7. On a Colubrid Snake (*Xenodon*) with a vertically movable Maxillary Bone. By E. G. Boulenger, F.Z.S., Curator of Reptiles.

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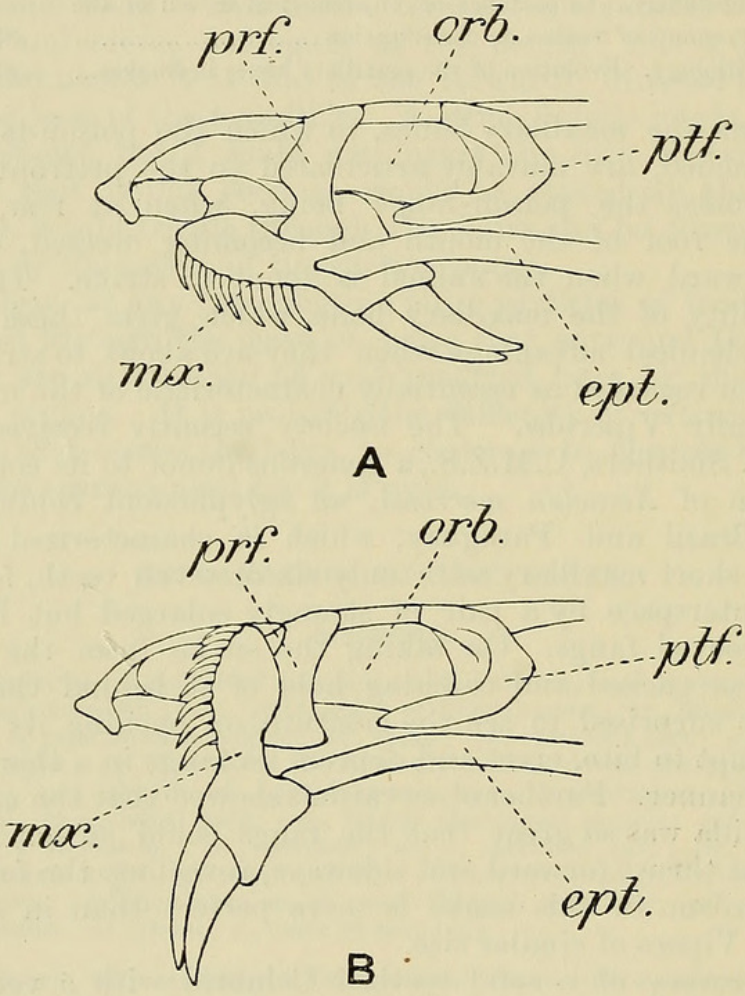
In Vipers the maxillary bones, to which the poison-fangs are firmly attached, are movably articulated to the prefrontals and ectopterygoids, the poison-fangs being, when at rest, folded against the roof of the mouth and becoming erected, or even thrust forward, when the animal is about to strike. This vertical mobility of the maxillary bone, which gives these snakes such a mechanical advantage when they are about to strike, has always been regarded as essentially characteristic of the members of the family Viperidæ. The Society recently received from Mr. W. A. Smithers, C.M.Z.S., a generous donor to its collection, a specimen of *Xenodon merremi*, an aglyphodont colubrid inhabiting Brazil and Paraguay, which is characterized by an extremely short maxillary with only six or seven teeth, followed after an interspace by a pair of strongly enlarged but likewise solid, ungrooved fangs. On taking the snake from the box in which it was packed and catching hold of it behind the head, I was most surprised to see the creature, on opening its mouth in an attempt to bite, erect and depress its fangs in a thoroughly Viperine manner. Further observations showed that the mobility of its maxilla was so great that the fangs could be not merely erected, but thrust forward and sideways, revealing the fact that the mechanism in this snake is more perfect than in a large number of Vipers of similar size.

This discovery of a solid toothed Colubrid with a vertically movable maxilla is of special interest, as I think it goes a long way towards settling the problem, so often discussed, of the derivation of the Viperine maxillary bone. The Viperidæ were formerly believed to have sprung from the Proteroglyph Colubrids. In the Catalogue of the British Museum, published in 1893, my father, G. A. Boulenger, F.R.S., expressed the opinion that the poison apparatus of the Vipers was in all probability derived from the Opisthoglyphs. Later, in a paper published in the Proceedings of this Society, he pointed out that, from the Aglyphodont forms in which the teeth increase in size posteriorly, we are gradually led to the Opisthoglyphs, which can be differentiated only by the presence of more or less deep grooves on the

posterior fang-like teeth, the series culminating in such forms as show the maxillary bone much abbreviated, the solid teeth reduced to two or three only, and the fangs extremely large and grooved. The latest contribution to the subject is one by Mr. John Hewitt *, who attempts to show that the Viperidæ are not of Opisthoglyph ancestry, but are more closely related to the Proteroglyphs. The most important arguments he uses to establish his point are that, in the first place, in the Opisthoglyphs the

Text-figure 1.



Maxillary (*mx.*) of *Xenodon merremi* at rest (A), and erected (B).

ept., ectopterygoid; *orb.*, orbit; *prf.*, prefrontal; *ptf.*, postfrontal.

fang-bearing portion of the maxilla is situated far behind the prefrontal, and consequently that as there appears to be no tendency amongst Opisthoglyphs for a forward movement of the fang-bearing portion, it is difficult to conceive how the evolution of the Viperine character commenced; secondly, that in the Proteroglyphs the fang-bearing portion of the maxilla is some-

* Ann. Transvaal Mus. iii. 1911.

what enlarged, often in a vertical direction, showing a resemblance to the state of things found in *Causus*.

The first argument is easily disposed of, as in a number of Opisthoglyphs the fangs are situated just below the prefrontal (*Miodon*, *Polemon*, *Brachyophis*). Now in *Xenodon* the portion of maxilla bearing the fang-like teeth will be found to be much enlarged, and in a more or less vertical direction, and it only remains for the last two teeth to be furnished with grooves to transform *Xenodon* into an Opisthoglyph with the fangs situated below the prefrontal. Further, we have only to compare the maxilla of *Xenodon* with that of the least specialized of the Vipers, *Causus*, to see that merely a slight tilting up of the maxilla of the former snake, with the loss of the few front teeth and a very slight modification of the bone, is needed to bring about a condition similar both in structure and mechanism to that of Vipers. Thus *Xenodon* with its vertically movable maxillæ enables us to trace the probable evolution of this bone, and the old view, recently revived, that Vipers are descended from Proteroglyphs must, in my opinion, be abandoned.

Mr. Hewitt in his papers states that the various experiments on snake-venom seem to show that there is more in common between the Proteroglyphs and the Vipers, than between the Opisthoglyphs and either of the other divisions. That this is so in the majority of cases has been demonstrated by Phisalix. It should be borne in mind, however, that, as has recently been shown by Fitzsimons, the poison of the most highly venomous Opisthoglyph, *Dispholidus typus*, in its physiological action is particularly characteristic of that of the South American Vipers of the genus *Lachesis*. The physiological action of the venoms can, therefore, have little importance in the settlement of the broader problem of the classification of Snakes from the point of view of descent.