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COMMUNICATION

THE PREORBITAL FOSSA OF HIPPARION

The significance of the preorbital fossa in the Equidae, and in *Hipparion* in particular, has often been discussed. Gaudry (1863) made it the site of a "larmier." Lydekker (1884) considered the cavity to be homologous to that which houses the facial gland in the artiodactyls. Gregory (1920*a*, *b*) seemed to rule out all other suppositions when he showed that none of them rests on any concrete evidence. According to him, neither a gland nor a muscle was situated in the preorbital fossa of the extinct Equidae; he regarded the fossa as accommodating a diverticulum nasi analogous to that observed in *E. greveyi.*

The following remarks bear on Gregory's hypothesis:

1. Gregory states that the "larmier" of the ruminants and oreodonts is "more or less circular in form and bounded by a well defined rim" (Gregory, 1920*b*). Specimens of Recent gazelles and cephalophines were examined at the British Museum (London) and it was found that the front margin of the fossa is not at all well defined but dies out smoothly forward and downward as it does in many Equidae. On the other hand, many specimens of *Hipparion* and other Equidae show a fossa in which the anterior rim is well defined. Gregory himself shows examples of this in his plate 18.

2. In *E. greveyi*, there is no such definite fossa as in *Hipparion*. Only a shallow groove is observable and it usually extends along the facial surface of the premaxilla, maxilla, and nasals. This groove lies between the infraorbital foramen and the margin of the anterior nares and close to the latter, whereas in *Hipparion* it lies much farther back, usually behind the infraorbital foramen, near the lacrymal, and it forms a shallow pit. The distance between the posterior notch of the nares and the fossa varies, in *Hipparion*, between 40 and 65 mm and the intervening space is occupied by the flat surface of the maxilla. The diverticulum nasi must have been contained in

a narrow space between the bone and the superficial muscle as it passed back to the fossa.

3. Gregory's hypothesis appears to be the only one which rests on a careful observation of a large number of Equidae. It is probably correct, in the form given by that author, so far as the later members of the family are concerned. It is however probable that, where the preorbital fossa is a definite pit, the blind end of the diverticulum contained a solid or semi-solid substance of a fatty or mucous nature.

4. The existence of a canal opening into the posterior pocket of the fossa has often been discussed. It has been denied by some authors. Sefve (1927) made a section of a skull of *Hipparion* and said he found a separate canal which was quite distinct from the infraorbital canal. The blood and nerve supply for the diverticulum passes through the infraorbital canal and therefore the preorbital fossa should, in Sefve's hypothesis, belong to a system distinct altogether from the diverticulum. Sefve also supposed that the canal of the fossa contained branches of the sphenopalatine nerve and artery. Unfortunately, nothing can be seen clearly on Sefve's picture of the section of the skull.

According to Sisson (1947), the sphenopalatine artery (medial branch) supplies the septum nasi of the horse. It branches from the internal maxillary artery in the pterygopalatine fossa but it may also arise from the infraorbital artery which is another branch of the internal maxillary. On the other hand, the diverticulum nasi is innervated by the external nasal branch of the infraorbital nerve which emerges through the infraorbital foramen. It seems that the diverticulum is also supplied in part from the infraorbital foramen.

Observations on *Hipparion* have shown (a) that there may or may not be a canal in the posterior pocket of the fossa, and (b) that the infraorbital foramen sometimes does not appear. In other words, as far as one can see, the pocket of the fossa may lead into a blind passage of varying depth or into a canal which appears to go downward and inward in the direction of the maxillary foramen. The infraorbital foramen may be seen outside or somewhat inside the fossa, or may be invisible. It cannot be said with certainty from the material at hand that the canal of the fossa exists only when the infraorbital

foramen does not and vice versa, but this is quite possible. In any case, it is worth noting that, when there is no proper infraorbital foramen but a canal through the posterior pocket of the fossa, the situation is analogous to that in *E. greveyi.* Then the fossa lies between the nostrils and the canal of the pocket which is obviously equivalent to the infraorbital canal. The difference between *Hipparion* and *E. greveyi* is merely that there is a greater distance between the nares and the fossa in the former than in the latter. In both animals, the maxilla only is involved, whereas the fossa is placed almost entirely in the lacrymal "in all deer and most antilopes" (Lydekker, 1884).

It is therefore probable that the so-called canal of the fossa is nothing but the infraorbital canal opening more posteriorly than usual. In any case, the blood supply and the innervation of the fossa and diverticulum come from the infraorbital system. It is unnecessary to invoke the intervention of the sphenopalatine artery and nerve, the destination of which is much deeper.

There is little doubt that this system has been variable in the Equidae. *Hipparion* itself may lack the fossa, as in *H. hippidiodus* (Sefve, 1937) and *Proboscihipparion* (ibid.). The position, depth and shape of the fossa also vary a great deal in *Hipparion.* On the other hand, the wall of the maxilla is very susceptible to lateral pressure and is sometimes found to be slightly depressed in modern horses. The development of the fossa is largely an individual character. Having regard to this fact, one may postulate considerable variation in the development of the diverticulum nasi. The preorbital fossa was probably of very little physiological importance to the individual and was likely to be an instable character.

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