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INDIAN TERTIARY & POST-TERTIARY VERTEBRATA.

Vol. IV.

Part II. THE FAUNA OF THE KARNUL CAVES.

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WITH 5 PLATES.

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14 and 17 being from the middle of the cheek-series of the left side, and the one in fig. 16 the last upper true molar of the same side; two are from bed *Cc*, while the third is from *Cd*. These teeth agree with those of existing species in the excessive length of the antero-internal pillar (*e*), and are inferior in size to *E. namadicus* of the Narbada pleistocene.[1] The specimen represented in fig. 16 appears scarcely larger than the corresponding opposite tooth of *E. asinus* represented in fig. 15; but this is accounted for by its much earlier stage of wear, its antero-posterior diameter at the horizontal plane corresponding to that of the latter specimen being 0·98 inch.

Lower molar.—The third right lower true molar from bed *Cb* in the Cathedral represented in fig. 13 exhibits the difference in size between the corresponding tooth of *E. asinus* (fig. 11).

Metatarsal.—A right third metatarsal (No. F. 259) from bed *Cf* in the Cathedral, which has lost a portion of its distal extremity, agrees in relative size with the foregoing teeth; its extreme length being 9·3 inches. This specimen is much smaller than the average of the metatarsals of the fossil races of *E. caballus* (and therefore than those of *E. namadicus*), and apparently indicates a species of the size of *E. onager*.

Affinities.—The foregoing specimens are insufficient for specific distinction, and all that can be said about them is that they indicate a species superior in size to *E. asinus*, which is certainly distinct both from the larger *E. namadicus* of the earlier pleistocene, and *E. sivalensis*[2] of the pliocene of India. This species was about equal in dimensions to the existing Indian *E. onager* and some of the south African species;[3] and, judging from the marked Ethiopian facies of a considerable portion of the Karnul fauna, and the absence at the present day of any existing wild *Equus* in southern India, it is not improbable that its affinities may be with the latter.

Rhinoceros karnuliensis, nobis.[4]

History.—The remains on which this species is founded were provisionally identified by Mr. Foote[5] with *R. sondaicus*, but their distinctness was shown by the present writer in the paper cited above. The remains comprise numerous detached upper and lower cheek-teeth, many of which are imperfect, the greater portion of the left ramus of the mandible, a fragment of a right ramus with one true molar, the greater part of a humerus, three imperfect cervical vertebræ, and the distal half of a metapodial. The mandible and the more perfect teeth, to which comparisons will be mainly confined, are figured in pl. X.

Mandible.—It will be convenient to commence the description with the left mandibular ramus, of which two views are given on a scale of one half in pl. X.

1 *Vide supra*, vol. II. pl. XIV. fig. 3—on the assumption that some of the specimens are premolars.

2 Distinguished by the antero-posterior shortness of the antero-internal pillar of the upper cheek-teeth.

3 In the upper molars of *E. zebra* figured by Rütimeyer in the "Pferde der Quaternär-Epoche" ('Abh. shweiz. pal. Ges.' vol. II.) pls. I. and II. fig. 7 (1877), the antero-internal pillar is more elongated antero-posteriorly.

4 'Rec. Geol. Surv. Ind.' vol. XIX. p. 120 (1886). 5 *Ibid.* vol. XVIII. p. 232 (*R. javanicus*).

figs. 4, 4a. This specimen comprises the greater portion of the horizontal ramus and the hinder part of the symphysis; the last five cheek-teeth are *in situ*, and from their worn condition indicate that their owner was an adult individual; the alveolus of pm.2 still remains, but as there is no trace of that of pm.1 the latter tooth must have totally disappeared. In size the specimen corresponds with the mandible of *R. sondaicus*. In the broken extremity of the symphysis there is no trace of alveoli for canines, and this circumstance, together with the backward extension of the symphysis to the anterior border of pm.3 (fig. 4), the convexity of the inferior border of the ramus, the sudden inward curvature of the external border of the ramus in advance of the same tooth, the backward position of the mentary foramen *(for.)*, and the narrow, deep, symphysial channel, indicate that the specimen belongs to that group[1] of rhinoceroses in which the canines are usually absent,[2] and all the known forms are bicorn. The length of the space occupied by the five cheek-teeth is 7·6 inches, and the length of m.3 1·9 inches. The cheek-teeth are remarkable for the extremely thick coat of cement which invests the bases of their crowns; they have no trace of any external cingulum, but do not present any other well-marked specific characters. The fragment of a right mandibular ramus (No. F. 238) containing the slightly worn m.3 is of rather larger size, the length of the tooth being 2·0 inches.

Upper true molars.—Of the upper true molars the crowns[3] of the associated left m.2 and m.3 are represented in pl. X. figs. 1, 1a, 1b; the collection also contains the crown of the right m.3 of the same individual, and a less perfect specimen of the right m.1 or m.2 (No. F. 234). The figured specimens are in a middle condition of wear, and belong to the more common type of structure, as exemplified in *R. sondaicus*. The first and second costæ (*c*, *d*) are prominent and form a well-marked buttress,[4] and the external surface is deeply curved; there is a distinct cingulum on the anterior and inner surfaces of the anterior collis (*a*), which is totally absent on the posterior collis (*b*); the two colles are separated by a considerable interval: the crochet (*e*) is well developed and has a separate accessory tubercle in the median valley, which occurs in all the specimens in the collection; there is no combing-plate, no antecrochet, nor any trace of a tubercle at the entrance of the median valley (*g*), and when more worn the crowns would present only two fossettes. Compared with the molars of *R. sondaicus* the crowns appear to have been relatively rather shorter, and may be described as being probably of a sub-brachydont type.[5] The length of the outer surface of m.2 is 1·8, and that of its anterior surface 2·1 inches.

1 The Atelodine group (to which *R. deccanensis* belongs); see "Cat. Foss. Mamm. Brit. Mus." pt. III. p. 92.

2 In *R. persiæ*, Pohlig ('Quart. Journ. Geol. Soc.' vol. XLII. p. 178), of Maragha lower canines are present.

3 The roots of all these teeth have been gnawed off by porcupines.

4 The absence of a buttress is seen in the third right upper true molar of *R. unicornis* represented in figs. 3, 3a of the same plate.

5 In the preliminary notice these teeth were described as decidedly brachydont. Subsequent examination has, however, shown that owing to their partially worn condition and the fact of the base of the crowns having been gnawed away, it is very difficult to come to a certain conclusion on this point.

Upper premolars.—There are unfortunately no perfect upper premolars in the collection; but the inner half of a well-worn right pm. 3 is represented in pl. X. fig. 2. This specimen[1] shows that there is no trace of a cingulum on the anterior collis (*a*), and merely an oblique ridge running downwards and backwards on the anterior aspect of the posterior collis (*b*); the two colles unite at their junction for a considerable part of their height. The corresponding portion of the left pm. 4 of the same individual (No. F. 135*a*) presents precisely similar features.

Affinities.—That the present form is specifically distinct from all the existing Indian species of *Rhinoceros* is self-apparent; and it will not be difficult to show its apparent distinctness from all the fossil species of the same country. In Madras two other species occur in a fossil condition; the first of which appears identical with the existing *R. unicornis*, and is known by the slightly-worn third right upper true molar represented in pl. X. figs. 3, 3a, which was obtained several years ago by Mr. Foote from a turbary, and is interesting as showing the extensive range of this species in past times.[2] The second species, *R. deccanensis*, Foote,[3] is of pleistocene age, and, although of somewhat superior size, agrees with the present form in the absence of lower canines, and in the general plan of structure of the upper true molars. The teeth are, however, described as being markedly hypsodont, and without any appreciable quantity of cement, while in the upper true molars the external surface is nearly flat, and the colles are approximated and show no trace of any internal cingulum. In the premolars, however, there is a very strongly-marked cingulum completely surrounding the inner half of the crown,[4] and the inner half of the anterior colles appears less flattened. The premolars are moreover larger in proportion to the true molars, the antero-posterior diameter of pm. 4 being 1·55 and that of m. 2 1·9, while in the present form the corresponding dimensions are 1·15 and 1·7. In the mandible the arcuation of the inferior border, and especially the upward inclination of its anterior moiety, is very much more strongly marked,[5] and the bases of the crowns of pm. 2 and pm. 3 are placed on a considerably higher level than that of pm. 4, instead of in the same horizontal line. The symphysial channel appears wider, much less distinctly defined, and more open; pm. 2 is apparently larger and more widely separated from its fellow of the opposite side, while there is a distinct cingulum at the two extremities of the outer surfaces of the premolars, but no trace of a mentary foramen below pm. 3. From the structure of that portion of the symphysis still remaining it appears probable that this part was rather shorter in the fossil. With the fossil rhinoceroses of the Siwaliks the present form has no affinity; the only bicorn species (*R. platyrhinus*) having upper cheek teeth of a totally different type of structure. The Maragha *R. persiæ*[6] is also an entirely different form.

1 It is highly probable that this and the next specimen belong to the same individual as the true molars.

2 The artist has foreshortened the inner surfaces of the colles in fig. 3, which makes the crown look lower than it really is, but its true height is shown in fig. 3a.

3 *Supra*, vol. I. pp. 1-17. pls. I.-III.

4 Compare Foote, *op. cit.* pl. I.

5 Compare Foote, pl. II. fig. 3.

6 *Vide supra*, p 41, note 2.

Of the fossil European members of the Atelodine group occurring above the Pikermi horizon the one which apparently comes nearest to the Karnul rhinoceros is *R. etruscus*. The upper cheek-dentition of that species is, however, apparently somewhat more brachydont, while the upper premolars usually have a very distinct horizontal cingulum on their inner aspect,[1] and are larger in porportion to the true molars. The latter are, however, very like those of the fossil, and show a cingulum on the inner aspect of the anterior collis in the two last of the series,[2] although the second costa does not extend to the base of the crown. The mandible also approaches the Karnul jaw in general contour, but the symphysial channel is shallower and less defined, while the outer surface of the horizontal ramus inclines less inwardly in front of $\overline{\text{pm.3}}$, and the mentary foramen is usually double and has its hinder aperture placed below $\overline{\text{pm.2}}$ instead of $\overline{\text{pm.3}}$, and nearer to the inferior border of the ramus;[3] there is also a distinct cingulum at the two extremities of the outer surface of the lower cheek-teeth.[4]

Of the two existing African rhinoceroses *R. simus* has no affinity with the present form, but *R. bicornis* appears very closely allied. The upper cheek-teeth of the latter have, however, considerably higher crowns, the second costa in the true molars does not extend to the base of the crown, and the buttress in the same teeth appears less strongly marked, while the premolars have a slight cingulum, which does not present an oblique ridge on the posterior collis. The contour of the inferior border of the mandible is also more curved,[5] but the hinder part of the symphysis is extremely like that of the fossil, many specimens showing the same well-defined channel. In most examples of the existing species the mentary foramen occupies the same position as in the fossil,[6] but the symphysis of the latter was almost certainly somewhat longer anteriorly, and was perhaps intermediate in this respect between *R. bicornis* and *R. etruscus*. The bicorn *R. pachygnathus* of Pikermi appears closely allied to *R. bicornis*, and differs from the fossil in much the same respects as the latter.

Summary—The usual ill fortune of the palæontologist obtains in the present instance, for had but the mandibular symphysis of the Karnul rhinoceros been complete there would have been no question whether its affinities were nearest to *R. etruscus* and *R. deccanensis*, or to *R. bicornis*. There is, however, apparently but little doubt as to its specific distinctness from the first of these three species; and if it be assumed that the presence of the cingulum in the upper premolars, the absence of a large amount of cement in the cheek-teeth, the contour of the mandible, and the position of the mentary foramen, are constant characters in the second species, it will be evident that the present form cannot be identified with the Deccan rhinoceros. The apparently more hypsodont dentition of *R. bicornis* and the difference in the contour

1 Compare Boyd-Dawkins "Quart. Journ. Geol. Soc," vol. XXIV. pl. VII. fig. 1 (1868).
2 *Ibid.* pl. VII. fig. 1. and VIII. fig. 4.
3 Compare "Falconer's Palæontological Memoirs," vol. II. pl. XXVII.
4 Compare Dawkins, *op. cit.* pl. VII. fig. 3.
5 Compare Blainville's "Ostéographie"—genus *Rhinoceros*, pl. III.
6 It is occasionally situated below $\overline{\text{pm.2}}$.

of the inferior border of the mandible, together with the apparently longer symphysis, seems to indicate specific distinction in this instance also.

These conclusions entail the necessity of at least provisionally regarding the Karnul rhinoceros as specifically distinct from all other described forms. Additional specimens are, however, essential to a fuller comprehension of its affinities, and all that can be said at present is that the species appears to show characters connecting it on the one hand with *R. etruscus* and *R. deccanensis*, and on the other with *R. bicornis*.

Horizon.—The majority of the specimens were obtained from the Cathedral cave, the more perfect ones being found in the beds *C*, *Cb*, *Cc*, and *Cd*, and broken fragments in *Ce* and *Cf*.[1] Specimens were also found in the Charnel-House, the right upper true molar (No. F. 234) noticed on page 41 being apparently the one alluded to by Mr. Foote[2] from that cave.

Bos, or Bubalus, sp.

Limb-bones, teeth, and mandible.—The remains of ruminants belonging either to one or both of the above-mentioned genera are abundant in the Cathedral, especially in the beds *Cb*, *Cc*, and *Cd*, and comprise limb-bones, detached teeth, and several imperfect mandibular rami. In the absence, however, of any of the characteristic portions of the cranium it seems impossible to make a generic determination of these specimens.

Boselaphus tragocamelus (Pallas).

Syn. *Portax picta*, H. Smith.

Upper molars.—Several upper molars of this species were obtained from the Cathedral in beds *Ca*, *Cb*, *Cc*, and *Cd*, of which three are represented in pl. XI. figs. 7, 8, 9. The slightly worn specimens represented from the inner aspects in figs. 7, 9, judging from their comparatively short crowns, are probably examples of m.1 (of the right side), while the unworn tooth of which the outer aspect is shown in fig. 8 is m.2 of the same side. These teeth agree precisely with the molars of the existing race, of which the left m.2 of a female is figured in the accompanying woodcut, and exhibit the characteristic tall crown, with the long and slender accessory inner column, which is attached entirely to the hinder crescent. It is very difficult to point out any characters by which these teeth can be distinguished from those of the Siwalik *Boselaphus* figured in plate XIII. of the preceding volume of this work.

Fig. 2. *Boselaphus tragocamelus*. The second left upper true molar, in an almost unworn condition: recent, India.

Lower molar and mandible.—An unworn left (second ?) lower true molar, which

[1] *Vide* Foote 'Rec. Geol. Surv. Ind.' vol. XVIII. p. 230.

[2] *Ibid.* vol. XVII. p. 204.

PLATE X.

PERISSODACTYLA.—*Rhinocerotidæ.*

Figs. 1, 1*a*, 1*b*. RHINOCEROS KARNULIENSIS, Lyd. The second and third left upper true molars, in a middle stage of wear; from the Cathedral cave (bed *Cc*). No. F. 233. Fig. 1 shows the inner and grinding surfaces of the two teeth, fig. 1*a* the outer surface of m. 2, and fig. 1*b* that of m. 3.—*Page* 41.

,, 2. RHINOCEROS KARNULIENSIS, Lyd. The inner half of the well-worn third right upper premolar; from the Cathedral cave (bed *Cc*). No. F. 236.—*Page* 42.

,, 3, 3*a*. RHINOCEROS UNICORNIS, Linn. The third right upper true molar, in an early stage of wear; from a turbary in Madras. No. F. 114. Fig. 3 shows the inner and grinding surfaces, and fig. 3*a* the outer surface.—*Page* 42.

,, 4, 4*a*. RHINOCEROS KARNULIENSIS, Lyd. Part of the symphysis and left ramus of the mandible; from the Cathedral cave (bed *Cd*). No. F. 237. Fig. 4 is from the oral, and fig. 4*a* from the external aspect.—*Page* 40.

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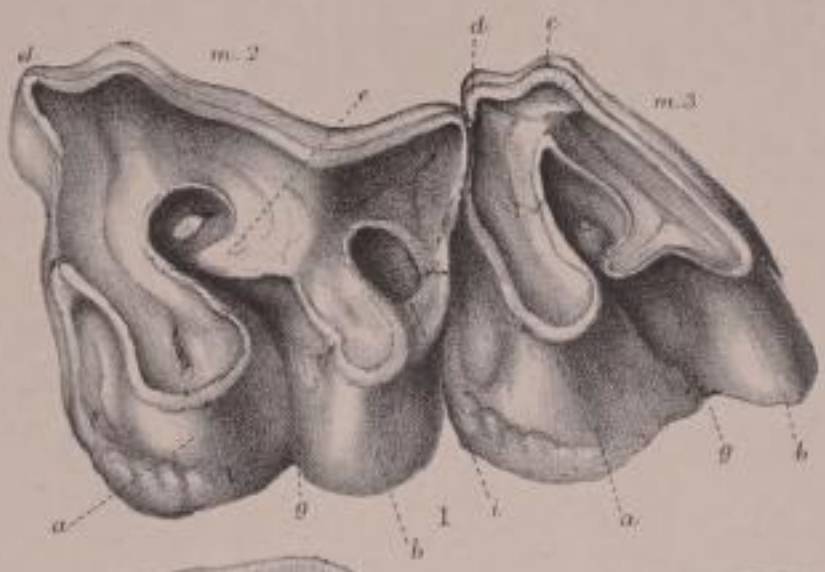
* All the specimens are in the Indian Museum, and with the exception of figs. 4, 4*a* (which are ½) are represented of the natural size. *a*, anterior collis; *b*, posterior collis; *c*, second costa; *d*, first costa; *e*, crochet; *for*, mentary foramen; *g*, entrance of median valley; *i*, posterior valley.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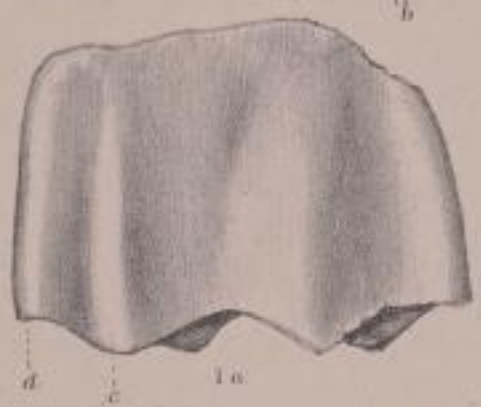
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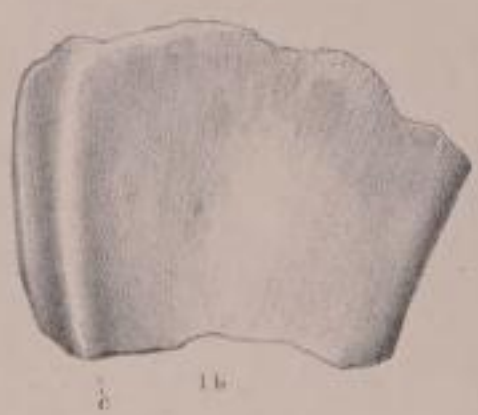
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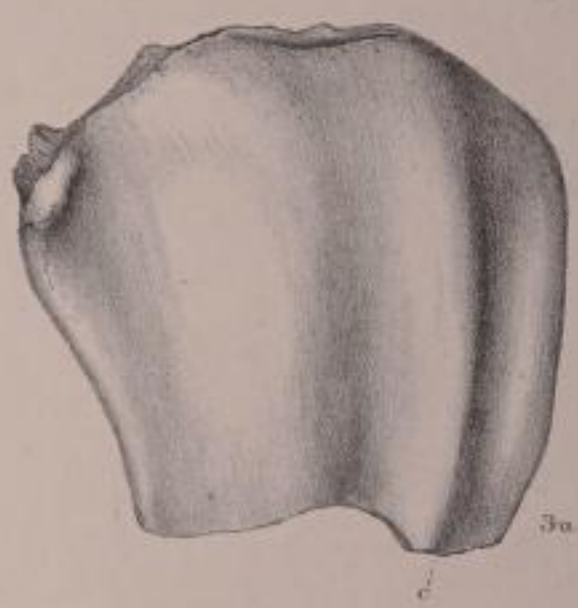
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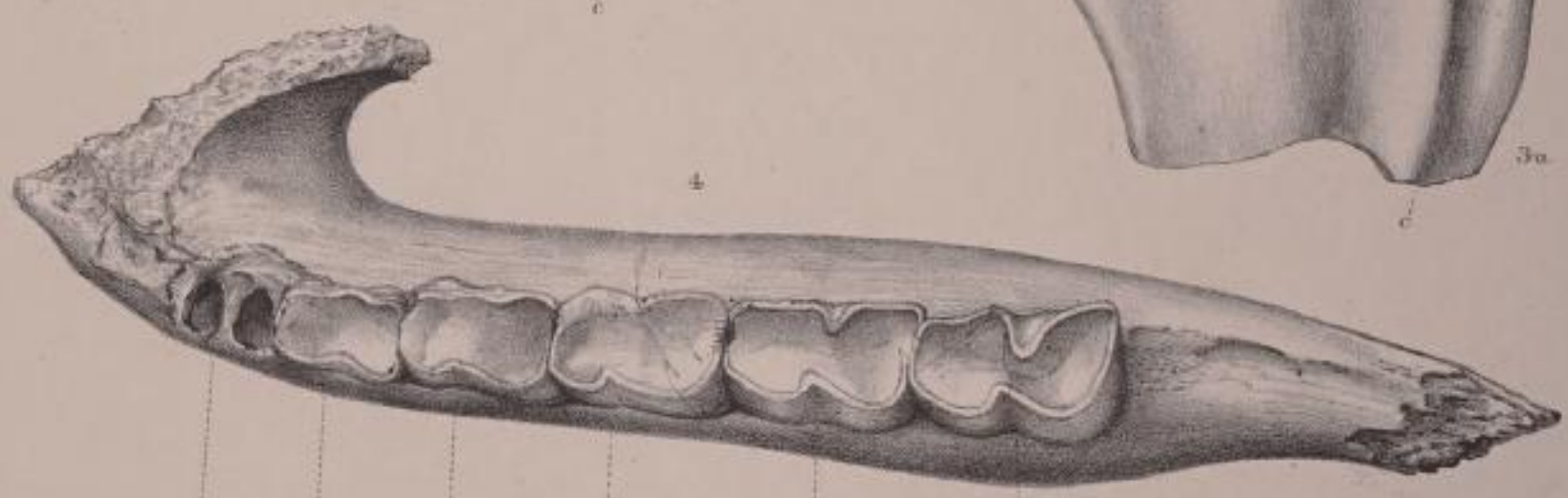
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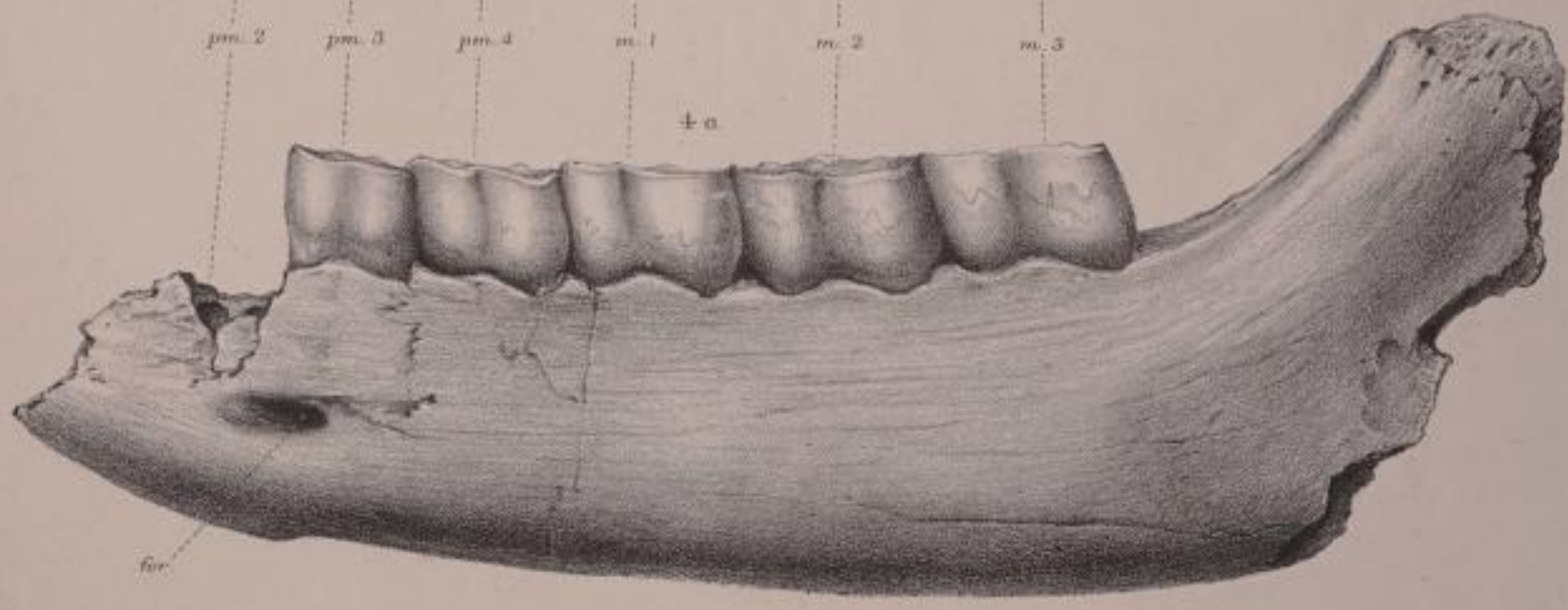
pm. 2
pm. 3
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