ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

(MINISTERIE VAN CULTUUR, RECREATIE EN MAATSCHAPPELIJK WERK)

Deel 43 no. 9 20 december 1968

# AN UNUSUAL RHINOCEROS VIPER, BITIS NASICORNIS, FROM GHANA, WEST AFRICA

by

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With 4 text-figures, 1 table and 2 plates

## Abstract

The characters which serve to distinguish the Gaboon Viper (*Bitis gabonica*) from the Rhinoceros Viper (*B. nasicornis*) are examined in relation to a subadult female from Dabocrom, Ghana, which displays characters of both species. It is more like *B. nasicornis* than *B. gabonica* but the admixture of *B. gabonica* characters is probably the result of interbreeding.

## Introduction

Snakes of the genus *Bitis* are large vipers confined to Africa and the Arabian Peninsula. There are ten species: seven restricted to southern or eastern Africa and three which occur throughout Africa south of the Sahara. The last are the only species found in West Africa (Klemmer, 1963). The Puff Adder — *Bitis arietans* (Merrem, 1820), occurs in savanna country; the Gaboon and Rhinoceros Vipers — *B. gabonica* (Dumeril & Bibron, 1854) and *B. nasicornis* (Shaw, 1802) respectively, in forest or recently forested areas. The forest species look alike superficially, the complex colour patterns being rather similar, but the head patterns are usually enough to distinguish them (fig. 1).

The head of *B. gabonica* is pale cream above with a dark brown stripe along the midline — resembling a dead leaf with a prominent midrib. Above the jaw angles are usually one or more small, dark spots. Radiating from beneath the eye one or two prominent dark brown or black triangles: whether there is one (temporal) or two (temporal and subocular) is the distinction made between eastern (Tanganyika - Cameroons) and western (Togo - Guinea) races, named *B.g. gabonica* and *B.g. rhinoceros* [1]) respectively (Mertens, 1951).

1) Not to be confused with the Rhinoceros Viper — *B. nasicornis*

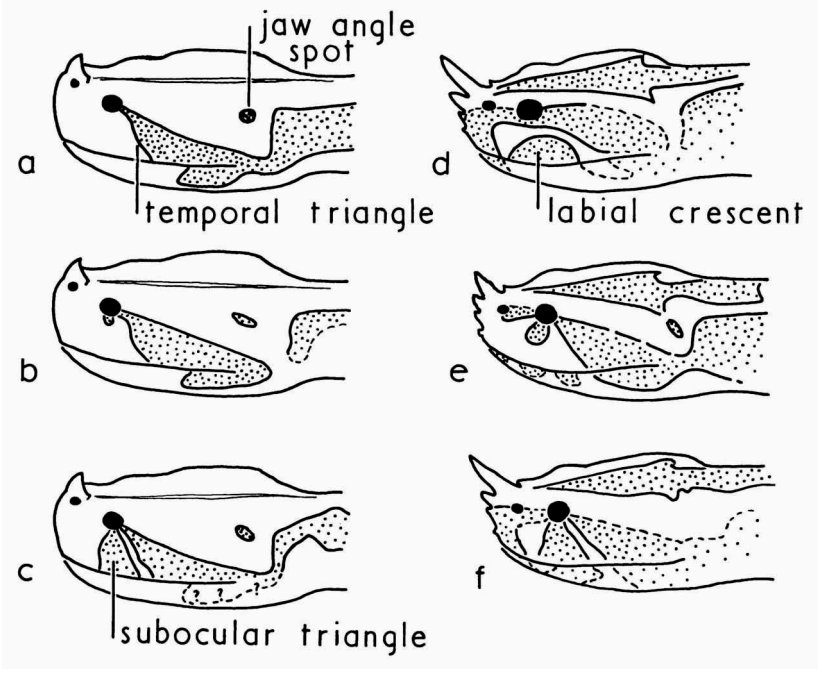


Fig. 1. Head patterns of (a-c) Gaboon and (d-f) Rhinoceros Vipers. a. *B. gabonica rhinoceros* (UG V3G19); b. *B. g. rhinoceros* (UG V3G32); c. *B. g. gabonica* (from Schmidt, 1923, plate XX); d. *B. nasicornis* (UG V3N23); e. *B. nasicornis* × *gabonica* (RMNH 1647); f. *B. nasicornis* (from Schmidt, 1923, plate XXI).

The top of the head of *B. nasicornis* is marked with a black triangle whose posterolateral corners may be continued towards the jaw angles as a pair of lines, but the spots found here in *B. gabonica* are never present. Beneath the eye there are sometimes two black triangles which may be compared with those of *B.g. gabonica* and named temporal and subocular as in that case; but they are not as distinct nor as intensely pigmented as in that form. In Ghana the usual pattern is of a posterior, temporal triangle reaching the eye and in front of that, in the position of a subocular triangle, a crescentic area restricted to the jaw margin by a light-coloured band which touches the ventral border of the eye. In some specimens the temporal triangle reaches the labial crescent below the eye, interrupting the light-coloured band in order to do so.

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2) Dabocrom has been equated with "Diabakrom" and sited at 07.40 N 02.58 W (Rosevaer, 1965); but the 1960 Population Census of Ghana lists "Dabo Krom" a few miles from the coastal town of Sekondi, and this is a much more likely source of material collected at that time.

The Rijksmuseum van Natuurlijke Historie, Leiden, Holland has a specimen of *Bitis* (RMNH 1647) collected at Dabocrom 2), Ghana in February 1843 by Mr. Pel, a Dutch administrator. This specimen is of interest in having the top of the head occupied by a black triangle, as is usual in *B. nasicornis,* but the sides of the head patterned with a distinct temporal triangle, such as found in the sympatric *B.g. rhinoceros,* and anterior to this a small area which seems to represent a diminutive subocular triangle. On balance the specimen seems referable to *B. nasicornis* but the presence of some elements of the *B. gabonica* pattern suggest it to be the product of hybridisation. This possibility may be assessed by enumerating the characters which serve to distinguish the two species (summarised in table 1) and seeing how they are expressed in the Dabocrom specimen. My remarks regarding *B. nasicornis* and *B. gabonica* are based on living or preserved material of 23 and 20 specimens respectively in the University of Ghana collections; all are from Ghana.

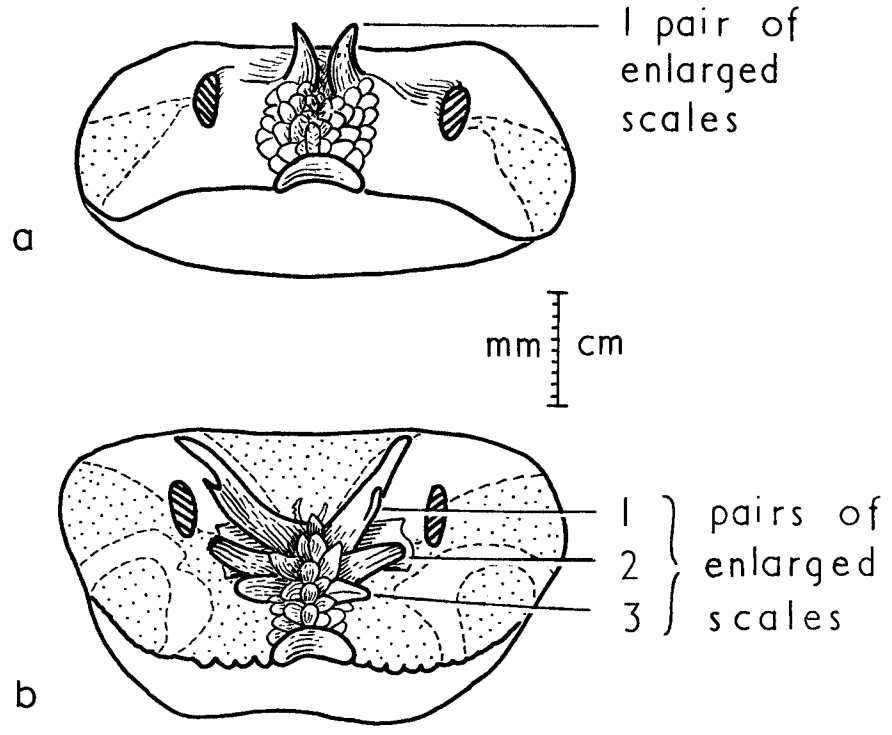



Fig. 2. Nasal rosettes of (a) Gaboon and (b) Rhinoceros Vipers. a. *B. g. rhinoceros* (UG V3G19); b. *B. nasicornis* (UG V3N23).

### Bitis gabonica, B. nasicornis and the Dabocrom specimen

Distinguishing characters may be discussed under the following heads: nasal rosette; scale number and shape; umbilical scar; and colour pattern of body and head.

Nasal rosette (fig. 2). — In *B. gabonica* a pair of scales medial to the nostrils is enlarged to form a pair of 'horns'. *B. nasicornis* has larger, more conspicuous 'horns' and in front of them two more pairs of scales are enlarged and deflected sideways to form the floor of a depression on the apex of the snout. The group of enlarged scales, three pairs, is known as a rosette'. The Dabocrom specimen has a rosette of the *B. nasicornis* type but it is smaller than usual, probably because the specimen is subadult.

Scale numbers (table 1). — Other details of scalation are given in table 1. With the exception of lower labial counts the ranges of variation in *B. gabonica* and *B. nasicornis* are taken from Villiers (1963). None of the counts is distinctive, in every case the ranges of the two species overlap, so the

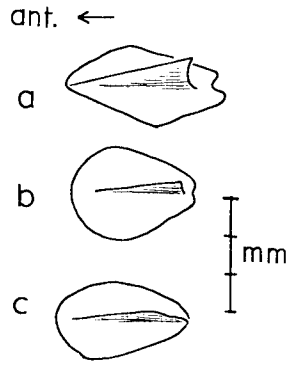



Fig. 3. Body scales of (a) Rhinoceros, (b) Dabocrom hybrid and (c) Gaboon Vipers. a. *B. nasicornis* (UG V3N21); b. *B. nasicornis* × *gabonica* (RMNH 1647); c. *B. g. rhinoceros* (UG V3G26).

data for the Dabocrom female do not assist in its identification but are included for the sake of completeness.

Scale shape (fig. 3). — *B. nasicornis* does not reach the size achieved by *B. gabonica* and its scales are correspondingly smaller and seemingly more closely packed together, each scale appearing more angular when compared with the smoothly rounded scales of *B. gabonica.* The scales of *B. nasicornis* are strongly keeled, especially towards the vertebral line, and at the free posterior end most scales are notched to accomodate the keel of the scale they overlap behind. The scales of *B. gabonica* are never more

than feebly keeled and it is unusual to find any that are notched, perhaps because scale overlap is less than in *B. nasicornis*.

The scales of the Dabocrom snake fit closely together and are mostly notched posteriorly, but keels of *B. nasicornis* type are fully developed only on the head scales, those of the body bearing smaller keels. The small size of the keels, as with the nasal rosette, may be attributed to the immaturity of the specimen.

Umbilical scar. — Beddard (1906, 1907) has described the position of the umbilicus in five juvenile *B. nasicornis* and the way in which the umbilical scar remains in older animals as a notch in the posterior border of some ventral scales. In his *B. nasicornis* the umbilicus emerged from between two ventral scales and the number between them and the anal scale varied from 9 to 14. In his single specimen of *B. gabonica* four scales were scarred and 8 scales separated these from the anal; it is not clear through which of the four the umbilicus had once emerged and therefore precisely how many scales once separated umbilicus from anal scale. Fourteen (?) newly born *B. nasicornis* in the University of Ghana collection have from 3 to 5 scales cleft in the midline and between 8 and 13 (mean 11) separating these from the anal scale. Seven *B. gabonica,* including only one youngster, average 3 notched scales and from 7 to 9 between these and the anal scale. The

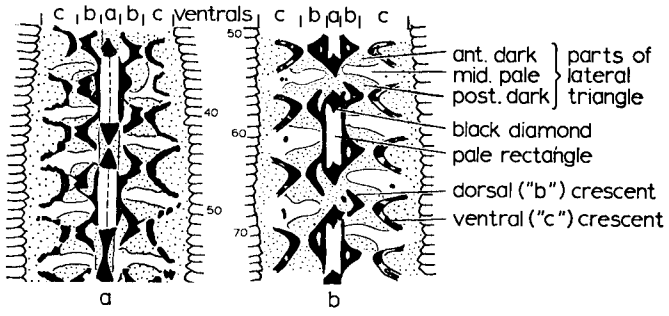



Fig. 4. Body patterns of (a) Gaboon and (b) Rhinoceros Vipers. a. *B. g. rhinoceros* (UG V3G26); b. *B. nasicornis* (UG V3N21). Compare with plate 2.

Dabocrom specimen has 3 scales notched posteriorly and 10 between these and the anal. In short, the umbilical scar of the Dabocrom animal is nearer the position prevailing in *B. nasicornis* than that in *B. gabonica.*

Colouration and pattern of body (fig. 4; plate 2). — The body patterns of *B. gabonica* and *B. nasicornis* have been analysed by Von Harnack (1953).

She has divided the pattern elements beween median dorsal, dorsolateral, and ventrolateral longitudinal rows. The median dorsal ("a" zone) comprises an alternating series of cream or pale brown rectangles and black, hour-glass shaped markings which may be severed in the middle and remain as caps at the ends of the lighter rectangles. Whether continuous or separated the black part meets the lighter rectangle in *B. gabonica* in a straight or slightly convex junction, but in *B. nasicornis* the black 'cap' is diamond-shaped and projects into a notch at the end of the rectangle. The latter condition is developed in the specimen from Dabocrom, but not to quite the usual extent, again perhaps because of its small size.

In *B. gabonica* the pale-coloured rectangle is often traversed lengthwise by a median black line or series of black spots; such is not found in Ghanaian *B. nasicornis,* nor is it to be seen in the specimen from Dabocrom.

The pattern elements of the "a" and "b" zones get "out of phase" when followed along the length of an idividual animal, but elements of the "b" and "c" zones are always "in phase" and produce a distinctive pattern of pale diamonds separated by dark, dorsal ("b") and ventral ("c") crescents. In most specimens of *B. gabonica* and *B. nasicornis* the pale diamonds are further differentiated into anterior and posterior darker areas separated by a pale band running through the diamond from top to bottom. In *B. gabonica* the anterior and posterior darker areas are evenly pigmented but in *B. nasicornis* they are tinted red and speckled with black. Furthermore, in both species the pale central band expands in its ventral part to fill the lower angle of the diamond and where is does so there is frequently present in *B. nasicornis,* but not in *B. gabonica,* a cluster of black specks or a black dot. Such markings are not to be seen in the Dabocrom specimen.

Colouration and pattern of head (fig. 1; plate 1). — The colour of the top of the head of *B. gabonica* is the same as that of the rectangles along its back, and the brown median stripe is comparable to a similar line often found on these rectangles (see above). Conversely the black triangle occupying the upper surface of the head of *B. nasicornis* may be likened to the black diamonds which in this species occur at the end of each vertebral rectangle. One might extend the comparison of head and body patterns further by comparison of the subocular and temporal triangles with the anterior and posterior limbs of a zone "b" crescent; but the shape of the head is so different from that of the body that such comparison is of little utility. It will suffice to notice the serial derivation of the distinctive head pattern of either species from different components of the "a" zone of the body pattern.

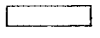
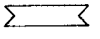
The head patterns of *B. gabonica* and *B. nasicornis* have been described in

the introduction and the resemblance of the Dabocrom snake to the latter in the presence of a black triangle on top of its head has been noticed. But the pattern on the *side* of the head does not conform exclusively with that of *B. gabonica* or *B. nasicornis*.

There are, in the Dabocrom specimen, three black areas on the side of the head, below the eye: the most posterior is comparable in all respects with the temporal triangle of *B. gabonica*; the second is a small black blob in contact with the eye and in the position of the subocular triangle of *B.g.*

TABLE I

Summary of characters which have been used to separate *Bitis gabonica* from *B. nasicornis* and their expression in the Dabocrom specimen.

| Character | *B. gabonica* | *B. nasicornis* | Dabocrom ♀ |
|---|---|---|---|
| 1. Nasal rosette, pairs of scales involved — | 1 | 3 | 3 |
| 2. Scale numbers — | | | |
| ventrals | 128-147 | 124-140 | 132 |
| subcaudals | 17-33 | 16-32 | 18 |
| scale rows | 28-44 | 35-41 | 37 |
| scales between eyes | 13-16 | 14-16 | 13 |
| scales around eyes | 15-19 | 15-20 | l. 15, r. 18 |
| upper labials | 13-16 | 15-18 | l. 15, r. 16 |
| lower labials | 15-19 | 15-18 | l. 18, r. 19 |
| 3. Scale shape, | | | |
| keeling | feeble | pronounced | moderate |
| post. notch | absent | present | present |
| 4. Umbilical scar, distance from anal in number ventrals | 7-9 | 8-13 | 10 |
| 5. Colouration and pattern — | | | |
| — of body: | | | |
| rectangle shape |  |  |  |
| rectangle median stripe | present | absent | absent |
| lateral diamonds | non-pigmented | pigmented | pigmented |
| — of head: | | | |
| dorsal triangle | absent | present | present |
| temporal triangle | present | present | present |
| subocular triangle | present/absent | present/absent | incipient |
| preocular mark | absent | present | incipient |
| spot over jaw angle | present | absent | present |

*gabonica* and *B. nasicornis*. A similar blob, but never a fully-developed triangle, is found here on both sides of four out of twenty Ghanaian *B. gabonica*: it would thus seem to be a normal variant of *B.g. rhinoceros*, but it is unknown in *B. nasicornis*. Thus far the markings resemble those of *B. gabonica*, but the third black mark, extending forward from the eye — preocular, is obviously like that always present in *B. nasicornis* but found as trace in one (UG V3G27) of our twenty Ghanaian *B.g. rhinoceros*.

## Discussion

Mertens (1956, 1964) has enumerated records of hybridisation in lizards and snakes but cites no examples in the genus *Bitis*. Our specimen is subadult, probably less than two years old, and female — judging from the low number of subcaudal scales. It would have been interesting to learn if the specimen were fertile but gut, gonads, etc. had long since been removed. Most characters (table 1) are those of *B. nasicornis* and where not fully developed (e.g. keeling of scales, nasal rosette) may be related to the immaturity of the specimen. But the colour patterns of head and body, especially the head, show such an admixture of *B. gabonica* elements as to suggest that we are dealing with a hybrid. The hemipenes of both species are illustrated by Doucet (1963, plate IX, i and text-fig. 51) who finds "the only clear difference is in the greater thickness of the lobes in *B. gabonica*". I have been unable to see any differences in dissection of a specimen of either species but have noticed each lobe to be made up of a papillate proximal part and a smooth, non-papillate distal part; the latter is not shown in Doucet's figures, presumably due to incomplete eversion.

It is perhaps no more than a coincidence, but none the less worth noting, that Ghana is at the eastern limit of the range of the western race, *B. gabonica rhinoceros*, which may be more likely to hybridize where it is undergoing genetic gradation into the eastern subspecies.

A more definite conclusion cannot be reached until more is known of the variation within *B. gabonica* and *B. nasicornis*.

## Acknowledgements

I am indebted to Prof. Dr. L. D. Brongersma and Mr. M. S. Hoogmoed for access to the collections in their care and for allowing me to borrow specimens that required further study. Through the generosity of Prof. E. Kramer (Basel) I came to possess a copy of "Die Giftschlangen der Erde", containing Klemmer's (1963) paper. Lastly, I would express my admiration of those early collectors — Pel among them, who braved an "insalubrious

climate, destructive to most Europeans" (Schlegel) and furnished the Rijksmuseum, Leiden, and other museums throughout the world with so many well-preserved specimens.

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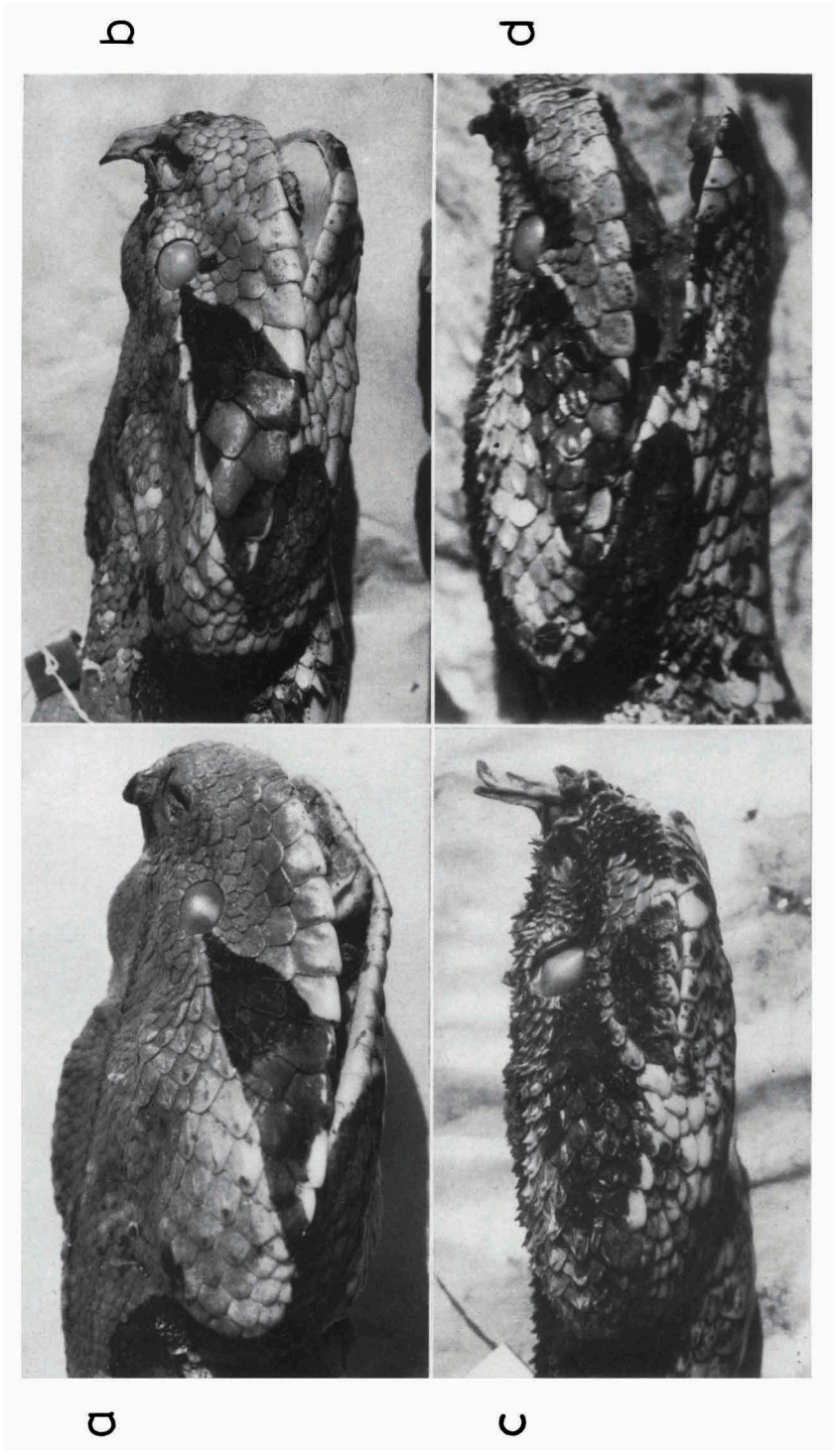
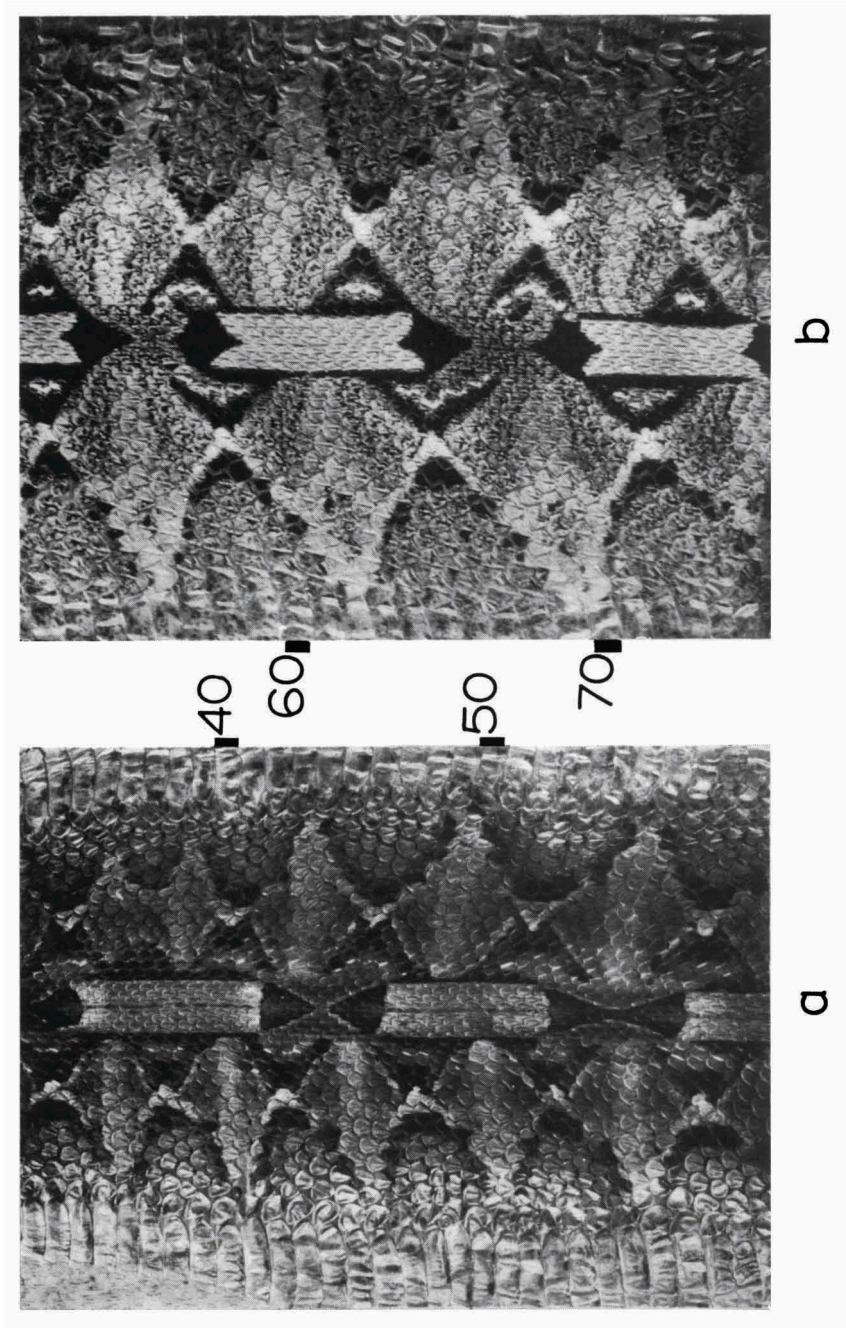



Heads of (a, b) Gaboon and (c, d) Rhinoceros Vipers. a. *B. g. rhinoceros* (UG V3G19); b. *B. g. rhinoceros* (UG V3G32); c. *B. nasicornis* (UG V3N23); d. *B. nasicornis* × *gabonica* (RMNH 1647). Compare with fig. 1.




Body patterns of (a) Gaboon and (b) Rhinoceros Vipers. a. *B. g. rhinoceros* (UG V3G26); b. *B. nasicornis* (UG V3N21). For explanation see fig. 4 and text.