapini, new subspecies

Type, No. 50480, ♂ adult, Medje, Belgian Congo, May 6, 1910; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 861. Named for James P. Chapin.

Smaller and much lighter in color than *A. beecrofti citrinus* Thomas,[1] from Benito River, Spanish Guinea.

General color above (including membranes), yellowish gray; middle of back from occiput to sacral region with an irregular broad band of ochraceous orange, varied with black, the hairs individually (about 20 mm. in length) mouse-gray basally, passing gradually into a broad band of dull black, followed by a subapical band (5–6 mm. wide) of ochraceous orange and conspicuously tipped with black; hairs of upper surface of membrane for the antero-lateral fourth of the border rigid and intense black; a well-defined patch of white or buffy white at lateral base of ears, indistinctly merging by a downward sweep with the white or whitish half collar in front of shoulders, and the usual small tuft of partly concealed white hairs on occiput; front and sides of head dull gray or buffy gray, extending laterally to sides of throat; general color below (including membranes) ochraceous buff to base of hairs (varying in some specimens to light buff or even whitish), except on the throat and a broad median band thence to anal region (usually narrowing posteriorly) and the inside of thighs, which parts are intense orange-rufous in high-colored specimens, paler in others; basal third of tail and caudal membrane below like ventral surface, above like the lower back; apical two-thirds of tail dull brown, varying in different specimens from dark brown to pale fulvous brown and even cinnamon-brown; upper surface of feet dull grayish with a slight buffy suffusion; soles and palms naked, pale brown, as are the nose and apical two-thirds of ears.

Collectors' measurements of type: Total length, 512 mm.; head and body, 310; tail vertebræ, 202; hind foot, 59; ear, 29.

Measurements of skull (type): Greatest (occipito-nasal) length, 54.5; condyloincisive length, 51.4; zygomatic breadth, 34.4; least interorbital breadth, 18.4; breadth of brain-case, 26.3; length of upper toothrow, 11.9.

Collectors' measurements of 10 adults (5 ♂, 5 ♀), of which 8 are from Medje and 1 each from Poko and Akenge:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	512 (501–518)	301 (278–323)	211 (195–223)	59 (56–62)	31 (29–32)
♀	510 (475–555)	297 (277–330)	213 (198–226)	59 (58–60)	31 (29–32)

Represented by 14 specimens (8 ♂, 6 ♀, all adult but 2), collected as follows:

Medje, 12, (6 ♂, 6 ♀), March 13, April 9, 13, 27, 30, May 6, 8, September 24, October 12, 1910, February 28, 1914.

Poko, 1 (♂), August 22, 1913.

Akenge, 1 (♂), October 1, 1913.

Anomalurops beecrofti chapini is geographically nearest *A. beecrofti citrinus* Thomas (type from "Benito River, Spanish Guinea," collected by G. L. Bates), from which it differs in considerably smaller size and much less intense coloration. Fortunately I am able to make

[1] *Anomalurus beecrofti citrinus* Thomas, 1916, Ann. Mag. Nat. Hist., (8) XVIII, August, p. 236. "About a dozen specimens examined."

direct comparison of the Congo series with four topotypes[1] of *citrinus* also collected by Mr. Bates. As shown in the accompanying tabulated measurements, *A. b. citrinus* exceeds *A. b. chapini* in total length by about 50 mm., and about the same in head and body length, while there is very little difference in the length of the tail. (It is probable that these latter measurements were not taken by the same method in the two cases.) In skull length *citrinus* exceeds *chapini* by about 4 mm., with the other skull measurements proportionately different. The impression given by comparison of the two series is a greater size difference than the measurements indicate, the *citrinus* skulls being more heavily ossified, with stronger ridges for muscular attachment in skulls of equal age than is the case in *chapini*. The color differences are strongly marked. The "ochraceous olive" or "citrine drab" effect above in *citrinus* is replaced by light clear gray, or slightly yellowish gray, in *chapini*, with a corresponding difference in the tone of the median dorsal band; below the ferruginous tone is much darker in the former, approaching chestnut-red on the throat and median line in *citrinus* in place of orange-rufous in *chapini*.

The series of 14 specimens of *A. b. chapini* presents the usual wide range of individual variation in both size and coloration. The smallest specimen in cranial measurements is a female (skull, 51.8 × 32.9) in which all the cheek-teeth have attained full development but are unworn; in external measurements it is the largest of the females except one, which is much the largest specimen of the entire series (skull, 58.5 × 36.8) in both external and cranial measurements.

The color above varies from clear light gray to yellowish gray, and the rufous dorsal line is in some weakly developed or nearly obsolete, in others heavy and continuous from the crown to the hips. The broad rufous zone of the median underparts likewise varies greatly in extent and intensity—from orange-rufous to dark ferruginous, and the adjoining lateral parts from ochraceous orange to pale buff. Young specimens are much paler below than the adults. The white crown spot is nearly always plainly distinguishable and usually forms a distinct mark which is occasionally conspicuous. In one specimen it is a transversely-oval patch, 15 × 25 mm. in area. There is apparently no sexual difference in size or color.

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[1]Borrowed from the United States National Museum through the kindness of Mr. G. S. Miller, Jr., Curator of Mammals.

Collectors' Measurements

	Locality	Sex	Total Length	Head and Body	Tail Vertebræ	Hind Foot
Type[1] *A. b. citrinus*	Benito River, Spanish Guinea	♀	582	357	225	60 s.u.
84546 N. M. *A. b. citrinus*	" "	♀	565	350	215	57 "
84547 " " "	" "	♂	540	355	185	53 "
84548 " " "	" "	♀	585	380	205	56 "
Average, 4 specimens			**568**	**361**	**208**	**56.5** "
50477 *A. b. chapini*	Medje, Upper Congo	♀	515	305	210	58 c.u.
50480 " "	" "	♂	512	310	205	59 "
50481 " "	" "	♀	555	330	225	60 "
50482 " "	" "	♂	517	298	219	62 "
50483 " "	" "	♀	490	282	208	60 "
50610 " "	" "	♂	518	323	195	60 "
50485 " "	Poko	♂	510	298	212	59 "
Average, 7 specimens			**517**	**305**	**211**	**60** "

Measurements of Skulls

	Locality	Sex	Greatest Length	Zygom. Breadth	Upper Toothrow
Type[1] *A. b. citrinus*	Benito River, Spanish Guinea	♀	58.5	38.0	12.8
84546 N. M. *A. b. citrinus*	" "	♀	59.5	38.3	13.0
84547 " " "	" "	♂	60.5	38.4	13.2
84548 " " "	" "	♀	59.7	38.3	13.0
84512 " " "	" "	♀	58.0	37.4	11.5[2]
Average, 5 specimens			**59.2**	**38.1**	**13.0**
50477 *A. b. chapini*	Medje, Upper Congo	♀	55.2	35.8	12.6
50480 " "	" "	♂	54.3	33.8	12.2
50481 " "	" "	♀	58.5	36.8	12.7
50482 " "	" "	♂	56.4	36.2	12.5
50483 " "	" "	♀	52.6	35.5	12.0
50610 " "	" "	♂	55.0	36.3	11.7
50485 " "	Poko	♂	55.1	33.8	11.8
Average, 7 specimens			**55.3**	**35.4**	**12.2**

[1]From the author's description (*loc. cit.*).
[2]Toothrow abnormally short and omitted from the average.

IDIURIDÆ

The Idiuridæ, recently separated from the Anomaluridæ as a distinct family group by Miller and Gidley,[1] are represented by three quite different forms, two of which are here for the first time described.

IDIURUS Matschie

Idiurus MATSCHIE, 1894, Sitzungsb. Ges. naturf. Freunde Berlin, No. 8, August, pp. 194–200, 1 text-fig. Genotype, by monotypy, *Idiurus zenkeri* Matschie.

Idiurus zenkeri zenkeri Matschie

Idiurus zenkeri MATSCHIE, 1894, Sitzungsb. Ges. naturf. Freunde Berlin, No. 8, October 16, p. 197, text fig. p. 198 (animal). Type locality, Yaunde Station, Cameroon District, West Africa. One specimen.

Represented by 30 specimens (22 skins with skulls, 8 in alcohol), collected as follows:

Medje, 27 (14 ♂, 13 ♀; 21 skins and skulls, 6 in alcohol), January 21, 25, March 9, 16, 1910.

Avakubi, 1 (♀, skin and skull), January 22, 1914.

Niapu, 2 (1 ♂, 1 ♀, in alcohol), January 27, 1914.

Collectors' measurements of 19 adults (10 males, 9 females) from Medje:

	Total Length	Head and Body	Tail Vertebræ	Hind Foot	Ear
♂	170 (165–175)	71 (64–78)	99 (93–104)	17.0 (16–18)	13.6 (12–14)
♀	173 (160–187)	73 (65–86)	101 (95–108)	17.3 (16–18)	13.4 (12–14)

Measurements of 14 skulls (7 males, 7 females), from the same series:

Greatest (=occipito-nasal) Length	Zygomatic Breadth
♂ 21.0 (20.5–21.3)	12.2 (11.5–12.8)
♀ 21.4 (21.1–21.8)	12.4 (11.9–12.8)

This fine series, particularly the 21 skins from Medje, throws much light upon questions of individual, sexual, and seasonal variation. The measurements, both external and cranial, indicate a slightly larger average size for females than males, but there is no recognizable sexual difference in coloration.

The range of color variation is considerable in the Medje specimens taken at the same date, due largely to the condition of the pelage in respect to wear, the general tone of the coloration becoming darker as the tips of the hairs wear off, showing more of the basal fur, while the hair-tips become paler by fading. Comparison of the twelve specimens

[1] 'Synopsis of the supergeneric groups of Rodents.' Gerrit S. Miller, Jr., and James W. Gidley, 1918, Journ. Washington Acad. Sci., VIII, No. 13, July 19, p. 422.

taken March 16 with the eight taken January 25, shows that the latter average darker in general effect and the hair-tips paler, yet certain specimens of the January series can be matched exactly by the paler specimens of the March series. The hair-tips on the back of the brighter colored examples of the March series are near snuff-brown, varying in intensity in different individuals, and about cinnamon-buff on the ventral surface, but often nearly wanting through wear, as in the single Avakubi specimen taken January 22, the most worn of any of the entire series of twenty skins.

A single skin and skull[1] of *I. zenkeri*, from the southern Cameroon, and thus practically a topotype, is rather darker than the average of the Medje series, but differs so little from some of them that they are provisionally referred to this species. Their relationship to *I. zenkeri kivuensis*, recently described by Lönnberg,[2] is not at present determinable. It appears to be a much darker form than typical *zenkeri*.

Idiurus langi, new species

Plate V

Type, No. 50542, ♂ adult, Medje, Belgian Congo, March 16, 1910; Herbert Lang and James P. Chapin, American Museum Congo Expedition. Orig. No. 737. Named for Herbert Lang, leader of the American Museum Congo Expedition.

Size of and proportions nearly as in *Idiurus macrotis* Miller, but very different in coloration.

Upperparts (type, in fresh, unworn pelage) washed with clay-color (Ridgway, 1912), strongest on middle of back, less heavily on lower back and sides; in worn pelage much paler (about cinnamon-buff), the light hair-tips partly worn off (almost wholly on lower back and sides); pelage of middle of back (in fresh coat), 11.5 mm. in length, the buffy tips about 2 mm. long, followed by a dark zone of about equal width, the basal two-thirds "mouse-gray." Underparts heavily washed with warm buff, almost wholly concealing the light neutral gray of the basal fur (varying in different specimens, especially when worn) to a faint wash of lighter tone); a conspicuous pale yellowish white patch on sides of nose extending from base of rictal bristles to the naked nose pad, about 4 × 6 mm. in extent; chin and interramal region white or pale yellowish white; upper surface of membranes thinly clothed with brownish black hairs, under side nearly naked; membranes and ears pale brownish (ears in some specimens slightly darker brown); feet and greater part of tail yellowish brown, the long tail hairs dark brown with a faint tone of chestnut, much less dark than in *I. macrotis*. The scale pad on the ventral base of the tail is much longer than in *macrotis* (given as 17 mm.), varying from 20 to 25 mm. in length, and the scales are larger and tend to form regular rows, and beyond what may be considered as the "scale pad" proper, the annulations on the lower surface of the tail are conspicuous and roughened, so that in some specimens it is difficult to determine what should be regarded as the

[1] No. 125438, U. S. Nat. Mus., ♀, Efulen, Bulu Country, Cameroon, July 21, 1903, coll. G. L. Bates.
[2] 1917, Kungl. Svens. ventensk. Akad. Handl., LVIII, No. 2, September, p. 67. Masisi, Belgian Congo, about forty miles northwest of Lake Kivu. Two specimens, adult and young.

apical end of the pad, as distinguished from the annulations. The fringes on outer edge of both fore and hind feet, the small tufts of whitish bristly hairs at tarsal and metatarsal joints, the tail fringes, and the scattered long hairs in the dorsal pelage, are evidently generic characters, being common to the three forms of *Idiurus* here under consideration.

Collectors' measurements of the type[1]: Total length, 224 mm.; head and body, 94; tail vertebræ, 130; hind foot, 20; ear, 18.

Collectors' measurements of type and 4 topotypes (all adult males): Total length, 218 (207–224); head and body, 91 (86–94); tail vertebræ, 129 (124–133); hind foot, 21 (20–22); ear, 15.7 (14–18).

Skull (measurements of type[1]): Greatest length, 26; zygomatic breadth, 16; least breadth of frontals,[2] 6.6; greatest breadth of nasals,[2] 3.2; upper toothrow, 3.5; distance between inner bases of m^3, 1.4; do. m^1, 1.1; greatest length of mandible, 16.4; greatest depth (at coronoid), 10.2; lower toothrow, 4.

Skull (type and same 4 topotypes): Greatest length, 25.8 (25.1–26.2); zygomatic breadth, 15.5 (15.0–16.0).

Represented by 6 adult males, all of which are skins with skulls, and 1 adult female in alcohol, all taken at Medje, January 25 (5 specimens) and March 16 (2 specimens), 1910.

The type is the only specimen in fresh, wholly unworn pelage. All the others show more or less wear, especially on the lower back and sides, and they vary much in the amount of buffy wash, both above and below, and form a graduated series from clay-color to a pale tone of buff on the upperparts, and on the lower parts from a strong yellowish wash to only a faint pale tone where the hair-tips are least worn. The two March 16 specimens differ greatly from each other in coloration and amount of wear; the January series of skins (all taken January 25) differs similarly in respect to amount of wear and consequent tones of color on both upper and lower surfaces.

Idiurus langi is smaller than *I. macrotis* in external measurements, but the cranial measurements are practically the same. It differs, however, strikingly in coloration, both above and below, the general color being much lighter, especially in respect to the basal fur, ears, and membranes. *I. langi* differs from *I. panga* in much larger size and in coloration, especially of the ventral surface, which has a pinkish tone in *panga* instead of yellowish, and the upper surface is much more heavily washed with buff. The yellowish white, sharply defined nose spot of *langi* will alone readily distinguish it at a glance from either *macrotis* or *panga*.

Idiurus panga, new species

Type, No. 50605, ♀ adult, Panga, Belgian Congo, September 18, 1914; Herbert Lang and James P. Chapin. American Museum Congo Expedition. Orig. No. 2552.

Similar to *Idiurus macrotis* Miller[3], but much smaller and considerably paler throughout, including the basal fur.

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[1]For measurements of *I. macrotis* see p. 71, where they are given in comparison with *I. panga*.

[2]Fronto-nasal sutures solidly ankylosed and indistinguishable, so that length of frontals and nasals cannot be given.

[3]*Idiurus macrotis* Miller, 1898, Proc. Biol. Soc. Washington, XII, pp. 73–76, figs. 15–19 (skull, ear, foot, and tail). Efulen, Cameroon District, West Africa.

Upperparts (in comparison with a para-topotype of *I. macrotis*) with the hairs narrowly tipped with light drab (instead of "sepia"), forming a slight wash of this tone, strongest on middle of back and sides of neck, darkened by the deep neutral gray (instead of dark plumbeous) underfur, which color predominates over the lower back and flanks; underparts superficially pale vinaceous buff (instead of yellowish wood-brown), the basal fur dark gull-gray (instead of plumbeous); upper surface of membranes thinly clothed with dusky brown hairs (less dark than in *macrotis*, as are also the membranes themselves); ears, feet, and base of tail also much lighter than in *macrotis*.

Collectors' measurements of type: Total length, 209 mm.; head and body, 73; tail vertebræ, 126; hind foot, 20 (20.5 in dry skin); ear, 18.

Collectors' measurements of the type and 3 topotypes (1 male, 3 females): Total length, 206 (199–212); head and body, 80.5 (73–87); tail vertebræ, 123 (117–128); hind foot, 20.5 (18–21); ear, 17.3 (17–18).

Corresponding measurements of the type and topotype (2 males) of *macrotis*, as given by the author (*loc. cit*): Total length, type 241, topotype, 228; head and body, 108, 105; tail vertebræ, 133, 123; hind foot, 21, 22; ear, 16, 15.5.

Skull (measurements of type, with measurements of type and topotype of *macrotis* in parentheses): Greatest length, 25 (26, 27); zygomatic breadth, 14.9 (15, 16); length of frontals,—[1] (96, 98); least width of frontals, 6.5 (7, 7); length of nasals,—[1] (7, 7); greatest breadth of nasals, 3.1 (3.25, 3.3); upper toothrow, 3.5 (3.8, 4); greatest distance between molars at m^3, 1.5 (2.2, 2); least distance between molars at m^1, 1 (1.2, 1.2); greatest length of mandible, 14.9 (15, 16); greatest depth (at coronoid), 9.7 (10, 10.6); lower toothrow, 3.7 (4, 4).

Skull (type and 3 topotypes): Greatest length, 25.0 (24.–25.6); zygomatic breadth, 14.5 (14.2–14.9).

Represented by 4 specimens (1 ♂, 3 ♀), all from Panga and all collected the same day, September 18, 1914. All are old adults, with the dentition fully mature and the fronto-nasal sutures fully ankylosed and wholly indistinguishable.

Idiurus panga is a member of the *I. macrotis* group and is so different from the *I. zenkeri* group as to need no comparison with it. It differs from *macrotis* in smaller general size, much less heavy skull and correspondingly weaker dentition. Also in the much paler hair-tips above, the decidedly pinkish tone of the underparts, and the lighter color of ears, membranes and feet, and also of the basal underfur, both above and below. The ears appear to be decidedly larger than in *macrotis*, as indicated by the field measurements and by direct comparison with the para-topotype loaned me for examination through the kindness of the describer of the species.

[1] Fronto-nasal sutures fully ankylosed and indeterminable.

The Classification of the Weaver-Birds. By James P. Chapin, 1917, Bulletin, XXXVII, Art. 9, pp. 243–280, Pls. VI–X, 10 text figures. 75c.

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The Birds of The American Museum of Natural History's Asiatic Zoölogical Expedition of 1916–1917. By Outram Bangs, 1921, Bulletin, XLIV, Art. XX, pp. 575–612. 40c.

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Harry Hoogstraal

THE AMERICAN MUSEUM CONGO EXPEDITION MANATEE AND OTHER RECENT MANATEES

(5)

By ROBERT T. HATT

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Article IV.—A MANATEE COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION, WITH OBSERVATIONS ON THE RECENT MANATEES[1]

By Robert T. Hatt

Plate XXVII; Text Figures 1 and 2

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INTRODUCTION

In the collections of the American Museum Congo Expedition there is a single specimen of the African manatee which was secured by Mr. Herbert Lang at Banana in August, 1915, just previous to his departure from Africa after six years of collecting in the upper Congo basin. The specimen, which is now preserved as a tanned skin, cleaned skeleton, and palatal pads in alcohol (A. M. N. H. No. 53939), is that of an immature individual. Photographs were made of this animal in the flesh, and three of them are here reproduced (Plate XXVII). The date of collection is not definitely established, and there is no record of measurements or of sex, though the form of the pelvic bones indicates that the animal is a female.

The occurrence of the manatee in the lower Congo has long been known, but no skeleton of a specimen from so far south has ever been described or compared with those from the northern part of the range, and for this reason the Congo Expedition manatee is of more than usual interest. As manatees are highly variable mammals and specimens few, any documented specimen is important, but this individual is particularly so since it is the sole representative of its species in the otherwise excellent American Museum collection of manatees. Because of the progressive extermination of manatees and the total inadequacy of material now in museums of the world, it is unlikely that we shall ever have a very complete picture of the geographical variation of these animals. As nearly as I have been able to ascertain, there are no speci-

[1]Scientific Results of the Congo Expedition. Mammalogy, No. 14.

mens of manatees either from the upper Niger River or from Lake Chad, though their occurrence in the former is virtually certain, and their former occurrence in the latter at least probable.

The most recent reviser of the genus *Trichechus*, Hartlaub (1886), assembled more African manatees than any other worker before or since, but it seems that these were compared with the American coastal manatees from Surinam only, and some of the characters by which Hartlaub distinguished *senegalensis* from the group he called *latirostris* have proved invalid in the case of skulls from Florida, Puerto Rico, and Guatemala. Furthermore, his studies were limited to skulls and did not bring out characters found elsewhere.

This report establishes a few hitherto unrecognized characters for the distinction of the crania of the different species of manatees, corrects certain erroneous conclusions made by Hartlaub, and records for the first time specific features of the postcranial skeleton. A review of the nomenclatorial history of the manatees is given, and an earlier name than that currently in use for the African manatees is established as valid; the type locality for several nominal species is fixed, or restricted, and the Florida manatee is recognized as a subspecies of the West Indian form. Literature concerning the range of the African manatee is reviewed in order to correct conflicting statements that occur occasionally even in comparatively recent papers.

NOMENCLATURE OF THE MANATEES

Trichechus Linnaeus

1758. *Trichechus* Linnaeus, 'Systema Naturae,' 10th Ed., I, p. 34. Type, by monotypy: *Trichechus manatus* Linnaeus. Type locality, by subsequent designation: "West Indies" (Thomas, 1911, Proc. Zool. Soc. London, p. 132). By Opinion 112, 'International Commission on Zoological Nomenclature' (Smithsonian Misc. Coll., LXXIII, No. 6, p. 19), *Trichechus* Linnaeus, 1758, type *T. manatus* is placed on the official list of generic names.

1772. *Manatus* Brünnich, 'Zoologiae Fundamenta,' pp. 34, 38. According to Palmer (1904, p. 398) the type species is *Trichechus manatus* Linnaeus, 1758. Suspension of the Rules in favor of *Manatus* Brünnich was declined by the 'International Commission on Zoological Nomenclature' (Opinion 112, *loc. cit.*).

1803. *Oxystomus* G. Fischer, 'Das National Museum Naturgesch. zu Paris,' II, p. 353. Type: *Oxystomus manatus* (=*Trichechus manatus* Linnaeus).

1848. *Halipaedisca* Gistel, 'Naturgesch. Thierreichs f. höhere Schulen,' p. 83. New name for *Manatus* Brünnich, 1772. Type: *Manatus americanus*.

Date? *Monatus* D'Orbigny, Keepsake's 'Hist. Nat. Desc. Mamm.,' pp. 256–257, Pl. xli, fig. 2. Paris. Misprint for *Manatus*. Original not seen. Reference from Palmer's 'Index Generum Mammalium,' 1904, p. 398.

Specific and Subspecific Names of Recent Manatees Referable to *Trichechus*

1758. *Trichechus manatus* Linnaeus, 'Systema Naturae,' 10th Ed., I, p. 34. "Habitat in Mari Americano." The type locality is fixed by Thomas (1911, Proc. Zool. Soc. London, p. 132) as "West Indies."

1784. *Manati Trichechus* Boddaert, 'Elenchus Animalium,' I, p. 173, Rotterdam (reference from J. A. Allen's 'Bibliography of Cetacea and Sirenia.' Original not seen). According to Allen, this is based on Pennant's 'Broad-tailed Manati,' which was (in the 1781 edition, the only one in which the name had appeared) applied to both American and African manatees. For purposes of standardization I assign the type locality to the West Indies.

1788. *Trichechus manatus australis* Gmelin, 'Systema Naturae,' 13th Ed., I, part 1, p. 60, Lipsiae. "Mari africano et americano." The name was applied to the true manatees in contradistinction to *T. m. borealis* (=*Rhytina borealis*). In 1800 its use was restricted by Shaw to the Senegal manatee, for which another name was already available.

1795. *Trichechus antillarum* Link, 'Beyträge zur Naturgeschichte,' Band 1, St. 2, p. 109. The name is referred to Buffon's 'Grand Lamantin des Antilles,' for which *T. manatus* was already available. As type locality, I designate the West Indies.

1795. *Trichechus americanus* Link, *idem.* The name refers to Buffon's 'Le Petit Lamantin de l'Amérique,' which is a confused account of a small species of manatee inhabiting American waters from the Amazon to Campêche and Cuba, including records now referable to the Central American manatee and the true South American river manatee. I assign the West Indies as the type locality.

1795. *Trichechus senegalensis* Link, *idem.* Based on Buffon's 'Le Petit Lamantin du Sénégal,' which in turn was founded on Adanson's description and the skull which he secured in Senegal. This latter is said to be in the Paris Museum. The type locality may be fixed as Senegal.

1799. *Manatus aequatorialis* Lacépède, 'Tableaux des Mammifères.' An. VII [1799], p. 17, Paris. *Manatus aequatorialis* is the only species of the genus named, and since the name is unaccompanied by diagnosis, and since it is not referable to any one species, it is a *nomen nudum.*

1800. *Manatus Guyannensis* Bechstein, in Pennant's 'Algemeine Uebersicht der vierfüssigen Thiere,' II, p. 732. Weimar. This name, was applied to Pennant's "Guiana manatee," which is the *Trichechus manatus* of Linnaeus.

1800. *Manatus Oronocensis* Bechstein, *idem.* This name was applied directly to Pennant's "Orinoko manatee," for which Shaw this same year proposed the name *Amazonius.* Despite the name given, I assign the West Indies as type locality on the ground that Pennant's "species" was founded on Buffon's composite 'Le Petit Lamantin de l'Amérique,' and any other assignation would necessitate revision of nomenclature or lead to confusion.

1800. *Manatus stroggylonurus* BECHSTEIN, *idem.* The name was proposed for Pennant's "Round-tailed manatee," for which Link's name is already available.

1800. *Trichechus Clusii* SHAW, 'General Zoology,' I, part 1, p. 246. Based on Clusius's figure and description of a West Indian manatee, therefore a synonym of *Trichechus manatus* Linnaeus. Its type locality may be given as the West Indies.

1800. *Trichechus Amazonius* SHAW, 'General Zoology,' *loc. cit.* Based on the reports of manatees in South American rivers, and referred to Pennant's "Orinoko manatee." Pennant specified that this was Buffon's 'Le Petit Lamantin de l'Amérique,' but Buffon, Pennant, and Shaw failed to define their animal clearly and confused the West Indian and the true river manatees. By reason of the foundation of the species, and despite the name, I designate the type locality as "West Indies," so that current nomenclature may not be unnecessarily disturbed.

1802.[1] *Manatus minor* DAUDIN, 'Histoire Naturelle' of Buffon, Didot Edition, 'Quadrupeds,' XIV, p. 194. Stated to be 'Le Petit Lamantin d'Amérique' and correctly referred to the account in Vol. IX, p. 251. This name has then the same status as *americanus* Link. I hereby fix the type locality as "West Indies."

1815. *Manatus fluviatilis* ILLIGER, Abhandl. d. Kön. Akad. d. Wissens. in Berlin, 1809–1811, p. 110. This name, given without diagnosis, appears with *M. americanus* in a list of South American mammals and is a *nomen nudum.*

1815. *Manatus sphaerurus* ILLIGER, *op. cit.*, p. 79. The name appears together with *Halicore cetacea* in a list of African mammals. No diagnosis is given it, and it is therefore a *nomen nudum.*

1816. *T[richechus], M[anatus] africanus* OKEN, 'Lehrbuch der Naturgesch.,' Th. III, Abt. II, p. 688. A short diagnosis is given, and the presence of the species in Senegal and the Congo is noted. The type locality I here designate as Senegal.

1824. *Manatus latirostris* HARLAN, Journ. Acad. Sci., Philadelphia, III, p. 394. The name was tentatively proposed for the manatee from the coast of eastern Florida if this should later prove distinct from *senegalensis.* A description based on two skulls is given. Presumably these are in the museum of the Philadelphia Academy of Natural Sciences.

1838. *Manatus atlanticus* OKEN, 'Allgemeine Naturgeschichte,' Abt. II, Band VII, p. 1098. The name is applied to both American and African manatees, followed immediately by the name *Trichechus manatus.* I propose the West Indies as its type locality.

1848. *Manatus nasutus* WYMAN, Proc. Boston Soc. Nat. Hist., II, p. 199. The name is proposed in a footnote (signed "J. W.") to an article by G. A. Perkins, describing a specimen from the Caracalla River, twenty miles east of Cape Palmas, Ivory Coast. The specimen on which the original description is assumed to have been based is at present in the Museum of Comparative Zoölogy.

[1]For the establishment of 1802 as the publication date of Lacépède's and Daudin's 'Tableaux,' see C. Davies Sherborn, 1899, 'Natural Science,' XV, pp. 406–409.

1856. *Manatus Vogelii* Owen, Edinburgh Phil. Journ., N.S., IV, p. 346. The name was tentatively proposed for the specimen taken by Vogel[1] from the river Benue.

1861. *Manatus Oweni* Du Chaillu, Proc. Boston Soc. Nat. Hist., VII, p. 367. Type locality: the Camma country, in the mouth of the Gaboon. The British Museum has four of the Du Chaillu specimens, the Mus. Coll. Surgeons, one.

1883. *Manatus inunguis* Natterer (in Pelzeln), Verh. Zool. Bot. Ges. Beiheft, XXXIII, p. 89. Pelzeln, who quoted Natterer's notes in full, considered *inunguis* a synonym of *australis*. Natterer's name is based on five specimens from the Rio Madeira, Brazil. Though several other older names have been used for this manatee, none of these names is clearly restricted to this one species.

1897. *Manatus Koellikeri* Kükenthal, Zool. Anz., XX, p. 40. Type locality: Surinam and hence a synonym of *manatus*. No specimen is mentioned.

The African Manatee

Trichechus senegalensis Link

Phoca manatus Brisson, 1762 (part), 'Regnum Animale,' p. 164. This is a recombination of Linnaeus's *Trichechus manatus*, but includes the African manatee.

Manati Trichechus Boddaert, 1784 (part) 'Elenchus Animalium,' I, p. 173, Rotterdam. 'Reference from Allen's 'Bibliography.' Original not seen.

Trichechus manatus australis Gmelin, 1788 (part), 'Systema Naturae,' 13th Ed., I, part 1, p. 60, Lipsiae.

Manatus australis Retzius, 1794 (part), Kungl. Sven. Vet. Akad. Handl., XV, p. 291.

Trichechus senegalensis Link, 1795, 'Beyträge zur Naturgeschichte,' Band I, St. 2, p. 109. The name is referred to Buffon wherein is described (1782, Suppl., VI, p. 403) 'Le Petit Lamantin du Sénégal,' based mainly on Adanson's account. Adanson's Senegal skull in the Museum d'Histoire Naturelle, Paris, is described in Buffon (1765, XIII, pp. 431–432).

Trichechus aequatorialis Lacépède, 1799 (part), 'Tableaux des Mammifères,' An. VII [1799], p. 17, Paris.

Trichechus Australis Shaw, 1800, 'General Zoology,' I, part 1, p. 244. This name is here limited to the African manatee. A meager description is given, and a specimen in the Leverian Museum noted. Pennant's fanciful figure of a "round-tailed manatee" is reproduced.

Manatus stroggylonurus Bechstein, 1800, in Pennant's 'Algemeine Uebersicht der vierfüssigen Thiere,' II, p. 732. Weimar.

Trichechus senegalensis Daudin, 1802, in Lacépède's and Daudin's 'Tableaux des Mammifères' in Buffon's 'Histoire Naturelle,' XIX, 'Quadrupeds,' XIV, Didot and Didot Edition, p. 194. Said to be 'Le Petit Lamantin du Sénégal' and referred to Vol. IX, p. 254, where a description of the Senegalese manatee taken chiefly from Adanson is found.

[1]This communication was read before the 1856 meeting of the British Association for the Advancement of Science. It was first published in the Edinburgh Philosophical Journal and subsequently (1857) with slight differences in the Report of the 26th Meeting of the British Assoc. Adv. Sci. and in the "Institute" (1857). I have not seen the latter reference.

Manatus sphaerurus Illiger, 1815, Abhandl. d. Kön. Akad. d. Wissens. in Berlin, 1809–1811, p. 79.

Trichechus, Manatus, africanus Oken, 1816, 'Lehrbuch der Naturgesch.,' Th. III, Abt. II, p. 688.

Manatus senegalensis Desmarest, 1817, 'Nouv. Dict. Hist. Nat.,' XVII, p. 262. Based on Cuvier's (1809, Ann. Museum, XIII, pp. 294–296, Pl. xix, figs. 4–5) description and figures. Though currently accepted as the correct name of the African manatee, Desmarest's name must be considered a homonym of Link's.

Manatus atlanticus Oken, 1838 (part), 'Allgemeine Naturgeschichte,' Abt. II, Band VII, p. 1098.

Manatus nasutus Wyman, 1848, Proc. Boston Soc. Nat. Hist., II, p. 199.

Manatus Vogelii Owen, 1856, Edinburgh Phil. Journ., N.S., IV, p. 346.

Manatus Oweni Du Chaillu, 1861, Proc. Boston Soc. Nat. Hist., VII, p. 367.

It is convenient to state at the outset my conclusion that Hartlaub was quite right in the recognition of but three full species of manatees, though geographical representatives may, in some cases, be worthy of subspecific recognition. The correct names for these manatees are:

Trichechus manatus manatus Linnaeus

Range.—The West Indies, the borders of the Caribbean Sea, the coast and lower reaches of the rivers of northeastern South America.

Trichechus manatus latirostris (Harlan)

Range.—The coast and coastal rivers of the United States from Beaufort, North Carolina, to the Florida Keys and the coasts of the Gulf of Mexico.

Trichechus senegalensis Link

Range.—The west coast and coastal rivers of West Africa from the Senegal to the Quanza, the upper reaches of the Niger, and probably the Lake Chad drainage. (See pages 554 to 560.)

Trichechus inunguis (Natterer)

Range.—The rivers of northeastern South America, particularly the Amazon and Orinoco systems.

The only changes from the nomenclature applied by most modern writers are the replacement of *Trichechus senegalensis* Desmarest, 1817, by *Trichechus senegalensis* Link, 1795, and the adoption of *latirostris* as a valid race of *manatus* instead of as a synonym of *manatus* or the name of a species distinct from the latter.

Specimens Examined

In the course of this study I examined the collection of manatees in the American Museum, which, at the time, consisted of the following:

T. senegalensis
1 skin, skeleton, Congo River
T. m. manatus
1 skeleton, Puerto Rico
1 skull, Honduras
T. m. latirostris
9 skeletons, Florida
2 skulls, locality unknown
T. inunguis
2 skeletons, Amazon
15 skulls, Amazon
1 embalmed specimen, Amazon
1 cast, locality unknown.

I also studied the following material, generously loaned by the Field Museum, to the officers of which I am greatly indebted.

T. m. manatus
4 skulls, Guatemala
T. m. latirostris
1 skull and partial skeleton, Florida
1 skull and partial skeleton, Texas (?)
T. inunguis
2 skulls, "Para." (Probably from farther up the Amazon.)

Furthermore I had the carefully executed figures of Hartlaub, Blainville, and certain others for comparison.

CRITERIA FOR THE CLASSIFICATION OF THE MANATEES

Material available for diagnosis of the external features of manatees is limited because of the inadequacy of published descriptions and the paucity of embalmed specimens, casts, reliable drawings, and good photographs. Tanned skins are uncommon and, when accessible, are so shapeless and changed as to be all but useless. Observations on the internal soft anatomy, though of great generic interest, are not of demonstrated value for specific diagnosis.

The skeletons have yielded much the most important and reliable information as to the differences in these animals, and as always, the skulls have been more commonly preserved and studied than other bony parts. The postcranial skeleton does, however, show variation that is correlated with age, sex, and specific habitus.

Individual Variation and Asymmetry

The range of variation in manatees is so extensive that Gray despaired of finding stable characters on which species nomenclature could be founded. Better series of specimens than were available to Gray, however, allow some sorting out of the characters, and it is an easy matter to distinguish at least three species of manatees, no matter how extensive their peculiarities, though occasional specimens are encountered that vary, not only in the form and proportion of a few characters, but very markedly in almost every character. Lacking a good series for comparison, these variants would appear to represent well-marked "species." Thus I examined the skeleton of one medium-sized Florida manatee in which the bones are lighter, more compact, and more strongly ridged than in any other specimen.

Asymmetry is uncommon and where present is pathological. On one young Florida skull the left occipital condyle is very nearly double the size of the right, but the bone forming it is rough and irregular. In another Florida specimen the diameters of the humerus, radius, and ulna of the left side are approximately 25 per cent greater than those of the other side, but here too the form of the bones is definitely anomalous. The sternum of a third Florida specimen is greatly warped to one side. The teeth of an adult Amazonian animal are completely disorientated, some of the teeth of each row, even those unerupted, lying with the direction of their ridges as much as 180° from the normal position.

The External Anatomy

When the wide range of variability shown in the external form of the species *manatus*, as documented by several accurate drawings, good photographs, and casts, is considered, it is deemed that from external characters *senegalensis* and *manatus* cannot be told apart. However, the species *inunguis* is, in all likelihood, constantly characterized by the absence of nails, a white breast patch, slender proportions, and elongated flippers.

The Vertebral Column

The Congo specimen possesses six cervical vertebrae, as do the other members of the genus. The rib-bearing vertebrae vary in number in Florida manatees (in a series of 11 skeletons) from 17 to 19; a Puerto Rican specimen has 17 such vertebrae, and each of two Amazonian manatees has 15 pairs of ribs. (Blainville's figure shows 16 pairs.) The presence of 17 pairs in the Congo specimen (Büttikofer's specimen

bore 18 pairs of ribs according to Jentink, 1888, p. 33) seems then to be in line with this form, being more nearly allied to the species *manatus* than *inunguis*. The numbers of lumbo-caudal vertebrae vary in the same Florida specimens from 27 to 29 (without respect to the number of rib-bearing elements in the same skeleton). In the Puerto Rican and Congo specimens there are 25 lumbo-caudals. Twenty-six were found in Büttikofer's Liberian manatee (Jentink, *loc. cit*). In the two Amazonian specimens there are 25 (older) and 22 (younger).

Other than this variation in numbers, in which specific tendencies seem to be weakly manifest, no characters of the column show any constant differences between the forms.

The Sternum

The sterna of manatees present well-marked shapes that, though individually variable, are specifically constant in certain features.

The sternum of *senegalensis* is much like that of *manatus*, except that the African species does not (in the Congo specimen) have a deep median notch in the anterior border of the bone but may have two light notches flanking a median prominence. This difference may be clearly seen by an examination of figure 1. The margin of the caudal prolongation of the sternum in the Congo specimen is also incised, a condition uncommon in the species *manatus*.

The sternum of *inunguis* is a smaller bone in proportion to the size of the animal than that of *manatus* and *senegalensis* and may be recognized by its slender proportions and backwardly directed lateral processes.

The Appendicular Skeleton

The Pectoral Girdle.—The pectoral girdles of manatees differ in the proportions of their component parts, but there is no deviation from the essential form. As in most other characters, the South American river manatees differ most widely from the type species *manatus*, for their flippers are proportionately longer than those of the other members of the genus, a lengthening which has occurred chiefly in the metacarpals and phalanges.

The scapula (Fig. 2) of the Congo manatee more closely resembles that of *inunguis* than that of *manatus*. From both it differs in being comparatively long and narrow and in having the coracoid border gently curved and without a pronounced angle at the coraco-vertebral juncture or above the incisura. The spine is apparently a little higher, the

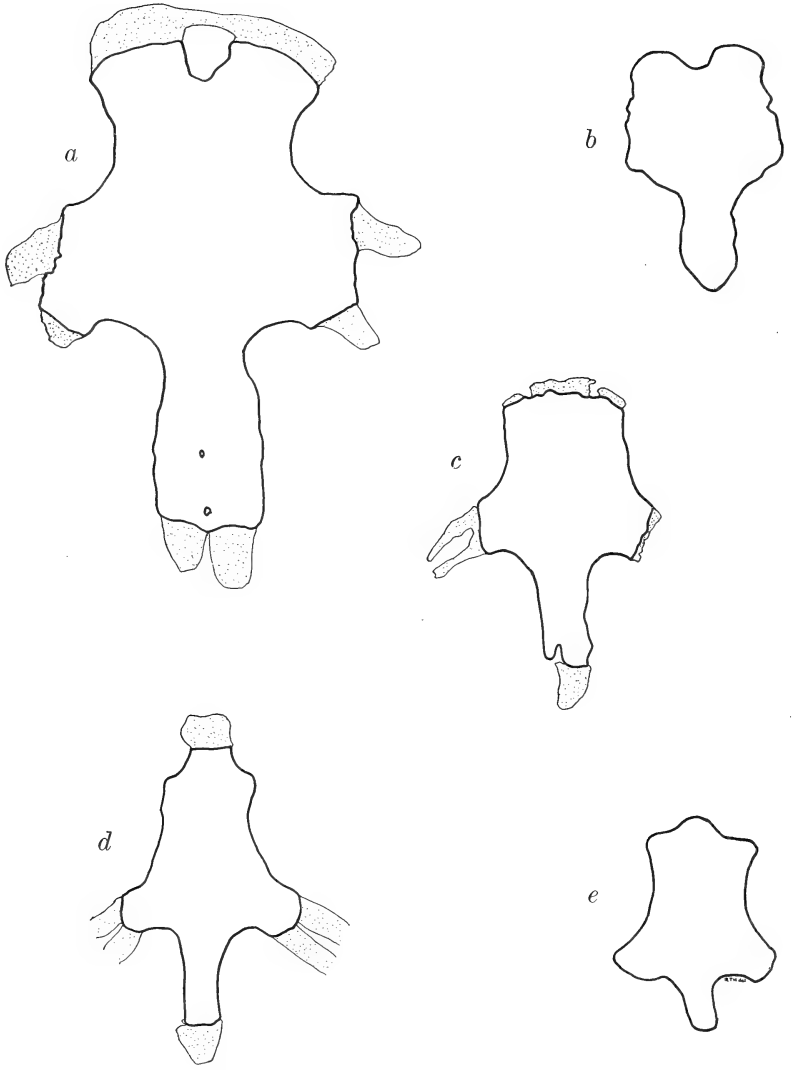

Fig. 1. Sterna of manatees.

a, *T. manatus latirostris*, Florida, A.M.N.H. No. 91096; *b*, *T. m. latirostris*, Florida, A.M.N.H. No. 35219; *c*, *T. senegalensis*, Congo, A.M.N.H. No. 53939; *d*, *T. inunguis*, Amazon, A.M.N.H. No. 94163; *e*, *T. inunguis*, Amazon, A.M.N.H. No. 94164.

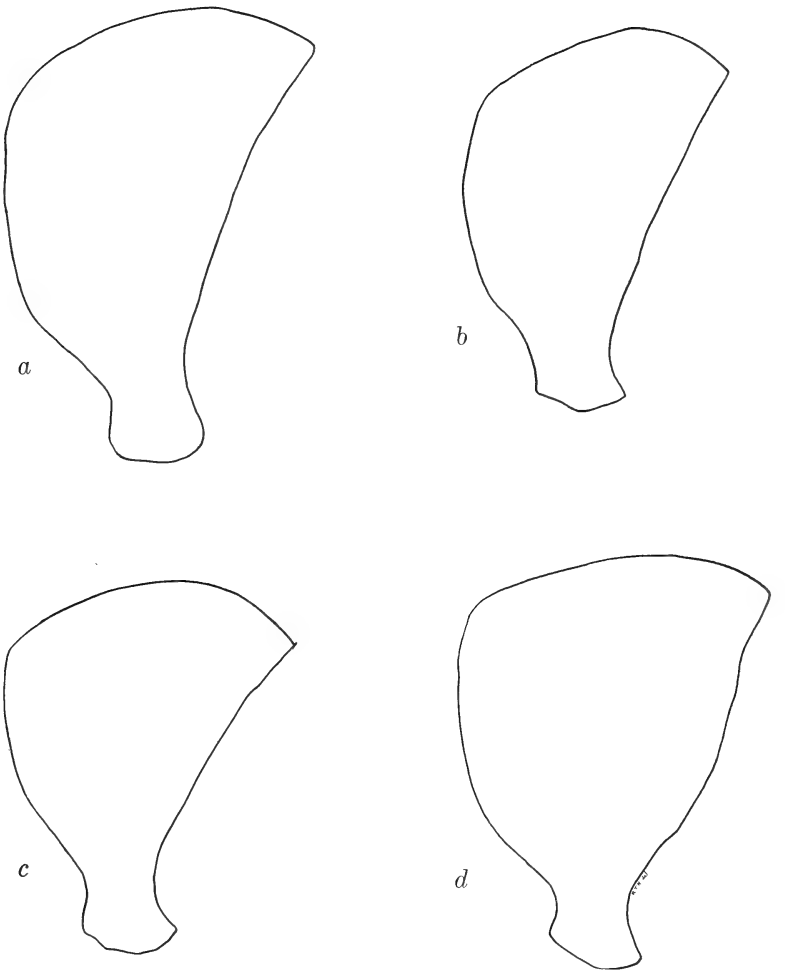

Fig. 2. Scapulae of manatees.

a, *T. inunguis*, Amazon, A.M.N.H. No. 94163; *b*, *T. senegalensis*, Congo, A.M.N.H. No. 53939; *c*, *T. manatus latirostris*, Florida, A.M.N.H. No. 90178; *d*, *T. m. manatus*, Puerto Rico, A.M.N.H. No. 35566.

acromion thinner, the tuberosity of the spine less pronounced. In the matter of proportionate narrowness, *inunguis* is intermediate between *senegalensis* and *manatus*, but in other characters it can hardly be distinguished from *manatus*. The geographical representatives of *manatus* show no constant peculiarities of the scapulae.

The humerus of the Congo Expedition manatee is distinctly thinner than that of Florida manatees of the same length. The weight of the Congo humeri is just half that of a typical pair of the same length from Florida. In this respect the Congo manatee is very closely similar to *inunguis*.

The relative proportions of the humerus are carried into the radius and ulna. In both *senegalensis* and *inunguis* these two elements are about one half the diameter of corresponding elements in *manatus*.

The metacarpals of the three species differ markedly in length. The fourth digit is the longest, and measurements were therefore made on the metacarpal and phalanges of this finger of each specimen. This metacarpal grows more rapidly or for a longer period than does the radius, and in consequence the metacarpal is proportionately longer in older specimens than in young, when, as here, the length of the radius is used as the unit of comparison. In specimens of approximately equal age, however, differences are marked. Thus in manatees of the approximate size of our Congo specimen the metacarpal is about 54 per cent of the radial length in *manatus*, about 64 per cent of the radial length in *inunguis*, while in the Congo specimen the metacarpal is 62 per cent as long as the radius.

In the matter of the length of the first carpal, *senegalensis* is not intermediate between the Caribbean manatees and *inunguis* but falls within the limits of variation of *manatus*. This first phalanx of the fourth digit does not grow as rapidly or over as long a period as its metacarpal, with the result that with increased age it is in proportion to this metacarpal increasingly shorter, whereas its growth rate outstrips that of the humerus, and increased age brings a proportionately, as well as an actually increased length.

Again comparing immature animals about the size of the Congo specimen, it is found that the first phalanx in both *manatus* and *senegalensis* is about 25 per cent of the humerus length, or 40 per cent of the metacarpal length (the specimens suggested that this element in the Florida manatees is considerably longer than that in the Puerto Rican), whereas in *inunguis* the corresponding percentages are 40 and 60.

The remaining phalanges follow the trend indicated by the first,

senegalensis and *manatus* being essentially short-fingered and *inunguis* long-fingered.

The Pelvic Girdle.—The immaturity of our Congo manatee precludes the determination of specific characters which might appear in the innominate bones, but these bones are sufficiently developed to furnish a key to the sex of the specimen and show it to be a female. These bones are indistinguishable from those of immature female Florida manatees and from those of certain Surinam specimens figured by Krauss. My failure to find any innominate bones in two uncleaned *inunguis* skeletons fresh from the field, and the lack of mention or figuration of these bones in literature may indicate that this species has completely lost its pelvic girdle.

The Skull

A glance serves to identify the skull of *Trichechus inunguis*, but the differences between the skulls of *senegalensis* and *manatus* are more subtle. The two manatees last mentioned differ from *inunguis*, not only in the general shape of the skulls, but in the very character of the bone itself, for though the skull bones of *senegalensis* and *manatus* are in general dense and smooth, those of *inunguis* are, with rare exceptions, soft, chalky, and rather elaborately roughened. The skull bones of this latter species are also lighter in proportion than those of the other two.

The general skull shape of *senegalensis* and *manatus* is broad and compact and the snout short (*senegalensis* being shorter than *manatus* in this respect), whereas the skull of *inunguis* is lengthened and characterized by a long snout. The conspicuous recession of the nasals and the posterior border of the anterior nasal opening leaves at the anterior end of the skull the characteristic large nasal basin, the floor of which is formed by the palatal parts of the maxillae and the vomer. The form of this basin is dependent in the main upon the extentof the forward growth of the premaxillae, and this is a process progressing with age to maturity, or possibly throughout life; but when comparisons are made of skulls of equal length, specific patterns are discernible. This nasal basin is broader in the adult African manatee than the corresponding area in *manatus*, but the difference is very slight, and in immature specimens it is impossible to distinguish these two species on the basis of this feature. The adult manatees of the western Caribbean and Gulf of Mexico appear to be slightly longer snouted than corresponding specimens from Florida, but additional material would be necessary to establish the constancy of this probable difference. The nasal basin of the Amazonian manatee is,

however, so very distinct that the smallest skulls show the characteristic long, narrow basin of this species.

The nasal process of the premaxilla of *senegalensis* covers the anterior part of the nasal cavity surface of the orbital process of the frontal to some extent, whereas in *inunguis* and *manatus* there is little or no such covering, the upper border of the premaxilla lying below the lower border of the frontal. This suture in *senegalensis* also differs from the other species in being distinctly shorter, a configuration which is accompanied by a relative rounding off of this end of the bone as contrasted with the sharply pointed ends found in adult *manatus* and *inunguis*. The specimen from the Congo does not, however, fit in with Hartlaub's characterization of *senegalensis* as a manatee with the nasal processes of the premaxillae distally expanded, for in this specimen these processes show less terminal expansion than some Florida specimens of the same size.

The anterior frontal margin between the roots of the orbital process in the African manatee is typically smooth and unserrated, but in this character it does not diverge strongly from *manatus* in which, particularly in old individuals, the frontal margin is a little jagged. The breadth of this margin is, however, considerably greater in *manatus* than in *senegalensis*, and the combination of relative breadth and irregularity or smoothness of this margin would probably suffice to identify any specimen.

The nasalia of manatees have been made known by Krauss and Hartlaub, but the statements concerning them rest on an insecure footing through the extreme variability in these bones and their frequent loss in the course of museum preparation. Hartlaub concluded that the *senegalensis* nasalia were typically platelike, that gradations to peglike bones were not infrequent, and that it was possible that in some animals these bones were completely undeveloped. The Congo Expedition manatee possesses a very small and spongy left nasal bone, lightly fixed in a small pit of the frontal. The nasal does not come nearer than 8 mm. to the ascending branch of the maxillary. There is but slight indication that the right nasal bone was ever present, though of course it may have been present and free.

The nasalia of *manatus*, as Hartlaub found, are typically thick almond-shaped bodies, but his small series of four specimens does not represent the range of variation, for I have found in a better series variation from large peglike bones to platelike types and have noted that in some cases the nasalia do not seem to have been developed. Twelve

skulls of Florida manatees examined range from 255 to 375 mm. in total length, or from youth to full maturity. In these specimens there is a great range of nasalia, from apparent total absence to well-developed peg-shaped bones lying in deep sockets of the frontal and uniting in a loose suture with the ascending rami of the maxillae, and (or) the premaxillae. In length these vary from 20 to 48 mm. in adult specimens. Of two skulls identical in size, one has large, long nasal bones, the other bears no evidence that nasal bones have ever been present.

A large manatee, reputedly from Texas, has nasalia thoroughly typical of those from Florida. Four specimens from Guatemala present extreme variation, two having peg-shaped bones, one with flat nasalia horizontally placed and roofing the posterior part of the nasal trough, and the fourth with its pair of nasalia flat and vertically placed as are those in specimens of *inunguis*. A Puerto Rican manatee differs in no respect from certain Florida specimens in regard to its nasalia.

The skulls of *inunguis* examined ranged in greatest length from 200 to 360 mm., from early youth to maturity. Ten of these were cleaned, three had been roughed out in such a way that the nasal bones, if present, may have been lost in the field, and six were roughed out so that there was very little possibility of the nasal bones having been lost. I cut away the dried flesh of these six skulls in a search for nasal bones with the following results: In two skulls, 265 and 330 mm., in greatest length, there was no trace of nasalia, either actually, in pits for their reception, or in grooved surfaces for articulation. Neither was there any indication that nasals had fused to the frontal bones. In another specimen, 355 mm. long, there was no trace of a nasal unless a minute conical nodule (4 mm. long) lying in the site of a right nasal was a vestige of this bone. On the right side of a fourth specimen, 270 mm. long, there was a well-developed plate of very compact bone lying totally free, but closely associated with the vertical surface of the frontal bone at the anterosuperior border of the nasal chamber. There was no trace of a corresponding bone on the opposite side. The two remaining skulls, 260 and 330 mm. long, bore nasalia on each side similar to that mentioned. The five such nasalia examined were alike in being of a modified lozenge-shape (triangular or quadrangular), though their greatest diameters ranged from 25 to 13 mm., their minima from 15 to 11 mm., and their thicknesses from 3 to 6 mm. These bones lay with their long axes anteroposterior, and their chief plane vertical. They were in loose contact with the median free surface of the orbital branch of the frontal directly posterior and ventral to the anterior median edge of the frontal. In one case the lateral

branch of the ethmoturbinals bounded the bones medially. The surface of the frontals with which the nasals were in proximity was in each case slightly concave in accommodation to these bones.

The lacrimal bone of the right side of the Congo skull is in place, but that of the opposite side is missing, due, obviously, to over-maceration. Since Hartlaub found these bones preserved in only one of the ten African skulls examined, and this in a newborn specimen, it appears worth while to note the condition of the lacrimal remaining in the Congo skull. It is, in general, intermediate in size, position, and shape between the type characteristic of *inunguis* and that invariably occurring in *manatus*. The bone is at its broadest exposed point 3 mm. in thickness and appears to taper down into its groove between two laminae of the maxillae. Its upper border is nearly in contact with the orbital process of the frontal, while its lower edge touches the edge of the jugal. A triangular surface is freely exposed laterally and forms part of the anteromedial wall of the orbital ring.

The lacrimalia of the *inunguis*, which I examined closely, resemble those described by Hartlaub. In each case their scalelike nature is evident, and they are quite unlike those of any *manatus* which I have examined. In most of the *manatus* studied these bones are in place, and in each case they are essentially similar, large, thick, and more like the same bones in *senegalensis* than in *inunguis*. Though the lacrimals are often missing, it is very clear that they had been present, and large, in every *manatus* skull which I saw.

The vomers of manatees show strong specific characters in their length. In *senegalensis* they are always short, extending approximately to the level of the middle of the orbit. In *manatus* they are long and, except in the newborn, reach to the foramen incisivum or beyond. In *inunguis* the vomer is intermediate in length between that of *senegalensis* and *manatus*, being in the newborn very nearly as short as in the African species, and in old specimens occasionally reaching to within an inch of the incisive foramen.

Low edges appear on either side of the floor of the nasal chamber anterior to the orbital region. In *senegalensis* these edges are probably constant. Though Hartlaub concluded from an examination of Surinam specimens that there were no such ledges in *manatus*, I find them well developed in most, but not all, of the specimens at hand. These ledges are usually present in *inunguis* but are lightly developed and farther to the rear than in the other species.

The circumorbital region of the manatees shows something of a

different pattern in the three species. In *senegalensis* the orbital process of the frontal diverges most strongly in a lateral direction, and the upper orbital borders formed by this process are strongly convergent in the African and Amazonian manatees. This latter character is a configuration well marked even in the newborn. If the line of the outer border of this orbital process is extended forward, it will cross the median line anterior to the end of the skull in *manatus*, whereas in *senegalensis* and *inunguis* this crossing occurs within the limits of the skull.

The age of the individual manatee determines the degree of backward divergence of the postorbital process of the orbital process of the frontal, and at the same time the closure of the orbital ring. In all species this occurs only late in life and is seen in few specimens, though it would appear that this closure is more frequent and occurs earlier in life among Guatemalan than among Florida manatees.

The infraorbital foramen in manatees is ordinarily simple, though it may be divided in *manatus*. Hartlaub observed that in this species the division was frequent, but, with the exception of two of four Guatemalan skulls examined, I have not found such division in any specimen of *manatus*. As most of my *manatus* skulls are from the northern limits of the species, and those of Hartlaub from the southern limits, it is possible that a divided infraorbital foramen is of more frequent occurrence in the south than in the north.

The bony ridges formed at the superior border of the temporal muscle are more or less vertically directed in *senegalensis* and *manatus*, while in *inunguis* these ridges are produced laterally and do not rise above the general level of the skull roof.

The malar process of the temporal in manatees is swollen and spongy in nature. At the anterior end the thin layer of compact bone sheathing the spongy mass is frequently discontinuous, and a rough or perforated surface is common. However, when the surface is reasonably uninterrupted, it is smooth in *senegalensis* and always rugose in *inunguis*. This same area in *manatus* from Florida is fairly well-grooved in most specimens, though this condition does not appear to apply to the species as a whole, the same area in a manatee from Puerto Rico, one from Texas (?), and three from Guatemala being smooth.

The zygomatic process at its base is much thicker in *senegalensis* and *manatus* than in *inunguis*.

The malar bone sends a process downward which, in *senegalensis*, is broad and sharply truncated. Specimens of *manatus* closely approach this shape in some instances, but often have a backwardly directed

process, in this respect resembling *inunguis*, although the ventral malar process in *inunguis* is always narrow and sharply tipped.

The supraoccipital bones of *senegalensis* and *manatus* are of a common pattern but differ very strongly from the same bones in the Amazonian manatee. The former present a very nearly flat, transverse plane, whereas the latter are rugose and so mounded that the lambdoidal ridge as seen from above is yoke-shaped.

The outer borders of the exoccipitals of *senegalensis* are knotty, pitted, and rough. In this respect the African species is similar to most *inunguis* and unlike *manatus*.

The foramen magnum of *senegalensis* and *inunguis* is roundish, while in *manatus* it is oval. This shape is modified in part by differences in the dorsal rim and also, as seen from the ventral surface, by the notching of the lower border. In manatees from the Congo, the Amazon, Puerto Rico, and Guatemala, that is to say, in representatives of all species, the dorsal border is strongly curved. Florida and Texas specimens of *manatus*, however, have flat dorsal rims, perhaps one of the most constant features on which the nominal race *latirostris* may lay claim to subspecific individuality from *manatus*. The notching of the lower border (the basioccipital) is also a fairly constant and peculiar mark of the northern representatives of the species *manatus*. These differences in the limits of the foramen may be partially synthesized by taking the ratio of greatest vertical diameter to greatest horizontal diameter. Extremes are found in a specimen from the Amazon in which the vertical diameter is 75 per cent of the horizontal, and in a Florida specimen in which the corresponding percentage is but 54 per cent. There are no specific limits to these ratios, however, for the Congo skull has a foraminate index of 0.66; skulls of *inunguis* vary from about 0.65 to 0.75; and specimens of *manatus* from 0.54 to 0.71. Within the species, however, there seem to be geographic trends, for Florida specimens have indices of from 0.54 to 0.61; a Texas specimen an index of 0.60; while four Guatemalan manatees have corresponding indices ranging from 0.66 to 0.71; and a Puerto Rican manatee has an index of something over 0.70.

Basally, skulls of the species of manatee may be recognized by a number of characters. Over the occipitosphenoidal suture is an eminence which in *inunguis* is median and simple, while in the other species it is lateral and double, and anterior to this the shape of the posterior nares is distinctive, though variable with age. In the Amazonian manatees the opening is sagittate in young individuals, while in old manatees it broadens out ventrally so that it is bicordate or presents the

form of a double, symmetrically notched circle. The posterior nares of *senegalensis* are very nearly circular, whereas those of *manatus* are deltoid.

The pterygoid process of the manatees is formed by wings of the alasphenoid, palatine, and pterygoid bones, and this compound process usually ends distally in three more or less distinct points that are aligned in a sequence of lateral, intermediate, and medial, best seen from the rear. These points correspond fairly closely to the distal ends of the three bones listed and may be called alasphenoid, palatal, and pterygoid points, respectively. In the species *inunguis* the pterygoid process is long and narrow, and the palatal point is much the highest of the three. In the Congo manatee the pterygoid process is also long and narrow, but here the palatine and pterygoid points are coequal and longer than the alasphenoid. No general rule applies for all specimens of the species *manatus* that I have examined. In the Florida and Texas specimens that I have seen the pterygoid process is similar to that of the Congo manatee, except that it is usually thicker. In manatees from Guatemala and Puerto Rico, however, the pterygoid process is short and very broad, with either the pterygoid, or palatine point longer.

According to Hartlaub, the foramen incisivum is always simple in *senegalensis*, a condition also found in the Congo specimen. The same author observes that this foramen is often completely or incompletely divided in *inunguis*. The foramen of *manatus*, however, may not be described as simple, for in a large percentage of the specimens that I have examined there is a partial division into anterior and posterior incisive foramina. Although the division is not complete in any case seen, it is sometimes nearly so.

The anterior end of the palate of the manatees is covered with a heavy plate that leaves a roughened area on the under side of the premaxillae and maxillae. This surface is broadest at about the juncture of the two bones and is constricted just anterior to the level of the foremost teeth. This constriction is most pronounced in *inunguis*, the width at the constriction being usually about one half that at the maxillary-premaxillary suture. The constriction in *manatus* and *senegalensis*, though individually variable, is usually not great, the least width being about 85 per cent of the greatest.

The molars[1] of *senegalensis* and *manatus* seem to me to be indistinguishable, though they differ strongly from those of *inunguis*. These

[1]At the time the manuscript of this report was in the hands of the printers, I saw in the British Museum a skull of *T. manatus* (B. M. 370E) from Surinam with a left upper incisor in place. This skull had a greatest length of 325 mm., so was adult. The incisor, flattened and almost straight-sided, measured 15.5 mm. in length. Its tip was well worn. There was a single root, but the tooth was perforated by a foramen from the center of its anterior to the center of its posterior face.

latter are of a smaller diameter and are strongly furrowed. In all of the species there are anterior and posterior cingula, but though these are smooth in the unerupted teeth of *manatus* and *senegalensis*, they are deeply furrowed in *inunguis*. In the first two species each of the two great transverse ridges is divided into three cones or sectors, but in the Amazonian manatee these primary cones are more or less broken up into a series of other smaller cones.

The Mandible

Hartlaub's analysis of the characters of the mandible of *senegalensis* is good, except that some of the features he assigned to the mandible of *inunguis* and *manatus* do not well apply to the series of these species that I have examined, and a few minor differences appear to have escaped his notice.

The interramal interval is broad in *senegalensis* as it is in *manatus*, a feature by which these species are again easily distinguished from *inunguis*, and the rami of the latter species lie more nearly in parallel planes than is the case in the other two species. The African species, however, differs from *manatus* in that there is less of a constriction in the diameter of the ventral border between the body and the angular process. In *senegalensis* this process is wider and more in line with the ramus than in the other species.

The symphysial suture closes early in the African manatee, as Hartlaub pointed out, and in this species there is no deep furrow along the anterior margin. In this respect it differs from American manatees. This furrow, which is most conspicuous in *manatus*, is a character best developed at maturity and is not well marked in the newborn or very young.

The interior mental fossa is always deeper in young manatees than in old, but comparing equal-aged material the fossae of African and Amazonian manatees are, in most instances, deeper than those of Caribbean specimens. The character is not constant, however, and, contrary to the conclusion of Hartlaub, is of little use to the taxonomist.

The anterior end of the mandible of all species is essentially similar in respect to form, as seen in norma dorsalis. Hartlaub claims that this region is truncated in *senegalensis* and *inunguis*, whereas in the Surinam manatee (*manatus*) it is tapered or tipped; but my good series of *manatus* shows no difference in this character from the other species, and I would describe the anterior end of the mandible of *manatus* as truncated. However, there is very often a sharp median cone of compact bone ex-

tending forward from the most anterior part of the symphysis, and though this spine does occasionally occur in *inunguis*, and possibly in *senegalensis*, it is almost a constant feature of the mandible of the postnatal *manatus*.

While not constant either for a species or, probably, even during the life of an individual, the mental foramina of the manatees follow different tendencies in *inunguis* than they do in *manatus* and possibly show a slightly different average in *senegalensis* than in *manatus*. In *inunguis* these foramina range in number from 11 to 15 (average 15—). The range in *manatus* is from 4 to 7 (average 6). In the Congo specimen there are 4 mental foramina, and in Blainville's figure 3 are shown on one side.

As Hartlaub noted, the ventral border of the mandibular ramus, presents a greater curve to the horizontal plane in *manatus* than it does in the other species; in the others there is no great difference. This curve results from the deepening of the mandibular symphysis and is so excessive in *manatus* that it is one of the most pronounced features of the species.

The coronoid process of the manatees presents the usual high variation in shape and cannot be relied upon in diagnosis. Hartlaub concludes that the posterior superior angle in *inunguis* is constantly hooked and that these hooks are only occasional in *manatus*. In my series I find that even in old animals the hooks are not always developed in *inunguis*, though they are usual in the Caribbean manatees. The extent of broadening of the coronoid, which Hartlaub regards as a distinguishing character of the species, appears to me to be very weak and unreliable for separation of *senegalensis* and *manatus* material, since in this feature Florida specimens are indistinguishable from the Congo animal.

The transverse breadth of the condyle of *senegalensis* is slight compared with that of *manatus* and *inunguis*, but the character is so relative that, lacking a large series of specimens, the difference is not discernible.

The mandibular foramen is subject to certain specific modifications. Thus, in the Congo specimen it is separated from the bony sheath by a septum of bone, whereas in *inunguis* and *manatus* no such septa occur, with the exception that there are, rarely, converging processes that may nearly touch to form a partial septum. This bony ridge is well developed in the Congo specimen, and is shown in a figure (Plate III, figure 27) accompanying Hartlaub's paper. However, it does not appear in the figure reproduced in Flower's 'Osteology' (1870, Fig. 64, p. 197) and may not be very constant.

A single specimen supposed to have come from Texas is different from other manatees examined in that the lamina lying medial to the

dental trough has expanded so as to mask completely the germinal wrapper from behind. Whether this is a geographical or an individual variation cannot be determined without additional material from the region.

The tooth rows reach farther forward in old age than in youth, but those of *inunguis*, unlike the other species, never closely approach the mandibular symphysis.

The Hyoid Arch

The hyoid bones of the Congo specimen closely resemble those of similar aged material from Florida, and it is believed that no characters for diagnosing the species are to be found in this structure.

THE DISTRIBUTION OF *TRICHECHUS* IN THE AFRICAN REGION

As far as I have been able to ascertain, all specimens of African manatees in museums are from the rivers or coastal lagoons of the West Coast between Senegal and the Quanza, and all of these specimens are from regions below the first rapids. However, it is certain that such specimens as are on record do not completely represent the distribution of the manatees in Africa, just as it is certain that all published records of their supposed distribution are unreliable. The waters from which the manatees have been reported with certainty or probability of correctness are the following:

Senegal

The African manatee does not seem to occur north of the Senegal coast. Its presence there is established by the following records:

1757.—Adanson (p. 143) mentions the capture of manatees in the marigot (lagoon) de Kantai in December and January.

1765.—Buffon (p. 390) notes the skull of a young specimen given by Adanson.

1793.—Pennant (II, p. 296) records the presence of a specimen in the Leverian Museum.[1]

1836.—A specimen was collected by Robert (p. 363) for the Paris Museum.

1883.—Rochebrune (p. 190) states that the manatee was found in the marigots of Lampsar, Leybar, and Bafing, and that Adanson mentioned their occurrence in the marigot of Sorres, from which they have since disappeared. Rochebrune further states that the manatee of the Senegal coast is not found in the rivers but in the marigots.

1886.—Hartlaub (p. 15) records the presence of a manatee from Senegal in the Vienna Museum.

[1]The contents of the Leverian Museum were disposed of by auction in 1806. A copy of the sale catalogue with the buyers' names added to some of the 7878 items is in the British Museum (Natural History). An examination of this catalogue might reveal the present whereabouts of the specimen named.

Gambia

Listed by Trouessart. Mr. Robert Rockwell informs me that while a member of the Blossom Expedition he heard definite reports of the occurrence of manatees in the Gambia River.

Sierra Leone

1737.—Atkins (p. 42) notes the manatee in the Sierra Leone River.

1846?—Clarke (p. 128) lists "fishes" commonly taken in Sierra Leone and among them mentions the manatee.

1881.—Flower (p. 454) quotes the journal of one R. B. Dobree who was shown places in which the manatees CAME ASHORE between Kikonkeh and the sea. Though such a statement cannot be construed as good evidence for the occurrence of manatees in the rivers of Sierra Leone, it seems to be probable that these animals do occur there.

Liberia

1885.—Büttikofer (pp. 144–147) recounts the capture of a manatee in Fisherman's Lake behind Cape Mount, and states that this animal is found in Liberian rivers up to the rapids.

1890.—Büttikofer (II, pp. 392–393) further records the occurrence of the manatee in the vicinity of Millsburg, below the last cataract of the Saint Paul River, and adds that in 1887 two were shot in the Missunado River.

1892.—Jentink (p. 199) records the presence in the Museum des Pays-Bas of Büttikofer's Cape Mount specimen.

Ivory Coast

Caracalla River: 1848.—Perkins (pp. 198–199) records a manatee from the Caracalla River, 20 miles east of Cape Palmas. This specimen, the type of *M. nasutus* Wyman, is now in the Museum of Comparative Zoölogy.

Slave Coast

1893.—The manatee is listed by Matschie (p. 180) in his 'Mammals of Togoland.'

1897.—Thomas and Lydekker (p. 596) record specimens in the British Museum from Lagos and Benin.

Niger River System

Manatees are known from three parts of the Niger system: the lower reaches near the coast, the upper section above Timbuctu, and from the river Benue.

Lower River: 1728.—Labat (p. 337) records that the "manaty" was often taken in the Niger. His is perhaps the first picture of an African manatee.

1857.—Baikie (p. 68) collected a specimen from the mouth of the Niger, and Maclaud (1908, p. 289) writes that there is a Niger River specimen in the Paris Museum, though the section of the river is not stated.

Upper Niger River: Though there appears to be no record of a manatee ever brought out from the upper Niger River where it is bordered by great, marshy lagoons, several reports make it seem almost certain that the animal is found in that region.

1858.—Barth (II, p. 605), who traveled along the upper Niger River, states that the manatee occurs in the Isa near Timbuctu and (V, p. 103), in reference to the decorations of some natives of the Niger above Timbuctu, he writes: "They wore also a rich profusion of white rings which are made of the bones of that very remarkable animal the 'ayu' (*Manatus*), which seems to be not less frequent in the western than in the eastern branch of the Niger," and (p. 472) "The lake [Débu, upper river, above Timbuctu] besides fish, contains numbers of that curious animal called 'ayu' (*Manatus*)."

1901.—Gratiolet (p. 248), on the report of M. Carpeaux of the Colonial Troops, states that the manatee occurs at Zinder and at Segou, above Timbuctu.

1908.—Maclaud (pp. 289–290) reproduces a photograph of a manatee in the Niger which he credits to the Mission Desplagnes, an archaeological expedition which studied the Timbuctu region. Of course, it is only an assumption that this photograph was taken in the upper river. Maclaud writes that the manatee is not uncommon in the LAKES along the Niger near Timbuctu, but that this animal has almost disappeared in the large coastal rivers.

1906.—Johnston's (p. 246) observation that it would be remarkable if the manatee could pass the Niger rapids from Busa to Say, seems to be answered by these several reports.

1925.—I am informed by M. Lucien Blancou that in a book by Captain Pivert titled, 'Mes Chasses en Afrique et en Extreme Orient,' published at Paris in 1925, there is a photograph of a manatee taken in the Niger at Gao or Ansongo.

BENUE RIVER: 1856.—Vogel (Owen, 1856, pp. 345–346) has described, and Owen has named a manatee, the type of which is now in the British Museum, and which Vogel took in the Benue.

1857.—Barth (II, p. 605) records that he heard stories of this animal along the Benue but did not see the animal.

1924.—Migeod (p. 167) found manatees common in this river especially at Numan, below Yola.

1931.—M. Lucien Blancou, of the French Colonial administration, informs me in correspondence that at Léré he saw articles made of manatee skin and that he has seen a photograph of a manatee taken in Lake Léré.

GULF OF GUINEA

OLD CALABAR RIVER: 1860.—McBain (p 150) described a skull from Old Calabar which is now (Turner, 1912, p. 156) in the Anatomical Museum of the University of Edinburgh.

BETICKA-BA-MALLALE: 1897.—Sjöstedt (p .45) records the presence of manatees at this point on the coast near Cameroon Mountain.

CAMEROONS: 1877.—Peters (p. 485) writes of a specimen taken by the Buchholz Expedition near Wuri on the Cameroon River, and states that the manatee is also found near the mouth of the river at Doctor's Cape, as well as in a larger stream near Mungo.

1886.—Hartlaub (p. 15, et seq.) records a specimen in the Berlin Museum and one in the Lübeck Museum from the Cameroons. In a letter quoted by Hartlaub, Pechuël-Loesche states that the manatee is found in the Camercons.

1897.—Three embryos from the Cameroons are described by Kükenthal (1897*a*).

1909.—Passarge (p. 446) states that the manatee occurs in the mangrove regions of the Cameroons.

1917.—In his book on the Cameroons, Calvert publishes (Pl. CLXXVII) a good photograph of a manatee (labeled "walrus") surrounded by a group of natives, one of whom holds a harpoon.

RIO MUNI: 1886.—Hartlaub quotes a statement of Pechuël-Loesche that the manatee occurs in the Rio Muni.

GABUN RIVER: 1861.—Du Chaillu (p. 367). *M. oweni* here described is probably from the Gabun River.

1865.—Gray (p. 133) notes the presence in the British Museum of four skeletons purchased from Du Chaillu and presumably from the mouth of the Gabun.

1886.—Hartlaub (p. 15 et seq.) lists three skulls from the Gabun River, one each in Stuttgart, Hamburg, and Bremen museums.

OGOWE RIVER: 1861.—Du Chaillu (p. 367) lists this as one of the rivers in which manatees occur, and some of his specimens may be from here.

1886.—Hartlaub (p. 15 et seq.) notes four skulls from this river, now in the Berlin Museum (Nos. 26333, 26335, 26337, 26338) and further states that Pechuël-Loesche writes of their occurrence in the same stream.

KUILU RIVER: 1886.—Hartlaub (p. 99) quotes a communication from Pechuël-Loesche to the effect that the manatee occurs in this river. However, in Pechuël-Loesche's account of the Loango Expedition (1882, p. 222), he states that no specimen was taken in the region, though one was distinctly seen. Whether or not Pechuël-Loesche received other records between the years 1882 and 1886, I cannot ascertain.

LUEMME RIVER: 1889.—Noack (p. 105) quotes a Mr. Hesse to the effect that he had a manatee-hide whip made from a specimen taken in the Luemme near Massabi.

CHILOANGA (TSCHILOANGA OR LOANGA) RIVER: 1886.—Hartlaub (p. 99) quotes Pechëul-Loesche as writing that manatees are found in the Chiloanga.

BELGIAN CONGO

CONGO RIVER: 1746.—According to Barbot (p. 518) Merolla says that the Zair (Congo) has plenty of these "monstrous fishes or mermaids, resembling a woman upwards."

1884.—Johnson (p. 379) writes that so far as is known the manatee never passes the cataracts of the Congo.

1886.—Hartlaub (p. 99) quotes Pechuël-Loesche to the effect that manatees occur in the Congo.

1889.—Noack (p. 105) writes of the statement of a Mr. Hesse that the manatee lives in the lower Congo, and quotes a seventeenth century account of manatees being frequently taken in the Congo.

1890.—Bocage (pp. 29–30) writes of the manatee's occurrence in the Zaire (Congo) and states that the Lisbon Museum has a specimen from Angola, which may, or may not, refer to the south bank of the mouth of the Congo.

1926.—Derscheid has given a valuable account of living specimens of manatees from the Congo and has accompanied his notes with a good photograph showing one of these out of the water resting on a platform in its aquarium. Dr. Rodhain is quoted to the effect that the manatees are found in the Congo from Binda to the "Chaudron d'Enfer." It is also stated that the Musée du Congo Belge possesses a series of skins

and skeletons from this region. Some observations on the natives' hunting and use of the species are given.

1930.—Schouteden (p. 370) states that the manatee is found in the lower Congo only and that it seems to be particularly localized in the region about Boma.

The single specimen of a manatee collected by the Congo Expedition was taken by Mr. Lang at Banana, in August, 1915. Photographs of this animal are reproduced here as plate XXVII.

Angola

1746.—Barbot (pp. 517–518) describes the manatee from the lakes of "Angola, Quihite, and Angolm in the province of Massingam," localities not appearing on any maps that I have consulted.

1920.—Possibly on information obtained from sources here quoted, Marquardsen (p. 69) writes of the occurrence of manatees in Angola rivers.

Loje River: 1875.—Monteiro (p. 17) had part of a specimen from near Ambriz at the mouth of the Loje.

Dande River: 1875.—Monteiro (p. 17) described the native method of trapping the manatee near the mouth of the Dande.

Bengo River: 1897.—Grèvé (p. 56) states that the manatee occurs in the Bengo, but on whose authority this records rests, I do not know.

Quanza River: 1875.—In this river, Monteiro (p. 17) saw a canoe with much of the flesh of a manatee in it. As far as I have been able to ascertain, this is the southernmost coastal record of the manatee's occurrence and is probably correctly founded.

UNCERTAIN OR ERRONEOUS REPORTS OF *T. senegalensis*

The Lake Chad Basin

1858.—Barth (III, p. 289) wrote that "there is also in the river Shari a very large animal apparently identical with the ayú of the Benue and Niger—*Manatus Vogelii*."

1881.—Nachtigal (p. 670), however, saw nothing of the manatee in the Shari region, though he is said to have looked for it.

1924.—Migeod (pp. 147–167) was unable to confirm the existence of manatees in Lake Chad, even though he made inquiry at several different places. The published records of the Boyd Alexander Expedition, the Mission Tilho, Foureau's Mission Saharienne, and Chevalier's Mission Chari-Tchad do not mention the animal.

1925, 1928.—The best evidence that the manatee does actually occur in Lake Chad and the Shari appears to be found in certain references which I have not seen personally, but which have been generously transmitted to me by letter from M. Jacques Pellegrin of the Museum National d'Histoire Naturelle. In substance these references (Monod, 1928 and Pécaud, 1925) state that in the Chad basin the manatee is now rare, but as elsewhere, was formerly abundant, that Major General Pécaud has himself seen the skin of a manatee in the region and that he was assured by his aides that previously, perhaps about 1905, the animals were captured near Fort Lamy.

1866.—In discussing the reputed occurrence of the manatees in the Chad district, Murray (p. 420) states that in his opinion this distribution is quite possible because "the watershed between the Lake and the Sea is not a lofty range of mountains from one side of which the rivers run into Lake Tschad, and from the other into the Niger,

but a flat, marshy tract of land, so nearly level, that it is almost an equal chance by which way the waters will run from it. It is like a large peat-bog, or a gigantic sponge, out of one side of which creeps the Arre and Shari, and out of the other the Benue. The Hippopotamus goes easily from one to the other, and in the rains, when the country becomes flooded, the natives go about in boats. It is like an inundation, so that the manatee could with ease come up from the Atlantic and find its way into Lake Tschad."

The Upper Congo System

1874.—Schweinfurth (II, pp. 159–160) heard from the natives of the Kibali, a branch of the Uele, stories concerning a "river sheep" which he believed could be nothing but a manatee. However, Schweinfurth believed that the Uele flowed into Lake Chad and may have been influenced in his conclusion by Barth's report.

1912.—From the Ubangi River tribes, von Wiese, Hauptmann, and Kaiserwaldau (I, p. 274) heard stories of a river animal which they assigned to the manatee.

1920.—Schwarz (p. 857) states that Schweinfurth, Schubotz, and von Wiese heard of the manatee in the Mbomu and Uele. The reference to Schubotz, however, is obscure, for I have found no mention of the manatee in his writings.

1887.—In his map of the distribution of the Sirenia (map 53f), Marshall accepted the account of Schweinfurth and drew the conclusion that manatees occupied the whole of the Uele and Congo.

1932.—M. Lucien Blancou states that the natives affirm the existence of the manatee in the lagoons along the Likouala aux Herbes and in the Sangha, right bank tributaries to the Congo in the region of Lukolela. Resting as this does on native accounts their presence in these streams must remain, for the present, problematical.

Lakes Victoria, Albert, and Tanganyika

1887.—Marshall (map 53f) indicates that Sirenia occur in the above-named lakes, but on whose authority he indicated this fabulous distribution I do not know.

The East Coast of Africa

Some authors of the nineteenth and twentieth centuries have stated that manatees occur on the east coast from the Cape of Good Hope to the Mozambique Channel. This must be due to credence given to reports of early navigators who saw the dugong on the Madagascar coast or elsewhere. There is on the Cape of Good Hope, between Cape Town and Port Elizabeth, a Zeekoe River, this name, however, appears to refer to the hippopotamus and not to the manatee or the dugong, for Sparrman (1785, I, p. 346) speaks of this river harboring "sea cows (*hippopotamus amphibius*, Plate IV)." The animal figured is clearly a hippopotamus, and Sparrman's account of hunting "sea cows" further shows that this animal was no sirenian. It is, however, stated in a letter which Sparrman wrote to a friend, and which was subsequently published (Sparrman, 1777, p. 40) that the author captured a "manatee" alive, and to judge by the route of this traveler, the capture must have been made in Cape

Province. The possibility that the word "manatee" is an error in translation before publication must not, however, be overlooked.

Abyssinia

Lake Tana: 1868.—Heuglin (pp. 247 and 289) states that in Lake Tana there lived a manatee-like animal called by a name which means "sea calf." That the author did not confuse the alleged mammal with the hippopotamus is clear from his statement that the hippopotamus also lived in the lake. Very large catfishes are said to inhabit this lake, and it may be that these are creatures that gave rise to Heuglin's report.

Mareb River: 1877.—Heuglin (*loc. cit.*) heard reports of an animal similar to, or identical with the supposed manatee of Lake Tana, living under a different native name in the Mareb and its tributaries, a part of the Nile drainage system. For this animal he suggested (1877, II, p. 137) identity with *Manatus Vogelii* of the Benue River. It is perhaps superfluous to observe that these purported Abyssinian manatees can only be considered mythical.

Oceanic Islands

St. Helena: A marine mammal called a "manati" was formerly not uncommon at St. Helena up to the nineteenth century, the last specimen having been killed in 1810. Lydekker (1899, pp. 796–798) concluded that this was in all probability a sirenian, but not identical with the African manatees. Unfortunately, since no specimen of this creature is known, nothing is to be gained by speculation as to its probable relationships, but it seems most likely that the conclusion reached by Dampier, during his visit to the island in 1691, is the correct one. Concerning this he wrote (1906, I, p. 526), "I was also informed that they get manatee or sea cows here, which seemed very strange to me. Therefore enquiring more strictly into the matter, I found the Santa Hellena Manatee to be by their shapes and manner of lying ashore on the Rocks, those Creatures called Sea-lyons."

SUMMARY

There are three known living species of manatees: one African (*Trichechus senegalensis* Link); one chiefly inhabiting the coastal waters of the West Indies and the eastern American coast from North Carolina to Brazil (*Trichechus manatus* Linnaeus); and a third occurring chiefly in the rivers of northeastern South America [*Trichechus inunguis* (Natterer)]. It is probable that geographic extremes of these species are racially distinct, and one such, *T. manatus latirostris* (Harlan), of Florida is here recognized, but the manatee of the mouth of the Congo cannot, on the basis of present knowledge, be distinguished from specimens of *senegalensis* taken in Senegal, as figured and described in the literature. *T. senegalensis* resembles *T. manatus* more than it does *inunguis*, and it is supposed that these two species are more closely related than the two New World species.

A study of the skeletons of the species of manatees shows that the principal postcranial differences lie in the proportion of the elements of the pectoral girdle. *T. senegalensis* has lightly built bones and hands proportionately about as long as those of *manatus*. The pectoral limb bones of *manatus* are about double the diameter of those of the African manatees, though their proportionate length is similar. The limb bones of *inunguis* are lightly built like those of *senegalensis*, but the distal elements, particularly the metacarpals and first phalanges, are considerably more elongate than those of the other two species.

The sterna of the three species are of distinctive types. These are shown in figure 1.

The differences in the skulls, for knowledge of which we are mainly indebted to Hartlaub, are centered principally about the nasal basin. Individual variation, which is so extensive in the genus, hinders the formulation of invariable criteria for the distinction of the species, but this variation is most pronounced in such vestigial parts as the lacrimal and nasal bones. Perhaps the most constant specific character of the skull is the length of the vomer. In *senegalensis* this usually extends only to the level of the middle of the orbits, in *inunguis* to the anterior edge of the orbits, and in *manatus* to the posterior edge of the incisive foramen or beyond.

Mandibular characters are well marked, though, in the main, subject to considerable age variation. The species *inunguis* is easy to recognize, among other features, by the large number of mental foramina (ten or more), *manatus* by its deep symphysial groove, and *senegalensis* by its lack of such a groove.

The range of the African manatees extends along the West African coast from Senegal to the Quanza River in Angola, and this full coastal range is represented by scattered specimens in the museums of Europe. The manatees are not known from far up any of the rivers flowing into this coast, if we except the Niger and its tributaries. A specimen in the British Museum was found along the Benue, and published reports make it seem certain that manatees occur in the upper Niger River above Timbuctu. It is also probable that manatees have occasionally been taken in the Lake Chad drainage, into which they are supposed to have gained access by crossing the seasonally flooded area lying between the Benue and the Shari. Reports of manatees in the Uele, Lake Tana, east of the Cape of Good Hope, and St. Helena are discredited.

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ADDENDA REGARDING LAKE CHAD MANATEES

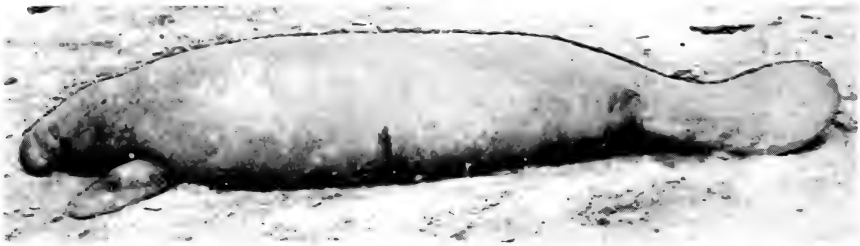
Since the date of completion of the manuscript (March, 1932) of this bulletin there has been published a photograph of a manatee (1933, Bulletin Économique de l'Afrique Equatoriale Française, 9^{e} Année, No. 30, p. 35) with the caption "Un lamentin pêché dans le Tchad." Inquiry has elicited the information that this photograph was taken in the Chad district, but not in the Chad drainage. It was in fact secured in the lake at Léré, in the vicinity of Moyo—Kebbi, from which records have already been quoted.

PLATE XXVII

PLATE XXVII

Figs. 1 to 3. Manatee at Banana, Belgian Congo, A.M.N.H. No. 53939.

1



2

3

Harry Hoogstraal

THE PANGOLINS AND AARD-VARKS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION

(6)

By ROBERT T. HATT

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Article VII.—THE PANGOLINS AND AARD-VARKS COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION[1]

By Robert T. Hatt

Plates XXXII to XXXIX; Text Figures 1 and 2

CONTENTS

INTRODUCTION

The collections of pangolins and aard-varks made by Messrs. Herbert Lang and James P. Chapin, while functioning as the American Museum Congo Expedition, are of exceptional value in that the species represented were secured in sufficient numbers to enable one, apparently for the first time, to gauge the range of variation occurring within geographically limited populations of these species.

There have been many revisions of the Manidae between that of Sundevall in 1843 and that of Frechkop in 1931, and current nomenclature synthesizes their conclusions. Thus, the two African arboreal species and the giant pangolin are now commonly recognized as generically differentiated and without subspecies, though exhibiting great individual variation in some characters, a status which the ninety-five scaly anteaters of the collection does not affect.

The Orycteropodidae, to the contrary, appear to present noteworthy localization of character combinations within areas not far separated.

[1]Scientific Results of the Congo Expedition. Mammalogy, No. 15.

To the long list of names for this latter animal already carried in the literature, it was deemed advisable to add another, though it is realized that our knowledge of the speciation of *Orycteropus* is totally inadequate. Unfortunately the meager material in the museums of this country does not place me in a position to judge as to the validity of the many forms described, often insufficiently or on the basis of a single specimen.

All of the "species" and "genera" of African pangolins named by the early workers, which are, in my present opinion, without foundation, have been placed in synonymy by reviewers of the Order, and for this reason I have not burdened this paper with a detailed synonymy. My one departure from currently accepted ranking of names of the scaly anteaters is the relegation of the names *Phataginus*, *Smutsia*, and *Uromanis*, recognized by Pocock and others as full genera, into subgeneric position. I do this with no depreciation of the established fact that the groups in question are very distinct, nor without appreciation of the importance of the characters upon which the distinction is based. It does seem, however, that nomenclature gains nothing and loses much by the multiplicity of generic names where each genus of a single family is represented by a single, or at the most, only two species. I consider it advisable to recognize these differences by name, but not so to elevate the rank involved that the fundamental relationship of all forms is obscured by designations that can be of meaning to no one but the specialist.

In the Congo Expedition report on ants there was published a section by Dr. J. Bequaert on 'The Predaceous Enemies of Ants,' to which Mr. Lang contributed a full and interesting section on mammals. This was in part founded on his field notes, but these were not completely given and not always recognizable as original. For this reason it seemed appropriate to reproduce them here, without additions, for their value as original information. In certain instances, as indicated by quotation marks, these notes are directly transcribed. Some notes, however, have been rewritten in order to place the subject matter in a more convenient form.

The excellent photographs of living and recently living animals (Plates XXXII to XXXIX) are products of Mr. Lang's painstaking photography. His labors resulted in many pictures of these species, of which those reproduced are but a small selection. Text figures 1 and 2 are from the pen of Miss Margaret M. Matthew.

It is a pleasure to acknowledge the generosity of Dr. Glover M. Allen of the Museum of Comparative Zoölogy, and Dr. Gerrit S. Miller,

Jr., of the United States National Museum, who loaned me such specimens as were in the collections in their charge. The manuscript of this report has received a critical reading by Mr. H. E. Anthony, and I wish to express my appreciation of his numerous helpful suggestions.

SPECIES WITH THEIR LOCALITIES AND NUMBER OF SPECIMENS FROM EACH LOCALITY

	SPECIES	LOCALITIES	SPECIMENS
1.	*Manis (Smutsia) gigantea*	Bafuka, 1; Niangara, 1; Niapu, 12; Poko, 2.	16
2.	*Manis (Uromanis) longicaudatus*	Akenge, 2; Bolobo, 1; Gamangui, 2; Medje, 1; Niapu, 7.	13
3.	*Manis (Phataginus) tricuspis*	Akenge, 15; Avakubi, 6; Faradje, 1; Gamangui, 1; Medje, 20; Ngayu, 1; Niangara, 2; Niapu, 18; Poko, 1; Stanleyville, 1.	66
4.	*Orycteropus erikssoni erikssoni*	Niapu, 2.	2
5.	*Orycteropus erikssoni faradjius*	Faradje, 11.	11

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
Akenge	*Manis longicaudatus*	2	
"	*Manis tricuspis*	15	17
Avakubi	*Manis tricuspis*	6	6
Bafuka	*Manis gigantea*	1	1
Bolobo	*Manis longicaudatus*	1	1
Faradje	*Manis tricuspis*	1	
"	*Orycteropus e. faradjius*	11	12
Gamangui	*Manis longicaudatus*	7	
"	*Manis tricuspis*	1	8
Medje	*Manis longicaudatus*	1	
"	*Manis tricuspis*	20	21
Ngayu	*Manis tricuspis*	1	1
Niangara	*Manis gigantea*	1	
"	*Manis tricuspis*	2	3
Niapu	*Manis gigantea*	12	
"	*Manis longicaudatus*	7	
"	*Manis tricuspis*	18	
"	*Orycteropus e. erikssoni*	2	39
Poko	*Manis gigantea*	2	
"	*Manis tricuspis*	1	3
Stanleyville	*Manis tricuspis*	1	1

New[1] Subspecies and Its Type Locality

1. *Orycteropus erikssoni faradjius* Hatt. Faradje.

Manidae

Manis Linnaeus[2]

Manis Linnaeus, 1758, 'Systema Naturae,' 10th Ed., p. 36. Type by monotypy, *pentadactyla*.

The following names, which, among others, have been proposed for the African pangolins, are here recognized as subgenera.

Phataginus Rafinesque, 1821, Ann. Gén. Sci. Phys. Brux., VII, pp. 214–215.[3] Included species *tricuspis* and *ceonyx* (=*longicaudatus*). Type by subsequent designation (Pocock, 1924, p. 722), *tricuspis*.

Smutsia Gray, 1865, Proc. Zool. Soc. London, 1865, p. 369. Type by designation, *temminckii*.

Uromanis Pocock, 1924, Proc. Zool. Soc. London, p. 722. Type by designation, *longicaudata*.

Manis (Smutsia) gigantea Illiger

Plates XXXII to XXXIV

Manis gigantea Illiger, 1815, Abh. d.k.Ak.d. Wissensch. Berlin, p. 84.

?Pholidotus wagneri Fitzinger, 1872, Sitzber. K. Akad. Wien Math. Naturwiss. Cl., LXV, (1), p. 48.

Manis gigantea is a terrestrial pangolin measuring in excess of 1200 mm. when adult. In common with all other African pangolins no hairs project between the scales, the median dorsal row of scales does not extend to the tail tip, and there is no external pinna of the ear. The belly is naked, the preaxial surface of the fore limb bears scales to the base of the claws, the tail is massive and bears no naked subterminal pad, characters shared with a smaller species *temminckii*. There are 12 to 15 scales in the median dorsal row of the tail. The massive skull measures over 130 mm. in adults.

Represented by 14 skins, 11 skeletons, 1 skull, and two fetuses in formalin, collected as follows:

Bafuka, 1 (skin of adult), April 5, 1913

Niangara 1 (adult ♀), April 26, 1913

Niapu, 12 (6 adult ♂, 4 adult ♀, 2 fetuses), November 18, 1913–January 27, 1914

Poko, 2 (1 adult ♀, 1 im. ♀) August 4 and 10, 1913.

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[1]Hatt, Robert T. 1932. 'The Aard-vark of the Haut Uele.' Amer. Museum Novitates, No. 535, p. 1.

[2]The reader is referred to Pocock (1924, p. 718) for a review of the generic nomenclature of the pangolins.

[3]The title-page bears the date 1820, but according to Sherborn (see Pocock, 1924, p. 721) it was not published until the following year.

The accumulated observations of the past century show profound differences between *gigantea* and its nearest relative, *temminckii*, but due either to a remarkable uniformity of the species or to the rarity of specimens, no one has yet pointed out any geographic differentiation within either species. The Congo Expedition series, representing the eastern limit of the range of *gigantea*, forms a basis for the judgment of range of variation found in specimens from other localities.

Size.—The external measurements—average (minimum-maximum)—of twelve adult *Manis gigantea*, taken from animals in the flesh, are as follows:

	Total Length	Tail Length
12 ♂, ♀	1373 (1185–1530)	627 (550–700)
5 ♂	1438 (1370–1530)	674 (650–700)
7 ♀	1298 (1185–1365)	596 (545–675)

The maximum size of the species appears not to be represented by this series, for Schubotz (1912, p. 356) has recorded a specimen 1650 mm. long from Angu, and Thilonius (1912, p. 373) mentions one 1600 mm. in length. Also there is a skull from Liberia in the collections of the Museum of Comparative Zoölogy that is slightly larger than any in the Congo collection.

Color.—The color and color pattern show some divergence in the series that is in part traceable to age changes but which is also somewhat the result of differences in methods of preservation. The greater number of the skins have been tanned and are thus free of foreign coloring matter, but a few have not received further treatment than that which was given them in the field, and, in consequence, the furrows on the bases of the scales harbor a considerable amount of the red soil of the region, and the general color of the animal is altered.

In the adults of medium size a color pattern is attained which is the same in both sexes and may be considered typical of the species. In a specimen of such an animal the scales of the head, neck, shoulders, arm, and hind legs are dominantly dark olive-brown.[1] This color shades gradually into avellaneous over the dorsal region. Individually the head scales are uniformly heavily pigmented except for light marginal bands of buffy brown. The dark area is more and more restricted toward the rear, so that in the mid-dorsal region the deep olive is confined to the basal and medial superior surface. This is flanked by a variable brownish area that is near buckthorn. Over the tail a deep Roman green assumes increasing prominence in the apical part of the scale. Here the base of the scale is a light brown.

[1]The color terms refer to Ridgway's 'Color Standards and Color Nomenclature.'

Though individual variation and differences in method of preservation seem to account for a high percentage of the differences represented, there is some divergence that is obviously due to age and its attendant wear on the scale surface. This attains extremes in the young animals with rough, unworn scales and in the old individuals in which all scales are smooth and polished through friction between themselves and between the scales and their environment. In both of these age extremes the color, general and local, is lighter. In the young animals this is achieved through the masking occasioned by rugosity and soiling, and in the older individuals, it seems, through the wearing away of the pigmented layer, though this of course may be only one of the factors responsible.

The naked skin of the under parts is, in the tanned hides, near warm buff. In his field catalogue Mr. Lang described a freshly killed animal in the following terms: "Nose dull blue-gray, rest of snout and other naked parts on head, pinkish gray, ventral surface grayish white. The iris darkish."

Scale Topography.—It has been written (1931, Frechkop, p. 7) that the scales of *gigantea* are without keels, but this is not wholly true, for the two smaller specimens of *gigantea* in the Congo series, where wear of the scales is very limited, show well-developed and characteristic median keels on the scales of the flanks and the limbs (Plate XXXII, figure 1). These are also prominent in the same areas in the embryonic specimens of the species (Plate XXXIV, figure 1). Keels are also found on the lower flank scales of young specimens of *temminckii*, however, and it would thus seem probable that these are characteristic of all of the scaly anteaters, and that the early disappearance in the large species is due only to the greater wear to which these terrestrial forms are subjected.

The shape of the scales in the two species of the *Smutsia* group is altered by the wearing away of the tip. In the dorsal region the posterior scale border is occasionally perfectly transverse, and the scales of both the back and tail appear as though truncated by some artificial process. More commonly the free margin is modified into an elipsoidal arc.

Scale Number.—Scalation is relatively constant, but not exactly so. The full number of scales appears during uterine life, and modification in scale count is, it seems, occasioned only by injury. Several individuals which were obviously confined for some time by a devise in the form of a halter have lost the scales in lines where the restraining

cords cut in. One old male from Niapu (53854) possesses a large number of small accessory scales largely underlying, though in some instances projecting beyond, a normal scale. These supernumerary scales vary from styliform to falciform. None approach the normal form or size for the region in which they are located.

The scale counts of *gigantea* and *temminckii* have been reported by others, and the present series adds little to our knowledge concerning the variation in these numbers.

Hair.—The species is hairless, except for a dense ring of short, circumorbital bristles and a patch of similar hairs in front of the auditory meatus. No other trace of hair is found on either the dried skins or the embryos preserved in alcohol.

Skull.—Within the series of *gigantea* skulls from the Congo collection there is little variation due to factors other than age, sex, and injury. One female (53853) presents great asymmetry in the occipital region, and in another (53851) there is extensive malformation in the nasals and frontals due, apparently, to injury occasioned by the long-continued restraint of a tightly binding halter. The second and third cervical vertebrae of this specimen are fused, the result certainly of abnormal conditions. Two of twelve skulls show bregmatic bones. The dorsal profile is in some crania very nearly straight, but in others it presents a marked depression in the frontal region. (Contrast Nos. 53849 and 53846.) This seems, however, not to be correlated with age or sex. Among the features presenting extensive individual variation that are seen in the basal surface of the skulls are the configuration of the ventral margin of the foramen magnum, the shape and size of the interpterygoid fossa, the shape of the palatine notch, the caudal extension of the palatine processes of the maxillae, and the presence of a palatine surface on the vomer.

The only sexual difference which I have found in the skulls is the attainment of greater size in the males and the sutures closing in the females when the skull is smaller than at the time corresponding closures occur in the males.

Age changes involve little other than increase in size, thickness and density of bone, closure of sutures, and reduction in the height of the lateral palatine ridge. The closure of the principal sutures in and across the median plane is approximately as follows: dorsomedian suture of exoccipitalia; basioccipital-basisphenoidal and the basisphenoidal-presphenoidal suture; frontal suture; nasal suture (occurring in old age).

Cranial Measurements of Adult *Manis gigantea*

Average (minimum-maximum)

	4 ♂	6 ♀	10 ♂, ♀
Greatest length	152 (148–162)	142 (134–148)	146 (134–162)
Basal length	142.7 (138–155)	133 (127–139)	137 (127–155)
Palatal length	94.5 (89–105)	90 (86– 99)	92.4 (86–105)
Breadth across zygomatic processes	49.5 (49– 50)	47 (45– 49)	48.3 (45– 50)
Greatest breadth of brain case	55.6 (54– 57)	53.4 (51– 56)	54.4 (51– 57)
Greatest length of nasals	59.2 (56– 62)	52.8 (51– 61)	55.6 (51– 62)
Breadth of single nasal	13 (12– 14)	12.4 (12– 13)	12.6 (12– 14)
Greatest length of mandible	112.5 (109–121)	105.5 (100–110)	109.3 (100–121)

Digestive Tract.—When in the field Mr. Lang observed that in a female 1360 mm. long that "The intestine measured 1080 mm. There is no caecum. The stomach is practically divided in two sections: one section is surrounded by strong muscles and resembles a gizzard; it was filled with small stones (the largest 5 mm. in diameter) and heads of ants it had eaten. There is towards the middle a large, roundish, raised gland patch; the rest of the stomach is provided with folds; and has been preserved in formalin. Towards the pyloric end is a raised portion that looks like a sort of stopper, and as it projects far into the stomach it certainly is of some assistance in grinding the food along its roundish folded surface."

Anal Glands.—"On either side of the anus are two ducts from which a strongly smelling, white pasty excretion is given off on pressure from the outside," according to Mr. Lang.

Reproduction.—Two fetuses were found in specimens of *gigantea* measuring 1350 and 1365 mm. in total length. One of these fetuses taken November 28, measures 240 mm. in total length. The other (Plate XXXIV, figure 1) removed on December 9, measures 290 mm.

Scales, Defense.—"The scales on the sides hang very loosely down when [the animal] stretched out," wrote Mr. Lang. "If one tried to unfold the living specimen it would suddenly glide its tail along its side, often with such force as easily to bend over a native-made knife of 3 mm. thickness stabbed in its side."

Burrow.—A burrow of this species, photographed by Mr. Lang at Babeyru, is shown in Plate XXXIV, figure 2.

Manis (Uromanis) longicaudatus (Brisson)

Plate XXXV; Figure 1

Pholidotus longicaudatus Brisson, 1762, 'Regnum Animale,' p. 19.
Manis tetradactyla Linnaeus, 1766, 'Systema Naturae,' 12th Ed., p. 53.
Manis macroura Erxleben, 1777, 'Systema Regni Animalis,' p. 101.
Manis africana Desmarest, 1820, 'Mammalogie,' part 1, p. 376.
?Manis ceonyx Rafinesque, 1821, Ann. Gén. Sci. Phys. Brux., VII, p. 215.
Manis longicauda Sundevall, 1843, K. Vet. Akad. Handl., 1842, p. 251.
Manis guineensis Fitzinger, 1872, Sitzber. K. Akad. Wien Math. Naturwiss. Cl., LXV, p. 24.
Manis senegalensis Fitzinger, 1872, idem, p. 25.
Manis hessi Noack, 1889, Zool. Jahrb. Abt. Syst., IV, p. 100.

Manis longicaudatus is an arboreal species with a long prehensile tail, equaling about two-thirds of the total length. There is a naked area on the under surface of the tail tip. The forearms bear no scales, but are covered with hair. The scales are large, yellow, and on the flanks are keeled. The two inferior postscapular scales are markedly larger than those adjacent to them. The skull may be recognized by its sharp anteorbital narrowing.

Represented by 10 skins, 3 skeletons, and 8 skulls, collected as follows:

Akenge, 1 (adult ♂) October 10, 1913
Bolobo, 1 native skin, December, 1914
Gamangui, 2 (adult ♂ and adult ♀) February 3 and 13, 1910
Medje, 1 (juv.) June 9, 1910
Niapu, 7 (2 adult ♂, 4 adult ♀, 1 adult, sex ?), November 28–December 20, 1913.

Collector's Measurements

	Total Length	Tail Length	Foot Length
9 ♂, ♀	860.4 (755–937)	577.0 (505–645)	50.4 (44–55)
3 ♂	874.0 (810–937)	613.3 (560–645)	53.0 (51–55)
5 ♀	851.4 (755–930)	560.6 (505–623)	49.0 (44–54)

Other measurements made by the collector on an adult male of 810 mm. total length, collected at Gamangui, are:

Middle of eye to tip of snout	35 mm.
Middle of eye to ear	25 mm.
Transverse diameter of mouth	18 mm.

External Characters.—There is a low coefficient of variability in scale count and color of *longicaudatus*. All of the specimens lie within the range of scale numbers set forth by Frechkop. In color the only noteworthy deviation from uniformity is the sporadic occurrence of a

few blond scales, usually on the tail but occasionally occurring on the flanks. That this lack of basal pigmentation in these few scales is not due to post-mortem desiccation or other changes is demonstrated by their visibility in a photograph of a specimen in the flesh (Plate XXXV, figure 2). Preserved skins often show a pronounced difference in color, due to soiling, that disappears when the scales are wetted.

The belly hair is black in most individuals, but in some is bleached or entirely changed to tawny or to russet. In none of the specimens examined does the throat or chin hair show any deviation from black. The hair over the dorsum of the antibrachium varies from black to russet, the usual combination being a black center stripe flanked by russet.

The external characters of a fresh specimen obtained by Mr. Lang were described in his field notes as follows: "The whole face, inclusive of nose and ears, dark brown, nearly black. The eyelids are thick and protruding, the eyes themselves are small and appear brilliant black. The toenails are blackish, the pads brown. The naked skin on the under side near fore limbs pinkish brown. The naked skin about the anal region pinkish gray. The scales look as nice and clean as if they had been rubbed off with oil. The anal region is slightly protruding, the penis hardly visible, the testes underlying the skin are imbedded in the fatty tissue outside of the abdomen (without forming a scrotum)."

Age Change.—In this species the alteration of the scales with advancing age does not follow the same pattern as that of the other two pangolins secured. The scales of the back retain the regular contours of youth until extreme old age, when, to judge principally from a large male specimen in the United States National Museum (No. 220402), collected by Mr. C. R. Aschemeier near Fernand Vaz, the scales are arrested in their growth and become scarred, broken, and irregular. The small scales of the head, feet, and under surface of the tail of this specimen are so extremely worn that in many cases they are reduced to little polished nodules presenting no free edge.

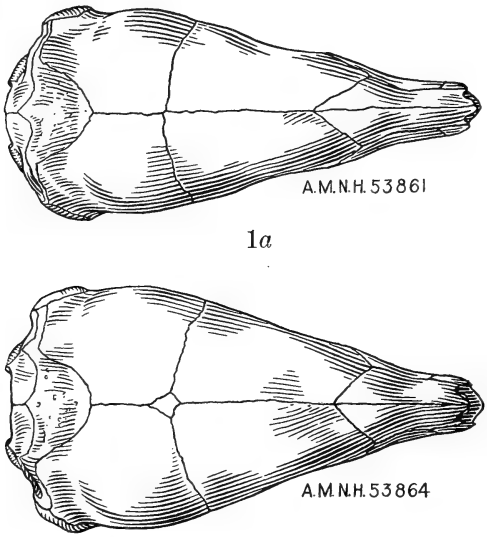
There is a tendency for the keeled scales of the sides, crus, and under tail to become mucronate and to parallel to a slight degree the tridentate scale shape of *tricuspis*. This is most pronounced in mid-life.

Color changes of the scales are confined to the shoulder and head, where a gradual darkening occurs at the base of these growing structures.

The hair over the belly of the older individuals is longer and denser than that in younger individuals from the same area.

Geographic Variation.—Representatives of the long-tailed pangolins from areas other than the Medje forest district do not always fall

completely within the limits of variation exhibited by our series from that region. Thus the specimen from Bolobo (a native skin) and one collected at Lukolela by Mr. Franklin Edson, III, both have the middle front claw 5 and 2 mm. longer, respectively, than any seen on specimens from other districts. The hair on the chins of these two animals from the Moyen Congo is also longer than that of the specimens from the forest of the Ituri-Haut Uele border, but in the absence of associated variables, and with such small series to study, there is no justification



1*a*

1*b*

Fig. 1. Extremes of skull shape in *Manis longicaudatus*. *a*.—Immature ♀, Akenge, Belgian Congo (No. 53861); *b*.—Immature ♀, Gamangui, Belgian Congo (No. 53864).

for assigning distinctive names to the animals bearing these minor characters. It may be added that the few specimens from Liberia, the Cameroons, and Gabun that I have examined show no single feature not duplicated by some specimen in the small series of the Congo collection, if marks of advanced age, discussed above, are excepted.

The Skull.—The skulls of *Manis longicaudatus* vary to the extremes of proportion exhibited by two female specimens taken within 40 kilometers of each other, shown in figure 1. These two are of only

approximately the same age, the short, wide skull having come from an individual 890 mm. long, the other from one 795 mm. The skulls themselves are within one millimeter of being the same in greatest length, but in one (53861) the width is but 44 per cent of the length, while in the other (53864) the width is 52 per cent of the length. That the disharmony exhibited is not due to age differences is shown by the fact that the oldest individuals in the complete series are nearer the shape of the skull from the smaller animal than that from the larger, and that in this series there is a perfect gradation from one type to the other among animals of very nearly the same size. The difference is not one of sex, since these two are females, and the other skulls available show no sex-form relationship. That two species, or races, are not involved is attested by the uniformity of other characters and the random distribution of the skull types within the localities represented by the Congo collection and other material coming from points ranging between Liberia and the middle Congo. Neither do the specimens examined lend support to any assumption that one type or other is the result of a pathologic condition or an endocrine disturbance, unless disruption of normal development is chronic in the species. Other matters of random variation in the skulls, such as the presence of Wormian bones, the variability of position in sutures, etc., appear to be of about the same magnitude as variation found in the better series of *tricuspis*. It must, therefore, be concluded that in development the skull of *longicaudatus* is normally subject to a wide variability.

The greatest age is not represented in the Congo series. The United States National Museum specimen (No. 220402) from Fernand Vaz, described above for old age characters of the scales, is accompanied by a skull 6 mm. longer in greatest, basal and palatal lengths, 2 mm. longer in nasal length, and 4 mm. longer in mandibular length than the largest skull of the Congo series.

The fact that the two male skulls are longer than the seven female skulls in the same collection is obviously due in part to the accident that the young individuals were all females, but it is probable that in this species, as in the two others considered here, the males do attain greater size than the complementary sex.

Cranial Measurements of *Manis longicaudatus*

Average (Minimum-maximum)

	2 ♂	7 ♀	10 ♂, ♀
Greatest length	70.0 (69.1–71.0)	65.3 (62.1–68.7)	65.8(62.1–71.0)
Basal length	65.6 (65.5–65.7)	60.2 (57.0–64.4)	60.8 (56.0–65.7)
Palatal length	40.6 (40.2–41.0)	36.9 (34.6–39.0)	37.1 (32.0–41.0)
Breadth across zygomatic processes	24.0 (23.6–24.4)	24.5 (22.8–26.9)	24.2 (22.0–26.9)
Greatest breadth of brain case	32.8 (31.4–34.2)	31.3 (28.5–33.7)	31.5 (28.5–34.2)
Greatest length of nasals	25.0 (24.1–25.9)	22.5 (19.1–25.8)	22.8 (19.1–25.9)
Breadth of single nasal	5.6 (5.4– 5.8)	5.6 (4.5– 7.5)	5.4 (4.2– 7.5)
Greatest length of mandible	42.6 (41.2–44.0)	44.0 (38.2–51.0)	43.3 (38.2–51.0)

Manis (Phataginus) tricuspis Rafinesque

Plates XXXVI and XXXVII; Figure 1

Manis tricuspis Rafinesque, 1821, Ann. Gén. Sci. Phys. Brux., VII, p. 215.
Manis multiscutata Gray, 1843, Proc. Zool. Soc. London, p. 22.
Manis tridentata Focillon, 1850, Rev. de Zool., (2) II, p. 472.

Manis tricuspis is an arboreal species with a tail constituting over half the total length. The characters of the tail tip and the fore limbs are like those of *Manis longicaudatus*. The scales, however, are small and numerous, brown, and during mid-life, tricuspid. The postscapulars are not enlarged. The skull is broad-muzzled, and its zygomatic processes are large and divergent.

Represented by 59 skins, 12 skeletons, 49 skulls and 2 embryos in alcohol, collected as follows:

Akenge, 15 (4 adult ♂, 9 adult ♀, 1 adult sex ?, 1 juv. ♀), September 10–October 22, 1913.

Avakubi, 7 (3 adult ♂, 3 adult ♀, 1 embryo), October 29, 1909–December 8, 1913.

Faradje, 1 (adult ♀), March 24, 1912.

Gamangui, 1 (adult ♂), February 11, 1910.

Medje, 20 (9 adult ♂, 7 adult ♀, 2 adult sex ?, 2 juv. ♂), January 24–October 2, 1910.

Ngayu, 1 (adult ♂), December 19, 1909.

Niangara, 2 (adult ♂, adult ♀), December 2, 1910 and April 20, 1913.

Niapu, 18 (6 adult ♂, 8 adult ♀, 4 juv. ♀), November 10, 1913–January 3, 1914.

Poko, 1 (adult ♂), August 11, 1913.

Stanleyville, 1 (adult ♂), August 9, 1909.

External Characters.—The external appearance of a living adult female, taken at Avakubi, November 10, 1909, was described by Mr. Lang in the following words: "Snout and skin around eyes pinkish brown, lips pinkish, iris dark brown. The skin that may be seen underneath the hair behind the eyes and around the ears is grayish. The visible skin on the fore and hind limbs dirty gray; throat, abdomen, and skin around anus, also the underside of legs, grayish white." The collector recorded the eye color of another female as medium brown and noted that the pupil was circular. The nose of a third female is described as "grayish above, somewhat brownish."

A male taken at Stanleyville, August 9, 1909, was characterized as follows: "Snout pinkish gray, underlip whitish, iris dark brown, eyes much protruding from the thick, swollen looking eyelids. Ears can be closed though they are often open, a simple slit outside, but supported by a cartilage."

Age Changes in External Characters.—The splendid series of *tricuspis* from a small area in the upper Congo basin shows extreme limits of variation in the contour, size, and count of the scales and the color, length and density of hair that embraces practically the entire range of variation that I have seen in specimens from Liberia, the Ivory Coast, Cameroons, Fernando Po, Gabun, the lower Congo, Kasai district, and central Angola.

The scales do not increase in number but grow in length and breadth. Throughout life they are deeply striate, but in old age the scales of the head and the tips of all scales, become worn smooth. At birth, and from that time until the individual attains a length of about 325 mm., the margins of the scales are even, but with ensuing wear, which by action between the scales is concentrated on the section bordering the median keel, the scales become sharply dentate, or, usually later, tridentate. This configuration of the scale margins is characteristic of youth, and usually disappears, particularly dorsally, by the time the individual reaches a length of 750 mm. During the period from youth to old age the scales grow in length more rapidly than in width, a scale from the mid-dorsal region transforming from a structure as wide as long to one in which the length is four times the width. Old animals with cuspless, worn, elongate scales present a drastically different appearance from the animals aptly described by their specific name. (Compare figures 1 and 2, Plate XXXVI.)

Hair changes during life are striking but subject to well-marked individual variation. At birth and for some time afterward the only

hair is that of the orbital ring. By the time the animal is half grown the unscaled parts of the skin are covered with a sparse growth of short, light-colored hair. The usual course of development is that the hair becomes increasingly dense and long, attaining a length of 20 mm. over the abdomen. Some areas, few of which are constant, become a Vandyke brown. The hair of the arms on adults is always colored in this manner and any other section may be so. Frequently the sides of the face, the rear legs, and the perineal region are suffused with this color and the throat and belly blotched with it.

Individual Variation.—Individual variation in length and color pattern of the hair is treated in the paragraph above. Variation in color of the scales appears to be little subject to random variation, though occasional specimens show a few unpigmented scales on the sides of the body and on the tail, which are probably not post-mortem changes, since they are seen in an embryo in alcohol. Scale counts of the transverse longitudinal body rows, of marginal and median caudal scales have been recorded by Frechkop and earlier writers. Ten specimens selected at random, with equal distribution among the sexes, show the following variation in count. My findings are followed in parentheses by the corresponding figures summarized in Frechkop. It is shown by my count that variation within one district is great enough to indicate that scale counts can be of little or no service in recognition of the source of any specimen of the species.

Number of pre-caudal median scales	27–30
Number of median body scales	19–21 (18–22)
Number of longitudinal rows	21–25 (19–23)
Number of marginal caudal scales	35–40 (34–38)
Number of median caudal scales	29–36 (30–33)

Sex Differences.—I am unable to discover external differences between the male and female *tricuspis* other than those of the sex organs and the lacteal apparatus. The males grow to greater length, as may be seen from the summary of the collector's measurements. The slight difference between the ratio of tail to head and body length obtained from these figures (♂ 168 per cent–♀ 166 per cent) is almost certainly of no significance.

Geographical Variation.—As suggested above, the external differences between members of this species from different localities seem to be inconstant, and whereas I am of the opinion that the animals from opposite extremes of the range present divergent tendencies, I have not found a single character which may be relied upon to differ in a constant

manner. Thus specimens from the Kasai and from Angola appear to have longer hair which carries less pigment than that in all but a few individuals from the northeastern Congo, and this same tendency is indicated by some of the ten scattered specimens from the Guinea coast which have come into my hands, though these specimens are too few and too closely approximated by specimens in the Congo Expedition series to warrant recognition of races within the species.

Collector's Measurements

	Total Length	Tail Length	Foot Length
52 ♂, ♀	777.9 (617–1027)	463.4 (350–607)	57.1 (45–75)
25 ♂	793.2 (617–1027)	469.6 (360–607)	58.0 (45–75)
25 ♀	768.4 (630– 920)	460.4 (350–590)	56.4 (45–75)

Cranial Characters.—Individual variation in the skulls of *tricuspis* is localized and does not approach the extreme variation in general form found, by contrast, in our much smaller series of *longicaudatus*. The features of *tricuspis* subject to most pronounced variation are the nasals, the lacrimals, and the foramina. The nasals vary most strikingly in the form of their lateral wings. These are occasionally bilaterally asymmetrical, as, for example, in one specimen in which the suture separating the right and left nasals is neither straight nor in the median plane. The lacrimals are in some specimens totally within the orbit, while in others they extend far forward between the frontal and maxillary. They are in some skulls high above the zygomatic processes of the maxillary and in others extend outward and downward to take some part in its formation. The foramen magnum and all of the smaller foramina present a wide range of variation in size and form.

Age variation presents no peculiar features in the species. Unlike the condition in *gigantea*, but in agreement with that in *longicaudatus*, the sutures of the roof and sides of the cranium seem never to fuse to the extent of obliteration of the sutures, though they are tight throughout the period of adult life.

The four occipitals unite early to form a single bone.

The suture of the basal components of the cranium unite in this sequence from the rear forward: basioccipital-basisphenoidal; basisphenoidal-presphenoidal. Other sutures seem never to close. Even in the oldest skulls the sutures of the palatal region are widely open.

Sexual differentiation appears not to have occurred in the skulls except with reference to size. As may be seen from an examination of the table of cranial measurements, the males exceed the females in size, as they do in the other African pangolins.

The Ivory Coast representatives may be somewhat distinct from that population represented by the Congo collection, for there is no parallel in this latter series for two features seen in a single skull of an immature specimen from the first locality. The two matters in which this skull differs are those of size and nasal shape. The posterior border of the combined nasals is here cuspidate, in contrast to the acute nasals of the compared series. The skull is also smaller and of denser bone than skulls of a similar stage of development in the Congo series, and it may be that in the western limits of the range these features are constant. This is rendered the more probable by Sjöstedt's (1897, p. 45) observation that *tricuspis* from the east is somewhat larger.

Distinctions between the Skulls of *M. tricuspis* and *M. longicaudatus*

The classification of the manids has been based chiefly on the external characters, sternae, and vertebrae. Nevertheless skull characters are well marked, and it may prove useful to note the diagnostic differences between the two arboreal forms here involved.

tricuspis

1.—The lateral borders of the skull converge anteriorly in a regular course. The muzzle is broad.

2.—The mastoid region is lightly inflated.

3.—The zygomatic process of the temporal is large and diverges strongly outward.

4.—The sphenopalatine foramen opens ventrally and is always prominent as seen from below.

5.—Slight variation in general skull shape.

longicaudatus

1.—There is a well-marked anteorbital constriction, and the muzzle in consequence is narrow.

2.—The mastoid region is strikingly inflated.

3.—The zygomatic process of the temporal is small and only lightly divergent.

4.—The sphenopalatine foramen opens posteriorly and is either inconspicuous or masked by the palatal flare.

5.—High degree of variation in skull shape.

Cranial Measurements of Adult *Manis tricuspis*

Average (minimum-maximum)

	22 ♂	20 ♀	44 ♂, ♀
Greatest length	72.8 (63.8–80.8)	68.7 (58.5–79.2)	70.7 (58.5–80.8)
Basal length	66.8 (57.9–75.4)	63.1 (51.6–73.3)	64.9 (51.6–75.4)
Palatal length	41.4 (34.5–44.6)	37.0 (31.5–43.3)	39.0 (31.5–44.6)
Breadth across zygomatic processes	27.3 (22.7–32.0)	25.4 (20.2–29.3)	26.4 (20.2–32.0)
Greatest breadth of brain case	32.3 (28.5–36.3)	30.6 (27.7–32.9)	31.5 (27.7–36.3)
Greatest length of nasals	27.1 (21.5–32.5)	24.3 (18.1–31.2)	25.7 (18.1–32.5)
Breadth of single nasal	5.3 (3.8– 7.0)	4.4 (3.5– 7.0)	5.0 (3.5– 7.0)
Greatest length of mandible	48.4 (41.7–57.0)	45.7 (37.8–53.1)	46.3 (37.8–57.0)

Reproduction.—Two embryos from the Congo collection are at hand. One of these was taken from a specimen 810 mm., in total length, killed at Medje, January 24, 1910. This embryo was 80 mm. long. A female taken November 16, 1909, carried an embryo 280 mm. long, which is but 22 mm., shorter than another specimen secured alive on December 4, at Lukolela by another expedition. It is indicated, then, that the young are approximately 290 mm. long at birth, and that they are sometimes born in November or December.

There is usually a single pair of mammae, as noted by the collector, and as may be seen from examination of dried skins. A single case was recorded in the field catalogue as "two pairs pectoral mammae," but I am unable to discern more than a single pair on the skin of this same specimen.

Movements.—The field notes on the feeding habits of this species were included in the Bequaert report. Mr. Lang's other notes concerning locomotion were made from observations on four individuals. These notes are transcribed from the field catalogue with slight alterations and paragraphed separately.

No. 1.—This specimen was an expert climber and surprisingly rapid in her movements. On the ground she would cover at least four feet in a second, shuffling along in a peculiar manner. When taken by the tip of her tail she would at once hook the claws of her hind limbs into the large lateral scales near the base of her tail, and either ascend by climbing up or, by bringing her body to a position at a right angle to her tail, she would swing around hooking after everything her fore limbs could possibly reach. In this position her horizontal body could make a three-quarter twist. She could then look toward the ground and halfway up again toward the sky. She would roll up when touched on her snout and would do this so rapidly that one could hardly take one's hand away quickly enough to avoid getting caught between the scales.

No. 2.—When ascending or descending a tree of about four inches in diameter this manis formed a half circle with the end of his tail, the lower surface of which was kept in close touch with the bark. In going up and down oil palms he moved his tail sidewise and up and down, probing for and taking hold of the slightest prominence with the tip of his tail. The skinny pad on the lower side was evidently of great sensibility. Once he had taken hold of any prominence or small branch, he at once worked freely with his fore limbs, as he could hold and direct himself when fastened only by his tail. As a rule, however, he used his hind limbs in keeping any position lasting more than a moment.

No. 3.—This young manis was still alive. Put upon the back of a dead though still unskinned male, it at once climbed toward the tail, grasping it firmly on the edges, and put its tail around the tail of the adult specimen. When the adult specimen was shaken the young seemed not to be troubled in the least. The trial was repeated several times, and every time it selected the tail to which to attach itself, sometimes with the head forward, sometimes backward. It is quite certain that the young

travel clasped firmly on the upper side and parallel with the tail (see Plate XXXVII, figure 1). It would roll itself like the adult specimens.

No. 4.—It was able to shuffle along as rapidly as a man can walk, always touching the tips of its claws to the ground, on the forelegs as well as hind legs. The manis rolled up whenever touched, hooking even the tip of its tail over the dorsal scales. When shaken by the tip it unrolled at once and started to walk. Sometimes the animal sat on its hind legs, and the forelegs then nearly touched the ground. It climbed well on trees and also on steep ground. It could hold itself as firmly with its tail as with its forelegs or hind legs alone. The animal never tried to scratch with its claws. Its only defence consisted in rolling up, though in a very short time it unrolled again (Plate XXXVI, figure 2) and walked away. Though evidently nocturnal, it seemed not to mind the sun at all.

ORYCTEROPODIDAE

ORYCTEROPUS Geoffroy

Orycteropus GEOFFROY, 1795, 'Décade Philosophique 1795.' [From Agassiz 1842, 'Nomenclature Zool.,' Mamm., p. 23.]

Type.—*Myrmecophaga capensis* GMELIN.

Of the thirteen aard-varks secured by the Congo Expedition two, an old male and an old female, came from Niapu, well within the forest. Eleven others, ranging from a very young animal with unworn teeth to mature individuals of both sexes, came from the savanna region of Faradje. Because of the lack of sufficient comparable material and the insignificant diagnoses given most of the sixteen nominal races, it has proved difficult to ascertain the affinities of the animals in the collection. The two old animals from the forest present many characters by which they may be separated from those of the savanna, 350 kilometers (i.e., c.217 miles) to the northeast, but some of these appear to be age characters, and there are relatively few that can not be attributed to senility or random variation. These few, however, are well marked and have appeared to be of sufficient importance to warrant the recognition of two races. Lönnberg's description of *O. erikssoni* from Guffuri (Gufuru) on the lower Bomu River agrees closely with the Niapu (forest) race, whereas the points in which the Faradje specimens approximate the characterization of *erikssoni* are, with two exceptions, those common to both Niapu and Faradje specimens. The two exceptions mentioned are the size of the praemaxillae (as measured by dividing the distance from the maxillo-praemaxilla-nasal juncture to the anterior end of the praemaxillae into the nasal suture) and the size of the teeth. In the first exception the praemaxillary measurement is half or less than half the length of the nasal suture, whereas this measurement in the forest specimens is well over the nasal length. In the eleven specimens from the

savanna country I find no evidence that the praemaxillae increase disproportionately in late life, and I conclude that in this aspect the Niapu specimens are not perfectly typical of *erikssoni*. The one other likeness of the savanna specimens to the type of *erikssoni* lies in the diameter of the teeth which are noticeably larger than those of the forest specimens. Thus longitudinal and transverse diameters of the next to the last molar in the largest animal from the forest are 10.0 and 6.0 mm., respectively, whereas corresponding measurements in a large savanna specimen are 12.5 and 9.0, exactly the measurements reported for *erikssoni*. This skull is, however, much smaller than that of *erikssoni* (24 mm. shorter). The series at hand offers faint suggestion that in senility the diameter of the teeth decreases with the total number. If this is true the small teeth of the two Niapu aard-varks (and Hirst's Cameron race, *leptodon*) are not diagnostic of race but only of age.

It is concluded then that the forest race of the northeastern Congo may be referred to Lönnberg's *erikssoni*. From available descriptions I was not able to refer the aard-varks from Faradje to any of the described forms, though on geographical grounds it would seem possible that they might resemble *kordofanicus* Rothschild. The meager note accompanying the proposed name for that race states that, with certain exceptions (which may be juvenile characters), the type is nearest *aethiopicus*, from which the Faradje aard-varks differ in several respects. I have therefore considered it necessary to propose a new name for the race from Faradje, which has been given as *Orycteropus erikssoni faradjius* Hatt, in a preliminary report.[1]

Orycteropus erikssoni erikssoni Lönnberg

Figure 2*a*

Orycteropus erikssoni Lönnberg, 1906, Arkiv för Zoologi, Stockholm, Bd. III, No. 3, p. 1.

Orycteropus e. erikssoni is a large aard-vark occurring in the forests of the Congo. It is characterized by short hair, short ears, and large claws. The skull is large, the anterior base of the zygoma narrow, and the mandible slender.

Represented by an old ♂ and an old ♀, skins with skeletons, collected at Niapu, November 24 and December 3, 1913.

The collector's measurements of these animals are:

	Total Length	Tail Length	Foot Length	Ear Length
♂	1980	760	300	
♀	1930	710	287	124

[1]1932, Amer. Mus. Novitates, No. 535, p. 1.

The two skins show the same sex dichromatism described below for *O. e. faradjius* but do not exhibit any coat character by which I can distinguish them from this other race.

The ears are very short and measure from notch to tip on the tanned skins 95 and 93 mm., in contrast to corresponding measurements of 120, 120, 125, and 140 mm. on the four largest specimens from Faradje.

The claws of *O. erikssoni* are larger than those of *O. e. faradjius*, as shown by measurements of the claw of the third digit of the manus. In the former, this length, from eponychium to nail tip is 54 mm. in one of the two specimens, 55 in the other. Similar measurements on four adult *O. e. faradjius* are 40, 40, 43, and 45 mm.

The skull of Lönnberg's aard-vark is easily distinguished from that of Faradje specimens by size, the character of the anterior base of the zygoma, the mandibular proportions, and the less conspicuous features noted in the diagnosis of the savanna race. The species differs unmistakably from such Abyssinian, East African, and South African animals, as I have seen in many features, of which, as Grote has shown, the mandibular are among the most striking.

Orycteropus erikssoni faradjius Hatt

Plates XXXVII, Figure 2; XXXVIII; XXXIX; Figure 2*b*

Orycteropus erikssoni faradjius Hatt, 1932, American Museum Novitates No. 535, p. 1.

Orycteropus e. faradjius is a large aard-vark occurring in the savannas of the northeastern Congo. It differs from *O. e. erikssoni* in smaller size, longer ears, and shorter claws. The anterior base of the zygoma is broad (over 20 mm.), the mandible heavy.

Orycteropus e. faradjius is represented in the collections of The American Museum of Natural History by 9 skins, 11 skulls with 10 skeletons, collected at Faradje between May 27, 1911 and February 24, 1913. Of these eleven individuals 4 are adult males, 6 adult females, and one a juvenile male.

The collector's measurements of the adults as summarized into averages, minima and maxima, are:

	Total Length	Tail Length	Foot Length	Ear Length
10 ♂, ♀	1750 (1610–1850)	642 (580–720)	273 (263–290)	170 (158–180)
4 ♂	1721 (1640–1785)	637 (610–720)	276 (270–290)	169 (162–175)
6 ♀	1770 (1610–1850)	644 (580–700)	270 (263–275)	171 (158–180)

The height at shoulder of two adult females was recorded as 400 and 370 mm., respectively. Other measurements of a female whose total

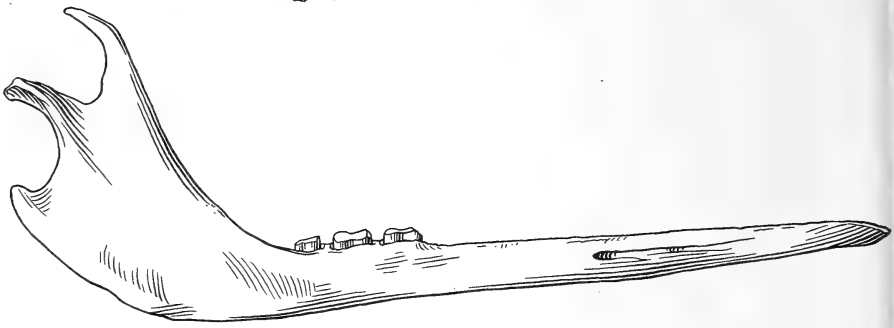
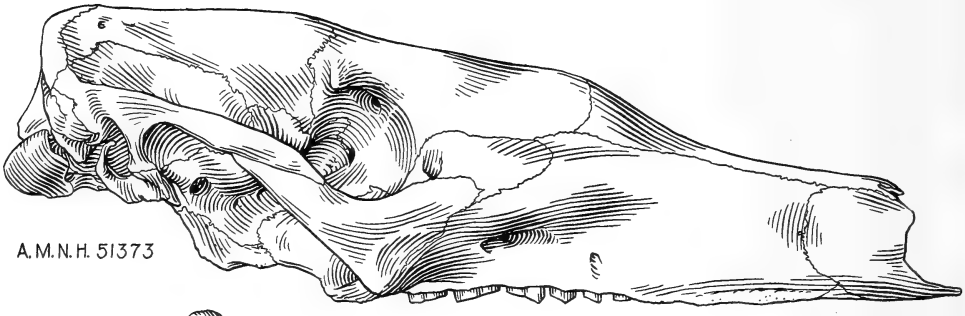


Fig. 2*a*



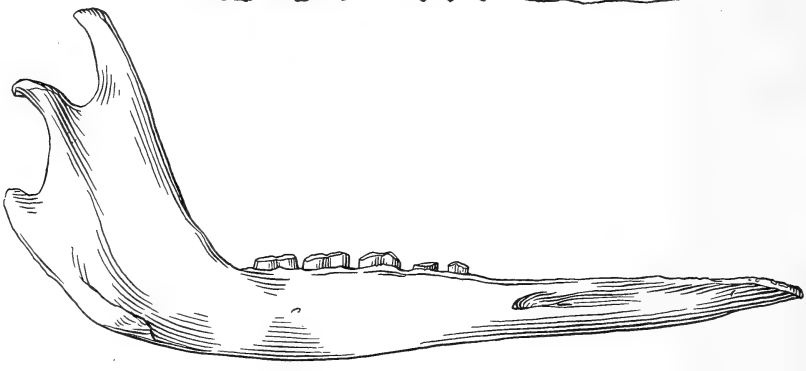


Fig. 2*b*

Fig. 2. *a*.—Skull of *Orycteropus e. erikssoni*, adult ♂, Niapu, Belgian Congo (No. 51375); *b*.—Skull of *Orycteropus e. faradjius*, adult ♂, Faradje, Belgian Congo (No. 51373). Type specimen.

length was 1780 were: length of mouth from tip of lower jaw to corner of mouth, 52; from middle of eye to end of snout, 185.

This aard-vark differs externally from *O. e. erikssoni* in its slightly smaller size, longer ears, and shorter front claws. The skull differs from *erikssoni*, as represented by the two specimens from Niapu and the type description, in the following features: The inflation of the region of the frontonasal suture is more pronounced, and, in consequence, the upward curve of the posterior part of the nasals is greater. The nasal region is also broader, to the extent that the greatest width of the combined nasalia is more than one half the length of the nasal suture. The lacrimal bone of *faradjius* is comparatively long, and the length of its suture shared with the frontal anterior to the orbit is about 70 per cent of the total length of the lower frontal border between the orbit and the posterior external angle of the nasal. In *erikssoni* the lacrimal-frontal suture is 60 per cent or less of the length of the lower frontal border. The zygomatic arch at the level of the end of the zygomatic process of the maxillary is very broad (over 20 mm.), while in *erikssoni*, the arch is very narrow, its depth measuring less than 20 mm.

The mandible of *faradjius* is more massive and broader, and the angular and coronoid processes are higher than in *erikssoni*. Thus the greatest height of the mandible equals about 45 per cent of its greatest length in the race from Faradje, whereas in *erikssoni* this height is only 39 per cent of the length. The greatest breadth of the mandible in the former race is contained in the mandibular length 4.8 times, whereas in the latter race the length is near 5.5 times the breadth. The tip of the angular process lies midway between the alveolar plane and the articular process, whereas in the larger forest form it is much lower, the height above the alveolar level being only about one half the distance from the tip of the angular process to the tip of the articular.

Sexual Differences.—Sexual dichromatism, which seems not to have been noted in the literature, is well marked in adult specimens. In the males the hair of the entire head is dark brown, but in the females that below the orbits, except for a dark gular stripe, is light-colored. On the outer surface of the thigh the hairs are slightly blacker in males than in females, in which sex the hairs retain more of the reddish wash of youth.

Age change of color in both sexes involves an intensification and extension of the pigmented areas of the head (particularly in the males), a progressive blackening of the dark area of the limbs and shoulders that all but obliterates the deep red color found on immature specimens,

Cranial Measurements of Adult *Orycteropus*

No. of specimens	*Orycteropus e. erikssoni*		*Orycteropus erikssoni faradjius*			
	♂	♀	4 ♂ (*3)[1]	6 ♀	10 (*9) ♂, ♀	Type ♂
Greatest length	276	265	*253 (252–254)	247 (240–255)	*249 (240–255)	255
Greatest breadth	97	94	92 (84–98)	92 (85–96)	92 (84–98)	98
Basal length	257	248	*235 (233–236)	229 (220–238)	*231 (220–238)	240
Palatal length	175	163	*159 (158–160)	152 (145–155)	*154 (145–160)	159
Breadth of palate at M–2	45	43	38 (35–40)	38 (36–40)	38 (35–40)	40
Length of nasal suture	102	98	*95 (93–98)	96 (93–103)	*96 (93–103)	94
Breadth of both nasals	50	49	53 (52–60)	55 (51–59)	55 (51–60)	60
Breadth between tips of post.-orbtl. processes	75	65	69 (67–71)	67 (60–71)	68 (60–71)	71
Least breadth of brain case	59	55	51 (48–55)	50 (48–53)	51 (48–55)	55
Greatest breadth of occipital bone	76	76	70 (67–74)	69 (64–72)	70 (64–74)	72

Depth at level of pmx.-mx.-nas. juncture	38	33	34 (33–35)	32 (30–35)	33 (30–35)	33
Depth at naso-frontal suture	54	55	55 (54–58)	51 (48–55)	53 (48–58)	58
Greatest width of zygomatic process	17	14	25 (23–27)	24 (22–26)	25 (22–27)	27
Upper molar I, length	10.1	9.5	10.3 (8.9–11.4)	10.8 (10.0–11.7)	10.6 (8.9–11.7)	10.0
Upper molar I, width	5.0	4.5	6.8 (6.0–7.5)	7.0 (6.4– 7.8)	6.9 (6.0– 7.8)	6.4
Upper molar II, length	10.2	10.6	12.3 (11.8–12.8)	11.6 (9.8–12.4)	11.8 (9.8–12.8)	12.0
Upper molar II, width	6.5	6.5	8.5 (7.8– 9.3)	8.1 (7.0– 9.0)	8.3 (7.0– 9.3)	8.2
Upper molar III, length	6.7	8.7	10.7 (9.1–10.5)	9.0 (7.0– 9.8)	10.4 (7.0–10.5)	10.2
Upper molar III, width	5.8	6.8	7.8 (7.3– 8.3)	7.0 (6.6– 7.8)	7.4 (6.6– 8.3)	8.0
Greatest length of mandible	230	223	*211 (212–219)	206 (200–210)	*209 (200–219)	212
Greatest width of mandible	43	39	*46 (43–50)	40 (37–43)	42 (37–50)	45
Width of mandible behind last molar	17	20	*23 (22–24)	20 (18–21)	*21 (18–24)	24

[1]An asterisk preceding an average indicates that that average and the minima and maxima of the same series are based on the smaller number of specimens indicated at the head of the column.

and, in contrast to these changes, a loss of virtually all pigment in the hair of the back, so that this area changes from one of deep bay, moderately long hairs to one of short, dirty-white hairs. The hairs of the distal two-thirds of the tail are uncolored throughout life, though the underlying dermal pigment, particularly of the basal half of the tail, may in the tanned skin, give a mottled pattern of yellow and gray.

Sex differences in the skull are not found in this series, though from a comparison with other material it seems probable that males attain greater size than do the females.

Age Differences.—Age changes in the skull are those of size, suture obliteration, and proportion. The first sutures to be obliterated are those separating the occipital elements, the parietal suture, and, later, the suture between the interparietal and parietals.

This later suture is open in a skull 250 mm. in greatest length, whereas the others, which were open in one of 181 mm., are completely obliterated in this larger skull. In skulls of yet older animals the parietal-interparietal suture is closed. The occipitoparietal suture, however, is open in the oldest specimens. Later the frontal suture closes progressively from the rear. Fusion occurs along the nasal suture very sporadically, being found only in two young skulls. The most prominent modifications of skull form are a great reduction in the proportionate degree of inflation in the anterior frontal region, and marked increase in skull length in proportion to skull depth.

The teeth commonly regarded as the first and second molars, when first erupted have two cones, but these are soon lost through wear. The skull of a newborn individual on which these cones are displayed, also shows double cones on the last premolar. On the left side two cones are also present on the next to last premolar, while on the right the area is occupied by two simple teeth which suggest a splitting of germinal buds as the explanation of the large number of maxillary teeth reported for the genus. The diameter of the teeth increases until maturity, but with approaching senility the anterior teeth are lost, and the posterior members may be slightly reduced in size.

Races then, the characters of which are founded on color, size, degree of frontal inflation, and tooth diameter must be critically examined with reference to the age class of the type.

The skull measurements of the adult specimens are represented in their averages, minima, and maxima in preceding table, pp. 666-667.

Field Data.—Mr. Lang's field notes on specimens of this race contain observations on anatomy, habits, and habitat, which may be conveniently arranged according to subject matter.

External Characters.—The ears of an adult female were whitish pink on the inside. The irises of this and another individual were a very dark brown.

The skin, particularly on the neck, was arranged in tiny folds. There was a pouch on either side of the vulva that contained a strongly smelling matter.

There are two pairs of abdominal mammae.

Digestive Tract.—In an individual 1780 mm. in total length the small intestine measured 4520 mm., the large intestine 2450, and the caecum 130 mm. The digestive tract at the base of the latter was greatly enlarged. Near the pylorus was a large muscular gland.

Food.—The stomachs of five contained termites, so well chewed up that none were complete.

Locomotion and Feeding.—Mr. Lang wrote that the aard-vark usually walks on tiptoes, though it may progress for a few steps with the whole hind foot resting on the ground. When walking, the nose is kept close to the ground, and then the nostrils are opened and shut by contracting the skin muscles pulling from the rear. The tail tip touches the ground when the animal is moving. The animal frequently sits on its haunches and when digging assumes this position. The tail, then, bears considerable weight.

The thick heavy claws borne by the muscular fore limbs are nearly straight, and with these chisel-like points the aard-varks have no difficulty in breaking into the hard, solid structures of the termites. These animals are licked up by the hundreds with the long slimy tongue as they assemble quickly in large masses near the point of destruction, either to defend their home or to repair it.

Burrows.—The field book carries the following note on burrows: "The *Orycteropus* live in burrows (probably in small families or singly) which they dig themselves in dry, hard ground. The excavated ground is thrown up in small hillocks close to the opening. These burrows are fairly large, the size of the tunnels allowing a small man to enter without great difficulties. Of seven burrows I have seen, two had only one entrance, four had two and one had three. The entrances of one tunnel were about 14 meters from one another at the maximum. All these burrows were deserted, and it is probable that they inhabit several burrows alternately, and it is sure that they occasionally dig a hole simply for shelter." (Plate XXXVII, figure 2.)

Time of Activity.—"The Orycteropus," observes Mr. Lang, "is rather difficult to procure, not only an account of its nocturnal habits,

but principally by reason of its scarcity. They roam about during the night, singly or in pairs, as may be seen from the impressions of their claws left on moist ground."

Habitat.—It was recorded that an aard-vark was captured by natives somewhat north of Rungu. North and northeastward of Niangara to Faradje the animal was said to occur everywhere. Mr. Lang considered it a "constant resident of the vast plainlike stretches which are abundantly covered by stunted trees and thick low bushes." There termites were abundant, and as they constituted the only food of Orycteropus, these animals found an ample supply and were usually well nourished.

Hunting by the Natives.—The relation of the aard-vark to the native life in the district as it existed at the time of the Congo Expediton is suggested by the following extract from the field book: "The native manner of securing the Orycteropus in these regions lends itself to adventure and has given rise to general and very deep set superstitions.

"It is currently held that some have lost their lives in the burrows and have never been heard of again. The native hunters usually track the Orycteropus to its burrow after a heavy rain, and having ascertained the exact locality they start out in numbers to secure the highly valued prize. Among the Azande and Logo, and probably among related tribes, it is the custom that one young fellow well supplied with 'medicine' enters the burrow armed only with a short handled spear or a long knife. If he is lucky he encounters the beast which usually tries to save itself by digging and throwing the excavated ground in the face of its pursuer; if it succeeds in placing a wall between the man and itself before he can successfully place his spear the man considers the undertaking a failure and tries to retreat. If however, the native can kill it he will indicate his position to the eagerly waiting outsiders by tapping against the upper wall. As rapidly as possible the natives sink a shaft in his direction and lift out the dead Orycteropus and the valiant hunter who is seldom deeper than five feet below the surface.

"The teeth are worn around the wrist by the Mangbetu, Azande, Logo, and affiliated tribes to prevent illness and to ward off ill fortune. The bristly hair of the nostrils and that between the toes is said to be fatal if well powdered and thrown into their beer. The consumer's neck is said to swell to such an extent that death usually occurs after three days. The claws carried in the baskets of women that are collecting the winged edible variety of termites insure an ample supply. The meat has a strong odor and the appearance of pork; it is eaten by the Azande, Mangbetu, and Logo."

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PLATES XXXII TO XXXIX

PLATE XXXII

Fig. 1. *Manis gigantea.* Young female, Poko, August 10, 1913 (No. 53860). Total length, 810 mm.

Fig. 2. *Manis gigantea.* Adult female, Niangara, April 26, 1913 (No. 53846). Total length, 1360 mm. Note the uneven wear of the scales, indicative of advanced age.

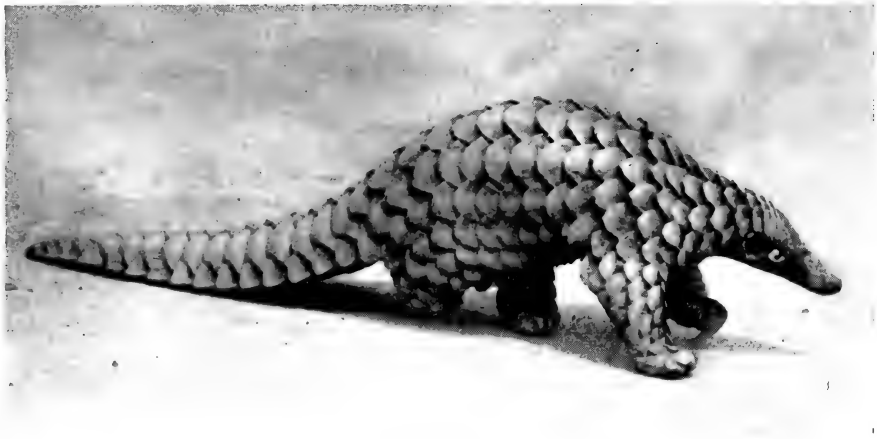

Fig. 1

Fig. 2

PLATE XXXIII

Fig. 1. *Manis gigantea.* Adult female, Niangara, April 26, 1913 (No. 53846).

Fig. 2. *Manis gigantea.* Young female, Poko, August 10, 1913 (No. 53860).

Fig. 1

Fig. 2

Plate XXXIV

Fig. 1. *Manis gigantea.* Embryo. Niapu, December 9, 1913 (No. 53856).

Note the keels on the scales of the lower flank and the rounded contours of the marginal caudal scales. The nipple, visible on the flank, is about one half the size of that near the axilla, which, in this photograph, is hidden by the arm. The claws in this fetus are bifid, as are the ungual phalanges of the adults.

Fig. 2. Burrow of *Manis gigantea*, near Babeyru, July, 1914.

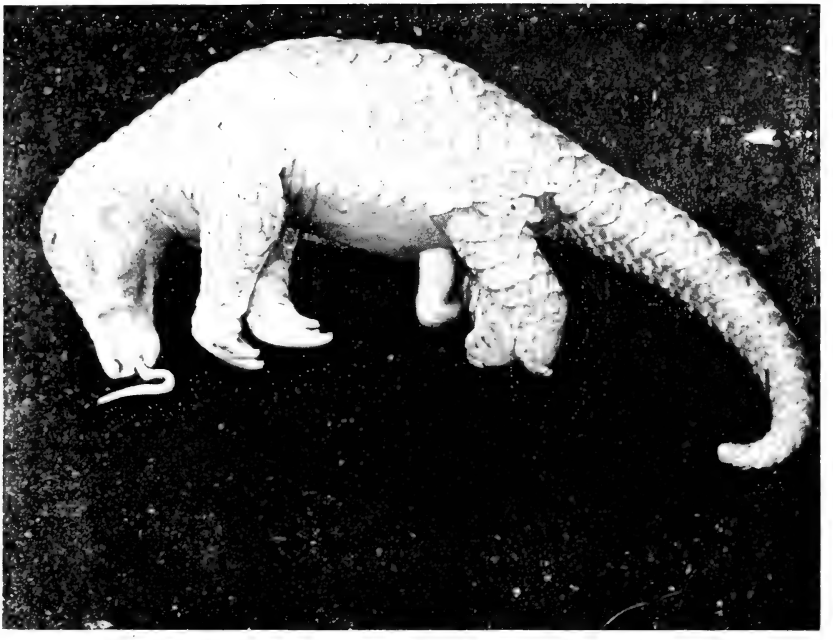

Fig. 1

Fig. 2

PLATE XXXV

Fig. 1. *Manis longicaudatus.* Adult male, Niapu, December 16, 1913 (No. 53871).

Fig. 2. *Manis longicaudatus.* Adult female, after death, Akenge, October 10, 1913 (No. 53862).

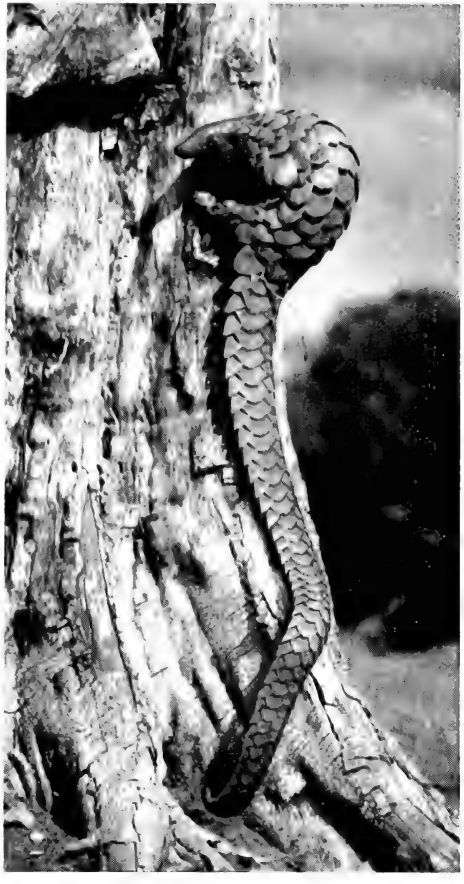

Fig. 1

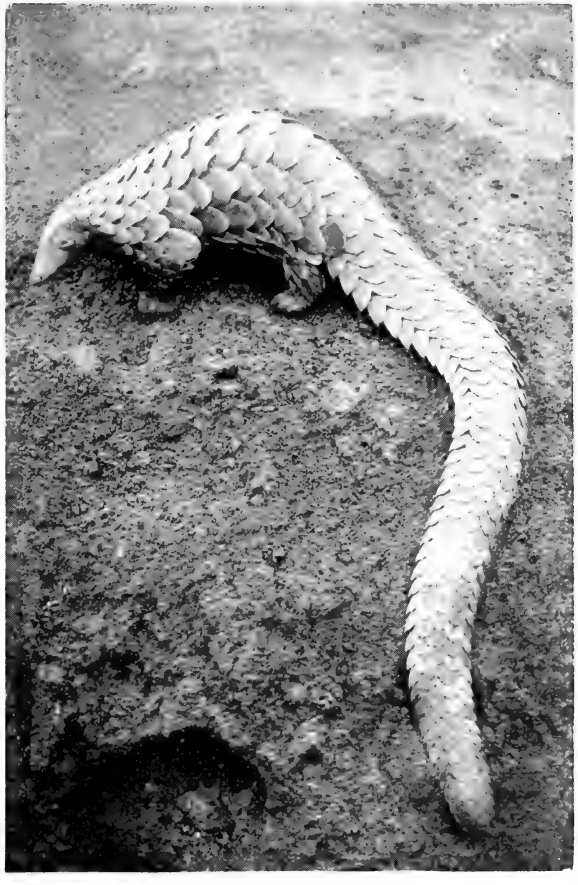

Fig. 2

PLATE XXXVI

Fig. 1. *Manis tricuspis.* Juvenile female, Avakubi, October 29, 1909 (No. 53888). This individual is a good example of the age period in which the dorsal scales are tricuspid.

Fig. 2. *Manis tricuspis.* Adult male, Stanleyville, August 9, 1909 (No. 53938). The mid-dorsal scales of this individual are no longer tricuspid, though this pattern is still retained on the scales of the head and flank. When photographed the animal was not so closely coiled as is possible.

Fig. 1

Fig. 2

PLATE XXXVII

Fig. 1. *Manis tricuspis.* The young of this species are transported in the manner here shown (see p. 660).

Fig. 2. Burrow of *Orycteropus erikssoni faradjius.* Faradje, March 6, 1911.

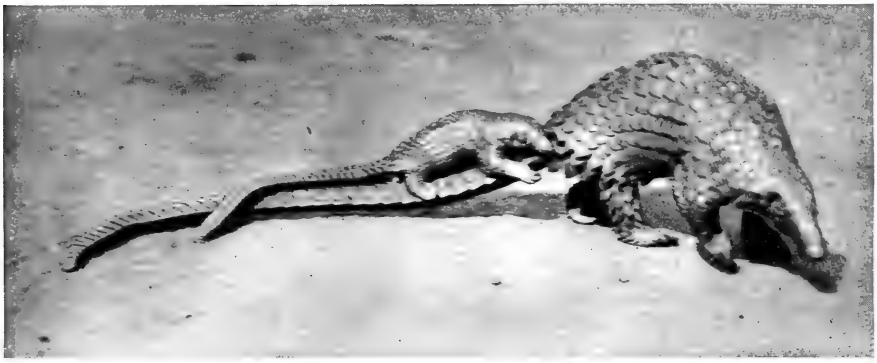

Fig. 1

Fig. 2

PLATE XXXVIII

Fig. 1. *Orycteropus erikssoni faradjius.* Adult female, Faradje, March 6, 1911 (No. 51235).

Fig. 2. Right manus of *Orycteropus erikssoni faradjius.*

Fig. 3. Left pes of *Orycteropus erikssoni faradjius.*

Fig. 1

Fig. 2

Fig. 3

PLATE XXXIX

Figs. 1 and 2. *Orycteropus erikssoni faradjius.* Faradje, March 6, 1911 (No. 51235).

The long ears, short claws, and inflation of the frontonasal region characteristic of this subspecies are well illustrated by this specimen.

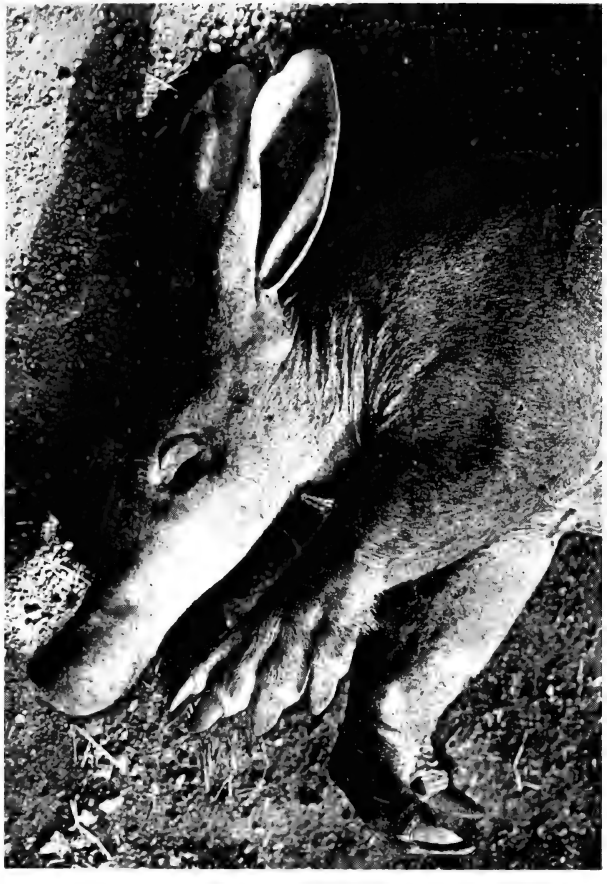

Fig. 1

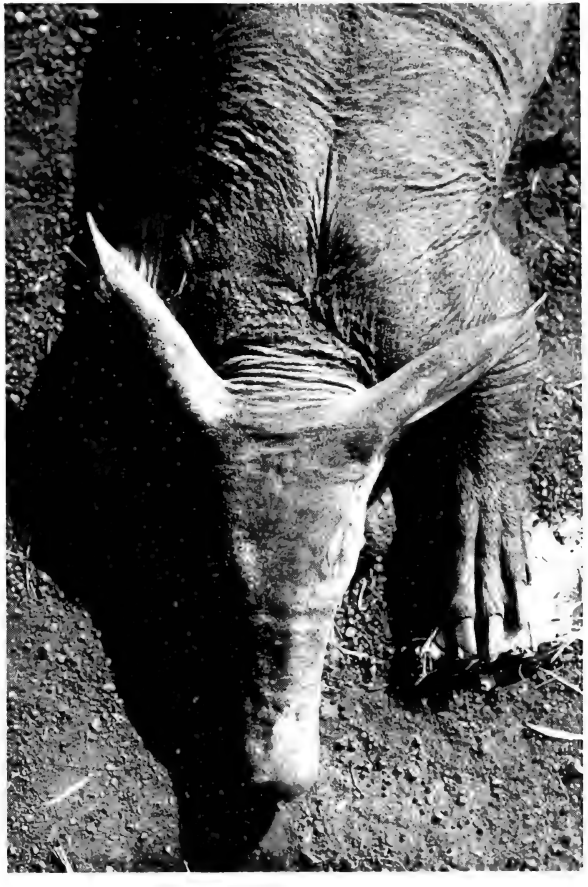

Fig. 2

Harry Hoogstraal

(7)

Hyraxes Collected by the American Museum Congo Expedition

By Robert T. Hatt

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Article IV.—THE HYRAXES COLLECTED BY THE AMERICAN MUSEUM CONGO EXPEDITION[1]

By Robert T. Hatt

Plates XVIII to XXII; Text Figures 1 to 3

INTRODUCTION

The American Museum Congo Expedition, of which Mr. Herbert Lang was leader and Mr. James P. Chapin assistant, operated in the Belgian Congo from 1909–1915.[2] Among the excellent series of mammals obtained were ninety-eight hyraxes. Particularly well represented was the then little-known Emin's tree hyrax. A novelty was a new species, *Heterohyrax chapini*, described in a preliminary report.[3]

Study of the Hyracoidea of the collection was initiated in 1932, but the manuscript left uncompleted pending the appearance of Hahn's monograph[4] of this group. The collection on which the present report is based represents rather fully the hyrax fauna of the northeastern Congo, and thus furnishes a good basis for the appraisal of Hahn's conclusions concerning the taxonomy of the species present in this same area.

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[1] Scientific results of the Congo Expedition, Mammalogy, No. 17.

[2] A general account of the expedition with a map of its collecting grounds may be found under the following reference:

Osborn, Henry Fairfield, 1919, 'The Congo Expedition of The American Museum of Natural History,' Bull. Amer. Museum of Natural History, XXXIX, pp. xv–xvii.

[3] Hatt, Robert T., 1933, 'An Annotated Catalogue of the Hyracoidea in the American Museum etc.,' American Museum Novitates, No. 594, 13 pages.

[4] Hahn, Herbert, 1935, 'Die Familie der Procaviidae,' Zeitschrift für Säugetierkunde, Bd. IX, pp. 207–358.

Hahn's monograph, a long-needed review of recent and fossil Hyracoidea, is based on the excellent collections in Berlin, Frankfort and Tervueren, together with notes compiled by the late Doctor Brauer on collections in other continental museums. It is unfortunate that the author had no opportunity to examine the British Museum Collection nor any of the material in America, specimens which are of immense importance in any study of this group of animals. Included in the work is a sound discussion of the skull and skeletal characters, used as criteria of relationship, together with a dissertation on the ecological and zoogeographical background of hyrax phylogeny.

Most of Hahn's conclusions appear sound, particularly as regards the main phyletic trends. As may be seen in the following treatment there are, however, numerous points on which I cannot agree with him concerning the taxonomy of Congo forms. Thus, it appears to me highly probable that *Dendrohyrax d. latrator* must be recognized; and I am convinced that there is no basis, other than Hahn's failure to recognize dichromatism, for considering the tree hyraxes of the northeastern Congo as anything but homogeneous. The fact that in the monograph my *Heterohyrax chapini* was listed under another species was due obviously to the fact that my previous report on the Order did not appear until it was too late for Doctor Hahn to give it consideration. The omission in Hahn's revision of all reference to types and type localities is an unfortunate neglect, particularly in that his predecessor, Brauer, so frequently made no mention of the number, sex or age of his types. Apparently overlooked in the review was *Dendrohyrax rubriventer* Brauer (= *D. d. emini* Thomas).

It is again my pleasure to tender my thanks to Doctor James P. Chapin for his invaluable advice; and to the authorities of the Field Museum, the United States National Museum, the Museum of Comparative Zoölogy and the British Museum for their courtesy in permitting the examination of collections in their charge.

The text figures in this Bulletin were drawn by Marcelle Roigneau Hatt and the photographs of animals in the flesh made by Mr. Lang.

SPECIES WITH THEIR LOCALITIES AND NUMBER OF SPECIMENS FROM EACH LOCALITY

Species	Localities	Specimens
1.—*Dendrohyrax dorsalis latrator*	Bolobo, 1.	1
2.—*Dendrohyrax dorsalis emini*	Akenge, 3; Avakubi, 1; Gamangui, 4; Medje, 6; Ngayu, 2; Niangara, 3; Niapu, 24.	69
3.—*Heterohyrax chapini*	Matadi, 2.	2
4.—*Procavia johnstoni lopesi*	Aba, 24; Faradje, 1; Vankerckhovenville, 1.	26

LIST OF LOCALITIES, WITH NAMES OF THE SPECIES AND SUBSPECIES AND NUMBER OF SPECIMENS TAKEN AT EACH LOCALITY

Localities	Species and Subspecies	Number of Specimens
Aba	*Procavia j. lopesi*	24
Akenge	*Dendrohyrax d. emini*	3
Avakubi	*Dendrohyrax d. emini*	1
Bolobo	*Dendrohyrax d. latrator*	1
Faradje	*Procavia j. lopesi*	1
Gamangui	*Dendrohyrax d. emini*	4
Matadi	*Heterohyrax chapini*	2
Medje	*Dendrohyrax d. emini*	6
Ngayu	*Dendrohyrax d. emini*	2
Niangara	*Dendrohyrax d. emini*	3
Niapu	*Dendrohyrax d. emini*	24
Vankerckhovenville	*Procavia j. lopesi*	1

VARIATION NOT INDICATIVE OF RELATIONSHIP

Individuality in Skulls

Skulls of the hyraxes show a range in variation in general skull type beyond that encountered in many mammals. Comparing specimens of equal apparent age,[1] as judged by suture closure, development of skull ridges and dental wear, there are found skulls that contrast to the extremes shown by the measurements given below for *Dendrohyrax d. emini*. Specimens of every intermediate size and shape occur in the

[1] For the convenience of the reader, Thomas's (1892, P. Z. S., p. 53) classification of the developmental stages of the hyraxes is repeated.

Stage I. Before the milk dentition is fully in place.
Stage II. Milk dentition all up and in use. M^1 not visible.
Stage III. M^1 up; M^2 below level of bone.
Stage IV. M^2 just appearing or partly up.
Stage V. M^2 nearly or quite up, M^3 below level of bone.
Stage VI. Tip of M^3 appearing.
Stage VII. M^3 partly or nearly up, but still unworn.
Stage VIII. M^3 up and in use.

series and one cannot admit the cases at one extreme or the other as dwarfism or gigantism.

Cranial Individuality in Adult Males of *Dendrohyrax d. emini*

	Old VIII		Early VIII	
American Museum Number	53836	53837	53823	53822
Greatest length	122.8	110.0	114.5	106.5
Condylobasal length	120.7	110.0	114.0	106.5
Zygomatic breadth	67.5	65.2	63.2	62.3
Anterior edge of orbit to gnathion	43.7	38.5	40.3	34.0
Frontal suture, length	34.2	32.9	36.7	35.0
Bregma to occiput	49.5	40.0	40.0	40.0
Palatal length	63.5	58.2	60.0	59.0
Basisphenoid plus basioccipital, length	41.2	34.3	35.9	32.1
Premolars plus molars, length	42.3	39.5	37.7	41.0

In the instance of the older skulls the two specimens contrasted differ chiefly in the measurements of length, the discrepancies between the two being greatest in the postorbital region, but also pronounced in the preorbital. The two younger skulls, on the other hand, show a striking difference in the length of muzzle but little difference other than this.

Similar broad divergence is observed in the Congo Expedition series of *Procavia j. lopesi* where the skulls of three female specimens all in Stage VIII and with nearly the same degree of tooth wear (see "height of crown") are of three types, one (No. 53776) long and slender, another (No. 53777) long and broad, a third (No. 53796) short and slender. The degree of difference is perhaps best shown by the following table of measurements.

Cranial Divergence of Stage VIII Females of *Procavia j. lopesi*

American Museum Number	53776	53777	53796
Greatest length	103.0	98.8	92.0
Condylobasal length	102.5	95.7	89.8
Zygomatic breadth	57.2	57.8	51.8
Width at postorbital processes	35.6	40.5	34.0
Length of nasal suture	27.0	24.4	24.5
Frontal suture, length	39.5	38.4	34.0
Bregma to occiput	33.2	32.7	31.7
Diastema, length	15.0	11.6	10.7
Premolars plus molars, length	42.3	41.8	39.3
Height of crown, M^3	4.5	4.1	4.1

Fontanel and Wormian Bones

Fontanel and wormian bones occur with relative frequency in the Congo Expedition series of *Procavia j. lopesi.* None were found in the skulls of *Dendrohyrax d. emini,* the early closure of the cranial sutures being unfavorable to their recognition, even should they be present in early life. In this respect these two species are representative of their generic groups, for fontanel and wormian bones are about four times as frequent in occurrence in *Procavia* as in *Dendrohyrax.*

The hypothesis advanced by Schultz (1923, Journal of Mammalogy, IV, p. 65) that these bones are neomorphs in the mammalia that appear at places in which the normal roofing-over process is inadequate to meet demands of protection, receives some slight support from these findings, for in the hyraxes these accessory ossicles occur with greatest frequency in the group with the most retarded solidification of the skull roof, and most rarely, if one may judge from examination of a series that contained few skulls with open parietal sutures, in the group in which early closure is the rule.

The incidence of occurrence in the three genera, as determined from a survey of all skulls of hyraxes in the American Museum, is as follows:

Genus	Total Number of Skulls	Number of Skulls with Wormian or Fontanel Bones	Incidence
Procavia	53	8	15.1%
Heterohyrax	34	3	8.8%
Dendrohydrax	78	3	3.7%
All forms	165	14	7.8%

The two species of Congo hyraxes represented by series show slightly different percentages than do the larger groups considered. Thus *Procavia j. lopesi* has five cases of accessory roofing bones in 22 skulls, an incidence of 30 per cent, whereas no case (unless a single Stage I skull in which the interparietal bears a median suture should be considered an exception) occurs in 37 skulls of *Dendrohyrax d. emini.*

The sexual distribution of extra bones in the mid-line was approximately equal, there being 6 males and 7 females showing the variant.

Asymmetry

Asymmetry is not a character of the Hyracoidea and no case of well-marked asymmetry in the skulls of Congo hyraxes has been encountered

that was not clearly the direct result of some individual pathological condition. However, one skull of *Dendrohyrax. d. nigricans* in the collections of the American Museum is exceptional in a distinct warping of the skull. Here the right side is longer than the left, the difference being most obvious in the occipital region. Correlated with this asymmetry is a difference in the upper tooth rows, that of the right side being nearly straight, that of the left clearly bowed.

Dental Anomalies in the Hyraxes

Parallel to the cases so frequently encountered among the rodents, where too the proper occlusion of the persistently growing incisors is dependent on even wear of the tips, are hyraxes in which the upper incisors, unopposed by wear below, grow in great arcs. No specimen in the Congo collection shows this anomaly, but the American Museum possesses one skull of this type picked up by Dr. Chapin on Mt. Kenya at an altitude of 14,000 feet. The specimen is that of a *Procavia j. mackinderi.*

Another similar anomaly occurs in a specimen of an old male *Dendrohyrax d. emini* in which one of the upper incisors had been lost long before death and the two lower incisors, which would normally oppose this tooth had grown forward about twice as far as the corresponding teeth on the opposite side. This same individual had suffered a broken zygomatic arch on the same side as the tooth loss, at what was probably the same time. Most of the chewing teeth had been broken and destroyed during life and it appears that this ancient hyrax may have died through the accidents to which his dental equipment had been subjected.

The first permanent teeth to wear completely away are the first molar above, the first molar below. These teeth are fully functional and well worn before the deciduous fourth premolar is shed and before the second molar is up in position. The condition in which the first molar is worn down to the roots is encountered in all of the genera of hyraxes, and is not uncommon, but specimens in which the second molar is also worn out are rare. I have encountered no skull in which the crown of the third molar has disappeared.

Sexual Characters in the Skulls

The sexual dimorphism of the upper incisors was established by Thomas (1892, P. Z. S., p. 54). As he pointed out, in some species the dimorphism is not well marked. It is, however, firmly established in

both *Procavia j. lopesi* and *Dendrohyrax d. emini* where the sex of any adult may be easily recognized by these teeth.

The size of the skull in the Congo species seems to be uncorrelated with sex as was also recognized by Thomas for the hyraxes as a whole.

Sex differences in the skulls of the *Procavia j. lopesi* and *Dendrohyrax d. emini* are not the same. In the latter, one observed difference is that the skulls of the males are more massive and rugged, the ridges overlying the roots of the incisors larger in the males, reflecting the larger size of the teeth.

Sex differences in the skulls of the rock hyraxes of Aba (*Procavia j. lopesi*) are centered about the muzzle and the incisors, reflecting a better fighting equipment in the males. Thus the heavy bony ring at the gum line of the incisors is in the males enlarged and rough, and the muzzle is slightly more massive. Most striking is the difference in the maxillary root of the zygomatic arch, the outer surface of which in all adult males is deeply concave, while in the females and young (Stage V) males it slopes gently from the gum line to the maxilla-malar suture. For purposes of sex diagnosis this is second in usefulness only to the shape of the incisors. The mandibular symphysis further reflects the increased strength of the male buccal region in the development of sharply delineated ridges which carry forward the line of the lower mandibular borders and pass upward to meet high on the symphysis.

In the males of this species there is the further difference that the frontal bone is on the average flatter and broader than in the females.

The Ages at Which the Upper Canine Is Lost

The deciduous canine is lost at different ages in different genera, as Hahn has shown. My own figures, given below, bear out his conclusion that in *Procavia* the tooth is lost before Stage V; that in *Heterohyrax* it may be retained in Stage V; and in *Dendrohyrax dorsalis* is always present to at least Stage IV and commonly to Stage VII.

In *Procavia j. lopesi* the five specimens in Stage III all retain the upper tooth which Lataste (1886, Ann. Genova Mus., (2) IV), concluded was a canine, whereas all specimens in stages older than this have lost this tooth. The Matadi hyrax (*H. chapini*) does not have this tooth in the specimen in Stage VIII, but does in the other which is in Stage V. The canine is retained in all specimens of *D. d. emini*, seven in number, of Stages I to V and is lost in the six specimens of Stages VI and VII. There are twenty-four specimens in Stage VIII, in twenty-

two of which no canine is present. In the two others, however, a canine is retained on one side.

SOME CHARACTERS UTILIZED FOR CLASSIFICATION OF HYRACOIDEA AND THEIR VARIATION IN THE CONGO SPECIES

Cranial Characters

Because Hahn's monograph treats exhaustively of the value of most commonly used skeletal characters it would be superfluous for me to discuss them in general, but the series which I have studied have furnished some information not covered by Hahn or at least neglected by him. Some of this is here recorded.

Closure of the Orbits

No specimen of either *Procavia j. lopesi* or *Heterohyrax chapini* in the Congo Expedition collection has closed orbits. Every skull of *Dendrohyrax d. emini* examined has closed orbits, even in Stage I. In this respect all specimens are in harmony with their generic standard. In many other species of hyrax such constancy does not obtain.

Length of Diastema

Diastema length, as I have noted above and as may be clearly seen from an examination of the table of cranial measurements, is subject to too great variation in equal aged individuals of the same sex, from the same locality, to be a reliable criterion as to race. Generic differences are well marked, it is true, and occasionally specific differences. The length of the diastema increases with age, both actually and relatively, in most, if not in all species.

The Course of the Temporal Ridges

The course of the temporal ridges in my experience, although Brauer[1] believed otherwise, has proved totally inconstant in every species of hyrax examined in series. Among equal-aged specimens of one sex of one species (e. g., *D. d. emini*) are found ridges that are parallel along the greater part of their superior border; others strongly bowed and most nearly approximate at the middle of the parietal; others which converge sharply from the anterior end of the parietal to its posterior border. For this reason I do not consider the pattern as indicative of genetic relationship.

[1] 1934, Zeitschr. für Säugetierkunde, Bd. IX, pp. 198–206.

Separation of Malar and Lacrymal Bones

The malar and lacrymal bones of *Procavia j. lopesi* usually come in contact before Stage VIII. In only one of ten Stage VIII skulls is there any separation, and this is but slight. Two Stage VII skulls have a gap of about 1 mm. between the bones, while two in Stage VI already have the bones in union. Three Stage V skulls show a gap between the two, while two in Stage IV show it closed. In three Stage III skulls there is contact of malar and lacrymal, while in a fourth these bones are separate. Thus for the rock hyrax of the Upper Uele it seems the rule that there is union of these bones in adults, but that the time of first contact is exceedingly irregular and may occur very early in life.

Union of malar and lacrymal bones in the Congo tree hyrax is rare, having been observed in only one of 24 Stage VIII skulls and in none of the nine skulls of earlier stages. It is further evident from an examination of the table of cranial measurements of Stage VIII specimens that the distance between these bones is on the whole fairly constant in the species.

These observations bear out Brauer's (1934) conclusion that the malar-lacrymal relationship serves as a good generic character.

The Breadth of the Lacrymal Process

Brauer has used the breadth of the lacrymal process in characterizing species, but the great individuality shown in the size of this process among series of hyraxes from a single locality suggests that this is insignificant and useless as a criterion. In Stage VIII *Procavia j. lopesi* this process varied from 2.2 to 3.3 mm. in width, while in *Dendrohyrax d. emini* the range is from 2.5 to 5.5 mm. This variation embraces the width of practically any specimen of hyrax in the Museum's collection, and the character is not believed to be of use in so far as the species here represented are concerned.

Position of Lacrymal Foramen

The position of the lacrymal foramen was found by Brauer to be of significance in some cases. In the Congo collection there is high variability in this structure that is uncorrelated with either age or sex, and though this variation is far greater in *Dendrohyrax d. emini* than in *Procavia j. lopesi* it is believed that the feature cannot at present be considered stable in either species and hence reliable for taxonomic

purposes. The position of the lacrymal foramen (on one side, there being little bilateral asymmetry) as found for these two species is as follows:

	Peripheral	Complete below Process	Complete behind Process
Dendrohyrax d. emini	9	16	11
Procavia j. lopesi	20	1	0

A survey of all the hyrax skulls in the American Museum indicates that all types of lacrymal foramina occur in all of the genera, but that central foramina are more common in the tree hyraxes and marginal foramina more frequent in *Heterohyrax* and *Procavia.*

The Ventral Surface of the Auditory Bullae

The ventral surface of the auditory bullae of hyraxes is fairly constant in shape within any age group of a species of hyraxes, and as different species show different forms of bullae the character has been used (by Brauer et al.) to distinguish the species. The character, however, is limited in its usefulness for the best descriptive terms are ambiguous and these bullae can at best be described as more or less inflated than those of another species to which they are compared.

Dendrohyrax dorsalis latrator (Thomas)

Procavia emini latrator Thomas, 1910, Ann. Mag. Nat. Hist., (8) V, p. 285. Type locality: Batempa, Upper Sankuru River, southern central Congo.

Dendrohyrax dorsalis emini Hahn, 1934 (part), Zeitschr. für Säugetierkunde, Bd. IX, p. 259.

A race distinguished from *D. d. emini* by the white or whitish coloration of the basal half of the body hairs.

Represented by a single, incomplete native skin, unsexed and juvenile, obtained at Bolobo in December, 1914. The American Museum has one other native skin of an adult, collected at Lukolela by a more recent expedition.

These two incomplete specimens, one probably of a Stage I individual, the other possibly of one in Stage VIII, bear out Thomas's original description of the race, as far as the skin areas are represented.

It would seem from the localities represented by the type and these two specimens that the range of *Dendrohyrax dorsalis latrator* extends along the southwestern border of the Congo Forest.

Dr. James P. Chapin informs me that the voice of *D. d. latrator,* as he

has heard it about Lukolela, is entirely different from that of *D. d. emini* as he knew it to the east. The two, he states, could never be confused by their calls.

Dendrohyrax dorsalis emini Thomas

Plates XVIII to XXI; Text Figure 1

Dendrohyrax emini Thomas, 1887, Ann. Mag. Nat. Hist., (5) XX, p. 440. Type locality: Tingasi, Monbuttu (2° 30′ N., 27° 50′ S.), Belgian Congo.

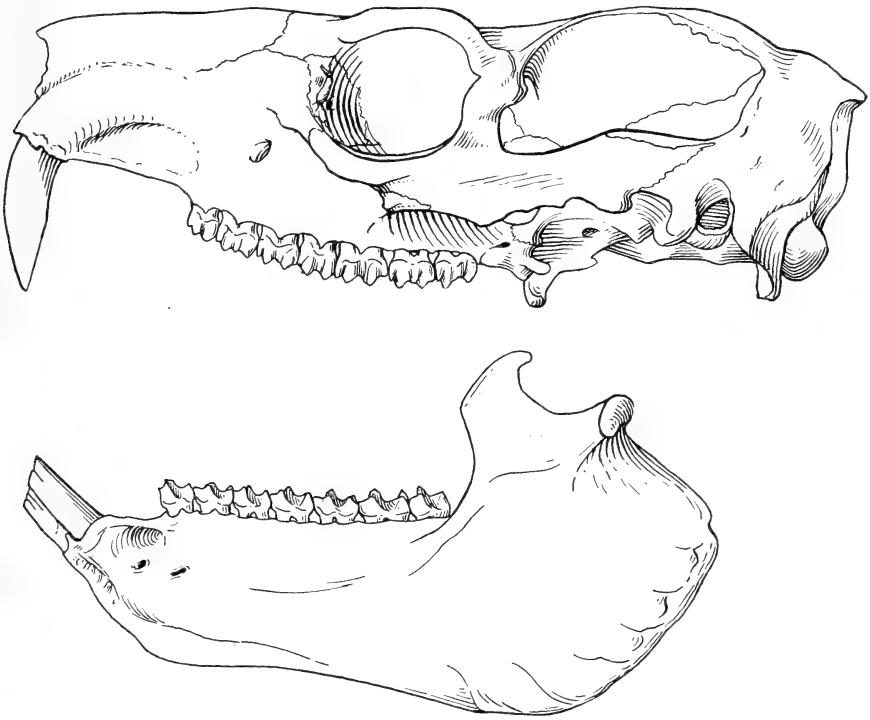

Fig. 1. *Dendrohyrax d. emini.* Male, Stage VIII. Niapu, Belgian Congo. A. M. N. H. No. 53830. Natural size.

Dendrohydrax beniensis Brauer, 1917, Sitz. Ber. Gesell, naturf. Freunde, p. 295. Type locality: Beni Zambo, between Kalumenda and Beni, Belgian Congo.

Dendrohyrax congoensis Brauer, 1917, *loc. cit.* Type locality: Beni (Kartoushi) [slightly north of Beni, close to the Semliki River], Belgian Congo.

Dendrohyrax rubriventer Brauer, 1917, *loc. cit.* Type locality: Kalumenda, Beni, Belgian Congo.

Dendrohyrax brevimaculatus Brauer, 1917, *loc. cit.* Type locality: Lesse, eastern Belgian Congo.

Dendrohyrax dorsalis nigricans Hahn, 1934 (part), Zeitschr. für Säugetierkunde, Bd. IX, p. 257.

Dendrohyrax dorsalis emini Hahn, 1934 (part), *op cit.*, p. 259.

Dendrohyrax d. emini is a large tree hyrax typical of the genus in cranial characters and the mammary formula. It belongs to the *dorsalis* group of forms in which the muzzle is largely naked in the adult animal, but differs from the typical subspecies in the pelage which in *emini* is usually more lightly colored and harsher. In many skull characters it resembles *D. d. dorsalis* but differs from that race in the fact that the interparietal-parietal sutures are closed and the interparietal-supraoccipital suture open, the reverse of which obtains in the Gulf of Guinea specimens.

Represented by 33 skins, 2 skeletons, 37 skulls and 5 fetuses in alcohol, collected as follows:

Akenge, 3 (♂♂), Oct. 2–18, 1913.
Avakubi, 1 (♀), Oct. 22, 1909.
Gamangui, 5 (♂♂), Feb. 10–18, 1910.
Medje, 6 (5♀♀, 1 fetus), Jan. 21–Oct. 1, 1910.
Ngayu, 2 (♂, 1 fetus), Dec. 19, 1909.
Niangara, 3 (♂♂), Nov. 20, 1910–April 28, 1913.
Niapu, 24 (14♂♂, 5♀♀, 2 juv. sex?, 3 fetuses), Nov. 10, 1913–Jan. 3, 1914.

The ages are represented as follows:

Stage	Males	Females	Sex?
I	..	2	2
II	..	..	..
III	1	1	..
IV	..	..	..
V	2	..	..
VI	1	..	..
VII	4	..	..
VIII	16	8	..
	24	11	2

Specimens with skins were taken in every month except March, June, August and September, but there is poor representation of such specimens in all the season from March to September. This is, however, of little importance for none of the specimens were taken as much as four degrees from the equator, and the two short dry periods in January and July probably produce no change in the pelage of the hyraxes.

The monthly catch of specimens was as follows: January, 2; February, 3; March, 2; April, 2; July, 1; October, 5; November, 5; December, 13.

The mammary formula of *Dendrohyrax d. emini*, as determined from an examination of skins of 8 females from the Congo series, is 0–1=2, which formula is typical of *Dendrohyrax*.

The Pelage

Dichromatism

Dichromatism in hyraxes was first noted by Aharoni[1] who observed that in the Syrian species some of the individuals were light colored, others dark. Shortly after this, in June, 1932,[2] MM. Heim de Balzac and Bégouen in the description of *Heterohyrax antineae* of the Hoggar Plateau, Central Sahara, noted two well-marked color phases, but mislead by an atypical combination of cranial characters they did not recognize that one of the color phases of their supposedly new species was nothing more than the earlier known Hoggar species *Procavia bounhioli* Kollman, a slip which Schwarz[3] soon discovered.

Dichromatism, as I have found, is also strongly marked in *Dendrohyrax d. emini*, a circumstance which mislead Brauer into describing too many forms and Hahn into recognizing too many. The common phase of the species is the type with a broad yellow wash (Plate XX, center), the rarer, a dark pelage (Plate XX, right). Between these are specimens superficially intermediate, but in reality these others are worn stages of the light and dark types. Color and color pattern in these two sorts of animals are not precisely constant, since lighter animals have, for example, dirty white, light yellow or orange bellies, and some less conspicuous features show a wide range in variation. That these color varieties are early established is shown by two Stage I specimens of approximately equal age, both females, one taken October 22 at Avakubi, the other January 21 at nearby Medje. The pelages of these two, well shown in Plate XIX, differ throughout, the bases as well as the tips of the hair shafts being darker in the dark individual than in the light. The diffusion of the pigment extends to belly, hands and feet.

The type specimen of *D. d. emini*, to judge by the color plate published of it (1888, P. Z. S., Plate II), is an animal in the more common yellow pelage. The types of *D. beniensis* and *D. congoensis* to judge by the original description are individuals of *emini* in the darker phase.

Well worn specimens of the light *emini* (Plate XXI, center) are intermediate in appearance, the lighter tips to the hairs being gone, the

[1] 1930, Zeitschr. für Säugetierkunde, V, p. 330.
[2] 1932, Bull. Mus. Hist. Nat. Paris, (2) IV, p. 479.
[3] 1933, Ann. Mag. Nat. Hist, (10) XII, p. 625.

dark bases show out and present a color much like that of true "darks." Worn "darks" are in turn slightly darker in general tone than their genetic twins in fresh pelage, for in individuals of the dark type there is a narrow subterminal band of brown which gives a grizzled appearance to the coat.

One individual in the collection (Plate XX, left), No. 53819, a Stage VIII ♂ taken November 20, 1910 at Niangara, is unique in the presence of three well-marked rusty-orange bands crossing the body transversely, one over the shoulders, one at the level of the anterior end of the dorsal spot (between these there is a light wash of the same color) and a third across the back at about the level of the crests of the ilia. These bands extend well down over the flanks but do not pass on over the belly. Basically the individual is a normal light phase, and it might be presumed that these bars were due to some period of faulty packing or storage of the skin, but because the orange color is exactly matched by the hair tip color, occurring as a uniform wash over other specimens, I am inclined to believe the unique pattern to be epidermal in origin.

Mr. Lang made some notes on the skin and eye colors of a living or freshly-killed male brought in to him alive at Ngayu, December 19, 1909. These notes, directly transcribed are:

> Snout and skin that is visible beneath the scanty hair up to and around the eyes, dark gray, nearly black. The tip of the lower jaw shows the same color. The skin visible on ears, dark gray, inside pinkish. Pupil round, iris dark brown. Pads on feet dark gray, pinkish in middle. The large elliptical place about the dorsal gland is pinkish white.

Emin's hyrax, diverse as are the colors and color patterns encountered, does not have any difference in the pelages of the sexes, as far as my eye can determine. Color, length and quality of the hair are seemingly equal in male and female.

A careful and detailed examination of this series has failed to reveal the slightest difference between specimens from any of the localities represented. It is concluded that within the areas the species is homogeneous.

Age changes in pelage involve at least two phenomena. The first of these is the replacement of the soft woolly juvenile pelage by a coarse coat typical of all adults of the species. A second change, progressive through life I believe, is the falling away of the hair in the region of the snout.

Mammals living so close to the equator as do the hyraxes in this series are not subjected to great seasonal fluctuations in climate. In

this area there are periods focussing in January and July in which the rainfall is slightly lighter than in the balance of the year, but the difference is small and the "seasons" short, with the result that pelage changes are not known to occur in response to the little seasonal change. The skins of this series were critically examined with reference to any such possible change, but none was found.

Many specimens in the collection have a reddish-yellow tinge, particularly marked on the lighter underparts, that is due either to a soiling in the original environment or to changes occasioned by grease incompletely removed from the study skin. A vigorous application of benzine serves to remove much of this color, but some of it, which I assume to be natural to the hair, remains. One striking example of a hyrax with a coloration that suggests staining, yet proves non-removable, is the yellow-banded individual (No. 53819) pictured in Plate XX.

Attainment of Full Growth

There is a range in total length of specimens with skulls in Stage VIII from 525 mm. to 625, with the individuals scattered fairly uniformly between these extremes. The four with skulls in Stage VII also lie within these limits, the lower limit coinciding with that of Stage VIII, the higher limit lying at 535 mm. Two specimens in Stage VI are 525 and 545 mm. long, and the one individual in Stage V, is 550 mm. long. It would thus appear that full growth in this species is attained at about Stage V, though the greater upper range limited to Stage VIII suggests a continuation of growth after Stage VIII is first attained. The one specimen in Stage IV and the one in Stage III are 465 and 460 mm. long, respectively, which is distinctly smaller than any of those in Stages V to VIII.

Behavior

Field notes made by Mr. Lang at Ngayu on December 19, 1909, Medje, January 22, 1910, and Gamangui, February 18, 1910, shed some light on the habits of the species. These notes combined for brevity and slightly altered in wording where necessary, are as follows:

General Behavior.—A male brought in alive by the pygmies, moved very slowly on the ground when undisturbed, but would rush rapidly for a yard or two towards a stick thrust at it, or a person that would approach. At such times it would turn its eyes so far backwards that only the yellowish white membranes in front or in back could be seen, and would also erect the hair along its back and that on its head. This little beast understands how to command the respect of all.

Voice.—The animal, when disturbed, as described above, would make a short, abrupt, pig-like grunting noise. It continually ground its teeth (seemingly the molariform series) producing a loud noise by these movements. When taken by the neck it would make a soft whistling noise, rapidly repeated.

The tree hyraxes in the forest cry or rather howl for ten minutes or even half an hour with practically no interruption, repeating one long-drawn howl[1] after another. Sometimes, however, one howls as rapidly and as strongly as though it would defy all competition. One would rather attribute the call to a cat-like animal on account of its peculiar sound. The animals start about 9:00 p. m. and cry particularly about 10:00 p. m., though they may be heard even as late as 2:00 a. m.

These night calls of the tree hyrax may be heard a half an hour's journey through the forest. No more than a single animal was heard calling in the same place. Apparently only males howl, as for a long time only males were brought in, and in the total collection the males are more abundant.

The calls were heard in many places, the first time in Batama, September 15, 1909.

Food and Feeding.—The pygmies and other natives at Ngayu claim that the tree hyrax descends the trees at night and feeds on the ground. The stomachs of three hyraxes taken at Gamangui contained chewed up leaves, all of the same species of trees. One of these stomachs also contained three bees in a ball of hair, all practically intact.

Native Capture.—The tree hyrax, although common all over the forest, is difficult to procure, as it does not start howling until after night-fall, and then the natives are afraid to wander about in the forest on account of leopards.

These hyraxes keep to the same place with great persistence, as they are nearly always heard in the same direction. The natives even claim that one keeps to the same tree for a certain time, which seems probable, as one was heard howling every night for about six days in at least the same clump of trees.

The natives secure the hyraxes by locating the tree upon which the animal is howling. In the morning they climb the tree and search for it, cut down the tree in order to secure the animal, or watch the animal closely until they find some opportunity to capture it. One specimen was taken from a dead hollow tree.

Heterohyrax chapini (Hatt)

Plate XXII; Text Figure 2

Procavia chapini Hatt, 1933, Amer. Mus. Novitates, No. 594, p. 1. Type locality: "Loadi Hill, 5 klm. SW. of Matadi, Bas Congo."

Heterohyrax syriacus bocagei Hahn, 1934 (part), Zeitschr. für Säugetierkunde, Bd. IX, p. 283.

A pale drab, coarse-haired bush hyrax with a well-marked light yellow dorsal spot. The mammary formula is 0–2 = 4. The cranial characters are those of the heterohyraxes except that the skull is larger, the muzzle longer, the dorsal profile flatter and the basisphenoid more elevated than in *H. syriacus* and its subspecies.

Represented by two females, one adult, one juvenile and two embryos from the adult. These were collected by James P. Chapin near

[1] Dr. Chapin (field notes) describes their cries as "agonized reiterated screeching."

Collector's Measurements of *Dendrohyrax d. emini*

Locality	Sex	Number	Total	Tail	Foot	Ear	Skull Stage
Akenge	♂	53803	605	25	79	..	VIII
"	♂	53804	545	35	85	31	VI
"	♂	53805	550	30	82	35	V
Gamangui	♂	53808	600	20	84	..	VIII
"	♂	53809	620	22	82	..	VIII
"	♂	53810	535	21	80	..	VIII
"	♂	53811	580	..	82	..	VIII
Ngayu	♂	53818	550	20	80	..	VIII
Niangara	♂	53819	525	20	78	30	VII
"	♂	53821	520	22	80	29	...
Niapu	♂	53822	538	18	75	35	VIII
"	♂	53823	540	20	87	32	VIII
"	♂	53825	555	20	86	31	VII
"	♂	53829	525	15	77	35	VIII
"	♂	53830	562	18	..	32	VIII
"	♂	53831	605	25	88	36	VIII
"	♂	53832	545	28	84	31	VIII
"	♂	53833	535	25	80	32	VII
"	♂	53834	525	25	85	31	VI
"	♂	53835	525	25	81	31	VIII
"	♂	53836	595	25	88	34	VIII
"	♂	53837	575	25	83	35	VIII
"	♂	53842	550	20	77	29	VII
"	♂	53844	595	20	82	33	VIII
Average	♂ ♂		**558.3**	**20.8**	**78.5**	**32.3**	**VII–VIII**
Minimum	♂ ♂		520	15	75	29	
Maximum	♂ ♂		620	30	88	36	
Medje	♀	53814	575	18	82	..	VIII
"	♀	53815	585	25	85	32	VIII
"	♀	53817	635	25	80	33	VIII
Niapu	♀	53824	580	20	82	32	VIII
"	♀	53826	565	20	85	30	VIII
"	♀	53828	590	18	82	32	VIII
"	♀	53838	585	25	85	35	VIII
"	♀	53840	585	15	85	34	VIII
Average	♀ ♀		**585**	**20.7**	**83.2**	**32.5**	**VIII**
Minimum	♀ ♀		565	15	80	30	
Maximum	♀ ♀		635	25	85	36	
Average	♂ ♂ ♀ ♀		**565**	**21.5**	**79.7**	**32.4**	**VII–VIII**
Minimum	♂ ♂ ♀ ♀		520	15	75	29	
Maximum	♂ ♂ ♀ ♀		635	30	88	36	

Matadi, December 27, 1914. The adult and juvenile are preserved as skins with skeletons, the embryos are preserved in formalin.

A novelty of the collection was Chapin's bush hyrax, secured as near to the mouth of the Congo as any hyrax is apt to occur. The reduced number of mammae (if the type specimen is indicative) set this species apart from others of the genus, and its nearest neighbor, *Heterohyrax bocagei*, is quite different in its longer, thicker pelage, smaller size, broader teeth, proportionately broader skull, elevated supraorbital ridges, shorter muzzle and flatter basicranium. (See Plate XXII.)

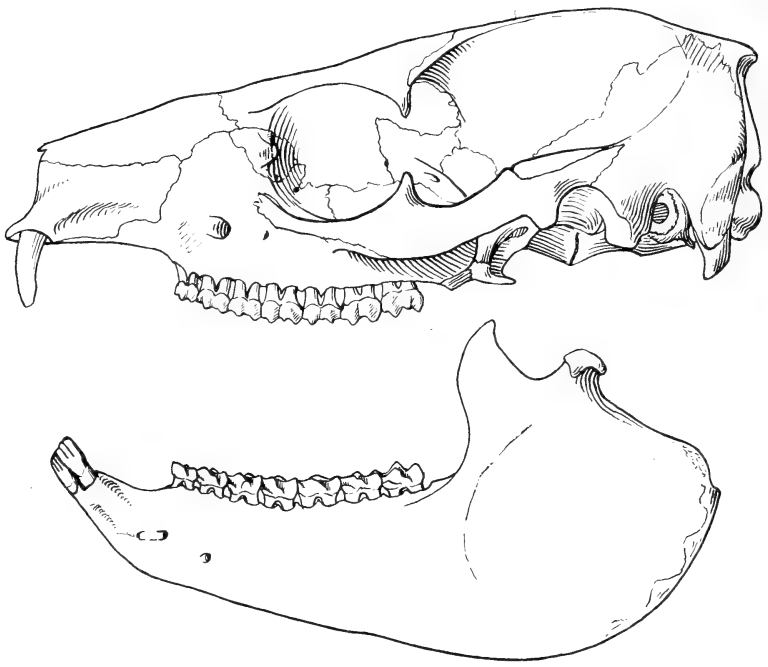

Fig. 2. *Heterohyrax chapini*. Female, Stage VIII. Type. Natural size.

Collector's Measurements of *Heterohyrax chapini*

Locality	Sex	Number	Total	Tail	Foot	Ear	Skull Stage
Matadi	♀	53800	522	12	68	35	VIII
"	♀	53801	430	10	60	30	V
Average	♀ ♀		**476**	**11**	**64**	**32.5**	

Procavia johnstoni lopesi Thomas

Plate XVIII; Text Figure 3

Procavia lopesi Thomas, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 520. Type locality: Kodja Hill, Gaima Range, Monbuttu, Congo.

Procavia ituriensis Brauer, 1917, Sitz. Ber. Gesell. naturf. Freunde, p. 303. Type locality: Ituri, Belgian Congo.

Procavia johnstoni lopesi Hahn, 1934, Zeitschr. für Säugetierkunde, Bd. IX, p. 293.

A large-toothed, coarse-haired rock hyrax apparently closely related to *P. j. matschiei*. The general color is Raw Umber to buffy brown. The crown is black and this shade occurs down to a sharply drawn line below the eye. The dorsal spot is broad and a deep Colonial Buff in color.

Represented by 23 skins, 6 skeletons, 17 skulls and 2 fetuses in alcohol, collected as follows:

Aba, 23 (8 ♂♂, 13 ♀♀, 2 fetuses), July 16, 1911—January 2, 1912.

Faradje, 1 (♂), April 1, 1911.

Vankerckhovenville, 1 (♂), August 7, 1910.

The ages represented may be summarized in the following table:

Stage	Males	Females
I	..	..
II	..	..
III	3	2
IV	1	..
V	2	1
VI	..	2
VII	..	2
VIII	4	6

It is thus apparent that the series of fully adult specimens is not large.

The seasonal distribution of specimens is only fairly satisfactory, the animals with skins being secured as follows: January, 3; April, 1; July, 3; August, 1; December, 15.

Distribution

Procavia j. lopesi was first made known by the description of Thomas who had two specimens collected by Boyd-Alexander on Kodja Hill, described by this noted explorer as "directly in back of the Gaima Range," which in turn lies on the left bank of the Kibali, below Vankerckhovenville. The Congo Expedition specimen labeled Vankerckhovenville was shot by Dr. Chapin on a hill behind Mt. Gaima which is, in all probability, the Kodja Hill of Boyd-Alexander, though the collector is

not perfectly certain on this point. The other specimens in the Congo collection are from hills in the vicinity of Faradje and Aba.

The Pelage

Procavia j. lopesi appears to be one of the least variable of hyraxes as regards its pelage. From early youth (Stage III) to old age the color pattern, the color and the character of the pelage remains almost unchanged.

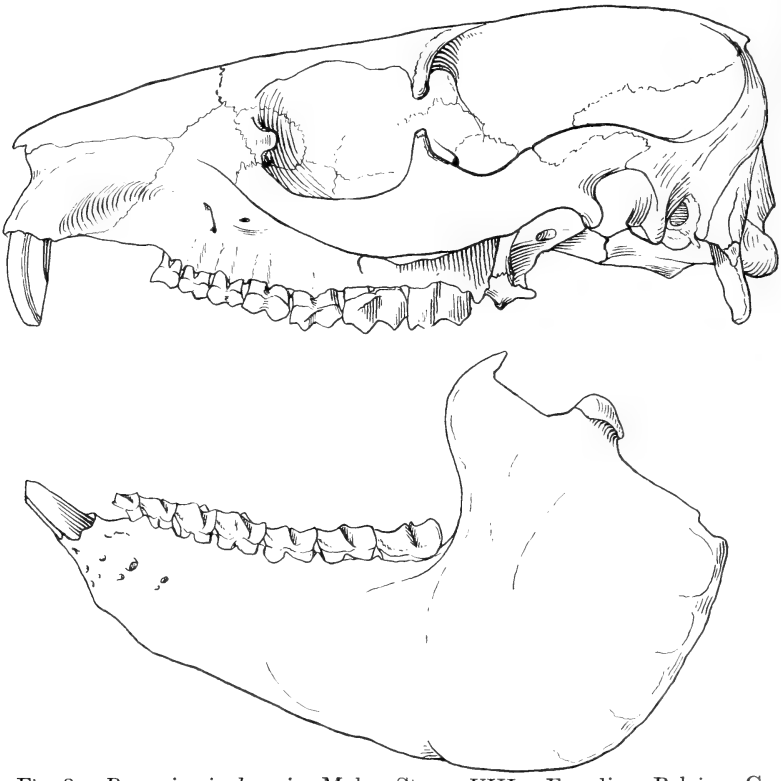

Fig. 3. *Procavia j. lopesi.* Male, Stage VIII. Faradje, Belgian Congo. A. M. N. H. No. 53799. Natural size.

There is a very slight diminution of the orange tint of the throat and belly between Stages III and VIII, and specimens of older individuals show a somewhat greater restriction of black pigment in the region of the ears, but beyond this, age leaves little mark upon them.

From hair characters I am unable to distinguish the sexes. If there is

an annual cycle of pelage change it is not indicated in this series which contains specimens scattered fairly well over the year. The series cannot be expected to show geographical variation as the three localities represented are close together—about one hundred miles apart in the extremes.

Attainment of Full Growth

The smallest specimen in Stage VIII measures 480 mm., the longest 585. Of the two specimens in Stage VII, the smaller measures only three mm. less than the smallest in Stage VIII, the larger well within the limits of variation of the above. The single skull in Stage VI is from a specimen longer than either of those in Stage VII, while three in Stage V are from specimens practically within the limits set by the two in Stage VII. The one skull in Stage IV is from a specimen 15 mm. longer than the smallest animal with a Stage VII skull. Two skulls in Stage III are from animals 378 and 382 mm. long. Thus, animals fully adult as measured by the attainment of function of the complete dentition range in size between limits that are within five mm. of embracing the range represented by all specimens down to the stage in which the second upper molar is only partly up. Animals in Stage III (M^1 functional, M^2 below the level of the bone) are distinctly smaller. It would appear from this that full growth in this species is attained at about the time of the eruption of the second upper molar, which contrasts with the situation suggested by the Congo Expedition collection of tree hyraxes (*Dendrohyrax d. emini*) where full growth seems not to be attained before the period of full function of the second upper molar (Stage V). The period of time between the eruption and the functioning of M^2 may not be great, however, and actual differences in growth pattern between these two species may be very slight, or even nonexistent, for the series with which I have worked is too small to furnish statistical proof.

Behavior

Notes made by Mr. Lang at Aba, December 18, 1911 are:

> The colonies on these rocky hills are rather small, three or four being the usual number of animals. They are, however, found on every rock, the cracks and boulders of which offer sufficient shelter to them. The largest number found in one colony was fourteen, but in this case the rock is exceptionally large and the hyraxes from the whole rock assemble at one side to bask in the sun. On this rock is a place where the water has collected. The hyraxes evidently wade into the water (about 5 inches deep) to chew off the sprouts of a flowering water plant.

The hyraxes leave their burrows or ledges towards three in the afternoon and probably feed throughout the night. At eight in the morning and slightly later they bask on their ledges, but are always watchful. After ten o'clock they are not seen out.

These animals are very shy and make a low barking (somewhat guttural) sound at the approach of danger. They run swiftly along and upward on the strongly inclined rocks where it would be impossible for any man to get a foothold.

These hyraxes evidently give birth to their young the end of December or the beginning of January.[1]

The hyraxes nibble off the fine grass growing between the rocks. This grass when chewed or rubbed has an aromatic smell. Their stomachs contain, chiefly, this grass finely chewed up. There are many other plants fed upon, also the ordinary grass, especially that sprouting freshly after being burned out in the beginning of the dry season. The natives assured me that the hyraxes are often found far from their rocks, feeding on young sprouting grass.

Collector's Measurements of *Procavia j. lopesi*

Locality	Sex	Number	Total	Tail	Foot	Ear	Skull Stage
Aba	♂	53779	515	20	71	33	VIII
"	♂	52780	490	21	71	29	V
"	♂	53784	556	20	75	27	VIII
"	♂	53786	475	20	65	27	V
"	♂	53791	580	24	73	35	VIII
"	♂	53797	545	22	70	35	VIII
Faradje	♂	53799	575	11	76	33	VIII
Average	♂ ♂		**534**	**19.7**	**71.5**	**31.3**	**VII–VIII**
Minimum	♂ ♂		475	11	65	27	
Maximum	♂ ♂		580	24	76	35	
Aba	♀	53776	570	22	71	38	VIII
"	♀	53777	566	20	71	36	VIII
"	♀	53781	520	22	67	32	VII
"	♀	53783	526	21	71	31	VI
"	♀	53787	545	22	68	32	VIII
"	♀	53788	525	21	67	32	V
"	♀	53793	585	24	76	32	VIII
"	♀	53795	477	20	66	33	VII
"	♀	53796	480	18	71	37	VIII
Average	♀ ♀		**532.6**	**21.1**	**69.7**	**33.6**	**VII–VIII**
Minimum	♀		477	18	66	31	
Maximum	♀		585	24	76	38	
Average	♂ ♂ ♀ ♀		**533**	**20.5**	**70.5**	**32.6**	**VII–VIII**
Minimum	♂ ♀		475	11	65	27	
Maximum	♂ ♀		585	24	76	38	

[1] A conclusion scarcely justified by observations made over only 7 months of the year, and on few adult females.

The natives (Logo) try to catch the animals with a noose, or a number hide late in the afternoon at the rocks where the hyraxes have been observed before in sufficient numbers. After the hyraxes are out the natives suddenly start howling and as the animals run back to take refuge in their holes many of them are stoned This is possible only near places where young short grass is abundant. The natives are very fond of eating these hyraxes.

Form and Locality	A. M. N. H. Number	Sex	Greatest length	Condylobasal length	Zygomatic breadth	Skull height	Length nasal suture	Greatest breadth nasals	Height premaxillae	Length nasal-PMX suture
Dendrohyrax dorsalis emini										
Akenge	53803	♂	112.5	112.3	63.3	30.0	32.5	23.1	16.6	20.6
Gamangui	53808	♂	112.0	112.0	63.6	31.9	31.0	25.9	17.2	20.0
"	53809	♂	119.8	119.8	67.3	32.0	27.3	23.5	19.0	?
"	53810	♂	113.7	110.3	65.0	31.5	?	?	18.8	19.2
"	53811	♂	111.8	109.3	66.1	35.0	30.0	23.0	16.7	20.0
Ngayu	53818	♂	119.7	114.2	68.0	31.8	27.7	23.7	18.0	20.0
Niapu	53822	♂	106.5	106.5	62.3	31.0	29.0	20.5	16.7	19.5
"	53823	♂	114.5	114.0	63.2	29.2	30.5	23.0	17.1	21.2
"	53829	♂	114.8	114.5	63.4	32.0	27.0	21.8	17.6	?
"	53830	♂	110.4	109.5	58.8	32.4	24.8	20.0	16.7	23.4
"	53831	♂	115.0	113.8	64.6	32.8	31.1	23.2	17.1	19.0
"	53832	♂	107.3	105.7	61.3	28.7	25.5	21.3	18.0	18.7
"	53835	♂	110.0	109.1	62.8	29.0	23.6	24.7	17.7	19.7
"	53836	♂	112.8	110.7	67.5	31.0	?	?	17.3	23.8
"	53837	♂	110.0	110.0	65.2	30.2	32.1	25.6	19.0	18.5
"	53844	♂	113.2	111.2	61.7	30.5	31.5	21.3	17.1	21.0
	Average	♂ ♂	**112.7**	**111.4**	**64.0**	**31.2**	**28.8**	**22.9**	**17.5**	**20.3**
Medje	52120	♀	109.5	109.5	54.5	31.5	24.6	19.7	16.7	19.5
"	53814	♀	106.0	105.6	59.1	30.7	27.7	22.3	15.9	18.4
"	53815	♀	108.5	108.2	56.6	30.7	30.5	19.1	15.7	21.8
Niapu	53824	♀	105.3	104.5	53.8	31.0	25.6	16.3	16.0	18.5
"	53826	♀	104.9	104.9	58.6	30.0	24.6	20.5	15.2	19.0
"	53828	♀	109.5	109.4	58.1	32.3	25.0	20.3	13.7	17.5
"	53838	♀	107.2	106.6	58.1	28.8	29.7	19.5	15.0	19.1
"	53840	♀	114.0	113.7	59.8	29.2	30.8	22.8	16.0	21.7
	Average	♀ ♀	**108.1**	**107.8**	**57.3**	**30.5**	**27.3**	**20.0**	**15.5**	**19.4**
	Average	♂ ♀	**111.2**	**110.2**	**61.8**	**30.9**	**28.3**	**21.8**	**16.8**	**20.0**
Heterohyrax chapini										
Matadi	53800	♀	95.0	94.6	50.3	31.8	22.0	21.0	10.6	17.7
Procavia j. lopesi										
Aba	53779	♂	97.5	96.5	55.4	31.8	27.5	21.6	13.5	18.2
"	53791	♂	96.8	95.9	57.3	33.2	24.3	21.0	14.0	17.3
"	53797	♂	96.7	93.7	56.7	34.6	25.0	21.2	13.8	17.6
Faradje	53799	♂	98.7	98.5	62.3	34.0	26.7	24.5	13.1	18.4
	Average	♂ ♂	**97.4**	**96.1**	**57.9**	**33.4**	**25.9**	**22.1**	**13.6**	**17.9**
Aba	53776	♀	103.0	102.5	57.2	32.0	27.0	20.8	12.7	19.0
"	53777	♀	98.8	95.7	57.8	34.2	24.4	22.1	11.8	17.3
"	53784	♀	96.0	96.0	56.4	32.4	24.2	21.0	13.5	16.7
"	53787	♀	94.5	93.5	56.3	31.2	25.6	22.0	11.4	15.0
"	53793	♀	96.0	94.5	57.0	32.8	24.3	21.1	12.7	16.8
"	53796	♀	92.0	89.8	51.8	30.8	24.5	19.2	10.6	16.2
	Average	♀ ♀	**96.7**	**95.3**	**56.1**	**32.2**	**25.0**	**21.0**	**12.1**	**16.8**
	Average	♂ ♀	**97.0**	**95.7**	**56.8**	**32.7**	**25.3**	**21.5**	**12.7**	**17.2**

Diastema	Length frontal suture	Postorbital breadth	Least distance lacrymal and malar	Closest approximation temporal fossae	Temporal fossae to occiput	Breadth palate inside M–1	Length of mandible	Premolar. Molar length	Width PM–2	Width M–1	Height M–3	Length PM–1
15.3	36.4	29.5	5.8	15.4	10.2	21.0	98.5	40.3	4.4	6.1	3.3	4.5
19.0	33.7	29.3	2.3	18.4	9.0	20.0	94.5	39.0	4.1	6.3	4.2	4.3
21.3	32.5	29.0	4.3	11.5	6.4	20.7	105.9	39.6	4.5	6.5	2.7	?
16.5	?	29.7	3.2	16.8	10.0	20.5	96.0	38.6	4.2	5.9	0.5	4.3
17.6	34.9	29.8	5.9	15.3	9.8	21.3	92.4	39.3	4.4	6.5	2.2	4.7
18.4	38.8	30.5	3.8	23.9	11.8	19.7	96.5	41.0	5.2	6.5	2.6	4.6
15.6	35.0	28.1	3.7	14.7	9.6	18.7	91.0	41.0	5.0	6.6	3.3	4.5
19.7	36.7	28.9	3.3	12.5	8.9	19.0	96.9	37.7	4.5	6.0	3.4	3.8
?	39.5	27.9	1.3	18.5	11.5	19.5	97.5	?	4.9	6.5	2.2	?
16.8	31.5	28.7	3.2	21.5	11.8	17.5	92.1	38.3	4.4	6.1	2.5	4.3
16.1	39.0	29.2	5.1	14.6	12.6	21.6	97.3	38.9	4.7	6.2	3.0	5.3
16.4	34.0	27.2	4.6	14.4	9.3	20.0	91.8	38.8	4.7	6.3	3.1	4.5
16.8	36.7	30.0	1.3	15.1	8.5	20.0	93.3	37.7	4.3	6.3	2.7	4.3
18.6	34.2	30.0	5.0	18.6	13.2	21.6	104.0	42.3	5.0	6.9	0.5	4.7
18.0	32.9	29.0	4.0	16.3	10.0	20.3	99.2	39.5	4.5	6.4	1.9	?
18.4	33.7	28.6	4.0	17.1	10.0	21.0	95.4	39.1	4.7	6.0	3.6	4.8
17.6	**35.3**	**29.1**	**3.8**	**16.5**	**10.2**	**20.1**	**96.4**	**39.4**	**4.6**	**6.3**	**2.6**	**4.5**
17.5	38.5	28.1	4.7	18.1	10.5	19.0	91.6	38.0	4.5	6.0	3.6	4.0
15.8	32.0	29.2	2.3	14.2	10.7	20.1	92.5	38.6	4.5	6.3	1.5	4.4
18.4	33.2	26.6	1.8	10.5	8.3	20.1	86.3	37.8	4.4	6.0	2.7	4.3
17.9	32.4	27.6	4.6	15.6	9.7	17.9	89.2	37.5	4.1	6.1	3.7	4.2
15.2	33.7	29.2	4.2	14.5	10.0	20.0	91.1	40.0	4.6	6.2	4.2	**5.3**
16.0	36.5	28.9	5.6	12.2	10.0	20.3	92.0	41.0	4.6	6.6	3.2	4.7
16.5	36.8	28.5	0	17.3	7.0	19.2	92.5	40.9	4.6	6.4	2.9	5.0
19.6	36.2	28.4	4.5	20.3	10.5	21.3	98.1	40.0	5.0	6.2	2.1	4.9
17.1	**34.9**	**28.3**	**3.9**	**15.3**	**9.6**	**19.7**	**91.6**	**39.2**	**4.5**	**6.2**	**3.0**	**4.6**
17.4	**35.1**	**28.8**	**3.8**	**16.1**	**9.9**	**20.0**	**94.8**	**39.3**	**4.5**	**6.3**	**2.7**	**4.5**
16.2	36.5	25.7	4.7	12.2	8.5	16.9	84.7	32.0	3.9	5.3	2.5	3.3
13.5	37.6	23.1	0	6.8	3.7	16.4	85.0	41.8	4.8	8.2	6.7	3.3
12.5	37.2	23.2	0	7.1	1.6	16.7	86.5	40.5	4.9	8.0	5.3	3.0
12.0	36.5	26.3	0	13.0	0.5	16.3	87.7	39.7	4.3	7.5	2.8	
13.4	36.2	24.8	0.5	3.7	3.1	15.7	89.5	41.5	4.5	7.5	5.7	3.1
12.8	**36.8**	**24.3**	**0.12**	**7.6**	**2.2**	**16.2**	**87.2**	**40.9**	**4.6**	**7.8**	**5.1**	**3.1**
15.0	39.5	24.7	0		6.0	16.4	90.0	42.3	5.0	8.5	4.5	3.6
11.6	38.4	26.8	0	5.5	2.5	16.0	85.2	41.8	5.1	8.2	4.1	4.2
10.5	36.8	24.0	0	4.2	4.2	15.0	84.7	39.0	4.3	8.0	0	3.5
9.0	34.9	24.3	0	3.1	4.0	16.1	82.0	42.7	4.8	8.3	6.5	3.5
12.8	39.0	25.1	0	5.7	1.8		86.2	40.7	5.0	7.9	5.9	3.5
10.7	34.0	24.7	0	3.0	1.5	16.0	80.5	39.3	4.5	8.0	4.1	3.0
11.6	**37.1**	**24.9**	**0**	**4.3**	**3.3**	**15.9**	**84.7**	**40.9**	**4.8**	**8.1**	**4.2**	**3.5**
12.1	**37.0**	**24.7**	**0.04**	**6.0**	**2.9**	**16.0**	**85.8**	**40.9**	**4.7**	**8.0**	**4.6**	**3.4**

PLATE XVIII

Fig. 1. *Dendrohyrax d. emini.*

Fig. 2. *Procavia j. lopesi.* Female, Aba, Belgian Congo. Contrast this species with that above for distribution of hair on the face, and apparent length of hair on the back.

Specimens in the flesh. Herbert Lang, photographer.

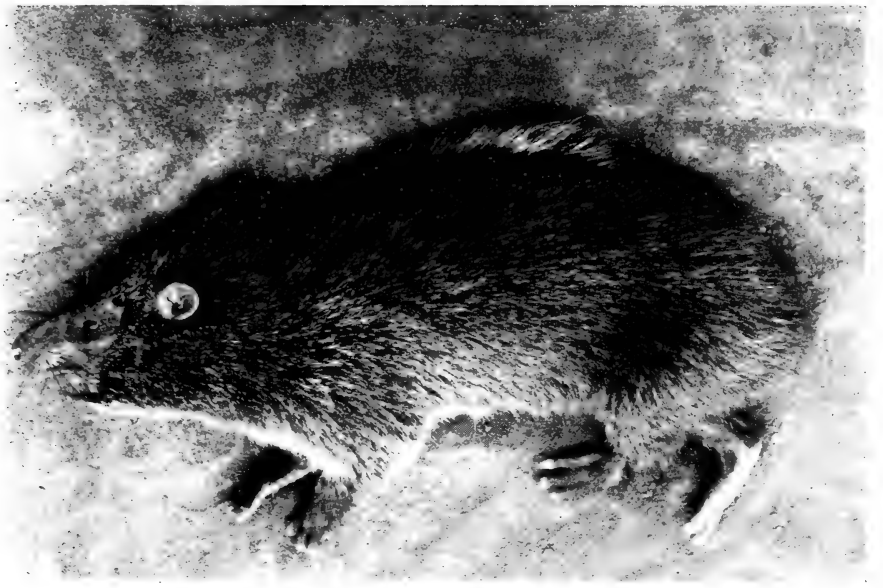

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PLATE XIX

Light and dark phases in juvenile *Dendrohyrax d. emini*. The light (A. M. N. H. No. 53806) is a female taken at Avakubi, October 22. The dark (A. M. N. H. No. 53812), also a female, was taken at Medje, January 21.

PLATE XX

Color phases in adult *Dendrohyrax d. emini*. The center specimen (A. M. N. H. No. 53836, ad. ♂, Niapu, December 17) is an example of the common blond phase. To its right is a specimen (A. M. N. H. No. 53821, ad. ♂, Niangara, April 28) in the dark phase, and on the left another (A. M. N. H. No. 53819, ad. ♂, Niangara, Nov. 20) basically blond, but exhibiting darker transverse bands of orange color.

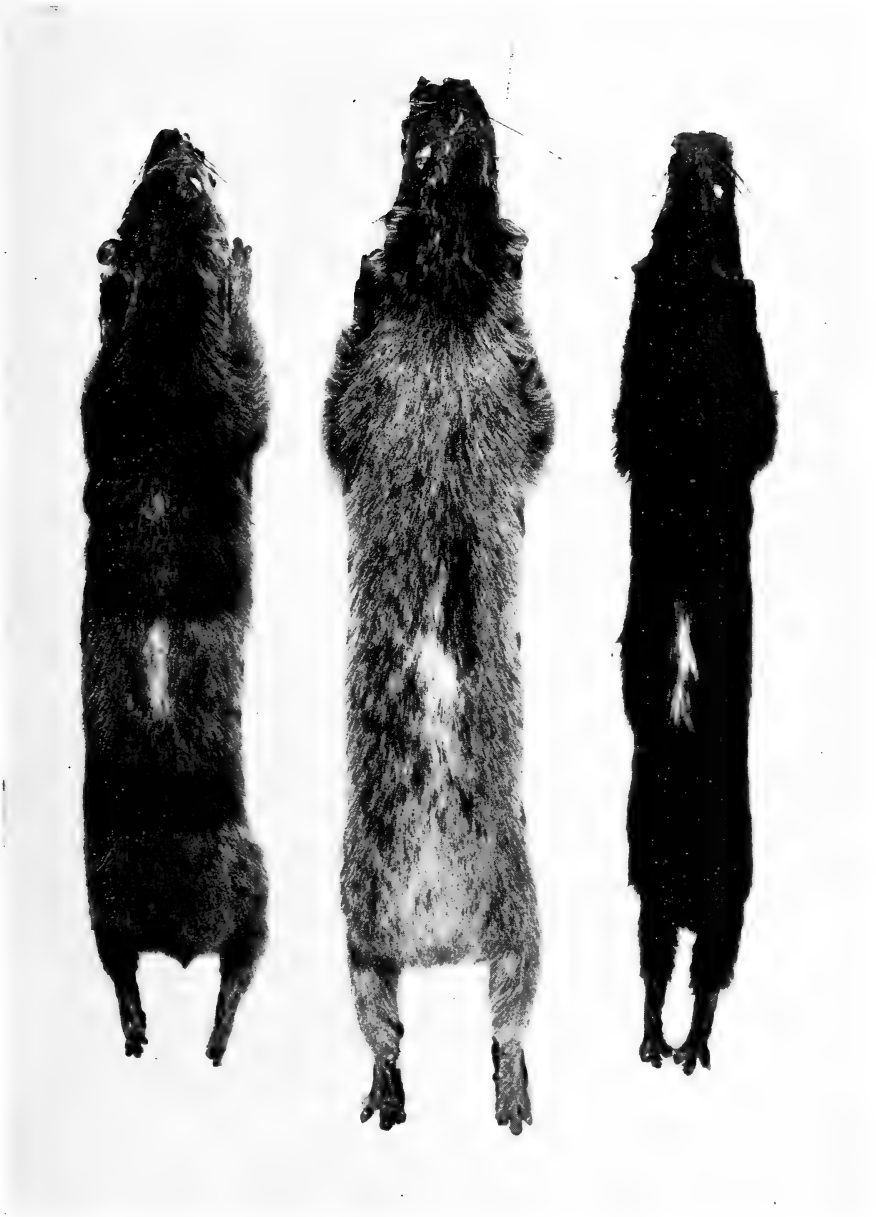

PLATE XXI

Color patterns due to wear in the pelage of *Dendrohyrax d. emini*. The left (A. M. N. H. No. 53836, ad. ♂, Niapu, December 17) is a light phase with unworn pelage. In the center is a specimen (A. M. N. H. No. 53815, ad. ♀, Medje July 27) with greatly worn pelage, in which over a broad area the dark bases of the hair show through. The specimen on the right (A. M. N. H. No. 53828, ad. ♀, Niapu, December 1) is an example of the dark phase in which the pelage is worn about equally to that in the center.

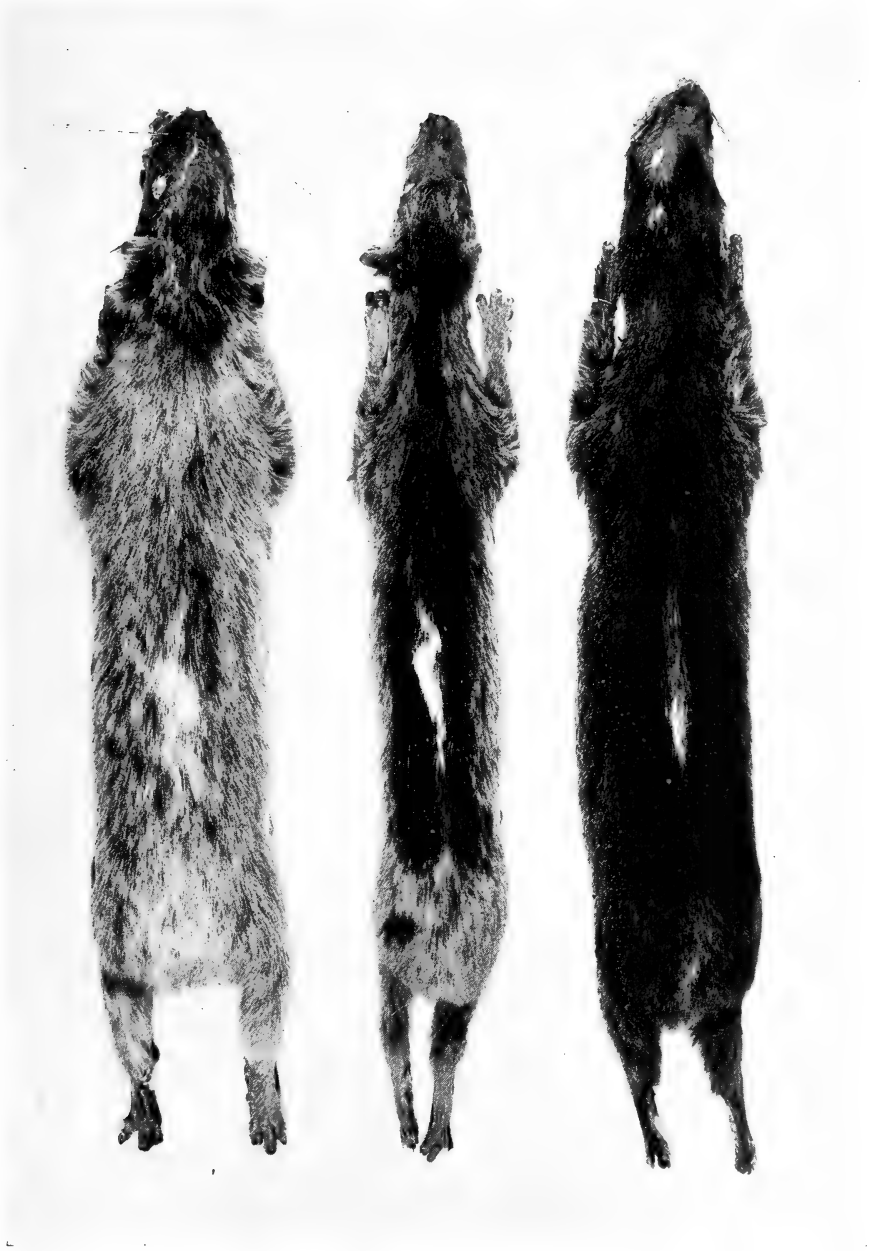

PLATE XXII

Skulls of *Heterohyrax s. bocagei* (above: A. M. N. H. No. 80601, ad. ♀, Lubango, Angola) and *Heterohyrax chapini* (below: type). Contrast the length of muzzle, the height of the supraorbital ridge, the basal eminence.