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Studies on Amphisbaenians (Reptilia). 7. The Small Round-headed Species (*Cynisca*) from Western Africa

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ABSTRACT

The West African genus *Cynisca* is reviewed based upon all known specimens from museum collections and recent field collections. Specimens come from Sénégal in the west, to the Central African Republic and Gabon in the east. All existing types were reexamined, diagnoses reformulated, and a key prepared. The study indicates that the

genus includes 16 species, two of which, *Cynisca williamsi* from Ghana and *C. senegalensis* from Sénégal, are here described as new. Specific diagnoses are based on segmental counts and body proportions, as well as head shield pattern and caudal specializations.

INTRODUCTION

Small and more or less round-headed specimens of amphisbaenians have been recorded from localities throughout a belt extending inland from the West African coast between Gabon and Sénégal. These forms, colloquially known as worm lizards (in Hausa, *cibiyān kasa*; Dunger, 1968), are characterized by enlargement or fusion of the anterior cephalic shields and traditionally assigned to the genera *Chirindia*, *Cynisca*, and *Placogaster*. Their composite range is roughly contiguous with that of the genus *Zygaspis* (Saiff, 1970; Broadley and Gans, 1975, 1978), which extends to the north of that of *Cynisca*. The distribution of the assemblage overlaps those of several other genera. For example, between Gabon and Cameroon it occurs together with some species of the spade-snouted genus *Monopeltis* (Gans and Latifi, 1971; Gans and Lehman, 1973²) and in Nigeria it overlaps that of the keel-headed monotypic genus *Baikia* (Dunger, 1965). To the east, the distribution of these round-headed amphisbaenians seems to be limited by the Zaire forest, and to the north and northwest by the inland savannahs and deserts that fringe the West African forests.

The several accounts of these animals were written in many different languages; indispensable materials, obviously dispersed owing to political dissection of the region, were available from the institutions of more than a dozen countries. Most previous redescriptions had attempted to deal with issues on a localized basis (e.g., Dunger, 1968); the revision of Loveridge (1941) is a notable exception. Only a few specimens each are known from many scattered localities. However, there are relatively large samples from a few localities, notably from the region around Accra, Ghana. This suggests that the scarcity of specimens in collections may reflect the attitudes of collectors rather than the actual abundance of the animals.

The present report is a review of the specific status of the entire genus *Cynisca* in which

16 species are recognized. Specimens were borrowed from every collection that had them. The pattern of data analysis and description follows that of earlier studies (Gans and Alexander, 1962; Gans, 1966, 1971; Gans and Latifi, 1971; Broadley et al., 1976). Unfortunately, the results show that (1) 9 of 16 species are still known only from their type series (or holotypes), (2) the material for certain other species, such as *C. liberiensis*, is in extremely poor condition, and (3) the distributional pattern of the species suggests that additional taxa probably remain to be discovered. The material now available is adequate only to characterize the round-headed West African amphisbaenids and to note, but not resolve, a biologically curious situation that exists in southern Ghana (perhaps Benin) and Ivory Coast.

MATERIALS AND METHODS

SOURCES

The approximately 485 specimens discussed derive from the following collections (identified by abbreviations throughout the text; an * identifies the few specimens not at hand when the report was prepared) and I am grateful to the curators (names given in parentheses) for assistance with loans or hospitality during visits.

AMG	Albany Museum, Grahamstown, C.P., South Africa (F. H. Farquharson)
AMNH	American Museum of Natural History, New York City, New York (R. G. Zweifel)
BM	British Museum (Natural History), London, England (A. G. C. Grandison, N. Arnold, and A. Stimson)
CAS	California Academy of Sciences, San Francisco, California (R. C. Drewes)
CG	Carl Gans collection, Ann Arbor, Michigan
CM	Carnegie Museum, Pittsburgh, Pennsylvania (C. J. McCoy, Jr.)
CZL	Centro de Zoologia, Ministerio do Ultramar, Lisbon, Portugal (S. Manaças and M. Pinheiro)
FMNH	Field Museum of Natural History, Chicago, Illinois (H. Marx and H. Voris)
HM	Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany (H. W. Koepcke)

² Matschie (1893) properly characterized *Monopeltis*. However, he noted that it occurs in Ghana and both to the north and south of Togo and added that the form from Togo was unnamed. I am unaware of any records of this genus from west of Cameroon.

IFAN	Institut fondamentale d'Afrique Noire, Dakar, Sénégal (M. Cissé)
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (J. Gosse and the late G. F. de Witte)
KM	Universitetets Zoologiske Museum, Copenhagen, Denmark (F. Braestrup)
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts (E. E. Williams)
MG	Museum du Genève, Switzerland (V. Aellen, V. Mahnert, and J.-L. Perret)
MHNP	Muséum National d'Histoire Naturelle, Paris, France (J. Guibé and E. R. Brygoo)
MSNG	Museo Civico di Storia Naturale "Giacomino Doria," Genoa, Italy (L. O. Capocaccia)
MVZ	Museum of Vertebrate Zoology, Berkeley, California (G. L. Stebbins, D. B. Wake, and H. W. Greene)
NHMB	Naturhistorisches Museum, Bern, Switzerland (H. Säggerer)
NMB	Naturhistorisches Museum, Basel, Switzerland (K. Kramer)
NRM	Naturhistoriska Riksmuseum, Stockholm, Sweden (U. Bergstrom)
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (M. Boesman and M. Hoogmoed)
RUCA	Rijks Universitair Centrum, Antwerp, Belgium (W. Verheyen)
SMF	Senckenbergische naturforschende Gesellschaft, Frankfurt-am-Main, Germany (K. Klemmer)
SMNH	Staatliches Museum für Naturkunde, Stuttgart, Germany (H. Wermuth)
UGL	University of Ghana, Legon, Ghana (B. Hughes)
USNM	United States National Museum of the Smithsonian Institution, Washington, D.C. (G. Zug)
ZIL	Zoological Institute U.S.S.R. Academy of Sciences, Leningrad, U.S.S.R. (I. S. Darevsky)
ZMU	Zoologisches Museum der Universität, Berlin, D.D.R. (G. Peters)

It is a pleasure to express appreciation to G. T. Dunger, Barry Hughes, and Charles Miller III for the gift of many interesting specimens. Particular appreciation is due to F. R. Allison who collected the holotype of *C. williamsi* and to the late D. H. Barry who presented it to me with the comment that it might represent a new species. W. E. Duellman and L. Trueb kindly reviewed the manuscript. I am also grateful to my colleagues M. Cissé

and B. Hughes who helped with the fieldwork. Messrs. Denis Harris and Douglas W. Nelson of the University of Michigan Museum of Zoology kindly x-rayed the animals. Mr. Robert Villforth and Ms. M. M. Walsworth assisted with parts of the analysis, Mr. Lewis Sadler, Mr. J. Goode, and Mr. René Schaerlaeken prepared the sketches, and Mr. David Bay provided the photographs. It is a pleasure to acknowledge that this is one of a number of studies that could be completed while I held a guest-professorship with Dr. F. de Vree at the Department of Biology of the University of Antwerp (UIA).

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GEOGRAPHY

The localities mentioned in the text are shown on figures 1-3. Localities were checked against the various gazetteers prepared by the U.S. Board on Geographic Names and the spellings are as given there. Sites that were never located and hence are omitted from the maps are (in order from east to west): Nigeria: Albinsi (Benue Province); Deert (Northern Province); West Province (Niger Province); Kunav. Benin: Anolouyeme; Djeho. Ghana: Klein Popo (Klein Pope in Tornier, 1901; there is a Grand Popo in coastal Benin). Liberia: Soforeh Place. Sierra Leone: Lagos; Tumbo Island.

CHARACTER STATES

ANNULI AND SEGMENTS: All counts of *body annuli* were made along the left side of the ventral surface from the first postoral annulus up to and including the annulus bearing the precloacal pores. The number of half-annuli found dorsal and lateral to the modified cloacal segments is recorded as *lateral annuli*. Occasionally, the halves of an annulus close ventrally back of the postcloacal shield. Annuli that are narrower and have a segment width differing from those of the following (caudal) annuli are included in this lateral count. The position of the *autotomy annulus*, or annuli, immediately before or after which autotomy may take place (by rupture along the interannular sulcus), is counted from the first complete postcloacal annulus (i.e., one lacking ventral shortening). This autotomy

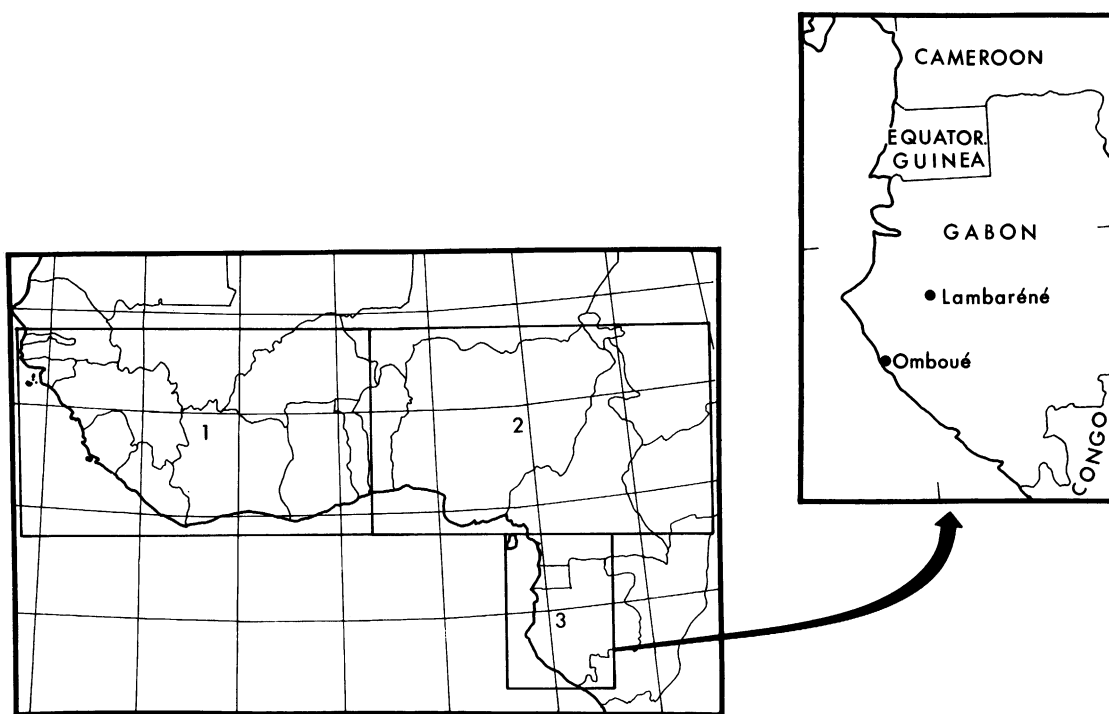


Fig. 1. *Cynisca*. Left. Map of entire study area with insets of areas 1 to 3. Areas 1 and 2 are shown in figures 2 and 3, respectively. Right. Map of Gabon, Equatorial Guinea, and Cameroon showing localities mentioned in the text. Omboué is sometimes listed as Fernan Vaz or Fernand-Vaz.

annulus generally is identifiable by a narrower diameter or different pigmentation. The *caudal annuli* are counted from the first complete postcloacal up to and including the last complete annulus showing regular segments.

The segments of an annulus are irregular in number and relative shape, and they may vary among adjacent annuli. Counts of *dorsal* and *ventral segments* to an annulus were made in the midbody region continuously around a set of five annuli selected at random. They were recorded as dorsal and ventral midbody segments (e.g., 17/10). An "x" follows the count whenever the midventrals of the two sides were fused—i.e., if there was a midventral series of azygous segments, each at least four times as wide as long.

In most species, the caudal tip of the tail is covered by a smooth, conical cap that is located immediately posterior to a regular series of caudal annuli. Generally, the cap lacks segmental subdivisions except along its base where the segments often are elongate. In one group of specimens (*Cynisca kraussi*) the tail is modified by the presence of a dorsal hump along its length (cf. fig. 22). About 1½ di-

ameters from the tip, the dorsocaudal surface slopes ventrally. The dorsally facing terminal aspect is covered with rosettes of irregularly elongated segments, which form cones in some specimens. Another species (*C. williamsi*) has the caudal surface obliquely truncated and covered with produced projecting segments (cf. fig. 37). The latter two forms show varying degrees of calcification underlying the caudal cap.

BODY PROPORTIONS: Snout-to-vent and tail measurements were made by adpressing the specimen to a meter stick. Body diameter was measured using calipers at the widest, undeformed site along the first third of the trunk.

Not only body dimensions, but also segment proportions change allometrically. Thus, Tornier (1901) noted that the medial ventral segments of *C. leucura* are more than two times as long as wide in juveniles, but barely two times as long as wide in adults.

HEAD SEGMENTATION: The arrangement of the large head shields (contrasted to the generally rectangular segments arranged in annuli over the trunk) was found to vary interspecifically. Functional studies (Gans, 1968)

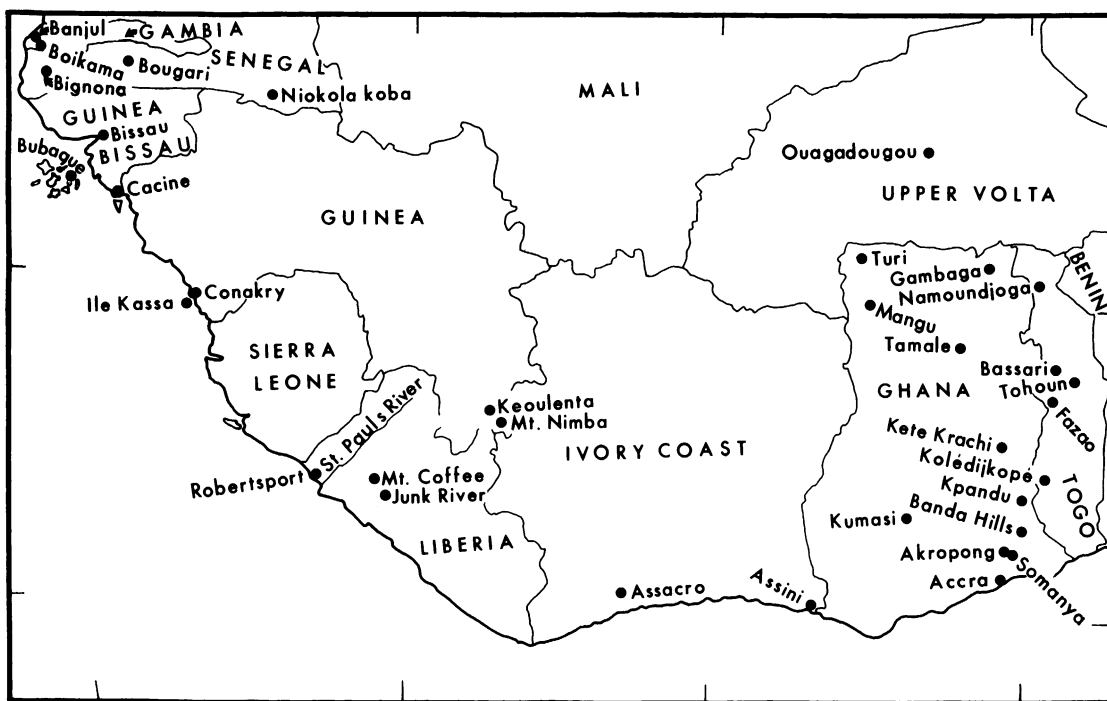


Fig. 2. *Cynisca*. Map of Togo, Ghana, Upper Volta (Burkina Faso), the Ivory Coast, Liberia, Guinea, Sierra Leone, Guinea Bissau, Gambia, and Sénégal showing localities mentioned in the text. Legon, Legon Hill, Christians Village, Labadi, Kwali Lagoon, and Achimota are found near Accra, Ghana. There are two spellings each for Agbodjedo (Agbodji) and Cacine (Cassine). Kwali Lagoon is sometimes listed as Korley-Bu and Somanya as Somanya Krobo.

suggest that enlargement of these shields is correlated with the mode of locomotion. The cephalic shields undergo a series of complete and partial fusions and subdivisions. Not only the geometry (including relative size) of the shields, but the relative constancy or variability of a region has functional as well as systematic importance. The patterns of fusions and shield modifications make it desirable to review their nomenclature as a basis for the subsequent descriptions (names of Loveridge, 1941, are given in parentheses below). The basic nomenclature is shown in figure 4.

Owing to the importance of head shield proportions in the classification of these amphisbaenians, I include both photographs and outline drawings of the shields in order to show the three-dimensional pattern of segmentation and the pigmentation, as well as the actual outlines of the shields and the arrangement of the sutures dividing them. To facilitate comparisons, within and among specimens, each set of illustrations is ar-

ranged in a standard way with the dorsal view on the top, the lateral view in the middle, and the ventral view on the bottom. The long axis of the specimen always lies at a right angle to the camera (or camera lucida) so that longitudinal dimensions do not change during rotation of the specimen by 90° for the next photograph (or drawing). The camera-object distance remains constant so that prints may be made with a single enlarger setting. Furthermore, the camera was placed far enough from the specimen to minimize parallax even in close-up photographs. This approach not only facilitates comparisons between any two views, but yields a more accurate estimate of the proportion of those shields that lie at an angle to the camera. The method is self-correcting, avoiding obvious errors, such as offering dorsal and ventral views of the same head with markedly different outlines.

The *rostral* is defined as the azygous shield bordering the upper lip and sometimes visible in dorsal view (fig. 4). It is in contact with the *supralabials*, defined as shields posterior

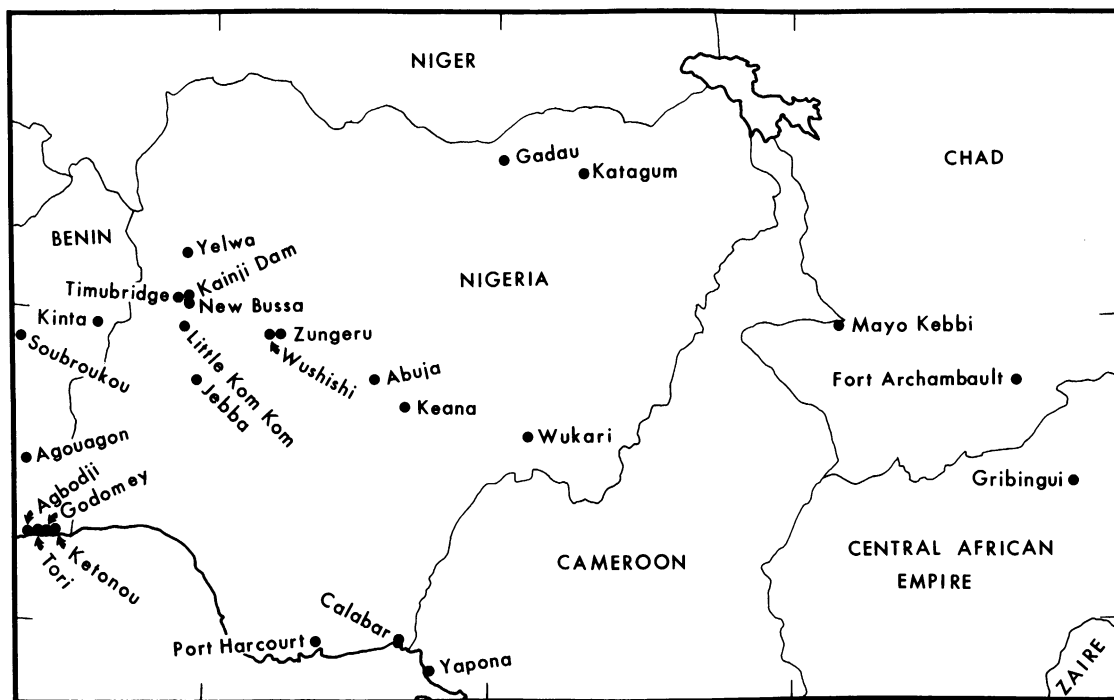


Fig. 3. *Cynisca*. Map of the Central African Republic, Chad, Cameroon, Nigeria, and Benin showing localities mentioned in the text. There are two spellings for Japoma (Yapoma), Zungeru (Lungeru), and Wushishi (Urushishi).

to the rostral and contacting the upper lip back to the end of the oral slit. Those one or two supralabials that lie anterior to the position of the eye (preocular) are smaller than the posterior (postocular) ones. The more or less regular annulus following posteriorly upon the angulus oris is considered to be the *first body annulus*; however, an enlarged *post-supralabial* shield sometimes appears to continue the supralabial row. The supralabials may be variably enlarged or fused to the (nasal, ocular, postocular) shields in the next dorsal series.

The *nasals* contain the nostrils and usually are in middorsal contact with each other. In sequence along the midline of the head lie a series of enlarged shields: (1) the paired *pre-frontals*, the posterior suture of which always contacts the ocular or terminates in the region of the eye, (2) sometimes, an *azygous* median shield (the frontal of Loveridge, 1941) that lies intercalated at the prefrontal-frontal junction, (3) the paired *frontals* (postfrontals), (4) the variably sized *parietals* (temporals), and (5) sometimes the *occipitals* (parietals), here defined as median enlarged

shields of the first dorsal portion of a body annulus (or intercalated dorsal half-annulus). In general, the line of contact of the frontals and the occipitals is equal to or longer than their length in a more lateral position. The length of midline contact of the parietals tends to be shorter than the overall length of these shields. The terminology of the various patterns of fusion is given below.

A series of variably sized shields lies on the dorsolateral aspect of the head between the labial and middorsal series. This dorsolateral series may include a *preocular* and an *ocular* (generally overlying the region beneath which the small, dark eye is visible). The ocular can be divided horizontally, in which case the dorsal shield is termed the *supraocular*. Various enlarged shields fill the region between the supralabial-postsupralabial series and the frontal-parietal-occipital one. If one or more of these enlarged shields contact the ocular, it (they) is (are) called the *postocular(s)*; others are called the *temporals*.

The chin segmentation always is characterized by an enlarged *mental*, which is flanked by enormous first *infralabials*. The

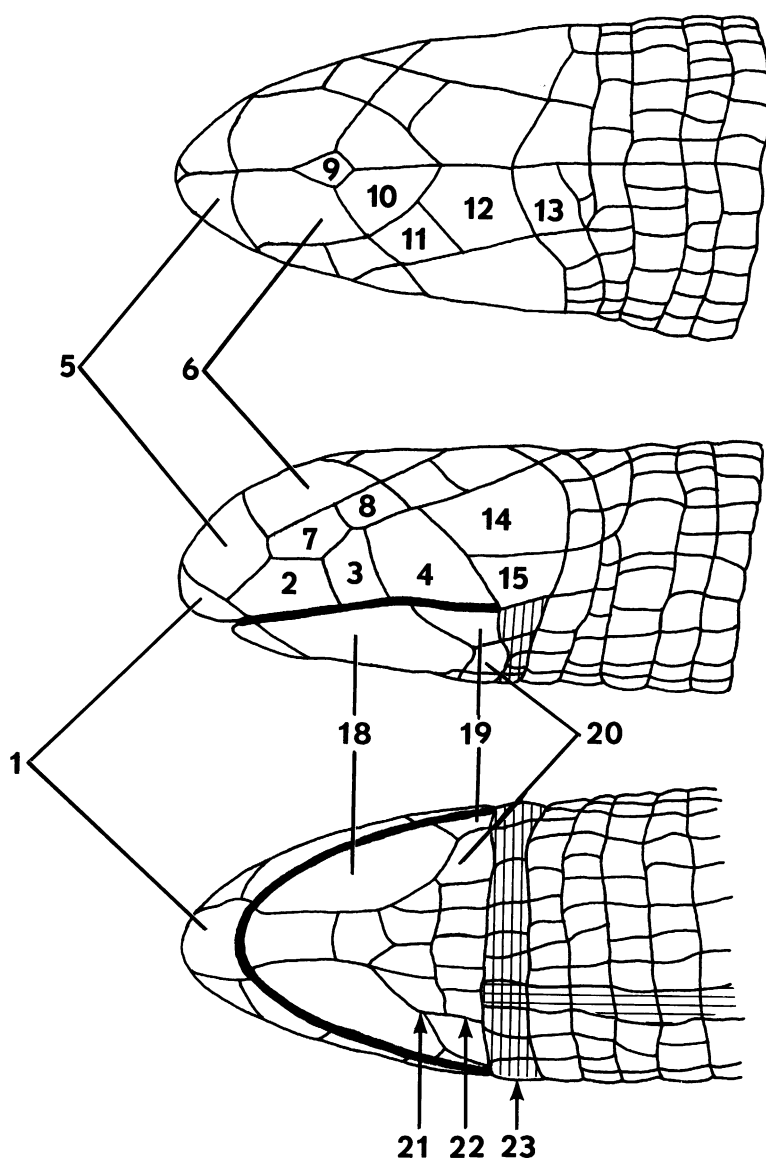


Fig. 4. *Cynisca*. Dorsal, lateral, and ventral views of the head segmentation to illustrate nomenclature. 1. Rostral; 2. first supralabial (first preocular); 3. second supralabial (second preocular supralabial); 4. third supralabial (first postocular supralabial); 5. nasal; 6. prefrontal; 7. preocular; 8. ocular; 9. azygous median; 10. frontal; 11. postocular; 12. parietal; 13. occipital; 14. temporal; 15. postsupralabial; 16. mental; 17. postmental; 18. first infralabial; 19. second infralabial; 20. malar; 21. first postgenial row; 22. second postgenial row; 23. first body annulus (the cross-hatching indicates start and direction of body annuli count).

latter are defined as shields that are in contact with the lip posterior to the mental, and that lie adjacent posteriorly to relatively small second infralabials that never contact the mental. Sometimes, a median *postmental* is divided off from the posterior portion of the

mental; the postmental retains broad (i.e., at least 50% of its length) contact with the first (but not the second) infralabials on each side. Occasionally, there is an enlarged median *postgenial* shield in the first (postgenial) row of small shields. There is a tendency toward

the formation of *malars*, defined as enlarged shields contacting the posterior edge of the enlarged first infralabial and the medial borders of the second infralabial. Unless the malars are at least twice the area of the postgenial (and generally longer as well), they are considered to be the lateralmost postgenials.

The first infralabials of all specimens of the present grouping (the genus *Cynisca*) are much larger than the second. The head segmentation of most members of the group tends to be characterized by a variably sized, medial *azygous* shield intercalated at the point where the paired prefrontals and frontals meet. There also is a general tendency both to enlargement and fusion of the anteriormost shields of the dorsal and the ventral surfaces of the head.

Perhaps the most interesting difference between these small amphisbaenians and members of the South American genus *Amphisbaena* is that all African forms have a band of enlarged (and generally paired) dorsal shields that extends posteriorly from the snout to the second or third body annulus. Consequently, one sees one or even two postsupralabials and a zone of variously fused and enlarged shields in the "postocular" region dorsal to the postsupralabials.

The cephalic scutellation of some species is characterized by exceptionally large shields. Often, it is difficult to determine whether shields have become enlarged resulting in elimination of adjacent shields, or whether once discrete shields have fused. The position of the nostril and the eye, as well as the angle of the mouth, are used as landmarks. Partial sutures also aid in determination of homologies. Fusions or replacements may involve (1) the shields covering the snout anterior to the level of the eye (first and second preocular supralabials, nasal, prefrontal, supraocular, and ocular), (2) the shields along the midline between the level of the eyes and the first dorsal half-annulus (frontal, parietal, occipital), and (3) the shields of the anterior (postoculars, first postocular supralabials) or posterior (first and second postsupralabials, temporals) side of the head. (Often, it is unclear whether the oculars have fused to the first or to the second supralabials.)

The parietal is particularly vexing; often the space where one would expect it to appear

seems either to have fused with the area otherwise occupied by the frontal (and occipital) or with that occupied by the anterior temporal. In some forms, the parietals are clearly defined, discrete elements lying posterior to the frontals along the midline; in most forms, the zone of midline contact is shorter than the length of the parietal farther laterally (perhaps in the zone of fusion with the temporals). In another group of forms, these medially narrower shields have been reduced to point contact with, or are entirely excluded from, the dorsal midline. In general, the enlarged shields of the snout and perhaps of the postocular and supralabial zones clearly are the result of fusion (i.e., loss of the intervening sutures). However, the frontal-parietal-temporal zone also involves a substantial degree of gradual sutural shift; apparently, the frontals often occupy part of the area once occupied by the parietals. However, in the present study the determination of homologies is secondary to an unequivocal identification of shields, that will permit unequivocal identification of the animals involved.

OTHER CHARACTERISTICS: The caudal autotomy site was noted by the occurrence of a caudal annulus, that is shorter anteroposteriorly, sometimes of smaller diameter, and more darkly pigmented than the remaining caudal annuli. The occurrence of autotomy and its frequency is a potentially interesting character that must be noted on freshly collected specimens, because preserved individuals sometimes lose the tail as they are handled.

Two species, *Cynisca kraussi* and *C. williamsi*, show modification of the extreme distal caudal tip. Rather than the symmetrically conical caudal cap seen in most species, these forms show tilting of the tip; that of *C. kraussi* shows a posterodorsally pointing rosette of reduced segments, whereas that of *C. williamsi* shows an inclined caudal boss of produced segments. In both of these species there is substantial internal ossification of the subdermal connective tissues. Minor calcium deposits were also observed in x-rayed specimens of *C. feae*, *haugi*, *kigomensis*, and *schaeferi*. However, no such unorganized ossification was noted in *C. gansi*, *leucura*, *liberiansis*, *muelleri*, *nigeriensis*, *oligopholis*, *rouxae*, and *senegalensis*, although these

forms showed longitudinally reduced and fused terminal vertebrae.

Precloacal pores occur in all of the species discussed here, although the occurrence and size of pores are sexually dimorphic in some species. Pores are absent in females at least of *C. degrysi*, *C. gansi*, *C. kigomensis*, *C. liberiensis*, *C. nigeriensis*, and *C. schaeferi*. This sexual dimorphism could be confirmed in all dissected specimens; however, the nature of the material limited the number of dissections. The shape (round or oval) and site at which pores were located on the precloacal segments (central or asymmetric), and the presence or absence of secretion cores were noted.

ANALYSIS APPROACH

The approach in this, as in all previous taxonomic studies of this series, has been to identify the "nondimensional" species (Mayr, 1946; Gans, 1959), namely those forms that behave as species in sympatric situations. Thereafter the allopatric populations are associated into species in space. Because the records for small West African amphisbaenians are extremely sparse, some distribution patterns seem anomalous and need to be verified. Apparent sympatry derives from specimens ascribed to large and imprecise ranges and in some cases quite possibly from erroneous collecting localities. It remains possible that most of the forms of this assemblage are allopatric.

The regions are dealt with in sequence from east to west. For reasons of convenience, the political subdivisions are used as an initial basis for discussion. It is clear that such subdivision is biogeographically artificial, for ecological differentiation in West Africa tends to run parallel rather than at an angle to the coast.

The samples from each subregion were subdivided, initially on the basis of cephalic segmentation. Other characteristics of the groupings thus defined are compared thereafter. Parallel differences in several nonassociated characteristics are considered evidence that the samples are likely to have been drawn from apparently discrete species. Ultimately, the groupings of such parapatric or possibly sympatric forms are compared to

determine which local units represent samples from taxa of wider geographic distribution. As the raw data are available as part of the appendix, the sequence of analysis here can be documented in a very abbreviated fashion.

Throughout the text and tables, the names ultimately applied to the taxa are given in parentheses. This is entirely for the convenience of the reader because the decision as to the appropriateness of the names followed rather than preceded analysis.

The entire assemblage may be subdivided into two main groupings. The first, occupying much of the central range (Nigeria to Guinea), it represented by a series of animals showing the general pattern of multiple labials and paired nasals, prefrontals, frontals, and parietals, as well as a medial unpaired shield on the dorsal surface of the head. The second grouping, occupying various peripheral regions, is represented by animals showing significantly fewer, but much larger, shields that cover the dorsal surface of the head and are apparently produced by the fusion of the discrete shields. However, at least one form (Pattern VI) is intermediate between these divisions; thus, we are dealing with a continuum.

VARIANTS OF CEPHALIC SEGMENTATION

Seventeen patterns of head segmentation may be characterized. In each case, the specimens have a discrete, triangular rostral; a middorsal suture extends from the tip of the rostral to divide the nasal and prefrontal shields of the two sides (in *C. williamsi* the rostral contacts the prefrontals). Also, the enlarged shields of the dorsum of the head extend to the back of the second or third body annulus. In all but one pattern, the temporal region is subdivided. The lower jaw generally is segmented into a median mental, two infralabials, a pair of slightly enlarged malars, and two (one in ZMU 22367 with Pattern XVI) rows of postgenials.

The 16 patterns can be divided into three groups (fig. 5): (1) Specimens of Pattern I have a discrete pair of nasals, prefrontals, frontals, parietals, and occipitals, but no median zygous shield. There are three supralabials. (2)

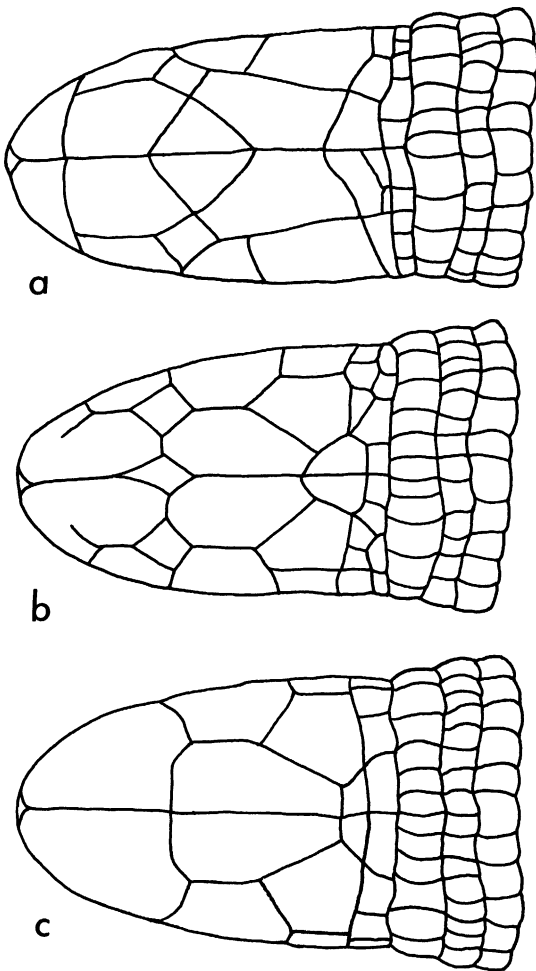


Fig. 5. *Cynisca*. Diagram to illustrate the characteristic components of the three major divisions of head segmentation patterns. **a.** Patterns characterized by the numerous discrete segments covering the entire dorsal surface of the head, by having three supralabials, and by the absence of an azygous median segment. **b.** Patterns characterized by variable fusion of the anteriormost segments of the dorsal surface of the head (region previously occupied by the first preocular supralabial, the nasal, and the prefrontal) and by the presence of an azygous median segment. The posterior segments show the beginnings of major fusions, as indicated by the elongated frontal-parietal segment. All but one form (Pattern VI) have three supralabials. **c.** Patterns characterized by the major fusion of the dorsal segments of the head. The anteriormost compound shield occupies the region previously occupied by the preocular supralabials, the nasal, the prefrontal, and perhaps the ocular (it is not clear whether the ocular has fused to the first supralabial or the second), by

Specimens of Patterns II–VII always have a median azygous shield, as well as discrete oculars. Parietals occur in all specimens, except those of Pattern VI. The rostral is posteriorly flanked by the nasals, which keep it from contacting the prefrontals. There are generally three, rarely two (Patterns VI and VII), supralabials. The unique specimen of Pattern XVII always shows a median azygous shield as well as discrete oculars and parietals. Its rostral is in broad contact with the prefrontals and it has three supralabials. (3) Specimens of Patterns VIII–XVI lack a median azygous shield; they have two supralabials and nasals that are fused with various anterior shields; large, paired shields extend posteriorly over the dorsal aspect of the head to the first two or three body annuli.

Pattern I (*C. kraussi*; cf. fig. 23): The dorsal surface of the head is subdivided into many discrete shields, including three supralabials, a preocular, and an ocular on each side, and paired nasals, prefrontals, frontals, parietals, and occipitals along the midline. There are no discrete supraoculars or postoculars. The large parietals are in broad contact with the oculars. Each temporal region is covered with a single large shield that includes the post-supralabial and contacts the parietals. The postmental is usually discrete.

Pattern II (*C. krausii*; cf. fig. 23): Segmentation is the same as in Pattern I, except that a small azygous shield is intercalated at the junction between the prefrontals and the frontals.

Pattern III (*C. leucura*; cf. fig. 25): The dorsal surface of the head is subdivided into many discrete shields, including three supralabials, a preocular, an ocular, a supraocular, a postocular, several temporals on each side, paired nasoprefrontals (in which the nostrils lie), frontals, parietals, and small occipitals on the midline. The azygous shield is large, but there are no discrete nasals, these being continuous with the first supralabials and prefrontals. The postmental is usually discrete.

Pattern IV (*C. rouxae*; cf. fig. 31): This pattern is similar to the preceding, in that the

←

having only two supralabials and by the absence of an azygous median segment.

dorsal surface is subdivided into many discrete shields, but like Patterns I and II, Pattern IV retains discrete nasals. Specimens lack both a supraocular and a postmental.

Pattern V (*C. muelleri*; cf. fig. 28): The arrangement resembles Pattern IV, but differs from it in having the nasal fused with the first supralabial, preocular, and prefrontal. The second and third supralabials are discrete, and the third is large. There are no discrete preoculars, supraoculars, or postmentals. The parietal and postocular (as well as some temporals) are expressed as a single large shield of irregular shape.

Pattern VI (*C. leonina*; cf. fig. 24): Although Pattern VI is similar to Pattern V, it has only one preocular supralabial. The first supralabial is fused with the nasal and the prefrontal. The frontal-parietal contacts the ocular. An enormous temporal-parietal may contact the dorsal midline between the frontal-parietal and the occipital. The lower jaw sometimes shows longitudinally enlarged postgenial shields that reach from the first postgenial row (which here contacts the mental) into the second.

Pattern VII (*C. oligopholis*; cf. fig. 30): Similar to Pattern VI in having two supralabials and no postmental. Also, the first supralabial is fused with the nasal and the prefrontal. Specimens differ from Pattern VI in that the frontal-parietal-occipital extends as a long, narrow, fused shield to the anterior edge of the first dorsal half-annulus. The second supralabial and the first postsupralabial (=temporal) each contact these enlarged medial shields because they have fused with all postocular and temporal shields.

Pattern VIII (*C. gansi*; cf. fig. 18): No azygous shield, but two supralabials and an enlarged postsupralabial are present. The first supralabial is fused with the nasal and the prefrontal. The second supralabial may have fused with the ocular as this is no longer discrete. The frontals are discrete, and enormous parietals contact the dorsal edge of the second supralabials and postsupralabials. The postmental is absent, but an enlarged medial element is present in the first postgenial row.

Pattern IX (*C. nigeriensis*; cf. fig. 29): Similar to Pattern VIII, except that the frontals are larger and extend posteriorly, and the parietals are smaller, include the temporals, and

may include the occipitals. The postmental is absent.

Pattern X (*C. feae*; cf. fig. 17): Similar to Pattern IX, in that the eyes lie deep to the second supralabial. It differs from this by fusion of frontal-parietal-occipital; this compound shield extends posteriorly to the anterior edge of the first dorsal half-annulus. There is a large temporal on each side dorsal to the postsupralabials; however, neither an enlarged postmental nor a discrete postgenial are present.

Pattern XI (*C. haughi*; cf. fig. 19): Similar to Pattern X in the arrangement of the anterior fused shields. It differs in that the eyes are seen beneath the suture between the first and second supralabials and that discrete frontals, parietals, postsupralabials, and temporals are present.

Pattern XII (*C. liberiensis*; cf. fig. 27): Similar to Pattern XI in possessing discrete postsupralabials and temporals. It differs in that the oculars are discrete and the frontal-parietals fused to each other.

Pattern XIII (*C. bifrontalis*; cf. fig. 16): Similar to Pattern XII in possessing discrete occipitals and oculars. It differs in having frontals and parietals discrete, in that the occipitals are small (or fused azygously) and the parietals are larger than the frontals.

Pattern XIV (*C. kigomensis*; cf. fig. 20): Similar to Pattern VIII in arrangement, but not in proportions of shields; differing in having discrete oculars and lacking an enlarged median postgenial.

Pattern XV (*C. senegalensis*; cf. fig. 33): Similar to Pattern XI in that there are discrete oculars, large frontals (incorporating small parietals), small occipitals, and large temporals. It is unique in possessing a suture from the ocular to the rostral, so that the prefrontals contact the rostral, and the fused first supralabials/nasals are excluded from the midline. The postmental is absent, but an enlarged median postgenial is present in the first row.

Pattern XVI (*C. schaeferi*; cf. fig. 32): The first supralabial is fused with the nasal, prefrontal, and ocular. The discrete frontals and the parietals are subequal, but the occipitals are smaller. There are two supralabials. The mental is followed by two medial azygous shields, the first corresponding to the post-

TABLE 1
Character States for Samples of *Cynisca* from the Eastern Part of the Range, Gabon to Cameroon
 Figures in parentheses (after ranges) represent mean values

Pattern:	XI	XIII	III	XVI
Species:	<i>haughi</i>	<i>bifrontalis</i>	<i>leucura</i>	<i>schaeferi</i>
Number of specimens:	1	1	3	3
Ranges:				
Body annuli	250	240	214–226 (219.6)	241–252 (247.0)
Caudal annuli	27	—	21–22 (21.5)	25–26 (25.5)
Lateral annuli	2	3	2–3 (2.7)	3 (3)
Autotomy site	7	11	7	13
Midbody segments				
Dorsal	8	8	18–20	12
Ventral	8	8	14–16	10
Dimensions (mm):				
Snout–vent	124	131	113–192	169–197
Tail	16	—	16–22	16–22
Frequencies:				
Precloacal pores				
0	0	—	—	2
8	—	—	2	—
10	—	—	1	—
12	—	1	—	1

mental position and the second to an enlarged shield of the postgenials.

Pattern XVII (*C. williamsi*; cf. fig. 34): The dorsal surface of the head is subdivided into many discrete shields, including three supralabials, a preocular, and an ocular on each side and paired nasals, prefrontals, frontals, and parietals along the midline. The rostral is in broad contact with the prefrontals and keeps the nasals from contacting each other. A diamond-shaped azygous shield lies intercalated along the midline between the prefrontals and frontals. There are no discrete supraoculars but an elongate and narrow postocular that fills the top of the temporal region just dorsal to the very large third supralabial. The postmental is discrete.

NONDIMENSIONAL SPECIES

GABON (table 1): Only two specimens are available from Gabon. One has head-segmentation Pattern XI (*C. haughi*), whereas the other has Pattern XIII (*C. bifrontalis*). These individuals also differ in the site of the

autotomy annulus, the number of segments to a midbody annulus, and the diameter and appearance of precloacal pores (which may be sexually determined) and seem to represent two species.

CENTRAL AFRICAN REPUBLIC, CHAD, AND CAMEROON (table 1): Only six specimens (four with data) are available from this vast area. The specimens from the Central African Republic and Chad have head shield Pattern III (*C. leucura*), whereas those from Cameroon have Pattern XVI (*C. schaeferi*). These groupings differ in numbers of body annuli, midbody segments, caudal autotomy site (although not in number of caudal annuli), and other aspects, and seem to represent two species.

NIGERIA (table 2): The 75 specimens from Nigeria include four head-segmentation groups, respectively, with Patterns III, VIII, IX, and XIV.

Specimens (N = 52) with Pattern III (*C. leucura*) derive mainly from along central Nigerian rivers. Most individuals have between 220 and 235 body annuli, with counts often

TABLE 2
Character States for Samples of *Cynisca* from Nigeria

Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Pattern:	III	VIII	IX	XIV
Species:	<i>leucura</i>	<i>gansi</i>	<i>nigeriensis</i>	<i>kigomensis</i>
Number of specimens:	52	6	15	2
Ranges:				
Body annuli	211–235 (225.6)	228–235 (232.5)	225–242 (231.6)	256–258 (257.0)
Caudal annuli	23–26 (23.8)	21–22 (21.5)	20–22 (21)	20 (20)
Lateral annuli	2–4 (3.1)	3–4 (3.8)	3–4 (3.2)	3–4 (3.5)
Midbody segments				
Dorsal	15–20	12	9–10	13–14
Ventral	12–14	10	8–9	12–14
Dimensions (mm):				
Snout–vent	84–215	115–140	99–153	159
Tail	10–27	14–16	10–18	15–17
Frequencies:				
Autotomy site				
5	1 (1.9)	—	2 (13.3)	—
6	13 (25.0)	—	11 (73.3)	—
7	32 (61.5)	4 (66.7)	2 (13.3)	1
8	6 (11.5)	2 (33.3)	—	1
Precloacal pores				
0	—	4 (66.7)	10 (66.7)	—
7	—	—	—	1
8	18 (35.3)	—	—	1
9	11 (21.6)	—	—	—
10	22 (43.1)	2 (33.3)	5 (33.3)	—
12	—	—	—	1

differing among specimens from neighboring localities. Numbers of midbody segments range widely (14–20/11–14). As there are no sharp discontinuities, all of the specimens seem to represent a single species.

All other specimens examined from Nigeria represent a second group, sharing major fusion of the anterior head shields (nasals, first and second preocular supralabials, preoculars, and prefrontals); a supraocular and an azygous shield are absent. The head is demarcated from the neck by a restriction which is covered with irregular segments. The number and expression of precloacal pores vary sexually. There are fewer segments per midbody annulus, and the absolute size and relative tail length are lower (fig. 6). This second group contains three distinct forms.

1. Head-segmentation group IX (*C. nigeriensis*; N = 15) derives from localities close to those from which specimens with Pattern III derived. The head segmentation of this form varies. Three specimens (AMNH 102418, 102422, and CG 3984) have only a single occipital, whereas three other specimens (AMNH 102415, 102417, and CG 3982) lack occipitals; one specimen (AMNH 102420) has point contact between the frontals and occipitals. These specimens have slightly higher numbers of body annuli and lower numbers of caudal annuli than those with Pattern III.

2. Head-segmentation group VIII (*C. gansi*; N = 6) shows variability among the head segments, including lack of one (AMNH 102409) or both (AMNH 102410) of the su-

tures enclosing the frontals. The meristic data for specimens characterized by Patterns VIII and IX overlap in every category except the number of segments to a midbody annulus. The head-segmentation patterns differ mainly in the sizes of the frontal and parietal shields, and the occurrence of a postmental.

3. Head segmentation group XIV (*C. kigomensis*; N = 2) differs from the two preceding forms in having a higher number of body annuli and midbody segments, and fewer precloacal pores.

The species of the first group is clearly distinct from the second. Whereas the three forms of the second group are distinct from each other, they originate from regions some distance apart. They are not nondimensional; additional specimens from intermediate sites are required in order to determine whether the two individuals represent closely related species or races of a single one. For the present, the three forms of the second group are also treated as distinct species.

BENIN (table 3): Specimens from Benin (formerly Dahomey) (N = 25), mainly from eight localities in the southern half of the country, have head-segmentation Pattern III (*C. leucura*). The specimen from the northern site of Soubroukou (UGL 27) differs from the others in having more annuli and midbody segments. However, the sample size is too small to indicate whether these are significant regional variations and the sample is treated as a single species.

TOGO (table 3): The 26 specimens from Togo were collected mainly from the central region of the country, and have head-segmentation Pattern III (*C. leucura*). All specimens vary in the segmentation of the lower jaw. Thus, 5 of the 18 specimens from Fazao have a fused mental-postmental (i.e., lack the latter). The number of body annuli ranges from 217 to 238. However, specimens from inland localities have more annuli than do those from the large and more central samples (217–232). The Bassari and Namoundjoga specimens also have more midbody segments than the other specimens from Togo (17–20/12–14 vs. 12–18/10–12). Specimens have 6 to 10 precloacal pores. These differences seem to represent regional variation in a single species.

GHANA (table 4): The large sample from Ghana (N = 267) contains five parapatric,

TABLE 3
Character States for Samples of Pattern III *Cynisca* (*leucura*) from Benin and Togo

Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Locality: Number of specimens:	Benin 25	Togo 26
Ranges:		
Body annuli	205–229 (214.2)	217–238 (224.1)
Caudal annuli	20–28 (26.1)	24–31 (27.7)
Lateral annuli	2–4 (2.90)	2–4 (2.96)
Midbody segments		
Dorsal	14–16	13–19
Ventral	10–12	10–14
Dimensions (mm):		
Snout–vent	90–144	155–243
Tail	21–33	26–31
Frequencies:		
Autotomy site		
6	5 (21.0)	4 (15.4)
7	10 (41.7)	9 (34.6)
8	8 (33.3)	13 (50)
9	1 (4.2)	—
Precloacal pores		
6	—	1 (3.9)
7	—	1 (3.9)
8	7 (28)	20 (76.9)
9	4 (16)	1 (3.9)
10	14 (56)	3 (11.5)

but not clearly sympatric head-segmentation subgroups I, II, III, V, and XVII, respectively. [KM specimens from Christians Village include individual members with all but one (Pattern I) of the five head-segmentation patterns; however, a small recent (CAS) collection from this site only includes specimens with head-segmentation Pattern III.]

Most of the Ghanaian specimens (N = 212) have head-segmentation Pattern III (*C. leucura*). Twenty-two specimens from several localities have Pattern III head segmentation, but lack postmentals. One specimen (CG 4771) from Legon has a wedge-shaped mental so that its first infralabials have point contact with each other. The numbers of body annuli range widely (205–252) and generally

TABLE 4
Character States for Samples of *Cynisca* from Ghana

Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Pattern:	I	II	III	V	XVII
Species:	<i>kraussi</i>	<i>kraussi</i>	<i>leucura</i>	<i>muelleri</i>	<i>williamsi</i>
Number of specimens:	30	8	212	16	1
Ranges:					
Body annuli	208–226 (217.2)	211–226 (218.0)	205–252 (217.1)	220–237 (229.0)	218
Caudal annuli	17–19 (18.2)	16–19 (17.6)	[22] 25–29 (26.7)	22–26 (23.8)	14
Lateral annuli	3–4 (3.3)	2–3 (2.9)	2–4 (3.3)	3–5 (3.7)	3
Midbody segments					
Dorsal	14–18	14–18	12–20	12–15	16
Ventral	12–16	12–16	9–14	10–12	12–13
Dimensions (mm):					
Snout–vent	74–160	80–122	74–258	124–156	161
Tail	7.5–17	11–14.5	7.5–35	8.0–18	10.5
Frequencies:					
Autotomy site					
5	6	6	—	—	None
6	19	4	11	1	
7	1	3	125	15	
8	—	—	71	—	
9	—	—	2	—	
Precloacal pores					
6	—	—	1	—	1
8	29	8	12	—	—
9	1	—	11	—	—
10	—	—	170	5	—
11	—	—	15	1	—
12	—	—	3	10	—

are higher among the northern specimens. However, extreme counts are found in three specimens from near the coast.

Thirty-eight specimens have head-segmentation Patterns I (N = 30) and II (N = 8), which differ from each other mainly in the occurrence of a small, azygous median frontal, but otherwise show no significant meristic differences. Both patterns are included in the single large sample from Banda Hills; however, the recently collected northern samples only include Pattern I. All specimens share a curious (and previously unreported) segmentation of their spatulate, depressed caudal tips (that have some internal ossification). The specimens appear to

represent a single species, referred to below as I/II (*C. kraussi*).

Sixteen specimens have head-segmentation Pattern V (*C. muelleri*) and show little variation of meristic data. This population differs from that with Pattern I/II by having 10 to 12 (rather than 8) precloacal pores, more body annuli, and a relatively shorter tail with a conical caudal tip. This is a distinct species.

One specimen has the unique head-segmentation Pattern XVII (*C. williamsi*) and otherwise differs from the other Ghanaian species in lacking caudal autotomy. It has a characteristic caudal tip terminating in an oblique, posteriorly facing shield, fringed with a ring of projecting rounded cones (fig. 37).

TABLE 5

Character States for Samples of *Cynisca* from Burkina Faso and the Ivory Coast

Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Region:	Burkina Faso	Burkina Faso	Ivory Coast	Ivory Coast
Locality:	Ouagadougou	Bobo Dioulasso		
Pattern:	III	III	III	IV
Species:	<i>leucura</i>	<i>leucura</i>	<i>leucura</i>	<i>rouxae</i>
Number of specimens:	4	1	5	3
Ranges:				
Body annuli	211–228 (216)	203	215–227 (221.4)	197–201 (198.7)
Caudal annuli	23–24 (23.67)	20	24–28 (26)	22 (22)
Lateral annuli	4 (4.0)	4	3–4 (3.5)	2–3 (2.67)
Midbody segments				
Dorsal	18–20	18	19–23	14–15
Ventral	14	12	14–16	12–14
Dimensions (mm):				
Snout–vent	127–199	172	145–225	79–123
Tail	16.5–27	21	20.5–25	11.5
Frequencies:				
Autotomy site				
6	1 (33.3)	1	1 (20)	—
7	1 (33.3)	—	4 (80)	3 (100)
8	1 (33.3)	—	—	—
Precloacal pores				
0	—	1	—	—
6	—	—	—	3 (100)
9	1 (33.3)	—	1 (20)	—
10	2 (66.7)	—	—	—
12	—	—	3 (60)	—
13	—	—	1 (20)	—

Whereas the underlying calcified plate (figs. 38, 39) is expressed more faintly in *C. kraussi* as well (and the latter species has some variation in head segmentation), the remaining aspects make it clear that this is more than an individual variant.

Although Pattern groups I/II, III, V, and XVII are never sympatric (see Banda Hills, under incertae sedis), they differ in six characters and seem to represent distinct species.

BURKINA FASO (table 5): There are four specimens of Pattern III (*C. leucura*) from Burkina Faso (Upper Volta), of which one is damaged. Except for the specimen from the geographically extreme locality of Bobo Dioulasso, which lacks precloacal pores, and has only 203 body annuli and 20 caudal an-

nuli, there is little variation and the sample seems to represent one species.

IVORY COAST (table 5): Seven of the eight specimens available from Ivory Coast derive from the coast. Three specimens have head-segmentation Pattern IV (*C. rouxae*), whereas the specimens from Assini have head-segmentation Pattern III (*C. leucura*). These two groups differ in numbers of body annuli, precloacal pores, midbody segments, and in the location of the autotomy annulus; although the sample sizes are small, these differences seem significant. On the other hand, the relative tail length of the one intact specimen with head-segmentation Pattern IV does not differ from those of specimens with Pattern III (fig. 6), suggesting that the form may rep-

TABLE 6

Character States for Samples of *Cynisca* from Guinea, Liberia, and "Sierra Leone"

(The pattern V specimen from the latter site is omitted.) Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Locality:	Guinea	Liberia	Sierra Leone
Pattern:	XII	XII	XII
Species:	<i>liberiensis</i>	<i>liberiensis</i>	<i>liberiensis</i>
Number of specimens:	3	15	1
Ranges:			
Body annuli	248–260 (253.6)	217–262 (237.2)	254
Caudal annuli	22–24 (23)	21–24 (22.4)	24
Lateral annuli	3–4 (3.3)	2–4 (3.2)	3
Midbody segments			
Dorsal	14–15	12–15	16
Ventral	10	8–10	10
Dimensions (mm):			
Snout–vent	117–129	86–158	144
Tail	15	9–18	18
Frequencies:			
Autotomy site			
6	—	3 (20)	—
7	—	8 (53.3)	—
8	3 (100)	3 (20)	?
9	—	1 (6.7)	—
Precloacal pores			
0	1 (50)	6 (40)	1
6	—	2 (13.3)	—
8	1 (50)	7 (46.7)	—

resent a geographical variant of the latter in spite of the substantial difference in morphology. Only one of the Pattern III specimens from this region has a postmental (MHNP 1885.696). The specimens with head-segmentation Patterns III and IV are best treated as different species.

LIBERIA AND INLAND GUINEA (table 6): Fifteen specimens have been reported from Liberia, but only five have precise locality data. All specimens have head-segmentation Pattern XII (*C. liberiensis*). The same pattern is seen in three specimens from southeastern Guinea. The number of precloacal pores (0,

6, or 8) seems to be sexually dimorphic, because many adults lack them. The number of body annuli varies widely (from 217 to 262). No other characteristics are associated with the specimens having extremely high and low annular counts; thus they probably represent a single species that is variable in this character.

SIERRA LEONE (table 6): Two specimens lack locality data other than "Sierra Leone." This is also the country from which there is the old record for the destroyed holotype of *C. degrayi* (see below). All are old records, presumably dating back to a period when Sierra Leone was a major center for British activity extending along the West African coast. One has head-segmentation Pattern V (*C. muelleri*), whereas the other has Pattern XII (*C. liberiensis*). These two forms differ markedly in numbers of body annuli and precloacal pores, and are clearly distinct. All other specimens with head-segmentation Pattern V come from eastern Ghana; this suggests that this old specimen (representing the holotype of *C. leucura*) actually may have been collected in Ghana as well. The specimen with Pattern XII, however, may have come from Sierra Leone.

COASTAL GUINEA (table 7): Nine specimens have been reported from coastal Guinea. Six of these have head-segmentation Pattern VI (*C. leonina*) and share coloration, shorter tails, and lower autotomy values, and other meristic characteristics. One specimen from the "coast of Guinea" and two specimens lacking further locality data have head-segmentation Pattern III (*C. leucura*). These are old specimens, dating to a period when "Guinea" was a generic designation for the West African coast. Furthermore, the closest documented specimens with Pattern III are those from the eastern Ivory Coast. Finally, the specimens in question are typical of members of this form from the region between Benin and Ghana. Hence, only Pattern VI now occurs in Guinea.

GUINEA BISSAU (table 7): Only three localities are represented in the sample from Guinea Bissau (N = 33). Eight specimens have head-segmentation Pattern VII (*C. oligopholis*); all others have Pattern X (*C. feae*). The two groups differ in numbers of body annuli, position of the autotomy annulus, midbody

TABLE 7

Character States for Samples of *Cynisca* from Coastal Guinea, Guinea Bissau, Sénégal, and Gambia
 Figures in parentheses (after or below ranges) represent mean values; figures in parentheses after frequencies represent percentiles

Locality:	Coastal Guinea VI	Guinea Bissau X	Guinea Bissau VII	Sénégal X	Sénégal XV	Gambia X
Pattern:						
Species:	<i>leonina</i>	<i>feae</i>	<i>oligopholis</i>	<i>feae</i>	<i>senegalensis</i>	<i>feae</i>
Number of specimens:	6	25	8	4	1	2
Ranges:						
Body annuli	233–243 (236.7)	244–265 (256.6)	224–240 (232.0)	251–258 (255.3)	278	251–256 (253.5)
Caudal annuli	18–19 (18.3)	21–25 (22.4)	23–25 (24.6)	20–23 (21.6)	23	22–23 (22.5)
Lateral annuli	2–3 (2.8)	2–3 (2.6)	2–3 (2.1)	3 (3.0)	4	3 (3.0)
Midbody segments						
Dorsal	14	12–14	10	12–14	14	14–15
Ventral	10	9x	8	9x	7–9x	9x
Dimensions (mm):						
Snout–vent	118–150	104–162	67–145	145–159	138	149–168
Tail	12–14	10.5–18	12–19	14–17	14.5	16–17
Frequencies:						
Autotomy site						
6	5 (83.3)	—	—	2 (50)	—	2 (50)
7	1 (16.7)	11 (44)	—	2 (50)	1 (100)	2 (50)
8	—	14 (56)	—	—	—	—
10	—	—	2 (33.3)	—	—	—
11	—	—	2 (33.3)	—	—	—
12	—	—	1 (16.7)	—	—	—
13	—	—	1 (16.7)	—	—	—
Precloacal pores						
6	—	25 (100)	—	2 (50)	—	4 (100)
7	1 (16.7)	—	—	2 (50)	1 (100)	—
8	5 (83.3)	—	1 (12.5)	—	—	—
9	—	—	1 (12.5)	—	—	—
10	—	—	5 (62.5)	—	—	—
11	—	—	1 (12.5)	—	—	—

segments, and precloacal pores. Pattern X is also characterized by widened, azygous, medial ventral segments. The differences are sufficient to support the concept that the two species are distinct.

SÉNÉGAL (table 7): Only five specimens are available from Sénégal. One of these has the remarkable head-segmentation Pattern XV (*C. senegalensis*). All other specimens have Pattern X (*C. feae*). The two groups differ markedly in numbers of body annuli, precloacal pores, and perhaps other aspects as

well. Both have azygous, median ventral segments. Although the sample size is small, the differences are sufficient to support the recognition of two species.

GAMBIA (table 7): Two specimens from Gambia have head-segmentation Pattern X (*C. feae*) and pertain to a single species.

SEPARATION OF THE SPECIES

ANALYSIS OF PATTERN III: Large numbers of specimens with head-segmentation Pat-

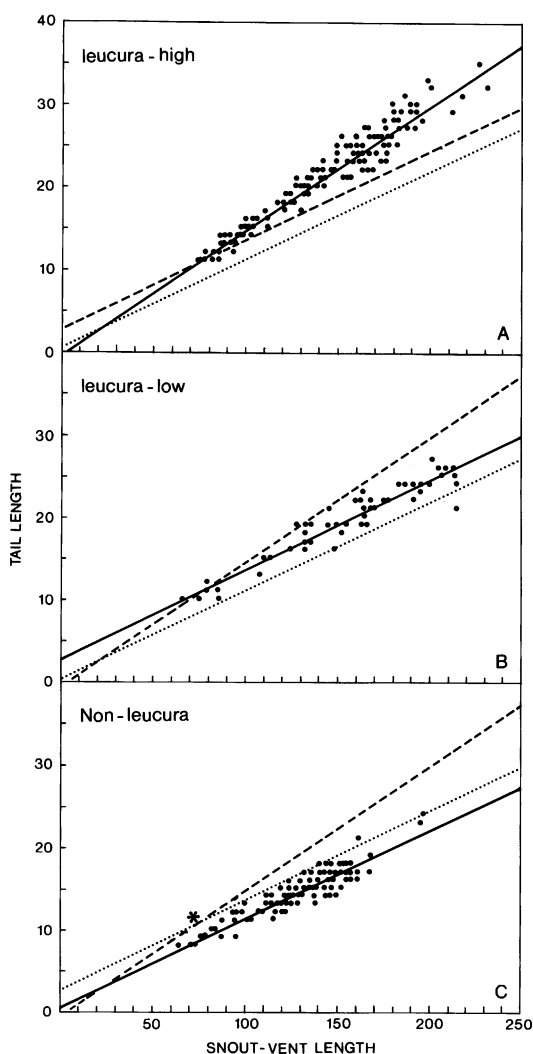


Fig. 6. *Cynisca*. Scatter plot of tail length versus snout-vent length of all specimens with intact tails. The solid lines represent regression lines for the points shown in the particular plot, whereas the dotted and dashed lines give the lines for the other two. **A.** Plot for long-tailed specimens of *C. leucura*, respectively from Benin, Togo, and southern Ghana. The equation for the regression line is $y = -0.4045 + 0.15183x$. **B.** Plot for short-tailed specimens of *C. leucura*, respectively from Nigeria and east and northern Ghana, Burkina Faso, and Ivory Coast. The equation for the regression line is $y = 2.6678 + 0.10930x$. **C.** Plot for specimens of the other species of the genus. Note the star which indicates the position of unique specimen of *C. rouxae*, which has been omitted for calculation of the regression line, the equation for which is $y = 0.4617 + 0.10835x$.

tern III (*C. leucura*) have been recorded from Nigeria (52), Benin (25), Togo (26), and Ghana (213). These have been shown to differ clearly from sympatric local populations displaying the various other head-shield patterns. Besides the characteristics adduced above, they differ in being larger and in having relatively longer tails (fig. 6). Other specimens with this pattern are known from the Central African Republic, Chad, Burkina Faso, the Ivory Coast, and perhaps Guinea (questionable records). The overall assemblage is here treated as a single, wide-ranging species that may ultimately prove to be polytypic.

SAMPLES FROM THE SOUTHEASTERN PORTION OF THE RANGE: The two specimens found at widely separated sites in Gabon, Pattern XI (*C. haughi*) and Pattern XIII (*C. bifrontalis*), have been found (see under Nondimensional Species) sufficiently different to warrant their recognition as distinct species.

The sample geographically closest to Gabon is that from coastal Cameroon (Pattern XVI, *C. schaeferi*). The Cameroon specimens clearly are similar to the former in the pattern of their head segmentation and in their numbers of body annuli. However, other characters separate them. Also, the counts of the Cameroon specimens cluster tightly. This suggests that the three samples represent species distinct from each other and from the roughly sympatric Pattern III (*C. leucura*).

THE FORMS IN NIGERIA: The analysis of Nigerian records (see Nondimensional Species section) indicates that Patterns VIII (*C. gansi*), IX (*C. nigeriensis*), and XIV (*C. kigomensis*) are distinct from Pattern III (*C. leucura*). None of the subsequent analyses suggests that this decision is inappropriate.

THE FORMS IN GHANA AND IVORY COAST: The analysis of Ghanaian records (see Nondimensional Species section) indicates that specimens with Pattern III (*C. leucura*) obviously are different from Pattern groups I/II (*C. kraussi*), V (*C. muelleri*), and XVII (*C. williamsi*). The discussion of the situation in the Ivory Coast suggests species status for Pattern IV (*C. rouxae*), relative to the allopatric Pattern III (*C. leucura*). Hence, all of these forms are treated as species.

THE FORMS FROM NORTHWEST OF GHANA: All specimens with Pattern XII (*C. liberien-*

sis) differ from those with Pattern III (*C. leucura*) and other Ghanaian forms primarily by having major differences in head segmentation, as well as somewhat shorter tails, more body annuli, and dimorphism in the appearance of precloacal pores. They are considered here to represent species.

The nondimensional analysis of Guinean specimens indicates that specimens with head-segmentation Pattern VI (*C. leonina*) differ markedly from those with head-segmentation Pattern III (*C. leucura*) and by implication from those with Pattern V (*C. muelleri*; see Ghana). Similarly, we have indication that Patterns VII (*C. oligopholis*), X (*C. feae*), XIV (*C. kigomensis*), and XV (*C. senegalensis*) are each distinct species. There is no evidence to suggest that any of them are sampled from populations of any of the forms previously recognized.

OVERVIEW: The preceding analysis leaves us with a series of 16 well-defined species, one of which (*C. leucura*) may be polytypic. This single grouping, characterized by head-segmentation Pattern III, represents a species (*C. leucura*) that ranges from the Central African Republic and Chad to Ivory Coast with relatively little variability. However, at this portion of the periphery of its range, within Ivory Coast and Ghana, the variation of the species increases markedly, as demonstrated by the specimens from Labadi and Kete Krachi. Also, this region contains three superficially similar, but clearly distinct, "sibling" species (and the curious *C. williamsi*).

In most cases, the decision about specific status has had to be made in the absence of evidence for sympatry or even parapatry. However, I note the great stability of head-shield characteristics in amphisbaenians generally. There remains the possibility that some of the samples, for instance of Pattern IV (*C. rouxae*), here considered to represent separate species, ultimately will prove to be extremes of poorly sampled distributions. However, the magnitude of the morphological gaps between the samples and particularly the observation that the multiple aspects of major head-shield characteristics are stable within the available samples, suggest that retention of these groupings as independent species represents a conservative decision. Also, the situation at the western part of the

range suggests benefit to further analysis of the species pattern by karyological and electrophoretic methods.

ATTRIBUTION OF NAMES

The following correlation matches the available specific names to cephalic patterns.

Date Described	Species	Pattern
1839	<i>C. leucura</i>	III
1878	<i>C. liberiensis</i>	XII
1878	<i>C. kraussi</i>	I/II
1881	<i>C. muelleri</i>	V
1885	<i>C. leonina</i>	VI
1904	<i>C. haughi</i>	XI
1906	<i>C. petersi</i>	
	<i>C. leucura</i> Synonym	III
1906	<i>C. oligopholis</i>	VII
1906	<i>C. bifrontalis</i>	XIII
1906	<i>C. feae</i>	X
1912	<i>C. schaeferi</i>	XVI
1941	<i>C. degrysi</i>	??
1943	<i>C. lamottei</i>	
	<i>C. liberiensis</i> Synonym	XII
1968	<i>C. gansi</i>	VIII
1968	<i>C. nigeriensis</i>	IX
1968	<i>C. kigomensis</i>	XIV
1979	<i>C. rouxae</i>	IV
	n. sp. <i>C. senegalensis</i>	XV
	n. sp. <i>C. williamsi</i>	XVII

THE GENUS *CYNISCA* GRAY

Cynisca Gray, 1844: 71. Type species: *Amphisbaena leucura* Duméril and Bibron, by monotypy.

Ophioproctes Boulenger, 1878: 300. Type species: *Ophioproctes liberiensis*, by monotypy.

Placogaster Boulenger, 1906: 203. Type species: *Placogaster feae*, by monotypy.

STATUS

In 1947, Laurent reviewed the generic status of African amphisbaenians. Loveridge (1941) had placed all African round-snouted amphisbaenians, except the species *feae* and *degrysi*, into the genus *Amphisbaena*; for the two latter species Loveridge resurrected the genus *Placogaster* (Boulenger, 1906). Laurent noted that *Placogaster* was presumably polyphyletic because the two species had their closest affinity to *Cynisca oligopholis* and to

C. leonina, respectively. He retained only *dolichomenta*, *phylofiniens*, *quadrifrons*, and *violacea* in the South American *Amphisbaena* and placed the East African species into *Chirindia*. He further suggested that the West African round-snouted amphisbaenians differed from his *Amphisbaena* and *Chirindia*. Consequently, he assigned all West African species to *Cynisca*, an appropriate decision followed by Vanzolini (1951a, 1951b) and here.

Vanzolini (1951a, 1951b) extended the generic separation of African and American "*Amphisbaena*," by assigning *phylofiniens* to *Loveridgea* and *dolichomenta* and *quadrifrons* to a genus now known as *Zygaspis*. This left *violacea* as the only African member of the South American genus *Amphisbaena*; it was placed into the genus *Zygaspis* by Broadley and Gans (1978).

All species of amphisbaenians included here share a set of several characters, and whereas the range of cephalic segmentation is considerable, there are no obvious discontinuities. Consequently, I here maintain the genus *Cynisca*, although its separation from *Zygaspis*, and ultimately from *Chirindia* and *Loveridgea*, obviously needs further attention. Also the species *C. williamsi* is distinct in its rostral arrangement, has the curious caudal modification, and lacks autotomy. I initially considered this sufficient for generic separation; however, I desist from recognizing a new genus, because (1) the caudal modification and its underlying calcification are seen faintly in *C. kraussi* which apparently occurs in a region only some 200 km away and (2) only a single specimen is available which prevents assay of individual and other variation. (For review of the morphological characteristics of the groups, see Vanzolini, 1951a, 1951b; Gans, 1978.)

DIAGNOSIS

Generally small and slender species with the anterior trunk dorsoventrally compressed, rounded at midbody, and vertically ovate posterior to the cloacal region (normally at or posterior to autotomy site).

Head rounded or variably pointed, usually horizontally oval. Rostral always discrete, but (except for *C. williamsi* in which in broad contact with the prefrontals), small, and vis-

ible only as a tiny triangle in dorsal view. All forms with a band of enlarged (and generally paired) dorsal segments extending posteriorly from the snout to incorporate portions of the second or third body annulus. All specimens with one or even two postsupralabials and a zone of variously fused and enlarged segments in the "postocular" region dorsal to these.

A lateral groove, filled with small, intercalated triangular segments, between the first third to half of the body and vent. Dorsal sulcus variably expressed; ventral sulcus, if present, indicated only by alignment of sutures. Median ventral segments generally enlarged. In some species, fused into an azygous medial segmental shield.

Males of all species with precloacal pores; females of some species without pores or even secretion cores. All species (but *C. williamsi*) with a caudal autotomy constriction. Distal tip of original tail usually regularly segmented, occasionally showing modifications, such as a dorsal hump or inclined array of segments.

KEY TO THE SPECIES

1. 4 medium to large-size shields (rostral and 3 supralabials) bordering upper lip. Shields on dorsal surface of the head relatively small, generally paired. (Most specimens with azygous median shield between prefrontals and frontals.) Ventral segments enlarged and paired 2
- 3 medium to large-size shields (rostral and 2 supralabials) bordering the upper lip. Shields on dorsal surface of the head relatively large, generally paired. Median ventral shields paired or azygous 6
2. Supraocular discrete, dorsal to ocular. Prefrontals and nasals fused. Median azygous element. 203–252 body annuli; 12–23 dorsal, 8–16 ventral segments to a midbody annulus. 6–13 precloacal pores in males, none in females; autotomy site at the 5th to 9th caudal annulus *C. leucura*
- No discrete supraocular dorsal to ocular ... 3
3. Lower jaw with discrete postmental. Nasals, prefrontals, oculars, and frontals discrete. Median dorsal azygous shield of variable size or absent 4
- Lower jaw lacking a discrete postmental. A median dorsal azygous element present ... 5
4. Autotomy present, site at 5th to 7th caudal annulus. 16–19 caudal annuli. Distal tip of tail with a spatulate, depressed distal tip

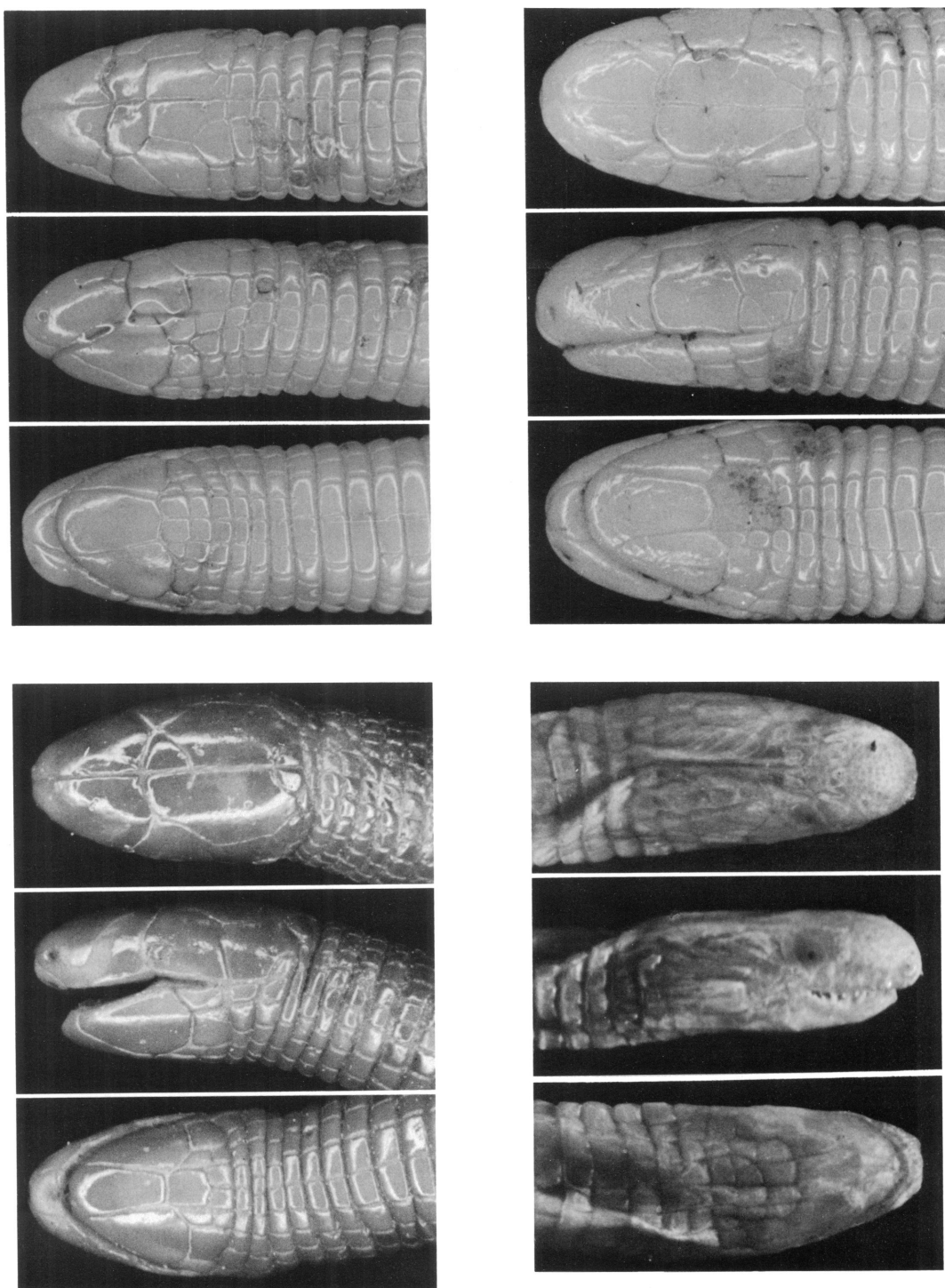


Fig. 7. *Cynisca*. Dorsal, lateral, and ventral views of head and nuchal region. Top left: *C. bifrontalis* (Pattern XIII), MSNG CE28163, holotype, from Omboué, Gabon. Top right: *C. feae* (Pattern X), CZL 1945.76, from Bissau, Guinea Bissau. Bottom left: *C. gansi* (Pattern VIII), AMNH 102409, holotype, from Okoloma Village, Nigeria. Bottom right: *C. haughi* (Pattern XI), MHNP 1901.531, holotype, from Lambaréné, Gabon.

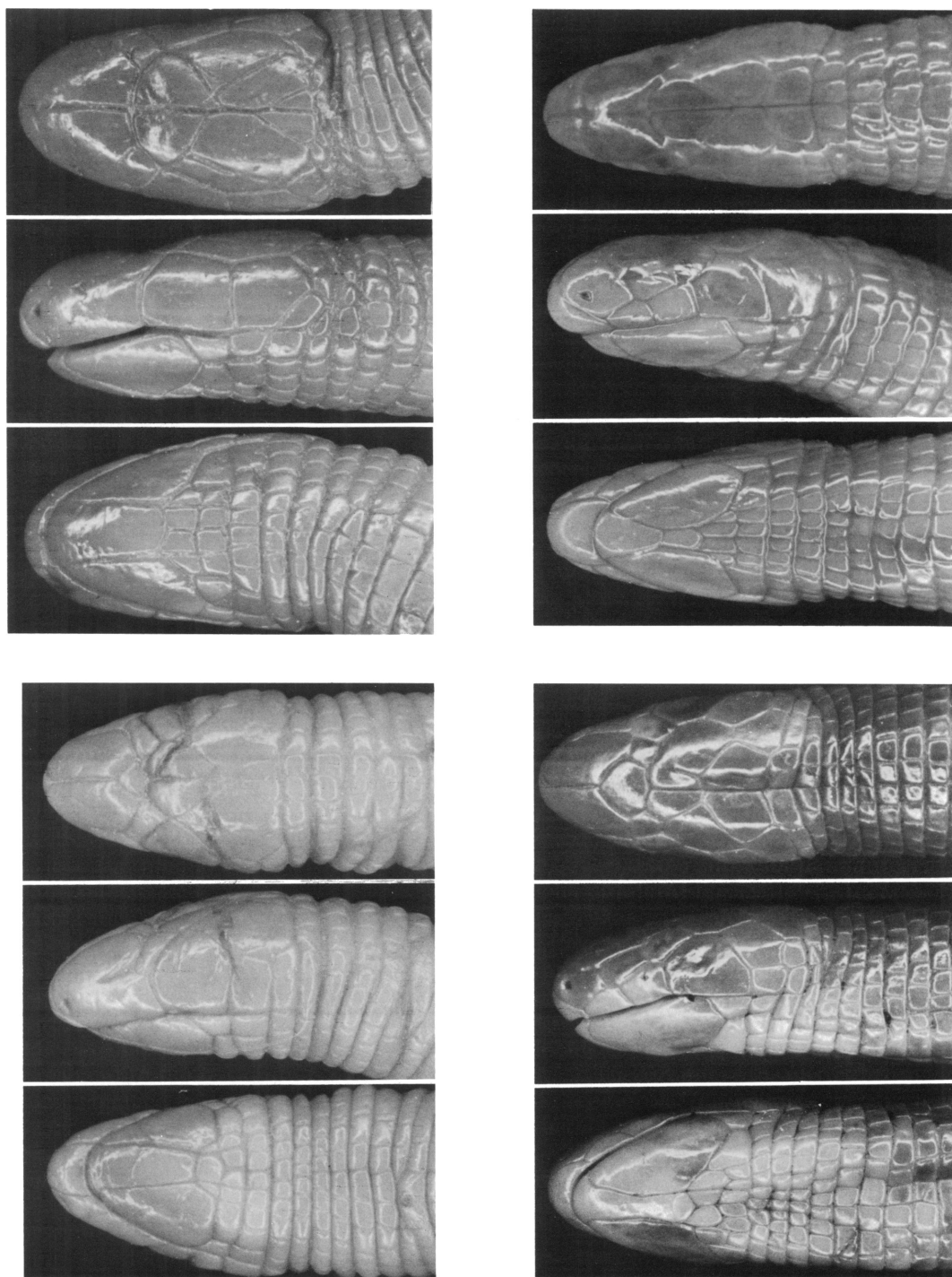


Fig. 8. *Cynisca*. Dorsal, lateral, and ventral views of head and nuchal region. Top left: *C. kigomensis* (Pattern XIV), AMNH 102424, holotype, from Kigom Hills, Nigeria. Top right: *C. kraussi* (Pattern II), BM 1946.1.6.90, from Banda Hills, Ghana. Bottom left: *C. leonina* (Pattern IV), MG 722.94a, Conakry, Guinea. Bottom right: *C. leucura* (Pattern III), RUCA 1460, from Fazao, Togo.

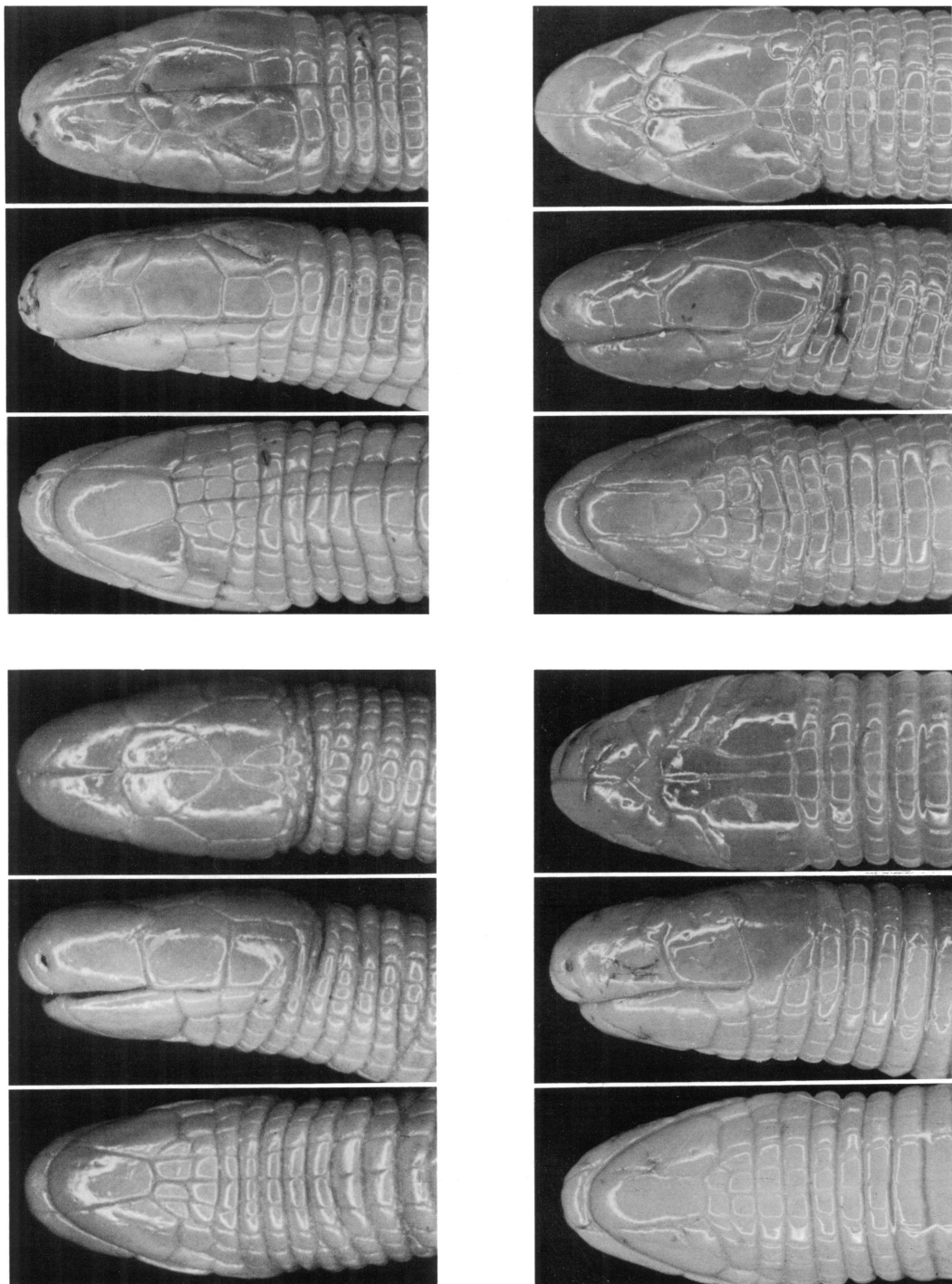


Fig. 9. *Cynisca*. Dorsal, lateral, and ventral views of head and nuchal region. Top left: *C. liberiensis* (Pattern XII), BM 1914.1.27.4, from Sierra Leone. Top right: *C. muelleri* (Pattern V), AMNH 102413, holotype, from Akropong, Ghana. Bottom left: *C. nigeriensis* (Pattern IX), AMNH 102413, holotype, from the vicinity of Takwashara, Nigeria. Bottom right: *C. oligopholis* (Pattern VII), BM 1946.8.2.46, syntype, from the Cassine River district, Guinea Bissau.

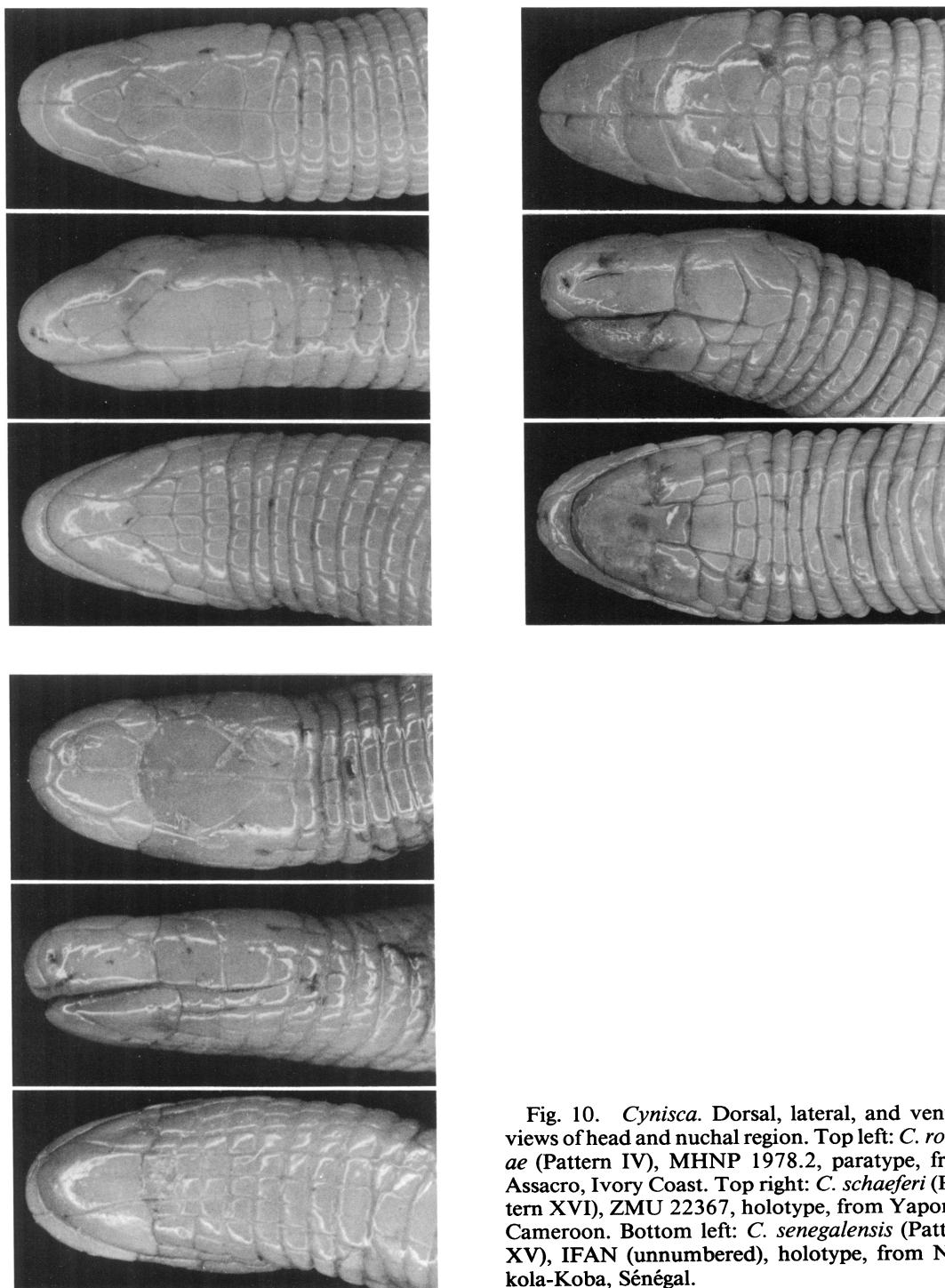


Fig. 10. *Cynisca*. Dorsal, lateral, and ventral views of head and nuchal region. Top left: *C. rouxae* (Pattern IV), MHNP 1978.2, paratype, from Assacro, Ivory Coast. Top right: *C. schaeferi* (Pattern XVI), ZMU 22367, holotype, from Yapoma, Cameroon. Bottom left: *C. senegalensis* (Pattern XV), IFAN (unnumbered), holotype, from Nio-kola-Koba, Sénégal.

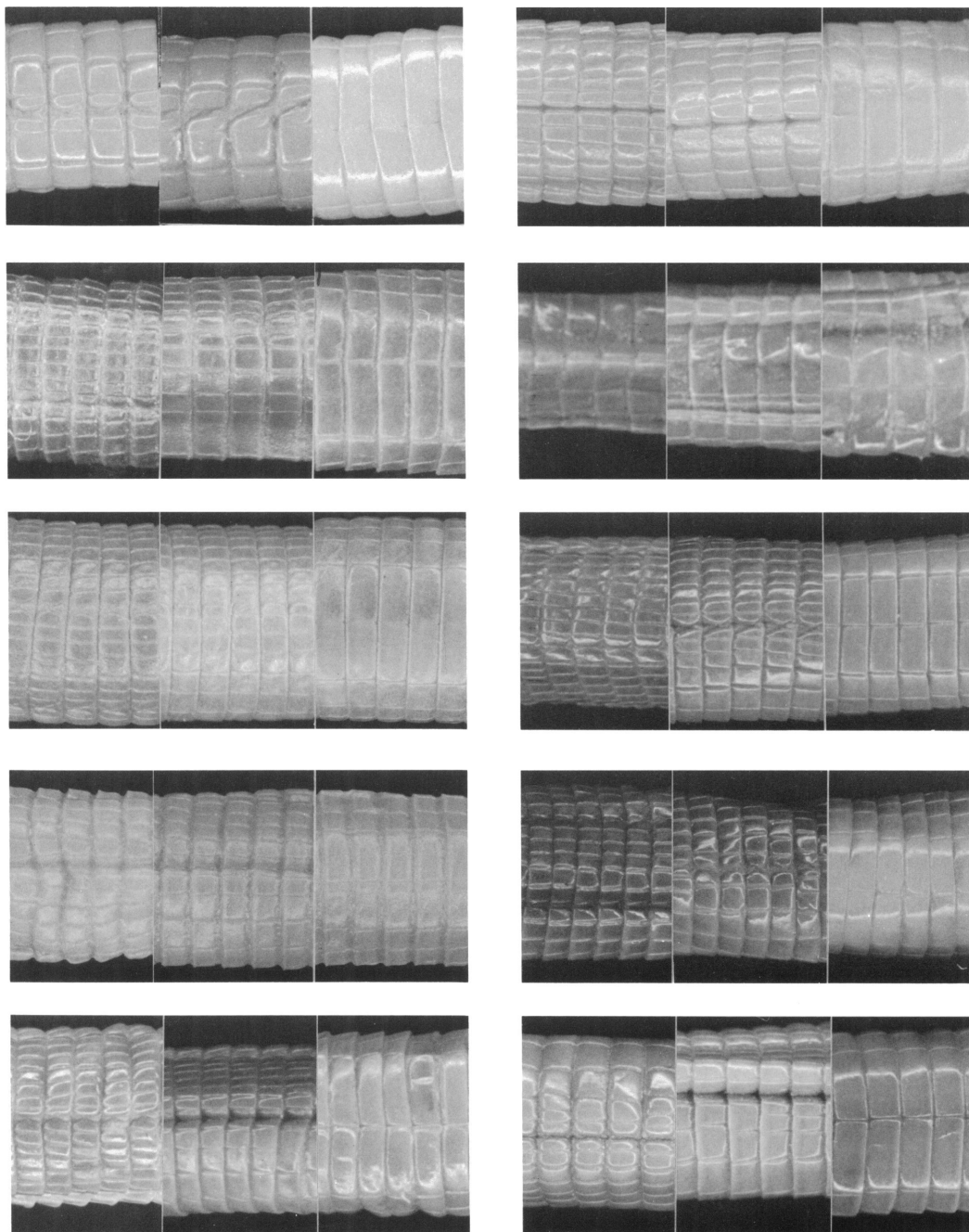


Fig. 11. *Cynisca*. Dorsal, lateral, and ventral views at midbody to show segment arrangement. Top row (left to right): *C. bifrontalis*, MSNG CE28163, holotype, Omboué, Gabon. *C. feae*, CZL 1945.76, from Bissau, Guinea Bissau. (Note that the median ventral segments are azygous.) Second row: *C. gansi*, AMNH 102409, holotype, from Okoloma Village, Nigeria. *C. haughi*, MHNP 1901.531, holotype, from Lambaréné, Gabon. Third row: *C. kigomensis*, AMNH 102424, holotype, from Kigom Hills, Nigeria. *C. kraussi*, BM 1946.1.6.90, from Banda Hills, Ghana. Fourth row: *C. leonina*, MG 722.94b, from Conakry, Guinea. *C. leucura*, RUCA 1460, from Fazao, Togo. Bottom row: *C. liberiensis*, BM 1914.1.27.4, from Sierra Leone. *C. muelleri*, MCZ 55189, from Somanga, Ghana.

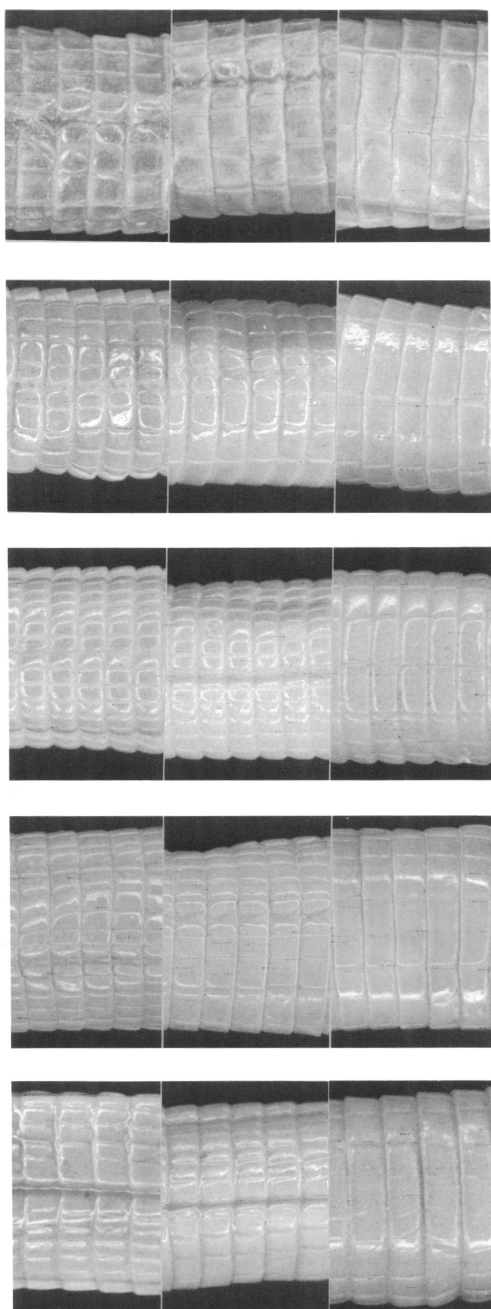


Fig. 12. *Cynisca*. Left to right. Dorsal, lateral, and ventral views at midbody region to show segment arrangement. Top row: *C. nigeriensis*, AMNH 102413, holotype, from the vicinity of Takwashara, Nigeria. Second row: *C. oligopholis*, BM 1946.8.2.46, syntype, from the Cacine River district, Guinea Bissau. Third row: *C. rouxae*, MHN 1978.2, paratype, from Assacro, Ivory Coast. Fourth row: *C. schaeferi*, ZMU 22367, holotype,

- covered dorsally by a rosette of segments (fig. 22). 208–226 body annuli; 14–20 dorsal, 12–16 ventral segments to a midbody annulus. 8 precloacal pores . . . *C. kraussi*
- No autotomy annulus. 14 caudal annuli. Distal tip of tail terminates in an oblique, posteriorly facing shield fringed with a ring of projecting rounded cones (fig. 37). 218 body annuli; 16 dorsal, 12–13 ventral segments to a midbody annulus. 6 precloacal pores . . . *C. williamsi*
 - 5. Nasals, prefrontals, and preoculars fused. Postocular supralabial contacts the parietal. 220–237 body annuli; 11–15 dorsal, 10–13 ventral midbody segments to a midbody annulus. 10–12 precloacal pores; autotomy site at the 6th to 8th caudal annulus . . . *C. muelleri*
 - Nasals, prefrontals, and preoculars discrete. Postocular supralabial contacts the postoculars, but not the parietals. 197–207 body annuli; 14–15 dorsal, 12–14 ventral segments to a midbody annulus. 6 precloacal pores; autotomy site at the 7th caudal annulus . . . *C. rouxae*
 - 6. A median azygous shield between the prefrontals and frontals (frontals and parietals fused) . . . 7
 - All median dorsal shields of the head paired . . . 8
 - 7. Frontals and parietals fused, relatively small; occipitals discrete. Temporals large, contact each other on the dorsal midline (?). 233–243 body annuli, 14 dorsal, 10 ventral segments to a midbody annulus; 7–8 precloacal pores; autotomy site at the 6th to 7th caudal annulus . . . *C. leonina*
 - Frontals, parietals, and occipitals fused into paired, long shields that occupy the midline of the dorsal surface of the head. Enormous temporals (including the first postsupralabials) that do not contact each other on the dorsal midline. 224–240 body annuli; 10 dorsal, 8 ventral segments to a midbody annulus. 8–11 precloacal pores; autotomy site at 10th to 13th caudal annulus . . . *C. oligopholis*
 - 8. Prefrontals contact rostral, thus exclude nasals (and fused preoculars and supralabials) from midline contact. Frontal and parietal fused; occipitals small; second supralabials large. Fused head shields include dorsal half

← from Yapoma, Cameroon. Bottom row: *C. senegalensis*, IFAN (unnumbered), holotype, from Niokola-Koba, Sénégal. (Note that median ventral segments are azygous.)

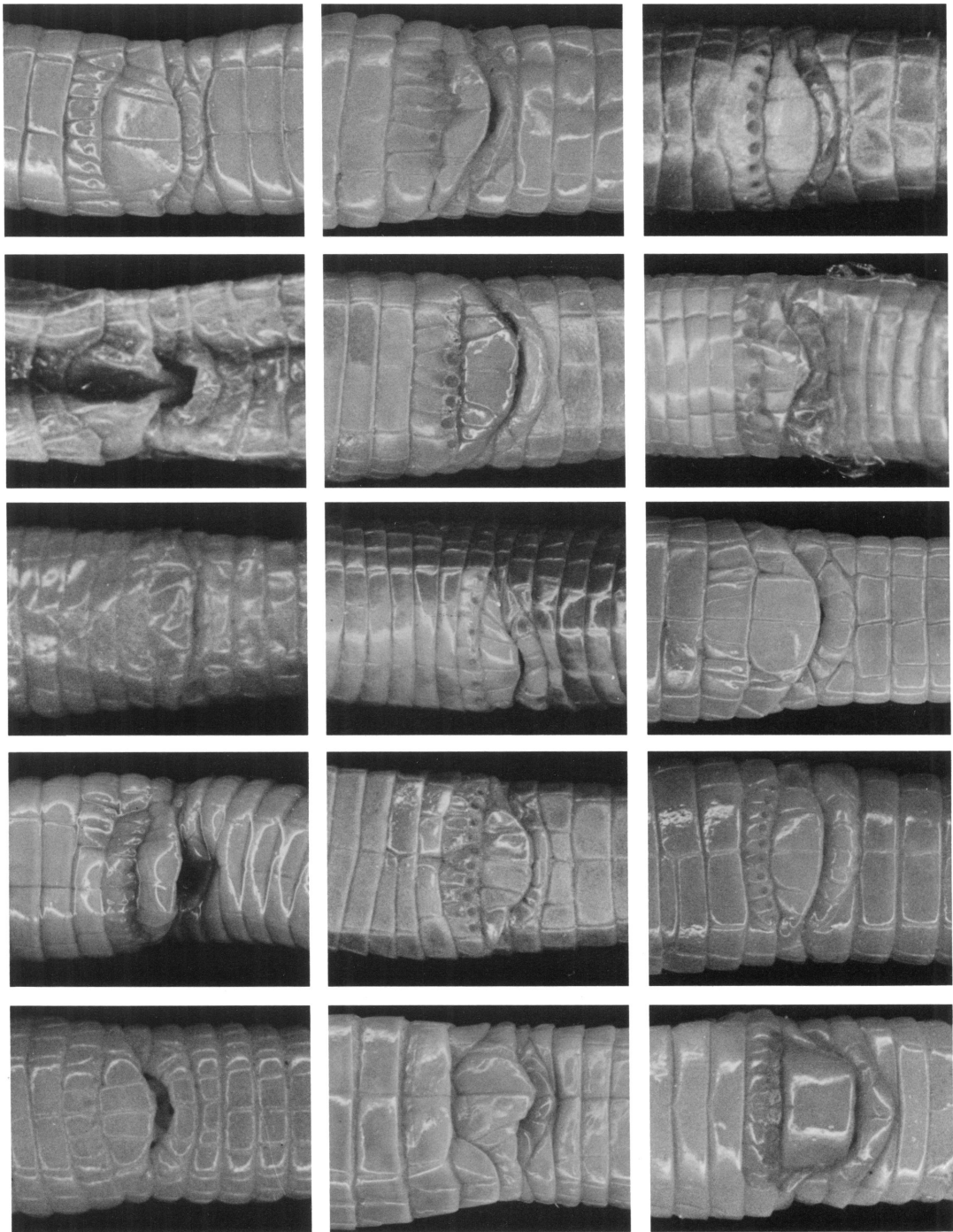
- of first 2 body annuli; 278 body annuli; 9 precloacal pores; 14 dorsal, 7–8 ventral segments to a midbody annulus; autotomy site at the 7th caudal annulus. Median ventral segments azygous *C. senegalensis*
- Prefrontals do not contact rostrals; nasals and shields fused thereto (preocular supralabials, nasals, prefrontals, and preoculars) in midline contact 9
 - 9. Neither a blind suture extending into the anteriormost compound shield from above level of eye nor discrete temporals ... 10
 - Blind suture extends into anteriormost compound shield from above level of eye; temporals discrete 12
 - 10. Oculars discrete. First postocular supralabial in narrow contact with lateral tips of frontals; occipitals triangular. 256–258 body annuli; 13–14 dorsal, 12–14 ventral segments to a midbody annulus; males 8 precloacal pores, females none; autotomy site at the 7th to 8th caudal annulus *C. kigomensis*
 - No discrete oculars (fused with compound anterior shield) 11
 - 11. Frontals shorter than first postocular supralabial and in narrow contact with it. Occipitals rounded, short; parietals with broad midline contact. Malars enclose 2nd row of postgenial segments. 228–235 body annuli; 12 dorsal, 10 ventral segments to a midbody annulus; autotomy site at the 7th to 8th caudal annulus *C. gansi*
 - Frontal and first postocular supralabial equal in length and in broad contact. Occipitals triangular, elongated; parietals have only narrow midline contact. 228–242 body annuli; 8–10 dorsal, 7–9 ventral segments to a midbody annulus; autotomy site at the 5th to the 7th caudal annulus *C. nigeriensis*
 - 12. Frontals and parietals discrete; median ventral segments enlarged, paired 13
 - Frontals and parietals fused; median ventral segments may be azygous 15
 - 13. Oculars discrete 14
 - Oculars fused to labials, preoculars, and prefrontals. Cloacal region corresponds to 4 lateral annuli. 251 body annuli; 8 dorsal, 8 ventral midbody segments; no precloacal pores (though their expression is probably sexually dimorphic); autotomy site at the 7th caudal annulus *C. haughi*
 - 14. Intercalated, dorsal half-annulus in nuchal region. Enlarged cephalic shields include the dorsal portion of the first 3 body annuli. Anterior portion of the suture between the mental and first infralabial does not extend to the lip. 241–252 body annuli; 12 dorsal, 10 ventral segments to a midbody annulus; males have 12 precloacal pores, females none; autotomy site at the 13th caudal annulus *C. schaeferi*
 - No intercalated dorsal half-annulus in nuchal region. Enlarged cephalic shields include the dorsal portion of the first 2 body annuli. 240 body annuli; 8 dorsal, 8 ventral segments to a midbody annulus; 10 precloacal pores (sexual dimorphism possible); autotomy site at the 11th caudal annulus *C. bifrontalis*
 - 15. Discrete ocular present. Occipitals discrete; temporals rectangular and in contact with only the first postsupralabial, but not the second. 217–262 body annuli; 12–16 dorsal, 8–10 ventral segments to a midbody annulus; 6 or 8 precloacal pores in males, none in females; autotomy site at the 6th to 9th caudal annulus. Median ventral segments enlarged and paired *C. liberiensis*
 - Discrete ocular lacking. Occipitals variably fused to large, elongated frontal-parietal; temporals squarish and in contact with both (first and second) supralabials. 244–265 body annuli; 12–14 dorsal, 7–9 ventral segments to a midbody annulus; 6 precloacal pores; autotomy site at the 6th to 8th caudal annulus. Median ventral segments enlarged and azygous *C. feae*

ACCOUNTS OF SPECIES

Cynisca bifrontalis (Boulenger)

Amphisbaena bifrontalis Boulenger, 1906: 202.
Type locality: "Fernand Vaz, French Congo."
Holotype: MSNG CE28163.

Fig. 13. *Cynisca*. Ventral view of the cloacal region. Top row (left to right): *C. bifrontalis*, MSNG CE28163 (this specimen is a sexually mature female, as indicated by the presence of eggs), holotype, Omboué, Gabon. *C. feae*, CZL 1945.76, from Bissau, Guinea Bissau. *C. gansi*, AMNH 102409, holotype, from Okoloma Village, Nigeria. Second row: *C. haughi*, MHNP 1901.531, holotype, from Lambaréné, Gabon. *C. kigomensis*, AMNH 102424, holotype, from Kigom Hills, Nigeria. *C. kraussi*, BM 1946.1.6.90, from Banda Hills, Ghana. Third row: *C. leonina*, MG 722.94b, from Conakry, Guinea. *C. leucura*, RUCA



1460, from Fazao, Togo. *C. liberiensis*, BM 1914.1.27.4, from Sierra Leone. Fourth row: *C. muelleri*, NMB 3808, from Akropong, Ghana. *C. nigeriensis*, AMNH 102413, holotype, from the vicinity of Takwashara, Nigeria. *C. oligopholis*, BM 1946.8.2.46, syntype, from the Cacine River district, Guinea Bissau. Bottom row: *C. rouxae*, MHNP 1978.1, paratype, from Asacro, Ivory Coast. *C. schaeferi*, ZMU 22367, holotype, from Yapoma, Cameroon. *C. senegalensis*, IFAN (unnumbered), holotype, Niokola-Koba, Sénégal.

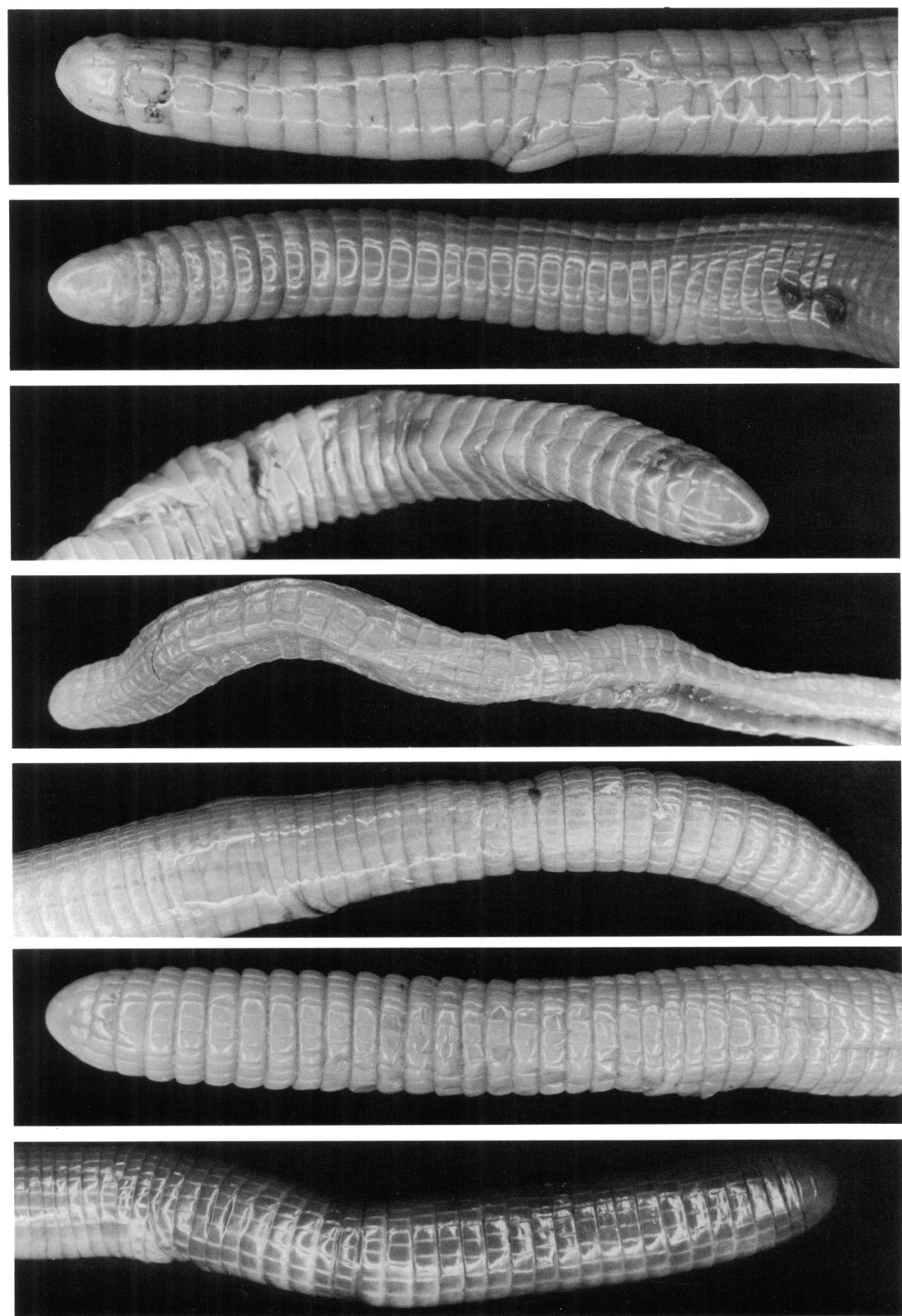


Fig. 14. See p. 32 for caption.

DIAGNOSIS: Preocular supralabials, nasal, preocular, and prefrontal fused, with blind suture entering fused shield from the anterior tip of the rectangular ocular. Subrectangular frontal and larger parietal discrete with long medial contact on midline; occipitals tiny. First postocular supralabial contacts frontal. A single very large temporal lies dorsal to the first postsupralabial and is followed by two smaller ones dorsal to the second. Head bulbous. 2 supralabials and 2 infralabials. Mental wider than first infralabials; malars slightly enlarged, enclosing two rows of postgenials, 4 segments in the first row, 4 in the second. 240 body annuli (tail autotomized). Midbody segments, 8 dorsal, 8 ventral. Median ventral segments enlarged, paired. 10 (poorly expressed) precloacal pores (in female holotype). Autotomy site at the 11th caudal annulus.

DESCRIPTION (Pattern XIII): Meristic characters are summarized in table 1. Figures 16 and 7 show the views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. The type is faded to a uniform pale brown.

The anterior head shields show major fusions. The rostral is relatively small and not visible in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, the nasals, the preoculars, and the prefrontals; the vertical posterior suture of these shields with the third supralabial (first postocular supralabial) bisects the position of the eye. There is no supraocular. The rectangular ocular is diagonally placed near the

upper two-thirds of the supralabial suture. A blind suture extends anteriorly into the compound shield from its anterior corner. The posterior corner gives rise to the medial suture of the second supralabial (or first postocular one) with the frontal. The shallowly convex anterior edge of the frontal is followed by a straight inward-angling suture with the supralabial, a short even more angling suture with the large temporal, and a transverse suture with the large hexagonal parietal.

The posteriorly asymmetrical parietals are but slightly narrower, but much longer than the frontals. Laterally, each parietal is in contact with a hexagonal temporal and it in turn with the rectangular postsupralabial. The right side of the dorsal half-annulus of the second body annulus includes the tiny occipital (fused to the parietal on the left side), which is smaller and shorter than the gabled flanking shields, each of which inserts between a parietal and temporal. Consequently, the enlarged cephalic shields only include the dorsal segments of the first two body annuli.

The snout is prognathous and the rostral is visible only in ventral view. The deep lower jaw is partially inserted into the bulbous snout which is almost twice as wide as high. In ventral view, the mental is slightly narrower than the enormous infralabials; however, the area of the latter is greater. The suture defining the posterior edges of the very large mental and the flanking first infralabials cross the chin at the level of the second infralabials; along the posteromedial portion of the infralabials this suture swings slightly anteromedially so that the widened malars correspond to two rows of four postgenials, rather than a single row. The second infralabials are small and their anterior suture extends anteriorly from the junction with the malars to the lip. Two wide segments, flanked by a narrower one on each side, occupy the first post-

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Fig. 14. *Cynisca*. Lateral view of tail and caudal region. Top to bottom: *C. bifrontalis*, MSNG CE28163, holotype, from Omboué, Gabon. *C. feae*, BM 1946.9.1.13, syntype, from the Cacine River district, Guinea Bissau. (Note the enlarged, median azygous segments.) *C. gansi*, CG 3580, paratype, from Okoloma Village, Nigeria. *C. haughi*, MHNP 1901.531, holotype, from Lambaréné, Gabon. Bottom row (left to right): *C. kigomensis*, AMNH 102424, holotype, from the Kigom hills, Nigeria. *C. leonina*, MG 722.94a, from Conakry, Guinea. *C. leucura*, RUCA 1460, from Fazao, Togo.

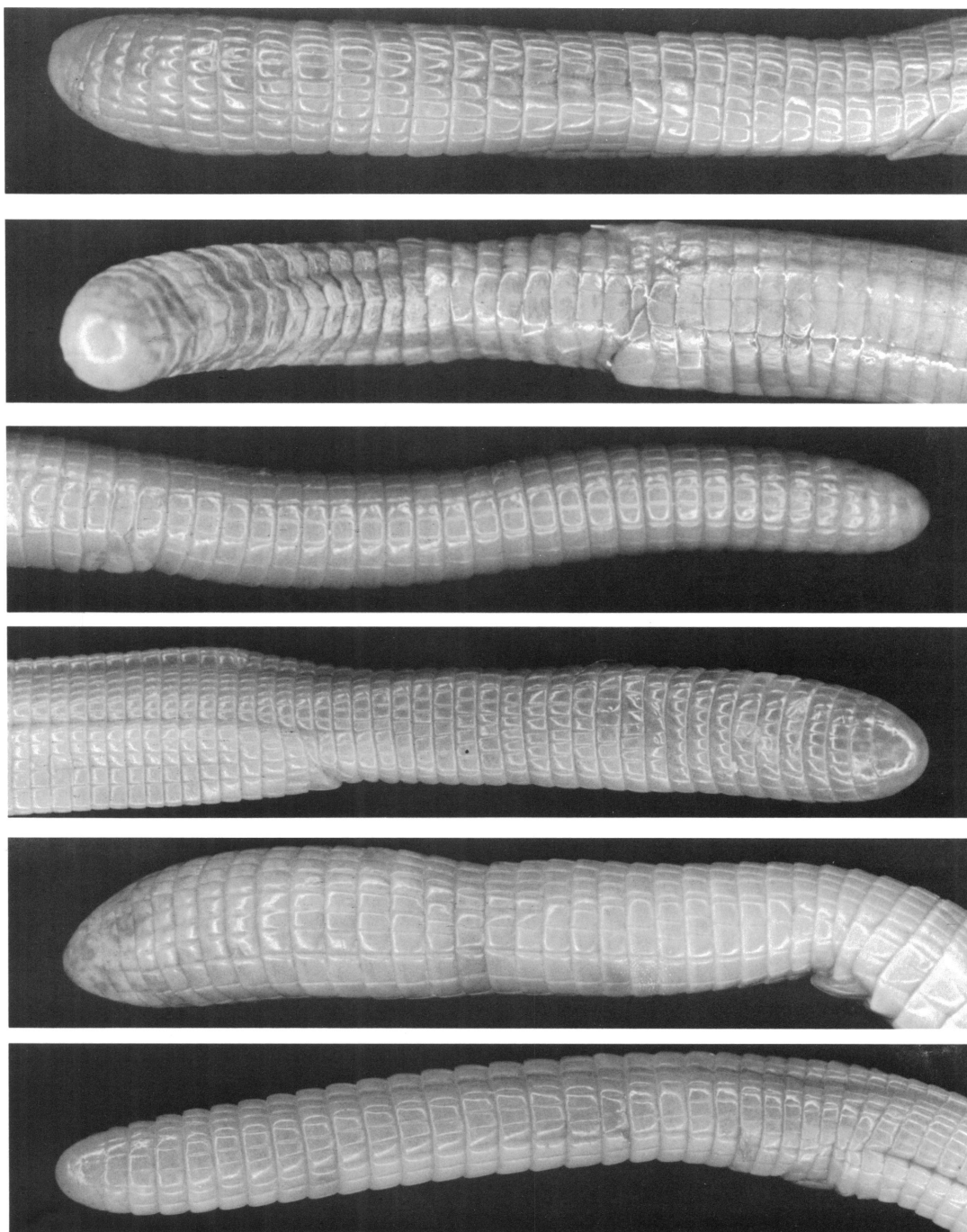


Fig. 15. *Cynisca*. Lateral view of tail and caudal region. Top to bottom: *C. liberiensis*, BM 1914.1.27.4, from Sierra Leone. *C. nigeriensis*, AMNH 102414, paratype, from the vicinity of Takwashara, Nigeria. *C. oligopholis*, BM 1946.8.2.46, syntype, from the Cacine River district, Guinea Bissau. *C. rouxae*, MHNP 1978.2, paratype, from the vicinity of Assacro, Ivory Coast. Bottom row (left to right): *C. schaeferi*, ZMU 22367, holotype, from Yapoma, Cameroon. *C. senegalensis*, IFAN (unnumbered), from Niokola-Koba, Sénégal (note the enlarged median azygous segments).

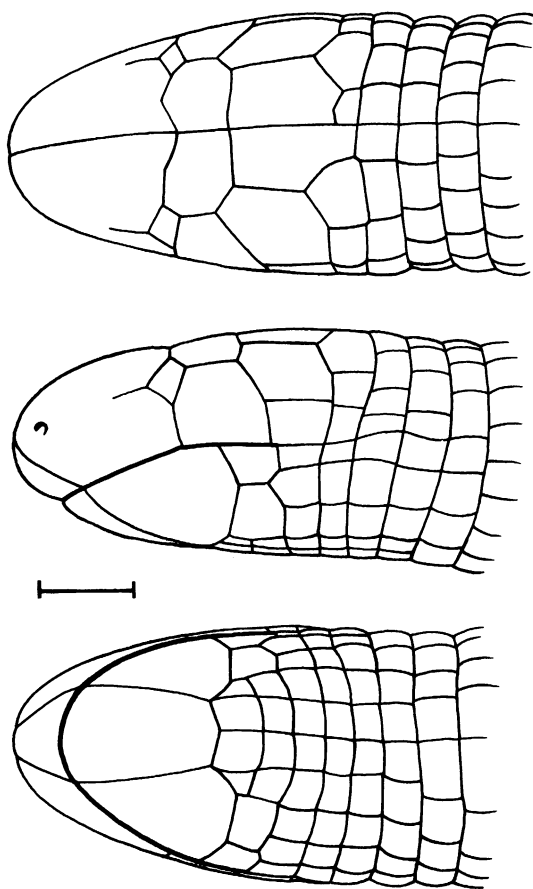


Fig. 16. *Cynisca bifrontalis* (Pattern XIII). Pattern of head segmentation. Dorsal (top), lateral, and ventral views of head and nuchal region of MSNG CE28163, holotype, from Omboué, French Congo. The line equals 1 mm to scale.

mental row; the latter elements lie medial to the malars, but posterior to the first infralabials. The segments of the gular region (annuli one through four) are slightly reduced in size and the midventral segments of the next annulus show the widening of the medial segments.

The type has 240 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing precloacal row. There are no obvious fusions, except for a spiral displacement just anterior to the cloaca; the four anteriormost dorsal half-annuli are narrowed and deeply folded. At midbody an annulus contains eight squarish to longer than wide dorsal segments and eight ventral ones, the medial about $2\frac{1}{2}$ times as wide as

long. The cloacal region corresponds to three lateral annuli. The healed autotomized tail bears 11 caudal annuli before an oval end.

There are eight precloacal pore scars lacking secretion cores, each inserted into the center of the posterior edge of one of the narrow median segments of the precloacal annulus. This set corresponds to the width of the enlarged pair of medial ventral segments. The rounded precloacal shield consists of two very wide median plus three left and two right narrower flanking segments, some of which extend laterally beyond the round portion. The narrow postcloacal edge is formed of 12 segments.

The trunk is generally rounded; however, it becomes slightly wider than high just anterior to the cloacal region and the tail is flattened (which may be an artifact of preservation). The healed caudal tip forms a distinct horizontal oval in cross section. The lateral sulci start at the level of the 12th body annulus, are filled with small triangular segments, and at midbody are approximately one-third the width of a flanking segment. Anteriorly (for the first 70 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and continues as a depressed groove onto the base of the tail. There is no ventral sulcus.

RANGE: Known from the holotype only.

LOCALITY RECORDS: GABON: Omboué (Fernan Vaz or Fernand-Vaz) MSNG CE 28163 (holotype of *Amphisbaena bifrontalis* Boulenger, 1906; Loveridge, 1941; Werner, 1910).

BIOLOGICAL MISCELLANEA: The small holotype contained eggs, indicating that the female specimen is sexually mature.

Cynisca degrysi (Loveridge)

Placogaster degrysi Loveridge, 1941: 400. Type locality: "Lagos, Sierra Leone." Holotype: formerly HM R.K. 1070-E.K. 13179; destroyed.

DIAGNOSIS (after original description; type never illustrated): Preocular supralabials, nasal, preocular, and prefrontal fused. Ocular discrete (large). A small median azygous shield. Frontals and parietals large and discrete, no occipitals (?). 2 temporals, upper very large, forming an extensive suture with frontal and parietal. 2 supralabials and 2 in-

fralabials. Mental elongate, between large first infralabials; no postmental. 4 postgenials. 243 body annuli; 26 (or fewer) caudal annuli. Midbody segments, 10 dorsal, 7 ventral. Median ventral segments azygous. No preloacal pores. (6 preloacal segments.) Snout-vent plus tail length, 107 + 13 mm.

RANGE: Known from the (destroyed) holotype only. Type locality questionable.

REMARKS: In his 1941 revision of the African members of the Amphisbaenia, Arthur Loveridge described *Placogaster degrysi* on the basis of a specimen in the Hamburg Museum collected in 1888 by a Dr. H. Ulex. The brief description does not fit any of the taxa here examined. The type, which apparently had been donated to the museum by a private collector, was destroyed during the Second World War (and a check with the curator, Dr. H. W. Koepcke, indicates that the specimen was obtained as part of a small private museum, without details about the collector). There are no documents that might facilitate tracing its source. No specimens reminding of the description were available from Sierra Leone, for which only the species with head-segmentation Pattern XII (and V) is recorded here. Furthermore, the name of the type locality is curious. There is no entry for Lagos in the Sierra Leone section of the Gazetteer of the U.S. Board on Geographic Names (however, the entry Lago occurs); the name Lagos does refer to an important city and old trading center in Nigeria. The latter port came under British control somewhat later than Sierra Leone which was one of the first centers of British missionary and administrative influence in West Africa. However, the character pattern of the specimen fits better with western than eastern species of *Cynisca*, so that it seems best to leave the name as incertae sedis.

Cynisca feae (Boulenger)

Placogaster feae Boulenger, 1906: 203. Type locality: "Cassine River District, Portuguese Guinea." Syntypes: BM 1906.3.30.34; RR1946.9.1.13, 1906.3.30.35; RR1946.9.1.14; MSNG CE28162 (seven specimens).

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, preocular, and ocular fused, with blind suture entering fused shield from above

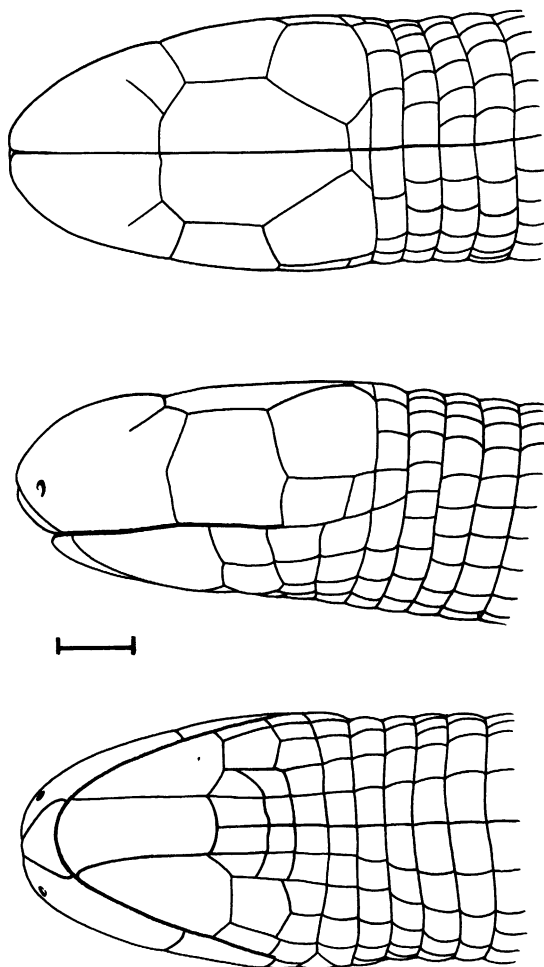


Fig. 17. *Cynisca feae* (Pattern X). Pattern of head segmentation. Dorsal (top), lateral, and ventral views of head and nuchal region of ZMU 31184, from Bubaque, Guinea Bissau. Some specimens show irregularities of the medial and lateral sutures of the median segments of the head (BM 1946.9.1.13). The line equals 1 mm to scale.

the level of the eye. Frontal, parietal, and occipital (?) fused. First postocular supralabial contacts frontal. A single very large temporal lying dorsal to the first postsupralabial is followed by two smaller ones dorsal to the second postsupralabial. Head bulbous. 2 supralabials and 2 infralabials. Mental wider than first infralabials in ventral view; malars enlarged, but most posterior chin segments subequal. 244–265 body annuli; 20–25 caudal annuli. Midbody segments, 12–14 dorsal, 7–9 ventral. Median ventral segments azy-

gous. 6 precloacal pores. Autotomy site at the 6th and 8th caudal annulus.

DESCRIPTION (Pattern X): Meristic characters are summarized in table 7. Figures 17 and 7 show the views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are a uniform pale brown dorsally and are slightly lighter on the ventral surface. The pigment density increases posteriorly and is greatest on the first half of the tail. Here there is a tendency for faint concentration of pigment in the segmental centers. The dorsal surface of the head and first five to seven dorsal half-annuli lack pigmentation, as do the second infralabials, though the rest of the chin is pigmented.

The anterior head shields show major fusions. The rostral is relatively small and barely visible in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, the nasals, the oculars, and the prefrontals; the vertical posterior suture of these shields either bisects or follows just anterior to the position of the eye. A diagonally running blind suture extends into this compound shield from just above the level of the eye, and passes ventrolateral. The position of the former ocular would correspond to the zone just ventral and posterior to this suture (a ventral suture remains azygously on CZL 1945.138).

The second supralabial (or first postocular one) extends dorsally to the level where the blind suture terminates and is in broad horizontal contact with the parallel-sided widened anterior portion of the bottle-shaped frontal-parietal-occipital shield. (There is some question whether these compound shields include fused occipitals as a few specimens show enlargement of the median segments of the first postcephalic annulus.) Immediately posterior to contact with the second supralabial, the fused median shields narrow sharply or gradually and extend to the first dorsal half-annulus. In some specimens (BM

1946.9.1.13) both the medial and lateral sutures of the median shields may be interrupted and irregular in the transition zone. An enormous temporal shield lies lateral to the frontal-parietal-occipital and between the medial portion of the second supralabial and the first dorsal half-annulus (which corresponds to the third ventral one). The temporal abuts ventrally onto the rectangular postsupralabial (or onto one or two squarish postsupralabials), though the several sutures tend to be shallowly inscribed and may be missing. The fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is prognathous and the rostral is obvious in ventral, but not in dorsal view. The lower jaw is not particularly deeply inserted into the bulbous snout, which is almost twice as wide as high. In ventral view, the mental is larger than the infralabials; however, the area of the latter is greater. The suture defining the posterior edges of the very large mental and the flanking first infralabials crosses the chin at the anterior level of the second infralabials; this suture often swings slightly anteromedially, and the enlarged malars generally correspond to two rows of postgenials, rather than a single one. The second infralabials are small; their anterior suture extends anteriorly from the malar junction to the lip. Only the medial pair of the two segments occupying the postmalar position is regularly larger than the segments of posterior body annuli. One wide or two narrow median segments lie back of the center of the mental; they form the center of the first of two rows generally containing four postgenials each. The segments of the gular region are slightly reduced in size and the midventral segments of the seventh annulus show the first indication of fusion of the medial segments.

There are 244–265 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portions of the seven to eight discrete dorsal half-annuli are narrowed and deeply folded. At midbody an annulus contains 12 to 14 (generally 14) squarish to longer than wide dorsal segments and seven to nine ventral ones (generally seven or nine), the unpaired medial ones more than four

times as wide as long. The cloacal region corresponds to two to four lateral annuli. The tail bears 20 to 25 caudal annuli before an oval end, which is generally twice or more as long as the last annulus and bears faintly indented sutures only near its anterior edge. An autotomy site is marked at the sixth through eighth postcloacal annulus. It is always well defined, being slightly narrowed and more intensely pigmented than other caudals. Ten of 32 specimens had broken tails. In some specimens, the first caudal annulus bears an azygous midventral segment; all other segments are paired.

There are six variably produced precloacal pores, each inserted into the middle of the posterior edge of one of the six (five in ZMU 31184) narrow median segments of the precloacal annulus. This set corresponds to the width of the fused, azygous ventral segments and is flanked on each side by a larger segment that reaches laterally to the edge of the crescentic precloacal shield. The shield consists of two very wide median plus a pair of narrower and triangular flanking segments. The narrow postcloacal edge is formed of eight to ten segments.

The trunk is generally slightly wider than high; however, it becomes rounded and slightly higher than wide just posterior to the cloacal region. The caudal tip forms a distinct vertical oval in cross section. The lateral sulci start at the level of the tenth body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 70 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and it continues as a depressed groove onto the base of the tail. There is no ventral sulcus.

RANGE: Guinea Bissau to eastern Sénégal and Gambia.

LOCALITY RECORDS: NO LOCALITY: IRSNB 14934 (Laurent, 1947). GUINEA BISSAU: Bubaque: ZMU 31184. Cacine River district (Cassine): BM 1946.9.1.13-1946.9.1.14; MSNG CE28162A-28162G (syntypes of *Placogaster feae* Boulenger, 1906; Loveridge, 1941). Bissau, city: *CZL 1945.53 (Manças, 1955). Bissalanca: *CZL 1945.64 (Manças, 1955). Marques Mano, Bissau: CZL 1945.28-

1945.29, 1945.40, 1945.42, 1945.46-1945.47, 1945.65-1945.66, 1945.70-1945.71, 1945.76-1945.77, 1945.93-1945.94, 1945.138 (Manças, 1955). SÉNÉGAL: Bougari, Casamance River: BM 1969.2896-1969.2897. Tabi, near Bignona (Casamance): MHNP 1962.46-1962.47. GAMBIA: Boikama: BM 1966.609. Banjul, 11 mi from Bathurst on Yundum road: BM 1966.610. Mention in key: (Werner, 1910).

Cynisca gansi Dunger

Cynisca gansi Dunger, 1968: 172. Type locality: "Okoloma village near Port Harcourt, Eastern Nigeria (4°42'N, 7°27'E)." Holotype: AMNH 102409 (Dunger, 1968, 1969). Paratypes: AMNH 102410-102412, CG 3579-3580.

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, preocular, and (probably) ocular fused. No blind suture enters fused shield. Small frontal; enormous parietal and small occipital discrete. First postocular supralabial in point or narrow contact with the rounded lateral tip of the frontal. Parietal includes temporal region dorsal to the postocular supralabial, the first and the second postsupralabial, and displaces some laterodorsal temporal segments of the third (occipital) and even the fourth body annulus. Snout bulbous, but head pointed. 2 supralabials and 2 infralabials. Mental shorter than first infralabials, narrower in ventral view; followed by a squarish median segment of the first postgenial row that is flanked by small triangular segments. Squarish malars enlarged, enclosing the posterior portion of the first and all of the second postgenial row, containing three and four segments, respectively. 228-235 body annuli; 21-22 caudal annuli. Midbody segments, 12 dorsal, 10 ventral. Median ventral segments enlarged, paired. 10 or 0 precloacal pores. Autotomy site at the 7th to 8th caudal annulus.

DESCRIPTION (Pattern VIII): The meristic characters are summarized in table 2. Figures 18 and 7 show views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are a uni-

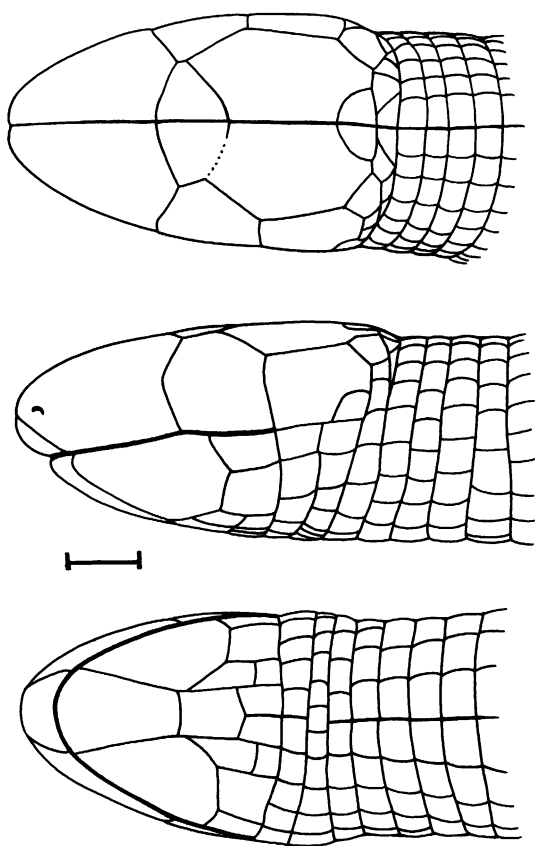


Fig. 18. *Cynisca gansi* (Pattern VIII). Pattern of head segmentation. Dorsal (top), lateral, and ventral views of head and nuchal region of CG 3580, paratype, from Okoloma Village, Nigeria. The line equals 1 mm to scale.

form brown dorsally, but are slightly lighter on the ventral surface. The pigment density increases posteriorly and is greatest on the first half of the tail. There is some tendency to a checkerboard dropout of pigment on the anterior ventral surface and near the cloacal region. In many specimens the ventral pigmentation becomes patchy on the individual segments. The chin and anterior ventral region are pale.

The anterior head shields show major fusions. The small rostral is visible as a triangle in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, the nasal, the preocular, and the prefrontal; the vertical posterior suture of these shields lies just anterior to the position of the

eye so that the second supralabial (rather than the anterior compound shield) may include the ocular.

The large second supralabial (or first postocular one) extends dorsally to narrow contact with the lateral edges of the small triangular frontal. The very large parietals include much of the area occupied in some other species by the postoculars and the temporals and broadly contact the large first post-supralabial, which extends posteriorly dorsal to the second postsupralabial and is much higher than it is long at the postlabial edge. A pair of small triangular occipitals lies medial to the posterior portion of the parietals. The posterior tip of the parietals may keep them from contacting the very small temporals (which lie dorsal to the third postsupralabial). The second (and third) postsupralabials are small and irregular, as are the shields dorsal to them up to the midline. Most of these and the nuchal intercalated dorsal half-annulus cover the posterior portion of the head along the deep nuchal constriction and face posteriorly, indicating that only the anteriorly and dorsally directed shields are enlarged. The dorsal portions of the first three annuli are involved in cephalic coverage.

The snout is prognathous and the rostral is far more obvious in ventral than in dorsal view. The lower jaw is not particularly deeply inserted into the bulbous snout, which is almost twice as wide as high. In ventral view, the mental is narrower than the infralabials; however, the area of the latter is greater. The anterior suture of the second infralabial extends anteriorly at an angle from the junction with the malars to the lip. The suture defining the posterior edges of the very large mental and the flanking first infralabials swings anteromedially so that the enlarged squarish malars generally lie lateral to the posterior portion of the first and all of the second postgenial rows. The lateral postgenials of the first row on each side lie posterior to the first infralabials and flank a single enlarged medial postgenial shield (specimen CG 3579 has four subequal first postgenials); there are four smaller postgenials in the second row. The postmalars are slightly enlarged. The segments of the gular region are slightly reduced in size and the midventral segments of the seventh annulus show the first indication of fusion of the medial segments. An interca-

lated dorsal half-annulus lies near the eighth body annulus.

There are 228 to 235 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portions of the seventh to eighth discrete dorsal half-annuli are narrowed and deeply folded. At midbody an annulus contains 12 $1\frac{1}{2}$ times as long as wide dorsal segments and 10 ventral ones, the medial ones about $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to three to four lateral annuli. The tail bears 21 to 22 caudal annuli before an oval end, which is generally twice or more as long as the last annulus and bears faintly indented sutures only near its anterior edge. An autotomy site is marked at the seventh to eighth postcloacal annulus. It is always well defined and slightly narrowed and more intensely pigmented than the caudal annuli. Two of six specimens have a broken tail.

There are either ten or no variably produced precloacal pores, each inserted into the middle of the posterior edge of one of the nine to ten narrow median segments of the precloacal annulus (some females show faint pore scars here). This set corresponds to the width of the enlarged midventral segments and precedes the edge of the crescentic precloacal shield. The shield consists of two very wide median plus two pairs of narrower and triangular flanking segments. The narrow postcloacal edge is formed of eight to ten segments.

The trunk is generally slightly wider than high; however, it becomes rounded and slightly higher than wide just posterior to the cloacal region. The tail is of smaller diameter than the trunk. The caudal tip forms a distinct vertical oval in cross section. The lateral sulci start at the level of the 20th body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 40 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and it continues as a depressed groove onto the base of the tail. The ventral sulcus is only indicated by alignment of sutures.

RANGE: Known from the types only.

LOCALITY RECORDS: NIGERIA: Okoloma

Village, near Port Harcourt: AMNH 102409 (holotype of *Cynisca gansi* Dunger, 1968, 1969), 102410-102412; CG 3579-3580 (paratypes).

BIOLOGICAL MISCELLANEA: Twenty specimens, as well as two *Melanoceps occidentalis* (Scincidae), were taken in 1500 square yards of an abandoned forest clearing in 12 to 18 in. of heavy black topsoil over red laterite. Two others were in heaps of soil covered with rotting leaves. Some ate earthworms in captivity (Dunger, 1968).

REMARKS: Pieces have been cut from the precloacal region of several specimens.

Cynisca haughi (Mocquard)

Amphisbaena Haughi Mocquard, 1904: 301. Type locality: "Gabon, à environ 50 kilomètres au sud-ouest de Lambaréné." Holotype: MHNP 1901.531.

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, preocular, and ocular fused, with blind suture entering fused shield from above the level of the eye. Large frontal and parietal discrete; occipital (?) tiny, smaller than flanking segments of second body annulus. First postocular supralabial broadly contacts frontals. A single large temporal lies dorsal to the first postsupralabial. Second body annulus forms complete ring of as many segments as third, includes small occipital and second postsupralabial, and is differentiated only by the more irregular anterior edge. Head bulbous. 2 supralabials and 2 infralabials. Mental (damaged) wider and slightly shorter than first infralabials in ventral view; malars enlarged, enclosing two rows, the first containing four segments, the second containing four regular segments and a single, small triangular segment. 251 body annuli; 27 caudal annuli. Midbody segments, 8 dorsal, 8 ventral. Median ventral segments enlarged, paired. No precloacal pores. Autotomy site at the 7th caudal annulus.

DESCRIPTION (Pattern XI): Meristic characters are summarized in table 1. Figures 19 and 7 show the views of the head, figure 13 the ventral surface of the caudal region, figure 11 the segment proportions, as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species

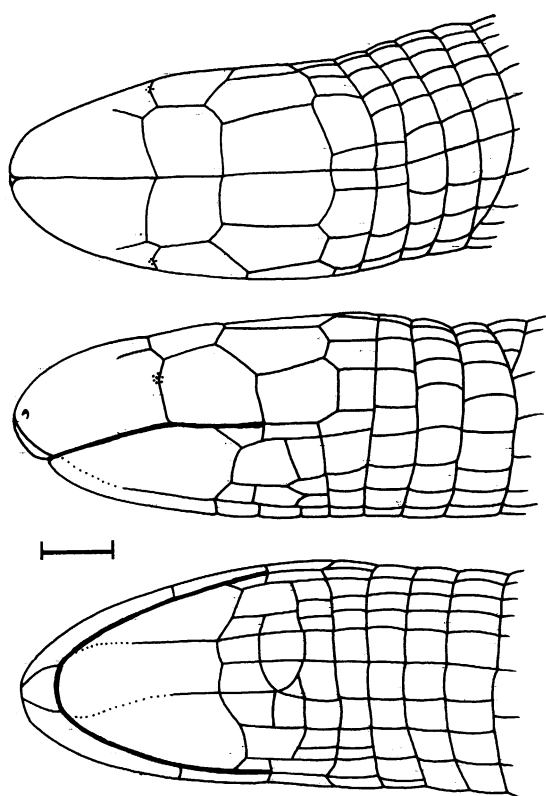


Fig. 19. *Cynisca haughi* (Pattern XI). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of MHNP 1901.531, holotype, from vicinity of 50 km southwest of Lambaréné, Gabon. The anteriormost portion and the left side of this specimen are badly abraded. Therefore, the right side of the head is pictured here. The line equals 1 mm to scale.

of *Cynisca*. The type is faded to a uniform pale brown.

The anterior head shields show major fusions. The rostral is relatively small, but visible in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, the nasal, the preocular, and the prefrontal; the vertical posterior suture of these shields with the second supralabial (first postocular supralabial) bisects the position of the eye. There is neither a discrete ocular nor a supraocular. A blind suture extends anteriorly into the compound shield just above the level at which the second supralabial is

in broad horizontal contact with the parallel-sided frontal. (The entire anterior region is quite worn; however, application of a surface stain suggests that there may once have been a discrete squarish ocular with the blind suture being its dorsal margin.)

The parietal is also squarish, but slightly narrower than the frontal. Laterally, it is in contact with a parallelogramic temporal and it in turn with the squarish postsupralabial. The dorsal half-annulus of the second body annulus includes the widened and tiny occipitals (?), which are smaller than the flanking segments. Consequently, the enlarged cephalic shields only include the dorsal segments of the first (and part of the second) body annulus.

The snout is prognathous and the rostral is far more obvious in ventral than in dorsal view. The lower jaw is inserted into the bulbous snout, which is almost twice as wide as high. In ventral view, the mental is narrower than the enormous infralabials; the area of the latter is greater and the anterior edges between them are obscured. The suture defining the posterior edges of the very large mental and the flanking first infralabials crosses the chin at the level of the second infralabials; medially, this suture swings slightly anteriorly and then reverses. The enlarged malars correspond to two rows of postgenials, rather than a single one. The second infralabials are small and their anterior suture passes anteriorly from the junction with the malars to the lip. Two wide segments, flanked by a narrower one on each side, occupy the first postmental row; the latter elements lie posterior to the first infralabials. The second postgenial row contains five segments (four squarish and one asymmetrically positioned and triangular). The segments of the gular region are slightly reduced in size and the midventral segments of the seventh annulus show the first indication of enlargement of the medial segments.

The type has 251 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portions of the first ten discrete dorsal half-annuli are irregular, involving fusions, and some are narrowed and deeply folded. At midbody, an annulus contains

eight squarish to longer than wide dorsal segments, and eight ventral ones, the medial about twice or slightly more as wide as long. The cloacal region corresponds to four lateral annuli. The tail bears 27 caudal annuli before an oval end, which is generally twice or more as long as the last annulus and bears faintly indented sutures only near its anterior edge. An autotomy site is very faintly marked at the seventh (not the ninth, as indicated by Dunger, 1968) postcloacal annulus. The tail of the holotype is intact. The first caudal annulus bears an azygous midventral segment; all other segments are paired.

There are no precloacal pores, but eight (or ten) narrow median segments of the precloacal annulus lie in the position of pore-bearing segments. This set corresponds to the width of the enlarged pair of medial ventral segments. The rounded precloacal shield consists of two very wide median plus several narrower flanking segments some of which extend laterally beyond the round portion. The narrow postcloacal edge is formed of ten segments.

The trunk is generally slightly wider than high; however, it becomes rounded and slightly higher than wide just posterior to the cloacal region. (The specimen is very desiccated and these are estimates.) The caudal tip forms a distinct vertical oval in cross section. The lateral sulci start at the level of the tenth body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 100 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and it continues as a depressed groove onto the base of the tail. There is no ventral sulcus.

RANGE: Known from the holotype only.

LOCALITY RECORDS: GABON: Vicinity of 50 km southwest of Lambaréné: MHNP 1901.531 (holotype of *Cynisca haughi* Mocquard, 1904; redescription and illustration, Dunger, 1968; Loveridge, 1941).

REMARKS: There is only a single specimen (MHNP 1901.531), the snout shields of which are unfortunately abraded; however, the useful illustration of Dunger (1968, his fig. 10)

is available. Its proportions are slightly idealized and the "blind suture" illustrated as dividing the left malar and penetrating the infralabial apparently is a fold.

Cynisca kigomensis Dunger

Cynisca kigomensis Dunger, 1968: 182. Type locality: "on the western escarpment of the Jos Plateau in the Kigom Hills, Northern Nigeria (approx. 9°47'N; 8°33'E)." Holotype: AMNH 102424 (Dunger, 1968, 1969). Paratype: AMNH 102425.

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, and preocular fused. No blind suture enters fused shield. Frontal, large parietal, and small triangular occipital discrete. First postocular supralabial in point or narrow contact with the rounded lateral tip of the frontal. Discrete squarish diagonal ocular in anterior corner between these two shields. Parietal includes temporal region, dorsal to the postocular supralabial, the first and the second postsupralabial and two segments of the second body annulus. Snout bulbous, but head not very pointed. 2 supralabials and 2 infralabials. Mental shorter than first infralabials, narrower in ventral view. Malars enlarged, enclosing posterior half of first and all of second postgenial row of four segments each. 256–258 body annuli; 20 caudal annuli. Midbody segments 13–14 dorsal, 12–14 ventral. Median ventral segments enlarged, paired. 8 or 0 precloacal pores. Autotomy site at the 7th to 8th caudal annulus.

DESCRIPTION (Pattern XIV): Meristic characters are summarized in table 2. Figures 20 and 8 show views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a medium-size species of *Cynisca*. Preserved specimens are a uniform pale brown dorsally, but are slightly lighter on the ventral surface. The pigment density increases posteriorly and is greatest on the first half of the tail. Pigment also drops out in an irregular checkerboard pattern ventrally; also the cloacal region is unpigmented. The snout seems to lack pigmentation.

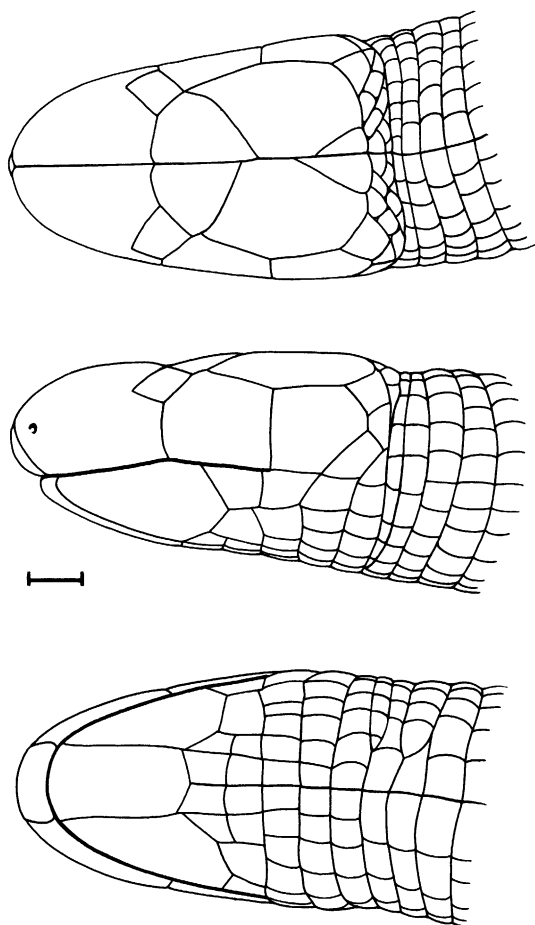


Fig. 20. *Cynisca kigomensis* (Pattern XIV). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of AMNH 102425, paratype, from the western escarpment of the Jos Plateau in the Kigom Hills, northern Nigeria. The specimen shows azygously irregular frontal and occipital segments. The line equals 1 mm to scale.

The anterior head shields show major fusions. The small rostral is barely visible as a triangle in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, nasals, preoculars, and prefrontals; the vertical posterior suture of these shields bisects the position of the eye. The small, squarish, diagonally placed ocular inserts into this compound shield anterior to the short contact zone between the postocular supralabial and the frontal.

The large second supralabial (or first postocular one) extends dorsally to point contact with the rounded lateral tips of the triangular frontal (which is azygously irregular in AMNH 102425). The very large parietal includes much of the area otherwise occupied by the postocular and the temporals and broadly contacts the large first postsupralabial, which extends posteriorly dorsal to the second body annulus and is much higher than its length along the postlabial edge. A small triangular occipital (azygously irregular in AMNH 102425) lies medial to the posterior portion of the parietal. The second and third postsupralabials are small and irregular, as are the segments dorsal to them up to the midline. Most of these cover the posterior portion of the head and face posteriorly, indicating that only the anteriorly and dorsally directed shields are enlarged. A crescentic intercalated nuchal half-annulus follows. Whereas only one or two body annuli are clearly incorporated in the enlarged head shields, the dorsal portions of the first three annuli are involved in cephalic coverage.

The snout is prognathous and the rostral is far more obvious in ventral than in dorsal view. The lower jaw is not particularly deeply inserted into the bulbous snout, which is almost twice as wide as high. In ventral view, the mental is narrower than the infralabials, but the area of the latter is greater. The anterior suture of the second infralabial extends at an angle from the junction with the malars to the lip. The suture defining the posterior edges of the very large mental and the flanking first infralabials first swings anteromedially and then slightly posteriorly toward the midline; thus, the enlarged pentagonal malars generally lie lateral to the posterior portion of the first and all of the second row of small paired postgenials of four segments each. The lateral postgenials on each side lie posterior to the infralabials and to the posterior portion of the first row of postgenial segments. The postmalars are slightly enlarged. The segments of the gular region are slightly reduced in size and the midventral segments of the seventh annulus show the first indication of fusion of the medial segments. An intercalated dorsal half-annulus lies near the ninth body annulus.

There are 256 to 258 body annuli, from the first segments posterior to the angulus oris

up to and including the pore-bearing precloacal row. The dorsal portions of the seventh to eighth discrete dorsal half-annuli are narrowed and deeply folded. At midbody an annulus contains 13 to 14 (generally 14) $1\frac{1}{2}$ to 2 times as long as wide dorsal segments and 12 or 14 ventral ones, the medial ones about $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to three to four lateral annuli. The tail bears 20 caudal annuli before an oval end, which is generally twice or more as long as the last annulus and bears faintly indented sutures only near its anterior edge. An autotomy site is marked at the seventh to eighth postcloacal annulus. It is always well defined, both tail and autotomy annulus being slightly narrowed and more intensely pigmented. One of two specimens had a broken tail.

There are eight or no variably produced precloacal pores, each inserted into the middle of the posterior edge of one of the seven to eight narrow median segments of the precloacal annulus. This set corresponds to the width of the enlarged midventral segments and turns around the anterior edge of the crescentic precloacal shield. The shield consists of two very wide median segments, plus a pair of narrower and triangular flanking segments. The narrow postcloacal edge is formed of eight to ten segments.

The trunk is generally slightly wider than high; however, it becomes rounded and slightly higher than wide just posterior to the cloacal region. The caudal tip forms a distinct vertical oval in cross section. The lateral sulci start at the level of the 20th body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 30 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures; at midbody, it is almost as wide as the lateral ones and continues as a depressed groove onto the base of the tail. The ventral sulcus is only indicated by alignment of sutures.

RANGE: Known from the types only.

LOCALITY RECORDS: NIGERIA: Western escarpment of the Jos Plateau in the Kigom Hills, Northern Nigeria: AMNH 102424 (holotype of *Cynisca kigomensis* Dunger, 1968, 1969), 102425 (paratype).

BIOLOGICAL MISCELLANEA: Taken from

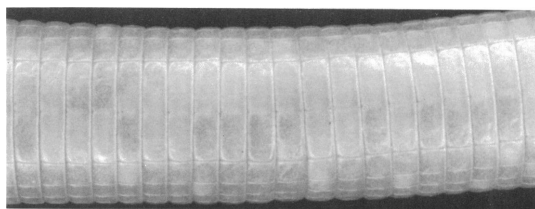


Fig. 21. *Cynisca kraussi*. Ventral view of CAS 134730, from 50 mi north of Bamboi, Ghana. Note the faint, but definite, checkerboard pigmentation of the ventral surface.

about 30 ft below ground at 3000 to 4000 ft elev. in Jan. and Apr., 1967 (Dunger, 1968).

Cynisca kraussi (W. C. H. Peters)

Amphisbaena kraussi W. C. H. Peters, 1878a: 192.

Type locality: "Westafrika." Syntypes: ZMU 9375; KM R-4470 (plus one not found).

DIAGNOSIS: Nasal, preocular, and prefrontal discrete. Ocular discrete (pentagonal, diagonally placed). A small, median azygous shield in 9 of the 39 specimens. Two preocular and one postocular supralabials. Frontals small, triangular. Occipital relatively large, clearly derived from second body annulus. Very large postocular supralabial in narrow contact with postocular (-parietal) that has broad contact with the midline, with the occipital, and with a very large first postsupralabial that appears to have fused with the temporal. Second postsupralabial small, forming part of second body annulus (that more dorsally contributes the occipitals). Snout generally pointed, preocular region swollen. 3 supralabials and 2 infralabials. Mental flanked by enormous first infralabials; its posterior tip separated into a postmental. One row of 2–4 small postgenials anterior to the enlarged malars and a second row of 4 to 7 between them. 208–226 body annuli; 16–19 caudal annuli. Most specimens have a hump in the tail leading to a spatulate depressed distal tip covered dorsally by a rosette of segments (and which is underlain by a faint terminal ossification). Midbody segments, 14–20 dorsal, 12–16 ventral. Median ventral segments enlarged, paired. 8 large round precloacal pores. Autotomy site at the 6th to 7th caudal annulus.

DESCRIPTION (Patterns I/II): The meristic characters are summarized in table 4. Figures 23 and 8 show the views of the head, figure

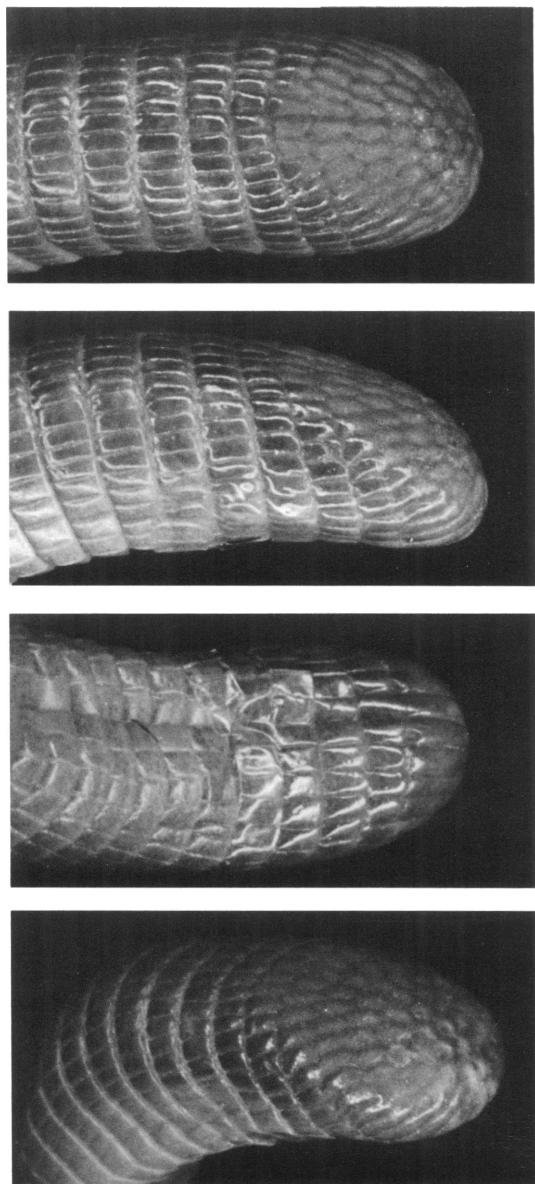


Fig. 22. *Cynisca kraussi*. Dorsal, lateral, ventral, and three-quarters dorsoposterior view of caudal tip of MCZ 49701 from Banda Hills, Ghana. Note distal rosette of protruding segments.

13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region, figure 21 the checkerboard coloration of the ventral surface, figure 22 details of the caudal rosette; figure 6 gives the body proportions and 39 provides

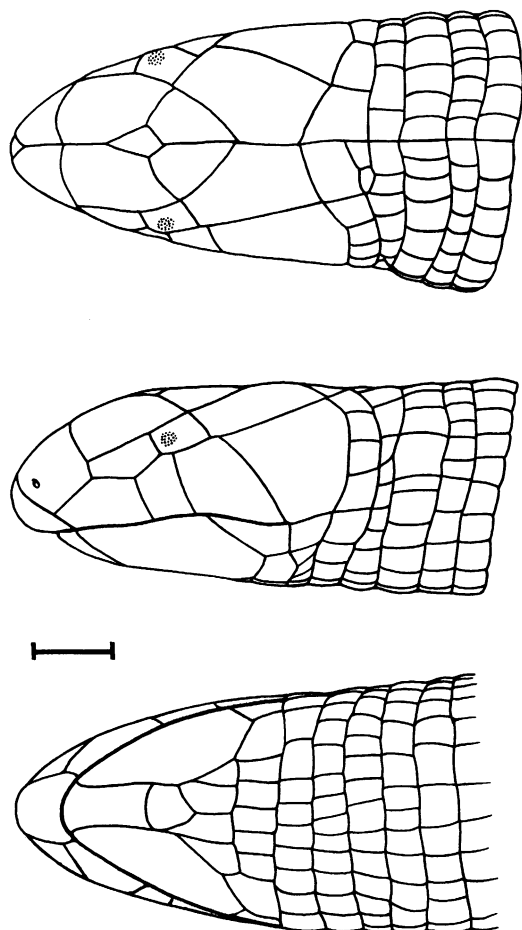


Fig. 23. *Cynisca kraussi* (Pattern II). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of ZMU 9375, syntype, from "Westafrika." Eight of 20 specimens show this small quadratic azygous segment between the oculars. The line equals 1 mm to scale.

radiographs of the caudal region in two specimens.

This is a very small, slender species of *Cynisca*. Preserved specimens are light brown dorsally and lighter on the ventral surface; the countershading proceeds just at the lateral sulci. However, both the dorsal and the ventral surfaces are pigmented; this pigmentation fades ventrally. Darker specimens show an erratic, light checkerboard arrangement of pigmented segments on the ventral surface (fig. 21); this is not apparent in lighter specimens. The intersegmental sutures of the dorsal surface are faintly lightened. The dorsal

pigmentation may be mottled. The dorsal surfaces of the top of the head (particularly the frontals) of the posterior quarter of the trunk and of the caudal region are somewhat darker than those of the anterior trunk. The pigmentation of the autotomy annulus does not differ dorsally, but is denser ventrally. The caudal rosette is colored a very dark leaden gray (rather than brown) and even the ventral portion of the tail is darkened. The autotomy annulus is darkened both dorsally and ventrally.

The anterior head shields show no major fusions. The rostral is visible in dorsal view as a small triangle. Posteriorly, it is followed on each side by a large nasal that sends a short wing to meet the preocular. The first preocular supralabial is longer than the second. The preocular contacts both these supralabials, the ocular, the prefrontal, and the nasal. The preocular of CAS 127398 is fused to the prefrontal and ocular on the left side. The diagonally placed ocular is longer than wide; the large eye lies just ventral to its center, and there is no supraocular. The prefrontals appear roughly rectangular in dorsal view, cover much of the dorsal surface of the snout anterior to the level of the eyes, and may include between them a small (sometimes absent) quadratic azygous shield. The convex posterior edge of this shield interdigitates between the anterior edges of the relatively small frontal shields. The anterior frontal edge extends anteriorly to the lateral tips of the azygous shield; the edge then continues posterolaterally to reach point contact with the dorsal tip of the oculars, then gradually narrows toward the midline, which it reaches at a level anterior to the angulus oris. The parietals are in variable contact along the midline, the contact often being longer than either that of the frontal or the occipital. It occupies the area otherwise filled by the postocular and consequently has narrow contact with the third supralabial and wide contact with the enormous postsupralabial, which widens dorsally. The second body annulus swings slightly anteriorly in the temporal region and contains three small segments dorsal to the second postsupralabial; these are followed in turn by a large occipital flanking the midline. The latter is almost as large as the frontal; however, it seems as if the en-

larged head shields only incorporate the dorsal segments of the first two body annuli. The middorsal segments of the third dorsal half-annulus may be enlarged. The nuchal region shows some irregularity. The third body annulus tends to be very narrow laterally just posterior to the postsupralabials and the fourth body annulus may be widened. There are no intercalated dorsal half-annuli. In general, the fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is markedly prognathous and the rostral is clearly visible in ventral view. The large mental is narrower posteriorly than anteriorly and is significantly shorter than the flanking enormous and considerably longer first infralabials. The anterior sutures of the small second infralabials extend at an angle from the malar junction to the lip. The anteriormost space between the first infralabials is occupied by a small postmental. The malars are enlarged. Anterior and medial to them lies a row of two to four postgenials, only the medial pair of which lies directly posterior to the postmental; a second row of five to seven postgenials follows between the malars. The ventral segments of the first five body annuli are reduced in size. Some specimens show fusion or other irregularities in the region of the 10th to 12th ventral annuli before the fully widened midventral segments appear.

There are 211 to 226 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to sixth discrete half-annuli may be narrowed and folded. At midbody an annulus contains 14 to 20 twice as long as wide dorsal segments and 12 to 16 (generally 12 to 14) ventral ones; the medial segments are $1\frac{1}{4}$ times as wide as long. The cloacal region corresponds to two to four lateral annuli. The tail bears 16 to 20 caudal annuli, the last 3 to 5 much narrower dorsally than ventrally, and the last one visible in ventral view showing an array of narrow elongated segments that completely occupies the caudal tip. The segments occupying the flattened dorsoposterior aspect of the tail are tightly joined so that the interannular sutures are no wider than the intersegmental ones. They form a series of concentric rings with the center filled with somewhat larger segments. In some specimens these segments

are faintly produced into cones. However, in the largest specimens the caudal tip appears to be worn smooth. A narrowed and markedly pigmented autotomy site occurs on the sixth to seventh postcloacal position. (Eight of the 39 specimens show autotomy.)

There are eight large round precloacal pores, each inserted into the center of the posterior edge of one of the eight segments of the precloacal annulus, those of the males bearing projecting cores. The pore-bearing row corresponds to the full width of the ventral region, as well as to that of the precloacal shield. The latter has a central posteriorly curved portion, that is covered by four parallel-sided segments, the median ones the largest, followed laterally by a gradually diminishing section of two segments. The postcloacal edge is formed of 10 to 12 segments.

The snout is markedly pointed, more in dorsal than in lateral view. At the level of the nostrils it is half as wide as at the level of the postsupralabials. The snout is vertically swollen anterior to the level of the eyes. The temporal region is hardly wider than the trunk at the level of the third through eighth annuli. The trunk is rounded anteriorly and variably compressed dorsoventrally thereafter onto the base of the tail. After the autotomy level it suddenly becomes higher than wide to form a dorsal hump, shortly posterior to which the spatulate distal section is compressed into a horizontal wedge. The lateral sulci start at the 20th to 50th body annulus, being indicated anteriorly only by alignment of sutures; at midbody an annulus is more than one-half the width of an adjacent segment and contains large triangular segments. The dorsal sulcus is marked from near the 70th annulus and is narrower than the lateral ones. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Southeastern Ghana.

LOCALITY RECORDS: WEST AFRICA: ZMU 9375 (holotype of *Amphisbaena kraussi* W. C. H. Peters, 1878a, 1878b, 1882; Boulenger, 1885; Loveridge, 1941; Strauch, 1881). GHANA: No locality: SMNH 1346a, 1346b. Christians Village: KM R4470. Banda Hills, 40 mi NW of Wendy: BM 1948.1.6.90-

1948.1.6.97; MCZ 49701-49709 (Cansdale, 1951, original series contained 21 specimens; Loveridge, 1948). Kete Krachi: ZMU 16070b. Bamboi, 6 mi north of: CAS 134733-134735. Bamboi, 12 mi north of: CAS 126398-126400. Bamboi, 50 mi north of: CAS 134727-134730. Tinga: CAS 126397. Wa: CAS 126394-126396, 134713-134715.

BIOLOGICAL NOTES: MCZ 42702 contained a large (decomposed) egg in the oviduct, suggesting that this slender individual was sexually mature. Banda Hills specimens (flesh-colored and entirely subterranean) were dug up during farming operations in savannah woodland (Cansdale, 1951). Skull briefly characterized (Vanzolini, 1951a).

REMARKS: The description of *Amphisbaena kraussi* W. C. H. Peters (1878a) from West Africa refers to three types in good agreement with each other, of which only the two now in the Berlin (ZMU 9375) and Copenhagen (KM R4470) museums were located. The Berlin specimen is a typical individual of the species with head-segmentation Pattern II as is the Copenhagen specimen (in their catalog listed as deriving from Christians Village, Ghana).

Cynisca leonina (F. Müller)

Amphisbaena leonina F. Müller, 1885b: 700. Type locality: "Tumbo Insel," Los Archipelago, Guinea. Holotype: NMB 3806.

DIAGNOSIS: Preocular supralabials, nasal, preocular, and prefrontal fused, with a blind suture entering fused shield from anterior corner of ocular. Ocular discrete (quadratic, diagonally placed). A small median azygous shield. Frontal and parietal fused (relatively small). Occipital distinct. Enormous first postocular supralabial contacts frontal-parietal. Large temporal lies dorsal to first and second postsupralabials. Snout generally pointed. 2 supralabials and 2 infralabials. Mental and first infralabials enormous. No true postmental, rather an enlarged median segment in the first postgenial row followed by two small segments in a second row, both rows flanked by elongate segments between the enlarged malars. 233-243 body annuli; 18-19 caudal annuli. Midbody segments, 14 dorsal, 10 ventral. Median ventral segments enlarged, paired. 7-8 round precloacal pores.

Autotomy site at the 6th to 7th caudal annulus.

DESCRIPTION (Pattern VI): The meristic characters are summarized in table 7. Figures 24 and 8 show views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 14 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are a uniform light brown dorsally and lighter on the ventral surface; the countershading proceeds within one or two segments just above the lateral sulci. The intersegmental sutures of the dorsal surface are lightened. A few lighter patches appear in the anterolateral region and it is uncertain whether or not these represent artifacts of preservation. The anterior fused shield as well as the supralabials are always lighter colored. In contrast, the median azygous shield, the oculars, and the frontal-parietals (and sometimes the occipitals), as well as irregular parts of adjacent shields, are a medium brown, much darker than any other part of the trunk. This pigmentation gives the appearance of a forked dark patch on the head. The dorsal surface of the caudal region is somewhat darker than that of the trunk and even the ventral portion of the tail is darkened. The cloacal shields may be lighter.

The anterior head shields show major fusions. The rostral is barely visible in dorsal view. Posteriorly, it is followed on each side by a large shield that includes the preocular supralabials, the nasal, and the prefrontal. The diagonally placed oculars are wider than long. A blind suture extends from its anterior corner into the fused shield. A triangular azygous shield lies on the midline. Its anterior tip inserts between the posterior portion of the anterior fused shield; laterally, it has point contact with the oculars and the transverse posterior edge contacts the fused, relatively small frontal (-parietal) shields. The second supralabial (or first postocular one) is longest at the level of the eye; it extends dorsally to contact the midlateral portion of the frontal-parietal shield. The frontal appears to be fused to the parietal, but the compound shield is relatively small and some specimens (MG 722.94b; MHNP 1895.481) show unilateral

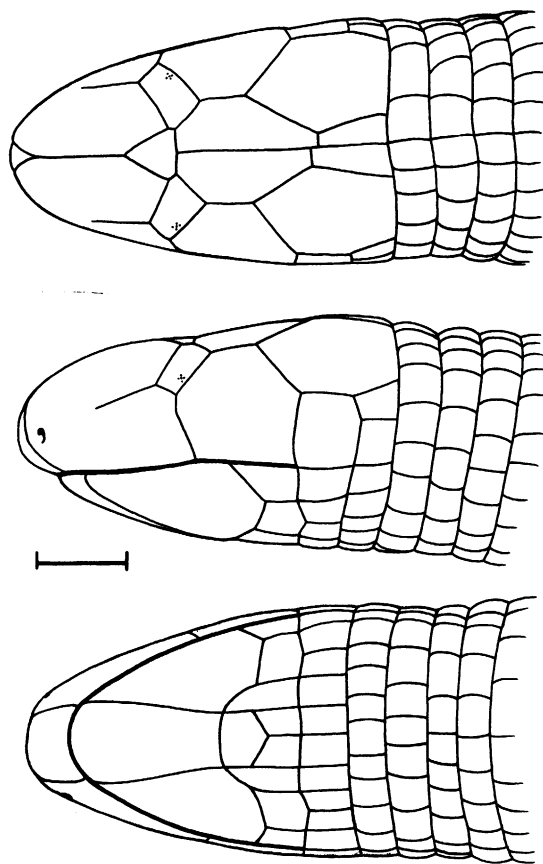


Fig. 24. *Cynisca leonina* (Pattern VI). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of MG 722.94a, from Conakry, Guinea. The midline contact of the temporal segment is variable, and only specimen MG 722.94a lacks a transverse suture bisecting the lateral postgenials of the first postgenial row. The line equals 1 mm to scale.

(or bilateral in MHNP 1897-319) point or broader contact of the enormous temporal to the midline. A triangular pair of occipitals (irregular in MG 722.94b) extends anteriorly from the third body annulus almost to the level of the angulus oris. The first postsupralabial is twice as high as long; the second is squarish and is followed dorsally by a second subequal shield which lies below the enormous temporal-parietal. The temporal covers the side of the head anterior to the first dorsal half-annulus and posterior to the first postocular supralabial. In general, the fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is slightly prognathous and the rostral is clearly visible in ventral view. The large mental is narrower posteriorly than anteriorly and is flanked completely by the enormous first infralabials. The anterior sutures of the small second infralabials extend anteriorly from the junction with the malars to the lip. The large and rectangular malars are twice as wide as long. A median enlarged postmental is followed posteriorly by two postgenials; all three are flanked by two elongate segments medial to the first infralabials and malars; thus a superficial count would give three postgenials of the first row and four postgenials in the second row. In most specimens, the flanking segments are subdivided so that there are two discrete rows of postgenials. The ventral segments of the first through sixth body annuli are reduced in size; the seventh and eighth swing anteriorly near the midventral line; neither more anterior nor more posterior annuli show this pattern. Some specimens show fusion or other irregularity of ventral annuli in this region.

There are 233 to 243 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to sixth discrete dorsal half-annuli may be narrowed and folded. At midbody an annulus contains 14, from twice as long as wide to squarish, dorsal segments and ten ventral ones, the medial ones $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to two to three lateral annuli. The tail bears 18 or 19 caudal annuli before a conically oval cap that is more than twice as long as the next annulus and generally includes indications of segmental subdivisions all around the base, but not on the distal tip. A narrowed, but not especially pigmented autotomy site occurs on the sixth to seventh postcloacal position. (None of the specimens shows autotomy.)

There are seven to eight variably produced round precloacal pores, each inserted near the posterior edge of one of the segments of the precloacal annulus; those of males bear projecting cores. (The holotype is aberrant in that only three of the eight precloacal segments bear any pores, but these are very well developed.) The pore-bearing row corresponds to the width of the paired ventral segments and to the four medial segments of the

six subequal ones covering the crescentic precloacal shield. The postcloacal edge is formed of six to eight segments.

The snout is markedly pointed, both in dorsal and in lateral view. At the level of the nostrils, it is half as wide as at the level of the postsupralabials. The temporal region is wider than the trunk at the level of the third through eighth annuli. The preocular portion of the snout is slightly swollen. The trunk is variably compressed dorsoventrally until the base of the tail where the cross section changes to a vertical oval. The lateral sulci start at the 40th body annulus, indicated anteriorly only by alignment of sutures; at midbody an annulus is less than half the width of an adjacent segment and contains some tiny triangular segments. The dorsal sulcus begins at the same level and is of similar proportions. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Tumbo and Kassa islands, Los Archipelago, Coastal Guinea.

LOCALITY RECORDS: GUINEA: Conakry: MG 722.94a-722.94b; MHNP 1897.319, 1895.481. Ile Kassa, Los Islands: IRSNB 910 (Loveridge, 1941; Parker, 1939). Tumbo Island: NMB 3806 (holotype of *Amphisbaena leonina* F. Müller, 1885b; Boulenger, 1885; Loveridge, 1941). [Loveridge, 1941, cites Rio Pongo, in Guinea Bissau.]

REMARKS: The holotype (NMB 3806) is in excellent condition, and even retains a faded color pattern, including the reverse-arrow marking on the head. It does show an aberrant pattern of precloacal segments, because only three of the eight segments bear large-colored precloacal pores.

Cynisca leucura (Duméril and Bibron)

Amphisbaena leucura Duméril and Bibron, 1839: 498. Type locality: "La côte de Guinée." Holotype: RMNH 3555.

Amphisbaena macrura Duméril and Bibron, 1839: 499. "Manuscript name" for type of *A. leucura*; unavailable as published in synonymy (Stoll and others, 1961, art. 11d).

Amphisbaena petersii Boulenger, 1906: 201. Type locality: "Gold Coast; and Jebba, Upper Niger" Nigeria. Syntypes: BM 93.9.6.1:RR1946.8.2.19 (Gold Coast); BM 99.8.23.10:RR1946.8.31.74,

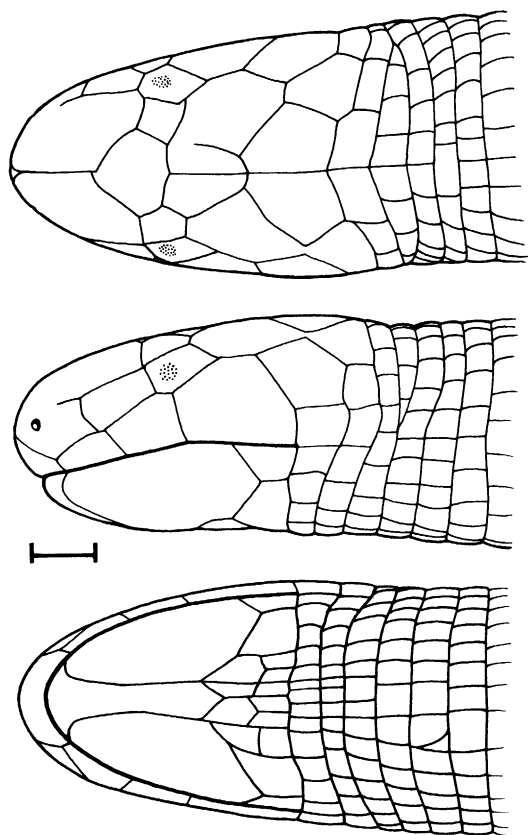


Fig. 25. *Cynisca leucura* (Pattern III). Dorsal, lateral, and ventral views of head and nuchal region of RUCA 1460, from Fazao, Togo. The line equals 1 mm to scale.

99.8.23.11:RR1946.8.31.75 (Jebba, Upper Niger, Nigeria).

DIAGNOSIS: Two preocular supralabials, preocular and ocular discrete. Nasal and prefrontal fused except for blind suture reaching anteriorly from corner of preocular. Median azygous shield. (Sometimes a pair of segments posterior to the azygous shield on the midline, anterior to the frontals.) Frontals, parietals, and occipitals distinct. Postocular supralabial kept from contact with frontal by large postocular. Two or more medium-size temporals dorsal to first (and second) post-supralabials. Snout generally pointed. 3 supralabials and 2 infralabials. First infralabials much wider and slightly longer than mental plus postmental (which are fused in 12% of specimens). Two rows of postgenials (2–6, 4–11; rarely three rows), each between enlarged

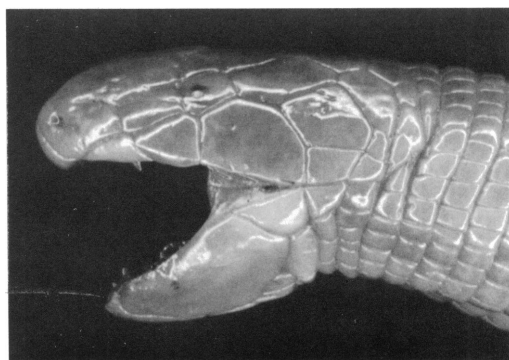


Fig. 26. *Cynisca leucura*. Lateral view of head of CG 4752, from Christians Village, Ghana. Specimen has open mouth, showing the extent to which the segments separate along the gape.

malars. 203–252 body annuli; 20–30 caudal annuli. Midbody segments, 12–23 dorsal, 8–16 ventral. Median ventral segments enlarged, paired. 0, 6–13 round precloacal pores. Autotomy site at the 5th to 9th caudal annulus.

DESCRIPTION (Pattern III): This widely ranging species shows substantial geographic variation. The meristic characters are summarized in tables 1, 2, 3, 4, and 5. Figures 25 and 8 show the views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions, as well as the pattern at midbody, figure 14 lateral view of tail and caudal region, figure 26 a lateral view of the head with the mouth open; figure 6 gives the body proportions.

This is a large species of *Cynisca*. Specimens are a uniform dark bluish-brown dorsally and lighter on the ventral surface; the countershading proceeds by general fading within one or two segments just ventral to the lateral sulci (though a very few specimens, such as RMNH 18672, show a checkerboard drop out of pigment) and the midventral segments may be very light. However, even the ventral surface of most specimens is pigmented, which is particularly obvious on the ventral surface of the tail. All or part of the chin tends to be unpigmented as may be the first supralabial; some specimens show a lightened partial neck band near the second and third annuli. In many specimens one sees the collagen fibers of the extracolumellar attachment as a light area deep to the large

infralabials. Some precloacal segments may be colorless and there may be a narrow non-pigmented midventral streak down the center of the tail. Pigmentation of segments tends to be uniform, except that the anterior half of each segment is darker (which is more obvious on the ventral surface). The dorsal surfaces of the head and caudal region are slightly darker than the trunk; the dorsal caudal cap is darkest. One or two autotomy annuli may be markedly darkened.

The anterior head shields show fusions only in the loss of the anterior sutures between nasals and prefrontals; however, there is notable variation in segmental proportions and marked asymmetry. The rostral is visible as a small triangle in dorsal view. Posteriorly, it is followed on each side by a very large nasal-prefrontal, though a horizontal blind suture extends into this shield from the anterior tip of the preocular. A pentagonal azygous shield of variable size lies along the midline between the fused nasal-prefrontal shields. (In a few specimens from Achimota the azygous shows a partial midline split from the posterior edge. The shield is subdivided into three smaller shields, effectively intercalating an additional pair of "prefrontals" back of the azygous that are in contact with the supraoculars, in CG 4736 and 4763.) Laterally, this shield is excluded from contact with the ocular by the quadrangular supraocular (azygously fused to the ocular in CG 3998, to the frontal and postocular in CG 4746), which keeps the prefrontal from contacting the frontal. The anterior edge of each frontal extends most anteriorly at the line where the azygous median shield contacts the supraoculars and slopes posteriorly from here to contact the oculars and postoculars along which it gradually narrows to asymmetrical contact with the parietals. The latter widen posteriorly along the postocular and narrow along contact with a temporal to join a pair of small occipitals, that derive from the median segments of the third body annulus, or of an intercalated dorsal half-annulus (lying between body annuli two and three).

There are two preocular supralabials; the second is larger and kept from contact with the prefrontal by the rectangular preocular. The small polygonal ocular is diagonally placed with the large eye visible in its center.

The third supralabial is enormous and extends dorsally along the posteroventral side of the ocular to contact the ventral edge of the large postocular. A slightly enlarged first postsupralabial and a smaller second one form the base of the temporal region. A large temporal shield lies dorsal to the first postsupralabial and two small ones dorsal to the second. An intercalated dorsal half-annulus follows after the first dorsal half-annulus corresponding to body annulus four. The zone of the first two postsupralabials extends upward to form the temporal region, the occipitals being part of the second (an intercalated half-annulus) or the third dorsal half-annulus. The zone of enlargement corresponds to the dorsal portions of two to three body annuli. However, the temporal and parietal-occipital regions of this species are highly variable, and show very irregular segmentation with differences common within samples and major asymmetries in most specimens.

The snout is slightly prognathous and the rostral is clearly visible in ventral view. The mental is narrower posteriorly than anteriorly; it is generally followed by an elongate postmental (see section on Geographic Variation) and both are flanked completely by the enormous first infralabials. The anterior sutures of the small second infralabials extend anteriorly from the malar junction to the lip. The enlarged trapezoidal malars enclose the posterior portion of the first and all of the second postgenial row, the first containing 2 to 6 segments and the latter 4 to 11; often the segments medial to the malars are elongate and undivided, whereas a few specimens show additional subdivision leading to a pattern resembling three postgenial rows. The lateral postgenials lie posterior to the first infralabials. The ventral segments of the first six to seven body annuli are reduced in size, by the 10th annulus the medial ones are squarish and by the 20th they are twice as wide as long.

There are 203 to 252 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to eighth anteriormost annuli may be narrowed and folded and a crescentic dorsal half-annulus lies intercalated between body annuli three and four (see above), whereas there tends to

be an intercalated or spiral annulus within the first ten body annuli and some segmental irregularity in the cloacal region. At midbody an annulus contains 12 to 23 dorsal segments, the medial ones twice as long as wide, whereas the medial segments of the 8 to 16 ventral ones are 2–2½ times as wide as long. The cloacal region corresponds to two to four (generally three to four) lateral annuli with asymmetries common. The tail bears 20 to 30 caudal annuli before a conically oval cap that is longer than the next annulus and generally includes indications of segmental subdivisions around the base, but not on the distal tip. A narrowed, often more densely pigmented, autotomy site occurs on the fifth to ninth postcloacal position.

There are 6 to 13 (generally 8 to 11) large round precloacal pores (in a continuous or medially interrupted row) on the posterior edge of the precloacal segments (a single specimen from Bobo Dioulasso lacks pores); projecting cores are each inserted into the center of one of the small segments lying anterior to the precloacal shield. The pore-bearing row corresponds to the width of the six midventral segments and exceeds the width of the four enlarged medial segments of the eight to ten covering the crescentic precloacal shield. The medial pair of segments tends to be longer than the more lateral ones and may extend into the pore-bearing row, separating it by the insertion of a triangular wedge. The postcloacal edge is formed of 7 to 11 (generally 8 to 10) segments.

The snout is more pointed in lateral than in dorsal view. At the level of the nostrils it is half as wide as at the level of the postsupralabials. The temporal region may be slightly wider than the trunk at the level of the third through eighth annuli and the back of the head may be slightly constricted. The trunk is rounded anteriorly and variably compressed dorsoventrally thereafter until the base of the tail, where the cross section changes to a vertical oval. The lateral sulci start near the 20th body annulus and extend just beyond the level of the cloaca. Anteriorly, they are indicated only by alignment of sutures; at midbody, they contain multiple, regular intercalated segments. The middorsal sulcus begins near the 10th annulus, but only becomes significantly widened near the 60th.

It is narrower than the lateral ones and only a tiny triangular segment on the posterior half of each annulus. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Chad, Central African Republic, Nigeria, Benin, Togo, Ghana, southern Burkina Faso, and eastern Ivory Coast.

LOCALITY RECORDS: WEST AFRICA: No locality: "La côte de Guinée" RMNH 3555 (holotype *C. leucura* Duméril and Bibron, 1839; Boulenger, 1885; Cope, 1885; Duméril, 1861; Duméril and Bocourt, 1882; Gray, 1844, 1872; Peters, 1862, 1879; Weinland, 1862). CENTRAL AFRICAN REPUBLIC: Gribingui: MHNP 1921.4. CHAD: Mayo Kebbi: MHNP 1965.96. Fort Archambault: MHNP 1904.160. NIGERIA: Calabar: BM 77.2.13.1 (Boulenger, 1885; Dunger, 1968; Loveridge, 1941; Strauch, 1881). Wukari, Benue Province: BM 1938.3.1.50. Albinsi (Abinsi), Benue Province, Bensia River: BM 1913.6.18.1 (Dunger, 1968). Keana, Northern Nigeria: AMG 4901a-4901c; BM 1927.11.19.1-1927.11.19.4; MCZ 28671 (Loveridge, 1941). Sherifuri, near Katogum (Katagum), Northern Nigeria: BM 1928.5.20.2 (Dunger, 1968). Gadau, Northern Province: AMNH 69642; BM 1937.12.4.17, 1938.3.1.54-1938.3.1.71 (Dunger, 1968). Deert, Northern Nigeria: BM 1911.7.19.3-1911.7.19.4. Wushishi, near Zungeru, Niger Province: FMNH 25053, 42562. West Province, Southern Nigeria: BM 1908.10.12.1-1908.10.12.1A. Jebba, Upper Niger: BM 1946.8.31.74-1946.8.31.75 (syn-types *Amphisbaena petersii* Boulenger, 1906; Dunger, 1968; Loveridge, 1941). Little Kom Kom, Wurumas, Kwara State: BM 1970.1770. New Bussa, Kwara State: BM 1970.1768-1970.1769. Kainji Dam: BM 1969.340-1969.342. Timubridge, Kwara State: BM 1970.1772. Yelwa, Northwest State: BM 1970.1771. Kunav: BM 1966.264 (Dunger, 1968). BENIN (ex Dahomey): Natingou: *IFAN 1929, 1952 (Loveridge, 1952). Ketonou: CG 3757-3758. Godomey: CG 3765-3766, 4150. Tori: CG 3772. Agbodji (Agbodjedo): CG 3997-3998. Agouagon: MHNP 1917.48-1917.48c, 1917.49-1917.49c (Chabanaud, 1917; Loveridge, 1941). Soubroukou: UGL 27. Kinta: CG

3777-3778. Anolouyeme: CG 4011. Djeho: CG 3994-3996. No locality specified: CG 5603-5604. TOGO: Koledjoke (Kolekope): RUCA 1541. Fazao: RUCA 1420-1421, 1460, 1476-1477, 1431A-1431M. Tohoun: IFAN 50.2.318-50.2.321 (Loveridge, 1952). Bassari: RUCA 1632. Namoundjoga: RUCA 1196. No locality specified: IFAN 55.20.325; ZMU 24917, 24918A-24918B, 24919. GHANA: Legon: CG 4129, 4139-4145, 4147-4148, 4731-4751, 4757-4768, 4770-4774, 4778-4780, 4902; FMNH 191868-191871, UGL 22-24, 29-32. Legon Hill: CAS 141776-141779, 146028, 147671-147680; CG 5513; UGL 12-13, 28. Achimota: BM 1954.1.5.9; CAS 125546-125548, 135324-135329, 136145, 136264-136266, 136375-136404; CG 4043, 4903-4905; FMNH 74861; MVZ 143-144, 75397-75405, 81406-81407; UGL 1-6, 14-17, 25. Accra: BM 1933.6.14.23-1933.6.14.25, 1937.7.13.3; CM 24688; ZMU 5742 (Loveridge, 1941; Orton and Morrison, 1946; Peters, 1879—illustrates specimen; Strauch, 1881). Kwali Lagoon (Korley-Bu), near Accra: BM 1931.5.6.4, 1932.6.1.13-1932.6.1.14; MCZ 49097-49098, NHMB (unnumbered). Christians Village: CG 4752-4755, KM R4471-R4472. Labadi, near Accra: UGL 18; ZMU 16069A-16069B. Klein Popo (Klein Pope): ZMU 14153 (Loveridge, 1941; Tornier, 1901). Kpandu: RMNH 18668-18674. Kete Krachi (Kete Kraschi, orig. Kete-Kratje): ZMU 16070a-16070b (Loveridge, 1941; Tornier, 1901). Tamale: CG 2301; UGL 20, 26. Mangu: ZMU 16068 (Loveridge, 1941; Tornier, 1901). Gambaga district: BM 1930.10.4.1. Turi: BM 1954.1.4.8-1954.1.4.9. No locality specified: BM 1916.9.9.2, RR1946.8.2.19 (syntype *Amphisbaena petersii* Boulenger, 1906); UGL B1, 21 (Werner, 1913). BURKINA FASO: Ouagadougou: MNHP A.71-A.74. Bobo-Dioulasso: IFAN 55.20.325 (Grandison, 1956; Papenfuss, 1967). IVORY COAST: Assini: MHNP 1885.599-1885.601, 1885.695-1885.696. No locality specified: ZMU 3804, 6905.

REMARKS: *Amphisbaena leucura* is the first name in the assemblage, described on the basis of one specimen (RMNH 3555) that apparently bore the "manuscript name" *Amphisbaena macrura* in the Leiden Museum collection. The individual clearly pertains to the populations between Nigeria and Ghana

on the basis of the number of midbody segments and other data; consequently, the name is assigned to that species. In 1844, Gray designated *leucura* as the type species of his genus *Cynisca*.

Amphisbaena petersii was described in a footnote reference to Peters' (1879) illustration and based on a series of three specimens—one from the "Gold Coast" (BM RR1946.8.2.19), and two from "Jebba, Upper Niger," Nigeria (BM RR1946.8.31.74-RR1946.8.31.75). The name is a strict synonym of *Cynisca leucura*. As the types have a discrete postmental (genial), the name could be made available by judicious restriction of the type locality of the nominal species and selection of either the "Ghana" or the Nigerian specimens as lectotypes. No such action is taken here.

GEOGRAPHICAL VARIATION (table 8): There seems to be some geographical variation, but there is no obvious line along which several characters change in parallel. For instance, the eastern specimens (through Nigeria), and those of north Ghana and to the west, have relatively shorter tails than do the animals from Benin, Togo, and southern Ghana (fig. 6). The Benin-Togo specimens also have lower numbers of segments to a midbody annulus than do those from Nigeria and east. This difference breaks down in central Ghana, although higher numbers of segments again are associated with shorter tails in Burkina Faso and the Ivory Coast. Most other characters, such as the appearance of a discrete postmental, show no geographic pattern. Numbers of body and caudal annuli, and of precloacal pores, show graded variation that is not clearly associated with variation in other features. It is unclear whether this is a real situation or merely the result of inadequate sampling.

BIOLOGICAL MISCELLANEA: Records of hearing curves (Gans and Wever, 1972; Wever, 1978) and anatomy of the ear (Wever, 1978; Wever and Gans, 1973) for specimens from Legon, Ghana. Description and views of entire skull; details of quadrate and stapes (Vanzolini, 1951a, 1951b). Dermal vertebral ratio is 2:1 for trunk and 1:1 for tail (Alexander and Gans, 1966). Everted hemipenes are shown by CG 3994-3995. The situs viscerum is described by Crook and Parsons (1980). The karyotype of specimens collected in Be-

nin and Ghana showed 6 pairs of metacentric M and 9 to 10 pairs of m chromosomes (Huang and Gans, 1971).

The Benin material was taken in sandy soil near compost heaps and under rotting palm fronds at temperatures of 28–29°C (C. Miller, personal commun.). The specimens from Legon (Ghana) were taken beneath piles of rotting vegetation in the first 20 cm of soil in shaded areas at the edge of a golf course (C. Gans, personal observ.).

Cynisca liberiensis (Boulenger)

Ophioproctes liberiensis Boulenger, 1878: 301.

Type locality: "Liberia." Holotype: IRSNB 2005.

Amphisbaena lamottei Angel, 1943: 163. Type locality: "Pierré-Richaud, un des sommets du Mont Nimba (alt. 850 m)," Guinea. Holotype: MHNP 1943-65. Paratypes: MHNP 1943-63, 1943-64 (Keoulenta, Mt. Nimba, alt. 500 m).

DIAGNOSIS: Preocular supralabials, nasal and prefrontal fused, with a blind suture entering fused shield from anterior corner of ocular. Ocular discrete (quadratic, diagonally placed). Frontal and parietal fused (relatively small). One or two pairs of distinct occipitals. Enormous first postocular supralabial in broad contact with frontal-parietal. Large temporal lies dorsal to large first and smaller second postsupralabials. Snout generally pointed. 2 supralabials and 2 infralabials. Mental and first infralabials enormous. 2 rows of up to 4 postgenials each between enlarged malars. 217–262 body annuli; 21–24 caudal annuli. Midbody segments, 12–16 dorsal, 8–10 ventral. Median ventral segments enlarged, paired. 6 or 8 round precloacal pores in males, none in females. Autotomy site at the 6th to 9th caudal annulus.

DESCRIPTION (Pattern XII): The meristic characters are summarized in table 6. Figures 27 and 9 show views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody, figure 15 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are a uniform brown dorsally, some specimens showing mottling of the dorsal segments, and a lighter pigmentation on the ventral surface;

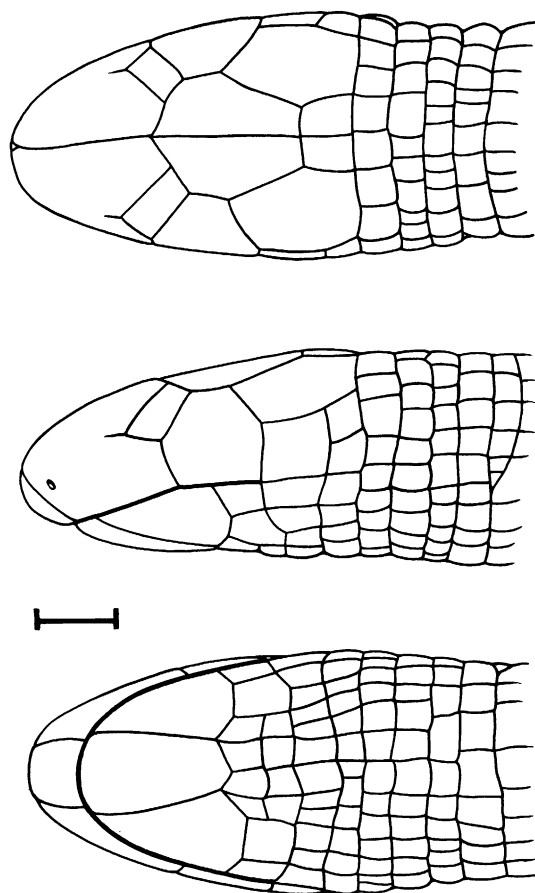


Fig. 27. *Cynisca liberiensis* (Pattern XII). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of BM 1914.1.27.4, from Sierra Leone. Specimens IRSNB 2005 and USNM 24294 show an enlarged median segment in the first postgenial row. The line equals 1 mm to scale.

the countershading proceeds within one or two segments just above the lateral sulci. The dorsal surface of the caudal region is somewhat darker than that of the trunk and even the ventral portion of the tail is darkened. The cloacal shields may be lighter and some parts of the ventral region may show the pigment dropping out by segments (checker-board pattern).

The anterior head shields show major fusions. The rostral is barely visible in dorsal view. Posteriorly, it is followed on each side by a large shield that includes the preocular supralabials, the nasal, and the prefrontal. The

diagonally placed oculars are wider than long (but the eye of preserved specimens often appears to be bisected by their posterior suture). A blind suture extends from its anterior corner into the fused shield. The suture between the large shield and frontals forms an anteriorly pointing, shallow V on the head. The frontal-parietal shields are relatively large. One of two pairs of rectangular occipitals extends anteriorly to the level of the midregion of the first postsupralabial. The second supralabial (or first postocular one) is longest at the level of the eye; it extends dorsally from the lip to contact the widest portion of the frontal-parietal shield. The first postsupralabial is twice as high as long; the second is squarish and followed dorsally by a second subequal one, which lies below the large temporal. The temporal covers the side of the head anterior to the first dorsal half-annulus and posterior to the first postocular supralabial. In general, the fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is slightly prognathous and the rostral is clearly visible in ventral view. The large mental is narrower posteriorly than anteriorly and flanked completely by the enormous first infralabials. The first postgenials may be fused or discrete (Brongersma, 1935). The anterior sutures of the small second infralabials extend from the junction with the malars anteriorly to the lip. The enlarged and rectangular malars are of variable proportions. There are two to four small postgenials in the first (IRSNB 2005 and USNM 24294 show an enlarged median one in the first) row and four to six in the second one. The ventral segments of the first six body annuli are reduced in size; the seventh and eighth swing anteriorly near the midventral line; neither more anterior nor more posterior annuli show this pattern. Some specimens show fusion or other irregularity of ventral annuli in this region.

There are 217–262 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to the sixth discrete dorsal half-annuli may be narrowed and folded. At midbody an annulus contains 12 to 16 dorsal segments (generally 14), from twice as long as wide to squarish, and 8 or 10 ventral ones, the medial segments

2½ times as wide as long. The cloacal region corresponds to two to four lateral annuli. The tail bears 21 to 24 caudal annuli before a conically oval cap occurs that is more than twice as long as the next annulus and includes faint segmental impressions along the base, but not on the distal tip. A narrowed, but relatively poorly defined autotomy site occurs on the sixth to ninth postcloacal position. (Four of 19 specimens have broken tails.)

There are six to eight variably produced round cored precloacal pores in the males; the females have none. The pore-bearing row corresponds to the width of the paired ventral segments and to the two to four enlarged medial segments of the six covering the crescentic precloacal shield. The postcloacal edge is formed of six to eight segments.

The snout is markedly pointed, both in dorsal and in lateral view. At the level of the nostrils it is half as wide as at the level of the postsupralabials. The temporal region is wider than the trunk at the level of the third through eighth annuli. The trunk is variably compressed dorsoventrally to the base of the tail where the cross section changes to a vertical oval. The lateral sulci start between the 10th and 20th body annulus and are indicated anteriorly only by alignment of sutures; at midbody an annulus is less than half the width of an adjacent segment and contains some tiny triangular segments. The dorsal sulcus begins at the 50th to 60th body annulus and is of similar proportions. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Liberia, Sierra Leone to inland Guinea.

LOCALITY RECORDS: LIBERIA: No locality: BM 95.6.20.1–95.6.20.4 (Boulenger, 1898; Barbour and Loveridge, 1930); IRSNB 2005 (holotype of *Ophioproctes liberiensis* Boulenger, 1878); KM R4473; MHNP 1896.360–1896.362; NMR 66. Junk River: ZIL 6928. Mount Coffee: USNM 24294. Soforeh Place, [on right bank, 50 mi from mouth of] St. Paul's River: RMNH 6458 (Brongersma, 1935; Loveridge, 1941). Robertsport, Grand Cape Mount: RMNH 6459, 6459A (Brongersma, 1935; Loveridge, 1941; Strauch, 1881). SIERRA LEONE: No locality: BM

1914.1.27.4. GUINEA: Mt. Nimba, Pierré-Richaud (850 m): MHNP 1943.65 (holotype of *Amphisbaena lamottei* Angel, 1943; Angel et al., 1954; Dunger, 1968). Keoulenta (500 m): MNHP 1943.63-1943.64 (paratypes of *Amphisbaena lamottei* Angel, 1943; Angel et al., 1954; Dunger, 1968).

BIOLOGICAL MISCELLANEA: Specimens were taken at 30 cm depth in savannah soil and in very poorly compacted soil (Angel et al., 1954). May occur in decayed wood (Büttikofer, 1890); RMNH 6458 was taken in a hollow tree (Brongersma, 1935).

REMARKS: The type of *Ophioproctes liberiensis* (IRSNB 2005) is a typical specimen of the low-body annuli variant of the species with head-segmentation Pattern XII.

In 1943, Angel described *Amphisbaena lamottei* on the basis of three specimens (MHNP 1943.65, 1943.63, 1943.64) from various places on Mt. Nimba, Guinea. The three types were available for analysis, and their characters agree well with the original description. In 1954, Angel et al. illustrated the head of the holotype in dorsal and lateral views and corrected part of the original description. Unfortunately, the specimens are brittle; the two paratypes are dried and broken, and even the holotype is damaged along the trunk. Because the specimens have Pattern XII, although the number of dorsal segments is on the high end of the range, this name is available for the high-count population of *Cynisca liberiensis*.

Cynisca muelleri (Strauch)

Cynisca sp.? F. Müller, 1878: 622, 704. Referred to two specimens (NMB 3807-3808) from "Akropong," Ghana.

Amphisbaena mülleri Strauch, 1881: 389, col. 68. Lectotype: NMB 3808, by designation of the illustrated specimen (Gans, 1967). Lectoparatype: NMB 3807. Based on F. Müller's specimens, plus one additional (lectoparatype) specimen from "Sierra Leone," SMNH 388.

Amphisbaena muelleri Boulenger, 1885: 448. Emendation.

DIAGNOSIS: First preocular supralabial, nasal, preocular, and prefrontal fused, with a blind suture entering fused shield from anterior corner of distinct second preocular supralabial. Ocular discrete, pentagonal, diagonally placed. A small median azygous shield.

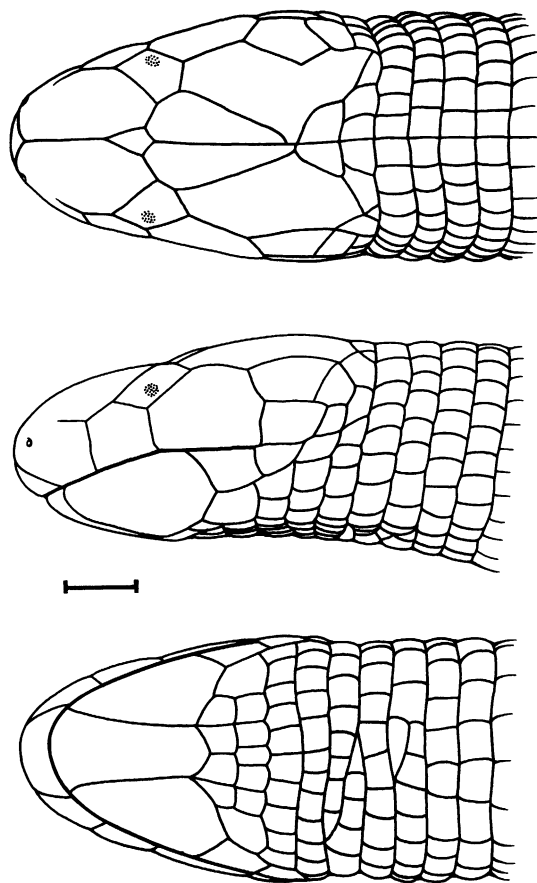


Fig. 28. *Cynisca muelleri* (Pattern V). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of NMB 3808, lectotype, from Ghana. The size of the rostral segment is variable; MCZ 55189 shows a single large segment dorsal to the postsupralabials. The line equals 1 mm to scale.

Frontals relatively small. Parietal either fused with frontal or with enormous temporal. Two pairs of small distinct occipitals. Very large first postocular supralabial kept from contact with frontal by enormous postocular (-temporal) that may have azygous contact with the midline and both first and second dorsal half-annulus. 1 or 2 temporals lie dorsal to first and second postsupralabials. 3 supralabials and 2 infralabials. Snout generally pointed, preocular region swollen. Mental flanked by enormous first infralabials. One row of 4 or 5 small postgenials anterior to and a second row of 4-6 postgenials between enlarged malars. 220-237 body annuli; 22-

26 caudal annuli. Midbody segments, 11–15 dorsal, 10–13 ventral. Median ventral segments enlarged, paired. 10–12 round precloacal pores. Autotomy site at the 6th to 8th caudal annulus.

DESCRIPTION (Pattern V): The meristic characters are summarized in table 4. Figures 28 and 9 show views of the head, figure 13 the ventral surface of the cloacal region, figure 11 the segment proportions as well as the pattern at midbody; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are a uniform light brown dorsally and lighter on the ventral surface; the countershading proceeds within one or two segments just above the lateral sulci. The intersegmental sutures of the dorsal surface are lightened. The dorsal pigmentation is mottled and emphasizes the anterior centers of dorsal segments. The dorsal surfaces of the posterior quarter of the trunk and the caudal region are somewhat darker than those of the anterior trunk and even the ventral portion of the tail is darkened. The cloacal shields may be lighter.

The anterior head shields show major fusions. The rostral is faintly visible in dorsal view. Posteriorly, it is followed on each side by a large shield that includes the first preocular supralabial, the nasal, the preocular, and the prefrontal. The diagonally placed ocular is wider than long. A blind suture extends from the anterior corner of the second preocular supralabial into the fused shield. A quadrangular azygous shield lies on the midline. Its anterior tip inserts between the prefrontal portion of the fused shield and its convex posterior edge between the fused, relatively narrow frontal (-parietal) shields. The anterior frontal edge flares sharply from the midline to reach the oculars and then gradually narrows to asymmetrical contact with the irregularly shaped occipitals, which widen posteriorly to meet the first dorsal half-annulus. Their anterior tips just reach the level of the middle of the first postsupralabials. The large first postocular supralabial extends dorsally to contact the anteroventral portion of the postocular (-parietal) shield. The frontals appear to be fused to the parietal, but the shield is relatively small and some specimens show unilateral or bilateral point

or broader contact of the enormous postocular to the midline, as well as to the first and second (by partial fusion with shields of the first) dorsal half-annuli. The first postsupralabial is twice as long as high and the second is significantly smaller and squarish; both are followed dorsally by a medium-size temporal. The posterior aspect of the enormous postocular (-parietal) that covers the side of the head anterior to the dorsal half-annuli is irregular. Its posterior portion may be divided off (asymmetrically) as another temporal, or show variable fusion with segments of the first annulus. Partly subdivided shields and blind sutures are common. The annular arrangement is both irregular and asymmetrical and there seem to be three dorsal half-annuli involved in the formation of the region of enlarged shields.

The snout is slightly prognathous and the rostral is clearly visible in ventral view. The large mental is slightly narrower posteriorly than anteriorly and flanked completely by the enormous longer first infralabials. The anterior sutures of the small second infralabials extend at a slight angle from the junction with the malar to the lip. A row of four to five postgenials (only the medial two lying posterior to the mental) lies anterior and medial to the malars; a second row of postgenials contains four to six segments and lies lateral to the malars. The ventral segments of the first five body annuli are reduced in size. Some specimens show fusion or other irregularity of ventral annuli in the region of 10 to 12 before the fully widened midventral segments appear.

There are 220 to 237 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to sixth discrete dorsal half-annuli may be narrowed and folded and preceded by one crescentic dorsal half-annulus. At midbody an annulus contains 11 to 15, twice as long as wide, dorsal segments and 10 to 13 ventral ones; the medial segments are $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to two to five lateral annuli. The tail bears 22 to 26 caudal annuli before a conically oval cap. The last annulus is markedly shortened and the unsegmented cap only slightly longer than an anterior caudal annulus. A narrowed,

but not especially pigmented autotomy site occurs at the sixth to eighth postcloacal position. (Two of the 17 specimens show autotomy.)

There are 10 to 12 variably produced round precloacal pores, each inserted in the posterior edge of 1 of the 12 segments of the precloacal annulus; those of males bear projecting cores. The pore-bearing row corresponds to the width of the two to four medial ventral segments and to the full width of the flared crescentic precloacal shield, which is covered by six subequal plus two smaller lateral segments. The postcloacal edge is formed of six to eight segments.

The snout is markedly pointed, more in dorsal than in lateral view. At the level of the nostrils it is half as wide as at the level of the postsupralabials. The temporal region is wider than the trunk at the level of the third through eighth annuli. The trunk is rounded anteriorly and variably compressed dorso-ventrally thereafter until the base of the tail where the cross section changes to faintly oval vertically. The lateral sulci start at the 20th body annulus, being indicated anteriorly only by alignment of sutures; at midbody an annulus is only a fraction of the width of an adjacent segment and contains some tiny triangular segments. The dorsal sulcus is marked near the 70th annulus and is of similar proportions. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Southeastern Ghana. The record from "Sierra Leone" is presumably an error.

LOCALITY RECORDS: GHANA: No locality: SMNH (unnumbered) (Matschie, 1893; Strauch, 1881). Christians Village: KM R4474. Somanya (Somanya Krobo): MCZ 55189-55200. Akropong: NMB 3808 (holotype of *Amphisbaena mülleri* Strauch, 1881; Boulenger, 1885; Loveridge, 1941; Müller, 1878, 1885a), 3807 (lectotype of *Amphisbaena mülleri* Strauch, 1881; Müller, 1878). SIERRA LEONE: no data (probably erroneous locality of specimen shipped via the adjacent British administrative center): SMNH 388 (lectoparatype of *Amphisbaena mülleri* Strauch, 1881; Boulenger, 1885; Loveridge, 1941).

BIOLOGICAL MISCELLANEA: Stated to occur in ant hills (Matschie, 1893).

REMARKS: F. Müller (1878), in the catalog of the Basel Museum, noted that two specimens from "Akropong," Ghana (NMB 3807, future lectotype per Gans, 1967, and 3808, future lectoparatype) were presumably distinct from previously described animals. In 1881, Strauch used this report to name *Amphisbaena mülleri* (emended to *muelleri*, Boulenger, 1885), including as a paratype one additional specimen (SMNH 388) from "Sierra Leone," a shipping point that likely refers to the adjacent missionary and administrative center so that the locality represents an error. The types are in good condition.

Cynisca nigeriensis Dunger

Cynisca nigeriensis Dunger, 1968: 177. Type locality: "in the vicinity of Takwashara, near Abuja (8°52'N, 7°27'E) in Northern Nigeria." Holotype: AMNH 102413 (Dunger, 1968, 1969). Paratypes: AMNH 102414-102423; CG 3981-3984.

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, preocular, and ocular fused. No blind suture enters fused shield. Frontal and parietal discrete; occipital discrete in most specimens (may keep parietals from contacting midline). First postocular supralabial broadly contacts lateral side of frontal. Parietal includes temporal region dorsal to the first and second postsupralabial and displaces the laterodorsal temporal segments of the third (occipital) annulus. Snout bulbous. 2 supralabials and 2 infralabials. Mental shorter than first infralabials, anteriorly as wide as larger first infralabials in ventral view; malars enlarged, enclosing posterior half of first and all of second postgenial rows (the first row containing 2 to 4 segments, the second contains 4 to 5). 225-242 body annuli; caudal annuli 20-22. Midbody segments, 8-10 dorsal, 7-9 ventral. Median ventral segments enlarged, paired. 10 or 0 precloacal pores. Autotomy site at the 5th to 7th caudal annulus.

DESCRIPTION (Pattern IX): The meristic characters are summarized in table 2. Figures 29 and 9 show views of the head, figure 13 the ventral surface of the cloacal region, figure 12 the segment proportions as well as the pattern at midbody, figure 15 lateral view of

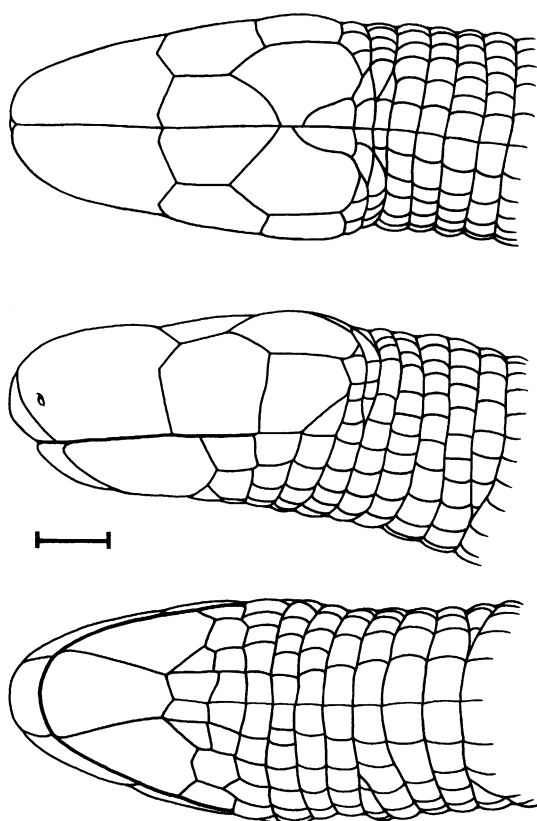


Fig. 29. *Cynisca nigeriensis* (Pattern IX). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of AMNH 102413, lectotype, from the vicinity of Takwashara, near Abuja in northern Nigeria. The line equals 1 mm to scale.

tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are colored a uniform brown dorsally, but are slightly lighter on the ventral surface. The pigment density increases posteriorly and is greatest on the first half of the tail. There is some tendency to checkerboard dropout of pigment in the cloacal region; however, the ventral pigmentation also becomes patchy on individual segments.

The anterior head shields show major fusions. The small rostral is barely visible as a triangle in dorsal view. It is followed posteriorly by enormous paired shields that cover the bulbously swollen snout and apparently include the regions occupied by the preocular

supralabials, nasals, oculars, preoculars, and prefrontals; the vertical posterior suture of these shields appears to bisect the position of the eye in one specimen, in which the integument appeared translucent.

The large second supralabial (or first postocular one) extends dorsally to wide contact with the lateral edges of the trapezoidal frontal and posterodorsally with the large parietal. The latter extends laterally to contact the first postsupralabial, which in turn extends posterodorsally to contact the third body annulus and is much higher than its length along the postlabial edge. The posterior parietal edge contacts the intercalated dorsal half-annulus posterior to the third body annulus. A small triangular occipital lies medial to the posterior portion of the parietal; the frontal and the occipital may restrict or eliminate contact of the parietal with the midline. The occipitals are azygously irregular. Three of the specimens lack occipitals (have them fused with the parietals); in two others, there is an occipital on one side only. The second and third postsupralabials are small and irregular, as are the segments dorsal to the third, up to the midline. Most of these and the intercalated dorsal half-annulus cover the posterior portion of the head and face posteriorly along the deep nuchal constriction, indicating that only the anteriorly and dorsally directed shields are enlarged. The dorsal portions of the first three annuli are involved in cephalic coverage.

The snout is prognathous and the rostral is far more obvious in ventral than in dorsal view. The lower jaw is not particularly deeply inserted into the bulbous snout which is almost twice as wide as high. In ventral view, the mental is narrower than the first infralabial, and the area of the latter is greater. The anterior suture of the second infralabial extends anteriorly at an angle from the junction with the malars to the lip. The suture defining the posterior edges of the very large mental and the flanking first infralabials swings anteromedially so that the enlarged pentagonal malars generally lie lateral to the posterior portion of the first and all of the second row of small paired postgenials. Each postgenial row contains four (rarely fewer than three in the first and rarely five in the second) segments. The lateral postgenials on each side

lie posterior to the infralabials, as do the lateral portions of the medial postgenial. The postmalars are slightly enlarged. The segments of the gular region are slightly reduced in size and the midventral segments of the seventh annulus show the first indication of widening of the medial segments. An intercalated dorsal half-annulus lies near the eighth annulus.

There are 225 to 242 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portions of the seventh to eighth discrete dorsal half-annuli are narrowed and deeply folded. At midbody, an annulus contains eight to ten (generally ten) dorsal segments $1\frac{1}{2}$ –2 times as wide and seven or nine (generally eight) ventral segments, the medial ones about $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to three to four lateral annuli. The narrowed tail bears 20 to 22 caudal annuli before a conically oval end, which is generally twice or more as long as the last annulus and bears faintly indented sutures near its anterior edge. An autotomy site is marked at the fifth to seventh postcloacal annulus. It is always well defined, both tail and autotomy annulus being slightly narrowed and more intensely pigmented. Four of 15 specimens have a broken tail.

There are either ten or no variably produced precloacal pores, each inserted into the middle of the posterior edge of one of the ten narrow median segments of the precloacal annulus (only nine in AMNH 102413). This set corresponds to the width of the enlarged midventral segments and precedes the edge of the bow-shaped precloacal shield. The shield consists of four very wide median segments plus a pair of narrower and shorter flanking segments. The narrow postcloacal edge is formed of eight to ten segments.

The trunk is generally slightly wider than high; however, it becomes rounded and slightly higher than wide just posterior to the cloacal region. The tail is of smaller diameter than the trunk. The caudal tip forms a distinct vertical oval in cross section. The lateral sulci start at the level of the 20th body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 60 or so annuli), the

middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and it continues as a depressed groove onto the base of the tail. The ventral sulcus is only indicated by alignment of sutures.

RANGE: Known from the types only.

LOCALITY RECORDS: NIGERIA: Vicinity of Takwashara, near Abuja (about 17 mi south of the main road between Abuja and Keffi): AMNH 102413 (holotype of *Cynisca nigeriensis* Dunger, 1968, 1969), 102414–102423; CG 3981–3984 (paratypes).

BIOLOGICAL MISCELLANEA: Specimens were taken "at shallow depths down to 6 ft during the early rains (March–July) in 1966" (Dunger, 1968).

Cynisca oligopholis (Boulenger)

Amphisbaena oligopholis Boulenger, 1906: 201.

Type locality: "Cassine River District, Portuguese Guinea." Syntypes: BM 1906.3.30.32; RR1946.8.2.46, 1906.3.30.33; RR1946.8.2.47; MSNG CE28164 (six specimens).

DIAGNOSIS: Preocular supralabials, nasal and prefrontal fused, with a blind suture entering the fused shield from the anterior corner of ocular. Oculars discrete (large and rectangular, diagonally placed). A small median azygous shield contacts the oculars. Frontal-parietal-occipitals fused into narrow median shields. First postocular supralabial contacts frontal shield. Enormous temporal extends posterodorsally from the second supralabial to fused shields. Head bulbous. 2 supralabials and 2 infralabials. Mental and first infralabials enormous. Postgenials only slightly enlarged. Malars enlarged, but most posterior chin segments subequal. 224–240 body annuli; 23–25 caudal annuli. Midbody segments, 10 dorsal, 8 ventral. Median ventral segments enlarged, paired. 8–11 precloacal pores. Autotomy site lies at 10th to 13th caudal annulus.

DESCRIPTION (Pattern VII): Meristic characters are summarized in table 7. Figures 30 and 9 show views of the head, figure 13 the ventral surface of the cloacal region, figure 12 the segment proportions as well as the pattern at midbody, figure 15 lateral view of tail and caudal region; figure 6 gives the body proportions.

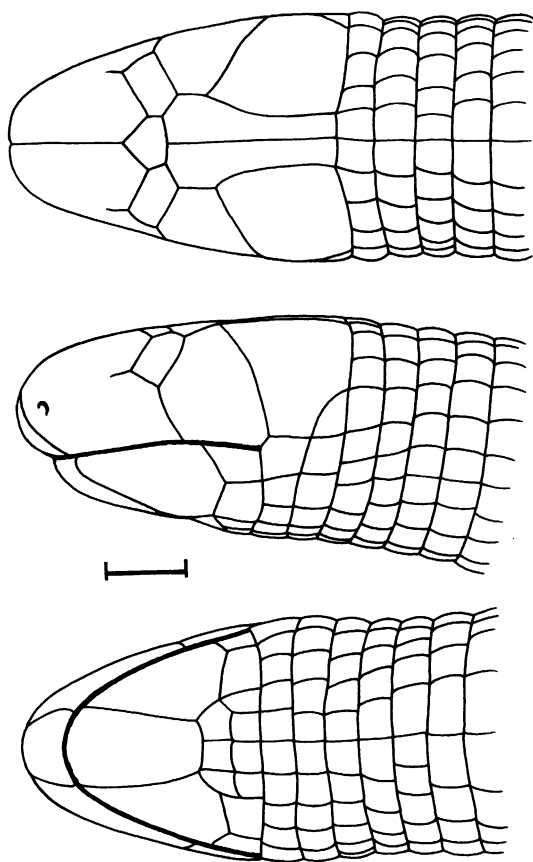


Fig. 30. *Cynisca oligopholis* (Pattern VII). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of BM 1946.8.2.46, syntype, from the Cacine River district, Guinea Bissau. The line equals 1 mm to scale.

This is a small, relatively slender species of *Cynisca*. Preserved specimens are uniformly pale brown dorsally and lighter on the ventral surface; the countershading is gradual and starts just above the level of the lateral sulcus. The dorsal pigmentation extends anteriorly onto the large head shields, though the tip of the snout and the chin appear lighter colored. The pigment density is greatest on the neck and dorsal surface of the tail. The pale ventral color extends from the chin across the anterior 15 percent of the trunk and the ventral surface becomes darker posteriorly. The cloacal shield and immediate precloacal rows may also be unpigmented.

The anterior head shields show major fusions. The rostral is not visible in dorsal view.

The anteriormost portion of the head is covered on each side by a large shield that includes the region otherwise occupied by the preocular supralabials, the nasal, and the prefrontal. The diagonally placed ocular is semi-rectangular, much wider than long and a small blind suture extends anteriorly from its anterior corner. The triangular, azygous median shield contacts the anterior fused shields along the midline, the oculars laterally, and the medial portions of the anterior edge of the fused frontal-parietal-occipital shields posteriorly. The second supralabial (or first postocular one) is shorter ventrally than dorsally, but extends dorsally to broad contact with the frontal-parietal-occipital shield that forms a narrow strip from the azygous shield to the anterior edge of the first dorsal half-annulus (or third body annulus). Posterior to the second supralabial lies the enormous temporal shield, which occupies the position of the first postsupralabial and then extends dorsally and posteriorly around the second one to provide a single shield lateral to the frontal-parietal-occipital shield, anterior to the second postsupralabial segment and the irregular first dorsal half-annulus. In general, the fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is slightly prognathous and the small rostral is clearly visible in ventral view. The large mental is slightly narrower posteriorly than anteriorly; its sides are entirely flanked by the enormous first infralabials. The anterior suture of the second infralabial extends at an angle from the junction with the malars to the lip. The small second infralabials medially contact the slightly enlarged malars; the left malar flanks only the second postgenial row, whereas the right malar flanks both rows. The two rows consist of variably arranged postgenial segments that extend laterally beyond the limits of the mental. The segments of the first four annuli in the gular region are slightly smaller than more posterior segments and there may be irregular fusion of annuli here.

There are 224 to 240 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portions of the seventh to eighth discrete dorsal half-annuli are

narrowed and deeply folded. At midbody an annulus contains ten dorsal segments (always longer than wide) and eight ventral segments, the medial ones each $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to two to three lateral annuli. The tail bears 23 to 25 caudal annuli before an oval end, which is generally two or more times as long as the next anterior annulus and bears faintly indented sutures only near its anterior edge. A slightly narrowed, but not differentially pigmented autotomy annulus is faintly visible between the 10th to 13th postcloacal position (almost 40% of the available specimens show broken tails).

There are eight to ten variably produced, round precloacal pores, each inserted into the middle of the posterior edge of the narrow median segments of the precloacal annulus. This set and the cloacal slit are each narrower than the paired median segments of the more anterior body annuli. The crescentic precloacal shield is covered by four large segments that are flanked by two smaller triangular segments. The narrow postcloacal edge is formed of eight to ten segments.

The head is slightly dorsoventrally compressed. The trunk is generally rounded down to the midbody region where it becomes slightly flattened dorsoventrally. The transition from horizontal to vertical compression occurs near the level of the autotomy annulus and the caudal tip is vertically oval in cross section. The lateral sulci start at the level of the 14th body annulus. At midbody they are filled with small triangular segments and are approximately as wide as a quarter of one of the flanking segments. Anteriorly (for the first 50 or so body annuli), the middorsal sulcus is indicated only by an alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and continues as a depressed groove onto the base of the tail until the autotomy annulus. The ventral sulcus is only indicated by an alignment of intersegmental sutures.

RANGE: Known from the types only.

LOCALITY RECORDS: GUINEA BISSAU: Cacine River district (Cassine): BM 1946.8.2.46-1946.8.2.47; MSNG CE28164A-CE28164F (syntypes of *Cynisca oligopholis* Boulenger, 1906; Loveridge, 1941).

Cynisca rouxae Hahn

Cynisca rouxae Hahn, 1979: 122. Type locality: "Vicinity of Assacro, 7°53'N 5°23'W, Ivory Coast." Holotype: MHNP 1978-1. Paratype: MHNP 1978-2.

DIAGNOSIS: Two preocular supralabials, nasal, prefrontal, preocular, and ocular discrete. A small, median azygous shield. Frontal, postocular, parietal, and occipital distinct. Postocular supralabial kept from contact with frontal by postocular. Two medium-size temporals dorsal to first (and second) post-supralabials. Snout generally pointed. 3 supralabials and 2 infralabials. First infralabials much wider and slightly longer than mental. 2 rows of 4 postgenials each between enlarged malars. 197-207 body annuli; 22 caudal annuli. Midbody segments, 14-15 dorsal, 12-14 ventral. Median ventral segments slightly enlarged, paired. 6 round precloacal pores. Autotomy site at the 6th to 7th caudal annulus.

DESCRIPTION (Pattern IV): Meristic characters are summarized in table 5. Figures 31 and 10 show views of the head, figure 13 the ventral surface of the cloacal region, figure 12 the segment proportions, as well as the pattern at midbody, figure 15 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. The faded types are a uniform, light brown dorsally and lighter on the ventral surface; the countershading proceeds within one or two segments just above the lateral sulci. The dorsal surface of the caudal region is somewhat darker than that of the trunk and even the ventral portion of the tail is pigmented. The caudal cap is darkest.

The anterior head shields show no major fusions. The rostral is barely visible in dorsal view. Posteriorly, it is followed on each side by a very large nasal shield that occupies the anterior extent of the snout. Along the dorsal midline, this is followed by a large rectangular prefrontal that forms a rounded, posteriorly concave suture with the nasal. A small, shield-shaped azygous shield lies along the midline between and posterior to the prefrontals. Laterally, this shield is excluded from contact with the ocular by the anterior aspect

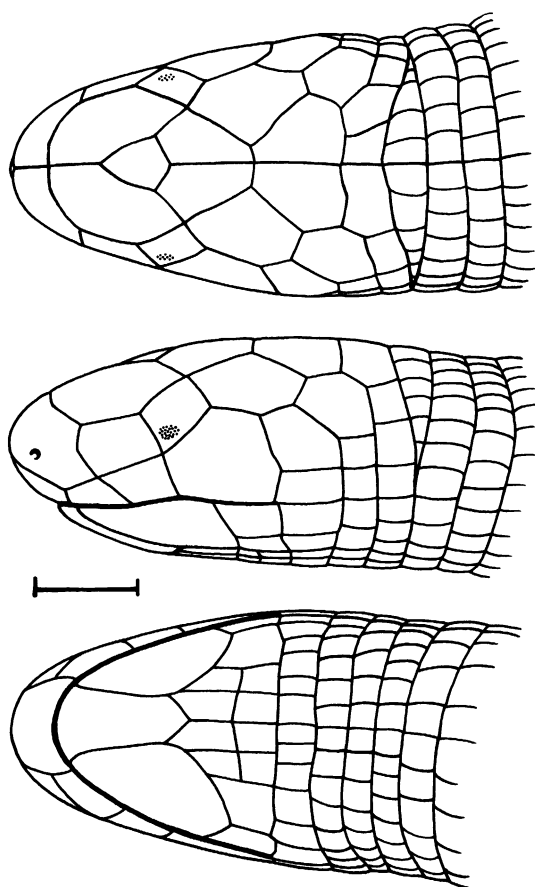


Fig. 31. *Cynisca rouxae* (Pattern IV). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of MHNP 1978.2, paratype, from the vicinity of Assacro, Ivory Coast. The line equals 1 mm to scale.

of the frontal, which broadly contacts the prefrontal, and by the point contact between the prefrontal and the postocular. The anterior edge of the frontal flares sharply from the midline to reach the oculars and then gradually narrows to asymmetrical contact with the parietals. The latter widen posteriorly to meet a pair of small occipitals, that derive from the median segments of the first dorsal half-annulus (pertaining to body annulus three?).

There are two preocular supralabials; the second is larger and both are kept from contact with the prefrontal by the rectangular preocular. The ocular is rectangular and diagonally placed with the eye visible near the

ventralmost apex. The third supralabial is enormous and extends dorsally along the posteroventral side of the ocular to contact the ventral edge of the large postocular. A slightly enlarged first postsupralabial and a smaller second one form the base of the temporal region. A small temporal shield lies dorsal to the second and two large ones follow each other dorsally to cover the bulging side of the head up to the medial row of shields, lying anterior to the first dorsal half-annulus. The back of the zone of enlarged shields is irregular and asymmetrical in the holotype. The occipitals are clearly part of the third dorsal half-annulus, though at the dorsal midline their posterior edge lies anterior to the back of this annulus at the level of the mouth. However, an intercalated dorsal half-annulus becomes wedge-shaped and disappears ventrally some two segments above the level of the mouth. The zone of enlargement corresponds to the dorsal portions of the first three body annuli.

The snout is slightly prognathous and the rostral is clearly visible in ventral view. The mental is narrower posteriorly than anteriorly and is flanked completely by the enormous first infralabials. The anterior sutures of the small second infralabials extend anteriorly from the malar junction to the lip. The enlarged trapezoidal malars enclose the posterior portion of the first and all of the second postgenial row, each containing four segments; the lateral postgenials lie posterior to the first infralabials. The ventral segments of the first six body annuli are reduced in size, and the more posterior medial segments widen very gradually.

There are 197 to 207 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing pre-cloacal row. The dorsal portion of the second to eighth discrete dorsal half-annuli may be narrowed and folded and two crescentic dorsal half-annuli lie intercalated between annuli two and three (see above). At midbody an annulus contains 14–15 twice as long as wide dorsal segments and 12 to 14 ventral ones; the medial segments are 2–2½ times as wide as long. The cloacal region corresponds to two to three lateral annuli. The tail (of the one specimen with an entire tail) bears 22 caudal annuli before a conically oval cap that

is more than twice as long as the next annulus and generally includes indications of segmental subdivisions all around the base, but not on the distal tip. A narrowed, but not especially pigmented autotomy site occurs on the seventh postcloacal position. (One of the types has a partially healed, autotomized tail.)

There are six large round precloacal pores on the posterior edge of the precloacal segments; the holotype shows narrow projecting cores each inserted into the center of the edge of one of six small segments lying anterior to the precloacal shield. The pore-bearing row corresponds to the width of the four mid-ventral segments and exceeds the width of the four enlarged medial segments of the six to seven covering the crescentic precloacal shield. The postcloacal edge is formed of seven to ten segments.

The snout is more pointed in dorsal than in lateral view. At the level of the nostrils, it is half as wide as at the level of the postsupralabials. The temporal region is wider than the trunk at the level of the third through eighth annuli and the back of the head is slightly constricted. The trunk is rounded anteriorly and variably compressed dorsoventrally thereafter until the base of the tail where the cross section changes to a vertical oval. The lateral sulci start near the 20th body annulus, being indicated anteriorly only by alignment of sutures; at midbody an annulus is less than half the width of an adjacent segment and contains regular intercalated segments. The middorsal sulcus begins near the 60th annulus and is narrower than the lateral ones. It continues as a deep groove onto the base of the tail, though the intercalated segments drop out at the level of the cloaca. The ventral sulcus is indicated only by an alignment of sutures.

RANGE: Known from the types and one specimen only.

LOCALITY RECORDS: IVORY COAST: Assacro, vicinity of: MHNP 1978-1 (holotype of *Cynisca rouxae* Hahn, 1979), 1978-2 (paratype). Parc National de la Comoé, près Bouaké, Wargo Fetini: MHNP 1983-400.

REMARKS: The description of *Cynisca rouxae* left some question regarding the segmentation, particularly as the different views of the head do not agree regarding the numbers, proportions, and sizes of shields. The

comment (Hahn, 1979) that the holotype has an autotomy constriction at the level of the 13th and 14th caudal annuli also is misleading; the tail is only pinched here and the actual autotomy site is indicated faintly at the seventh caudal annulus, at which autotomy took place on the paratype. The two specimens seem to have been tagged after the description; thus the smaller specimen with a complete tail is the holotype, even though it was tagged with MHNP 1978.2.

BIOLOGICAL MISCELLANEA: The types were taken in an open savannah (Hahn, 1979), the third specimen in litter within a dense forest of *Anogeissus leiocarpus*.

Cynisca schaeferi (Sternfeld)

Chirindia schaeferi Sternfeld, 1912: 250. Type locality: "Japoma (Kamerun)." Holotype: ZMU 22367.

DIAGNOSIS: Preocular supralabials, nasal, prefrontal, preocular, and ocular fused, with shallow blind suture entering a shallowly delimited fused shield from above the level of the eye. Subrectangular frontal, parietal, and pentagonal occipital discrete. First postocular supralabial very large, in contact with frontal. A single trapezoidal temporal dorsal to the first postsupralabial, followed by one smaller one lateral to the occipital. Head pointed. 2 supralabials and 2 infralabials. Mental fused with first infralabials anteriorly; a large postgenial flanked by one or two small segments; enlarged rectangular malar. 241–252 body annuli; 25–26 caudal annuli. Midbody segments, 12 dorsal, 10 ventral. Median ventral segments enlarged, paired. 12 or 0 precloacal pores. Autotomy site at 13th caudal annulus.

DESCRIPTION (Pattern XVI): Meristic characters are summarized in table 1. Figures 32 and 10 show views of the head, figure 13 the ventral surface of the cloacal region, figure 12 the segment proportions, as well as the pattern at midbody, figure 15 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a relatively large, fairly stout species of *Cynisca*. Preserved specimens are faded, but there are traces of pigment, suggesting that the tail was darkened.

The anterior head shields show major fu-

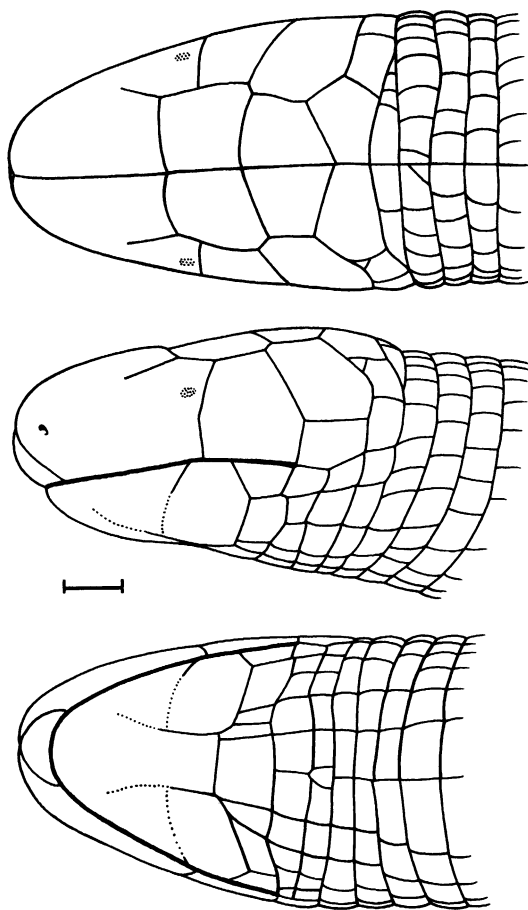


Fig. 32. *Cynisca schaeferi* (Pattern XVI). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of ZMU 22367, holotype, from Yapoma (Kamerun). Only specimen ZMU 22367 has but a single row of postgenial segments. Specimen SMF 30263 shows a tiny segment (ocular?) on the left side at the site where the posterior suture of the compound shield sends a tip between the large supralabial and the frontal. The line equals 1 mm to scale.

sions. The rostral is relatively small and barely visible in dorsal view. Enormous paired shields cover the anteriormost portion of the bulbously swollen snout and apparently include the regions occupied by the preocular supralabials, the nasals, the preoculars, the oculars, and the prefrontals; the vertical posterior suture of these shields either bisects or follows just posterior to the position of the eye. A blind suture extends anteriorly into

this compound shield on each side from the anteriorly convex frontal suture. One specimen (SMF 30263) shows a tiny (ocular?) shield on the left side at the site where the posterior suture of the compound shield sends a tip between the large supralabial and the frontal.

The enormous second supralabial (or first postocular one) extends dorsally to broad horizontal contact with the parallel-sided frontal. The irregular parietal is also parallel-sided, but slightly narrower than the frontal. Laterally, it is in contact with the first and largest of the irregular temporals that extends dorsally from contact with the first and second (which may be fused) postsupralabial. The temporal may be vertically subdivided (azygously). It is followed posteriorly by the segments of the third body annulus that extend from the third postsupralabial to reach the occipital which tends to be slightly shorter laterally than at the midline. In general, the fused head shields occupy the place of the dorsal half of the first three body annuli. All specimens show a partial dorsal half-annulus in the nuchal region between the occipital and the dorsal portion of the fourth body annulus.

The snout is prognathous and the rostral is clearly visible in ventral view. The lower jaw is not particularly deeply inserted into the bulbous snout, which is almost twice as wide as high and swollen up to the level of the eye. In ventral view, the mental is narrower than the first infralabials, and the anterior sutures separating them do not reach the lip. The suture defining the posterior edges of the very large mental and the flanking first infralabials crosses the chin at the anterior level of the second infralabials, swinging anteriorly in the middle so that the enlarged malars generally correspond to the posterior portion of the median enlarged postgenial, which is flanked by one or two smaller segments on each side and may be posteriorly divided. The ventral segments of the gular region (first five body annuli) are slightly reduced in size and the ventral segments of the following annuli swing slightly anteriorly.

There are 241 to 252 body annuli, from the first segments posterior to the angulus oris up to and including the pore-bearing pre-cloacal row. The dorsal portions of the seventh to eighth discrete dorsal half-annuli are narrowed and deeply folded. At midbody an

annulus contains 12 dorsal segments, three times longer than wide, and 10 ventral ones, the medial ones more than $2\frac{1}{2}$ times as wide as long. The cloacal region corresponds to three lateral annuli. The tail bears 25 to 26 caudal annuli before a conically pointed end, which is more than twice as long as the last annulus and bears no indented sutures. An autotomy site is marked at the 13th caudal annulus. It is always well defined, being slightly narrowed and (perhaps) more intensely pigmented. None of the specimens had a broken tail.

There are 12 or 0 variably produced precloacal pores, each inserted into the middle of a small segment; these 12 segments form a precloacal semicircle that occupies the midventral portion, but separates laterally from the precloacal annulus. The specimens lacking pores also lack discrete segments of this row. This set is wider than the enlarged and paired midventral segments of the preceding annuli and reaches laterally to surround the anterior edge of the oxbow-shaped precloacal shield. The shield consists of two very wide and long median plus two pairs of narrower and shorter flanking segments. The narrow postcloacal edge is formed of 8 to 12 segments. The trunk is generally rounded anteriorly and then becomes slightly wider than high near the midbody and continues thus past the cloacal region. Posterior to the autotomy site, the caudal tip is vertically oval in cross section. The lateral sulci start at the level of the 40th body annulus, are filled with small triangular segments, and at midbody are approximately as wide as half of one of the flanking segments. Anteriorly (for the first 50 or so annuli), the middorsal sulcus is indicated only by alignment of intersegmental sutures. At midbody, it is almost as wide as the lateral ones and it continues as a depressed groove onto the base of the tail. The ventral sulcus also is only indicated by alignment of sutures.

RANGE: Cameroon, Yapoma.

LOCALITY RECORDS: CAMEROON: No locality: SMF 30263-30264. Yapoma: ZMU 22367 (holotype of *Chirindia schaeferi* Sternfeld, 1912; Loveridge, 1941).

REMARKS: *Chirindia schaeferi* is based on a single specimen (ZMU 22367) from Yapoma, Cameroon; this is the only specimen of the species that has locality data. The an-

terior shields of the lower jaw of the holotype are severely abraded and the snout appears to have been scratched.

Cynisca senegalensis, new species

HOLOTYPE: IFAN (unnumbered). A single specimen from the Parc Niokolo-Koba, Sénégal, collected in September 1973 by Mr. Segouzac.

ETYMOLOGY: Named for the country.

DIAGNOSIS: Preocular supralabials fused with nasals, but excluded from contact on the dorsal midline by paired "prefrontals" that have broad contact with the rostral. 2 supralabials and 2 infralabials. Mental wide and larger than flanking first infralabials; malars and second infralabials very slightly enlarged. Head bulbous. 278 body annuli; 23 caudal annuli. Midbody segments, 14 dorsal, 7 to 8 ventral. Segments of median ventral row azygous and more than 4 times as wide as long. 9 precloacal pores. Autotomy site at the 7th caudal annulus.

DESCRIPTION (Pattern XV): Meristic characters are summarized in table 7. Figures 33 and 10 show views of the head, figure 13 the ventral surface of the cloacal region, figure 12 the segment proportions, as well as the pattern at midbody, figure 15 lateral view of tail and caudal region; figure 6 gives the body proportions.

This is a small, relatively slender species of *Cynisca*. The holotype is a uniform, pale brown dorsally and lighter on the ventral surface. The pigment density increases posteriorly and is greatest on the anterior portion of the tail, specifically on the autotomy annulus. The dorsal pigmentation consists of a very fine speckling of melanocytes expressed within the segments and fading out ventrally. The dorsal surface of the head and of the two to three dorsal half-annuli following thereupon lack obvious pigmentation, as does the chin.

The anterior head shields show major fusions. The rostral is relatively sizable and clearly noticeable in dorsal view. It is followed posteriorly by paired prefrontal shields that are unique in the preceding assemblage by excluding the nasals from midline contact. The prefrontals reach from broad contact with the rostral to the transverse prefrontal-frontal suture at the level of the eyes. The nasal is

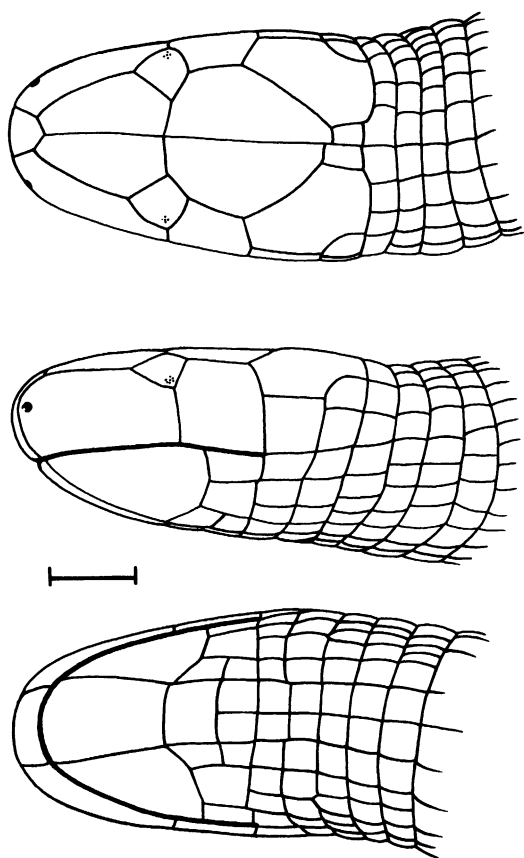


Fig. 33. *Cynisca senegalensis* (Pattern XV). Head-segmentation pattern. Dorsal, lateral, and ventral views of head and nuchal region of IFAN (unnumbered), holotype, from Niokola-Koba, Sénégal. The line equals 1 mm to scale.

fused with both preocular supralabials. The oculars are large, more or less quadrangular with the corner overlaying the eye representing the ventralmost position. The more posterior portion of the head is covered by the enormous frontal-parietal that is followed posteriorly by the small occipital, though the arrangement of sutures is irregular. The second supralabials are very large and extend to the dorsal surface of the head where they are in broad contact with the anterior portion of the frontal-parietal shield. Posterior to it lie two postsupralabials with a rather small dorsal segment lying dorsal to the posterior one. The remaining portion of the side of the head is occupied by an enormous temporal. The fused head shields occupy the place of the dorsal half of the first two body annuli.

The snout is only slightly prognathous and in ventral view the rostral and supralabials are only visible as a narrow crescent. The lower jaw is not markedly inserted in the bulging snout, which is almost twice as wide as high, higher at the preocular region than at the level of the eye. The mental is very wide anteriorly and slightly narrower posteriorly. It is clearly larger than the infralabials. The anterior suture of the second infralabial extends at an angle from the junction of the malars to the lip. The sutures defining the posterior edges of the mental and of the flanking first infralabials crosses the chin at the anterior level of the second infralabials; however, the posterior portion of the mental terminates somewhat anterior to the posterior edges of the first infralabials. This space is filled by a single wide shield that does extend beyond the edge of the first infralabials, so that it is partly postmental and partly postgenial. It is flanked by two small segments that lie median to the enlarged malars and posterior to the first infralabials. Back of these three median segments lies a second postgenial row of four small segments, the back edge of which aligns with the posterior edge of the second infralabials. The segments of the gular region are slightly reduced in size. The ninth annulus shows the first indication of fusion of the medial segments.

The specimen has 278 body annuli from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal rows. The dorsolateral portions of the third through sixth anterior annuli are folded. At midbody an annulus contains 14 always longer than wide dorsal segments and 7 to 8 ventral ones, of which the median ones are azygous and always more than four times as wide as long. The cloacal region corresponds to four lateral annuli. The tail bears 23 caudal annuli to the oval rounded tip which is more than twice the length of the next anterior annulus. Only faint segmental impressions mark its anterior edge. The seventh postcloacal annulus represents the slightly narrowed and more intensely pigmented autotomy site. All subcaudal segments are paired.

There are nine strongly indicated precloacal pores, each inserted into the middle of the posterior edge of one of the nine narrowed median segments of the precloacal annulus.

This set corresponds to the width of the azygous ventral segments that reach laterally to the edge of the large and rectangular precloacal shield, which is covered by two very large segments. The postcloacal edge is formed of ten irregular segments.

The trunk is generally slightly wider than high; however, it becomes rounder posteriorly and then higher than wide just posterior to the cloacal region. The caudal tip forms a distinct vertical oval in section. The lateral sulci start between the seventh and tenth body annuli and at midbody are filled with very tiny triangular segments approximately as wide as one of the flanking segments. For the first 50 or so annuli, the dorsal sulcus is indicated only by alignment of intersegmental sutures; at midbody, it is almost as wide as the lateral ones and continues as a depressed groove onto the tail. There is no ventral sulcus.

RANGE: Known from the type only.

Cynisca williamsi, new species

HOLOTYPE: A male specimen (formerly Carl Gans Collection no. 2806, now AMNH no. 130339) collected during 1963 at Wenchi, about 60 mi north and slightly east of Kumasi, Ghana, by F. R. Allison.

ETYMOLOGY: The name *Cynisca williamsi* permits me to express my appreciation to Professor Ernest E. Williams for his support during my days as a graduate student and for his continuing contributions to herpetology.

DIAGNOSIS: A short, slender, pointed-headed amphisbaenian. A large rostral in wide contact with the prefrontals and consequently widely exposed in dorsal view. Two preocular supralabials, nasal, preocular, prefrontal, and ocular discrete. A median azygous shield. Very large and distinct frontals, parietals, and occipitals. Very large postocular supralabial, kept from contact with frontal by large postocular which also extends over anterior portion of postsupralabial, the more posterior portion covered by a small rectangular temporal. Snout generally pointed. 3 supralabials and 2 infralabials. First infralabials enormous, much wider and substantially longer than mental plus discrete postmental. Two rows of postgenials (4, 5); the latter between the short malars. 218 body annuli; 14 caudal

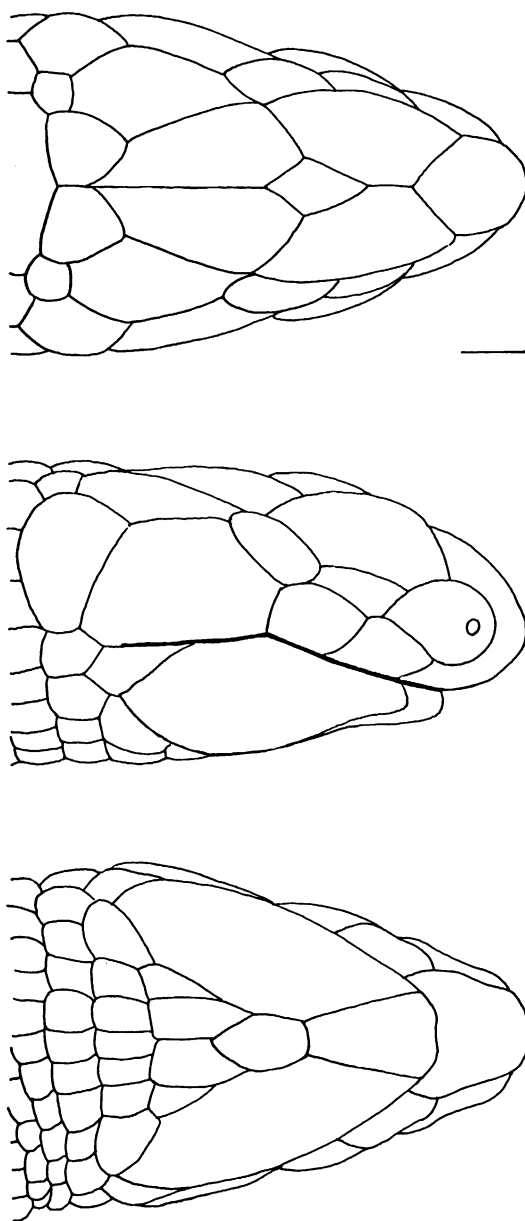


Fig. 34. *Cynisca williamsi* (Pattern XVII). Dorsal, lateral, and ventral views of the head of CG 2806 from Wenchi, Ghana, to show the segmentation. The line equals 10 mm to scale.

annuli. Midbody segments, 16 dorsal, 12–13 ventral. Median ventral segments enlarged, paired. 6 round precloacal pores. A short tail lacking autotomy, and with the distal surface terminating in an oblique, posteriorly facing shield fringed with a ring of projecting round-

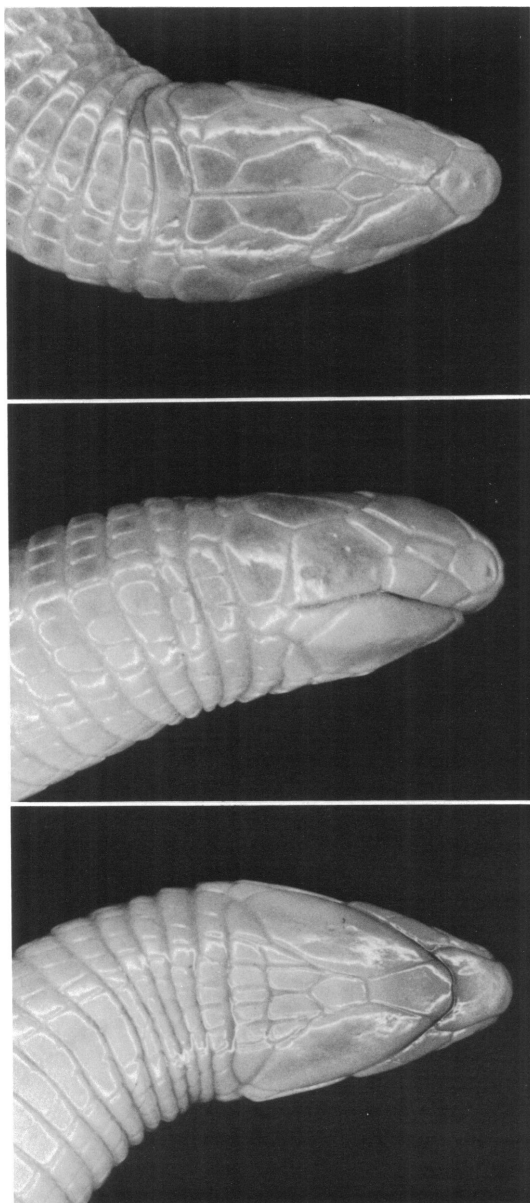


Fig. 35. *Cynisca williamsi* (Pattern XVII). Photographs of CG 2806 from Wenchi, Ghana, to show dorsal, lateral, and ventral views of the head. These document segmental arrangement and coloration.

ed cones. Internally, the shield is underlain by a calcified plate that seems associated with the terminal caudal vertebrae.

DESCRIPTION (Pattern XVII): The meristic characters are stated in table 4. Figures 34 and 35 show views of the head, figure 36

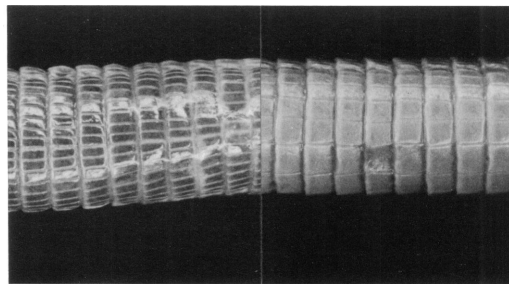


Fig. 36. *Cynisca williamsi* (Pattern XVII). Photographs of CG 2806 from Wenchi, Ghana, to show dorsal (left) and ventral (right) views of the midbody region. These document segmental proportions and coloration.

details of segmentation at midbody, figure 37 views of the cloacal region and tail and details of its distal tip. Figure 38 illustrates an x-ray of the entire animal.

This is a relatively small species (assuming that the male is sexually mature). Dimensions are $161 + 10.5$ mm snout-vent plus tail length and 4.5 mm midbody diameter. The trunk of the holotype is a uniform dark bluish-brown dorsally and lighter on the ventral surface; the countershading proceeding by general fading within one or two segments just ventral to the lateral sulci and the mid-ventral segments. Pigmentation is very light, although the pigment of the midventral segments definitely drops out in a checkerboard pattern. The precloacal shield is clear. The ventral surface of the tail is pigmented and this pigmentation is particularly obvious toward the distal tip. The head is relatively pale and the pigment of the nuchal segments is concentrated in the center of the segments. All or part of the chin tends to be unpigmented as is the first supralabial. The collagen fibers of the extracolumellar attachment appear as a light area deep to the large first infralabial.

The anterior head shields show no obvious fusions and the head segments appear symmetrical. The rostral is visible as a large pentagonal area in dorsal view. On each side it is in broad lateral contact with a very large nasal and posterodorsally it inserts between the anterior aspects of the large prefrontals. A relatively small shield-shaped pentagonal azygous segment lies along the midline with its longer anterior portion inserting between

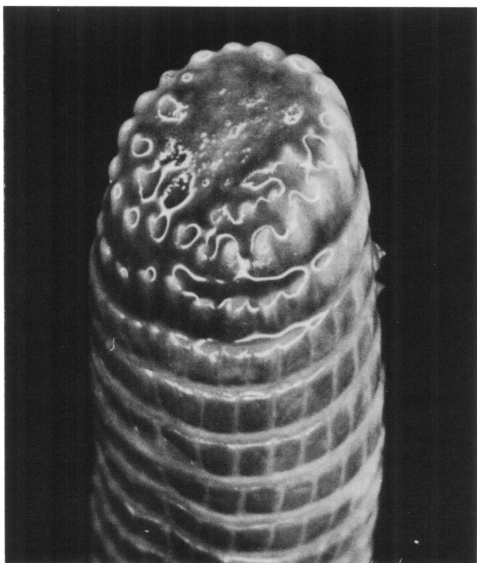
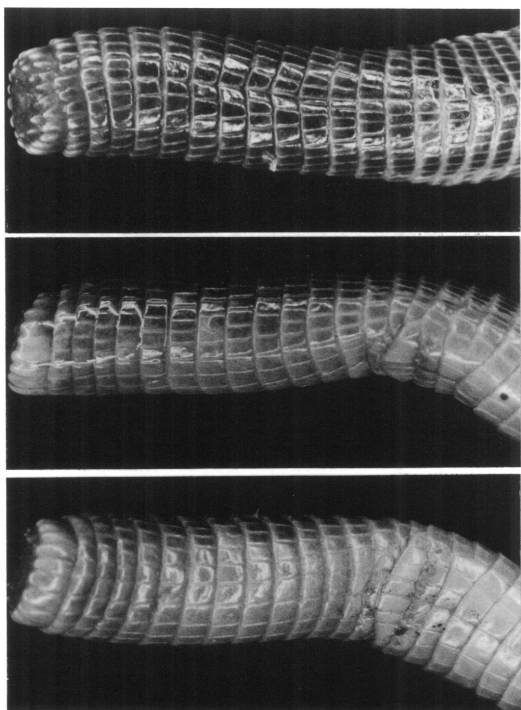


Fig. 37. *Cynisca williamsi* (Pattern XVII). Views of the cloacal region and tail of CG 2806 from Wench, Ghana, to document the arrangement of precloacal pores, proportions of segments, and details of the distal caudal tip.

the large prefrontal shields and the shorter posterior one between the very large pentagonal frontals. The anterior edge of each fron-

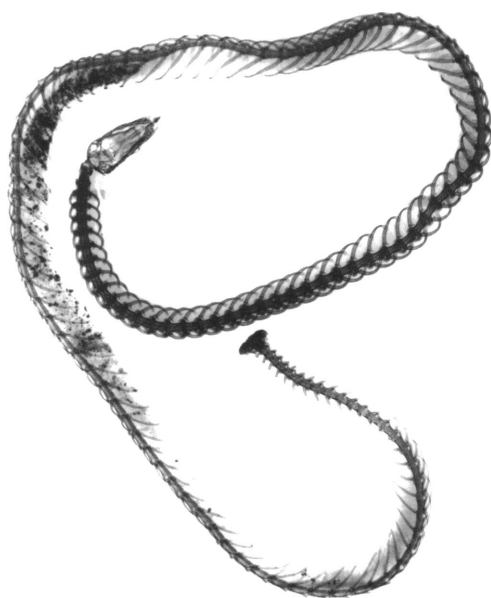


Fig. 38. *Cynisca williamsi* (Pattern XVII). X-ray of CG 2806 from Wench, Ghana, to illustrate the skeletal arrangement, particularly of the skull and caudal tip. Note absence of any trace of an autotomy plane, as well as the modification of the two distal vertebrae into a mushroom-shaped terminal disk.

tal extends posterolaterally from the sides of the azygous to point contact with the dorsal tips of the oculars. The frontals then narrow gradually in long contact with the postocular to contact with the parietals after which they form a blunt angle to the midline. The parietals widen posterior to the frontals and then narrow slightly in contact with a small rectangular temporal. They are followed posteriorly by a short pair of wide occipitals that derive from the median segments of the second body annulus, or of an intercalated dorsal half-annulus (lying between body annuli one and two).

There are two preocular supralabials; the second is larger and kept from contact with the prefrontal by the rectangular preocular that is in rectangular contact with the nasal. The polygonal ocular is diagonally placed with the large eye visible in its center. The third supralabial is enormous and extends dorsally along the posteroventral side of the ocular to contact the ventral edge of the large postocular. A large and tall first postsupralabial extends ventral to the posterior aspect of the

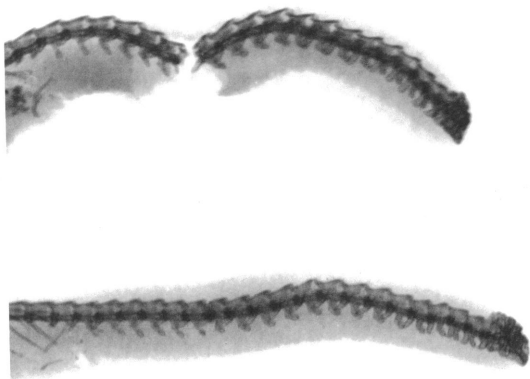


Fig. 39. *Cynisca kraussi*. X-rays of the caudal region. Details of two specimens, MCZ 49704 (with broken tail) and MCZ 49706, from Banda Hills, Ghana, to show the autotomy plane and the terminal portion of the caudal cap, which is much less ossified than that of *C. williamsi*.

postocular and then contacts the small rectangular temporal. An intercalated dorsal half-annulus is indicated only by the temporal and the posterior portion of the parietal; it lies anterior to the first dorsal half-annulus corresponding to body annulus one. The temporal region is thus covered almost entirely by the posterior extension of the head shields and the zone of enlargement corresponds to the dorsal portions of the first body annulus.

The snout is very markedly prognathous and the rostral is widely visible in ventral view. The mental is narrower posteriorly than anteriorly; it is followed by an elongate postmental and both are flanked by the enormous first infralabials. The anterior sutures of the small second infralabials extend anteriorly from the narrow malar junction to the lip. The first postgenial row comprises four segments, the median much the longest and largest, the lateral ones triangular. The second postgenial row comprises five subequal segments that are flanked by the relatively small wedge-shaped malars, the anterior tips of which just flank the first row. The ventral segments of the first six to seven body annuli are reduced in size; by the 10th annulus the medial ones are squarish and by the 20th they are twice as wide as long.

There are 218 body annuli, from the first segment posterior to the angulus oris up to and including the pore-bearing precloacal row. The dorsal portion of the second to eighth anteriormost annuli is only slightly narrowed and there are no intercalated or spiral annuli within the body annuli; however, there is some annular irregularity in the precloacal region. At midbody an annulus contains 16 dorsal segments, the medial ones more than twice as long as wide, whereas the medial segments of the 12 to 13 ventral ones are approximately two times as wide as long. The cloacal region corresponds to three lateral annuli. The tail bears 14 caudal annuli. After the seventh the next three become narrowed and also of reduced diameter. The last annulus is the longest. The posterior aspect of the 14th annulus marks a sharp flat termination, as if the tail had here been cut with a slightly dorsad-facing inclination. The mid-dorsal segments of the 12th, the dorsal segments of the 13th, and all segments of the 14th caudal annulus bear posteriorly projecting cones. A partial semicircle of cones lies within the (14th) ring on each side, whereas the center of the terminal shield is merely rugose. (See below for the underlying osseous structures.)

There are six large round precloacal pores (in a continuous row) on the posterior edge of the small precloacal segments lying anterior to the precloacal shield; projecting cores are inserted into the center of each segment. The pore-bearing row corresponds to the width of the six midventral segments and to that of the segments of the eight covering the crescentic precloacal shield. The postcloacal edge is formed of 11 segments.

The snout is more pointed in lateral than in dorsal view. At the level of the nostrils it is half as wide as at the level of the postsupralabials. The temporal region is slightly wider than the trunk at the level of the third through eighth annuli and the back of the head is slightly constricted. The trunk is rounded anteriorly and variably compressed dorsoventrally thereafter until the base of the tail, where the cross section changes to a vertical oval. The lateral sulci start near the 30th body annulus and extend just beyond the level of the cloaca. Anteriorly, they are indicated only by alignment of sutures; at midbody each

contains multiple, regular intercalated segments. The middorsal sulcus begins near the 10th annulus, but only becomes significantly widened near the 60th. It does not include any small triangular segments and it is not obvious by the level of the cloaca. Thereafter, it continues as a deep groove onto the base of the tail. The ventral sulcus is indicated only by an alignment of sutures.

The unique holotype was not dissected. However, a series of x-rays taken at various exposures permits some statements regarding the skeleton. The skull is generally equivalent to those of the round-headed African species. There are no special modifications of the prefrontal region; indeed, the anterior blade of the latter bone provides a simple vertical blade. The quadrate lies almost horizontal and the extracolumella appears to curve along its lateral face (it is unclear whether it here passes in a groove), before extending along the mandible. The head joint is normal, but no special hypocentral ossification is seen.

Vertebrae and ribs are as in other species of the group. Near the base of the tail one sees the shift from the two-to-one dermal/vertebral ratio to the one-to-one ratio characteristic of tails. There is no trace of an autotomy split. Near the 13th caudal vertebra there starts an oblique heavily ossified plate that terminates the tail. It is heaviest immediately deep to the caudal shield and its base then curves inward to join the modified 14th and 15th caudal vertebrae.

RANGE: Known from the type only.

INCERTAE SEDIS

The following literature references could not be assigned to species and are cited here as the localities may be interesting and the specimens should be checked if discovered.

NIGERIA: Port Harcourt: *C. leucura* (Dunger, 1968).

BENIN (Dahomey): *C. leucura* (Chabanaud, 1917).

TOGO: Sokode: Two *C. leucura* (Tornier, 1901; Loveridge, 1941).

GHANA: Banda Hills: (one *C. leucura* is listed among 22 specimens taken here; the remainder were *C. kraussi* (Cansdale, 1951; Loveridge, 1948). (Only 16 of the series could be examined so that the putative sympatry

could not be confirmed.) Keta: (Loveridge, 1941; Strauch, 1881).

LIBERIA: Mention of *C. leucura* by Strauch (1881) without further comment. Loveridge (1941) notes that he examined this Hamburg Museum specimen, which since has been destroyed.

GUINEA BISSAU: Rio Pongo: *C. leonina* (Loveridge, 1941).

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APPENDIX

The following appendix includes the raw data of all of the specimens in geographical order from east to west. Provision of this material has two merits. (1) It permits subsequent workers to follow the logic of my assignments to species; thus, the section covering this may be much shortened. (2) It is hoped that additional material will become available. This will likely require modification of the taxonomic pattern here proposed. Availability of the original and individual data should facilitate this process.

The following key identifies the columns in the appendix. See text sections under Character States for details of measurements.

KEY TO THE DATA APPENDIX FOR *CYNISCA*

1. Number of body annuli
2. Number of lateral annuli (left/right)
3. Autotomy site
4. Number of caudal annuli
5. Number of dorsal and ventral segments to a midbody annulus. (An x following upon the number of ventrals indicates that there is a wide azygous midventral shield.)
6. Snout–vent length (mm)
7. Tail length (mm)
8. Midbody diameter (mm)
9. Number of precloacal pores (pore scars in parentheses)
10. Number of supra/infralabials
11. Number of postgenials in the first row (number in parentheses is the count with anteroposteriorly fused segments considered separately in each row)
12. Number of postgenials in the second row (number in parentheses is the count with anteroposteriorly fused segments considered separately in each row)
13. Discrete azygous median segment present
14. Discrete ocular present
15. Discrete supraocular present
16. Frontal and parietal fused (* parietal-temporal may be unilaterally or bilaterally excluded from the midline)
17. Discrete postmental present
18. Pattern number

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<u>AFRICA No further data</u>																		
IRSNB 14934	250	4	8	x	13-14/9x	133	x	3.1	6	2/2	3	4	no	no	no	yes	no	X
ZMU 9375	218	3	6	17	19-20/16	126	13	2.7	8	3/2	4	5	yes	yes	no	no	yes	II
<u>Coast of Guinea</u>																		
RMNH 3555	217	4	8	23	14/10	208	29	4	10	3/2	5	6	yes	yes	yes	no	yes	III
<u>No specified locality</u>																		
ZMU 3804	220	3	7	28	14/10	129	20.5	4	9	3/2	3	5	yes	yes	yes	no	yes	III
ZMU 6905	222	4	7	29	14/10	178	26	5	10	3/2	4	6	yes	yes	yes	no	yes	III
<u>GABON</u>																		
<u>Omboue (Fernand Vaz)</u>																		
MSNG CE 28163	240	3	11	x	8/8	131	x	3	10	2/2	4	4	no	yes	no	no	no	XIII
<u>Lambarene</u>																		
MHNP 1901.531	251	2	7	27	8/8	124	16	2.0	0	2/2	4	5	no	no	no	no	no	XI
<u>CENTRAL AFRICAN REPUBLIC</u>																		
<u>Gribingui</u>																		
MHNP 1921.4	219	4	7	21	18-19/14-16	133	16	4.0	8	3/2	4	5	yes	yes	yes	no	yes	III
<u>CHAD</u>																		
<u>Mayo Kebbi</u>																		
MHNP 1965.96	214	3	7	22	18/16	192	22	6	10	3/2	4	4	yes	yes	yes	no	yes	III
<u>Fort Archambault</u>																		
MHNP 1904.160	226	3	7	x	20/16	162	x	5.0	8	3/2	4	5	yes	yes	yes	no	yes	III
<u>CAMEROON</u>																		
<u>Yapoma (Japoma)</u>																		
ZMU 22367	241	3	13	26	12/10	196	23	5	0	2/2	4	0	no	no	no	no	no	XVI
<u>No locality</u>																		
SMF 30263	248	3	13	25	12/10	197	24	4.8	12	2/2	3	5	no	no	no	no	no	XVI
SMF 30264	252	3	13	25	12/10	169	19	4.5	0	2/2	3	4(5)	no	no	no	no	no	XVI
<u>NIGERIA</u>																		
<u>Calabar</u>																		
BM 77.2.13.1	234	3	7	24	18-20/13-14	202	27	6.1	8	3/2	4	5	yes	yes	yes	no	no	III
<u>Okoloma Village, near Port Harcourt</u>																		
AMNH 102409	233	3/4	7	21	12/10	136	16	3.6	10	2/2	3	4	no	no	no	no	no	VIII
AMNH 102410	233	4	8	22	12/10	115	14	3.1	0	2/2	3	4	no	no	no	yes	no	VIII
AMNH 102411	232	4	7	x	12/10	135	x	3.3	0	2/2	3	4	no	no	no	no	no	VIII
AMNH 102412	235	4	7	22	12/10	133	15	3.5	0	2/2	3	4	no	no	no	no	no	VIII
CG 3579	228	3	8	x	12/10	132	x	3.1	10	2/2	4	4	no	no	no	no	no	VIII
CG 3580	234	4	7	21	12/10	140	15	3.7	0	2/2	3	4	no	no	no	no	no	VIII
<u>Wukari, Benue Province</u>																		
BM 1938.3.1.50	226	3	6	23	19/14	215	24	6	10	3/2	2	5	yes	yes	yes	no	yes	III
<u>Albinsi, Benue Province, Bensia River</u>																		
BM 1913.6.18.1	229	3	7	25	17/12	178	22	4.5	10	3/2	4	4	yes	yes	yes	no	yes	III
<u>Keana, Northern Nigeria</u>																		
AMG 4901a	-	2	7	-	16/12	-	-	3.2	8	3/2	4	6	yes	yes	yes	no	yes	III
AMG 4901b	226	3	7	x	16/12-14	84	x	2.8	10	3/2	4	6	yes	yes	yes	no	yes	III
AMG 4901c	219	3	7	24	16/14	165	20	4.8	8	3/2	4	4	yes	yes	yes	no	yes	III
BM 1927.11.19.1	216	3	7	24	16-18/14	169	22	5	10	3/2	4	4	yes	yes	yes	no	yes	III
BM 1927.11.19.2	229	4	7	24	17/12-13	153	18	4.3	9	3/2	4	5	yes	yes	yes	no	yes	III
BM 1927.11.19.3	211	3	7	23	16/12	114	15	3.7	9	3/2	4	5	yes	yes	yes	no	yes	III
BM 1927.11.19.4	214	3	8	24	16/12	76	10	2.6	10	3/2	4	4	yes	yes	yes	no	yes	III
MCZ 28671	220	4	7	24	16-17/14	110	15	3.8	10	3/2	4	5	yes	yes	yes	no	yes	III
<u>Takwashara near Abuja</u>																		
AMNH 102413	233	4/3	6	20	10/8-9	144	15	3.8	10	2/2	4	4	no	no	no	no	no	IX
AMNH 102414	238	3	5	22	10/8	147	17	3.8	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102415	230	4/3	6	21	9/8	142	16.5	3.7	10	2/2	3	4	no	no	no	no	no	IX

Appendix continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AMNH 102416	228	3	7	22	10/8	152	17	4	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102417	242	3	6	21	10/8	153	18	4.1	0	2/2	2	4	no	no	no	no	no	IX
AMNH 102418	233	3	6	22	10/8	95	10.5	2.2	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102419	228	3	6	20	10/8	135	15	3.5	10	2/2	4	4	no	no	no	no	no	IX
AMNH 102420	234	4	6	x	10/8-9	134	x	3.2	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102421	236	3	6	21	10/8	147	16.5	3.5	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102422	230	3	6	21	8-10/8	140	18	3.7	0	2/2	4	4	no	no	no	no	no	IX
AMNH 102423	225	3	6	21	10/8	99	12	2.7	0	2/2	4	4	no	no	no	no	no	IX
CG 3981	227	3	5	x	10/8-9	125	x	3.6	10	2/2	4	4	no	no	no	no	no	IX
CG 3982	232	3	6	20	10/8	146	16	4.0	10	2/2	4	5	no	no	no	no	no	IX
CG 3983	228	4	6	x	10/7-8	106	x	2.5	0	2/2	4	4	no	no	no	no	no	IX
CG 3984	230	3	7	x	10/8-9	139	x	3.5	0	2/2	4	4	no	no	no	no	no	IX
<u>Kigom Hills, Jos Plateau</u>																		
AMNH 102424	258	4	8	20	14/14	153	17	3.8	8	2/2	4	4	no	yes	no	no	no	XIV
AMNH 102425	256	3	7	20	13-14/12	153	15	3.5	0(7)	2/2	4	4	no	yes	no	no	no	XIV
<u>Sherifuri, near Katogom, northern Nigeria</u>																		
BM 1928.5.20.2	230	3	7	23	18/13-14	164	19	4.9	8	3/2	2	5	yes	yes	yes	no	yes	III
<u>Gadua, Northern Province</u>																		
AMNH 69642	230	3	7	23	18-19/12-13	201	24	6.0	10	3/2	3(4)	5	yes	yes	yes	no	yes	III
BM 1937.12.4.17	227	2	7	x	17-18/13-14	189	x	5.9	9	3/2	4	4(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.51	228	3	6	x	19/14	213	x	6.2	10	3/2	4	4	yes	yes	yes	no	yes	III
BM 1938.3.1.52	226	3	6	x	18-19/14	204	x	6.3	9	3/2	2	3	yes	yes	yes	no	yes	III
BM 1938.3.1.53	223	3	7	24	18-19/14	205	26	6.5	10	3/2	3	(2)	yes	yes	yes	no	yes	III
BM 1938.3.1.54	227	2/3	6	24	19/14	187	23.5	5.9	10	3/2	4	6	yes	yes	yes	no	yes	III
BM 1938.3.1.55	227	3	7	24	17-18/14	207	25	6	9	3/2	4	(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.56	226	4	6	x	18-20/14	221	x	6.0	10	3/2	3(4)	6	yes	yes	yes	no	yes	III
BM 1938.3.1.57	227	4	6	x	18/14	202	x	5.7	10	3/2	4	6	yes	yes	yes	no	no	III
BM 1938.3.1.58	232	3	7	x	18/11-13	220	x	5.5	10	3/2	4	5(6)	yes	yes	yes	no	yes	III
BM 1938.3.1.59	233	3	7	23	20/14	214	25	5.6	8	3/2	3(4)	5	yes	yes	yes	no	yes	III
BM 1938.3.1.60	228	3	7	23	18/13-14	209	26	5.7	10	3/2	4	2(4)	yes	yes	yes	no	yes	III
BM 1938.3.1.61	223	3	6	23	17-19/14	195	23	5.5	10	3/2	2	3(4)	yes	yes	yes	no	yes	III
BM 1938.3.1.62	229	3	7	x	18-19/14	185	x	5.8	9	3/2	3(4)	4	yes	yes	yes	no	yes	III
BM 1938.3.1.63	229	3	7	23	18-19/14	176	22	5.3	10	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.64	231	4	5	x	18/14	185	x	5.5	9	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.65	229	4	6	24	19/14	187	24	5.1	9	3/2	4	5	yes	yes	yes	no	no	III
BM 1938.3.1.66	227	3	7	24	18/12-13	169	21	5.0	10	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.67	224	4	6	x	18-19/14	145	x	5	10	3/2	3(4)	4(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.68	224	3	7	24	18-19/14	133	17	4.0	8	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.69	228	3	7	25	18/14	133	18	4.5	10	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.70	225	3	6	24	18/14	125	16	4.3	10	3/2	4	3(5)	yes	yes	yes	no	yes	III
BM 1938.3.1.71	228	3	7	23	17-18/13-14	108	13	3.6	9	3/2	4	4(5)	yes	yes	yes	no	yes	III
<u>Deert, Northern Nigeria</u>																		
BM 1911.7.19.3	217	3	8	23	18/14	168	21.5	5.1	9	3/2	4	4	yes	yes	yes	no	yes	III
BM 1911.7.19.4	217	3	7	x	18-20/14	177	x	4.5	8	3/2	4	4	yes	yes	yes	no	yes	III
<u>Wushishi, near Zungeru, Niger Province</u>																		
FMNH 25053	224	3	6	x	16-18/12	164	x	4.5	8	3/2	4	6(7)	yes	yes	yes	no	yes	III
FMNH 42562	224	3	7	x	17-18/14	190	x	5	8	3/2	4	6(7)	yes	yes	yes	no	yes	III
<u>West Province, Southern Nigeria</u>																		
BM 1908.10.12.1	233	3	7	x	17-18/12	193	x	4.8	8	3/2	4	4	yes	yes	yes	no	yes	III
BM 1908.10.12.1A	229	3	6	23	20/14	135	17	4.8	10	3/2	4	5	yes	yes	yes	no	yes	III
<u>Jebba, Upper Niger</u>																		
BM 1946.8.31.74	229	3	7	25	18/14	191	24	6	10	3/2	4	-	yes	yes	yes	no	yes	III
BM 1946.8.31.75	229	3	7	23	16-18/12	196	24	5	8	3/2	4	6	yes	yes	yes	no	yes	III
<u>Little Kom Kom, Wurumas, Kwara State</u>																		
BM 1970.1770	214	3	7	25	18/14	163	22	5	9	3/2	4	6	yes	yes	yes	no	yes	III
<u>New Bussa, Kwara State</u>																		
BM 1970.1768	223	3	7	26	16/12	184	24	5.1	8	3/2	4	6	yes	yes	yes	no	yes	III
BM 1970.1769	230	x	8	x	16/12	204	x	5.5	-	3/2	4	4	yes	yes	yes	no	yes	III
<u>Kainji Dam</u>																		
BM 1969.340	226	3	8	25	16/12	155	19	4.6	8	3/2	4	6	yes	yes	yes	no	yes	III
BM 1969.341	228	3	7	24	17-18/14	170	21	4.6	8	3/2	4	6	yes	yes	yes	no	yes	III
BM 1969.342	212	3	8	x	16-17/13-14	170	x	5.6	8	3/2	4	5	yes	yes	yes	no	yes	III

Appendix continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Timubridge, Kwara State																		
BM 1970.1772	223	3	7	23	14-15/12	165	21	4.9	8	3/2	4	5	yes	yes	yes	no	yes	III
Yelwa, Northwest State																		
BM 1970.1771	235	3	6	23	17/12	149	16	4	8	3/2	4	6	yes	yes	yes	no	yes	III
Kunav																		
BM 1966.264	226	3	8	25	18-20/12-14	150	19	4.2	8	3/2	4	5	yes	yes	yes	no	yes	III
BENIN																		
Ketonou																		
CG 3757	214	2	7	x	14/10	164	x	4	8	-	-	-	yes	yes	yes	no	yes	III
CG 3758	215	2	8	25	14/10	152	26	3.1	8	3/2	4	6	yes	yes	yes	no	yes	III
Godomey																		
CG 3765	216	3	7	26	16/10	199	33	5.9	8	3/2	4	6	yes	yes	yes	no	yes	III
CG 3766	213	2	x	26	14/10	156	24.5	5.2	8	3/2	4	5	yes	yes	yes	no	yes	III
CG 4150	215	2	9	20	14/10-12	187	27	3.5	10	3/2	4	6	yes	yes	yes	no	yes	III
Tori																		
CG 3772	-	3	7	27	14/10	-	10	2.1	10	-	-	-	-	-	-	-	-	(-)
Agbodji (Agbodjedo)																		
CG 3997	217	3	8	27	14/10	182	27.5	4.8	9	3/2	5	7	yes	yes	yes	no	yes	III
CG 3998	213	3	6	x	14/10	121	x	4.1	9	3/2	3	5	yes	yes	no	no	yes	III
Agouagon																		
MHNP 1917.48	214	3	7	28	14/10	196	28	5.5	10	3/2	4	5	yes	yes	yes	no	yes	III
MHNP 1917.48a	212	3	8	27	14/10	142	23	4	10	3/2	4	5	yes	yes	yes	no	yes	III
MHNP 1917.48b	205	4	7	27	14/10	134	21	3.9	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP 1917.48c	213	3	8	x	14/10	152	x	4.6	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP 1917.49	207	4	7	28	14/10	149	24.5	4.3	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP 1917.49a	210	3	7	x	14/10	151	x	4.8	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP 1917.49b	212	3	8	27	14/10	167	26	4.8	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP 1917.49c	210	3	8	28	14/10	136	22	3.7	10	3/2	4	6	yes	yes	yes	no	yes	III
Soubroukou																		
UGL 27	229	3	8	24	16/12	173	23	5.3	8	3/2	4	6	yes	yes	yes	no	yes	III
Kinta																		
CG 3777	216	3	7	x	14/10	135	x	3.2	8	3/2	4(5)	7	yes	yes	yes	no	yes	III
CG 3778	218	3	6	x	14/10	175	x	4.7	10	3/2	4(5)	5	yes	yes	yes	no	yes	III
Anolouyeme																		
CG 4011	216	3	6	x	16/10	90	x	3	10	3/2	4(5)	6	yes	yes	yes	no	yes	III
Djebo																		
CG 3994	215	3	7	25	15-16/10	174	25.5	5.1	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 3995	215	3	7	25	16/10	169	26	5.5	9	3/2	3	6	yes	yes	yes	no	yes	III
CG 3996	215	3	6	x	14/10	174	x	5	9	3/2	6	7	yes	yes	yes	no	yes	III
No locality specified																		
CG 5603	217	3	6	x	14/10	160	x	4.2	8	3/2	4	5	yes	yes	yes	no	yes	III
CG 5604	214	3	8	27	14/10	166	27	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
TOGO																		
Koledijkope (Kolekope)																		
RUCA 1541	219	3	6	x	13-14/10	201	x	5	8	3/2	4	4(5)	yes	yes	yes	no	yes	III
Fazao																		
RUCA 1420	223	3	7	27	14/10	183	27	5.1	7	3/2	4	4	yes	yes	yes	no	yes	III
RUCA 1421	221	3	7	28	14/11-12	160	26	4.1	8	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1460	220	3	7	29	14/11-12	165	27	4.9	8	3/2	4	6	yes	yes	yes	no	no	III
RUCA 1476	218	x	8	x	14/10	190	x	4.7	8	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1477	221	3	6	x	12-13/10	173	x	5.3	8	3/2	4	6	yes	yes	yes	no	no	III
RUCA 1431A	232	3	7	x	13/11-12	155	x	4.1	6	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1431B	225	3	8	28	13-14/10	200	32	5.2	8	3/2	4	6	yes	yes	yes	no	no	III
RUCA 1431C	225	2	8	28	14/10	184	29	5	8	3/2	4	5	yes	yes	yes	no	no	III
RUCA 1431D	222	2	8	29	14/10-11	173	26	4.9	8	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1431E	224	3	8	30	14/11-12	175	28	5.2	8	3/2	3	5	yes	yes	yes	no	yes	III
RUCA 1431F	228	3	7	29	12-14/11-12	157	24.5	4.3	8	3/2	4	7	yes	yes	yes	no	yes	III
RUCA 1431G	225	3	7	x	14-15/11-12	163	x	3.9	8	3/2	4	5	yes	yes	yes	no	yes	III

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RUCA 1431H	217	3	8	28	14/12	186	31	5.3	8	3/2	4	5	yes	yes	yes	no	no	III
RUCA 1431I	222	3	8	27	14/11-12	193	29	5	8	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1431J	224	3	7	28	13-14/12	189	30	5.3	8	3/2	4	6	yes	yes	yes	no	yes	III
RUCA 1431K	224	3	8	28	14/10	188	27	5.9	8	3/2	4	5	yes	yes	yes	no	yes	III
RUCA 1431L	224	3	8	x	14/10-11	195	x	5.3	8	3/2	4	6	yes	yes	yes	no	yes	III
RUCA 1431M	224	3	7	x	14-15/10	196	x	5.0	8	3/2	4	6	yes	yes	yes	no	no	III
Tohoun																		
IFAN 50.2.318	218	3	7	x	13-14/10	156	x	3.7	10	3/2	4	5	yes	yes	yes	no	yes	III
IFAN 50.2.319	219	3	8	x	14/10	210	x	5.5	10	3/2	4	4(5)	yes	yes	yes	no	yes	III
IFAN 50.2.320	218	3	8	x	14/10	193	x	5.3	10	3/2	4	5	yes	yes	yes	no	yes	III
IFAN 50.2.321	226	3	8	24	16-18/12	201	27	5.9	8	3/2	4	6	yes	yes	yes	no	yes	III
Bassari																		
RUCA 1632	238	4	6	25	17/12	243	29	7.2	8	3/2	4	5	yes	yes	yes	no	yes	III
Namoundjoga																		
RUCA 1196	233	3	6	x	18-20/14	178	x	5.5	8	3/2	4	5	yes	yes	yes	no	yes	III
No locality specified																		
ZMU 24919	223	3	8	27	14/10	161	24	4.4	9	3/2	4	5	yes	yes	yes	no	yes	III
GHANA																		
Legon																		
CG 4129	211	2/4	7	x	14-15/10	170	x	4.1	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4139	214	3	7	x	16/12	159	x	4.5	11	3/2	5	7	yes	yes	yes	no	yes	III
CG 4140	222	2	8	x	16/10	152	x	4.3	11	3/2	4	6	yes	yes	yes	no	yes	III
CG 4141	214	3	7	27	14/12	179	26	4.6	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4142	220	2/3	8	x	14/10-12	150	x	4.2	8	3/2	5	6	yes	yes	yes	no	yes	III
CG 4143	213	4	8	28	14/12	141	22	4.2	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4144	215	3	7	x	14-16/12	188	x	4.7	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4145	215	2/3	8	26	14-15/10	135	21	4.2	11	3/2	6	8	yes	yes	yes	no	yes	III
CG 4146	214	4	7	27	16/12	-	21	4.5	8	3/2	6	7	yes	yes	yes	no	yes	III
CG 4147	214	3	9	28	16/10-11	127	20	3.7	10	3/2	5	6	yes	yes	yes	no	yes	III
CG 4148	218	2	8	27	14/10-11	176	25	5.1	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4731	217	3	7	x	15/10	162	x	3.5	11	3/2	4	5	yes	yes	yes	no	yes	III
CG 4732	218	3	8	26	14/10	159	23	4.2	10	3/2	6	6	yes	yes	yes	no	yes	III
CG 4733	215	3	7	27	14/10-11	124	19	4	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4734	213	4	7	x	14/10-11	150	x	4.3	10	3/2	6	6	yes	yes	yes	no	yes	III
CG 4735	215	3	8	29	16/12	171	26	5	10	3/2	6	7	yes	yes	yes	no	yes	III
CG 4736	219	3	8	28	13/10-12	135	21	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4737	218	3	8	27	14/10	161	24	5	10	x/x	x	x	yes	yes	yes	no	yes	III
CG 4738	210	3	8	27	14/10	167	24	4.9	10	3/2	4(1)	7	yes	yes	yes	no	yes	III
CG 4739	213	x	x	x	14-15/12	127	x	4	10	3/2	3	6	yes	yes	yes	no	yes	III
CG 4740	222	3	7/8	28	14/12	132	20	4	10	3/2	4	6	yes	yes	yes	no	no	III
CG 4741	224	3	8	26	13-14/10-11	162	23	4.4	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4742	214	3	8	27	16/10	160	25	5	10	3/2	5	6	yes	yes	yes	no	yes	III
CG 4743	212	4/3	8	x	14/10	126	x	3.6	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4744	215	4	7	26	14-16/10-11	161	23	5	10	3/2	4	8	yes	yes	yes	no	yes	III
CG 4745	208	3	6	25	14/10	164	23	4.7	10	3/2	4	8	yes	yes	yes	no	yes	III
CG 4746	217	3/4	6	26	14-15/13	133	19	3.7	10	3/2	5	8	yes	yes	yes	no	yes	III
CG 4747	216	4	7	27	14-15/10	149	23	4.2	10	3/2	4	4	yes	yes	yes	no	yes	III
CG 4748	217	3	8	x	14/10	184	x	5.2	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4749	218	3	8	27	14-15/11-12	100	15.5	3.5	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4750	219	3	8	x	14-15/10	140	x	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4751	217	3	8	27	16/10-11	159	24	5	10	3/2	5	6	yes	yes	yes	no	no	III
CG 4757	220	2/3	7	27	15/12	174	26	5.2	11	3/2	4	6	yes	yes	yes	no	yes	III
CG 4758	216	3	7	x	14/11-12	180	x	5.2	10	3/2	5	7	yes	yes	yes	no	yes	III
CG 4759	215	3	7	x	14/10	192	x	5.0	10	3/2	4	5	yes	yes	yes	no	no	III
CG 4760	214	3	7	27	14/12	78	12	2.5	10	3/2	6	7	yes	yes	yes	no	yes	III
CG 4761	215	3	8	27	14-15/10-12	176	27	5.1	11	3/2	4	5	yes	yes	yes	no	yes	III
CG 4762	216	3	8	26	14/11	132	19	4	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4763	205	4	7	27	14/12	155	22.5	5.1	10	3/2	4	6	yes	yes	yes	no	no	III
CG 4764	214	4	7	27	16/12	176	26.5	5.9	10	3/2	6	7	yes	yes	yes	no	yes	III
CG 4765	217	4	7	27	14/11	161	23	5.1	10	3/2	4	4	yes	yes	yes	no	yes	III
CG 4766	215	3	7	26	15/10	153	21	4.9	10	3/2	5	6	yes	yes	yes	no	yes	III
CG 4767	211	3	8	26	16/10	140	20.5	4.3	10	3/2	4	6	yes	yes	yes	no	no	III
CG 4768	216	2	8	26	14/10	183	26.7	6	10	3/2	4	6	yes	yes	yes	no	no	III
CG 4770	217	3/4	7	28	14/12	124	19	3.3	11	3/2	5	7	yes	yes	yes	no	yes	III
CG 4771	218	3/4	8	27	14/10	139	20	3.9	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4772	214	3/4	7	26	16/12	165	24	5.2	11	3/2	5	7	yes	yes	yes	no	yes	III
CG 4773	214	4	7	26	16/12	177	26	4.8	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4774	216	3	7	28	14/10	169	26	4.5	10	3/2	6	7	yes	yes	yes	no	yes	III

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CG 4778	221	3	7	26	14/10	157	21	3.8	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4779	219	4	6	27	16/12	165	23	4.7	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4780	217	4	7	27	14/11-12	161	23	4.6	8	3/2	5	7	yes	yes	yes	no	yes	III
CG 4902	213	4	7	26	14/10	192	30	5.2	8	3/2	4	6	yes	yes	yes	no	no	III
FMNH 191868	213	3	8	27	14/10	172	26	5.4	10	3/2	4	5	yes	yes	yes	no	yes	III
FMNH 191869	210	3	8	27	14/10	141	21	4.3	10	3/2	4	6	yes	yes	yes	no	yes	III
FMNH 191870	214	3	8	28	14/10	177	24	5.4	11	3/2	4	6	yes	yes	yes	no	yes	III
FMNH 191871	211	3	7	26	14-15/10	121	17.5	4.2	10	3/2	4	5	yes	yes	yes	no	yes	III
UGL 22	217	3	8	x	14-15/10-12	178	x	5.1	10	3/2	4	5	yes	yes	yes	no	yes	III
UGL 23	219	3	8	27	14-15/10-11	163	25	4.3	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 24	218	3	7	x	14-15/12	183	x	4.6	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 29	217	3	8	x	14/10	145	x	4.3	9	3/2	5	7	yes	yes	yes	no	yes	III
UGL 30	210	3	7	26	16/11-12	146	22	4.8	10	3/2	4	7	yes	yes	yes	no	yes	III
UGL 31	210	3	8	x	14/10	127	x	3.8	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 32	212	4	7	x	13-14/10	103	x	3.6	10	3/2	4	5	yes	yes	yes	no	yes	III
Lagon Hill																		
CAS 141776	215	3	8	27	14-15/10-12	150	24	5.0	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 141777	215	4	7	27	14/12	170	25.5	5.1	10	3/2	4	7	yes	yes	yes	no	yes	III
CAS 141778	213	4	7	26	14/10-12	171	25.5	5.3	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 147673	216	3	7	28	14-16/10	166	22	6.0	10	3/2	4	4	yes	yes	yes	no	yes	III
CAS 147674	217	4	7	27	14/12	91	14	3.4	10	3/2-3	4	5	yes	yes	yes	no	yes	III
CAS 147675	225	4	5(6)	26	13-14/10-12	94.5	13.5	3.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 147676	211	3	7	26	13-14/10	99	14	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 147677	218	3	7	26	14/10	121	18.5	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 147678	220	3	7	27	14-15/12	112	15	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 147679	215	3	7	27	13-14/10	98.5	15.5	3.7	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 147680	221	3	7	25	14-16/10-12	84.5	11	3.0	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 5513	223	3	8	x	15/10	168	x	4	10	3/2	4	6	yes	yes	yes	no	no	III
UGL 12	215	3	8	27	14-15/10	134	19	4	10	3/2	4	5	yes	yes	yes	no	yes	III
UGL 13	207	3	8	x	14-15/10-12	153	x	4.2	10	3/2	5	6	yes	yes	yes	no	yes	III
UGL 28	217	4	7	27	15-16/10	174	25	5.5	11	3/2	6	7	yes	yes	yes	no	yes	III
Achimota																		
BW 1954.1.5.9	215	3	-	27	12-14/10	177	25	4.5	10	3/2	4	7	yes	yes	yes	no	yes	III
CAS 125546	212	3	8	x	14/10	149	x	4.2	10	3/2	5	6	yes	yes	yes	no	yes	III
CAS 125547	219	3	7	28	14-15/12	176	26.5	4.9	10	3/2	4	6	yes	yes	yes	no	no	III
CAS 125548	218	3	7	x	13-14/10	163.5	x	5.3	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135324	220	3	7	26	14-16/12	99	14	3.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135325	215	4	7	x	14-16/10-12	195	x	5.2	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135326	216	3	7	26	14/11-12	98	13.5	3.7	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135327	219	4	7	27	14/10	172	26	4.9	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135328	217	3	7	26	14-15/11-12	94	14	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 135329	221	3	7	27	14-15/12	76	11	3.0	10	3/2	6	7	yes	yes	yes	no	yes	III
CAS 136145	217	3	7	x	14-15/12	196	x	6.5	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136239	218	4	6	26	14-16/12	93.5	13	3.1	10	3/2	5	6	yes	yes	yes	no	yes	III
CAS 136240	223	3	6	26	14-16/12	176	23	5.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136241	221	3	8	29	14-16/12	86	12.5	3.0	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136242	216	3	7	27	14/11-12	188.5	28.5	5.0	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136243	221	4	7	26	14/12	117	17.5	3.9	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136244	218	3	8	28	14-15/12	171	24	4.8	10	3/2	4	8	yes	yes	yes	no	no	III
CAS 136245	222	3	7	26	15-16/12	192	27	5.8	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136246	220	3	7	27	14/12	103.5	15	3.5	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136247	214	3	8	29	14/10-12	106	16.5	3.6	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136248	217	4	7	27	14-16/11-12	179	29.5	5.8	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136264	215	3	8	27	14-15/12	132	19	4.2	11	3/2	4	6	yes	yes	yes	no	no	III
CAS 136265	214	4/3	7	27	14/12	74	10.5	3.0	10	3/2	3	6	yes	yes	yes	no	yes	III
CAS 136266	218	3	7	27	16/12	153	20.5	4.2	9	3/2	4	7	yes	yes	yes	no	yes	III
CAS 136375	216	3	7	26	14/10	130	19.5	3.7	10	3/2	4	4	yes	yes	yes	no	yes	III
CAS 136376	219	4	7	27	14-15/12	104	16	3.2	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136377	216	3	7	x	14-15/10-12	150	x	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136378	218	3	7	28	14/12	96.5	15	3.7	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136379	213	3	7	27	14/12	86	12.5	2.9	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136380	218	3	8	28	14/12	217	31	5.7	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136381	213	3	7	26	12/10-12	76	11	2.8	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136382	215	3	7	27	13-14/12	78	11.2	3.0	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136383	208	4	7	26	14/11-12	142	21	3.7	10	3/2	5	6	yes	yes	yes	no	yes	III
CAS 136384	212	4	6	25	14/10-12	132.5	19	4.1	10	3/2	4(1)	6	yes	yes	yes	no	yes	III
CAS 136385	213	3/4	7	26	14/10	82.5	11.5	3.0	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136386	216	3	7	25	14-16/12	85.5	12.5	3.2	12	3/2	4	7	yes	yes	yes	no	yes	III
CAS 136387	214	3	8	28	14-15/10-12	127.5	21	4.0	10	3/2	4	4	yes	yes	yes	no	yes	III
CAS 136388	218	3	7	x	14/10-12	156	x	4.2	9	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136389	220	4	7	x	14/10	101	x	3.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136390	214	3	8	27	15-16/12	86.5	12.5	3.1	10	3/2	5	7	yes	yes	yes	no	yes	III

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CAS 136391	218	3/4	7	27	14/10	87	14	2.6	9	3/2	4	5	yes	yes	yes	no	no	III
CAS 136392	211	3	7	25	14/12	142	20	4.0	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136393	218	3/4	7	26	14/10-12	103	14	2.8	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136394	214	3	6	x	14-15/10-12	138.2	x	3.1	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136395	215	3/4	7	26	14/10-12	133.5	20.5	4.0	10	3/2	5	6	yes	yes	yes	no	yes	III
CAS 136396	220	3	8	27	13-14/10-11	155	20.5	4.0	10	3/2	4(1)	4	yes	yes	yes	no	yes	III
CAS 136397	212	3	7	25	13-14/12	132	20	4.1	9	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136398	214	3	7	26	13-14/10	122	18.5	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136399	212	3	8	26	14/10-12	142	22	4.2	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136400	208	3	7	24	13-14/10-12	124.5	18	3.9	10	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136401	211	3	7	24	14/10	157	21	4.8	9	3/2	4	5	yes	yes	yes	no	yes	III
CAS 136402	217	3	7	26	14-15/12	143	21.5	4.2	8	3/2	4(2)	6	yes	yes	yes	no	yes	III
CAS 136403	215	3/4	7	x	14-15/12	164.5	x	4.2	10	3/2	4	6	yes	yes	yes	no	yes	III
CAS 136404	215	3/4	7	26	13-14/10	146	21.5	4.1	9	3/2	4	6	yes	yes	yes	no	yes	III
CG 4043	213	3	7	23	14-15/11-12	188	28.5	5.4	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4903	214	3	8	27	14/10	141	21	4.2	9	3/2	4	6	yes	yes	yes	no	yes	III
CG 4904	223	3	7	27	14/12	93	13	3.1	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4905	210	3	7	26	14/12	139	22	2.8	10	3/2	4	6	yes	yes	yes	no	yes	III
FMNH 74861	216	3/4	8	27	14/10	155	23	5	12	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 143	221	4	8	28	16/12	93	12.5	3.2	10	3/2	5	7	yes	yes	yes	no	yes	III
MVZ 144	209	3	7	27	14/10	181	27.5	5.5	10	3/2	4	6	yes	yes	yes	no	no	III
MVZ 75397	216	3	6	26	14-16/12	104	14.5	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 75398	219	3	7	27	14/11-12	96	13.5	3.3	10	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 75399	216	4	7	27	14-16/12	102	15	3.3	10	3/2	4	5/6	yes	yes	yes	no	yes	III
MVZ 75400	215	3	7	27	14/11	147	22	4.4	10	3/2	4	5	yes	yes	yes	no	yes	III
MVZ 75401	218	3	7	x	14-16/12	178	x	5.5	10	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 75402	215	3	7	26	14/11	167	24	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 75403	221	3	7	26	14/12	163	22	4.4	10	3/2	5	7	yes	yes	yes	no	yes	III
MVZ 75404	223	3	7	28	14/10-11	148	22	4.4	10	3/2	4	5	yes	yes	yes	no	yes	III
MVZ 75405	219	3	8	x	14/11-12	178	x	4.9	10	3/2	5	7	yes	yes	yes	no	yes	III
MVZ 81406	217	3	8	26	14/12	174	25	4.5	10	3/2	4	6	yes	yes	yes	no	yes	III
MVZ 81407	220	3	8	29	15-16/12	163	25	4.2	12	3/2	5	7	yes	yes	yes	no	yes	III
UGL 1	215	3	7	26	14/10-11	212	28.5	6.2	11	3/2	4	7	yes	yes	yes	no	yes	III
UGL 2	215	3	7	27	14-16/11-12	155	22.5	4.5	10	3/2	4	7	yes	yes	yes	no	no	III
UGL 3	207	3	7	x	16/12	162	x	5.5	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 4	206	3	8	x	14-15/10-11	179	x	5.7	10	3/2	5	5	yes	yes	yes	no	yes	III
UGL 5	215	3	7	x	14/11	147	x	4.3	8	3/2	4	6	yes	yes	yes	no	yes	III
UGL 6	218	4/3	7	28	14-15/12-13	112	16	3.6	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 14	217	3	8	x	14/10	197	x	5.8	10	3/2	6	6	yes	yes	yes	no	no	III
UGL 15	216	3	7	28	14/11-12	231	31.5	5.1	10	3/2	4	6	yes	yes	yes	no	yes	III
UGL 16	216	3	8	27	14/10	180	28	5.3	11	3/2	4	8	yes	yes	yes	no	yes	III
UGL 17	215	3	8	29	13-15/12	130	17	4.6	9	3/2	6	7	yes	yes	yes	no	yes	III
UGL 25	212	3	7	x	14/11-12	205	x	6	10	3/2	4	7	yes	yes	yes	no	yes	III
Accra																		
BM 1933.6.14.23	215	3	7	26	14/10	192	29	5.7	10	3/2	4	4	yes	yes	yes	no	yes	III
BM 1933.6.14.24	222	4	7	x	13/12	159	x	4.6	10	3/2	4	6	yes	yes	yes	no	yes	III
BM 1933.6.14.25	218	3	8	27	14/12	82	11	2.6	10	3/2	4	5	yes	yes	yes	no	yes	III
BM 1937.7.13.3	212	3/4	7	26	14/10	127	18	3.4	8	3/2	4	6	yes	yes	yes	no	yes	III
CM 24688	221	3	8	27	13-14/10-11	154	24.5	4.2	10	3/2	4	6	yes	yes	yes	no	yes	III
ZMU 5742	218	3	8	x	14/10-11	203	x	6	10	3/2	4	5	yes	yes	yes	no	yes	III
Kwali Lagoon (Korley-Bu) near Accra																		
BM 1931.5.6.4	224	3	7	28	14/10	80	12	2.9	10	3/2	4	5	yes	yes	yes	no	yes	III
BM 1932.6.1.13	215	3	7	x	14/12	182	x	5.1	10	3/2	4	6	yes	yes	yes	no	yes	III
BM 1932.6.1.14	216	3	8	26	14/10	66	10	2	10	3/2	4	6	yes	yes	yes	no	yes	III
MCZ 49097	214	4	7	26	14/12	136	19	4.4	10	3/2	4	7	yes	yes	yes	no	yes	III
MCZ 49098	220	3	8	28	14/12	145	19	4.5	10	3/2	5	7	yes	yes	yes	no	yes	III
NHMB No #	216	3	7	25	14/10	133	19	3.7	10	3/2	4	5	yes	yes	yes	no	yes	III
Christians Village																		
CG 4752	218	4	7	x	14/10	194	x	5.2	10	3/2	5	6	yes	yes	yes	no	yes	III
CG 4753	219	4	7	x	15-16/10	170	x	4.5	10	3/2	4	7	yes	yes	yes	no	yes	III
CG 4754	222	4	7	28	14/10	121	17	3.8	10	3/2	4	6	yes	yes	yes	no	yes	III
CG 4755	214	3	7	27	14/12	110	16.5	3.3	10	3/2	4	5	yes	yes	yes	no	yes	III
CG 4756	214	3	7/8	27	14/10	89	13.5	2.8	10	3/2	4	5	yes	yes	yes	no	yes	III
KM R4470	217	3	6	18	18/14	132	13.5	3.5	8	3/2	2	4	yes	yes	no	no	yes	II
KM R4471	216	3	8	26	14-15/11-12	190	29	5.9	10	3/2	4	5	yes	yes	yes	no	yes	III
KM R4472	216	4	7	26	14/10-11	176	26.5	4.7	10	3/2	4	5	yes	yes	yes	no	yes	III
KM R4474	230	3	7	23	14/10	100	13	2.9	12	3/2	4	5	no	yes	no	no*	yes	v
Labadi near Accra																		
UGL 18	212	3	7	x	14/10	185	x	5.1	10	3/2	4	5	yes	yes	yes	no	yes	III
ZMU 16069A	252	4	7	28	15-16/10-13	258	31	4.9	10	3/2	4	6	yes	yes	yes	no	yes	III

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ZMU 16069B	245	4	8	27	17/14	220	26	4.1	10	3/2	4	5	yes	yes	yes	no	yes	III
<u>Somanya (Somanya Krobo)</u>																		
MCZ 55189	234	5	7	x	13-14/10-12	143	x	3.6	12	3/2	4	4	yes	yes	no	no	no	V
MCZ 55190	228	5	7	23	14/10	133	16.5	3.4	12	3/2	4	5	yes	yes	no	no*	no	V
MCZ 55191	235	4	7	x	11-13/10	147	x	3.3	12	3/2	4	6	yes	yes	no	no	no	V
MCZ 55192	237	4	7	26	14/10-12	148	18	3.3	11	3/2	4	5	yes	yes	no	no	no	V
MCZ 55193	232	4	7	24	14/10	135	16	3.3	12	3/2	4	5	yes	yes	no	no	no	V
MCZ 55194	227	4	7	22	14/10	140	16	3.5	10	3/2	5	5	yes	yes	no	no	no	V
MCZ 55195	225	4	7	23	14/10	130	16	3.0	12	3/2	4	5	yes	yes	no	no*	no	V
MCZ 55196	225	3	7	26	14/10	137	17	3.3	12	3/2	4	5	yes	yes	no	no	no	V
MCZ 55197	232	3	7	23	14/10	83	9.8	2.7	10	3/2	4	5	yes	yes	no	no	no	V
MCZ 55198	225	4	7	26	14/10	88	10.5	2.7	10	3/2	4	5	yes	yes	no	no	no	V
MCZ 55199	220	4	7	23	14/10	72	8.0	2.5	10	3/2	4	5	yes	yes	no	no	no	V
MCZ 55200	227	3	7	24	14/10	65	8.2	2.2	12	3/2	4	5	yes	yes	no	no	no	V
<u>Akropong</u>																		
NMB 3807	226	3	7	23	14/11-12	144	17	3.4	12	3/2	4	5	yes	yes	no	no*	no	V
NMB 3808	231	4	6	23	15/11-13	156	18	3.6	12	3/2	4	5	yes	yes	no	no*	no	V
<u>Klein Popo</u>																		
ZMU 14153	220	3	8	28	14/10	80	11	2.8	10	3/2	4	6	yes	yes	yes	no	yes	III
<u>Banda Hills, 40 miles northwest of Wendi</u>																		
BM 1948.1.6.90	224	3	6	x	15/13	122	x	3.3	8	3/2	2	4	no	yes	no	no	yes	I
BM 1948.1.6.91	219	3	6	19	14/12	112	13.5	3.0	8	3/2	2	2	yes	yes	no	no	yes	II
BM 1948.1.6.92	221	3	6	19	14/12	103	11	2.8	8	3/2	2	4	no	yes	no	no	yes	I
BM 1948.1.6.93	219	x	x	x	15-16/14	119	x	3.0	8	3/2	2	4	yes	yes	no	no	yes	II
BM 1948.1.6.94	221	3	6	19	16/14	84	10	2.4	8	3/2	2	6	no	yes	no	no	yes	I
BM 1948.1.6.95	214	3	6	x	15/13	80	x	2.3	8	3/2	-	-	no	yes	no	no	yes	I
BM 1948.1.6.96	-	3	7	18	14-15/15	90	-	-	8	3/2	2	5	no	yes	no	no	yes	I
BM 1948.1.6.97	-	4	6	x	14-16/14	90	x	-	8	3/2	4	6	no	yes	no	no	yes	I
MCZ 49701	226	4	6	18	14/14	127	14	3.1	8	3/2	4	4	no	yes	no	no	yes	I
MCZ 49702	216	3	6	x	16/12	120	x	3.0	8	3/2	-	-	no	yes	no	no	yes	I
MCZ 49703	226	3	6	19	14/13-14	123	13	3.0	8	3/2	3	4	no	yes	no	no	yes	I
MCZ 49704	217	3	6	18	14-15/14	120	14.5	3.1	8	3/2	3	5	yes	yes	no	no	yes	II
MCZ 49705	224	3	6	18	15/13	117	12	3.0	8	3/2	3	4	no	yes	no	no	yes	I
MCZ 49706	221	3	6	19	14/14	122	13.5	3.1	8	3/2	4	4	no	yes	no	no	yes	I
MCZ 49707	225	3	6	17	14/14	109	12	2.8	8	3/2	4	3	no	yes	no	no	yes	I
MCZ 49708	226	3	7	19	14/14	112	13	2.8	8	3/2	4	4	yes	yes	no	no	yes	II
MCZ 49709	211	3	6	17	16/14	111	12	2.9	8	3/2	4	4	yes	yes	no	no	yes	II
<u>Kpandu</u>																		
RMNH 18668	223	3	8	28	12-14/9-10	182	25	5	10	3/2	4	4	yes	yes	yes	no	yes	III
RMNH 18669	220	4	7	x	14/8-9	228	x	6.3	10	3/2	4	5	yes	yes	yes	no	yes	III
RMNH 18670	230	3	8	28	14/10	170	26	5.1	10	3/2	4	5	yes	yes	yes	no	yes	III
RMNH 18671	224	4	7	29	14/10	185	28.5	5.2	10	3/2	4	4	yes	yes	yes	no	yes	III
RMNH 18672	225	3	9	x	14-15/10	228	x	6.2	10	3/2	4	5	yes	yes	yes	no	yes	III
RMNH 18673	223	4	7	29	14/10	169	22	4.2	10	3/2	4	5	yes	yes	yes	no	yes	III
RMNH 18674	227	3	8	29	14/10	227	35	6.6	10	3/2	4	5	yes	yes	yes	no	no	III
<u>Kete Krachi (Kete Kraschi)</u>																		
ZMU 16070a	236	3	7	27	14/10	160	22	3.9	10	3/2	4	5	yes	yes	yes	no	yes	III
ZMU 16070b	216	3	7	17	15/13	120	13	3.1	9	3/2	4	5	no	yes	no	no	yes	I
<u>Bamboi, 6 miles north of</u>																		
CAS 134733	215	2	6	19	16-17/14	126	13	3.2	8	3/2	3	4	no	yes	no	no	yes	I
CAS 134734	210	3	6	19	15-17/12	121	13	3.7	8	3/2	4	4	no	yes	no	no	yes	I
CAS 134735	216	3	5	18	16/14	114.5	13	3.5	8	3/2	4	5	no	yes	no	no	yes	I
<u>Bamboi, 12 miles north of</u>																		
CAS 126398	212	3	6	x	16/14	115	x	3.6	8	3/2	4	5	no	yes	no	no	yes	I
CAS 126399	210	3	6	19	14-16/14-15	118	13	3.2	8	3/2	4	4	no	yes	no	no	yes	I
CAS 126400	212	3	6	x	16/13-14	115	x	3.7	8	3/2	4	4	no	yes	no	no	yes	I
<u>Bamboi, 50 miles north of</u>																		
CAS 134727	212	3	6	x	16-18/13-14	135	x	4.3	8	3/2	4	5	no	yes	no	no	yes	I
CAS 134728	212	3	5	19	16-17/14	136	17	4.2	8	3/2	4	4	no	yes	no	no	yes	I
CAS 134729	213	3	6	18	16-18/14	78	8.5	3.5	8	3/2	4	5	no	yes	no	no	yes	I
CAS 134730	212	3	5	17	16/14	141	17	4.4	8	3/2	4	5	no	yes	no	no	yes	I
<u>Tamale</u>																		
CAS 146345	220	3	7	26	18/12	165	23	5.2	8x	3/2	4	6	yes	yes	yes	no	yes	III
CG 2301	220	4	6	x	16/12	188	x	5.5	8	3/2	4	5	yes	yes	yes	no	yes	III

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
UGL 20	224	4	7	x	19-20/14	118	x	3.7	6	3/2	4	5	yes	yes	yes	no	yes	III
UGL 26	213	3	8	26	16/12	165	23	6.2	8	3/2	4	5	yes	yes	yes	no	yes	III
<u>Tinga</u>																		
CAS 126397	208	3	6	x	16/14	124.5	x	3.9	8	3/2	4	5	no	yes	no	no	yes	I
<u>Mangu</u>																		
ZMU 16068	237	4	7	27	17-18/12	260	31	5.3	9	3/2	4	5	yes	yes	yes	no	yes	III
ZMU 24917	223	3	8	23	20/14	86	10	3.2	10	3/2	4	4	yes	yes	yes	no	yes	III
ZMU 24918A	235	3	7	23	16/12	215	20.5	6.1	8	3/2	4	5	yes	yes	yes	no	yes	III
ZMU 24918B	224	3	7	27	16-17/12	85	11	2.9	8	3/2	4	6	yes	yes	yes	no	yes	III
<u>Wenchi</u>																		
CG 2806	218	3	-	14	16/12-12	160	x	4.3	6	3/2	4	5	yes	yes	no	no	yes	XVII
<u>Wa</u>																		
CAS 126394	220	3	6	18	16/14	122	12	3.8	8	3/2	4	4	no	yes	no	no	yes	I
CAS 126395	218	3	6	18	16/16	74	7.5	3.0	8	3/2	2	4	no	yes	no	no	yes	I
CAS 126396	220	3	5	19	16-17/14	79	8.5	2.8	8	3/2	4	5	no	yes	no	no	yes	I
CAS 134713	221	3	6	17	16/14	96	8.8	3.7	8	3/2	2	4	no	yes	no	no	yes	I
CAS 134714	221	2/3	5	x	18/16	156	x	4.7	8	3/2	4	5	no	yes	no	no	yes	I
CAS 134715	216	2	5	18	14-16/14-16	139	13	4.8	8	3/2	4	5	no	yes	no	no	yes	I
<u>Gambaga district</u>																		
BM 1930.10.4.1	222	4/3	7	25	18/14	174	23	5	10	3/2	4	8	yes	yes	yes	no	yes	III
<u>Turi</u>																		
BM 1954.1.4.8	225	4	6	22	18/14	177	22.5	5.5	10	3/2	4	5	yes	yes	yes	no	yes	III
BM 1954.1.4.9	227	4	6	23	16/14	169	20	5.2	9	2/2	4	5	yes	yes	yes	no	yes	III
<u>No Locality Specified</u>																		
BM 1916.9.9.2	215	4	7	29	14/10	166	19	3.7	10	3/2	4	5	yes	yes	yes	no	no	III
BM 1946.8.2.19	216	3	8	28	14-16/10	128	19	3.7	11	3/2	4	7	yes	yes	yes	no	yes	III
SMNH 1346a	214	2	7	16	18/16	121	11.5	3.6	8	3/2	4	7	yes	yes	no	no	yes	II
SMNH 1346b	221	3	7	16	18/16	116	11	3.5	8	3/2	4	6	yes	yes	no	no	yes	II
SMNH No #	230	2	7	x	14/10-11	124	x	3.1	10	3/2	4	7	yes	yes	no	no*	yes	V
UGL B1	216	4	8	26	16/10	146	20.5	4.5	10	3/2	4	6	yes	yes	yes	no	no	III
UGL 21	215	4	7	26	14/12	145	22	4.1	10	3/2	4	6	yes	yes	yes	no	yes	III
<u>BOURKINA FASO</u>																		
<u>Ouagadougou</u>																		
MHNP A.71	211	4	6	23	18/14	195	24.5	5.6	10	3/2	4	6	yes	yes	yes	no	yes	III
MHNP A.72	222	4	7	24	19-20/14	199	27	5.9	10	3/2	4	5	yes	yes	yes	no	yes	III
MHNP A.73	-	-	-	-	18/14	-	-	-	-	3/2	4	6	yes	yes	yes	no	yes	III
MHNP A.74	228	4	8	24	19-20/14	127	16.5	4	9	3/2	4	5	yes	yes	yes	no	yes	III
<u>Bobo Dioulasso</u>																		
IFAN 55.20.325	203	4	6	20	17-18/12	172	21	5.5	0	3/2	4	6	yes	yes	yes	no	yes	III
<u>IVORY COAST</u>																		
<u>Assini</u>																		
MHNP 1885.599	223	3	7	x	21-23/16	225	x	6.5	13	3/2	4	5	yes	yes	yes	no	no	III
MHNP 1885.600	221	3/4	7	28	19-21/16	180	25	5.1	12	3/2	4	5	yes	yes	yes	no	no	III
MHNP 1885.601	227	4	6	x	21-22/16	154	x	4.2	9	3/2	4	5	yes	yes	yes	no	no	III
MHNP 1885.695	221	4	7	24	19-21/16	145	20.5	4.9	12	3/2	4	4	yes	yes	yes	no	no	III
MHNP 1885.696	215	3	7	x	20-21/14-16	212	x	5.8	12	3/2	4	4	yes	yes	yes	no	yes	III
<u>Bouaké</u>																		
MHNP 1983.400	209	3	7	x	14-15/12	90	x	3.0	6	3/2	4	4	yes	yes	no	no	no	IV
<u>Assacro</u>																		
MHNP 1978.2	197	2/3	7	22	14/14	79	11.5	2.5	6	3/2	4	4	yes	yes	no	no	no	IV
MHNP 1978.1	207	-	7	x	14/13-14	123	x	3.3	6	3/2	4	4	yes	yes	no	no	no	IV
<u>LIBERIA</u>																		
<u>Junk River</u>																		
ZIL 6928	240	4	8	24	14/10	147	18	3.5	8	2/2	-	-	-	-	-	-	-	XII
<u>Mount Coffee</u>																		
USNM 24294	250	3	9	23	14/10	141	17.5	3.4	8	2/2	3	4	no	yes	no	yes	no	XII

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<u>Soforeh Place-St. Paul's River</u>																		
RMNH 6458	217	4	8	23	14-15/10	129	13	2.5	8	2/2	3	4	no	yes	no	yes	no	XII
<u>Robertsport-Grand Cape Mount</u>																		
RMNH 6459	239	4	7	21	14/8	130	14	3.1	0	2/2	2	4	no	yes	no	yes	no	XII
RMNH 6459A	222	4	7	22	14/8	128	15	3.1	0	2/2	4	4	no	yes	no	yes	no	XII
<u>No Locality Specified</u>																		
BM 95.6.20.1	240	3	7	x	13-14/8	138	x	3	0	2/2	4	4	no	yes	no	yes	no	XII
BM 95.6.20.2	236	2	7	21	14/8	103	11	2.7	0	2/2	4	4	no	yes	no	yes	no	XII
BM 95.6.20.3	239	3	6	23	12/8	96	12	2	6	2/2	4	4	no	yes	no	yes	no	XII
BM 95.6.20.4	241	3	6	24	14/8	88	9	2	6	2/2	4	6	no	yes	no	yes	no	XII
IRSNB 2005	221	4	7	24	14/10	145	18	3	8	2/2	4	4	no	yes	no	yes	no	XII
KM R4473	235	4	6	x	12/8	86	x	1.7	0	2/2	2	4	no	yes	no	yes	no	XII
MHNP 1896.360	228	2	7	21	12/8	115	13	2.6	8	2/2	4	4	no	yes	no	yes	no	XII
MHNP 1896.361	224	3	7	22	13-14/8	120	13	2.4	8	2/2	4	4	no	yes	no	yes	no	XII
MHNP 1896.362	261	2	7	21	14/10	137	15	3.2	8	2/2	4	4	no	yes	no	yes	no	XII
NMR 66	262	3	8	22	13-14/10	158	17.5	3.2	0	2/2	4	4	no	yes	no	yes	no	XII
<u>SIERRA LEONE</u>																		
<u>No Locality Specified</u>																		
BM 1914.1.27.4	254	3	8	24	16/10	144	18	3.4	0	2/2	4	4	no	yes	no	yes	no	XII
SMNH 388	229	3	8	23	14/11-12	162	20.5	4.1	12	3/2	4	5	yes	yes	no	no*	no	V
<u>GUINEA</u>																		
<u>Mount Nimba</u>																		
MHNP 1943.65	248	x	8	22	15/10	129	15	3.0	0	2/2	4	4	no	yes	no	no	no	XII
<u>Keoulenta</u>																		
MHNP 1943.63	253	3/4	8	24	14/10	125	15	3	8	2/2	4	4	no	yes	no	no	no	XII
MHNP 1943.64	260	3/3	8	x	14/10	117	x	2.5	-	2/2	3	4	no	yes	no	no	no	XII
<u>Conakry</u>																		
MG 722.94a	243	3	6	18	14/10	118	12	3	8	2/2	3	2(4)	yes	yes	no	no	no	VI
MG 722.94b	236	3	6	18	14/10	129	13	3.5	8	2/2	3	4	yes	yes	no	no	no	VI
MHNP 1897.319	237	2	6	18	14/10	124	13	3.2	8	2/2	3	4	yes	yes	no	no	no	VI
MHNP 1895.481	236	3	6	18	14/10	150	14	3.8	8	2/2	3	4	yes	yes	no	no	no	VI
<u>Ile Kassa</u>																		
IRSNB 910	233	3	6	19	14/10	125	14	3.5	7	2/2	3	4	yes	yes	no	no	no	VI
<u>Tumbo Island</u>																		
NMB 3806	235	3	7	19	14/10	130	14	3.4	3(8?)	2/2	3	4	yes	yes	no	yes	no	VI
<u>GUINEA BISSAU</u>																		
<u>Bubaque</u>																		
ZMU 31184	253	3	8	22	14/9	158	16	3.5	6	2/2	1(3)	3	no	no	no	yes	yes	X
<u>Cacine River district (Cassine)</u>																		
BM 1946.8.2.46	224	2	12	25	10/8	127	19	3.5	10	2/2	3	4	yes	yes	no	yes	no	VII
BM 1946.8.2.47	240	3	x	25	10/8	95	12	2.5	8	2/2	6	0	yes	yes	no	yes	no	VII
MSNG CE28164A	236	2	10	25	10/8	145	17	3.8	9	2/2	2(4)	4	yes	yes	no	yes	no	VII
MSNG CE28164B	232	2	10	x	10/8	145	x	4	11	2/2	2(4)	4	yes	yes	no	yes	no	VII
MSNG CE28164C	224	2	13	x	10/8	116	x	3	10	2/2	2(4)	0	yes	yes	no	?	no	VII
MSNG CE28164D	233	2	11	25	10/8	115	13	3	10	2/2	2(4)	4	yes	yes	no	yes	no?	VII
MSNG CE28164E	236	2	?	23	10/8	96	12	2.8	10	2/2	(3)?	4	yes	yes	no	yes	yes	VII
MSNG CE28164F	231	2	11	x	10/8	67	x	1.5	10	2/2	2(4)	0	yes	yes	no	yes	yes	VII
BM 1946.9.1.13	257	3	8	21	12/7-8x	147	14	3.3	6	2/2	3	4	no	no	no	yes	no	X
BM 1946.9.1.14	259	3	7	x	12/7x	151	x	3	6	2/2	6	9	no	no	no	yes	no	X
MSNG CE28162A	248	2	8	25	13-14/7x	161	16	3.2	6	2/2	(4)	(4)	no	no	no	yes	yes	X
MSNG CE28162B	249	3	7	22	12/7x	148	15	3.6	8	2/2	2(4)	0	no	no	no	yes	no	X
MSNG CE28162C	250	2	7	22	12/7x	159	16	3.5	6	2/2	2(4)	0	no	no	no	yes	no	X
MSNG CE28162D	265	2	8	x	12/7x	124	x	2.5	6	2/2	2(4)	0	no	no	no	yes	no	X
MSNG CE28162E	250	3	7	21	12/7x	138	14	3.5	6	2/2	2(4)	0	no	no	no	yes	no	X
MSNG CE28164F	261	3	7	22	12/7x	104	10.5	2.8	6	2/2+	2(4)	2(4)?	no	no	no	yes	no	X
MSNG CE28164G	256	2	7	22	12/7x	118	12	2.8	6	2/2	2(4)	0	no	no	no	yes	no	X
<u>Bissau</u>																		
CZL 1945.28	265	3	8	x	13-14/9x	154	x	3	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.29	249	3	7	x	14/9x	149	x	3	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.40	259	3	8	22	13/9x	154	18	3.2	6	2/2	4	4	no	no	no	yes	no	X

Appendix continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CZL 1945.42	263	3	8	22	14/9x	135	15	2.9	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.46	254	3	7	23	13-14/8-9x	142	17	3.1	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.47	258	2	8	x	13-14/9x	142	x	3.1	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.65	254	2	8	x	12/7-8x	145	x	3.1	6	2/2	1	3	no	no	no	yes	no	X
CZL 1945.66	258	2	7	x	12-13/9x	155	x	3.1	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.70	258	3	8	23	13-14/9x	155	17	3.3	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.71	244	3	7	21	13-14/9x	147	15	3.1	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.76	261	3	7	23	14/9x	157	16	2.6	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.77	259	3	8	24	14/9x	157	17	3.0	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.93	261	2	8	x	12-13/9x	154	x	3.1	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.94	264	3	8	23	12-13/9x	146	16	2.8	6	2/2	4	4	no	no	no	yes	no	X
CZL 1945.138	259	2	8	23	12/9x	162	17	3	6	2/2	4	4	no	yes	no	yes	no	X
<u>SENEGAL</u>																		
<u>Niokolo-Koba National Park</u>																		
IFAN	278	4	7	23	14/7-8x	138	14.5	3.2	9	2/2	4	4	no	yes	no	yes	no	XV
<u>Bougari, Casamance river</u>																		
BM 1969.2896	251	3	6	x	14/9x	150	x	3.3	6	2/2	4	4	no	no	no	yes	no	X
BM 1969.2897	254	3	7	23	14/9x	150	17	4	6	2/2	4	4	no	no	no	yes	yes	X
<u>Bignona</u>																		
MHNP 1962.46	258	3	6	20	12-13/9x	145	14	3.1	6	2/2	4	6	no	no	no	yes	no	X
MHNP 1962.47	258	3	7	22	13-14/9x	159	17	3.5	6	2/2	4	6	no	no	no	yes	no	X
<u>GAMBIA</u>																		
<u>Boikama</u>																		
BM 1966.609	251	3	7	22	14/9x	149	16	3.5	6	2/2	4	4	no	no	no	yes	no	X
<u>Banjul (Bathurst) (11 miles from Bathurst on Yundum Rd.)</u>																		
BM 1966.610	256	3	8	23	14-15/9x	168	17	4.1	6	2/2	4	4	no	no	no	yes	no	X

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