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ON THE CYNOGNATHIDAE

By A. S. Brink

Abstract

In this paper attention is drawn to the fact that the family Cynognathidae is as a whole very badly known and in need of taxonomic revision. Unfortunately the author had too little material available to attempt a proper revision, but some suggestions are made.

The paper starts with a brief historical account and continues with descriptions of a lower jaw of a Cynognathid, evidently belonging to the genus *Lycaenognathus*. This specimen belongs to the Bernard Price Institute.

Attention is further drawn to the complete absence of convincing characteristics for distinguishing between the genera *Cynognathus* and *Cynidiognathus*, but they are nevertheless acknowledged as distinct genera. Four specimens are described as *Cynidiognathus merenskyi*, one of which belongs to the Bernard Price Institute and the other three to the National Museum, Bloemfontein.

The Bernard Price Institute recently obtained a number of *Cynognathus* zone specimens, one of which is a practically complete and beautifully preserved specimen of *Cynidiognathus*, with its lower jaw in position. Another is an isolated lower jaw of a different Cynognathid, with a number of beautiful teeth.

Some time ago I visited the National Museum in Bloemfontein where the Director, Dr. A. C. Hoffman, showed me three *Cynidiognathus* specimens which I felt were worth describing. All three specimens come from the same locality. They are peculiar in being almost exactly similar as far as preservation is concerned and, above all, they were entirely cleaned by nature. There is hardly a trace of matrix on any of them although entirely untouced by hammer and chisel. The specimens were of course completely disarticulated when discovered.

The family Cynognathidae requires taxonomic revision, as there is considerable confusion regarding the number of postcanine teeth and the importance that may be attached to it. Unfortunately I have very little material at my disposal to attempt such a revision, but I would like to tender a number of suggestions. For a list of the genera and species recognised at the moment in this family, as well as a short synopsis on the family, see volume II of *Palaeontologia Africana*, page 163 (1954).

Although *Tribolodon* was the first member of the family to be described, it was so badly known that even in 1932 Broom was not sure whether it should fall in the same family with *Cynognathus*. Broili and Schröder contributed much to our knowledge of this genus in 1934. The structure of the postcanine teeth is completely different from any of the other forms of this family. Now that the exact relationship of *Tribolodon* is known, the name of the family is not based on the earliest described genus.

The skull of *Cynognathus* is large, high and narrow in the type. This skull is, however, laterally compressed so that no definite conclusions can be based on general proportions. As far as size itself is concerned, this skull is appreciably larger than any of the other known members of this family, but size is hardly enough for use as a basis for classification.

In 1895 Seeley described four species of *Cynognathus*, i.e. *C. crateronotus*, *C. berryi*, *C. platyceps* and *C. leptorhinus*. The latter two were later referred to the genus and species *Lycaenognathus platyceps*, and *C. berryi* was referred to the genus *Cynogomphius*. Broom referred a specimen in 1911 to *Cynognathus berryi*, but it was transferred to a new genus and species, *Cynidiognathus broomi*, by Haughton in 1922.

The major difference between *Cynognathus* and *Cynidiognathus* was at first considered to be the number of postcanine teeth. Nine postcanine teeth were recognised for *Cynognathus* and ten for *Cynidiognathus*. In 1934 Broili and Schröder (op. cit.) described a specimen as *Cynognathus platyceps* with ten postcanine teeth, and expressed their doubt over the presence of nine postcanine teeth in *Cynognathus crateronotus*. It is very likely that a tenth postcanine was included in the dentition of the latter, judging from a cast of the type which I have at my disposal. Furthermore, it will be pointed out below that nine postcanine teeth can occur in the genus *Cynidiognathus*, considering the new specimens at hand.

Broom (1932) states that the difference between *Cynognathus* and *Lycaenognathus* lies in the structure of the teeth. He gave, however, no reason why he changed *Cynognathus berryi* to *Cynogomphius berryi* (op. cit.) *Lycochampsa ferox* was distinguished as a new genus on account of its having only three incisors on each side in the upper jaw. I communicated with the American Museum of Natural History, where the type is housed, and was informed that even with the aid of X-ray methods the number of incisors in this specimen could not be established. I would like to make use of this opportunity to thank Dr. E. H. Colbert of the American Museum of Natural History, and other members of his staff, for the trouble they took in trying to establish the number of incisors in this specimen.

Disregarding dental characteristics, it is difficult to find a genuine difference between *Cynognathus* and *Cynidiognathus*. The skull of the former is high and narrow, while in the latter it is broad and flat, but this difference is obviously much exaggerated by lateral compression in the type of *Cynognathus crateronotus*. In *Cynognathus* the skull is somewhat larger and more robust. The dentary is much higher, especially in the region of the coronoid process, the zygomatic arch stronger, and the postorbital arch broader than in *Cynidiognathus*. These differences may, however, be accounted for in terms of sex differentiation. There is no genuine objection against considering *Cynognathus* as a large male and *Cynidiognathus* as a female. The only objection is that *Cynidiognathus* appears to be far more common and it has not yet been found in exactly the same stratum or locality as *Cynognathus*. I am therefore obliged to recognise *Cynognathus* and *Cynidiognathus* as two separate genera on characteristics not fully convincing.

Of the already described genera and species of this family the new specimens agree most satisfactorily with *Cynidiognathus merenskyi*, but the isolated lower jaw may belong to the genus *Lycaenognathus*.

Lycaenognathus? sp.

The specimen described here as doubtfully belonging to the genus *Lycaenognathus* is a nearly complete lower jaw with a few beautiful teeth. Both rami are present in their full lengths, but the coronoid process appears to be complete only on the left side. In this region the lower jaw is not very high, in contrast with

Cynidiognathus and especially *Cynognathus*, where the dentary reaches a considerable height.

The symphysial region is beautifully preserved. It measures 66 mm. across the canines, where it is broadest. Some 20 mm. farther back, the lower jaw is narrowest, measuring 40 mm. Both measurements are taken on the alveolar border. At the level of the canines the jaw becomes narrower in a ventral direction, but at the level of the second measurement (first and second postcanine teeth) the jaw becomes slightly broader ventrally. The symphysis is 75 mm. long.

In this region alone, the jaw differs completely from that of both *Cynognathus* and *Cynidiognathus*. Although the jaw is nearly as large as that of *Cynognathus crateronotus*, the symphysial region is much lower and in the region of the canines considerably broader. In neither *Cynognathus* nor *Cynidiognathus* does this region become so markedly narrower ventrally. The jaw is larger than the average *Cynidiognathus*, measuring 284 mm. in length (dentaries only), but in proportion the symphysial region is considerably more robust.

The most remarkable feature about this lower jaw is that there is already evidence of eleven postcanine teeth, while tooth replacement shows that the jaw is immature. In addition, tooth replacement is demonstrated in the penultimate postcanine socket, so that no distinction can be made between premolars and molars. There is no evidence of a single succession either. All the teeth preserved in the specimen are erupted to different extents and it is not possible to recognise alternate replacement.

The sockets of the three largest postcanine teeth were opened but no tooth buds were found. On the medial side of each root a groove extends along its length from the neck of the crown to the tip, making it appear semi-double. This groove is certainly not the impression left by a budding subsequent tooth, because it is similarly developed on three teeth erupted to different extents. It appears that these grooves are the first attempts at splitting the roots into two separate roots for each crown. A fragment of the lower jaw of another Cynognathid, apparently *Cynidiognathus*, was opened from the medial side to expose all the roots in a postcanine series, but no grooves were found. The series includes, in addition to the canine, the first six postcanine teeth, all fully erupted with small pulp cavities and no sign of further replacement.

All the teeth are very loosely placed in their sockets, further evidence of immaturity. There are three incisors on each side, of which the central of each side is preserved, but the crowns are broken, showing large pulp cavities. Both canines are preserved, the crowns also broken and also showing large pulp cavities. In the right ramus the first and second postcanine teeth are in situ; the second is about twice as large as the first. The rest of the series is represented by empty sockets, except for the sixth behind the canine, which shows the tip of a replacing tooth. On the left side the first, third, sixth, eighth and ninth teeth are preserved, with the tip of a replacing tooth in the seventh socket. All the empty sockets appear as though they housed fully erupted teeth.

The sixth tooth on the left side is simple cone-shaped with a serrated anterior edge. The two large teeth farther back are beautiful. The anterior of the two shows two small cusps in front of the main cusp as well as two small cusps posterior to the main cusp. The posterior tooth appears to

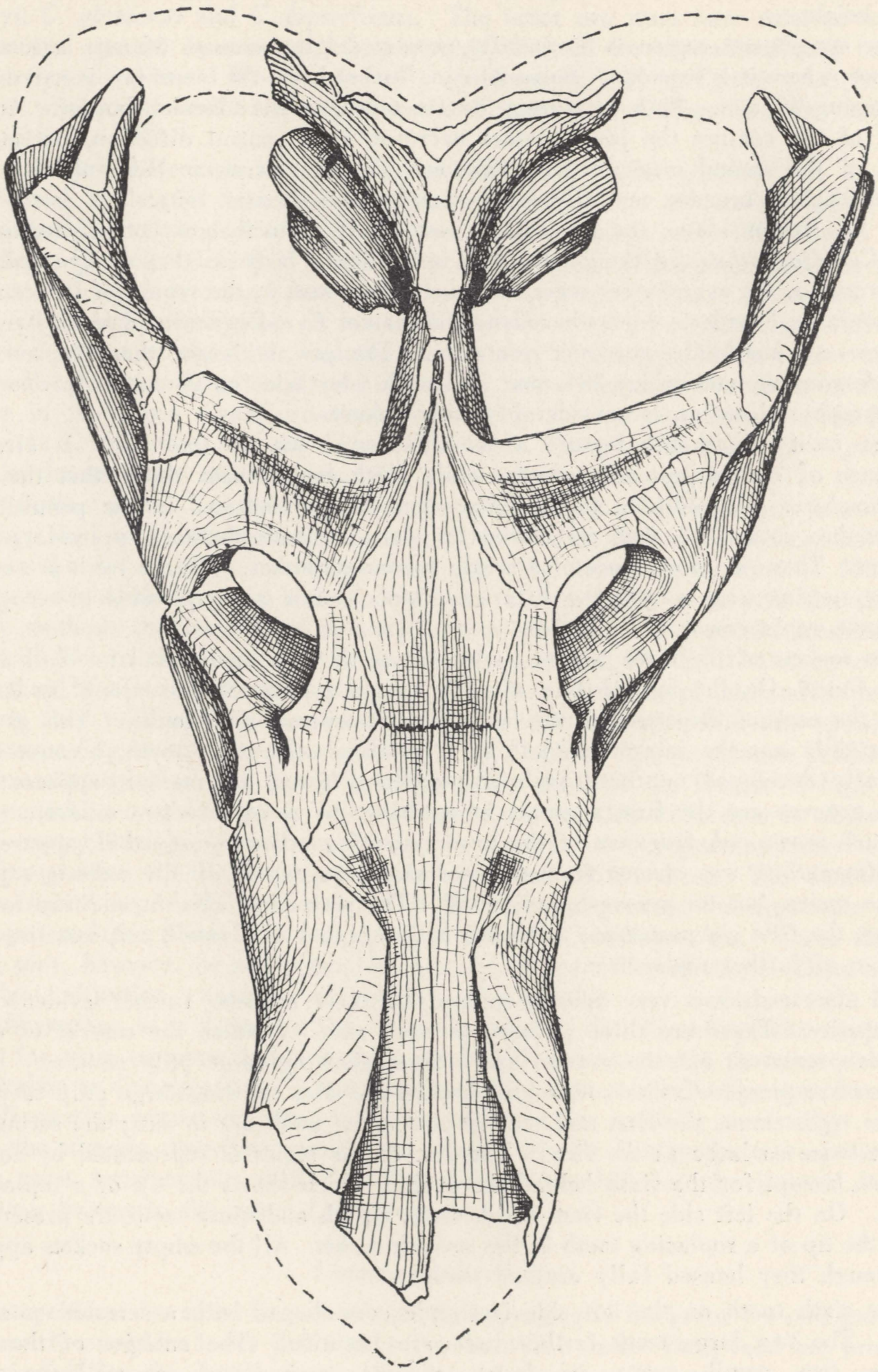


Fig. 13.—Dorsal view of skull No. C.2775: *Cynidiognathus merenskyi*, ½ natural size.

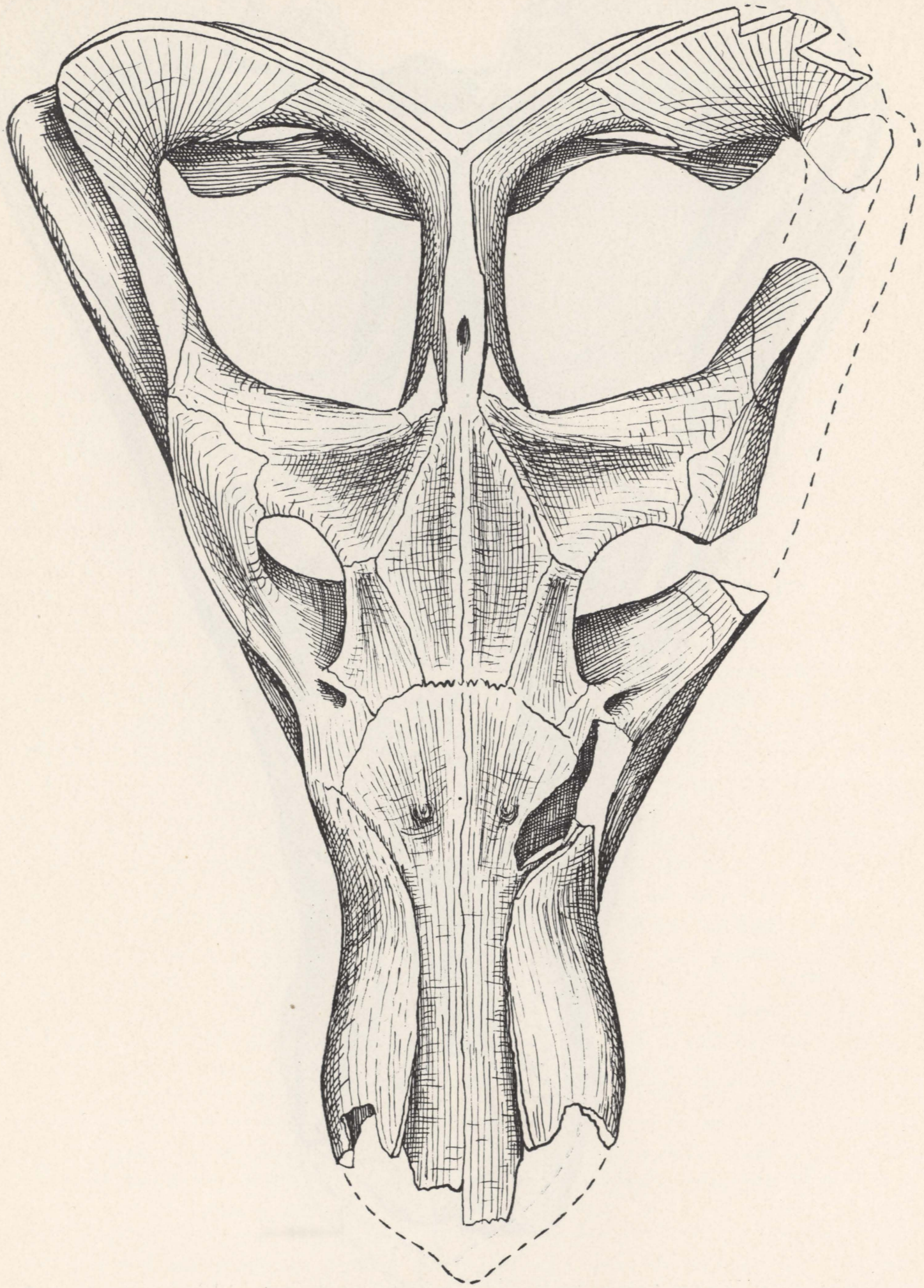


Fig. 14.—Dorsal view of skull No. C.2715: *Cynidiognathus merenskyi*, ½ natural size.

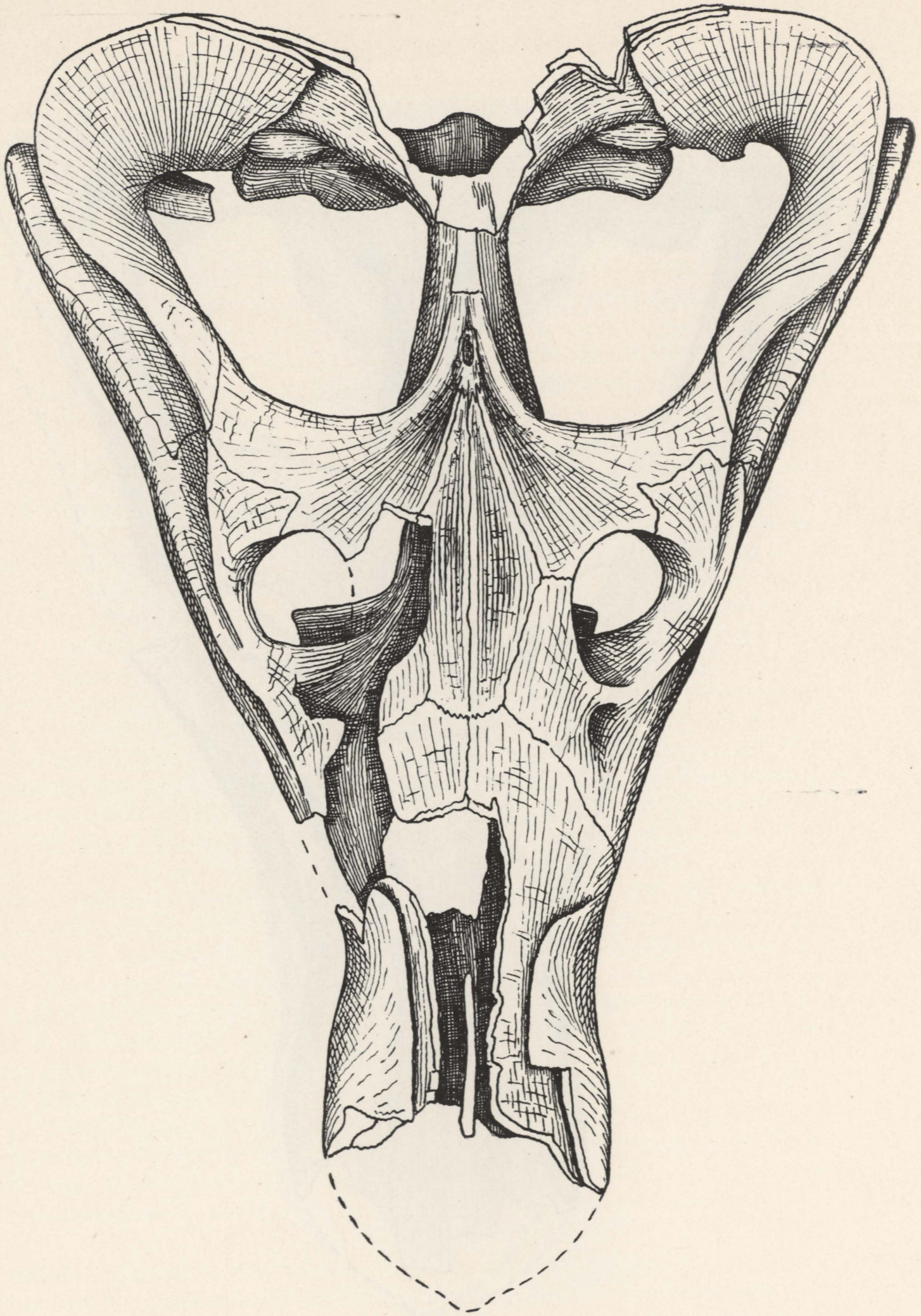


Fig. 15.—Dorsal view of skull No. C.2716: *Cynidiognathus merenskyi*, ½ natural size.

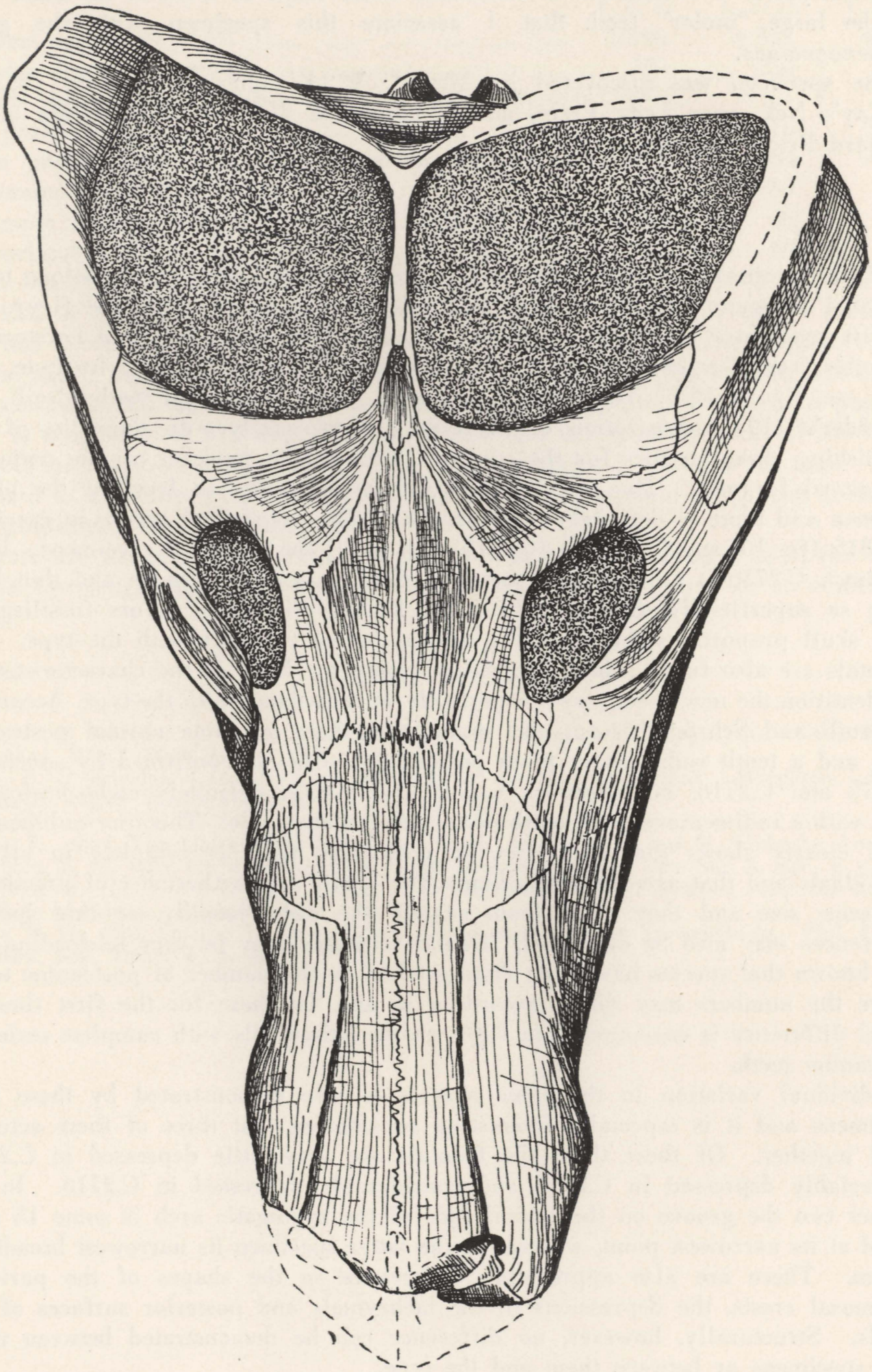


Fig. 16.—Dorsal view of skull No. 315, B.P.I., *Cynidiognathus merenskyi*, ½ natural size.

be exactly similar, but the two small cusps in front of the main cusp were damaged artificially. It is on account of these two small cusps in front of the main cusp of the large "molar" teeth that I associate this specimen with the genus *Lycaenognathus*.

The specimen was discovered by Mrs. J. W. Kitching in January, 1952, at McKay's Nek, near Lady Frere, and is numbered 316 in the collection of the Bernard Price Institute.

Cynidiognathus merenskyi Broili and Schröder

Of the specimens described here as *Cynidiognathus merenskyi* three belong to the National Museum, Bloemfontein (C.2775, see figure 13; C.2715, see figure 14; C.2716, see figure 15), all from exactly the same locality on the farm Eerstegeluk, 13 miles from Burghersdorp, and one belongs to the Bernard Price Institute (No. 315, see figure 16). These four specimens agree very well with Broili and Schröder's (1935) description of the type and especially with their list of distinguishing characteristics for the species. They differ, however, in the region of the pineal foramen. The parietal crest is not as narrow in front of the pineal foramen and there is definitely a preparietal. The preparietal occurs in specimen No. 315 (fig 16) and in C.2716 (fig. 15), but not in the other two specimens. From specimen C.2716 it appears that the preparietal is a very delicate and thin bone lying so superficially that it could easily become dislocated before fossilization.

In skull proportions the present specimens agree perfectly with the type. The parietals are also fused behind the pineal foramen. Even in the characteristics of the dentition the new specimens are perfectly in accordance with the type. According to Broili and Schröder's (op. cit.) description there are nine normal postcanine teeth and a tenth rudimentary tooth posteriorly. This is confirmed by specimens C.2775 and C.2716, but specimen C.2715 shows most definitely eight postcanine teeth with a rudimentary ninth tooth posteriorly on each side. This tiny rudimentary tooth clearly shows that the series of postcanine teeth is complete in all the individuals and that age is no criterion. The skulls are furthermore of practically the same size and they come from exactly the same locality, so that specific differences may also be discarded. Dental formulae may be very misleading and it is known that species have been distinguished on the number of postcanine teeth, where the numbers may differ according to age, but here for the first time an actual difference is encountered in fully grown individuals with complete series of postcanine teeth.

Individual variation in the same species is also demonstrated by these four specimens and it is especially interesting considering that three of them actually lived together. Of these three the frontals are very little depressed in C.2775, appreciably depressed in C.2715 and considerably depressed in C.2716. In the former two the groove on the lateral face of the zygomatic arch is some 15 mm. broad at its narrowest point, whereas in the latter specimen its narrowest breadth is 5 mm. There are also appreciable differences in the shapes of the parietal-squamosal crests, the depressions in the lachrymals and posterior surfaces of the nasals. Structurally, however, no difference can be demonstrated between these four specimens or between them and the type.

The following are some useful measurements, all given in millimeters:

	C.2775	C.2715	C.2716
Greatest length of skull	±340	±342	±346
Breadth across squamosals	220	250	255
Length from premaxillaries to posterior end of parietal crest	±313	±316	±335
From premaxillaries to anterior borders of orbits	±166	±164	±170
Maximum breadth of snout	80	80	78
Minimum breadth of snout	73	68	69
Interorbital width	61	60	60

The specimen in the Bernard Price Institute was collected by Mr. J. W. Kitching in 1952 in the Matyantya basin, east of Lady Frere. The skull agrees perfectly with the three skulls in the National Museum, Bloemfontein. The greatest length of the skull, including the premaxillaries, is 340 mm. and the breadth across the squamosals is 226 mm. From the premaxillaries to the posterior end of the parietal crest is a distance of 310 mm. The maximum and minimum breadths of the snout are 80 mm. and 75 mm. respectively. The interorbital width is 60 mm.

There is a distinct preparietal extending posteriorly around the pineal foramen. The preparietal appears to be paired.

There are ten postcanine teeth, but the tenth is not rudimentary, as in the other known *Cynidiognathus* specimens. The maxillary leaves no room for an additional tooth.

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