59.76(67.5)

Article II.—CONTRIBUTIONS TO THE HERPETOLOGY OF THE BELGIAN CONGO BASED ON THE COLLECTION OF THE AMERICAN MUSEUM CONGO EXPEDITION, 1909–1915[1]

PART III. AMPHIBIA

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WITH ABSTRACTS FROM THE FIELD NOTES OF HERBERT LANG AND JAMES P. CHAPIN

PLATES XXIII TO XLII, 8 TEXT FIGURES

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INTRODUCTION

The Amphibia collected by the American Museum Congo Expedition number 2,170 well-preserved specimens, distributed among fifteen genera and fifty-three species. The present report following so closely on my recent paper on 'The Phylogeny of the Salientia' (Noble, 1922) considers matters of only systematic and zoögeographic interest. No comprehensive work dealing with African Amphibia has appeared since Boulenger's catalogue in 1882.[2] A glance at the appended bibliography will show that the papers dealing with African Amphibia published since

[1]Scientific Results of The American Museum of Natural History Congo Expedition, Herpetology, No. 3.

[2]The comprehensive volume by Nieden, 1923, 'Amphibia, Anura I,' 'Das Tierreich' (Berlin) unfortunately appeared too late to be included in this paper.

that time have been extraordinarily numerous. Collections of African Amphibia are very rare in America and any report on them made in this country must be to a certain extent provisional. Much bibliographic work was required to reach any conclusions. In order that this work may not be lost I have attempted to bring together at the close of this paper a check list based on a study of the data contained in the many papers included in the bibliography. In this list I have tried to indicate the accepted opinion as to the status of the various species—an opinion not always known by recent students of African herpetology. It also gives the range of these species so far as the ranges can be deduced from the literature. The check list is modelled after that of Stejneger and Barbour on the North American Amphibia and Reptilia. It is hoped that it may serve the same useful purpose. Forms which are not included in the list are not considered valid. The synonymy has been limited to the original description, the authority for the combination, and a reference to the most important discussion of each species.

The body of the paper is devoted to a discussion of the fifty-three species represented in the Congo collection. Lack of comparative material has necessitated a very conservative opinion on many of them, especially on the species of *Hyperolius*. The synonymy under each species is intended to include references to all the literature which has appeared since Boulenger's 'Catalogue' (1882). The synonymy is therefore not complete but sufficient for distributional studies. The new *Hymenochirus* is remarkable in coming from a region which was herpetologically well known. This, together with the fact that a number of forms recorded from the Congo basin are not represented in the collection, presents further evidence of the difficulties of most herpetological collecting, work in which the Expedition was so highly successful.

Field study of Amphibia is a specialized task. In spite of the broad interests of the Expedition, much time was devoted to the careful describing of the colors of the living specimens. Abstracts made from these field descriptions form one of the more important contributions of this paper. These abstracts are included in the body of the paper, but they have been set off by quotation marks from the rest of the text. Most of these field notes were made by Mr. Lang, the leader of the Expedition. They include only information actually recorded in the field. Mr. Lang is to be heartily congratulated on these numerous and accurate notes. I am indebted to Mr. Lang for the splendid series of batrachian portraits included in the paper. The Amphibian collection was made under Mr.

Lang's personal supervision. He devoted much time and labor in bringing together the large collection discussed below.

The observations of habits recorded in the field by Mr. Lang and Mr. Chapin have been supplemented by a study of the gonads and of the stomach contents. Little is known about the breeding season of tropical frogs, but my study of their sexual organs has allowed me to infer that this season may be very irregular in the Congo basin. The work on the stomach contents was greatly facilitated by the experienced aid of Dr. J. Bequaert, who has kindly identified all the invertebrate material contained in the stomachs. The heterogeneous nature of this material, listed under the various species, gives further support to the opinion now fairly well established, that frogs and toads are rarely specialized to particular food habits. *Hemisus*, to be sure, is an "ant-eater," but a great many generalized forms live largely upon ants and termites. The presence or absence of teeth is not definitely correlated with a particular diet. The absence of teeth may, however, limit to a certain extent the variety of food secured. Thus *Bufo superciliaris*, in spite of its large size, does not seem to feed on vertebrates, while several species of *Rana*, much smaller in size, prey to a large extent upon toads or other species of Salientia. Frogs and toads seize whatever living animal food is in their vicinity.

The work on the Amphibian collection has been greatly facilitated by coöperation from many sources. I am chiefly indebted to Mr. Karl P. Schmidt and Doctor Joseph Bequaert, who have aided me with bibliographic references. Dr. Bequaert has kindly read the entire manuscript. Thanks are due to Dr. Thomas Barbour, who has placed the magnificient Cameroon collections of the Museum of Comparative Zoölogy at my disposal. I am also indebted to Dr. A. G. Ruthven of the University of Michigan for the loan of a collection of Cameroon Amphibia previously reported upon by Dr. Barbour. Mr. Henry W. Fowler has given me the opportunity of studying the African collections in the Philadelphia Academy of Sciences. In the preparation of the paper I have received advice from Dr. Stejneger of the United States National Museum and Dr. Dunn of Smith College. Many within the American Museum of Natural History have helped me materially. The microphotographs were made by Mr. Charles F. Herm, under my direction. The drawings are evidence of the skill of Mrs. Helen Ziska and Mrs. E. L. Beutenmüller.

LIST OF LOCALITIES FROM WHICH SPECIMENS ARE RECORDED WITH THEIR APPROXIMATE LATITUDE AND LONGITUDE

Akenge.—2° 55′ N., 26° 50′ E.
Avakubi.—1° 20′ N., 27° 40′ E.
Bafwabaka.—2° 10′ N., 27° 50′ E.
Bafwaboli.—0° 40′ N., 26° 10′ E.
Bafwamoko.—0° 40′ N., 26° 55′ E.
Bafwasende.—1° 10′ N., 27° 15′ E.
Banalia.—1° 30′ N., 25° 40′ E.
Batama.—1° N., 26° 40′ E.
Boma.—5° 50′ S., 13° 10′ E.
Boyulu.—1° N., 27° E.
Dungu.—3° 30′ N., 28° 30′ E.
Faradje.—3° 40′ N., 29° 40′ E.
Gamangui.—2° 10′ N., 27° 20′ E.
Garamba.—4° 10′ N., 29° 40′ E.
Kamumionge.—1° N., 27° 5′ E.
Leopoldville.—4° 25′ S., 15° 20′ E.
Lié.—2° N., 21° 20′ E.
Lukolela.—1° 10′ N., 17° 10′ E.
Matadi.—5° 50′ S., 13° 35′ E.
Medje.—2° 25′ N., 27° 30′ E.
Mobeka.—2° N., 19° 50′ E.
Nala.—2° 50′ N., 27° 50′ N.
(Nepoko River (Gamangui).—2° 10′ N., 27° 20′ E.
Ngayu.—1° 40′ N., 27° 40′ E.
Niangara.—3° 40′ N., 27° 50′ E.
Niapu.—2° 15′ N., 26° 50′ E.
Poko.—3° 10′ N., 26° 50′ E.
Rungu.—3° N., 28° E.
Stanleyville.—0° 30′ N., 25° 15′ E.
Thysville.—5° 30′ S., 15° E.
Ukaturaka.—2° N., 20° 30′ E.
Vankerckhovenville.—3° 20′ N., 29° 20′ E.
Yakuluku.—4° 20′ N., 28° 50′ E.
Zambi.—6° S., 12° 50′ E.

ORIGIN AND AFFINITIES OF THE AFRICAN SALIENTIA

The origin of the African Amphibia has been so recently discussed by me (Noble, 1922, pp. 64–67) that little need be added at this time. The few papers which have appeared since my earlier paper went to press tend to confirm my conclusions, namely, that the amphibian fauna of Africa gained access to that continent from the North and that no land bridges need be postulated to account for the presence of the pipids, hylids or bufonids (cystignathids) or any other groups of Amphibia found there today. The evidence for this opinion is given in the paper mentioned and need not be repeated here.

The fauna of Madagascar was derived at some early period from that of Africa. Most of the Salientia found in Africa today are either recent immigrants from the North or have been derived from African stocks. Only two African genera are found today in Madagascar. I assumed three in my earlier paper, but it has been shown by Witte (1921, p. 14, footnote) that *Arthroleptis horridus* of Madagascar is not congeneric with the African forms.

The recent discovery of a urodele by Chabanaud (1921, p. 139) south of the Sahara in no way alters my earlier conclusions. This species,

now referred to *Molge waltl* (Angel, 1921, p. 736), was found in the Niger drainage. The discovery merely lends further support to the conclusions reached from geological evidence that the Niger at one time flowed to the north, emptying either into the "Sahara Sea" or into the Mediterranean.

PRESENT DISTRIBUTION OF THE SALIENTIA IN AFRICA

A study of the check list at the close of this paper will make clear how difficult it is to give any statement as to faunal areas. The Ethiopian region is clearly marked off from the Mediterranean and is nearly as distinct from the Mascarene but, except for the strikingly different forest and savannah provinces, no well-marked divisions of the continent south of the Sahara may be made. Schmidt, in his critical review of the distribution of the African reptiles (Parts I and II of this series of papers), has found good reason for proposing a number of subprovinces. The distribution of the Amphibia does not conform to these areas. Certain little-known species are often confined to one or another of them, but so many exceptions occur, so many species range through parts of two or three of these hypothetical faunal areas, that they have little importance in our discussion.

The forest fauna is, of course, very different from that of the savannah. Further, the fauna of the Cameroon-Gaboon area supports many more indigenous genera than any other region of similar size in Africa. If we were to divide the Ethiopian region into faunal provinces, the Cameroon-Gaboon area would be one of our primary divisions. The discrepancy between the conditions found in the reptiles and in the amphibians probably lies in the fact that many amphibians are local in their distribution, often known only from their type localities, while the distribution of the reptiles, as that of the mammals, seems to be chiefly dependent on the climatic and vegetation zones. Vegetation, but chiefly hydrographic conditions, doubtlessly has considerable effect on the distribution of the Amphibia but, after a study of the data at hand, it seems premature to make any definite statement as to faunal zones.

The distribution of the genera of frogs and toads south of the Sahara has been represented diagrammatically in the accompanying graph. It will be noted that the Cameroon-Gaboon region supports more than twice as many genera as the combined regions visited by the Expedition. This is the more significant in that the latter regions embrace together much more territory than the former.

In the map I have indicated the areas considered. A cursory glance at the check list at the close of this paper will show that these areas can

hardly be called faunal zones. But they are more nearly faunal zones than any other regions which could be indicated. Areas 2, 8, and 10 have apparently been centers of generic differentiation, while 7 and 9 have been migration routes for many species. Area 6 is chiefly characterized by the presence of many species at present not known from 5, which is climatically very similar to 6. Area 1, although forested as 2, lacks many of the genera found there. Area 4 is a forest outlyer with an amphibian fauna composed of a mixture from areas 3 and 9. The

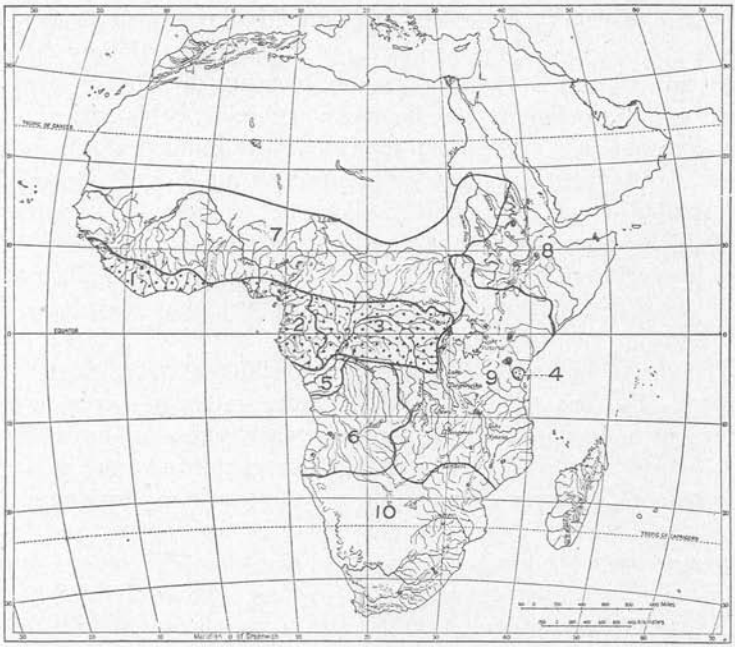
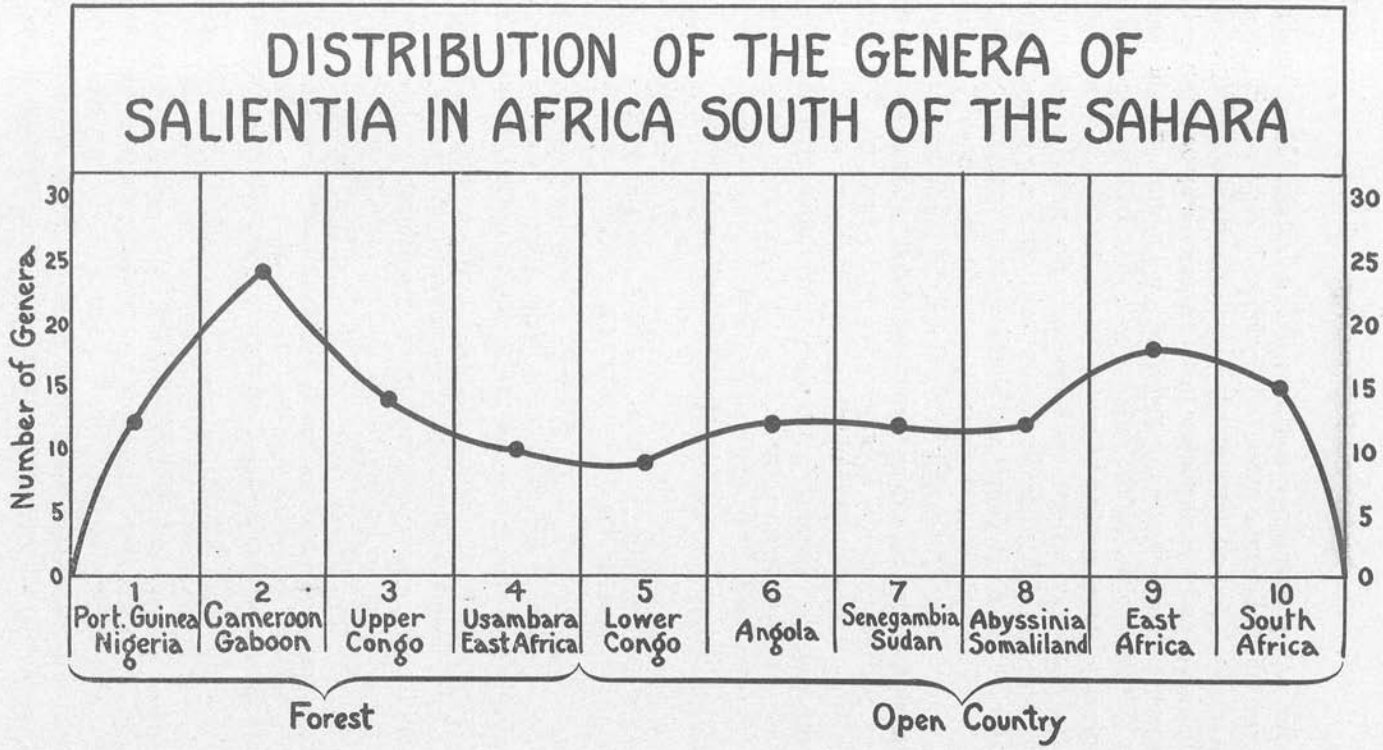


Fig. 1. Africa, subdivided into convenient areas for distributional discussion.
For explanation, see opposite page.

similarity of areas 4 and 3 suggests that the forests of the Upper Congo may have extended to the east coast, but the much richer fauna of area 2 leads one to suspect that the Cameroon-Gaboon region has fostered amphibian specialization longer than any other single region.

The fact that I have been unable to distinguish well-defined or even poorly defined faunal zones suggests that such zones do not exist. The factors which control the distribution of one group of animals do not necessarily control the distribution of another. Isotherms do not limit the distribution of most African Amphibia. Humidity must play a part,


DISTRIBUTION OF THE GENERA OF SALIENTIA IN AFRICA SOUTH OF THE SAHARA
Number of Genera
0
5
10
15
20
25
30
1 Port. Guinea Nigeria
2 Cameroon Gaboon
3 Upper Congo
4 Usambara East Africa
5 Lower Congo
6 Angola
7 Senegambia Sudan
8 Abyssinia Somaliland
9 East Africa
10 South Africa
Forest
Open Country

but whether it plays a very important part is uncertain. Most Amphibia have specialized breeding habits. They breed in only certain types of streams, ponds, or on land in situations of certain humidity. The distribution of Salientia during the breeding season may be dependent on the presence of these situations. Salientia do not migrate great distances. Their distribution during the entire season may be dependent on the occurrence of these breeding habitats.

The species of African Amphibia are comparatively well known, but the breeding of these species remains, with a few exceptions, entirely unknown. If the exact habitat and breeding site of even a fair proportion of the species listed in the appended Check List were known, I feel that there would be little difficulty in determining the chief factors which control the distribution of African Amphibia. Food habits of the Salientia are rarely circumscribed. Large areas of Africa have much the same temperature. If food and temperature do not play an important part in controlling distribution, it is probable that humidity and breeding sites may be of more importance than usually conceded. Before any sound conclusions may be reached, much more must be known of the exact conditions under which Amphibia live and breed.

DISCUSSION OF THE FAMILIES, GENERA, AND SPECIES REPRESENTED IN THE COLLECTION

Pipidæ

Two of the three genera of African aglossal frogs parallel each other in having certain species restricted to the forest and others to the open country. *Hymenochirus boettgeri*, *H. feæ*, and *Xenopus tropicalis* are the forest forms, while *H. curtipes*, *Xenopus clivii*, *X. mülleri*, and *X. lævis* are the open country species. It is noteworthy that, while *X. clivii* is restricted to the northeastern faunal area, the other three of the second group are not characteristic of any one definite faunal province as is the case of so many species of reptiles.

The recently described *Pseudhymenochirus*, is known only from the type species secured near Conakry, French Guinea.

HYMENOCHIRUS Boulenger

The Congo Expedition secured a species of this genus which is very distinct from the two species formerly known. The three species now included in the genus are readily distinguishable by their different leg length and by the different extent of the webbing between the digits.

Hymenochirus curtipes, new species

Plate XXIII; Text Figure 2

Three specimens from Zambi, Lower Congo, June 1915, A. M. N. H. Nos. 9453–9455.

DISTRIBUTION.—While the species is known only from Zambi, it is assumed that its range embraces more or less of the Lower Congo.

DIAGNOSTIC CHARACTERS.—Leg-length much shorter than in the other species of *Hymenochirus;* tibiotarsal articulation barely reaching the shoulder; tibia contained nearly three times in the head and body length. Fingers half webbed, toes completely webbed, the webs scarcely indented. Tubercles of the sides of the body not distinctly enlarged, only a little larger than those of the back.

TYPE.—A. M. N. H. No. 9453, adult ♂, from Zambi, June 1915.

DESCRIPTION OF TYPE SPECIMEN.—Head narrow, flat, without any indication of a canthus rostralis; snout subtruncate, the nostrils terminal; eye directed nearly dorsally, its greatest diameter contained one and a third times into the distance between its anterior end and the nostril; interorbital space a little less than three times the greatest diameter of the eye; no tympanum; no upper eyelid. Fingers about half webbed, the web scarcely indented; one (of inner digit), one, two and two phalanges of the respective fingers free; toes webbed to the base of each of the terminal phalanges, the web slightly more indented than that of the fingers. Tibiotarsal articulation nearly reaching the shoulder; the tibia contained in the head and body length a trifle less than three times; a prominent inner metatarsal tubercle, without horny sheath. Skin coarsely and uniformly tubercular, the tubercles of the sides of the body and hinder surfaces of the thighs a trifle larger than those of the back.

Muddy brown above, indistinctly spotted with dark brown above, distinctly below.

MEASUREMENTS

Snout to Vent	24 mm.
Width of Head	5.5 mm.
Foreleg	9 "
Hind leg (vent to tip of longest toe)	24 "
Tibia	8 "

RELATIONS.—I am not at all convinced that the Cameroon-Gaboon specimens of *H. boettgeri* which Boulenger (1899, p. 122) has considered indistinguishable from the type as described are really identical with it. There is considerable discrepancy in leg-length and rugosity between them and the original description. Still our specimens of *H. curtipes* differ so greatly from both the original description of *H. boettgeri* and the Cameroon specimens available to me that they cannot be confused with either. I have examined three Cameroon specimens referred by Boulenger to *H. boettgeri,* one (M. C. Z. 2468) thirty-three millimeters in length from the Ja River, another (M. C. Z. 2469) twenty-seven millimeters in length from Kribi, and the third (M. C. Z. 2462) twenty-five

millimeters long, from north Cameroon. Whether or not these specimens are identical with *H. boettgeri* it is impossible to say without an examination of the type. They are, nevertheless, conspicuously different from *H. curtipes* in their much greater leg-length, enlarged lateral tubercles, broad heads and indented webbing of the digits. The tibia of these specimens is contained into their head and body length from two and one-fifth to two and one-third times. Their tibiotarsal articulation just reaches or nearly reaches the eye. Tornier (1896, p. 163) states in his original description of *H. boettgeri* that it is the tarso-metatarsal joint which just reaches the eye. In our specimens of *H. curtipes* the tarso-metatarsal articulation extends at most only a little beyond the shoulder. It is apparent that, regardless of the status of the Cameroon specimens, *H. curtipes* is very different from *H. boettgeri*.

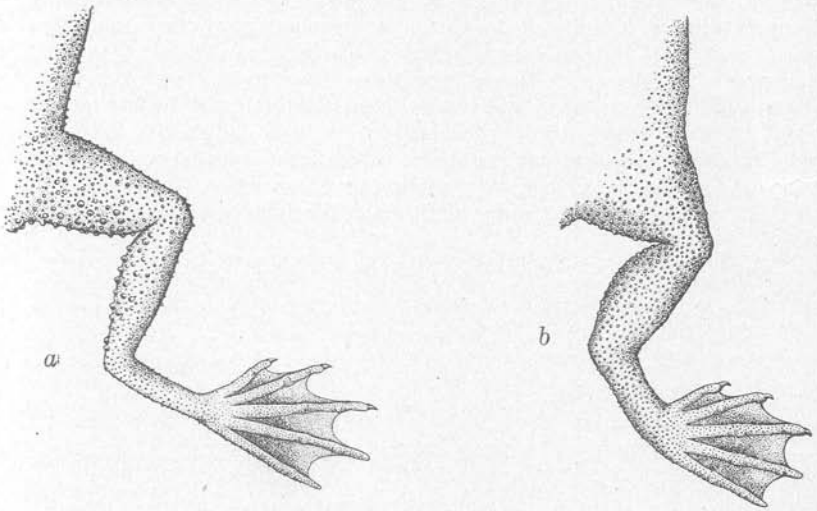


Fig. 2. (*a*) *Hymenochirus boettgeri*, (Tornier) and (*b*) *Hymenochirus curtipes*, new species. Comparison of the right hind limbs, dorsal aspect.

Boulenger (1906, p. 158) states that *H. feæ* is very similar to *H. boettgeri*, "agreeing with it in every respect except that the fingers and toes are fully webbed to the tips." But, to judge from Boulenger's figure (idem, Pl. 1, fig. 1), it would seem that *H. feæ* is also different from *H. boettgeri* and like *H. curtipes* in lacking the greatly enlarged tubercles of the sides of the body which, although not shown in Tornier's figure of *H. boettgeri*, are very distinct in the Cameroon specimens that I have examined.

VARIATION.—The three specimens of *H. curtipes* in our series measure 28, 26, and 24 mm. from snout to vent. There is no variation in color, and practically none in proportions.

XENOPUS Wagler

Only four species of *Xenopus* are actually recognizable. These may be distinguished by the following key.

a_1.—Metatarsal tubercle provided with a black claw.
  b_1.—Tentacle much shorter than half the length of the eye.....*X. clivii.*
  b_2.—Tentacle about half the diameter of the eye.....*X. tropicalis.*
a_2.—Metatarsal tubercle naked.
  b_1.—Tentacle much shorter than half the diameter of the eye; metatarsal tubercle weak, blunt.....*X. lævis.*
  b_2.—Tentacle about half the diameter of the eye; metatarsal tubercle prominent, pointed.....*X. mülleri.*

Xenopus mülleri (Peters)

Plate XXIV

Dactylethra mülleri PETERS, 1844, Monatsber. Akad. Wiss. Berlin, p. 37 (type locality: Mozambique).

Xenopus muelleri BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 457 (part: Zanzibar). PETERS, 1882, 'Reise nach Mossambique,' III, p. 180, Pl. XXV, fig. 3, Pl. XXVI, fig. 12 (Zanzibar and Mozambique: Cabaçeira, Boror, Tette, Sena, Mesuril and Quilimane). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 12 (Zanzibar and Kingani, East Africa). BOETTGER, 1892, 'Cat. Batr. Mus. Senck.,' p. 51 (Mozambique). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 104 (Zanzibar and Kingani, East Africa). BOULENGER, 1895, Proc. Zoöl. Soc. London, p. 540 (Murgen, Western Somaliland). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 27 (Mozambique: six localities). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 162 (Zanzibar and German East Africa: Tanga, Dar-es-Salaam, Irangi, Kakomo, Kawendi and Bukoba). BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: N. W. Nyasa, Nyika Plateau and Fort Hill, Masuka District). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a*. TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). BOULENGER, 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). NICKEL, 1901, Helios, XVIII, p. 72 (German East Africa). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 409 (British East Africa: Atchi on Mount Kouyou). SCHERER, 1903, Blätter Aquar. Terrarien kunde, XIV, p. 61 (German East Africa). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1907 (Sudan: Gondokoro). KRAFT, 1910, Blätter Aquar. Terrarien kunde, XXI, p. 642 (Africa). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 27 (Tanga, German East Africa). HEWITT, 1911, Rec. Albany Mus., II,

part 3, p. 228 (Mozambique, Nyasaland and Zanzibar). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 178 (East Africa and the Sudan). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 344, 347, 357 and 367 (East Africa: Mikindani, Kenia, and Zanzibar). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 387 (German East Africa: nine localities; British East Africa: four localities; Portuguese East Africa: one locality). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Agouagon, Dahomey).

Eighty-nine adults and ninety-five tadpoles: sixty-two of the former from Faradje, October 1912; twelve from the same locality January 1913 and nine, February 1911; five from Niangara, June 1913, and one from the same locality, November 1910; all of the tadpoles from Faradje, October 1912. (A. M. N. H. Nos. 9456–9546.)

DISTRIBUTION.—*Xenopus mülleri* has a wide range throughout the Sudan and East Africa from Gondokoro in the north to Tette in the south. The locality records of the Congo Expedition show that this range extends considerably east in the Sudanese savannahs but is abruptly limited by the forest a little farther south.

RELATIONS.—*X. mülleri* has been confused with *X. lævis* by various authors and it is impossible to state at the present time just how far the range of these two species overlap in East Africa. Boulenger (1905*b*, p. 249) has summed up the problem and our material does not permit further discussion since none of our specimens are intermediate between the two species. Andersson (1905, p. 29) referred some badly preserved specimens of *X. clivii* from Cameroon to this species but was later corrected by Nieden (1908*a*, p. 510). No specimens of *X. clivii* are available for study. It has been recorded from only Eritrea, Abyssinia, and Cameroon. This distribution is remarkable, for it seems impossible that the same species should occur locally in two such widely separated localities. *X. clivii* requires careful comparison with *X. tropicalis* more than with *X. mülleri*. The naked metatarsal tubercle, much longer than in *X. lævis*, seems to be the most diagnostic character of *X. mülleri*.

VARIATION.—Practically all the specimens which have just metamorphosed are distinctly spotted above, the spots, often irregular in outline, forming three to seven irregular longitudinal rows. In fully adult specimens these spots are visible in only those which are not darkened. The darkening may be due in part to preservation, for the majority of the adults were described in the field as "greenish gray, or brownish green above, with many irregular spots; the lateral-line structures pale yellowish; sides of the body yellowish; throat yellow and abdomen whitish; under surface of the thighs reddish. Iris bronzy with a very fine golden ring about the round pupil."

I can find no important difference between the tadpole of *X. mülleri* and that of *X. lævis* as described and figured by Bles (1905, Pl. XLI, figs. 22–24). It is, however, important to note that none of our series of ninety-five tadpoles show any indication of a branching of the tentacles so well described in *X. lævis* by Bles (*loc. cit.*, p. 814, text figs. *A*, *B*, *C*, and *D*).

HABITS.—All of the specimens were taken in waterholes, often only a few yards in diameter. When the smaller waterholes were bailed out, the frogs secreted themselves in the mud.

Our series of tadpoles, although nearly all taken at one time, are in most of the stages of development, the smallest measuring 32 mm. and the largest 87 mm. It is, therefore, evident that the breeding season is rather extended at any one locality.

In view of the very detailed observations (cf. especially Bles, 1905) as to the feeding habits of the tadpoles of *X. lævis*, any information as to the food of *X. mülleri* should be of value. I have examined the alimentary tract of a number of our tadpoles. These specimens were in various stages of development, ranging from 53 to 85 mm. in total length. In none of them did I find any small Crustacea. The alimentary tracts were packed tightly with a green material which consisted solely of algæ. Diatoms were very abundant, but unidentifiable green fragments formed the larger percentage of the mass.

Six specimens which had just lost their tails had their stomachs full of small worm-like, dipterous (?) larvæ. The stomachs of the fully adult specimens contained a more varied diet. Six small tadpoles of *Xenopus*, presumably the same species, were found in the stomachs of the six specimens examined. The stomach contents of these six specimens included also 12 termites, 2 beetles, 1 ant, 1 homopterous bug, and a small amount of mud.

MORPHOLOGICAL NOTE.—I have compared various stages in the development of the vertebral column in *X. mülleri* with the admirable account given by Ridewood for *X. lævis*. I find that the two species agree in all essential particulars except that the hypochordal cartilage is exceedingly thin and only distinguishable from the notochordal sheath when the latter is dissected free. It is not visible under the ordinary binocular nor in the microphotographs reproduced on Plate XXIV. I have not been able to compare my preparations directly with *X. lævis* but, judging from Ridewood's description and figures, the conditions in *X. mülleri* differ considerably from those of *X. lævis* and approach those of *Pipa* in that the hypochordal cartilage is reduced.

Another difference, to judge from Ridewood's description, is that the centra in *X. mülleri*, like the neural arches, begin to ossify from two centers and only in tadpoles which have well-developed appendages do these two parts unite to form the horizontal epichordal series of plates which Ridewood describes.

Xenopus tropicalis (Gray)

Silurana tropicalis GRAY, 1864, Ann. Mag. Nat. Hist., (3) XIV, p. 315 (Type locality: Lagos, West Africa); Proc. Zoöl. Soc. London, p. 458 (Lagos).

Xenopus (Dactylethra) calcaratus PETERS, 1875, Monatsber. Akad. Wiss. Berlin, p. 200 (Victoria, Cameroon).

Xenopus calcaratus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 458 (Lagos, West Africa). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 674 (Tumbo Island, BÜTTIKOFER, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). MATSCHIE, 1893, Mitt. Deutschen Schutzgebieten, VI, p. 214 (Togo). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 434 ("West Africa, from Liberia to the Congo"); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 61 (Cape St. John, Spanish Guinea). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 29 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 157 (French Congo: Fernand Vaz, N'Djole; Portuguese Guinea: Bolama; and Fernando Po). JOHNSTON, 1906, 'Liberia,' II, p. 833 (Liberia). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 510 (Cameroon: Assindinge, Bipindi and Duala); 1910, Arch. Naturg., LXXVI, part 1, p. 246 (Sadsche, Cameroon); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 69, figs. 149–150 (Cameroon localities of Nieden 1908; in addition, Makomo, Spanish Guinea). DESPAX, 1911, in Cottes, 'Mission Cottes au Sud-Cameroun,' p. 242 (French Congo). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 179 (West Africa). BOULENGER, E. G., 1914, 'Reptiles and Batrachians,' p. 243 (West Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 449 (N'Zerekoré French Guianea and Samikolé Liberia).

Xenopus mülleri ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 29 (Cameroon). (Not of Peters.)

Xenopus fraseri BOULENGER, 1905, Proc. Zoöl. Soc. London, II, p. 250 ("West Africa"). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 180 (West Africa). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 2 (Belgian Congo: Avakubi, Boga and Medje).

Xenopus tropicalis MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., XIV, p. 223 (Cameroon: Isongo and Mowange).

Two hundred and sixty-five specimens, all adult: one hundred and eighty-eight from Niapu, January 1914; three from the same locality, November 1913; eighteen from Medje, June 1914, one, July 1914, and nine, March 1910; eighteen from Avakubi, January 1914, one, February 1914, and one, October 1909; nineteen from Ngayu, December 1909; seven from Rungu, July 1913; and one from Banalia, September 1914.

DISTRIBUTION.—*X. tropicalis* is confined to the Rain Forest. Our specimens from Rungu were collected at the limits of the Rain Forest. Boulenger (1919) has recorded the species from the extreme eastern end of the Ituri. The species is apparently not rare throughout the forest.

RELATIONS.—Our series of specimens, especially the large number from Niapu, exhibit such a range of variation that there can be no doubt that *X. fraseri* is identical with *X. tropicalis*. Boulenger (1919) distinguishes the two by the difference of half a millimeter in the diameter of the eye and the same in the length of the tentacle. I find in our series that the large eye is not always associated with a long tubercle. In specimens of the same size, from the same locality, and identical even to the peculiar pale dorsal and occipital stripe, I find a variation of over a millimeter in the diameter of the eye and of slightly more than two millimeters in the length of the tentacles. The extremes are connected by every intermediate step and certainly no specific distinction may be made between them. The variation is not always constant in both tentacles or both eyes of the same specimen. For example, one specimen (No. 9791 from Avakubi, January 1914) has both eyes approximately 2.3 mm. in diameter but the tentacle of the right side is less than half a millimeter in length, while of the left side it is slightly over a millimeter in length.

X. clivii is apparently different from *X. tropicalis* in its constantly shorter tentacle and larger size. I strongly suspect that the specimens from Cameroon referred by Nieden (1908*a*, p. 511) to the former species are actually referable to the latter.

VARIATION.—It has been pointed out above that there is considerable variation in the length of the tentacles and less so of the eyes. A third variable feature is the coloration. In addition to the parietal band of pale brown already commented upon by Boulenger (1903), a pale vertebral stripe, several millimeters in width, may be present. One or both of these bands may be absent and either may or may not be bordered with blackish brown. The ventral surface in some of the specimens is heavily spotted with dark brown, but in general it is uniformly yellowish, indistinctly stippled with brown on the throat. In life the patterns were the same but the ground tone above was greenish not grayish brown.

X. tropicalis averages much smaller than its Sudanese relative, *X. mülleri*. The largest specimen (No. 9809) in our series measures 56 mm. from snout to vent; the smallest (No. 9790) 20 mm. The latter, in spite of its small size, is completely formed and has no rudiment of its larval tail.

HABITS.—At Medje, *X. tropicalis* was found "abundant in the well-shaded portions of the shallow brooks which drain the forest. The frogs when disturbed would seek refuge among the roots and drowned branches of the overhanging trees bordering the pool. One of these frogs when caught dropped from its mouth a tadpole, and other tadpoles were found in its stomach."

An examination of the stomachs of eleven specimens from Niapu and Medje showed that *X. tropicalis* takes a variety of food, but mostly insects which fall into the water. The stomachs contained: 25 soldier and worker termites, 5 ants, 3 bugs, 1 beetle larva, and fragments of other insects.

Bufonidæ[1]

Five genera of bufonids occur in Africa. Three of these are representatives of a relatively ancient dispersal, since they either belong to palæogenic groups (*Nectophryne* and *Pseudophryne*) or have no close affinities to any other African genera (*Werneria* and *Heleophryne*). The fifth genus, *Bufo*, is apparently a recent arrival in Africa. The twenty-eight species of the genus in Africa form such a heterogeneous assemblage that it seems probable that representatives of the group gained access to Africa at a number of different times, though probably always by way of the north.

The relationships of *Werneria* are not at all clear. *Werneria* may have descended from the stock which gave rise to *Notaden*. It possesses more internal features in common with the Australian than with the neotropical genera of bufonids. Its peculiar tongue is almost certainly an adaptation merely parallel to that of *Rhinophrynus* and without genetic significance.

Nectophryne may not be a natural assemblage. It would apparently express the genetic relationships of the species better to unite *Nectophryne* with *Pseudophryne* as Nieden (1915, p. 383) has suggested. The form of the terminal phalanges has been the chief basis for distinguishing these two genera. It is apparent from the photographs (Plate XXVI, figs. 3, 4) of the terminal phalanges of *N. afra*, the type of the genus, and *N. guentheri* of Borneo that there is considerable variation in the form of these structures within the genus. It is also apparent that some of the terminal phalanges of *N. afra* may more properly be called simple than T-shaped. The terminal phalanges of *Pseudophryne australis* have no

[1]For use of this name see Noble, 1922.

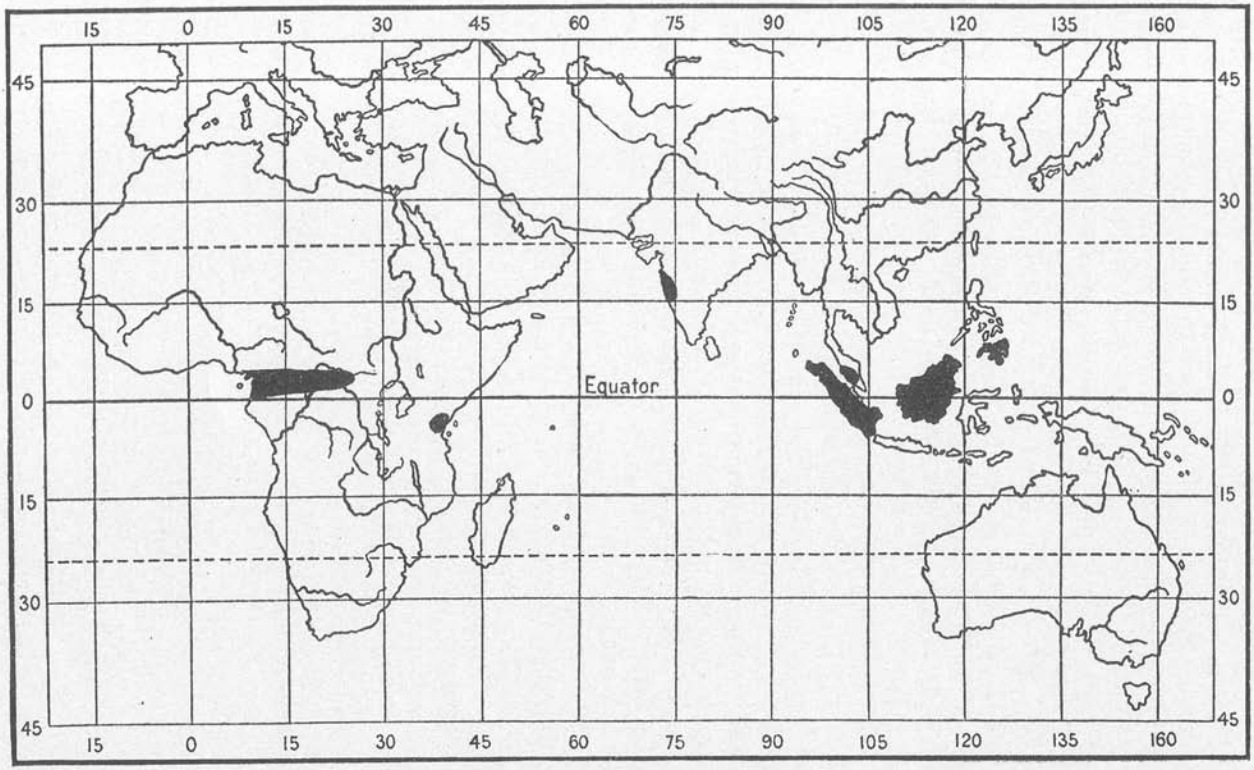


Fig. 3. Distribution of the Genus *Nectophryne*.

indication of the terminal swelling. The range of variation in the form of the terminal phalanges is much greater within the genus *Nectophryne* than between the type species of that genus and the type species of *Pseudophryne*. Nevertheless, it does not seem advisable to unite these two genera until the internal structure of *Pseudophryne* is better understood.

Boulenger (1888, p. 188) has regarded *Pseudophryne* as a toothless *Crinia* (see discussion in Noble, 1922). In other words, *Pseudophryne* might be considered a "leptodactylid." If this opinion can be confirmed, we shall have in Africa two toothed bufonid stocks for which to account. Probably the simplest way to avoid difficulty would be to assume a northern origin for both *Pseudophryne* and *Nectophryne*.

NECTOPHRYNE Buchholz and Peters

Of the sixteen species of *Nectophryne* recognized today, only five occur in Africa. The genus reaches its maximum differentiation in Borneo, where eight species occur. *N. afra* and *N. batesii* differ remarkably from all the other species of the genus in the possession of digital lamellæ. It would be well, perhaps, to distinguish these two with a subgeneric name.

The distribution of the genus is represented in Fig. 3. It is apparent that the genus, if natural, is a palæogenic one, for its distribution is very discontinuous.

The African species of *Nectophryne* may be distinguished by the following key.

a_1.—Digits flattened, bearing transverse lamellæ below.
  b_1.—Snout projecting well beyond the mouth.....*N. afra.*
  b_2.—Snout projecting only slightly beyond the mouth.....*N. batesii.*
a_2.—Digits not bearing lamellæ below.
  b_1.—Toes only half webbed.
    c_1.—Skin tubercular above.....*N. tornieri.*
    c_2.—Skin smooth above.....*N. wertheri.*
  b_2.—Toes more than half webbed.....*N. parvipalmata.*

Nectophryne afra Buchholz and Peters

Plate XXV, Figure 1; XXVI, Figure 4

Nectophryne afra BUCHHOLZ AND PETERS, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202, Pl. II, fig. 5 (type locality: Cameroon). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 279 (Cameroon); 1900, Proc. Zoöl. Soc. London, II, p. 436, fig. 1 (Benito River, Gaboon); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 25 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus.

Stor. Nat. Genova, (3) II, p. 159 (Fernando Po and French Congo: Fernand Vaz and N'Kogo). ROUX, 1906, Proc. Zoöl. Soc. London, I, p. 59 (Efulen, Cameroon and the Benito River, Gaboon). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507 (Fernando Po and Cameroon: Bipindi and Johann Albrechtshöhe). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1), Heft 2, p. 64, figs. 134–136 (Cameroon localities of Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, p. 135 (Bitye, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 82 (Cameroon: Bibundi, Isongo, and Mowange). BOULENGER, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 71, fig. (Spanish Guinea; Cameroon: Kribi, Alsok, Efulen, Zima Country and Bitye; Fernando Po; and southern Nigeria: Oban Hills).

One adult female, from Medje, June 1914 (A. M. N. H. No. 9451).

DISTRIBUTION.—The distribution given by Boulenger (1913) covers the range of the species as reported up to this time in the literature. Our single specimen from Medje adds another species to the list of frogs formerly known only from the Gaboon-Cameroon area but found by the expedition to occur also in the Ituri. *N. afra* will probably be shown to have a wide and uniform range throughout the Rain Forest.

RELATIONS.—*N. afra* and *N. batesii*, with their peculiar lamelliform pads on the feet, are so very different from all other species at present grouped under *Nectophryne* that they may be readily recognized. It is probable that they should be separated generically from their East Indian and East African relatives. *N. afra* is the type of the genus, and any new name proposed would not affect the species considered here.

VARIATION.—Our specimen in alcohol is a nearly uniform reddish brown above and yellowish below. In life it was "pale greenish above, fading to gray on the sides. A broad stripe of dark gray commenced at the snout and extended to just beyond the forelimb." No indication of a pattern was present such as is found in a specimen (A. M. N. H. No. 3145) of *N. afra* from the Ja River, Cameroon. The dorsal surface of this specimen is an ashy gray with two broad bands of cream-color extending along the sides. These bands are edged with brown, and a few dark spots appear on the sides below the bands.

Our specimen from Medje has perhaps attained the maximum size of the species. It is an adult female, larger than those reported by Boulenger (1913). The specimen measures 27 mm. from snout to vent and has its ovaries greatly distended with ova which measure 2.7 mm. in diameter.

HABITS.—Nothing is known about the breeding habits of *N. afra* but it is assumed that they are similar to those described by Boulenger (1913) for *N. batesii*.

The stomach of our single specimen contained only 4 ants.

Nectophryne batesii Boulenger

Nectophryne batesii BOULENGER, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 70, fig. (Type locality: Bitye on the Ja River, Cameroon).

A single adult male from Medje, June 1914. (A. M. N. H. No. 9452).

DISTRIBUTION.—The species is known only from the type series. Boulenger (1913) reported the occurrence of *N. batesii* on the Ja River in close association with *N. afra*, which it resembles very closely. The presence of both species at Medje is hardly surprising, since the Ja River forms part of the Congo River system.

RELATIONS.—Our specimen agrees entirely with Boulenger's original description of *N. batesii* and his comparison of it with *N. afra*. The snout of our specimen is equally as blunt as that of the type. Except for Bates' field observations (cf. Boulenger, 1913) no one would suspect that the two species were distinct.

VARIATION —Our single specimen of *N. batesii* is darker in alcohol than the specimen of *N. afra* from the same locality. In life it was a darker green and had a few irregular dark markings above. In alcohol the green has changed to reddish brown. Our specimen is apparently adult. It is a male, 22 mm. in length from snout to vent.

HABITS.—The observations of Bates upon the breeding habits of this species, reported upon by Boulenger (1913), form an interesting contribution to the life histories of batrachians.

The species is an ant-eater. The stomach of our specimen contained only 5 ants.

BUFO Laurenti

The nearly world-wide distribution of the genus *Bufo* (absent from Madagascar, Polynesia, and New Zealand) has been commented upon by many writers. Pfeffer (1905, p. 429) has suggested that *Bufo* may be a relatively recent but aggressive member of an otherwise old family. The absence of *Bufo* from Madagascar seems to support the opinion that the genus did not gain access to Africa until comparatively recent times, but considerable evidence is given in my earlier paper (Noble, 1922) to show that the family Bufonidæ as a whole is a derived and unnatural one.

Although more than one hundred and thirty species of *Bufo* are generally recognized, only twenty-eight occur in Africa. These have a heterogeneous distribution, twenty-one species being confined to open, mostly arid regions while only seven occur in the forest. Of these seven species, five are confined to the Rain Forest. Five species are peculiar to South Africa but the other fifteen species characteristic of open country cannot be said to be definitely restricted to certain faunal areas (except for *B. mauritanicus*, *B. viridis*, and *B. vulgaris*, which are restricted to the Mediterranean region).

The African species of *Bufo* may be distinguished from one another by the following key.

a_1.—First finger shorter than second.
  b_1.—Skin smooth above.....*B. preussi.*
  b_2.—Skin warty above.
    c_1.—Parotoid glands long, extending beyond shoulder.
      d_1.—Tympanum distinct.....*B. steindachneri.*
      d_2.—Tympanum absent.....*B. lönnbergi.*
    c_2.—Parotoid glands not extending beyond shoulder.
      d_1.—Tarsal fold present.....*B. buchneri.*
      d_2.—Tarsal fold absent.....*B. vittatus.*
a_2.—First finger equal to, or longer than, second.
  b_1.—Skin smooth above.
    c_1.—A prominent horn over each eyelid.....*B. superciliaris.*
    c_2.—No such horn over the eyelids.....*B. chevalieri.*
  b_2.—Skin warty above.
    c_1.—No distinct parotoid glands.
      d_1.—Tympanum large, close to eye.
        e_1.—A glandular lateral fold from behind the eye.....*B. carens.*
        e_2.—No glandular lateral fold.....*B. vertebralis.*
      d_2.—Tympanum much smaller than eye or absent.
        e_1.—Present.....*B. blanfordii.*
        e_2.—Absent.....*B. chudeaui.*
    c_2.—Parotoid glands more or less distinct.
      d_1.—Tympanum absent.
        e_1.—Snout rounded, parotoid glands small, narrow..*B. taitanus.*
        e_2.—Snout pointed, parotoid glands large, extending down sides. *B. anotis.*
      d_2.—Tympanum present.
        e_1.—No tarsal fold.
          f_1.—Subarticular tubercle of toes simple.
            g_1.—First finger much longer than second..*B. tuberosus.*
            g_2.—First finger a little longer than second...*B. funereus.*
          f_2.—Subarticular tubercle in part double.
            g_1.—First finger distinctly longer than second. *B. dombensis.*
            g_2.—First and second fingers subequal.

h_1.—Toes two-thirds webbed.....*B. vulgaris.*
h_2.—Toes one-third webbed.....*B. fenoulheti.*
e_2.—Tarsal fold more or less distinct.
f_1.—Subarticular tubercle double.....*B. mauritanicus.*
f_2.—Subarticular tubercle single.
g_1.—Toes at least half webbed.
h_1.—Parotoids small, oval, very distinct; dorsal surface covered by scattered but very prominent tubercles.....*B. polycercus.*
h_2.—Parotoids large, dorsal surface covered by indistinct warts.
i_1.—Tarso-metatarsal joint reaching eye or nearly as far.....*B. viridis.*
i_2.—Tarso-metatarsal joint reaching tympanum. *B. pentoni.*
g_2.—Toes less than half webbed.
h_1.—First finger longer than second.
i_1.—Flanks distinctly marked off from dorsal surface by dorso-lateral fold and by contrasting colors.....*B. brauni.*
i_2.—Flanks not distinctly marked off from dorsal surface.
j_1.—Tympanum as large or nearly as large as eye.....*B. regularis.*
j_2.—Tympanum two-thirds the diameter of eye.....*B. dodsoni.*
h_2.—First finger nearly equal to second.
i_1.—Snout pointed; tympanum larger than eye. *B. lemairii.*
i_2.—Snout rounded, tympanum smaller than eye.
j_1.—Tarso-metatarsal articulation not reaching beyond tympanum. *B. gariepensis.*
j_2.—Tarso-metatarsal articulation extending to eye or nearly as far. *B. angusticeps.*

Bufo regularis Reuss

Plate XXVII

Bufo regularis Reuss, 1834, Mus. Senckenberg., I, p. 60 (type locality: Egypt). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298 (Egypt, three localities; Abyssinia, Zambezi, Gambia, Old Calabar, Carangigo, Duque de Bragança, Midian, Coast of Guinea, Sierra Leone, Cape of Good Hope, Port Elizabeth, Port Natal). Peters, 1882, 'Reise nach Mossambique,' p. 178 (Mozambique, seven localities mentioned). Vaillant, 1882, 'Faune et Flore Pays Çomalis,' p. 25 (Bender-Meraya). Fischer, 1884, Jahrb. Hamburg. Wiss. Anst., I, p. 26 (British East Africa: Naivasha Lake Region). Tristram, 1884, 'Survey of

Western Palestine,' p. 160 (Western Palestine). VAILLANT, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini); Bull. Soc. Zool. France, IX, p. 353 (Effirou, Assini). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Gold Coast). DOLLO, 1886, Bull. Mus. Roy. Hist. Nat. Belgique, IV, p. 152 (Egypt, Senegambia, Gaboon, South Africa). PARENTI AND PICAGLIA, 1886, Atti. Soc. Modena, Mem., (3) V, p. 77 (Red Sea). BOCAGE, 1887, Jorn. Sci. Lisboa, (1) XI, pp. 192, 208 (Angola: St. Salvador du Congo and Mossamedes). BOETTGER, 1887, Ber. Senck. Ges., p. 171 (Cape Town). GÜNTHER, 1888, Proc. Zoöl. Soc. London, p. 51 (Monbuttu, Upper Congo). PFEFFER, 1889 (1888), Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 12 (Mhondo, Ungúu). BOETTGER, 1889, Ber. Senck. Ges., p. 291 (Pondoland). HÉRON-ROYER AND VAN BAMBEKE, 1889, Arch. Biol., IX, p. 297, Pl. XXIV, figs. 7–9 (tadpole, no locality). SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286 (Boma, Congo). BOETTGER, 1890, 'Kat. Batr. Mus. Senck.,' p. 35 (Dahalak Island, Gaboon, Egypt, Abyssinia). BÜTTIKOFER, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, pp. 258 and 689 (Tumbo and Cape Colony). GÜNTHER, 1892, Proc. Zoöl. Soc. London, p. 555 (Shiré Plateau, British Central Africa). MATSCHIE, 1892, Sitzber. Ges. Naturf. Freude Berlin, p. 110 (Usambara, German East Africa); Zool. Jahrb. (Syst.), V, p. 610 (Transvaal). PFEFFER, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 103 (German East Africa: Usegua, Quilimane, Mhonda). BOETTGER, 1893, Zool. Anz., XVI, p. 132 (Somaliland). MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 55 (reprint) (Togo). STEJNEGER, 1893, Proc. U. S. Nat. Mus., XVI, p. 737 (Tana River; Kilimanjaro). TRIMEN, 1893, in Noble, 'Illustrated Official Handbook of the Cape and South Africa,' p. 87 (South Africa). GÜNTHER, 1894, Proc. Zoöl. Soc. London, p. 88 (East Africa, vicinity of Mt. Kenia). BOCAGE, 1895, 'Herpétol. Angola,' p. 185 (Duque de Bragança, St. Salvador du Congo, Mossamedes, Bihé, Benguella, Pungo-Andongo, Caconda, Dombe). BOULENGER, 1895, Ann. Mag. Nat. Hist., (6) XVI, p. 169 (Goolis Mts.); Proc. Zoöl. Soc. London, p. 540 (Somaliland). GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 526 (Shiré Highlands; Buddu). JEUDE, 1895, Notes Leyden Mus., XVI, p. 230 (Transvaal: confluence of Comati and Crocodile Rivers). ANDERSON, 1896, 'Herpétol. Arabia and Egypt.,' p. 110 (Arabia: Median; Egypt: several localities of Anderson 1898). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 81, 96, 114, 119 (Portuguese Guinea, Mozambique, Angola, Transvaal). BOULENGER, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554 (Saati, Chinda, Eritrea); (2) XVII, pp. 14, 22 (Dabanac, Elba, Web Valley, Dolo, Magala Umberto, Degagolla, Coromma in Gallaland; Bravia, Matagoi, Lugh, Web in Somaliland); Proc. Zoöl. Soc. London, p. 217 (Lake Abeia, Lake Stephanie). MOCQUARD, 1896, C. R. Soc. Philom. Paris, No. 19, p. 45 (Upper Ubangi). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 160 (German East Africa, fourteen localities). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Transvaal). BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 281 (Zambi, Congo); Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 722 (Somaliland: Lugh, Badditu-Dime; Sancurar-Amarr Region); (2) XVII, p. 280 (Somali-Gallaland); Proc. Zoöl. Soc. London, p. 801 (Northern Nyasaland, five localities). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a*

(Nyasaland). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa); ANDERSON, 1898, 'Zoöl. Egypt.,' I, p. 353 (Egypt, nine localities). SCLATER, 1898, Ann. S. African Mus., I, p. 108 (South Africa). TORNIER, 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 303 (German East Africa). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202 (Barombi Station; Victoria, Cameroon). BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 435 ("Whole of Africa with the exception of Barbary"); 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Mwero). STEINDACHNER, 1901, Denkschr. Akad. Wiss. Wien (math.-natur.), LXIX, p. 335 (Mekka and vicinity). BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland); in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 342 (Windhoek, German Southwest Africa). ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and the White Nile,' 1901, I, fasc. 4, p. 12 (White Nile, Mahmudia). CAMERANO, 1904, Mem. Acad. Sci. Torino, (2) LIV, p. 247 (Wadi Halfa, Sudan). PERACCA, 1904, Boll. Mus. Torino, XIX, No. 467, p. 6 (Eritrea). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Angola: Duque de Bragança, Pungo Andongo, Locomi, Canhoca, Marimba, between Benguella and Bihé); Proc. Zoöl. Soc. London, II, p. 250 (South Africa: Umfolosi Station, Hluhluwe Stream, Ngoye Hills, Wakkerstroom). SCLATER, 1905, in Flint and Gilchrist, 'Science in South Africa,' p. 149 (South Africa). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Portuguese Guinea: Bolama, Bissao, Farim, Rio Cassini; French Congo: Fernand-Vaz, Lambaréné). JOHNSTON, 1906, 'Liberia,' II, p. 833 (Liberia). CALABRESI, 1906, Mointore Zool. Ital., XXVII, p. 37 (Bardera, Somaliland). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 24r4 (Part: Bibundi, Cameroon). BOULENGER, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, No. 12, p. 4 (Northern Rhodesia: Lukashashi Rive, Petauke, Mterige River); Proc. Zoöl. Soc. London, p. 479, Pl. XXI (color) (Transvaal: Woodbush, Klein Letaba; Portuguese East Africa: Coguna, Beira). WERNER, 1906, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1907 (Gebel Sarsur on the White Nile, Khor Attar, Mongalla, Gondokoro). BOULENGER, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands); Ann. Natal Mus., I, p. 221 (Zululand: Mseleni, Indukuduku). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507 (Cameroon: Barombi, Kribi, Bipindi, Ossindinge, Jaunde, Garua, Deidodorf, Ngoko). ODHNER, 1908, Ark. Zool. Stockholm, IV, No. 18, p. 7 (Durban; Lake Sibayi). BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 193 (Tzeghie, Abyssinia); p. 304 (Sesse Islands); CHUBB, 1909, Proc. Zoöl. Soc. London, p. 591 (Matabeleland: Bulaway, Matopos). PELLEGRIN, 1909, Bull. Soc. Zool. France, XXXIV, p. 205 (Egypt: Wadi Halfa, Singa, Rahad River, Roseires). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 175 (Ruwenzori). ANDERSSON, 1910, Jahrb. Nassau. Ver. Naturk., LXIII, p. 205 (Harrar, Abyssinia). BOULENGER, 1910, Ann. S. African Mus., V, p. 536 (Cape Colony, nine localities; Transvaal, three localities; Southern Rhodesia; Orange River Colony). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 26 (Kibonoto, Usambara, Tanga, Meru Steppe). MEEK, 1910, Publ. Field Mus. Zoöl., VII, No. 11, p. 404 (British East Africa: Athi Plains, Molo, Lake Elmenteita). NIEDEN, 1910, Arch. Naturg., LXXVI, Beiheft 1, p. 246

(Cameroon: Garua, Dodo, Banjo Range); 'Fauna Deutschen Kol.,' (1), Heft 2, p. 67, figs. 143 and 144 (Cameroon: Longo, Bamenda and localities of Nieden, 1908); Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (Tanga, German East Africa). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 102 (Uganda: German East Africa: Bukoba, Busoga, Biaramuli). WERNER, 1910, in Schultze, 'Zool. und Anthrop. Ergeb. Forschungreise im West und Zentr. Süd-Afrika,' IV, p. 291 (Kalahari, Okahandja, Cape Town). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 34 (British East Africa: Mombassa, Meruboma, Escarpment). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Cameroon; Gaboon; Angola). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Bussu, Bululo, Mbale). HEWITT, 1911, Rec. Albany Mus., II, part 3, pp. 227–228 (Transvaal; Kimberley, King William's Town, Grahamstown, Cape Town). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Monrovia, Liberia; Harrar, Abyssinia; Dehane and Tanga, Cameroon). STERNFELD, 1911, 'Fauna Deutschen Kol.,' (4) Heft 2, p. 58 (German Southwest Africa: Windhuk, Okahandja, Klein-Namaland, Kalahari). BOULENGER, 1912, Ann. Mus. Stor. Nat. Genova, (3) V, p. 332 (Abyssinia: Dolo Webi Mana). HEWITT, 1912, Rev. Albany Mus., II, part 4, p. 281 Modder River, Knysna, Oudtshoorn, Kaimans River). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 185 (Bukoba, Bwanja, Karagwe, Ussui, Ruanda shores and islands of Lake Kivu, Ruasa, Mtualen Gahama, south end of Lake Albert Edward, Beni, Bomeli, Usumbura, Uvira, northwest bank of Tanganyika, and Bugoie). PERACCA, 1912, Annuar. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 8 (Lake Bangueolo, Sekantui, Luangasci; Rhodesia). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 223 (Africa). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 349, 356, 357, 360, 362, 365 (Pemba, Lamu Island, Mikindame, Dar-es-Salam, Usambara, Kilimanjaro). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 173 (South Africa: thirteen localities). KLAPTOCZ, 1913, Zool. Jahrb. (Syst)., XXXIV, p. 289 (French Guinea: Konkoure, Mamou, Dabola). NIEDEN, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (Windhuk, German Southwest Africa). WERNER, 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719 (Port Elizabeth). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 384 (German East Africa, twenty-four localities; Portuguese East Africa, five localities; British East Africa, eleven localities). WERNER, 1915, in Michaelsen, 'Beiträge zur Kenntnis der Land und Süsswasser Fauna Deutsch-Süd-Westafrikas,' part 3, p. 371 (German Southwest Africa: Okahandja, Tsumeb, and Windhuk). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Timbuctu, French West Africa; Agouagon, Dahomey). WERNER, 1919, Denk. Akad. Wiss. Wien, XCVI, p. 452 (Anglo-Egyptian Sudan: several localities). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 420 (British and German East Africa; several localities). CHABANAUD, 1921, Bull. et. Hist. et Scient. A. O. F., p. 449, (French Guinea and Liberia).

Bufo regularis var. *spinosa* BOETTGER, 1888, Ber. Senck. Ges., p. 100 (Lower Congo: Quilu, Loango, Banana, Boma, Quanza).

Bufo pantherinus COPE, 1889, Bull. U. S. Nat. Mus., No. 34, Pl. LX. MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 137 (Nubia and Cape Ceres).

Bufo garmani MEEK, 1896, Publ. Field Mus. Zoöl., I, No. 8, p. 176 (Haili, Somaliland).

Bufo benguelensis ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 26 (Cameroon). (Not of Boulenger 1882.)

(For bibliography of this species *ante* Boulenger 1882, refer to Anderson, 1898, p. 353.)

Sixty-two specimens, six of which are immature: thirteen from Medje, March 4 and August 29, 1910, August 31, 1913, April and June 1914; eight from Stanleyville, August 4, August 21, 1909, and March 30, 1915; four from Avakubi, October 3, 1909; six from Faradje, February 17 and 22, 1911, October 4 and 22, 1912; nine from Garamba, May and June 1912; ten from near Lié, July 26, 1909; three from Niangara, November 1910; two from Akenge, September 1912; and one from each of the following localities: Leopoldville, July 9, 1909; Lukolela, July 17, 1909; Bafwaboka, December 3, 1909; Nepoko, March 4, 1910; Poko, August 1913; Thysville, June 2, 1915; and Boma, June 15, 1915. (A. M. N. H. Nos. 8406–8463; 8582–8585.)

DISTRIBUTION.—Although it has been generally assumed that *B. regularis* is widely distributed throughout all of Africa except Barbary, Boulenger in 1900 and again in 1905 mentioned that he had not observed any specimens recently taken in the Cameroon-Gaboon area. Nieden (1908*a*) in referring to the latter statement lists a number of Cameroon specimens. *B. regularis* occurs throughout the Ituri forest as the above-mentioned localities indicate, but it was found most abundantly, and in some localities only, in the clearings about habitations. This apparent preference of *B. regularis* for clearings may account for its absence in the Cameroon collections reported upon by Boulenger.

VARIATION.—The specimens in our series (maximum head and body length, 98 mm.; minimum, 18 mm.; average, 73 mm.) vary in color from a pale yellowish, blotched with gray, to a uniform blackish brown. Only one specimen (No. 8412, Garamba, June 1912) shows any indication of the bright pink tones mentioned by Boulenger (1907*e*, p. 479, Pl. XXI). Some of the specimens in the series from the savannahs of Garamba can be matched in the series from the forest about Stanleyville. In life the majority of the specimens were some tone of "brown blotched with a darker brown; the iris a silvery brown with a golden band across its horizontal axis."

B. regularis shows a slight sexual dimorphism other than size. Our large series of thirty-four females, nineteen males, and three very young individuals shows that this dimorphism is not a constant feature. The majority of breeding males are spiny, each wart on the back consisting of a single spine surrounded by a group of smaller ones. The majority of

females are not spiny but possess large flat warts on their dorsal surfaces. Five sexually mature males are not spiny and, except for some indication of digital asperities (absent in one), more slender body form, and slightly smaller size (marked difference in some specimens), cannot be distinguished externally from the breeding females of the same localities. Six of the females show an indication of spinosity. These specimens have more or less of the dorsal warts replaced by spines, but these spines are single, not compound as in the males. *B. regularis* is like *B. marinus* of South America in its ubiquity, but is unlike that species in that the spinosity of breeding males is not a constant character.

HABITS.—An examination of the sexual organs of the series of specimens has allowed me to infer that the breeding season of *B. regularis* is extended in the Belgian Congo through several months. One of two females (Nos. 8449–8450) taken at Avakubi, October 3, 1909, has the ovaries greatly distended with large ova, while the other has the "pepper and salt" gonads characteristic of the time directly following oviposition. One of another pair (Nos. 8444–8445) from Medje, August 29, 1910, has the distended ovaries, while the other has the post-oviposition condition. None of the females taken in any part of the Belgian Congo from November to March have the ovaries enlarged. April and May specimens show intermediate conditions. Two specimens from Akenge taken in September 1913 are both females exhibiting the "pepper and salt" ovaries. One specimen (No. 8451) from Stanleyville, August 21, 1909, possesses very large ova. The majority of the females taken in Medje during August have distended ovaries. It seems probable that the breeding season of *B. regularis* in the Rain Forest is extended through the months of August, September, and early October.

The breeding season of *B. regularis* throughout the rest of Africa varies according to the locality. Fischer (1884) states that breeding pairs were found in the vicinity of Naivasha Lake, British East Africa, on May 11. Andersson (1911) reports mated pairs in the vicinity of Nairobi on April 11, 1911, while Lönnberg (1910) gives a detailed account of a breeding chorus at Kibonoto, Kilimanjaro, on July 26, 1905. Hewitt and Powers (1913) discuss the breeding of *B. regularis* in South Africa:

> At Modder River the breeding season commences about the end of September or beginning of October, when the males resort to little pools amongst the rocks and during night-time make loud and incessant calls to attract the females; the vocal sac, bluish in color, becomes inflated to about twice the size of the head. The male call resembles the hoarse "wook-wook" of duck, and the female responds with a call like "woop," followed by a quick "wop-wop."

The field notes of Mr. Lang indicate that these toads do not confine their croaking to the time when they are in the water: "Five large toads taken at Stanleyville, August 4, 1909, were found catching insects about the palm oil lamps which light the roads. They were frequently observed to catch small moths. These toads croaked very loudly at intervals, often repeating their call for the duration of half a minute."

Thirty-eight stomachs contained food which consisted of 377 worker and soldier termites and the débris of many others; 46 beetles (carabids, curculionids, dung-beetles, etc.); 474 ants (males, females, and workers), and the débris of others; 7 heteropterous and 1 homopterous insects; 10 myriopods (julids, scolopendrids, etc.); 4 spiders; 30 dipterous larvæ; 5 caterpillars; 3 isopods; 3 crickets; 1 grasshopper; 1 earwig; 2 leafhoppers; 5 caddice-flies; and 4 snails (*Limicolaria*, etc.).

Snakes are known to feed on *B. regularis*. A specimen (A. M. N. H. No. 12303) of *Leptodeira hotamboeia* taken at Garamba, July 5, 1912, disgorged a specimen of *B. regularis* which hopped away as soon as released. Another toad of the same species was found in its stomach.

Bufo funereus Bocage

Plate XXVIII, Figure 1

Bufo funereus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77 (type locality: Duque de Bragança, Angola). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' pp. 281 and 475. Bocage, 1895, 'Herpétol. Angola,' p. 186 (Angola: Duque de Bragança and Caconda); 1897, Jorn. Sci. Losboa, (2) IV, p. 205 (Angola: Duque de Bragança and Caconda); 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po and French Congo). Ferreria, 1906, Jorn. Sci. Lisboa, (2) VII, p. 166 (Angola). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 509 (Longji, Cameroon). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge LIV, No. 2, p. 136 (Efulen, Cameroon). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Dahomey).

Bufo benguelensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 299, Pl. xix, fig. 3 (Benguella and Fernando Po).

Bufo gracilipes Boulenger, 1899, Ann. Mag. Nat. Hist., (7) III, p. 276, Pl. xii, fig. 2 (Benito River, Gaboon); 1900, Proc. Zoöl. Soc. London, p. 436 (locality of Boulenger 1899); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John).

Bufo regularis Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (part: Bibundi, Cameroon). (Not of Reuss, 1834.)

Seventy-two specimens ranging in size from 31 to 62.5 mm.: twenty-seven from Medje, one specimen September 14 and two September 23, 1910, one specimen in March, four in April, three in April or May,

thirteen in June and three in July 1914; sixteen specimens from Akenge, September and October 1913; thirteen specimens from Niapu, November 1913 and January 1914; four specimens from Niangara, November 1910 and June 1913; three specimens from Avakubi, October 31, 1909 and January 10, 1914; two specimens from Ngayu, December 12 and 20, 1909, two specimens from Boyulu, September 22, 1909; and one specimen from each of the following: Bafwaboli, September 13, 1909; Bafwamoko, September 14, 1909; Batama, September 16, 1909; Bafwasende, September 23, 1909, and Poko, August 1913. (A. M. N. H. Nos. 8510–8581.)

DISTRIBUTION.—The fact that *B. funereus* was found by the American Museum expedition only in the Rain Forest or outlying forest galleries, such as Niangara, renders the reported distribution of the species difficult to interpret. Careful comparison of specimens from southern Angola with those from the Rain Forest should be made before any explanation is offered for the unusual distribution. The species has not been found to extend its range into the savannah areas lying to the north or to the east of the Rain Forest, and there seems to be no reason for the appearance of the species in southern Angola.

VARIATION.—*B. funereus* has been carefully described by Boulenger (1900) under the name of *B. gracilipes*. It is a very distinct species of toad, with its numerous, closely set warts above, narrow paratoids, and rather slim head. It could be confused only with the male of *B. regularis*. The absence of tarsal fold and short first finger distinguishes it from that species. Still young individuals sometimes have an indication of a tarsal fold (as in No. 8516), or at least have the outer tarsal warts arranged in a straight line, simulating a fold. These young specimens may be distinguished from the young of *B. regularis* by the smaller, more numerous granules of the back, narrower paratoids, and slight instead of distinct tarsal fold.

The majority of the specimens in the series are nearly a uniform brown above, indistinctly marbled with a darker tone. Few of the specimens possess a well-defined pattern. This consists of two pairs of dark spots on the back and two pairs on the head, one pair of the latter being in front, and the other behind the orbits. The sides of the body are reticulated with a dark brown and the legs are crossbanded. Two of the males, which are less warty than the females, have the ground tone of the back a yellowish gray, and one specimen (No. 8457) has the legs heavily washed with a blackish brown. In life *B. funereus* was "brownish above with irregular dark markings. The sides of the body were distinctly lighter and there was an indication of a light vertebral line."

One specimen (No. 8518) from Ngayu, December 12, 1909, was "rusty brown above, pinkish on the chest and yellowish gray on the abdomen. The iris was light bronze."

The majority of the males in our series may be readily distinguished from the females by their smaller size and smoother dorsal skin. The male (No. 8550) of a pair taken in embrace at Niangara, November 1910, is distinctly smaller than the female (No. 8551), being only 46 mm. in length as against 62 mm. But a breeding pair taken at Medje on September 23, 1910, does not show this difference, the male measuring 40 mm. and the female 49. Ten of the seventeen males have only a few scattered tubercles above, and not the dense matting of fine tubercles given as characteristic of the species. But six of the males, all from Niapu, January 1914, are exactly as tubercular above as the females. One male from Boyulu, September 22, 1909, represents an intermediate condition. It is apparent that smoothness of skin is not a constant feature in the male.

HABITS.—*B. funereus* was often taken "under dead tree trunks and among the leaves about the plantations. One was found in the rest house at Bafwamoko. The majority were collected in the forest under fallen trees and other dead wood."

This species has perhaps a more extended breeding season than any of the other toads in the collection. Pairs in embrace were taken at Avakubi on October 3 (1909). At Niangara breeding pairs were observed about the middle of November (1910). Females with greatly distended ovaries were taken in July (Medje, 1914), on September 14 (Medje, 1910) on September 23 (Bafwasende, 1909), on December 12 (Ngayu, 1909) and in the middle of January (Niapu, 1914). This difference of sexual maturity is not wholly dependent upon difference in locality. Two specimens of nearly the same size (Nos. 8557 and 8558) taken at Medje on June 6, 1910 exhibit a great difference in the degree of development of their ova. Moreover, I fail to find any marked uniformity from any other locality, although such uniformity is the rule in the other species of toads. Males possess well-developed nuptial asperities from June 6 (Medje, 1914) to January 10 (Avakubi, 1914). But, since all except one of the seventeen males in the collection have some indication of the nuptial asperities, too much emphasis should not be laid upon the development of these structures. Sexual maturity in *B. funereus* is very irregular, which condition may indicate a prolonged breeding season.

The stomachs of sixty-two specimens contained food. This consisted of 426 worker termites, 86 winged termites and the fragments of

many others; 59 beetles (Curculionidæ, longicorn, etc.) and the fragments of others; 735 worker ants and the heads of a few others; 2 hymenopterous insects (a psammocharid and a mutillid); 1 heteropterous and 3 hemipterous insects (Reduviidæ, etc.); 6 myriopods (julids, polydesmids, etc.); 6 spiders, 6 caterpillars; 3 roaches; 2 earwigs; 1 grasshopper; and 1 leaf-hopper.

Bufo tuberosus Günther

Bufo tuberosus GÜNTHER, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 60, Pl. III, fig. C (type locality: Fernando Po). PETERS, 1875, Monatsber. Akad. Wiss. Berlin, p. 202 (Abo, Cameroon). BOULENGER, 1880, Proc. Zoöl. Soc. London, p. 572 (Fernando Po; Gaboon); 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 304 (Fernando Po; Gaboon); 1887, Proc. Zoöl. Soc. London, p. 565 (Rio del Rey, Cameroon). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202 (Cameroon). BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 435 (Benito River, Gaboon); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, Heft 4, p. 509 (Victoria, Johann-Albrechtshöhe, Bipindi, Cameroon; Makomo, Spanish Guinea). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Mundame, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' I, Heft 2, p. 68, fig. 147 (Victoria, Johann-Albrechtshöhe, Bipindi, Cameroon). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Kribi, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 220 (Cameroon: Bibundi and Campo).

Six specimens, varying in size from 27.5 mm. to 68 mm. in length (snout to vent): Ngayu, three specimens, December 12; one, December 16, 1909; Bafwabaka, one specimen, probably December 1909; Medje, one specimen, April-May 1910 (A. M. N. H. Nos. 8400–8405).

DISTRIBUTION.—The range of *Bufo tuberosus* is considerably extended by the discovery of these six specimens in the Ituri forest. No doubt further collecting will demonstrate that the species is widely distributed throughout the Rain Forest. But no specimens have as yet been taken west of Cameroon.

VARIATION.—*Bufo tuberosus*, with its prominent egg-shaped parotoid glands and scattered dorsal spines, cannot be confused with any other forest toad. It has been so minutely described by Boulenger (1880, pp. 572–573) that little further need be said here. In none of the specimens of our series are the parotoid glands as large as those indicated by Günther (1858, Pl. III, fig. *C*). These structures vary in size from one-half (smallest specimen) to two-thirds (two largest specimens) the diameter between their anterior borders and the nostrils, and do not equal that distance as shown in Günther's excellent figure.

The specimens in our series are not brightly colored and do not present the vertebral line mentioned by Boulenger (1900, p. 435). The predominating tones are grays and browns. The four specimens from Ngayu are somewhat differently colored from the other two in the series. The ground tone above is a pale gray, becoming white below. The dorsal surface is heavily blotched with steel-gray while the ventral surface is more or less marbled with same color. This marbling is so extensive in one specimen (No. 8403) that the white tone has a stippled appearance. The other two specimens in the series are from northern localities. Their dorsal gray tones are suffused with a dark brown and there are no marblings on the ventral surfaces, which present a uniform muddy appearance.

HABITS.—Little is known about the habits of *B. tuberosus*. Most of the specimens in our series were "caught by pygmies in the forest; and were said to live in the swamps."

Five of the specimens contained food in their stomachs. This consisted of 121 termites (workers and soldiers of two species), 38 ants (workers of several species); one beetle (Curculionidæ); and one ichneumonid wasp.

Bufo polycercus Werner

Plate XXVIII, Figure 2

Bufo polycercus WERNER, 1897, Sitzber. Akad. Wiss. München, XXVII, p. 211 (type locality: Cameroon); 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719.

Bufo latifrons BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 435, Pl. XXVII, fig. 1 (Benito River, Gaboon); 1906, (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po). (?) CALABRESI, 1906, Monitore Zool. Ital., XXVII, p. 37 (Southern Somaliland). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 508 (Cameroon: Barombi, Victoria, Bipindi, Johann-Albrechtshöhe, Longji, Jaunde, and Jabassi; Spanish Guinea: Makomo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 67, Figs. 145 and 146 (Cameroon, same localities as Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Efulen, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Cameroon: Bibundi, Dehane, and Isongo). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush', p. 470 (Nigeria). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, pp. 186 and 191 (South end of Lake Albert Edward; Entebbe on Lake Victoria; and forest between Mawambi and Avakubi, Belgian Congo); 1915, Mitt. Zool. Mus. Berlin, VII, p. 386 (same as Nieden, 1912).

Bufo regularis WERNER, 1900, Arch. Naturg., LXVI, part 2, p. 58 (not of Reuss 1834). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 417 (French Guinea). STEINDACHNER, 1906, Ann. Hofmus. Wien, XXI, p. 154 (Cameroon).

Forty-six specimens, all adult: twenty-three from Medje, seven of which were taken during April-May 1910, one on August 29, 1910, one in March 1914, seven in April 1914, six in June 1914, and one in July 1914; eighteen specimens from Akenge, September and October 1913; two from Gamangui, February 18, 1910; two from Niapu, November 1913 and January 1914; and one from Ngayu, December 19, 1909. (A. M. N. H. Nos. 8464–8509.)

DISTRIBUTION.—*B. polycercus* is apparently confined to the Rain Forest and outlying forest islands. Except for one very dubious record of *B. polycercus* in southern Somaliland (Calabresi, 1906), no specimens have ever been taken in other than forested regions. Our forty-six specimens help to confirm the opinion of Nieden (1912, p. 191) that this species has a continuous range throughout the Rain Forest.

RELATIONS.—*B. polycercus* has been confused with *B. regularis* by various authors, and it is probable that some of the specimens recorded from the Rain Forest as *B. regularis* may yet prove to be referable to the former, more typical, forest species. The distinguishing characters given by Boulenger (1900, p. 435), but more especially those pointed out by Nieden (1908*a*, p. 509), are very apparent in our two large series of specimens. As Nieden has indicated, the chief difference lies in the wartiness of the skin. *B. regularis* never possesses the large pointed warts on the sides of the body. Even when the dorsal surface of *B. polycercus* is nearly smooth, the lateral spines are prominent forming a ready means of distinguishing the two species.

The largest warts in *B. polycercus* are arranged as in *B. tuberosus* in a group just behind each angle of the mouth. Both species occur together in the Rain Forest. The former, however, is readily distinguishable from the latter by its narrow, elongate parotoids.

VARIATION.—The color of most of our specimens has faded in alcohol to some tone of brown indistinctly marked with black. In a few of the specimens the pattern is very distinct. It consists of two pairs of black spots, one pair on the scapular, the other on the sacral region, and one or two dark interorbital bars. The limbs are crossbarred with black and the sides vermiculated with the same color. A light vertebral line is generally present. In our brightest specimens (Nos. 8493 and 8496, females from Akenge, September 1913) the sides were tinged with salmon. This coloration served to distinguish the toad in the field. The description made in the field of one of the specimens (No. 8493) mentioned above may be taken as characteristic of the species: "Ground tone brown above, grayish or greenish on the limbs; the dark spots on

the back a velvety black; sides of the head and body tinged with a rich pink; vertebral surface whitish changing to pink posteriorly. Iris silvery gray."

HABITS.—One pair of the toads was taken in embrace at Akenge during October 1913. Only one other male was found, that at Medje during May and June 1914. An examination of the ovaries of the forty-four females in the series has allowed me to infer that the breeding season may extend through more than one month. The ovaries of one specimen (No. 8497) taken in September at Akenge exhibit post-oviposition conditions. Mature ova are found in three specimens (Nos. 8481–8483) from Medje taken in June and July, and nearly mature ova in another specimen (No. 8491) taken in May at the same locality. The ovaries of three specimens (Nos. 8506, 8505 and 8501) from Akenge, October 1913, are greatly distended. No specimen from any locality taken between the months of November and April have the ova at all enlarged. It is evident that the ova of *B. polycercus* reach maturity between the months of May and October.

The stomachs and intestines of nearly all the specimens contained parasitic worms. Several of the stomachs were covered with numerous cysts. The intestine immediately posterior to the pylorus of one specimen (No. 8504) possessed a large rent. Since the edges of the rent were curled back and hardened, the wound must have been made before the capture of the toad. In spite of this opening of the alimentary tract into the cœlum, the stomach of the toad contained food and the usual parasitic worms were found in the intestine.

Forty-two stomachs contained food: 41 winged termites and 234 workers; 72 beetles (Curculionidæ; Staphylinidæ, etc.); 14 male and female ants and 393 workers; 2 wasps (*Polybioides tabida* and *P. melaina*); 2 heteropterous and 6 hemipterous insects (Reduviidæ, etc.), 5 dipterous larvæ; 16 myriopods (Julidæ, Scolopendridæ and Polydesmidæ); 14 spiders; 12 caterpillars; 4 beetle larvæ, 2 isopods; 1 grasshopper; 1 cricket; 1 leaf-hopper; and 1 snail.

Bufo polycercus is fed upon by snakes and probably other animals. Partial remains of this toad were found in the stomachs of two specimens of *Dipsadoboa unicolor* (A. M. N. H. Nos. 12474 and 12475) taken at Medje during March 1914.

Bufo superciliaris Boulenger

Plate XXV, Figure 2

Bufo superciliaris BOULENGER, 1887, Proc. Zoöl. Soc. London, p. 565 (type locality: Rio del Rey, Cameroon); 1890, p. 325 (Rio del Rey, Cameroon); 1900, p. 436

(Benito River, Gaboon; and the Belgian Congo). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 26 (Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 510 (Cameroon: Victoria, Bipindi, and Kribi). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN 1910, 'Fauna Deutschen Kol.,' (1), Heft 2, p. 66, fig. 142 (Spanish Guinea: Makomo; Cameroon; localities of Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 136 (Ja River, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Cameroon: Dehane and Campo). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). BOULENGER, E. G., 1914, 'Reptiles and Batrachians,' p. 224, fig. (Cameroon).

Bufo lævissimus WERNER, 1897, Sitzber. Akad. Wiss. München, XXVII, p. 212 (Cameroon); 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202, Pl. II, fig. 1 (Cameroon).

Bufo superciliosus WERNER, 1900, Arch. Naturg., LXVI, part 2, p. 58. (Misspelling for *Bufo superciliaris* Boulenger.)

Seventy-nine specimens, thirteen of which are skeletons: Medje, one specimen, January 1910, three, August 1910, seven, September 1910, twenty, April 1914, fourteen, June 1914, and eight, July 1914; Niapu, three specimens, November 1913, six, December 1913, and three, January 1914; Gamangui, seven specimens, February 1910; Ngayu, six specimens, December 1909; locality uncertain (tag corroded) one specimen. (A. M. N. H. Nos. 8586–8664.)

DISTRIBUTION.—As in the case of many other forest species formerly only known from the Cameroon-Gaboon area, the range of *B. superciliaris* was found to extend much farther eastward than formerly reported. The species is confined to the Rain Forest and represents the largest and most striking toad of this region. Still it has not been reported farther west than Nigeria. Future work may show that the species does not occur in the extreme western end of the forest, but our present knowledge of that area is so limited that little can be said.

VARIATION.—The coloration of *B. superciliaris* has been adequately described by Boulenger (1887*a*). It may be added that the one or two pairs of black ocelli on the back are often narrowly outlined with pale yellow. The parietal chevron is not present in most of the large specimens. In life the coloration was generally brighter, especially the rich maroon wash of the sides; and the yellowish dorso-lateral line was sharply defined. The iris was a "dark bronzy brown."

The forty-three females and twenty-two males in the series exhibit no sexual difference other than size. Fifteen fully adult males average 106.7 mm. from snout to vent (maximum, 112; minimum, 98 mm.) in contrast to 136.9 mm., the average of the same number of sexually

mature females (maximum, 149; minimum, 133 mm.). No nuptial asperities are developed on the digits of the breeding males.

HABITS.—Oviposition may occur throughout several months. It certainly occurs in April, for one specimen (No. 8587) taken at Medje early in April still contained ova in its cloaca and oviducts. About fifty eggs had been squeezed into the urinary bladder. No ova were found in the cœlom, and the ovaries exhibited the usual post-oviposition conditions. *B. superciliaris* is potentially able to oviposit throughout most of the year. Females with greatly distended ovaries were taken in April (Medje, 1914), June and July (Medje, 1914), August (Medje, 1910), November and December (Niapu, 1913), January (Niapu, 1914) and February (Gamangui, 1910).

Bufo superciliaris is active throughout the rainy season, which continues in most of the forest throughout the entire year except for a few weeks in February or March, these weeks varying with the locality and the year. During this rainy season *B. superciliaris* "was found practically everywhere in the forest, but during the dryer weeks the toad disappeared, only a single specimen or two to be found after long searching in some shallow depression, usually among the damp leaves of the forest, especially in hollows where the humus and moldering leaves remain damp throughout the year. When disturbed, the quiescent toad would play dead, lowering the head to the ground, and drooping the prominent upper eyelids. At such times the toad is able to squirt the secretion of its parotoid glands to a distance of several feet. The natives are greatly afraid of this whitish secretion for they believe that it is able to destroy the eyesight."

The stomachs of fifty-five specimens contained food. It is noteworthy that often large insects but never any vertebrates were found in the stomachs. The food consisted of 453 worker and soldier termites (all but three from a single stomach); 86 beetles (mostly large longicorns, carabids, Curculionidæ, dung-beetles, etc.); 182 ants; 1 ichneumonid and 1 chalcid wasp; 16 myriopods (julids, polydesmids and platydesmids); remains of 3 grasshoppers; 2 caterpillars, 1 isopod, 1 beetle larva, 1 ant-lion larva, 13 dipterous larvæ and a small amount of leaves and other extraneous matter.

MORPHOLOGICAL NOTES.—In correlation with the great body size, the eggs of *B. superciliaris* have not become very much larger than those of other forest toads but they are very much more numerous. The average diameter of ten eggs (envelopes removed) from the urinary bladder of the specimen (No. 8587) mentioned above as having just deposited its

eggs is approximately 1.8 mm., maximum diameter 2 mm., and minimum 1.6; while the average of the same number of eggs removed from the cœlom of a gravid specimen of *B. polycercus* (No. 8501) is 1.5 mm., maximum 1.6 mm. and minimum 1.4. By removing a single lobe of an ovary, counting the ova in it, and multiplying by the total number of lobes, we may estimate the number of eggs in any gravid female. The number in the specimen of *B. polycercus* mentioned above was found to be between 1200 and 1500. *B. superciliaris* develops many more eggs than this. One specimen (No. 8588) was estimated to have at least three times, probably three and a half times, as many. That this rough estimate cannot be very far out of the way is shown by the fact that the ovaries of the two specimens vary in length in the proportion of one to two, while the ova differ in the proportion of two to three. The size of the ovaries is more or less dependent on the size of the toad, and in the present case the specimen of *B. polycercus* is 71 mm. long while the specimen of *B. superciliaris* is 142 mm.

In apparent correlation with the great increase in number of eggs of *B. superciliaris*, the male reproductive organs are extraordinarily developed. Even before the breeding season and when the fat bodies are still very small, the tests become greatly lengthened and folded into many turns. Each testis of one specimen (No. 8586, Niapu, December 1913) is twisted back and forth across the kidney with six sharp turns. The kidneys are not oval but slightly lobate, the lobes underlying the turns of the testes. If the testes could be straightened out, they would measure at least twice as long as the kidneys. Our series of twenty-two males shows definitely that this twisting of the testes is due to an increase in length, but this increase is greater than that which I have observed in any other species of *Bufo*.

Ranidæ

Of the thirty-nine genera of Salientia found in Africa, twenty-two, or fifty-six per cent, are ranids, and all but three of these twenty-two genera are confined to the continent. Two of the three exceptions, *Megalixalus*, and *Hyperolius*, are characteristically African but have extended their range to Madagascar, while the third exception, *Rana*, is a recent arrival in Africa from the north.

It is of little value to state that the African ranids (with the exception of *Rana*) are all typically African, either indigenous to that continent or migrants from there, unless some attempt is made to determine the mutual relationships of these genera and to seek the stocks from which

they have arisen. This undertaking offers considerable difficulty because our knowledge of the internal structure of most of these genera is very limited. From a study of their osteology it seems probable that certain of them, such as *Chiromantis*, very probably find their closest affinities in genera not found today in Africa, but others may very probably have arisen directly from indigenous genera. A third category includes genera whose affinities to other genera are so close that their generic status is questionable. For purposes of discussion it is advisable to divide the twenty-two genera of ranids into a number of natural groups and to examine what evidence there is as to the affinities of these groups.

GROUP I.—*Astylosternus*, *Gampsosteonyx*, *Scotobleps*, and *Nyctibates*. These four genera form a natural group of closely related genera confined to the Cameroon-Gaboon area. It is a matter of opinion whether or not *Gampsosteonyx* is really generically distinct from *Astylosternus*. *Scotobleps*, *Nyctibates*, and *Astylosternus* differ from each other chiefly in the degree of ossification of the various parts of the pectoral girdle. I have remarked on certain specialized features of this group elsewhere.[1] Too little is known about the morphology of these and related genera to offer an opinion as to the stock from which they have arisen. Still, it seems fairly certain that they are local specializations of the oldest ranid stock of Africa.

GROUP II.—*Phrynobatrachus*, *Arthroleptis*, *Arthroleptides*, *Petropedetes*, *Dimorphognathus*, *Schoutedenella* and *Cardioglossa*. These genera are all small, active ranids, very similar in general appearance. Witte (1919), in reviewing the genus *Phrynobatrachus*, states that since Boulenger has abandoned the extent of the webbing between the metatarsals as a character defining the genus *Rana*, the extent of this web in *Phrynobatrachus* is probably not a good character to distinguish *Phrynobatrachus* from *Arthroleptis*. As shown in Figure 5, the extent of the separation of the metatarsals is extremely variable. *P. natalensis*, the type of the genus, may be said to have the metatarsals as closely bound together as the majority of the species of *Arthrolepis*. The only character commonly used to distinguish *Phrynobatrachus* from *Arthroleptis* is the separation of the outer metatarsals by a web but, since this distinction is entirely arbitrary, this character can be of little importance in distinguishing these genera.

The form of the pectoral girdle was considered by Boulenger of primary importance in defining his subgenera of *Rana*. A study of this

[1]Noble, 1920, p. 17.

structure in all the species of *Arthroleptis* and *Phrynobatrachus* available to me has helped to demonstrate that the character of the metatarsal region cannot be correlated with any grouping of the species based on the structure of the pectoral girdle. Species with a X-shaped omosternum (Plate XXIX) may or may not have the separated metatarsals and species with an entire omosternum are at present grouped under both *Arthroleptis* and *Phrynobatrachus*.

If we should abandon the metatarsal character entirely and use the form of the pectoral girdle in distinguishing *Phrynobatrachus* from *Arthroleptis,* further difficulties would immediately present themselves. A complete series of intergradation may be found between the two extremes of girdle form. Examples from this series are represented in Plate XXIX.

Although no characters can be found to group into definite categories the species at present ranged under *Arthroleptis* and *Phrynobatrachus,* still the study of the pectoral girdle has shown that the relationships between certain species are much closer than between others, and these relationships are indicated in part by a pectoral girdle of identical form in these related species. Thus the pectoral girdles of *A. variabilis* and *A. pœcilonotus* agree in all essential particulars; similarly those of *A. bottegi, A. feæ,* and *A. parvulus* have the same form; and those of *P. plicatus* and *P. dendrobates* are indentical and are not very different from that of *A. batesii.*

If the form of the pectoral girdle is an index of relationship (as in *Rana*) it is of especial interest that the girdles of *A. wahlbergi* and *P. natalensis,* the type species of *Arthroleptis* and *Phrynobatrachus* respectively, should be identical. It is also important to note that the pectoral girdle of *Cardioglossa leucomystax* is very similar to that of *A. wahlbergi* while that of *Dimorphognathus africanus* is practically identical with that of *A. batesii.* This has been mentioned in my discussion of the classification of the Salientia (Noble, 1922). There is good reason to believe that *Cardioglossa* has been derived directly from an *A. wahlbergi-A. variabilis* stock by a loss of teeth and *Dimorphognathus* from an *A. batesii* stock by the development of teeth on the mandible. When all the species of *Arthroleptis* and *Phrynobatrachus* have been studied osteologically, a number of natural groups will be found. It has seemed advisable for the purposes of this paper and to avoid further complicating the synonymy to use the terms *Arthroleptis* and *Phrynobatrachus* in their old sense, although it is obvious from the above discussion not only that these genera are two very unnatural assemblages but also that the one

character which distinguished them from each other is untrustworthy, even undefinable.

It is impossible to say at the present time from what stock this *Arthroleptis-Phrynobatrachus* group springs. Their procœlous vertebral column and cartilaginous metasternum are indicative of their generalized structure. They do not seem to have any close affinities in the Oriental or Neotropical regions.

GROUP III.—*Hylambates, Kassina, Hyperolius, Megalixalus, Leptopelis,* and *Chiromantis.* Two very distinct groups of species have up to the present time been referred to *Hylambates.* This is the more surprising since Peters (1882, Pl. XXVI, fig. 4) gave an excellent figure of the pectoral girdle of the type of the genus, *H. maculatus.* In this species the omosternum is forked posteriorly and the metasternum is a broad cartilaginous plate. Two of the species taken by the American Museum expedition, *H. verrucosus* (Plate XXXI, fig. 1) and *H. greshoffi* (Plate XXXI, fig. 2) have a similar pectoral girdle, but in all the other species usually referred to *Hylambates* which I have examined the omosternum was found to be entire and the metasternum bony. Until intermediates can be found it seems advisable to distinguish the second group of species by a name. The first name available for that purpose appears to be *Leptopelis.*

I am not at all sure that annectant forms will be found between the first and second groups. *Leptopelis* seems to comprise a distinct group of species as nearly related to *Chiromantis* as to the group of species which I now restrict to the genus *Hylambates.* The pectoral girdle of *Hyperolius, Megalixalus,* and *Kassina* are very similar to that of *Hylambates* (*sensu stricto*). The first two genera may have been derived directly from *Hylambates* by a loss of the vomerine teeth. *Hyperolius* differs from *Hylambates* only in the absence of these structures.

In recent years much evidence has been accumulated to show the trivial significance of the absence of the vomerine teeth as defining natural groups. Among the pipids there is at least one case (*Xenopus*) where the presence or absence of vomerine teeth in the adult has not even specific importance (Boulenger, 1919, p. 3). Among the pelobatids there are several instances (*Leptobrachium* and *Xenophrys*) of the same (Boulenger, 1889, p. 750; Sclater, 1892, p. 348). In the toothed bufonids and hylids the presence of vomerine teeth is a variable feature in several genera: *Telmatobius* (Barbour and Noble, 1920, p. 416); *Hyla* (Van Kampen, 1906, p. 174, and Noble, 1918, p. 335). Among the ranids this variability of the vomerine teeth is even more frequent: *Rhacophorus*

(Boulenger, 1897, p. 234); *Kassina* (Peracca, 1907); *Rana* (Boulenger, 1897, p. 234); and *Staurois* (Boulenger, 1918*c*, p. 373). It appears then that the structural difference which distinguishes *Hyperolius* from *Hylambates* is very slight.

Kassina possesses a peculiarity which leads one to suspect that it has not been evolved directly from *Hylambates*. The terminal phalanges are dilated very much as in *Chiromantis*. Nevertheless, *Kassina*, with its widely divided omosternum, very probably was not evolved directly from *Chiromantis*.

Chiromantis has much in common with *Polypedates*. That widely distributed genus is sufficiently generalized to form the stock from which *Hylambates*, *Leptopelis*, *Kassina*, *Chiromantis*, and their derivatives, *Hyperolius* and *Megalixalus*, may have evolved. I have shown elsewhere (1917, p. 793) that T-shaped terminal phalanges may be changed during the ontogeny of an individual to simple terminal phalanges, and I have suggested that claw-shaped phalanges are easily derivable from these. *Chiromantis*, with its undivided omosternum and dilated terminal phalanges, stands nearest to the *Polypedates* stock than any of the other members of this group.

GROUP IV.—*Phrynopsis*, *Leptodactylodon*, and *Rothschildia*. The first and last of these three genera are known to me only from the descriptions. *Leptodactylodon* seems to have much in common with *Phrynopsis*. Nevertheless, it does not always have a cartilaginous omosternum as often stated. A breeding male (No. 6726) which I examined was found to have a well ossified style to the omosternum. It seems probable that *Leptodactylodon* and *Phrynopsis* have been derived from some ranid stock of Group I.

The affinities of *Rothschildia* are a puzzle. Its pointed terminal phalanges, united metatarsals, cartilaginous omosternum and sternum, clearly indicate that it cannot have any close relationship to *Chiromantis* in spite of Mocquard's (1905, p. 288) statement to the contrary. Further study may show that it is related to *Phrynopsis*, or possibly *Hyperolius*.

GROUP V.—*Rana* and *Conraua*. The latter genus is probably not generically distinct from the former. Boulenger (1918) has recently discussed the origin and affinities of the African species of *Rana* and, since not only the genus but also certain groups of species find their closest affinities beyond the continent. it seems very probable that the genus is only a recent migrant into Africa, probably by way of the northeast. It is interesting, however, that the genus should have extended so widely over the continent and have become such a dominant element of its batrachian fauna.

PHRYNOBATRACHUS Günther

This genus has been recently monographed by Witte (1919 and 1921). As shown in the appended check list, I have not been able to agree with him on the status of certain of the species. Nevertheless, Witte's synopsis so nearly agrees with my views that it does not seem advisable to offer an additional key to the species. Werner (1919) has recently published a key which expresses his views as to the recognizable species.

Natalobatrachus Hewitt and Methuen is certainly synonymous with *Phrynobatrachus*. *N. bonebergi* is closely allied to *P. dendrobates* and *P. plicatus*. A microphotograph of the pectoral girdle of *N. bonebergi* is represented in Plate XXIX, fig. 8. The species should be referred to *Phrynobatrachus*.

Phrynobatrachus natalensis (A. Smith)

Plate XXXIII, Figure 1; Text Figure 5

Stenorhynchus natalensis SMITH, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24 (type locality: Port Natal).

Phrynobatrachus natalensis BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112 (Natal and Angola: Duque de Bragança). PETERS, 1882, 'Reise nach Mossambique,' III, p. 156 (Tette, Mozambique). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (Zanzibar). BOETTGER, 1892, 'Kat. Batr. Mus. Senck.,' p. 19 (Abyssinia). BOULENGER, 1892, in Distant, 'A Naturalist in the Transvaal,' p. 176 (Pretoria). BOCAGE, 1895, 'Herpétol. Angola,' p. 162 (High plateaux of the interior of Angola: Duque de Bragança, Quissange, Quindumbo, Caconda, and Bihé). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 101 (Mozambique); p. 211 (Hanha). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (German East Africa: Zanzibar, Usambara, Usagara, Kakoma, Unyamwesi, Nyansa, Undussuma, and Kinangiri). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Transvaal). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). SCLATER, 1899, Ann. S. African Mus., I, p. 107 (South Africa). TORNIER, 1901, Zool. Anz., XXIV, p. 64 (Port Elizabeth). BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 108 (Angola: Bange Ngola); Proc. Zoöl. Soc. London, II, p. 251 (Zululand: Sibudeni). FERREIRA, 1906, Jorn. Sci. Lisboa, (2) VII, p. 166 (Angola). BOULENGER, 1907, Proc. Zoöl. Soc. London, II, p. 482, Pl. XXII, fig. 2 (Portuguese East Africa: Coguna and Beira). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1901 (Sudan). BOULENGER, 1908, Ann. Natal Mus., I, p. 222 (Zululand: Mseleni and Hlabisa). CHUBB, 1908, Ann. Mag. Nat. Hist., (8) II, p. 220 (Matabeleland: Gwamaya and Kana Rivers). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (South Africa: Durban, Umfolozi, and Lake Sibayi). CHUBB, 1909, Proc. Zoöl. Soc. London, II, p. 592 (Matabeleland: three localities). BOULENGER, 1910, Ann. S. African Mus., V, p. 529 (Natal, Zululand, Transvaal, Orange River Colony, Southern Rhodesia, Angola, Central and East Africa). LÖNNBERG,

1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 23 (Kilimanjaro). MEEK, 1910, Publ. Field Mus., Zoöl., VII, p. 403 (British East Africa: Nairobi and Lukenya). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 101 (Uganda: Busoga). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, part 6, p. 28 (British East Africa: Nairobi, Thika, and Roiru River). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Uganda: Bussu, Masindi, and Mbale). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 12 (South Africa); Rec. Albany Mus., III, part 2, pp. 209, 222, and 281 (summary of localities with additions from Transvaal and Natal). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 171 (Lake Region: Kifumbiro). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 321 ("from the Egyptian Sudan to Natal and Angola"). BARBOUR, 1913, Proc. Biol. Soc. Washington, XXVI, p. 149 (Sudan: Abiad). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Rhodesia: Marandellas; Transvaal: Christiana). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 356 (German East Africa, eight localities; British East Africa, three localities; Portuguese East Africa, three localities). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 4 (Partial résumé of above localities with additions: Zami on Lake Tsama, Abyssinia; and MacCarthy Island, Gambia, the most important of these). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey; Sediou, French West Africa). WERNER, 1919, Denk. Akad. Wiss. Wien (math.-natur.), XCVI, p. 454 (Anglo-Egyptian Sudan, several localities). Procter, 1920, Proc. Zoöl. Soc. London, p. 413 (British and German East Africa, several localities). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (French Guinea and Libera, several localities).

Phrynobatrachus ranoides BOULENGER, 1894, Proc. Zoöl. Soc. London, p. 644, Pl. XXXIX, fig. 2 (Natal: Pietermaritzburg). SCLATER, 1899, Ann. S. African Mus., I, p. 107 (South Africa). SCHENKEL, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Natal). BOULENGER, 1910, Ann. S. African Mus., V, p. 529 (Natal). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 23 (Kilimanjaro). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 4 (Résumé with important additions: British Central Africa: Nyika Plateau; Belgian Congo: Pweto on Lake Moero, and Albertville; region of Chari Tchad). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 413 (Mongoro, German East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (Dixine and Kéronané, French Guinea). WITTE, 1921, Rev. Zool., App. IX, p. 9.

Phrynobatrachus natalensis form *gracilis* ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and White Nile,' I, part 4, p. 10 (White Nile: Grab-el-Aish).

Phrynobatrachus boulengeri WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 6 (Portuguese East Africa: Beira and Coguna). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 413 (German East Africa, several localities). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (French Guinea and Liberia, several localities). WITTE, 1921, Rev. Zool., App. IX, p. 10.

One hundred and forty-three specimens: eighty-nine from Faradje, January 1913; eleven from the same locality, October 1912; nine from the same locality, January 1914; one from the same locality, September

1911–January 1912; and one, January 1914; fifteen from Garamba, May–June 1912; eight from Medje, October 1912; five from Vankerckhovenville, April 1912; two from Yakuluku, November 1911; and two from Niangara; June 1913. (A. M. N. H. Nos. 9167–9309.)

DISTRIBUTION.—*P. natalensis*, although one of the most widely distributed species of African frogs, avoids the forest entirely or barely enters its margin (as at Medje). It ranges all over South Africa, East Africa, and the Sudan, occurring in the west in Gambia just north of the forest and in Angola directly south of the wooded regions. Our records afford further evidence of the uniform distribution of the species in the Sudanese savannahs, where it has not been taken north of Gambia, Lake Chad, and the Province of Sennar in Egypt. *P. natalensis* is a water frog, and its local distribution is more or less dependent on streams. The wide range of the species is indicative of its aggressiveness and adaptability to the varying conditions of African waterways.

RELATIONS.—The specific status of *P. ranoides* has been discussed by Hewitt (1911*b*) and in greater length by Nieden (1915). Both of these investigators have failed to find any character by which to distinguish *P. ranoides* from *P. natalensis*. Witte (1919), in recently revising the genus, has used key characters for *P. ranoides* which fall well within the variability of *P. natalensis* as exhibited by our series. The recorded ranges of the two species coincide and, since I can find no characters with which to distinguish the two species, I have considered them identical.

Four specimens (Nos. 5213–5216) of *P. natalensis* from Cape Colony, received in exchange from the Albany Museum, and two others (Nos. 3192–3193) from Marianhill, Natal, received in exchange from the Durban Museum, are indistinguishable from our fully adult specimens from Faradje. I do not believe that this wide-ranging species can be separated into races. Still, a very young specimen (No. 6684) from Abiad, Dindu River, Sudan, received in exchange from the Museum of Comparative Zoölogy, has a slightly more extensive webbing between the toes than our other specimens of the same size.

Witte (1919) has described as a distinct species the specimens of *P. natalensis* from Portuguese East Africa figured by Boulenger (1907*e*). Several of the specimens in our series agree so well with Boulenger's figure both in the distinctness of the digital dilations and the formation of the dorsal folds that I cannot accept Witte's species. I refer it for the present to *P. natalensis*.

VARIATION.—The figures given by Boulenger (1907*e*) illustrate the main types of color pattern exhibited in our series. Rough-skinned

specimens are generally slate-gray, with or without darker markings and a light vertebral line. Smooth-skinned specimens or those having ridges instead of tubercles above are extremely variable. These showed equally diverse types of coloration in life, the ground tone being any shade from gray to green and the pattern a brownish, yellowish, or greenish. The large series of specimens (Nos. 9167–9253) taken at one time at Faradje may be taken as an illustration of this variability. Mr. Lang described these as follows: "Color varying from a light brown or gray to a dark brown; a vertebral line of different widths present in most of the specimens; color of the vertebral line varying from a pale yellowish or reddish brown to a bright green; a narrow line sometimes present down the center of the broadest vertebral stripes, the latter generally bordered with a dark tone. Many of the specimens with a roughened skin, the raised portions often darker than the general body color. Iris varying from a bronze to a golden. Underside whitish tinged with green; the throat of the male washed with a dark tone."

HABITS.—All of the specimens were taken in the vicinity of pools left by the river or in stagnant ponds near the watercourses. The breeding season appears to be irregular; females with greatly distended ovaries were taken from May to October. A large percentage of the females taken at Faradje, October 1–15, were in this condition. Their ova averaged .7 mm. in diameter and had one hemisphere densely, the other very slightly, pigmented.

The total food content of ten partially full stomachs was 26 soldier and worker termites; 20 worker ants; and 1 caterpillar.

Phrynobatrachus perpalmatus Boulenger

Plate XXIX, Figure 4; XXX, Figure 2; Text Figure 5

Phrynobatrachus perpalmatus BOULENGER, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. XXXVIII, fig. 1 (type locality: Lake Moero); 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and White Nile,' I, part 4, p. 10 (Egypt: El Gerassi). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1902 (summary of above localities). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Stanleyville and Medje, Belgian Congo). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 6 (summary of the above localities). WERNER, 1919, Denk. Akad. Wiss. Wien (math.-natur.), XCVI, p. 455 (White Nile).

Thirty-three specimens, three of them advanced tadpoles: twenty-six, both adults and larvæ, from Stanleyville, August 1909; three adults from the same locality in March and one in April 1915; two from Niapu, January 1914; and one from Niangara, June 1913. (A. M. N. H. Nos. 9136–9166.)

DISTRIBUTION.—Werner (1907) has considered the occurrence of *P. perpalmatus* in the Sudan as sporadic. The distribution of the species is, on the whole, peculiar. Very few species of limited distribution occur both in the Rain Forest and on the open savannahs. Our specimens all come from the forest where the species seems to have a rather extended range over the eastern half of the Rain Forest proper and the outlying forest patches.

RELATIONS.—As Witte (1919, p. 2) has indicated in his recent review of the genus, *P. perpalmatus* holds a very distinct position because of its fully webbed toes. The metatarsals are nearly completely separated by the web, a condition found in no other species of *Phrynobatrachus* from the forest. The degree of separation of the metatarsals should not be used alone for generic differentiation, since in other species of *Phrynobatrachus* it has hardly specific value. *P. perpalmatus*, in the structure of its girdle (see above), skull, and tongue, shows a close affinity to that group of species assembled at present partly under *Phrynobatrachus* and partly under *Arthroleptis* but characterized by an unforked or slightly forked omosternum, tarsal tubercle, slender habitus, etc. Unfortunately, material is not available to define properly this group.

VARIATION.—The majority of the specimens are a chocolate-brown with a light band on each side of the body. The sides of body below these bands are darker than the dorsal surfaces and are stippled with white. The legs are barred with dark brown. A light line runs the length of the hinder surfaces of the thighs. Indistinct dark spots are present on the dorsal surfaces, forming in very young specimens six longitudinal stripes. A narrow vertebral line of white is present in a few of the specimens both young and adult.

There is a distinct sexual dimorphism. Sexually mature males have a yellow tinge to the throat which, although more or less spotted with dark brown, is a very bright yellow in a few of the specimens. This tinge may be very faint, but it is present in all of our adult males, and absent in all of our females. There is no difference in size between the sexes, an average pair (Nos. 9136–9137) measuring 26 and 24 mm. respectively from snout to vent. Several of the females are a little longer, the largest being 28 mm. in length.

The three advanced larvæ in the collection are not in a good state of preservation, having lost their horny mouth-parts. Their coloration is nearly a uniform brown with some indication of a vertebral and dorsolateral line of white. The spiraculum of the smallest specimen (12.5

mm. from snout to vent; 36 mm. from snout to tip of tail) is sinistral, heavily pigmented and extends beyond the body for about a millimeter in the form of a tube slightly fringed at the tip.

HABITS.—*P. perpalmatus*, as indicated by the extensive webbing between the toes, is essentially a water frog. All of our specimens were found near brooks or fresh-water swamps. At Stanltyville the species was: "common in a waterhole near the station, also in the grassy swamps nearby; very clever in concealing itself."

The breeding season may occur in June. At least, only those females taken during that month possessed greatly distended ovaries. Eggs removed from such individuals were a trifle less than a millimeter in diameter and were completely pigmented.

Only eight stomachs of those examined contained food. This consisted of 7 ants; 3 beetles; 2 spiders; 2 waterbugs; 1 hemipterous insect (*Gerris*); 1 chalcid; 2 larvæ of Odonata; 1 minute gryllid; and two, probably dipterous, larvæ.

Phrynobatrachus plicatus (Günther)

Text Figure 5

Hyperolius plicatus GÜNTHER, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. *C* (type locality: Coast of Guinea).

Phrynobatrachus plicatus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112 (Coast of Guinea). BOCAGE, 1895, 'Herpétol. Angola,' p. 163 (Loango Coast); 1903, Jorn. Sci. Lisboa, (2) VII, p. 44 (Fernando Po). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 11 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Fernando Po and French Congo: Fernand Vaz); Ann. Mag. Nat. Hist., (7) XVII, p. 373 (Unyoro, Lake Albert Region). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 500 (Cameroon: Efulen, Bipindi and Victoria; Spanish Guinea: Makomo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 45, figs. 77 and 78 (Cameroon localities of Nieden 1908 and in addition Buea). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 132 (Cameroon, Bitye and Efulen). PERACCA, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 7 (Northern Rhodesia). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Medje, Belgian Congo). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 8 (partial summary of above localities; in addition, Ogowe and Cape St. John, Gaboon, and Oban, Southern Nigeria).

Phrynobatrachus auritus BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 440, Pl. XXVIII, fig. 2 (Benito River, Gaboon). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon).

Phrynobatrachus discodactylus BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Medje, Belgian Congo).

Sixty-three specimens, nearly all adult: eighteen from Boyulu, September 22, 1909; seventeen from Gamangui, February 1910; ten from Medje, April–May 1910; one from the same locality, September 1910; seven from Niangara, June 1913; four from Avakubi, two of which were taken in October 1909, and two in May 1914; three from Stanleyville, February–March 1915; one from each of the following localities: Lukolela, July 1909; Niapu, January 1914, and Akenge, April 1915. (A. M. N. H. Nos. 9048–9110.)

DISTRIBUTION.—*P. plicatus* has a wide range throughout the Rain Forest. It has been taken as far north and west as southern Nigeria. as far south as the Loango Coast and northern Rhodesia, and as far east as Unyoro in Uganda. Our records from many localities in the Rain Forest tend to show that the species has a uniform distribution throughout this region. The occurrence of the species in the outlying forest patches at Niangara and Unyoro is not surprising but Peracca (1912) has recorded the species far to the south of the Rain Forest. This latter record certainly requires confirmation.

RELATIONS.—In our large series of specimens from the Ituri, the small differences employed by Boulenger (1919) to distinguish *P. discodactylus* from *P. plicatus* disappear entirely and I am unable to recognize the former species as distinct. I have been able to find only the following characters in his description to separate his *P. discodactylus* from *P. plicatus* as usually described. These characters seem insignificant in view of the variation already observed in the latter species (cf. Boulenger, 1903).

(1.) Snout not longer than the eye.
(2.) Nostril a little nearer the end of the snout than the eye.
(3.) First finger a little shorter than the second.
(4.) Skin smooth or finely granular above, a glandular fold above the tympanum.
(5.) Throat of the males with rounded, scattered tubercles.

I have compared our series of eleven topotypes with a series of *P. plicatus* from Bitye and Metet, Cameroon. These four specimens, which must be considered typical *P. plicatus*, show several of the distinguishing features of *P. discodactylus*. In our series of sixty-three specimens from the Congo all five characters show so much variation that it is at once evident that *P. discodactylus* cannot be considered distinct.

VARIATION.—A statement that *P. plicatus* may or may not possess all the distinguishing characters given for *P. auritus* and *P. discodactylus* by no means covers the total range of variation found in our specimens, The distinctness and form of the dorsal fold, the sharpness of the snout.

the presence or absence of the tympanum have been discussed by others. The tibia varies a little in length, but the leg is never as short as that of *P. acridoides* compared by Boulenger (1919) with his *P. discodactylus*.

It would be useless to attempt a description of the range of color variation in *P. plicatus*. The ground tone may vary from a bright pink to a pale gray, or it may be very dark brown. The tympanic stripe and the dark markings on the back are the most constant features of the pattern, but several of the specimens are nearly a uniform gray. The colors have faded but little in alcohol. The specimens in life showed the same variety of browns, pinks and grays.

HABITS.—It is very probable that the breeding season of *P. plicatus* is irregular. Females of our series show a maximum development of the ovaries early in February (Gamangui, 1910), early in July (Niangara, 1913), late in September (Boyulu, 1909), and early in October (Avakubi, 1909).

Only three of all the stomachs examined contained food. This consisted of 1 beetle; 1 spider; and 1 ichneumonid wasp.

Phrynobatrachus dendrobates (Boulenger)

Plate XXIX, Figure 6; XXX, Figure 4; Text Figures 4 and 5

Arthroleptis dendrobates BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8 (type locality: Medje, Belgian Congo). WITTE, 1921, Rev. Zool. Africaine, IX, p. 16.

Twenty-five specimens: eighteen from Medje, of which one was taken in March, four in April, and one in June 1910; ten in June and two in July 1914; two from Ngayu, December 1909; two from Gamangui February 1910; two from Niapu, January 1914; and one from near Kamunionge, September 1909. (A. M. N. H. Nos. 9111–9135.)

DISTRIBUTION.—*P. dendrobates*, so recently described as a species of *Arthroleptis*, is apparently confined to the Ituri forest. Our most eastern record is from Ngayu, our most western from Niapu.

RELATIONS.—The species must be referred to *Phrynobatrachus*, although the distinction between this genus and *Arthroleptis* is not at all apparent. I have discussed above the relationships of some of the species at present assembled under the two genera. The natural affinities of all of the species can only be determined by monographic treatment. For the present I have retained the genus *Phrynobatrachus* in its old sense. Boulenger's *A. dendrobates* must be referred to that genus, for the webbing between its metatarsals is at least as extensive as in *P. natalensis*, the type of the genus. The metatarsals of *P. dendrobates* are from

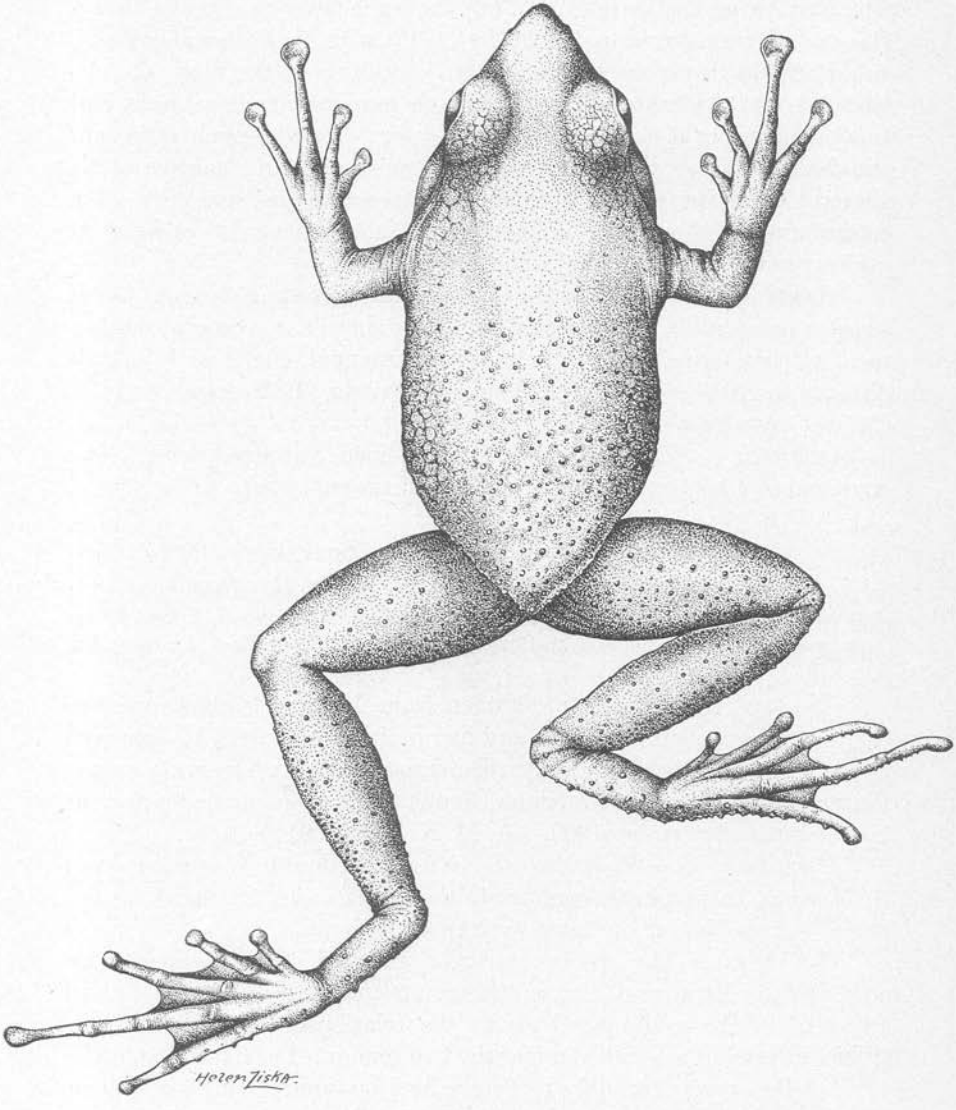


Fig. 4. *Phrynobatrachus dendrobates* (Boulenger), adult ♂.

one-fourth to one-third of their length separated by webbing. The extent of this separation is thus a little less than that of *P. plicatus* (see Fig. 5. But many other features, such as the structure of the pectoral girdle, the form of the body, and terminal phalanges, show that the species finds its closest affinity in *P. plicatus*. Boulenger (1919, p. 9) in referring to his *Arthroleptis dendrobates* admitted that it held a unique position in that genus. It shows some affinity to some of the species at present grouped under *Arthroleptis*, perhaps most to *A. batesii*. But if we are to retain the genus *Phrynobatrachus* in its old sense we must refer the species to that genus.

VARIATION.—The coloration above is generally reddish brown. The black marblings and white spots of the sides of the head and body are often indistinct. The most constant of the light spots is the one under the eye. It may be continued below the tympanum to the shoulder, forming a bright stripe. Several of the specimens show a distinct dorsal pattern. This consists of a dark interorbital bar, a Λ-shaped mark on the back, and crossbars on the legs. The brown throat-and-chest patch is divided longitudinally in the majority of the females by a light line which is lacking or indistinct in the males. One specimen (No. 9135) from near Kamunionge, September 21, 1909, differs strikingly in coloration from all the other specimens in our series. This deviation from the normal coloration is in the direction of one of the color phases of *P. plicatus*. Instead of having a more or less uniform coloration above, the pecimen thas two pale yellowish stripes, one on each side of the body from sthe eye o the groin. The dark area between these two stripes, as well as the dorsal surface of the head, is vermiculated with yellowish brown.

The sexually mature male possesses not only the peculiar rugosities on the hind limbs, as described by Boulenger, but similar tubercles are scattered all over the posterior parts of the body. The distribution of these tubercles is somewhat similar to that found in *Megalixalus spinosus*.

HABITS.—The breeding season of *P. dendrobates* occurs probably in late June. Only females taken during that month possessed greatly swollen gonads. The eggs of several of these specimens (Nos. 9118 and 9128) while still within the ovarium measured approximately 2 mm. in diameter and were heavily pigmented at one pole.

Ten stomachs were found to contain food. In these the food was composed of 2 waterbugs; 2 caterpillars; 1 isopod; 1 fly; 1 cricket; and 1 ant.

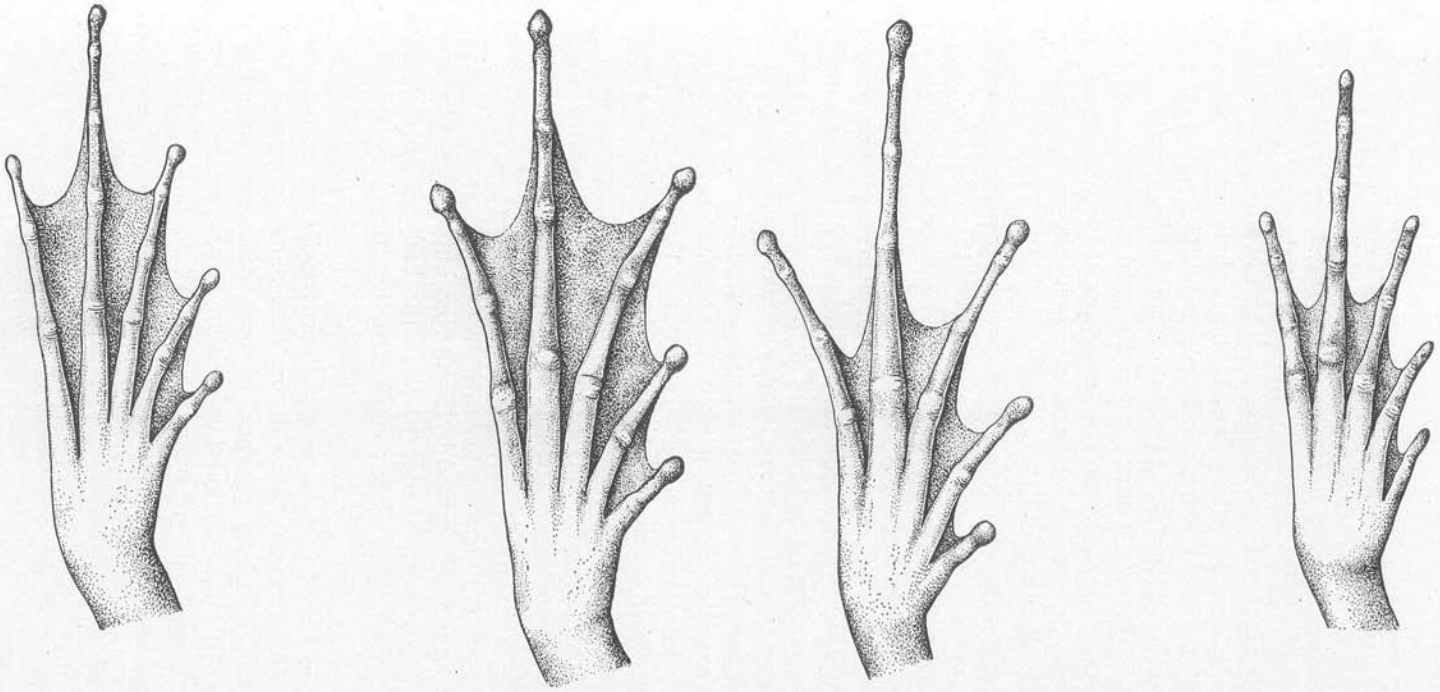


Fig. 5. (*a*) *Phrynobatrachus perpalmatus* (Boulenger), (*b*) *P. plicatus* (Günther), (*c*) *P. dendrobates* (Boulenger), and (*d*) *P. natalensis* (A. Smith). Left hind feet, dorsal aspect, comparing the webbing of metatarsal region.

ARTHROLEPTIS Smith

Only thirty five of the numerous described species of *Arthroleptis* are probably distinct. Most of the species are very little known and their ranges may not be so restricted as it would seem from the check list. The recognizable African species of *Arthroleptis* may be distinguished by the following key. The recently described species, *A. lameeri*, *A. boulengeri*, *A. schoutedeni*, and *A. procteræ* have been distinguished by a key (Witte, 1921) and for the sake of brevity are not included below.

a_1.—One metatarsal tubercle, no tarsal tubercle, toes free or with a slight rudiment of web; third finger greatly elongated in males.

b_1.—Tympanum hidden.....*A. schebeni.*

b_2.—Tympanum distinct.

c_1.—Tibiotarsal articulation not reaching beyond tympanum; tips of fingers and toes slightly dilated.

d_1.—First finger as long as second.

e_1.—Metatarsal tubercle much shorter than inner toe.
A. wahlbergii.

e_2.—Metatarsal tubercle as long as inner toe.

f_1.—Tongue papilla present.....*A. stenodactylus.*

f_2.—Tongue papilla lacking.....*A. lönnbergi.*

d_2.—First finger shorter than second.

e_1.—Tips of digits swollen.

f_1.—Skin tubercular above, tubercles forming three series.
A. spinalis.

f_2.—Skin smooth above.

g_1.—Snout pointed, projecting beyond mouth, tympanum two-thirds diameter of eye.....*A. xenochirus.*

g_2.—Snout rounded, tympanum half diameter of eye.
A. lightfooti.

e_2.—Tips of digits dilated into distinct disks.....*A. schubotzi.*

c_2.—Tibiotarsal articulation reaching eye or between eye and tip of snout.

d_1.—First finger as long as or nearly as long as second.

e_1.—Digital expansions produced into a point.....*A. xenodactylus.*

e_2.—Digital expansions not pointed, often indistinct.

f_1.—Metatarsal tubercle as long as inner toe....*A. variabilis.*

f_2.—Metatarsal tubercle shorter than inner toe.

g_1.—Habit stout, body depressed.....*A. adolfi-friederici.*

g_2.—Habit slender, body not or but little depressed.

h_1.—Head not wider than body, generally much narrower.....*A. pœcilonotus.*

h_2.—Head wider than body.....*A. carquejai.*

d_2.—First finger much shorter than second.

e_1.—Tips of fingers and toes very strongly dilated.....*A. reicheri.*

e_2.—Tips of fingers and toes distinctly but not strongly dilated.
A. tæniatus.

a_2.—Two small metatarsal tubercles and a third tubercle on the tarsus; toes with at least a distinct rudiment of a web, third finger not longer in male than in female.

b_1.—Toes one-third webbed or less.

c_1.—Toes less than one-fourth webbed.

d_1.—A conical or spine-like tubercle on upper eyelid.....*A. calcaratus.*

d_2.—No such tubercle.

e_1.—Inner metatarsal tubercle nearer to tarsal tubercle than to outer one.....*A. batesii.*

e_2.—Inner metatarsal tubercle equally distant from or farther away from tarsal tubercle than from outer metatarsal tubercle.

f_1.—Skin smooth above.

g_1.—Snout a little shorter than diameter of orbit. *A. minutus.*

g_2.—Snout a little longer than diameter of orbit. *A. werneri.*

f_2.—Skin warty above.

g_1.—Tubercles confluent in shoulder region to form indistinct folds.....*A. scheffleri.*

g_2.—Tubercles not so confluent.

h_1.—A median stripe.....*A. gutturosus.*

h_2.—No median stripe.

i_1.—Tibio-tarsal articulation reaching end of the snout.....*A. fraterculus.*

i_2.—Tibio-tarsal articulation not reaching snout. *A. tokba.*

c_2.—Toes more than one-fourth but not more than one-third webbed.

d_1.—Tips of digits very slightly swollen.....*A. parvulus.*

d_2.—Tips of digits dilated into distinct disks.

e_1.—Inner metatarsal tubercle considerably nearer to outer than to tarsal tubercle.....*A. dispar.*

e_2.—Inner metatarsal tubercle nearly equally distant from outer and from tarsal tubercle.....*A. feæ.*

b_2.—Toes more than one-third webbed.

c_1.—Tips of digits very slightly swollen.

d_1.—Tibiotarsal articulation reaching end of snout.....*A. moorii.*

d_2.—Tibiotarsal articulation reaching eye.....*A. bottegi.*

c_2.—Tips of toes dilated into very distinct disks.

d_1.—Distance between the two metatarsal tubercles considerably less than distance between inner and tarsal tubercles..*A. ogoensis.*

d_2.—Distance between the two metatarsal tubercles more than distance between inner and tarsal tubercles.....*A. rouxi.*

Arthroleptis feæ Boulenger

Plate XXIX, Figure 3

Arthroleptis feæ Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161, Pl. I, figs. 4–6 (type locality: Prince's Island, West Africa). Chabanaud, 1921, Bull. Com. et Hist. et Sci. A. O. F., p. 454 (N'Nébéla, French Guinea).

Sixteen specimens: Faradje, one in February and one in March 1911, seven in October 1912; Stanleyville, five in August 1909; Avakubi, two in January 1914. (A. M. N. H. Nos. 8979–8984; 9037–9046.)

DISTRIBUTION.—It was indeed surprising to find this species in the collections made at so great a distance from the type locality. Our specimens from Stanleyville and Faradje suggest that the species is a wide-ranging forest form.

RELATIONS.—*A. dispar*, the nearest relative of *A. feæ*, is known from Saint Thomas and the Loango Coast. It is probable that the ranges of the two species do not overlap. *A. parvulus*, with which *A. feæ* has much in common, has also an adjacent, not overlapping range. These facts argue for the close affinity of the three species.

VARIATION.—Our specimens agree in structural detail with the original description except for one feature, The tibiotarsal articulation, extended forward, reaches to the anterior border of the eye or to the nostril and not just to the eye as stated by Boulenger. After the variation I have found in the leg length of other species of *Arthroleptis* I have regarded this discrepancy as due to only individual variation.

In five of our six specimens the dominant tone is grayish brown and not dark brown as the type series. Our specimens show equally as much variation as the specimens figured by Boulenger (1906, Figs. 4, 5, and 6). The white vertebral line is present in only one specimen. Three of the specimens agree among themselves in having the ground tone above a grayish brown with an irregular W-shaped mark of dark brown on the scapular region. In two of these specimens a few dark spots are present on the posterior part of the back, and crossbars appear on the legs. The specimen (No. 8984) taken at Faradje differs from the others in being nearly uniform dark brown above.

Our specimens average a trifle larger than the types, our largest female being 18 mm, in length and our largest male, 15 mm. These specimens are sexually mature.

HABITS.—The five specimens taken at Stanleyville were "found hopping on the ground in an old coffee plantation." Two of these, taken August 12, 1909, had their ovaries greatly distended with completely pigmented ova, averaging about 6 mm. in diameter. The stomachs of three of the specimens contained food, which amounted to only 2 ants and 1 beetle.

Arthroleptis parvulus Boulenger

Arthroleptis parvulus BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109, Pl. IV, figs. 3–3*b* (type locality: Bange Ngola, northeastern Angola).

Three specimens: two from Matadi, June 1909, and one from Zambi, June 1915. (A. M. N. H. Nos. 8976–8978.)

DISTRIBUTION.—This species, hitherto known only from the type series, seems to have a very restricted range in the savannahs of northern Angola and western end of the Belgian Congo. It is essentially a continuous range limited by the forests on the north and by the arid regions on the south.

RELATIONS.—*A. parvulus*, *A. feæ*, and *A. dispar* form a distinct group of phrynobatrachoid species distinguished from the other groups of species referred to *Arthroleptis* by a combination of the following characters: slender form, tarsal tubercle, short webs, and unforked omosternum. *A. parvulus* may be synonymous with *A. dispar*, but I have considered them distinct on the basis of the distinguishing characters given by Boulenger (1906, p. 164).

VARIATION.—One of our specimens (No. 8976) is practically identical with one of the type specimens (cf. Boulenger, 1905*a*, Fig. 3) but the only other adult in our series is different not only in color but in limb proportions. Boulenger, in his original description, gives the tibiotarsal articulation as reaching the eye. In one of our specimens it reaches the anterior border of the eye, but in the other it extends to the end of the snout. A careful comparison of the specimens shows that this difference of leg-length is due almost entirely to a difference in tibia length. The tibia of the first is contained in the head and body length almost two times while the tibia of the second is contained 1.77 times. These two specimens differ structurally in no other way and, in view of the variability in the length of the tibia of *A. pœcilonotus* and *A. variabilis*, I feel sure that this difference has no special significance.

The coloration of the longer-legged specimen does not agree entirely with that given in the original description. Its chief features are: ground color above, a brownish gray blotched with dark gray, the blotches forming an indistinct hour-glass-shaped mark on the shoulder region; a narrow, vertebral line of white continued along the posterior surfaces of the thighs by a broader line of the same color; yellowish white below, the throat and sides of the body stippled with brown.

A broad grayish area edged with black extends the length of our smallest specimen which is only 9 mm. from snout to vent. This pat-

tern is identical to one figured by Boulenger (idem, Fig. 3) for the adult and found in one of our adult specimens (No. 8976).

HABITS.—Two stomachs contained food, consisting of 2 minute beetles and 1 ant.

Arthroleptis xenodactylus Boulenger

Plate XXIX, Figure 7

Arthroleptis xenodactylus BOULENGER, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 496 (type locality: Amani, German East Africa). NIEDEN, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 447 (Amani, German East Africa). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 321 (German East Africa). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 361 (Amani, German East Africa). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8 (Medje, Belgian Congo).

A single adult female from Medje, June 30, 1910. (A. M. N. H. No. 8975.)

DISTRIBUTION.—Boulenger (1919) has recently reported this species from the very locality where our single specimen was found. The species apparently has a restricted range in the eastern end of the Rain Forest and the forest outlyer of Usambara.

RELATIONS.—*A. xenodactylus* is readily distinguishable from the other forest species of *Arthroleptis* by the pointed disks of the digits. The tongue of our only specimen is badly damaged and I have not been able to confirm the observations of others as to the absence of the median papilla. Still, there is present in this specimen at the extreme anterior end of the tongue a pair of small papillæ which may or may not be homologous to the median one of other forms. *A. xenodactylus* is similar to *A. pœcilonotus* in body form. I have referred above to the general relationships of these species.

VARIATION.—Our specimen differs somewhat from the type but, in view of the variability of related species, these differences cannot warrant specific distinction. The tibiotarsal articulation of our specimen reaches only the eye. The tibia is contained into the head and body length 1.9 times. The nostril is nearer the end of the snout than the eye, and the tympanum is a little more than half the diameter of the eye. Our specimen differs most strikingly from the type in color. The type was described as "brown above; loreal region dark brown; lower parts white, finely speckled with brown."

In our specimen the dorsal surface of the thighs and a broad patch on the sides of the belly is a pale yellowish. The dark loreal stripe is continued well in back of the tympanum. The brown speckling of the lower surfaces is confined to the gular regions.

The specimen was described in the field as "ground tone above a brownish gray, lighter on the snout; a few dark spots behind the eyes and on the back; on each side of the head a black line extending from the tip of the snout to somewhat beyond the tympanum; limbs gray stippled with a lighter tone; anterior portions of the thighs reddish, the color extending partly over the dorsal surfaces."

HABITS.—The single specimen was taken on the forest floor. Its stomach contained no food. What little is known about the habits of *A. xenodactylus* has been briefly stated by Werner (1912).

Arthroleptis bottegi Boulenger

Arthroleptis bottegi BOULENGER, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16, Pl. IV, fig. 3 (type locality: Auata, Somaliland); 1896, (2) XVII, p. 14 (Gallaland: Tumpé, Hauacio, Degagolla); 1897, (2) XVII, p. 280 (Somali and Gallaland); 1898, Proc. Zoöl. Soc. London, p. 475 (Somaliland). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177 (Uganda: Toro). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 24 (Kilimanjaro: Kibonoto). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Bussu, Uganda). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VIII, p. 362 (Kilimanjaro: Kibonoto).

A single adult female, 29 mm. in length, from Garamba, May 1912. (A. M. N. H. No. 9047.)

DISTRIBUTION.—The discovery of this single specimen at Garamba extends the known range of *A. bottegi* farther westward into the Sudanese savannah areas. The species, although widely distributed in northeast Africa, is best known from Somaliland.

RELATIONS.—After the great variation of leg-length I have found in certain species of *Arthroleptis* discussed in this paper, it seems highly improbable that *A. moorii* is distinct from *A. bottegi*. Still, the known ranges of these two species are adjacent, not overlapping, and a few minor points of difference may be found in the original descriptions. *A. moorii* is known to me only from the description and I have not considered it advisable to refer to it the synonymy of *A. bottegi* at this time.

VARIATION.—Our specimen is a uniform olive-gray above with a light vertebral line narrowly edged with a dark tone. The sides of the body are indistinctly mottled with dark gray and irregular bars of the same color appear on the legs. The ventral surface is pale yellowish, lightly stippled on the throat and marbled on the chest with a dark brown.

HABITS.—The ovaries of our specimen are greatly distended with ova. It seems probable that the breeding season may occur about the time our specimen was taken or a little later, e.g., May or June. Nothing is known about the food habits of this species of *Arthroleptis*.

Arthroleptis pœcilonotus Peters

Arthroleptis pœcilonotus PETERS, 1863, Monatsber. Akad. Wiss. Berlin, p. 446 (type locality: Boutry, Coast of Guinea). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117 (same locality as above). MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). BOULENGER, 1890, Proc. Zoöl. Soc. London, p. 324 (Gold Coast); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161 (Fernando Po, Portuguese Guinea: Bolama and Rio Cassini; French Congo: Fernand-Vaz, Lambaréné and N'Djole); 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 320. NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 501 (Cameroon: Buea, Victoria, Bipindi, Johann-Albrechtshöhe, and Ebolowa). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN 1910, Arch. Naturg., LXXVI, part 1, p. 242 (Bamenda, Cameroon); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 50, fig. 97 (localities of Nieden 1908 and in addition, Bibundi, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 213 (Mowange, Cameroon). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). CHABANAUD, 1919, Bull. Mus. Nat. Hist., Paris, p. 457 (Dahomey).

Arthroleptis macrodactylus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117, Pl. XI, fig. 5 (Gaboon); 1885, Zoöl. Record, Rept., p. 23. GÜNTHER, 1893, Proc. Zoöl. Soc. London, p. 620 (Nyasaland). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 104 (Nyasaland). JOHNSTON, 1897, 'British Central Africa,' p. 361*a* (Nyasaland). WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 144 (Cameroon). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 441 (Gaboon, Tumbo Island in the Gulf of Guinea, and Nyasaland); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 13 (Cameroon); 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 236 (Bibundi, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LIV, p. 214 (Bibundi, Cameroon).

Arthroleptis bivittatus F. MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 671, Pl. IX, figs. *k–l* (Tumbo Island).

Arthroleptis inguinalis BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. XXVII, fig. 2 (Benito River, Gaboon). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon, near Lambaréné). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Efulen, Cameroon).

Arthroleptis pœcilonatus NICKEL, 1901, Helios, XVIII, p. 72 (Cameroon). (Misspelling for *A. pœcilonotus*.)

Four specimens: two from Avakubi, October 1909; and two from Medje, July 1914. (A. M. N. H. Nos. 8971–8974.)

DISTRIBUTION.—*A. pœcilonotus* is well known from the Rain Forest. It has been recorded from the outlying forest "island" of Usambara, and the semi-forested area of Nyasaland. Günther (1893) expressed some uncertainty as to his record of the species from the latter region. The occurrence of the species so far south of the Rain Forest requires confirmation. The records seem to show that *A. pœcilonotus* is a typical

forest species which may or may not occur in the various stretches of forest which lie beyond the Rain Forest proper.

RELATIONS.—*A. pœcilonotus* is a well-defined species belonging to the *typica* group of *Arthroleptis*. This group is distinguished chiefly by its widely forked omosternum, slight indication of a web between the toes, and the elongate third finger in the males. *A. pœcilonotus* is a smaller and more slender frog than *A. variabilis*, with which it has many features in common. It is also closely related to *A. carquejai*. This species was only briefly described, but judging from the figure (Ferreira, 1906, plate facing p. 159) it has a darker and much more heavily spotted throat than any specimen of *A. pœcilonotus* which I have examined.

VARIATION.—Several investigators have remarked on the variability of this species. Our series, three adult males and one young individual (male ?), shows that this variability is not limited to color. The two specimens (Nos. 8971–8972) from Avakubi measure 22 mm. and 20 mm. respectively in length (snout to vent), and yet the first has a tibia 10 mm. in length and the second, 11 mm. Thus the relative difference of the length of the tibia compared to the length of the body of these specimens is 2.2 to 1.8. The two specimens from Medje and two others (Nos. 3140 and 6694) from Cameroon have the tibia proportionately intermediate in length.

One of the adult males from Medje is very warty above, while the other is nearly smooth. They are both chestnut-brown in color, delicately marbled with black. A broad triangle between the eyes, a series of confluent spots posterior to it, and a number of crossbars on the legs are the most conspicuous of these markings.

The two specimens from Avakubi are both ashy gray above marked with blackish, very similar to the Medje specimens. In life these patterns were distinct but the ground tones were different. The smaller specimen was described in the field as "whitish gray above, faintly marbled with darker; silvery gray below with a white area on the abdomen." The larger specimen, on the other hand, was found to be "pale green above with irregular dark markings; whitish below, translucent on the throat and hind limbs."

HABITS.—Nothing is known of the habits of this species of *Arthroleptis*. Related forms have been found in the vicinity of forest pools. Only one stomach contained food. This consisted of three ants and fragments of a fly or beetle larva.

Arthroleptis variabilis Matschie

Plate XXIX, Figure 5; XXX, Figures 1, 3; XXXII, Figure 1

Arthroleptis variabilis Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 173 (type locality: Buea and Barombi, Cameroon). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 193 (Buea, Cameroon); 1899, XLIX, p. 144 (Victoria, Cameroon). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 441 (Fernando Po, Cameroon and Gaboon). Schenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Cameroon). Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Buea, Cameroon and Fernando Po). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 502 (Cameroon: Buea, Victoria, Johann-Albrechtshöhe, Ebolowa, Bipindi, and Loppo). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 50, figs. 93–96 (localities of Nieden 1908 except Loppo, and in addition Bibundi, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Kribi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 213 (Cameroon: Bibundi, Isongo, and Mowange). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (Dixine and Keronané, French Guinea).

Arthroleptis dispar Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117 (part: West Africa). (Not of Peters, 1870.)

Atthroleptis variabilis var. *tuberosa* Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14 (Cameroon).

Fifty-two specimens: twenty-eight from Akenge, September and October 1913; fourteen from Medje, five of which were taken in March 1910, five in April–May 1910, two in September 1910, one in June 1914, and one in July 1914; seven from Gamangui, February 1910; and one from each of the following localities: Faradje, November 1911, Vankerckhovenville, April 1912, and Avakubi, November 1913. (A. M. N. H. Nos. 8985–9036.)

Distribution.—*A. variabilis* represents still another Cameroon species found abundantly in the Ituri. Like many of these wide-ranging forest forms, it also occurs in the forested areas lying beyond the Rain Forest proper.

Relations.—Nieden, (1912) has considered his *A. adolfi-friederici* distinct from *A. variabilis* on the basis of its shorter metatarsal tubercle. This structure shows some variation in our large series. It averages a little longer than the inner toe, but several of the specimens have it a little shorter. Nieden's largest specimen of *A. adolfi-friederici* was only one millimeter larger than our largest specimen of *A. variabilis*, and his type was about the average of our adult females. Whatever might be the true status of *A. adolfi-friederici*, I would, for zoögeographic reasons, regard the specimen recorded by Nieden (*loc. cit.*) from Avakubi as *A.*

adolfi-friederici as actually referable to another species. It should have been referred to either *A. pœcilonotus* or *A. variabilis*. Without the specimen at hand, it would be difficult to say which. Its small size at sexual maturity makes it seem probably referable to the former species.

VARIATION.—The great variation in color of *A. variabilis* has been commented upon by Peters (1875), Matschie (1893), Werner (1898), Andersson (1905), Nieden (1910*a*), and others. Our series shows considerably more uniformity than some of the series discussed by these investigators. Most of the specimens are nearly uniform reddish brown above, paler on the snout, and faintly mottled on the sides of the body. The black tympanic stripe is always more or less distinct. The throat is generally marbled with dark brown. A light vertebral stripe is often present.

The specimens have faded but little in alcohol. One specimen (No. 9002) from Gamangui, February 13, 1910, was described in the field: "Dorsal surface brownish gray, paler on the head; a dark bar between the eyes; legs crossbarred with dark brown; throat mottled with gray, a light median line dividing it horizontally; abdomen grayish with blue green tints, becoming pinkish on the under surface of the thighs; iris golden."

HABITS.—An examination of the sexual organs of our series of specimens has led me to infer that the breeding season may occur in June and July. This inference is based on negative rather than positive evidence since our series of specimens taken during those months is limited.

Of those stomachs examined seventeen contained food, consisting of 400 winged termites; 6 soldier and worker termites; 1 winged and 8 worker ants; 5 snails (*Helixarion*); 5 caterpillars; 3 roaches; 2 spiders; 1 myriopod (Julidæ); and 1 beetle.

CARDIOGLOSSA Boulenger

Plate XXXII, Figure 2

This genus, which has been defined as a toothless *Arthroleptis*, is restricted in range to the Rain Forest. It includes five species which may be distinguished as follows:

a_1.—Digits dilated into distinct disks.
  b_1.—Toes half webbed ..... *C. dorsalis.*
  b_2.—Toes much less than half webbed ..... *C. elegans.*
a_2.—Digits only slightly dilated.
  b_1.—Tibiotarsal articulation reaching to tympanum or eye.
    c_1.—Metatarsal tubercle as long as first toe; interorbital space much wider than upper eyelid ..... *C. escaleræ.*

c_2.—Metatarsal tubercle a little shorter than inner toe; interorbital space only slightly wider than upper eyelid.....*C. leucomystax.*

b_2.—Tibiotarsal articulation reaching end of snout or beyond.....*C. gracilis.*

Cardioglossa leucomystax (Boulenger)

Plate XXXII, Figure 2

Arthroleptis leucomystax BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62, Pl. v, figs. 1 and 2 (type locality: Cape St. John and the Benito River, Spanish Guinea; and Kribi, Cameroon).

Cardioglossa leucomystax BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321. NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 (Cameroon: Victoria, Jaunde, and Johann-Albrechtshöhe); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 62, figs. 132 and 133 (localities of Nieden, 1908, and in addition Kribi, Cameroon). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria).

Cardioglossa leucomystax var. *nigromaculata* NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 (Johann-Albrechtshöhe, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 63, fig. 133 (Bamenda and Johann-Albrechtshöhe, Cameroon); Arch. Naturg., LXXVI, part 1, p. 245 (Bamenda, Cameroon); 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 182, Pl. v, figs. 6 and 7 (Forest 90 km. west of the south end of Lake Albert Edward).

Seven specimens: one from Medje in April–May 1910, one in March 1914, and two in June 1914; one from Gamangui, February 1910; one from Batama, September 1909; and one without an exact locality. (A. M. N. H. Nos. 9310–9316.)

DISTRIBUTION.—*C. leucomystax* is essentially a forest frog. Our locality records tend to show that the species has a wide distribution throughout the Rain Forest. The fact that our specimens were taken singly and mostly by accident is indicative of the secretive nature of the species, which is indeed very little known.

RELATIONS.—It is difficult for me to believe that *C. escaleræ* is really distinct from *C. leucomystax*. The two unimportant characters which I have used in the key are the only diagnostic ones in the original descriptions. The former species was described with toes free, while the latter with toes provided with a rudiment of a web. This apparent difference disappears in our series, where the rudiment of a web is sometimes fleshy and indistinguishable from the metatarsal region.

VARIATION.—The metatarsal tubercle shows so much variation in our series that its size can hardly be used as diagnostic of *C. escaleræ*. In one specimen (No. 9316) it is about one-third as long as the inner toe, while in another (No. 9315) it is nearly as long as that structure.

In view of the several color variations found by Nieden, our series shows great uniformity. The pattern in all of the specimens is practically identical with that well shown in the photograph (Plate XXXII, fig. 2).

The ground tone above varies from a pale gray to an olive-brown. The lateral spots very in shape but their arrangement is very much the same in all the specimens. The specimen (No. 9310) shown in the photograph was described in life: "dark brown above with indistinct tracing of pale lines; sides of the body heavily spotted with large dark blotches outlined with pale blue; sides of the head washed with the same dark tone, bordered below by a whitish line; throat brownish speckled with pale blue; abdomen marbled with dark brown and pale blue; appendages indistinctly crossbarred with dark brown; iris dark brown, the upper third golden."

HABITS.—The breeding season may occur in June, for only the specimens taken during that month are sexually mature. It is probable that the larval period is more or less abbreviated, for mature eggs taken from the ovaries are 2.5 mm. in diameter and are unpigmented. Nothing is known about the habits of the species. All of our specimens were taken in the forest and mostly by natives.

Only three stomachs of those examined contained food. This was composed entirely of termites: 82 soldiers and workers were counted.

Cardioglossa gracilis Boulenger

Cardioglossa gracilis BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 445, text fig. 2 (type locality: Benito River, Gaboon). WERNER, 1901, Verh. Zool.-Bot. Ges. Wien, LI, p. 634 (same locality). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Cape St. John, Spanish Guinea). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507; 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 63 (between the Cameroon mountains and Rio del Rey). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., LIV, No. 2, p. 135 (Ja River, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 217 (Bibundi, Cameroon).

A single immature female from Boyulu, September 22, 1909. (A. M. N. H. No. 9317.)

DISTRIBUTION.—*C. gracilis*, formerly known only from the Cameroon-Gaboon area, will probably be shown to have the same wide range in the Rain Forest as *C. leucomystax*, to which it is closely related, if not identical.

RELATIONS.—Two closely related species rarely ever occupy the same range, a fact which lends support to my opinion that the species may be identical. The only real difference I can find between them is the distinctly greater leg-length of *C. gracilis*, a difference we have seen to have little specific value in various species of *Arthroleptis*, the prototype of *Cardioglossa*. Our single specimen of *C. gracilis* has the tibiotarsal

articulation extending beyond the snout, but in every other way it is identical to *C. leucomystax*. Our specimen is only 26 mm. long. In most species of *Phrynobatrachus* and *Arthroleptis* the young individuals exhibit greater variation in leg-length than fully adult ones. None of the specimens of *C. leucomystax* in our series show any intermediate condition, and I have considered it advisable to keep *C. gracilis* and *C. leucomystax* distinct for the present.

VARIATION.—The coloration of our specimen is practically identical to that of *C. leucomystax* as figured by Boulenger (1903, Pl. v, fig. 2), In other words, the dorsal pattern, indistinct in our series of *C. leucomystax*, is in this specimen very sharp. The dark lateral blotches, however, were outlined in life with yellow instead of pale blue as in *C. leucomystax* and the ground tone above was a pale gray instead of a dark brown.

HABITS.—Our specimen was caught in the forest at Boyulu near the road. Its stomach contained the fragments of several ants.

RANA Linnæus

Boulenger has for some time had in preparation a revision of this genus. He has indicated (1918) that the genus might be divided into a number of subgenera characterized by differences in the skull, pectoral girdle, and metatarsal region. Procter (1919) has contributed some support to Boulenger's view. Equally important differences of skull and metatarsal region are known in many other genera but these differences have not been considered of subgeneric value in these latter cases. The genus *Hyla* may be taken as an example. *Smilisca* has a very definite and peculiar skull-form but that genus is generally merged into *Hyla* without even subgeneric distinction. The form of the omosternum has been shown above to be characteristic of groups of species of *Arthroleptis*. The characters upon which Boulenger bases his subgenera of *Rana* are apparent in the material I have examined, but it would be inconsistent to recognize with a name these differences in *Rana* and disregard those in *Arthroleptis*. Until the use of subgenera becomes more universal in herpetology it is at least conservative to disregard them in our discussion.

In view of Boulenger's forthcoming monograph, no attempt has been made to construct a key to the African species of *Rana*. The check list indicates what species are generally considered valid. My conclusions do not agree entirely with those of Boulenger. Witte (1921) has published a translation of part of Boulenger's forthcoming key.

Rana occipitalis Günther

Plate XXXIV, Figure 2

Rana occipitalis GÜNTHER, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 130, Pl. XI (type localities: "West Africa," "Africa," and Gambia). BOULENGER, 1882, 'Cat, Batr. Sal. Brit. Mus.,' p. 27 (Angola and the above localities). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, French Congo). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, pp. 275 and 670 (Tumbo Island and Senegambia). GÜNTHER, 1888, Proc. Zoöl. Soc. London, p. 51 (Monbuttu, Belgian Congo). BÜTTIKOFER, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). BOETTGER, 1892, 'Kat. Batr. Mus. Senck.,' p. 3 (Senegal). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland). BOCAGE, 1895, 'Herpétol. Angola,' p. 155 (Littoral and northern Angola: Duque de Bragança, Dondo, Ambaca, Novo Redondo, and Catumbella); 1896, Jorn. Sci. Lisboa, (2) IV, p. 80 (Portuguese Guinea). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 91 (Kakoma, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p 65 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 299 (German East Africa). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Bissau, Portuguese Guinea). JOHNSTON, 1906, 'Liberia,' II, p. 833 (Liberia). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1887 (Sudan: Mongalla). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 495 (Garua, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 39 (same locality); Arch. Naturg., LXXVI, part 1, p. 241 (Dodo, Cameroon). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167 (Bussu, Uganda). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 208 (Senegal). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 312 (Africa). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 349 (Kakoma, German East Africa and Entebbe, Uganda). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Timbouctou, French West Africa; Agouagon, Dahomey).

Rana (Fejérvárya) occipitalis BOLKAY, 1915, Anat. Anz., XLVIII, p. 172, figs. 1–3 and 7 (Shirati, German East Africa). (Subgenus used generically for figures but not for text.)

Rana tigrina var. *occipitalis* BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 4 (Poko, Medje, and Albertville, Belgian Congo; also summary of distribution).

Rana tigrina occipitalis CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 450 (French Guinea and Liberia).

Fifty-seven specimens: six from Faradje, February 1911, one from the same locality in February, twenty-three in October and two in November 1912; four from Medje in August and two in September 1910; one from the same locality in April, one in March, and one in June 1914; two from Stanleyville in August 1909, one in March 1910, four in February and two in April 1915; two from Garamba, June 1912; and one from each of the following localities: Mobeka, July 1909; Niangara, November 1910; Poko, July 1913; Zambi, June 1915; and Malela, July 1915. (A. M. N. H. Nos. 10899–10955.)

DISTRIBUTION.—*R. occipitalis* is a river-frog and its range is not limited to a single vegetation zone. It is a very conspicuous frog, one not easily confused with any other species. Its wide distribution throughout both forest and plains from Senegal and the Sudan in the north to Angola and Tanganyika Territory in the south suggests that few factors beside temperature and drainage control its dispersal.

RELATIONS.—Boulenger (1919) has reduced *R. occipitalis* to a subspecies of *R. tigrina*. *R. occipitalis* is only distinguishable from *R. tigrina* externally by its very distinct occipital furrow. Still, I am not at all convinced that the many differences of skeleton pointed out by Bolkay (1915) are to be attributed solely to individual variation. The ranges of *R. occipitalis* and *R. tigrina* are not contiguous. For the present it seems advisable to return *R. occipitalis* to its specific status.

VARIATION.—The variation in color pattern is largely dependent on a variation in the ground tone. Young specimens which have generally a light ground tone, are mostly spotted. Older specimens are sometimes a uniform dark greenish gray above, but more often have some indication of the spotting which is very distinct in those with the pale grayish ground tone. The light occipital bar is very distinct in all but the darkest specimens.

One of the darker specimens (No. 10899) taken at Faradje in November 1912 was described in the field: "general color above a greenish brown with darker markings, especially on the limbs; tympanum pinkish brown; throat pinkish gray and creamy markings; abdomen grayish white; sides of the body grayish green with pale yellowish markings along the lower edge; iris bronzy green with numerous fine anastomosing black radiations."

HABITS.—*R. occipitalis* was found only in the vicinity of streams, ponds or marshes. It appears to have much the same habits as our bull frog. Its large size enables it to feed on many of the smaller frogs of the region. Four frogs taken from stomachs of four specimens of *R. occipitalis* are unidentifiable but they appear to be young of the same species. One specimen of *R. occipitalis*, 104 mm. long, had a specimen of *R. oxyrhyncha*, 43 mm. long, in its stomach. Another specimen, 117 mm. long, had eaten a *Bufo regularis*, 50 mm. in length. Of special interest was a specimen (No. 10953) 112 mm. in length, from Medje, taken August 29, 1910. It contained in its stomach three specimens of *Hyperolius pusillus* (?) each about 33 mm. from snout to vent.

Twenty-five stomachs were examined. In addition to the 8 frogs and 1 toad mentioned above, they contained 1 crab; 18 beetles; 14

ants; 4 spiders; 2 winged dragon flies and 3 larvæ; 3 termites; 3 crickets; 4 bees (*Ceratina* and *Megachile*); 3 pentatomids (Heteroptera); 2 julids (Myriopoda); 2 mole-crickets (*Gryllotalpa*); 1 horse-fly larva (Tabanidæ) and 1 pupa; 1 isopod; 1 driver ant; 2 snails (*Succinea*, *Limicolaria*); 1 caterpillar; 1 fly; 1 grasshopper; 1 water-bug; 1 lombricid; and a number of leaves.

Rana chapini, new species

Text Figure 6*a*

A single adult male, Batama, September 16, 1909 (A. M. N. H. No. 11260).

DISTRIBUTION.—*R. chapini* is apparently the forest representative of the *R. nutti—R. angolensis* stock. *R. nutti* is known from Abyssinia to western Tanganyika Territory, while *R. angolensis* has been recorded from Angola and Nyasaland southward to the eastern Cape Colony.

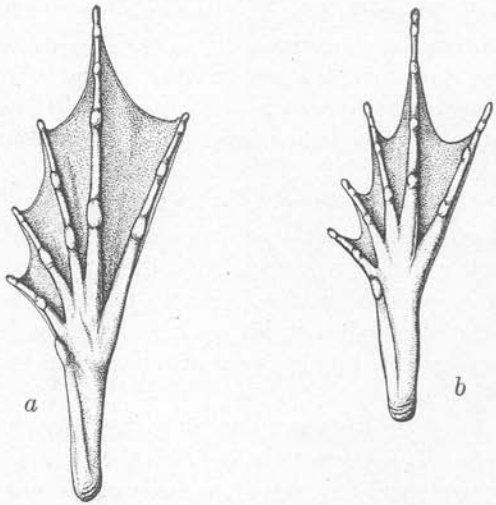


Fig. 6. (*a*) *Rana chapini*, new species, and (*b*) *R. angolensis* Bocage, ventral aspect of foot, showing the difference in the extent of the webbing.

DIAGNOSTIC CHARACTERS.—Tibiotarsal articulation extending considerably beyond the snout; tibia contained one and a half times in the distance between snout and vent; toes webbed to half the length of the distal phalanges of the third and fifth toes, and to beyond the proximal joint of the penultimate phalanx of the fourth. A single metatarsal tubercle; skin smooth, a dorsolateral fold on each side; no external vocal sacks in the male; size large.

TYPE.—The only specimen secured.

DESCRIPTION OF TYPE SPECIMEN.—Vomerine teeth in two oblique series extending from the anterior borders of the choanæ to a level with their posterior margins; distance between the two series of teeth equal to about half the length of a single series. Head about a sixth longer than broad; snout obtusely acuminate, projecting slightly beyond the mouth; once and a half as long as the eye; canthus rostralis obtuse; loreal region feebly concave; nostril equidistant from the eye and tip of the snout; the distance between the nostrils greater than the interorbital width which is much less than that of the upper eye-lid; tympanum very distinct, three-fourths the diameter of the eye and two and a half times as wide as the distance between it and the eye. Fingers pointed, first and second equal; subarticular tubercles distinct. Tibiotarsal articulation extending beyond the snout for a distance of half the length of the head; heels strongly overlapping; tibia contained one and a half times in the distance between snout and vent, slightly longer than the foot. Toes pointed, nearly completely webbed, the web extending to the tip of the first and second toes, to more than half the length of the distal phalanges of the third and fifth toes and to beyond the proximal end of the penultimate phalanx of the fourth toe; subarticular tubercles not prominent; an indistinct tarsal fold present, but no tarsal tubercle; inner metatarsal tubercle oval, one-third the length of the inner toe, no outer tubercle. Upper surfaces smooth; a narrow but very distinct dorsolateral glandular fold, extending to the groin on each side; a curved fold from the eye extending over the tympanum to the shoulder; lower surfaces smooth; posterior surfaces of the thighs granular.

Color above uniform dark brown, grayish on the head and indistinctly spotted on the legs; posterior surfaces of the thighs spotted with a darker tone, ventral surfaces yellowish, marbled with brown and white on the throat, chest and sides of the belly. In life, colors much the same but the head suffused with green and not gray.

Vocal sacs internal, not indicated by folds on the sides of the throat.

MEASUREMENTS

Snout to Vent	78	mm.
Width of Head	21	"
Foreleg	45	"
Hind Leg (Vent to Tip of Longest Toe)	151	"
Tibia	49	"

RELATIONS.—*R. chapini* is most closely related to *R. nutti* Boulenger, which Nieden (1912) has regarded as probably identical with *R. delalandii* Duméril and Bibron (=*R. angolensis* auct.). It is, nevertheless, readily distinguishable from both of these species by its more extensive webbing between the toes. It is very probably a larger frog, for the largest male *R. angolensis* recorded by Boulenger (1918*a*) in his recent critical study of that species is three millimeters smaller than our single specimen of *R. chapini*.

HABITS.—Our specimen was taken in the grass bordering the brook at Batama. Its stomach contained fragments of a single beetle and a caterpillar.

Rana albolabris Hollowell

Plate XXXIV, Figure 1

Rana albolabris HALLOWELL, 1856, Proc. Acad. Nat. Sci. Philadelphia, p. 153 (type locality: West Africa). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 59, figs. 2, 2*a*, and 2*b* (Gaboon and Fernando Po). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Gaboon). VAILLANT, 1884, Bull. Soc. Zool. France, IX, p. 353 (Assini, French West Africa). BOETTGER, 1888, Ber. Senck. Ges., p. 94 (Assini, French West Africa; Akkra, Gold Coast; Abo, Cameroon; Fernando Po; Dongila, Gaboon; Lambaréné on the Ogowe; Chinchoxo, Loango Coast; and Banana, Lower Congo); 1892, 'Kat. Batr. Senck. Ges.,' p. 12 (Banana, Lower Congo). MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). BOCAGE, 1895, 'Herpétol. Angola,' p. 162 (Lower Congo and the Loango Coast). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (part: Bukoba, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 65) (German East Africa); 1898, in Werther, 'Die mittleren Hochländer der nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 7 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Gaboon: Fernand Vaz and N'Djole: Cameroon: Buea; and Fernando Po). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 229 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 496 (Spanish Guinea: Makomo; Cameroon: Bipindi, Jaunde, Ebolowa, Longji and Ossidinge). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 39, figs. 62–63 (Victoria and Cameroon localities of Nieden 1908); 1910, Arch. Naturg., LXXVI, part 1, p. 241 (Dodo, Cameroon). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, p. 130 (Efulen, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 211 (Bibundi and Isongo, Cameroon). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 353 (Entebbe, Uganda; and Bukoba, German East Africa).

Limnodytes albolabris VAILLANT, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini).

Chiromantis lepus ANDERSSON, 1903, Verh. Zool.-Brit. Ges. Wien, LIII, p. 142 (type locality: Cameroon); 1905, Ark. Zool., Stockholm, II, No. 20, p. 9, Pl. I, figs. 1 and 1*a* (Cameroon). NIEDEN, 1908, Mitt. Zool., Mus. Berlin, III, p. 500 (Cameroon).

Rana albilabris BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 323 (Unyoro, East of Lake Albert) (Emendation to *R. albolabris*); 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands; Victoria Nyanza). KLAPTOCZ, 1913, Zool. Jahrb. (Syst.), XXIV, p. 288 (Mamou, French Guinea). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 1 (Bafwadi, Bafwasikuli, Fundi, Mombaka, and Medje, Belgian Congo).

Rana zenkeri NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 497 (type locality: Bipindi, Cameroon). BARBOUR, 1911, Bull. Mus. Comp. Zoöl. Cambridge, LIV, p. 130, Pl. I (Efulen, Cameroon).

Rana (Hylorana) albolabris CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 450 (Kerouané, French Guinea and Sanikolé, Liberia).

Ninety-six specimens: thirty-four from Niapu, January 1914; one from the same locality, November 1913; two from Medje in April, nine in June, and six in July 1914; six from the same locality in April–May, 1910; six from Stanleyville in August 1909 and four in April 1915; eight from Niangara, November 1910; two from Avakubi in October 1909 and one in September 1913; three from Faradje, February 1911; two from Nala, July 1913; and one from each of the following localities: Ukaturaka, July 1909; Ngayu. December 1909; Yakuluku, November 1911; Vankerckhovenville, April 1912; Dungu, July 1913; Garamba, July 1912; and Akenge, September–October 1913. (A. M. N. H. Nos. 10992–11087.)

DISTRIBUTION.—*R. albolabris* is a very characteristic frog of the Rain Forest. . Still, its range is not limited to that area. The species has been taken as far east as Bukoba in Tanganyika Territory, and Unyoro and Entebbe in Uganda. Specimens were taken by the expedition as far north as Yakuluku and Garamba. The species has been recorded south of the forest by Boettger (1892). It is probable that swamps and other moist areas have enabled *R. albolabris* to maintain itself in the savannahs beyond the forest.

RELATIONS.—It is only with considerable hesitancy that I have followed Boulenger (1919, p. 4) in referring *R. zenkeri* to the synonymy of this species. The distinguishing characters given by Nieden (1908*a*) are of little value in a large series, but I have examined a number of specimens in the Museum of Comparative Zoölogy from Cameroon which, although not breeding frogs, are considerably larger than our largest sexually mature females of *R. albolabris*. These specimens, between 80 and 90 mm. in length, are much more granular above than any of our specimens, and the width of their head is a little greater. The average of the ten largest specimens of *R. albolabris* in our series is 68.3 mm. from snout to vent (maximum, 73 mm.; minimum, 66 mm.).

VARIATION.—The ground tone varies in our series from a pale grayish to a dark brown. The dark spots above, the dark blotches below and the light tinge to the lips show various degrees of development. The labial stripe and the dorsal spots are present in the darkest individuals of our series. The labial stripe is not always present in the pale specimens.

Two of our specimens (Nos. 11066–11067) from Faradje, taken February 15, 1911, may be considered typical. They were described in the field as: "grayish green above, with many irregular dark markings, several black bands across the hind limbs; sides of the body pale greenish; the larger specimen metallic blue below, whitish on the belly and

pinkish on the appendages, the smaller specimen nearly black below except for the hind limbs which are pinkish."

HABITS.—*R. albolabris* was found at Stanleyville, August 21, 1909, hopping on the ground in a coffee plantation; at Nala, July 1913, it was taken in the tall grass near the swamps; while at Faradje, February 1911, it was chiefly observed in the waterholes with *Xenopus*.

Females which show the maximum degree of development of their ovaries were taken at Stanleyville in August and at Medje in May and June.

Twenty-three of the stomachs examined contained food. The following material was recognizable: 25 ants; 6 caterpillars; 7 beetles; 2 grasshoppers; 2 spiders; 2 snails; 2 myriopods (julids); 1 slug (*Vaginulidæ*); 1 membracid; 1 wasp (Psammocharidæ); and 1 hemipterous insect (Reduviidæ).

Rana mascareniensis Duméril and Bibron

Rana mascareniensis DUMÉRIL AND BIBRON, 1841, 'Erpét. Gén.,' VIII, p. 350 (type locality: Seychelles, Mauritius, and Bourbon). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 52 (part: Barbary, Gambia, Zanzibar, and Seychelles; Angola: Bragança; Abyssinia: Sooroo Pass and Ain Samhar). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, pp. 275 and 670 (Senegambia and Tumbo Island). GÜNTHER, 1888, Proc. Zoöl. Soc. London, p 51 (Monbuttu, Belgian Congo). MOCQUARD, 1888, Mém. Cent. Soc. Philom., p. 133 (Somaliland). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (Alexandria, Egypt; Korogwe, German East Africa). HÉRON-ROYER AND VAN BAMBEKE, 1889, Arch. Biol., IX, p. 252, Pl. XVI, figs. 1–3 (locality an error). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, p. 253 (Bolama, Portuguese Guinea). BOETTGER, 1892, 'Kat. Batr. Mus. Senck. Ges.,' p. 10 (Senegal, Abyssinia, and Dahalak Island). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 90 (Zanzibar; Alexandria, Egypt; Korogwe, German East Africa). BOETTGER, 1893, Zool. Anz., XVI, p. 132 (Somaliland). STEJNEGER, 1893, Proc. U. S. Nat. Mus., XVI, p. 738 (Seychelles). GÜNTHER, 1894, Proc. Zoöl. Soc. London, p. 88 (Kribibi Basin, north of Lamu Island). BOCAGE, 1895, 'Herpétol. Angola,' p. 160 (Zanzibar and Mozambique). BOULENGER, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16 (Somaliland: Auata and near Aberio); Proc. Zoöl. Soc. London, p. 539 (Tooroo, Somaliland). GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 526 (Uganda and Shiré Highlands). ANDERSON, 1896, 'Herpetol. Arabia and Egypt,' p. 110 (localities of Anderson, 1898). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 80 and 96 (Mozambique and Portuguese Guinea: Bisao and Bolama). BOULENGER, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554 (Shoa, Abyssinia, and Saati, Eritrea); (2) XVII, pp. 14, 22 and 280 (Somaliland, Laffarug, Elba, Coromma, Lugh and Lake Abaia); Proc. Zoöl. Soc. London, p. 217 (Lake Rudolf and Dawa River). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 92 (Zanzibar and German East Africa: Usambara,

Dar-es-Salaam, Korogwe, Yaquiro, Itoli, Victoria Nyanza, Pori Usiomi, Manjaro, Kwa Mumija and Bukoba). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 147 (Transvaal). BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: N. W. Nyasa and Nyika Plateau). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Afrika); ANDERSON, 1898, 'Zool. Egypt.,' I, p. 346, Pl. L, fig. 1 (Egypt: near Gizeh pyramids, Mahallet el Kabir and the Freshwater Canal, Suez). BOULENGER, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721 (Lugh, Somaliland). FERREIRA, 1898, Jorn. Sci. Lisboa, (2) V, p. 240 (Rio Cuce and Caconda, Angola). TORNIER, 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch Ost-Afrika,' p. 300 (German East Africa). BOULENGER, 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). STEINDACHNER, 1901, Denkschr. Akad. Wiss. Wien (math.-natur.), LXIX, p. 335 (Suez and Sahiti). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 447 (Uganda). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa: Atchi River). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). ANDERSSON, 1904, in Jägerskiöld, 'Results Swed. Zool. Exp. to Egypt and the White Nile,' 1901, I, fasc. 4, p. 9 (Egypt: Inchas, White River and White Nile). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Northeast Benguella, Angola); Proc. Zoöl. Soc. London, II, p. 251 (Sibudeni, Zululand); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Portuguese Guinea: Bolama, Rio Cassini and Bissao, French Congo: Fernand-Vaz, N'Djolé, and Cape Lopez). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 229 (Bibundi, Cameroon). BOULENGER, 1907, Proc. Zoöl. Soc. London, II, p. 481 (Beira, Portuguese East Africa). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1888 (Sudan: Khor Attar and Gondokoro). BOULENGER, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands); Ann. Natal Mus., I, p. 222 (Zululand: Mseleni). CHUBB, 1908, Ann. Mag. Nat. Hist., (8) II, p. 219 (Matabeleland). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 496 (part: Cameroon, several localities). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 6 (Natal and Lake Sibayi). BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 304 (Sesse Islands). CHUBB, 1909, Proc. Zoöl. Soc. London, p. 592 (Gwamayaya River, Matabeleland). PELLEGRIN, 1909, Bull. Soc. Zool. France, XXXIV, p. 205 (Egypt: Singa and Agadi). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 175 (Toro, Ruwenzori). BOULENGER, 1910, Ann. S. African Mus., V, p. 527 (Salisbury, Southern Rhodesia; "Egypt and Tropical Africa to Southern Rhodesia and Zululand"). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 22 (Kilimanjaro and Mombo, Usambara). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 37, figs. 49–51 (Part: Cameroon); Sitzber. Ges. Naturf. Freunde Berlin, p. 444 (Amani, German East Africa). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 101 (German East Africa: Bukoba and Njarugenje). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, part 6, p. 27 (British East Africa: Escarpment and vicinity of Nairobi). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167 (Bussu and Kabulamuliro, Uganda). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 12 (Victoria Falls, and Pirie, Cape Colony); Rec. Albany Mus., II, part 3, p. 222 (Marandellas, Rhodesia; Woodbush, Transvaal; also

partial summary of above localities). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LIV, p. 210 (part: Mombassa and Kawirondo, British East Africa; possibly Cameroon). BOULENGER, 1912, Ann. Mus. Stor. Nat. Genova, (3) V, p. 322 (Abyssinia: Wabi Mana, Hawash River). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch Zentr. Afrika Exp.,' IV, p. 166 (Lake Region: Bukoba, Kifumbiro Ruanda, Lake Mohasi, Lake Kivu, Lake Mulera and northwestern edge of Lake Tanganyika). PERACCA, 1912, Ann. Mus. Zool., Napoli, (2) III, No. 25, p. 7 (Northern Rhodesia). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 313 (Central and South Africa). BARBOUR, 1913, Proc. Biol. Soc. Washington, XXVI, p. 149 (Gizeh, Egypt). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 356 and 362 (Lamu Island and Usambara). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Eldorado and Marandellas, Southern Rhodesia). KLAPTOCZ, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 288 (French Guinea: Kouakry, Dubreka, Mamou and Koukoure). PELLEGRIN, 1914, Doc. Sci. Mis. Tilho, III, p. 128 (Northern Nigeria). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 351 (German East Africa, thirteen localities; British East Africa, five localities). WERNER, 1915, in Michaelsen, 'Beiträge zur Kenntnis des Land und Süsswasser Fauna Deutsch-Südwestafrikas,' part 3, p. 372 (Okawanga, German Southwest Africa). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 6 (Belgian Congo: Stanleyville, Bafwasende, Avakubi, Lesse, and Bosabangi). WERNER, 1919, Denk. Akad. Wiss. Wien (math.-naturw.), XCVI, p. 453 (Senaar, Anglo-Egyptian, Sudan). PROCTER, 1921, Proc. Zoöl. Soc. London, p. 412 (British and German East Africa).

Rana esculenta MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 129 (Part: Egypt).

Rana marchii ROCHEBRUNE, 1885, Bull. Soc. Philom. Paris, (7) IX, p. 90 (Sangourougou, Senegal).

Rana mascareniensis var. *porossissima* BOCAGE, 1895, 'Herpétol. Angola,' p. 160 (Angola: St. Salvador du Congo, Duque de Bragança, Ambaca, Quibula, Caconda, Rio Quando and Huilla).

Rana subpunctata BOCAGE, 1895, 'Herpétol. Angola,' p. 161 (Duque de Bragança).

Rana mascariensis JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). (Misspelling for *R. mascareniensis*.) MEEK, 1910, Publ. Field Mus., Zoöl., VII, p. 403 (British East Africa: Nairobi, Athi River and Lake Elmenteita).

Rana mascarensis FLOWER, 1900, Proc. Zoöl. Soc. London, p. 968 (Jebel Ain, White Nile). (Misspelling for *R. mascareniensis*.)

Rana (*Ptychadena*) *mascareniensis* BOULENGER, 1918, Bull. Soc. Zool. France, XLIII, p. 114; C. R. Acad. Sci. Paris, CLXV, p. 988. CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 451 (French Guinea and Liberia).

(For bibliography *ante* Boulenger 1882, refer to Anderson, 1898, p. 346.)

One hundred and thirty-eight specimens: twenty-six from Faradje in October 1912, four in January 1913, three in February, and one in April 1911; thirty-five probably from the same locality in October 1912; two from Stanleyville in February and thirty-six in April 1915; fourteen from the same locality in August 1909; five from Medje in March 1914; one from the same locality in July, two in August, and one in September

1910; two from Bafwasende, September 1909; two from Avakubi, October 1909; one from Garamba in May and one in June 1912; one from Niangara, November 1910; and one from Ngayu, December 1909. (A. M. N. H. Nos. 11122–11259.)

DISTRIBUTION.—Hewitt (1911*b*, p. 222) has summed up the distribution of *R. mascareniensis* as "from Barbary and Egypt throughout Tropical Africa, southwards into Rhodesia (Gwamayaya River, Chubb). Mozambique, to Zululand (Mseleni and Sibudeni)." It is apparent that vegetation zones have little control over the range of *R. mascareniensis*. I am not at all sure that all the Cameroon records given above are referable to this species. *R. bibroni* appears to be much the commoner frog in that area and it has often been confused with *R. mascareniensis*. In other parts of the forest, such as the Upper Congo, *R. mascareniensis* is perhaps the dominant element of the amphibian fauna.

RELATIONS.—I have examined typical specimens of both *R. mascareniensis* and *R. bibroni* from Cameroon. The latter species with its greatly prolonged snout and long legs is not to be confused with the former. Werner (1907) has proposed three new species of frogs closely related to *R. mascareniensis*. These, although reported from the Sudan, are not represented in our collections made in the Uele region. The specimens captured at Faradje are indistinguishable from specimens taken at Medje and Stanleyville.

VARIATIONS.—The well-preserved specimens in our series show an extraordinary constancy in the presence of the eight dorsal folds. But the color-variation is great and not correlated with either age or sex. The vertebral stripe, dorsolateral bands, and dorsal blotches exhibit great variation in specimens from a single locality. In life the specimens were equally variable. The series of twelve (Nos. 11209–11220) taken at Faradje on one occasion during October 1912 were described in the field as: "Dorsal surface generally pale brown, greenish or greenish brown; dorsolateral stripes yellowish, bright yellow in young specimens; vertebral stripe varying from brownish to yellowish in color, and of variable width, sometimes lacking; crossbands of legs broken into spots or absent; sides of the body a greenish gray; ventral surface whitish."

HABITS.—These specimens described above were "found in meadows and plantations, also on the road at some distance from the swamps where they were most abundant."

Perhaps the majority of the specimens were collected in the vicinity of the marshes.

A pair taken August 9, 1909, in a swamp at Stanleyville, were found in embrace. Two specimens (Nos. 11155–11156) taken at the same locality, August 26, 1909, contained eggs in the cloaca and oviducts. It is apparent that the breeding season of *R. mascareniensis* at Stanleyville is at its height during the end of August. One specimen (No. 11242) taken at Faradje, October 1, 1912, has apparently just metamorphosed, for it is only 18 mm. in length. The breeding season at Faradje is probably not coincident with that at Stanleyville.

Thirty-nine stomachs which contained food were found to have the following assortment recognizable: 11 winged ants; 10 beetles; 5 winged termites; 7 spiders; 2 caterpillars, 2 grasshoppers; 2 snails (*Limicolaria*); 2 roaches, 2 bugs; 1 cricket, 1 isopod; 1 fossorial wasp (Sphegoidea); 1 reduviid and 1 dragon-fly. There was also present in these stomachs a great many fragments of insects.

Rana christyi Boulenger

Plate XXXV, Figure 1

Rana christyi BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 5 (type locality, Medje, Belgian Congo).

Thirty-six specimens: sixteen topotypes, five of these taken in April–May, one in July, and two in August 1910; eight taken in June 1914; sixteen specimens from Boyulu, September 1909; two from Faradje, October 1912; one from Garamba, May 1912; and one from Stanleyville, August 1915. (A. M. N. H. Nos. 10956–10991.)

DISTRIBUTION.—*R. christyi*, if actually distinct from *R. æquiplicata*, represents at best only an eastern race of that species. Still, I do not care to use trinomials until the status of the two species is better understood. Our specimens were taken both in the Ituri forest and the Uele plains. *R. æquiplicata* has been recorded from only the Cameroon-Gaboon area, except for Boulenger's (1919) record of it from Medje and Mocquard's (1906) very probably erroneous record of it from Transvaal.

RELATIONS.—Boulenger (1919) records both *R. christyi* and *E. æquiplicata* from Medje. The majority of our specimens agree with Boulenger's description of *R. christyi*, but a number of them approach so nearly the original description of *R. æquiplicata* that it seems very probable that Boulenger had similar specimens before him when he recorded *R. æquiplicata* from Medje. The differences which Boulenger (1919) points out for distinguishing *R. christyi* from *R. æquiplicata* disappear in our large series. Many of our specimens have small longitudinal folds between the pronounced dorsolateral folds. There is also

much variation in head form. I have examined a typical specimen (M. C. Z. 2652) of *R. æquiplicata* in the Museum of Comparative Zoölogy from Efulen, Kribi, Cameroon. It differs from our specimens of *R. christyi* in lacking the pronounced dorsolateral folds, in having the vomerine teeth restricted to the inner edge of the choanæ (e.g. not projecting over their anterior end) and in having the webbing of the toes more extensive, especially noticeable on the fourth toe where it extends beyond the proximal joint of the penultimate phalanges (not falling just short of that joint as in our specimens of *R. christyi*). In view of the well-known variation in *R. oxyrhynchus* and *R. mascareniensis*, the closest relatives of the species under discussion, I am not at all convinced that *R. christyi* deserves recognition as a distinct species.

VARIATION.—Although short dorsal folds similar to those of *R. æquiplicata* may be present in this species, they are never as pronounced as the dorsolateral folds. In a few specimens of our series there is a Λ-shaped fold on the scapular region. Ovate tubercles forming short folds on the sides of the body are present in most of the specimens.

The variation in coloration is chiefly due to a change of the ground color from a pale yellowish gray to a dark reddish brown. The majority of the specimens are grayish with a tinge of yellow or pink. A black interorbital bar, a Λ on the scapular region and a series of spots on the sides and posterior regions are present on the most highly colored specimens. Dark cross-bars are nearly always present on the upper surfaces of the legs but the spotting on the posterior faces of the thighs exhibits great irregularity and is sometimes entirely absent.

In life, the specimens captured at Boyulu were either "light gray, nearly white above, with no spotting, except on the sides; or greenish to dark brown with a series of black spots between the pronounced dorsolateral folds."

HABITS.—These specimens described above were found "in temporary pools formed in the road through the forest. When approached the frogs would leap rapidly into the nearby grass and would hide under leaves or moss to escape detection. It was apparently the height of the breeding season for large masses of spawn were found in these pools. The chorus was very persistent, each performer uttering two sharp notes in rapid succession."

These breeding frogs were taken at Boyulu, September 19, 1909. An examination of the sexual organs of specimens from this and other localities allows me to infer that oviposition may take place at Medje during May and August. A specimen (No. 10988) taken in May 1912,

at Garamba, has its ovaries greatly distended with large ova. It seems very probable that the breeding season is irregular and not coincident in different localities.

Six stomachs contained food. This included 4 grasshoppers (*Tettigonia*, etc.); 1 snail (*Helixarion*); 1 caterpillar; 1 cricket; 1 beetle; 1 soldier termite; 1 winged ant; and 1 spider,

MORPHOLOGICAL NOTE.—I have remarked elsewhere (Noble, 1920) that the terminal phalanges of *R. christyi* normally pierce the skin as commonly as do those of *R. mascareniensis*. Boulenger (1917*b*) has discussed this problem in some detail and I may only add that in *R. christyi* there is present a dense capsule of connective tissue through which the exposed terminal phalanges may slip (Pl. XXVI, fig. 2). The number of exposed terminal phalanges is subject to considerable variation, but in general the inner digits exhibit this anomalous condition of the phalanges more commonly than do the outer ones.

Rana oxyrhynchus A. Smith

Plate XXXV, Figure 2

Rana oxyrhynchus A. SMITH, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXXVII, fig. 2 (type locality: Kafirland and region of Port Natal). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 51 (Angola: Bragança and Caragigo; Cape of Good Hope and and Natal). PETERS, 1882, 'Reise nach Mossambique,' III, 147 (Zanzibar and Mozambique: Boror, Quilimane, and Cabaçeira). BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: northwest Nyasa and Nyika Plateau). SCLATER, 1899, Ann. S. African Mus., I p. 107 (South Africa). BOULENGER, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). PERACCA, 1904, Boll. Mus. Torino, XIX, No. 467, p. 4 (Eritrea). BOULENGER, 1905, Ann. Mus. Nat. Hist., (7) XVI, p. 108 (Angola: Duque de Bragança and Quanza River); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Bissao, Portuguese Guinea); 1907, Proc. Zoöl. Soc. London, II, p. 481 (Zoutspansberg, Transvaal; and Coguno and Beira, Portuguese East Africa); 1908, Ann. Natal Mus., I, p. 222 (Natal and Zululand; Kasi Bay); 1909, Trans. Zoöl. Soc. London, XIX, p. 240 (Ruwenzori); 1910, Ann. S. African Mus., V, p. 527 (Rhodesia: Salisbury and Livingstone). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 101 (Busoga, Uganda). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 28 (British East Africa: Lekiundo and vicinity of Blue Post). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Bussu and Kakindu, Uganda). HEWITT, 1911, Rec. Albany Mus., II, p. 221 (partial summary of above localities. In addition: Waterval Onder, Transvaal; Marandellas, Rhodesia). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 210 (Tuwa River, German East Africa, and Mowange, Cameroon). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). HEWITT, 1912, Rec. Albany Mus., II, p. 281 (Marianhill, Natal). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 346, 348, 356, and 357 (Zanzibar, Pemba, and Lamu Islands; Mikin-

dani, German East Africa). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Marandellas, Rhodesia). NIEDEN, 1914, Sitzber. Ges. Naturf. Freunde Berlin, p. 367 (German East Africa). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey; Sédhiou, French West Africa). PROCTER, 1921, Proc. Zoöl. Soc. London, p. 412 (Kagiado, German East Africa).

Rana oxyrhyncha MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 130 (South Africa). PFEFFER, 1888, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (German East Africa: Kikoko); 1892, X, part 1, p. 90 (German East Africa: Korogwe and Kikoko). MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). BOCAGE, 1895, 'Herpétol. Angola,' p. 159 (Angola: Duque de Bragança, Pungo-Andongo, Benguella, Quissange, Quindumbo, Cohota, Caconda, and Rio Quando); 1896, Jorn. Sci. Lisboa, (2) IV, pp. 80, 101, and 210 (Portuguese Guinea: Bolama; Mozambique; Quilimane and Boror; and Angola: Hanha). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 91 (Zanzibar and German East Africa: Undussuma, Kakoma, Korogwe, and Kikoko); 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa: Atchi River). FERREIRA, 1906, Jorn. Sci. Lisboa, (2) VII, p. 160 (Luinha River, Angola). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 495 (Ossidinge, Cameroon). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 22 (Kilimanjaro). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 38, figs. 52 and 53; Arch. Naturg., LXXVI, part 1, p. 241 (Garua District, Cameroon); Sitzber. Naturf. Freunde Berlin, p. 444 (Amani, German East Africa); 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 166 (Kifumbiro, Mporo, and near Beni); 1915, Mitt. Zool. Mus. Berlin, VII, p. 349 (German East Africa, twenty localities; Portuguese East Africa, three localities; British East Africa, six localities).

Rana oxyrhynehus WERNER, 1896, Jahrb. Ver. Magdeburg, p. 147 (Transvaal). (Misspelling for *R. oxyrhynchus*.)

Rana (Ptychadena) oxyrhynchus CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 451 (French Guinea; several localities).

Thirty-four specimens: ten from Medje in April–May and one in July 1910; three from the same locality in April and two in June 1914; two from Faradje in February, seven in March, and one in April 1911; two from the same locality in December 1912 and one in September 1911–June 1912; two from Niapu, January 1914; one from Garamba in May and one in June 1912; one from Gamangui, February 1910. (A. M. N. H. Nos. 11088–11121.)

DISTRIBUTION.—*R. oxyrhynchus* is widely distributed over Africa south of the Sudan. It is unknown from the Abyssinian-Somaliland area except for a single record by Peracca (1904) of its occurrence in Eritrea. It is replaced in the Sudan proper by several related species. Our specimens from Garamba and Faradje are indistinguishable from those from

the Rain Forest. The range of *R. oxyrhynchus* is about as extensive as that of *R. mascareniensis*. In the case of both species vegetation zones seem to have little effect upon the distribution.

RELATIONS.—*R. oxyrhynchus* is distinguished from the other species of *Rana* by a combination of the following characters: six or more longitudinal folds on the back (rarely broken); tibio-tarsal articulation extending considerably beyond the snout; toes webbed to the tips of the third and fifth toes, the tips not dilated; a single metatarsal tubercle present. *R. oxyrhynchus* with its very extensive webbing is not to be confused with *R. mascareniensis* with which it is often associated.

VARIATION.—The majority of our specimens are identical with two specimens (Nos. 3191 and 5199) of *R. oxyrhynchus* from Natal. In a few, however, the dorsal folds are partially discontinuous. The series of specimens (Nos. 11088–11097) from Medje, April–May 1910, exhibits all stages from a field of irregular folds scarcely definable as rows to the more frequent arrangement of eight complete folds extending the length of the back. It is evident that a series of complete folds is not a constant feature of the species.

The variation in color is chiefly due to a multiplication of the black spots of the back. The ground tone is generally reddish or greenish brown. A broad vertebral stripe of pale brown is present in some of the specimens. The specimens have changed but little in preservation. The field description for one specimen (No. 11104) from Gamangui, taken February 14, 1910, may be considered characteristic for the species: "Dark gray above, tinged with brown; a dark bar between the eyes; many irregular dark markings on the body and hind limbs; throat and abdomen yellowish, a few dark markings on the lips and across the chest; upper half of iris yellowish, lower half a dark brown."

HABITS.—*R. oxyrhynchus* was found to be "abundant in the swamps, along the brooks, and near the shores of rivers." Specimens taken at Medje in April and May 1910 were found in the forest where "they were observed to hop rapidly over the ground and take shelter among the fallen leaves. There they were discovered with difficulty for their colors blended well with the decaying leaves. They croaked very loudly during the evening and at night in puddles near a village."

Females exhibiting the maximum development of the ovaries were taken at Medje during April, May, and July. It seems probable that they were breeding during this period.

Only fourteen stomachs of those examined contained food. The larger part of this was too fragmentary for identification. The following

was the total amount of material distinguishable: 4 grasshoppers; 2 snails (*Helixarion*); 1 beetle; 1 spider; and 1 cricket.

Rana ornatissima Bocage

Plate XXXIII, Figure 2

Rana ornatissima Bocage, 1879, Jorn. Sci. Lisboa, (1) VII, pp. 89 and 98 (type locality: Bihé, Angola); 1895, 'Herpétol. Angola,' p. 157, Pl. xvi, fig. 2 (high plateaux of Angola: Bihé and Galanga); 1987, Jorn. Sci. Lisboa, (2) IV, p. 202 (same localities). Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Bingondo in northern Bihé, Angola).

Hildebrandtia ornatissima Nieden, 1907, Sitzber. Ges. Naturf. Freunde, p. 228.

Rana ruddi (?) Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Eldorado, Southern Rhodesia). (Not of Boulenger, 1907.)

Rana (Hildebrandtia) ornatissima Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, p. 34 (Southern Rhodesia and Mossamedes, Angola).

Twenty specimens from Garamba: fourteen taken in May, five in June and one in July 1912. (A. M. N. H. Nos. 10879–10898.)

Distribution.—Boulenger (1919*d*) gives the range of *R. ornatissima* as extending from Angola to Southern Rhodesia. Our specimens were taken far north of this region.

Relations.—It was only with considerable hesitation that I have referred our specimens to *R. ornatissima*. Our specimens are certainly nearer to that species as defined by Boulenger (1919*d*) than to any other. Perhaps the most distinctive character of our specimens is their short webs. Two phalanges of the third toe are free. Nevertheless, all the specimens have the dorsolateral folds very obscure. In some specimens there is no indication at all of such folds. The tympanum is at least three-fourths the size of the eye, and in the majority of the specimens it equals it in diameter. Apparently our specimens exhibit some of the distinguishing features of *R. macrotympanum* and *R. ornata*, but I can find no constant character in our series with which to separate our specimens from *R. ornatissima*. The explanation of this condition probably lies in the fact that *R. ornatissima* is at best a subspecies of *R. ornata* and that *R. macrotympanum*, known only from Gallaland, is synonymous with *R. ornata*. Boulenger (1905*a*) formerly indicated that *R. budgetti* was "merely a color variety" of *R. ornatissima*. *R. togoensis* probably falls in the same category. It seems to me that the only recognizable species of the section *Hildebrandtia* are *R. ruddi*, *R. moeruensis* and *R. ornata*. Our material, coming from only a single locality, exhibits so much variability that it practically confirms this opinion. Still, I do not care to unite *R. ornatissima* with *R. ornata* until I have examined typical material from East Africa.

VARIATION.—Aside from the variability in size of the tympanum and roughness of the back, our series shows little uniformity in the length of the hind limb. The tibiotarsal articulation reaches either the tympanum or the eye. In ten specimens of various sizes taken at Garamba in May, the tibia into the head and body length averaged 2.3 times (maximum, 2.5; minimum, 2.2). None of these ten specimens were sexually mature, the largest being a female 64 mm. from snout to vent.

The color-pattern shows great uniformity throughout our series. Its variation is limited to a breaking up of the two dorsal stripes into segments and to a confluence or a restriction of the spots on the sides of the back and body.

HABITS.—In the fifteen stomachs which contained food, four young toads were found. These toads were not small. One specimen of *R. ornatissima*, a female 57 mm. in length, taken in May 1912, contained a badly crushed specimen of *Bufo regularis* 31 mm. in length, or 54 per cent of the length of the *R. ornatissima*. Another specimen of *R. ornatissima*, taken the same time as the other, but measuring only 42 mm. in length, had swallowed an unidentifiable toad 24 mm. in length. A third specimen of *R. ornatissima*, taken in June and measuring 57 mm. from snout to vent, contained in its stomach two whole specimens of *B. regularis*, each 22 mm. in length. It is apparent that young toads form a large part of the diet of *R. ornatissima*.

The remainder of the food consisted of 6 ants; 6 crickets; 5 beetles; 4 bugs; 4 grasshoppers; 3 snails; 3 caterpillars; 2 myriopods; 2 lumbricids; 2 spiders; 2 larvæ (beetle ?); 1 termite; and some extraneous matter, including flowers.

CHIROMANTIS Peters

The distribution of the species of *Chiromantis* illustrates very well the distinctness of the forest and open country faunas. *C. rufescens* is apparently confined to the forest (see below), while the other four recognizable species of the genus have more or less extensive ranges in the open country from Abyssinia to northern South Africa.

The five species of *Chiromantis* may be distinguished as follows:

a_1.—Outer finger webbed to one-third or less its length.
  b_1.—Disks of digits small.
    c_1.—Loreal region concave, interorbital space less than upper eyelid. *C. kachowskii.*
    c_2.—Loreal region not concave, interorbital space equal to or broader than upper eyelid ..... *C. petersii.*
  b_2.—Disks of digits very large ..... *C. kelleri.*

a_2.—Outer finger webbed more than one-third its length.
b_1.—Outer finger one-half to two-thirds webbed.....*C. xerampelina.*
b_2.—Outer finger three-fourths to completely webbed.....*C. rufescens.*

Chiromantis rufescens (Gunther)

Plate XXXVI

Polypedates rufescens GÜNTHER, 1868, Proc. Zoöl. Soc. London, p. 486 (type locality: West Africa).

Chiromantis rufescens BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 92, Pl. x, fig. 2 (West Africa). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (Usambara, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Africa). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 193 (Cameroon). MOCQUARD, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219 (Plains of the Zambezi). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 445 (Cameroon and Gaboon). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 10 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernando Po). MOCQUARD, 1908, in Foà, 'Résultats Scientifiques des Voyages en Afrique d'Edouard Foà,' p. 558 (Plains of the Zambezi). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 500 (Cameroon: Victoria, Buea, Bipindi, Jaunde, Johann-Albrechtshöhe, and Ebolowa). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Mundamé, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 52, figs. 102–104 (localities of Nieden, 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 132 (Efulen, Cameroon). DESPAX, 1911, in Cottes, 'La Mission Cottes au Sud-Cameroun,' p. 241 (Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 212 (Cameroon: Bibundi, Isongo, and Mowange). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 363 (Part: Usambara, German East Africa). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 9 (Medje, Belgian Congo).

Thirty-six specimens, all from Medje: two in June and two in August 1910; one in February, three in April, two in May and twenty-six in June 1914. (A. M. N. H. Nos. 9364–9399.)

DISTRIBUTION.—It is apparent from the literature given above that *C. rufescens* is primarily a Rain Forest form. Its occurrence in the forest outlyer of Usambara was to be expected but it seems highly probable that Mocquard's records of *R. rufescens* in the Zambezi region should be referred to *C. xerampelina*. These two species are very much alike but I cannot agree with Nieden (1915) that they are identical. If they should be proved identical, then *C. rufescens* would have an extraordinary range throughout the Rain Forest of western Africa and the arid plains of the southeastern provinces.

RELATIONS.—Nieden (1915) has discussed the status of the two species in considerable detail, and I can add only that the small series before me does not bear out his opinion that the two species are identical. Our specimens of *C. rufescens* from Medje are identical with a large

series in the Museum of Comparative Zoölogy from Cameroon. All the well-preserved specimens in both series differ from two beautiful specimens (A. M. N. H. Nos. 3133 and 3187) of *C. xerampelina* from Mokowe, Zululand, in having a more extensive webbing between the digits and in being some tone of reddish brown instead of ashy gray. One of these specimens (No. 3187) is a sexually mature male, 63 mm. from snout to vent, distinctly larger than any of the males of *C. rufescens* in our series (maximum, 57 mm.; minimum, 54 mm.; average, 56.1 mm. for ten breeding males). I agree with Nieden that head-form has very little importance in distinguishing the two species but, if well-preserved specimens are compared, a difference is very apparent in the extent of the webbing along the outer fingers. Several of the specimens of *C. rufescens* are very pale but they are tinged with yellow and are not ashy as both of our specimens of *C. xerampelina*.

VARIATION.—The ground color of our series varies from a pale yellow to a dark reddish brown. The narrow interorbital band of dark brown and the broader bands of the same color across the shoulder and sacral regions are more or less connected by a delicate network of reddish brown. The photograph (Plate XXXVI, fig. 1) shows well the pattern characteristic of our specimens.

The colors have changed but little in alcohol. The yellows and reddish browns were sharply contrasted in life. Very conspicuous was the iris, which was pale yellow finely veined with dark brown and bearing a dark spot just before and another just behind the pupil.

Most of the breeding males in our series are shagreened above with small spines. While none of the females possess these spines, some of the breeding males, taken at the same locality as the others, lack them entirely. It is apparent that these spines are not a constant secondary sexual character.

There is a marked difference between the sexes in size, the females being conspicuously larger. The largest female (No. 9384) in our series is 71 mm. from snout to vent. The average of ten breeding females is 67.2 mm. (maximum, 71 mm., minimum, 64 mm.). It is apparent that even the smallest sexually mature female is larger than the largest male.

HABITS.—The many writers who have commented on the peculiar habits of *Chiromantis rufescens* have considered the species arboreal. This term would ordinarily convey the idea that the species is tree-dwelling in the sense of the South American Hylas. It was therefore of interest to learn that Messrs. Lang and Chapin found the frog never high in the trees and generally on low bushes or in ponds near streams.

Observations made by them confirm the well-known account of the breeding habits of *C. rufescens* as given by Peters (1876). Egg "nests" were taken at Medje on May 28, June 17, and June 24, 1914. These were found on the stems and leaves of trees, often at a distance from water. On one occasion one "nest" was found on one side and another on the other side of a single large leaf. Only one of the several nests discovered was found attached to the trunk of a tree low to the ground. All of the "nests" were found within five or six feet of the ground, and some of them were very disorderly, the gelatinous foam smeared over several leaves, and the egg cluster fully exposed to the light.

It has been generally assumed after the observation made on related species of frogs (especially noteworthy: Siedecki, 1908 and 1909) that the foam "nests" of *C. rufescens* were formed by beating of the hind limbs of the copulating frogs. Mr. Lang was able to confirm this opinion in observing a female beating a froth even in the absence of the male. I quote directly from the field notes: "We received an especially large female and I put it alive in a little box where it would be safe from the ants. A short time later on opening the lid of the box I was amazed to find it sitting on a patch of frothy matter (60 mm. in diameter and 45 mm. high) which looked exactly like the beaten white of egg. It was apparent that the frog had been working the mass with its legs for they were covered with the gelatinous substance. This substance could be squeezed by pressure from the anus of the frog. It was colorless, jelly-like and when rubbed between the fingers became foamy like the matter under the frog. Later the frog was observed to move its legs slowly backward and forward in beating more air into the foamy mass."

Unfortunately, none of the egg-masses were preserved. Eggs taken from the cloaca of a female (No. 9398) are unpigmented and average 2.5 mm. in diameter. This specimen was taken as late as July 5, 1914. It is therefore apparent that the breeding season of *C. rufescens* is extended through at least the month of June. The majority of our females taken during that month show post-oviposition conditions of their ovaries, but a few still possess eggs in the ovarium.

Of eleven stomachs which contained food, only the following variety was identifiable: 2 beetles, 1 caterpillar; 1 heteropterous insect (pentatomid); 1 wasp (*Odynerus*) and 1 leaf-hopper.

KASSINA Girard

This genus of characteristically savannah frogs embraces but two species. These two species are readily distinguishable from each other.

a_1.—Toes one-third webbed. Brownish above with a darker tone; a light inguinal area.....*K. obscura.*

a_2.—Toes with a slight rudiment of a web, often indistinct. Greenish above, more or less striped on the back; no inguinal spot.....*K. senegalensis.*

Kassina senegalensis (Duméril and Bibron)

Cystignathus senegalensis DUMRÉIL AND BIBRON, 1841, 'Erpét. Gén., VIII, p. 418 (type locality: Lakes in the vicinity of Galam, Senegal).

Cassina senegalensis BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131 (Cape of Good Hope and the Zambezi). GÜNTHER, 1893, Proc. Zoöl. Soc. London, p. 618 (Nyasaland). BOULENGER, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 17 (Auata, Somaliland). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (German East Africa: Mossai-Niyka and Dar-es-Salaam). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). TORNIER, 1897 Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). ANDERSON, 1898, Zool. Egypt, I, p. 348 (Egypt: Sennar District). SCLATER, 1899, Ann. S. African Mus., I, p. 108 (South Africa). BOULENGER, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero); 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 409 (British East Africa: Atchi River). SCHENKEL, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Natal). BOULENGER, 1907, Proc. Zoöl. Soc. London, II, p. 482 (Illovo, Natal). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1905 (Sennar, Egypt). CHUBB, 1908, Ann. Mag. Nat. Hist., (8) II, p. 220 (Matabeleland: Kana, Shangani, and Bubi Rivers). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (Northern Zululand: Sibayi-Lake). CHUBB, 1909, Proc. Zoöl. Soc. London, II, p. 592 (Matabeleland: Kana River). BOULENGER, 1910, Ann. S. African Mus., V, p. 532 ("Tropical Africa," Cape Colony, Natal, and Southern Rhodesia). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 25 (Kilimanjaro). MEEK, 1910, Publ. Field Mus., Zoöl., VII, p. 404 (British East Africa: Nairobi and Athi Plains). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 32 (British East Africa: Nairobi and Pundamelia). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Mbola). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 13 (Cape Colony); Rec. Albany Mus., II, p. 224 (Résumé of distribution with additional South African localities); 1912, II, p. 280 (Kaaimans River, Cape Colony). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 181 (Ruanda, Lake Region). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Cape Colony: Kimberley, Kaaimans River, Bechuanaland: Madibi). NIEDEN, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (German Southwest Africa: Windhuk and Klein Nauas); 1915, Mitt. Zool. Mus. Berlin, VII, p. 370 (partial résumé with additional localities. British East Africa: Kibwezi. German East Africa: Ukerewe Island, Tanga, and Kilwa). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 419 (Nairobi, British East Africa and German East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (Dixine, French Guinea).

Cassina wealii BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131 Pl. x, fig. 7 (Kaffraria). SCLATER, 1899, Ann. S. African Mus., I, p. 108 (South Africa).

BOULENGER, 1910, Ann. S. African Mus., V, p. 532 (Cape Colony and Natal). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 460 (Beyla and N'Zébéla, French Guinea; Sanikolé, Liberia).

Cassina argyreivittis PETERS, 1882, 'Reise nach Mossambique,' III, p. 157, Pl. XXII, fig. 2; Pl. XXVI, fig. 3 (Portuguese East Africa: Boror and Cabaçeira). FISCHER, 1884, Jahrb. Hamburg. Wiss. Anst., part 1, p. 27 (Naivasha Lake).

Cassina senegalensis var. *intermedia* WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Cape Colony).

Forty-five specimens: thirty-eight from Niangara, June 1913; two from Bafwasende, September 23, 1909; two from Garamba, May 1912; two from Faradje, November 1912; and one from Rungu, January 28, 1913. (A. M. N. H. Nos. 9318–9355.)

DISTRIBUTION.—The range of *K. senegalensis* is very extensive, embracing all of the open country of Africa south of the Sahara excepting certain parts of Angola, Southwest Africa, and other little-explored regions. Our two specimens from Bafwasende represent the first record of the species from the Rain Forest proper. It seems almost certain that the occurrence of the species in that region is of an accidental nature for the species is a well-known inhabitant of the plains.

RELATIONS.—Boulenger (1907*e* and 1910*a*), Andersson (1911) and Hewitt (1911*b*) have already pointed out that *K. wealii* is probably identical with *K. senegalensis*. Our series of specimens exhibits considerable variation in the distinctness of the rudimentary web. I can find no distinguishing character of *K. wealii* which is not present in our series of *K. senegalensis* and I have not hesitated in uniting these two species.

VARIATION.—Andersson (1911) has discussed the variation in limb proportions of this species and Nieden (1915) the variation in color. *K. senegalensis* is such a well-marked species that no further discussion is necessary for purposes of identification.

I have compared a specimen (A. M. N. H. No. 5198) of *K. senegalensis* from Cape Colony with our large series from Niangara and can find no differences of any kind. This is another illustration of uniformity in the wide-ranging forms.

HABITS.—Most of the females taken at Niangara in June have their bodies greatly extended with ova. These ova are slightly less than a millimeter in diameter and are densely pigmented at one pole. It is probable that the breeding season occurs in June or July.

Very little is known about the habits of *Kassina senegalensis*. Chubb (1908) has remarked: "This frog makes a peculiar shrill noise; it occasionally ascends trees and was pointed out to me as a tree frog." Hewitt and Power (1913) have said: "It is a running frog and does not

jump. Near Grahamstown, at midsummer, we have taken it in abandoned ant-hills near a vlei far remote from bush, but in general it seems to favor bush or forest districts and is said to climb trees. Andrew Smith took his specimens in burrows in the ground."

In the stomachs of nineteen of our specimens the following assortment of food was found: over 200 worker and soldier termites; 7 worker ants; 1 cricket; 1 grasshopper; 1 beetle; and 4 larvæ (beetle ?).

LEPTOPELIS Günther

It has been pointed out above that this genus possesses a very different pectoral girdle than *Hylambates*, the genus with which it has hitherto been confused. Only the following eight species can at this time be included in the genus, but dissection will reveal that many of the species grouped under *Hylambates* are actually referable to *Leptopelis*.

a_1.—Fingers free ..... *L. anchietæ*.
a_2.—Fingers more or less webbed.
  b_1.—Fingers less than one-third webbed.
    c_1.—Metatarsal tubercle oval, not compressed ..... *L. notatus*.
    c_2.—Metatarsal tubercle prominent, compressed.
      d_1.—Third and fifth toes completely webbed ..... *L. tessmanni*.
      d_2.—Third and fifth toes two-thirds webbed ..... *L. aubryi*.
  b_2.—Fingers at least one-third webbed.
    c_1.—Head greatly widened behind eyes, nearly full breadth of tympanum seen from above ..... *L. brevirostris*.
    c_2.—Head not distinctly widened behind eyes; tympanum lateral.
      d_1.—Fingers two-thirds webbed, web extending to terminal phalanx of outer finger, not quite to this point on third finger. *L. palmatus*.
      d_2.—Fingers not more than half webbed, but web sometimes continued as seam to terminal phalanx of outer finger.
        e_1.—A conical tubercle on heel, two or three tubercles forming a seam on forearm near elbow ..... *L. calcaratus*.
        e_2.—No tubercle on heel or forearm ..... *L. rufus*.

Leptopelis anchietæ (Bocage)

Plate XXXI, Figure 4; XXXVIII, Figure 2

Hylambates anchietæ BOCAGE, 1873, Jorn. Sci. Lisboa, IV, p. 226 (type locality: interior of Mossamedes). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133 (same as above); 1890, Proc. Zoöl. Soc. London, p. 324 (Angola). BOCAGE, 1895, 'Herpétol. Angola,' p. 177, Pl. XIX, figs. 4 and 4*a* ("hauts plateaux de l'intérieur" of Angola: Huilla, Caconda and Quindumbo); 1897, Jorn. Sci. Lisboa, (2) IV, p. 205 (Angola: Huilla). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 110 (N. E. Benguella, Angola). NIEDEN, 1910, Arch. Naturg., LXXVI, part 1, p. 243 (Cameroon: Bamenda); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 54, figs. 54 and 55 (same locality).

Ten adults: six from Faradje, October 1912 and January 1913 and one from each of the following localities: Niangara, November 1910; Yakuluku, November 1911; Vankerckhovenville, April 1912; and Garamba, June 1912. (A. M. N. H. Nos. 8668–8677.)

DISTRIBUTION.—Prior to 1910, *Leptopelis anchietæ* was known only from Angola. Tornier's record (1896, p. 66) of its occurrence in Tanganyika Territory was shown by Nieden (1915, p. 368) to be an error. In 1910 Nieden recorded the species from Bamenda, a high savannah area north of the Cameroon forests. Nieden's record, supported by the fact that the American Museum expedition found the species only in the savannah areas north of the Ituri, suggests the probability that the species may be a typical savannah form with a more or less continuous range throughout the savannahs skirting the Rain Forest.

I have recently examined a specimen (M. C. Z. 3484) taken from the stomach of a snake captured near the Guaso Nyiro River, Kenya Colony. This specimen differs from our specimens of *L. anchietæ* in having slightly smaller digital expansions. Further, the ∩-shaped mark on the back is darker and broader than in any of the specimens of *L. anchietæ* before me. No other differences are apparent to distinguish this East African specimen from our series from the Sudan. For the present, we must conclude that *L. anchietæ* occurs not only in the savannahs north and south of the Rain Forest but also in Kenya Colony.

RELATIONS.—Boulenger (1906, p. 166) has considerably reduced the number of species related to *H. bocagii*, but in his synopsis (idem, p. 170) of the genus *Hylambates* he has distinguished *anchietæ* from that species by its less-developed metatarsal tubercle. Judging only from the descriptions, and Bocage's figures (1895), I would be inclined to reduce *anchietæ*, also, to synonymy. Our series of ten specimens show so much variation that little weight can be placed on the degree of development of the "shovel." Still, an examination of a series of specimens from Angola may show that *anchietæ* possesses a distinctive coloration or some other constant difference. If not identical, *anchietæ* is very closely related to *bocagii*.

VARIATION.—The "shovel" varies from a little more than one-half the length of the inner toe, to nearly the length of it. This range covers the differences given by Boulenger (1906) for distinguishing the species from *bocagii*. It is to be noted that the metatarsal tubercle as indicated by Bocage (1895, Pl. XVII, fig. 1) is distinctly longer than the inner toe.

Seven of the ten specimens have a well-marked pattern on their dorsal surface. This pattern consists of three dark longitudinal stripes

which flow broadly together just behind the head. The ground tone in alcohol is either brown or gray. There is an additional broad stripe on each side. In the smallest specimens this stripe is edged above with a white line. A similar white line occurs above the anus and along the legs as shown in the photograph (Plate XXXVIII, fig. 2). The specimens have faded little in alcohol, for no greens were present. One specimen (No. 9676), a sexually immature female, taken at Faradje, in February, was observed in the field to be: "light brown above, with three nearly black lines extending the length of the back. A broad stripe of dark brown was present on the sides of the head and body. The lower margin of this stripe was stippled with a white or bluish tone. The tip of the snout and the lips were lighter than the rest of the head. The iris was dark brown of bronzy lustre."

Our specimens vary in size from 33 mm. to 51 mm., from snout to vent. There is apparently no sexual dimorphism other than size. No breeding pairs were taken and the degree of this difference is not exactly known.

HABITS.—One female (No. 8670), taken at Garamba in June 1912, has the ovaries greatly distended with large ova. Since none of the other five females taken during other months approach this condition, it is probable that the breeding season occurs in June or July.

The stomachs of only six individuals contained food. Only the following was distinguishable: 4 grasshoppers, 2 beetles, and 1 cricket.

Leptopelis notatus (Buchholz and Peters)

Hylambates notatus BUCHHOLZ AND PETERS, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 205, Pl. II, fig. 1 (type locality: Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 505 (Cameroon: Bipindi and Jaunde); 1909, Arch. Naturg., LXXV, part 1, p. 365 (Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 55, fig. 111 (Cameroon: Victoria, Bipindi, and Jaunde).

Hylambates rufus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 136 (part: West Africa). (Not of Reichenow.)

Hylambates cubitoalbus BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 323 (Zima, South Cameroon and Unyoro, Lake Albert Region); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 171. BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Kribi, Cameroon).

Hylambates aubryi ANDERSSON, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 168 (part: Cameroon). (Not of A. Duméril.)

A single immature female taken at Medje in July 1914. (A. M. N. H. No. 8874.)

DISTRIBUTION.—This little-known species is apparently confined to the rain forests. I have recently examined in the Museum of Compara-

tive Zoölogy at Harvard a fine series (M. C. Z. 3446–3448) from Lolodorf, Cameroon).

RELATIONS.—This series convinces me that *L. notatus* must be a distinct species in spite of Andersson's statement to the contrary. Our specimen is nearly uniform grayish-brown (70) above and possesses the characteristic white spots on the elbow, knee, and heel. Nieden (1909) has claimed these white marks to be diagnostic of the species. Certainly none of the immature specimens of *L. aubryi* or *L. rufus* in our series show any condition approaching that found in the specimen under consideration. Our specimen is only 27 mm. in length (head and body). Nothing is known of its habits.

Leptopelis calcaratus (Boulenger)

Plate XXXI, Figure 3

Hylambates calcaratus BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322 (type localities: Efulen, Cameroon; Spanish Guinea: Cape St. John and the Benito River District); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 169 (Buea, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 Makomo, Spanish Guinea). BARBOUR, 1911, Bull. Mus. Comp, Zoöl., Cambridge, LIV, No. 2, p. 135 (five miles inland from Kribi, Cameroon).

Hylambates rufus NIEDEN, 1909, Arch. Naturg., LXXV, part 1, p. 364 (West Africa). (Not of Reichenow.)

Thirty-five specimens: three from Niapu, January 1914; the rest from Medje, taken as follows: during 1910, three in April, one in June and two in July; during 1914, two in April, one in May, sixteen in June and six in July. (A. M. N. H. Nos. 8676–8712.)

DISTRIBUTION.—The range of *L. calcaratus* is apparently limited to the Rain Forest. The few references in the literature to this species do not include any record of its occurrence west of Cameroon. This is not surprising in view of the fact that the species has until recently been confused with *L. rufus*.

RELATIONS.—Boulenger, in his original description of *L. calcaratus*, states: "this species stands very near *H. rufus*, Reichn., differing only in the rather less depressed head and in the presence of a conical tubercle on the heels." Nieden (1909), not finding these characters diagnostic, reduced *L. calcaratus* to synonymy. After a careful comparison of our large series with an equally large one of *L. rufus*, I cannot agree with Nieden for, while the characters given by Boulenger are somewhat variable, there are other differences which are constant:

L. calcaratus	*L. rufus*
Spur on the heel always more or less developed	Spur generally absent; an indication of a tubercle in some young specimens.
A denticulated ridge along the forearm.	A smooth seam often present on the forearm.
Fingers a trifle less than half webbed, no seam extending along the inside of the outer finger.	Fingers half webbed or more, a seam generally present on the inside of the outer finger.
End of the snout always of much lighter color than the rest of the head.	End of the snout (except sometimes the lip) of same color as the rest of the head.
Ventral coloration when distinct (faded in most females) consisting of a dark wash or marbling on the sides of the belly and across the chest; the central part of the belly white or slightly spotted.	Ventral coloration when distinct consisting of a coarse network of dark color extending uniformly across the entire ventral surface or restricted to the chest; never a sharply differentiated light area on the belly.
A sexually mature pair measuring ♂ 40 mm. ♀ 56.5 mm.	A sexually mature pair measuring ♂ 45 mm. ♀ 68 mm.
Maximum size ♀ 58 mm.	Maximum size ♀ 73 mm.

VARIATION.—Only one specimen (No. 8712) in our series lacks the spurs. This specimen has the denticulated seam along the forearm and the light snout. The absence of the spurs may be due to rubbing or some other injury after fixation.

Most of the specimens in the series are reddish brown above, with some indication of dark spotting; a few are uniform gray above with a light tip to the end of the rostrum. The gray specimens (such as No. 8682) were gray in life. One specimen (No. 8706) was described in the field as "yellowish gray above, tip of the snout a lighter tone; a brownish patch on the anus outlined with a pale yellow. Skin granular above, the larger granules yellowish. Iris golden with a dark brown outer edge."

Another specimen (No. 8683) was described as "dark brown above, sides a distinctly lighter tone; hind legs with irregular dark cross-bands; tip of the snout a pale yellowish; a spot of the same color below each eye; the denticulated ridge along the forearm and the spur on the heel tinged with the same light tone."

HABITS.—This last-mentioned specimen was caught "among yellowish leaves on the ground." The other specimens also were apparently taken on the forest floor.

None of the thirty-five specimens were found in copulation. Twenty-six of them are females, exhibiting an extraordinary irregularity of development in their sexual products. One specimen (No. 8708)

taken in April 1914 at Medje contained eggs in its oviducts. These eggs averaged 3 mm. in diameter and were unpigmented. Other specimens taken at Medje in June 1914 and July 1910 contained in their ovaries eggs of nearly the same size. On the other hand, specimens taken at Niapu in January possessed fully developed ova. One of two specimens (Nos. 8685 and 8686) of identical size taken at Medje in July 1914 contained very large ova, while the other specimen had apparently just laid its eggs. The breeding season may occur in July but, since there is little uniformity in the degree of sexual maturity of specimens taken during July as well as the other months, it is probable that the breeding season is irregular. Very little data is available on the breeding season of any of the forest frogs.

Only a very small percentage of the stomachs contained food. The contents of thirteen stomachs consisted of 7 grasshoppers; 2 roaches; 2 spiders; 1 caterpillar; 1 cricket; and 2 ants.

Leptopelis aubryi (A. Duméril)

Plate XXXI, Figure 6; XXXVIII, Figure 1

Hyla aubryi A. DUMÉRIL, 1856, Rev. Mag. Zool., (2) VIII, p. 561 (type locality: Gaboon).

Hylambates aubryi PETERS, 1878 (for 1877), Monatsber. Akad. Wiss. Berlin, p. 618 (Chinchoxo, Loango Coast). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 135 (Ashanti, Gaboon, and the Gold Coast). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). VAILLANT, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini); Bull. Soc. Zool. France, IX, p. 353 (Assini: Effirou and Couacrou). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Tumbo Island). BOETTGER, 1888 (for 1887–1888), Ber. Senck. Ges., p. 99 (Massabi, Loango Coast). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, p. 257 (Tumbo Island). BOETTGER, 1892, 'Kat. Mus. Senck. Ges.,' p. 21 (Massabi, Loango Coast). BOCAGE, 1895, 'Herpétol. Angola,' p. 181 (Loango Coast: Massabi and Chinchoxo). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 158 (part: Usambara, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Spanish Guinea: Cape St. John). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 20 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 168–169 (Buea, Cameroon). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 242 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 502 (Cameroon: Bipindi, Ebolowa; Spanish Guinea, Mokomo). ANDERSSON, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107 (part: Cameroon). NIEDEN, 1909, Arch. Naturg., LXXV, part 1, p. 365, figs. 1*c* and 2*c* (West Africa); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 55, figs. 112–114 (Victoria, Cameroon and localities of Nieden 1908); Sitzber. Ges. Naturf. Freunde Berlin, p. 448 (Amani, German East Africa). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Efulen,

Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Cameroon: Bibundi, Isongo, and Mowange). ANDERSSON, 1913, Jahrb. Nassau. Ver. Naturk., LXVI, p. 78 (part: Bibundi, Cameroon). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 368 (Usambara, German East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 460 (N'Zérékore, French Guinea).

Hylambates ocellatus MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 413 (Gaboon). STEINDACHNER, 1906, Ann. Hofmus., Wien, XXI, p. 154 (Cameroon: Nyang District). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Ja River, Cameroon).

Nyctibates lævis BARBOUR,[1] 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 131, Pl. II, fig. 1 (Efulen, Cameroon).

Seventy-one specimens, nearly all adult: Medje, one in January, sixteen in April–May, one in July and three in September 1910, one in January, two in March, three in April, two in May, seventeen in June and five in July 1914; Bafwaboli, seven in September 1909; Stanleyville, eight in August 1909; Niapu, one in November 1913 and two in January 1914; Avakubi, one in October 1909; Ngayu, one in December 1909; Vankerckhovenville, one in April 1912. (A. M. N. H. Nos. 8810–8873, 11261–11267.)

DISTRIBUTION.—*L. aubryi* is apparently more restricted to the Rain Forest than its close relative *L. rufus*. Nieden (1915, p. 368) has shown that the several records of *L. aubryi* from Tanganyika Territory in regions beyond the forest should be credited to the latter species. He concludes (translation): "Amani is apparently the only place in Tanganyika Territory where this essentially West African species has until now been known, a fact which is not surprising, since there has been found in mountainous Usambara numerous West African forms as well as East African species."

There was only one region outside the Rain Forest where the expedition observed *L. aubryi* in any abundance. This was at Vankerckhovenville in a large patch of forest fringing the river. It was not taken at any of the other forest outlyers, such as those at Niangara or Faradje.

RELATIONS.—*L. aubryi* cannot be confused with *L. rufus* if typical specimens are examined. Intermediate specimens in most cases will probably be found to be referable to *L. tessmanni*. The relation of *L. aubryi* to *L. tessmanni* is discussed in some detail under the latter species.

VARIATION.—Twenty of our seventy-one specimens are males. These differ markedly in size from the females. Ten of the sexually mature males average 44.4 mm. in length (head and body); maximum, 47 mm.; minimum, 40 mm. The average length of the same number of

[1]Type examined.

sexually mature females is 64 mm.; maximum, 75 mm.; minimum, 61 mm. The males possess two glandular circular areas on the chest, one at the base of each forelimb.

Our specimens show considerable variation in color. The ground color is some dull tone of gray, brown, or green. White spots are present on the dorsal surface of some specimens. These are very numerous on one specimen (No. 8857) from Bafwaboli, taken September 12, 1909. The ventral surface when pigmented is stippled with brown and there is no network of color as in *L. rufus*. In alcohol the dorsal color pattern is sometimes indistinct but in life there was always some indication of a pattern. The ground tone varied in life from a dark brown to a pale yellow, or from a dark bluish-gray to a light green. A pale yellowish line extended from the tip of the snout to half the length of the body in many of the specimens. Some indication of this line was present on all of them. A dark stripe was generally present below this line. One specimen (No. 8810), a photograph of which is reproduced on Plate XXXVIII, fig. 1, was described in life as follows: "General color above a light brown; on each side of the body a broad irregular band of gray, extending from the nostril to the lumbar region where it breaks up into a series of grayish-green blotches, this band edged above with a narrow, dark red line; wedge-shaped mark of dark brown on the back; head tinged with the same color, limbs indistinctly crossbanded; above the anus and on the heel a narrow line of yellowish or pinkish; ventral surface uniform white, shading into pink posteriorly; iris an irridescent golden bronze."

HABITS.—At Vankerckhovenville in April (1912), *L. aubryi* was found mostly in the grass, on low bushes or among the leaves of large plants; at Medje in July (1910) chiefly on the ground, upon logs, or among other forest débris. At Bafwaboli in September (1910) many frogs of this species were "taken at night with the help of a candle. They were found sitting on leaves of young oil palms planted recently at the station where most of the natural vegetation had been destroyed. The frogs called only at night when they uttered deliberately at short intervals a sharp musical note."

The breeding season of *L. aubryi* may be extended from April through June or longer. One specimen (No. 8843) taken at Medje in April 1914 had a number of eggs in its oviducts. Other specimens from Medje taken as late as June had the ovaries greatly distended with large ova. Another specimen (No. 8858) taken September 12, 1909 at Bafwaboli still possessed large ova. *L. aubryi* is potentially ready for oviposition throughout several months.

Most of the stomachs examined contained little food. The contents of only twenty-seven were identifiable. The food consisted of 13 caterpillars; 9 grasshoppers (and fragments of others); 6 snails (*Helixarion*, etc.); 3 spiders; 2 beetles; 2 crickets; 1 winged ant; 1 slug (Vaginulidæ); and a considerable amount of leaves and other extraneous matter.

Leptopelis rufus Reichenow

Plate XXXVII

Leptopelis rufus Reichenow, 1874, Arch. Naturg., XL, part 1, p. 291, Pl. ix, figs. 1*a* and 1*b* (type locality: Victoria, Cameroon, at foot of Cameroon mountains).

Hylambates rufus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 136 (Gaboon, Cameroon, and Fernando Po). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). Boulenger, 1900, Proc. Zoöl. Soc. London, p. 445 (Fernando Po, Cameroon and Gaboon). Bocage, 1903, Jorn. Sci. Lisboa, (2), VII, p. 45 (Fernando Po). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Spanish Guinea: Cape St. John). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 18 (part: Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 169 (Cameroon: Buea; Fernando Po: Punta Frailes and Basilé; French Congo: Fernando-Vaz). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 240 (Bibundi, Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 505 (Cameroon: Victoria, Johann-Albrechtshöhe, and Bipindi; Spanish Guinea: Makomo; and Fernando Po); 1909, Arch. Naturg., LXXV, part 1, Figs. 1*b*, 2*b*, and 3*a* (West Africa). Krefft, 1910, Blätter Aquar. Terr. Kunde, XXI, p. 463 (German East Africa). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Cameroon). Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 447 (Amani, German East Africa); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 56, figs. 115, 117, and 118 (localities of Nieden, 1908, except for Fernando Po). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Kribi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 216 (Cameroon: Bibundi and Isongo). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush' (Nigeria). Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 179 (Lake Region, five localities). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 320, Pl. iii, figs. 3 and 4. Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 368 (German East Africa: Tanga, Usambara, Amani, Derema, and Nguru).

Hylambates millsonii Boulenger, 1894, Proc. Zoöl. Soc. London, p. 644 (mouth of the Niger). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Ja River, Cameroon).

Hylambates anchietæ Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (German East Africa: Forest of Magila and Usegua, Verneleguidé, west of Lake Albert); 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). (Not of Bocage.)

Hylambates aubryi Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 158 (part: Tanga, German East Africa). (Not of A. Duméril.)

Hylambates aubryi Andersson, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107, fig. 3 (part: Cameroon), (not of A. Duméril); 1913, LXVI, p. 79, fig. (Bibundi, Cameroon).

Hylambates rufus var. *boulengeri* WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 197 (Victoria, Cameroon). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 241 (Bibundi, Cameroon).

Hylambates rufus var. *modesta* WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 197 (Cameroon).

Hylambates rufus var. *ventrimaculata* WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 198 (Cameroon).

Hylambates rufus var. *aubryoides* ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 241 (Bibundi, Cameroon).

Eighty-three specimens: Medje, 1910, one in January, fourteen in April, four in August, and two in September; 1914, one in March, ten in April, seven in May, thirty in June, and two in July; Gamangui, two in February 1909 and one in January 1910; Niapu, five in January 1914; Batama, one in September 1909; Ngayu, one in December 1909; Niangara, one in November 1910; and Poko, one in August 1913. (A. M. N. H. Nos. 8713–8795.)

DISTRIBUTION.—*L. rufus* has been recorded from several localities in Tanganyika Territory where no large forests occur. The species may be considered a true forest inhabitant which has migrated along the wooded river-banks beyond the limits of the forest. It is also possible that the forest once had a greater extent; especially is this true in Tanganyika Territory. The American Museum expedition found the species only in the Rain Forest and outlying forest island of Niangara.

RELATIONS.—Of the various species which have been confused with *L. rufus* in the past, *L. palmatus* and *L. brevirostris* require special consideration. Both these species are confined to the Cameroon-Gaboon area (except for one doubtful record of *L. brevirostris* in Tanganyika Territory) and afford further evidence of this region being a center of specialization for the frogs and toads.

The adult of *L. palmatus* is distinctly larger than any specimen of *L. rufus* which I have examined. One specimen (M. C. Z. 2454) measures 83 mm. from snout to vent, two others (M. C. Z. 2745 and 2665) measure 81 mm. and 80 mm. respectively. The web between the fingers is more extensive than in any specimen of *L. rufus* before me. As Andersson (1909, p. 105) has pointed out, Boulenger (1882, p. 136) in his catalogue exaggerated the extent of the web. But a comparison of Peters' (1869, Pl. II) original figure with any specimen of *L. rufus* will show that the web between the second and third fingers is more extensive in *L. palmatus* than in the latter species.

Although Nieden (1909) recognized *L. palmatus* as distinct from *L. rufus*, he made *L. brevirostris* a "variety" of the latter. *L. rufus* ex-

hibits an extraordinary range in head-form but in all the eighty-three specimens of our series and in the numerous specimens of this species in the Museum of Comparative Zoölogy I find none which show that the species intergrade. The dorsolaterally placed tympanum is the most striking feature of *L. brevirostris*, but I have seen no specimen of *L. rufus* that is so coarsely granular above as the several specimens of *L. brevirostris* examined. The two specimens of that species in the American Museum possess very short omosternums (Plate XXXI) distinctly different from *L. rufus*. It seems to me that the buccal nursing habits of *L. brevirostris* may represent further evidence of its specific identity.

I have referred *L. millsonii* to the synonymy of *L. rufus* because I find nothing in the original description to distinguish it from that species. The only specimen of the former species available for study is an immature individual (M. C. Z. 2647) from the Ja River, Cameroon. This specimen is identical with young specimens of *L. rufus* in our series.

VARIATION.—There are only sixteen males in our series. Ten of the sexually mature ones average 45.6 mm. in length (maximum, 50 mm.; minimum, 42 mm.). In contrast to this, ten sexually mature females average 68.3 mm. (maximum, 73 mm.; minimum, 65 mm.). It is indeed strange that both the smallest and largest sexually mature female in our series of sixty-seven should contain eggs in the oviducts. The former (No. 8730) is 52 mm. in length and the latter (No. 8727) 73 mm.

The majority of the specimens are a uniform grayish blue above, or a reddish brown stippled with a darker tone. The sides of most are a grayish brown spotted with white. A number of smaller spots are scattered over the back of a few of the specimens. In eighteen of the specimens the grayish brown of the sides is extended over the chest and abdomen in the form of a network. In most of the specimens in our series this network is only partly developed, being restricted to the throat and sides of the abdomen. Twenty-five have a uniform whitish under-surface. The reddish-brown specimens have generally a number of large dark brown spots above. These sometimes tend to form crossbars on the back.

Specimens taken at Medje in March, June, August, and January were reddish brown in life, with some indication of darker markings on the back and across the limbs. In some specimens a light spot was present under the eye and there was a sprinkling of fine light spots on the posterior part of the body. In a few specimens the brown shaded off into a gray on the sides. Others were distinctly tinged with green.

The photograph of one specimen taken at Niapu in January 1914 is reproduced on Plate XL, fig. 1. This specimen (No. 8732) was described in life as follows: "Greenish brown above, faintly stippled with yellowish; a series of very delicate transverse stripes of a golden tone extending across the back; the stripe between the eyes and those in the lumbar region more distinct than the others, which are confluent and not very distinct from the ground tone; sides of the body a lustrous green, the legs a grayish green, and the digital expansions a pale yellowish-brown; a narrow line of yellowish white above the arms; posterior surfaces of the thighs and sides of the body spotted with the same color; ventral surface yellowish faintly reticulated with purplish."

HABITS.—The specimen described above was found "under dry leaves in a moist situation. When picked up it emitted at short intervals a loud squeal. The dry season had lasted nearly two months and this tree frog, as all the other frogs and toads, had hidden itself away."

"During the rainy season the tree frogs were usually found sitting beneath the leaves of plants which fringe the plantations. Specimens taken at Medje in March were found on shrubbery or lianas a short distance above the ground."

The breeding season of *L. rufus* is very probably extended through several months. One specimen (No. 8733) taken at Medje in June 1914, has eggs in its oviducts, while another (No. 8730) from the same locality, taken August 4, 1910, exhibits the same condition. Specimens with distended ovaries were taken at Medje, in March (1914) and at Ngayu in December (1909). It is therefore possible that the breeding season of *L. rufus* may be a little later than that of *L. aubryi*, but it is more probable that the two seasons greatly overlap. This latter probability would lend further support to my suggestion (see below) that *L. tessmanni* is a hybrid of *L. rufus* × *L. aubryi*.

Only forty-five stomachs contained food. This consisted of 22 grasshoppers; 15 beetles; 12 caterpillars; 5 spiders; 2 mantids; 2 roaches; 2 ants; 1 heteropterous insect; 1 moth; 1 cricket; and 1 myriopod.

Leptopelis tessmanni (Nieden)

Hylambates tessmanni NIEDEN, 1909, Arch. Naturg., LXXV, part 1, p. 365, figs. 4*a* and 4*b* (Makomo, Spanish Guinea).

Hylambates aubryi ANDERSSON, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107 (part: Cameroon); 1913, LXVI, p. 78 (part: Bibundi, Cameroon).

Twenty-four specimens, all from Medje, three taken in April, three in May, nine in June, and four in July 1914; one taken in March, two in

April-May, one in August, and one in September 1910. (A. M. N. H. Nos. 8796–8809; 11268–11277.)

DISTRIBUTION.—*L. tessmanni* will probably be shown to be confined to the Rain Forest. The specific status of the species is not at all well understood and little may be said at this time as to its range.

RELATIONS.—The twenty-four specimens listed above would doubtlessly be referred by Nieden to *L. tessmanni*. They form a very uniform series intermediate between *L. aubryi* and *L. rufus* but showing no intergradations into either species. They possess the following:

L. rufus characters.—(1) Third and fifth toe webbed to the base of the terminal phalanges;

(2.) No indication of a dorsolateral line behind the tympanum;

L. aubryi characters.—(1) Fingers less than one-third webbed;

(2.) Ventral pigmentation when present, stippled, never forming a network.

Special Characters.—Average size larger than either *L. aubryi* or *L. rufus* (including the largest females); average head and body length of fifteen specimens 73.2 mm.; maximum, 79 mm.; minimum, 60 mm.

From the above list, it would seem that *L. tessmanni* is a distinct species intermediate between but larger than either *L. rufus* or *L. aubryi*. Still, there is one remarkable feature about this series of specimens. In spite of their large size and the fact that they were taken at various seasons, none of the specimens are sexually mature. More than half of them have the gonads rudimentary and only two specimens (Nos. 11276–11277) show any signs of their ovaries developing beyond an immature condition.

Two possibilities are suggested by the above facts. Either these large specimens are very immature (except the two specimens mentioned) or they are sterile adults. With the material before me, I am inclined to the latter view. The possibility then arises of their being hybrids of the two species they resemble, *L. aubryi* and *L. rufus*. But hybrids in nature are very little known and it is not at all certain that hybrids formed from a cross of two related species of frog would be sterile. Born (1886, p. 263), in discussing this latter difficulty, states (translation):

> In most cases, however, where not only fertilization but also development progresses regularly nature assures the integral preservation of the species in that the hybrid becomes sterile.

This statement has not been entirely confirmed by the experiments of recent years. Further evidence is needed. For the present we cannot regard *L. tessmanni* as anything more than a very interesting form intermediate between *L. aubryi* and *L. rufus*, but larger than either and, unlike any other species of *Leptopelis*, exhibiting a high percentage of sterility.

VARIATION.—All the specimens in the series are a nearly uniform bluish green above, without any indication of a dorsal pattern. They were described in life as "bright green above, with no markings of any sort; the yellow line on the posterior limbs restricted or absent." Others were described as changing from this uniform green to a uniform brown.

HABITS.—The stomachs of five specimens examined contained fragments of orthopterous insects only.

HYLAMBATES A. Duméril

The status of this genus has been discussed above and its composite nature indicated. The species which at the present time must be referred to this genus may be distinguished by the following key.

a_1.—Fingers free.
  b_1.—Toes slightly webbed at base.
    c_1.—Tibiotarsal articulation not reaching beyond shoulder; metatarsal tubercle weak, not compressed.....*H. cassinoides.*
    c_2.—Tibiotarsal articulation reaching between shoulder and eye; metatarsal tubercle strong, compressed.
      d_1.—Tips of fingers and toes scarcely dilated.
        e_1.—Foot not more than half length of head and body..*H. bocagii.*
        e_2.—Foot more than half length of head and body..*H. marginatus.*
      d_2.—Tips of fingers and toes distinctly dilated.
        e_1.—Skin finely areolate above.....*H. hyloides.*
        e_2.—Skin with scattered warts above.....*H. verrucosus.*
  b_2.—Toes at least half webbed.
    c_1.—Metatarsal tubercle strong, very prominent.....*H. argenteus.*
    c_2.—Metatarsal tubercle weak, feebly prominent.
      d_1.—Tibiotarsal articulation reaching eye; vomerine teeth just behind level of choanæ.....*H. leonardi.*
      d_2.—Tibiotarsal articulation not reaching eye; vomerine teeth on level with posterior border of choanæ.....*H. maculatus.*
a_2.—Fingers more or less webbed.
  b_1.—Fingers less than one-third webbed.
    c_1.—Toes more than half webbed.....*H. greshoffii.*
    c_2.—Toes webbed half way, three distal phalanges of fourth toe and two of fifth free.
      d_1.—Metatarsal tubercle weak, not compressed.
        e_1.—Tibiotarsal articulation reaching tympanum.....*H. ragazzii.*
        e_2.—Tibiotarsal articulation reaching eye or further.
          f_1.—Upper parts smooth.....*H. vermiculatus.*
          f_2.—Upper parts with scattered small round warts. *H. vannutellii.*
      d_2.—Metatarsal tubercle strong, compressed.
        e_1.—Vomerine teeth between choanæ; tibiotarsal articulation reaching eye or a little beyond.....*H. johnstoni.*

e_2.—Vomerine teeth behind choanæ.
f_1.—Tibiotarsal articulation not reaching eye...*H. brevipes.*
f_2.—Tibiotarsal articulation reaching eye or beyond.
g_1.—Tibiotarsal articulation reaching eye....*H. christyi.*
g_2.—Tibiotarsal articulation reaching end of snout. *H. haugi.*
b_2.—Fingers at least one-third webbed, toes more than half webbed. *H. natalensis.*

Hylambates verrucosus Boulenger

Plate XXXVIII, Figure 3

Hylambates verrucosus BOULENGER, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141 (type locality; Mabira Forest, Chagwe, Uganda).

Two adults of opposite sex, taken at Medje, the female in March and the male in May 1914. (A. M. N. H. Nos. 8665–8666.)

DISTRIBUTION.—The American Museum expedition's fortunate discovery of this species in the Ituri forest affords further evidence of the homogeneity in fauna between the Rain Forest and the outlying forests of Uganda.

RELATIONS.—The species was formerly known only from a single female. The male possesses the two gular vocal sacks separated by a gular pad as in *H. leonardi.* While *H. verrucosus* is perhaps closely related to *H. leonardi,* it is readily distinguishable from this and all other species of *Hylambates* by its unique coloration, especially by the large patches of "flash color."

VARIATION.—Boulenger, in his original description of the species, states that the toes are barely one-fourth webbed. In our specimens the fourth toe is webbed for about one-fourth its length. The first toe is not webbed, the second is webbed to the distal end of the metatarsal, the third and fourth toes to the distal end of the proximal phalanx and the fifth to slightly beyond this point. It is evident that Boulenger's expression applies only to the longest toe.

Our two specimens are nearly identical in coloration. In the female the dorsal surface is not so dark as that of the male and an indistinct pattern of a number of darker spots is visible. The orange "flash colors" have faded in alcohol to a yellowish white. The ventral surfaces of both specimens are not uniform dark purplish brown as described by Boulenger for the type, but are closely stippled with yellowish white. In life the specimens were browner, and the indistinct blotches appeared black. The iris was a dark bronze color of nearly a uniform tone.

The male is readily distinguishable from the female. It possesses vocal sacs already mentioned and is smaller in size, measuring 48 mm.

from snout to vent, in contrast to 53 mm., the length of the female. Almost as striking a character, which I take to be entirely sexual, are the numerous white asperities which entirely cover the dorsal surface of the male. In addition to these asperities, the male possesses the large flat warts of the female, but the asperities are minute and bear no relation to the warts.

HABITS.—The female, taken in March, possessed very mature ova, suggesting that the breeding season may occur shortly after this month. When captured, the male appeared "very sluggish, preferring to crawl into the crevices of a palm tree than to leap away from its captors."

The stomach of the two specimens contained the unidentifiable fragments of several insects.

Hylambates greshoffii Schilthuis

Hylambates greshoffii SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286, Figs *a* and *b* (type locality: Boma, Belgian Congo). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 168 and 171 (refers to type). NIEDEN, 1909, Arch. Naturg., LXXV, part 1, p. 336 (refers to type).

A single adult male taken at Stanleyville, August 13, 1909. (A. M. N. H. Nos. 8667.)

DISTRIBUTION.—It is thirty years since *H. greshoffii* was made known to science and since that time no specimens, to my knowledge, have hitherto been secured. The fact that our single specimen was taken at Stanleyville suggests that the type may have been collected in the forested area north of Boma and that the species may have a wide distribution in the Rain Forest.

RELATIONS.—Boulenger (1906) has compared the species with *H. leonardi* and Nieden (1909) with *H. tessmanni.*

In external features *H. greshoffii* is very distinct from any other species of *Hylambates* or any species of the allied genus *Leptopelis.* Its completely webbed toes, nearly webless fingers, smooth skin, and uniform coloration readily distinguishes *H. greshoffii* from these forms. It is apparently related to *H. leonardi,* but is remarkable in lacking the gular vocal sacs and gular pad characteristic of that related species.

VARIATION.—Our specimen agrees entirely with the brief description of Schilthuis. To this description it may be added that the tibiotarsal articulation reaches the middle of the eye, that the tibia is contained 2.1 times into the head and body length, and that the disks of the digits are not quite as large as the tympanum. In alcohol the specimen is a uniform reddish brown above and white below. In life the dorsal

surface was "a light rusty brown, very waxy in appearance. The brown tone graded off into an orange red on the digits and into a pink on the throat. The belly was a yellowish white, fading gradually into the yellowish brown of the sides. The iris was of the brilliancy and color of an emerald, in sharp contrast to the sombre tones of the body."

HABITS.—The single specimen was caught on the ground in a coffee plantation. Its alimentary tract contained the wings of a grasshopper.

HYPEROLIUS Rapp

In no genus of frogs are there so many undefinable, intergrading species as in *Hyperolius*. It is the most dominant tree frog of Africa and yet systematically it is the most unsatisfactory. *Eleutherodactylus* of the American tropics perhaps affords a close parallel but this is apparently an older genus where specialization has proceeded to a greater extent and we do not find the great structural uniformity of *Hyperolius*.

The number of described species of *Hyperolius* has become so large, and the differences employed appear so trivial, that many herpetologists have either left certain of their species unidentified in their reports or have omitted the genus entirely. Nieden (1912 and 1915) refused to complicate the already involved synonymy of *Hyperolius* by referring the numerous specimens which he had before him to any of the described species. Werner (1907) did exactly the opposite; after admitting that "the more than fifty described species of this large and difficult genus" were too intangible for him he proceeded to describe as new all the species in his collection. This extreme rashness may have been due to the example of recent workers; some years before he (1898) left one of the species of *Hyperolius* he was considering *sp. indet.* Bocage (1896), Müller (1910), Andersson, (1911) and Klaptocz (1913) have adopted this latter system of ridding themselves of the more troublesome specimens. Others, such as Pfeffer (1892) and Hewitt (1911) have simply deplored the confusion into which the species of *Hyperolius* have been thrown, but they have contributed little to help matters.

It was at once obvious that with the few species of *Hyperolius* available in the museums in America I could contribute little of value to the problem. Nevertheless, I append a rough key to the sixty-one species I consider valid and a table of their reported distribution in Africa. A comparison of the key with the variation discussions under the species will show some great discrepancies. The key has been compiled from the literature, and at least it may serve as a check on the published descriptions. I have found both the key and the table useful in my work

on the genus and, if considerable allowances are made for the incorrect identification by early authors, both key and table should be useful to future workers.

The first synthetic work on the genus *Hyperolius* was attempted by Tornier (1896). Unfortunately, he lost sight of the natural groups as exhibited by structural features and contiguous ranges. Without any insight into the genetic relations of the species he arranged all the specimens he could secure in a number of series (often representatives of one species in several different series) just as anyone might do with almost any group of vertebrates exhibiting great variation in color pattern. I fail to see that Tornier's elaborate plate (1896, Pl. III) is a distinct contribution to the phylogeny of the genus, for, in order to show that the color variations could be arranged in a series, Tornier has utterly disregarded the few constant characters of structure. Our study of the genus shows that coloration is not always present, but, when the pattern is complete, it has a constant form in each species. Variation is thus limited within each species to a fading of a definite pattern (possible exceptions in certain species such as *H. marmoratus*). This fading is well shown for *H. symetricus* by Andersson (1911, Pl. I, figs. 2*a*–2*e*). Studies in variation within the species will do much to untangle the synonymy of the many undefinable species of *Hyperolius*.

Résumé of the African Species of *Hyperolius*

a_1.—Outer fingers less than a third webbed.

b_1.—Tibiotarsal articulation reaching not beyond eye.

c_1.—Uniform above (excluding sides of head)..*H. aylmeri, H. concolor, H. platyrhinus, H. pusillus.*

c_2.—Spotted above (with or without a lateral stripe)..*H. pleurotænius, H. riggenbachi, H. vermiculatus, H. tristis.*

c_3.—Striped above.....*H. molleri, H. spurrelli.*

c_4.—Striped or spotted on sides only...*H. balfouri, H. bivittatus, H. cinnamomeo-ventris.*

c_5.—Occipital spot and a more or less confluent median pattern..*H. platyceps.*

b_2.—Tibiotarsal articulation reaching beyond eye.

c_1.—Uniform above.....*H. thomensis.*

c_2.—Spotted or stippled above..*H. sansibaricus, H. benguellensis, H. nasutus, H. platycephalus, H. punctulatus.*

c_3.—Marbled and spotted above.....*H. pliciferus.*

c_4.—Striped above.....*H. granulatus, H. quinquevittatus.*

c_5.—Striped or spotted on sides only.

H. cinctiventris, H. osorioi, H. sugillatus.

a_2.—Outer fingers one-third or more webbed.

b_1.—Tibiotarsal articulation extending not beyond eye.

c_1.—Uniform above (typically so)..... *H. pachydermus, H. steindachnerii.*
c_2.—Spotted or stippled above.... *H. argus, H. guttatus, H. guttulatus, H. sordidus, H. viridiflavus.*
c_3.—Marbled above..... *H. ferniquei, H. marmoratus.*
c_4.—Striped above..... *H. fulvovittatus, H. oxyrhynchus.*
c_5.—Striped or marbled on sides only.. *H. bayoni, H. fasciatus, H. flavoviridis, H. fusciventris, H. picturatus, H. fuscigula, H. rhodoscelis, H. fimbriolatus, H. burgeoni.*
c_6.—Occipital spot and a more or less confluent median pattern. *H. symetricus, H. undulatus.*

b_2.—Tibiotarsal articulation reaching beyond eye.
c_1.—Two irregular, more or less diagonal zones of color above. *H. phantasticus.*
c_2.—Uniform above..... *H. salinæ, H. tuberilinguis.*
c_3.—Spotted or stippled above..... *H. bocagei, H. langi, H. ocellatus.*
c_4.—Marbled above..... *H. lagoensis.*
c_5.—Striped above..... *H. toulsonii.*
c_6.—Striped or marbled on sides only..... *H. burtonii, H. chlorosteus, H. horstockii, H. microps, H. seabrai.*
c_7.—A symmetrical spot and a more or less median pattern.. *H. acutirostris.*

	Forest				Open Country			
Species	Portuguese Guinea-Nigeria	Cameroon-Gaboon	Upper Congo	Lower Congo	Angola	Senegambia Sudan	East Africa	South Africa
Hyperolius acutirostris Buchholz and Peters	×	×	×					
Hyperolius argus Peters							×	×
Hyperolius aylmeri (E. G. Boulenger)	×							
Hyperolius balfouri (Werner)						×		
Hyperolius bayoni (Boulenger)							×	
Hyperolius benguellensis (Bocage)					×			
Hyperolius bivittatus (Ferreira)					×			
Hyperolius bocagei Steindachner					×			
Hyperolius burgeoni (Witte)			×					
Hyperolius burtonii (Boulenger)	×							
Hyperolius chlorosteus (E. G. Boulenger)	×							
Hyperolius cinctiventris Cope				×	×	×	×	×
Hyperolius cinnamomeo-ventris Bocage					×			
Hyperolius concolor (Hallowell)	×	×			×	×	×	×
Hyperolius fasciatus (Ferreira)					×			
Hyperolius ferniquei (Mocquard)							×	
Hyperolius fimbriolatus Buchholz and Peters		×		×				
Hyperolius flavoviridis Peters							×	
Hyperolius fulvovittatus Cope					×		×	

Species	Forest				Open Country			
	Portuguese Guinea-Nigeria	Cameroon-Gaboon	Upper Congo	Lower Congo	Angola	Senegambia Sudan	East Africa	South Africa
Hyperolius fuscigula Bocage	×	×		×	×			
Hyperolius fusciventris Peters	×	×						
Hyperolius granulatus (Boulenger)							×	
Hyperolius guttatus Peters	×	×						
Hyperolius guttulatus Günther	?							
Hyperolius horstockii (Schlegel)								×
Hyperolius lagoensis (Günther)	×							
Hyperolius langi Noble			×					
Hyperolius marmoratus Rapp	×	×	×	×	×		×	×
Hyperolius microps Günther		?			×		×	?
Hyperolius molleri (Bedriaga)		×						
Hyperolius nasutus Günther				×	×	×	×	×
Hyperolius ocellatus Günther		×	×		×			
Hyperolius osorioi (Ferreira)					×			
Hyperolius oxyrhynchus (Boulenger)							×	
Hyperolius pachydermus (Werner)						×		
Hyperolius phantasticus (Boulenger)		×	×					
Hyperolius picturatus Peters	×	×	×				×	
Hyperolius platycephalus (Pfeffer)							×	
Hyperolius platyceps (Boulenger)		×			×			
Hyperolius platyrhinus (Procter)							×	
Hyperolius pleurotænius (Boulenger)		×	×					
Hyperolius pliciferus (Bocage)					×			
Hyperolius punctulatus (Bocage)					×			
Hyperolius pusillus (Cope)	×	×		×	×	×		×
Hyperolius quinquevittatus Bocage			×		×			
Hyperolius rhodoscelis (Boulenger)							×	
Hyperolius riggenbachi (Nieden)		×						
Hyperolius salinæ (Bianconi)							×	
Hyperolius sansibaricus (Pfeffer)							×	
Hyperolius seabrai (Ferreira)					×			
Hyperolius sordidus (Fischer)	×	×	×					
Hyperolius spurrelli (Boulenger)	×							
Hyperolius steindachnerii Bocage		×	×		×			
Hyperolius sugillatus Cope								×
Hyperolius symetricus (Mocquard)							×	
Hyperolius thomensis Bocage		×						
Hyperolius toulsonii Bocage					×			
Hyperolius tristis Bocage				×	×			
Hyperolius tuberilinguis Smith								×
Hyperolius undulatus (Boulenger)							×	×
Hyperolius vermiculatus (Pfeffer)							×	
Hyperolius viridiflavus (Duméril and Bibron)							×	

Hyperolius concolor (Hallowell)

Plate XXXIX, Figure 3

Ixalus concolor HALLOWELL, 1844, Proc. Acad. Nat. Sci., Philadelphia, p. 60 (type locality: Liberia).

Rappia concolor BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 124 (Gold Coast, Shiré Valley and Portuguese East Africa: Quilimane). FISCHER, 1884, Jahrb. Hamburg. Wiss. Anst., I, p. 27 (vicinity of Naivasha Lake). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, p. 257 (Zanzibar). BOULENGER, 1891, Proc. Zoöl. Soc. London, p. 308 (Shiré Valley). MATSCHIE, 1892, Sitzber. Ges. Naturf. Freunde Berlin, p. 110 (German East Africa); 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland); 1894, Proc. Zoöl. Soc. London, p. 88 (Njemps, British East Africa). BOCAGE, 1895, 'Herpétol. Angola,' p. 173 (Angola: Duque de Bragança, Huilla, Caconda, Rio Quando and Bihé); 1896, Jorn. Sci. Lisboa, (2) IV, pp. 101 and 211 (Mozambique and Angola: Hanha). TORNIER, 1896, 'Kriechthiere Deutsch Ost-Afrikas,' p. 146 (part: German East Africa). MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 19 (Lambaréné, Gaboon). BOULENGER, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 54 (Prince's Island). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Prince's Island, St. Thomas and Portuguese Guinea: Bolama). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 237 (Bibundi, Cameroon). BOULENGER, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands); Ann. Natal Mus., I, p. 223 (Zululand: Lower Umbiluzi); 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 304 (Sesse Islands). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 102 (Bukoba, German East Africa). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 32 (Mount Kenia). HEWITT, 1911, Rec. Albany Mus., II, p. 223 (partial summary of above localities). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 78 (Bibundi and Isongo, Cameroon). PERACCA, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 8 (Rhodesia: Lake Bangueolo). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 346 (Zanzibar). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375. CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 457 (French Guinea and Liberia: several localities).

Fifty-four specimens: thirty-two from Vankerckhovenville, April 1912; five from Garamba in April, three in May and one in June 1912; one from Faradje in February and another in April 1911; four from the same locality in March, and two in October 1912; three from Niangara, June 1913; and two from Poko, August 1913. (A. M. N. H. Nos. 9984–9999, 10800–10837.)

DISTRIBUTION.—The systematic status of *H. concolor* is very unsatisfactory, making the reported distribution of the species equally puzzling. The American Museum expedition found the species only in the open country lying to the north of the forest. The species is typically a savannah form with an extreme range in the Sudan, East Africa, and Angola and with reported occurrences in the Rain Forest.

RELATIONS.—Our specimens average in coloration distinctly different from any described species of *Hyperolius*. Structurally they are identical with the type (A. N. S. P. 3216) of *H. concolor;* in the shape of the head, the extent of the digital webbing and the leg-length they agree entirely with it. The color of the type specimen has completely faded,[1] both dorsal and ventral surfaces being a uniform white. The original description of *H. concolor* is brief. A few of our specimens agree entirely with it but the majority are very different. A dorsolateral stripe of bluish gray and a fine speckling of dark brown appear in most of the specimens. The ground color is some tone of brown and not green as Boulenger (1882) has added to the description of the species. Mocquard (1897) has found a dorsolateral stripe in his specimens of *H. concolor* and Andersson (1907) mentions a speckling. Still, it seems obvious that several authors at least have not had the same species at hand when discussing specimens which they referred to *H. concolor*. Our specimens are certainly very near to the type of that species, differing only in an inconstant color feature. It is this inconsistency of the blue-gray dorsolateral line and dark speckling which prohibits the separating of our Sudanese specimens from typical *H. concolor* of Liberia.

Judging only from the descriptions, I would be inclined to refer, first of all, *H. balfouri* to the synonymy of this species. *H. sansibarica* is supposed to differ from *H. concolor* in lacking the webs between the fingers. The webs are rudimentary but very distinct in our series of the latter species. *H. salinæ* has been described with half-webbed fingers, but no other striking feature distinguishes it from *H. concolor*. Without an examination of the types of these related species, any change in the synonymy would lend further confusion, especially since many of the related species have been inadequately defined.

VARIATION.—The series of thirty-two specimens taken at Vankerckhovenville during April 1912 shows a great range of variation, practically as much as is exhibited by our entire series. The general color above varies from a yellowish gray to a dark chocolate-brown. The majority of the specimens have some indication of the slaty-blue dorsolateral stripe. Nine of the thirty-two specimens lack the speckling above. Of these nine only two have no trace of the dorsolateral line and are therefore identical with the type of *H. concolor* as originally described (except for the ventral staining of the type). The ventral surfaces of our

[1]In this connection I may add that the type specimen of *H. fulvovittatus*, although still in the collections of the Philadelphia Academy of Natural Sciences, has become reduced to a few bones and fragments of white skin.

specimens are uniformly yellowish, sometimes stippled with brown on the chin. In a few of the specimens the abdomen and ventral surface of the legs are darker, but apparently due to discoloration.

The variation occurring in life is well summed up in the field description for five specimens (Nos. 10819–10823) from Garamba, taken April 14, 1912: "General color above pale buff to gray; iris pale bronzy to dark bronzy and showing considerable variegation in the same individual; dorsolateral stripes grayish green to dark gray; pads, underside of the thigh, outer side of the lower leg bright pinkish; ventral surface whitish."

HABITS.—Specimens taken during April, May and June show the greatest development of the ovaries. The breeding season may be an extended one.

Of those stomachs examined only eight contained food. This consisted of 2 winged termites; 1 caterpillar, 1 moth; and fragments of various insects, mostly beetles.

Hyperolius pusillus (Cope)

Crumenifera pusilla COPE, 1862, Proc. Acad. Nat. Sci. Philadelphia, p. 343 (type locality: Umvoti, Natal).

Rappia pusilla BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127 (same locality, erroneously stated "Umvoti, West Africa"). SCHILTHUIS, 1889, Tijd. Neder. Dier, Ver., (2) II, p. 286 (Boma, Belgian Congo). (Species doubtfully recorded.) BOULENGER, 1890, Proc. Zoöl. Soc. London, p. 324 (Brass, Niger). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, p. 688 (Brass, Nigeria). SCLATER, 1899, Ann. S. African Mus., I, p. 108 (South Africa). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 445 (Niger Delta to Gaboon). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Cameroon). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 61 (Cameroon). HEWITT, 1911, Rec. Albany Mus., II, pp. 210 and 224.

Forty-one specimens: twenty-five from Garamba in May and six in June 1912; two from Faradje in April 1911; two from the same locality in March and one in October 1912; two from Vankerckhovenville, April 1912; one from Niangara, June 1913; one from Matadi, December 1914; and one from Zambi, June 1915. (A. M. N. H. Nos. 10838–10878.)

DISTRIBUTION.—Our specimens are all from the open country lying to the north or the south of the forest. The only Rain Forest specimens referred to *H. pusillus* which I have been able to examine are those recorded by Barbour (1911, p. 133) from Cameroon. At least one of these (M. C. Z. 2746) is identical with specimens I have considered *H.*

ocellatus and differ widely both in structure and color from the original description of *H. pusillus*. It seems to me that other forest records for that species may prove referable to other species and that *H. pusillus* will be found to occur only in the open country. The present known range of *H. pusillus* extends from the Sudan to Natal.

RELATIONS.—*H. pusillus* is one of the least understood species of the genus. It was described as having an "incomplete" pattern, and many workers have referred to it their specimens which possessed only a partially developed pattern, although a larger series might have shown that they were not considering the same species. In our series of specimens, those of minimum coloration are inseparable from *H. pusillus* as originally described, but the highly colored specimens differ greatly from any described species. Our series exhibits a gradual change from a pale brownish ground color and dark frenal stripe characteristic of *H. pusillus* to a yellowish ground tone covered with evenly spaced pink spots, then to a net pattern of black regularly arranged about the spots, and finally to almost a uniform black dorsal surface with only a slight indication of the pink spots, which in this stage appear very much like mould or growths of fungus.

Our specimens agree entirely with *H. pusillus* structurally. The vocal sac in the male has the deep posterior pockets, but the "median frenum" is not always distinct. Except for the elaborate vocal apparatus with its broad gular disk the pale specimens in our series are identical with *H. citrinus* Günther (1864, Pl. XXVII, fig. 2). This species has been generally referred to *H. cinctiventris*, from which it seems to differ in color. Although *H. cinctiventris* has been recorded by Günther (1888) from the region where most of the above specimens were found, it is, nevertheless, unrepresented in our collection.

With the extraordinarily great range of color variation exhibited by our series of *H. pusillus*, it is obvious that many described species may possibly be referable to this one. Slight differences appearing in the original descriptions would probably disappear in a large series of specimens, but lack of comparative material has prevented me from reducing the more questionable species to synonymy. *H. pachydermus* is credited with half-webbed fingers. The palest specimens in our series are otherwise identical with it. *H. bayoni* has brownish thighs, and it sometimes possesses a vertebral stripe. Still, it has many other features in common with *H. pusillus*. *H. sordidus*, recently recorded from the Ituri by Boulenger (1919), has the black streaking above of our highly colored specimens but it lacks the pink spots. *H. platycephalus* agrees very well

in color with one stage in our series but the species was described as having much longer legs than occur in our specimens. Finally, *H. rhodoscelis* is superficially very similar to certain of our specimens but it possesses a light dorsolateral stripe.

VARIATION.—The main color changes exhibited by our series have been outlined above. In life the majority of the specimens were bright yellow with pinkish spots. A number were pale gray with a dusky tinge to the canthal region. The thighs and ventral surfaces of the appendages ranged from pinkish to scarlet. One of the darkest specimens (No. 10873) was described in the field as "blackish above with curious yellowish spots each with a dark center; sides and ventral surfaces of the body yellowish; thighs, digits and under surfaces of the appendages bright pinkish; iris dark bronzy."

HABITS.—Specimens taken at Vankerckhovenville in April and at Faradje in October 1912 were found in the grass bordering the swamps. Certain specimens taken at Garamba in May possessed the most highly developed sexual organs in our series, but other specimens from this same locality and taken the same time had their gonads in all stages of development. The breeding season may be irregular.

In ten stomachs which contained food there were found eighteen winged ants and the fragments of a number of other insects.

Hyperolius pleurotænius (Boulenger)

Plate XL, Figure 1

Rappia pleurotænia BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322 (type locality: Zima, Cameroon and Benito River, Spanish Guinea); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernand-Vaz, French Congo). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Ebolowa, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60 (Zima and Longji, Cameroon).

Thirty-one specimens: fifteen from Medje in June and six in July 1914; two from the same locality in April-May and two in July 1910; three from Gamangui, February 1910; one from Bafwasende, September 1909; one from Stanleyville in August 1913 and one in April 1915. (A. M. N. H. Nos. 9950–9980.)

DISTRIBUTION.—Although *H. pleurotænius* was formerly known only from the Cameroon-Gaboon area, the American Museum expedition found it common in the Ituri. The species will probably be shown to have a wide range in the Rain Forest.

RELATIONS.—None of our specimens agree entirely with the original description of *H. pleurotænius* for they lack the white spots above.

Nieden (1910*a*) states that these spots may be present or absent. Our specimens agree in all other details with both Boulenger's and Nieden's descriptions. They can be referable to no other species. A combination of rudimentary web between the fingers, short legs, purplish ground tone, broad dorsolateral stripe which is often edged with a very dark border and spotted with a similar tone distinguishes *H. pleurotænius* from all other forest forms of *Hyperolius*.

VARIATIONS.—Although our specimens have no well-defined white spots, the ground tone of purplish brown sometimes appears spotty, and in several of the specimens forms very distinct spots. The ground tone is sometimes very faint and the general color is yellowish instead of purplish brown. The light-colored specimens were greenish in life, the dark ones more brownish than purplish. The dorsolateral stripes were yellow and in several of the specimens, including the one photographed (Plate XL, fig. 1), vermilion spots were present on the anterior surface of the thighs.

HABITS.—A number of the specimens were taken on the forest floor. Only a few had been recently feeding, for only three stomachs of those examined contained food. This included 3 winged termites; 1 caterpillar; 1 ant; and 1 beetle.

Hyperolius nasutus Günther

Hyperolius nasutus GÜNTHER, 1864, Proc. Zoöl. Soc. London, p. 482, Pl. XXXIII, fig. 3 (type locality: Duque de Bragança).

Rappia nasuta BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127 (Duque de Bragança, Angola). SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 285 (Boma, Belgian Congo). GÜNTHER, 1893, Proc. Zoöl. Soc. London, p. 619 (Nyasaland). BOCAGE, 1895, 'Herpétol. Angola,' p. 169 (Angola: Duque de Bragança, Huilla and Caconda); 1896, Jorn. Sci. Lisboa, (2) IV, p. 104 (Nyasaland); 1897, (2) IV, p. 204 (Angola). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 110 (Angola: Bange Ngola and Canhoca); 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Bululo and Kabulamuliro). HEWITT, 1911, Rec. Albany Mus., II, part 3, p. 224 (Marandellas, Rhodesia). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Southern Rhodesia).

Rappia puncticulata PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 99 (Zanzibar). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 25 (Kibonoto, Kilimanjaro). ROUX, 1910, Rev. Suisse. Zool., XVIII, p. 102 (Jinga, Uganda. NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375.

Rappia papyri WERNER, 1903, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1903, Pl. IV, fig. 14 (Sudan); 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 322 (White Nile).

Forty-one specimens: thirteen from Faradje, January 1913; ten from the same locality, December 1912; six from Garamba, May 1912,

and two from the same locality, March 1912; ten from Vankerckhovenville, April 1912. (A. M. N. H. Nos. 9905–9945.)

DISTRIBUTION.—*Hyperolius nasutus* is a savannah species. Its range circumscribes the forest except in the northwest. Although apparently most abundant in the savannahs lying within ten degrees of the equator, the species has been taken as far south as Southern Rhodesia.

RELATIONS.—A combination of small size, pointed snout, slender form, long hind legs and short webbing between the toes renders *H. nasutus* readily distinguishable from the other species of *Hyperolius* occurring in the Sudanese area. In *H. nasutus* the color-pattern, which is not strikingly different from that of several of the other species, is very often reduced or completely absent.

VARIATION.—Variation in *H. nasutus* is not limited to color. The tibiotarsal articulation may reach only to the middle of the eye or it may extend to nearly the end of the snout. The webbing between the fingers is often scarcely noticeable, and the webbing between the toes generally extends to only half the length of the penultimate phalanges of the third and fifth toes, and to four-fifths the length of the antepenultimate of the fourth toe.

All but four of our forty-one specimens have some indication of the white dorsolateral stripe. About half of them lack the dark stippling above. In alcohol the ground tones vary from a pale yellowish, greenish, or brownish. The series (Nos. 9936–9945) from Vankerckhovenville were described in the field as: "Ground tones varying from dark gray or brown to pale buff or greenish; dorsolateral stripes golden; ventral surfaces whitish or grayish."

HABITS.—All the specimens were taken in the vicinity of swamps. At Faradje they were found associated with *Phrynobatrachus natalensis* in the rank vegetation close to the water's edge.

Of those stomachs examined, only seven contained food. This consisted mostly of ants, of which twenty-two workers were recognizable.

Hyperolius marmoratus Rapp

Hyperolius marmoratus RAPP, 1842, Arch. Naturg., part 1, p. 289, Pl. VI, figs. 1 and 2 (type locality: Natal).

Rappia marmorata BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 121 (part: Zambesi, Natal, Cape of Good Hope, Donda River, Gambia, West Africa, and Angola: Benguella, Huilla, and Ambris). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, French Congo). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Liberia). DOLLO, 1886, Bull. Mus. Roy. Hist. Nat.

Belgique, IV, p. 152 (region of Lake Tanganyika). SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 285 (Boma, Belgian Congo). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 94 (Mozambique: Quilimane). TRIMEN, 1893, in Noble, 'Illustrated Official Handbook of the Cape and South Africa,' p. 87 (South Africa). GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, pp. 526–527 (Uganda and Nyasaland: Mandala). BOCAGE, 1896, Jorn Sci. Lisboa, (2) IV, pp. 96, 113, and 211 (Portuguese Guinea, Mozambique, and Angola: Hanha). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Natal). BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 281 (Zambi, Belgian Congo); Proc. Zoöl. Soc. London, p. 800 (Northwest Nyasaland). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). SCLATER, 1898, Ann. S. African Mus., I, p. 108 (South Africa). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 444 (Gaboon); 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). TORNIER, 1901, Zool. Anz., XXIV, p. 64 (Boma, Belgian Congo). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda); Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland); 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109 (Angola: seven localities); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Bolama, Portuguese Guinea and Lambaréné, French Congo); 1907, Proc. Zoöl. Soc. London, II, p. 482 (Portuguese East Africa: Beira); 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands; Victoria Nyanza). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 503 (Bipindi, Cameroon). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (South Africa: Durban and Lake Sibayi). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177 (Fort Portal, East Africa). BOULENGER, 1910, Ann. S. African Mus., V, p. 530 (Salisbury, Southern Rhodesia; Delagoa Bay, Mozambique; Otjimbora, German Southwest Africa; Kentani, Port St. Johns, and Cape Peninsula, Cape Colony). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 24, Pl. 1 (Kilimanjaro: Kibonoto). MEEK, 1910, Publ. Field Mus. Zoöl., VII, p. 404 (British East Africa: Athi Plains and Lukenya). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 59 (Bamenda, Cameroon); Arch. Naturg., LXXVI, part 1, p. 243, fig. 3 (Cameroon). ROUX, 1910, Rev. Suisse Zool., XIII, p. 101 (Bukoba, German East Africa: Busoga and Njarugenje, Uganda). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Anda, Lake Azingo, Gaboon). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Uganda: five localities). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 13; Rec. Albany Mus., II, pp. 210 and 223 ("West Africa, Congo, Angola, Abyssinia, East Africa and on the eastern side extending southwards as far as eastern Cape Colony"; seven localities enumerated in South Africa). PERACCA, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 7 (North Rhodesia: Luangasci and Lake Bangweolo). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Southern Rhodesia). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375. CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, pp. 456–7 (Agouagon, Dahomey; Ivory Coast near Mbayakio). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 417 (Basil and Nairobi, British East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 458 (N'Zerékoré, French Guinea and Samikole, Liberia).

Rappia marmorata var. *parallelus* BOETTGER, 1888, Ber. Senck. Ges., p. 96 (Vista, Ango-Ango and Lukungu, Lower and Middle Congo); 1892, 'Kat. Batr. Mus.

Senck.,' p. 20 (localities of Boettger, 1888). BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (Chinchoxo and the Lower Congo; also Bocage's localities for var. *insignis*). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Natal).

Rappia marmorata var. *marginata* BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (Duque de Bragança, Angola).

Rappia marmorata var. *tæniolata* BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (Duque de Bragança, Huilla, Caconda, and Cohata, Angola). FERREIRA, 1898, Jorn. Sci. Lisboa, (2) V, p. 241 (Caconda, Angola).

Rappia marmorata var. *huillensis* BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (Huilla, Cahata, Quindumbo, and Bihé, Angola). FERREIRA, 1898, Jorn. Sci. Lisboa, (2) V, p. 241 (Caconda, Angola).

Rappia marmorata var. *variegata* BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (Cohata and Quindumbo, Angola).

Rappia marmorata var. *insignis* BOCAGE, 1895, 'Herpétol. Angola,' p. 164 (St. Salvador du Congo, Quanza, Novo Redondo, and Dombé, Angola); 1896, Jorn. Sci. Lisboa, (2) IV, p. 80 (Bolama, Portuguese Guinea). FERREIRA, 1906, Jorn. Sci. Lisboa, (2) VII, p. 160 (Cambondo and Quilombo, Angola).

One specimen from Zambi, and one from Matadi, June 1915. (A. M. N. H. Nos. 9903–9904.)

DISTRIBUTION.—These two specimens, which are typical *H. parallelus* of Günther and "variety" *parallelus* of several authors, are very likely not conspecific with many of the specimens referred to in the above literature. Whether they be considered a subspecies of *H. marmoratus* or simply a color form appearing most often in our region, the statement made long ago by Boettger (1888) would apply equally well today for the distribution of this *parallelus* group of *H. marmoratus* (translation):

> This variety appearing very constantly in the Lower Congo extends along the West Coast from the Cape, from where Günther received his specimens, across Angola at least to Chinchoxo in Loango. The species itself is distributed in numerous color forms, which often have received special names, over the whole of tropical Africa from Senegal and Gambia on one side to Abyssinia on the other and appears also to dwell in one part of subtropical South Africa, in Natal and Cape Colony.

It is a significant fact that the American Museum expedition did not meet with *H. marmoratus* in the Ituri.

RELATIONS.—Because of the undoubted variability of *H. marmoratus* and the less certain variability of many other species, many authors have referred their uncertain specimens to this species. The several specimens of *H. marmoratus* in the Museum of Comparative Zoölogy and the American Museum from regions other than the Lower Congo are so totally different in coloration from our series that it seems absurd to refer our specimens to the same species. Our specimens are undoubtedly identical with Günther's *H. parellelus* and only a large series of specimens from

South Africa can determine the identity of Günther's species with *H. marmoratus* of Rapp.

VARIATION.—Our two specimens are nearly identical in coloration, differing only in the abundance of spots on the appendages. They agree very well with Günther's figure (1858, Pl. VIII, fig. *a*). They are both sexually immature females measuring 28 and 33 mm. respectively from snout to vent.

HABITS.—Nothing is known of the conditions under which our two specimens were taken.

Only one stomach contained food. This consisted of fragments of an unidentifiable grasshopper.

Hyperolius picturatus Peters

Plate XL, Figure 3

Hyperolius picturatus PETERS, 1875, Monatsber. Akad. Wiss. Berlin, p. 206, Pl. II, fig. 2 (type locality: Victoria, Cameroon).

Rappia picturatus MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 195 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (St. Thomas and French Congo: Fernand-Vaz and Lambaréné). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Anda, Lake Azingo, Gaboon). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 349 (Pemba Island). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Medje, Belgian Congo).

Rappia marmorata BOULENGER, (?) 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 122 (part: Cameroon).

Fifty-six specimens: twenty-two from Medje in June 1914; five from the same locality in July and one in August 1914; five from the same locality in April-May 1910; seventeen from Gamangui in February 1910; two from Vankerckhovenville in April 1912; and one from each of the following localities: Garamba, May 1912; Niangara, November 1910; Bafwasende, September 1909; and Avakubi, October 1909. (A. M. N. H. Nos. 9863–9899; 9901–9902.)

DISTRIBUTION.—*H. picturatus* has very probably been confused with several other species and its recorded range may not represent its actual distribution. *H. picturatus* is primarily a Rain Forest form, but how widely it occurs beyond the forest is unknown.

RELATIONS.—Our several specimens from beyond the limits of the forest are decidedly smaller at sexual maturity than the specimens from the Rain Forest. But in color, in proportions and in all structural characters they are identical with them. The specific limits of the numerous

species of *Hyperolius* are extremely variable and not well understood. It does not seem advisable to separate a species on size alone.

Boulenger (1906) has commented on the close similarity of *H. picturatus* with *H. concolor* and *H. fuscigula*. The key characters which I have used above show little variation in our series. *H. picturatus* has much in common with *H. fuscigula* and may not be distinct from it. Without a large series of specimens of all the related species, it would be impossible to determine the true status of *H. picturatus*.

VARIATION.—Our series exhibits an extraordinary uniformity in coloration. The ground tone above varies from a pale straw-color to a dark bluish-green, but the pattern is essentially the same in all the specimens. The dorsal surface is always immaculate and sharply delimitated from the ventral color by an irregular dark line which is lateral and not dorsolateral as in several other forest species.

In life *H. picturatus* was either uniform green above or green tinged with yellow laterally. The anterior and posterior surfaces of the thighs were brilliant red in all. One specimen (No. 9890), a photograph of which is reproduced on Plate XL, fig. 3, was described in life as "green above, sides yellowish, a dark streak in front of the eye continued back along the abdomen and dividing the yellowish color of the sides from the creamy tint of the ventral surface; front and rear surfaces of the thighs a bright red. Iris bronzy."

Sexually mature females from Medje, taken in June 1914, average 32 mm. (maximum, 33 mm.; minimum, 31 mm.). On the other hand, a sexually mature female from Vankerckhovenville, taken in April 1922, measures only 20 mm. from snout to vent. I have indicated above that the last specimen may not be conspecific with the others, but there is no other character but size with which to distinguish it as a race.

HABITS.—At Medje, *H. picturatus* was often found resting on the plantain leaves; at Vankerckhovenville, it was taken in the papyrus swamps. The breeding season may occur in June. At least, the sexual organs of specimens taken during that month show the greatest development.

Twelve stomachs of those examined contained food. The following assortment was recognizable: 4 flies (*Lucilia* ?); 3 worker ants; 1 roach; 1 gryllid; and fragments of membracids, beetles and numerous small leaf-hoppers.

Hyperolius phantasticus (Boulenger)

Rappia phantastica BOULENGER, 1899, Ann. Mag. Nat. Hist., (7) III, p. 274, Pl. XI, fig. 2 (type locality: Benito River, Spanish Guinea); 1900, Proc. Zoöl. Soc. London, II, p. 444 (same locality); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernand-Vaz, French Congo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 61 (Edea, Cameroon). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Stanleyville, Belgian Congo).

Two specimens from Medje, April 1914. (A. N. H. N. Nos. 9981–9982.)

DISTRIBUTION.—*H. phantasticus* is a forest species, already recorded from the Upper Congo by Boulenger (1919). Our two specimens from Medje now add an Ituri locality to its range, which very probably extends widely through the forest.

RELATIONS.—Both of our specimens lack the bright colors characteristic of *H. phantasticus*, but both have the vertical loreal region and half-webbed fingers of that species. Boulenger (1899*a*) has stated the close affinity between *H. phantasticus* and *H. steindachnerii*. Although the latter species has been recorded (Boulenger, 1919) from the locality where our two specimens were taken, our specimens are certainly not referable to that species. In head-form and type of color-pattern our specimens do not agree. I have examined fifteen specimens of *H. steindachnerii* from Kribi and Ja River, Cameroon. No specimens in our collection from the Ituri have the ventral spotting of that species. In the larger of our two specimens which I have referred to *H. phantasticus*, color is present dorsally in zones as described for *H. phantasticus* and not in spots as I have observed in *H. steindachnerii*. Bright colors are often variable in batrachians. The type of color-pattern of our specimens agrees with *H. phantasticus* and there are no structural characters to distinguish these specimens from it. If not identical with *H. phantasticus*, our specimens are more closely related to it than to any other species of *Hyperolius* now described.

VARIATION.—The dorsal colors of the larger of our two specimens are not bright yellow and red, as described for *H. phantasticus*, but dull greenish yellow and purplish brown. The yellowish tone is much more extensive on the head than in the type of *H. phantasticus*. The distribution of the light and dark areas ventrally in our larger specimen is very much as described for *H. phantasticus* but the dark tone is not black but purplish brown, slightly darker than the purplish tone above. In life some black was present but the predominating tones were purplish brown on a yellowish ground.

The smaller specimen has a somewhat different coloration from the larger. The ground tone is the same dull greenish-yellow, but only a slight tinge of purple is visible on the back and tip of the snout. In life there was a slight indication of a pale dorsolateral stripe. The colors in life were much the same as in alcohol, no bright reds or yellows being present.

HABITS.—Nothing is known of the habits of *H. phantasticus*. The larger of our specimens is a sexually mature male, 27 mm. from snout to vent. It may have been breeding, for its vocal sac is greatly distended.

The stomachs of both of our specimens were empty.

Hyperolius langi, new species

Plate XXXIX, Figure 1

A single adult ♀, Niapu, January 1914. (A. M. N. H. No. 9983.)

DISTRIBUTION.—The species is known only from the type.

DIAGNOSTIC CHARACTERS.—Outer fingers one-third, toes nearly completely webbed; tibiotarsal articulation extending to half the distance between the eye and the nostril; dorsal surface very finely granular.

Reddish brown above, a yellowish canthal streak broadening out into a wide spot in the scapular region; a sprinkling of yellowish spots on the distal portions of the tibia; concealed surfaces yellowish.

TYPE.—The only specimen secured.

DESCRIPTION OF TYPE SPECIMEN.—Head broader than the body; broader than long; snout subacuminate, equal in length to the greatest diameter of the eye; the profile of the tip vertical, canthus rostralis distinct; loreal region slightly oblique, concave; nostril nearly at the end of the snout; interorbital space one and a third times the greatest diameter of the upper eyelid; tympanum hidden. Outer fingers one-third webbed (half the length of the penultimate phalanges of the two outer digits). Third and fifth toes webbed nearly to the disks, fourth toe to the base of the penultimate phalanx; tibiotarsal articulation extending midway between the eye and the end of the snout; heels well overlapping when the folded legs are held at right angles to the body; breadth of the tibia contained four and a half times in its length; tibia contained nearly two times in the head and body length; subarticular and metatarsal tubercle well-developed. Skin very finely granular above, throat smooth, belly coarsely granular, no fold across the chest.

Reddish brown above, lighter below; an indistinct stripe of pale yellow along the canthus rostralis, through the eye and widening out to a broad spot on the scapular region. Portions of the appendages, which are concealed when the legs are folded, flesh color; a few indistinct spots of yellow on the distal portions of the tibia.

In life the ground tone more brown, less red than in the preserved specimen; the light pattern yellowish and much more distinct; lower surfaces greenish, translucent, the throat lighter; iris bronzy.

Measurements	
Snout to Vent	30 mm.
Width of Head	30 "
Foreleg	19 "
Hing Leg (Vent to Tip of Longest Toe)	47 "
Tibia	16 "

Relations.—*H. langi* differs from all the other species of *Hyperolius* in color-pattern. The dark ground tone with a light canthal stripe broadening out on the scapular region is not found in any other species. *H. langi* has some resemblance to *H. aylmeri*. In the key it falls nearest *H. bocagei*.

Habits.—The stomach of our single specimen contained nothing but a single ant.

Hyperolius ocellatus Günther

Plate XXXIX, Figure 2

Hyperolius ocellatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. vii, fig. B (type localities: Fernando Po and Angola).

Rappia ocellata Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 125 (same localities) Bocage, 1895, 'Herpétol. Angola.' p. 165 (same localities). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 444 (same localities). Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernando Po). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 503 (Cameroon and Fernando Po); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60, fig. 127 (Bibundi, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Bitye, Ja River, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 78 (Bibundi and Isongo, Cameroon).

Rappia pusilla Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Efulen, Cameroon). (Not of Cope 1862.)

Four specimens: one from Niapu in January; two from Medje in June and one in July 1914. (A. M. N. H. Nos. 9946–9949.)

Distribution.—The occurrence of *H. ocellatus* in the Ituri, although not unexpected, is of interest because of the rarity of the species in collections. *H. ocellatus* is apparently a forest form and its reported occurrence in Angola requires confirmation.

Relations.—At least one of our specimens is identical with a specimen (M. C. Z. 2649) from Bitye, Ja River, Cameroon, referred by Barbour (1911) to *H. ocellatus* and probably originally identified as such by Boulenger. All of our specimens are very similar to this one, and all differ from the type specimens as originally described in that they lack the white outlines to the dorsal spots, and the brown marblings to the

sides of the body. Further, the fingers are more nearly half than two-thirds webbed. Nevertheless, after the variation we have seen in other species of *Hyperolius*, I do not believe that the specimens from the Ja River and the Ituri are specifically separable from the types of *H. ocellatus*, described from Fernando Po and Angola.

VARIATION.—In all four specimens the tibiotarsal articulation extends beyond the eye, and the fingers are at least half webbed. Coloration, also, shows little variation. The ground tone is uniformly pink, in alcohol, and the spots are black. The distribution of these spots anteriorly and their fading out posteriorly is well shown in the photograph (Plate XXXIX, fig. 2). The specimen photographed was described in life as "dull milky white with a tinge of pinkish or bluish; many round black spots on the back and forelimbs; throat chrome yellow; rest of ventral surface translucent, tinged with green; iris golden. Ground tone while under observation changing from white to bluish, and from pink to yellowish."

HABITS.—Nothing is known of the habits of this species of *Hyperolius*. Only two stomachs contained food, and this was very fragmentary, consisting mostly of pieces of beetle elytra.

Hyperolius acutirostris Buchholz and Peters

Plate XL, Figure 2

Hyperolius acutirostris BUCHHOLZ AND PETERS, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 207 (type locality: Cameroon).

Rappia acutirostris TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 154 (Cameroon). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 194 (Cameroon). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60 (Cameroon). DESPAX, 1911, in Cottes, 'Mission Cottes au Sud-Cameroun,' p. 242 (Gaboon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 214 (Cameroon: Bibundi and Isongo).

Rappia tuberculata MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 18 (Lower Ogowe, Gaboon); Bull. Mus. Hist. Nat., Paris, p. 55 (Lower Ogowe, Gaboon). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 444 (Ogowe River, Gaboon). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Cameroon). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria).

Thirty-three specimens: fourteen from Medje in June and eleven in July 1914; one from the same locality in May, four in July, one in August and one in September 1910; one from Bafwasende, September 1909. (A. M. N. H. Nos. 9813–9845.)

DISTRIBUTION.—*H. acutirostris* was formerly known only from the Cameroon-Gaboon area and Nigeria. Our large series from the Ituri

shows that the species must be equally abundant at the eastern end of the Rain Forest. Our series adds another species to the list of batrachians which range throughout the forest at least as far west as Nigeria.

RELATIONS.—Of the many species of *Hyperolius* which have been described and which I have recognized in the above table as actually distinct, only three have been described as possessing a well-developed digital web and a symmetrical pattern consisting of an interorbital bar and a more or less median pattern. In the key I have distinguished *H. acutirostris* from the other two species of this group by its longer hind limbs. In some of the specimens of *H. acutirostris* the tibiotarsal articulation reaches only to the anterior border of the eye. But the species may be distinguished from *H. symetricus* by its longer snout (longer than the eye) and from *H. undulatus* by the presence of a partial gular disk in the male. Further, the two latter species are East African while *H. acutirostris* is known only from the Rain Forest. The orange, or bright flesh-color, tinge serves as a ready means of distinguishing *H. acutirostris* from the other species in our collection. Its color-pattern is also unique in our series, but this color-pattern is not always present. A large percentage of the specimens, doubtlessly referable to *H. acutirostris*, are nearly a uniform flesh-color above and below.

There is nothing in the original description of *H. tuberculatus* to separate it from *H. acutirostris*. The range of the two species overlap and I see no reason for keeping the two species distinct.

VARIATION.—The majority of our specimens are nearly smooth. The most granular are those with the greatest development of color pattern.

The variation in color-pattern is well illustrated in a series (Nos. 9826–9836) from Medje, all taken in July 1914. In the specimen (No. 9826) with the most complete pattern the interorbital spot is in the form of a triangle directed backward; a dark area behind the shoulder is formed by the confluence of two undulating bands which form a zig-zag pattern on each side of the upper surface; a dark bar across the thighs, two across the feet, one across the forearms, and another across the hands, stand out in sharp contrast to the pale reddish ground-tones. The ventral surface is immaculate. The specimens in the series may be arranged to represent stages in the reduction of the pattern. In the first stage the undulating bands break up into a series of segments. Of these the most pronounced is the interorbital triangle, a spot in the scapular region, a pair of spots behind the shoulder, and a pair of spots in the sacral region. A dark area remains above each arm. The final

stage is a complete loss of the dark pattern, the whole upper surface becoming flesh-color. Under the lens, contracted chromatophores may be distinguished. They give the whole dorsal surface a slightly darker tinge than the ventral surface. In some cases the pattern has not been reduced (or produced) evenly. One specimen (No. 9834), in addition to a reduced pattern, is covered above with a number of fine dark dots.

The specimens have changed but little in preservation. In life the ground tone was generally a reddish brown, although in a few it was tinged with green. The appendages, especially the webs, were suffused with pink. One specimen (No. 9825) may be taken as typical for the species. It was described as "reddish brown above, lighter on the sides; yellowish on the throat; reddish on the appendages, especially their lower surfaces; a dark spot on the crown; another behind the shoulder; another on the sacral region and several across the appendages; these dark marks not very conspicuous. Iris dark gray, nearly black."

HABITS.—Nothing is known of the habits of this species. It is inferred from an examination of the gonads of our large series that the breeding season may occur in June, at least at Medje.

Only two stomachs contained food. This consisted of the fragments of several insects.

MEGALIXALUS Günther

The comparison of the osteology of two species of this genus with that of a number of species of *Hyperolius* has not revealed any important differences. *Megalixalus* may be defined as *Hyperolius* with a vertical pupil. The twelve recognizable species of the genus may be distinguished by the following key.

a_1.—Toes two-thirds webbed or more (not more than a single phalanx of the third and fifth digit and two phalanges of the fourth free).

b_1.—Tympanum distinct.

c_1.—Tibiotarsal articulation reaching end of snout; color above yellowish brown with dark confluent spots on appendages and posterior parts of back..... *M. pantherinus.*

c_2.—Tibiotarsal articulation reaching eye.

d_1.—Fingers with short web continued as a seam to disks; brownish above thickly stippled with black..... *M. lindholmi.*

d_2.—Fingers nearly free, no seam.

e_1.—Uniform brownish above..... *M. immaculatus.*

e_2.—Upper parts dark violet, with round yellow spots. *M. flavomaculatus.*

b_2.—Tympanum hidden.

c_1.—Spinous warts present on dorsal surface of the body or on upper surface of snout alone.

d_1.—Spines restricted to snout, fingers nearly free.....*M. spinifrons.*
d_2.—Spines most numerous posteriorly, fingers two-thirds or more webbed.....*M. spinosus.*
c_2.—Skin smooth or slightly granular above.
d_1.—Three light bands extending length of back, never confluent; adult females not over 30 mm. in length.....*M. leptosomus.*
d_2.—Two light bands on back confluent or broken in sacral region; adult females over 30 mm. in length.....*M. fornasinii.*
d_3.—Pale brown above, with a faintly marked band, commencing on snout and progressively widening on the back....*M. loveridgii.*
a_2.—Toes less than two-thirds webbed.
b_1.—Digital disks small.....*M. gramineus.*
b_2.—Digital disks large.
c_1.—Grayish above with two brown lines along back.....*M. brachycnemis.*
c_2.—Grayish above stippled with red, four longitudinal brown lines converging on head.....*M. vittiger.*

Megalixalus spinosus (Buchholz and Peters)

Plate XLI, Figure 2

Hyperolius spinosus Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. I, fig. 3 (type locality: Cameroon).

Megalixalus spinosus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130 (Cameroon). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 196 (Cameroon). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Cape St. John, Spanish Guinea). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Fernando Po and Cameroon: Victoria and Bipindi); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 58, fig. 124 (Cameroon: Victoria and Johann-Albrechtsthöhe). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Bibundi, Cameroon). Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Medje, Belgian Congo).

Two specimens, ♂ and ♀, from Medje, June 1914. (A. M. N. H. Nos. 9400–9401.)

Distribution.—Boulenger (1919) has already remarked upon the occurrence of this typical Cameroon form in the Ituri. The singular form of *M. spinosus* would lead us to expect that the species was confined to the forest.

Relations.—In spite of its extraordinarily produced head, extended webs, and roughened skin, *M. spinosus* shows close affinity to other species of *Megalixalus* in its internal structure. The omosternum is not so widely forked as in *M. fornasinii*, and the claw-shaped terminal phalanges are decidedly more blunt at the tips, but on the whole the species is internally a typical *Megalixalus*.

Variation.—It is only the male of our two specimens which has along the ventral surface of the tarsus the enlarged horny spines com-

mented upon by several authors. I strongly suspect these tarsal spurs are characteristic of only the male sex. Both of our specimens are sexually mature, apparently breeding, and yet, oddly enough, the male is a little larger than the female, being 38.5 mm. (from snout to vent) as against 37 mm.

Another feature which I take to be a secondary sexual character of the male is a pair of gular glands, one below each angle of the jaw. These are ovoid in shape, 3×5 mm. in size, of the same color as the throat, and without any indication of excrescencies. They deserve histological comparison with the brachial glands of *Leptopelis rufus* and *L. aubryi*.

The female specimen is grayer than the male and more heavily marbled with black; the dorsal spines are less prominent and are not disinctively colored as in the male (in alcohol). The latter was described in the field as "translucent green above, with many rounded protuberances often of a lighter shade; dark gray on the snout; a blackish interorbital bar of triangular form, the point directed posteriorly; a blackish triangular mark in the shoulder region pointing forward; a large dark blotch in the sacral region; all these dark markings more or less connected by a fine reticulation of same color; sides of the body grayish clouded with a darker tone; ventral surface whitish, heavily marbled with gray."

HABITS.—Both specimens were taken by natives, the male between the stones bordering a forest brook. The female contained in her ovaries a small number of very large eggs (over 3 mm. in diameter). They were pigmented at one pole. Future field work will probably reveal that *M. spinosus* has a peculiar life history. Nearly all frogs with large eggs have an abbreviated larval life, but in all the other cases of heavily yolked eggs, with which I am familiar, the eggs in the ovarium are unpigmented

Both stomachs contained a small amount of food. This consisted of the fragments of several insects and a syrphid fly larva (*Eristalis*).

Megalixalus leptosomus (Peters)

Hyperolius leptosomus PETERS, 1877, Monatsber. Akad. Wiss. Berlin, p. 619, fig. 5 (type locality: Chinchoxo, Portuguese Congo).

Megalixalus leptosomus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 129 (same locality). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (Island of Zanzibar and German East Africa: Tanga and Undussuma). MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 19 (Gaboon: Lambaréné). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). VAILLANT, 1904, Bull. Mus. Hist. Nat., Paris, X, p. 436 (Senegal: Douma). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 362 (Usambara). CHABANAUD,

1919, Bull. Mus. Hist. Nat., Paris, pp. 456–7 (Agouagon, Dahomey). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (French Guinea and Liberia; several localities).

Megalixalus stuhlmannii PFEFFER, 1893 (for 1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 99 (Zanzibar).

Megalixalus leptosomus quadrivittatus WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1900 (Sudan: Khor Attar).

Megalixalus vittiger BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Bitye, Cameroon). (Not of Peters.)

Megalixalus fornasinii NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 372 (part: German East Africa). (Not of Bianconi.)

Nine specimens: three from Faradje, December 1911, one September and one December 1912; one from Stanleyville, August 1909; one from Garamba, March 1911; one from Vankerckhovenville, April 1912; and one from Medje, July 1914. (A. M. N. H. Nos. 9402–9410.)

DISTRIBUTION.—The range of *M. leptosomus* presents an anomaly. While it is highly probable that the species has been confused with *M. fornasinii*, this confusion would not account for the almost undoubted occurrence of the species in two such dissimilar habitats as the Gaboon and Sudan areas. Our specimens were taken in such scattered localities in both the Rain Forest and Sudanese savannahs that it is apparent that factors other than hydrographic and vegetational ones govern the distribution of the species.

RELATIONS.—The literature cited in the above synonymy does not include all the references to *M. leptosomus*, but only those which I am able to judge actually apply to that species. *M. leptosomus* has been confused with *M. fornasinii* by many authors. Nieden (1915), after reviewing the discussion, concludes that the two species are identical. I agree with Nieden that the characters formerly used for separating the two species are of little or no value, but I cannot admit that our series of *M. leptosomus* shows any intergradation to the distinctly larger and very differently colored *M. fornasinii*. The two sexually mature males in our series measure from snout to vent 22.5 mm. (No. 9404) and 25 mm. (No. 9402), respectively; the three adult females, 28 mm. (No. 9405), 25 mm. (No. 9408), and 26 mm. (No. 9409), respectively. As I have indicated in the key, these specimens differ decidedly from *M. fornasinii* in color-pattern.

I feel certain that our specimens are identical with Werner's *M. l. quadrivittatus* from farther north in the Sudan. There is nothing in Peters' original description or figure of *M. leptosomus* to distinguish our specimens from the type of that species. Werner compares his race with East African specimens, but it appears from his remarks that

these specimens were actually referable to *M. fornasinii* and not to *M. leptosomus.*

VARIATION.—One of the characters used by Boulenger (1882) and others to distinguish the two species was the presence or absence of tubercles on the dorsal surface. It has been pointed out by Werner (1898) and Nieden (1915) that *M. fornasinii* shows considerable variation in this respect. In *M. leptosomus* I find that it is only the female and immature specimens which are smooth above; sexually mature males are covered dorsally with extremely fine but sharply pointed tubercles. A large series would probably show some variation in this respect (e.g., as in *Chiromantis*) but for the present we may consider these tubercles characteristic in *M. leptosomus* of only the breeding male.

Our series shows little variation in color and I have employed pattern as a distinguishing character of this species as of many species of the related genus *Hyperolius.* As Werner (1907) has pointed out, the light stripes are not silvery in life but are reddish brown; the dark stripes, a dark reddish or purplish.

HABITS.—The majority of our specimens were taken in the vicinity of papyrus swamps. Werner (1907) found his specimens under similar conditions. The specimen (No. 9405) taken at Stanleyville was found on the forest floor. The three specimens (Nos. 9408–9410) taken at Faradje in February 1911 "were found sitting in the hollow trunk of a rotten papaw tree which was lying on the ground."

Vaillant (1904) has reported that McClaud found in February at Douma, Casamance (Senegal), in the internode of a green bamboo about thirty estivating frogs of this species. The specimens taken at Faradje during the same month were apparently not estivating but simply passing the day in hiding.

Only two stomachs contained food, and in these stomachs only 2 spiders and 1 hemipteron were recognizable.

Megalixalus fornasinii (Bianconi)

Plate XLI, Figure 1

Euchnemis fornasinii BIANCONI, 1850, 'Spec. Zool. Mosamb., Rept.,' fasc. 2, p. 23, Pl. v, fig. 1 (type locality: Mozambique).

Megalixalus fornasinii BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130 (Mozambique, Shiré Valley, Zanzibar, and Lake Nyasa). PETERS, 1882, 'Reise nach Mossambique,' III, p. 160, Pl. XXIV, fig. 2, Pl. XXVI, fig. 6 (Boror and Inhambane, Mozambique). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (German East Africa: Mhonda and Kingani). BOULENGER, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 93 (Ugogo, German East Africa). MÜLLER, 1890, Verh.

Naturf. Ges. Basel, VIII, p. 257 (Zanzibar). BOULENGER, 1891, Proc. Zoöl. Soc. London, p. 308 (Shiré Valley and Lake Nyasa). BOETTGER, 1892, 'Kat. Batr, Mus. Senck.,' p. 21 (Mozambique). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 99 (German East Africa: Kingani, Mhonda, and Ungúu). GÜNTHER, 1894, Proc. Zoöl. Soc. London, p. 88 (British East Africa: Ngatana). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 101 (Mozambique). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 156 (Zanzibar and German East Africa: Tanga, Dar-es-Salaam, and certain localities given above). GÜNTHER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 195 (Cameroon). MOCQUARD, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219 (Zambezi). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 445 ("Gold Coast to Congo, Nyasaland, East Africa from the Zanzibar Coast to Delagoa Bay"). NICKEL, 1901, Helios, XVIII, p. 72 (German East Africa). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 18 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 166 (Fernando Po; Cameroon: Buea; and French Congo: Fernand Vaz and Lambaréné). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 238, figs. 1–3 (Bibundi, Cameroon). MOCQUARD, 1908, in Foà, 'Résult. Sci. Voyages en Afrique d'Edouard Foà,' p. 558 (Plain of the Zambezi). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Fernando Po and Cameroon: Victoria and Bipindi). BOULENGER, 1910, Ann. S. African Mus., V, p. 531 (Tropical Africa and Portuguese East Africa). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjara-Meru Exp.,' I, part 4, p. 25 (Mombo, German East Africa). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 58, figs. 121–123 (Cameroon: Bibundi, Victoria, and Bipindi). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Lake Asebbe, Gaboon, and Efulen, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Cameroon: Bibundi, Isongo, and Mowange). HEWITT, 1911, Rec. Albany Mus., II, p. 224 (Distribution of Boulenger, 1900). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika.,' III, pp. 346 (Zanzibar). HEWITT, 1913, Ann. Natal Mus., II, p. 479 (part: Marianhill, Natal). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 372 (part: German East Africa). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Dahomey); 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (French Guinea and Liberia: several localities).

Megalixalus schneideri BOETTGER, 1889, Ber. Senck. Ges., p. 276 (Bonamandune, Cameroon).

Megalixalus fornasinii var. *unicolor* BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 349 (Pemba).

Megalixalus fomasinii BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). (Misspelling.)

Forty specimens: twenty-four from Bafwasende, September 23, 1909; nine from Medje in June and five in July 1914; two from Gamangui, February 1910. (A. M. N. H. Nos. 9411–9450.)

DISTRIBUTION.—The range of *M. fornasinii* is not limited by the Rain Forest as our locality records would imply. The species appears

equally abundant in East Africa from Pemba Island and Ngatana south to Marianhill. This distribution is exceptional and probably dependent on causes other than those affecting the distribution of the majority of African batrachians.

RELATIONS.—Hewitt (1913) has considered *M. spinifrons* identical with this species. In another paper (Hewitt, 1912, p. 280) he has discussed the status of the two species more fully. Hewitt's arguments fail to be convincing when based on the spinosity of the two species for, as pointed out below, the presence or absence of spines is a sexual not a specific character of *M. fornasinii*. A single specimen of *M. spinifrons* from Marianhill, Natal, received in exchange from the Durban Museum, shows only a trace of the dorsal striping. It is a female, 20 mm. in length, with ova half developed. It has very prominent spines on the head and scapular regions. Our series of *M. fornasinii* shows that in this species the spines are characteristic of only certain adult males. The presence of these spines in the female, the variable coloration, and perhaps the smaller size distinguish *M. spinifrons* from *M. fornasinii*.

M. fornasinii shows so much uniformity in coloration throughout its range that I have used its color-pattern as a key character. The only exception to this uniformity has been reported by Boettger (1913) from Pemba Island. I have referred his "variety" *unicolor* doubtfully to *M. fornasinii*. Specimens from that region require comparison with West African specimens before any further statement may be made.

Andersson (1907) has shown the range of color-pattern variation in *M. fornasinii*. His extreme dark specimen (Plate XLI, fig. 1) so nearly approaches the description of *M. schneideri* that I have not hesitated in referring the latter to the synonymy of *M. fornasinii*. *M. schneideri* was known only from the type, although Cameroon is herpetologically well known.

VARIATION.—Our series does not show as much variation in color-pattern as the series described by Andersson. In life the pale dorsal stripes were generally whitish or brownish gray. In a number of specimens taken 10 o'clock in the morning, September 23, 1909, at Bafwasende, the pale stripes were golden or of a light bronzy tone.

Spines are present on the dorsal surface of nearly all of the adult males in our series. A few of the adult males do not have any indication of them. All seven of our adult females are perfectly smooth above. This would seem to indicate that in *M. fornasinii*, as in many other African frogs, spinosity is a variable feature but one peculiar to the adult male.

Two specimens (Nos. 9447–9448) from Medje, June 1914, are of especial interest. The first is 15 mm. from snout to vent and still possesses a larval tail 8 mm. long. The second is 16.5 mm. in head and body length and has a tail 5 mm. long. These two specimens are identical in coloration with the adults and show no tendency toward the complete stripes of *M. leptosomus*. In this distinctive coloration, and in their large size at metamorphosis the young of *M. fornasinii* are sharply differentiated from the young of *M. leptosomus*.

There is a distinct difference in the size of the sexes of *M. fornasinii*. Our series of seven adult females average 34.9 mm. (maximum, 37 mm.; minimum, 33 mm.); while our series of thirty-one adult males average 29.8 mm. (maximum, 32 mm.; minimum, 27 mm.).

HABITS.—Nothing is known of the breeding season of this species. Females with greatly distended ova were taken at Bafwasende in September. Here they were found common in the immediate vicinity of the station.

Three of the stomachs examined contained food. The only distinguishable forms in these stomachs were 2 roaches.

Brevicipitidæ

Five genera of brevicipitids lacking the maxillary teeth and two possessing them have been described from Africa. The relationships of these seven genera are not very clear. This may be due to the fact that the family as a whole is a derived one (see Noble, 1922), the African genera having had a polyphyletic origin. Every indication points to their having evolved from a comparatively ancient stock, the same that found access to Madagascar and gave rise to no less than thirteen genera, four of which have lost the maxillary teeth. We have postulated an early migration of a toothed brevicipitid stock into Africa and a subsequent introduction into Madagascar. This migration may have occurred more than once, since the assemblage of genera at present in Africa does not form a natural group.

Callulina is apparently most closely related to the recently described *Aphantophryne* of New Guinea. Nieden's original description of the former genus is very brief and Fry (1916, p. 770) in his admirable paper on the latter overlooked the former genus entirely.

Hemisus and *Breviceps* are so specialized that little may be said as to their nearest relatives. Their extraordinary modification leads one to suspect that they may be representatives of the oldest batrachian fauna of Africa.

Didynamipus does not seem closely related to any brevicipitid. It appears externally very much like a bufonid. Boulenger (1906, p. 159) apparently had a specimen of *Didynamipus sjöstedti* before him when he described *Atelophryne minuta* and referred it to the Bufonidæ. I take these two species to be identical and Boulenger's *Atelophryne* synonymous with *Didynamipus*. Boulenger does not state that he has examined the internal structure of his material.

Phrynomantis is one of the few genera of African batrachians which is not confined to the continent. Still, *P. fusca*, the single exotic species of *Phrynomantis*, may not be congeneric with the African forms. It was described long ago from the islands of Amboyna and Batanta in the East Indies and is today very unsatisfactorily known. Peters and Doria (1878, p. 420) have pointed out some differences between the coracoid of *P. fusca* and *P. bifasciata*. Further, *P. fusca* does not possess a metatarsal tubercle and has different digital proportions from the African species. Less difficulty is experienced in assuming that *P. fusca* is a case of convergent evolution than in assuming land-bridges or former wide dispersals to account for the present distribution of the species grouped under *Phrynomantis*.[1]

Cacosternum seems to be most closely related to recently described *Anhydrophryne*, which in its scarcely dilated sacral diapophyses is more primitive than any known brevicipitid. Hewitt (1919, p. 186) would apparently derive the toothless *Phrynomantis* as well from *Anhydrophryne* or from a closely related stock, but he proceeds very cautiously: "From the above-mentioned facts it will be understood that the supposed relationship between *Phrynomantis*, *Cacosternum*, and *Anhydrophryne* is an inference based solely on the characters of the pectoral girdle, due allowance being made for the fact that these three genera are South African, the two latter being peculiar to the continent." The relationships of these brevicipitids have been discussed in greater detail in my earlier paper (Noble, 1922). It seems highly probable that they have all evolved from a primitive stock. *Cacosternum* and *Anhydrophryne* have little in common with any exotic genera. Nevertheless, they possess a few features in common with *Anodonthyla* of Madagascar and *Calliglutus* of Borneo.

Hemisus Günther

This genus is the only brevicipitid represented in the collection. It embraces two closely related species which may be distinguished as follows.

[1] Van Kampen (1923, 'The Amphibia of the Indo-Australian Archipelago') has doubtfully referred *P. fusca* to *Oreophryne celebensis*.

a_1.—Inner metatarsal tubercle not longer than free part of inner toe.... *H. guttatum.*
a_2.—Inner metatarsal tubercle longer, generally much longer than free part of inner toe..... *H. marmoratum.*

Hemisus marmoratum (Peters)

Plate XLII; Text Figures 7 and 8

Engystoma marmoratum Peters, 1855, Arch. Naturg., part 1, p. 58 (type locality, Cabaçeira, Portuguese East Africa).

Hemisus marmoratus Peters, 1882, 'Reise nach Mossambique,' p. 173, Pl. xxv, fig. 1; Pl. xxvi, figs. 10*a*, 10*b*, and 10*c* (Portuguese East Africa: Cabaçeira and Boror).

Hemisus sudanese Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 178 (Kordofan, Egypt: Coast of Guinea, Benguella, Angola; and West Africa). Schilthuis, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286 (Boma, Lower Congo). Müller, 1890, Verh. Naturf. Ges. Basel, VIII, p. 689 (South Africa). Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, p. 102 (Quilimane, Portuguese East Africa). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 160 (German East Africa: Tanga, Kihengo, Kahoma, and Kawende); 1887, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). Andersson, 1898, 'Zool. Egypt.,' I, p. 349 (Kordofan). Tornier, 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 303 (German East Africa). Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 417 (Kouroussa, French Guinea). Andersson, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and the White Nile,' 1901, I, fasc. 4, p. 10, figs. (Egypt: south of Kaka). Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1906 (Kordofan, Kaka on the White Nile, and Bahr-el-Ghazal; also Portuguese East Africa, German East Africa, and the Upper Ubangi). Pellegrin, 1909, Bull. Soc. Zool. France, XXXIV, p. 205 (Abu Naâma on the Blue Nile). Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 25 (Kibonoto, Kilimanjaro District). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 347 (Zanzibar). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Agouagon, Dahomey and French Guinea).

Hemisus sudanensis Pfeffer, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 12 (German East Africa: Kihengo and Kiste); 1893, X, part 1, p. 103 (Quilimane, Portuguese East Africa and Kihengo, German East Africa).

Hemisus marmoratum Bocage, 1895, 'Herpétol. Angola, p. 183, Pl. xviii, fig. 2 (Angola: St. Salvador du Congo, Dondo, and Catumbella); 1896, Jorn. Sci. Lisboa, (2) IV, p. 102 (localities of Peters 1882). Boulenger, 1901, Ann. Mus. Congo, (1) II, part 1, p. 2 (Lake Moero); 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Semba Acendu, Angola); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Bolama, Portuguese Guinea). Bles, 1907, 'The work of John Samuel Budgett,' p. 443 (Gambia). Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 480 (Portuguese East Africa, Beira); 1910, Ann. S. African Mus., V, p. 535 ("Tropical Africa southwards to Angola, Mashonaland, and Beira"). Meek, 1910, Publ. Field Mus. Zool., VII, p. 404 (British East Africa: Lukenya Hills). Hewitt, 1911, Rec. Albany Mus., II, part 3, p. 226. Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 183 (region east of Kasongo Forest, Belgian Congo and area north of Lake Tanganyika). Werner, 1912, in Brehm's 'Tier-

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Hemisus taitanus PETERS, 1882, 'Reise nach Mossambique,' III, p. 175 (Taita, German East Africa).

Ninety-six specimens: ninety-two of these from Niangara, June 1913; one from Faradje, July 1911; one, October and another, November 1912, from the same place; and one from Zambi, June 1915. (A. M. N. H. Nos. 8875–8970.)

DISTRIBUTION.—Although Boulenger (1910*a*) has given the range of the species as "tropical Africa southwards to Angola, Mashonaland, and Beira," an examination of the locality records will show that this

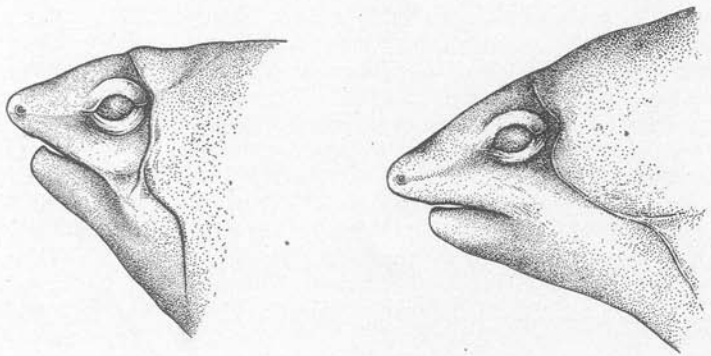

Fig. 7. *Hemisus marmoratum* (Peters). Lateral aspect of head to show individual variation in length of the snout.

statement does not include its actual distribution. *H. marmoratum* occurs in the savannahs both to the north and to the south of the Rain Forest. It has a wide range in the open country of East Africa. It has been taken as far south as Southern Rhodesia, and as far west as Kouroussa by Mocquard (1902*a*), so that the distribution of the species as a whole shows that it is a typical wide-ranging savannah form.

RELATIONS.—Various investigators have pointed out that Steindachner's figure (1863, Pl. I, figs. 10–12) of *H. sudanense* represent a much longer snouted species than the typical *H. marmoratum*. Bocage (1895, p. 184) and Nieden (1912, p. 183) have indicated that the species

should be considered distinct. Nevertheless, Boulenger (1910) has referred *H. sudanense* to *H. marmoratum* without discussion and has later (1910*a*) included it in the synonymy of the latter species. In this he has recently been followed by Hewitt (1913). Our ninety-two specimens taken during June at Niangara show such an extraordinary range of variation that there can be no doubt that Boulenger was correct in his disposition of *H. sudanense.* The snout, foot, and tibia vary greatly in length, while two of the specimens have the inner metatarsal tubercle only slightly more pronounced than that of *H. guttatum.* Only one specimen of the latter species is available for study. This has the distance between the eye and the tip of the snout distinctly shorter than the distance between the anterior corners of the eyes. Still, it may be distinguished from *H. marmoratum* by its very small "shovel." Since the subarticular tubercles are often absent in the latter species, I cannot agree with Boulenger (1910) in considering their absence diagnostic of *H. guttatum.* In brief, it is apparent that the genus *Hemisus* is represented by but two closely related forms.

VARIATION.—As in many other species of frogs, the snout does not show a constant form. Its length does not always vary in proportion to its width. In our series the distance between the eyes is generally four-fifths the distance between the eye and the end of the snout. In a few of our specimens the distance between the first two of these points is equal to the distance between the latter two, while in others it is but three-fourths that distance.

The length of the tibia is another variable feature. In males and females of 32 mm. in length (head and body) the tibia is contained in the distance between snout and vent two and one-half times. In gravid females it is contained three times or more. This is a great range of difference, but one apparently due to the fact that as the body of the female increases in size, to accommodate the eggs, the posterior appendages do not lengthen in proportion. In individuals of the same size there is a certain degree of variation, difficult to measure because of the small size of the elements.

Specimens having the longest tibia were found to have the longest feet. The difference between the extremes, generally less than a millimeter, may be seen in Figure 8 of a foot from each of two males of identical size, 33 mm., taken at Niangara in June 1913. The "shovel" is least developed in one individual (No. 8935) which has apparently not been digging for some time since the ends of the digits were fleshy, not callous as in most specimens. The "shovel" was not well developed in

another specimen which had the right forelimb amputated at the wrist and the left hind limb at the knee, both wounds completely healed. This specimen, a male, 33 mm. long, has probably not been able to do much digging with its one remaining "shovel."

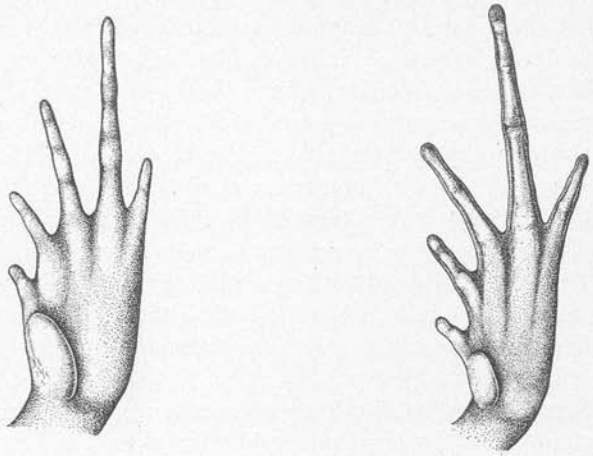

Fig. 8. *Hemisus marmoratum* (Peters). Ventral aspect of left feet to show individual variation in development of "shovel" and length of digits.

Sexually mature males average 32mm. in length (maximum, 34 mm.; minimum, 31 mm.). Gravid females average 47 mm. (maximum, 50 mm.; minimum, 45 mm.). Breeding males have a broad glandular surface covering the upper surfaces of the wrist and three inner fingers. No black asperities are visible on these surfaces. Adult males have a much darker throat than females of the same size. A few of the adult females have a throat which approaches that of the adult male in color.

The coloration of most of our specimens does not agree with that generally given for the species. The majority are dark reddish-brown above, spotted with yellow on the sides of the body and on the upper surfaces of the appendages. Some of the specimens lack the spots entirely and are grayer, less reddish than the others. All of the specimens except one have the ventral surface exclusive of the gular region immaculate. This one (No. 8935) has the ventral surface chocolate-brown spotted with pale yellow. It is interesting that this peculiar coloration should be correlated with a small "shovel" and elongate tibia and foot with the ends of the digits devoid of callouses.

In life the ground-tone above was "dark brown, spotted with yellow on the sides; ventral surface pinkish, translucent. Iris a dark bronzy tone."

HABITS.—Tornier (1896), Werner (1907), and Bles (1907) have briefly commented on the habits of *H. marmoratum*. The American Museum expedition was able to confirm the statement of earlier workers that the species lives mostly underground, chiefly in the nests of termites. I quote directly from Mr. Lang's field notes:

"After heavy rains great numbers of this species came out of their burrows, and were then easily caught. Only three were found under other circumstances: one in a papyrus swamp; another on a small heap of fresh earth where an elephant had been recently digging; and the third about one inch below the surface of rather firm ground underlying a fallen log.

"One specimen was kept in a tin box with soft moist sand. When disturbed by lifting of the cover, the creature would burrow rapidly out of sight. In the process of the digging, it not only used its hind limbs, but after a start had been made, it would use its snout for pushing the soil upward over its back."

The degree of development of the ovaries in our huge series of specimens from Niangara suggests that the breeding season of *H. marmoratum* may occur in the Uele District about the same time as Budgett found it to take place in Gambia, namely, about the second week in July. Still, such a large proportion of the females are immature that it seems very probable that two years or more are required for them to reach sexual maturity.

H. marmoratum has been often termed an "ant-eater." The following summary of the stomach contents of twenty-two specimens indicates that the name is an appropriate one: over 910 soldier and worker termites; 55 minute, blind, driver ants and 41 worker ants.

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ZENKER, G. 1892. 'Beobachtungen über die Reptilien und Amphibien des Yaunde-Landes.' Mitt. Deutsch. Schutzgebieten, V, pp. 181–184.

CAUDATA

Oppel, 1811, 'Ordn. Rept.,' p. 72

Salamandridæ

PLEURODELES

Michahelles, 1830, Isis, p. 195

TYPE: *waltl*

Pleurodeles waltl Michahelles

Pleurodeles waltl Michahelles, 1830, Isis, p. 195.

Molge waltlii Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 27.

TYPE LOCALITY: Southern Spain.

RANGE: Spain and Portugal; Morocco eastward to Tunisia, and south of the Sahara at Diéké, French Guinea.

TRITURUS

Rafinesque, 1815, 'Analyse de la Nature' (Palermo), p. 78

TYPE: *cristatus*[1]

Triturus hagenmulleri (Lataste)

Glossoliga hagenmulleri Lataste, 1881, Le Naturaliste, I, p. 371.

Molge hagenmuelleri Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 26.

TYPE LOCALITY: Bona, Algeria.

RANGE: Algeria.

Triturus poireti (Gervais)

Triton poireti Gervais, 1835, Bull. Soc. Sci. Nat., p. 113.

Molge poireti Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 25.

TYPE LOCALITY: Barbary.[2]

RANGE: Algeria.

SALAMANDRA

Laurenti, 1768, 'Syn. Rept.,' p. 41

TYPE: *salamandra*

Salamandra salamandra (Linnæus)

Lacerta salamandra Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 204.

Salamandra maculosa Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 3.

TYPE LOCALITY: Europe.

RANGE: Barbary; central and southern Europe to Syria.

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[1] *Triturus* is a substitute name for *Triton* Laurenti, preoccupied. The name *Triturus* was proposed several times by Rafinesque, at least twice before the name *Molge* of Merrem. The type *cristatus* seems to be the earliest designated type of *Triturus*.

[2] This locality has not been verified from the original description. Only a subsequent description is available to me (1836, Ann. Sci. Nat., VII, p. 313).

GYMNOPHIONA

J. Müller, 1832, Zeitsch. Phys., p. 206

Cæciliidæ

BDELLOPHIS

Boulenger, 1895, Proc. Zoöl. Soc. London, p. 412
TYPE: *vittatus*

Bdellophis unicolor Boettger

Bdellophis unicolor Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 353, Pl. XXIII, fig. 18.
TYPE LOCALITY: Peccetoni, Kenya Colony.
RANGE: Known only from the type locality.

Bdellophis vittatus Boulenger

Bdellophis vittatus Boulenger, 1895, Proc. Zoöl. Soc. London, p. 412, Pl. XXIV, fig. 4. Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 389.
TYPE LOCALITY: Usambara, Tanganyika Territory.
RANGE: Tanganyika Territory.

BOULENGERULA

Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 164
TYPE: *boulengeri*

Boulengerula boulengeri Tornier

Boulengerula boulengeri Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 164. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 27, fig. 19.
TYPE LOCALITY: Usambara, Tanganyika Territory.
RANGE: Usambara, Tanganyika Territory.

Boulengerula denhardti Nieden

Boulengerula denhardti Nieden, 1912, Sitzber. Ges. Naturf. Freunde Berlin, p. 199.
TYPE LOCALITY: Tana region, Kenya Colony.
RANGE: Known only from the type locality.

DERMOPHIS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 937
TYPE: *mexicanus*

Dermophis gregorii Boulenger

Dermophis gregorii Boulenger, 1894, Proc. Zoöl. Soc. London, p. 646, Pl. XL, fig. 4.
TYPE LOCALITY: Ngatana, Kenya Colony.
RANGE: Known only from the type locality.

Dermophis thomensis (Bocage)

Siphonops thomensis Bocage, 1873, Jorn. Sci. Lisboa, IV, p. 224.

Dermophis thomensis Boulenger, 1894, Proc. Zoöl. Soc. London, p. 646, Pl. XL, fig. 5.

TYPE LOCALITY: St. Thomas.

RANGE: St. Thomas and Rolas Islands, Gulf of Guinea.

GEOTRYPETES

Peters, 1880, Sitzber. Ges. Naturf. Freunde Berlin, p. 55

TYPE: *seraphini* (=*petersii*)

Geotrypetes petersii Boulenger

Geotrypetes petersii Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 329. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 15, fig. 14.

TYPE LOCALITY: "West Africa."

RANGE: Gaboon to Togo.

HERPELE

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 939

TYPE: *squalostoma*

Herpele bornmuelleri Werner

Herpele bornmuelleri Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 144.

TYPE LOCALITY: Victoria, Cameroon.

RANGE: Known only from the type locality.

Herpele multiplicata Nieden

Herpele multiplicata Nieden, 1912, Sitzber. Ges. Naturf. Freunde Berlin, p. 210.

TYPE LOCALITY: Mundame, Cameroon.

RANGE: Known only from the type locality.

Herpele squalostoma (Stutchbury)

Cæcilia squalostoma Stutchbury, 1834, Trans. Linn. Soc. London, XVII, p. 362.

Herpele squalostoma Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 939, Pl., fig. 8.

TYPE LOCALITY: Gaboon.

RANGE: Cameroon-Gaboon area including Fernando Po.

HYPOGEOPHIS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 936

TYPE: *rostratus*

Hypogeophis guentheri Boulenger

Hypogeophis guentheri Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 96, Pl. VII, fig. 1.

TYPE LOCALITY: Zanzibar.

RANGE: Known only from the type locality.

SCOLECOMORPHUS

Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XI, p. 48

TYPE: *kirkii*

Scolecomorphus kirkii Boulenger

Scolecomorphus kirkii Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XI, p. 48. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 28, fig. 20.

TYPE LOCALITY: "Probably vicinity of Lake Tanganyika."

RANGE: Nyasaland.

URÆOTYPHLUS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 933

TYPE: *oxyurus*

Uræotyphlus seraphini (A. Duméril)

Cœcilia seraphini A. Duméril, 1859, Arch. Mus. Hist. Nat. Paris, X, p. 222.

Uræotyphlus seraphini Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 328.

TYPE LOCALITY: Gaboon.

RANGE: French Guinea south to Gaboon.

SALIENTIA

Laurenti, 1768, 'Syn. Rept.,' p. 24

Pipidæ

HYMENOCHIRUS

Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 420

TYPE: *boettgeri*

Hymenochirus boettgeri (Tornier)

Xenopus boettgeri, Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 163, fig. L.

Hymenochirus boettgeri Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 420; 1899, (7) IV, p. 122.

TYPE LOCALITY: "Wandesoma," Ituri Forest, Belgian Congo.

RANGE: Cameroon and Gaboon, eastward to the limits of the Ituri Forest.

Hymenochirus curtipes Noble

Hymenochirus curtipes Noble, see above, p. 155, Pl. XXIII.

TYPE LOCALITY: Zambi, Lower Congo.

RANGE: Known only from the type locality.

Hymenochirus feæ Boulenger

Hymenochirus feæ Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158, Pl. 1, fig. 1.

TYPE LOCALITY: Fernand-Vaz, French Congo.

RANGE: Known only from the type locality.

PSEUDHYMENOCHIRUS

Chabanaud, 1920, Bull. Et. Hist. et Scient. A.O.F., p. 494

TYPE: *merlini*

Pseudhymenochirus merlini Chabanaud

Pseudhymenochirus merlini Chabanaud, 1920, Bull. Et. Hist. et Scient. A.O.F., p. 494; 1921, *op. cit.*, p. 448, Pl. 1.

TYPE LOCALITY: Dixine (near Conakry) French Guinea.

RANGE: Known only from the type locality.

XENOPUS

Wagler, 1827, Isis, p. 726

TYPE: *boiei* = *lævis*

Xenopus clivii Peracca

Xenopus clivii Peracca, 1898, Boll. Mus. Torino, XIII, No. 321, p. 3.

TYPE LOCALITY: Eritrea.

RANGE: Eritrea and Abyssinia.[1]

Xenopus lævis (Daudin)

Bufo lævis Daudin, 1803, 'Hist. Nat. des Rainettes,' p. 85, Pl. XXX, fig. 1.

Xenopus lævis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 456.

TYPE LOCALITY: Unknown.

RANGE: South Africa, northward to Angola on the west, and probably Kilimandjaro on the east.

Xenopus muelleri (Peters)

Dactylethra muelleri Peters, 1844, Monatsber. Akad. Wiss. Berlin, p. 37.

Xenopus muelleri Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 457 (part).

TYPE LOCALITY: Mozambique.

RANGE: The Sudan and East Africa.

Xenopus tropicalis (Gray)

Silurana tropicalis Gray, 1864, Ann. Mag. Nat. Hist., (3) XIV, p. 316.

Xenopus calcaratus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 458.

Xenopus tropicalis Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625.

TYPE LOCALITY: Lagos, West Africa.

RANGE: The Rain Forest.

Discoglossidæ

DISCOGLOSSUS

Otth, 1837, Neue Denkschr. Allgem. Schweiz. Naturf. Ges., I, p. 6, figs. 1–8

TYPE: *pictus*

Discoglossus pictus Otth

Discoglossus pictus Otth, 1837, Neue Denkschr. Allgem. Schweiz. Naturf. Ges., I, p. 6, figs. 1–8.

TYPE LOCALITIES: Sicily and Spain, apparently Lower Italy also.

RANGE: Southwestern Europe and northwestern Africa.

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[1]Recorded also from Cameroon, see discussion above, p. 158.

Bufonidæ[1]

Bufo

Laurenti, 1768, 'Syn. Rept.,' p. 25 (part)
TYPE: *vulgaris* = *bufo*

Bufo angusticeps Smith

Bufo angusticeps Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXIX, figs. 1 and 1*a*. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 300.
TYPE LOCALITY: "Interior of South Africa."
RANGE: Cape Colony.[2]

Bufo anotis Boulenger

Bufo anotis Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 48, Pl. III; 1910, Ann. S. African Mus., V, p. 537.
TYPE LOCALITY: Chirinda Forest, southeastern Mashonaland.
RANGE: Known only from the type locality.

Bufo blanfordii Boulenger

Bufo blanfordii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 301, Pl. XIX fig. 4.
TYPE LOCALITIES: Ain Sambar and Sooroo, Abyssinia.
RANGE: Eritrea south through Abyssinia to Gallaland.

Bufo brauni Nieden

Bufo brauni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 450. Werner, 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 718.
TYPE LOCALITY: Amani, Tanganyika Territory.
RANGE: Tanganyika Territory.

Bufo buchneri Peters

Bufo buchneri Peters, 1882, Sitzber. Ges. Naturf. Freunde Berlin, p. 147.
TYPE LOCALITY: Lunda, Angola.
RANGE: Known only from the type locality.

Bufo carens Smith

Bufo carens Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXVIII, fig. 1. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 301 (part).
TYPE LOCALITY: "Interior of South Africa."
RANGE: South Africa and East Africa as far north as Nairobi, British East Africa.

Bufo chevalieri Mocquard

Bufo chevalieri Mocquard, 1908, Bull. Mus. Hist. Nat., Paris, XIV, p. 262.
TYPE LOCALITY: Ivory Coast.
RANGE: Known only from the Ivory Coast.

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[1]For use of this name see Noble, 1922.
[2]Recorded also from Transvaal and the Lake Region but perhaps through error.

Bufo chudeaui Chabanaud

Bufo chudeaui Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 454.
TYPE LOCALITY: Senegal: Bata marsh (Sahel de Nioro).
RANGE: Known only from the type locality.

Bufo dodsoni Boulenger

Bufo dodsoni Boulenger, 1895, Proc. Zoöl. Soc. London, p. 540, Pl. xxx, fig. 5.
TYPE LOCALITY: Rassa Alla, Somaliland.
RANGE: The Sudan, Somali, and Galliland.

Bufo dombensis Bocage

Bufo dombensis Bocage, 1895, Jorn. Sci. Lisboa, (2) IV, p. 51. Boulenger, 1905, Proc. Zoöl. Soc. London, II, p. 250.
TYPE LOCALITY: Dombé, southern Angola.
RANGE: Angola.

Bufo fenoulheti Hewitt and Methuen

Bufo fenoulheti Hewitt and Methuen, 1913, Trans. Roy. Soc. S. Africa, III, p. 108.
TYPE LOCALITY: Newington and Woodbush, northeastern Transvaal.
RANGE: Northeastern Transvaal.

Bufo funereus Bocage

Bufo funereus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' pp. 281 and 475.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Dahomey, south through the Rain Forest to southern Angola.

Bufo gariepensis Smith

Bufo gariepensis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXIX, figs. 2 and 2*a*. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 174.
TYPE LOCALITY: Banks of the Orange River.
RANGE: Cape Colony, Orange River Colony, and Natal.

Bufo lemairii Boulenger

Bufo lemairii Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 1, Pl. I, fig. 1.
TYPE LOCALITY: Pweto, Lake Moero.
RANGE: Known only from the type locality.

Bufo lönnbergi Andersson

Bufo lönnbergi Andersson, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 35, Pl. II.
TYPE LOCALITY: Mount Kenia, Kenya Colony.
RANGE: Known only from the type locality.

Bufo mauritanicus Schlegel

Bufo mauritanicus Schlegel, 1841, in Wagner, 'Reisen in der Regentschaft Algier,' III, p. 134. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298.
TYPE LOCALITY: Algiers, Algeria.
RANGE: Africa north of the Sahara.

Bufo pentoni Anderson

Bufo pentoni Anderson, 1893, Ann. Mag. Nat. Hist., (6) XII, p. 440; 1898, Zoöl. Egypt, I, p. 355, Pl. L, fig. 4.

TYPE LOCALITY: "Shaata Gardens, situated about one mile outside of Suakin," Egypt.

RANGE: Egypt as far south as Nigeria, northern Cameroon (Garua), the Sudan, and Eritrea.

Bufo polycercus Werner

Bufo polycercus Werner, 1897, Sitzber. Akad. Wiss., München, XXVII, p. 211; 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719.

TYPE LOCALITY: Cameroon.

RANGE: Rain Forest and outlying forest islands.[1]

Bufo preussi Matschie

Bufo preussi Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 175. Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158.

TYPE LOCALITY: Buea, Cameroon.

RANGE: Cameroon.

Bufo regularis Reuss

Bufo regularis Reuss, 1834, Mus. Senckenberg., I, p. 60. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298 (figured in Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 479, Pl. XXI, figs. 1–4).

TYPE LOCALITY: Egypt.

RANGE: All of Africa except Barbary.

Bufo steindachnerii Pfeffer

Bufo steindachnerii Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 103, Pl. II, fig. 8.

TYPE LOCALITY: Kihengo, East Africa.

RANGE: Gallaland, south through Tanganyika Territory.

Bufo superciliaris Boulenger

Bufo superciliaris Boulenger, 1887, Proc. Zoöl. Soc. London, p. 565.

TYPE LOCALITY: Rio del Rey, Cameroon.

RANGE: Rain Forest as far west as Nigeria.

Bufo taitanus Peters

Bufo taitanus Peters, 1878, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. II, fig. 9. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 305.

TYPE LOCALITY: Taita, East Africa.

RANGE: Abyssinia, south to Portuguese East Africa, west to Lake Tanganyika.

Bufo tuberosus Günther

Bufo tuberosus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 60, Pl. III, fig. C. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 304.

TYPE LOCALITY: Fernando Po.

RANGE: Rain Forest as far west as Cameroon.

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[1]Recorded also from southern Somaliland but probably through error.

Bufo vertebralis Smith

Bufo vertebralis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXVIII, figs. 2 and 2*a*. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 173.

TYPE LOCALITY: "Interior districts of southern Africa, northeast of the Cape Colony."

RANGE: Cape Colony and Orange River Colony.

Bufo viridis Laurenti

Bufo viridis Laurenti, 1768, 'Syn. Rept.,' pp. 27 and 111, Pl. I, fig. 1. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 297.

TYPE LOCALITY: Vienna, Austria.

RANGE: Europe, Asia, and Africa north of the Sahara.

Bufo vittatus Boulenger

Bufo vittatus Boulenger, 1906, Proc. Zoöl. Soc. London, p. 573, fig. 98.

TYPE LOCALITY: Entebbe, Uganda.

RANGE: Uganda and the Sudan.

Bufo vulgaris Laurenti

Bufo vulgaris Laurenti, 1768, 'Syn. Rept.,' pp. 28 and 125. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 303.

TYPE LOCALITY: Not given, but by inference Europe.

RANGE: Europe, Asia, and northwestern Africa.

HELEOPHRYNE[1]

Sclater, 1899, Ann. S. African Mus., I, p. 110

TYPE: *purcelli*

Heleophryne natalensis Hewitt

Heleophryne natalensis Hewitt, 1913, Ann. Natal Mus., II, p. 477, Pl. XXXIX.

TYPE LOCALITY: Krantzkloof, Natal.

RANGE: Known only from the type locality.

Heleophryne purcelli Sclater

Heleophryne purcelli Sclater, 1899, Ann. S. African Mus., I, p. 111, Pl. v, figs. 3 and 3*a*. Hewitt, 1909, Ann. Transvaal Mus., II, p. 45.

TYPE LOCALITY: Stellenbosch, Cape Colony.

RANGE: Known only from the type locality.

Heleophryne regis Hewitt

Heleophryne regis Hewitt, 1909, Ann. Transvaal Mus., II, p. 45; 1913, Ann. Natal Mus., II, p. 477, Pl. XXXIV.

TYPE LOCALITY: Knysna, Cape Colony.

RANGE: Known only from the type locality.

NECTOPHRYNE

Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202

TYPE: *afra*

[1]For a discussion of the relationships of this genus see Noble, 1922.

Nectophryne afra Buchholz and Peters

Nectophryne afra Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202, Pl. II, fig. 5. Roux, 1906, Proc. Zoöl. Soc. London, I, p. 59.

TYPE LOCALITY: Cameroon.

RANGE: Rain Forest as far west as southern Nigeria.

Nectophyrne batesii Boulenger

Nectophryne batesii Boulenger, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 71, fig.

TYPE LOCALITY: Bitye, Ja River, Cameroon.

RANGE: Rain Forest as far west as the Ja River, Cameroon.

Nectophryne parvipalmata Werner

Nectophryne parvipalmata Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 201, Pl. II, figs. 7 and 7*a*. Roux, 1906, Proc. Zoöl. Soc. London, I, p. 61.

TYPE LOCALITY: "Kamerun?"

RANGE: Cameroon.

Nectophryne tornieri Roux

Nectophryne tornieri Roux, 1906, Proc. Zoöl. Soc. London, I, p. 63, Pl. II, fig. 4. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 450.

TYPE LOCALITY: Ukami, Tanganyika Territory.

RANGE: Tanganyika Territory.

Nectophryne werthi Nieden

Nectophryne werthi Nieden, 1910, Sitzber. Ges. Naturf. Ges. Freunde Berlin, p. 439.

TYPE LOCALITY: Dar-es-Salaam, East Africa.

RANGE: Known only from the type locality.

PSEUDOPHRYNE

Fitzinger, 1843, 'Syst. Rept.,' p. 32

TYPE: *australis*

Pseudophryne vivipara Tornier

Pseudophryne vivipara Tornier, 1905, Sitzber. Akad. Wiss. Berlin, II, p. 855 (part). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 383.

TYPE LOCALITIES: Rungwe and Kinga Mountains, East Africa.

RANGE: Known only from the type localities.

WERNERIA

Poche, 1903, Zool. Anz., XXVI, p. 701

TYPE: *fulva*

Werneria fulva (Andersson)

Stenoglossa fulva Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 144.
Werneria fulva Poche, 1903, Zool. Anz., XXVI, p. 701.

TYPE LOCALITY: Cameroon range (Buea).

RANGE: Known only from the type locality.

Hylidæ

HYLA

Laurenti, 1768, 'Syn. Rept.,' p. 32 (part)
TYPE: *viridis*

Hyla arborea meridionalis Boettger

Hyla arborea var. *meridionalis* Boettger, 1875, Abh. Senck. Naturf. Ges., IX, p. 186. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 380 (part).

TYPE LOCALITIES: Southern France and Teneriffe.

RANGE: Northwest Africa, Madeira, Canary, and Balearic Islands, south of France, Italy, and the Pyrenean peninsula.

Hyla arborea savignyi Audouin

Hyla savignyi Audouin, 1812, 'Suppl. Rept.,' Pl. II, figs. 13_1 and 13_2.

Hyla arborea var. *savignyi* Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 380.

TYPE LOCALITY: Indefinite, probably Egypt.

RANGE: Probably Lower Egypt: also Corsica, Elba, Sardinia, Greek Archipelago, southwestern Asia, Corea, China, and Japan.

Hyla wachei Nieden

Hyla wachei Nieden, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 285.

TYPE LOCALITY: Dire Daua, Abyssinia.

RANGE: Known only from the type locality.

Ranidæ

ARTHROLEPTIDES

Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 445
TYPE: *martiensseni*

Arthroleptides martiensseni Nieden

Arthroleptides martiensseni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 445.

TYPE LOCALITY: Amani, Tanganyika Territory.

RANGE: Known only from the type locality.

ARTHROLEPTIS

Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24
TYPE: *wahlbergii*

Arthroleptis adolfi-friederici Nieden

Arthroleptis adolfi-friederici Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 440; 1912,[1] 'Wiss. Ergeb. Deutsch. Zentr.-Afrika-Exp.,' IV, p. 175, Pl. v, figs. 4*a-c*.

TYPE LOCALITIES: Rugege forest, Lake Region.

RANGE: Cameroon eastward to the Lake Region.

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[1]Called *adolfi friderici* here.

Arthroleptis batesii Boulenger

Arthroleptis batesii Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 318.
TYPE LOCALITIES: Efulen and Zima, Cameroon.
RANGE: Cameroon.

Arthroleptis bottegi Boulenger

Arthroleptis bottegi Boulenger, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16, Pl. v, fig. 3.
TYPE LOCALITY: Auata River, Somaliland.
RANGE: Somaliland, south to Uganda and Kilimanjaro, west to Garamba, Belgian Congo.

Arthroleptis boulengeri Witte

Arthroleptis boulengeri Witte, 1921, Rev. Zool. Afr., IX, p. 12, Pl. IV, fig. 2.
TYPE LOCALITY: Saint Louis, Lake Tanganiko, Belgian Congo.
RANGE: Known only from the type locality.

Arthroleptis calcaratus (Peters)

Hemimantis calcaratus Peters, 1863, Monatsber. Akad. Wiss. Berlin, p. 452.
Arthroleptis calcarata Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 210. Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 502.
TYPE LOCALITY: Boutry, Ashanti.
RANGE: Ashanti to Gaboon, including Fernando Po and St. Thomas.

Arthroleptis carquejai Ferreira

Arthroleptis carquejai Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 165, fig. on Pl.
TYPE LOCALITY: Cambondo, Angola.
RANGE: Known only from the type locality.

Arthroleptis dispar Peters

Arthroleptis dispar Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 649, Pl. II, fig. 3. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117.
TYPE LOCALITY: Prince's Island.
RANGE: Cameroon-Gaboon area, including St. Thomas and Prince's Island, north to French Guinea.

Arthroleptis fraterculus Chabanaud

Arthroleptis fraterculus Chabanaud, 1921, Bull. Com. Et. Hist. et Scient. A.O.F., p. 456, Pl. III, figs. 4 and 5.
TYPE LOCALITY: Macento, French Guinea.
RANGE: Known only from the type locality.

Arthroleptis feæ Boulenger

Arthroleptis feæ Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161, Pl. I, figs. 4–6.
TYPE LOCALITY: Prince's Island.
RANGE: Rain Forest as far west as Prince's Island, north to French Guinea.

Arthroleptis gutturosus Chabanaud

Arthroleptis gutturosus Chabanaud, 1921, Bull. Com. Et Hist. et Scient. A.O.F., p. 452, Pl. II.

TYPE LOCALITY: Sanikolé, Liberia.
RANGE: Known only from the type locality.

Arthroleptis lameerei Witte

Arthroleptis lameerei Witte, 1921, Rev. Zool. Afr., IX, p. 12, Pl. IV, fig. 1.
TYPE LOCALITY: Lofoï (Katanga), Belgian Congo.
RANGE: Known only from the type locality.

Arthroleptis lightfooti Boulenger

Arthroleptis lightfooti Boulenger, 1910, Ann. S. African Mus., V, pp. 529 and 538.
TYPE LOCALITY: Newlands, near Capetown.
RANGE: Known only from the type locality.

Arthroleptis lönnbergi Nieden

Arthroleptis lönnbergi Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 361.
TYPE LOCALITY: Mombo, Usambara.
RANGE: Known only from Usambara, Tanganyika Territory.

Arthroleptis macrodactylus Boulenger

Arthroleptis macrodactylus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117, Pl. XI, fig. 5. Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14.
TYPE LOCALITY: Gaboon.
RANGE: Cameroon-Gaboon area, eastward to Nyasaland.

Arthrol eptis minutus Boulenger

Arthroleptis minutus Boulenger, 1895, Proc. Zoöl. Soc. London, p. 539, Pl. XXX, fig. 4; 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 161 and 163.
TYPE LOCALITY: Durro, western Somaliland.
RANGE: Somaliland and British East Africa, westward across the Sudan to Portuguese Guinea.

Arthroleptis moorii Boulenger

Arthroleptis moorii Boulenger, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. XXXVIII, fig. 2.
TYPE LOCALITY: Kinyamkolo, Lake Tanganyika.
RANGE: Lake Tanganyika to Stanley Pool.

Arthroleptis ogoensis Boulenger

Arthroleptis ogoensis Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 162, Pl. I, figs. 7–8.
TYPE LOCALITY: Lambaréné, Ogowe.
RANGE: French Congo, north to French Guinea.

Arthroleptis parvulus Boulenger

Arthroleptis parvulus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109, Pl. IV, figs. 3–3*b*.
TYPE LOCALITY: Bange Ngola northeast Angola.
RANGE: Northeast Angola and region of the Lower Congo.

Arthroleptis pœcilonotus Peters

Arthroleptis pœcilonotus Peters, 1863, Monatsber. Akad. Wiss. Berlin, p. 446.

TYPE LOCALITY: Boutry, Ashanti.
RANGE: Entire Rain Forest from Portuguese Guinea to the French Congo, and eastward to the Lake Region; recorded also from Usambara and Nyasaland.

Arthroleptis procterae Witte

Arthroleptis procterae Witte, 1921, Rev. Zool. Afr., IX, p. 11, Pl. III, fig. 2.
TYPE LOCALITY: Beni (Kivu), Belgian Congo.
RANGE: Known only from the type locality.

Arthroleptis reichei Nieden

Arthroleptis reichei Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 437.
TYPE LOCALITY: Crater Lake, Ngosi Volcano, north of Langenburg, Tanganyika Territory.
RANGE: Known only from the type locality.

Arthroleptis rouxi Nieden

Arthroleptis rouxi Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr.-Afrika-Exp.,' IV, p. 178, Pl. v, figs. 5*a*–*b*.
TYPE LOCALITY: Buddu Forest, Lake Victoria.
RANGE: Known only from the type locality.

Arthroleptis schebeni Nieden

Arthroleptis schebeni Nieden, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 451.
TYPE LOCALITY: Klein Nauas, Southwest Africa.
RANGE: Southwest Africa.

Arthroleptis scheffleri Nieden

Arthroleptis scheffleri Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 438.
TYPE LOCALITIES: Kibwesi, Nairobi, Zanzibar, and M'papua, East Africa.
RANGE: Kenya Colony and Tanganyika Territory, westward to the Lake Region.

Arthroleptis schoutedeni Witte

Arthroleptis schoutedeni Witte, 1921, Rev. Zool. Afr., IX, p. 13, Pl. IV, fig. 3.
TYPE LOCALITY: Lofoï (Katanga), Belgian Congo.
RANGE: Known only from the type locality.

Arthroleptis schubotzi Nieden

Arthroleptis schubotzi Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 440; 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 177, Pl. v, fig. 3.
TYPE LOCALITY: Usumbura, Tanganyika Territory.
RANGE: Known only from the type locality.

Arthroleptis spinalis Boulenger

Arthroleptis spinalis Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 2, p. 187.
TYPE LOCALITY: St. Louis, Lake Tanganyika, Belgian Congo.
RANGE: Known only from the type locality.

Arthroleptis stenodactylus Pfeffer[1]

Arthroleptis stenodactylus Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 93.

[1] (= *A. whytii* auct.)

TYPE LOCALITY: Kihengo, Tanganyika Territory.
RANGE: Portuguese East Africa and Nyasaland, northward to Tanganyika Territory; recorded also from Spanish Guinea but probably through error.

Arthroleptis tæniatus Boulenger

Arthroleptis tæniatus Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 319.
TYPE LOCALITY: Zima, southern Cameroon.
RANGE: Known only from the type locality.

Arthroleptis tokba Chabanaud

Arthroleptis tokba Chabanaud, 1921, Bull. Com. Et. Hist. et Scient. A.O.F., p. 454, Pl. III, figs. 2, 3.
TYPE LOCALITIES: N'Zébéla and N'Zérékoré, French Guinea.
RANGE: Known only from the type localities.

Arthroleptis variabilis Matschie

Arthroleptis variabilis Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 173.
TYPE LOCALITIES: Buea and Barombi, Cameroon.
RANGE: Rain Forest as far west as Cameroon and Fernando Po, north to French Guinea.

Arthroleptis wahlbergii Smith

Arthroleptis wahlbergii Smith, 1849, 'Illus. Zool. S. Africa,' III, Appendix, p. 24.
TYPE LOCALITY: "Interior of Southern Africa."
RANGE: Cape Colony north to northern Tanganyika Territory.

Arthroleptis werneri Nieden

Arthroleptis werneri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 242.
TYPE LOCALITIES: Banjo District and Bamenda, Cameroon.
RANGE: Known only from the type localities.

Arthroleptis xenochirus Boulenger

Arthroleptis xenochirus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 108, Pl. IV, figs. 2 and 2*a*.
TYPE LOCALITY: Marimba, Angola.
RANGE: Angola and Cameroon.

Arthroleptis xenodactylus Boulenger

Arthroleptis xenodactylus Boulenger, 1909, Ann. Mag Nat. Hist., (8) IV, p. 496.
TYPE LOCALITY: Amani, Tanganyika Territory.
RANGE: Eastern end of the Rain Forest and the forest at Usambara.

ASTYLOSTERNUS

Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 200, figs.
TYPE: *diadematus*

Astylosternus diadematus Werner

Astylosternus diadematus Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 200, figs.

TYPE LOCALITY: Victoria, Cameroon.
RANGE: Cameroon.

Astylosternus oxyrchynchus Nieden[1]

Astylosternus oxyrchynchus Nieden, 1908, Zool. Anz., XXXII, p. 660; Mitt. Zool. Mus. Berlin, III, p. 499.
TYPE LOCALITY: Lolodorf, Cameroon.
RANGE: Cameroon.

Astylosternus robustus (Boulenger)

Trichobatrachus robustus Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 443, Pl. XXX; 1901, II, p. 709, Pl. XXXVIII, fig. 1.
Astylosternus robustus Nieden, 1908, Zool. Anz., XXXII, p. 659.
TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Spanish Guinea and Cameroon.

CARDIOGLOSSA

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445
TYPE: *gracilis*

Cardioglossa dorsalis (Peters)

Hylambates dorsalis Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 209, Pl. III, fig. 5.
Cardioglossa dorsalis Nieden, 1908, Zool. Anz., XXXII, p. 661.
TYPE LOCALITY: Yoruba, Lagos.
RANGE: Known only from the type locality.

Cardioglossa elegans Boulenger

Cardioglossa elegans Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Known only from the type locality.

Cardioglossa escaleræ Boulenger

Cardioglossa escaleræ Boulenger, 1903, Mem. Soc. Esp. Nat. Hist., I, p. 64, Pl. v, fig. 4.
TYPE LOCALITY: Cape St. John, Spanish Guinea.
RANGE: Known only from the type locality.

Cardioglossa gracilis Boulenger

Cardioglossa gracilis Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 446, text fig. 2.
TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Rain Forest, west to the Cameroon-Gaboon area.

Cardioglossa leucomystax (Boulenger)

Arthroleptis leucomystax Boulenger, 1903, Mem. Soc. Esp. Nat. Hist., I, p. 62, Pl. v, figs. 1–2.

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[1]Later corrected to *oxyrhynchus*.

Cardioglossa leucomystax Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 506.

TYPE LOCALITIES: Cape St. John and the Benito River, Spanish Guinea; and Kribi, Cameroon.

RANGE: Rain Forest, from Cameroon east nearly to Lake Albert Edward.

CHIROMANTIS

Peters, 1855, Arch. Naturg., XXI, part 1, p. 56
TYPE: *xerampelina*

Chiromantis kachowskii Nikolsky

Chiromantis kachowskii Nikolsky, 1900, Ann. Mus. Zool. St. Pétersbourg, V, p. 246.

TYPE LOCALITY: Ferad, Abyssinia.

RANGE: Known only from the type locality.

Chiromantis kelleri Boettger

Chiromantis kelleri Boettger, 1893, Zool. Anz., XVI, p. 131.

TYPE LOCALITY: Somaliland, Lake Laku and region north of Webi Valley.

RANGE: Known only from the type locality.

Chiromantis rufescens (Günther)

Polypedates rufescens Günther, 1868, Proc. Zoöl. Soc. London, p. 486.

Chiromantis rufescens Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 92, Pl. x, fig. 2.

TYPE LOCALITY: "West Africa."

RANGE: Rain Forest as far west as the Cameroon-Gaboon area; found also in Usambara, Tanganyika Territory, and reported, perhaps incorrectly, from the Zambezi.

Chiromantis petersii Boulenger

Chiromantis petersii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 93, Pl. x, fig. 1.

TYPE LOCALITY: "Interior of East Africa."

RANGE: Somaliland, south to Transvaal.

Chiromantis xerampelina Peters[1]

Chiromantis xerampelina Peters, 1855, Arch. Naturg., XXI, part 1, p. 56. Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 91.

TYPE LOCALITIES: Tette and Sena, Mozambique.

RANGE: Transvaal, north to Kenya Colony.

CONRAUA

Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 497
TYPE: *robusta*

Conraua robusta Nieden

Conraua robusta Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 497.

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[1] *Chiromantis umbelluzianus* (Ferreira, 1920, Jorn. Sci. Lisboa, (3) VIII, 6 pp., 2 pls.) seems to be hardly distinct from this species.

TYPE LOCALITY: Cameroon.
RANGE: Known only from the type locality.

DIMORPHOGNATHUS

Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321, fig. 2
TYPE: *africanus*

Dimorphognathus africanus (Hallowell)

Heteroglossa africana Hallowell, 1857, Proc. Acad. Nat. Sci., Phila., p. 64.
Dimorphognathus africana Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321, fig. 2.
TYPE LOCALITY: Gaboon.
RANGE: Cameroon-Gaboon area.

GAMPSOSTEONYX

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. XXIX
TYPE: *batesi*

Gampsosteonyx batesi Boulenger

Gampsosteonyx batesi Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. XXIX.
TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Cameroon-Gaboon area.

HYLAMBATES[1]

A. Duméril, 1853, Ann. Sci. Nat., (3) XIX, p. 162
TYPE: *maculatus*

Hylambates argenteus Pfeffer

Hylambates argenteus Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 100, Pl. II, fig. 3.
TYPE LOCALITY: Marsh south of Bagamoyo, Tanganyika Territory.
RANGE: Tanganyika Territory.

Hylambates bocagii (Günther)

Cystignathus bocagii Günther, 1864, Proc. Zoöl. Soc. London, p. 481, Pl. XXXIII, fig. 2.
Hylambates bocagii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133, figs.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Savannahs north and south of the Rain Forest; reported from Portuguese Guinea, Abyssinia, Kenya Colony, and Angola.

Hylambates brevipes Boulenger

Hylambates brevipes Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 168, Pl. II, fig. 4.
TYPE LOCALITY: Musola, Fernando Po.
RANGE: Known only from the type locality.

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[1]Many of the species included in this genus are probably referable to *Leptopelis*, see above discussion, p. 186.

Hylambates cassinoides Boulenger

Hylambates cassinoides Boulenger, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 556.
TYPE LOCALITY: MacCarthy Island, Gambia.
RANGE: Known only from the type locality.

Hylambates christyi Boulenger

Hylambates christyi Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.
TYPE LOCALITY: Mabira Forest, Chagwe, Uganda.
RANGE: Known only from the type locality.

Hylambates enantiodactylus[1] Calabresi

Hylambates enantiodactylus Calabresi, 1916, Monitore Zool. Ital., XXVII, p. 36, Pl. II, fig. 2.
TYPE LOCALITY: Bardera, Somaliland.
RANGE: Known only from the type locality.

Hylambates greshoffiii Schilthuis

Hylambates greshoffiii Schilthuis, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286, fig.
TYPE LOCALITY: Boma, Lower Congo.
RANGE: Belgian Congo, from Stanleyville to Boma.

Hylambates haugi Mocquard

Hylambates haugi Mocquard, 1902, Bull. Mus. Nat. Hist., Paris, VIII, p. 413.
TYPE LOCALITY: Near Lambaréné, Gaboon.
RANGE: Known only from the type locality.

Hylambates hyloides Boulenger

Hylambates hyloides Boulenger, 1906 (1905), Ann. Stor. Nat. Genova, (3) II, p. 167, Pl. II, figs. 1 and 2.
TYPE LOCALITY: Bolama, Portuguese Guinea.
RANGE: Portuguese Guinea south to Liberia.

Hylambates johnstoni Boulenger

Hylambates johnstoni Boulenger, 1897, Proc. Zoöl. Soc. London, p. 803, Pl. XLVI, fig. 4.
TYPE LOCALITY: Kondowe-Karonga and Nyika Plateau, Nyasaland.
RANGE: Transvaal, north to Usambara, Tanganyika Territory.

Hylambates leonardi Boulenger

Hylambates leonardi Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 167, Pl. II, fig. 3. Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 362, figs. 1 and 2.
TYPE LOCALITIES: Punta Frailes, Fernando Po, and N'Djolè, French Congo.
RANGE: Cameroon-Gaboon area including Fernando Po.

Hylambates maculatus A. Duméril

Hylambates maculatus A. Duméril, 1853, Ann. Sci. Nat., (3) XIX, p. 165, Pl. VII, figs. 1–1*b* and 4. Peters, 1882, 'Reise nach Mossambique,' III, p. 159, Pl. XXVI, fig. 4.

[1]This species will doubtlessly be demonstrated to be a *Chiromantis* and for that reason it is not included in the key.

TYPE LOCALITY: Zanzibar.
RANGE: Mozambique, north to Zanzibar.

Hylambates marginatus Bocage

Hylambates marginatus Bocage, 1895, 'Herpétol. Angola,' p. 178.
TYPE LOCALITY: Quissange, interior of Benguella, Angola.
RANGE: Angola.

Hylambates natalensis (A. Smith)

Polypedates natalensis A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 25.
Hylambates natalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 135, figs.
TYPE LOCALITY: "Small river a little to the westward of Port Natal."
RANGE: Natal.

Hylambates ragazzii Boulenger

Hylambates ragazzii Boulenger, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554.
TYPE LOCALITY: Shoa, Abyssinia.
RANGE: Known only from the type locality.

Hylambates vannutellii Boulenger

Hylambates vannutellii Boulenger, 1898, Ann. Mus. Stor. Nat. Genova, (2*a*) XVIII, p. 722, Pl. x, fig. 3.
TYPE LOCALITY: "Between Badditù and Dimè," Somaliland.
RANGE: Known only from the type locality.

Hylambates vermiculatus Boulenger

Hylambates vermiculatus Boulenger, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 497. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 448.
TYPE LOCALITY: Amani, Tanganyika Territory.
RANGE: Tanganyika Territory.

Hylambates verrucosus Boulenger

Hylambates verrucosus Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.
TYPE LOCALITY: Mabira Forest, Chagwe, Uganda.
RANGE: Known only from the type locality.

HYPEROLIUS

Rapp, 1842, Arch. Naturg., VIII, part 1, p. 289
TYPE: *marmoratus*

Hyperolius acutirostris Buchholz and Peters

Hyperolius acutirostris Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. II, fig. 4.
Rappia acutirostris Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 154.
TYPE LOCALITY : Cameroon.
RANGE: Rain Forest as far west as Nigeria.

Hyperolius argus Peters

Hyperolius argus Peters, 1855, Arch. Naturg., part 1, p. 57.

Rappia argus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 122.
TYPE LOCALITY: Boror, Mozambique.
RANGE: Mozambique and Nyasaland to Tanganyika Territory.

Hyperolius aylmeri (E. G. Boulenger)

Rappia aylmeri E. G. Boulenger, 1915, Proc. Zoöl. Soc. London, I, p. 243.
TYPE LOCALITY: Sierra Leone.
RANGE: Known only from the type locality.

Hyperolius balfouri (Werner)

Rappia balfouri Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, Abt. 1, part 2, p. 1904, Pl. IV, fig. 15.
TYPE LOCALITY: Gondokoro, Sudan.
RANGE: Known only from the type locality.

Hyperolius bayoni (Boulenger)

Rappia bayoni Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168.
TYPE LOCALITIES: Uganda: Bussu, Bululo, Mbale, Jinja, Kabulamuliro, and Entebbe.
RANGE: Known only from the type localities.

Hyperolius benguellensis (Bocage)

Rappia benguellensis Bocage, 1983, Jorn. Sci. Lisboa, (2) III, p. 119.
TYPE LOCALITY: Cahata, Angola.
RANGE: Angola.

Hyperolius ferreirai Noble

Rappia bivittatus[1] Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 161, Pl.
TYPE LOCALITIES: Angola: Rio Luinha, Quilombo, N'gollo Bumba.
RANGE: Known only from the type localities.

Hyperolius bocagei Steindachner

Hyperolius bocagei Steindachner, 1869, 'Reise Novara, Zool., I, Amph.,' p. 51, Pl. V, fig. 11.
TYPE LOCALITY: Angola.
RANGE: Angola.

Hyperolius burgeoni (Witte)

Rappia burgeoni Witte, 1921, Rev. Zool. Afr., IX, p. 19, Pl. V, fig. 2.
TYPE LOCALITY: Madyu (Uelé), Belgian Congo.
RANGE: Known only from the type locality.

Hyperolius burtonii (Boulenger)

Rappia burtonii Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XII, p. 163.
TYPE LOCALITY: Ancober River, Gold Coast.
RANGE: Known only from the type locality.

Hyperolius chlorosteus (E. G. Boulenger)

Rappia chlorostea E. G. Boulenger, 1915, Proc. Zoöl. Soc. London, I, p. 243.
TYPE LOCALITY: Sierra Leone.
RANGE: Known only from the type locality.

[1]This name is preoccupied by *Hyperolius bivittatus* Peters, 1855, Arch. Naturg., part 1, p. 56.

Hyperolius cinctiventris Cope

Hyperolius cinctiventris Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 324.
Rappia cinctiventris Boettger, 1888, Ber. Senck. Ges., p. 98.
TYPE LOCALITY: Umvoti, Natal.
RANGE: All of Africa, exclusive of the Rain Forest, from French Guinea, Somaliland and the Sudan, southward.

Hyperolius cinnamomeo-ventris Bocage

Hyperolius cinnamomeo-ventris Bocage, 1866, Jorn. Sci. Lisboa, I, p. 75.
Rappia cinnamomeiventris Bocage, 1895, 'Herpétol. Angola,' p. 172, Pl. XIX, fig. 1.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Angola.

Hyperolius concolor (Hallowell)

Ixalus concolor Hallowell, 1844, Proc. Acad. Nat. Sci., Phila., II, p. 60.
Rappia concolor Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 124.
TYPE LOCALITY: Liberia.
RANGE: All of Africa from Portuguese Guinea and Kenya Colony south to Angola and Mozambique; not reported from the Congo Basin.

Hyperolius fasciatus(Ferreria)

Rappia fasciata Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 164, fig. on Pl.
TYPE LOCALITY: Quilombo, Angola.
RANGE: Known only from the type locality.

Hyperolius ferniquei (Mocquard)

Rappia ferniquei Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 407.
TYPE LOCALITY: Atchi River, Kenya Colony.
RANGE: Known only from the type locality.

Hyperolius fimbriolatus Buchholz and Peters

Hyperolius fimbriolatus Buchholz and Peters, in Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 121.
TYPE LOCALITY: Lambaréné, French Congo.
RANGE: Cameroon-Gaboon area and the Lower Congo.

Hyperolius flavoviridis Peters

Hyperolius flavoviridis Peters, 1855, Arch. Naturg., XXI, part 1, p. 57.
TYPE LOCALITY: Boror, Mozambique.
RANGE: Mozambique to Kenya Colony.

Hyperolius fulvovittatus Cope

Hyperolius fulvovittatus Cope, 1860, Proc. Acad. Nat. Sci. Phila., p. 517.
TYPE LOCALITY: Liberia.
RANGE: Zanzibar to Nyasaland, also Angola.

Hyperolius fuscigula Bocage

Hyperolius fuscigula Bocage, 1866, Jorn. Sci. Lisboa, I, p. 76.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Liberia to Angola.

Hyperolius fusciventris Peters

Hyperolius fusciventris Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 122.
TYPE LOCALITY: Liberia.
RANGE: Spanish Guinea to Liberia.

Hyperolius granulatus (Boulenger)

Rappia granulata Boulenger, 1901, Ann. Mus. Congo., (1) II, fasc. 1, p. 4, Pl. II, fig. 3.
TYPE LOCALITY: Pweto, Lake Moero.
RANGE: Lake Moero and Tanganyika Territory.

Hyperolius guttatus Peters

Hyperolius guttatus Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. II, fig. 3.
TYPE LOCALITY: Boutry, Ashanti.
RANGE: Ashanti to Cameroon.

Hyperolius guttulatus Günther

Hyperolius guttulatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 86, Pl. VII, fig. *A*.
TYPE LOCALITY: Africa.
RANGE: Known only from the type specimens.

Hyperolius horstockii (Schlegel)

Hyla horstockii Schlegel, 1844, 'Abbildung.,' p. 24.
Hyperolius horstockii Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 85.
TYPE LOCALITY: Northern part of Cape of Good Hope.
RANGE: South Africa as far north as northern Rhodesia.

Hyperolius lagoensis (Günther)

Rappia lagoensis Günther, 1868, Proc. Zoöl. Soc. London, p. 487, Pl. XL, fig. 2.
Hyperolius lagoensis 1875, Peters, Monatsber. Akad. Wiss. Berlin, p. 207.
TYPE LOCALITY: Lagos.
RANGE: Lagos and Nigeria.

Hyperolius langi Noble

Hyperolius langi Noble, see above, p. 266, Pl. XXXIX, fig. 1.
TYPE LOCALITY: Niapu, Belgian Congo.
RANGE: Known only from the type locality.

Hyperolius marmoratus Rapp[1]

Hyperolius marmoratus Rapp, 1842, Arch. Naturg., VIII, part 1, p. 289, Pl. VI, figs. 1 and 2.
TYPE LOCALITY: Natal.
RANGE: All of Africa from Portuguese Guinea and Kenya Colony southward.

Hyperolius microps Günther

Hyperolius microps Günther, 1864, Proc. Zoöl. Soc. London, p. 311, Pl. XXVII, fig. 3.

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[1] *Rappia soror* Chabanaud, 1921, p. 458, seems to belong here.

TYPE LOCALITY: Rovuma Bay, East Africa.
RANGE: Mozambique to Angola; recorded probably through error from French Guinea.

Hyperolius molleri (Bedriaga)

Rappia molleri Bedriaga, 1892, 'Amph. Rept. Guinée,' p. 10.[1]
TYPE LOCALITY: S. Thomé.
RANGE: S. Thomé.

Hyperolius nasutus Günther

Hyperolius nasutus Günther, 1864, Proc. Zoöl. Soc. London, p. 482, Pl. XXXIII, fig. 3.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: The Sudan to southern Rhodesia, westward south of the Rain Forest to Angola and the Lower Congo.

Hyperolius ocellatus Günther

Hyperolius ocellatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. *B*.
TYPE LOCALITIES: Fernando Po and Angola.
RANGE: Angola and the Rain Forest, west to Cameroon.

Hyperolius osorioi (Ferreira)

Rappia osorioi Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 162, fig. on Pl.
TYPE LOCALITY: Quilombo, Angola.
RANGE: Known only from the type locality.

Hyperolius oxyrhynchus (Boulenger)

Rappia oxyrhynchus Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 5, Pl. II, fig. 4.
TYPE LOCALITIES: Pweto and Lofoi, Belgian Congo.
RANGE: Known only from the type localities.

Hyperolius pachydermus (Werner)

Rappia pachyderma Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1903.
TYPE LOCALITY: Gondokoro, Sudan.
RANGE: Known only from the type locality.

Hyperolius phantasticus (Boulenger)

Rappia phantastica Boulenger, 1899, Ann. Mag. Nat. Hist., (7) III, p. 274, Pl. XI, fig. 2.
TYPE LOCALITY: Benito River, Gaboon.
RANGE: Rain Forest as far west as Cameroon.

Hyperolius picturatus Peters

Hyperolius picturatus Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 206, Pl. II, fig. 2.
TYPE LOCALITY: Boutry, Ashanti.
RANGE: Rain Forest and Kenya Colony.

[1]This paper not examined, but the description appearing in another form (Bedriaga, 1892) has been available.

Hyperolius platycephalus (Pfeffer)

Rappia platycephala Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 96, Pl. II, fig. 2.
TYPE LOCALITY: Quilimane, Mozambique.
RANGE: Mozambique.

Hyperolius platyceps (Boulenger)

Rappia platyceps Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 444, Pl. XXVII, fig. 4.
TYPE LOCALITY: Benito River, Gaboon.
RANGE: Cameroon and Angola.[1]

Hyperolius platyrhinus (Procter)

Rappia platyrhinus Procter, 1920, Proc. Zoöl. Soc. London, p. 416.
TYPE LOCALITY: Nairobi, Kenya Colony.
RANGE: Known only from the type locality.

Hyperolius pleurotænius (Boulenger)

Rappia pleurotænia Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322.
TYPE LOCALITIES: Zima, Cameroon and Benito River, Spanish Guinea.
RANGE: Cameroon-Gaboon area and Upper Congo.

Hyperolius pliciferus (Bocage)

Rappia plicifera Bocage, 1893, Jorn. Sci. Lisboa, (2) III, p. 118.
TYPE LOCALITY: Caconda and Duque de Bragança, Angola.
RANGE: Angola.

Hyperolius punctulatus (Bocage)

Rappia punctulata Bocage, 1895, 'Herpétol. Angola,' p. 168.
TYPE LOCALITY: Banks of the Quanza River, Angola.
RANGE: Angola.

Hyperolius pusillus (Cope)

Crumenifera pusilla Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 343.
Rappia pusilla Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127.
TYPE LOCALITY: Umvoti, Natal.
RANGE: Nigeria and the Sudan southward to Natal.

Hyperolius quinquevittatus Bocage

Hyperolius quinquevittatus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Angola and the Upper Congo.

Hyperolius rhodoscelis (Boulenger)

Rappia rhodoscelis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 3, Pl. II, fig. 1.
TYPE LOCALITY: [Pweto, Lake Moero.
RANGE: Known only from the type locality.

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[1] *H. platyceps* var. *angolensis* (Ferreira) may not be conspecific with *H. platyceps*, in which case the range of the latter form would be restricted to the Cameroon-Gaboon area.

Hyperolius riggenbachi (Nieden)

Rappia riggenbachi Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 244, fig. 4.

TYPE LOCALITY: Banjo, Cameroon.

RANGE: Known only from the type locality.

Hyperolius salinæ (Bianconi)

Euchnemis salinæ Bianconi, 1850, 'Spec. Zool. Mosamb., Rept.,' p. 24, Pl. v, fig. 2.

Rappia salinæ Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 123.

TYPE LOCALITY: Mozambique.

RANGE: Kenya Colony to Mozambique.

Hyperolius sansibarica (Pfeffer)

Rappia sansibarica Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 97, Pl. II, fig. 4.

TYPE LOCALITY: Zanzibar.

RANGE: From Zanzibar to Bukoba, Tanganyika Territory.

Hyperolius seabrai (Ferreira)

Rappia seabrai Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 163, fig. on Pl.

TYPE LOCALITY: Duque de Bragança, Angola.

RANGE: Known only from the type locality.

Hyperolius sordidus (Fischer)

Rappia sordida Fischer, 1888, Jahrb. Hamburg. Wiss. Anst., V, p. 10.

TYPE LOCALITY: Cameroon.

RANGE: Rain Forest.

Hyperolius spurrelli (Boulenger)

Rappia spurrelli Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XIX, p. 408.

TYPE LOCALITY: Obuasi, southern Ashanti.

RANGE: Known only from the type locality.

Hyperolius steindachnerii Bocage

Hyperolius steindachnerii Bocage, 1866, Jorn. Sci. Lisboa, I, p. 75.

TYPE LOCALITY: Duque de Bragança, Angola.

RANGE: Angola and the Rain Forest as far west as Cameroon.

Hyperolius sugillatus Cope

Hyperolius sugillatus Cope, 1862, Proc. Acad. Nat. Sci., Phila., p. 342.

TYPE LOCALITY: Umvoti, Natal.

RANGE: Natal to Angola.

Hyperolius symetricus (Cope)

Rappia symetrica Mocquard, 1902, Bull. Mus. Hist. Nat., VIII, p. 408.

TYPE LOCALITY: Atchi River, Kenya Colony.

RANGE: Kenya Colony.

Hyperolius thomensis Bocage

Hyperolius thomensis Bocage, 1886, Jorn. Sci. Lisboa, XI, p. 74.

TYPE LOCALITY: S. Thomé.

RANGE: S. Thomé.

Hyperolius toulsonii Bocage

Hyperolius toulsonii Bocage, 1867, Proc. Zoöl. Soc. London, p. 845, fig. 3.
TYPE LOCALITY: Loanda, Angola.
RANGE: Angola.

Hyperolius tristis Bocage

Hyperolius tristis Bocage, 1866, Jorn. Sci. Lisboa, I, p. 76.
Rappia tristis Bocage, 1895, 'Herpétol. Angola,' p. 171, Pl. XIX, fig. 2.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Angola and the Lower Congo.

Hyperolius tuberilinguis Smith

Hyperolius tuberilinguis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 26.
TYPE LOCALITY: "Country to the eastward of Cape Colony."
RANGE: Caffraria.

Hyperolius undulatus (Boulenger)

Rappia undulata Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 4, Pl. II, fig. 2.
TYPE LOCALITIES: Pweto and Lofoi, Belgian Congo.
RANGE: Lake Moero to Cape Colony.

Hyperolius vermiculatus (Pfeffer)

Rappia vermiculata Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 98, Pl. I, fig. 12.
TYPE LOCALITY: Zanzibar.
RANGE: Known only from the type locality.

Hyperolius viridiflavus (Duméril and Bibron)

Eucnemis viridi-flavus Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 528.
TYPE LOCALITY: Abyssinia.
RANGE: Abyssinia, Somaliland, and Uganda.

KASSINA

Girard, 1853, Proc. Acad. Nat. Sci. Phila., VI, p. 421
TYPE: *senegalensis*

Kassina obscura Boulenger

Cassina obscura Boulenger, 1894, Proc. Zoöl. Soc. London, p. 644, Pl. XXXIX, fig. 3. Peracca, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177.
TYPE LOCALITY: Let Merafia, Shoa, Abyssinia.
RANGE: Abyssinia, south to the Sudan, Uganda, and Gallaland.

Kassina senegalensis (Duméril and Bibron)

Cystignathus senegalensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 418.
Cassina senegalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131.
TYPE LOCALITY: Lakes in the vicinity of Galam, Senegal.
RANGE: Open country south of the Sahara; accidental in the Rain Forest.

LEPTODACTYLODON

Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 141
TYPE: *ovatus*

Leptodactylodon albiventris (Boulenger)

Bulua albiventris Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 283.
Leptodactylodon albiventris Nieden, 1908, Mitt. Zool. Mus. Berlin, III, part 4 p. 501.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Cameroon.

Leptodactylodon boulengeri Nieden

Leptodactylodon boulengeri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 242, fig. 2.
TYPE LOCALITY: Banjo, Cameroon.
RANGE: Known only from the type locality.

Leptodactylodon ovatus Andersson

Leptodactylodon ovatus Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 141.
TYPE LOCALITY: Cameroon.
RANGE: Cameroon.

LEPTOPELIS

Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 89
TYPE: *aubryi*

Leptopelis anchietæ (Bocage)

Hylambates anchietæ Bocage, 1873, Jorn. Sci. Lisboa, IV, p. 226. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133.
TYPE LOCALITY: Interior to Mossamedes, Angola.
RANGE: Savannahs directly to the north, east, and south of the Rain Forest; best known from Angola.

Leptopelis aubryi (A. Duméril)

Hyla aubryi A. Duméril, 1856, Rev. Mag. Zool., (2) VIII, p. 561.
Leptopelis aubryi Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 89.
TYPE LOCALITY: Gaboon.
RANGE: Rain Forest, the forest at Amani, East Africa, and possibly other Rain Forest "outlyers."

Leptopelis brevirostris (Werner)

Hylambates brevirostris Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 199, Pl. II, figs. 5 and 6. Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445.
TYPE LOCALITY: Victoria, Cameroon.
RANGE: Cameroon-Gaboon area including Fernando Po; reported also from Tanganyika Territory.

Leptopelis calcaratus (Boulenger)

Hylambates calcaratus Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322.
TYPE LOCALITIES: Efulen, Cameroon; Cape St. John and Rio Benito, Spanish Guinea.
RANGE: Cameroon-Gaboon area.

Leptopelis notatus (Buchholz and Peters)

Hylambates notatus Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 205, Pl. II, fig. 1.
TYPE LOCALITY: Cameroon.
RANGE: Cameroon-Gaboon area.

Leptopelis palmatus (Peters)

Hylambates palmatus Peters, 1868, Monatsber. Akad. Wiss. Berlin, p. 453, Pl. II, fig. 2.
TYPE LOCALITY: Prince's Island.
RANGE: Cameroon-Gaboon area including Fernando Po and Prince's Island.

Leptopelis rufus Reichenow

Leptopelis rufus Reichenow, 1874, Arch. Naturg., XL, part 1, p. 291, Pl. IX, figs. 1*a* and 1*b*.
TYPE LOCALITY: Victoria, Cameroon (at foot of Cameroon Mountains).
RANGE: Rain Forest and the forest at Usambara, Tanganyika Territory.

Leptopelis tessmanni (Nieden)

Hylambates tessmanni Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 365, fig. 4.
TYPE LOCALITY: Makomo, Spanish Guinea.
RANGE: Cameroon-Gaboon area.

MEGALIXALUS

Günther, 1868, Proc. Zoöl. Soc. London, p. 485
TYPE: *infrarufus* = *seychellensis*

Megalixalus brachycnemis Boulenger

Megalixalus brachycnemis Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVII, p. 403, Pl. XVII, fig. 2.
TYPE LOCALITY: Chiradzulu, Nyasaland.
RANGE: Nyasaland.

Megalixalus flavomaculatus (Günther)

Hyperolius flavomaculatus Günther, 1864, Proc. Zoöl. Soc. London, p. 310, Pl. XXVII, fig. 1.
Megalixalus flavomaculatus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 128.
TYPE LOCALITY: Rovuma Bay, East Africa.
RANGE: Known only from the type locality.

Megalixalus fornasinii (Bianconi)

Euchnemis fornasinii Bianconi, 1850, 'Spec. Zool. Mosamb., Rept.,' Pl. V, fig. 1.

Megalixalus fornasinii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.
TYPE LOCALITY: Mozambique.
RANGE: Rain Forest and East Africa, from Pemba Island south to Marianhill, Natal.

Megalixalus gramineus Boulenger

Megalixalus gramineus Boulenger, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721, Pl. x, fig. 2.
TYPE LOCALITY: Between Badditù and Dimé, Kenya Colony.
RANGE: Kenya Colony.

Megalixalus immaculatus Boulenger

Megalixalus immaculatus Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 63, Pl. v, fig. 3.
TYPE LOCALITY: Cape St. John, Spanish Guinea.
RANGE: Spanish Guinea and French Congo.

Megalixalus leptosomus (Peters)

Hyperolius leptosomus Peters, 1877, Monatsber. Akad. Wiss. Berlin, p. 619, Pl., fig. 5.
Megalixalus leptosomus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 129.
TYPE LOCALITY: Chinchoxo, Portuguese Congo.
RANGE: Rain Forest, Sudan, and Tanganyika Territory.

Megalixalus lindholmi Andersson

Megalixalus lindholmi Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 239, figs. 4–6.
TYPE LOCALITY: Bibundi, Cameroon.
RANGE: Cameroon.

Megalixalus loveridgii Procter

Megalixalus loveridgii Procter, 1920, Proc. Zoöl. Soc. London, p. 418.
TYPE LOCALITY: Morogoro, Tanganyika Territory.
RANGE: Known only from the type locality.

Megalixalus pantherinus Steindachner

Megalixalus pantherinus Steindachner, 1891, Anz. Akad. Wiss. Wien, XXVIII, No. 14, p. 142.
TYPE LOCALITY: Leikipia, Kenya Colony.
RANGE: Known only from the type locality.

Megalixalus spinifrons (Cope).

Hyperolius spinifrons Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 342.
Megalixalus ? spinifrons Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.
TYPE LOCALITY: Umvoti, Natal.
RANGE: Cape Colony and Natal.

Megalixalus spinosus (Buchholz and Peters)

Hyperolius spinosus Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. I, fig. 3.
Megalixalus spinosus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.
TYPE LOCALITY: Cameroon.
RANGE: Rain Forest as far west as the Cameroon-Gaboon area.

Megalixalus vittiger (Peters)

Hyperolius vittiger Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 122.
Megalixalus vittiger Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169.
TYPE LOCALITY: Liberia.
RANGE: Rain Forest and Uganda.

NYCTIBATES

Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIII, p. 261
TYPE: *corrugatus*

Nyctibates corrugatus Boulenger

Nyctibates corrugatus Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIII, p. 261.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Cameroon.

PETROPEDETES

Reichenow, 1874, Arch. Naturg., XL, part 1, p. 290
TYPE: *cameronensis*

Petropedetes cameronensis Reichenow

Petropedetes cameronensis Reichenow, 1874, Arch. Naturg., XL, part 1, p. 290, Pl. IX, figs. 2, 2*a* and 2*b*. Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 164, fig.
TYPE LOCALITY: Bimbia, Cameroon.
RANGE: Cameroon and Fernando Po.

Petropedetes johnstoni (Boulenger)

Cornufer johnstoni Boulenger, 1887, Proc. Zoöl. Soc. London, p. 564.
Petropedetes johnstoni Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439.
TYPE LOCALITY: Rio del Rey, Cameroon.
RANGE: Cameroon.

Petropedetes natator Boulenger

Petropedetes natator Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 281.
TYPE LOCALITY: Sierra Leone.
RANGE: Known only from the type locality.

Petropedetes newtonii (Bocage)

Tympanoceros newtonii Bocage, 1895, Jorn. Sci. Lisboa, (2) III, p. 270; IV, p. 18, Pl.
Petropedetes newtoni Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439.
TYPE LOCALITY: Fernando Po.
RANGE: Cameroon-Gaboon area including Fernando Po.

Petropedetes palmipes Boulenger

Petropedetes palmipes Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 282.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Cameroon.

PHRYNOBATRACHUS

Günther, 1862, Proc. Zoöl. Soc. London, p. 190
TYPE: *natalensis*

Phrynobatrachus acridoides (Cope)

Staurois acridoides Cope, 1867, Journ. Acad. Nat. Sci. Phila., VI, p. 198.
Phrynobatrachus acridoides Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 113.
TYPE LOCALITY: Zanzibar.
RANGE: Mozambique to Eritrea in the east, Gambia to the French Congo in the west; not known from the interior of the continent except for a number of records from Nyasaland and the East African highlands.

Phrynobatrachus acutirostris Nieden

Phrynobatrachus acutirostris Nieden, 1912, 'Wiss. Ergeb. Deutsch.-Zentr. Afrika Exp.,' IV, p. 173, figs. 1*a-c*.
TYPE LOCALITY: Rugege Forest, Lake Region.
RANGE: Lake Region.

Phrynobatrachus bonebergi (Hewitt and Methuen)

Natalobatrachus bonebergi Hewitt and Methuen, 1913, Trans. Roy. Soc. S. Africa, III, p. 107.
TYPE LOCALITY: Marianhill, Natal.
RANGE: Known only from the type locality.

Phrynobatrachus capensis Boulenger

Phrynobatrachus capensis Boulenger, 1910, Ann. S. African Mus., V, pp. 529 and 538.
TYPE LOCALITY: Cape Flats, Cape Colony.
RANGE: Known only from the type locality.

Phrynobatrachus dendrobates (Boulenger)

Arthroleptis dendrobates Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8.
TYPE LOCALITY: Medje, Belgian Congo.
RANGE: Ituri Forest, Belgian Congo.

Phrynobatrachus francisci Boulenger

Phrynobatrachus francisci Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.
TYPE LOCALITY: Province of Zaria, Northern Nigeria.
RANGE: Senegambia to the French Congo.

Phrynobatrachus giorgii Witte

Phrynobatrachus giorgii Witte, 1921, Rev. Zool. Afr., IX, p. 8, Pl. III, fig. 1.
TYPE LOCALITY: Yambata, Lower Congo.
RANGE: Known only from the type locality.

Phrynobatrachus graueri (Nieden)

Arthroleptis graueri Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 441.
Phrynobatrachus graueri Nieden, 1912, 'Wiss. Ergeb. Deutsch.-Zentr. Afrika Exp.,' IV, p. 174, Pl. v, figs. 2*a-b*.
TYPE LOCALITY: Rugege Forest, Lake Region.
RANGE: Known only from the type locality.

Phrynobatrachus krefftii Boulenger

Phrynobatrachus krefftii Boulenger, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 496.
TYPE LOCALITY: Amani, Tanganyika Territory.
RANGE: Tanganyika Territory and the Belgian Congo as far west as the Rain Forest.

Phrynobatrachus natalensis (A. Smith)

Stenorhynchus natalensis A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24.
Phrynobatrachus natalensis Günther, 1862, Proc. Zoöl. Soc. London, p. 190.
TYPE LOCALITY: Port Natal.
RANGE: All of Africa, south of the Sahara and exclusive of the Rain Forest (possibly encroaching upon the border of the latter).

Phrynobatrachus perpalmatus Boulenger

Phrynobatrachus perpalmatus Boulenger, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. XXXVIII, fig. 1.
TYPE LOCALITY: Lake Moero.
RANGE: Lake Moero, north to El Gerassi, Egypt, including the Ituri Forest.

Phrynobatrachus plicatus (Günther)

Hyperolius plicatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. *C*.
Phrynobatrachus plicatus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112.
TYPE LOCALITY: Coast of Guinea.
RANGE: Rain Forest and outlying forested regions to the east; recorded perhaps incorrectly from northern Rhodesia; not reported further west than Nigeria.

Phrynobatrachus steindachneri Nieden

Phrynobatrachus steindachneri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 241.
TYPE LOCALITY: Banjo, Cameroon.
RANGE: Known only from the type locality.

Phrynobatrachus tellinii Peracca

Phrynobatrachus tellinii Peracca, 1904, Boll. Mus. Torino, XIX, No. 467, p. 4.
TYPE LOCALITY: Between Massaua and Cheren, Eritrea.
RANGE: Known only from the type locality.

PHRYNOPSIS

Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, p. 101, Pl. II, figs. 5 and 6
TYPE: *boulengerii*

Phrynopsis boulengerii Pfeffer

Phrynopsis boulengerii Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, p. 101, Pl. II, figs. 5 and 6.
TYPE LOCALITY: Quilimane, Mozambique.
RANGE: Mozambique.

Phrynopsis ventrimaculata Nieden

Phrynopsis ventrimaculata Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 499.
TYPE LOCALITY: Longji, Cameroon.
RANGE: Known only from the type locality.

RANA

Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 210
TYPE: *temporaria*

Rana adspersa (Duméril and Bibron)

Pyxicephalus adspersus Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 444.
Rana adspersa Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 33, fig.
TYPE LOCALITY: South Africa.
RANGE: South Africa northward to the Sudan and Kenya Colony in the east and Angola in the west.

Rana æquiplicata Werner

Rana mascareniensis var. *æquiplicata* Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 192.
Rana æquiplicata Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 437.
TYPE LOCALITIES: Victoria and Buea, Cameroon.
RANGE: Rain Forest as far west as Cameroon; recorded also from the Transvaal (Mocquard, 1906) but probably through error.

Rana albolabris Hallowell

Rana albolabris Hallowell, 1856, Proc. Acad. Nat. Sci. Phila., VIII, p. 153. Boulenger, 1882, 'Cat. Batr. Sal. Mus.,' p. 59, Pl. v, fig. 2, 2*a* and 2*b*.
TYPE LOCALITY: West Africa.
RANGE: Rain Forest and surrounding territory: Lower Congo, Lake Region, Uele District, and French Guinea.

Rana angolensis Bocage

Rana angolensis Bocage, 1866, Jorn. Sci. Lisboa, I, p. 73. Boulenger, 1918, Trans. Roy. Soc. S. Africa, VII, part 2, p. 131.
TYPE LOCALITY: Duque de Bragança, Angola.
RANGE: Eastern parts of Cape Province, northward to Portuguese East Africa, Nyasaland, and Angola.

Rana ansorgii Boulenger

Rana ansorgii Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107, Pl. IV, fig. 1.
TYPE LOCALITY: Between Benguella and Bihé, Angola.
RANGE: Angola to Cameroon.

Rana beccarii Boulenger

Rana beccarii Boulenger, 1911, Ann. Mus. Stor. Nat., Genova, (3) V, p. 160.
TYPE LOCALITY: Filfil, Eritrea.
RANGE: Eritrea and Abyssinia.

Rana bibronii Hallowell

Rana bibronii Hallowell, 1845, Proc. Acad. Nat. Sci. Phila., II, p. 249.
TYPE LOCALITY: Liberia.
RANGE: French Guinea and Liberia to Gaboon.

Rana budgetti Boulenger

Rana budgetti Boulenger, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 555.
TYPE LOCALITY: MacCarthy Island, Gambia.
RANGE: Known only from the type locality.

Rana bunoderma Boulenger

Rana bunoderma Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 214.
TYPE LOCALITY: Caconda, Angola.
RANGE: Known only from the type locality.

Rana chapini Noble

Rana chapini Noble, 1920, see above, p. 214.
TYPE LOCALITY: Batama, Belgian Congo.
RANGE: Known only from the type locality.

Rana christyi Boulenger

Rana christyi Boulenger, 1919, Rev. Zool. Afr., VII, p. 5.
TYPE LOCALITY: Medje, Belgian Congo.
RANGE: Ituri forest and Uelé plains.

Rana cordofana (Steindachner)

Pyxicephalus cordofanus Steindachner, 1869, 'Reise Novara, Zool., I, Amph.,' p. 8.
Rana cordofana Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 31.
TYPE LOCALITY: Kordofan, Egypt.
RANGE: The Sudan.

Rana crassipes Buchholz and Peters

Rana crassipes Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 201.
TYPE LOCALITY: Abo, Cameroon.
RANGE: Cameroon-Gaboon area.

Rana cryptotis Boulenger

Rana cryptotis Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 109.
TYPE LOCALITY: Mossamedes, Angola (Kafitu Swamps and Catequero).
RANGE: Known only from the type locality.

Rana darlingi Boulenger

Rana darlingi Boulenger, 1902, Proc. Zoöl. Soc. London, II, p. 15, Pl. III, fig. 1.
TYPE LOCALITY: Mashonaland (Mazoë or between Umtali and Marandellas).
RANGE: Mashonaland to Victoria Falls, Rhodesia.

Rana delalandii (Duméril and Bibron)

Pyxicephalus delalandii Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 445, Pl. LXXXVII, figs. 1, 1*a*, and 1*b*.
Rana delalandii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 31.

TYPE LOCALITY: South Africa.
RANGE: South Africa northward in the east to Eritrea and the Sudan, in the west to Southwest Africa.

Rana elegans Boulenger

Rana elegans Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 59, Pl. v, fig. 1.
TYPE LOCALITY: "West Africa."
RANGE: Gaboon.

Rana esculenta ridibunda Pallas

Rana ridibunda Pallas, 1771, 'Reise,' I, p. 458.
Rana esculenta var. *ridibunda* Boulenger, 1897, 'Tailless Batr. Europe,' II, p. 270, Pl. XVII, figs. 100*a*, 101.
TYPE LOCALITY: Caspian Sea, Volga, and Jaico.
RANGE: Africa north of the Sahara, western Asia, and all of Europe (except northwestern and central portions and Italy).

Rana fasciata Duméril and Bibron

Rana fasciata Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 389.
TYPE LOCALITY: Cape of Good Hope.
RANGE: South Africa north to the Shiré Plateau, Nyasaland.

Rana flavigula (Calabresi)

Pyxicephalus flavigula Calabresi, 1916, Monitore Zool. Ital., XXVII, p. 34, Pl. II, fig. 1.
TYPE LOCALITY: Orofillo, Somaliland.
RANGE: Known only from the type locality.

Rana floweri Boulenger

Rana floweri Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XX, p. 417.
TYPE LOCALITY: Roseires on the Blue Nile.
RANGE: Known only from the type locality.

Rana fülleborni Nieden

Rana fülleborni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 436.
TYPE LOCALITY: Crater Lake of N'gosi volcano, Langenburg, Tanganyika Territory.
RANGE: Known only from the type locality.

Rana fuscigula Duméril and Bibron

Rana fuscigula Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 386. Boulenger, 1918, Trans. Roy. Soc. S. Africa, VIII, part 2, p. 131.
TYPE LOCALITY: South Africa.
RANGE: Cape Colony northward to Nyasaland; recorded as far north as Abyssinia and Southwest Africa, but probably due to confusion with closely related species.

Rana galamensis Duméril and Bibron

Rana galamensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 367. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 61.
TYPE LOCALITY: Galam Lakes, Senegal.
RANGE: Typically the open country from Senegal and the Sudan south to Portuguese East Africa; recorded from the forested regions of Nigeria and Cameroon.

Rana goliath Boulenger

Rana goliath Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 317.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Cameroon.

Rana gondokorensis Werner

Rana gondokorensis Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1891, Pl. III, fig. 9.
TYPE LOCALITY: Gondokoro, Anglo-Egyptian Sudan.
RANGE: Known only from the type locality.

Rana grayii A. Smith

Rana grayii A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXXVIII, figs. 2, 2*a-c*.
TYPE LOCALITY: Western districts of Cape Colony.
RANGE: South Africa north to Transvaal.

Rana guerzea Chabanaud

Rana guerzea Chabanaud, 1920, Bull. Com. Et. Hist. et Scient. A. O. F., p. 493.
TYPE LOCALITIES: N'Zébéla, and N'Zérékore, French Guinea.
RANGE: Known only from the type localities.

Rana johnstoni Günther

Rana johnstoni Günther, 1893, Proc. Zoöl. Soc. London, p. 620.
TYPE LOCALITY: Chiromo, Nyasaland.
RANGE: Nyasaland.

Rana katangae Witte

Rana katangae Witte, 1921, Rev. Zool. Afr., IX, p. 3, Pl. II, figs. 1, 2, 3, and 4.
TYPE LOCALITY: Lofoi, Katanga.
RANGE: Known only from the type locality.

Rana lemairei Witte

Rana lemairei Witte, 1921, Rev. Zool. Afr., IX, p. 1, Pl. I.
TYPE LOCALITY: Lofoi, Katanga.
RANGE: Known only from the type locality.

Rana leonensis Boulenger

Rana leonensis Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XIX, p. 407; XX, p. 418.
TYPE LOCALITY: "Sierra Leone," corrected to Bibianaka, Gold Coast.
RANGE: Known only from the type locality.

Rana longirostris Peters

Rana longirostris Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 646, Pl. I, fig. 5.
TYPE LOCALITY: Keta, Gold Coast.
RANGE: Gold Coast to Gaboon.

Rana macrotympanum (Boulenger)

Pyxicephalus macrotympanum Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 140.
Rana (Hildebrandtia) macrotympanum Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 33.

TYPE LOCALITY: West of the Juba River, Gallaland.
RANGE: Known only from the type locality.

Rana bufonia (Boettger)

Maltzania bufonia Boettger, 1881, Abh. Senck. Ges., XII, p. 418, Pl. I, figs. 3*a-e*.
Rana maltzanii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 34.
TYPE LOCALITY: Rufisque, Senegal.
RANGE: Known only from the type locality.

Rana mascareniensis Duméril and Bibron

Rana mascareniensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 350.
TYPE LOCALITIES: Seychelles, Mauritius, and Bourbon.
RANGE: All of Africa, from Egypt and the Sahara, south to Southwest Africa, Rhodesia, and Zululand.

Rana merumontana Lönnberg

Rana merumontana Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 21, Pl. I, figs. 4*a* and 4*b*.
TYPE LOCALITY: Meru.
RANGE: Known only from the type locality.

Rana moeruensis Boulenger

Rana moeruensis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2, Pl. I, fig. 2.
TYPE LOCALITY: Pweto, Lake Moero.
RANGE: Known only from the type locality.

Rana miotympanum Boulenger

Rana (*Hildebrandtia*) *miotympanum* Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 34.
TYPE LOCALITY: Loanda, Angola.
RANGE: Angola.

Rana natalensis (A. Smith)

Pyxicephalus natalensis A. Smith, 1849, 'Illus. Zool. S. Africa, Rept.,' III, Appendix, p. 23.
Rana natalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 30.
TYPE LOCALITY: "Country to the eastward of Cape Colony."
RANGE: Natal to Transvaal.

Rana newtoni Bocage

Rana newtoni Bocage, 1886, Jorn. Sci. Lisboa, XI, p. 73.
TYPE LOCALITY: S. Thomé.
RANGE: S. Thomé and Fernando Po.

Rana nutti Boulenger

Rana nutti Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 467; 1909, Trans. Zoöl. Soc. London, XIX, p. 240, Pl. VIII, figs. 1 and 2.
TYPE LOCALITY: Lake Tanganyika.
RANGE: Abyssinia southward to Uganda and Tanganyika Territory.

Rana nyassæ Günther

Rana nyassæ Günther, 1892, Proc. Zoöl. Soc. London, p. 558.
TYPE LOCALITY: Shiré Highlands, Nyasaland.
RANGE: Nyasaland.

Rana occipitalis Günther

Rana occipitalis Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 130, Pl. XI.
TYPE LOCALITIES: "West Africa," "Africa," Gambia.
RANGE: Senegal and the Sudan, south to Angola, and Tanganyika Territory.

Rana ornata (Peters)

Pyxicephalus ornatus Peters, 1878, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. II, fig. 7.
Rana ornata Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 33.
TYPE LOCALITY: Taita, Kenya Colony.
RANGE: Somaliland to Portuguese East Africa.

Rana ornatissima Bocage

Rana ornatissima Bocage, 1879, Jorn. Sci. Lisboa, (1) VII, p. 98.
Rana (Hildebrandtia) ornatissima Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, p. 34.
TYPE LOCALITY: Bihé, Angola.
RANGE: Uelé Region, south through the savannahs, to Angola and Southern Rhodesia.

Rana oxyrhynchus A. Smith

Rana oxyrhynchus A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXXVII, figs. 2 and 2*a-c*.
TYPE LOCALITY: Kafirland and region of Port Natal.
RANGE: Eritrea, Uelé Region, and Portuguese Guinea, southward throughout Africa.

Rana perpalmata Witte

Rana perpalmata Witte, 1922, Rev. Zool. Afr., X, p. 320.
TYPE LOCALITY: Chiloango Basin, Lower Congo.
RANGE: Known only from the type locality.

Rana pulchra Boulenger

Rana pulchra Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 468.
TYPE LOCALITY: Lake Tanganyika.
RANGE: Known only from the type locality.

Rana pumilio Boulenger

Rana pumilio Boulenger, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 106.
TYPE LOCALITY: Medine, Senegal.
RANGE: Known only from the type locality.

Rana ruddi Boulenger

Rana ruddi Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 480, Pl. XXII, fig. 1.
Rana (Hildebrandtia) ruddi Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 36.
TYPE LOCALITY: Beira, Portuguese East Africa.
RANGE: Known only from the type locality.

Rana schillukorum Werner

Rana schillukorum Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1890, Pl. III, fig. 10.

TYPE LOCALITY: Khor Attar, Sudan.

RANGE: Known only from the type locality.

Rana stenocephala Boulenger

Rana stenocephala Boulenger, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 515.

TYPE LOCALITY: Entebbe, Uganda.

RANGE: Uganda.

Rana subsigillata A. Duméril

Rana subsigillata A. Duméril, 1856, Rev. Mag. Zool., p. 560. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 23.

TYPE LOCALITY: Gaboon.

RANGE: French Guinea south to Gaboon.

Rana togoensis Boulenger

Rana (Hildebrandtia) togoensis Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 34.

TYPE LOCALITY: Mangu, Togo.

RANGE: Togoland.

Rana trinodis Boettger

Rana trinodis Boettger, 1881, Abh. Senck. Ges., XII, p. 414, Pl. I, figs. 2*a-e*. Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 90.

TYPE LOCALITIES: Dakar and Rufisque, Senegal.

RANGE: Senegambia and Kenya Colony southward through the open country to Mozambique.

Rana tuberculosa (Günther)

Pyxicephalus rugosus Günther, 1864, Proc. Zoöl. Soc. London, p. 479, Pl. XXXIII, fig. 1.

Rana tuberculosa Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 30.

TYPE LOCALITY: Pungo Andongo, Angola.

RANGE: Angola.

Rana venusta Werner

Rana venusta Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1892, Pl. IV, fig. 11.

TYPE LOCALITIES: Mongalla, Lagos, and Entebbe, Victoria Nyanza.

RANGE: Known only from the above localities.

ROTHSCHILDIA

Mocquard, 1905, Bull. Mus. Hist. Nat., Paris, XI, p. 288

TYPE: *kounhiensis*

Rothschildia kounhiensis Mocquard

Rothschildia kounhiensis Mocquard, 1905, Bull. Mus. Hist. Nat., Paris, XI, p. 288.

TYPE LOCALITY: Ouardji, Valley of Kounhi, Abyssinia.
RANGE: Known only from the type locality.

SCHOUTEDENELLA

Witte, 1921, Rev. Zool. Africaine, IX, p. 18
TYPE: *globosa*

Schoutedenella globosa Witte

Schoutedenella globosa Witte, 1921, Rev. Zool. Africaine, IX, p. 18.
TYPE LOCALITY: Lofoï (Katanga), Belgian Congo.
RANGE: Known only from the type locality.

SCOTOBLEPS

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 438, Pl. XXVIII, fig. 1
TYPE: *gabonicus*

Scotobleps gabonicus Boulenger

Scotobleps gabonicus Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439, Pl. XXVIII, fig. 1.
TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Cameroon and Spanish Guinea.

Brevicipitidæ

ANHYDROPHRNYE

Hewitt, 1919, Rec. Albany Mus., III, p. 182, Pl. v, text fig.
TYPE: *rattrayi*

Anhydrophryne rattrayi Hewitt

Anhydrophryne rattrayi Hewitt, 1919, Rec. Albany Mus., III, p. 182, Pl. v, text fig.
TYPE LOCALITY: Hogsback, Amatola Range, Cape Colony.
RANGE: Known only from the type locality.

BREVICEPS

Merrem, 1820, 'Tent. Syst. Amph.,' p. 177
TYPE: *gibbosus*

Breviceps adspersus Peters

Breviceps adspersus Peters, 1882, 'Reise nach Mossambique,' III, p. 177. Boulenger, 1910, Ann. S. African Mus., V, p. 534.
TYPE LOCALITY: Damaraland and Transvaal.
RANGE: Southwest Africa, Colony, and Cape Transvaal.

Breviceps gibbosus (Linné)

Rana gibbosa Linné, 1758, 'Syst. Nat.,' 10th Ed., I, p. 211.
Breviceps gibbosus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 176.
TYPE LOCALITY: Indefinite.
RANGE: South Africa north to southern Angola and British Central Africa.

Breviceps macrops Boulenger

Breviceps macrops Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 46, fig. and Pl. II.

TYPE LOCALITY: Namaqualand.

RANGE: Namaqualand.

Breviceps mossambicus Peters

Breviceps mossambicus Peters, 1855, Arch. Naturg., XXI, part 1, p. 58. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 177.

TYPE LOCALITIES: Island of Mozambique and Sena.

RANGE: South Africa, north to Angola, Lake Moero, and northern Tanganyika Territory.

Breviceps verrucosus Rapp

Breviceps verrucosus Rapp, 1842, Arch. Naturg., VIII, part 1, p. 291, Pl. VI, fig. 5. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 177.

TYPE LOCALITY: Natal.

RANGE: South Africa, north on the east to Uganda.

CACOSTERNUM

Boulenger, 1887, Ann. Mag. Nat. Hist., (5) XX, p. 51

TYPE: *boettgeri*

Cacosternum boettgeri (Boulenger)

Arthroleptis boettgeri Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 118, Pl. XI, fig. 6.

Cacosternum nanum Boulenger, 1887, Ann. Mag. Nat. Hist., (5) XX, p. 52.

Cacosternum boettgeri Boulenger, 1896, (7) XVII, p. 321.

TYPE LOCALITY: Vleis, Kaffraria.

RANGE: Southwest Africa and South Africa, north to Kenya Colony.

CALLULINA

Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 449

TYPE: *kreffti*

Callulina kreffti Nieden

Callulina kreffti Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 449.

TYPE LOCALITIES: Amani and Tanga, Tanganyika Territory.

RANGE: Known only from the type localities.

DIDYNAMIPUS

Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 143

TYPE: *sjöstedti*

Didynamipus sjöstedti Andersson

Didynamipus sjöstedti Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 143; 1905, Ark. Zool., Stockholm, II, No. 20, p. 24, Pl. I, figs. 3, 3*a-d*.

TYPE LOCALITY: Cameroon.

RANGE: Cameroon.

Hemisus

Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 47
Type: *guttatum*

Hemisus guttatum (Rapp)

Engystoma guttatum Rapp, 1842, Arch. Naturg., VIII, part 1, p. 290, Pl. VI, figs. 3 and 4.

Hemisus guttatum Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 47. Boulenger, 1910, Ann. S. African Mus., V, p. 535.

Type Locality: Natal.

Range: South Africa north to southern Angola and Zululand.

Hemisus marmoratum (Peters)

Engystoma marmoratum Peters, 1855, Arch. Naturg., XXI, part 1, p. 58.

Hemisus marmoratus Peters, 1882, 'Reise nach Mossambique,' III, p. 173, Pl. XXV, fig. 1; Pl. XXVI, figs. 10, 10*a*, and 10*b*.

Hemisus marmoratum Boulenger, 1910, Ann. S. African Mus., V, p. 535.

Type Locality: Cabaçeira, Portuguese East Africa.

Range: Gambia and Egypt, south to southern Rhodesia; practically absent from the forest, but occurring to the north and south of it.

Phrynomantis

Peters, 1867, Monatsber. Akad. Wiss. Berlin, p. 35
Type: *fusca*

Phrynomantis affinis Boulenger

Phrynomantis affinis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 6, Pl. II, figs. 5-5*d*.

Type Locality: Pweto, Lake Moero.

Range: Known only from the type locality.

Phrynomantis annectens Werner

Phrynomantis annectens Werner, 1910, in Schultze, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 294. Hewitt, 1911, Ann. Transvaal Mus., III, part 1, p. 54.

Type Locality: Aar River, Cape Colony.

Range: Known only from the type locality.

Phrynomantis bifasciata (Smith)

Brachymerus bifasciatus Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXIII.

Phrynomantis bifasciata Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 172.

Type Locality: "Country to the east and northeast of the Cape Colony."

Range: South Africa northward to Angola in the west, to northern Kenya Colony in the east.

Phrynomantis microps Peters

Phrynomantis microps Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 210, Pl. III, fig. 6. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 173.

TYPE LOCALITY: Accra, Gold Coast.

RANGE: Gold Coast eastward through the Sudan, possibly reaching Tanganyika Territory.

Phrynomantis nasuta Methuen and Hewitt

Phrynomantis nasuta Methuen and Hewitt, 1914, Ann. Transvaal Mus., IV, p. 122.

TYPE LOCALITY: Kraiklooft, Southwest Africa.

RANGE: Known only from the type locality.

PLATES XXIII TO XLII

PLATE XXIII

Hymenochirus curtipes, new species, type.

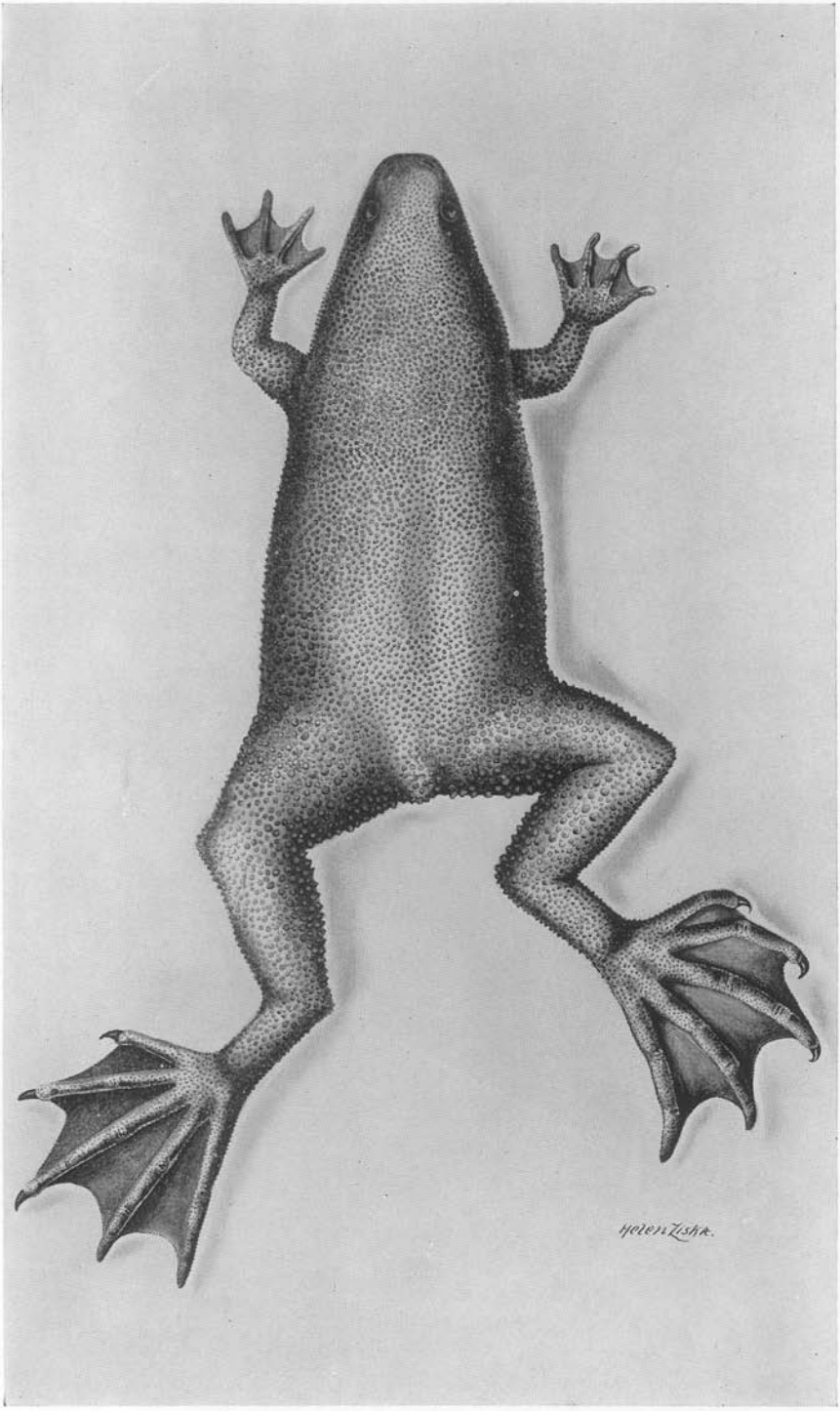
Helen Fisher.

Plate XXIV

Xenopus mülleri (Peters), larvæ, ventral aspect. Two stages in development of ribs. Larva in Fig. 1, 57 mm. in total length, in Fig. 2, 67 mm.

a, ribs; *b*, notochord (the hypochordal cartilage is not visible); *c*, coccyx; d, connective tissue capsule for anterior lobe of lung; *e*, sacral diapophyses.

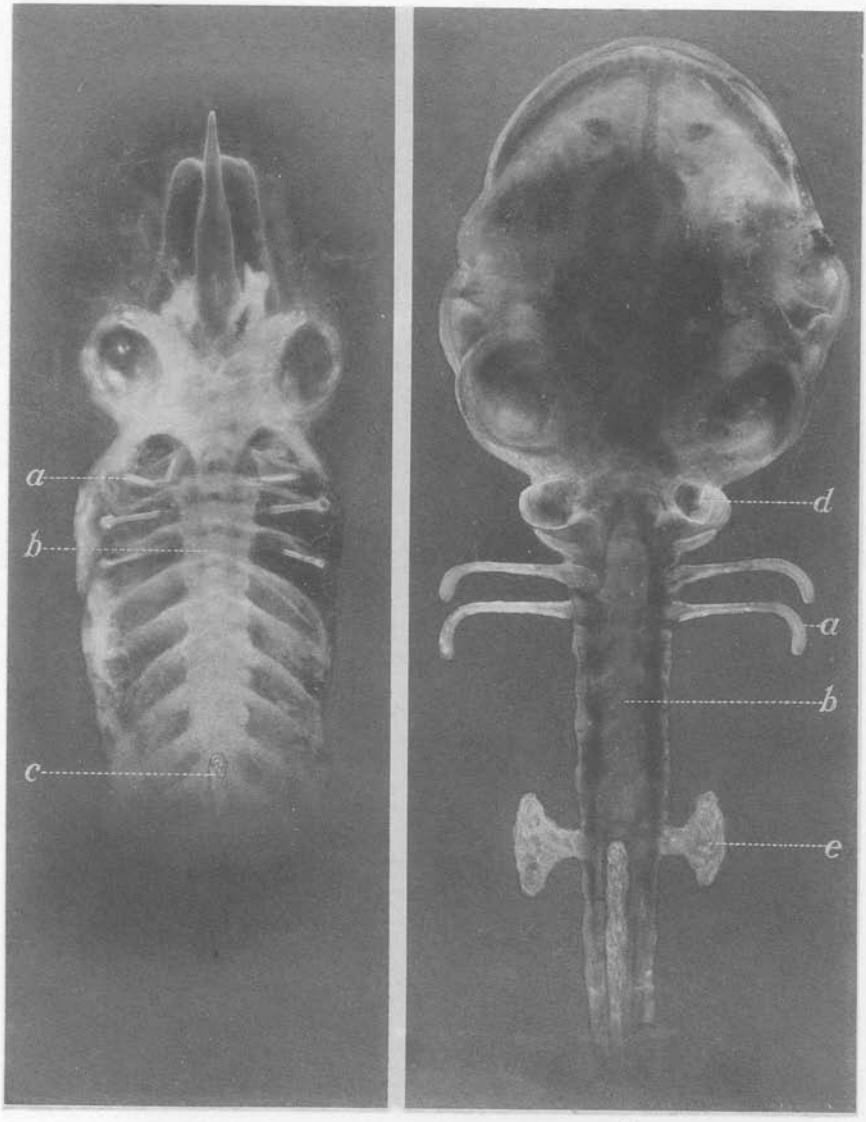

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PLATE XXV

Fig. 1. *Nectophryne afra* Buchholz and Peters (dead specimen). Fig. 2. *Bufo superciliaris* Boulenger.

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Plate XXVI

Fig. 1. *Kassina senegalensis* (Duméril and Bibron), digit showing T-shaped terminal phalanx and intercalary bone. Fig. 2. *Rana christyi* Boulenger, third and fourth digits of foot, the former with exposed terminal phalanx in its capsule of connective tissue. Fig. 3. *Nectophryne guentheri* Boulenger, terminal phalanx. Fig. 4. *Nectophryne afra* Buchholz and Peters, left hand, ventral aspect, showing both the form of the terminal phalanges and extent of the digital lamellæ.

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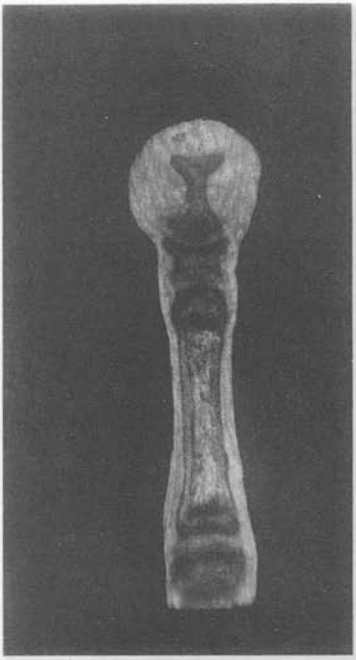

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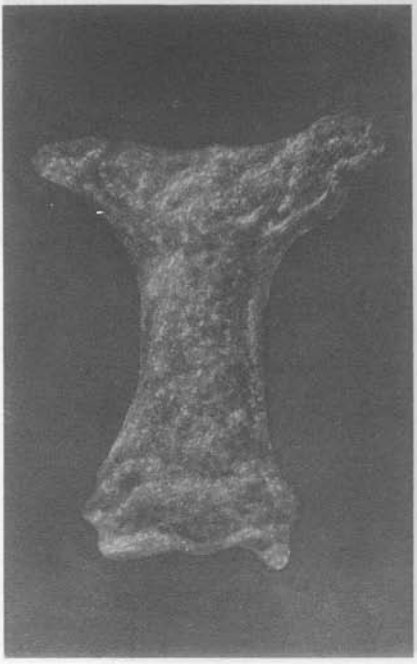
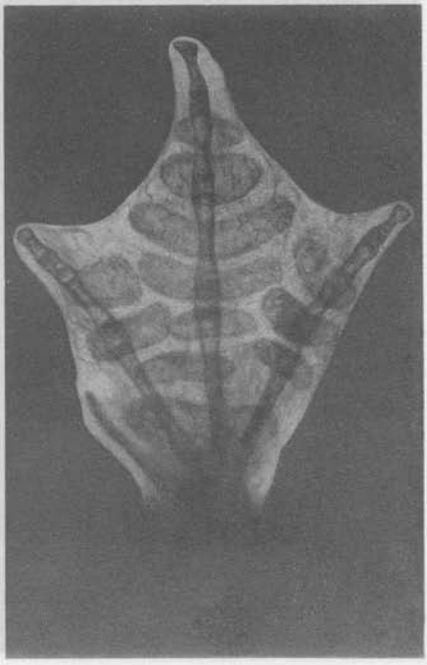




4

PLATE XXVII

Bufo regularis Reuss. Fig. 1, ♂; Fig. 2, ♀.

1

2

PLATE XXVIII

Fig. 1. *Bufo funereus* Bocage.

Fig. 2. *Bufo polycercus* Werner.

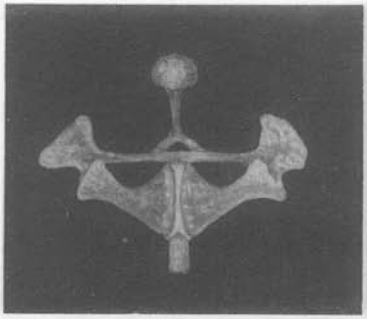
1

2

Plate XXIX

Ventral Aspect of Pectoral Girdles.

Fig. 1. *Arthroleptis wahlbergi* Smith.
Fig. 2. *Arthroleptis batesii* Boulenger.
Fig. 3. *Arthroleptis feæ* Boulenger.
Fig. 4. *Phrynobatrachus perpalmatus* (Boulenger).
Fig. 5. *Arthroleptis variabilis* Matschie.
Fig. 6. *Phrynobatrachus dendrobates* (Boulenger).
Fig. 7. *Arthroleptis xenodactylus* Boulenger.
Fig. 8. *Phrynobatrachus bonebergi* (Hewitt and Methuen).



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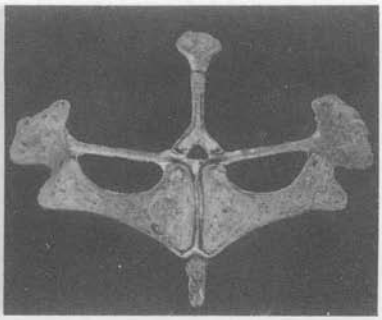

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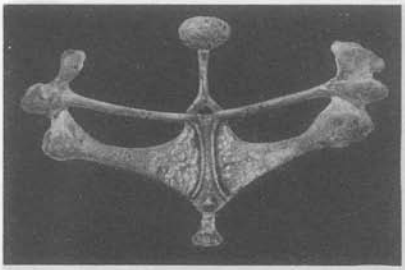

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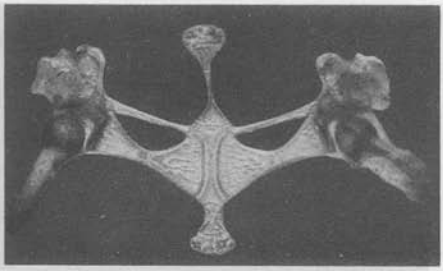

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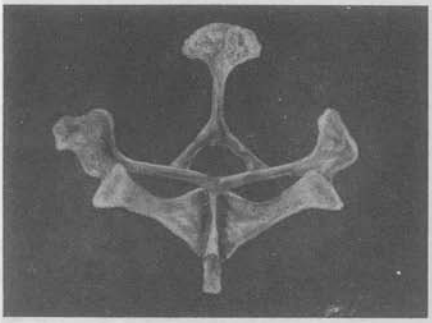

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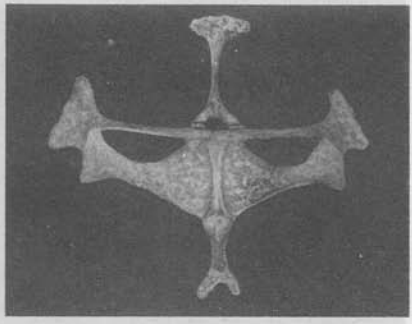

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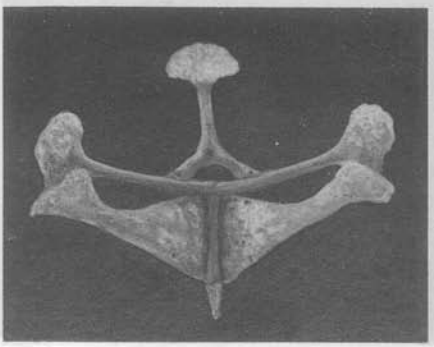

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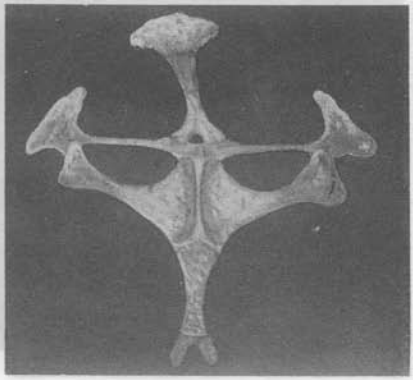


8

PLATE XXX

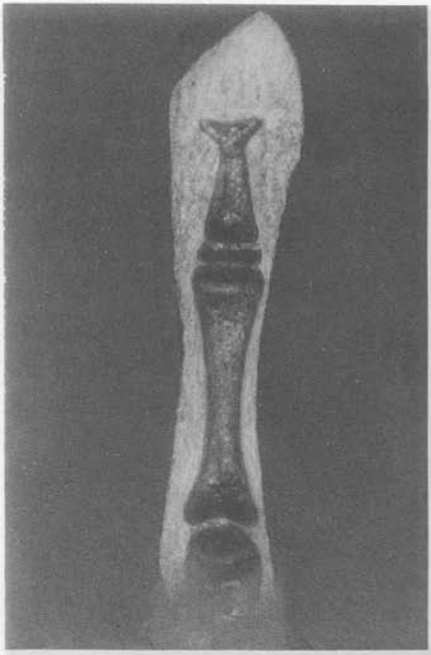
Fig. 1. *Arthroleptis variabilis* Matschie, maximum expansion of terminal phalanx.

Fig. 2. *Phrynobatrachus perpalmatus* (Boulenger), maximum expansion of terminal phalanx.

Fig. 3. *Arthroleptis variabilis* Matschie, left hand, dorsal aspect.

Fig. 4. *Phrynobatrachus dendrobates* (Boulenger), left hand, dorsal aspect.

1



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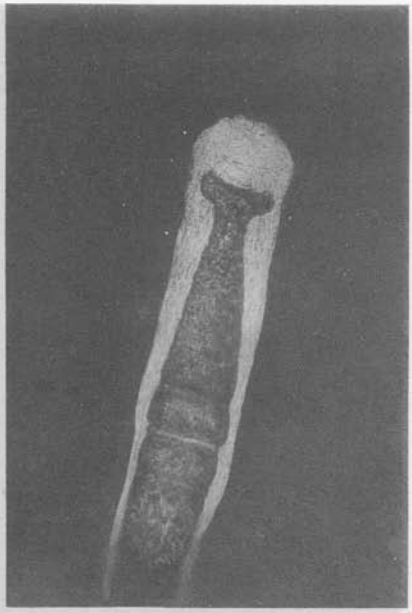

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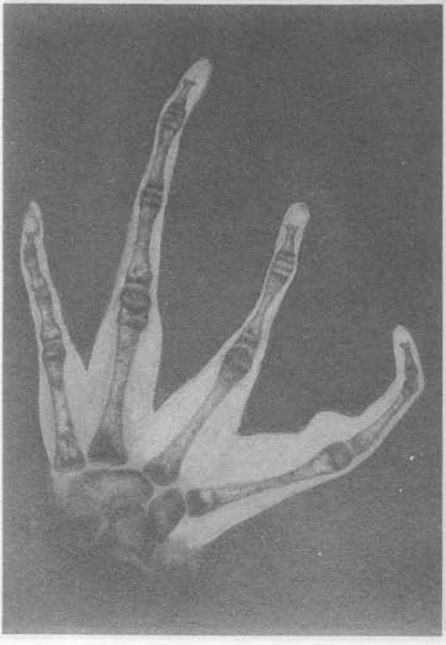

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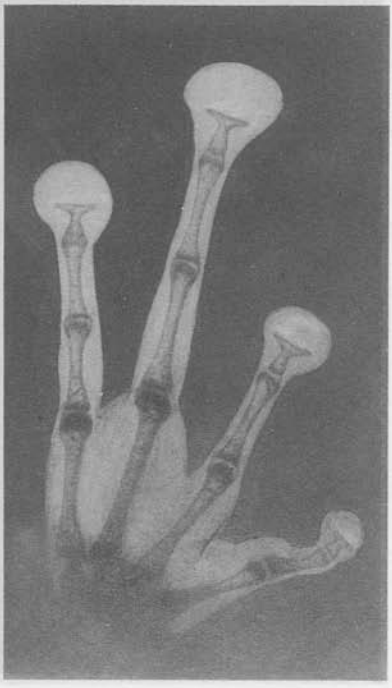
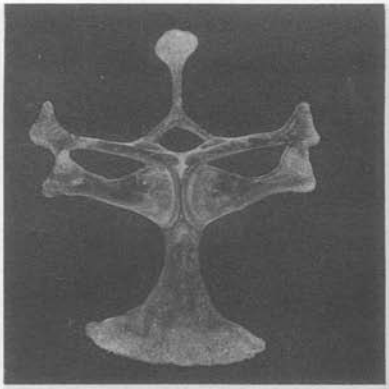


Plate XXXI

Ventral Aspect of Pectoral Girdles.

Fig. 1. *Hylambates verrucosus* Boulenger.
Fig. 2. *Hylambates greshoffi* Schilthuis.
Fig. 3. *Leptopelis calcaratus* (Boulenger).
Fig. 4. *Leptopelis anchietæ* (Bocage).
Fig. 5. *Leptopelis aubryi* (Werner).
Fig. 6. *Leptopelis brevirostris* (A. Duméril).



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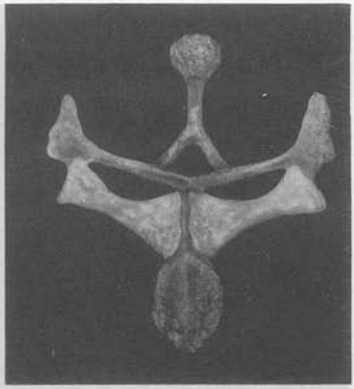

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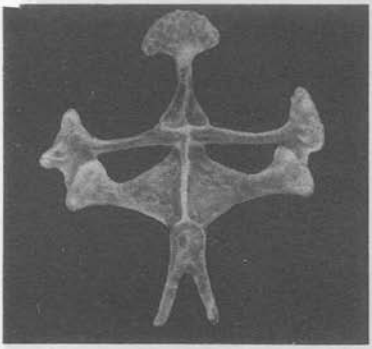

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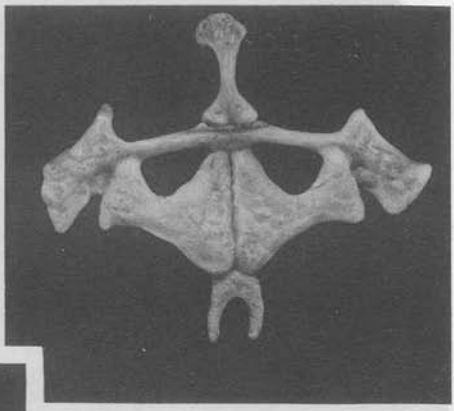

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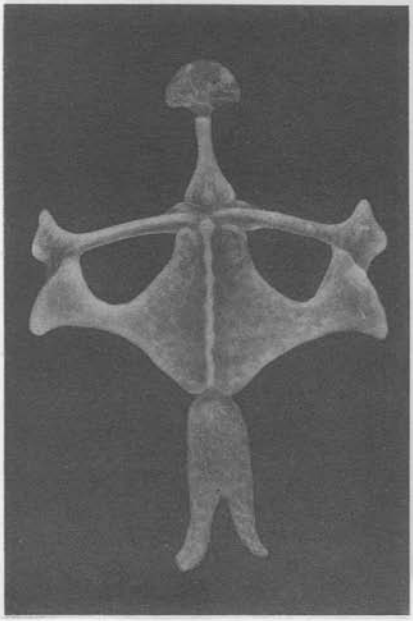

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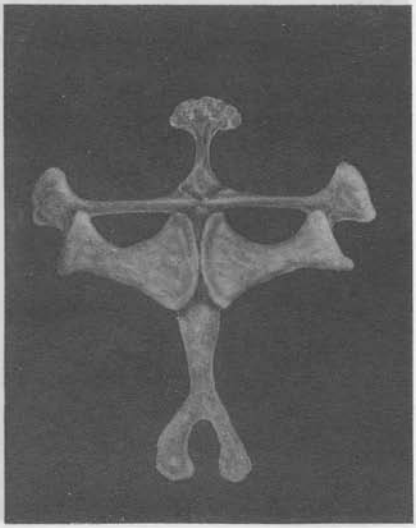


6

PLATE XXXII

Fig. 1. *Arthroleptis variabilis* Matschie.

Fig. 2. *Cardioglossa leucomystax* (Boulenger).

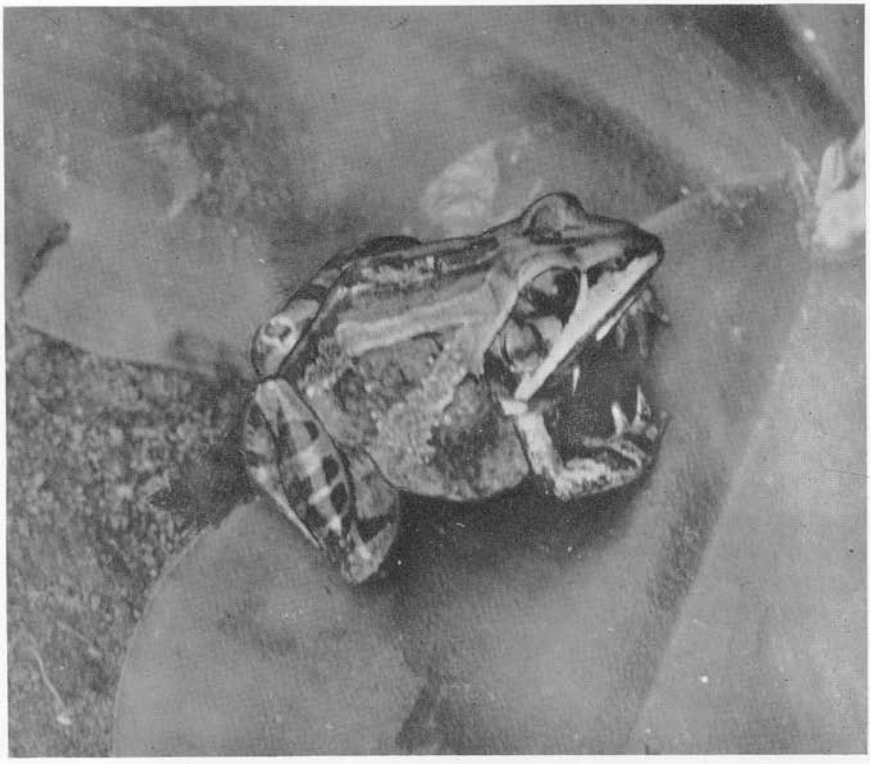
1

2

PLATE XXXIII

Fig. 1. *Phrynobatrachus natalensis* (A. Smith).
Fig. 2. *Rana ornatissima* Bocage.

2



1

PLATE XXXIV

Fig. 1. *Rana albolabris* Hallowell.

Fig. 2. *Rana occipitalis* Günther.

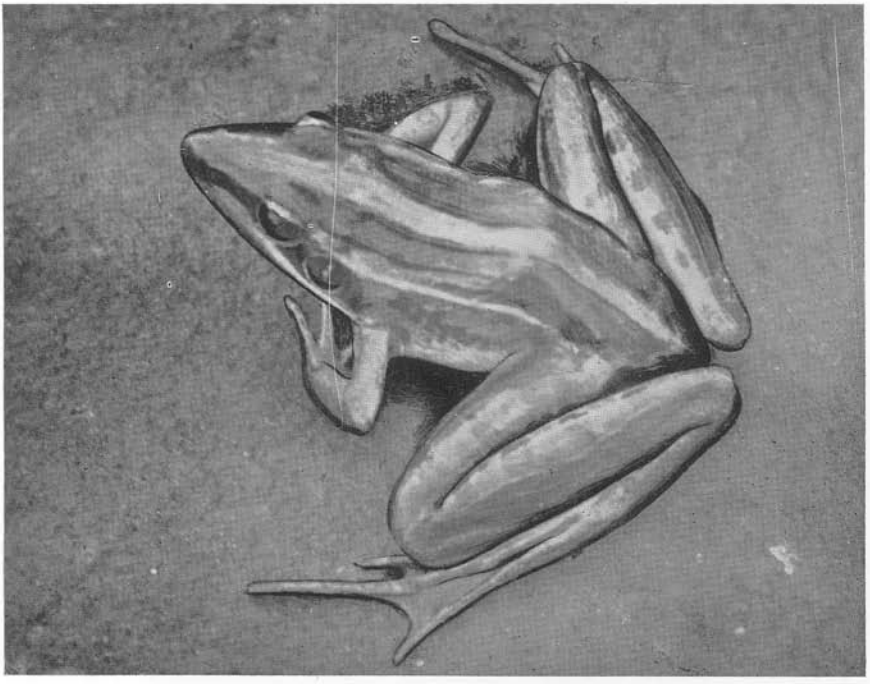
1

2

PLATE XXXV

Fig. 1. *Rana christyi* Boulenger.
Fig. 2. *Rana oxyrhynchus* A. Smith.

1



2

PLATE XXXVI

Fig. 1. *Chiromantis rufescens* (Günther).

Fig. 2. Two types of "nest" of *C. rufescens* (Günther); the first on the trunk of a tree, and the second on low hanging leaves.

1

2

PLATE XXXVII

Leptopelis rufus Reichenow, showing both complete and incomplete patterns.

1

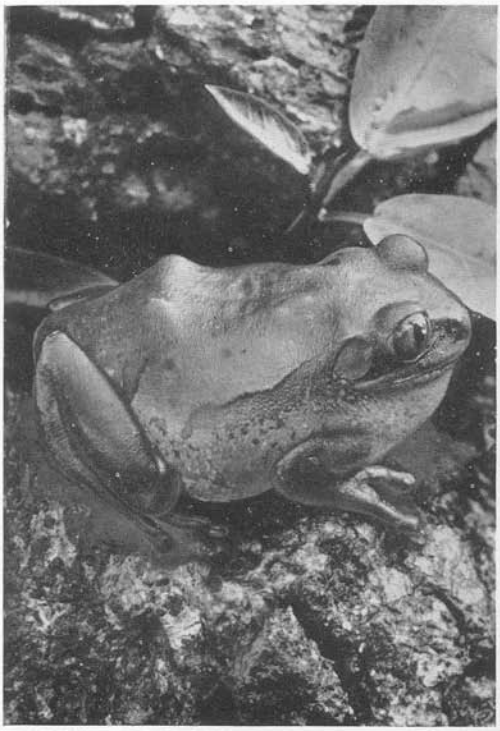
2

3

PLATE XXXVIII

Fig. 1. *Leptopelis aubryi* (Werner).
Fig. 2. *Leptopelis anchietæ* (Bocage).
Fig. 3. *Hylambates verrucosus* Boulenger.

1



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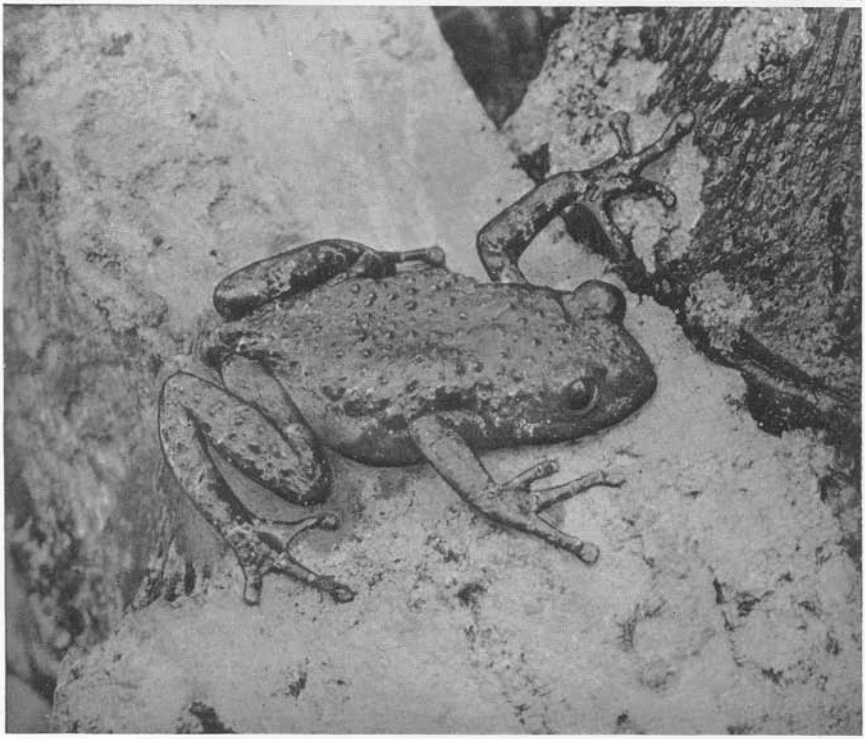
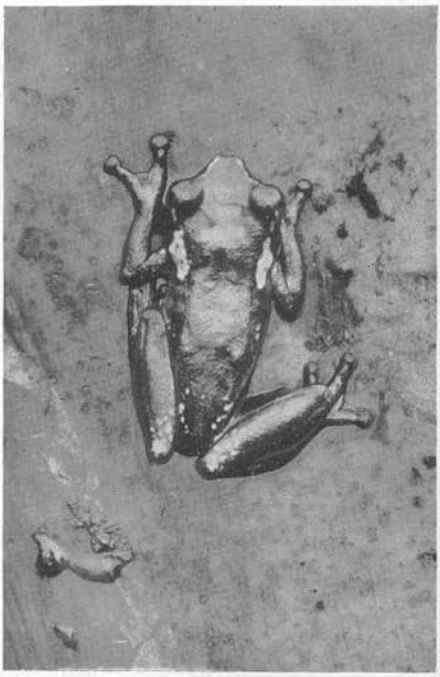


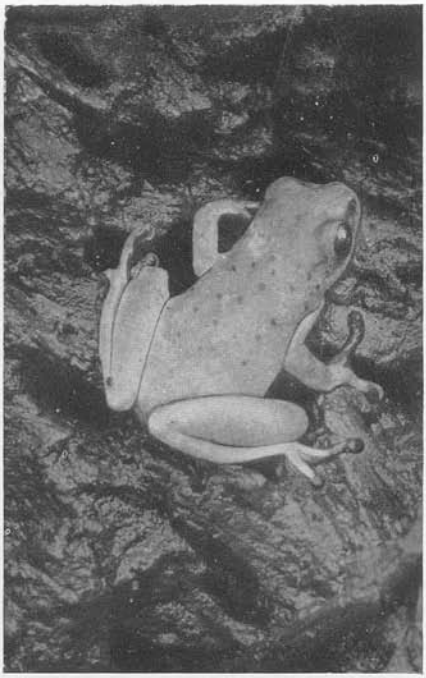
3

Plate XXXIX

Fig. 1. *Hyperolius langi*, new species.
Fig. 2. *Hyperolius ocellatus* Günther.
Fig. 3. *Hyperolius concolor* (Hallowell).

1





2

3

PLATE XL

Fig. 1. *Hyperolius pleurotænius* (Boulenger).
Fig. 2. *Hyperolius acutirostris* Buchholz and Peters.
Fig. 3. *Hyperolius picturatus* Peters.

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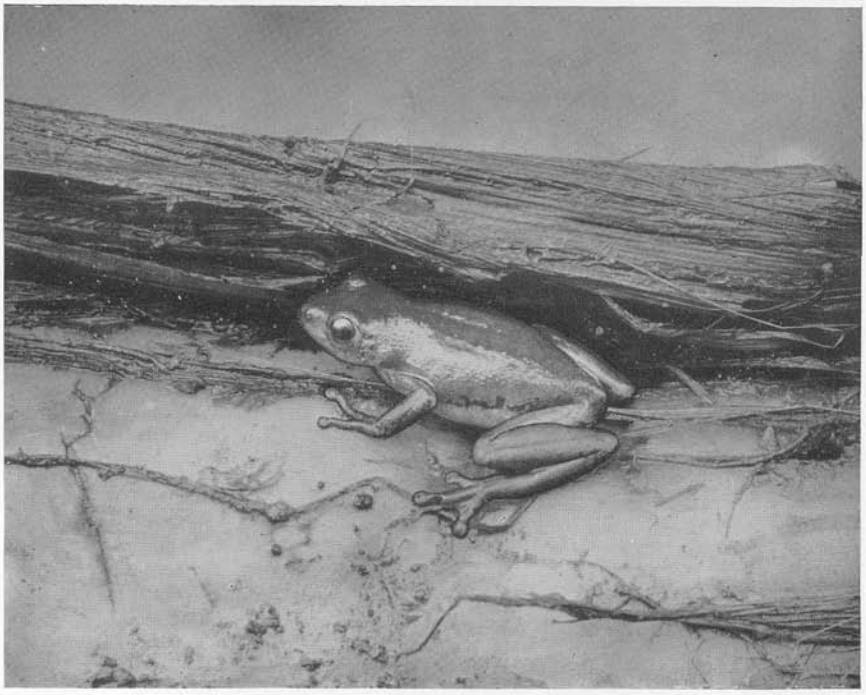
2

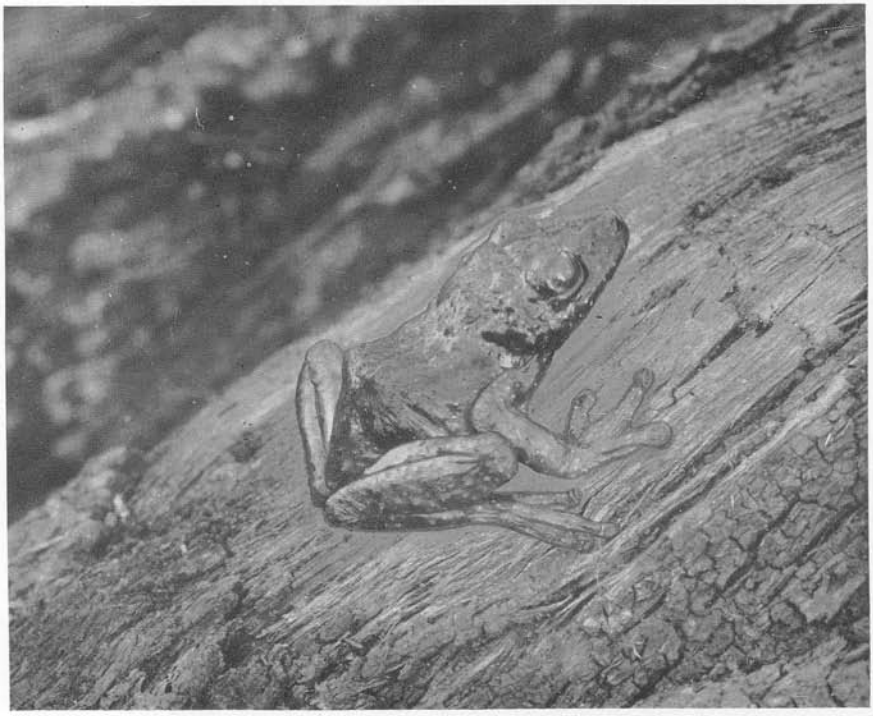


3

PLATE XLI

Fig. 1. *Megalixalus fornasinii* (Bianconi).
Fig. 2. *Megalixalus spinosus* (Buchholz and Peters).

1



2

PLATE XLII

Hemisus marmoratum (Peters).

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2