IV. *On the Fossil Mammals of Australia.*—Part II. *Description of an almost entire Skull of the* Thylacoleo carnifex, OWEN, *from a freshwater deposit, Darling Downs, Queensland.* *By Professor* OWEN, *F.R.S., &c.*

Received June 8,—Read June 15, 1865.

I HAVE been favoured by EDWARD HILL, Esq., of Sydney, New South Wales, through the kind offices of his brother-in-law Sir DANIEL COOPER, Bart., with a small collection of fossil remains from that part of the freshwater deposits of Darling Downs through which the river Condamine has cut its bed.

Among these fossils were parts of a broken skull, at once recognizable, by its carnassial teeth, as belonging to the same large carnivorous marsupial as afforded the subject of Part I. of the present series of papers.

On readjusting these fragments, I was gratified to find that they formed a more perfect skull than the one which first indicated the genus and species, and not only confirmed the marsupial character of the fossil, but supplied particulars of much value in determining the affinities of *Thylacoleo* in the marsupial series.

In previously reconstructing so much of the skull of the *Thylacoleo* as is figured in Plate XI. of the 'Philosophical Transactions' for 1859, I had, for the facial portion there preserved, only the guide of a small surface on the nasal process of a detached maxillary bone which fitted to about half an inch of the fractured surface of the fore part of the cranium. I was glad, therefore, to have the accuracy of that 'fit' confirmed by the more perfect state of the skull here described.

In comparing the upper carnassial tooth of *Thylacoleo* with that of *Felis* in my former paper, I had to regret that a fracture, with some loss of the tooth in the marsupial carnivore, prevented the precise determination of its degree of difference from that of the placental feline in regard to the "tubercular" part of the carnassial; but a close inspection of the tooth in the fossil led me to infer that "little more than the enamel" had been broken away (p. 311). The perfect condition of both right and left carnassials at the fore part of the crown in the present instance (Plate III. p_4) enables me to state that, in the place of the tubercle, there is only a low vertical ridge of enamel, about a line in breadth, without any additional inner root at the fore part of the tooth: the large carnassial of *Thylacoleo* consists exclusively of the "blade." This is more worn than in the original specimen described. A smooth and polished surface is exposed by attrition, sloping from within downward and outward, and meeting the inwardly bent outer enamelled surface at an angle of about 50°. The worn surface is deeper at the fore and hind parts of the tooth than at the middle, agreeably with the antero-posterior concavity of the

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outer surface. The hindmost part of the worn surface, which is 4 lines across, slopes rather outwardly from the rest, at a low angle defined by a linear boundary. I conclude that this surface is formed by the attrition of the small tooth succeeding the carnassial in the lower jaw, and marked *m* 1, fig. 3, Plate XI. of the former paper. The more extended anterior surface indicates that the lower carnassials pass within the upper ones when the mouth is shut. The whole abraded surface shows a play of the teeth for trenchant action, like that of the blades of shears, in a more striking degree than in the carnassials of Felines. The fore part of the carnassial, here 7 lines in breadth at the base of the crown, is formed by a ridge of enamel, acquiring, as it approaches the working surface, a line in breadth; from this the crown quickly expands to its greatest breadth, which is defined by a similar vertical ridge on both the outer and inner sides of the tooth. The enamel tract between the anterior and outer ridges is convex; that between the anterior and inner ridges is flat. The outer surface of the enamel behind the ridge shows several slight linear vertical impressions, between which the enamel slightly bulges out, at the basal part of the crown, the grooves subsiding halfway toward the trenchant border; the enamel is also finely wrinkled. The vertical extent of the enamel decreases from the fore to the hind end of the crown. I have nothing more to add from this second specimen to the description of the upper carnassial of *Thylacoleo* given at p. 311 of my former paper. The breadth of the palate between the fore parts of the carnassials is 3 inches 5 lines, and between the hind parts 3 inches 10 lines; showing the slight convergence of the antero-posteriorly extended crowns of the carnassials anteriorly.

In the portion of upper jaw first described, the fore part had been broken away immediately in front of the alveolus of the carnassial tooth; but enough of the bone on the outer side of the socket remained to determine a differential character between *Felis* and *Thylacoleo* in favour of the marsupiality of the latter. From the state of the first specimen I could only say that the suborbital or antorbital canal "must open some way in advance of the socket of the penultimate tooth, as it does in *Sarcophilus*" (p. 312). The present specimen shows that the anterior opening of the canal (Plate III. $_{21}$) is about 3 lines in advance of the alveolus of that tooth (here the carnassial, p $_4$), 10 lines above the alveolar border of the maxillary, and 6 lines behind the maxillo-premaxillary suture. The foramen is vertically elliptical, $3\frac{1}{2}$ lines in long diameter, and $2\frac{1}{2}$ in the opposite diameter. The corresponding foramen in *Felis Leo* may be 10 lines in long diameter and 6 lines in short diameter. This difference indicates the minor extent of sensitive surface and (vibrissal?) appendages in *Thylacoleo* as compared with *Felis*, and corresponds with the singular relative shortness of the muzzle in *Thylacoleo*, which the present instructive fossil exemplifies.

In this specimen the right occipital condyle is entire: it forms outwardly a strong oblique convexity, broadest above, contracting as it bends round the outside of the foramen magnum forward and inward; toward the foramen the condyle is slightly concave lengthwise (Plate III. $_2$). The lower ends of the condyles are about 5 lines apart, the

upper ends 1 inch 3 lines. The foramen magnum is 1 inch in transverse, and $7\frac{1}{2}$ lines in vertical diameter: it looks backward and a little downward. About 4 lines in advance of the foramen the basioccipital (Plate III. 1) begins to show a median longitudinal ridge, formed, or left apparently, by a pair of smooth excavations of this part of the under surface of the basi-occipito-sphenoid, the anterior half of which is bounded externally by the thick obtuse ridges developed from the sides of the basisphenoid (*ib.* 5). The depressions and dividing ridge are present, but more feebly marked in *Felis*; the basisphenoida ridges, which prolong backward the pterygoid walls (*ib.* 24) of the post-narial canal, are not developed in *Felis*: the breadth of the basis cranii between the tympanics is much greater in *Thylacoleo* than in *Felis*. The suture between the basioccipital and basisphenoid is obliterated. The pterygoids (*ib.* 24) are of great length; their bases almost meet beneath the presphenoid, but gradually diverge as they extend backward, uniting suturally with the sides of the basisphenoid as far back as the low thick ridges (*ib.* 5), which are the sole representatives of the "pterygoid processes" of the sphenoid. The bodies of the cranial vertebræ describe the same curve, convex lengthwise downward, as in the first specimen. The basisphenoid anterior to the median ridge is gently concave transversely, and this concavity becomes deepened by the junction of the pterygoids, as the centrums advance, the pterygoid plates arching from the junction downward and outward, to form the sides of the posterior continuation of the bony nostrils or respiratory passage. The conformity in this part of the cranial structure of *Thylacoleo* with that in *Thylacinus* (Phil. Trans. 1859, Pl. XIV. fig. 3) is very close.

The paroccipital (Plates II. & III. 4) is broken, but seems not to have extended far below the level of the occipital condyle; it articulates externally with the mastoid (8), which is not coextensive therewith vertically. Together they form a low, thick, obtuse, rough, subtrihedral pyramid, with the base downward and the outer side excavated.

The median vertical superoccipital ridge (Plate IV. fig. 2, 3) and the lateral depressions are better developed in the present specimen, with the more abraded carnassial teeth, than in the one first described; indicating the longer subjection of the bone to the action of the nuchal muscles.

The cranial nervures and vascular foramina are as in the first specimen, with which also the tympanic (Plate III. 28) agrees in its small size and relative position.

Nearly the whole of the articular surface for the mandibular ramus (Plate III. 27) is preserved on the right side of the present specimen; it is 1 inch 6 lines in transverse, and nearly 1 inch in antero-posterior extent; concave transversely, moderately convex from behind forward at its horizontal part; this facet changing or deepening to the concave only, where it is continued upon the post-glenoid plate: this is deeper than in the Lion, and much thicker; it is on the same transverse line as the tympanic, and is divided by the narrow fissure below the meatus auditorius externus from the mastoid.

There was sufficient of the articular surface in the first-described fossil to show that it had a greater antero-posterior extent than in *Felis*, with some minor characters of difference in which it more resembled that part in the Ursine Dasyure. So much of

this significant part of the skull being preserved in the present fossil as is formed by the zygomatic process of the squamosal demonstrates the wide difference from the semicylindrical transverse canal characteristic of the ginglymoid joint of the lower jaw in placental *Carnivora*. The surface, though of great transverse extent, was probably carried out further in that direction by the malar bone (to judge by the analogy of the *Dasyurus*, Philosophical Transactions, 1859, Plate XIV. fig. 2); but this part of the zygoma has been broken away. There is a striking similarity, indeed, in the kind of mutilation which the fossil skull from the freshwater deposits at Colungoolac (*ib.* p. 310), and that from the same formations channelled by the Condamine, has undergone. The occipital condyles, zygomatic arches, and postorbital processes have suffered, differing only in the degree in which these projecting parts have been broken away during the apparently similar cosmical violences to which both fossils have been subject. Besides the post-glenoid ridge (Plates II. & III. *l*) in *Thylacoleo*, there is a narrower boundary wall descending in the inner or mesial end of the articular surface, nearly as low as the posterior one; it renders the surface concave in the transverse direction; and against this "entoglenoid process" (ib. *e*) abuts the apex of a thick obtuse triangular mass of bone, with the base turned toward the descending basisphenoid ridge, but separated from it and from the end of the pterygoid by a groove. This convex portion of bone (Plate III. 6) appears to be developed from the base of the alisphenoid, and to have contributed to the tympanic cavity, like the second "bulla ossea" in *Perameles**; it was broken away on both sides in the first-described skull, but the pneumatic cavity by which it was excavated is partly shown on the left side (Philosophical Transactions, 1859, Plate XIV. 6); its base is perforated by the "foramen ovale."

In the present skull the cranium has been broken across lengthwise, and almost horizontally, exposing the extension of the air-sinuses (Plate IV. fig. 4) from the nose to the occiput, raising the outer table of the cranium nearly 2 inches above the inner one at the middle of the intertemporal ridge, and showing the small cerebral cavity restricted to the lower and hinder half of the cranium. The length of this cavity is 4 inches, its breadth 3 inches, its height 2 inches. Neither falx nor tentorium was ossified. The anterior boundary of the "sella" is indicated by a transverse rising produced into a pair of small retroverted "clinoid" processes, but there is no depression below the level of the cranial surface of the basisphenoid. The rhinencephalic compartment is relatively large.

In all the characters of the cranium shown and described in the original specimen the present fossil corresponds therewith. The posterior palatine vacuity, indicated by the smoothly convex inner border of the roof of the mouth parallel with the hind half of the sectorial tooth (in Plate XIV. fig. 1, *d*, *tom. cit.*), is shown in the present skull (Plate III. *d*) to be the fore part of the wide and advanced "palato-nares;" they are divided, mesially, by the presphenoid rostrum and vomer, and are bounded, laterally, by an extension of the palatal process of the maxillary and of the palatine to the ptery-

* Cyclopædia of Anatomy and Physiology, vol. iii. Art. *Marsupialia*, fig. 96.

goid. This extension (*ib.* 20), flat below, convex above, contracts to a diameter of eight lines opposite the middle of the posterior nostril, then increases in breadth, and loses in depth as it passes into the pterygoid wall of the wide and deep pterygo-sphenoid basicranial longitudinal median canal. Each posterior bony nostril is longitudinally ovate, with the great end forward, 2 inches in longitudinal and rather more than 1 inch in transverse diameter; with the plane of the opening inclined from without upward and inward, and, more feebly, from before upward and backward. The bony roof of the mouth is thus much reduced in length; a dimension which is surpassed by its breadth between the great carnassial teeth. Its posterior border is thin, and sharp where it forms the fore part of the palatal nostril, and gradually thickens, becoming smoothly convex at the outer side of that aperture. The bony palate is perforated by a pair of apertures about 1 inch in advance of the hind border, and $1\frac{1}{2}$ inch from the anterior end; that on the left side (Plate III. *a*) is elliptic, about 5 lines by 3 lines in its two diameters; on the right side the bony palate is partly broken away: these answer to the incisive or prepalatal foramina, and are on the line of the suture of the premaxillary with the maxillary palatal processes. The breadth of the palate, which is nearly 4 inches between the hind ends of the carnassials, is reduced to 1 inch 3 lines anterior to the small openings above-mentioned, and rapidly contracts to a breadth of 3 lines between the large sockets of the anterior teeth, which here, descending, convert the fore part of the palate into a deep groove.

The most welcome and instructive part of the present fossil skull is the fore part, giving evidence of the anterior teeth, and of the formation, position, and aspect of the external nostril. This orifice (Plate IV. fig. 1) is formed by the premaxillaries (22) and extremities of the nasals (15). A characteristic of most of the facial sutures in *Thylacoleo* is their finely undulated or subdentate structure. This is shown between the maxillary (Plate II. 21) and malar (26), between the maxillary (21) and premaxillary (22), and between the nasals (15) and premaxillaries; though not in the median suture between the nasals themselves. These bones (Plates II. & IV. figs. 1 & 3, 15) slightly expand at their fore ends, where their free margin is thick and obtuse, and forms the upper third of the external nostril. The premaxillaries form the sides of the opening by a similar margin, which rapidly expands at the lower half, to form or be continued, sloping forward, into the alveoli of the pair of incisor tusks (*i* 1). The inner or medial border of each alveolar outlet (Plate III. *i* 1) is continued downward below the level of the contiguous bony palate for about 4 lines, forming the sides of a groove or canal at that part about 3 lines in breadth, which expands as the palate extends backward between these alveoli. At the middle of the lower boundary of the external nostril the premaxillaries rise into a slight prominence; the lateral borders of the nostril are slightly concave vertically (Plate II. 22); the form of the nostril (Plate IV. fig. 1) is transversely elliptic; its plane almost vertical, with the lower border a little advanced; the anterior margin of the nasals is, through fracture, not quite entire. The vertical diameter of the nostril is 1 inch 2 lines, the transverse diameter 1 inch 10 lines. The vertical extent of the premaxillary is

2 inches 7 lines; the antero-posterior extent of the upper part of the premaxillary, or of the naso-premaxillary, suture (Plate III. between 15 & 22) is 2 inches; the maxillo-premaxillary suture (*ib.* between 21 & 22), as it descends, runs forward, reducing that dimension of the bone at the middle of the nostril (22) to 1 inch, whence it expands to 1 inch 8 lines, where it contributes to the alveolar border of the upper jaw and to the bony palate; the pair of incisive or premaxillary palatal foramina, before described (Plate III. *a*), open upon the suture of the premaxillary with the palatal plate of the maxillary.

Each premaxillary has three alveoli; the outlet of the foremost (Plate III. i 1) is oval, with the larger end forward, 1 inch in long diameter, $7\frac{1}{2}$ lines across the widest part: this socket rises for nearly 2 inches in the substance of the bone, inclining a little backward and outward to its closed end; the long axes of the outlets converge forward. The outlet of the second incisor (ib. i 2) is a full ellipse, 4 lines by $3\frac{1}{2}$ lines in the two diameters; that of the third incisor (ib. i 3) seems to have been of similar size. The breadth of both premaxillaries posteriorly is 2 inches 10 lines; anteriorly, across the first alveoli, 1 inch 8 lines; the length of the premaxillary part of the bony palate is 1 inch 7 lines. The maxillary (Plate II. 21) swells outward as it leaves the premaxillary to form the socket of the great carnassial (p 4), above which it rises to join the malar (26), the lacrymal (13), the frontal (11), and the nasal (15) bones. Anterior to the root of the carnassial it is perforated by the small antorbital foramen. Behind the carnassial socket the bone extends outward and backward for $1\frac{1}{4}$ inch, forming the lower and fore part of the temporal fossa, and there terminating by a free obtuse convex border (*ib.* 21′), of similar vertical extent, below the malo-maxillary suture. The corresponding part of the posterior border of the maxillary in *Felis* is concave. On the inner side of the hinder end of the carnassial socket is that (Plate III. m 1) for the small tubercular tooth, which was preserved in the first described specimen; the long axis of its outlet forms an open angle with that of the carnassial socket, at the fore part of which the alveolar border of the maxillary is excavated by either a similar socket for a two-rooted tooth, or by two contiguous sockets for two small single-rooted teeth (ib. p 3). I think the first the more likely explanation, in which case the long axis of the outlet of this socket forms an open angle with that of the carnassial one, extending therefrom inward and forward, instead of inward and backward, like the posterior socket. The extent of such axis is 6 lines, the first subcircular orifice being rather less, the next rather more than 3 lines in diameter. The fore part of this socket is near the lower end of the maxillo-premaxillary suture, and the state of the alveolar and contiguous palatal part of the jaw here precludes any clear determination relative to a canine; such a tooth (ib. *c*), of small size, conical and obtuse, had been cemented to this broken part of the alveolar border, in the line of the small posterior incisors.

The posterior part of the maxillary is concave as it rises from the border to form the fore part of the temporal fossa, and then bulges out into that fossa as a smooth convexity, on the inner side of which is the hinder opening of the suborbital canal (Plate IV. fig. 3, *o*). Above this convexity the lower and fore part of the orbit impresses that

part of the maxillary which supports the lacrymal, which forming that part of the rim of the orbit and extending backward adds to the depth of the depression. The rim subsides above the lacrymal, and the upper part of the orbit is continued convexly upon the upper part of the skull parallel with the posterior ends of the nasals and contiguous part of the frontal (*ib.* 11). The superorbital ridge is resumed by the outstanding and down-bending process of the frontal (Plate II. 12), which, being broken away on both sides of the skull, exposes the large air-sinus with which it was excavated. The rimless upper part of the orbit is 10 lines in extent. The orbit is relatively smaller than in *Felis*, deeper anteriorly, and more significantly different by its wall not being pierced for the lacrymal canal, the entry of which (*ib.* 13) is situated externally, as shown in the first-described specimen of *Thylacoleo*. The length of the nasal bones (Plate IV. fig. 3, 15) is 3 inches 6 lines; their least breadth, conjointly, is 1 inch; they slightly expand at both ends, but most so posteriorly, where they are 2 inches across. Their median suture remains; that of the frontals is in great part obliterated, and the conjoined frontals (*ib.* 11) enter the posterior interspace of the nasals. The fronto-nasal suture is undulatory. The nasal processes of the maxillaries do not extend so far back as the nasals, which terminate angularly, but with the apex largely rounded off.

The upper cranial surface of the frontals (Plate IV. fig. 3, 11) contracts backward to the intertemporal ridge (ib. *t*); the boundary between frontal and parietal is not shown. At the anterior expanded part of the frontals the external surface forms a pair of low convexities divided by a median longitudinal shallow channel, but deeper and with the convexities better marked than in the first specimen. These convexities give a contour line to the upper part of the skull (Plate II.), resembling that in the Brown Bear, which also the skull resembles in the breadth of the naso-maxillary part. The upper and hinder parts of the cranium correspond with those which were characterized in the former paper.

The dentition of the upper jaw, as indicated by alveoli in the present specimen, includes, on each side, three incisors (Plate III. *i*, 1, 2, 3), followed by three or four other teeth: of these, one is the great carnassial (*p* 4), another, the small transversely-oblong tubercular (*m* 1): the seat of doubt is between the carnassials and incisors. To one of the doubts expression has been already given; whether, viz., the carnassial was preceded by one small two-rooted premolar (*p* 3), or by two smaller and single-rooted teeth. A canine appears to be represented by the tooth with a subcircular, conical, obtusely worn crown, under 3 lines in diameter, supported on a thicker base (ib. *c*). Future specimens may clear up this part of the dentition of *Thylacoleo*. It is certain that the anterior incisor (ib. *i* 1) bore a relation of size to the carnassial similar to that of the canine tusk in *Felis* to the carnassial. Of the two small premaxillary teeth which succeeded the front tusk, neither is preserved,

The size of the laniary canine in *Felis* being here transferred to the first incisor, its function as killer was similarly provided for by its approximation to the moving power, through the extreme shortness of both upper and lower jaws, especially anterior to the

chief molar teeth. In *Felis* the small incisors are very little in advance of the canine; this large tooth is almost at the fore part of both upper and lower jaws; and in *Thylacoleo* the relative position of the incisor-tusk to the enormous temporal fossa is such as to give it the advantage of a harder or closer grip during the action of the powerful temporal muscles.

In the former paper so much of the characters of the lower jaw, and its teeth, of *Thylacoleo* were given as could be deduced from the cast of a portion of that bone figured in Plates XI. & XIII. figs. 3, 4, & 5, pp. 317 & 318, of the Philosophical Transactions for 1859.

The carnassial and succeeding tubercular teeth, being in place, served to refer this fossil to the same species as that indicated by the upper jaw (Plate XI. figs. 1 & 2, *tom. cit.*). A socket for a second smaller "tubercular" was evident, behind the one in place. The chief doubt remained in regard to the fore part of the mandibular ramus; the plaster-cast did not admit of any certain conclusion as to the extent to which the original might there have suffered fracture; part of the symphysial surface and the base or socket of a large obliquely produced tooth could be made out, and this "seemed to be the sole tooth in advance of" the carnassial. Accordingly I wrote, "If the ramus be really produced at the upper part of the symphysis further than is indicated in the present cast, it may have contained one or more incisors, and the broken tooth in question may be the lower canine. If, however, this be really the foremost tooth of the jaw, it would appear to be one of a pair of large incisors, according to the marsupial type exhibited by the *Macropodidæ* and *Phalangistidæ*" (*loc. cit.* p. 318).

The perfect condition of the upper jaw of the chief subject of the present paper determined the alternative, and proved the *Thylacoleo* to be the carnivorous modification of the more common and characteristic type of Australian Marsupials, having the incisors of the lower jaw reduced to a pair of large, more or less procumbent and approximate, conical teeth or "tusks."

I have been favoured by Mr. GERARD KREFFT, the able Curator of the Australian Museum, Sydney, New South Wales, with a "photograph" of the outer side, and an outline sketch, natural size, of the inner side, of a portion of the right mandibular ramus of *Thylacoleo carnifex* in that Museum, which presents the same general resemblance, in the kind and degree of mutilation, to the original of the cast described in Part I., which the cranium from the "Condamine River" presents to the one from "Colungoolac." It is fortunately, however, a little more complete; sufficiently so to demonstrate that the large socket (Plate IV. figs. 5 & 6, *i*) is of the foremost tooth of the lower jaw. It also exhibits two small approximate alveoli, or the divisions of an alveolus, for a two-fanged tooth, corresponding in size and in relative position to the carnassial, with the similar socket or sockets noticed in the description of the upper jaw (Plate III. p^3). There are evidently no smaller incisors behind the large one of the lower jaw, nor any other teeth between the large incisive tusk and the small tooth or teeth on the inner side of the fore part of the great lower carnassial. The portion of

lower jaw in the Sydney Museum also shows the socket for the minute tubercular tooth (Plate IV. figs. 5 & 6, m_2) behind the posterior double-rooted one (*ib.* m_1). The "foramen mentale," the anterior boundary of the depression for the insertion of the large temporal muscle, and the form of symphysis, closely resemble all these characters as shown by the cast of the mandible first described. Mr. KREFFT has dotted the depth to which the socket of the lower incisive tusk descends in the symphysial part of the jaw (*ib.* fig. 6, *i*): it is somewhat greater than that of the upper tusk.

The length of the dental series of the upper jaw, in a straight line, is 4 inches 3 lines; that of the lower jaw is 3 inches 3 lines.

From present data the probable formula of *Thylacoleo* is:—$i\frac{3-3}{p}$, $c\frac{1-1}{p}$, $p\frac{2-2}{2-2}$, $m\frac{1-1}{2-2}=24$. Of the incisors of the upper jaw, the first is a large tusk; of the premolars, the first is small, probably two-fanged, the second a very large carnassial. The first molar is small and two-fanged in both jaws, the second is restricted to the lower jaw, is still smaller, and is single-rooted. The chief business of the teeth has been delegated to the tusks and carnassials: development has been concentrated on these at the cost of the rest of the normal or typical dental series. The foremost teeth seized, pierced, lacerated or killed, the carnassials divided the nutritive fibres of the prey.

Thylacoleo exemplifies the simplest and most effective dental machinery for predatory life and carnivorous diet known in the Mammalian class. It is the extreme modification, to this end, of the Diprotodont type of *Marsupialia*.

Besides the full confirmation which the additional fossils, here described, give of the marsupiality of *Thylacoleo*, its closer affinities in that Order are shown to be, not to the existing Carnivorous Marsupials, e. g., *Sarcophilus*, *Dasyurus*, *Thylacinus*, *Didelphys*, but to the Diprotodons, Nototheres, Koalas, Phalangers, and Kangaroos. It may, I think, be said that the skull above described is one of the most singular and interesting mammalian fossils hitherto discovered.

Admeasurements of the Skull.

	in.	lin.
Length	9	8
Length of the facial part anterior to the orbit	3	0
Breadth at the preserved posterior part of the zygoma	7	2
Breadth at the preserved anterior root of the zygoma	6	9
Breadth of the cranium between the temporal fossæ	2	3
Length of the bony palate, from the fore border of the palato-nares	2	11
Breadth of the bony palate at the same part	3	6
From the fore end of premaxillary to the hind border of the palato-nares	4	9
From the hind border of the palato-nares to that of the occipital condyles	5	6
Length of the temporal fossa, including the orbit	7	2
Breadth of the interorbital space across the antero-superorbital ridges	3	10
Breadth of the interorbital space behind the antero-superorbital ridges	3	0
Least breadth of the foramen magnum	0	11

	in.	lin.
Least height of the foramen magnum	0	7
Breadth between the upper ends of the condyles	1	4
Breadth across the broadest part of the condyles	2	5
Breadth across the paroccipitals	4	2
Breadth across the mastoids	5	3
Vertical diameter, or depth of the upper jaw, at and including the fore part of the carnassial tooth	4	0
Vertical diameter, or depth of the mandible, at and including the fore part of the carnassial tooth	3	0

Other admeasurements are noted in the text.

Description of the Plates.

PLATE II.

Side view of the skull, without the mandible, of the *Thylacoleo carnifex*:—nat. size.

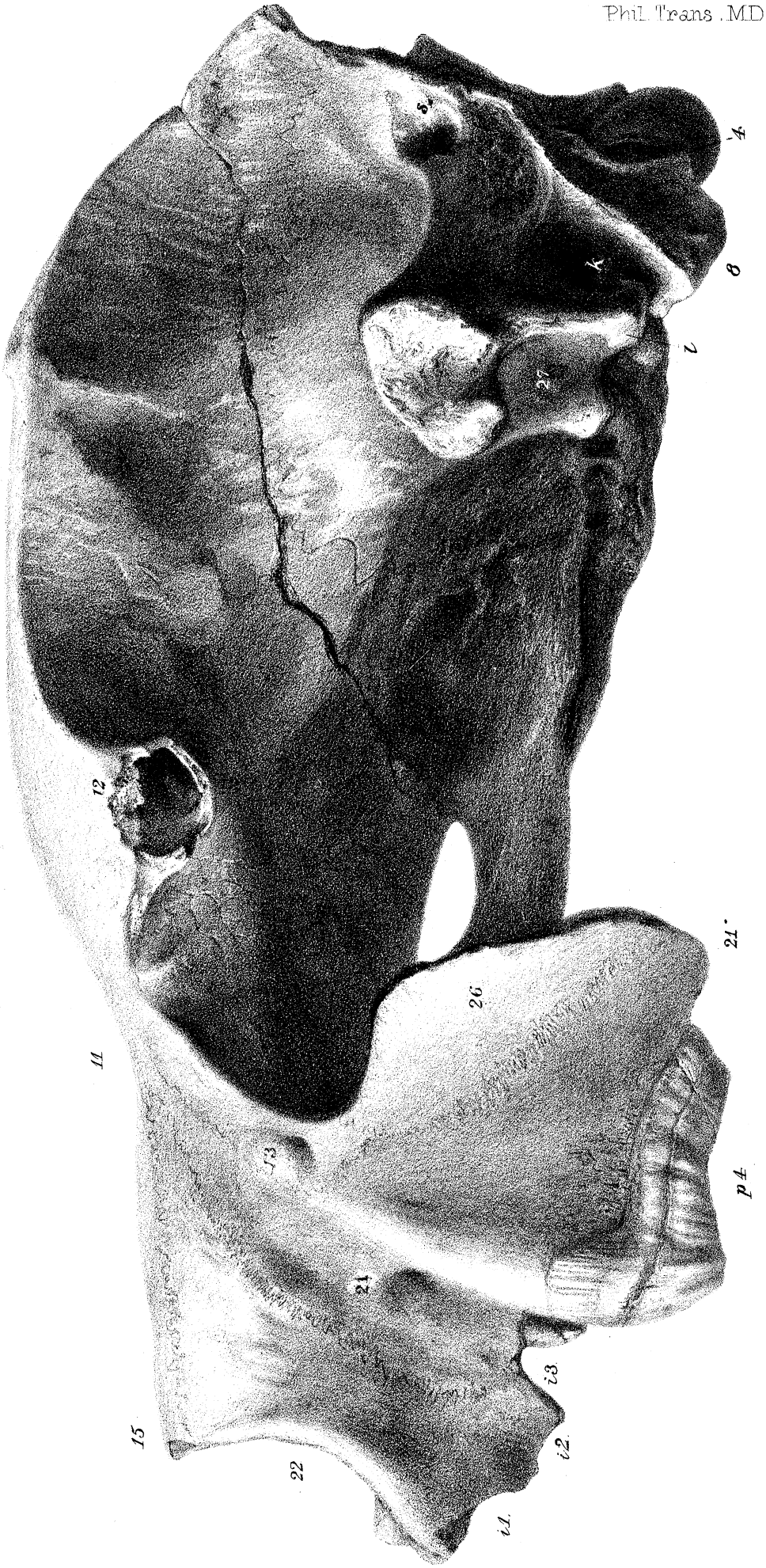
PLATE III.

Base view of the skull of the *Thylacoleo carnifex*:—nat. size.

PLATE IV.

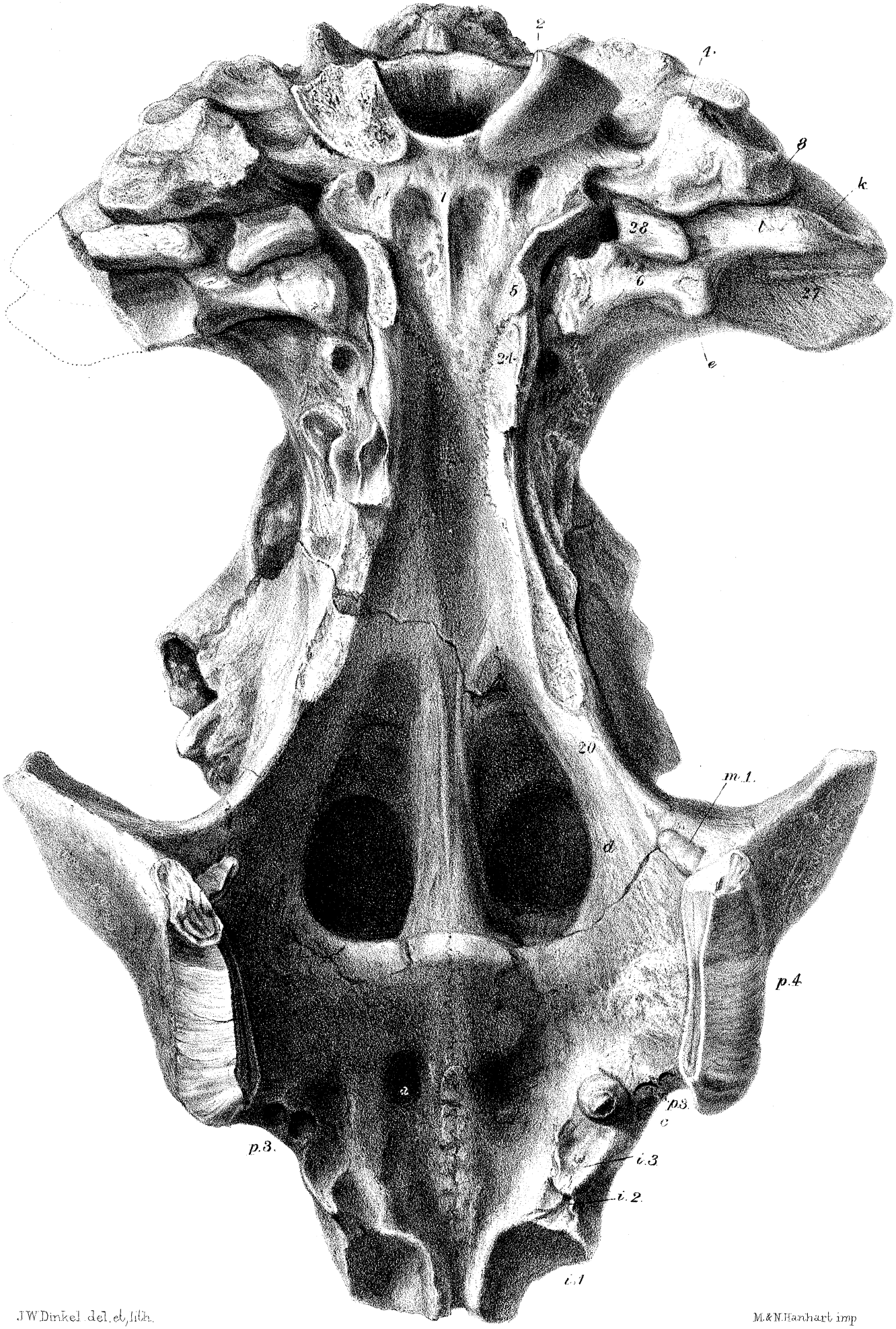
Fig. 1. Front view of the skull of the *Thylacoleo carnifex*.
Fig. 2. Back view of the same skull.
Fig. 3. Upper view of the same skull.
Fig. 4. Air-cells of the diploë above the cavity for the brain.
Fig. 5. Outer side of part of the right mandibular ramus, with the carnassial (p_4) and first molar (m_1).
Fig. 6. Inner side of the same portion of mandible: the second molar (m_2) and the incisive tusk (i) are indicated in outline.

All the figures in this Plate are half the natural size.
The letters and figures are explained in the text.



J. W. Dinkel del. et lith.

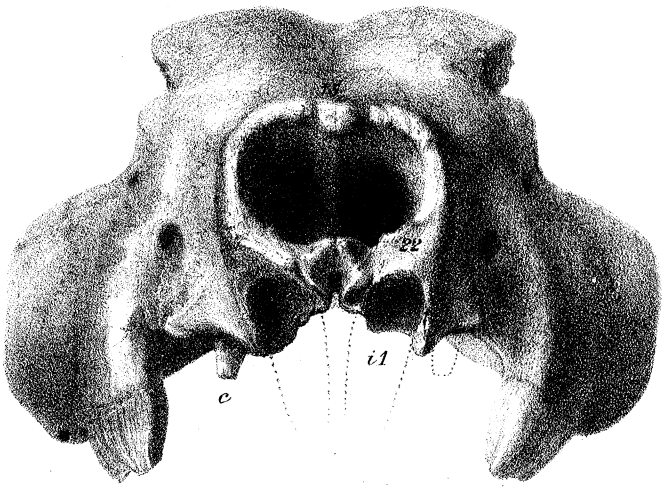
M. & N. Hanhart imp.



J.W.Dinkel del. et lith.

M.&N.Hanhart imp

1



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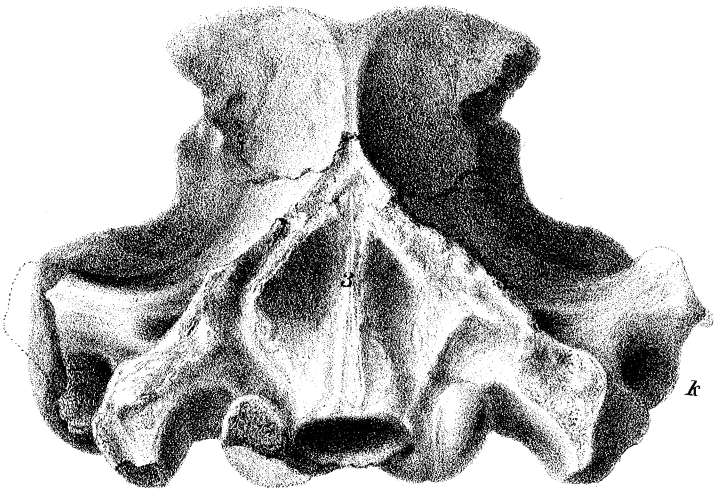

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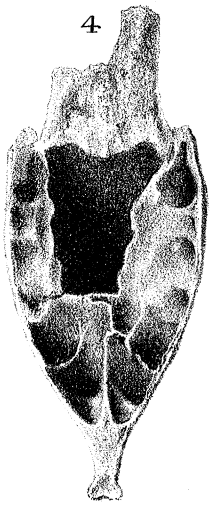

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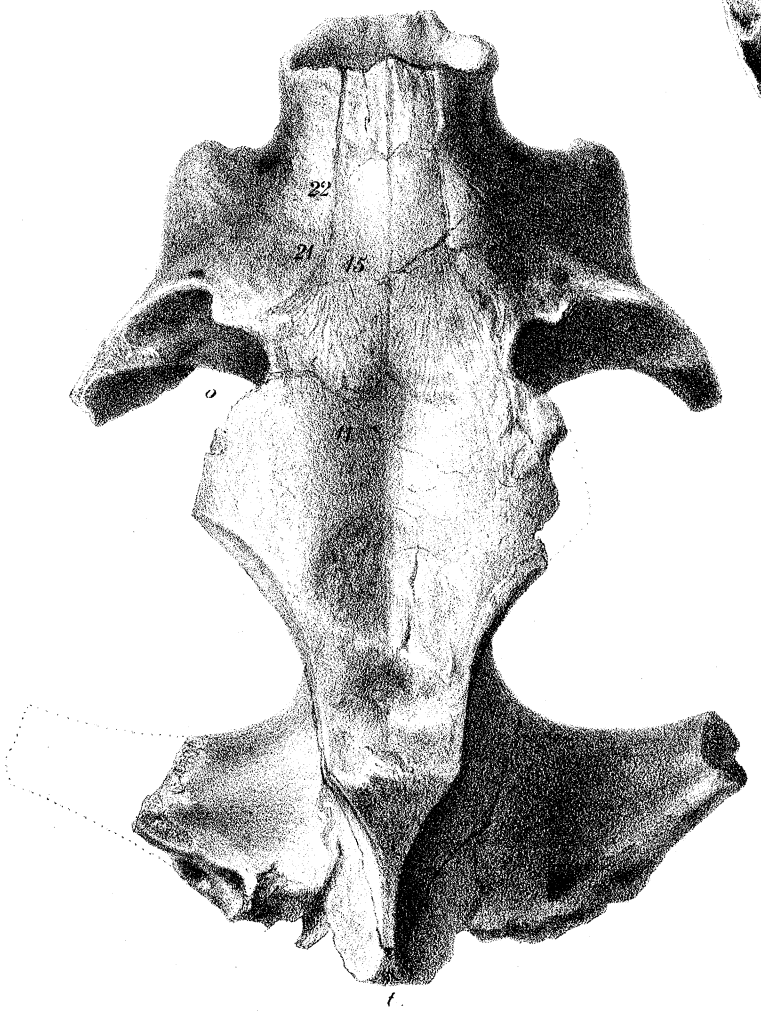

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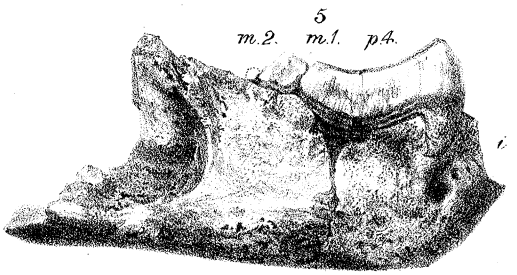

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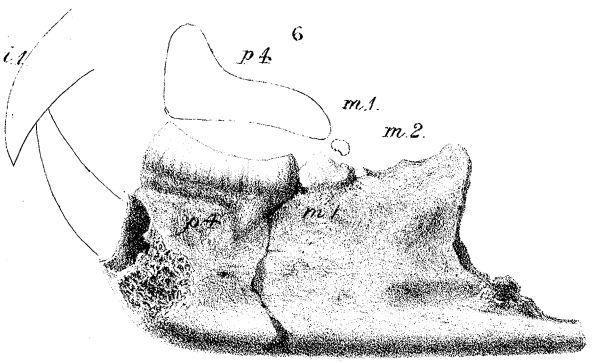

J.W.Dinkel del. et lith.

M&N.Hanhart imp.