

---

*Herpetological Results of the Vernay Angola Expedition*

BY C. M. BOGERT

---

BULLETIN  
OF  
THE AMERICAN MUSEUM OF NATURAL HISTORY

VOL. LXXVII, ART. I, pp. 1-107

*New York*

*Issued June 3, 1940*

---





BULLETIN  
OF  
THE AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME LXXVII, 1940

Article I.—HERPETOLOGICAL RESULTS OF THE VERNAY ANGOLA  
EXPEDITION

WITH NOTES ON AFRICAN REPTILES IN OTHER COLLECTIONS

PART I.—SNAKES, INCLUDING AN ARRANGEMENT OF AFRICAN COLUBRIDAE

BY C. M. BOGERT

PLATE I; TEXT FIGURES 1 TO 18

CONTENTS

	PAGE
INTRODUCTION .....	3
Material and Sources .....	3
Acknowledgments .....	4
Localities from Which Specimens Are Recorded .....	4
List of New Forms with Their Type Localities .....	5
Summary of Taxonomic Conclusions .....	5
Method Adopted in Systematic Account .....	6
General Conclusions .....	7
Tentative Arrangement of African Colubridae .....	11
SQUAMATA .....	13
SERPENTES .....	13
Leptotyphlopidae .....	13
<i>Leptotyphlops</i> Fitzinger .....	13
Typhlopidae .....	14
<i>Typhlops</i> Schneider .....	14
Boidae .....	17
Pythoninae .....	17
<i>Python</i> Daudin .....	17
<i>Calabaria</i> Gray .....	18
Colubridae .....	18
Colubrinae .....	18
<i>Ablabophis</i> Boulenger .....	18
<i>Lamprophis</i> Fitzinger .....	19
<i>Bothrophthalmus</i> Peters .....	20
<i>Boaedon</i> Duméril and Bibron .....	21
<i>Pseudoboodon</i> Peracca .....	25
<i>Hormonotus</i> Hallowell .....	26
<i>Mehelya</i> Csiki .....	26
<i>Lycophidion</i> Duméril and Bibron .....	30
<i>Oophilositum</i> Parker .....	31
<i>Natrix</i> Laurenti .....	32
<i>Neusterophis</i> Günther .....	33
<i>Limnophis</i> Günther .....	36
<i>Geodipsas</i> Boulenger .....	38
<i>Duberria</i> Fitzinger .....	39

<i>Grayia</i> Günther.....	40
<i>Pseudaspis</i> Fitzinger.....	42
<i>Aparallactus</i> Smith.....	43
<i>Miodon</i> Duméril.....	45
<i>Meizodon</i> Fischer.....	46
<i>Chlorophis</i> Hallowell.....	51
<i>Philothammus</i> Smith.....	56
<i>Hapsidophrys</i> Fischer.....	57
<i>Gastropyxis</i> Cope.....	58
<i>Thrasops</i> Hallowell.....	58
<i>Prosymna</i> Gray.....	59
<i>Boiga</i> Fitzinger.....	60
<i>Crotaphopeltis</i> Fitzinger.....	62
<i>Dipsadoboa</i> Günther.....	63
<i>Tarbophis</i> Fleischmann.....	66
<i>Dispholidus</i> Duvernoy.....	68
<i>Thelotornis</i> Smith.....	69
<i>Hemirhagerrhis</i> Boettger.....	73
<i>Cerastes</i> Laurenti.....	77
<i>Dromophis</i> Peters.....	79
<i>Psammophis</i> Boie.....	79
<i>Rhamphiophis</i> Peters.....	83
<i>Macrelaps</i> Boulenger.....	84
Dasypeltinae.....	85
<i>Dasypeltis</i> Wagler.....	85
Elapidae.....	86
Elapinae.....	86
<i>Elapsoidea</i> Bocage.....	86
<i>Hemachatus</i> Fleming.....	87
<i>Naja</i> Laurenti.....	87
<i>Dendroaspis</i> Schlegel.....	91
<i>Aspidelaps</i> Smith.....	92
Viperidae.....	96
Viperinae.....	96
<i>Causus</i> Wagler.....	96
<i>Bitis</i> Gray.....	99
<i>Echis</i> Merrem.....	102
<i>Atheris</i> Cope.....	103
<i>Atractaspis</i> Smith.....	106



## INTRODUCTION

## MATERIAL AND SOURCES

Primarily, the present report was intended to cover the results of the Vernay Angola Expedition of 1925. However, immediately prior to, as well as since 1925, several other smaller collections have been received by the Department of Herpetology at the American Museum. A preliminary survey of this material revealed the desirability of reporting the results of these various collections in a single treatise. Such a procedure permitted comparisons of specimens from various localities, frequently providing data from which more satisfactory conclusions could be drawn.

Accordingly, this report covers the snakes received from fifteen individual sources, not including a specimen lent by the Field Museum of Natural History, and described herein as a new species. The total number of specimens is 549, distributed among six families, fifty-two genera and one hundred sixteen species and subspecies, six of which are described as new or hitherto unrecognized forms. Arranged in the order of their importance, expeditions and individual collectors have assembled these rather extensive collections of snakes as follows:

Of paramount importance is the material received from the Vernay Angola Expedition of 1925. This collection includes 202 specimens representing 39 forms, most of which were secured in southern Angola by Mr. Arthur S. Vernay, Mr. Herbert Lang and Mr. Rudyerd Boulton. However, after the expedition returned from Angola, Mr. Lang traveled southward, collecting a few specimens in Southwest Africa, Cape Province, Orange Free State and Natal, which have been included under the results of the expedition. Three of the forms taken in Angola are herein described as new.

Second in importance is the collection made by Mr. and Mrs. Rudyerd Boulton while they were attached to the Straus Central African Expedition of 1929. This includes 103 specimens, one of them representing a new subspecies; the remainder

are distributed among twenty-three species and subspecies taken in Tanganyika Territory, Nyasaland and Southern Rhodesia. The collection includes the third recorded specimen of *Ablabophis whytii*, heretofore not known from Tanganyika Territory.

Dr. James P. Chapin and the late Mr. Franklin Edson of the Chapin Congo Expedition of 1929-1931 secured no less than thirty-four species and subspecies represented among 64 specimens. Nearly all of these were taken at Lukolela and they are of especial importance in the determination of the relationships of the vast herpetological faunae of the Congo and the Cameroon regions. This collection was assembled largely through the efforts of Dr. James P. Chapin, whose excellent notes on the coloration of the live snakes are frequently quoted. Of similar importance is a collection of 56 specimens which includes 22 species taken at Metet, French Cameroon, by Mr. Finley McC. Grissett.

Despite the fact that an American herpetologist, Dr. Edward Hallowell, made some of the earliest investigations in Liberia, comparatively little material from the region is represented in museums in the United States. Therefore, a collection made by Dr. George W. Harley at Ganta is especially useful since it is fairly representative of the ophidian population of the region. The Harley collection includes 47 specimens and thirteen species.

Mr. F. G. Carnochan collected in Tanganyika Territory and Uganda Protectorate in 1927, in 1929 and again in 1934-1935, securing 23 specimens including representatives of 14 species which he generously donated to the American Museum. In 1926 and 1927 Dr. James P. Chapin, Mr. Frank P. Mathews and Mr. DeWitt L. Sage of the Ruwenzori-Kivu Expedition spent some time in Kenya Colony, eastern Belgian Congo, Uganda and Tanganyika Territory and returned with fifteen snakes including eleven species, one of which was the rare "red phase" of the cobra, *Naja nigricollis*.

Smaller collections include: fourteen snakes taken in Natal by Mr. D. Coghill in 1933, six (including a new species of *Tarbophis*) taken in Ethiopia and Somaliland Protectorate by Dr. Barnum Brown in 1919-1920 and 1925, six taken by the Trubee Davison-Martin Johnson Safari in Kenya Colony and Tanganyika Territory in 1933, four secured in the Sudan by Dr. H. E. Anthony on the Taylor Sudan Expedition of 1929, three collected by Mr. Henry C. Raven in French Cameroon while he was with the American Museum-Columbia Anatomical Expedition of 1929, two brought back from Ethiopia by Mr. T. Donald Carter of the Sanford-Legendre Expedition of 1929, and three from St. Thomas Island in the Gulf of Guinea collected by Mr. J. G. Correia, and transmitted to the American Museum by the Rockefeller-Murphy Tanganyika Expedition.

It should be borne in mind that in most cases, as would be expected, each collection mentioned includes many more lizards than snakes. The lizards, crocodylians and turtles will provide the basis for a second report.

#### ACKNOWLEDGMENTS<sup>1</sup>

In the preparation of this report several persons and institutions have rendered invaluable assistance. Dr. Thomas Barbour and Mr. Arthur Loveridge, of the Museum of Comparative Zoology, and Mr. K. P. Schmidt, of the Field Museum of Natural History, have generously lent material in their charge. Mr. H. W. Parker, of the British Museum (Natural History), has kindly supplied much useful information and has lent valuable specimens for comparisons. Dr. James P. Chapin, Dr. H. E. Anthony, Mr. Donald Carter, Mr. Henry C. Raven, Dr. Raymond B. Cowles and particularly Mr. Rudyerd Boulton have supplied material assistance in plotting obscure localities. Miss Marion Brand and Mr. R. P. Thompson, artists provided by the Works Progress Administration,

have been tireless in their accurate preparation of the drawings reproduced as text figures. Mr. Herbert Lang secured the photographs reproduced in the plate while he was in the field with the Vernay Angola Expedition.

For advice and suggestions I am indebted to Dr. G. K. Noble, Mr. K. P. Schmidt, Mr. Arthur Loveridge, Mr. Clifford H. Pope, Dr. Libbie Hyman and Dr. Harvey Bassler. For their critical reading of the manuscript I am most grateful to Dr. G. K. Noble and to Mr. K. P. Schmidt. To these and to others who have furthered the prosecution of this work I wish to render my thanks.

#### LOCALITIES FROM WHICH SPECIMENS ARE RECORDED

##### With Approximate Latitude and Longitude

##### ANGLO EGYPTIAN SUDAN

Akona.—11° 29' N., 32° 45' E.

Lake No.—9° 39' N., 30° 35' E.

Red Sea Hills.—18° 15' N., 37° 45' E.

##### ANGOLA

Capelongo.—14° 55' S., 15° 5' E.

Chitau.—11° 15' S., 17° 10' E.

Hanha.—12° 15' S., 13° 45' E.

Huambo.—12° 50' S., 15° 40' E.

Lobito Bay.—12° 20' S., 13° 35' E.

Mombolo.—12° 10' S., 14° 50' E.

Munhino.—14° 55' S., 13° 0' E.

##### BELGIAN CONGO

Beni.—0° 20' N., 29° 40' E.

Fataki.—0° 40' N., 29° 40' E.

Irumu.—1° 20' N., 30° 0' E.

Lukolela.—1° 10' S., 17° 10' E.

Luluabourg.—5° 57' S., 22° 30' E.

Ruchuru (Rutshuru).—1° 15' S., 29° 30' E.

Uvira.—3° 25' S., 29° 10' E.

##### BELGIAN RUANDA-URUNDI

Escarpment below Bihunga (Bihungi).—Bihunga is in Uganda on the eastern slope of the Ruwenzori Mountains. (Mt. Ruwenzori.—0° 30' N., 29° 50' E.)

BRITISH SOMALILAND.—See Somaliland Protectorate.

##### CAPE PROVINCE

Cape Town.—33° 58' S., 18° 28' E.

George.—33° 55' S., 22° 19' E.

ETHIOPIA (Included on some recent maps as part of "Italian East Africa")

Addis Ababa.—9° 4' N., 38° 50' E.

Albasso Plateau, Arusi Province.—7° 30' N., 39° 15' E.

Ganamé.—9° 7' N., 39° 20' E.

Grau.—9° 8' N., 39° 30' E.

Harar.—9° 15' N., 42° 10' E.

Jig-Jiga.—9° 20' N., 42° 50' E.

<sup>1</sup> Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Project No. 465-97-3-67.



- Mojo.—8° 35' N., 39° 5' E.  
 Sheik Hussein.—7° 38' N., 40° 43' E.
- FRENCH CAMEROON  
 Djaposten.—2° 30' N., 12° 30' E.  
 Metet (Metit).—3° 45' N., 11° 35' E.
- FRENCH CONGO  
 Kassa.—1° 10' S., 17° 10' E. (North, immediately across the Congo River from Lukolela, Belgian Congo)
- KENYA COLONY  
 Chogoria.—0° 15' S., 37° 15' E. (At the east base of Mt. Kenya)  
 Garissa.—0° 30' S., 39° 45' E.  
 Sankuri.—0° 10' S., 39° 35' E.  
 Tana River.—0° 40' S., 39° 0' E.  
 Tsavo.—3° 0' S., 38° 29' E.
- LIBERIA  
 Ganta.—7° 14' N., 8° 58' E.
- NATAL  
 Drakensberg National Park.—29° 0' S., 29° 0' E.  
 Merebank (A suburb of Durban).—29° 50' S., 31° 0' E.  
 Tugela River (Big Tugela Valley).—28° 35' S., 30° 0' E.
- NYASALAND  
 Fort Johnson.—14° 30' S., 35° 15' E.  
 Karonga.—9° 55' S., 33° 55' E.
- Mlanje.—16° 0' S., 35° 35' E.  
 Mzimba.—11° 50' S., 33° 35' E.
- ORANGE FREE STATE  
 Kroonstad.—27° 28' S., 27° 20' E.
- SOMALILAND PROTECTORATE  
 Hargeisa.—9° 30' N., 44° 0' E.
- SOUTHERN RHODESIA  
 Mount Selinda.—20° 25' S., 32° 40' E
- SOUTHWEST AFRICA  
 Lüderitz Bay.—26° 40' S., 15° 10' E.  
 Pomona Island.—27° 10' S., 15° 20' E.
- ST. THOMAS ISLAND (SAO THOMÉ)  
 In the Gulf of Guinea about 175 miles west of French Equatorial Africa.—0° 20' N., 6° 45' E.
- SUDAN.—See Anglo Egyptian Sudan.
- TANGANYIKA TERRITORY (GERMAN EAST AFRICA)  
 Kizumbe.—50° 9' S., 32° 50' E.  
 Mawere Shamba.—5° 9' S., 32° 50' E.  
 Mwaya.—9° 34' S., 35° 50' E.  
 Rungwe Mountains.—9° 6' S., 33° 44' E.  
 Tabora.—5° 10' S., 32° 50' E.  
 Tindi (Tinde).—11° 27' S., 34° 6' E.  
 Tukuyu.—9° 18' S., 33° 42' E.
- UGANDA  
 Fort Portal.—0° 20' N., 32° 25' E.  
 Kampala.—0° 20' N., 32° 25' E.  
 Mulu.—0° 5' N., 30° 10' E.

## LIST OF NEW FORMS WITH THEIR TYPE LOCALITIES

<i>Mehelya vernayi</i> .....	Hanha, Angola.....	p. 28
<i>Meizodon loveridgei</i> .....	Sheik Hussein, Ethiopia.....	p. 49
<i>Tarbophis barnumbrowni</i> .....	Jig-Jiga, Ethiopia.....	p. 66
<i>Naja nigricollis nigricinctus</i> .....	Munhino, Angola.....	p. 89
<i>Aspidelaps lubricus cowlesi</i> .....	Munhino, Angola.....	p. 94
<i>Atheris nitschei rungweensis</i> .....	Rungwe Mts., Tanganyika Territory.....	p. 104

## SUMMARY OF TAXONOMIC CONCLUSIONS

The attempt to examine the maxillary dentition and the hemipeneal characters of all African colubrid genera represented in collections in the United States has provided data necessitating several changes in generic status. New material, or a summary of the data in the literature, has likewise required changes in the status of several species and subspecies. Nomenclatorial changes involved in the preparation of this report are summarized below:

The following genera have been removed from their respective synonymies:

*Neusterophis* Günther from *Natrix* Laurenti  
*Limnophis* Günther from *Helicops* Wagler  
*Meizodon* Fischer from *Coronella* Laurenti

The genera listed below are considered to be straight synonyms:

*Elapops* Günther = *Aparallactus* Smith  
*Cynodontophis* Werner = *Miodon* Duméril  
*Dipsoglyphophis* Barbour and Amaral =  
*Dipsadoboa* Günther

The species, *nototaenia*, has been removed from the genus *Amplorhinus* Smith (now monotypic, to include *multimaculatus*) and added to the genus *Hemirhagerrhis* Boettger. *Coronella semiornata fuscrosea* Loveridge has been placed as a species of *Coluber*. These changes and the generic changes listed above require alterations in the current names of species as follows:

*Natrix laevissima* Günther =  
*Neusterophis laevissimus* (Günther)  
*Natrix olivacea* (Peters) =  
*Neusterophis olivaceus* (Peters)  
*Natrix fuliginoides* (Günther) =  
*Neusterophis fuliginoides* (Günther)

*Helicops bicolor* (Günther) =  
*Limnophis bicolor* Günther  
*Elapops modestus* Günther =  
*Aparallactus modestus* (Günther)  
*Coronella coronata* (Schlegel) =  
*Meizodon coronatus* (Schlegel)  
*Coronella semiornata* (Peters) =  
*Meizodon semiornatus* (Peters)  
*Dipsoglyphophis duchesnii* (Boulenger) =  
*Dipsadoboa duchesnii* (Boulenger)  
*Amplorhinus nototaenia* (Günther) =  
*Hemirhagerrhis nototaenia* (Günther)

In addition to the changes occasioned by shifts in generic name, the following are considered to be straight synonyms:

*Typhlops vanderysti* Witte =  
*Typhlops stejnegeri* Loveridge  
*Coronella semiornata fuscurosea* Loveridge =  
*Coluber smithi* (Boulenger)  
*Cynodontophis werneri* Müller =  
*Miodon gabonensis* (Duméril)  
*Microsoma collare* Peters =  
*Miodon gabonensis* (Duméril)  
*Philothamnus neglectus* Peters =  
*Chlorophis hoplogaster* (Günther)  
*Chlorophis vernayi* FitzSimons =  
*Chlorophis irregularis* (Leach)  
*Leptodeira guineensis* Chabanaud =  
*Dipsadoboa duchesnii* (Boulenger)  
*Tarbophis guidimakaensis* Chabanaud =  
*Tarbophis obtusus* (Reuss)  
*Amplorhinus guntheri* Mocquard =  
*Hemirhagerrhis n. nototaenia* (Günther)  
*Atheris laeviceps* Boettger =  
*Atheris squamigera anisolepis* Mocquard

The following are not sufficiently distinct to be regarded as full species and have been reduced to subspecific status:

*Glauconia distanti* Boulenger =  
*Leptotyphlops conjuncta distanti* (Boulenger)  
*Boodon bedriagae* Boulenger =  
*Boaedon lineatus bedriagae* (Boulenger)  
*Philothamnus thomensis* Bocage =  
*Philothamnus semivariegatus thomensis* Bocage  
*Philothamnus girardi* Bocage =  
*Philothamnus semivariegatus girardi* Bocage  
*Dasypeltis macrops* Boulenger =  
*Dasypeltis scaber macrops* Boulenger

The following have been revived from their respective synonymies; and placed as listed:

*Bothrophthalmus brunneus* Günther =  
*Bothrophthalmus lineatus brunneus* Günther  
*Boodon mentalis* Günther =  
*Boaedon lineatus mentalis* (Günther)  
*Homalosoma abyssinicum* Boulenger =  
*Duberria lutrix abyssinicum* (Boulenger)  
*Psammophylax viperinus* Bocage =  
*Hemirhagerrhis nototaenia viperinus* (Bocage)

*Thelotornis capensis* Smith =  
*Thelotornis capensis* Smith  
*Atheris anisolepis* Mocquard =  
*Atheris squamigera anisolepis* Mocquard

Schmidt's record of *Typhlops tornieri* from the Belgian Congo has been referred to the recently described species, *Typhlops lestradei* Witte, and Loveridge's record of *Aeluroglena cucullata* from Ethiopia is assigned to a species herein described as *Meizodon loveridgei*.

#### METHOD ADOPTED IN SYSTEMATIC ACCOUNT

This report is intended to present in the most convenient form all data that were available and that seemed pertinent. To this has been added such conclusions as could be drawn. In order to conserve space extensive synonymies are rarely given. In listing references it is intended to give (1) the original citation for each species discussed and the type locality, (2) at least one reference to the name in its current form unless a change has been necessary in the preparation of the text and (3) references to literature mentioned in the discussion.

In listing localities for species taken in widely separated areas, the arrangement is from north to south, with those from West Africa usually listed first. All numbers refer to specimens in The American Museum of Natural History unless another prefix designating the Museum of Comparative Zoölogy (M. C. Z.) or the Field Museum of Natural History (F. M. N. H.) is given with the number.

In descriptions, those characters that have any possible taxonomic or phylogenetic significance are listed. Characters correlated or suspected of being correlated with sex are described separately for males and females. The importance of accurate determination of sex in comparing most species can hardly be overemphasized. Herpetologists in the past have been extremely casual in stating the sex of specimens described.

Descriptions of the maxillary dentition, frequently useful in comparing species as well as genera, are given for as many species as possible since no investigation of



this feature of the anatomy has been sufficiently extensive for an adequate understanding of generic relationships. Boulenger in his "Catalogue" has given descriptions for each genus, but in most cases they are based upon only one species of the genus with little or no attempt having been made to ascertain the amount of variation. Furthermore, many of Boulenger's descriptions are inaccurate. In this report statements concerning the size and the number of teeth are based, unless otherwise noted, upon maxillae that have been removed from the snakes in order that sockets, as well as teeth actually present, could be accurately counted. Many descriptions of dentition in the literature are erroneous because only the teeth present were counted. When sufficient material was at my disposal more than one maxilla has been examined in order to obtain an index of the variation within the species.

Although Cope described and depicted the hemipenes of several species of African snakes, herpetologists dealing with African material in recent years have made little if any use of the information. Hemipeneal characters have been extensively investigated recently in snakes of other continents, by Dunn, by Amaral and by Stuart in the Americas, by Pope in Asia, as well as by other authors. Partly to correlate the information with that of other authors, but primarily to gain a better understanding of African genera, an attempt has been made to examine the hemipenes of all African colubrids of which there were males available in the United States.

Descriptions of hemipenes, unless otherwise noted, are drawn from an examination of the organ *in situ*. Since the hemipenes of snakes are paired projectile organs in the form of hollow tubes whose bases are attached on one side of the middle line, opening into the anus, it is possible to examine them only by dissecting unless they have been everted prior to preservation. When retracted each hemipenis lies within the tail, extending for a greater or less distance and terminating in a cylindrical muscle, or in two muscles when the organ is bifurcate. The two muscles from the bifurcated organ

join posteriorly to form a single muscle so that whether the organ is single or bilobed one muscle extends to an insertion on one of the caudal vertebrae. When the organ is projected, this muscle is drawn forward, so as to evaginate the tubular organ. Thus the inside of the tube becomes the outside and the organ projects freely from its base when everted. Since the important structures lie on the inside of the organ in the retracted position it becomes necessary to make a lengthwise slit in the tail, cutting through the surrounding muscle to the tubular hemipenis which can then be lifted up, slit open and exposed for examination. There is an obvious advantage in examining the organ as dissected from the retracted position since it is possible to describe the location of structures and to designate its length by reference to the caudal scutes. This procedure has been followed in preparing definitions of most of the hemipenes mentioned in the text.

#### GENERAL CONCLUSIONS

Since the publication of G. A. Boulenger's keys to African snakes in 1910 and 1915, the majority of the larger papers dealing with African serpents have been confined to distributional, faunal or zoögeographical studies. No comprehensive survey dealing with the generic characters of African serpents has appeared.

Because the material in the collections at my disposal has come from several areas, more species of snakes are included than have been dealt with in any single African paper since Boulenger's "Catalogue" appeared. Thus, an opportunity was provided for a preliminary investigation of generic relationships in one family, the *Colubridae*. The conclusions summarized in this report represent only a preliminary and a far from complete account of African colubrid genera, many of which are not represented in the collections in the United States. Nevertheless, this phase of the report has been materially augmented by an examination of material in the Museum of Comparative Zoölogy and the Field Museum of Natural History.

Several authors have noted that the sub-

family groups *Colubrinae* and *Boiginae* were more or less artificial. Schmidt (1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 35) observes that, "The great assemblage of genera grouped as the family *Colubridae* offers a stumbling block to the study of the distribution of snakes. Many of these genera are almost certainly heterogeneous, and even the subfamilies *Colubrinae* and *Boiginae* are more or less artificial groups." Dunn (1928, Bull. Antivenin Inst. Amer., II, p. 19) calls them "completely unnatural assemblages" after a study of the hemipenes of American snakes. Mosauer (1935, Publ. Univ. Calif. at Los Angeles in Biol. Sci., I, p. 117), among other conclusions drawn from a study of the myology of the trunk region in snakes, makes the statement that, "The subdivisions *Aglypha* and *Opisthoglypha* should be abandoned." Mahendra (1938, Anat. Anz., LXXXVI, p. 355) has summarized the skeletal characters of the families of ophidia and offered a phylogenetic scheme in which he completely ignores the *Aglypha*, the *Opisthoglypha* as well as the *Proteroglypha*, adding in a footnote that, "Leaving aside the nature of the teeth, there is no other character which can distinguish these three series from each other."

Further evidence pointing to the unsatisfactory nature of the characters used to separate the *Boiginae* and the *Colubrinae* is presented in the present report under the discussion of *Aparallactus*. Tentatively, I am willing to recognize the *Elapidae* as a family paralleling the *Hydrophiidae* which are elevated to family rank in Malcolm Smith's (1926) monograph. In spite of the fact that the *Elapidae* are separable from the *Colubridae* only upon the character of the teeth, the classification appears to be a natural one.

As K. P. Schmidt noted, the family *Colubridae* which comprises nearly two-thirds of snakes known has been exceedingly troublesome to the zoögeographer. Authors of distributional studies, of necessity, have dealt entirely with genera when seeking information dealing with colubrids. Even when dealing with genera they have drawn conclusions from doubtful if not

completely erroneous data supplied by the taxonomist. It now becomes imperative that a more thorough survey of generic characters be undertaken, and furthermore that species within each genus be examined critically, particularly when representatives of a single genus are reported for widely separated areas. Descriptive summaries of individual characters for large numbers of genera greatly facilitate comparisons. Although no systematic arrangement can be regarded as final until numerous features of the anatomy are known, extensive surveys of single characters should eventually provide sufficient data from which sound generalizations can be drawn.

A preliminary step in this direction was undertaken by Dunn in his "Tentative Key and Arrangement of the American Genera of *Colubridae*" (1928, Bull. Antivenin Inst. Amer., II, pp. 19-24). In this paper Dunn already has reviewed the classifications of Boulenger and of Cope, in particular calling attention to the main features of the Copeian system, and proposing a modification and simplification of Cope's arrangement of subfamilies. Dunn's key to the subfamilies lays considerable stress on the hemipenes as may be noted.

"Sulcus spermaticus forked.....  
 ..... *Ophiinae* [= *Xenodontinae*].  
 Sulcus spermaticus single  
 Hypapophyses absent posteriorly. . . *Colubrinae*.  
 Hypapophyses present posteriorly  
 Dentary free posteriorly, hypapophyses  
 long, narrow, and projecting posteriorly;  
 hemipenis calyculate distally.....  
 ..... *Sibynophiinae*.  
 Dentary not free posteriorly; hypapophyses  
 short, broad, and not projecting poste-  
 riorly; hemipenis spinous, not calyculate  
 distally..... *Natricinae*."

Mr. K. P. Schmidt suggested that I attempt to fit African *Colubridae* into Dunn's key for American subfamilies in order to determine the validity of such an arrangement. However, when I undertook a comparison of the African groups with those of the Americas certain criticisms of Dunn's arrangement became apparent.

Obviously, any arrangement of subfamilies should indicate natural relationships, and if it is to be satisfactory it should be based upon characters which are not



subject to gradations from one form to another. In other words, conservative rather than adaptive characters must be used, and the characters must be of a contrasting nature. In 1894 when Cope (Amer. Nat., XXVII, pp. 831-844) published some initial results of his survey of hemipeneal characters he implied that he had attained something approaching that ideal. Indeed, the Copeian system, corrected and simplified by Dunn, superficially looks promising. But when it is viewed in the light of pertinent facts it may be shown to bear the defects of other classifications of colubrids.

The male genitalia of snakes conceivably might exhibit more conservatism in their evolution than do other characters of the group. More particularly would this seem to be a tenable assumption in light of the recent review by Noble (1937, Bull. Amer. Mus. Nat. Hist., LXIII, pp. 673-721), of the courtship behavior of snakes. He states (p. 691) that, "The courtship pattern of snakes has not undergone a great change in phylogeny." Any assumption that evolution of the copulatory organs has been similarly conservative is not borne out by investigation. Whereas groups of species or groups of genera usually possess similar or sometimes nearly identical hemipenes, there is reason to believe that adaptations to specialized habitats have been concomitant with modifications of the penes. Dunn (*op. cit.*, p. 20) notes that "wide peneal variation in closely related snakes is found chiefly among arboreal and among burrowing forms," and a similar observation may be made for African burrowing snakes, the genera *Scaphiophis* and *Prosymna* possessing no characters which indicate with any certainty their close affinities to other serpents. Likewise, two slender arboreal forms, *Dipsadoboa duchesnii* and *Thelotornis kirtlandii*, offer evidence that the evolution of a slender tail is coupled with a shortening of the hemipenis.

Aside from this evidence that male genitalia are at least indirectly affected by adaptive changes, there is reason to believe that the single sulcus has been derived from the bifurcated sulcus, not once, as a

classification based on this feature should imply, but numerous times. Although Dunn would include *Natrix* in his subfamily *Natricinae*, Asiatic species still included in the genus possess strongly bifurcated organs with the sulcus forked. Similarly Dunn would include *Liodytes* under *Natricinae*, whereas *Helicops*, almost certainly closest to the ancestral stock of *Liodytes*, falls into the subfamily *Xenodontinae*. The African species recently known as *Helicops bicolor* but now shown to possess an unforked sulcus would, therefore, fall into the same subfamily as *Liodytes* although a relative, *Hydraethiops*, with the hemipenis distally bifurcate, but the sulcus undivided, provides evidence that each genus has been derived from *Helicops* stock with a bifurcated sulcus. A parallel case may be cited in *Neusterophis* of Africa apparently derived from the more primitive *Liopholidophis* of Madagascar.

Other grounds pointing to the evanescent nature of the forked sulcus as a subfamily character may be cited in *Miodon*, *Calamelaps* and *Rhinocalamus* where the sulcus division is so near the end of the hemipenes that it must be considered as representing a vestigial condition in the evolution of the unforked sulcus of *Xenocalamus*, *Chilorhino* and *Macrelaps*. The habitus, dentition and vertebral characters of these two groups are correlated with similar hemipeneal structures if the sulcus is not considered.

To recapitulate, snakes included under Dunn's *Colubrinae* appear to have been derived by separate routes from those included under *Xenodontinae*, and forms that may be called intermediate are still in existence. Similarly, several forms included under his *Natricinae* seem to have been derived from genera in his *Xenodontinae*. There remains the genus *Sibynophis* Fitzinger placed as a separate subfamily, the *Sibynophiinae*. These supposedly primitive snakes with the dentary loosely attached to the articular, and with the posterior hypapophyses strongly developed, comprise a well-defined group. They are known from southern Mexico and Central America, from Asia and the Malay Archipelago, and from Madagascar and the

Comoro Islands. In Dunn's key they are placed under the group having the sulcus spermaticus single. Popé (1935) in "The Reptiles of China" describes the hemipenis of three Asiatic species, *collaris*, *grahami* and *chinensis* as single, with the sulcus undivided. Dunn in 1928 had concluded that the Mexican species, *annulatus*, was congeneric with *collaris*.

The genus *Sibynophis* (*Polydontophis auct.*) is not represented in Africa, but of two species known from Madagascar, I have had a male of the species, *torquatus* (No. 60677, from Monjakatempo, Madagascar), at my disposal. In this specimen the hemipenis extends to the fourteenth caudal, bifurcating at the seventh, the sulcus dividing at the sixth. There is, therefore, but one of two alternatives: (1) either we must assume that parallel evolution accounts for the existence in widely separated regions of snakes with the loosely articulated dentary, or (2) we must assume that such snakes with the sulcus undivided were directly derived from snakes with sulcus and hemipenis bifurcate.

The latter assumption is the more reasonable of the two, more particularly since the fauna of Madagascar is definitely primitive, and in colubrids the bifurcated sulcus seems to be associated with the more primitive representatives. However, if we use Dunn's key such an interpretation is not possible since we should be forced to lay more stress upon peneal characters and place *Sibynophis torquatus* (Boulenger) in the *Xenodontinae* and at least some of the Asiatic and Central American species in the *Sibynophiinae*. The difference in hemipeneal characters is indicative of generic separation, but *torquatus* should not be placed in a separate subfamily.

The conclusion is inevitable that peneal characters, although extremely useful in gaining an understanding of generic relationships, are unsatisfactory as subfamily characters. Other characters used by Dunn are similarly useful, but any single one or any pair of them fails to define supergeneric groups broad enough to be classed as subfamilies. Hypapophyses on the posterior vertebrae are somewhat variable

and although their presence or absence in some groups, even in single species, is disputed, if allowance for variation is made they do characterize more or less natural groups. Of the characters that have been offered none at present seems to be of greater importance. Accordingly, the arrangement suggested below lays greater emphasis on vertebral characters than upon others. Primarily the grouping of genera is based upon three characters, hypapophyses, hemipenes and dentition. Hemipenes in particular are correlated to a large extent with similarities in the lepidosis and habitus.

The arrangement is presented as the most convenient method of summarizing the results of the survey. The presence or absence of hypapophyses on the posterior vertebrae has been verified in several instances, but in many cases the data for vertebral characters are drawn from Boulenger. Because of the fact that all the species in some genera have not been examined, the conclusions drawn with respect to these will be valid only when previous authors have been correct in assigning the species to the proper genus. Whenever possible, data have been based upon the type species of genera.

All genera of which representatives have been seen are placed, and those not obtainable in the United States are listed separately. Aggregations of genera listed as groups with Roman numbers are believed to represent the most closely allied forms. Each group containing more than one genus would correspond roughly to the supergenus of other taxonomic systems, but since this category has not been widely used in herpetological literature I have not introduced it here. Nor have I applied subfamily names to the larger subdivisions, since there are obvious defects in the arrangement. The genera included under Group VII probably are most closely related to those in Group XVII. The forked sulcus of those in Group VII is interpreted elsewhere in this report as the probable immediate ancestral condition of those in Group XVII. The presence or absence of grooved posterior teeth is noted

in the arrangement since it is of some phylogenetic significance. Nevertheless, in *Aparallactus*, listed as a genus with grooved posterior teeth, one species, *modestus*, lacks grooved teeth. As a classification the

arrangement is somewhat artificial, but if it serves as a preliminary step in our understanding of the generic relationships of the African *Colubridae* it will achieve its purpose.

#### A TENTATIVE ARRANGEMENT OF AFRICAN COLUBRIDAE

A.—Hypapophyses present posteriorly.

B.—Sulcus spermaticus forked.

C.—No grooved teeth.

##### GROUP I

*Glypholicus* Günther  
*Ablabophis* Boulenger  
*Lamprophis* Fitzinger  
*Bothrophthalmus* Peters  
*Boaedon* Duméril and Bibron  
*Pseudoboodon* Peracca  
*Bothrolycus* Günther

##### GROUP II

*Hormonotus* Hallowell  
*Gonionotophis* Boulenger  
*Mehelya* Csiki  
*Lycophidion* Duméril and Bibron  
*Oophilositum* Parker

CC.—With grooved posterior maxillary teeth.

##### GROUP III

*Geodipsas* Boulenger

BB.—Sulcus spermaticus not forked.

C.—No grooved teeth.

##### GROUP IV

*Natrix* Laurenti  
*Neusterophis* Günther  
*Hydraethiops* Günther  
*Limnophis* Günther

AA.—Hypapophyses absent posteriorly.

B.—Sulcus spermaticus forked.

C.—No grooved teeth.

##### GROUP V

*Duberria* Fitzinger  
*Grayia* Günther  
*Pseudaspis* Fitzinger

C.—With grooved posterior maxillary teeth.

##### GROUP VI

*Amplorehinus* Smith

##### GROUP VII

*Aparallactus* Smith<sup>1</sup>  
*Miodon* Duméril  
*Calamelaps* Günther  
*Rhinocalamus* Günther

BB.—Sulcus spermaticus not forked.

C.—No grooved teeth.

##### GROUP VIII

*Coronella* Laurenti  
*Meizodon* Fischer  
*Coluber* Linnæus  
*Aeluroglena* Boulenger  
*Spalerosophis* Jan  
*Lytorhynchus* Peters

##### GROUP IX

*Chlorophis* Hallowell  
*Philothamnus* Smith  
*Hapsidophrys* Fischer  
*Gastropyxis* Cope

<sup>1</sup> Teeth not grooved in *A. modestus*.

## GROUP X

*Rhamnophis* Günther  
*Thrasops* Hallowell

## GROUP XI

*Scaphiophis* Peters

## GROUP XII

*Prosymna* Gray

CC.—With grooved posterior maxillary teeth.

## GROUP XIII

*Boiga* Fitzinger  
*Crotaphopeltis* Fitzinger  
*Chamaetortus* Günther  
*Dipsadoboa* Günther

## GROUP XIV

*Tarbophis* Fleischmann  
*Macropotodon* Guichenot

## GROUP XV

*Dispholidus* Duvernoy  
*Thelotornis* Smith

## GROUP XVI

*Hemirhagerrhis* Boettger  
*Cerastes* Laurenti  
*Malpolon* Fitzinger  
*Dromophis* Peters  
*Psammodphis* Boie  
*Rhamphiophis* Peters

## GROUP XVII

*Xenocalamus* Günther  
*Chilorhinophis* Werner  
*Macrelaps* Boulenger  
*Micrelaps* Boettger

AAA.—Hypapophyses absent posteriorly, strongly enlarged in the region of the oesophagus.

B.—Sulcus spermaticus not forked.

C.—Teeth vestigial.

## GROUP XVIII

*Dasypeltis* Wagler

The following annotated list of African colubrid genera, males of which have not been examined, includes those described since Boulenger's "Catalogue" appeared, as well as those in place in that work. Some of the former are probably synonyms of older valid genera. The relationships suggested may aid in determining their validity. Genera listed as invalid in the present paper are not included; those re-recognized are placed above, and those placed as synonyms by workers since Boulenger (1896) are listed with current status indicated.<sup>1</sup>

*Amblyodipsas* PETERS, 1856, Monatsb. Akad. Wiss. Berl., p. 252. Allied to the snakes in Groups VII or XVII.

*Apostolepis* COPE, 1861, African species referred to *Chilorhinophis* Werner, 1907.

*Asthenophis* BOULENGER, 1896, Ann. Mus. Civ. Stor. Nat. Genova, (2) XXVII, p. 8. Said to be closely allied to *Prosymna*.

*Brachyophis* MOCQUARD, 1888, Mem. Cent. Soc. Philom., p. 125. A female (M. C. Z. No.

38672) has been examined. There are three anterior maxillary teeth, followed by a diastema and two enlarged grooved teeth. Boulenger placed the genus near *Macrelaps*. This remarkable burrowing form seems to be so highly specialized that its relationships are problematical. Examination of hemipenes may aid in placing it.

*Contia* BAIRD AND GIRARD, 1853, Cat. N. Amer. Rept., part 1, p. 110. One species, *africana*, is said to occur in the Red Sea Province and in Eritrea. Probably a composite genus at present since the type is North American. Allied to *Coronella*? Barbour (1914, Proc. New Eng. Zool. Club, V, p. 89), on implied zoogeographical grounds, would restrict the name *Contia* to the American species and use *Eivensis* Jan for allied Old World forms. Examination of teeth and hemipenes probably would verify his conclusion.

*Chamaelycus* BOULENGER, 1919, Rev. Zool. Afr., VII, p. 22. Said to be related to *Lycophidion*.

*Dakaria* WERNER, 1924 = *Idiophis* Mocquard, 1901, of Madagascar.

*Ditytophis* GÜNTHER, 1881, Proc. Zool. Soc. Lond., p. 462. (Socotra Island.) Probably allied to *Geodipsas*.

*Elapocalamus* BOULENGER, 1911, Ann. Mag. Nat. Hist., (8) VIII, p. 371. Allied to snakes in Groups VII and XVII.

<sup>1</sup> *Aporophis crucifer*, described by Ahl (1925, Zool. Anz., LXIII), from "entweder Buea (Kamerun) oder Paramaribo" is doubtless South American.



*Elapotinus* JAN, 1862, Arch. Zool. Anat. Phys., II, p. 31. Listed by Boulenger (1896) from "Tropical Africa?" Not recorded from Africa with certainty.

*Guyomarchia* ANGEL, 1923, Bull. Mus. Hist. Nat. [Paris], p. 348. Said to be nearest to *Prosymna*. (?)

*Hypoptophis* BOULENGER, 1908, Ann. Mag. Nat. Hist., (8) II, p. 92. Related to snakes in Groups VII and XVII.

*Micaela* WERNER, 1915 = *Xenocalamus* Günther, 1868.

*Michellia* MÜLLER, 1911 = *Hypoptophis* Boulenger, 1908.

*Migturtinophis* SCORETTECCI, 1935, Ann. Mus. Civ. Stor. Nat., LIX, p. 1. Probably allied to *Tarbophis*.

*Oligodon* BOIE, 1827, Isis, XX, p. 519. The only record for the species *melanocephalum* (Jan) from Egypt is stated by Flower (1933, Proc. Zool. Soc. Lond., p. 816) to be doubtful. Allied to *Coronella*?

*Opisthotropis* GÜNTHER, 1872, Ann. Mag. Nat. Hist., (6) VII, p. 16. The type species, *atra*, supposed to have come from Africa, is of doubtful origin. All other species are known from Asia. Probably nearest to *Helicops* although Asiatic species have the sulcus undivided.

*Parkerophis* BARBOUR AND AMARAL, 1927 = *Chilorhinophis* Werner, 1907.

*Pelophis* WITTE, 1922, Rev. Zool. Afr., X, p. 318. Described as being closest to *Hydraethiops*.

*Poecilopholis* BOULENGER, 1903, Ann. Mag. Nat. Hist., (7) XXII, p. 352. Related to genera in Groups VII and XVII.

*Polemon* JAN, 1858, Rev. and Mag. Zool., (2) X, p. 520. Doubtless allied to genera in Groups VII and XVII.

*Procleria* WERNER, 1924, Sitzber. Akad. Wiss. Wien. Math-natur., Bd. 133, p. 48. Allegedly close to *Pseudozenodon* Boulenger, 1890. Impossible to place with any certainty if, indeed, the locality of the type species is authentic.

*Pythonodipsas* GÜNTHER, 1868, Ann. Mag. Nat. Hist., (4) I, p. 425. Allied to *Geodipsas*?

*Rouleophis* CHABANAUD, 1916, Bull. Mus. Hist. Nat. [Paris], XXII, p. 379. Probably should be referred to *Aparallactus* Smith, 1849 (*sic* Loveridge, 1938).

*Stenorhabdium* WERNER, 1909, Jahr. Württem. Ver. Natur., p. 59. Doubtless related to snakes in Groups VII and XVII.

*Tropidophidion* WERNER, 1902, Verh. Zool. Bot. Ges. Wien., p. 335. Said to be close to *Gastropyxis* of which it may be a synonym.

## SQUAMATA SERPENTES

### LEPTOTYPHLOPIDAE

#### LEPTOTYPHLOPS FITZINGER

#### *Leptotyphlops conjuncta distanti* (Boulenger)

*Glauconia distanti* BOULENGER, 1892, in Distant's "A Naturalist in the Transvaal," p. 175, Fig. 1: Pretoria, South Africa; 1893, Cat. Snakes Brit. Mus., I, p. 62.

*Leptotyphlops distanti* PARKER, 1936, "Novitates Zoologicae," XL, p. 121.

Chitau, Angola, 5 (Nos. 51933-37, Vernay, Lang, Boulton, 1925).

LEPIDOSIS AND MEASUREMENTS.—All specimens have 14 scale-rows at midbody, three upper labials, with the nasal separating the first and second. Total length varies from 125 mm. to 175 mm. with tail included from 10.4 to 13.5 and averaging 11.5. Diameter included in the total length from 47 to 56 times.

COLORATION.—The Angolan specimens, as well as the East African series used for comparison, are brown above and lighter on the underside of the body.

REMARKS.—These specimens have been referred to this form after careful comparison of *L. c. conjuncta* (Jan) from East

Africa, and one from Rhodesia. My reasons for using trinominals to indicate the close relationship of *distanti* with *L. conjuncta* (Jan) are as follows:

Loveridge (1928, Bull. Mus. Comp. Zool., LXXIV, pp. 224-226) referred *distanti* to the synonymy of *Stenostoma scutifrons* Peters 1896 (*nec.* Peters 1854, *vide* Parker *loc. cit.*) pointing out that *scutifrons* (= *distanti* Boulenger) could be most readily separated from *conjuncta* by the width of the rostral in comparison with the width of the nasal, "rostral at least three times the width of the nasal" in *distanti* and "not more than twice the width of the nasal in *conjuncta*." On none of the five specimens from Angola is it possible to include the width of the nasal in the rostral three times. On one specimen the width of the rostral is approximately twice that of the nasal, whereas a specimen from Morogoro, Tanganyika (No. 16875), nearly approaches it with a rostral scarcely less than twice the width of the nasal. Nor does the ratio of the diameter to the body length offer any more evidence of specific distinctness.

It will be admitted that on the average *distanti* has a proportionately broader rostral than has *conjuncta*, but certainly such a difference is hardly of specific value. Only when more extensive series of specimens from Africa south of the Equator have been examined will it be possible to determine the approximate ranges of the two races.

#### **Leptotyphlops nigricans** (Schlegel)

*Typhlops nigricans* SCHLEGEL, 1844, Abbild. Amphib., p. 38, Pl. XXXII, figs. 21-24: no type locality.

*Leptotyphlops nigricans* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 53.

George, Cape Province, 1 (No. 31932, Lang, April, 1926).

Closely agrees with typical specimens, being 190 mm. long, tail 14.5 mm. contained in the total length 13 times. Diameter 3.5 mm., contained in the length 54 times. Scale-rows at midbody 14.

#### **Leptotyphlops emini** (Boulenger)

*Glauconia emini* BOULENGER, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 91: Karagwe Bukoba, Tanganyika Territory.

*Leptotyphlops emini* LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 223.

Mt. Selinda, Southern Rhodesia, 1 (No. 51948, Boulton and Boulton, November 27, 1929).

This specimen seems to be referable to this species, although the small size and the poor condition of the head render it impossible to make an accurate determination of the supralabials.

DIMENSIONS.—Total length 110 mm., tail 13.7 included in the total length 8 times. Diameter 2 mm., included in the total length 55 times. Scale-rows 14 at midbody.

### **TYPHLOPIDAE**

#### **TYPHLOPS SCHNEIDER**

#### **Typhlops punctatus punctatus** (Leach)

*Acontias punctatus* LEACH, 1819, in Bowdich, Miss. Ashantee, p. 493: Fantee, Gold Coast.

*Typhlops punctatus* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 42; 1896, III, p. 587.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 45.

*Typhlops punctatus punctatus* LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 19.

Ganta, Liberia, 4 (Nos. 51940-43, Harley, June, 1932).

Metet, French Cameroon, 2 (Nos. 51945-46, Grissett, August to October, 1927).

Lukolela, Belgian Congo, 1 (No. 45912, Chapin, Edson, December 4, 1930).

Fataki (between Irumu and Beni), Belgian Congo, 1 (No. 51938, Chapin, Sage, Mathews, 1926).

Harar, Ethiopia, 1 (No. 20339, Brown, November 4, 1920).

Chogoria, Kenya Colony, el. 5200 ft., 1 (No. 51939, Chapin, Sage, Mathews, May 6, 1926).

VARIATION.—On this series the midbody scale-rows vary from 24 to 28. The diameter of the body is included in the length from 23 to 30 times, averaging lower in the Congo specimens and highest in those from Liberia. The ratio of tail to total length varies from .01 to .02. The smallest specimen, from Liberia, measures 200 mm. and is marked with the blotched pattern of two adults from the same locality whereas a fourth has the "lineolate" pattern above and is uniformly yellow below. The largest specimen (Fataki) measures 485 mm. and represents the *congestus* color form.

The Chogoria individual differs from all others in having a comparatively narrow rostral, about half the diameter of the head at the oculars, the prefrontal making a narrower contact with the rostral than in other specimens. The color of this specimen is more brownish than the others, a dark spot at the base of each scale being visible through the transparent apical end of each overlying scale. The belly is only slightly lighter than the dorsum. Possibly it represents an ill-defined mountain race but the difference is so slight that I should hesitate to name it.

REMARKS.—I am following Loveridge in the use of trinomials only to indicate the close relationship of typical *punctatus* with the race *T. p. gierrai* Mocquard of East Africa. Comparison of the series listed above, with other specimens in The American Museum of Natural History previously reported upon by Schmidt (*op. cit.*), indicates that neither *congestus* nor *inter-*

*medius* can be recognized with status above that of color forms. In scale characters and morphology no difference between them and *punctatus* is indicated, and apparently there is no evidence of correlation of color and pattern with either habitat or range.

### ***Typhlops lestradei* Witte**

*Typhlops lestradei* WITTE, 1933, Rev. Zool. Bot. Afr., (2) XXIII, p. 206, Figs. 1-3: Ruanda.

*Typhlops tornieri* SCHMIDT (*non* Sternfeld), 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 60.

Schmidt (*loc. cit. supra.*) recorded a specimen, A. M. N. H. No. 11673, from Stanleyville, Belgian Congo, as *Typhlops tornieri* Sternfeld, now a synonym of *T. p. punctatus* (*vide* Loveridge, 1933, Bull. Mus. Comp. Zoöl., LXXIV, No. 7, p. 214). Examination of this specimen indicates that it is not *punctatus*, for the prefrontal is nearly as broad as long, its contact with the rostral about half its width, while the nasals extend well behind the rostral. In *punctatus* the supraocular is narrow, its contact with the preocular much shorter than with the ocular, while in this specimen the two contacts are nearly equal as depicted for *lestradei* by Witte.

The specimen as described by Schmidt was 198 mm. long with a diameter of 7 mm. Without stretching the snake I obtained a measurement of 203 mm. for the length and a maximum width (measured with Vernier calipers) of 6.4 mm. Thus the diameter is contained in the total length 32 times. Scale-rows at midbody 26 as given by Schmidt. Witte described *lestradei* as having 34 scale-rows, and the diameter contained in the body length 47 times. But his description, "grayish above, yellowish below," agrees well with the specimen, and since the arrangement of the scales on the head agrees perfectly with Witte's description, I have little hesitancy in referring the Stanleyville specimen to *lestradei*, for scale-rows and body ratios vary extensively in most *Typhlops*. If my views are correct the species is an addition to the fauna of the Belgian Congo. It is possible that the species is an aberrant form of *punctatus*, but no available specimen of the latter has a similar development of the prefrontal

which in *lestradei* resembles some species of *Leptotyphlops*.

### ***Typhlops bibronii* (Smith)**

*Onychocephalus bibronii* SMITH, 1849, Illus. Zool. So. Africa, III, Rept. Pl. LI, Fig. 2, and Pl. LIV, figs. 5-8: "Northward of Latakoo," South Africa.

*Typhlops bibronii* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 44; 1910, Ann. So. Afr. Mus., V, p. 498.

Drakensberg National Park, Natal, 1 (No. 57630, Coghill, December, 1932).

The distribution, as well as the general morphology of this species, suggests that *T. schlegelii schlegelii* may prove to be a subspecies of it. However, *T. bibronii* readily may be recognized because it lacks the cutting edge on the snout. It would seem to be a more primitive form than *T. schlegelii*.

LEPIDOSIS.—Scales in 30 rows at midbody. Preocular in contact with second labial.

DIMENSIONS AND COLORATION.—Total length 355 mm.; tail 5 mm., contained in total length 71 times. Diameter 10 mm., contained in length 35 times. Above, the snake is evenly colored dark olivaceous brown, the edges of the scales appearing lighter probably due to their transparency. The venter is yellowish, over an area about eight scale-rows wide, being rather sharply delineated from the color of the dorsum.

LIFE HISTORY NOTES.—Five eggs, averaging 9 mm. × 23 mm. in size, were contained in the oviducts.

### ***Typhlops schlegelii schlegelii* Bianconi**

*Typhlops schlegelii* BIANCONI, 1850, Spec. Zool. Mosamb., p. 13, Pl. III, fig. 1: Inhambane, Mozambique.

*Typhlops schlegelii schlegelii* LOVERIDGE, 1933, Bull. Mus. Comp. Zoöl., LXXIV, p. 214.

Mt. Selinda, Southern Rhodesia, 1 (No. 51949, Boulton and Boulton, November 27, 1929).

This specimen agrees with Loveridge's summary (*op. cit.*) of the characters of the race in having a rather well-defined immaculate yellowish band, four to five scale-rows wide, on the median line of the belly. The remainder of the body is dark olivaceous with a faint lineolate pattern discernible.

LEPIDOSIS AND MEASUREMENTS.—Midbody scale-rows 34. Total length 510 mm., tail 6 mm. Diameter of body 15 mm., contained in the total length 34 times.

***Typhlops schlegelii mucroso* (Peters)**

*Onychocephalus mucroso* PETERS (*partim*), 1854, Monatsb. Akad. Wiss. Berlin, p. 621: Macanga (i.e., Makanga), Mozambique.

*Typhlops schlegelii mucroso* LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 216.

Kizumbe, Tanganyika Territory, 1 (No. 51947, Carnochan, 1929).

Fort Johnson, Nyasaland, 1 (No. 39116, Boulton and Boulton, 1929).

These two specimens would fall within the range of characters listed by Loveridge for the race *mucroso*. There is no significant difference in the lepidosis of the two specimens although in color and pattern they are unlike. The Kizumbe specimen is dark olivaceous above, with a desultory sort of pattern produced by an occasional single yellow scale or series of yellow scales interrupting the otherwise even pigmentation on the dorsum. Below, the snake is uniformly yellow, with areas of this color extending well up onto the sides in irregular patches. The pattern of the Fort Johnson specimen is reminiscent of the lineolate dorsum which fades on the sides to an immaculate yellow belly observed in many specimens of *punctatus*.

LEPIDOSIS AND MEASUREMENTS.—The Kizumbe specimen has 34 scale-rows at midbody; total length 375 mm., tail 3 mm. Diameter 13 mm., contained in total length 29 times. The Fort Johnson specimen is 290 mm. long, tail 4 mm., with the diameter (11 mm.) included in the length 35 times and it has 32 scale-rows at midbody.

***Typhlops avakubae* Schmidt**

*Typhlops avakubae* SCHMIDT 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 51, Fig. 1: Avakubi, Belgian Congo.

Kassa, French Congo, 7 (Nos. 45910, an adult female, and 45911a, b, c, d, e, f, six juveniles taken with the female, one still contained in the egg; Chapin, Edson, October 25, 1930).

LEPIDOSIS.—The adult female has twenty-four scale-rows at midbody. Snout with a sharp, translucent cutting edge, the ros-

tral produced backward a distance equaling the width of the head. Nostril adjacent to rostral; eye not visible. Three young, in good condition, are similar to the adult, the cutting edge on the snout being present, probably performs the function of the egg-tooth at the time of emergence from the egg. The heads and necks of the juveniles are not depressed as in the adults, nor are the heads set off from the body.

DIMENSIONS.—The adult female measures 385 mm., with the diameter (7 mm.) contained in the body length 55 times. In this respect the specimen compares favorably with a paratype in the American Museum collection. The type (A. M. N. H. No. 11674) is probably a male and the more elongate body (diameter contained 74 times in the total length) may be attributed to dimorphism between the sexes. Three juveniles measure from 120 to 123 mm. in length, with diameters of 2.5 to 3 mm. contained in the total lengths 41 to 48 times.

COLORATION.—The adult was described in the field when preserved as "pale pink." In spirits the Kassa specimen, as well as the type and paratype, are pale yellowish.

DISTRIBUTION.—The type from Avakubi and the paratypes from Medje, Belgian Congo, appear to be the only previous records for this distinct species. The present locality record extends the range some seven hundred miles southwestward from Medje, across the Congo River into the French Congo.

LIFE HISTORY NOTES.—The field tag states that the adult (probably the mother) was taken with the young, three of which had emerged, and three eggs "in termite nest under a roof." Two of the eggs containing the young have been mutilated and the small snakes are in poor condition. One egg, with the embryonic snake still coiled within the unbroken membranes, measures 8 mm.  $\times$  22 mm. The occurrence of this blind snake in a termite nest off the ground may give some clue to the reason for its scarcity in collections.

REMARKS.—In some respects *T. avakubae* appears to bear superficial resemblance to *T. stejnegeri* Loveridge (1931, Copeia, No.



3, p. 92, Figs. 1-2, type locality Luebo District, Belgian Congo), but the distinctive arrangement of cephalic shields in the former readily distinguishes it. On the other hand, *T. vanderysti* Witte (1933, Rev. Zool. Bot. Afr., XXIV, No. 1, p. 104, Figs. 1-3, type locality Kikwit, Belgian Congo) is probably a synonym of *stejnegeri*. The type localities are both on the Kasai River drainage and the specimens could have come from within one hundred miles of each other. Moreover, the figures for each are as nearly alike as two artists might be expected to depict the same species. Each is described as having but two supralabials and a trenchant horizontal edge on the snout. The diameter of *vanderysti* is contained in the total length 56 times and it has 25 scale-rows, whereas in *stejnegeri* the type contains the diameter 46 times and the paratype 53 times, and each has 26 scale-rows. Since most species of *Typhlops* exhibit similar variation such minor differences cannot be considered significant.

Witte's description does not entirely agree with his figures, for he described the nostril as "tout contre la rostral," whereas in figures one and two it is not shown touching the rostral. Neither does his description of the labial contacts entirely agree with his figures. Assuming his description to be more accurate than his figures, there remain only two characters of any importance which might be used to distinguish one snake from the other. Loveridge describes the second labial as "exceedingly small," and Witte describes it as the larger of the two. The coloration of *stejnegeri* is described as "uniform yellowish white," and Witte's specimen is "roseate, dorsum speckled with brownish" (translation). Loveridge does not say when his type was collected, but implies that it has been in the United States National Museum for many years during which time it may have bleached. Moreover Witte's type is 30 mm. longer than the type of *stejnegeri* and it easily may be that pigmentation is acquired with age. But on the whole, none of these differences is beyond the expected individual variation within a single species

and I believe that *vanderysti* safely may be considered a synonym of *stejnegeri*.

## BOIDAE

### Pythoninae

#### PYTHON DAUDIN

#### *Python sebae* (Gmelin)

*Coluber sebae* GMELIN, 1788, Syst. Nat., I, p. 1118: no type locality.

*Python sebae* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 53.

Tanganyika Territory, 1 (No. 50790, Davison, Johnson, September 5, 1933).

Metet, French Cameroon, 1 (No. 50502, Grissett, 1927). Head only.

Hanha, Angola, 1 (No. 50667, Vernay, Lang, Boulton, 1935). Skull.

Capelongo, Angola, 2 (Nos. 51796-97, Vernay, Lang, Boulton, July 20, 1925).

The head of the Metet specimen was evidently taken from a moderately large specimen since it is approximately 80 mm. wide and 100 mm. long, measured from the snout to the angles of the jaws.

LEPIDOSIS AND MEASUREMENTS.—The Capelongo males have 282 and 273 ventrals each with 60 caudals. Scale-rows at midbody 84 on No. 51796; in the Tanganyika specimen the whole formula is 69-89-51. The other Capelongo snake is skinned with the tail intact but, not being skinned down the venter, is useless for an accurate determination of the scale-rows. However, the collector, Herbert Lang, did make measurements of the total length of the freshly killed snake as 2480 mm. The tail, measured on the preserved specimen, is 289 mm., giving a figure of .12 for the ratio of tail to total length. No. 51796 is 1740 mm. long, with the tail (240 mm.) giving a figure of .14 for the same ratio. The Tanganyika female is 1530 mm. overall, with the tail (153 mm.), constituting .10 of the total length.

The latter specimen, as well as the unskinned male from Capelongo and the head from Metet, is normal in possessing pits on the first and second labials. The skin of the other Capelongo specimen has a smaller, although well-defined pit, on the third labial of each side.

DENTITION.—The Hanha skull has two

recurved teeth on each premaxilla, the right on one side and the left on the other not yet grown into their respective sockets when the snake was killed. Maxillary teeth 17 on each side, the anterior 11 largest, slightly diminishing in size posteriorly; the posterior six about equal in size, noticeably smaller than the anterior.

FIELD NOTE.—The Tanganyika snake was "killed while sunning itself on driftwood in the stream bed."

#### *Python anchietae* Bocage

*Python anchietae* BOCAGE, 1887, Journ. Acad. Sci. Lisboa, XII, p. 87: Catumbella, Benguela, Angola.—BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 88.

Hanha, Angola, 1 (No. 50501, Vernay, Lang, Boulton, May 19, 1925).

LEPIDOSIS.—A female with scale-rows 55–57–37, ventrals 256, anal single, caudals 48, in two series. Supralabials 14, the first five with pits. Infralabials 16, the tenth, eleventh and twelfth with pits. Scales in the ocular ring 16–15, with the supraocular about twice the diameter of the others.

DIMENSIONS.—Total length 922 mm., tail 90 mm. Ratio of tail to total length approximately .10.

The pattern closely agrees with that described by Boulenger (*loc. cit.*).

#### CALABARIA GRAY

##### *Calabaria reinhardtii* (Schlegel)

*Eryx reinhardtii* SCHLEGEL, 1848, Bijdr. tot de Dierk., I, p. 2, Pl.: Gold Coast.

*Calabaria reinhardtii* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 57, Pl. II.

Lukolela, Belgian Congo, 1 (No. 45901, Chapin, Edson, January 14, 1931).

LEPIDOSIS.—A male, falling near the average for the characters of 25 specimens reported from the Congo by Schmidt in 1923. Scale-rows 28–33–25. Ventrals 223, anal single, caudals 25. Supralabials 8, the third and fourth entering the eye. Infralabials 10–11. Loreal 1, preocular 1, postoculars 2, temporals 3+4.

DIMENSIONS.—Total length 750 mm., tail 60 mm. Ratio of tail to total length .08.

## COLUBRIDAE

### Colubrinae

#### ABLABOPHIS BOULENGER

##### *Ablabophis rufulus* (Lichtenstein)

*Coluber rufulus* LICHTENSTEIN, 1823, Verz. Doubl. Mus. Berlin, p. 205: South Africa.

*Ablabophis rufulus* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 318.—COTT, 1934, Proc. Zool. Soc. London, p. 964.

Merebank, Natal, South Africa, 2 (Nos. 57620, 60113, Coghill, 1933).

LEPIDOSIS.—Dorsal scales 21–19–17 and 19–19–17. Ventrals, female 171, and male 172, anal entire; caudals, female 65, and male 76. Supralabials 8, the fourth and fifth entering the orbit. Infralabials 8, the first four touching the anterior chinshields. Loreal single, preocular single, postoculars 2, temporals 1+2+3. Rostral and preoculars not produced to the upper surface of the head.

DIMENSIONS.—There is some evidence of sexual dimorphism in the species. The female measures 735 mm., the tail (154 mm.) comprising .21 of the total length. The male is smaller with a proportionately longer tail; length overall 605 mm., tail 160 mm. or .26 of the total.

MAXILLARY TEETH.—There were twenty-five teeth in the right maxilla of each of the two specimens. The anterior six teeth are slightly less recurved than those immediately following and the posterior teeth are somewhat smaller.

HEMIPENIS.—The hemipenis of No. 60113 extends to the tenth caudal, the extreme distal end bifid. The sulcus divides at the sixth caudal. Basal spines are feebly enlarged, arranged in diagonal rows. Toward the distal end spines are arranged in chevrons, the spines decreasing in size on the terminus of each lobe.

##### *Ablabophis whytii* (Boulenger)

*Glypholicus whytii* BOULENGER, 1897, Proc. Zool. Soc. London, p. 802, Pl. XLVI, fig. 2: Fort Hill, Nyasaland.

*Ablabophis whytii* COTT, 1934, Proc. Zool. Soc. London, p. 965.

Rungwe Mountains, Tanganyika Territory, 1 (No. 38984, Boulton and Boulton, 1929).

**LEPIDOSIS.**—Scale characters of this rarely collected snake agree well with Boulenger's (*loc. cit.*) description of the type. This specimen, a female, has the dorsal scales all smooth, without pits, disposed in 19 rows at midbody, the complete formula being 21-19-17. Ventrals 168, anal plate single, caudals 47. Supralabials 8, the fourth and fifth reaching the orbit, the labials separated from the scutes above by a long, groove-like suture. Infralabials 8 on one side but the other side could not be determined because the mandibles are distorted, one of them thrust through the skin. Nasal divided, the nostril situated in the anterior plate. Loreal longer than high, subtriangular. Preocular single on one side, divided on the other (i.e., with a small plate below the normal one). Postoculars 2, temporals 1+2. The frontal is nearly twice as long as wide (3.7 mm.  $\times$  6 mm.).

**DIMENSIONS.**—Total length 625 mm., the tail (106 mm.) comprising .17 of the total length.

**COLORATION.**—Uniformly slate-gray above, yellowish white below, the lighter color of the venter extending to include part of the lower row of dorsal scales on each side. Down the middle of the venter there are a few irregular darkly pigmented areas.

**MAXILLARY TEETH.**—Both maxillae have been crushed so that it is impossible to make a satisfactory tooth count. One maxilla, broken in two places, appears to have borne 24 subequal teeth.

**STOMACH CONTENTS.**—The Tanganyika specimen contained the digested remains of an amphibian, only the hind feet remaining.

**REMARKS.**—This specimen constitutes a new record for Tanganyika Territory, the type from Nyasaland and the specimen from Charre, Portuguese East Africa (Cott, *loc. cit.*), being the only specimens hitherto recorded. This individual from the Rungwe Mountains differs from the type in only minor respects, a slightly longer frontal, faint marks on an otherwise immaculate belly and five more ventrals being the only important differences.

Cott (*supra cit.*) has quoted an unpublished manuscript of H. W. Parker pointing out that the species described by Boulenger as *Glypholicus whytii* agrees better with *Ablabophis* than with *Glypholicus*. Since no males of *A. whytii* have been available it is impossible to examine the hemipeneal characters. However, *Ablabophis rufulus* is available and through the generosity of Mr. Arthur Loveridge I have examined a specimen of *Glypholicus bicolor*. The hemipenes of the two are similar, but in *Glypholicus* the distal end of the hemipenis is not bifurcated. Actually *Glypholicus*, both in dentition and hemipeneal characters, seems to be related to *Boaedon* through *Lamprophis* and *Ablabophis* in approximately that order.

#### LAMPROPHIS FITZINGER

##### *Lamprophis aurora* (Linnaeus)

*Coluber aurora* LINNAEUS, 1758, Syst. Nat., Ed. 10, I, p. 219: "America" = Africa.

*Lamprophis aurora* SMITH, 1849, Illus. Zool. So. Africa, Rept., App., p. 19.—BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 321.

Kroonstad, Orange Free State, South Africa, 2 (Nos. 50548-49, Lang, February 25, 1926).

**LEPIDOSIS.**—A specimen of each sex, with dorsal scales 23-23-21. Ventrals 174 (male) and 170 (female), caudals, respectively, 53 and 43. Supralabials 8, the fourth and fifth entering the orbit. Infralabials 8, the first four touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2, temporals 1+2 on both specimens.

**DIMENSIONS.**—The male measures 285 mm. overall, with the tail (50 mm.) constituting .17 of the total length. The female measures 195 mm., tail, 30 mm. or .15 of the total length.

**MAXILLARY TEETH.**—Six in the anterior increasing in size to the fifth, the sixth slightly smaller, and followed after a short diastema by eleven smaller subequal teeth.

**HEMIPENIS.**—Extends to the twelfth caudal, bifurcating at the tenth. Sulcus buried between two prominent folds armed with spines, divides at the seventh caudal. Basal portion of the hemipenis armed with longitudinal ridges with an abrupt change

to well-developed spines immediately proximal to the division of the sulcus. Distally there is a transition from spines to strongly denticulated calyces on each lobe.

**COLORATION.**—Belly and two lower scale-rows white, dorsal scales brown with narrow white cross-bars, the scales of the vertebral row white with darker tips, producing the effect of a vertebral stripe. Throat and lips white, with the head spotted, a lighter area on the frontal region and on the median suture of the parietals extends as a prolongation of the vertebral stripe.

### **Lamprophis inornatus** Duméril and Bibron

*Lamprophis inornatus* DUMÉRIL AND BIBRON, 1854, *Erpétol. Gén.*, VII, p. 454: "environs du Cap de Bonne-Esperance."—BOULENGER, 1893, *Cat. Snakes Brit. Mus.*, I, p. 321.—SMITH, 1928, *Ann. Mag. Nat. Hist.*, (10) I, p. 495.

*Boodon infernalis* GÜNTHER, 1858, *Cat. Colubrine Snakes Brit. Mus.*, p. 199: Durban (Port Natal), Natal.—BOULENGER, 1893, *Cat. Snakes Brit. Mus.*, I, p. 330.

Cape Town, Cape Province, 1 (No. 32802, Lang, 1926).

**LEPIDOSIS.**—A female with dorsal scales 25–23–21. Ventrals 194, anal entire, caudals 50. Supralabials 8, the third, fourth and fifth entering the orbit. Infralabials 8, the first four touching the anterior chin-shields. Loreal about twice as long as high, preoculars 2, postoculars 2, temporals 1+2.

**DIMENSIONS.**—Length overall 570 mm.; tail 84 mm. Ratio of tail to total length .15.

**MAXILLARY TEETH.**—Anterior teeth slightly enlarged and somewhat stouter, no diastema present. The total number of teeth is eighteen.

**REMARKS.**—Malcolm Smith (*loc. cit.*) has assigned Werner's genus and species, *Pachyophis temporalis*, to the synonymy of *L. inornatus* adding that Mr. H. W. Parker has pointed out to him that Günther's *Boodon infernalis* is also identical. He states that the Günther's types were found to have typical *Lamprophis* dentition. However, as I shall point out under *Boaedon l. lineatus*, the diastema, as well as the enlargement of the anterior

teeth, is highly variable in *Boaedon*. Actually the dentition of *Lamprophis* is not distinguishable from that of *Boaedon*, when series of each are examined.

Hemipenes of *Lamprophis* and *Boaedon* are so similar that there is no adequate basis for generic separation on the basis of this character. There remains only the absence of apical scale pits in *Lamprophis* to separate it. Although Boulenger (*loc. cit.*) included *Lamprophis inornatus* under genera both with and without scale pits I am unable to discover pits on the specimens now available.

It is perhaps well to mention here that Cope (1900, *Ann. Report United States Nat. Mus.*, for 1898, Pl. xxii, figs. 4 and 5) has depicted the hemipenes of two snakes, calling one *Lamprophis inornatus* and the other *Boaedon infernalis*. Inasmuch as the two species are now considered to be synonyms it is obvious that he was in error in depicting separate types of structures. The figure purported to be a representation of *Lamprophis inornatus* bears close resemblance to the hemipenis of *Ablabophis rufulus*, a species readily confused with *L. inornatus* when preserved specimens are examined. The lack of a male *L. inornatus* makes it impossible for me to form a definite opinion as to the identity of Cope's other figure.

### **BOTHROPHTHALAMUS PETERS**

#### **Bothrophthalmus lineatus lineatus** (Peters)

*Elaphe (Bothrophthalmus) lineatus* PETERS, 1863, *Monatsb. Akad. Wiss. Berlin*, p. 287: "Guinea."

*Bothrophthalmus lineatus* BOULENGER (*partim*), 1893, *Cat. Snakes Brit. Mus.*, I, p. 324.—SCHMIDT (*non partim*), 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 61.

*Bothrophthalmus lineatus lineatus* LOVE-RIDGE, 1938, *Proc. Acad. Nat. Sci. Phila.*, LXXXIX, p. 271.

Lukolela, Belgian Congo, 1 (No. 45909, Chapin, Edson, January 19, 1931).

**LEPIDOSIS.**—This single specimen agrees well with the description given by Schmidt (*loc. cit.*) for a series of 37 specimens from the Congo. Dorsal scales 23–23–21, ventrals 194, tail incomplete. Dorsum black,



with five white (bright red in life) longitudinal lines.

**MAXILLARY TEETH.**—Twenty-one in number, enlarged anteriorly, decreasing in size posteriorly so that the rear teeth are about one-half the size of those in the front of the jaw.

***Bothrophthalmus lineatus brunneus*  
Günther**

*Bothrophthalmus brunneus* GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) XII, p. 356, Pl. VI, fig. E: Fernando Po Island, Gulf of Guinea.

*Bothrophthalmus lineatus* BOULENGER (pro parte, "Type C"), 1893, Cat. Snakes Brit. Mus., I, p. 324.

Metet, French Cameroon, 2 (Nos. 50556-57, Grissett, August to October, 1927).

**LEPIDOSIS.**—Dorsal scale-rows 23-23-19, and 23-23-21. Ventrals 188 and 192; caudals 75-76. Supralabials 8, the fourth and fifth entering the orbit. Preoculars 2, postoculars 2, temporals 2+3.

**DIMENSIONS.**—Total lengths 470 mm. and 780 mm., tail ratios .17 and .19, respectively.

**MAXILLARY TEETH.**—Identical with those of the typical form, twenty-one in number, decreasing in size posteriorly.

**HEMPENIS.**—(No. 50557) Spiny, elongate, extending to the sixteenth caudal, bifurcating at the eleventh. Sulcus forked at the sixth caudal. Spines enlarged basally, numerous, extending to the tips of each branch in strips, decreasing in size distally.

**PARASITES.**—The larger specimen was heavily infested with mites, many of them imbedded near the bases of dorsal scales, sometimes two to a scale.

**COLORATION AND REMARKS.**—These two males are uniform brown above, this color extending to the first scale-row with the venter yellowish (in alcohol). The upper surface of the head is lighter, sharply set off from the brown on the neck. The smaller specimen has a distinct brown-bordered, light, V-shaped mark on the head, the apex extending as a light line which terminates at the suture of the internasals. A similar pattern is obscurely defined on the larger specimen. The underside of

the neck is darker than the rest of the venter, and the tips of the lower labials are edged with brown in both specimens. Although no differences in scalation can be detected, this form without stripes seems to be separable as a race of the typical form.

**BOAEDON DUMÉRIL AND BIBRON**

***Boaedon lineatus lineatus* Duméril and  
Bibron**

*Boaedon lineatus* DUMÉRIL AND BIBRON, 1854, Expét. Gén., VII, p. 363: Gold Coast.

*Boodon lineatus* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 332.

Rungwe Mountains, Tanganyika Territory, 14 (Nos. 38982, 38987, 38999, 39002, 39006, 39096, 39175-79, 39184-85, 39195, Boulton and Boulton, 1929).

Mwaya, Tanganyika Territory, 2 (Nos. 50642-43, Carnochan, 1929).

Mawere Shamba, Tanganyika Territory, 1 (No. 49919, Carnochan, 1929).

Mlanje, Nyasaland, 5 (Nos. 44307, 44324-27, Boulton and Boulton, 1929).

Karonga, Nyasaland, 1 (No. 39007, Boulton and Boulton, 1929).

Ruchuru, Belgian Congo, 1 (No. 50645, Chapin, Edson, April, 1931).

Hanha, Angola, 23 (Nos. 50646-66, 58323-24, Vernay, Lang, Boulton, 1925).

Merebank, Natal, 2 (Nos. 57621, 57631, Coghill, 1933).

**LEPIDOSIS.**—Scale-count data for the series of 49 specimens listed above indicate a fair amount of variation within the species. Some evidence of incipient speciation is apparent when scale counts and other data are tabulated for separate areas. Yet on the whole the differences shown in this series appear to be too slight to warrant the recognition of races, more especially since there seems to be no significant majority of characters confined to any one population. An insular and a possible mainland subspecies have been listed under separate heads.

Dorsal scale-rows most commonly 25-27-19 on snakes from all areas except Natal, the two specimens available from this region having 19-31-19 and 21-31-19, respectively. In the whole series extremes of variation are 25 to 31 for midbody scale-rows. Averages for ventral scale counts

are as follows for respective areas (extremes given in parentheses): Tanganyika Territory, males 205.2 (202-209, 4 specimens), females 222.7 (218-226, 12 specimens); Nyasaland, male 216, females 219 (212-225, four specimens); Belgian Congo, female 231; Natal, females 221-222 (two specimens); Angola, males 200.2 (195-204, 8 specimens), females 219.2 (213-231, fifteen specimens). Anal divided throughout the entire series.

Caudals in two series, one specimen from Angola with the first four single. Averages for caudal counts (extremes in parentheses): Tanganyika Territory, males 62.5 (60-66, five specimens), females 47.6 (43-53); Nyasaland, male 68, females 49.8 (48-54, five specimens); Angola, males 68.8 (62-72, eight specimens), females 53.8 (52-59, fourteen specimens).

Supralabials 8, except one specimen which has 8-9, the fourth and fifth entering the orbit in 51 per cent of the specimens, the third, fourth and fifth in 37 per cent, the remaining 12 per cent being asymmetrical. Infralabials normally 9, rarely 10, the first three or four, more rarely the first five, in contact with the anterior chin-shields. Loreals all single except seven from Angola with 2. In one specimen the loreal makes a broad contact with the eye below the preocular. Preoculars more frequently 1 (53 per cent), less commonly 2 (40 per cent), with 7 per cent asymmetrical or undetermined. Temporals 1+2(+3), occasionally 1+3.

**DIMENSIONS.**—Maximum-sized snakes for the several areas represented are: Tanganyika, female 1005 mm.; Nyasaland, female 980 mm.; Belgian Congo, female 1045 mm.; Natal, female 950 mm.; Angola, female 1013 mm. Ratios of tail to total length have a maximum variation of .10 to .20, with averages and extremes for separate areas and sexes as follows: Tanganyika, males .17 (.16-.17), females .12 (.10-.12); Nyasaland, male .17, females .13 (.12-.13); Belgian Congo, female .11; Natal, females .14 (.13-.14); Angola, males .17 (.15-.20), females .14 (.12-.15). The variation shown is insufficient for racial separation.

**MAXILLARY TEETH.**—Three specimens examined (Nos. 39178, 39006, 50643) have 22, 21 and 20, respectively. The first six teeth are somewhat enlarged, and a diastema separates these from the posterior teeth in the specimen with twenty, a smaller diastema is present in the maxillary with twenty-one teeth, while the one with twenty-two not only shows no gap in the series of teeth, but the anterior teeth are not conspicuously enlarged.

**HEMIPENIS.**—Two specimens examined, one from Angola, No. 38982, and one from Tanganyika Territory, No. 50647, are essentially identical. The structure extends to the fourteenth caudal, bifurcating at the twelfth. Sulcus divides at the eighth caudal. Basal spines enlarged, arranged in approximately twelve strips or rows of spines which merge distally into a chevron-like pattern, the extreme distal position with denticulate calyces.

***Boaedon lineatus mentalis* (Günther)**

*Boodon mentalis* GÜNTHER, 1888, Ann. Mag. Nat. Hist., (6) I, p. 331, Pl. XIX, fig. A: "Damaraland," Southwest Africa.

(?) *Boodon mentalis-lineatus* STERNFELD, 1910, Mittl. Zool. Mus. Berlin, V, p. 54.

Kroonstad, Orange Free State, South Africa, 1 (No. 50644, Lang, 1926).

**LEPIDOSIS.**—On the single female which seems referable to this form the dorsal scales are 25-27-19. Ventrals 211, anal single, caudals 46. Supralabials 8, fourth and fifth entering the orbit; infralabials 9, the first four touching the anterior pair of chin-shields. The anterior chin-shields extend posteriorly, completely separating the second pair of chin-shields which are narrow and scale-like. Loreal single, preocular 1, postoculars 2, temporals 1+2.

**DIMENSIONS.**—Total length 700 mm., tail 90 mm. giving a tail/total ratio of .12.

**MAXILLARY TEETH.**—Similar to those of other members of the genus, anterior six slightly enlarged, separated by a slight diastema from twelve posterior teeth which are nearly of equal size.

**REMARKS.**—The validity of *mentalis* is open to some question, and the indefinite source of the holotype has contributed to the doubt. Sternfeld (*loc. cit.*), reporting

upon a collection from Southwest Africa, lists 16 specimens under the combined name *mentalis-lineatus* given above as a questionable synonym. Sternfeld's remarks are indefinite, for he does not mention the fairly distinct character of *mentalis*, i.e., the separated anterior chin-shields. FitzSimons (1935, Ann. Transvaal Mus., XVI, p. 310) lists Sternfeld's reference as a synonym of *lineatus* with no further comment. Possibly separated posterior chin-shields represent a character in reality only an individual aberration to be met in South African *B. lineatus*. I have examined the chin-shields on a large series of typical *lineatus* in the American Museum collection, but not a single snake with separated posterior chin-shields was discovered. On the other hand, the Kroonstad specimen has only 211 ventrals, a lower count than any female *lineatus* examined, and the type of *mentalis* has 214, sex not stated. It should be noted here that the sexual dimorphism for both ventrals and caudals in all species of *Boaedon* is so extensive that figures given are of little significance unless the sex is stated. However, what few data there are available for *mentalis* suggest an average ventral count lower than for that of *lineatus*. The pattern and other characters of *mentalis* are obviously close to *lineatus*, and therefore I have tentatively placed it as a race of the latter. Comparisons of large series from the interior of South Africa eventually should establish or disprove its validity. The indefinite type locality, "Damaraland," will be of little help.

#### *Boaedon lineatus bedriagae* (Boulenger)

*Boaedon bedriagae* BOULENGER, 1905, Ann. Mus. Civ. Stor. Nat., (3) II, p. 211: St. Thomas Island, Gulf of Guinea.—ANGEL, 1920, Bull. Mus. Hist. Nat. [Paris], XXVI, p. 199.

*Boaedon quadrilineatus* JAN, 1870 (*nec* Duméril), Icon. Ophid., Livr. 36, Pl. II, fig. 3.

St. Thomas Island, Gulf of Guinea, 1 (No. 50530, Correia, 1929).

LEPIDOSIS.—Dorsal scales 27–27–23. Ventrals 232, anal plate single, ventrals 34 + (tail incomplete). Supralabials 8, the fourth and fifth entering the orbit, the

posterior portion of the third extending nearly to the eye. Infralabials 9, the first four touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2.

DIMENSIONS.—Total length (tail incomplete) 1070 mm., tail, with healed extremity, 100 mm. The single specimen is a female. Angel (*loc. cit.*) gives measurements on two specimens, the largest and the smallest of six from St. Thomas as follows: total length 1150 mm., tail 190 mm., the smaller specimen as 450 mm., tail 82 mm. These would give respective tail/total ratios of .16 and .18, for two specimens, probably males as indicated by the ventral counts which Angel gives as 202 to 206.

MAXILLARY TEETH.—The anterior six greatly enlarged, separated from fifteen posterior teeth of nearly equal size by a diastema. The anterior six teeth are twice the size of the others in this specimen, but there is such extensive variation in the teeth of other species of *Boaedon* that such a character is of little specific taxonomic significance.

REMARKS.—Boulenger (*loc. cit.*) in the original description of *bedriagae* gives the following diagnosis: "This species differs from *B. lineatus* in the third upper labial constantly entering the eye, and in the markings of the head, the light lateral streaks uniting in the praefrontal shields, the greater part of the snout being light colored, with darker spots, and a dark streak through the nostril, whilst in *B. lineatus* the dark brown area of the top of the head extends to the internasals."

Angel (*loc. cit.*) mentions a specimen with the eye bordered by the fourth and fifth labials on one side, whereas the specimen now available is symmetrical. As shown under *B. lineatus lineatus*, the labial character is exceedingly variable in the typical form, and thus can have no diagnostic significance in separating *bedriagae*. On the other hand, if we combine the counts given by Boulenger with those given by Angel we obtain for *bedriagae*: ventrals 202–237, caudals 61–81, dorsal scales at midbody 27–31. Only average differences for these characters are in-

licated for *bedriagae* if we are to separate it from *lineatus*. The pattern (not determined in No. 50530 which is faded and discolored) seems to warrant separation, and likewise the average size appears to be greater than in *lineatus*. But none of these characters seems to me to be of great importance and accordingly I have referred it to *lineatus*, its obvious progenitor, as a race inhabiting St. Thomas and Prince's Islands. It is interesting to note that insular isolation appears to have produced a larger form rather than a smaller one as more frequently happens with mammals, but much less frequently with reptiles.

#### **Boaedon virgatus** (Hallowell)

*Coelopeltis virgatus* HALLOWELL, 1854, Proc. Acad. Nat. Sci. Phila., VII, p. 98: Liberia.

*Boodon virgatus* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 331.

Ganta, Liberia, 6 (Nos. 50636-41 and 50721, fourteen eggs containing embryos, Harley, Aug. 3, 1932).

LEPIDOSIS.—Dorsal scales 19-21-17 on three specimens, 19, 21, or 23-23-17 on three others, females tending to have the higher midbody count. Ventrals 197-200 on two males, extremes for four females 213-218; respective averages 198 (males) and 216 (females). Anal plate single, caudals, males 55-62, mean 58; females 42-47, mean 44. Supralabials 8, the fourth and fifth entering the orbit, infralabials 9. Preoculars 2, except for one specimen with 1. Postoculars uniformly 2. Temporals 1+2+3, one specimen with 1+1.

DIMENSIONS.—Largest female 710 mm., largest male 520 mm. Tail/total ratios: males average .16 with extremes of .15 to .16; females average .12 with extremes of .11 to .13.

MAXILLARY TEETH.—Nos. 50636 and 50641 each have twenty, the first six slightly enlarged, in the latter specimen separated from the remainder by a short diastema. In the former there is no diastema.

HEMPENIS.—(No. 50638). Essentially like that of *B. l. lineatus*, but distal portion more spinous. Extends to the fourteenth caudal, bifurcating at the eighth. Sulcus

divides at the eighth caudal. Basal spines enlarged, decreasing in size distally and near the region of bifurcation merging into a chevron-like arrangement which extends to the tip of each fork.

LIFE HISTORY NOTE.—Fourteen eggs collected by Dr. G. W. Harley on August 3 are nearly full term. One embryo measured approximately 145 mm. in length. Six of the eggs are in an adherent mass, roughly arranged in two rows of three. Eggs vary in length from 27 mm. to 36 mm.; in width from 15 mm. to 18 mm., the shorter eggs tending to be wider.

#### **Boaedon olivaceus** (Duméril)

*Holuropholis olivaceus* DUMÉRIL, 1856, Rev. Mag. Zool., (2) VIII, p. 466: Gaboon, French Equatorial Africa.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 66.

*Boaedon olivaceus* LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 23.

Metet, French Cameroon, 11 (Nos. 50560-66, 50568-71, two specimens are heads only, Grissett, April, 1927).

Lukolela, Belgian Congo, 2 (Nos. 45919, 50567, Chapin, Edson, 1930 and 1931).

LEPIDOSIS.—Midbody scale-rows 25 to 29, with 29 the mode for the Metet specimens, while both Lukolela specimens have 27 which Schmidt (*loc. cit.*) lists as the mode for Congo specimens. Data for five females and four males from Metet are as follows: ventrals (males), extremes 182-192, mean 189; (females), extremes 204-208, mean 205. Caudals (males), extremes 52-56, mean 53.5; (females), extremes 40-44, mean 41. Thus females average 16 more ventrals and 12.5 fewer caudals than males in this series. The Lukolela specimens, male and female, have 206 and 187 ventrals with 43 and 54 caudals, respectively.

Supralabials 8, the fourth, fifth and sixth entering the orbit on seven specimens, the fourth and fifth only on four other Metet specimens whereas both Congo snakes are asymmetrical for this character. Loreal single, touching the orbit below the preocular on about half the series. Preoculars uniformly 1, postoculars 2, one individual having a single postocular on one side. Temporals either 1+2 or 1+3.



Caudals all single except on one specimen which has the first two divided.

**COLORATION.**—Dr. J. P. Chapin gives data on a live Congo specimen as “greenish gray above, dull grayish yellow below, eyes light brown.” On this specimen the yellow of the venter extends on the underside of the tail. On all other specimens the underside of the tail is dark, while the whole venter or merely the midline may be yellowish.

**DIMENSIONS.**—Largest male 660 mm., largest female 780 mm., both from Metet. Proportionate tail length in Metet males varies from .12 to .19, mean .16; in females from .11 to .12, mean .12. It may be noted that the shortest tail on any male is on the smallest one (measuring 290 mm. overall).

**MAXILLARY TEETH.**—Two specimens examined, Nos. 50568 and 50571, have nineteen and twenty, respectively. On each the first six are slightly enlarged, a scarcely noticeable diastema separating them from the others.

**HEMIPENIS.**—Well developed (No. 50569), extends to the nineteenth caudal, bifurcating at the fourteenth, sulcus divided at the seventh. Proximal portion with about twelve rows of enlarged spines which diminish slightly in size and merge into reticulated calyces on each branch. Calyces denticulate except on the terminus of each lobe.

#### PSEUDOBOODON PERACCA

##### *Pseudoboodon lemniscatus* (Duméril and Bibron)

*Boaedon lemniscatum* DUMÉRIL AND BIBRON, 1854, *Erpét. Gén.*, VII, p. 365: Abyssinia (Ethiopia).

*Boodon lemniscatus* BOULENGER, 1893, *Cat. Snakes Brit. Mus.*, I, p. 329.

*Pseudoboodon lemniscatus* PARKER, 1930, *Ann. Mag. Nat. Hist.*, (10) VI, p. 598.—LOVERIDGE, 1936, *Zool. Ser. Field Mus. Nat. Hist.*, XXII, p. 22.

Ganamé, Ethiopia, 1 (No. 20346, Brown, October 24, 1920).

**LEPIDOSIS.**—A male with dorsal scales 23–23–17, ventrals 200, anal entire, caudals 62. Supralabials 8, the third, fourth and fifth entering the orbit. The depression or labial pit on each side falls on the

fifth and sixth labials, the common suture of which is curved as a result. Infra-labials 9, the first three on one side, the first four on the other touching the anterior pair of chin-shields. Loreal single, preocular 1, postoculars 2, temporals 1+2. The pattern corresponds closely to the description given by Boulenger (*loc. cit.*).

**DIMENSIONS.**—Length overall 480 mm., the tail (88 mm.) comprising .18 of the total length.

**MAXILLARY TEETH.**—Anteriorly there are five larger teeth followed by a sixth which is isolated from the others by a narrow diastema on either side of it. Behind this tooth there are fourteen other teeth which are subequal in size.

**FIELD NOTE.**—Dr. Barnum Brown has recorded that the Ganamé specimen “was carried all day between the saddle and pad of Captain Moore’s horse before it was discovered. It had doubtless crept in during the night to seek warmth.” More probably it was merely seeking a place to secrete itself.

**HEMIPENIS.**—The organ extends to the twenty-fourth caudal, bifurcating at the twenty-first. The sulcus divides at the tenth caudal. Basal spines small, arranged in diagonal rows. Distally spines increase in size to a maximum length near the region where the organ bifurcates. On each lobe the spines rapidly diminish in size toward the tip where the spines are smallest. On the side opposite the sulcus a longitudinal groove covered by a flap of tissue bears some resemblance to a sulcus spermaticus, but the groove does not extend to the region of bifurcation.

**REMARKS.**—Parker (*loc. cit.*) has given arguments for the retention of the genus *Pseudoboodon*. The genus may be separable from *Boaedon* on the basis of the peculiar labial pits and the absence of apical pits on the dorsal scales. However, although Parker has mentioned dentitional differences, neither the teeth nor the hemipenes provide any basis for separating *Pseudoboodon* from *Boaedon*. Under *Boaedon l. lineatus* I have shown in that species that the diastema may be either present or absent and the anterior teeth

may or may not be strongly enlarged. Furthermore, I have examined a specimen of *Pseudoboodon erlangeri* Werner (M. C. Z. No. 22204) from Ethiopia and it has the anterior teeth enlarged and the diastema present.

The hemipenis of *P. lemniscatus* resembles those of species of *Boaedon* but lacks the distal calyces, which are present, however, on the hemipenis of *P. erlangeri* mentioned above.

#### HORMONOTUS HALLOWELL

##### *Hormonotus modestus* (Duméril and Bibron)

*Lamprophis modestus* DUMÉRIL AND BIBRON, 1854, *Erpét. Gén.*, VII, p. 429: Coast of Guinea. *Hormonotus modestus* GÜNTHER, 1862, *Ann. Mag. Nat. Hist.*, (3) IX, p. 53.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 70.

Lukolela, Belgian Congo, 2 (Nos. 45922-23, Chapin, Edson, 1931).

Metet, French Cameroon, 1 (No. 51779, Grissett, 1927).

LEPIDOSIS.—Dorsal scales in all specimens 15-15-13. Ventrals, Lukolela males 234 and 232, Metet female 230. Caudals, males 90 and 94, female 85. Supralabials 8, uniformly, with the third, fourth and fifth entering the orbit. Infralabials 9, the first four touching the anterior chinshields on all specimens. Loreal 1, preocular 1, postoculars 3, without variation. Temporals 1+3+4 and 2+3 in the Lukolela specimens, whereas the Metet specimen has 1+2+3.

DIMENSIONS.—Total lengths for the males are 610 mm. and 670 mm., with tails 130 mm. and 152 mm., respectively, and tail/total ratios of .21 and .23. The female, measured with doubtful accuracy inasmuch as the body has been severed and stitched together, has a length overall of 500 mm.(?), with a tail 98 mm., giving a questionable ratio of .19.

COLORATION.—Uniformly brownish above, lighter below, the dorsal plates on the head slightly darker with lighter edges. Both males are uniformly cream-color on the chin, whereas the female has a dark spot at the tip of each infralabial.

MAXILLARY TEETH.—Both Congo specimens have five anterior teeth sharply in-

creasing in size, followed after a diastema by, respectively, eleven and thirteen small, subequal teeth. The Cameroon specimen is similar, but with six anterior and fifteen posterior teeth.

HEMIPENIS.—Three specimens examined (including one previously reported upon by Schmidt, *loc. cit.*) were similar. No. 45922 may be described as follows: Extends to the ninth caudal, bifurcating at the sixth, sulcus dividing at the third. Proximal portion with a few scattered spinules, largest adjacent to the sulcus, followed by six basal spines, two on either side of the sulcus greatly enlarged, each followed by a smaller one, with two spines intermediate in size situated between these four. Terminal portion and each lobe spiny, the size of the spines decreasing in size distally.

STOMACH CONTENTS.—One of the Lukolela specimens contained a *Hemidactylus*.

#### MEHELIA CSIKI

##### *Mehelya poensis* (Smith)

*Heterolepis poensis* SMITH, 1849, *Illus. Zool. So. Africa*, Rept. (under *Heterolepis capensis*, Pl. IV): Fernando Po Island, Gulf of Guinea.

*Mehelya poensis* SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 72, Pl. VI.

Metet, French Cameroon, 2 (Nos. 50515-16, Grissett, 1927).

Lukolela, Belgian Congo, 1 (No. 45924, Chapin and Edson, December 20, 1930).

LEPIDOSIS.—Dorsal scales 19-15-15, the vertebral row bicarinate, the others with a median keel and with secondary keels on lower rows. Ventrals 245 and 248 for two males, 248 for a female. Caudals 104 and 109 for males, 92 for the female. Supralabials 7, the third and fourth entering the orbit; infralabials 8. Loreal 1, preocular 1, postoculars 2, temporals 1+2 on all specimens.

COLORATION.—Dr. J. P. Chapin gives field notes on the specimen captured at Lukolela as "dull bluish gray above, whitish below." In spirits the specimen is brownish, with a faintly yellowish belly.

DIMENSIONS.—The larger male measures 855 mm., the tail measuring 200 mm. The ratio of tail to total length for males, respectively, .22 and .23. The female

measures 545 mm. with a tail/total ratio of .20.

**MAXILLARY TEETH.**—The maxillary bone removed from the Metet female has eight anterior teeth sharply increasing in size toward the posterior, followed after a diastema by sixteen small, subequal teeth.

**HEMIPENIS.**—The organ examined in the Metet male is characterized by exceedingly long slender branches. It bifurcates at the seventh caudal, extending to the retracting muscle at the twenty-third caudal. Basal portion with sulcus buried beneath two enlarged folds or ridges, the sulcus dividing at the fifth caudals and extending to the tips of each of the long branches. Enlarged, somewhat blunt spines arranged in diagonal rows originate near the division of the sulcus, decreasing in size toward the middle of the branches, and near the twelfth caudal being replaced by small papillae. Distally from the twelfth caudal, spines increase in size, the ends of the branches being armed with rather long, slender, pointed spines.

**REMARKS.**—This species seems to be the commonest and most readily identified representative of the genus *Mehelya* inhabiting West Africa. The absence of diagonal striations on the dorsal scales appears to be characteristic, even of larger specimens, whereas in some other species there is evidence that the striations are acquired with age.

#### *Mehelya nyassae* (Günther)

*Simocephalus nyassae* GÜNTHER, 1888, Ann. Mag. Nat. Hist., (6) I, p. 328: Lake Nyasa, Nyasaland.

*Mehelya nyassae* LOVERIDGE, 1936, Bull. Mus. Comp. Zool., LXXIX, p. 243.

Mt. Selinda, Southern Rhodesia, 1 (No. 51953, Boulton and Boulton, November, 1929).

**LEPIDOSIS.**—A female with dorsal scales 17-15-15, the vertebral row bicarinate, the scales of the contiguous rows with median keels which do not extend to the apical end, where two lateral keels or elongate tubercles are situated in lateral positions (similar to the positions of double apical pits of some other snakes). Toward the venter successive scale-rows are char-

acterized by scales with increasingly longer median keels, the row adjacent to the ventrals having a weaker keel extending to the apical end, whereas the lower secondary keel may be missing. Scales on the posterior half of the tail smooth. Ventrals 175, anal plate single, caudals 58+, a very small portion of the tail missing. Supralabials 7, the third and fourth entering the orbit. Infralabials 8, the first five touching the anterior chin-shields. Loreal slightly longer than high, in contact with a single preocular on each side; postoculars 1, temporals 1+3. The diameter of the eye is hardly larger than that of the nostril, smaller than the anterior nasal. The frontal is scarcely longer than broad, about as long as the prefrontals, a little more than half as long as the parietals.

**COLORATION.**—Blackish above, the exposed skin between the scales lighter, with a purplish-brown tinge. Venter brownish, the posterior margins of the ventrals lighter. Head plumbeous black above; below the mental and the first three infralabials are brownish yellow, edges of the fourth, fifth and sixth labials and the posterior pair of chin-shields similar in color. Anterior chin-shields dark brown.

**DIMENSIONS.**—Total length 534 mm.; tail, with perhaps 5 mm. missing, measures 107 mm. The ratio of tail to total length computed on the basis of the measurements gives a figure of .20 which agrees favorably with computations made for two other females recorded by Loveridge from Kenya Colony and Mozambique. These two specimens had tail/total ratios of .18 and .21, respectively. The same ratio for the holotype (sex not stated) can be determined as .21.

**MAXILLARY TEETH.**—Anterior eight sharply increasing in size posteriorly, followed after a diastema by eighteen smaller teeth which diminish slightly in size toward the posterior.

**REMARKS.**—This species bears considerable resemblance to *Mehelya stenophthalmus* from which it appears to differ in having no secondary keels on the dorsals (?), a proportionately longer tail and fewer ventrals (171 to 178 for *nyassae* and 198

to 214 for *stenophthalmus*, *vide* Loveridge, 1939). One of three cotypes upon which Mocquard (1887, Bull. Soc. Philom., (7) XI, p. 16, Pl. I, fig. 1: type locality Cape Lopez, French Congo) based his description of *stenophthalmus* is figured and bears considerable resemblance to the specimen at hand, not only in the proportionate sizes and arrangement of the cephalic plates but also in the similar (but not identical) markings on the chin. The small eye of

uous range and the necessity of reducing *nyassae* to the status of a subspecies of *stenophthalmus*. Or the similar habitus of each may be a case of convergent evolution. More satisfactory comparisons of specimens reported in the literature will be possible if the sex of individual specimens is stated. To date no males have been reported as such, and accordingly there is no knowledge concerning possible dimorphism.

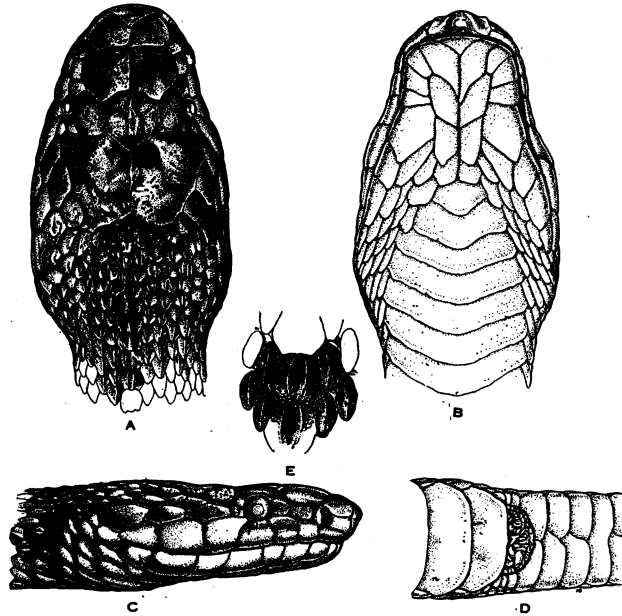


Fig. 1. *Mehelya vernayi*, new species (A. M. N. H. No. 51795, adult female type). (A) dorsum of head showing rugose head shields, (B) ventral view of head, (C) lateral view of head, (D) ventral view of anal region, (E) detail of middorsal scales showing striations. All figures natural size except (E) which is enlarged twice.

*stenophthalmus* usually has been used to characterize the species, yet Mocquard's plate shows rather definitely that the eye is scarcely smaller than that found in the specimen of *nyassae* now before me.

*Mehelya stenophthalmus* is known from West Africa, whereas *M. nyassae* is known only from East and South Africa, the present record constituting the first for Southern Rhodesia. Thus, there is no evidence that the respective ranges of the two are contiguous. Further collecting in the interior of Africa may indicate a contin-

### *Mehelya vernayi*, new species<sup>1</sup>

Figures 1-2

DIAGNOSTIC CHARACTERS.—A large species with heavily keeled and diagonally striated dorsal scales arranged in nineteen rows at midbody and with three labials entering the orbit. From *Mehelya riggenbachi*, the only other species with nineteen scale-rows, it differs in having a much higher ventral scale count, three labials entering

<sup>1</sup> Since this paper was written Loveridge (1939, Bull. Mus. Comp. Zool., LXXXVI, pp. 131-162) has published a revision of the genus *Mehelya*. His conclusions require no changes in the diagnosis of *M. vernayi*, but it is worth mentioning that the remarks under the three species discussed in this paper were written prior to the publication date of the paper by Mr. Loveridge.

the eye and proportionately longer parietals (as compared with the length of the frontal). From *M. capensis* and *M. guirali*, which it approaches in coloration and number of ventrals, it readily may be distinguished by the more numerous scale-rows, and apparently by a more flattened head.

**TYPE.**—A. M. N. H. No. 51795, an adult female. Collected at Hanha, Angola, May 13-19, 1925, by Messrs. Arthur S. Vernay, Herbert Lang and Rudyerd Boulton of the Vernay Angola Expedition.

**DESCRIPTION OF THE TYPE.**—**LEPIDOSIS:** The scale-rows are 21-19-17, the vertebral row bicarinate, the lateral rows from the occiput to near the end of the tail, with pronounced median keel and diagonal striations. Ventrals 256; anal plate entire; caudals in two series, 65 in number. Lateral keels on the venter feebly developed.

Rostral twice as broad as high, deeply concave and recurved on the underside. There is a pair of internasals, each plate slightly broader than long, their common suture half as long as their respective sutures with the prefrontals. Prefrontals as long as the frontal, about one and one-half times as long as the internasals, hardly as wide as long. Frontal as wide as long and a little

first ventral and the posterior chin-shields may represent a third pair of chin-shields. (See Fig. 1.)

**FORM.**—Body moderately stout, roughly subtriangular in cross section. Head flat (13 mm. in thickness and 26 mm. wide at the posterior end of temporals), sharply distinct from neck. Tail moderate or short, its base narrower than body at anus. Although Boulenger describes the genus as having a vertically elliptical pupil, it appears to be round in this preserved specimen.

**DIMENSIONS.**—Length overall 1035 mm.; length of tail 193 mm.; ratio of tail to total length .18.

**DENTITION.**—Maxillary teeth twenty-five on either side, the first eight increasing in size posteriorly, followed after a very short diastema by thirteen smaller, rather blunt, teeth which diminish slightly in size toward posterior of the bone. Mandibular teeth twenty-five, the first six increasing in size so that the largest tooth is the sixth which is followed by nineteen smaller teeth which diminish in size toward the posterior. Palatine and pterygoid teeth numerous and well developed. (See Fig. 2.)

**COLORATION.**—Upper surface of the head and dorsum of the neck region uniformly dark olivaceous. The posterior five supralabials,

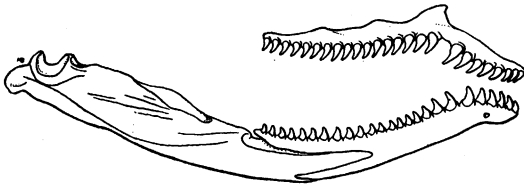


Fig. 2. Maxilla and mandible of *Mehelya vernayi* (A. M. N. H. No. 51795, type  $\times 2$ ).

shorter than its distance from the rostral. Parietals more than one and one-half times as long as the frontal, their common suture half as long as the frontal. Supraoculars longer than wide, a little more than half as wide as the frontal.

Anterior nasal about as high as wide, the posterior nasal about one and one-half times as large as the anterior. Nostril two-thirds the diameter of the eye, situated on the commissure between the nasals. A single loreal on either side, each a little longer than high, situated above the suture between the third and fourth labials. A single preocular on each side in contact with supraocular, prefrontal, loreal, third labial and orbit. Two small postoculars. The eye is moderately large, its diameter equal to its distance from the mouth, less than half as great as the distance from the nostril to the eye. Temporals on each side 1+2.

Supralabials 7, the fifth and sixth larger, the third, fourth and fifth entering the orbit. Infra-labials 8, the first pair meeting on a long suture behind a rather large mental plate, the fifth much larger than the others. The first five infra-labials touch anterior chin-shields which are longer than posterior pair. Two scales between

postoculars and temporal shields with lighter posterior margins. On the neck the vertebral and contiguous dorsal scales are uniformly dark; posteriorly all dorsal scales have lighter margins at their apical ends, the width of the lighter margins increasing to a third or a half of individual scales at midbody. Rows of scales adjacent to the ventrals lighter than those above, the proportion of light to dark on scales increasing with successive rows toward the venter. Chin, throat, neck and venter immaculate yellow; ventrals on the anterior third of the body with darker lateral margins.

**LIFE HISTORY NOTES.**—The oviducts of the type contained eggs, the number of which could not be determined because the membranes of most of them were broken and the eggs formed a coalesced mass. One egg, more or less intact, measured 37 mm.  $\times$  15 mm. The stomach contained the tail of a large gerrhosaurid lizard, and the abdominal "shell" of a large tenebrionid beetle, probably the undigested remains of the stomach contents of the lizard.

**PARASITES.**—A large tick was attached firmly to the specimen, near the third scale-row at a point about twenty cm. behind the head.

REMARKS.—The description above is given in some detail, inasmuch as it is impossible, with the existing literature, to determine which characters are of greatest value in distinguishing the species of *Mehelya*. It is possible that *M. vernayi* may prove to be a race of either *guirali* or of *capensis*, yet the very significant difference of four scale-rows at midbody appears to be a criterion warranting specific separation, unless and until the existence of a related form with seventeen scale-rows at midbody can be shown to exist in an area adjacent to or in Angola. Nor does it appear probable that the type represents an individual abnormality. The number of scale-rows seems to be a consistent character in other species of the genus, nor is an increase of four rows more than the normal fifteen a probable aberration. However, the validity of these assumptions remains to be proved, and it must be pointed out that both *M. crossi* and *M. riggenbachi*, with seventeen and nineteen scale-rows, respectively, are still known only from a single specimen each.

The species is named in honor of Mr. Arthur S. Vernay whose expeditions into Africa have contributed so extensively to our knowledge of the fauna of the continent.

#### LYCOPHIDION DUMÉRIL AND BIBRON

##### *Lycophidion capense capense* (Smith)

*Lycodon capensis* SMITH, 1831, South Afr. Quart. Jour., I, No. 5, p. 18: beyond Kurri-chane about 25° S. Lat., Cape Colony, South Africa.

*Lycophidion capense capense* LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 233.

Mlanje, Nyasaland, 1 (No. 44308, Boulton and Boulton, 1929).

"Angola," 1 (No. 50511, Vernay, Lang and Boulton, 1925).

Merebank, Natal, South Africa, 1 (No. 60109, Coghill, 1933).

LEPIDOSIS.—Dorsal scales 17-17-15, single apical pits. Ventrals, Mlanje and Merebank females 198 and 189, Angolan male 163. Caudals, females 36 and 46, male 31. Supralabials 8, the third, fourth and fifth entering the orbit throughout the series. Infralabials 8, the first four touching the anterior chin-shields on two speci-

mens, the other asymmetrical with five touching on one side. Nasal divided, the posterior much smaller. Loreal triangular, single, preocular single, postoculars 2, temporals 1+2. Small tubercles present on the mental and upper and lower labials of the Mlanje female, feebly developed on the males.

DIMENSIONS.—The Mlanje female measures 385 mm. with a tail/total ratio of .11, the Merebank female measures 316 mm., tail .46 constituting .14 of the total length. The Angolan male is 215 mm. overall, with a tail/ratio of .12.

MAXILLARY TEETH.—The Mlanje specimen has seven anterior maxillary teeth, sharply increasing in size posteriorly, followed, after a long interspace following the upward curve of the bone, by thirteen teeth of nearly equal size. The anterior and posterior internal maxillary processes are not in contact, but nearly meet to include a large foramen described for the genus *Lycophidion* by Parker (1933, Ann. Mag. Nat. Hist., (10) XII, p. 546).

COLORATION.—The specimen from "Angola" has a pattern that seems not to be mentioned in the literature. The three vertebral rows are evenly pigmented dark brown, bordered by two rows of scales whose centers and posterior margins are dirty white. The other lateral scales have only the posterior margins whitish, so that the effect is given of a vertebral brown stripe bordered by two indistinct white stripes. Throat, labials and chin whitish, labial sutures dark. In part the pattern approaches that described for *L. ornatum* Parker, 1936, from Congulu, Angola, but the snake bears little similarity in scalation. The Mlanje and Merebank specimens are uniformly brown.

HEMIPENIS.—(Examined on No. 16883, a specimen from Morogoro, Tanganyika Territory.) Extends to the fourteenth caudal, bifurcating at the tenth, the sulcus dividing at the seventh. Proximal portion furrowed, with two enlarged basal spines in the region of the fifth caudal. Beyond these, spines extend in about nine rows, decreasing in size to spinules at the distal end of each fork.

STOMACH CONTENTS.—A medium-sized skink, *Mabuya striata*, was removed from the stomach of the Mlanje female.

***Lycophidion capense uzungwensis***

Loveridge

*Lycophidion capense uzungwensis* LOVERIDGE, 1932, Bull. Mus. Comp. Zool., LXXII, p. 375: Dabaga, Uzungwe Mountains, Tanganyika Territory.

Sankuri, Tana River, Kenya Colony, 1 (No. 50792, Davison, Johnson, 1933).

LEPIDOSIS.—A juvenile female having dorsal scale-rows 17-17-15, with single apical pits. Ventrals 160, the first 10 or more divided, with occasional others similarly aberrant and with supernumerary half-ventrals present. Caudals 36, anal plate single. Supralabials 8, the third, fourth and fifth entering the orbit. Infra-labials 8, the first four touching the anterior chin-shields. Loreal single, rectangular, about twice as long as high (instead of triangular as more frequently found in *L. c. capense*). Preocular 1, temporals 1+2.

DIMENSIONS.—Total length 162 mm., tail 20 mm., giving a ratio of .12.

COLORATION AND REMARKS.—This small individual is referred to this race with some doubt, for while the dorsum is uniformly slate colored, with inconspicuous white dots on the tips of the scales, the lighter band following the contour of the snout is marked with dark punctations. The numerous divided ventrals indicate that the specimen is an abnormal individual in other respects.

***Lycophidion laterale*** Hallowell

*Lycophidion laterale* HALLOWELL, 1857, Proc. Acad. Nat. Sci. Phila., IX, p. 58; Gaboon.—PARKER, 1933, Ann. Mag. Nat. Hist., (10) XII, p. 548 (in key).

Metet, French Cameroon, 1 (No. 51780, Grissett, 1927).

LEPIDOSIS.—This female agrees well with Parker's (*loc. cit.*) recent diagnosis, having dorsal scales, with double apical pits, arranged in 17 rows without reduction in number. Ventrals 189, anal plate single, caudals 31. Supralabials 8, the fourth and fifth reaching the eye. Infralabials 9, the first four touching the anterior chin-

shields. Loreal triangular, single, preocular 1, temporals 1+2.

DIMENSIONS.—Total length 376 mm., tail 40 mm., ratio of tail to total length .10.

MAXILLARY TEETH.—Similar in all respects to those of *L. capense*, seven anterior teeth, followed after a wide interspace by thirteen.

HEMIPENIS.—No male has been available. However, Cope's figure (1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. XXII, fig. 6) depicting the organ of *laterale* closely resembles the organ of *L. c. capense* and probably is moderately accurate.

**OOPHILOSITUM PARKER**

***Oophilosotium fasciatum*** (Günther)

*Alopecion fasciatum* GÜNTHER, 1859, Cat. Colubrine Snakes Brit. Mus., p. 196: West Africa.

*Lycophidion fasciatum* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 69.

*Oophilosotium fasciatum* PARKER, 1933, Ann. Mag. Nat. Hist., (10) XII, p. 545.

Lukolela, Belgian Congo, 2 (Nos. 45913, 50547, Chapin, Edson, 1931).

LEPIDOSIS.—Dorsal scales, with double apical pits, arranged in rows 17-17-15. Ventrals, female 174, male 166, caudals, respectively, 46 and 43. Supralabials 8 on one with the third, fourth and fifth entering the orbit, the other 6-7, normal on the side with seven labials, only the third and fourth entering the orbit on the other. Loreal single, preocular single, postoculars 2, temporals 1+2.

DIMENSIONS.—Male and female, respectively, 380 mm., tail 56 mm., and 360 mm., tail 52. Ratio of tail to total length, each .12.

MAXILLARY TEETH.—Removed from a specimen (No. 12028, Medje, Belgian Congo) reported upon by Schmidt (*loc. cit.*). Anterior teeth five, increasing in size toward the rear, followed after a wide diastema by ten small, subequal, conical teeth as described for the genus by Parker (*loc. cit.*). The maxillary foramen in this specimen is reduced to pinhole size.

HEMIPENIS.—Examined on No. 12028 from Medje mentioned above. Extends to the ninth caudal, bifurcating at the sixth, sulcus dividing at the second. Spines arranged in about nine rows or



strips, the proximal ones enlarged, distally decreasing in size to spinules at the ends of the forks. Two rows of spines on either side of the sulcus more enlarged than others.

**Oophilosotum weneri** (Mocquard)

*Lycophidium weneri* MOCQUARD, 1902. Bull. Mus. Hist. Nat. [Paris], VIII, p. 412: Gaboon.

Metet, French Cameroon, 1 (No. 51781, Grissett, 1927).

**LEPIDOSIS.**—The skin on the head of one side of this snake is damaged so that a complete labial count on one side is impossible. The specimen, a male, is otherwise in inferior condition, but the following characters can be determined: Dorsal scales with two apical pits, scale-rows 17-17-15. Ventrals 189; anal plate single; caudals 50. Supralabials 7-?, the second, third and fourth on one side, and the third, fourth and fifth on the other entering the orbit. The elongate second labial extending to the eye probably represents an abnormal fusion of the second and third labials. Infralabials 8-?, the first five touching the anterior chin-shields. Preocular 1, postocular 1, temporals 1+2. Loreal single on each side, extending below the preocular to reach the orbit with a well-defined contact.

**DIMENSIONS.**—Total length 330 mm., the tail (51 mm.) giving a tail/total length ratio of .15.

**COLORATION.**—Uniformly slate-gray, the edges of the ventrals and caudals with whitish edges.

**DENTITION.**—As implied by Parker (1933, p. 546) in his original diagnosis of the genus *Oophilosotum*, the internal processes of the maxillary in this species have fused to enclose a foramen. This specimen of *weneri* has a much larger foramen than that found in the single specimen of *O. fasciatum* examined, but Parker (1936, Nov. Zool., XL, p. 124) has shown that the size of the foramen is of no taxonomic significance and the foramen may be either large, small or even absent, i.e., the processes completely fused, in *fasciatum*. This specimen of *weneri* has but four rather blunt anterior maxillary teeth followed, after a wide diastema on the upward curve

of the bone, by only five small conical teeth. The mandibular teeth are similarly reduced in size and number, with four anterior and five posterior teeth.

**HEMIPENIS.**—Apparently not different from *O. fasciatum*. The organ *in situ* extends to the ninth caudal, bifurcates at the sixth, with the sulcus dividing at the second caudal. Spines arranged in strips with larger spines bordering the sulcus, all spines decreasing in size distally. Distal portion not determined with certainty on the specimen examined.

**REMARKS.**—Parker's original diagnosis of *Oophilosotum* (*loc. cit.*, p. 547) contains the statement, "This species (*weneri*), if it is really distinct from *fasciatum*, should accordingly be referred to *Oophilosotum*." With his implication and with his view I am in agreement, for certainly *weneri* is not distantly related to *fasciatum*, whereas the occurrence of *weneri* in the Cameroons and Gaboon, near the center of the range of *fasciatum*, is contrary to the Jordan Rule, and therefore open to some suspicion. On the other hand, the character "loreal entering the orbit" seems to be rather distinctive for *weneri* although it is not correlated with other distinctive characters. The situation is somewhat analogous to that which exists for Parker's recently named *Lycophidion ornatum*, which he describes as intermediate between *L. capense* and *L. laterale* although it occurs within the range of each. Studies of habits and habitat may provide some basis for determining the validity of *weneri*. The loreal character of the species is unique for the genus *Oophilosotum* (but typical of *Lycophidion elapoides*) and until it can be shown that the character occurs rather commonly in *fasciatum* from other areas, or until series from the same area show both characters with no other correlated differences, the name *weneri* will have to be retained.

**NATRIX LAURENTI**

**Natrix ferox** (Günther)

*Tropidonotus ferox* GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) XII, p. 355, Pl. VI, fig. F: Fernando Po Island, Gulf of Guinea.—BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 241.

*Natrix ferox* BARBOUR AND LOVERIDGE, 1930 (in R. Strong), "Report of the Harvard-African Expedition upon the African Republic of Liberia and the Belgian Congo," p. 772.

Ganta, Liberia, 3 (Nos. 50524-26, Harley, February, 1932).

LEPIDOSIS.—Dorsal scales 25-23-19, strongly keeled with large double apical pits. Ventrals 140 to 142, anal divided. Caudals 63 and 68 for two females and 76 for a male. Supralabials 9 on two specimens, 9-8 on the other. Preocular 1, 1-2 on two specimens. Suboculars 3, postoculars 2. Temporals 1+2. Conspicuous tubercles are present on the anterior chin-shields of the male.

DIMENSIONS.—The largest female measures 510 mm., the male 460 mm. Some sexual dimorphism is indicated for the females have an average tail/total ratio of .24 and the male .28.

MAXILLARY TEETH.—Twenty-six slightly increasing in size posteriorly, (No. 50524).

HEMIPENIS.—Extends to the eighth caudal, slightly bifurcated at the distal end. Sulcus not branched. A single enlarged basal spine on side opposite sulcus. Spinules arranged in several rows, extending to the distal end (No. 50524). The organ is not unlike that of some North American species of *Natrix*.

#### NEUSTEROPHIS GÜNTHER

##### *Neusterophis fuliginoides* (Günther)

*Coronella fuliginoides* GÜNTHER, 1858, Cat. Colubrine Snakes Brit. Mus., p. 39: West Africa.

*Tropidonotus fuliginoides* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 217.

*Natrix fuliginoides* LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 21.

Lukolela, Belgian Congo, 1 (No. 45927, Chapin, Edson, 1931).

Metet, French Cameroon, 1 (No. 50552, Grissett, 1927).

LEPIDOSIS.—Dorsal scales all smooth, without apical pits, arranged in rows with the formula 17-17-15. Ventrals 122 on the Lukolela male, 129 on the Metet female. The anal plate is single on each, tails incomplete on both specimens. Preocular 1, postoculars 3. Temporals 1+2 on the Lukolela specimen. On the Metet

specimen the anterior temporal appears to have fused with the parietal on each side; the parietals are abnormally wide and are in contact with the seventh supralabials so that the temporal formula may be written 0+2.

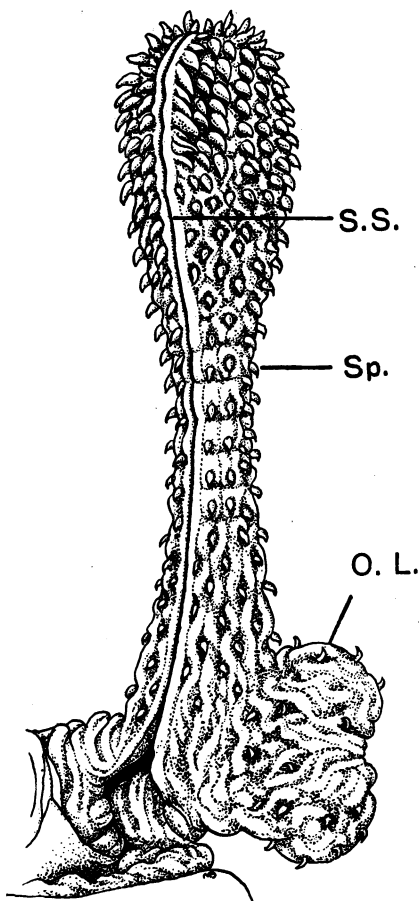


Fig. 3. Everted left hemipenis of *Neusterophis fuliginoides* Günther (A. M. N. H. No. 45927,  $\times 8$ ). (S. S.) sulcus spermaticus, (Sp.) spinules, (O. L.) outer lobe.

DIMENSIONS.—The specimens, each with the tail incomplete, measure, respectively, 370 mm. and 310 mm.

MAXILLARY TEETH.—One maxilla from each specimen was examined. On each there are twenty-four teeth, the anterior ones subequal and the posterior three sharply increasing in size.

HEMIPENIS.—Completely everted on the Lukolela specimen with the following characters determined: The organ is unevenly bifurcate at the base with an undivided sulcus located on the inner branch. The inner branch is the longer of the two, extending to the seventh caudal. It is somewhat club-shaped, narrower at the base and enlarged at the distal end. The outer branch is short, hardly two caudals long, superficially having the appearance of an incompletely everted lobe. Small hooks irregularly arranged are present on the short branch. The main or inner branch has similar hooks on the basal portion which are replaced distally by spines arranged in longitudinal rows which become fleshy protuberances near the terminus. (See Fig. 3.)

REMARKS.—In spite of the fact that the smooth-scaled African snakes heretofore referred to the genus *Natrix* closely resemble serpents of that genus in dentition and markings, they differ remarkably in other correlated characters. Typical snakes of the genus *Natrix* (type species *natrix*) possess strongly keeled scales with double apical pits. In contrast the three African species *laevissima*, *fuliginoides* (including *variegatus*) and *olivacea* all possess smooth scales without pits. In still greater contrast, however, are the hemipenes of this group. The basal bifurcation with one long lobe bearing the sulcus and a second vestigial (?) lobe is unique among African snakes for which data are available, and not at all similar to the hemipenes of any true *Natrix*.

Accordingly I propose the separation of smooth-scaled snakes under the earliest available name, *Neusterophis* Günther. The species *olivacea* and *fuliginoides* were each described under the generic name (*Coronella*) of another valid genus discussed under *Meizodon* in the present paper. Peters in 1861 (Monatsb. Akad. Wiss. Berlin, p. 358) described *variegatus* under the name *Mizodon*, obviously a misspelling of *Meizodon* (type species *regularis*) since that genus was long associated with certain snakes later placed by Boulenger in *Tropidonotus*.

Günther in 1862 (Ann. Mag. Nat. Hist., (3) IX, p. 124, Pl. ix, fig. 4) described a smooth-scaled snake "probably from the East Indies" under the name *Natrix laevissima*. This snake has since become definitely identified with the South African snake currently known by that name. *Neusterophis* was first applied to a snake in this group when in 1863 Günther (Proc. Zool. Soc. London, p. 16) reported on a collection from Fernando Po Island and included a footnote in his description of *Atheris burtonii* stating, "There is also a specimen, in very bad state of preservation, which appears to belong to *Neusterophis laevissima* (*Natrix laevissima* Gthr.)." Since the range of *laevissima* is confined to South Africa, the snake from Fernando Po, therefore, was certainly not *laevissima*. More probably it was *fuliginoides*, the only species now recognized from the Cameroon region and the species presumed to inhabit Fernando Po Island. Thus Günther's reference probably should be included as a questionable synonym of *fuliginoides*.

However, this erroneous reference does not invalidate *laevissima* as the type species since it is the "single original species." The erroneous identification of the species by Günther in 1863 seems to be covered in No. 14 of the "Summaries of Opinions Rendered," by the International Commission where it is stated, "even if the question of the erroneous identification. . . be taken into consideration, the conclusion must be drawn that this erroneous identification did not exclude the original specimens. . . from being covered by this specific name." To reinsure the type designation I hereby designate *laevissima* as type species of *Neusterophis* Günther.

It may be added in conclusion that *Neusterophis laevissimus* is a larger species than the other recognized forms in the genus. Moreover, there is a slight difference in dentition, to judge only from a single maxilla examined. A specimen from Alicedale, Cape Colony (No. 8943), has twenty-five teeth, slightly increasing in size toward the middle of the bone and posteriorly *diminishing* slightly in size.

Unfortunately, no male has been available for an examination of the hemipenis.

The African snakes which belong to true *Natrix* include *tessellata*, *viperina* and *ferox*. On external characters they may readily be distinguished from snakes of the genus *Neusterophis* by their strongly keeled scales with double apical pits. Internally they differ in having hemipenes which are either undivided or bifurcate on the extreme distal end. *Neusterophis* is probably closest to *Liopholidophis* Mocquard, of Madagascar, a genus in which the sulcus is bifurcate.

#### ***Neusterophis olivaceus olivaceus* (Peters)**

*Coronella olivacea* PETERS, 1854, Monatsb. Akad. Wiss. Berlin, p. 622: Tete, Mozambique.

*Tropidonotus olivaceus* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 227.

*Natrix olivacea olivacea* LOVERIDGE, 1935, Bull. Mus. Comp. Zool., LXXIX, p. 7.

Lake No, Anglo Egyptian Sudan, 1 (No. 50528, Anthony, February 13, 1929).

LEPIDOSIS.—A male with dorsal scale-rows 21–19–16. Ventrals 140, anal divided, tail incomplete. Supralabials 8, the fourth and fifth entering the orbit. Loreal single, preocular single, postoculars 3, temporals 1+2.

DIMENSIONS.—Total length 380 mm. plus an undetermined part of the tail which is missing.

REMARKS.—The dentition and hemipeneal characters of this specimen are similar, if not identical, with those described below under the subspecies *uluguruensis*. Further remarks concerning relationships are to be found under the same heading.

#### ***Neusterophis olivaceus uluguruensis* (Loveridge)**

*Natrix olivacea uluguruensis* LOVERIDGE, 1935, Bull. Mus. Comp. Zool., LXXIX, p. 7: Uluguru Mountains, Tanganyika Territory.

Rungwe Mountains, Tanganyika Territory, 3 (Nos. 38983, 38985, 39095, Boulton and Boulton, 1929).

Tukuyu, Tanganyika Territory, 2 (Nos. 39125–26, Boulton and Boulton, 1929).

"Angola," 2 (Nos. 51782–83, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—Dorsal scale-rows 17–17–15

on all specimens, the dorsal scales all smooth and without apical pits. Ventrals vary from 126 to 136, averaging 131.7 for the series which includes two females from Rungwe Mountains with 130 and 136 ventrals, respectively. Anal divided on all specimens. Caudals 71 to 79, one specimen with the tail incomplete. Supralabials usually 8, one exception with 8–9, the fourth and fifth entering the orbit normally, but two specimens have the fifth and sixth on one side making the ocular contact. Loreal single, preocular single without exception. Postoculars normally 3, with 2 on one side of a Rungwe Mountain specimen. Temporals 1+2, a single example having 1+1 on one side of the head.

DIMENSIONS.—Proportionate tail lengths vary from .29 to .36, averaging .33 for three Tanganyika males, .30 for Angolan males and .29 for a single complete female from Tanganyika. The largest specimen is a male 347 mm. overall, from Tukuyu, Tanganyika Territory.

MAXILLARY TEETH.—One specimen examined has twenty-five teeth, the anterior subequal, the posterior three sharply increasing in size.

HEMIPENIS.—A snake from Tukuyu has a hemipenis that appears to be nearly identical with the everted organ depicted for the Lukolela specimen of *fuliginoides*. The organ is basally bifid, and *in situ* in the tail a short lobe, extending to the third caudal, lies dorsad to a much longer lobe which extends to the eighth caudal. The two lobes are controlled by separate retractor muscles, the one attached to the short lobe being comparatively slender. The sulcus is not divided and extends to the terminus of the longer lobe. The short lobe is armed with sparsely arranged hooklets which are likewise present on the base of the longer lobe. Distally on the long lobe spines arranged in longitudinal rows increase and then decrease in size to the terminus.

REMARKS.—The two snakes from Angola are referred to this subspecies with an element of doubt. Specimens in the American Museum, from the Belgian Congo, have the dorsal scales in 19 rows

at midbody and therefore agree with Loveridge's (*loc. cit.*) recent diagnosis of *Natrix o. olivacea*. The Angolan specimens, on the other hand, both fall within the range of characters for the subspecies *uluguruensis*, except for the preanal count. Loveridge describes *uluguruensis* as having 17 scale-rows at midbody and 17 at the anus. On the two specimens from Angola the midbody scale count is 17 but the total formula might best be written 17-17-15-15 for the fourth row drops out on each side a little anterior to midbody. Were more specimens available with more precise locality data it might be possible to predicate the separation of an Angolan race upon such a character. Meanwhile, on the basis of morphological characters, I am forced to assign these specimens to *uluguruensis* with the additional remark that its presence in Angola would lend a peculiar distribution to what Loveridge describes as a "montane" form in Tanganyika Territory.

The examination of a small amount of additional material does not clarify the situation. A specimen from the Ja River, French Cameroon (No. 24286), has the dorsal scale-row formula 17-15-15-15, supralabials 8, the fourth and fifth entering the orbit, the anal divided and 132 ventrals. Such specimens heretofore have been referred to *Natrix variegatus* (Peters) which Loveridge (1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 21) has placed in the synonymy of *Natrix fuliginoides*, noting that within a series from Bitye, Cameroon, the anal was either divided or entire and the scale-rows at midbody varied from 15 to 17.

Loveridge has clarified relationships of the forms of *Neusterophis* in East Africa, but the situation in West Africa has become exceedingly confusing. Snakes in the Congo Drainage Basin may have either 15, 17 or 19 scale-rows at midbody; the anal may be either single or divided. Thus the characters which have been used to separate the species, *fuliginoides*, *variegatus* and *olivaceus*, no longer seem to be tenable. Schmidt (1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 59) has offered evi-

dence to show that there is some correlation of coloration and morphological characters in specimens from the Belgian Congo. The implication is obvious from the data available in Schmidt's paper and from the remarks above that the situation is complex but quite possibly one that can be solved when large series from several areas are available. Probably several West African races can be recognized and I strongly suspect that all of them will prove to be subspecies of *olivaceus*. The South African form, *laevissima*, with less specialized dentition attains a larger size and probably is a distinct species.

#### LIMNOPHIS GÜNTHER

##### *Limnophis bicolor* Günther

###### Figure 4B

*Limnophis bicolor* GÜNTHER, 1865, Ann. Mag. Nat. Hist., (3) XV, Pl. II, fig. C: Duque de Bragança, Angola.

*Helicops bicolor* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 274.

"Angola," 8 (Nos. 50533-40, Vernay, Lang, Boulton, 1926).

LEPIDOSIS.—Dorsal scales all smooth, 19-19-17, except one specimen with the formula 21-23-17. Ventrals 132-139 for seven males, a single male having 135; average for both sexes 136. Caudals: females 44-51, averaging 48.3, the male 58 indicating a dimorphism in the sexes that is correlated with the length of tail. Supralabials 8, the third and fourth entering the orbit; infralabials 10, the first five touching the anterior pair of chin-shields. On all specimens the loreal is single, preocular single, postoculars 2. Temporals most commonly 1+2, one specimen has 1+1 on one side; two specimens are 0+1+2 on both sides and a third specimen has the condition on one side. The scales of the temporal region are variable to the extent that the sixth supralabial may be in contact with the parietal or separated from it by the anterior temporal. Thus the anterior temporal may or may not be in contact with the postoculars.

DIMENSIONS.—The largest female is 490 mm., and the single male 400 mm. overall. Proportionate tail length varies from .17 to .20 in females, averaging .18.

The male has a proportionately longer tail (96 mm.), comprising .24 of the total length.

**MAXILLARY TEETH.**—Three maxillae examined each contained 28 teeth, slightly increasing in size toward the posterior of the bone.

**HEMIPENIS.**—As shown in the figure (4B), the hemipenis extends to the ninth caudal with no evidence of bifurcation, the sulcus undivided. Short spines, arranged in longitudinal rows, emerge from fleshy ridges; no enlarged basal spines.

an arrangement is open to some criticism as I have remarked in the introduction.

On gross examination it would seem necessary to include the African species, *bicolor*, in the genus *Liodytes* Cope. However, I have examined specimens of *Liodytes alleni* and I find the hemipenis to be accurately shown by Cope (1900, Ann. Rept. United States Nat. Mus. (for 1898), Pl. XXI, fig. 8). The hemipenis of *Liodytes* lacks spines on the distal end and possesses two strongly enlarged basal spines, whereas the hemipenis of *Limnophis* (as the African

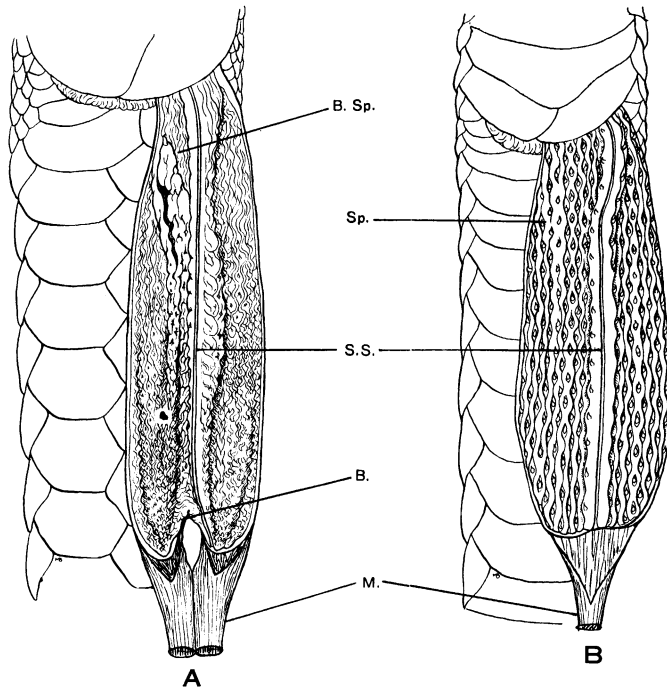


Fig. 4. (A) left hemipenis of *Hydraethiops melanogaster* Günther (A. M. N. H. No. 11939,  $\times 4$ ) and (B) left hemipenis of *Limnophis bicolor* Günther (A. M. N. H. No. 50532,  $\times 4$ ). Depicted in the retracted position, slit down the dorsal aspect and laid open. (B. sp.) Enlarged basal spines, (Sp.) spines, (S. S.) sulcus spermaticus, (B.) bifurcation at distal end, (M.) retracting muscle.

**REMARKS.**—It becomes necessary from an examination of hemipeneal characters to remove *bicolor* from the genus *Helicops* Wagler. Already we recognize the North American genus *Liodytes* with the sulcus undivided, although Boulenger included it under *Helicops*. Dunn (1928, Bull. Antivenin Inst., II, pp. 18–24) would place *Liodytes* and *Helicops* in separate sub-families even though the validity of such

genus must now be known) has no enlarged basal spines although spines are present on the distal end. Furthermore *Liodytes* has the dorsal scales weakly keeled and strongly keeled scales on the tail in contrast to the smooth scales of *Limnophis bicolor*. The maxillary teeth are similar, but *Liodytes alleni* has 29, one more than *Limnophis bicolor* possesses. The similarity of the two genera in certain characters may best

be interpreted as one of parallel or convergent evolution.

Pope (1935, "The Reptiles of China," p. 159) has noted that, "In case the African and Asiatic species in question [*bicolor* and *schistosus*] warrant generic separation [from *Helicops*] the name *Atretium* Cope is applicable to them." I have examined a specimen of *Helicops schistosus* (M. C. Z. No. 22416), the type species of *Atretium*, from Ceylon, and I find enlarged basal spines present and the sulcus branched as in South American species of *Helicops*.

Boulenger was willing to recognize the genus *Hydraethiops* Günther with apical pits, although the single species externally and in dentition is similar to *Helicops*. The hemipenis of this genus (examined on *H. melanogaster*, No. 11927, from Niangara, Belgian Congo) proves to be intermediate between *Helicops* and *Limnophis*. The sulcus is single, as in *Limnophis*, but the extreme distal end of the organ is bifurcate (see Figs. 4A, 4B). Basal spines are present adjacent to the sulcus as in *Helicops schistosus*. The genera *Liodytes*, *Limnophis* and *Hydraethiops* may be regarded as direct derivatives from the ancestral stock of *Helicops* surviving as relict forms now separated from the main range of the parent stock.

The species recently described by Mertens (1936, Zool. Anz., CXIV, p. 284) as *Helicops bangweolicus*, type locality Nsombo, Northern Rhodesia, is doubtless referable to the genus *Limnophis* if it proves valid. Mertens differentiates it from *bicolor* on the grounds that the anterior temporal separates the parietal from the sixth supralabial. Although the type of *bicolor* had the parietal-labial contact, I have shown in the series tabulated above that the condition is variable in the species. However, Mertens described *bangweolicus* as having 24 to 25 maxillary teeth and he described the underside of the tail as light gray with a dark gray longitudinal line in the center. The lepidosis of the type and paratype fall within the variation of *Limnophis bicolor*, but the teeth and the markings on the underside of the tail may serve to separate it, possibly as a subspecies.

#### GEODIPSAS BOULENGER

##### *Geodipsas depressiceps* (Werner)

*Tropidonotus depressiceps* WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 402: Barombi Station, British Cameroon.

*Geodipsas depressiceps* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 101.

Metet, French Cameroon, 1 (No. 51778, Grissett, 1927).

Lukolela, Belgian Congo, 1 (No. 45914, Chapin, Edson, August 6, 1930).

LEPIDOSIS.—Dorsal scales 21–19–17 on the Metet snake, 19–19–17 on the other. Ventrals 146 and 143, both females; caudals 27 and 35. Supralabials 7, the third and fourth entering the orbit; infralabials, 8 on one, 9 on the other, the first four touching the anterior chin-shields. On both specimens the loreal is single, preoculars are 2, postoculars 2. Temporals 1+2, one followed by three on one side of the Lukolela individual.

DIMENSIONS.—The Metet specimen measures 280 mm. overall, the tail (33 mm.) constituting .12 of the total length. The Lukolela snake is 260 mm. in length with a shorter tail comprising but eight per cent of the total.

MAXILLARY TEETH.—Fifteen (on one, sixteen on the other) subequal teeth followed after a diastema by two grooved fangs which are about a third larger than the other teeth.

HEMIPENIS.—(Description based on No. 12203 from Batama, Belgian Congo, reported by Schmidt, *loc. cit.*) Not bifid, extending to the seventh caudal, but with the sulcus bifurcating at the second. Near the base are about thirteen slightly enlarged basal hooks in a V-shaped arrangement, with the apex distally at the sulcus immediately anterior to its division. From each basal hook there extends a ridge surmounted with spinules, the ridges becoming less apparent at the distal end which is ornamented with slender spines.

COLORATION.—These two specimens differ from Congo specimens described by Schmidt (*loc. cit.*) in having no distinct pattern on the body, although head and neck markings are identical. Both specimens are uniformly brownish above with very faint indications of two darker stripes



paralleling the vertebral lighter stripe. The venter of each is purplish brown, somewhat lighter anteriorly. In many respects this species appears to be intermediate between *G. vauerocegae* Tornier and *G. procterae* Loveridge of East Africa although the three recognized African species appear to be distinct.

#### DUBERRIA FITZINGER

##### *Duberria lutrix lutrix* (Linnaeus)

*Coluber lutrix* LINNAEUS, 1766, Syst. Nat., Ed. XII, I, p. 375: "Indiis" = Cape Region?

*Homalosoma lutrix* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 274.

*Duberria lutrix lutrix* LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 242.

Merebank, Natal, South Africa, 2 (Nos. 60110-11, Coghill, 1933).

LEPIDOSIS.—Dorsal scales 15-15-15. Ventrals, male 128, female 131. Anal plate single; caudals, male 51, female 48. Supralabials 6, the third and fourth entering the orbit. Infralabials 6, the first three in contact with the anterior chinshields. Loreal 1, preocular 1, postoculars 2, temporals 1+2 in both specimens.

DIMENSIONS.—The male measures 210 mm., the female 205 mm., with respective tail/total ratios of .22 and .20.

REMARKS.—Loveridge (*loc. cit.*) has given sufficient reasons for recognizing *shiranum* as a race of *lutrix*. Four specimens of the latter, in addition to the two mentioned above, in the American Museum collections agree with his diagnosis in all scale characters, but as shown below under *shiranum* the presence or absence of the dark vertebral band seems to be of little significance.

##### *Duberria lutrix shiranum* (Boulenger)

*Homalosoma shiranum* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 276: Pl. XIII, fig. 1: Shire Highlands, Nyasaland.

*Homalosoma lutrix (partim)* BOULENGER, 1910, Ann. So. Afr. Mus., V, p. 509; 1915 (*partim*), Proc. Zool. Soc. London, p. 625.

*Duberria lutrix shiranum* LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 241.

Rungwe Mountains, Tanganyika Territory, 17 (Nos. 39001, 39099, 39187-94, 39196-98, 39200-02, 39204, Boulton and Boulton, 1929).

Fort Portal, Uganda, 1 (No. 50503, Chapin, Sage, Mathews, 1926).

LEPIDOSIS.—Dorsal scales more commonly 15-15-15, on three specimens 17-15-15, on one specimen 16-15-15 (Rungwe series); the Fort Portal specimen has 17-16-15. Ventrals: in the Rungwe series six males vary from 122 to 139, averaging 130; ten females vary from 136 to 143, averaging 139.6, indicating considerable dimorphism for this character and the necessity for considering the sexes separately in comparisons of populations. Caudals for the same series vary from 42 to 47 in males, averaging 44.5, and from 30 to 38 in females, averaging 33.5, agreeing well with Loveridge's key to sexes (*op. cit.*). The Fort Portal specimen has 141 ventrals and only 19 caudals, fewer than any yet recorded. One Rungwe specimen was unsatisfactory for counts. Supralabials uniformly 6, the third and fourth entering the orbit. Infralabials 6, with two exceptions having 6-7. Loreal absent on both sides of twelve specimens, present on both sides of two Rungwe specimens and the Fort Portal individual and on the right side of a single Rungwe specimen, the loreal on the left obviously being coalesced with the prefrontal (one snake not determined). Preoculars invariably 1; postoculars 1 on all but a single Rungwe specimen. Temporals all 1+2.

DIMENSIONS.—The largest Rungwe female measures 380 mm.; three others, including the Fort Portal snake, measure 375 mm. The largest male measures 375 mm. For the Rungwe snakes ratios of tail to total length for six males vary from .13 to .23, averaging .19; for eight females from .14 to .16, averaging .15. The Fort Portal female has an exceptionally short tail with a ratio to total length of .09.

MAXILLARY TEETH.—Ten in number, subequal in size and rather more widely spaced than in most snakes. No teeth or sockets on the anterior sixth of the maxilla.

HEMIPENIS.—Bifurcate branching at the ninth caudal, each lobe extending to the thirteenth. Sulcus branches at the fifth caudal. No enlarged basal spines, spinules arranged in series somewhat increasing in

size to a point near the fifth caudal and then decreasing in size toward the distal end of each lobe.

**PATTERN.**—In this series the narrow black vertebral stripe is definitely present in nine specimens, faint in three specimens and absent from the remainder, thus not conforming to Loveridge's diagnosis (*op. cit.*, p. 242). However, the absence of a loreal and the presence of only one postocular serve to identify the race.

**LIFE HISTORY NOTES.**—Several of the Rungwe females as well as the Fort Portal snake contained eggs. In some of the snakes, eggs were a coalesced mass and therefore could not be counted. Others contained the following amounts of ova: one contained seven (the largest female), a second contained six, three in each oviduct, two specimens had five in each oviduct (one snake measuring 375 mm., the other 295 mm.), and a single specimen measuring 375 mm. contained seventeen eggs, three in the left oviduct and fourteen in the right. The size of the eggs was approximately 6 mm.  $\times$  13 mm. in the snake with six eggs, and 8 mm.  $\times$  7 mm. in the snake with seventeen, being wider than long and quite variable in size in the latter. Thus there appears to be little correlation of size with the number of eggs in this series, although Loveridge (*op. cit.*) suggests that such a correlation exists in a series he examined.

#### **Duberria lutrix abyssinicum** (Boulenger)

*Homalosoma abyssinicum* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 276, Pl. XIII, fig. 2: Ashangi, Ethiopia.

*Homalosoma lutrix (partim)* BOULENGER, 1915, Proc. Zool. Soc. London, p. 625.

Grau, Ethiopia, 1 (No. 20347, Brown, 1920).

**LEPIDOSIS.**—Dorsal scales ?-15-15. Ventrals (a female) 129; anal plate single; caudals 26. Supralabials 6, the third and fourth entering the orbit. Loreal 1; preocular 1; postocular 1; temporals 1+2.

**DIMENSIONS.**—Length overall 240 mm., tail 30 mm. Ratio of tail to total length .12.

**REMARKS.**—Although Boulenger referred *abyssinicum* to the synonymy of *lutrix* it now appears probable that the

name should be revived. In ventral counts the present specimen falls far below any Tanganyika *shiranum* female listed above and Boulenger's holotype, a male, had but 120, fewer than Loveridge gives for *shiranum*. Caudal counts likewise are lower than the average for *shiranum*. Boulenger's male has fewer than any male *shiranum* reported and the present female with 26 falls considerably below the average (but within the range) of Tanganyika specimens.

Pattern and color are both reported as variable in *shiranum* and in typical *lutrix*, and therefore these characters may be of little value in segregating *abyssinicum*. Nevertheless the pattern and color of the present specimen agree with Boulenger's description of the type, and upon these criteria alone may readily be distinguished from available Tanganyika and Uganda specimens, although a South African *lutrix* is similar. But tentatively, at least until more specimens from Ethiopia become available, the form may be recognized with racial status.

#### **GRAYIA GÜNTHER**

##### **Grayia ornata** (Bocage)

*Macrophis ornatus* BOCAGE, 1866, Journ. Sci. Lisboa, I, p. 67: Duque de Bragança, Angola.

*Grayia ornata* BOULENGER, 1910 (1909), Proc. Zool. Soc. London, p. 944, Fig. 296.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 92.

Metet, French Cameroon, 1 (No. 50550, Grissett, 1927).

**LEPIDOSIS.**—A juvenile female with dorsal scales 19-17-15. Ventrals 158, anal plate divided; caudals 79. Supralabials 8, with an additional small triangular scale separated from the lower anterior corner of the sixth on each side; the fourth labial forms the lower portion of the orbit. Loreal 1; preocular 1; postoculars 2; temporals 2+3.

**DIMENSIONS.**—Length overall 310 mm., tail 78 mm. Ratio of tail to total length .25, the average given for females by Schmidt (*loc. cit.*).

**MAXILLARY TEETH.**—Twenty-seven, sharply recurved, those in the anterior a trifle smaller than the remainder which are subequal in size.

**HEMIPENIS.**—The following description

is based upon No. 12163 referred to by Schmidt (*loc. cit.*). The organ is exceptionally long in snakes of this genus; in the single specimen examined it extends to the seventeenth caudal, forking at the twelfth, the sulcus dividing at the sixth. Two greatly enlarged basal spines or hooks are present; the proximal one at the fifth caudal is larger than a second one near the division of the sulcus. Both are equipped with hard, claw-like spines emerging from a fleshy base. Three pairs of smaller spines, pairs decreasing in size distally, are present. Each slender lobe is armed with numerous small spinules, the distal end with five slightly enlarged spines.

**PATTERN.**—This juvenile may be described as black with lighter cross-bands, the bands more distinct on the anterior third of the body and decreasing in distinctness toward the tail which is uniformly blackish above and below. A white dot is present on the fifth and sixth supralabials, with similar dots on most of the lower labials and chin-shields. A narrow light line extends through the lower anterior temporals. The pattern corresponds very closely to that described by Sternfeld (1910, *Mitt. Zool. Mus. Berlin*, V, p. 69), under the name *striata* which Schmidt (*loc. cit.*) already has listed as a synonym of *ornata*.

#### **Grayia smythii** (Leach)

*Coluber smythii* LEACH, 1818, in Tuckey, "Explor. River Zaire," App., p. 409: Boma (Embomma), Belgian Congo.

*Grayia smythii* BOULENGER, 1910 (1909), *Proc. Zool. Soc. London*, p. 948.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 94.

Lukolela, Belgian Congo, 1 (No. 45903, Chapin, Edson, 1931).

**LEPIDOSIS.**—A female with dorsal scales 19–17–15, ventrals 158, anal plate divided, caudals 90. Supralabials 7, the fourth on each side entering the orbit. Infralabials 11, the first five touching the anterior chin-shields. Loreal 1; preoculars 1–2; postoculars 2; temporals 2+3.

**DIMENSIONS.**—Length overall 950 mm., tail 305 mm. Ratio of tail to total length .30.

**MAXILLARY TEETH.**—Twenty-four, smaller and more sharply recurved in the anterior of the bone.

**HEMIPENIS.**—Examined on No. 12154 from Avakubi, Belgian Congo, previously reported by Schmidt (*loc. cit.*). Hemipenis bifid, elongate, extending to the twentieth caudal, dividing at the twelfth. Sulcus divides at the fifth caudal, with two greatly enlarged spines attached near the division. On the side opposite the sulcus are two rows of enlarged spines (about seven pairs) which decrease in size distally. Numerous smaller spines are present near the region of bifurcation. Each lobe is long and slender, with spinules near the crotch increasing in size distally to form numerous needle-like spines at the terminus.

It is interesting to note the essential similarity of this species and *G. ornata* in hemipeneal characters. Each is characterized by the two large basal spines accompanied by two rows (or pairs in series) of smaller spines, although these secondary basal spines are more numerous in *smythii*. In each species the organ bifurcates at the twelfth caudal, but in *smythii* the organ is slightly longer, and has a different arrangement of spinules on the lobes.

**PATTERN.**—At midbody the markings conform to the adult pattern figured by Boulenger (Fig. 298, *op. cit.*). The narrow, black-edged, whitish cross-bars on a ground color of gray are interrupted by single black scales extending across the white. Posteriorly the cross-bars, thirty-nine in number, become progressively less distinct and are absent from the tail. Belly whitish anteriorly, with irregular black spots along the edges. Toward the posterior and on the underside of the tail the edges of the scales are black.

#### **Grayia caesar** (Günther)

*Xenurophis caesar* GÜNTHER, 1863, *Ann. Mag. Nat. Hist.*, (3) XII, p. 357, Pl. VI: Fernando Po.—BOULENGER, 1894, *Cat. Snakes Brit. Mus.*, II, p. 288.

*Grayia caesar* SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 96, Pl. IX, fig. 2.—WITTE, 1933, *Ann. Mus. Congo Belge*, (1) III, No. 2, p. 24.

Metet, French Cameroon, 1 (No. 50520, Grissett, 1927).

**LEPIDOSIS.**—A female with dorsal scales 15–15–15, ventrals 142, anal plate single, caudals 149. Supralabials 8, the fourth

and fifth entering the orbit. Infralabials 10, the first five touching the anterior chin-shields. Loreal 1; preocular 1; postoculars 2; temporals 2+3. The pattern and coloration closely correspond to a specimen from Niapu, Belgian Congo, reported upon by Schmidt (*loc. cit.*). There are approximately twenty-five black-edged, white cross-bars on the body and about thirty-six indications of bars on the tail.

**DIMENSIONS.**—Length overall 910 mm., tail 440 mm., constituting 48.3 per cent of the total length. This remarkable snake has been reported from several localities in the Rain Forest, but appears to be a moderately rare snake. Witte (*loc. cit.*) has recently reported six specimens from the Congo, but does not mention the sex. Where sex is mentioned only females have been reported, and no male has been available to me for examination of the hemipenis. It will be of interest to know if the exceptionally long tail is correlated in any degree with the length of the male organs which are exceptionally long in other species of the genus with proportionately shorter tails. The genus is further remarkable in that its species are considerably more alike in characteristics of pattern than in morphology.

**MAXILLARY TEETH.**—This species surpasses any other member of the genus in possessing from thirty-five (*vide* Boulenger, *loc. cit.*) to thirty-eight maxillary teeth in the present specimen. The teeth are small, closely set, slightly increasing in size toward the posterior of the bone.

#### PSEUDASPIS FITZINGER

##### *Pseudaspis cana* (Linnaeus)

*Coluber canus* LINNAEUS, 1758, Syst. Nat., Ed., 10, I, p. 221: "Indiis" = South Africa.

*Pseudaspis cana* BOULENGER, 1893, Cat. Snakes Brit. Mus., I, p. 373.

Mombolo, Angola, 3 (Nos. 50605-06, 51798, Vernay, Lang, Boulton, 1925).

Cape Town, Cape Province, 1 (No. 50608, Lang, 1926).

**LEPIDOSIS.**—Two Mombolo specimens with dorsal scales 23-25-17, one with 23-27-17, the Cape Town specimen with 28-28-19. Females with ventrals 198 to 211, a Mombolo male with 189. Caudals 43 to

54 in females, 62+ in a single male. Supralabials uniformly 7, the fourth only entering the orbit. Infralabials 13 on two specimens, 12-13 on another and on the fourth specimen not determined, with the first five touching the anterior chin-shields on two specimens and the first six on each side of another. Loreal 1 throughout the series. Preocular 1, on three snakes, 1-2 on the fourth. Postoculars 2, and subocular single, with no subocular on one side of a single Mombolo snake. Temporals quite variable, 2+4 being present on five sides, 3+4 on two and 3+5 on one.

**DIMENSIONS.**—Two Mombolo females measure 525 mm. and 530 mm., with respective tail lengths of 60 mm. and 64 mm., and tail/total ratios of .11 and .12. The Mombolo male measures 1175 mm. overall, the tail 230 mm. constituting .19 of the total length. The female from Cape Town had been skinned, with the head and tail intact, and could not be satisfactorily measured.

**MAXILLARY TEETH.**—Some variation is apparent from an examination of three specimens. In No. 50608 each maxilla contained fourteen stout subequal teeth. A specimen (No. 5896) from Natal had but twelve, the posterior two enlarged and fang-like. The maxillary bones of this species are exceptionally short and stout and converge toward the anterior, seemingly providing support to the long, overhanging snout.

**HEMIPENIS.**—The organ was completely everted on the Mombolo male, but satisfactory dissection was possible on No. 5896, a specimen from Hilary, Natal. The organ *in situ* extends to the thirty-second caudal, bifurcating at the eighth, the sulcus dividing at the fourth. No basal spines are present, but each branch is armed with numerous small spinules from the crotch to the end. The separate muscles attached to each fork are not straight, but are drawn back in a series of sinuous folds, as though there were insufficient space for both the hemipenis and the muscles within the sheath in the tail. It is not clear how such retractor muscles can serve to invaginate an everted hemipenis, although

the situation is comparable to what must exist in *Prosymna*, the remarkable "telescoped" hemipenis of which is longer when everted than the tail (*vide* Schmidt, 1923, p. 89, who suggests that the hemipenis of *Prosymna ambigua* may be relatively long "due to a reduction in tail length undergone with the adoption of burrowing habits").

The hemipenis of the monotypic genus *Pseudaspis* in some respects resembles that of snakes of the genus *Grayia*, and the species may well represent a structurally adapted modification of some mutual ancestor.

**LIFE HISTORY NOTES.**—The Cape Town female, unfortunately not measurable, is stated on the field tag to have contained forty-one eggs, six of which were preserved. Of the six, two are infertile while the remaining four contain developing embryos which lie coiled on the yolk mass. The fertile eggs, one of them apparently double-yolked, approximate 25 mm.  $\times$  35 mm., the embryo constituting about one-fifth of the ovoid mass.

#### APARALLACTUS SMITH

##### *Aparallactus capensis* Smith

*Aparallactus capensis* SMITH, 1849, *Illus. Zool. So. Africa*, III, App., p. 16: Kaffirland eastward of Cape Colony.—LOVERIDGE, 1936, *Bull. Mus. Comp. Zool.*, LXXIX, p. 268.

Mlanje, Nyasaland, 1 (No. 44311, Boulton and Boulton, 1929).

**LEPIDOSIS.**—A male with dorsal scale-rows 15-15-15; ventrals 141; anal single; caudals 47, in single series. Supralabials 7, the third and fourth entering the orbit, the fifth in contact with the parietal. Infralabials 7, the first three touching the anterior chin-shields which extend to the mental. Nasals semi-divided, in contact with the preoculars which are single; postocular single; temporals 0+1+1.

**DIMENSIONS.**—The single male is 245 mm. overall, with the tail (53 mm.) comprising .22 of the total length.

**MAXILLARY TEETH.**—Examined on two specimens from the Transvaal, in addition to the specimen mentioned above, and found to vary with from five to seven an-

terior teeth, followed after a diastema by two enlarged grooved fangs.

**HEMIPENIS.**—Extends to the seventh caudal with the distal end bifurcate. No enlarged basal spines; spinules arranged in diagonal rows, slightly diminishing in size toward the distal end. The sulcus extends to the apex of the bifurcation, where it branches as shown in Fig. 5 for *Aparallactus modestus*.

**REMARKS.**—In *Aparallactus*, *Miodon*, *Calamelaps* and *Rhinocalamus*, the sulcus divides on the extreme distal end of the organ, particularly in *Aparallactus*. In *Xenocalamus*, *Chilorhinophis* and *Macrelaps* a division of the sulcus could not be demonstrated in dissections although the hemipenes of the latter group closely resemble those of the former. It seems highly probable that the two groups are related but that the genera included in the latter group have completely lost the bifurcation of the sulcus at a comparatively recent stage in their evolution. In *Aparallactus*, and to a lesser extent in *Calamelaps*, the division of the sulcus is so nearly on the terminus of the hemipenis that it probably should be called vestigial.

These facts, as well as those mentioned in the discussion of the genus *Limnophis*, suggest that snakes with a divided sulcus are primitive in this respect whereas those with a simple sulcus represent a more advanced stage in the evolution of the copulatory organ, and one directly derived from the former. The nature of such evidence requires that it be interpreted on a hypothetical basis. But the taxonomic implications are obvious; hemipeneal characters, although they are exceedingly useful in determining generic relationships, provide poor criteria upon which to base subfamilies.

##### *Aparallactus modestus* (Günther)

Figure 5

*Elapops modestus* GÜNTHER, 1859, *Ann. Mag. Nat. Hist.*, (3) IV, p. 161, Pl. IV, fig. C: West Africa.—BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 162.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 121, Pl. XVII, fig. 2.

Metet, French Cameroon, 6 (Nos. 50541-46, Grissett, 1927).

Lukolela, Belgian Congo, 2 (Nos. 45920-21, Chapin, Edson, 1931).

LEPIDOSIS.—Dorsal scales uniformly 15-15-15. Ventrals, three males each 141; four females vary from 155 to 160 (a fifth female is in two sections and an accurate count was not certain). Anal single throughout; caudals 46 on a single male with tail complete, from 39 to 44 for five females. Supralabials 7, the third and fourth entering the orbit, without excep-

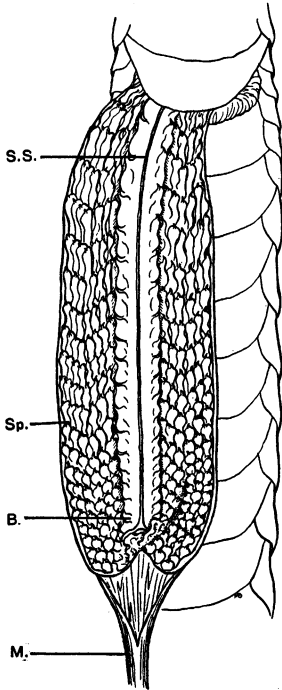


Fig. 5. Right hemipenis of *Aparallactus modestus* (Günther) (A. M. N. H. No. 50544,  $\times 4$ ). Depicted in the retracted position, slit down the dorsal aspect and laid open. (S. S.) sulcus spermaticus, (Sp.) spines, (B.) vestigial bifurcation of sulcus.

tion. Infralabials 7 on five, 8 on two, 8-9 on one, the first four touching the anterior chin-shields except the side with nine where five touch. Nasals divided in five cases, undivided on both sides of one and on one side of another. No loreal, preocular 1, postoculars 2, temporals 0+1 without variation.

DIMENSIONS.—The largest specimen is a female measuring 550 mm. The largest male, without complete tail, is 490 mm.

The ratio of tail to total length varies from .13 to .14 for four females, and the single male with tail intact has a tail comprising .19 of the total.

MAXILLARY TEETH.—Four maxillae examined indicate no significant variation in the teeth. There are ten small, somewhat irregular teeth, without diastema in three maxillae, but with a diastema on the fourth, followed by two slightly enlarged teeth without grooves. (See remarks below.)

HEMIPENIS.—The organ was examined on all three males in the present series. It extends to the eighth caudal, with sulcus single, but the distal end of the organ is bifid, the sulcus terminating in two fossae which lack the smooth surface of the inner walls of the sulcus. Spines are arranged in diagonal rows, or near the end where they diminish in size, in three chevrons. Cope's figure (1900, Ann. Report U. S. Nat. Mus. (for 1898), Pl. xxii, fig. 7) fails to show the distal end. (See Fig. 5.)

REMARKS.—Schmidt (*loc. cit.*) has given an excellent summary of 19 specimens of *A. modestus* from the Congo, noting that only three out of eight maxillae examined had grooved teeth. An examination of four removed maxillae convinces me that true grooves are non-existent. Boulenger (*loc. cit.*) states that the last two teeth are "feebly grooved on the inner side," unlike those of any other opisthoglyph snakes. Feeble grooves on solid teeth are not of rare occurrence in several genera. Below I have mentioned *Psammophis sibilans* in which rather pronounced grooves are present on anterior teeth, but it is extremely doubtful whether such grooves are of any taxonomic significance.

Recently Dunn (1936, Proc. Nat. Acad. Sci., XXII, No. 12, p. 689) has shown that both snakes with and without grooves in their teeth comprise a natural group now included under a single genus, *Leptodeira*, in North America, and he considers the grooving of the maxillary teeth to have been lost in the so-called *Hypsiglenas*. I believe that a similar loss has occurred in the genus heretofore called *Elapops* which included only the single valid species *modestus*.

Inasmuch as there exist no generically significant differences in lepidosis nor in hemipeneal characters between *Elapops modestus* of Günther and forms included in the older genus *Aparallactus* of Smith, I am assigning the species *modestus* to the latter group, which therefore includes *Elapops* as a strict synonym. Boulenger (*op. cit.*, p. 255) lists a variation of six to nine anterior teeth for *Aparallactus* and since *Aparallactus modestus* has but ten there is a strong probability that variations within the genus will show such a minor difference to be of no importance. The slightly reduced size of the posterior solid teeth of *modestus* as compared with other species of *Aparallactus* well may have accompanied the secondary loss of the grooves.

#### MIODON DUMÉRIL

##### *Miodon gabonensis* (Duméril)

*Elapomorphus gabonensis* DUMÉRIL, 1856, *Rev. Mag. Zool.*, (2) VII, p. 468: Gaboon, West Africa.—STERNFELD, 1908, *Mitt. Zool. Mus. Berlin*, III, p. 413.—MÜLLER, 1910, *Abh. Bayer. Akad. Wiss.*, 2 Kl., XXIV, p. 609.

*Microsoma collare* PETERS, 1881, *Sitzber. Ges. Naturf. Freunde, Berlin*, p. 148: "Macange" (= Maconge, Angola), West Africa.

*Miodon gabonensis* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 252.

*Miodon collaris* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 251.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 120.—WITTE, 1933, *Ann. Mus. Congo Belge*, (1) III, p. 95.

*Cynodontophis werneri* MÜLLER, 1910, *Abh. Bayer. Akad. Wiss.*, 2 Kl., XXIV, p. 612.

Metet, French Cameroon, 1 (No. 50529, Grissett, 1927).

**LEPIDOSIS.**—A female with dorsal scales 15–15–15, ventrals 195, anal divided, caudals 20, in two series. Supralabials 7, the third and fourth entering the orbit. Infralabials 7, the first four in contact with the anterior chin-shields. Nasal divided; loreal absent; preocular 1; postoculars 2; temporals 1+1.

**DIMENSIONS.**—Length overall 540 mm., tail 36 mm., comprising .06 of the total length.

**MAXILLARY TEETH.**—Examined on the specimen listed above as well as upon specimens from Bitye, Cameroon (No. 7680), and from Medje (Nos. 12445, 12450)

and Niapu (Nos. 12447–48), in the Belgian Congo. The Metet specimen has four anterior teeth, the others three anterior teeth followed after a diastema by a greatly enlarged, grooved fang, with an additional fang or a socket present.

**HEMIPENIS.**—Extends to the eighth caudal, bifurcating at the seventh, the sulcus dividing at the same place. Basal spines slightly enlarged, arranged in strips which merge distally into a chevron-like arrangement of spines which decrease slightly in size toward the tips.

**COLORATION.**—Slate-gray above, with a faint brownish color at the occiput. The color of the dorsum extends to the edges of the ventrals and caudals which are yellowish.

**PARASITES.**—Two large linguatulids were removed from the lungs of the Metet snake.

**REMARKS.**—Both Sternfeld (*loc. cit.*) and Müller (*loc. cit.*) have presented arguments to show that *M. collaris* is a synonym of *M. gabonensis*. In their respective opinions I concur, although Schmidt (*loc. cit.*) was able to distinguish the two species (recording both from Medje) and to describe a new one, *M. unicolor*. I have examined eight of the nine specimens (No. 12452 was sent to the Museum of the Belgian Congo at Tervueren) which Schmidt segregated as three species. The only significant difference which I can detect between the two snakes he referred to *gabonensis* and those he referred to *collaris* lies in the absence of the dark color on the ends of the ventrals in the former. This, in my opinion, hardly constitutes a specific difference, more especially since there is no evidence that the two forms inhabit separate geographic areas or occupy different ecological niches. Boulenger (*loc. cit.*) indicates no differences in the ranges of the two except that Angola is not included in the range of *gabonensis*.

The conclusion is inevitable that a single, if somewhat variable, species, *gabonensis*, exists. *Microsoma collare* of Peters has been separated upon superficial characters, and inasmuch as it occupies the same areas, it must be considered a strict synonym of *Miodon gabonensis* (Duméril).



Schmidt's (*op. cit.*, p. 119, Fig. 13) species, *M. unicolor*, may be distinguished from *M. gabonensis* in being uniformly bluish gray above and below, and in having the seventh labial in contact with the parietal. I strongly suspect that it may prove to be an aberrant *M. gabonensis*, since it occurs within the territory of this species, and ventral and caudal counts fall within the ranges already reported for *gabonensis*.

Müller (*op. cit.*) referred *Cynodontophis aemulans*, described by Werner in 1902 (*Verh. Zool.-Bot. Ges. Wien*, Bd. 52, p. 346), to the synonymy of *Miodon notatus* (Peters) but tentatively, pending an opportunity to examine more material, he suggested that the genus *Cynodontophis* (type species *aemulans* = *notatus*) might be recognized. Furthermore he described a new species, *Cynodontophis werneri*, based upon a small specimen from "Kamerun?" His conclusion was that *Cynodontophis* Werner might stand as a genus to include *notatus* and *werneri*, the presence of but a single tooth anterior to the grooved fang being the sole criterion upon which to separate it from *Miodon* Duméril.

Since the question of the status of *Cynodontophis* has remained unsolved, I have examined the maxillae of the six snakes mentioned above as well as the maxilla of the type of *Miodon unicolor*. In three cases out of seven only one tooth remained in the maxilla in addition to the fang (or fangs when both were present). The sockets left by missing teeth are difficult to distinguish from normal diastemae or fossae on the exceedingly short maxillae, and were it not for the series at my disposal difficulty would have been experienced in determining the number of teeth. On only one maxilla were both fangs present, and on this one the more anterior of the two was about to be shed; on the others the posterior fang was loose and readily became detached when the surrounding tissue was removed in the process of cleaning the bone. From these facts it is to be inferred that in *Miodon* the posterior and anterior fangs shed alternately in much the same fashion as Klauber (1936, *Trans. San Diego Soc. Nat. Hist.*, VIII, p. 118)

has described for the genus *Crotalus*. In *Crotalus*, however, the position of the sockets on the maxilla is right or left, depending upon which fang most recently has shed. A similar process of fang replacement is undoubtedly present in the *Elapidae*. The condition in *Miodon* represents a stage in the evolution of the mechanism of fang replacement intermediate between that of most opisthoglyphs and that of the elapids.

The above résumé is primarily intended, however, to indicate that when Werner and later Müller examined the maxillae of small snakes they may easily have failed to interpret sockets as evidence for the existence of teeth in the live animals. Boulenger (*op. cit.*) in his diagnosis of the genus *Miodon* states that there are "two or three small teeth, followed after an interspace by a very large fang," although in his figure (Fig. 18) he shows two fangs.

The conclusion is inevitable that *Cynodontophis* represents a synonym of *Miodon*. Even were it demonstrated with certainty that only two teeth, a solid tooth and a fang, existed in the maxilla of Werner's specimen upon which he based a new genus, this is insufficient grounds for erecting a new genus when *Miodon* has but two or three teeth in addition to the single fang normally present.

In conclusion it must be added that Müller's species, *Cynodontophis werneri*, with little question, is referable to *Miodon gabonensis* with which it agrees in all characters exclusive of dentition and the latter character is stated to have been determined with questionable accuracy.

#### MEIZODON FISCHER

##### *Meizodon coronatus* (Schlegel)

###### Figure 6A

*Calamaria coronata* SCHLEGEL, 1834, *Phys. Serp.*, II, p. 46: Gold Coast.

*Coronella coronata* BOULENGER, 1894, *Cat. Snakes Brit. Mus.*, II, p. 196.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 87.—LOVERIDGE, 1936, *Bull. Mus. Comp. Zool.*, LXXIX, p. 253.

Ganta, Liberia, 3 (Nos. 51773-75, Harley, August, 1932).

LEPIDOSIS.—Three females (an adult and two juveniles) show little variation. Dor-

sal scales uniformly 19–19–17. Ventrals 192–194. Anal divided; caudals 61–63. Supralabials uniformly 8, the fourth and fifth entering the orbit. Loreal 1, preocular 1, postoculars 2 without variation. Temporals show some variation, either 1+2 or 2+2.

**DIMENSIONS.**—The adult measures 585 mm., two juveniles 265 mm. and 360 mm. Ratios of tail to total length .18 on one specimen and .19 on the other two.

**MAXILLARY TEETH.**—Nineteen on two specimens examined, the posterior three teeth slightly larger and somewhat stouter (see Fig. 6); a third specimen has twenty teeth.

**HEMIPENIS.**—The hemipenis extends to the fifteenth caudal, not bifurcate, sulcus

the upper lips, chin and neck whitish with a black area extending to the underside between the two posterior white lines on the juveniles, and with a black area in a similar position on the adult.

**REMARKS.**—Boulenger in his catalogue (*op. cit.*) included an assortment of species under the generic name *Coronella*, type species *austriaca* Laurenti. Many of these species already have been removed in the currently recognized genera *Lampropeltis* and *Diadophis*. Whether the species still included under the name are related is a matter for investigation.

I have examined both European species, *austriaca* (No. 3676, from Wurttemberg, Germany) and *girondica* (No. 3678, from the "Mediterranean region"). Each has

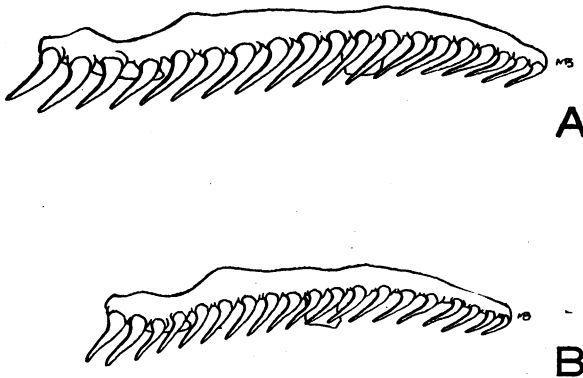


Fig. 6. Right maxillae of (A) *Meizodon coronatus* (Schlegel) (A. M. N. H. No. 51773,  $\times 8$ ) and of (B) *Meizodon loveridgeti*, new species (F. M. N. H. No. 12536,  $\times 10$ ) showing similar dentition.

undivided. From the seventh to the tenth caudals there are strongly enlarged spines arranged irregularly. From the tenth caudal to the distal end the organ is armed with numerous finely denticulated calyces. (Based upon M. C. Z., No. 13602, from Niangara, Belgian Congo.)

**COLORATION.**—Each of the two juveniles has four narrow white bars on the head and neck, the first extending from the lip anterior to the eye to the supraocular, the second, behind the eye, extends across the posterior end of the frontal from lip to lip, the third from the angle of the mouth across the occiput, with a similar narrow band behind it on the neck. These bands are lacking on the adult. All three specimens are plumbeous above and below,

the sulcus single, but the distal end is bifurcated for a distance of about three caudals. (Cope's figure, 1900, Ann. Rept. U. S. Nat. Mus. (1898), Pl. xviii, fig. 8, fails to show the distal ends.) Basal spines are strongly enlarged and gradually diminish in size toward the lobes which are armed with calyces on the ends. In addition to *coronata* mentioned above, I have examined the hemipenis of *semiornata* (M. C. Z., No. 30160, from Mangasini, Tanganyika Territory) with the sulcus undivided and the distal end not bifurcate.

An examination of the maxillary teeth of representatives of related genera, as well as the teeth of the species mentioned above, warrants the following notes:

*Coluber gemonensis* (No. 21794 from

Dalmatia) has fourteen teeth, slightly increasing in size posteriorly, and followed after a well-defined diastema by two distinctly enlarged teeth. Two other species of the same genus, *najadum* (No. 3463 from Dalmatia) and *florulentus* (No. 21795 from Cairo, Egypt), each have thirteen teeth, respectively, followed after a diastema by two enlarged teeth in each species.

*Coronella austriaca* and *C. girondica* have, respectively, thirteen teeth increasing in size posteriorly, but no diastema and no pair of enlarged teeth follow.

*Meizodon coronatus* I have described above. The species currently known as *Coronella semiornata semiornata* has similar dentition, with nineteen teeth in continuous series. (Based upon M. C. Z. No. 18200 from Dar-es Salaam, Tanganyika Territory.)

Recently Loveridge (1935, Bull. Mus. Comp. Zoöl., LXXIX, p. 8) has described a snake as *Coronella semiornata fuscurosea* (type M. C. Z. No. 40555, an adult male from the lower slopes of Mount Mbololo, Taita, Kenya Colony). Subsequently (*op. cit.*, 1936, p. 252) he has discussed the relationships of this form implying that *fuscurosea* was possibly close to *Coluber florulentus*. This tentative conclusion was drawn from similarities in the patterns of the juveniles as well as from the presence of a lower preocular in *fuscurosea*. Loveridge called attention to the fact that this scale might equally well be called a subocular, the presence of which was used by Boulenger (*op. cit.*, p. 3) to separate *Zamenis* (= *Coluber*) from *Coronella*.

Through the courtesy of Mr. Arthur Loveridge I have been able to examine one of the paratypes of *fuscurosea* (M. C. Z. No. 40556, from Mt. Mbololo, Kenya Colony) with permission to remove the maxilla. As Loveridge anticipated, the specimen proves to possess the dentition of *Coluber* with twelve teeth increasing in size posteriorly, followed after a diastema by two enlarged teeth. The form is, therefore, not as closely related to *semiornatus* as the external characters might lead one to suspect. The description of the type and paratypes given by Loveridge (*supra*

*cit.*) closely agrees with the snake described by Boulenger (1895, Proc. Zool. Soc. London, p. 536, Pl. xxx, fig. 2) under the name *Zamenis smithi*, type locality Webi Shebeli, Italian Somaliland. The species *smithi* is already known from Kenya Colony north of the equator and Parker (1936, Ann. Mag. Nat. Hist., (10) XVIII, p. 606), in a brief discussion of two specimens from Lodwar, suggests that *smithi* will eventually be shown to be merely an eastern form of *Coluber florulentus*. The known range of characters reported for *Coluber smithi* includes all variations reported for Loveridge's *fuscurosea* and I have little hesitation in assigning it to the synonymy of that species.<sup>1</sup> Loveridge's records from Mt. Mbololo and Tsavo are of interest in that they extend the range of the genus *Coluber* south of the equator.

One additional genus must now be considered. Boulenger in 1898 (Ann. Mag. Nat. Hist., (7) II, p. 132) described the genus *Aeluroglena*, based on a single specimen from British Somaliland. Since that time three additional specimens have been reported, including a specimen from Ethiopia in the Field Museum of Natural History identified by Loveridge (1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 28). Mr. K. P. Schmidt kindly lent me the Field Museum specimen, and although it closely agreed with Boulenger's description of the lepidosis of *Aeluroglena cucullata* it possessed nineteen teeth, closely corresponding to the arrangement in typical *Meizodon*, instead of eleven teeth as described for *Aeluroglena* by Boulenger. Furthermore, the pupil of the Field Museum specimen was doubtfully to be described as vertically elliptical, and since this was one of the diagnostic characters given by Boulenger for *Aeluroglena* I was disposed to doubt the validity of the genus. Correspondence with Mr. H. W. Parker brought forth the fact, however, that in three specimens, including the type of *Aeluroglena cucullata*, the pupil was definitely

<sup>1</sup> Under the date January 25, 1940, Mr. Arthur Loveridge has kindly advised me that while he was in London he compared specimens of *Coluber smithi* with a paratype of *Coronella semiornata fuscurosea*. He states that "they are undoubtedly the same thing and I should be glad if you would synonymize it."

elliptical. Mr. Parker courteously lent two specimens from British Somaliland for comparison with the Field Museum individual from Ethiopia and whereas the Somaliland specimens closely resembled the Ethiopian snake, differences in pattern as well as in dentition were noted. Thus, *Aeluroglena* stands as a valid genus with fifteen to sixteen maxillary teeth (in contrast to Boulenger's description) and with a vertically elliptical pupil, hemipenis not divided, sulcus not bifurcate. The Ethiopian snake erroneously identified as *Aeluroglena cucullata* is unquestionably to be referred to the genus *Meizodon*. Since it apparently represents an undescribed form I take pleasure in naming it in honor of Mr.

DIAGNOSTIC CHARACTERS.—A pale buff species with widely spaced black dots on the body, and black markings on the head; dorsal scales in 21 rows at midbody. Most closely related to *Meizodon semiornatus*, from which it differs in pattern as well as in having a more flattened head. From *Aeluroglena cucullata* with which it has been confused it differs in possessing three more maxillary and three more mandibular teeth. (See Fig. 7.)

TYPE.—An adult (?) male, No. 12536, in the Field Museum of Natural History. Collected at Sheik Hussien, Ethiopia, by Dr. W. H. Osgood in 1926.

DESCRIPTION OF THE TYPE.—LEPIDOSIS: Head scutellation normal; two internasals; two prefrontals; internasal suture nearly equal to prefrontal suture. Frontal longer than its distance from the end of the snout, as long as the common suture of the parietals; supraocular shorter than frontal. Nostril pierced at upper

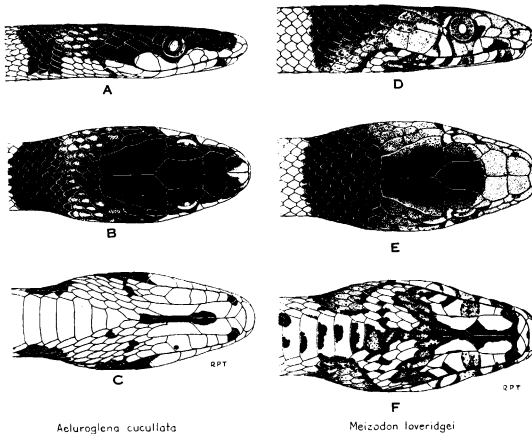


Fig. 7. *Aeluroglena cucullata* Boulenger (B. M. N. H. No. 1931.7.26.394, from Haud, Somaliland Protectorate,  $\times 2$ ). (A) lateral view of head, (B) dorsum of head, (C) ventral view of head. *Meizodon loveridgei*, new species (F. M. N. H. No. 12536,  $\times 2$ ). (D) lateral view of head, (E) dorsum of head, (F) ventral view of head.

Arthur Loveridge, who suggested that I undertake an investigation of the snakes related to *Coronella*. The species, therefore, is to be called:

### *Meizodon loveridgei*, new species<sup>1</sup>

Figures 6B, 7D-F

*Aeluroglena cucullata* LOVERIDGE (non Boulenger), 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 28.

<sup>1</sup> A recent paper, describing a "*Coronella*" from Africa, was inadvertently overlooked and not discovered until this description was about to go to press. Scortecci (1932, Atti. Soc. Ital. Mus. Civ. Milano, LXXI, p. 58) has described *Coronella somalica* based on a type from Afgoi, Italian Somaliland, and a paratype from Sana, Yemen. The specimen from Sheik Hussien is almost certainly referable to the species described by Scortecci which should now be known as *Meizodon somalicus*.

end of suture between two nasals; loreal longer than high, in contact with second and third labials; preocular barely extending to upper surface of head, separated from frontal; postoculars two, the upper broader and deeper than the lower; temporals 1+2. Supralabials 8, the fourth and fifth entering the orbit, seventh largest. Infralabials 9, the first pair meeting on a normal suture behind a mental, the first four touching the anterior chin-shields, the fifth largest. Anterior chin-shields in contact, as long as posterior pair which are separated by two scales followed by three small scales.

Dorsal scales with single apical pits, disposed in 21 rows anteriorly and 17 at the vent, decreasing in size toward the vertebral row. Ventrals 201; anal divided; caudals 80.

FORM.—A relatively slender species with head flattened and distinct from neck. Eye moderate, its diameter less than its distance from the nostril; pupil probably round in life, but in the

preserved specimen very slightly vertically elliptical. Total length 362 mm., tail (86 mm.) comprising .24 of the total length.

Maxillary teeth 19, in continuous series, increasing in size posteriorly, the last three somewhat stouter. Mandibular teeth 17, longer anteriorly (see Fig. 6B).

Hemipenis extends to the eleventh caudal, not divided, sulcus not bifurcate. From the region of the third to the seventh caudals there are spines arranged in about ten longitudinal rows, increasing in size to soft papillae which diminish in size distally. On the terminus the sulcus is bordered by roughened tissue probably to be interpreted as calyces but the specimen is too small for the details to be seen.

**COLORATION.**—Dorsum of head with a black area extending from behind the prefrontals across the frontal, the supraoculars and the parietals except their lateral margins, to the occiput where the black extends to the lower scale rows. Internasals and prefrontals pale buff, a light line narrowly margined with black extends through the postoculars to the mouth, with a dark area beneath the eye separated from a dark blotch on the second and third labials, and a small black spot on the suture of the first labial and the rostral. On the underside of the head a black area extends from behind the mental, broadening to include part of the first, second and third labials, and extending on either side of the anterior chin-shield suture. Toward the posterior the black area falls principally on the scales between the posterior pair of chin-shields, behind them extending on the gulars to the lips on each side, with a median extension to first ventral. Black margins on several of the anterior ventrals (see Fig. 7).

From the occiput to the end of the tail the body is uniformly pale buff, with roundish black dots, approximately the width of the scales, roughly disposed in four irregular series, two on either side of the vertebral row of scales. Venter but slightly paler than ground color of the dorsum.

**REMARKS.**—The species *M. semiornatus* is known to range from Portuguese East Africa and Rhodesia northward into the Sudan and into Italian Somaliland, but it seems not to have been recorded from Ethiopia. The species described above will extend the range of the genus *Meizodon*, as now understood, farther north in eastern Africa than any previous record had indicated. Further collecting may indicate that the range of *semiornatus* extends into Ethiopia and *M. loveridgei* may prove to be a subspecies of it, but the unique pattern of the new form appears to warrant specific status at present.

It is obvious that a thorough and ex-

tensive survey of the snakes allied to *Coluber* must be made before any decision can be reached concerning the generic status of species. Unfortunately, few descriptions of new species include any information concerning dentition or hemipenes, characters which I suspect will offer the more sound bases for generic separation. Ortenburger (1928, Mem. Univ. Mich. Mus., I), has reported the diastema in North America *Coluber* to be present or absent and when present to be followed by three enlarged teeth. Whether this permits the separation of Old World snakes having a diastema followed by two teeth under the generic name *Zamenis* I am not prepared to state. The ideal of generic characters that are not variable will certainly be difficult of attainment in many genera when information concerning the variability within species is assembled. I have not been able to examine sufficient material to determine whether the diastema in the maxillary dentition of Old World *Coluber* is variable. But until such a survey can be undertaken I propose the following tentative arrangement for certain Old World genera, based largely upon the data given above.

- A.—Maxillary teeth with a diastema followed by two enlarged solid teeth.....  
.....*Coluber* Linnaeus, type *constrictor*.
- AA.—Maxillary teeth without diastema or strongly enlarged teeth.
  - a.—Hemipenis distally bifurcate, only the extreme distal portion calyculate  
.. *Coronella* Laurenti, type *austriaca*.
  - aa.—Hemipenis not bifurcate, distal half calyculate.
    - 1.—Maxillary teeth 19 to 20.....  
..... *Meizodon* Fischer, type *regularis* (= *coronatus*).
    - 2.—Maxillary teeth 15 to 16.. *Aeluroglena* Boulenger, type *cucullata*.

I concur in the opinions of Loveridge and Schmidt in uniting the species *regularis* and *coronatus* under the latter name, but the generic name *Meizodon* Fischer (1856, Abhand. Nat. Ver. Hamburg, III, p. 112) is apparently the oldest valid name available. The genus will include the valid forms, *coronatus*, *semiornatus* and *loveridgei*.

In closing this discussion it may be worth while to remark that the Chinese snake known from a single specimen (*vide* Pope,

1935, "The Reptiles of China," p. 288), and now known as *Coronella bella* Stanley, does not belong in the genus *Coronella*. The snake is reported to lack apical pits and to have but nine teeth in the maxilla, neither character being known for any species of *Coronella*.

#### CHLOROPHIS HALLOWELL

##### *Chlorophis carinatus* Andersson

*Chlorophis carinatus* ANDERSSON, 1901, Bi-hang, Svenska Vetensk.-Handl., XXVII, part 4, p. 9: Cameroon.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 74.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 28.

Lukolela, Belgian Congo, 2 (Nos. 45917, 60062, Chapin, 1931).

Beni, Belgian Congo, 1 (No. 50532, Chapin, Sage, Mathews, 1926).

LEPIDOSIS.—Dorsal scales 13-13-11 in all specimens. Ventrals 165 and 155 two females, 150 a single male; anal plate single; caudals 86 and 76, females, male 82. Supralabials 9, the fourth, fifth and sixth entering the eye in all specimens. Infralabials 10 on two specimens, 11 on one, the first five touching the anterior chin-shields. Loreal 1; preocular 1; postoculars 2; temporals 2+2.

DIMENSIONS.—Two females measure 590 and 600 mm., respectively; a male measures 520. Ratios of tail to total length .24 for females, .22 for the male.

MAXILLARY TEETH.—Three counts indicate comparatively little variation for a species with so many teeth. Respectively, three specimens had 39, 41 and 42, the posterior four or five enlarged and stouter than the others.

HEMIPENIS.—Extends to the sixth caudal; not bifurcate with sulcus undivided. Basal spines well developed, merging distally into reticulate calyces. Toward the end of the structure the calyces grade into numerous flattened papillae.

ENEMIES.—One of the Lukolela specimens was removed from the digestive tract of a *Theletornis kirtlandii*. The *C. carinatus* was nearly completely engulfed, only 30 mm. of the tail protruded from the mouth of its preserved captor.

REMARKS.—Loveridge (*loc. cit.*) has

questioned the number of maxillary teeth given by Andersson (*loc. cit.*) as forty for the type of *carinatus*. As noted above, three specimens examined in this study indicate a range in number of teeth from 39 to 42, thus including and verifying Andersson's count. Loveridge (*in litt.*) has advised me that his counts were based upon the number of teeth observed *in situ*, and not upon the number of sockets in the bone. Such counts are obviously unreliable, and no conclusions can be drawn from them. Similarly his data with respect to the dentition of *C. heterodermus* are erroneous. He reports 12 to 16 for this species, whereas in two typical specimens of this species (Nos. 7692-93 from Bitye, Cameroon) I find 33 and 35 maxillary teeth, indicating that in this character *heterodermus* approaches *carinatus*.

Comparison of the two Cameroon *heterodermus* mentioned above with the fine series of *carinatus* from the Congo reported upon by Schmidt (*loc. cit.*) in 1923 indicates striking similarities in color, habitus, hemipeneal characters and lepidosis, although the lower number of scale-rows and slightly greater number of teeth serve to distinguish the latter form. Nevertheless, the ranges, as outlined by Loveridge (*loc. cit.*), indicate the possibility that *carinatus* represents a subspecific form of *heterodermus*. The occurrence of both forms in the Cameroon may indicate only that specimens with 15 and 13 midbody scale-rows, respectively, represent intergrades when found in the same locality. Similarly, the difference in number of maxillary teeth may be nothing more than a subspecific difference. Were it possible to assemble data concerning the number of maxillary teeth in each form, it seems possible that only an average difference might be shown.

##### *Chlorophis ornatus* (Bocage)

*Philothamnus ornatus* BOCAGE, 1872, Journ. Sci. Lisboa, IV, p. 80: Huilla, Angola.

*Chlorophis ornatus* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 93.—ANGEL, 1933, Serp. Afri. Occid. Fran., p. 109.

Huambo, Angola, 1 (No. 51772, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—Dorsal scales 15-15-11;

ventrals 150; anal plate divided; caudals 106. Supralabials 8, the third, fourth and fifth entering the orbit. Infralabials 10, the first five in contact with the anterior chin-shields. Loreal 1; preocular 1; postoculars 2; temporals 1+1.

**COLORATION.**—A brown vertebral stripe, one and two half scales wide, bordered by a greenish-olive color which extends to the ventrals. Venter lighter, greenish blue with the posterior margins of the ventrals brownish.

**DIMENSIONS.**—A male, length overall 610 mm.; tail 205 mm.; ratio of tail to total length .34.

**MAXILLARY TEETH.**—Twenty-six in number, slightly increasing in size posteriorly.

**HEMIPENIS.**—Not bifurcate, sulcus undivided, extends to the eighth caudal. Basal spines large and blunt, merge into six flosses which occupy the middle third. Distal third with reticulated calyces merging into papillae at the tip.

**REMARKS.**—Bocage's original description was based upon three specimens, one from "Cacheu" (= Cacheo), Portuguese Guinea, and two others from Huilla (in the Mossamedes District), Angola. Inasmuch as no type seems to have been selected, I hereby designate the type locality as Huilla, Angola. The species is known from few records in addition to the types. Boulenger has recorded it from Benguela, Angola, and Angel from Northern Rhodesia, but the Portuguese Guinea record requires verification.

#### ***Chlorophis heterodermus* Hallowell**

*Chlorophis heterodermus* HALLOWELL, 1857. Proc. Acad. Nat. Phila., IX, p. 54: Gaboon.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 29.

Ganta, Liberia, 1 (No. 51768, Harley, 1932).

**LEPIDOSIS.**—Dorsal scales 15-15-11; ventrals 150, with faint lateral keels; anal plate single; caudals 93. Supralabials 9, the fourth, fifth and sixth entering the orbit. Infralabials 10, the first five touching the anterior chin-shields. Loreal 1; preocular 1; temporals 2+2.

**COLORATION.**—The juvenile from Ganta

was described when collected by Dr. G. W. Harley as a "very small purple snake, greenish head." In spirits the pattern is mottled with black and the throat and venter lighter, this color falling well within the variations exhibited by *C. carinatus*.

**DIMENSIONS.**—A juvenile male with a length overall of 262 mm. and a tail length of 73 mm. Ratio of tail to total length .28. Two other specimens available for comparison (Nos. 7692, female, and 7693, male, from Bitye, Cameroon) have respective tail/total ratios of .25 and .29 which agree favorably with computations that can be made from data available in the literature.

**MAXILLARY TEETH.**—The juvenile from Ganta was unsatisfactory for an examination of teeth, but two reliable counts of maxillary teeth were made upon the Cameroon specimens mentioned above. As already mentioned under *C. carinatus* these individuals had thirty-three and thirty-five, respectively, the posterior ones increasing in size.

**HEMIPENIS.**—(Description based upon No. 7693, from Bitye, Cameroon.) The organ, not bifurcate, with sulcus undivided extends to the seventh caudal. Basal spines enlarged, followed distally by two or three flosses which merge into reticulated calyces and reduce to numerous fine papillae on the distal end.

**REMARKS.**—Loveridge (*op. cit.*, p. 29) reports *C. heterodermus* from as far west as Sierra Leone. However, since Barbour and Loveridge (1930, "Reptiles of the Harvard-African Expedition upon the African Republic of Liberia and the Belgian Congo," II, p. 784) omit the species from their list of reptiles known from Liberia (two specimens of *Chlorophis irregularis* are reported although the species is listed in appendix No. 1 as not collected) it may be well to explain my basis for identification.

Four *Chlorophis* were collected by Dr. Harley at Ganta. Three of these are referable to *irregularis* as noted under that species. One has been referred to *heterodermus* because it differs in three characters, viz., a single anal, temporals 2+2 and 150 ventrals. *C. irregularis* from the same



locality has a divided anal, temporals 1+1, and averages 169 ventrals. In addition, it would appear that *heterodermus* has at least five more maxillary teeth than *irregularis*, if the two Biteye specimens furnish reliable criteria, and the tail of *irregularis* averages proportionately longer.

### *Chlorophis irregularis* (Leach)

*Coleber irregularis* LEACH, 1819, in Bowdich, "Miss. Ashantee," p. 494: Ashantee, Gold Coast.

*Ahaetulla heterolepidota* GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) II, p. 286: Africa.

*Chlorophis heterolepidotus* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 76.

*Chlorophis irregularis* LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 30; 1937, Proc. Acad. Nat. Sci. Phila., LXXXIX, pp. 266 and 273.

*Chlorophis vernayi* FITZSIMONS, 1932, Ann. Transvaal Mus., XV, p. 38: Maun, Ngamiland, South Africa; 1933, Ann. Transvaal Mus., XVI, part 2, p. 312.

Ganta, Liberia, 3 (Nos. 51771, 50582-83, Harley, 1932).

Beni, Belgian Congo, 3 (Nos. 50592-94, Chapin, Sage, Mathews, October, 1926).

Luluabourg, Belgian Congo, 1 (No. 31842, Chapin, Edson, 1930).

Escarpment below Bihunga, Uganda, but in Belgian Ruanda at an elevation of 7000 ft., 1 (No. 50595, Chapin, Sage, Mathews, 1927).

Capelongo, Angola, 4 (Nos. 51769-70, 50630-31, Vernay, Lang, Boulton, 1925).

Lake No, Anglo Egyptian Sudan, 1 (No. 51776, Anthony, February, 1929).

Rungwe Mountains, Tanganyika Territory, 1 (No. 39159, Boulton and Boulton, 1929).

Mlanje, Nyasaland, 2 (Nos. 44319, 44321, Boulton and Boulton, 1929).

Mt. Selinda, Southern Rhodesia, 1 (No. 51950, Boulton and Boulton, 1929).

LEPIDOSIS.—Dorsal scales uniformly 15-15-11 throughout the series. Ventral plates vary from 159 to 187, averaging 167 for eleven females and 168.4 for six males. These figures are of no significance in indicating the true sexual dimorphism inasmuch as a preponderant number of females from localities where *irregularis* has higher average counts distorts the figure. Even were large series from individual localities

available it would doubtless show that the average dimorphism in the number of ventrals varies for each separate area. Ventral plates with lateral keels, either distinct or faint, occur on all specimens with the exception of those from the Belgian Congo where keels are entirely lacking. Anal plate divided throughout. Caudals in the present series show an extreme variation of 90 to 119, averaging 108 for females and 116 for males, indicating some dimorphism between the sexes but again providing only a questionable index to the average dimorphism of the species.

Supralabials 9 on all specimens with the exception of the four from Capelongo with 8, and one from Lake No which has 8-9. The number of labials entering the orbit is closely correlated with the number of labials; those with nine have the fourth, fifth and sixth; those with eight have the third, fourth and fifth. A Capelongo specimen with only the fourth and fifth entering the orbit on one side is the only exception to the normal in this series.

Infralabials vary from nine to eleven, with the first five touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2 on all specimens. Temporals 1+1 with the exception of two specimens with 1+2.

DIMENSIONS.—The largest specimen in the series is a female from Mlanje which measures 1050 mm. The largest male, from Belgian Ruanda, measures 825 mm. Ratios of tail to total length vary from .29 to .31, averaging .30 for females and from .31 to .33 in males, averaging .32.

MAXILLARY TEETH.—Vary in number from 22 to 28, more commonly 28 (six specimens examined). Two specimens from Liberia have fewest. On some specimens all teeth are subequal in size, whereas others have teeth increasing in size posteriorly.

HEMIPENIS.—Specimens from Luluabourg, Capelongo, Lake No and Mt. Selinda were examined. The organ, undivided, with sulcus single; varies in length from the seventh to the ninth caudals. Basal spines large, followed by reticulated calyces on the middle third.

Calyces give way distally to papillae on the end.

LIFE HISTORY NOTES.—Both Mlanje females contained eggs. No. 44319 contained ova averaging in size 20 mm.  $\times$  8 mm., three in the left oviduct, nine in the right. A Ganta female contained six eggs measuring 31 mm.  $\times$  9 mm., two in the left and four in the right oviducts. This specimen had eaten a frog, the digested remains of which could not be identified.

REMARKS.—I have little hesitancy in considering *Chlorophis vernayi* a synonym of *irregularis*. Every character listed by FitzSimons falls within the range of the species as we now understand it to include *heterolepidota* Günther, *gracillima* Günther, *emini* Günther, *gracilis* Sternfeld, *schubotzi* Sternfeld, and *bequaerti* Schmidt (*vide* Loveridge 1936, *loc. cit.*, and Loveridge, 1937, *op. cit.*, p. 266).

The species included as synonyms now would show an excessive amount of variation for *C. irregularis* with ventrals ranging from 150 to 190, and caudals ranging from 90 to 135, figures obtained by combining those of Boulenger listed and corrected by Loveridge (1937, *loc. cit. supra*) for *irregularis* and *heterolepidotus*. Both of these extremes require verification. If *bequaerti* is included as a synonym, the anal plate may be either single or divided. Supralabials vary from seven to ten, with labials from the third to the seventh (Loveridge, 1929, *loc. cit.*) entering the orbit in pairs or in three's.

Seemingly the species is as variable in morphology as it is in scutellation. Four specimens included in the series listed above, in particular the Luluabourg individual, are noticeably more slender than the others. Two specimens reported by Schmidt (*loc. cit.*) as *heterolepidotus* have been examined and they too represent the slender form. Although it is impossible to make entirely satisfactory measurements of preserved material, an index of variability in body form may be obtained by dividing the width of the head into the body length, excluding the tail. Selecting two specimens of approximately the same length, No. 50583 from Ganta (length overall 725

mm., tail 210 mm.), and a specimen reported by Schmidt, No. 12087 from Niangara, Belgian Congo (length overall 730 mm., tail 250 mm.), it is found that the body length contains the head width 51 and 74 times, respectively. Nor is there any indication that the difference is correlated with sex. Both of the above specimens are males, but a female from Niangara (No. 12092) is equally slender, the head width being contained in the body length 72 times. However, when ratios are figured for the series it is discovered that even this character is too variable to serve as a satisfactory means of distinguishing species. Head width is contained in body length from 40 to 80 times in 14 specimens considered to be well preserved. Specimens from any given area possibly would show comparatively little variation, three individuals from Liberia having head widths divided into body lengths from 51 to 53 times.

Thus it may be observed that all characters tabulated appear to be subject to considerable deviation from a normal that cannot be determined until large series are treated statistically. No satisfactory understanding of the specific relations within the genus *Chlorophis* can be attained until some worker undertakes to monograph the group. Klauber's brilliant work with North American rattlesnakes has demonstrated the feasibility and practicability of applying statistical methods to complex groups of snakes. It seems highly probable that several races of *Chlorophis irregularis* can be segregated with such intensive study, particularly when such studies can be correlated with environmental factors. Meanwhile, we are forced to accept Loveridge's conclusion that the species includes several synonyms, in addition to *C. vernayi* synonymized above.

#### *Chlorophis hoplogaster* (Günther)

*Ahaetulla hoplogaster* GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) XI, p. 284: Port Natal (Durban), South Africa.

*Chlorophis hoplogaster* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 93, Pl. v, fig. 2.—LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 236,

*Philothamnus neglectus* PETERS, 1866, Mon-

atsb. Akad. Wiss. Berlin, p. 890: Prazo Boror, Mozambique.

*Chlorophis neglectus* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 94.

Rungwe Mountains, Tanganyika Territory, 7 (Nos. 39160-65, 39000, Boulton and Boulton, 1929).

Karonga, Nyasaland, 1 (No. 38998, Boulton and Boulton, 1929).

Lukolela, Belgian Congo, 2 (Nos. 45926, 45916, Chapin, Edson, August, 1930).

Merebank, Natal, South Africa, 1 (No. 60108, Coghill, June, 1933).

LEPIDOSIS.—Dorsal scales 15-15-11 throughout the series. Ventrals vary from 130 to 164, the number being lowest in a Rungwe male and highest in a Lukolela female. Sexual dimorphism in the character is indicated; four Rungwe females vary from 148 to 152 and average 148, whereas three males vary from 130 to 148 and average 142. Caudals indicate a similar, but reversed, dimorphism, the four females averaging 83 and the three males averaging 93. Total variation in caudals ranges from 79 to 105. Anal plate divided throughout the series. Supralabials 8, one exception with 9-8. Labials entering the orbit are the fourth and fifth, with one specimen having the fifth and sixth entering on one side. Infralabials vary from nine to eleven, most commonly 10 with the first five touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2, temporals 1+1, with the exception of a Rungwe male with 1+0+1 on the right and 0+0+1 on the left, one labial on the right and two on the left extending to the parietals.

DIMENSIONS.—The largest specimen is a Rungwe female measuring 560 mm. The largest male, from the same locality, measures 530 mm. Ratios of tail to total length vary in females from .28 to .30, in males from .31 to .34. Comparing sexes in the Rungwe series an average dimorphism is indicated with .29 for females and .32 for males.

MAXILLARY TEETH.—Two Rungwe specimens have twenty-seven, and one Lukolela specimen has twenty-nine. The posterior teeth are slightly enlarged.

HEMIPENIS.—The organ in No. 31960 extends to the eighth caudal, in all respects

resembling the hemipenis described under *C. irregularis*.

REMARKS.—Material available for examination in the American Museum collection as well as the numerous data reported in the literature indicate that there is no sound basis for recognizing the species *neglectus*. In 1933 Loveridge (*loc. cit.*) noted that a series of snakes from Iloilo, Tanganyika Territory, was intermediate between *hoplogaster* and *neglectus*, for the keel on the ventrals was exceedingly variable. He suspects that "*neglectus* is more entitled to be regarded as a race of *hoplogaster*." Such a view is hardly tenable inasmuch as both species have been recorded from several localities in Tanganyika Territory, Kenya Colony and Uganda, and the type locality of *hoplogaster* indicates that the range of the form would include that of *neglectus* represented by the type locality in Mozambique.

Ventral counts and other characters when tabulated give further evidence that the species are synonyms. Snakes without lateral keels on the ventrals, i.e., typical *hoplogaster*, have been reported with ventral counts varying from 141 to 169, a specimen listed above having 130, whereas *neglectus* ranges from 145 to 170. Caudal counts indicate no difference for *hoplogaster* with 82 to 105 versus 77 to 120 for *neglectus*. Summarizing our data we find that only the presence or absence of ventral keels can be used to separate *neglectus* from *hoplogaster* and this putatively specific character proves to be only an individual variation. Thus, we have a situation with *hoplogaster* analogous to that in another species of *Chlorophis*. Loveridge has given evidence to show that *C. emini* is a synonym of *C. irregularis* (following Flower, 1933, Proc. Zool. Soc. Lond., p. 806), the ventral keels being present or absent in representatives of the species.

It is pertinent that some remarks be made concerning two specimens from Lukolela here referred to *hoplogaster* on the basis of two labials entering the orbit. On a geographical basis it is altogether possible that these specimens might as well be considered to be atypical *irregularis*. Simi-

larly a single specimen from Rungwe, assigned to *irregularis* because it had three labials entering the orbit, might well represent an aberrant specimen of *hoplogaster*. The occurrence of such specimens offers strong evidence that in reality we are dealing with a single species which is exceedingly variable in many characters, one character or another being dominant in small areas, the number of labials entering the orbit being a character with two larger geographical regions of dominance. On West African specimens, three labials most frequently are in contact with the eye, in East Africa usually two. Statistical studies of large series from these regions probably will show numerical dominance of one or more characters, with a minority of the alternate character present in each population. The form *hoplogaster* then would become a race of *irregularis*. Change in nomenclature awaits verification of this tentative conclusion.

PHILOTHAMNUS SMITH

*Philothamnus semivariiegatus semivariiegatus* (Smith)

*Dendrophis (Philothamnus) semivariiegata* SMITH, 1849, Illus. Zool. So. Africa, III, Pls. LXIX, LX and LXIV, figs. 1, 1a, 1b: Bushman Flat, Cape Province.

*Philothamnus semivariiegatus* BARBOUR AND LOVERIDGE, 1928, Mem. Mus. Comp. Zoöl., L, p. 118.—FITZSIMONS 1937, Ann. Transvaal Mus., XVII, p. 262.

*Philothamnus semivariiegatus semivariiegatus* LOVERIDGE, 1933, Bull. Mus. Comp. Zoöl., LXXIV, p. 237.

Tindi, Tanganyika Territory, 1 (No. 51790, Carnochan, December 23, 1929).

Kizumbe, Tanganyika Territory, 1 (No. 51791, Carnochan, December 28, 1929).

Mawere Shamba, Tanganyika Territory, 1 (No. 49923, Carnochan, 1935).

LEPIDOSIS.—Dorsal scales 15–15–11. Ventrals 194, 195 and 200, all females. Caudals 127, 135, 143. Supralabials 8 on two specimens, with the fourth, fifth and sixth entering the orbit. The third specimen has labials 9–8, with the labials entering the orbit as above on the side with nine, but on the side with eight, the third, fourth and fifth reach the eye. Loreal single, preocular 1, postoculars 2, temporals 2+2+2 throughout the series.

DIMENSIONS.—These three females have respective lengths overall of 700 mm., 640 mm. and 925 mm., with tail/total ratios of .34, .32 and .32.

MAXILLARY TEETH.—Twenty-one, subequal in size, not so closely set as in the related *Chlorophis* (based upon No. 51790).

REMARKS.—Barbour and Loveridge (*loc. cit.*) suggest that *nitidus* "is entitled to rank only as a subspecies of *semivariiegatus*." In this opinion I concur, adding below that a similar status is indicated for the insular *thomensis*. Loveridge (*loc. cit.*) has shown that the temporals, typically 2+2 in *semivariiegatus*, 1+2 in *nitidus*, 1+1 in *dorsalis* and 1+2 in *thomensis*, are characters subject to some variation in the former two and the literature discloses a similar variation in the latter two. There is a dominant condition in each population, correlated to some extent with the average numbers of ventrals and caudals. Geographical as well as morphological considerations must be taken into account when subspecific identifications are reported.

In his original description Smith mentions an adult from Bushman Flat and young ones from beyond Kurrichane. An adult from Bushman Flat, apparently one of Smith's cotypes, may be designated as the type, accordingly restricting the type locality (*vide* FitzSimons, *loc. cit.*) of the typical form.

*Philothamnus semivariiegatus dorsalis* (Bocage)

*Leptophis dorsalis* BOCAGE, 1866, Journ. Sci. Lisboa, I, p. 69: Duque de Bragança and Molembo, Angola.

*Philothamnus semivariiegatus dorsalis* LOVERIDGE, 1933, Bull. Mus. Comp. Zoöl., LXXIV, p. 238.

"Angola," 6 (Nos. 51784–89, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—Dorsal scales uniformly 15–15–11. Ventrals, two females 175 to 180; four males 171 to 190, averaging 183. Caudals, females 110 to 132; males 121 to 130, averaging 125. Supralabials uniformly 9, the fourth, fifth and sixth entering the orbit. Loreal 1, postocular 1 throughout the series. Postoculars 2, one exception with 3–1. Temporals 1+1+1 on four specimens, 2+2+2 on one, and

3+2+2 on one side of one specimen and 2+2+2 on the other.

**DIMENSIONS.**—The largest of the six specimens is a male 890 mm. long. Ratios of tail to total length vary from .32 to .35 (females) and .30 to .36 (males).

**MAXILLARY TEETH.**—Two specimens examined are quite similar to the typical form with twenty teeth each.

**HEMIPENIS.**—Extends to the eighth caudal on two specimens examined (Nos. 51784 and 51787). Not bifurcate, sulcus undivided, basal spines well developed, followed distally by three to four flounces which gradually are replaced by reticulated calyces, these in turn giving way to papillae on the tip. The hemipenis of *Philothamnus* does not differ from that of some species of *Chlorophis*.

### ***Philothamnus semivariiegatus thomensis*** Bocage

*Philothamnus thomensis* BOCAGE, 1882, Journ. Sci. Lisboa, IX, p. 11, Fig.: St. Thomas Island, Gulf of Guinea; 1895, *Herpétol. Angola et Congo*, p. 94.—ANGEL, 1920, Bull. Mus. Hist. Nat. [Paris], XXVI, p. 3.—BOULENGER, 1896, Cat. Snakes Brit. Mus., II, p. 101.

St. Thomas Island, Gulf of Guinea, 1 (No. 51792, Correia, June, 1929).

**LEPIDOSIS.**—Dorsal scales 15–15–11. Ventrals 207; anal plate divided; caudals 164. Supralabials ?–9, the fourth, fifth and sixth entering the orbit on one side. The right side of the head on this specimen has been partly destroyed so that it is impossible to make complete counts as noted. Loreal ?–1, preocular ?–1, postoculars 2, temporals 1+1+2.

**DIMENSIONS.**—Length overall 1055 mm., tail 370 mm. Ratio of tail to total length .35. The specimen is a female.

**LIFE HISTORY NOTES.**—This individual contained five eggs, one of them measuring 8 mm. × 37 mm.

**REMARKS.**—As noted under typical *semivariiegatus*, the variation within the mainland forms, *dorsalis* and *nitidus*, necessitates reduction to subspecific rank for *thomensis*. Like *Boaedon lineatus bedriagae* which likewise occurs on St. Thomas Island this insular *Philothamnus* appears to average higher in both ventral and caudal

counts than the mainland forms. But there seem to be no dichotomous characters which might serve to distinguish it as a species. In most respects the race is closer to *nitidus* of the adjacent mainland with which it overlaps in most, if not all characters.

Angel ("Les Serpents de l'Afrique Occidentale Française, Paris," 1933, p. 110) reports the variation of scale-rows in *nitidus* as 13 to 15. If this be so, *Philothamnus girardi* Bocage from Annobon Island in the Gulf of Guinea likewise should be ranked as a subspecies of *semivariiegatus* since the only significant difference between *nitidus* and *girardi* lies in the lesser number of scale-rows in the latter.

### **HAPSIDOPHRYS FISCHER**

#### ***Hapsidophrys lineatus* Fischer**

*Hapsidophrys lineatus* FISCHER, 1856, Abhand. Nat. Ver. Hamburg, III, Pl. II, fig. 5: Elmina, Gold Coast Colony.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 80.

Metet, French Cameroon, 2 (Nos. 50558–59, Grissett, 1927).

Lukolela, Belgian Congo, 1 (No. 45908, Chapin, Edson, August 23, 1930).

**LEPIDOSIS.**—Dorsal scales 15–15–13 on one Metet specimen (the other Metet snake is a head only), and 15–15–11 on the Lukolela individual. Ventrals 164 and 165. Anal plate single; caudals 101 and 103. Supralabials 8, in both Metet specimens, with the fourth and fifth entering the orbit, but 9 in the Lukolela specimen with the fourth, fifth and sixth reaching the eye. Infralabials 9 or 10, the first five touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2 without variation. Temporals 2+2, with the exception of one individual with 1+2 on one side.

**DIMENSIONS.**—Two complete females measure 955 mm. and 965 mm., with tail/total ratios of .28 and .27, respectively.

**MAXILLARY TEETH.**—Variation for three maxillae examined 31 to 32, the posterior teeth increasing in size.

**HEMIPENIS.**—Examined in No. 12132 from Medje, Belgian Congo, previously reported by Schmidt (*loc. cit.*). The organ is single, extending to the sixth caudal, with unbranched sulcus. Proximal por-

tion with enlarged blunt spines, basal spines somewhat enlarged. Distal portion with reticulated calyces with crenulated edges.

#### GASTROPYXIS COPE

##### *Gastropyxis smaragdina* (Schlegel)

*Dendrophis smaragdina* SCHLEGEL, 1837, Essai Phys. Serp., II, p. 237: Gold Coast.

*Gastropyxis smaragdina* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 79.

Lukolela, Belgian Congo, 1 (No. 45925, Chapin, Edson, 1931).

St. Thomas Island, Gulf of Guinea, 1 (No. 51777, Correia, 1929).

LEPIDOSIS.—Dorsal scales 15–15–11 on the St. Thomas specimen, 15–15–10 on the Lukolela specimen. Ventrals 154 and 164. Anal plate divided; caudals in two series, numbering 144 in the Lukolela specimen, tail incomplete in the other. Supralabials 9, the fifth and sixth entering the orbit. Loreal elongate, single, preocular 1, postoculars 2 in both specimens. Temporals 1+1 on one side of the Lukolela snake, 1+2 on the other side and on both sides of the other specimen.

DIMENSIONS.—The female from Lukolela measures 910 mm., the ratio of tail to total length being .38. The other female is without complete tail as noted above.

MAXILLARY TEETH.—Twenty in number perceptibly increasing in size toward the posterior.

HEMPENIS.—A male (No. 12127, from Stanleyville, Belgian Congo) reported by Schmidt (*loc. cit.*) was examined. The organ is single, extending to the eighth caudal. Sulcus not bifid; enlarged basal spines present. Middle portion with reticulated calyces; distal portion papillate. The hemipenis of this species bears considerable resemblance to that of *Chlorophis* but lacks flounces proximal to the calyces.

#### THRASOPS HALLOWELL

##### *Thrasops jacksonii jacksonii* Günther

*Thrasops jacksonii* GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 528: Kavirondo, Kenya Colony.

*Thrasops jacksonii jacksonii* LOVERIDGE, 1936, Proc. Biol. Soc. Wash., XLIX, p. 64.

Lukolela, Belgian Congo, 3 (Nos. 50576, 45864–65, Chapin, Edson, 1931).

Kampalla, Uganda, 1 (No. 50572, Carnochan, 1927).

LEPIDOSIS.—One Lukolela specimen is in three sections, tail complete, but large portions of the midbody missing. Congo specimens are all black in coloration, whereas the Kampalla specimen is a juvenile with irregular yellow mottling on the dorsum. Dorsal scales 19–19–15 and 17–19–13. Ventrals 189 on the juvenile, 198–202 on adults, anal divided, caudals 137 and 136. Supralabials 8, fourth and fifth entering the orbit. Infralabials 10 to 12, the Kampalla snake with eleven on one side. Loreal single, preoculars 1 to 3, postoculars 3, temporals 1+1.

DIMENSIONS.—The largest specimen, a male, measures 1845 mm. overall, tail 545 mm.; ratio of tail to total length .29. A female measures 1768 mm., the tail comprising .28 of the total length.

MAXILLARY TEETH.—Two specimens examined have eighteen subequal anterior teeth followed after a diastema by three enlarged ones.

HEMPENIS.—Everted on the Lukolela specimen, single, sulcus undivided. Greatly enlarged basal spines on side opposite sulcus, spines decreasing in size distally and merging into fringed reticulate calyces at the end. The organ appears to be nearly identical with that of *T. flavigularis* described below.

##### *Thrasops flavigularis* (Hallowell)

*Dendrophis flavigularis* HALLOWELL, 1852, Proc. Acad. Nat. Sci. Phila., VI, p. 205: Gaboon.

*Thrasops flavigularis* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 105.

Metet, French Cameroon, 3 (Nos. 50573–75, Grissett, 1927).

LEPIDOSIS.—Dorsal scales 15–13–11 on two females, 15–13–13 on a male. Ventrals 209 and 214 on the females, 207 on the male, anal divided, caudals, respectively, 142, 145 and 141. Supralabials 8 on two, 9–8 on the third, the fourth and fifth entering the orbit on all. Loreal 1, preocular 1, postoculars 3, temporals 1+1.

DIMENSIONS.—Largest female measures 1740 mm., the male 1305 mm., Tail/total length ratios for all three specimens .29.

MAXILLARY TEETH.—Anterior eighteen

teeth subequal in size, followed after a diastema by three enlarged teeth. This arrangement is identical with that found in *T. j. jacksonii*.

**HEMIPENIS.**—(No. 50574) Not bifid, extends to eighth caudal, sulcus undivided, small spinules separating sulcus from about 12 enlarged and conspicuous spines on the opposite side. Proximal spines much larger than others, arranged in more or less uneven rows, decreasing in size distally and merging into terminal reticulated calyces.

**STOMACH CONTENTS.**—Consisted of unidentifiable small mammal remains, probably rodent, a few nematodes, a rootlet and a piece of straw. The latter two items doubtless were ingested accidentally.

**REMARKS.**—Schmidt (1923, p. 85) has noted that the yellow throat characteristic of *flavicularis* occurs also in *jacksonii*. Likewise he reports the observation that "*Thrasops flavicularis* appears to replace it (*jacksonii*) in the Gaboon region, but the two species occur together in the Liberian Forest Area."

It seems improbable that two such closely related species should inhabit the same area. There is no significant difference between the three forms now recognized other than the number of midbody scale-rows which varies from 17 to 21 in *T. j. jacksonii* and from 13 to 15 in *flavicularis* according to Boulenger (*loc. cit.*), whereas the four specimens upon which *T. j. schmidti* Loveridge (1936, Proc. Biol. Soc. Wash., XLIX, p. 63), was based are characterized by 17 scale-rows at midbody. Therefore, I believe the occurrence together of *jacksonii* and *flavicularis* in the Liberian Forest is open to considerable question and specimens from this area should be re-examined. More probably the Gaboon region will be shown to be an area of intergradation, in which case the other two forms will become races of *flavicularis*.

#### PROSYMNA GRAY

##### *Prosymna angolensis* Boulenger

*Prosymna frontalis* BOCAGE (*nec.* Peters), 1895, *Herpétol. Angola*, p. 98, Pl. XI, fig. 2.

*Prosymna angolensis* BOULENGER, 1915, *Proc. Zool. Soc. London*, p. 208: southwestern Angola (original description under *P. frontalis* of Bocage).

Capelongo, Angola, 1 (No. 50504, Vernay Lang, Boulton, 1925).

**LÉPIDOSIS.**—A female with dorsal scales 17-15-15, ventrals 149, anal plate single, caudals 20. Supralabials 6, the third and fourth entering the orbit. Infralabials 7, the first three touching the chin-shields. Loreal 1; preocular 1; postocular 1; temporals 1+2. A single internasal, prefrontal separated from the eyes by the supraoculars and the preoculars.

**DIMENSIONS.**—Length overall 254 mm., tail 23 mm. constituting .09 of the total length.

**MAXILLARY TEETH.**—The anterior part of the maxilla makes a diagonal suture with a posterior elongation of the premaxilla, seemingly as an adaptation to provide mechanical support to the flattened nose in burrowing. This unique osteological arrangement deserves further investigation, preferably with cleared material. There are eight anterior maxillary teeth which are small and somewhat vestigial in character, followed by three enlarged, lancet-shaped teeth.

**HEMIPENIS.**—The singular, "telescoping" organ of a related species (*ambigua*) has been depicted by Schmidt (1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 89). The sulcus is single and the organ unbranched. I have little doubt but that the hemipenis of *angolensis* is similar.

**COLORATION.**—Above the snake is uniformly light brown, with a small cream-colored dot at the apical end of each scale. The interstitial skin shows as a narrow light margin around each scale. The venter and the two lower scale-rows and the posterior lower portion of the third scale-rows are immaculate creamy white. On the head a lighter area includes the labials and extends on either side of the eye to the top of the head becoming only faintly distinct as two ill-defined lines across the prefrontal and the posterior of the frontal. The specimen lacks the "semicollier noir" described and figured by Bocage (*loc. cit.*).

**REMARKS.**—Bocage (*loc. cit.*) originally described the present species under the name *frontalis*, listing specimens from seven localities in Benguela and Mossa

medes. Subsequently, Boulenger (1915, *loc. cit.*) omitted *frontalis* from his list of Angolan snakes and applied the name *angolensis*, giving no description beyond a synopsis of forms known from the Congo, Northern Rhodesia and Angola, and a citation of Bocage's original description. Therefore, a type locality more definite than that listed above cannot be given.

The status of *Prosymna ambigua* and its related forms is open to considerable question. It seems possible that *angolensis* may prove to be a race of *ambigua*, the type locality of which is "Duque de Bragança" (= Braganza on some maps) in northwestern Angola. Although the type had seventeen scale-rows at mid-body, ventral and caudal counts fall within the range of *angolensis*, and the coloration of the type as given by Bocage (p. 100, *op. cit.*) more closely approaches *angolensis* than it approaches that of East and Central African specimens now commonly referred to *ambigua* (with its northeastern race, *stuhlmanni*) despite the fact that these specimens possess but fifteen scale-rows. Two specimens from the northeastern Congo reported by Schmidt (*loc. cit.*) agree with Boulenger's description of coloration for *bocagii*, but have more caudals and fewer ventrals. Although Schmidt reports one specimen as a male and the other as a female, examination of the two discloses the fact that both of them are males. Since Boulenger's type of *bocagii* was reported as a female it seems reasonable to ascribe the difference in ventral counts to the difference between the sexes, and to suspect that Schmidt's Congo specimens might best be referred to *bocagii*.

Loveridge (1936, Bull. Mus. Comp. Zoöl., LXXXIX, No. 5, p. 255) has shown a somewhat comparable dimorphism in the sexes of *P. a. stuhlmanni*. Likewise, Loveridge (1937, Proc. Acad. Nat. Sci. Phila., LXXXIX, part 7, p. 275) has reported a second female *bocagii* which agrees closely in ventral and caudal counts with the female type. Furthermore, Loveridge reports this specimen to have two postoculars, unlike the type which had but one (one postocular is reported as not un-

common in East African *ambigua*). The prefrontal enters the orbit in *bocagii* and normally does not enter the orbit in *P. a. stuhlmanni* although Loveridge (1936, *loc. cit.*) reports a specimen with the former condition from Ngatana, Kenya Colony. There remain only the differences in ventrals upon which to predicate a separation of the two forms. Loveridge reports *stuhlmanni* as follows:

"Males . . . have 133-140 ventrals and  
30-34 subcaudals,  
Females . . . have 140-152 ventrals and  
19-24 subcaudals."

Two *bocagii* females reported, the type from Ubangi Rapids, Belgian Congo, and one from French Cameroon (Loveridge, 1937, Proc. Acad. Nat. Sci. Phila., LXXXIX, p. 274), have 167 ventrals and 19 caudals, and 167 ventrals and 15 caudals, respectively. Schmidt's males (from Garamba, Belgian Congo) have 148 and 139 ventrals and 30 and 32 caudals. The Garamba snakes may represent intermediates, and possibly northern Congo and Cameroon snakes can be segregated as a race (*bocagii*) of *ambigua*, related to *stuhlmanni*, or Barbour and Loveridge (1928, Mem. Mus. Comp. Zoöl., L, p. 121) may be correct in adding it to the synonymy of *ambigua*, the type of which more closely approaches *stuhlmanni* in ventral counts. The genus is badly in need of revision.

#### BOIGA FITZINGER

#### *Boiga pulverulenta* (Fischer)

##### Figure 8A

*Dipsas pulverulenta* FISCHER, 1856, Abh. Naturw. Ver. Hamburg, III, p. 81, Pl. III, fig. 1: Edina, Grand Bassa County, Liberia.

*Dipsadomorphus pulverulentus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 68.

*Boiga pulverulenta* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 102, Pl. x, figs. 1-2.

Ganta, Liberia, 4 (Nos. 50586-89, Harley, July-August, 1932).

Metet, French Cameroon, 2 (Nos. 50590-91, Grissett, 1927).

LEPIDOSIS.—All specimens with dorsal scale-rows 21-19-15 with one exception,



23-19-15. Ventrals 245 to 259 in females, 253 to 262 in males. Anal plate undivided, caudals 104 to 112 in females, 111 to 118 in males. Supralabials 8 throughout the series, the third, fourth and fifth entering the orbit in all but one with only the fourth and fifth on one side. In all specimens the loreal is single, preocular 1, postoculars 2, temporals 2+2 without variation.

**DIMENSIONS.**—The largest snake is a Ganta male measuring 1112 mm. The

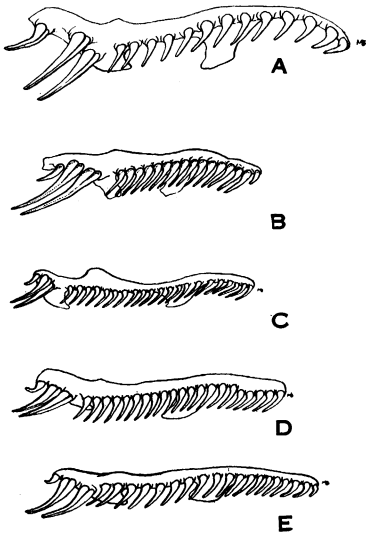


Fig. 8. Maxillary dentition of snakes allied to the genus *Boiga*, showing the small vestigial tooth posterior to the large grooved fangs. (A) *Boiga pulverulenta* (Fischer) (A. M. N. H. No. 50590,  $\times 4$ ), (B) *Crotaphopeltis h. hotamboëia* (Laurenti) (A. M. N. H. No. 49920,  $\times 4$ ), (C) *Dipsadoboa duchesnii* (Boulenger) (A. M. N. H. No. 45930,  $\times 4$ ), (D) *Dipsadoboa elongata* (Barbour) (A. M. N. H. No. 45928,  $\times 4$ ), (E) *Dipsadoboa unicolor* Günther (A. M. N. H. No. 45932,  $\times 4$ ).

larger female, also from Ganta, measures 1050 mm. The tail length varies from .20 to .22 with no significant difference between sexes.

**MAXILLARY TEETH.**—Five specimens examined show variation from eleven to thirteen anterior subequal teeth followed after a very short diastema by two larger grooved fangs and a smaller fang, the total number of teeth being fourteen to eighteen (Fig. 8).

**HEMIPENIS.**—Single, extending to the tenth pair of caudals. The sulcus is single, and deeply buried between two prominent ridges. The base of the organ is covered with small spines abruptly replaced by six to eight rows of greatly enlarged spines on the middle portion. Distally the spines are replaced by numerous flattened papillae which cover the tip.

**COLORATION.**—All specimens fall within the variations described by Boulenger and by Schmidt (*loc. cit.*). The Liberia specimens are distinctly more reddish brown than the Cameroon specimens but otherwise are strikingly similar for specimens from different localities.

#### *Boiga blandingii* (Hallowell)

*Dipsas blandingii* HALLOWELL, 1844, Proc. Acad. Nat. Sci. Phila., p. 170: Liberia.

*Boiga blandingii* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 103, Pl. x, fig. 1.

Lukolela, Belgian Congo, 1 (No. 45907, Chapin, Edson, August 7, 1930).

**LEPIDOSIS.**—The single specimen is a male which has been cut in several places and stitched together so that some counts and measurements are impossible. Dorsal scales are 23 at midbody. The anal plate is single (but variable in the species as noted by Schmidt, *loc. cit.*). Supralabials 9, the fourth, fifth and sixth entering the orbit. Loreal 1; preoculars 2, postoculars 2, temporals 2+2+4.

**MAXILLARY TEETH.**—Examined in the specimen listed above as well as in a specimen (No. 12243) from Akenge, Belgian Congo. On each the anterior maxillary teeth are ten in number, followed after a short diastema by three enlarged, grooved fangs, the posterior one of which is smaller than the other two.

**HEMIPENIS.**—Not bifurcate, extending to the tenth caudal, the undivided sulcus deeply buried between two fleshy fold. The basal half is heavily armed with stout spines but distally the organ is calyculate, the edges of the calyces crenulated.

**COLORATION.**—The fresh specimen was described by Dr. James P. Chapin as "olive-brown, with dark brown patches; below grayish brown."

## CROTAPHOPELTIS FITZINGER

**Crotaphopeltis hotamboeia hotamboeia**  
(Laurenti)

Figure 8B

*Coronella hotamboeia* LAURENTI, 1768, Syn. Rept., p. 85: India orientali, i.e., Africa.*Leptodeira hotamboeia* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 107, Pl. III, fig. 1.*Crotaphopeltis hotamboeia* BARBOUR AND AMARAL, 1927, Bull. Antivenin Inst. Amer., I, p. 26.*Crotaphopeltis hotamboeia hotamboeia* BARBOUR AND LOVERIDGE, 1928, Mem. Mus. Comp. Zoöl., L, p. 125.

Ganta, Liberia, 8 (Nos. 50517-18, 50720 (six full-term eggs), Harley, 1932).

Lukolela, Belgian Congo, 2 (Nos. 45918, 45931, Chapin, Edson, 1930).

Uvira, Belgian Congo, 1 (No. 50634, Chapin, Sage, Mathews, July 23, 1927).

Rungwe Mountains, Tanganyika Territory, 6 (Nos. 38986, 39080-82, 39199, 39203, Boulton and Boulton, 1929).

Mawere Shamba, Tanganyika Territory, 1 (No. 49920, Carnochan, 1935).

Mlanje, Nyasaland, 2 (Nos. 44309-10, Boulton and Boulton, 1929).

Karonga, Nyasaland, 1 (No. 39008, Boulton and Boulton, 1929).

Kroonstad, Orange Free State, 1 (No. 50635, Lang, 1926).

LEPIDOSIS.—Dorsal scales 19 at mid-body, two exceptions from Rungwe having 17. The normal arrangement for the dorsal scales is 17-19-15, although 19 scale rows on the neck are not unusual. For sixteen adults tabulated only three are males, and since no significant difference between the sexes is evident they are not listed separately in the following summary. The Kroonstadt male has but 147 ventrals. On the others, ventrals vary from 156 to 170, the mean being 165 for Tanganyika specimens, 160 for Nyasaland females, 163 for two Congo snakes and 167.5 for two Liberia adults.

Caudals show a variation for sixteen adults of 34-44, averaging 37.4. Supralabials normally 8, the third, fourth and fifth entering the orbit. But one specimen has 9 labials on both sides, and one is asymmetrical with 8-9, having the fourth, fifth and sixth labials reaching the eye on one side. Infralabials vary from 9 to 12,

with the first four to six touching the anterior chin-shields.

Preocular 1 in all specimens with the exception of three from the Rungwe Mountains, two of which have 2 and one 1-2. Postoculars 2, with only two exceptions having 2-3. Temporals normally 1+2, not uncommonly 1+1.

DIMENSIONS.—The largest snake in the series is a female from Rungwe measuring 590 mm. The largest male measures 370 mm. The ratio of the tail to total length varies from .11 in a Karonga female to .16 in the male from Kroonstad. Females average slightly lower than males in tail ratios but the overlap is so extensive that the difference between sexes is practically non-existent.

MAXILLARY TEETH.—In this species there are from fourteen to eighteen anterior teeth, which may or may not increase slightly in size posteriorly. These are followed after a noticeable diastema by two greatly enlarged fangs, and a small, probably vestigial, tooth which is not grooved, and frequently is sharply recurved. The right maxillae of six specimens were examined (see Fig. 8). The solid tooth behind the fangs was noted for *Leptodira rufescens* (= *C. hotamboeia*) by West (1895, Proc. Zool. Soc. London, p. 819, Pl. XLV, fig. 10).

HEMIPENIS AND REMARKS.—Although the copulatory organ of snakes in the genus *Crotaphopeltis* has been described by Barbour and Amaral (*loc. cit.*) their description does not conform with my findings. Their description, I believe, was based upon the everted organ, whereas I have examined the structures *in situ* on three snakes, respectively, from Tanganyika, Belgian Congo and South Africa. In each the organ extends to the tenth caudal. The organ is not bifurcate, and the sulcus is single as reported by Barbour and Amaral. The most conspicuous structures are three large, stout but pointed spines, equal in size, which are attached in the region of the fourth caudal, one on either side of the sulcus, and the third between these. Barbour and Amaral make no mention of these spines, although their

presence serves to distinguish *C. h. hotamboeia*, at least, from all other African snakes whose hemipenes I have examined. The basal portion of the hemipenis is armed with numerous short, stout spines and *in situ* three or four ridges extend the length of the organ with these spines staggered along opposite sides. Only a small area at the distal end is calyculate. Cope's figure (1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. xxviii, fig. 8) is inadequate. Variation within the lepidosis of the present series makes the recognition of the race *tornieri* even more doubtful than has been assumed.

LIFE HISTORY NOTES.—Dr. G. W. Harley, who collected the Liberia specimens, states that these snakes "live in logs and in grass." Nine eggs were removed from the oviducts of one Liberia specimen, and Doctor Harley sent six eggs from Ganta, "dug from a termite hill, August 3, 1932." Three of these eggs containing full-term embryos are intact and measure 23 mm.  $\times$  15 mm., 21 mm.  $\times$  16 mm., and 21 mm.  $\times$  15 mm., respectively (in alcohol). Three juveniles removed from eggs in which all the yolk had been exhausted measure 145 mm., 150 mm. and 150 mm. The ratio of tail to total length in these juveniles varies from .13 to .14, agreeing with the two adult Ganta females. It was possible to remove a maxilla from one of these small snakes and to observe the elongate pair of rear fangs followed by the vestigial tooth; no attempt was made to make full scale-counts although the lepidosis of the head was typical in all three.

#### DIPSADOBOA GÜNTHER

##### *Dipsadoboa unicolor* Günther

###### Figure 8E

*Dipsadoboa unicolor* GÜNTHER, 1858, Cat. Snakes Brit. Mus., p. 183: West Africa.—BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 81.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 105, Pl. xi, fig. 1.—BARBOUR AND AMARAL, 1927, Bull. Antivenin Inst. Amer., I, p. 26.

Metet, French Cameroon, 3 (Nos. 50553-55, Grissett, 1927).

Lukolela, Belgian Congo, 1 (No. 45932, Chapin, Edson, August 30, 1930).

LEPIDOSIS.—Dorsal scales uniformly 17-17-13. Ventrals 185 to 193 for three males, 197 for one female. Anal plate single throughout. Caudals all single (female with a portion of the tail macerated), Lukolela male 72, Metet males 62 and 56, respectively. Supralabials 8, the third, fourth and fifth touching the eye, a single male having nine on one side with the fourth, fifth and sixth entering the orbit. Infralabials normally 10 with the first five touching the anterior chinshields, one specimen with six making this contact. Loreal 1, preocular 1, postoculars 2, without variation. Temporals 1+2, a single exception having 1+1.

DIMENSIONS.—The largest specimen is a Metet male measuring 800 mm., with the tail (147 mm.) comprising .18 of the total length. For the three males the ratio of tail to total length varies from .17 to .20, falling within the range given by Schmidt (*loc. cit.*). The single female was not in a condition to be satisfactorily measured.

MAXILLARY TEETH.—Variation from seventeen to twenty anterior teeth is noted in three maxillae examined. These are followed after a short interspace by two enlarged grooved fangs and a third tooth which is about half the size of the two fangs. Boulenger (*loc. cit.*) in his generic diagnosis does not mention the presence of the third posterior tooth, nor do Barbour and Amaral (*loc. cit.*) probably because it is more easily lost than the other two, although the socket can always be observed with careful inspection. The groove in the third tooth is present in African *Boiga*, sometimes well developed, but this fang sometimes is sharply recurved in contrast to the moderately curved anterior fangs. It appears to be a vestigial tooth, grooved in African *Boiga*, but not grooved in *Crotaphopeltis*, *Chamaetortus* nor in *Dipsadoboa*, whereas in *Theletornis* and *Dispholidus*, snakes not closely related to the *Boiga* group, it is present as a full-sized third fang. (See Fig. 8.)

HEMIPENIS.—Not bifurcate and variable in length as indicated for three males in which it extended to the seventh, to the eighth and to the tenth (in the Lukolela

male). The sulcus, not branched, is bordered on one side by two rows of greatly enlarged spines, approximately six in each row. On the other side of the sulcus is a single row of feebly enlarged spines. The double row of enlarged spines terminates distally in large, irregularly reticulated calyces with crenulated or denticulated edges. The remainder of the distal portion is armed with smaller reticulate calyces.

REMARKS.—The present specimens correspond with Schmidt's (*loc. cit.*) description of coloration and pattern, but on the Metet specimens the white of the venter extends on the upper labials from the first to the seventh and reaches the eye. This character is of no value in separating *unicolor* from *elongata*, as suggested by Schmidt, although other diagnostic characters he mentions are valid.

The Metet specimens have conspicuously more blunt heads than any of the large series from the Congo which are available for comparison. Furthermore, it will be noted that in caudal counts both Metet males fall below the minimum given by Schmidt for Congo specimens, and likewise the Congo specimen examined has a longer hemipenis. Racial identity is suggested, but more material is needed for a final conclusion.

### *Dipsadoboa elongata* (Barbour)

Figure 8D

*Dipsadoboa unicolor* (part) BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 183.

*Crotaphopeltis elongata* BARBOUR, 1914, Proc. New England Zool. Club, IV, p. 95: Lolodorf, French Cameroon.

*Dipsadoboa elongata* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 106, Fig. 11, and Pl. XI, fig. 2.

Lukolela, Belgian Congo, 1 (No. 45928, Chapin, Edson, September 6, 1930).

LEPIDOSIS.—A male with dorsal scales 17-17-13, ventrals 220, anal plate single, caudals 100, in single series. Supralabials 8, the fourth and fifth entering the orbit. Infralabials 11-12, the first five touching the anterior chin-shields. Loreal 1; preocular 1; postoculars 2; temporals 1+2.

DIMENSIONS.—Length overall 1090 mm.,

the tail 245 mm., comprising .24 of the total length.

MAXILLARY TEETH.—The present specimen has more than any previously reported for the genus. There are twenty-one subequal slender anterior teeth, followed by two enlarged grooved fangs and a smaller third ungrooved tooth which is conspicuously recurved, and probably vestigial as suggested under *D. unicolor*. (See Fig. 8.)

HEMIPENIS.—Not bifurcate, extending only to the fifth caudal. Sulcus single, with two rows of greatly enlarged spines on one side, and a single row of feebly enlarged spines on the other. The two rows of enlarged spines terminate in a reticulate arrangement of denticulate calyces.

STOMACH CONTENTS.—Two slender rear legs of an unidentified arboreal frog were found in the stomach of the Lukolela specimen.

REMARKS.—The hemipenis is strikingly similar in the two species, *elongata* and *unicolor*, and although there is obvious variation in the length of the organ in the latter species, *elongata* seems to be characterized by a much shorter copulatory organ. An additional difference between the two species is perhaps worth pointing out. In *unicolor* three labials enter the orbit, whereas in *elongata* normally two labials reach the orbit.

### *Dipsadoboa duchesnii* (Boulenger)

Figure 8C

*Leptodira duchesnii* BOULENGER, 1901, Ann. Mus. Congo, (1) II, p. 10, Pl. IV, fig. 1: Mandungu, Itimbiri River, Belgian Congo.

*Leptodira guineensis* CHABANAUD, 1920, Bull. Comp. Etudes Hist. Scient. Afrique Occ. Française, p. 491: Dieke, French Guinea; 1921, p. 470, Pl. IV, figs. 3, 4, 5.

*Leptodeira duchesnii* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 109, Pl. XII, fig. 1.

*Dipsoglyphophis duchesnii* BARBOUR AND AMARAL, 1927, Bull. Antivenin Inst. Amer., I, p. 26.

Lukolela, Belgian Congo, 2 (Nos. 45929-30, Chapin, Edson, July 26, 1930).

LEPIDOSIS.—Dorsal scales 17-17-13. Ventrals 205 on both male and female; anal plate single; caudals 102 on the fe-

male, 107 on the male. Supralabials 8 on one, with the third, fourth and fifth labials entering the orbit on both sides. The other snake has 9-8, with the fourth, fifth and sixth labials entering the orbit on the side with nine. Infralabials 10, the first four touching the anterior chin-shields on both snakes. The nasal plate is single on both specimens. One specimen has a horizontally elongate loreal on each side entering the orbit below a small preocular; on the other snake a vertically rectangular loreal is present on both sides with a large preocular preventing contact with the eye. Postoculars 2 and temporals 1+1+2 on both specimens.

**DIMENSIONS.**—The male is 855 mm. overall, with the tail (230 mm.), comprising .27 of the total. The female measures 700 mm. with the tail (170 mm.) comprising .24 of the total length.

**MAXILLARY TEETH.**—In the right maxilla of each specimen examined there are twenty small, subequal teeth, followed after an interspace by two enlarged grooved fangs, and a smaller vestigial solid tooth. In this species, as well as in other African genera examined by Barbour and Amaral (*loc. cit.*), no mention is made of this small tooth posterior to the fangs although, as noted below, it appears to have considerable phylogenetic significance. (See Fig. 8.)

**HEMIPENIS.**—Approximately as described by Barbour and Amaral, single with sulcus single. The organ *in situ* extends to the eighth caudal; basal portion with longitudinal ridges and small spines which increase in size toward the distal end of the organ to be replaced by long, slender spines. Two rows of spines adjacent to the sulcus are present as in other species of *Dipsadoboa*, and similarly these merge at the distal end with large, deep calyces with denticulated edges. Smaller reticulated calyces are present on the opposite side of the distal end.

**STOMACH CONTENTS.**—One snake contained the digested remains of an unidentified frog.

**REMARKS.**—It becomes pertinent here to discuss the relationships of some African

opisthoglyph genera in which a vestigial tooth (or grooved fang in African *Boiga*) is present posterior to the two enlarged fangs. Barbour and Amaral (*op. cit.*) offered scanty evidence for a separation of New World *Leptodeira* from African snakes formerly referred to this genus, but sufficient data now can be assembled to verify their conclusion. Through the generosity of Dr. Harvey Bassler, I have been able to examine a number of maxillae removed from South American *Leptodeira* and in no instance has the third posterior tooth been found. Nor has Dunn (1936, Proc. Nat. Acad. Sci., XXII, No. 12, pp. 689-698) mentioned the occurrence of more than two enlarged teeth or fangs in his recent review of North American *Leptodeira*.

On the other hand the skull of a Malayan *Boiga dendrophila* has been available, and the vestigial posterior tooth is found to be present. Pope (1935, "The Reptiles of China," p. 446) records *Boiga kraepelini* as having three posterior teeth, and *B. multomaculata* as possessing but two. Smith (1930, Bull. Raffles Mus. Singapore, No. 3, p. 64) reports a variable condition in *B. cynodon*. Either the genus *Boiga* is a composite group or it may be considered that the vestigial tooth has been completely lost in some species. Nevertheless, data assembled for the African species which have been available to me, indicate that this feature of the dentition is quite useful in determining relationships. (See Fig. 8.)

Certainly it is not illogical to regard snakes with three posterior teeth as comprising a natural group, and there is some evidence for the belief that it was the primitive condition in a common ancestor from which many opisthoglyph genera have been derived. Summarizing, it may be stated that all three grooved fangs have been retained in *Boiga*, the third fang being present and grooved but considerably reduced in size. In *Crotaphopeltis*, *Dipsadoboa* and *Chamaetortus* the third fang is present as a vestigial structure, the grooving having been lost secondarily.

Without much question *duchesnii* should

not be referred to *Dipsoglyphophis*. It is obviously close to *Dipsadoboa* Günther both in dentition and in hemipeneal characters. There remain only the vertebral scale-row, which is not "slightly enlarged" and the single caudals to separate it from *Dipsadoboa* of which neither character is of good generic value. The species, *Boaedon olivaceous*, is included in a genus in which normally the caudals are divided in other species, and in many serpent genera species both with and without slightly larger vertebral scale-rows are included. Aside from these slight differences snakes of the genera *Dipsadoboa* and the proposed genus *Dipsoglyphophis* comprise a natural group of elongate, blunt-headed forest snakes. There is nothing to be gained by isolating a single species in a monotypic genus when it is obviously most closely related to other species. Such procedure merely serves to obscure our understanding natural relationships.

Chabanaud's *Leptodira guineensis* seems to be a synonym of Boulenger's *L. duchesnii*. The chief characters which Chabanaud used to distinguish it from the latter were the shorter loreal not bordering the eye, the undivided anal plate and the number of ventrals. Schmidt (*loc. cit.*) already has shown that the divided anal of the types of *duchesnii* was abnormal, and he lists a specimen with 217 ventrals which falls well within the range of *guineensis* (213-230). The two specimens herein reported indicate that the loreal may or may not enter the orbit, and since the specimens are otherwise nearly identical it would seem that the variation within the species is extensive and *guineensis* must be considered a pure synonym of *duchesnii*. It may be well to add that Chabanaud's figure (1921, *loc. cit.*) agrees perfectly with the Congo specimen lacking the loreal-eye contact.

Since Barbour and Amaral designated *guineensis* (Chabanaud, not Mocquard as stated) as the type of the genus *Dipsoglyphophis* it becomes necessary to re-designate the species *duchesnii* as the genotype even though the genus now is included in *Dipsadoboa*.

#### TARBOPHIS FLEISCHMANN

The present attempt to provide a key to the species of *Tarbophis* known to occur in Africa is the result only of a survey of the literature. Flower (1933, Proc. Zool. Soc. London, pp. 819-820) states that neither the species *fallax* Fleischmann nor *savignyi* Boulenger occurs in Africa and accordingly these have been omitted from the key. Chabanaud (1916, Bull. Mus. Hist. Nat., No. 1, p. 77) described *Tarbophis guidimakaensis* from Guidimaka, Mauritania, but his description indicates that undoubtedly it is a synonym of *T. obtusus* (*Coluber obtusus* Reuss, 1834, Mus. Senckenb. 1, p. 137, type locality Egypt) which Flower (*loc. cit.*) records from Mauritania. In lepidosis *guidimakaensis* differs from *obtusum* only in having two (instead of three) labials entering the orbit, and Chabanaud states that the upper anterior angle of the third labial nearly approaches the orbit. All other characters of both coloration and lepidosis fall within the recorded variation for *obtusum*.

Among the reptiles secured by Dr. Barnum Brown while he was engaged in paleontological field work in Ethiopia in 1920 is a juvenile snake which is referable to the genus *Tarbophis*. Although the species *obtusum* has been reported from localities in Ethiopia the specimen taken by Dr. Brown differs in important characters, and it gives me pleasure to name it in his honor. The species therefore is to be called:

#### *Tarbophis barnumbrowni*, new species

Figure 9

DIAGNOSTIC CHARACTERS.—A species with exceptionally low caudal and ventral scale-counts, differing in these respects from both *T. obtusum* and *T. guentheri*. It approaches the Asiatic species *T. savignyi* in these characters but differs in possessing 21 instead of 19 midbody scale-rows, and in having an undivided anal. In most characters it more nearly approaches *T. dipsadomorphoides* of the Cameroon.

TYPE.—A. M. N. H. No. 20348 (Fig. 9), an immature male collected at Jig-Jiga, Ethiopia, "on a desert plain at 6500 ft.," November 13, 1920, by Dr. Barnum Brown.

DESCRIPTION OF THE TYPE.—LEPIDOSIS: Dorsal scales all smooth, with single apical pits, arranged in twenty-one rows at midbody, diminishing in size toward vertebral row. Dorsal

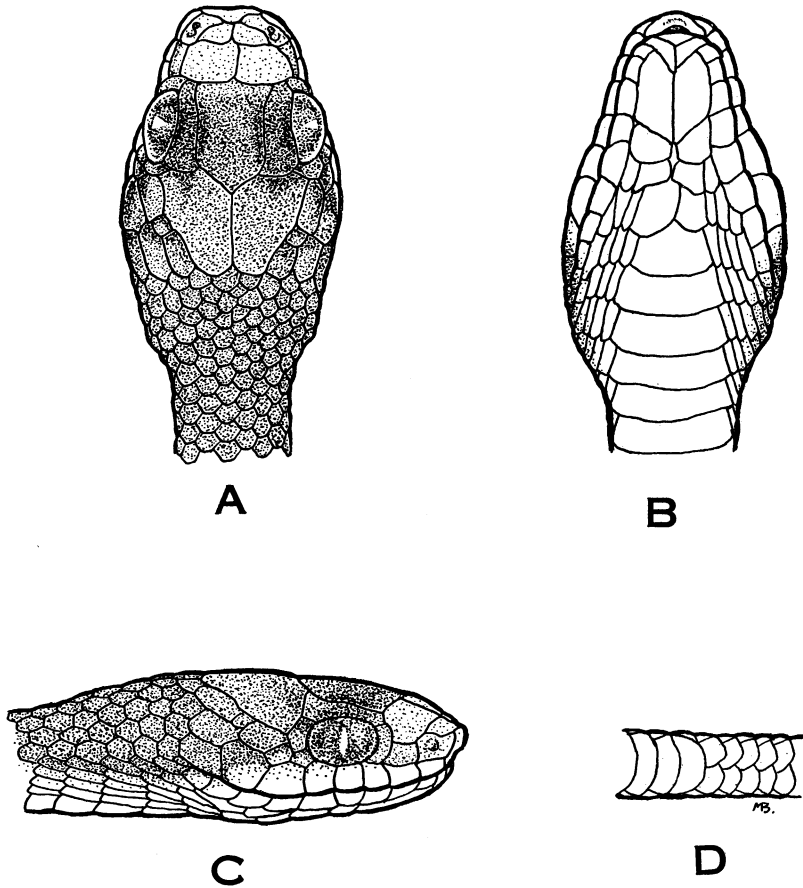


Fig. 9. *Tarbophis barnumbrowni*, new species (A. M. N. H. No. 20348, type, Juvenile male,  $\times 4$ ). (A) dorsum of head, (B) ventral view of head, (C) lateral view of head, (D) ventral view of anal region.

TENTATIVE KEY TO SPECIES OF *Tarbophis* OCCURRING IN AFRICA

- A.—Anal plate divided.
    - B.—Ventrals fewer than 200.
      - C.—Midbody scale-rows 19.
        - D.—Caudals 76; temporals 2+3 (South Africa)..... *splendidus* Ahl, 1924.
      - CC.—Midbody scale-rows 21.
        - D.—Caudals 73; temporals 1+2 (Buea, Cameroons)..... *dipsadomorphoides* Ahl, 1925.
    - BB.—Ventrals more than 200.
      - C.—Midbody scale-rows 19.
        - D.—Three labials entering orbit (Africa, excluding northwest portion and Rain Forest)..... *semiannulatus* (Smith), 1849.
        - DD.—Two labials entering orbit (Tropical Africa)..... *variegatus* (Reinhardt), 1843.
      - CC.—Midbody scale-rows 21-23.
        - D.—Three labials entering orbit (North and East Africa)..... *obtusus* (Reuss), 1834.
  - AA.—Anal plate entire.
    - B.—Temporals 2+3; labials 9 to 10, three entering orbit.
      - C.—Caudals 46 (Kolmanskop, Southwest Protectorate)..... *beetzii* Barbour, 1922.
      - CC.—Caudals 69-75 (East Africa and Adjacent Asia)..... *guentheri* Anderson, 1895.
    - BB.—Temporals 1+2; labials 8, three entering orbit.
      - C.—Caudals 44 (Jig-Jiga, Ethiopia)..... *barnumbrowni*, new species.

scale formula 19-21-17. Ventrals 169; anal entire; caudals 44, in two series. Rostral about twice as wide as high, a rounded portion visible from above where it touches two small internasals. Prefrontals large, more than twice as long as internasals, extending to the sides of the head where they make broad contacts with a sub-trapezoidal loreal of each side. Frontal not quite twice as broad as long, about one-third longer than its distance from the end of snout, a little shorter than parietals. A single preocular is prevented from reaching frontal by a supraocular of each side which makes broad contact with prefrontals. Postoculars two, upper one larger, in contact with anterior temporal, parietal and supraocular. Temporals one, followed by two, but on each side a small scale is present below the anterior temporal.

Supralabials 8, third, fourth and fifth entering the orbit, first touching the rostral and an undivided nasal on each side. Infralabials 10, first four on right and first five on left touching anterior chin-shields, first pair meeting on a common suture behind a normal mental. Anterior chin-shields followed by two pairs of chin-shields, each of which is about half as long as anterior pair. Chin-shields meet on a medium suture.

FORM.—Head broad, sharply distinct from neck; eye moderate with vertically elliptical pupil (based on condition in preservative). Body moderately elongate, sub-cylindrical. Length overall 200 mm.; length of tail 27 mm.; ratio of tail to total length 13.5 per cent. Maxillary teeth eleven, subequal and stout anteriorly, followed after a diastema by two enlarged grooved fangs (left maxilla removed for examination). The hemipenis is undivided but too poorly developed in this juvenile for complete examination.

COLORATION.—Brownish above, with faint, narrow, light cross-bars visible at middle of body. Snout, including prefrontals, cream-color, the light area extending on the lips to the seventh labial. Infralabials, chin, throat and ventrals immaculate creamy white.

#### **Tarbophis semiannulatus** (Smith)

*Telescopus semiannulatus* SMITH, 1849, Illus. Zool. So. Africa, III, Pl. LXXII: no locality given (South Africa).

*Tarbophis semiannulatus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 51.

Mawere Shamba, Tanganyika Territory, 2 (Nos. 49926-27, Carnochan, 1935).

LEPIDOSIS.—Dorsal scales 19-19-15 and 19-19-13. Ventrals (both females) 229 and 243. Anal plate divided; caudals 52 and 64. Supralabials 9, the third, fourth and fifth entering the orbit. Infralabials 12, the first four touching the anterior chin-shields. Loreal 1, preocular 1, postoculars 2, in both specimens. Tem-

porals 2+3, and 2+2 on one side of one specimen.

DIMENSIONS.—Although both females were taken at the same locality they differ somewhat in proportions. One is 835 mm. overall, with the tail (107 mm.) comprising .13 of the total length. The other measures 800 mm. and the tail is 123 mm. or about .15 of the total.

MAXILLARY TEETH.—Two maxillae from separate snakes, one mentioned above and the other (No. 16887) from Serowe, South Africa, were identical. Each had eleven stout anterior teeth followed after an interspace by two enlarged grooved fangs.

HEMIPENIS.—The specimens in the present collections being both females, the copulatory organs of the specimen from Serowe mentioned above and one from Port Lumbo were examined. The hemipenis, undivided, with simple sulcus, extends to the fourteenth caudal. A single basal hook near the sulcus is present. Enlarged spines encircle the base immediately distal to the basal hook. Distal portion calyculate, the calyces deep, with denticulated edges.

#### DISPHOLIDUS DUVERNOY

##### **Dispholidus typus** (Smith)

*Bucephalus typus* SMITH, 1829, Zool. Journ., IV, p. 441: Old Latakoo, South Africa.

*Dispholidus typus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 187.

Kenya Colony, 1 (No. 50794, Davison and Johnson, 1933).

Mawere Shamba, Tanganyika Territory, 1 (No. 49922, Carnochan, 1935).

Mzimba, Nyasaland, 1 (No. 51954, Boulton and Boulton, 1929).

Mombolo, Angola, 5 (Nos. 50577-81, Vernay, Lang, Boulton, 1925).

Capelongo, Angola, 1 (No. 51799, Vernay, Lang, Boulton, July 20, 1925).

LEPIDOSIS.—Dorsal scales more commonly 25-19-13, the anterior count sometimes 21 or 23. Ventrals: extremes in this series 167 (Mombolo) to 186 (Mawere Shamba), averaging 174 for three Angolan females, and 175 for three Angolan males. Caudals vary from 95 (Mombolo) to 118 (Mzimba), averaging 100.3 for three



Angolan females, and 104 for Angolan males. Supralabials 7, with the third and fourth entering the orbit on six specimens; three others are asymmetrical with labial 7-8, the side with eight being normal on one, with the fourth and fifth entering the orbit on a second specimen and the fifth and sixth on another. Infralabials 10 to 12 with the first four or five touching the anterior chin-shields.

Loreal uniformly single; preocular 1; postoculars 3 on all specimens with the exception of one from Mombolo where the upper postocular is fused with the supraoculars leaving but two separate postoculars. Temporals 1+2, a single exception having 2+2 on one side.

**DIMENSIONS.**—The two larger specimens in this series are males, each measuring 1440 mm., from Kenya Colony and Mzimba. The ratio of tail to total length varies from .23 in a Mombolo female to .27 in a male from the same locality. The average differences between sexes is not marked; tail/total ratios for three Angolan males average .25, for three Angolan females .24.

**MAXILLARY TEETH.**—The right maxillae from two specimens, each from Mombolo, contain five subequal anterior teeth followed after a diastema by three very large subequal grooved fangs. The Kenya specimen has seven anterior teeth, followed by three fangs.

**HEMIPENIS.**—Not bifurcate, with sulcus undivided, extending to the ninth caudal. Three greatly enlarged basal spines, which are clawlike, with hardened points extend from fleshy sheaths. One spine is adjacent to the sulcus, with the other two roughly spaced in thirds about the circumference of the base. Distally these basal spines are followed by numerous small spines which diminish in size toward the distal end which is covered with coarsely reticulated calyces. The structure is shown correctly by Cope (1900, *Ann. Rept. U. S. Nat. Mus.* (for 1898), Pl. xvii, fig. 9).

**LIFE HISTORY NOTES.**—A female measuring 1395 mm., taken at Capelongo, July 20, 1925, contains fourteen eggs, five in the left oviduct, nine in the right. The most

posteriorly situated egg measures approximately 40 mm.  $\times$  20 mm., the most anterior egg 25 mm.  $\times$  25 mm.

**STOMACH CONTENTS.**—A small Mombolo male only 700 mm. long contained a large *Chamaeleo*, the head of which was digested so that specific identification was uncertain. The *Chamaeleo* contained several large grasshoppers.

#### THELOTORNIS SMITH

##### *Thelotornis kirtlandii* (Hallowell)

###### Figure 10

*L(eptophis) kirtlandii* HALLOWELL, 1844, *Proc. Acad. Nat. Sci. Phila.*, p. 62: Liberia.

*Thelotornis kirtlandii* (*pro parte*, type "A") BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 185.—SCHMIDT (*non partim*), 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 112.

*Dryiophis kirtlandii* (*partim*) BOCAGE, 1895, *Herpétol. Angola*, p. 119.

Lukolela, Belgian Congo, 1 (No. 50531, Chapin, Edson, 1931).

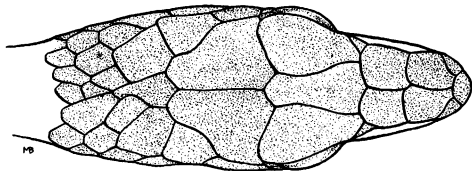
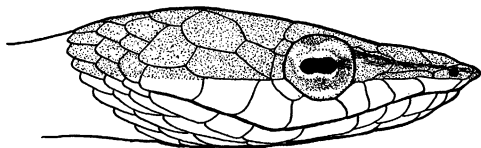
**LEPIDOSIS.**—Dorsal scales 19-19-13. Ventrals 177, anal divided, caudals 154. Supralabials 8, the fourth and fifth entering the orbit. Infralabials 10, the first four touching the anterior chin-shields. Loreal single on one side, divided on the other. Preocular 1, postoculars 3, temporals 1+2. (Fig. 10.)

**DIMENSIONS.**—A male, 1200 mm. overall, with the tail (430 mm.) comprising .36 of the total length.

**MAXILLARY TEETH.**—An examination of four maxillae indicates an astonishing amount of variation. Boulenger (*loc. cit.*) in his diagnosis of the genus noted some variation, "16 or 17, gradually increasing in size, followed after a short interspace by two or three enlarged grooved teeth situated below the posterior border of the eye." In the present series of maxillae examined, which includes three specimens from Akenge, Belgian Congo (included in Schmidt's description, *loc. cit.*), and the specimen from Lukolela, the teeth preceding the three enlarged fangs vary in number from 11 to 14. The Lukolela individual is remarkable in that there are nine anterior teeth, slightly increasing in size, followed by a wide diastema without tooth sockets, two closely set teeth, a

second diastema and the normal three enlarged fangs.

**HEMIPENIS.**—In addition to the Lukolela specimen, the hemipenes on three others from the Belgian Congo were examined (Nos. 12272 and 12279 from Akenge, and 12286 from "Belgian Congo"). In every case the organ extended to the sixth caudal. On the basal portion five strongly enlarged spines are arranged with the two most proximal ones on either side of the sulcus, followed by three slightly larger spines, one of which is more strongly enlarged than any of the others. These



### *Theletornis capensis* Smith

Figure 11

*Theletornis capensis* SMITH, 1849, Illus. Zool. So. Africa, III, App. p. 19: "Kaffirland and the country toward Port Natal."

*Dryiophis kirtlandii* (partim) BOGAGE, 1895, Herpétol. Angola, p. 119.

*Theletornis kirtlandii* (pro parte, type "B") BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 185; 1910, Ann. So. African Mus., V, p. 515.—LOVERIDGE, 1936, Bull. Mus. Comp. Zoöl., LXXIX, p. 265.—LOVERIDGE, 1937, Bull. Mus. Comp. Zoöl., LXXIX, pp. 493, 496, 503.

*Theletornis kirtlandii capensis* MERTENS, 1937, Abh. senkenberg naturf. Ges., No. 435, p. 14.

Fig. 10. Lateral and dorsal views of *Theletornis kirtlandii* (Hallowell) (F. M. N. H. No. 4020,  $\times 2$ ), showing immaculate surface of head with nasals and rostral recurved to the top of the snout.

enlarged basal spines are followed by smaller spines which diminish in size distally and are gradually replaced by coarsely reticulated, smooth-edged calyces on the distal end.

**COLORATION.**—The Lukolela specimen agrees with others from the Belgian Congo, described by Schmidt (*loc. cit.*), and falls within the category of type "A" of Boulenger (*loc. cit.*). As noted under the species *capensis*, coloration is correlated with a sufficient number of morphological characters to warrant the separation of *capensis* as a well-defined species inhabiting the Savannah Province and the highlands.

**STOMACH CONTENTS.**—The snake from Lukolela contained a *Chlorophis carinatus* and a nematode worm.

Hanha, Angola, 2 (Nos. 51951–52, Vernay, Lang, Boulton, 1925).

Rungwe Mountains, Tanganyika Territory, 1 (No. 39170, Boulton and Boulton, 1929).

Mlanje, Nyasaland, 3 (Nos. 44303–05, Boulton and Boulton, 1929).

**LEPIDOSIS.**—Dorsal scale-rows 19–19–11 on all specimens except one from Hanha with 19–19–13. Ventrals vary from 147 (Rungwe) to 161 (Hanha), anal divided. Caudals 132 to 136 on the three Mlanje specimens; the others have incomplete or injured tails. Supralabials uniformly 8, with the fourth and fifth entering the orbit. Infralabials vary from 11 to 12, with the first four or five touching the anterior chin-shields. The loreal is divided on each side of all six specimens. Preocular single,

postoculars vary from 2 to 4, most commonly 3. Temporals uniformly 1+2.

**DIMENSIONS.**—The largest snake in this series is a female from Hanha measuring 1180 mm. overall. The smallest is a male 445 mm. long. The ratio of tail to total length for four specimens varies from .35 to .37.

**MAXILLARY TEETH.**—The variation in the maxillary teeth is similar to that described under *T. kirtlandii*. The right maxilla was removed from four of the specimens listed above and in these the teeth anterior to three enlarged fangs vary

temporal region, unlike the Rain Forest species with the top of the head immaculate. Spots are present on the ends of the anterior labials and on larger specimens a narrow black line extends from the orbit through the sixth supralabial. On the juvenile specimen the spots are less conspicuous but nevertheless present.

**STOMACH CONTENTS.**—The Rungwe specimen contained two *Brookesia platyceps*. One of the Hanha snakes had eaten two small toads of a terrestrial species.

**REMARKS.**—Some years ago Bocage (1895, *loc. cit.*) called attention to the fact

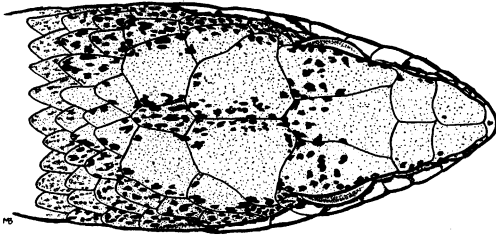
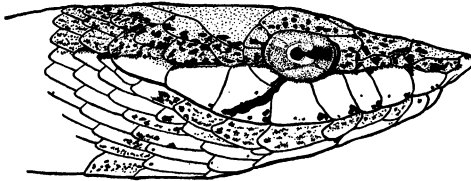


Fig. 11. Lateral and dorsal views of *Theletornis capensis* Smith (A. M. N. H. No. 44303,  $\times 2$ ), showing black markings on head.

in number from 11 in a Hanha snake to 16 in one from the Rungwe Mountains.

**HEMIPENIS.**—The organ on two adult specimens, one from Hanha and one from Mlanje, was examined. The hemipenis is undivided, the sulcus single, basal spines enlarged, diminishing in size distally where they are replaced by reticulated calyces having smooth edges. However, on each of the two specimens the hemipenis extended to the ninth caudal, in contrast to the condition in *kirtlandii* where the organ extends to the sixth caudal.

**COLORATION.**—Although there is variation in the coloration, each of the specimens has dark spots on the head and

that there were certain differences in coloration and morphology correlated with habitat in the snakes of the genus *Theletornis*. However, he included the named forms in his synonymy of *kirtlandii*. Boulenger (1896, *loc. cit.*) a year later listed two color varieties and locality data that are correlated with habitat except for his listing of one specimen from Taveta, East Africa, with those from the Rain Forest. Since Boulenger's "Catalogue" most authors have considered the genus to be monotypic although recently Mertens (1927, *loc. cit.*) has used the trinomial designation for a specimen from Portuguese East Africa.

With a small series available I had

originally followed Boulenger's views, and noted the possibility of recognizing *capensis*. Mr. K. P. Schmidt, who kindly read the first manuscript, had already noticed differences in the series at Field Museum of Natural History and planned a study of the group. After reading the manuscript he generously suggested that I make a more extensive study and he lent me the specimens in the collection in his charge. Other specimens were available in the American Museum.

Thus I have been able to examine seventeen specimens from the Rain Forest including the snake from Lukolela described under *kirtlandii*, eleven of those reported by Schmidt (1923 (*loc. cit.*), under *T. kirtlandii*), and one in the Field Museum from the Belgian Congo, two from the Ja River, French Cameroon, one from Benito River, Spanish Guinea and one from Ifon, Ondo Province, Nigeria. From the Savannah Province and highland districts I have examined the six specimens tabulated above as well as one from Uleia, Tanganyika Territory, one from Pretoria, Transvaal and one from Caconda, Angola, the latter three specimens being from the Field Museum.

Several prominent characters are so well correlated in these two groups that I believe two distinct species to be represented. On morphological grounds specific status is indicated for *capensis*, there being no evidence of intergradation.

Bocage (*loc. cit.*) called attention to the singular extensions of the rostral and nasals to the upper surface of the snout in *kirtlandii* in contrast to the feeble development in *capensis*. (See Figs. 10 and 11.) In addition to this character and the coloration differences, there is a good average difference in ventral counts for the two populations and a difference in the length of the hemipenis in the two forms. The habitus of the forest form is conspicuously more slender than that of the savannah form, doubtless a character correlated with a more strictly arboreal habitat. The shortening of the hemipenis is seemingly correlated with the slender body, a condition analogous to that found

in *Dipsadoboa* where the development of a slender tail is concomitant with a hemipenis shorter than that found in closely related forms with stouter tails. These differences may be summarized in tabular form:

	<i>kirtlandii</i>	<i>capensis</i>
Coloration	Head immaculate above, black cross-bands on neck	Head with black dots on dorsum and sides, no cross-bands on neck
Rostral	Strongly recurved on snout	Feebly recurved on snout
Nasals	Anterior end recurved behind rostral to upper surface of snout	Not extended to upper surface of snout
Ventrals	161 to 189, average 175.1	147 to 170, average 157.8
Hemipenis	Extends to 6th caudal	Extends to 9th caudal

Data summarized for the ventral counts are based upon the material examined and records in the literature. Since an average for the counts in the literature compared favorably with the average for the specimens of each species examined the two were combined. Thus, the table is based upon ventral counts for 26 specimens of *kirtlandii* and 25 specimens of *capensis*. Only two adult males of the latter species were available for an examination of hemipenes and further investigation may indicate greater variability in the length of the copulatory organs.

Schmidt (*supra cit.*) states that "*Thelotornis* represents an extreme specialization for the arboreal habitat, and it is known to feed on birds and tree lizards; from this fact the assumption is logical that it is primarily a forest species which has spread outside the forest limits after reaching specific distinctness. An arboreal form originating in the savannah would be expected to become still more specialized for the arboreal habitat if it entered the Rain Forest, while the reverse is obviously not the case (irreversibility of evolution)."

When Schmidt made this statement he was unaware of the morphological differences correlated with the coloration of the savannah species, *capensis* (which at the time he suggested might be recognized as a

subspecies), since he had only Rain Forest specimens before him. The Rain Forest form is obviously more specialized for an arboreal habitat than the savannah form. This can be interpreted as a case where the direction of the evolution has been reversed or else we must conceive of a snake becoming specialized for an arboreal habitat in the savannah and later becoming still more specialized in the forest. The latter view seems to be not impossible but it is improbable. The closely related *Dispholidus typus* does not enter the Rain Forest (*vide* Schmidt) but reaches its borders. This permits a third interpretation that precludes any necessity for a reversed evolution. Early differentiation in the parental stock produced a forest form, *Thelotornis*, and a savannah form, *Dispholidus*. If we hypothecate a change of ecological conditions arresting the evolution of arboreal specialization, *Thelotornis* may have retained sufficient plasticity in spite of its specialization, to enter the savannah habitat at a subsequent period. The East African relict forest fauna has been explained (Sternfeld, 1915, *Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.*, IV, p. 198) on the hypothesis that a "greater Rain Forest" extended to the East African Coast. Perhaps a less completely adapted forest *Thelotornis* at the eastern periphery was forced into the savannah habitat as the hypothetical forest "withdrew," leaving *capensis* in an arrested state of arboreal specialization and still capable of surviving in the savannah. This hypothetical interpretation would account for the absence of intergrades and, if this postulated absence of intergradation is borne out by future collecting, will provide a theoretical basis for the existence of two distinct species.

The ranges of the two species cannot be defined with absolute certainty owing to the long existing confusion concerning the status of the two forms. The data concerning material examined imply that true *kirtlandii* is nearly confined to the limits of the Rain Forest. Localities listed in the literature indicate a north-south range extending from Liberia southward as far

as Duque de Bragança in northern Angola (Bocage, *supra cit.*, specifically differentiates a specimen from the latter locality from those taken in southern Angola which he notes resemble specimens from Matabeleland and Mozambique).

*Thelotornis capensis* ranges from Kenya Colony (Loveridge, 1937) southward as far as Natal (Boulenger, 1910) with a westward extension of the range into central and southern Angola and even northern Southwest Africa (Schmidt, 1923).

It is interesting to note that Loveridge (*op. cit.*, p. 503) lists *Thelotornis kirtlandii* (= *capensis*) among the species occurring in the Upland Savannah Zone and farther on notes that it is one of several species which "sometimes occur in rain forest, though not typical of its fauna, having invaded it from the adjacent savannah."

Walls (1932, *Bull. Antivenin Inst.*, V, p. 69) has called attention to the pupil of *Thelotornis* noting its "key-hole" shape with other morphological provisions said to provide for binocular vision. In the specimens examined the various stages of pupil dilation show the transition from the horizontal slit to the keyhole modification. The figures illustrating the differences between the two species depict two of the stages in the dilation as observed in the specimens from which the drawings were made. (Figs. 10 and 11.)

Although the closely related genus *Dispholidus* is described as having a round pupil, a fresh specimen from the New York Zoological Society was observed to have a distinctly horizontal pupil. This observation should be verified with a live specimen. Undoubtedly, *Dispholidus* and *Thelotornis* are derived from a common ancestor, and a more primitive (or degenerate?) stage in the optical modifications might well be found in *Dispholidus*.

#### HEMIRHAGERRHIS BOETTGER

##### *Hemirhagerrhis nototaenia nototaenia* (Günther)

*Coronella nototaenia* GÜNTHER, 1864, *Proc. Zool. Soc. London*, p. 309, Pl. xxvi, fig. 1: "Rios de Sena, Zambesi," i.e., Sena, Portuguese East Africa.

*Ablabes hüdebrandtii* PETERS, 1879, *Monatsb.*

Akad. Wiss. Berlin, p. 205, Pl. II, fig. 6: Kitui, Kenya Colony.—FISCHER, 1884, Jahrb. Hamburg. Wiss. Anst., I, p. 7.

*Hemirhagerrhis hildebrandtii* STEJNEGER, 1893, Proc. U. S. Nat. Mus., XVI, p. 729.

*Hemirhagerrhis nototaenia* STEJNEGER, 1893, Proc. U. S. Nat. Mus., XVI, p. 730.

*Amphiophis nototaenia* BOULENGER, 1891, Proc. Zool. Soc. London, p. 307.

*Amplorhinus nototaenia* BOULENGER (*partim*), 1896, Cat. Snakes Brit. Mus., III, p. 125; (*non partim*) 1896, Ann. Mus. Civ. Stor. Nat. Genova, (2a) XVII, p. 12, and p. 21; 1898, Ann. Mus. Civ. Stor. Nat. Genova, (2a) XVIII, p. 721.—WERNER, 1907, Stizber. Akad. Wiss. (math. natur.), CXVI, part 2, p. 1878.—CALABRESI, 1916, Monitore Zool. Ital., XXVII, p. 39.—LOVERIDGE, 1917, Jour. E. Africa and Uganda Nat. Hist. Soc., VI, p. 188.—CALABRESI, 1923, Atti Soc. Ital. Mus. Civ. Milano, LXII, p. 162.—LOVERIDGE, 1923, Proc. Zool. Soc. London, p. 882; 1924, Jour. E. Africa and Uganda Nat. Hist. Soc., Special Supplement No. 3, p. 6; 1928, Proc. U. S. Nat. Mus., LXXIII, p. 55.—SCORTECCI, 1929, Atti Soc. Ital. Mus. Civ. Milano, LXVIII, p. 277.—LOVERIDGE, 1929, Bull. U. S. Nat. Mus. No. 151, p. 30; 1933, Bull. Mus. Comp. Zool., LXXIV, p. 250.—WITTE, 1933, Ann. Mus. Congo Belge, Tervueren, (1) III, No. 2, p. 92.—FITZSIMONS, 1933, Ann. Transvaal Mus., XVI, p. 314.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 36.—PARKER, 1936, Ann. Mag. Nat. Hist., (10) XVIII, p. 594.—LOVERIDGE, 1937, Bull. Mus. Comp. Zool., LXXIX, p. 496.

*Amplorhinus güntheri* MOCQUARD, 1906, Bull. Mus. Hist. Nat. [Paris], XII, p. 251: Lake Ngami, Bechuanaland Protectorate.

*Anoplorhinus nototaenia* (misprint) BOULENGER, 1912, Ann. Mus. Civ. Stor. Nat. Genova, (3) V, p. 332.

Tindi, Tanganyika Territory, 1 (No. 50505, Carnochan, December 11, 1928).

LEPIDOSIS.—A female with dorsal scale-rows 17–17–13. Ventrals 168; anal divided; caudals 75. Supralabials 8, the fourth and fifth entering the orbit. Infra-labials 9, the first four in contact with the anterior pair of chin-shields. Nasal semi-divided; loreal 1; preocular 1; post-oculars 2; temporals 1+2.

DIMENSIONS.—Length overall 305 mm., the tail (75 mm.) comprising .25 of the total length.

MAXILLARY TEETH.—Stejneger (*loc. cit.*) has recorded nine teeth followed by a fang in his Tana River specimen of *H. n. nototaenia* (under *Hemirhagerrhis hildebrandtii*). His count was approximately accurate, although he is not correct in stating that there is a single fang. The

present specimen, as well as two specimens of *H. n. viperinus* noted below, each have nine anterior teeth, increasing slightly in size posteriorly, and followed after a diastema by two enlarged grooved fangs.

HEMIPENIS.—(Based on M. C. Z., No. 18212.) Papilliform (when everted) sulcus not bifid, extends to fourth caudal. No calyces, spines or other armament present.

REMARKS.—Trinominals are used because a survey of the characters reported in the literature, augmented by the examination of five specimens kindly lent by Mr. Arthur Loveridge of the Museum of Comparative Zoölogy, indicates that a subspecies inhabiting southwestern Angola and Southwest Africa may be recognized. The majority of the important papers are listed in the synonymy above, excluding those which merely repeated older records. Peter's record (1882, Reise nach Mossamb., III, p. 118) of *Tachymenis nototaenia* from "Kafferlande" has been omitted as a synonym because the snake he describes has 19 scale-rows, 137 ventrals, 85 caudals and seven supralabials, the third and fourth entering the orbit. None of these characters corresponds to those of *H. n. nototaenia*.

*Amplorhinus güntheri* of Mocquard appears to differ from typical *nototaenia* in lacking a loreal; all other characters fall within the described variations of the typical form. I suspect that it represents an aberrant individual, if, indeed, Mocquard's description is accurate. He notes that there are no apical pits, but in a footnote he states that this was perhaps due to "la recente formation d'un nouvel epiderme."

Some years ago Loveridge (1929, Bull. U. S. Nat. Mus., 151, p. 30) tabulated evidence to show the minor differences which existed between the genera *Hemirhagerrhis* and *Amplorhinus* as defined by Boulenger (1896, Cat. Snakes, III). Loveridge noted the similarity between *H. kelleri* of Boettger and what now must be known as *H. nototaenia nototaenia* and suggested that the differences hardly warranted generic distinction. I am indebted to Mr. Loveridge for the loan of

material in his charge at the Museum of Comparative Zoölogy, including two specimens of *H. kelleri* and three specimens of *Amplorhinus multimaculata*. From an examination of the maxillae and hemipenes of the two forms, I have drawn the conclusion that *nototaenia* is unquestionably closely related to *H. kelleri* but not close to *Amplorhinus multimaculata*. *Amplorhinus* Smith, 1849, is unique in many respects and for the present, at least, must become a monotypic genus. *Hemirhagerrhis* Boettger, 1893 (*Zool. Anz.*, XVI, p. 119) appears to be the earliest name available for the forms *kelleri* (type species), and *nototaenia* with its race *viperinus*.

I have examined the maxillary teeth of *H. kelleri* (M. C. Z., No. 40621) and find them to be nearly identical with those of *nototaenia* and its subspecies *viperinus*. There are nine anterior teeth slightly increasing in size posteriorly and followed after a narrow diastema by two slightly enlarged, curved, grooved fangs. *Amplorhinus multimaculatus* (M. C. Z., No. 3629) has twelve anterior teeth, approximately subequal in size, and followed after an interspace by two rather prominent grooved fangs.

More significant, however, are the differences in the hemipenis. *H. kelleri* and *H. n. nototaenia* each have short papilliform structures without spines or calyces. The organs correspond closely to those of *Cerastes*, *Psammophis* and related genera, an affinity that is further suggested by the color and pattern of *kelleri* in particular.

In contrast, the copulatory organ of *Amplorhinus* is a complex structure, unique among those of African opisthophylaxs for which there are descriptions. The organ on M. C. Z., No. 3629 (from Cape of Good Hope) extends to the twenty-fourth caudal, bifurcating at the seventh, the sulcus dividing at the sixth. Basal portion, with spines in longitudinal rows; spines largest on either side of the sulcus. At the junction of the two lobes spines are enlarged, arranged in rows on projecting folds. For a distance of two caudals beyond the bifurcation each lobe is enlarged and spiny, but

from each there is a long and exceedingly slender prolongation, including the sulcus and accompanied by rows of minute spinules, which extends a distance of fourteen caudals to the retracting muscle. These and other differences between the genera as now understood may be summarized in tabular form:

Character	<i>Hemirhagerrhis</i>	<i>Amplorhinus</i>
Maxillary teeth	9+2	12+2
Hemipenis	Papilliform, short, sulcus not bifurcate	Divided, spiny, sulcus bifurcate
Anal plate	Divided	Single
Dorsal scales	17-17-13, all smooth	17-17-15, feebly keeled

There is no significant difference in the mandibular teeth, but the pupil shape may furnish additional evidence for generic distinction. Walls (1932, *Bull. Antivenin Inst. Amer.*, V, p. 69) has pointed out that pupil shape cannot be determined accurately in preserved specimens. *H. kelleri* is reported to have a subelliptic pupil whereas Boulenger defined *Amplorhinus* as having a round pupil. Whether Boulenger's description should include *H. nototaenia* can be determined only by the examination of a live specimen. I strongly suspect that the pupil shapes in the two species of *Hemirhagerrhis* will prove to be similar, but this is purely speculative. At best, so-called "subelliptic" pupils, while unquestionably of phylogenetic significance, are difficult to use in taxonomic work.

It might be added that my conclusion concerning the status of *Hemirhagerrhis* is not altogether new, for nearly forty-five years ago Stejneger (*op. cit.*) drew a similar conclusion although his data were inadequate and he failed to note that *Ablabes hildebrandtii* Peters, 1879, was a synonym of *H. nototaenia*, as Loveridge (1928, *loc. cit.*) has pointed out.

#### *Hemirhagerrhis nototaenia viperinus* (Bocage)

Figures 12A, 13 and 15E

*Psammophylax rhombeatus* ? BOCAGE, 1867, *Jorn. Sci. Lisboa*, I, p. 224.

*Psammophylax viperinus* BOCAGE, 1873, *Jorn.*

Sci. Lisboa, IV, p. 222: "Dombe" (Benguella), i.e., Dombe Grande, Benguela, Angola.

*Psammophylax nototaenia* BOCAGE, 1895, Herpétol. Angola, p. 109.

*Amplorhinus nototaenia* BOULENGER (*partim*), 1896, Cat. Snakes Brit. Mus., III, p. 125.—STERNFELD (*non partim*), 1910, Mitt. Zool. Mus. Berlin, V, p. 55.

Huambo, Angola, 1 (No. 50506, Vernay, Lang, Boulton, April 17, 1925).

Munhino, Angola, 2 (Nos. 50509–10, Vernay, Lang, Boulton, June 5, 1925).

Hanha, Angola, 1 (No. 50512, Vernay, Lang, Boulton, May 17, 1925).

LEPIDOSIS.—A specimen from Munhino, the only male, lacks the head; the others are complete. Dorsal scale-rows 17–17–13.

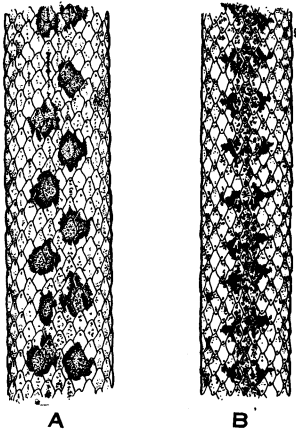


Fig. 12. Comparison of patterns at midbody. (A) *Hemirhagerrhis nototaenia viperinus* (Bocage) (A. M. N. H. No. 50506,  $\times 2$ ), and (B) *Hemirhagerrhis nototaenia nototaenia* (Günther) (A. M. N. H. No. 50505,  $\times 2$ ).

Ventrals 164 to 170; anal divided, caudals 57 to 60. Supralabials 8, the fourth and fifth entering the orbit. Nasal semi-divided; loreal 1; preocular 1; postoculars 2, without variation for the four characters. Temporals 1+2 on two specimens, 2+3 on one Munhino specimen. (Fig. 12.)

DIMENSIONS.—The largest specimen in the series is a complete female from Munhino with an overall measurement of 360 mm., the tail (65 mm.) comprising .18 of the total. The ratio of tail to total length varies in three specimens from .18 to .20. A specimen from Capangombe, Angola, for which Bocage (1895, *loc. cit.*)

gives measurements, has a tail/total ratio of .20. All these ratios are lower than any reported for typical *nototaenia* as noted below.

MAXILLARY TEETH.—Maxillae of two specimens examined are identical with those of typical *nototaenia*. The right maxillae of Nos. 50512 and 50506 have nine anterior teeth, slightly increasing in size toward the posterior. The teeth are not closely spaced, and the diastema between them and two slightly enlarged grooved fangs is but little greater than the space between other teeth. (See Fig. 15E.)

HEMIPENIS.—The copulatory organs in this species are exceedingly small and difficult to examine satisfactorily. The only male of this species that has been available is the one from Munhino which lacks a head, but the hemipenes are everted and show the papilliform structure, without spines or calyces, characteristic of *Psammophis* and related genera. The hemipenis could not be examined *in situ* but appears to extend to approximately the third or fourth caudal.

COLORATION.—The typical form, *nototaenia*, has been depicted accurately by Günther, and by Peters in his description of *hildebrandtii*. Bocage's *viperinus* has not been figured until now. It differs from the typical form in possessing no tendency toward a vertebral stripe connecting series of small black spots. In *viperinus* small black or dark brown spots on a gray ground color are enlarged into a series of definite, black, subtriangular spots on either side of a light-colored vertebral row of scales. These spots merge as a single vertebral row on the tail, and anteriorly merge to form a broad bar at the occiput. The thin brown lateral lines characteristic of *nototaenia* are present on the Hanha specimens with two series of pale brown spots on the two lower scale rows. (See Figs. 12 and 13.)

STOMACH CONTENTS.—The Hanha specimen contained a small *Mabuya quinque-taeniata*.

REMARKS.—The revival of Bocage's name, *viperinus*, as a subspecies of *noto-*



*taenia* is based upon average differences for three morphological characters aside from the differences in pattern noted above. Sternfeld's records (*loc. cit.*) of two specimens from "Southwest Africa" and one from Gobabis in the same region have been referred to *viperinus* on the basis of their low caudal counts and the geographical proximity of the localities to the type locality in Angola. Bocage (1895, *loc. cit.*) has given scale counts for specimens from four Angolan localities (Capangombe, Humbe, Maconje and Dombe Grande), and dimensions for a single specimen. Thus it is possible to summarize data for

supplied the following data. The type "is a female, not a male; it has 178 ventrals and 73+1 subcaudals. Boulenger's 187 is obviously just a printer's inversion."

Below, corrected data are arranged in tabular form with extremes given in parentheses:

	<i>nototaenia</i>	<i>viperinus</i>
Ventrals, average	(167-183) 172.4	(154-177) 166.7
Caudals, average	(68-98) 86.1	(52-75) 60.8
Tail/total ratio	(.24-.34) .26	(.18-.20) .19

These data indicate good average differences for three characters for the two populations, *viperinus* apparently representing a more recently developed form probably confined to southern Angola and Southwest Africa. The typical form has been reported from Italian Somaliland, Kenya Colony, Tanganyika Territory, Sudan, Belgian Congo, Rhodesia, Nyasaland and Bechuanaland Protectorate.

CERASTES LAURENTI

*Cerastes tritaeniatus tritaeniatus* (Günther)

Figure 15C

*Rhagerhis tritaeniatus* GÜNTHER, 1863, Ann. Mag. Nat. Hist., (4) I, p. 423, Pl. XIX, fig. 8: Southeast Africa.

*Psammophylax variabilis* GÜNTHER, 1892, Proc. Zool. Soc. London, p. 557, Pl. XXXV: Shire Highlands, Nyasaland.

*Trimerorhinus tritaeniatus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 139.—LOVERIDGE, 1929, Bull. U. S. Nat. Mus., No. 151, p. 31.

*Trimerorhinus tritaeniatus tritaeniatus* LOVERIDGE, 1932, Proc. Biol. Soc. Wash., XLV, p. 85.

*Cerastes tritaeniatus tritaeniatus* MERTENS, 1937, Abh. senckenberg. naturf. Ges., No. 435, p. 14; 1937, Verofthen. Deutsch. Kolon. Übers. Mus. Bremen, II, No. 1, p. 8.

Capelongo, Angola, 1 (No. 50584, Vernay, Lang, Boulton, July 20, 1925).

Rungwe Mountains, Tanganyika Territory, 5 (Nos. 39097, 39166-69, Boulton and Boulton, 1929).

Karonga, Nyasaland, 1 (No. 38997, Boulton and Boulton, 1929).

Kroonstad, Orange Free State, 1 (No. 50513, Lang, 1926).

LEPIDOSIS.—Dorsal scales uniformly 17-17-13. Ventrals vary from 159-168. Anal

ten ventral and caudal counts, and four tail/total ratios for *viperinus*. Under *H. n. nototaenia* are listed the sources for similar data which include those for six specimens examined and ten ventral and caudal scale counts taken from the literature and fourteen tail/total ratios including examined material. It is pertinent to note here that although Günther described the type of *nototaenia* as having 177 ventrals and 76 caudals, Boulenger (1896, *loc. cit.*) lists it as having 187 ventrals (the maximum reported) and 76 caudals.

Mr. H. W. Parker recently examined the type at my request and he has kindly

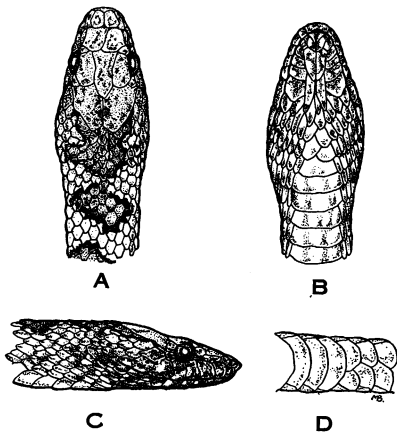


Fig. 13. *Hemirhagerhis nototaenia viperinus* (Bocage) (A. M. N. H. No. 50506, female, X2). (A) dorsum of head, (B) ventral view of head, (C) lateral view of head, (D) ventral view of anal region.

divided on all; caudals vary from 53 (Rungwe) to 68 (Kroonstad), averaging 59. Supralabials 8, the fourth and fifth entering the orbit, the Kroonstad specimen being abnormal with a small wedge-shaped scale on the lip between the third and fourth labials. Infralabials normally 10, sometimes eleven and rarely twelve, with the first five touching the anterior chin-shields. Loreal uniformly 1, preocular 1, postoculars 2 throughout the series. Temporals variable, 2+2, 2+3, 2+4 or 1+3, four specimens having two and four specimens having one anterior temporal without geographical correlation.

**DIMENSIONS.**—The largest snake of the present series is a male 675 mm. overall, from Capelongo. The ratio of tail to total length varies from .17 (a Karonga female) to .22 (a Kroonstad female).

**MAXILLARY TEETH.**—There are ten anterior teeth slightly increasing in size toward the posterior, and followed after an interspace by two enlarged grooved fangs. (See Fig. 15.)

**HEMPENIS.**—A short, papilliform structure without arnament, extending to the third caudal. The sulcus is single, extending to the tip as in more typical hemipenes. There is no macroscopic difference between the hemipenes of *Cerastes* and related genera, i.e., *Dromophis*, *Psammophis*, *Mimophis*, *Rhamphiophis*, *Hemirhagerrhis* and perhaps others not yet available for examination. (See Fig. 15.)

**STOMACH CONTENTS.**—One Rungwe snake had eaten a mouse; a second specimen from the same locality contained a recently hatched bird of a small species.

**REMARKS.**—The specimen from Karonga, Nyasaland, is the form *variabilis* of Günther, and although in lepidosis it agrees with *tritaeniatus* it is readily distinguishable from all other specimens available by its pattern and coloration. Loveridge (1929, *loc. cit.*) has referred it to the synonymy of *tritaeniatus*, but it seems possible that it may be recognizable as a race of the latter if it can be shown that this form is geographically isolated in the

sense that more typical *tritaeniatus* does not occur within the same area.

It is perhaps worth pointing out that the present records slightly extend the range of variation in ventrals for the race from 163 reported as the maximum by Loveridge (*loc. cit.*) to 168, the number present on both a Rungwe and a Karonga specimen.

### *Cerastes tritaeniatus multisquamis* (Loveridge)

*Trimerorhinus tritaeniatus multisquamis*  
LOVERIDGE, 1932, Proc. Biol. Soc. Wash., XLIV, p. 84: Nairobi, Kenya Colony; 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 36.

Albasso Plateau, Arussi Province, Ethiopia, 1 (No. 37894, Carter, February 13, 1929).

Addis Ababa, Ethiopia, 1 (No. 37895, Carter, May 17, 1929).

Tindi, Tanganyika Territory, 1 (No. 50585, Carnochan, 1929).

**LEPIDOSIS.**—Three females with dorsal scales 17–17–13. Ventrals 162 (Tindi) and 178–179 for Ethiopian specimens. Anal plate divided; caudals 62 (Tindi) and 55–56 for Ethiopian snakes. Supralabials 8, the fourth and fifth entering the orbit on all. Infralabials 10 on the Ethiopian specimens with the first five touching the anterior chin-shields; 11–12 on the Tindi specimen with the first five on one side, the first six on the other in contact with the first pair of chin-shields. Loreal 1, preocular 1, postoculars 2, temporals 2+3 on all.

**DIMENSIONS.**—The Tindi and the Addis Ababa specimens each measure 600 mm. with respective tail lengths of 125 mm. and 100 mm., giving ratios of .20 and .17.

**HABITS AND HABITAT.**—The Tindi specimen had three young mice in its stomach. Mr. Donald Carter's field notes state that the Addis Ababa specimen was taken within the city, the Arussi specimen on a "grassy plateau at an elevation of 2750 meters." The Tindi specimen is from an area close to the region of intergradation with the typical form, and in ventral count falls on the minimum reported for the subspecies by Loveridge (1936).

**DROMOPHIS PETERS*****Dromophis lineatus* (Duméril and Bibron)**

Figure 15A

*Dryophylax lineatus* DUMÉRIL AND BIBRON, 1864, *Erpétol. Gén.*, VII, p. 1124: White Nile, Africa.

*Dromophis lineatus* BOULENGER, 1895, *Ann. Mag. Nat. Hist.*, (6) XVI, p. 33.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 110, Pl. XIII.

Akona, Sudan, 1 (No. 50519, Anthony, February 8, 1929).

"Angola," 1 (No. 50611, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—Two males, each with dorsal scales 17-17-13. Ventrals 146 and 147; anal divided; caudals 84 on the Angola snake, tail incomplete on the other. Supralabials 8, with the fourth and fifth entering the orbit. Infralabials 9, with the first four in contact with the anterior chin-shields. Each with loreal single, preocular 1, postoculars 2, and temporals 1+2.

DIMENSIONS.—The complete Angolan specimen measures 1000 mm. overall, the tail (300 mm.) comprising .30 of the total length.

MAXILLARY TEETH.—The teeth arrangement of snakes in this species (no *Dromophis praeornatus* have been available for comparison) is essentially that of the genus *Psammophis* but the two anterior interspaces on either side of two enlarged teeth are lacking. The two teeth near the middle of the maxilla may be not much enlarged, so that some specimens approach the genus *Cerastes* (*Trimerorhinus auct.*) in this feature of the dentition. Three maxillae examined (including No. 12261 from Faradje, Belgian Congo) show a variation in *lineatus* of thirteen, fourteen and sixteen anterior teeth, followed after a diastema by two enlarged grooved fangs. (See Fig. 15A.)

**PSAMMOPHIS BOIE*****Psammophis sibilans sibilans* (Linnaeus)**

Figures 14 and 15H

*Coluber sibilans* LINNAEUS (*partim*) 1766, *Syst. Nat.*, Ed. 12, I, p. 323: "Asia."

*Psammophis sibilans* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 161.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 111.

*Psammophis sibilans sibilans* MERTENS, 1937, *Veroff. Deuts. Kol. Übers. Mus. Bremen*, II, No. 2, p. 8.

Ganta, Liberia, 2 (Nos. 51793-94, Harley, 1932).

Lukolela, Belgian Congo, 1 (No. 45915, Chapin, Edson, 1930).

Lobito Bay, Angola, 9 (Nos. 50612-20, Vernay, Lang, Boulton, 1925).

Capelongo, Angola, 11 (Nos. 50621-29, 50632-33, Vernay, Lang, Boulton, 1925).

Tindi, Tanganyika Territory, 2 (Nos. 50507-08, Carnochan, December 18-20, 1928).

Mawere Shamba, Tanganyika Territory, 1 (No. 49921, Carnochan, 1925).

Mlanje, Nyasaland, 2 (Nos. 44320, 44328, Boulton and Boulton, 1929).

Merebank, Natal, 1 (No. 57637, Coghill, 1933).

LEPIDOSIS.—Dorsal scales 17-17-13, a single exception from Lobito Bay with 18-17-13. Ventrals show an extreme variation in twenty-nine specimens of 151 (Capelongo) to 172 (represented by several localities). Sexual dimorphism is indicated in the two series from Angola; five males vary from 162 to 172, average 167.4, whereas fifteen females vary from 151 to 172, and average 163. The following ventral counts are given for separate areas: Liberia 170, 171; Belgian Congo 167; Tanganyika 152, 156, 172; Nyasaland 171, 172; Natal 167. Anal divided in all specimens except on one from Ganta and one from "Angola." Caudals in the present series (three with tails incomplete) vary from 75 (Capelongo) to 103, averaging 87.7 for twelve Angolan females with complete tails and 92.8 for five Angolan males.

Supralabials 8, with the fourth and fifth entering the orbit, a single exception being a Capelongo specimen with 7-8, the side with seven having the third and fourth labials entering the orbit. Infralabials normally ten, sometimes nine, rarely eleven, with the first four touching the anterior chin-shields, a single specimen having the first five touching. Loreal single throughout, preocular 1, a Capelongo specimen with 2, and a Lobito Bay specimen with 2-1, being the only exceptions. Postoculars extend to the

frontal in four specimens from Capelongo. Postoculars 2 in all cases; temporals 2+2, not uncommonly 2+3.

**DIMENSIONS.**—The largest snake in the series is a Capelongo male measuring 1415 mm. overall. The largest female is one measuring 930 mm. from the same locality. The smallest specimen is a recently hatched Liberia juvenile measuring 290 mm. The ratio of tail to total length varies from .25 to .31; the average for twenty specimens is .28 with no significant differences between the sexes indicated.

**MAXILLARY TEETH.**—The right maxilla of eight specimens was examined and the typical arrangement is as follows: Four slightly enlarged anterior teeth, diastema, two enlarged teeth, diastema, three smaller teeth, narrow diastema, two

organs of *sibilans* are little more than short, papilliform structures with undivided sulci extending their full length. Very frequently the hemipenes are extruded in the course of preservation, but unless this is done, very careful dissection is required in order to determine the sex satisfactorily. There is no armamentation, neither spines nor calyces, on the hemipenes which extend approximately to the third caudal. (See Fig. 14.)

**LIFE HISTORY NOTES.**—Developing ova were present in the oviducts of two snakes, three in the left and six in the right oviducts of a Capelongo snake, and seven in the left and nine in the right oviducts of a Mlanje specimen.

**STOMACH CONTENTS.**—The catholic tastes of the species are indicated by the

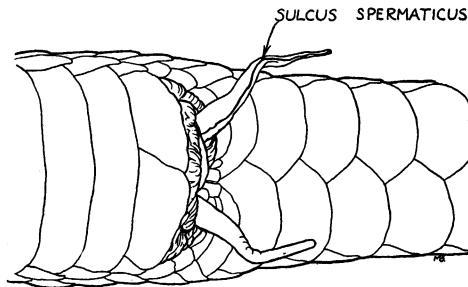


Fig. 14. Anal region of *Psammophis sibilans* (Linnaeus) (A. M. N. H. No. 50613,  $\times 2$ ) showing everted hemipenes typical of *Psammophis* and several closely related genera.

enlarged grooved fangs. (See Fig. 15H.) The only variation occurring in the series was confined to the small teeth preceding the fangs which varied from two to five. In formula this might be written 4+2+2+2 to 4+2+5+2. It is of interest to report that on two Capelongo specimens (Nos. 50621 and 50633) the anterior enlarged teeth showed conspicuous grooves. On one of these maxillae taken from the largest specimen in the series, the remaining tooth of the two anterior enlarged pair has three distinct grooves. The most anterior groove is deep and extends from the base of the tooth to near the tip.

**HEMIPENIS.**—Like the hemipenes of all other species of *Psammophis* and several related genera examined, the copulatory

following: A small frog was taken from one juvenile from Ganta; a Lobito Bay snake had eaten a *Mabuya* sp., and another from Capelongo contained a mouse in its stomach. A linguatulid identified by Dr. H. R. Hill as *Porocephalus subulifer* (Leuckart) was removed from the body cavity of No. 50622.

**REMARKS.**—The widespread occurrence of *Psammophis sibilans* in Africa offers interesting problems which may be satisfactorily solved only by someone who undertakes to assemble sufficient material to monograph the genus. The very variable pattern of the species has contributed to an overdescription of forms, some of which may prove valid. Recently Mertens (*loc. cit.*) has revived the use of trinominals to indicate subspecific recognition of

*subtaeniatus*. It is of interest to note that Schmidt (*loc. cit.*) reports 178 ventrals as the mean for thirteen specimens of *sibilans* taken in the Congo, whereas I am unable to report means for Angolan males as 167, and for Angolan females as 163. The standard deviation is not extensive, and I believe a significant statistical difference might be proved with larger series.

appears to be nearly identical with *sibilans* but does not appear to attain the maximum number of ventrals reported for *sibilans*. Unfortunately no averages for *brevirostris* are available, but I am inclined to believe that it may prove to be a subspecies of *sibilans* or possibly a synonym of *furcatus* Peters, 1867, which Mertens (*op. cit.*, p. 15) lately has referred to *sibilans* as a race. It

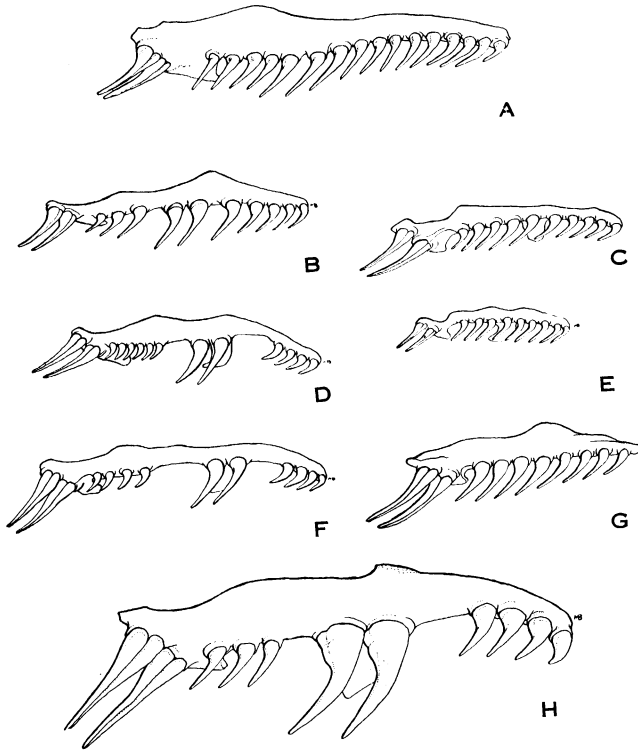


Fig. 15. Maxillary dentition of *Psammophis* and related genera: (A) *Dromophis lineatus* (Duméril and Bibron) (A. M. N. H. No. 12261,  $\times 4$ ); (B) *Mimophis mahafalensis* (Grandid) (A. M. N. H. No. 60658,  $\times 4$ , from Madagascar); (C) *Cerastes tritaeniatus tritaeniatus* (Günther) (A. M. N. H. No. 39097,  $\times 4$ ); (D) *Psammophis nolistictus* Peters (A. M. N. H. No. 8412,  $\times 4$ ); (E) *Hemirhagerrhis. nototaenia viperinus* (Bocage) (A. M. N. H. No. 50506,  $\times 5$ ); (F) *Psammophis bocagii* Boulenger (A. M. N. H. No. 50522,  $\times 4$ ); (G) *Rhamphiophis rostratus* Peters (A. M. N. H. No. 49925,  $\times 4$ ); (H) *Psammophis sibilans sibilans* (Linnaeus) (A. M. N. H. No. 50621,  $\times 4$ ).

I am unable to draw any satisfactory conclusions concerning the validity of *P. brevirostris* Peters, 1881, reported from Angola and South Africa. Boulenger (*loc. cit.*) distinguishes it from *sibilans* on the basis of a proportionately broader frontal in comparison with the supra-oculars. In scale counts *brevirostris* ap-

is interesting to note that four specimens from Capelongo show the frontal-preocular contact characteristic of *furcatus*, and it is possible that such specimens might more correctly be designated as *sibilans-furcatus* intergrades.

Since the above notes were prepared Loveridge (1938, Proc. New England Zool.

Club, XVII, p. 59) has published a record for a snake from Ganta, Liberia, using the trinomial, *Psammophis sibilans phillipsii* (Hallowell). He states, "The specimen consists of the anterior half only, yet it is referred to the extreme western form, as all our Liberian and Sierra Leone material agrees in possessing an entire anal. The matter will be dealt with in a revision of the genus now in the course of preparation."

Inasmuch as the two specimens from Ganta noted above possess an entire anal in one and a divided anal in the other I am able to draw no conclusion concerning the status of *phillipsii*. Pending the publication of Loveridge's revision of the genus I am including the Liberian specimens under *sibilans*. If sufficient specimens from Liberia are available to demonstrate the existence of an entire anal in the majority of snakes within the population it can be recognized as a race.

#### *Psammophis bocagii* Boulenger

Figure 15F

*Psammophis bocagii* BOULENGER, 1895, Proc. Zool. Soc. London, p. 538: "Angola."—BOULENGER, 1910, Ann. So. African Mus., V, part 10, pp. 513-514.

"Angola," 3 (Nos. 50521-23, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—Three males with dorsal scales 17-17-13, the preanal count in one specimen being twelve. Ventrals 164, 166 and 168; anal divided, caudals 111 and 123, a third specimen with tail incomplete. Supralabials 9, the fourth, fifth and sixth entering the orbit on all specimens. Infralabials 10, the first four touching anterior chin-shields. Loreal single; preocular 1 on two specimens, 2 on the third. One specimen has the preocular reaching the frontal on both sides, a second has this condition on one side only, while on the third neither preocular reaches the frontal. Postoculars 2, temporals 2+2 on the three specimens.

DIMENSIONS.—Two complete specimens measure 1030 mm. and 1100 mm., respectively, with tails 360 mm. and 402 mm. comprising .35 and .36 of the total length.

MAXILLARY TEETH.—The arrangement

is as follows: four slightly enlarged anterior teeth, diastema, two greatly enlarged teeth, diastema, four small teeth followed after a narrower interspace by two large grooved fangs, or in formula 4+2+4+2. (See Fig. 15F.)

REMARKS.—The present specimens agree well with Boulenger's description of the pattern of the type, and in most details, with the lepidosis. However, the variation in preoculars noted above points to the inadvisability of using this character in keys as Boulenger (1910, *loc. cit.*) did upon the basis of the variation then known.

#### *Psammophis notostictus* Peters

Figure 15D

*Psammophis moniliger*, var. *notostictus* PETERS, 1867, Monatsb. Akad. Wiss. Berlin, p. 237: Southwest Africa.

*Psammophis notostictus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 156.

Lüderitz Bay, Southwest Africa, 1 (No. 50527, Lang, October 1, 1925).

LEPIDOSIS.—A female with dorsal scales 17-17-13. Ventrals 177; anal plate single; caudals 94. Supralabials 8, the fourth and fifth entering the orbit. Infralabials 10, the anterior four touching the first pair of chin-shields. Loreal 1, preoculars 2, the upper one on each side reaching the frontal, postoculars 2, temporals 2+2. The pattern and coloration fall within the variations given by Boulenger (*loc. cit.*).

DIMENSIONS.—Length overall 575 mm., the tail 120 mm., comprising .21 of the total length.

MAXILLARY TEETH.—The right maxilla of the Lüderitz Bay specimen as well as an additional one from a specimen from Cape Colony (No. 8942) were examined. Each showed the same arrangement and number of teeth; four slightly enlarged anterior teeth, followed after a wide diastema by two enlarged teeth. A second diastema after the enlarged teeth is followed by six small teeth separated by a narrow diastema from two enlarged fangs. The tooth formula might be written: 4+2+6+2. (See Fig. 15D.)

#### *Psammophis biseriatus* Peters

*Psammophis biseriatus* PETERS, 1881, Sitzber. Ges. naturf. Freunde Berlin, p. 88: Taita,

Kenya Colony.—BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 168.

"Northern Rhodesia," 1 (No. 58329, Hunter, 1936).

Hargeisa, Somaliland Protectorate, el. 5200 ft., 1 (No. 20344, Brown, October 12, 1920).

LEPIDOSIS.—Dorsal scales 14–15–11 on one female, 15–15–11 on the other. Ventrals 153 and 159; anal plate divided; caudals 106 on the Rhodesia specimen, tail incomplete in the other. Supralabials 9, the fourth, fifth and sixth entering the orbit. Infralabials ten or eleven, the first five touching the anterior chin-shields. Loreal single on both specimens, nearly three times as long as high. Preoculars 2 on the Rhodesia specimen, 1 on the Hargeisa snake, but a suture is present on each side which partially divides each preocular. Postoculars 2, temporals 2+2.

DIMENSIONS.—The Hargeisa snake has an incomplete tail; the Rhodesia specimen measures 735 mm. overall, with the tail, 255 mm., comprising .34 of the total length.

MAXILLARY TEETH.—Arranged in the following order: Anterior teeth enlarged, a diastema, two greatly enlarged teeth, a diastema, six smaller teeth, a short diastema, two enlarged fangs. This may be expressed in formula: 4+2+6+2.

HABITAT.—Dr. Barnum Brown's field notes state that the Hargeisa specimen was taken at an elevation of 5200 feet during the dry season.

#### RHAMPHIOPHIS PETERS

##### *Rhamphiophis rostratus* Peters

Figure 15G

*Rhamphiophis rostratus* PETERS, 1854, Monatsb. Akad. Wiss. Berlin, p. 624: Tete; Mesuril; and Quitangonha, Mozambique.—LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXXIV, p. 253.

*Rhamphiophis oxyrhynchus* LOVERIDGE, 1923, Proc. Zool. Soc. London, p. 883.

Mawere Shamba, Tanganyika Territory, 2 (Nos. 49924–25, Carnochan, December, 1934).

LEPIDOSIS.—Two females with dorsal scales 19–17–13, ventrals 176–178, anal plate divided, caudals 106–108. Supralabials 8, the fifth entering the orbit. Infralabials 11, the first five in contact with the anterior chin-shields. Loreal 1; pre-

oculars 3 on one specimen, 3–2 on the other; postoculars 2; temporals 2+4 on three sides, 2+3 on the fourth.

DIMENSIONS.—The larger specimen measures 1140 mm., the other 830 mm. Ratios of tail to total length .30 and .29, respectively.

MAXILLARY TEETH.—The right maxilla of each specimen was examined. In each there are eight anterior teeth, increasing sharply in size toward the posterior and followed without noticeable diastema by two enlarged fangs. (See Fig. 15G.)

HEMIPENIS.—The male organs in this species are essentially like those of *Psammophis* and related genera. Throughout this entire group the hemipenis is reduced to the minimum essentials, that is, to a short, unarmed structure carrying the sulcus. In none of these snakes can any significant difference in hemipeneal structures be observed.

REMARKS.—The simple hemipenes, so closely correlated with habitus, markings and the arrangement of scales in the genera *Psammophis*, *Dromophis*, *Cerastes* and their relatives, point to an early origin and dispersal of the group in Africa. *Rhamphiophis* is obviously another close relative that has become well differentiated, many of the generic characters doubtless being correlated with specializations for burrowing. Of these specializations the most obvious one is the overhanging snout with the sharp edge developed on the rostral. Accompanying this modification is a shortening of the maxillae and the consequent loss of teeth.

It would be highly interesting to know more of the mating behavior of any of these snakes with the papilliform type of hemipenis. The lack of spines or calyces on the organ suggests that copulation must be accomplished in some fashion differing from that of other colubrids where these structures are present to aid the snakes in maintaining the organ inserted in the cloaca. Loveridge (1923, *loc. cit.*) on December 4, 1920, observed a pair in coitus but unfortunately gives no details with respect to the positions assumed by the snakes.

## MACRELAPS BOULENGER

**Macrelaps microlepidotus** (Günther)

*Uriechis microlepidotus* GÜNTHER, 1860, Ann. Mag. Nat. Hist., (3) V, p. 168, Pl. IX: Port Elizabeth, Cape Colony.

*Macrelaps microlepidotus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 255.

Merebank, Natal, 3 (Nos. 57622, 57636, 60314, Coghill, June, 1933).

LEPIDOSIS.—Dorsal scales 23–25–19 on two, 23–25–21 on the third. Ventrals (all males) 160–161 on two embryos, 166 on an adult. Anal single; caudals 46–47. Nasal single on one embryo, semidivided on the other embryo and on the adult. Supralabials 7, the third and fourth entering the orbit, the third likewise touching the prefrontal on all. Infralabials 8, the first four touching the anterior chin-shields on five sides, the first three on one side. Anterior pair of chin-shields larger than posterior pair. No loreal, no preocular, postocular single, small. Temporals 1+2 without variation.

DIMENSIONS.—The adult male measures 670 mm. overall, with the tail (119 mm.) comprising .18 of the total length. A female in the American Museum collection (No. 18227) from Mayville, Natal, measures 595 mm. with the tail comprising .13 of the total length, indicating a significant difference between the sexes for this character. Further evidence of sexual dimorphism is indicated by the caudal count of this female with 37 caudals, the exact figure given by Boulenger for one of Günther's cotypes which was a female (the counts given in the original description by Günther are apparently erroneous). One of the two immature male embryos removed from eggs has a total length of 185 mm. with the tail comprising .19 of the total.

MAXILLARY TEETH.—The maxilla of the female from Mayville, mentioned above, was removed and found to contain four anterior teeth increasing in size toward the posterior, and followed by a greatly enlarged grooved fang, with an additional fang-socket on the inner side of the bone. Such an arrangement is nearly identical with that found in *Miodon collaris*, but the latter possesses only the single functional

fang with the additional socket either anterior or posterior to the fang. The shortening of the maxilla with the accompanying loss of teeth seems to be correlated with burrowing habits, although in many species thus adapted there is a cartilaginous extension from the maxilla on each side to the snout. Seemingly, this is a mechanical provision for resilience when the snout is thrust through the soil.

HEMIPENIS.—Undivided, sulcus undivided, extends to the ninth caudal. Spines at the base feebly enlarged, followed by a series of denticulated frounces or spines arranged in horizontal rows with web-like connections. Spines less distinct on the distal end which is semi-calyculate. Cope's figure (1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. XXVII, fig. 7) is accurately drawn.

LIFE HISTORY NOTES.—The two embryos mentioned above were removed from eggs containing a small amount of yolk indicating their immature state of development. One of these embryos had been removed in the field; the other was removed in the laboratory from an egg measuring (in spirits) 45 mm. × 27 mm. Both embryos were males, this fact being readily determined because hemipenes were extruded as other authors have recorded for immature embryonic males. Günther (*loc. cit.*), in his description of the two cotypes, mentioned that one contained mature eggs "1½ inches long," adding a note by Mr. Gurney who collected the types that this one "was ploughed up by my man, and the eggs were ploughed up close to it." The situation in which the present eggs were found unfortunately is not recorded. The embryos are light brown in coloration, whereas the adult male is coal-black, with hard scales and a glossy surface characteristic of many other burrowing serpents.

SECONDARY SEX CHARACTERS.—Both the adult male from Merebank and the female from Maysville have scales with strong median keels in the anal region. However, the keels on the male are much more distinct, under the binocular, appearing as whitish translucent ridges extending more than half the length of the scale.



Furthermore, four small scales on either side of the cloaca in the male are ornamented with conspicuous whitish tubercles, the "supracloacal tubercles" described for males of other species which Noble (1934, Anat. Record, LVIII, Supplement, p. 3, abstract) has studied histologically, showing that they represent capsules of tactile cells and nerve fibres.

REMARKS.—I am unable to account for Boulenger's (*loc. cit.*) listing of the types from "Durban," Natal, when Günther definitely states that they came from "Port Elizabeth in Algoa Bay."

## Dasypeltinae

### DASYPELTIS WAGLER

#### *Dasypeltis scaber scaber* (Linnaeus)

*Coluber scaber* LINNAEUS, 1758, Syst. Nat., I, p. 223: "Indiis."

*Dasypeltis scabra* BOULENGER, 1894, Cat. Snakes Brit. Mus., II, p. 354.

"Angola," 2 (Nos. 50596-97, Vernay, Lang, Boulton, 1925).

Lobito Bay, Angola, 1 (No. 50598, Vernay, Lang, Boulton, 1925).

Ganamé, Ethiopia, 1 (No. 20345, Brown, 1920).

"Tanganyika Territory," 1 (No. 50791, Davison, Johnson, 1933).

Beni, Belgian Congo, 1 (No. 50599, Chapin, Sage, Mathews, 1926).

LEPIDOSIS.—Dorsal scales at midbody vary from 21 to 25, with considerable variation in neck and posterior dorsal scale-rows. Ventrals: 256 in the Ganamé female, 224 in the Beni female; the Tanganyika Territory male is the lowest for the present series with 210, and Angolan males vary from 225 to 244. Caudals vary from 53 to 75, averaging 54.5 for two females, and 71 for four males. Supralabials 7 on four specimens, 7-6 on one and 7-8 on another. When the labials are seven, the third and fourth enter the orbit; when six the second and third, and the side with eight has the third, fourth and fifth. Infralabials all 8 with the exception of the Ganamé female with 9, the first three touching the anterior chin-shields in all. Preocular 1 on five specimens, 2 on two Angolan snakes. Postoculars 2 on four snakes, 1 on two others,

Temporals two, followed by from three to five, more commonly by four.

DIMENSIONS.—The largest specimen of this series is a female measuring 760 mm. from Ganamé. In males the tail constitutes from .16 to .17 of the total length, in males averaging .17, in females .12.

MAXILLARY TEETH.—The dentition in snakes of this genus is approximately as described by Boulenger (*loc. cit.*); in three specimens of the present series the number of maxillary teeth varies from seven to nine (Boulenger gives three to seven), with no teeth in the anterior of the bones.

HEMIPENIS.—Five specimens were examined, and the copulatory organs of these snakes indicate considerable variation in length. The organ is single, extending in the tail as far as the fourteenth to the eighteenth caudals. Small spinules present on the basal portion. Two rows of greatly enlarged spines occur on the middle portion, one on either side of the undivided sulcus. Smaller spines on the distal half are replaced with reticulate calyces with crenulated edges, followed by somewhat flattened papillae on the end. Cope's figure (under the name *D. palmarum*, 1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. XVII, fig. 10) is moderately accurate.

COLORATION AND REMARKS.—It is well known that *Dasypeltis scaber* is highly variable in coloration, and although several racial forms have been described upon this basis in no case has it been shown that coloration can be correlated with any scale characters. It seems quite probable that a snake with such an extensive range has undergone some segregation, but until data for very extensive series can be tabulated and the results presented statistically it becomes impossible to recognize more than a single species with a Rain Forest race, *macrops*, as noted below.

The present series includes two melanistic individuals, one from Beni, the other from Ganamé. The Lobito Bay snake represents the uniform reddish brown "*palmarum*" color phase, and the Angolan males are similar, but indistinct blackish cross-bars are present. The small snake from Tanganyika is the more widespread

variety with rhomboid blotches on the dorsum and bars on the side.

Flower (1933, Proc. Zool. Soc. London, p. 818), states that Linnaeus' designation "in Indiis" meant "received via the Cape, so in this case may be read as 'South Africa.'" This statement probably applies to other species similarly designated by Linnaeus.

### *Dasypeltis scaber macrops* Boulenger

*Dasypeltis macrops* BOULENGER, 1907, Ann. Mag. Nat. Hist., (7) XXIX, p. 324: Efulen, French Cameroon.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 100.

Metet, French Cameroon, 4 (Nos. 50600-03, Grissett, 1927).

LEPIDOSIS.—Dorsal scales 21 to 25 on the neck, 19 to 22 at midbody and 17 to 19 immediately anterior to the anus. Ventrals 230 and 234 for two males, 240 and 241 for two females. Caudals, males 78 and 79, females 72 and 73. Supralabials 7 on three, with the third and fourth entering the orbit, 6 on the other, with the second and third on each side entering the orbit. Infralabials uniformly 8, with the first three touching the anterior chin-shields. Preoculars 2 on three specimens, 2-1 on the fourth. Postoculars 2 on three, 1 on one. Temporals 2+4+5 on all specimens.

DIMENSIONS.—The larger female measures 910 mm., the larger male 660 mm. Ratios of tail to total length are .15 and .16 in females, .18 in males.

MAXILLARY TEETH.—Six vestigial teeth are present in one specimen, fewer than had any specimen of *scaber* examined, but falling within the range given by Boulenger for *scaber*.

HEMIPENIS.—Similar in nearly all respects to that described under *scaber*, but on two specimens examined it extends to the twentieth caudal.

REMARKS.—The most distinctive characters of *D. s. macrops* are the slightly larger eye, a greater average tail length and the larger frontal with parallel edges in contrast to the more typically wedge-shaped frontal of *D. scaber*. Schmidt (*loc. cit.*) states that in *macrops* "the suture between the internasals equals or exceeds that between the prefrontals," a condition

which I find to be characteristic of the snakes (some of them no longer available in the American Museum) upon which he based his description. However, a similar condition is found in specimens of *scaber*, and likewise specimens of *scaber* occasionally possess frontals with the edges parallel. Even the larger eye of *macrops* provides a doubtful character for any dichotomous separation from *scaber*; when series are examined many specimens of *scaber* are found with equally large eyes, a character to some extent correlated with two preoculars.

The pattern and coloration of the Metet series agree in part with that given by Boulenger for the type, but alternating, somewhat irregular, yellowish and blackish cross-bars are found throughout the length of all four snakes. Thus, when the variation within the forms *macrops* and *scaber* is taken into consideration it appears that *macrops* of the Rain Forest, at best, represents a race of the typical form.

## ELAPIDAE

### Elapinae

#### ELAPSOIDEA BOGAGE

##### *Elapsoidea güntherii* Bogage

*Elapsoidea güntherii* BOGAGE, 1866, Journ. Sci. Lisboa, I, p. 70, Pl. I, fig. 3: Cabinda, Angola and Bissao, Portuguese Guinea.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 41.

*Elapechis guentheri* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 349.

"Angola" (probably Hanha), 1 (No. 51837, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—A male with dorsal scales 13-13-13, ventrals 153, anal single, caudals 25. Supralabials 7, the third and fourth entering the orbit. Infralabials 7, the first four touching the anterior chin-shields. Nasal divided; no loreal; preocular 1, postoculars 2, temporals 1+2.

DIMENSIONS.—Length overall 475 mm., tail 37 mm., comprising 7.8 per cent of the total.

HEMIPENIS.—Extends to the eleventh caudal, bifurcating at the ninth. Sulcus bifurcates at the seventh caudal. Basal portion with small spines, a row of en-

larged spines increasing in size distally on either side of the sulcus with smaller spines in the intervening space. On the side opposite the sulcus, a pair of enlarged spines is present in the region of the sixth caudal. Each fork is armed with small spines in longitudinal rows.

**COLORATION AND PATTERN.**—Brownish above, with faint white cross "bands" produced by lighter lateral margins on scales otherwise brownish. There are forty-four light "bands" on the body and five on the tail. Belly grayish.

**REMARKS.**—Loveridge (*loc. cit.*) notes that in fifty east and central African records, ventrals range from 153 to 163, and he suggests that a central and east African race, *nigra*, may be recognized when further data become available for Angolan snakes. Unfortunately he has not given the sex of the snakes examined.

#### HEMACHATUS FLEMING

##### *Hemachatus haemachatus* (Lácepède)

*Vipere haemachate* LÁCEPÈDE, 1788, Hist. Nat. Quad. Ovip. Serp., II, p. 115, Pl. III, fig. 2: "Japon—et Perse." (Probably South Africa.)

*Sepedon haemachatus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 389.

*Hemachatus haemachatus* STEJNEGER, 1936, Copeia, No. 2, p. 114.

Kroonstad, Orange Free State, 1 (No. 51838, Lang, July, 1926).

Big Tugela Valley (8500 feet elevation), Natal, 1 (No. 51839, Lang, August, 1926).

**LEPIDOSIS.**—Two males with dorsal scales 17–19–13 and 19–19–13, ventrals 134 and 138, anal single, caudals 46 and 44. Supralabials 7, the third and fourth entering the orbit. No loreal, preocular 1, postoculars 3, temporals 2+3.

**DIMENSIONS.**—The Kroonstad specimen is 1140 mm. overall, with the tail (200 mm.) comprising .17 of the total. The other male has a similar relative tail length.

**HEMIPENIS.**—Extends to the twelfth caudal, bifurcating at the fifth. Sulcus divided at the fourth caudal. Basal portion with longitudinal folds, slightly enlarged spines in the region of the sulcus division decrease in size toward the extremities of each fork, where there is a transition of spines to coarsely reticulated calyces.

Cope (1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. XXXIX, fig. 3) has depicted accurately the hemipenis of the species.

**REMARKS.**—Smith (1936, Copeia, No. 1, p. 70), proposed the generic name *Sepedonopsis* for the preoccupied *Sepedon* of Merrem, in general use since Boulenger's catalogues appeared. However, Stejneger (*supra cit.*) has pointed out that the name *Hemachatus* Fleming (1822, Philos. Zool., II, p. 295) is available for the genus.

#### NAJA LAURENTI

##### *Naja melanoleuca* Hallowell

*Naja haie* var. *melanoleuca* HALLOWELL, 1857, Proc. Acad. Nat. Sci. Phila., p. 61: Gaboon, West Africa.

*Naja melanoleuca* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 376.

Metet, French Cameroon, 6 (Nos. 51815–20, Grissett, 1927).

Lukolela, Belgian Congo, 2 (Nos. 45905–06, Chapin, Edson, 1931).

Hanha, Angola, 1 (No. 51814, Vernay, Lang, Boulton, May 8, 1925).

**LEPIDOSIS.**—Dorsal scale-rows 23 to 27 on the neck, 19 at midbody, the preanal count normally 13, one specimen with 12. Ventrals show an extreme variation from 206 (on a juvenile male from Angola) to 225 on a female from Metet. No differences between sexes is indicated for two Metet males compared with three Metet females, the sixth specimen from this locality consisting of the head only. Anal plate single; caudals 60 to 68. Supralabials 7, the third and fourth entering the orbit, and infra-labials 8, the first four touching the anterior chin-shields without exception. No variation is indicated for other head shields which are as follows: preocular 1, postoculars 3, temporals 1+2.

**DIMENSIONS.**—The largest specimen of the eight complete snakes listed is a male measuring 720 mm. overall, from Metet. The ratio of tail to total length varies from .16 in a Metet male to .18 in the Hanha male with no average difference between sexes indicated.

##### *Naja nigricollis nigricollis* Reinhardt

*Naja nigricollis* REINHARDT, 1843, Danske Vidensk. Selsk. Aft., X, p. 269, Pl. III, figs. 5 and 7: Guinea, West Africa.

*Naja nigricollis* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 373.

*Naja nigricollis nigricollis* LOVERIDGE, 1936, Bull. Mus. Comp. Zool., LXXIX, p. 272.

Capelongo, Angola, 13 (Nos. 51800-7, 51824-27, Vernay, Lang, Boulton, July, 1925).

Tsavo, Kenya Colony, 1 (No. 51821, Chapin, Sage, Mathews, July 4, 1926).

Tindi, Tanganyika Territory, 1 (No. 51822, Carnochan, December 21, 1929).

Karonga, Nyasaland, 1 (No. 39009, Boulton and Boulton, 1929).

Merebank, Natal, 1 (No. 57619, Coghill, 1933, head of large specimen).

LEPIDOSIS.—(The snake from Tsavo is described separately below since it differs in several respects from others in the series.) Dorsal scale-rows variable, most commonly approaching the formula 21-19-13. The count on the neck varies from 19 to 25, at midbody from 19 to 21, and the preanal counts from 11 to 15. Ventrals: Nine Angolan males vary from 176 to 193, averaging 186.7; three Angolan females from 194 to 197, averaging 196.3. Ventral counts for two others are as follows: Karonga female 181, Tindi female 200. Ventral counts show an extreme variation of 56 (a Karonga female) to 65 on a Capelongo male. Angolan specimens average 61.5 ventrals with no significant difference between sexes.

Supralabials 6 on ten Angolan specimens and on one from Nyasaland, with the third on each side entering the orbit. Two Angolan specimens are asymmetrical with labials 6-7, one with the fourth entering the orbit on one side. The Tindi specimen has seven labials, the third entering the orbit on each side. Infralabials 9 on all but three specimens with 8-9, the first four touching the anterior chin-shields in all cases. Preoculars 2 on all specimens with the exception of one from Capelongo having 2-1; postoculars uniformly 3 without exception. Temporals variable, and owing to the irregular arrangement in the species not satisfactorily expressed in numbers. Normally there are two anterior temporals followed by four or five irregular scales. The Karonga snake has three anterior temporals on one side.

COLORATION.—Capelongo, Karonga and Tindi specimens are similar, yet the variations do not seem to fit precisely either the "var. *mossambica*, Peters" or the "*forma typica*" as described by Boulenger (*loc. cit.*). On all of these specimens the head is olivaceous above, on some with the chin and lips sooty black. On others the chin is olivaceous, but on each the throat region is black, sometimes with a second black band posterior to the broader band on the throat. On all specimens the bellies are mottled anteriorly, the variegations fading into irregular bars toward the definite bars on the neck. The dorsum of all specimens is gray, sometimes with faint variegations, more frequently with each scale edged with a narrow black border. All specimens are nearly uniformly grayish on the posterior of the body and tail, both above and below.

The Tsavo female differs from all others in the present series in having the dorsal scale-rows arranged 27-25-17, in having seven supralabials, with the third and fourth entering the orbit on one side, and the fourth on the other. This is brought about by the fusion of the lower preocular with the third labial on the right side of the head, so that preoculars are 2-1. In other determined characters of the lepidosis the specimen is normal, but Dr. James P. Chapin has noted on the field tag that the specimen was "dull red" in color. In preservative the snake (unfortunately cut or smashed into two parts) is uniformly light yellowish brown, with eight black ventrals on the neck, the black area extending to the dorsum on the skin between the scales so that a dark ring, blacker on the underside, encircles the neck. The suture of the fourth and fifth supralabials is brownish. The venter is slightly lighter than the dorsum, but aside from the black markings mentioned the coloration is immaculate.

Loveridge (*supra cit.*) has described a snake from Kibwezi, Kenya Colony, as "the rare red variety," noting that it had 27 midbody scale-rows, the highest on record except for another from Kenya. I suspect that the greater number of dorsal scales and the different color of Kenya

specimens are characters indicative of incipient speciation.

**DIMENSIONS.**—The largest specimen in the series listed herewith is a Capelongo female with an overall measurement of 1535 mm. The largest male, also from Capelongo, measures 1520 mm. The ratio of tail to total length varies from .17 in the largest female to .19 in a large male. No significant difference for the sexes is indicated.

**HEMIPENIS.**—The copulatory organs were examined on several males. There is some variation in the length of the structures, but No. 51826 is fairly typical, the organ extending to the tenth caudal, bifurcating at the sixth, the sulcus dividing at the fifth. Several enlarged spines are present in the region of the division of the sulcus. Each fork is covered with numerous thickly set spinules, those on either side of the sulcus slightly enlarged.

**STOMACH CONTENTS.**—Several of the larger specimens from Capelongo were examined, and most of the stomachs were found to be empty. One contained the digested remains of an amphibian, another contained a rootlet, doubtless ingested accidentally. The rootlet was 290 mm. long and about one millimeter in diameter, most of it being in the stomach although a centimeter or so projected into the oesophagus.

**REMARKS.**—It would appear from data recorded in the literature that typical *Naja nigricollis* occupies an extensive range in the Savannah Province. However, around the northern and southern periphery of the range there seems to be a tendency toward variation, and it seems quite possible that in some cases evolution has progressed sufficiently far that subspecies may be recognized. In the northwestern part (French Sudan) of the range, the subspecies *katiensis* Angel (1922), with fewer ventrals (165–174) appears to be the most distinct. Perhaps the Kenya Colony "red variety" should be referred to *pallida* of Boulenger (1896), specimens of which are mentioned in the "Catalogue," from Somaliland and northern Kenya Colony. This "variety" has nominal status under the Rules and quite possibly should be recognized. In

the southeastern edge of the range, the form, *mossambica*, appears to be currently recognized on the basis of color although the types described by Peters (1854) indicate no significant differences in scalation. It is perhaps worth noting that East African specimens average more scale-rows across the neck, 19 to 25 being normal for West African snakes, whereas East African specimens frequently have 27 or even 31. Below I have described a single individual from southwestern Angola that appears to represent a distinct subspecies.

***Naja nigricollis nigricinctus*, new subspecies**

Plate I, figure 1

Among the cobras taken by the Vernay Angola Expedition there is one specimen that is so remarkably different in color and pattern that a name for it seems warranted.

**DIAGNOSTIC CHARACTERS.**—Closely allied to *Naja nigricollis*, as indicated by nearly identical lepidosis, but differing from all African species of *Naja* in possessing approximately seventy black cross-bars or bands on the body and tail. These bands are on a reddish-brown ground color.

**TYPE.**—A. M. N. H. No. 51823, an adult male. Collected at Munhino, Angola, July 6, 1925, by Messrs. Arthur S. Vernay, Herbert Lang and Rudyerd Boulton. Mr. Boulton advises me that the habitat at Munhino (101 km. east of Mossamedes via railroad) may be defined as an "acacia-short desert grass association."

**DESCRIPTION OF THE TYPE.**—**LEPIDOSIS:** Dorsal scale-rows 23–21–15. Ventrals 198, anal plate entire, caudals 60 (plus about four for the missing tip of the tail). Upper labials 6, the third entering the orbit; infralabials 9, the first four touching the anterior pair of chin-shields. Preoculars 2, postoculars 3, temporals 2+4.

**DIMENSIONS.**—Length overall 1100+ mm., the tail (195+ mm.) comprising approximately .18 of the total length.

**COLORATION.**—In preservative, the head is reddish brown above and below, and the throat is black as in specimens of the typical form from Angola. The body is ornamented with fifty-two sharply defined black cross-bars, with approximately eighteen narrower bars on the tail. Most of these bars extend to the ventrals although in a few instances they nearly encircle the body. Some of the cross-bars are even, others are zig-zag or chevron-shaped, at times with a faint bar between two distinct bars. The ground color is light brick-red on the body and tail; the venter is similar in coloration.

Mr. Herbert Lang, one of the collectors, who took the photograph (Plate I), has described the freshly killed snake in his field notes as "pale grayish brown with black transverse markings,

some of them forming broad bands. Dark brown glossy head, bluish-black throat band. Yellowish on underside."

REMARKS.—The type was taken within 125 miles of Capelongo, Angola, where specimens of the typical species were secured. Nevertheless, the totally unique character of the pattern readily distinguishes the Munhino snake from these specimens. It is possible, of course, that such a pattern occurs as an individual variant, but at present there seems to be no cobra with a similar pattern known from Africa. *Naja n. nigricollis* has hitherto been recorded both to the north as well as to the south of Munhino, but not from the immediate region. Whether there are striking habitat differences or ecological conditions that distinguish the Munhino region from contiguous regions I am unable to ascertain. It is noteworthy that a very distinct race of *Aspidelaps lubricus* was secured at the same locality.

#### *Naja goldii* Boulenger

*Naja goldii* BOULENGER, 1895, Ann. Mag. Nat. Hist., (6) XVI, p. 34: Asaba, Nigeria.

*Naja goldii* SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 130.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 42.

Lukolela, Belgian Congo, 1 (No. 61758, Chapin, Edson, 1931).

LEPIDOSIS.—An adult male with dorsal scale-rows 15–15–11. Ventrals 199; anal single; caudals 86. Supralabials 7, the third and fourth entering the orbit. Infralabials 8, the first four touching the anterior chin-shields. Preocular 1, postoculars 3, temporals 1+2.

COLORATION.—Black above, yellowish on most of belly, the ventrals margined with black. Underside of tail and preanal region black. Upper labials margined with black.

DIMENSIONS.—Length overall 2175 mm., tail 500 mm. Ratio of tail to total length .23. Apparently this excellent specimen secured by Dr. Chapin slightly exceeds the maximum size previously reported (Loveridge, *loc. cit.*). Schmidt (*loc. cit.*) has called attention to the comparatively long tail in this species, the tail/total ratio for two juveniles, one of each sex, reported by him, being exactly that of the adult

male from Lukolela. There is no apparent difference between the sexes.

HEMIPENIS.—The everted organs on this large male differ but slightly from those of *Naja melanoleuca*. Three rows of stout spines around the base are separated by a space from deep, coarsely reticulated calyces with well-developed spines on the anterior margin of each depression. Distally calyces diminish in size.

PARASITES.—A linguatulid taken from the lungs was identified by Dr. Howard R. Hill as *Raillietiella boulengeri* Vaney and Sambon.

#### *Naja haje anchietae* Bocage

*Naja anchietae* BOCAGE, 1879, Journ. Sci. Lisboa, V, p. 89 (name and locality listed), and p. 98 (name and description): Caconda, Angola.—FITZSIMONS, 1935, Ann. Transvaal Mus., XVI, p. 325; 1936, *op. cit.*, XXIX, p. 159.

*Naja haje anchietae* MERTENS, 1937, Abh. senckenberg. naturf. Ges., No. 435, p. 15.

Capelongo, Angola, 1 (No. 51810, Vernay, Lang, Boulton, July, 1935).

LEPIDOSIS.—A female with dorsal scale-rows 14–17–13. Ventrals 186; anal entire; caudals 57. Supralabials 7; infralabials 7, the first four touching the anterior chin-shields. Preocular 1; postoculars 2; suboculars 3; temporals 1+2.

DIMENSIONS.—Length overall 1370 mm., tail 245 mm. Ratio of tail to total length .18.

REMARKS.—Trinominals are used in accordance with the views expressed by Mertens (*loc. cit.*). The validity of the race, *barotseensis*, described by Angel (1921, Bull. Mus. Hist. Nat. [Paris], XXVII, p. 43) is open to some question. Angel's type, taken in Northern Rhodesia, "district de Lealui," was a small specimen 430 mm. in length, and it is possible that differences noted may be due partly to juvenile coloration. The chief diagnostic character was 15 midbody scale-rows. This may or may not prove to be constant when additional specimens from the region become available. Doubtless South African cobras with 19 midbody scale-rows, currently referred to *haje*, should now be assigned to *N. h. anchietae*. FitzSimons (1935, *loc. cit.*) describes five specimens from the Kalahari Desert as having 17

scale-rows on the neck and body, whereas the specimen described above has but 14 rows on the neck.

#### DENDROASPIS SCHLEGEL

##### *Dendroaspis jamesoni jamesoni* (Trail)

*Elaps jamesoni* TRAIL, 1843, in Schlegel, *Essai Phys. Serpents*, English Transl., p. 179, Pl. II, figs. 19 and 20: "South America" (in error).

*Dendroaspis jamesonii* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 436.

*Dendroaspis jamesoni jamesoni* LOVERIDGE, 1936, *Proc. Biol. Soc. Wash.*, LXIX, p. 64 (under *D. j. kaimosae*).

Lukolela, Belgian Congo, 3 (Nos. 45904, 45867-68, Chapin, Edson, 1931).

Metet, French Cameroon, 3 (Nos. 51833-35, Grissett, 1927).

LEPIDOSIS.—Dorsal scale-rows uniformly 17-17-11. Ventrals: males have 213 to 222, both extremes present in Lukolela males. Anal divided throughout; caudals 103-110 on Lukolela males 102, 111 on a Lukolela female, 102, 107, 116 on Metet males. Supralabials 8 on four specimens, 9 on another, 9-8 on one, the fourth entering the orbit in all except one with the fourth and fifth. Infralabials 9 to 10, the first four in contact with the anterior chin-shields. Preoculars 3; postoculars 3 on one Lukolela snake, 4 on the remainder. Temporals exceedingly variable, all the following conditions being shown in this small series: 1, 1+1, 2+1 and 2+2, only one specimen being asymmetrical.

DIMENSIONS.—The largest snake of this series is a female from Lukolela, 2152 mm. overall, with the tail (535 mm.) comprising .24 of the total length. The tail/total length ratio shows little variation, ranging from .23 to .24 in six specimens.

HEMIPENIS.—Extends to the eighth caudal, bifurcating at the seventh, the sulcus dividing at the sixth. Spines in strips, sulcus bordered by prominent folds on either side. Several enlarged basal spines. (Based on No. 51835.) Cope's figure (1900, *Ann. Rept. U. S. Nat. Mus.* (for 1898), Pl. XXIX, fig. 1) is fairly accurate.

COLORATION.—All specimens in the present series have the dorsal and subcaudal scales margined with black as Loveridge (*loc. cit.*) has characterized the typical

*D. j. jamesoni* form in his diagnosis of the race, *kaimosae*.

REMARKS.—The variations noted above indicate a slightly greater range in the number of caudals for West African *jamesoni* than Loveridge had anticipated. Yet an average difference in the number of caudals for the two populations is indicated and the pattern is sufficiently different to warrant separation.

Brongersma (1936, *Zool. Meded. Leiden*, XIX, p. 136) has shown that *Dendroaspis* Schlegel, 1848? is the proper name for the genus. *Dendroaspis auct.* is preoccupied by *Dendroaspis* Fitzinger, 1843, a synonym of *Hamadryas* Cantor, 1836.

##### *Dendroaspis jamesoni kaimosae* (Loveridge)

*Dendroaspis jamesoni kaimosae* LOVERIDGE, 1936, *Proc. Biol. Soc. Wash.*, XLIX, p. 64: Kaimosi Forest, Kakamega District, Nyanza Province, Kenya Colony.

Ruchuru, Belgian Congo, 2 (Nos. 51831-32, Chapin, Sage, Mathews, May, 1927).

LEPIDOSIS.—Two females, one consisting of the head and posterior portion of the body and tail, the other complete. The complete specimen has dorsal scale-rows 17-15-11. Ventrals 217; anal divided; caudals 102 and 108. Supralabials 8 and 7-8, the fourth entering the orbit. Infralabials 9 and 9-10, the first four touching the anterior chin-shields. Preoculars 3; postoculars 3 and 4; temporals 0+1, 1+0, that is, labials reach the parietals anterior to the temporal on both sides of one, and the other has a single temporal that reaches the postoculars on each side.

DIMENSIONS.—The complete specimen is 1310 mm. overall, with the tail (310 mm.) comprising .23 of the total.

COLORATION.—Dr. James P. Chapin has described the specimen when taken in the field as, "Above greenish black; below light green, yellowish anteriorly, with a suggestion of black barring on the sides." In preservative the Ruchuru specimens are nearly uniformly black, in contrast to the typical form where dorsal and subcaudal plates are light, margined with black.

REMARKS.—Loveridge (*supra cit.*) has stated in his diagnosis that Ruchuru is the "area of intermediates." Although both

specimens correspond to the East African subspecies, *kaimosae*, in coloration, one has the higher subcaudal count (108) of the typical form. However, since Loveridge lists one of the paratypes of *kaimosae* from Ruchuru, I feel justified in referring both specimens listed to this subspecies.

#### *Dendroaspis angusticeps* (Smith)

*Naja angusticeps* SMITH, 1849, Illus. So. African Zool., III, Pl. LXX: "Natal and the country eastwards towards Delagoa Bay."

*Dendroaspis angusticeps* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 347.

Hanha, Angola, 4 (Nos. 51808-09, 51828-29, Vernay, Lang, Boulton, May, 1925).

LEPIDOSIS.—Dorsal scale-rows 25 on the neck, 21-23 at midbody, preanal counts 15, 16 and 18. Ventrals 267, 275 and 282 on three females, 264 on a large male. Anal plate divided, caudals 126 on a male, 116 on a female, the other two with tails incomplete. Heads of the two largest specimens were damaged in such a manner that accurate determination of all head scutes was not possible. Two smaller females have nine supralabials, the fourth entering the orbit. Infralabials 13 on one specimen, 12-13 on another, with the first five (or four on the side with 12) touching the anterior chin-shields. Nasal divided, a single loreal on one side of each of two specimens. Preoculars 3 on two, 3-? on another. Postoculars 3-4, 4-5 and 4-? for three snakes. Temporals on three snakes are 1+3, 2+3 and 2+4 (the latter on one side, 2+3 on the other of one specimen).

DIMENSIONS.—The largest specimen in this small series is a female measuring 2520 mm. (over 8 feet, tail incomplete). The male with tail complete is 2260 mm. overall, the tail comprising .22 of the total length. A smaller female (1125 mm., tail 235 mm.) is similar with a tail/total ratio of .21.

HEMIPENIS.—Bifurcate, sulcus forked. Basal spines enlarged, a row numbering approximately thirteen, encircles the base in the region of the fourth caudal. Two spines on either side of sulcus largest; distally spines are present, decreasing in size.

#### *Dendroaspis viridis* (Hallowell)

*Leptophis viridis* HALLOWELL, 1844, Proc. Acad. Nat. Sci. Phila., II, p. 172: Liberia.

*Dendroaspis viridis* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 435.

Ganta, Liberia, 2 (Nos. 51830, 60092, Harley, 1932).

LEPIDOSIS.—Two females with dorsal scale-rows 15-13-9, ventrals 222-223, anal divided, caudals 105-111. Supralabials 8, the fourth only entering the orbit; infralabials 10, the first four touching the anterior chin-shields. Nasal divided; preoculars 3; postoculars 4. Temporals 2+2 on both sides of one specimen, 1+2 on both sides of the other. Occipitals three, symmetrically arranged, the lateral two in broad contact with the upper temporal.

DIMENSIONS.—The larger of the two specimens measures 2150 mm. including the tail which is 505 mm. in length. The smaller snake is 650 mm. overall. The ratio of tail to total length is .23 in each. No male has been available for an examination of hemipeneal characters.

COLORATION.—As described by Boulenger (*loc. cit.*), the smaller specimen darker, the margins of the dorsal scales less apparent.

#### ASPIDELAPS SMITH

##### *Aspidelaps lubricus lubricus* (Laurenti)

Figure 16

*Natrix lubrica* Laurenti, 1768, "Synopsis Reptilium," p. 80 (based upon Seba, 1735, Thes., II, Pl. XLIII, fig. 3): Cape of Good Hope.

*Aspidelaps lubricus* SMITH, 1849, Illus. Zool. So. Africa, III, App., p. 21.—BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 390.—WERNER, 1902, Verh. Zool.-bot. Ges., Wien, p. 341.—BOULENGER, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 217; 1905, Proc. Zool. Soc. London, p. 255.—GOUGH, 1908, Ann. Transvaal Mus., Pretoria, I, p. 36.—STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, p. 57.—BOULENGER, 1910, Ann. So. African Mus., V, part 10, p. 518.—WERNER, 1910 (in L. Schultze), Jena Denkschr. Med. Ges. XVI, Taf. 6, p. 365, Fig. 14; 1915, Hamburg. Ergebn. Hamburger deutschsüdwest-afrikan. Studienreise 1911, p. 367.—LAWRENCE, 1929, Journ. S. W. Africa Sci. Soc., pp. 21, 27.—MERTENS, 1937, Abh. senckenberg. naturf. Ges. No. 435, p. 15.

Pomona Island, Southwest Africa, 1 (No. 51836, Lang, October, 1925).

LEPIDOSIS.—A female with dorsal scale-



rows 19-19-15, 172 ventrals (four more than the maximum previously reported), anal plate single, caudals 30. Supralabials 6, the third and fourth entering the orbit. Infralabials 8, the first three touching the anterior chin-shields. Pre-

parative Zoölogy for permission to examine the hemipenis of M. C. Z. No. 11919, a specimen of the typical form from Middleburg, Cape Province. The organ extends to the ninth caudal, bifurcating at the fifth, the sulcus dividing at the fourth. Distally

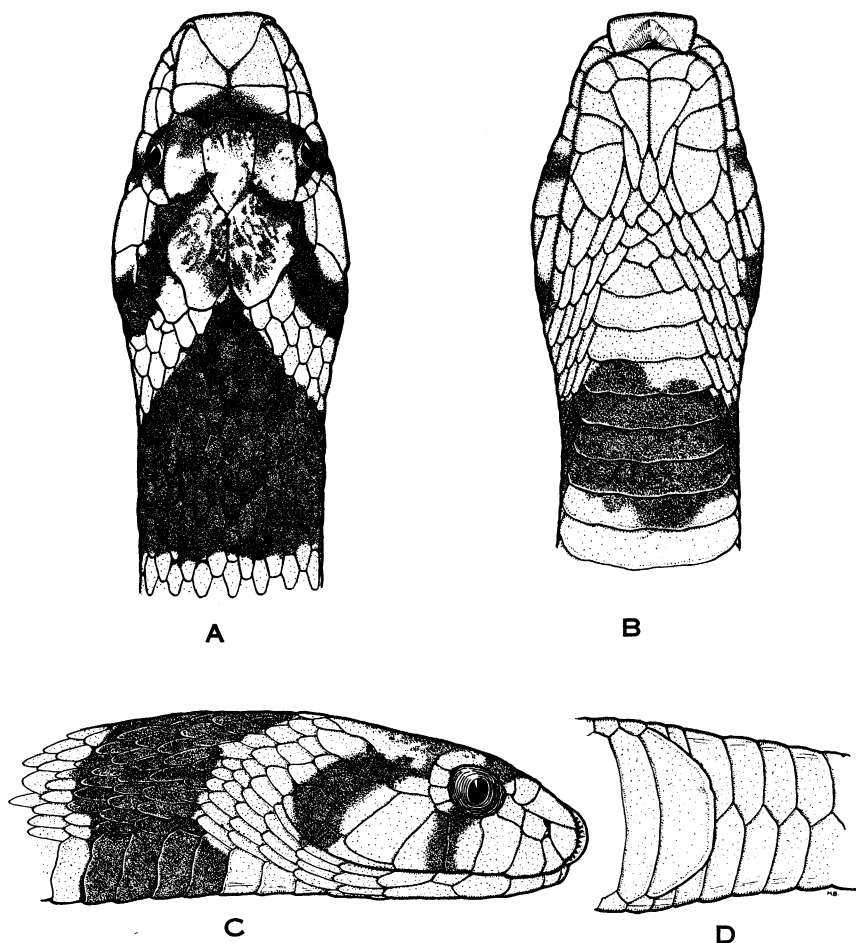


Fig. 16. *Aspidelaps lubricus lubricus* (Laurenti) (A. M. N. H. No. 51836, adult female,  $\times 2$ ). (A) dorsum of head, (B) ventral view of head, (C) lateral view of head, (D) ventral view of anal region.

oculars 1, postoculars 3-2, temporals 2+2. (Fig. 16.)

**DIMENSIONS.**—Length overall 645 mm., the tail (67 mm.) comprising .10 of the total length.

**HEMIPENIS.**—I am indebted to Mr. Arthur Loveridge of the Museum of Com-

to the division of the sulcus well-developed spines are arranged in diagonal rows, the extreme portions of the lobes with ill-defined calyces.

**PATTERN.**—Snout and chin dusky white, a black band extending across the head from eye to eye, and from the lower margin of the

eye to the lips. Parietals streaked with black near their common suture, a black band extending from their anterior margins through the parietals to the angle of the mouth. A broad, black collar on the neck with a V-shaped anterior extension, the apex extending to a small occipital wedged in between the ends of the parietal, constitutes the first of twenty-two black cross-bands. Between the cross-bands indistinct bands are formed by the black anterior margins on the scales. Several of the bands extend to the venter, those at the neck region being most distinct. The ground color on the preserved specimen is dirty white.

STOMACH CONTENTS.—The stomach of this snake contained a small unidentified rodent and nineteen eggs, presumably of some lizard. The eggs measure approximately 10 mm.  $\times$  6 mm., with soft shells, typical of many species of gecko.

REMARKS.—Through the courtesy of Mr. Arthur Loveridge I have had available for comparison two specimens of *Aspidelaps l. lubricus* (M. C. Z. Nos. 11919–20) from Middleburg, Cape Province. These two specimens are essentially similar to the specimen from Pomona Island, but differ in possessing more conspicuously blunt tails. This was obviously not a difference correlated with sex inasmuch as the Cape specimens were male and female. A survey of the literature where individual scale counts are listed discloses the fact that the blunt tails of Cape Province specimens are correlated with lower ventral and caudal counts as compared with specimens from Southwest Africa. The few cases in the literature where the sex was stated make it impossible to make a satisfactory comparison of males and females, but averages taken from three males and eight females indicate an insignificant difference in ventral and caudal counts.

Comparing recorded ventral and caudal counts for the two populations we find that: Eleven snakes from Cape Province have from 146 to 167 ventrals, mean 154.9, and from 20 to 28 ventrals, mean 22.9. Eight snakes from Southwest Africa have from 151 to 172 ventrals, mean 159.6, and

from 26 to 36 caudals, mean 30.5. These differences are minor, but since they indicate a tendency toward longer tails in the northwestern part of their range they are significant in that Southwest African specimens show characters intermediate between the Cape population and snakes from Angola described below as a new subspecies of the typical form.

There seems to be little doubt but that the remarkable rostral development of snakes in the genus *Aspidelaps*, as well as in some other genera, is correlated to some extent with burrowing habits. Elsewhere (1939) I have discussed the probable function of the snout in some species of *Salvadora* which have the flattened rostral with lateral edges free, yet seem not to be burrowers. Likewise, the Asiatic *Holarchus violaceus* has a similar rostral modification, with no propensity for burrowing reported. *Lytorhynchus* of north Africa is doubtless a burrower as implied by its overhanging snout and flattened head in addition to its flattened rostral. But the North American colubrid genus *Phyllorhynchus* is most strikingly similar to *Aspidelaps* and is definitely a burrowing snake. Like *Aspidelaps*, it is nocturnal and it inhabits rocky or sandy desert situations, even having similar food habits, being known to feed upon gecko eggs and upon geckos. Probably, however, the species of *Phyllorhynchus* are too small to feed upon rodents (*vide* Klauber, 1935, Bull. Zool. Soc. San Diego, No. 12, p. 24). It is noteworthy that the arid regions of southwestern United States and those of South Africa are not unlike in climate and terrain. Parallel modifications in reptiles are many when species of the two areas are compared. Nevertheless, it is interesting to note that whatever the function of the flattened rostral, it seems to be definitely correlated with environmental factors in the attainment of its maximum development in *Aspidelaps* and *Phyllorhynchus*, snakes belonging to separate families.

***Aspidelaps lubricus cowlesi*, new subspecies**

Plate I, figure 2; Figure 17

Heretofore the genus *Aspidelaps* has not been known from Angola, the nearest records for the

species *lubricus* being approximately 200 miles to the south in Southwest Africa. Two specimens, A. M. N. H. Nos. 32801 and 32791, taken by the Vernay Angola Expedition at Munhino in southwestern Angola represent a new form which I propose to name in honor of Dr. Raymond B. Cowles, ornithologist and herpetologist, whose study of *Varanus niloticus* perhaps has made the life history of this species better known than that of any other African reptile.

DIAGNOSTIC CHARACTERS.—A subspecies of *Aspidelaps lubricus* characterized by a nearly complete absence of pattern, a proportionately broader head, and a slightly more pointed tail.

Rostral enlarged, imbricate with lateral edges free and grooved on the posterior of the projecting edges; it is concave below, and curved backward over the snout, forming a right angle with the apex on the median suture of the internasals. A single pair of internasals meet on a narrow suture at the apex of the rostral. A pair of prefrontals, whose common suture is a little longer than that of the internasals, is followed by a small frontal and two supraoculars whose width is only a little less than that of the frontal. There is a small pair of parietals whose common suture is approximately equal to the length of the frontal. Nasals divided by a large nostril, the anterior

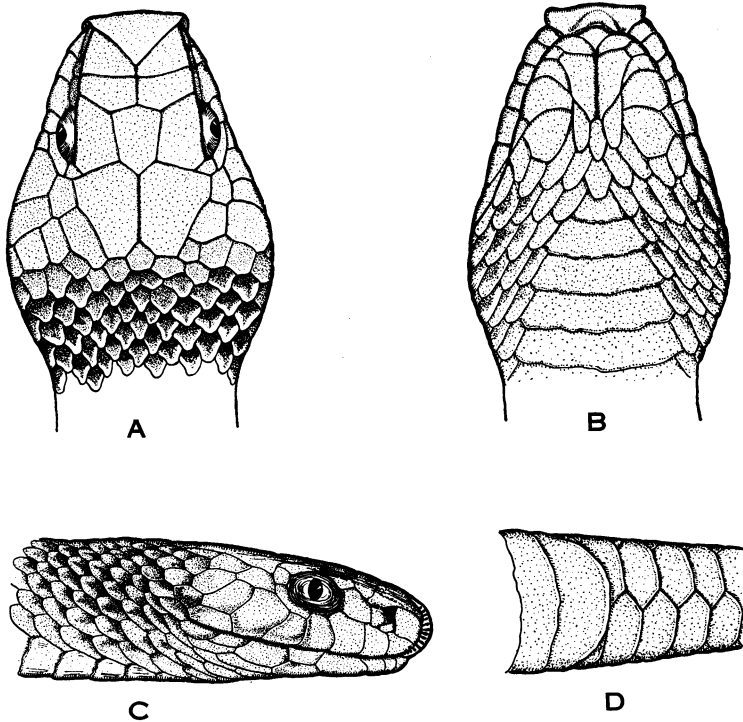


Fig. 17. *Aspidelaps lubricus cowlesi*, new subspecies (A. M. N. H. No. 32801, type male,  $\times 2$ ). (A) dorsum of head, (B) ventral view of head, (C) lateral view of head, (D) ventral view of anal region.

Habitus moderately stout; dorsal scales all smooth, in twenty-one rows at midbody. Ventral plates 147-160; caudals 30-31. Three or four black bars on the underside of the neck.

TYPE.—A. M. N. H., No. 32801, an adult male. (Fig. 17.) Collected at Munhino (101 km. east of Mossamedes, via railroad), Angola, July 7, 1925, by Messrs. Arthur S. Vernay, Herbert Lang and Rudyerd Boulton.

DESCRIPTION OF THE TYPE.—LEPIDOSIS: Dorsal scale-rows 21-21-15, scales slightly decreasing in size toward the vertebral row, all smooth, without pits. Ventrals 147; anal entire; caudals 31, in two series.

plate larger, the posterior plate in contact with a single preocular on each side. Two preoculars, the lower about twice the size of the upper and in contact with labials five and six on each side. Temporals two on each side, the anterior one touching the postoculars between the parietal and the sixth labial. The supralabials are 7, the third and fourth entering the orbit, the sixth much larger than the others, the seventh small and longer than high. Infralabials 8, the first pair meeting on a suture at the apex of a triangular mental, the fourth on each side largest. Anterior pair of chin-shields sub-triangular, in broad contact. Posterior pair of chin-shields,

small, scale-like, separated by a single scale. (See Fig. 17.)

**DIMENSIONS.**—Length overall 500 mm.; length of tail 63 mm.; ratio of tail to total length .12.

**HEMIPENIS.**—Extends to the eighth caudal, bifurcating at the fifth, the sulcus dividing at the third. Distally to the sulcus division rather stout spines are arranged in diagonal rows with a transition to coarsely reticulated calyces on the distal end of each lobe.

**COLORATION.**—Roughly described, the specimen is unicolored brownish. More careful inspection discloses the fact that scales on the neck are bordered anteriorly with darker brown. Posteriorly either the anterior or posterior margins of the scales may be outlined in darker brown. The head is uniformly light brown in mild contrast to the dark-edged scales of the occipital region. The venter and underside of the tail, including the two lower scale rows, are immaculate straw-color but for three irregular black bars on the throat.

**NOTES ON THE PARATYPE.**—The single paratype, A. M. N. H. No. 32791, taken at the same locality as the type, is a female, slightly larger than the male type specimen. It differs in minor respects from the male. Dorsal scale-rows 23–21–15; ventrals 160; caudals 30. Length overall 680 mm., the tail (80 mm.) comprising .11 of the total. On the underside of the neck there are three broad black bars, followed by a narrow fourth. On the dorsum darker edged scales on alternate sections of the body produce very faint indications of bars probably to be interpreted as vestigial cross-bars. In all other characters it is similar to the type.

**REMARKS.**—As indicated in the notes under *A. l. lubricus*, there is a tendency toward a greater number of ventrals and caudals, and toward more slender tails in the specimens from the northern portion of the range in Southwest Africa. In this respect, as might be anticipated, *A. l. cowlesi* more closely resembles these specimens than more typical *lubricus* from the Cape region. Werner (1915, Hamburg, *Ergebn. Hamburger deutschsüdwestafrikan. Studienreise 1911*, p. 367) has reported specimens of *lubricus* from the vicinity of Windhuk, and from near Keetmanshoop. He has described the variations in the pattern, noting specimens with heads and necks black, and some specimens with indistinct cross-bands. Some of these represent patterns intermediate between that of the typical form and those from Angola, yet none closely approaches the nearly unicolored condition of the latter.

**FIELD NOTES.**—Mr. Herbert Lang has

recorded in his field book that the “digging snake” which accompanied the specimen photographed, was in life, “Above dark gray; whitish below. Was seeking refuge in a hole about three feet long and six inches below the ground.” He does not state what time of day these observations were made, but the assumption is that it was in daytime. In the Cape region typical *lubricus* is reported to be crepuscular or nocturnal in habits, and there is no reason to doubt that the same is not true of *A. l. cowlesi*, as implied by the elliptical pupils.

## VIPERIDAE

### Viperinae

#### CAUSUS WAGLER

##### *Causus rhombeatus* (Lichtenstein)

*Sepedon rhombeatus* LICHTENSTEIN, 1823, *Verz. Doubl. Mus. Berlin*, p. 106: no type locality.

*Causus rhombeatus* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 467.

Ganta, Liberia 7 (Nos. 51903–09, Harley, May–July, 1932).

Lukolela, Belgian Congo, 6 (Nos. 45933–38, Chapin, Edson, September, 1930).

Capelongo, Angola, 3 (Nos. 51900–02, Vernay, Lang, Boulton, July, 1925).

Mombolo, Angola, 1 (No. 51910, Vernay, Lang, Boulton, 1925).

“Angola,” 4 (Nos. 51896–99, Vernay, Lang, Boulton, 1925).

Rungwe Mountains, Tanganyika Territory, 4 (Nos. 39098, 39171–72, 39174, Boulton and Boulton, 1929).

Mlanje, Nyasaland, 3 (Nos. 44318, 44322–23, Boulton and Boulton, 1929).

Karonga, Nyasaland, 1 (No. 44331, Boulton and Boulton, 1929).

**LEPIDOSIS.**—Dorsal scale-rows exceedingly variable, the midbody count being 19 in fifteen cases, or about 50 per cent of the series, 18 in eight cases, 17 in five and 20 in one. The cervical count varies from 17 to 20, with 17 and 19 being of most frequent occurrence, and the preanal count varies from 11 to 13, with 12 (!) as the mode. There is no correlation of scale-row counts with geographical areas, similar variation in dorsal counts occurring in each locality.

Ventrals show an extreme variation ranging from 129 in a Lukolela male to 148 in a Capelongo male. Caudals range from 18 in a Lukolela female and three Ganta females to 33 in a Capelongo male, one snake from Ganta having the first five caudals single. Extremes and averages for ventrals and caudals for various political areas represented in the series are given below in tabular form (extremes given in parentheses):

	NUMBER OF SPECIMENS	VENTRALS		CAUDALS	
		(Extremes)	Average	(Extremes)	Average
Liberia, males	3	(128-133)	130.6	(20-22)	21.3
“ females	4	(138-140)	139.0	(18-19)	18.3
Congo, males	2	(129-131)	130.0	(20-20)	20.0
“ females	4	(138-142)	140.0	(18-20)	18.7
Angola, males	3	(131-148)	139.0	(27-33)	31.3
“ females	5	(139-147)	145.0	(22-28)	24.4
Tan. T., males	2	(141-148)	144.5	(28-28)	28.0
“ “ females	2	(142-143)	142.5	(24-26)	25.0
Nyasaland, females	4	(136-141)	138.7	(19-24)	21.2

An average difference between the sexes is indicated for both characters, and the lower counts for Congo and for Liberia specimens suggest that meticulous study would provide evidence for recognition of a race probably confined to the Rain Forest.

Supralabials 7 or 6, depending upon whether a smaller scale at the posterior of the lip is included. Loreal single with the exception of two specimens from Capelongo having 2. Scales in the ocular ring normally five, with variation from four to six. Temporals 2+3, with two exceptions, one from Capelongo with 2+2 on one side, and one from Rungwe with 3+3.

**DIMENSIONS.**—The largest specimen in the series is a Capelongo male 640 mm. overall. The largest female is one from Lukolela with length overall 610 mm. The ratio of tail to total length varies from .04 in a juvenile female from Ganta to .11 for Capelongo and Rungwe Mountain males. However, average differences in relative tail lengths are slight, .08 for females and .09 for males.

**HEMIPENIS.**—Extends to the ninth caudal, bifurcating at the fourth, the sulcus dividing at the third. Basal spines enlarged, and lateral edges of the forks armed with strong spines arranged in diagonal rows. Ends of the forks calyculate, the calyces crenate, and larger and deeper dis-

tally to the enlarged spines on the outer sides.

**STOMACH CONTENTS.**—Toads of various species were found in the stomachs of specimens from Capelongo, Lukolela and Rungwe Mountains. In addition, the stomach of the Capelongo snake contained numerous nematode worms.

**LIFE HISTORY NOTES.**—A Lukolela female measuring 610 mm. contained seven eggs in the right oviduct and six in the left.

The eggs *in situ* in the preserved specimen, taken September 11, 1930, averaged 17 mm. × 7 mm.

#### **Causus resimus** (Peters)

*Heterophis resimus* PETERS, 1862, Monatsb. Akad. Wiss. Berlin, p. 277, Pl., fig. 4: Gebel Ghule, Senaar, Sudan.

*Causus resimus* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 468.

Hanha, Angola, 21 (Nos. 51911-31, Vernay, Lang, Boulton, May, 1925).

Tindi, Tanganyika Territory, 2 (Nos. 48466-67, Carnochan, December 11, 1928).

**LEPIDOSIS.**—Dorsal scale-rows most commonly 19-19-13, with the anterior count occasionally 17 to 20, the midbody count 18 or 20, and the preanal count 12 to 14. Ventrals: eight Hanha males, extremes 139-146, averaging 141.2 (a Tindi male has 148); thirteen Hanha females, extremes 136-152, averaging 148 (Tindi female, 152). Thus an average difference between sexes of 6.8 ventrals is indicated for Angolan specimens, with both Tanganyika specimens falling at the maximum. More pronounced sexual dimorphism is shown in the caudal counts which do not overlap, males varying from 20-23, averaging 22, females from 16-19, averaging 17.4. Supralabials 7, a single exception having 6-7. Infralabials normally 10, with one exception, the first four being in

contact with the anterior chin-shields; two specimens have 11 infralabials, one has 9, two have 9-10, and a Tindi female has only the anterior three touching the first pair of chin-shields. Loreal uniformly single; preoculars 2, with a Tindi specimen 2-1; subocular uniformly 1. Postoculars: sixteen specimens have 1, five have 2, two have 2-1. Temporals all 2+3 with remarkable consistency.

**DIMENSIONS.**—The largest snake in the series is a Hanha female 590 mm. overall. The largest male, from Hanha, measures 510 mm. The smallest specimen is a female measuring 190 mm. The ratio of tail to total length varies from .06 to .09 in Hanha males, mean .08; in females from .06 to .07, mean .07. The Tindi male exceeds all others in the series with a tail/total ratio of .10.

**HEMIPENIS.**—Extends to the eighth caudal, bifurcating at the fourth. Sulcus divided at the third caudal. Basal spines enlarged, followed by spines arranged in diagonal rows which extend distally on the outer sides of the forks. Each fork terminates in reticulated calyces with crenate edges.

**COLORATION AND PATTERN.**—Mr. Herbert Lang has recorded notes in the field on a large Hanha female as follows: "Dull greenish brown, yellowish on the head and neck." In preservative all Hanha specimens have from 22 to 28 blackish cross-bars or blotches on the body on a ground color of dull gray. On the posterior of the body the blotches become obscure, being very faint or completely absent on the tail. The belly is uniformly grayish. The Tindi specimens are uniformly bluish green above and whitish below.

**STOMACH CONTENTS.**—One Hanha female had eaten a large toad, too well digested for identification. Night adders bear striking similarity in habitus, color and markings, as well as in food preferences, to the harmless North American snakes of the colubrid genus *Heterodon*. It is of further interest that each genus has become segregated into a similar number of species. It would be of interest to know the precise function of the upturned snout,

for seemingly there is some correlation between habits and morphology.

**LIFE HISTORY NOTES.**—A Hanha female measuring 580 mm. contained fourteen well-developed ova, five in the left oviduct, nine in the right. The average size of the eggs was approximately 20 mm.  $\times$  9 mm.

**REMARKS.**—The data showing that the two Tindi snakes fall near or a little beyond the maximum counts for Hanha specimens in ventrals, caudals and tail ratios suggest that it might be possible to segregate a West African subspecies (for which Günther's name, *jacksonii*, 1888, would be applicable) were sufficient specimens available from both areas for an accurate statistical comparison. The lack of cross-bars or blotches on the Tanganyika specimens may offer additional evidence of difference, or conceivably it may be due to different preserving techniques.

The length of the elongate venom glands lying just below the skin on the neck varies extensively in individuals as well as in different species. It would be of interest to know how venom is forced from the glands without the surrounding muscles found in other viperid genera.

#### ***Causus lichtensteini* (Jan)**

*H(eterodon) lichtensteini* JAN, 1859, Rev. Mag. Zool., p. 511: Gold Coast.

*Causus lichtensteini* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 470.

Beni, Belgian Congo, 1 (No. 51895 Chapin, Sage, Mathews, 1926).

Lukolela, Belgian Congo, 1 (No. 45939, Chapin, Edson, January 3, 1931).

**LEPIDOSIS.**—Two males each with dorsal scale-rows 15-15-11, ventrals 133 and 139; anal single, caudals in single series, 18 and 20. Supralabials 7. Infralabials 9, the first four touching the anterior chin-shields. Loreal 1, preoculars 3, suboculars 2, postoculars 2, temporals 2+3, without variation.

**DIMENSIONS.**—The larger of the two males is the Beni specimen with a length overall of 485 mm. The ratio of the tail to total length in each is .09.

**HEMIPENIS.**—Extends to the seventh caudal, bifurcating at the second, the sulcus dividing at the first. Spines well developed,

arranged in strips, increasing in size on the innerside of the lobe with their maximum enlargement at the fourth caudal. Extremities of each fork armed with reticulated calyces with crenulated edges.

### *Causus defilippii* (Jan)

*H(eterodon) De Filippii* JAN, 1863, Arch. Zool. Anat. Fisio., II, p. 225: Africa.

*Causus defilippii* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 469.

Rungwe Mountains, Tanganyika Territory, 1 (No. 39173, Boulton and Boulton, 1929).

Mlanje, Nyasaland, 6 (Nos. 44312-17, Boulton and Boulton, 1929).

LEPIDOSIS.—Seven females with dorsal scale-rows typically 17-17-12, the preanal count varying from 11 to 13. Ventrals vary from 120 to 125, averaging 122.7. Anal single, caudals 13 to 15 with 13 the mode. Supralabials 7, one exception with 6-7. Infralabials 10, one with 9, the first four, or rarely the first three touching the anterior chin-shields. Scales in the ocular ring most commonly six; nearly as frequently there are five. Temporals 2+3 on five specimens, 2+4 on the other two.

DIMENSIONS.—The largest is a Mlanje female with a total length of 315 mm., the tail (20 mm.) comprising .06 of the total. The variation for the seven females is .04 to .07, with some correlation of size and relative tail lengths, the smaller snakes having proportionately shorter tails. No males of this species have been available for comparison, nor for an examination of the hemipenes.

### BITIS GRAY

#### *Bitis lachesis* (Laurenti)

*Cobra lachesis* LAURENTI, 1768, Synopsis Reptilium, p. 104: no locality.—MERTENS, 1937, Abh. senckenberg. naturf. Ges., No. 435, p. 16.

*Vipera (Echidna) arietans* MERREM, 1820, Tent. Syst. Amph., p. 152: Cape of Good Hope.

*Bitis arietans* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 493.—SCHMIDT, 1923, Bull. Amer. Nat. Hist., XLIX, p. 140, Pl. XXII, fig. 1.—LOVERIDGE, 1936, Bull. Mus. Comp. Zoöl., LXXIX, p. 278, Pl. v, fig. 1.

"Angola," 15 (Nos. 51848-62, Vernay, Lang, Boulton, 1925).

Chitau, Angola, 7 (Nos. 51863-69, Vernay, Lang, Boulton, August 12-14, 1925).

Capelongo, Angola, 17 (Nos. 51870-86, Vernay, Lang, Boulton, July 11-20, 1925).

Huambo, Angola, 1 (No. 51846, Vernay, Lang, Boulton, 1925).

Tana River, Kenya Colony, 1 (No. 50795, Davison, Johnson, 1933).

Mawere Shamba, Tanganyika Territory, 1 (No. 49918, Carnochan, March, 1934).

Karonga, Nyasaland, 2 (Nos. 44329-30, Boulton and Boulton, 1929).

LEPIDOSIS.—Complete scale counts were not made on the forty-four specimens listed above since the wide-ranging puff adder is known from numerous specimens, and Angolan specimens were nearly typical in pattern and color. However, as no attempt appears to have been made heretofore to segregate populations, the ventrals and caudals were counted on a series of forty specimens from Angola to provide index characters for comparison with specimens from other areas and to determine the sexual dimorphism. Twenty-four males and sixteen females from Angola are tabulated (with extremes in parentheses) below:

	MALES	FEMALES
Ventrals, average	(125-131) 128.1	(126-132) 129.0
Caudals, average	(21-33) 25.1	(13-18) 16.0
Ratio of tail to total length	(.10-.13) .12	(.05-.08) .06

DIMENSIONS.—The largest specimen in the series is a male from Karonga with a length overall of 1000 mm. The largest Angolan snake is a Capelongo male measuring 860 mm. A female from Angola preserved as head and tail intact in the skin, was measured before being preserved by Mr. H. Lang who recorded an overall length of 850 mm.

HEMIPENIS.—Extends to the eleventh caudal, bifurcating at the third, with the sulcus branched at the second. Enlarged basal spines are present, and the proximal half of the organ is armed with closely set spines which exhibit a transition to calyces on the distal portion. Distal calyces are

deep, reticulate, with strongly crenate edges. At the broad end of each lobe, a slender conical structure covered with small spines extends inward a distance of two caudals when the hemipenis is *in situ*. The sulcus follows this conical structure to the tip, thus being recurved in the inverted hemipenis, but in the everted organ the projected cone provides additional length for the sulcus. Cope's plate (1900, Ann. Rept. U. S. Nat. Mus. (for 1898), Pl. XII, fig. 10) is not entirely accurate, and the distal extension of the sulcus is entirely omitted.

STOMACH CONTENTS.—Angolan puff adders contained unidentified rodents in two cases, a lizard in one and another had eaten a small weaver bird of the genus *Euplectes*. I am indebted to Dr. James P. Chapin for the identification of the bird.

REMARKS.—Unfortunately few extensive series of puff adders have been counted, so that comparisons of populations are not entirely satisfactory. Schmidt (*loc. cit.*) has given figures for fifteen specimens from the Belgian Congo, stating that ventrals vary from 137 to 147, beyond the maximum for any of the forty Angolan specimens tabulated above. Loveridge (*loc. cit.*) records ten specimens from Uganda and Kenya Colony with a variation of 132 to 143 ventrals, the minimum figure falling at the maximum for Angolan specimens. Boulenger (*loc. cit.*) lists several specimens, including one from Mossamedes, Angola, with 140 ventrals.

On the whole, it may be observed that Angolan specimens, particularly those from the interior, have fewer ventrals, on the average, than specimens from East Africa and from the periphery of the Rain Forest in the Congo. However, the other variations listed by Boulenger indicate that segregation of subspecies may prove unprofitable, unless and until other characters can be correlated with ventral counts. Any satisfactory study will, of necessity, be based upon large numbers of specimens, but the known range of *B. lachesis*, which includes the "whole of Africa except the Rain Forest" (Schmidt, *supra cit.*) as well as Arabia and Barbary, is most remarkable,

and it would seem almost certain that natural selection has produced some divergent strains in this viper.

Stejneger (1936, Copeia, No. 3, p. 140) recently has shown that according to the rules the older name, *Cobra* of Laurenti, should be used for the genus long known as *Bitis*.<sup>1</sup> He states that of three nominal species, *C. clotho*, *C. lachesis* and *C. atropos*, "The two former are based on figures by Seba (Seba II., 93 and 94.2) and are practically unidentifiable." Mertens (*loc. cit.*) more recently has pointed out that figure two of Seba's plate 94 is undoubtedly the puff adder and, furthermore, that Boulenger included the older name *lachesis* Laurenti as a synonym of *arietans* in his "Catalogue." Mertens concludes, therefore, that the name *lachesis* is available and has priority. I have examined Seba's figure, as well as Laurenti's brief description. The "falciis nigra transversa per oculos," depicted by Seba, is characteristic of most puff adders, and I concur with Mertens in the resumption of use of the older name, *lachesis*, for the species.

#### *Bitis nasicornis* (Shaw)

*Coluber nasicornis* SHAW, 1802, Nat. Miscell., III, Pl. xciv: interior of Africa.

*Bitis nasicornis* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 500.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 143, Pl. XXI, figs. 1-2.

Djaposten, French Cameroon, 1 (No. 45947, skin with head intact, Raven, April, 1930).

Lukolela, Belgian Congo, 1 (No. 45946, Chapin, Edson, 1931).

LEPIDOSIS.—Two females, an accurate scale-row count impossible to make on one, dorsal scale-rows 36-41-29 on the Djapos-

<sup>1</sup> In this paper I have refrained from using the term *Cobra* in a generic sense owing to the confusion that would result after the long use of the word "cobra" in the vernacular connotation to designate any of several elapid snakes. Mr. K. P. Schmidt advised me that a decision of the International Commission on Zoological Nomenclature was pending, and Mr. H. W. Parker of the British Museum has supplied me additional information in a letter dated July 26, 1938. In part, Mr. Parker states, "The situation with regard to *Bitis* and *Cobra* is that I have approached the International Commission to have the rules suspended. The Royal Society of Medicine wrote to the Commission deprecating the proposed substitution of *Cobra* for *Bitis* and the President of the International Commission, (Dr.) Karl Jordan, has circulated the commissioners setting forth the argument supplied."



ten skin. Ventrals 136 and 140; caudals 18 and 21. Supralabials 18-19 and 17-19. Infralabials vary from 18 to 19, the first five touching the chin-shields. Scales around the eye 15 to 18. Schmidt (*loc. cit.*) has summarized the data for thirty specimens taken in the Congo Rain Forest, noting the sexual dimorphism.

HEMIPENIS.—The organ was examined in No. 11829 already recorded from Stanleyville, Belgian Congo, by Schmidt (*supra cit.*). The hemipenes on this male were partly everted so that no exact dimensions can be given. Normally *in situ* the organ extends to approximately the eighteenth caudal, bifurcating near the base. The sulcus is divided near the base, extending to the end of each lobe. Basal portion with flattened hooks arranged in longitudinal series which undergo transition to crenulated calyces. Toward the distal ends of each lobe crenulations diminish in size, the calyces at the distal ends being simple, deep and reticulate. It is of interest to note that the terminal extensions on the lobes of the hemipenes of *B. lachesis* are absent in this, as well as other species of *Bitis* whose copulatory organs were available for examination.

#### *Bitis caudalis* (Smith)

*Vipera caudalis* SMITH, 1849, Illus. Zool. So. Africa, III, Pl. VII: sandy districts north of the Cape Colony.

*Bitis caudalis* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 498.

Lüderitz Bay, Southwest Africa, 1 (No. 51888, Lang, 1925).

LEPIDOSIS.—A female with dorsal scale-rows 21-25-19, 137 ventrals, anal single; caudals 25, with distinct keels. Supralabials 11-?, infralabials 11-?, the first three touching the chin-shields. Scales in the ocular ring 11-10; scales across the head from eye to eye 11.

DIMENSIONS.—Total length 310 mm.; length of tail 25 mm. Ratio of tail to total length .08.

COLORATION.—Pale buff, with scarcely any evidence of pattern.

REMARKS.—The habitus and enlarged scale over each eye are similar in many respects to the North American "sidewinder"

or *Crotalus cerastes*. It would be of interest to know if the method of locomotion of this species of *Bitis* is similar to the American desert dwelling rattlesnake, *Crotalus cerastes*, which in habitus so closely parallels that of the vipers (*Aspis*) of the Sahara Desert. The larger species of *Bitis* seem to be more highly adapted to perform what has been termed "caterpillar" locomotion, but obviously they are too thick-bodied to "sidewind." Captive *Bitis lachesis*, when attempting to move rapidly, have been observed performing what crudely approaches true sidewinding, and it seems reasonable to believe that more slender species in the genus might actually sidewind. Whether or not such locomotion has been achieved by *B. caudalis* readily could be determined in the field by examining tracks in the sand (*vide* Mosauer, 1928, Zool. Anzeiger, LXXIX, No. 5/6, p. 195). *Bitis cornuta albanica* is reported to bury itself in the sand and it seems probable that it too may be capable of true sidewinding.

#### *Bitis peringueyi* (Boulenger)

*Vipera peringueyi* BOULENGER, 1888, Ann. Mag. Nat. Hist., (2) II, p. 141: ten miles east of Walfisch Bay, Southwest Africa.

*Bitis peringueyi* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 495.

Mombolo, Angola, 1 (No. 51891, Vernay, Lang, Boulton, 1925).

LEPIDOSIS.—A male with dorsal scale-rows 23-25-17, 135 ventrals and 24 caudals. Supralabials 12, separated from the ocular by two continuous rows of scales, and alternate scales of a third row. Infralabials 11, the first three in contact with the anterior chin-shields. Scales in the ocular ring 13-12; nasal separated from rostral by two scales.

DIMENSIONS.—Length overall 259 mm.; length of tail 28 mm. Ratio of tail to total length a little than .10.

COLORATION.—Although the specimen is in an inferior state of preservation there is a distinct pattern consisting of a series of sub-diamond-shaped blotches on the median line of the back. The ground color is gray, with each blotch outlined with a narrow dark line, the centers somewhat darker than the ground color. No outer

series of darker spots described by Boulenger (1896, *loc. cit.*) as "ocellar" are visible on the specimen. Belly heavily mottled with dark spots. The pattern, as well as a few other minor characters, does not correspond entirely with Boulenger's descriptions which were based upon few specimens. But on the whole, there is no indication of greater variability than occurs in other species of *Bitis*.

**HEMIPENIS.**—Extends to the tenth caudal, bifurcating at the fifth; sulcus dividing at the fourth. No spines nor calyces could be detected, but the organ was too fragile for satisfactory dissection and examination.

***Bitis gabonica* (Duméril and Bibron)**

*Echidna gabonica* Duméril and Bibron, 1854, *Erpétol. Gén.*, VII, p. 1428, Pl. LXXXb: Gaboon, West Africa.

*Bitis gabonica* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 449.—SCHMIDT, 1923, *Bull. Amer. Mus. Nat. Hist.*, XLIX, p. 142, Pl. xx, figs. 1-2.

Ganta, Liberia, 1 (No. 51890, head only, Harley, 1932).

Djaposten, French Cameroon, 2 (Nos. 45948-49, skins with head intact, Raven, December, 1929).

**LEPIDOSIS.**—Scale-rows at midbody 36-41 for two skins, with ventrals 131-137, and caudals 28 on both. These two specimens are evidently males, the caudal count falling within the extremes given for males by Schmidt (*loc. cit.*). Supralabials vary from 14 to 15. Infralabials 17 to 19, the first four on one side of the Ganta specimen touching the chin-shields, the first five in the remainder. Scales across the head from eye to eye 12 to 14. Scales in the ocular ring 17 to 19.

**DIMENSIONS.**—Measurements of skins are, of course, valueless aside from the fact that they give an approximation of the size of the specimens. One skin from Djaposten measures 900 mm., the other 1200 mm. The larger specimen lacks the median brown stripe on the head. Schmidt (*supra cit.*) has already given an excellent summary of characters for twenty-five Congo specimens, noting significant sexual dimorphism in tail ratios and numbers of ventrals.

**HEMIPENIS.**—The following description is based upon a specimen (No. 11807) from Niangara, Belgian Congo, included in Schmidt's summary mentioned above. The organ examined in this individual extends to the eleventh caudal, bifurcating at the sixth, the sulcus dividing at the fourth. The portion proximal to the bifurcation lacks basal spines, although a series of longitudinal folds are present. Each lobe is armed with semi-reticulate calyces, the reticulate pattern being somewhat more apparent at the end.

***Bitis cornuta cornuta* (Daudin)**

*Vipera cornuta* DAUDIN, 1803, *Hist. Rept.*, VI, p. 188: Cape of Good Hope.

*Bitis cornuta* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 497.

Lüderitz Bay, Southwest Africa (No. 51889, Lang, 1925).

**LEPIDOSIS.**—The posterior portion of the body and the tail are missing from this specimen. Dorsal scale-rows 27-27-?. Supralabials 13. Infralabials 12, the first three touching the chin-shields. Scales in the ocular ring 15. There are three rows of scales between the eye and the labials, two scales between the supranasals, but only one scale separating the nasal from the rostral. Six to eight scales are raised as horn-like projections over each eye. Including the enlarged scales, there are seventeen scales separating the eyes across the crown. The pattern for the portion of the specimen available conforms to the description given by Boulenger (*loc. cit.*).

**ECHIS MERREM**

***Echis carinatus* (Schneider)**

*Pseudoboa carinatus* SCHNEIDER, 1801, *Hist. Amph.*, II, p. 285: no locality.

*Echis carinatus* BOULENGER, 1896, *Cat. Snakes Brit. Mus.*, III, p. 505.

Red Sea Hills, Anglo Egyptian Sudan, 1 (No. 51845, Anthony, April 28, 1929).

Garissa, Tana River, Kenya Colony, 1 (No. 50796, Davison and Johnson, August 1, 1933).

**LEPIDOSIS.**—Two males with dorsal scales 25-31-19 and 23-27-17. Ventrals 165 and 169; anal single; caudals 36 and 38. One snake has 10 supralabials, the

other 12; infralabials 11 and 10-11. Scales in the ocular ring 15-14 on one, 16 on the other, each with three series of scales between the eye and the supralabials.

**DIMENSIONS.**—The Sudan specimen is 460 mm. overall, the Kenya Colony snake 480 mm. The ratio of tail to total length is .11 for each.

**HEMIPENIS.**—Bifurcate on No. 50796 extending to the twelfth caudal, branching at the second. Sulcus divides at the first caudal. Basal hooks not prominently enlarged. Distally hooks are arranged in a reticulated pattern, becoming smaller near the ends of each branch. A fold or ridge on the side opposite the sulcus extends the entire length of each branch. No. 51845 is similar, but the spines are longer and more slender, and the bifurcation is at the sixth caudal, the sulcus dividing at the fourth caudal.

**REMARKS.**—These two specimens have been compared with three females in the American Museum (Nos. 2153, 2257 and 46353) from "India." There is no conspicuous difference between them, the three females having 148 to 172 ventrals, and from 25 to 29 caudals.

#### ATHERIS COPE

### *Atheris squamigera squamigera*

(Hallowell)

*Echis squamigera* HALLOWELL, 1854, Proc. Acad. Nat. Sci. Phila., p. 193: near the River Gaboon.

*Atheris squamigera* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 509.—SCHMIDT, 1923, Bull. Amer. Mus. Nat. Hist., XLIX, p. 144.—LOVERIDGE, 1933, Bull. Mus. Comp. Zool., LXIV, p. 277 (under *A. barbouri*).

Metet, French Cameroon, 3 (Nos. 51841-43 (one specimen a head only) Grissett, 1927).

Lukolela, Belgian Congo, 7 (Nos. 45940-45, Chapin, Edson, August to November, 1930, No. 51840, Chapin) Edson, February 31, 1931).

**LEPIDOSIS.**—Dorsal scale-rows vary from 19 to 23 on the neck, 19 to 23 at midbody and from 14 to 17 in the preanal region. Ventrals: from 152 to 154 in males, from 150 to 162 in females. Caudals vary from 51 (a Metet female) to 67 (a Lukolela male). Supralabials from 9 to 11. In-

fralabials from 9 to 12, with the anterior two or three touching the chin-shields. Two scales between the nasal and the eye; from 11 to 16 scales in the ocular ring; scales from eye to eye across the crown 7 to 9, more commonly 8, all keeled. One row of scales between the eye and labials, in all specimens, with one exception having a single row plus alternate scales in a second row. On the underside of the head there are from four to eight scales between the mental and the first ventral, including the first pair of labials and the chin-shields. Gular scales with keels, six or more commonly seven scales from the angle of the mouth to the ventrals.

**DIMENSIONS.**—The largest specimen in the series is a female, in an inferior state of preservation, from Metet. It measures a little less than 700 mm. The largest Lukolela specimen, a male, measures 450 mm., with the tail not quite complete. The ratio of tail to total length varies from .15 to .17 for four females and from .17 to .18 for three males.

**HEMIPENIS.**—(No. 45940) Extends to the ninth caudal, bifurcating at the fifth, sulcus dividing at the fourth. Basal spines longest, followed by spines arranged in longitudinal rows, diminishing in size distally to the terminus of each lobe.

**COLORATION.**—The Metet specimens are nearly uniform grayish in preservative, probably greenish in life as described for a series of forty-one specimens from the Belgian Congo (Akenge, Avakubi, Medje, Nala, Niapu and Rungu) by Schmidt (*loc. cit.*). The series of seven specimens from Lukolela is remarkably variable in coloration; Dr. James P. Chapin has given notes on the field tags for several specimens as follows: (No. 45940) "Above, uniformly dull, light yellowish green, below, yellowish cream color." (No. 45941) "Greenish above, lighter below." (No. 45943) "General color light greenish yellow, with darker gray and green patches along back." Two other specimens are the dull-colored typical form, whereas the smallest individual (335 mm. overall) is uniformly canary-yellow above and below without the faintest trace of markings.

REMARKS.—Trinominals are used because it is believed that a subspecies from the Lower Congo may be recognized. Schmidt (*op. cit.*, p. 146) in 1923 revived the name, *laeviceps*, stating that it was merely "desired to emphasize the observed distinction" between it and typical *squamigera*. Furthermore, he noted that probably it should be accorded subspecific rank, along with *chlorechis* (Schlegel, 1855). I have examined Schmidt's material as well as two specimens of *chlorechis* (M. C. Z., Nos. 22555–56) kindly lent by Mr. Arthur Loveridge of the Museum of Comparative Zoölogy, and the material listed above. *A. chlorechis* appears to differ significantly from *squamigera* in minor characters only, more scales in the ocular ring, and a greater number of scales between the eyes. Furthermore, on zoögeographical grounds it might be expected to represent a subspecies.

*Atheris laeviceps* of Boettger (1887, Zool. Anz., X, p. 651, type locality Banana, Lower Congo), however, appears to be preoccupied by *Atheris anisolepis* Mocquard (1887, Bull. Soc. Philom., (7) XI, p. 89, type locality Alima Leketi, French Cameroon). Although the two descriptions were published the same year, Mocquard's apparently preceded Boettger's (*vide* Günther, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 266).

In many respects the Lukolela specimens are intermediate between *anisolepis* and *squamigera*. Nearly every character listed by Schmidt (*supra cit.*) in his summary of differences is represented. Of the characters suggested by Schmidt these appear to be most useful in distinguishing *anisolepis*: two rows of scales between the eye and the labials, 11 to 13 supralabials, and 12 to 14 infralabials. Other characters, such as the yellow coloration with green spots, the symmetrical suprarostrals and the orbit arched above the eye are moderately distinctive characters which may indicate average differences, but all of these characters are represented on one or more of the Lukolela specimens.

Schmidt was in error in reporting the Banana specimens (Nos. 11898–99) as males; they are both females.

### *Atheris nitschei nitschei* Tornier

*Atheris nitschei* TORNIER, 1902, Zool. Jahrb. Syst., XVI, p. 589: Mpororo Swamp, Belgian Ruanda-Urundi.—LOVERIDGE, 1936, Zool. Ser. Field Mus. Nat. Hist., XXII, p. 46.

Mulu, Uganda (8000 ft. elevation), 1 (No. 51844, Chapin, Sage, Mathews, March 8, 1927).

LEPIDOSIS.—A female with dorsal scales 27–26–19, ventrals 148, anal single, caudals 46. Supralabials 10; infralabials 12, the first four touching the chin-shields. Scales between the nasal and the eye 3, between eye and labials one plus alternate scales; scales in the ocular ring 13–12. Scales from mental to first ventral plate, including first pair of labials and chin-shields, 7. Gulars smooth, rows counted from the angle of the mouth to the first ventral 7–6. Dorsal head scales smooth, a few faintly keeled; counted across the crown from eye to eye, there are eight rows.

DIMENSIONS.—Total length 600 mm., the tail (85 mm.) comprising .14 of the total length.

HEMIPENIS.—(Description based upon M. C. Z., No. 42970 from Goma, Belgian Congo.) On this specimen the organ extends to the thirteenth caudal, bifurcating at the fourth, the sulcus dividing at the third. Basal spines strongly enlarged, decreasing in size distally to the terminus of each lobe.

REMARKS.—Binominals are used because a new subspecies from the Rungwe Mountains in Tanganyika Territory appears to differ in several minor respects from the typical form. Although the variation is extensive in *A. nitschei*, as well as in other species of the genus, several characters appear to be correlated in the new race described below.

### *Atheris nitschei rungweensis*, new subspecies

Figure 18

DIAGNOSIS.—A subspecies of *nitschei* which differs from the typical form (characters of *A. n. nitschei* are given in parentheses, based upon an examination of thirteen specimens) in possessing: twelve (9–11) supralabials; four (2–3) scales between the nasal and the eye; seven (5–6) scales between the mental and the first ventral, including the first pair of labials and the chin-

shields; and in having thirteen (8-11) scales across the crown from eye to eye. Furthermore, it differs from typical *nitschei* in possessing distinctly keeled scales on the top of the head, and in having the gulars keeled. The *canthus rostralis* is well developed, and the snout is propor-

DESCRIPTION OF THE TYPE.—LEPIDOSIS: Dorsal scale-rows 27-25-19, lower row slightly larger, scales in all rows with median keels. Ventrals 159, including two that extend only to the midline of the venter. Anal plate single; caudals 47 in single series. Supralabials 12,

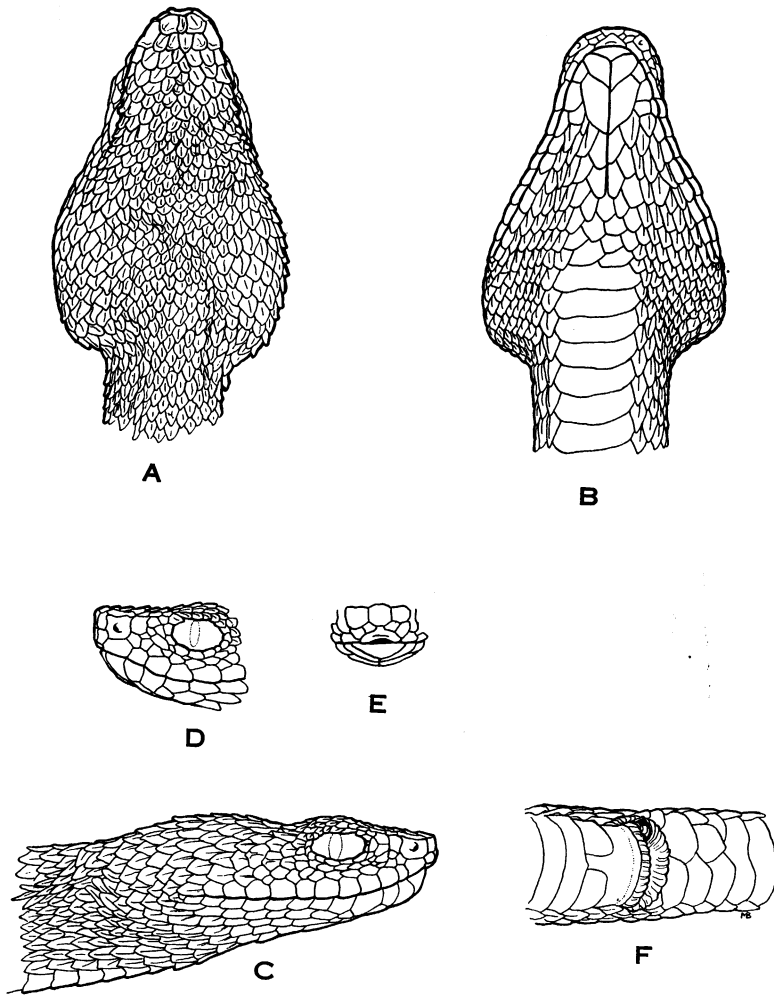


Fig. 18. *Atheris nitschei rungweensis*, new subspecies (A. M. N. H. No. 39186, type female,  $\times 2$ ). (A) dorsum of head, (B) ventral view of head, (C) lateral view of right side of head, (D) lateral view of left side of anterior portion of head, (E) front view of snout, (F) ventral view of anal region.

tionately more narrow than that of the typical form.

TYPE.—A. M. N. H. No. 39186 (Fig. 18), an adult female, collected at Rungwe Mountains, Tanganyika Territory, by Mr. and Mrs. Rudyerd Boulton of the Straus African Expedition of 1929.

slightly increasing in size posteriorly, those posterior to the eye with keel-like ornaments. Infralabials 11, the first three in contact with the chin-shields, the posterior three keeled. Counted along the *canthus rostralis* there are four scales between the single nasal and the orbit. Scales in the ocular ring 16 on each side. The

eye is separated from the supralabials by three rows of scales on the right side, by two rows on the left side. Rostral crescentic below, an arched extension above touching a median supra-rostral which is flanked on either side by a scale sub-equal in size, the outer two being separated from the rostral by small scales.

On the underside of the head a rather large mental is followed by the first pair of infralabials which meet on a common suture only a little shorter than the suture of the first pair of chin-shields. Eight pairs of scales, including first pair of labials and the chin-shields, are situated between the mental and the first ventral. Gulars, except inner row, distinctly keeled. From the angle of the mouth to the first ventral there are eight scales on either side.

FORM.—More slender than the typical form, head sharply distinct from neck, more than one-fourth longer than greatest width, snout truncate, canthus rostralis well developed, extending to the supraoculars which are slightly arched above the orbit. Length overall 450 mm., the tail (60 mm.) comprising .13 of the total.

COLORATION.—Slaty black above and below, with the exception of the extremity of the tail which is dirty white, the edges of the scales outlined with brown.

REMARKS.—So many characters appear to be correlated in this one snake that it hardly seemed wise to extend the range of variation in the typical form. On the whole, in the single specimen there is a tendency toward more scales with stronger carination. For comparison I have had available thirteen specimens of *A. nitschei* representing localities in the Belgian Congo, Belgian Ruanda and Uganda. One of these is described in the present report; the remainder, including five adults and seven mature embryos were lent by the Museum of Comparative Zoölogy through the courtesy of Mr. Arthur Loveridge to whom I am indebted for the loan, as well as for the information that no *Atheris* heretofore has been known from the Rungwe region.

#### ATRACTASPIS SMITH

##### *Atractaspis bibronii* Smith

*Atractaspis bibronii* SMITH, 1849, Illus. Zool. So. Africa, III, Pl. LXXI: eastern districts of Cape Colony.—BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 515.

Mlanje, Nyasaland, 1 (No. 44306, Boulton and Boulton, 1929).

LEPIDOSIS.—A single small male, with the head somewhat desiccated so that the infralabial count was not possible to deter-

mine, has the dorsal scale formula 23-23-17. Ventrals 246; anal single; caudals 26, in single series. Supralabials 5, the third and fourth entering the orbit. Pre-ocular 1, postocular 1, temporal 1. On this desiccated head the canthus labialis is probably more pronounced than in life, but the "countersunk" lower jaw and other features of the species noted by Smith in the original description seem to indicate that this form is more highly specialized for burrowing than are other forms in the genus.

DIMENSIONS.—Length overall 276 mm., the tail (17 mm.) comprising .06 of the total length. The specimen was too small to make a satisfactory examination of the hemipenis.

##### *Atractaspis irregularis* (Reinhardt)

*Elaps irregularis* REINHARDT, 1843, Danske Vidensk. Selsk. Afh., X, p. 264, Pl. III, figs. 1-3: Gaboon.

*Atractaspis irregularis* BOULENGER, 1896, Cat. Snakes Brit. Mus., III, p. 513.

Ganta, Liberia, 3 (Nos. 51892-94, Harley, July, 1932).

Lukolela, Belgian Congo, 1 (No. 45902, Chapin, Edson, January 19, 1931).

LEPIDOSIS.—Dorsal scale-rows are 25-27-21 on three Ganta specimens, and 27-27-21 on the Lukolela snake. Ventrals 230 on the single male from Ganta and 234-238 on the three females. Anal divided; caudals in two series, the male with 25, females with 24 to 26. Supralabials uniformly 5, with the third and fourth entering the orbit. Infralabials 6, the first three in contact with the single pair of chin-shields.

DIMENSIONS.—The largest individual in the series is the Lukolela female with a length overall of 550 mm., the tail 40 mm. The Ganta male measures 510 mm., tail 41. Ratio of tail to total length .08 in the male, .06 to .07 in females.

HEMIPENIS.—Extends to the eleventh caudal, bifurcating at the tenth, the sulcus dividing at the ninth. Basal spines not greatly enlarged. The proximal portion is covered with about eighteen longitudinal rows of spines which become blunt and irregularly arranged toward the distal end.

FIELD NOTE.—Dr. James P. Chapin has recorded on the field tag that the Lukolela specimen was “caught at night in path.” In the southwestern United States as well as in Mexico, many burrowing and secretive snakes are known to emerge at night. Many species formerly believed rare are now found to be common when collecting

is done after sundown. I have little doubt but that a similar collecting technique might be employed in Africa with fruitful results. Snakes found at present only through fortuitous discovery may be found in considerable numbers once their habits and time of emergence from hiding are discovered.





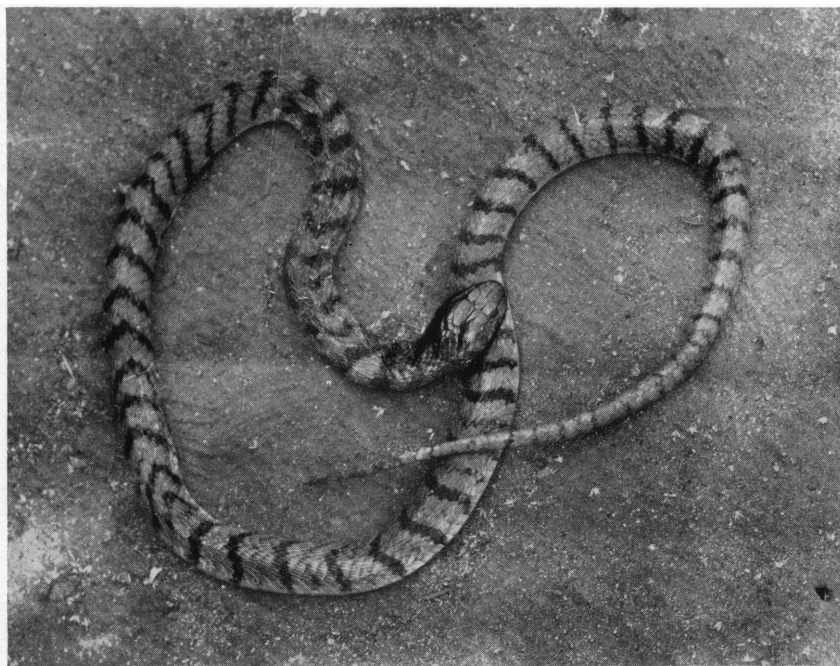


Fig. 1. *Naja nigricollis nigricinctus*, new subspecies (A. M. N. H. No. 51823, male type). From dead specimen.



Fig. 2. *Aspidelaps lubricus cowlesi*, new subspecies (A. M. N. H. No. 32791, female paratype). From dead specimen.













