

中國古生物誌新丙種第七號

總號二二一冊

楊鍾健著

許

氏

祿

豐

龍

中華民國三十年十月

經濟部中央地質調查所印行

(學術研究與國立中央研究院國立北平
研究國立北京大學兩廣地質調查所
湖南地質調查所合作)

許氏祿豐龍 (中文摘要)

楊鍾健著

在雲南祿豐縣城東北沙灣大冲一帶所採骨化石中，有最完整之一骨架，頭骨脊椎肋骨腹部肋骨前肢前足後肢後足均保存。所殘缺者，僅少數不關重要部分，易于補充完整。此項骨架，得自沙灣村東之山坡，由卡美年君偕同技工王存義杜林泰小心採掘，運至昆明地質調查所昆明辦事處，謹慎修理完成，由余加以研究。該骨架因尚無適當之陳列地點，故仍未裝架，但研究則已竣事。

此項骨架經研究之結果，判定爲一種蜥龍類之原蜥脚類。所歸之科，應爲板龍科。(Plateosauridae) 定爲新屬新種。名稱爲許氏祿豐龍。(Luftungosaurus huenei) 屬名代表發現之地點，種名則獻給德國秋秉根大學教授許耐氏。因許氏對於作者之此項研究，甚多臂助，而又爲研究蜥龍化石之權威專家也。

許氏祿豐龍之地質年代，經判定爲上三疊紀。此項結果，不但與其他共生之化石相符合，且與南非及歐洲中部之同時代化石，亦無衝突之處。此項化石所存在之地層，爲一種暗紫色泥沙岩與其上下之地層，略稱雲南之紅色岩層。其地質年代前有視爲二疊者，亦有視爲第三紀者。經此項研究，其年代始獲確定。

許氏祿豐龍之主要特徵，已在英文原文中詳盡記述。茲僅節誌其主要性質于次：頭小，長約當尾脊椎前部三個半脊椎之長。頭骨不十分伸長，鼻孔作三角狀，眼前孔小而高短。眼孔圓而大，上顳顬孔向上，自側視之，幾不能見。牙齒微扁平，具有鋸齒狀，與板龍相近。頸長，頸背脊椎均甚堅硬，尾亦硬大。脊椎之數目爲：頸十(?) 背十四(?) 坐骨脊椎三，尾四十五。肩梁骨具有骨化甚佳之胸前骨一對。坐骨之恥骨之柄相當弱細。脛骨比較短，第三足掌骨長。前肢比後肢甚短，手與足之第一指趾特別堅強。

PALAEONTOLOGIA SINICA

Board of Editors:

T. H. YIN (*Chairman*), T. C. CHOW (*Secretary*)

A. W. GRABAU, J. S. LEE, Y. C. SUN, C. C. YOUNG, T. K. HUANG

A Complete Osteology of *Lufengosaurus huenei* Young (gen. et
sp. nov.) from Lufeng, Yunnan, China

BY

YOUNG CHUNG-CHIEN

With 6 Plates and 25 Text-Figures



Published by the Geological Survey of China

Pehpei, Chungking, 1941.

CONTENTS

	PAGE
INTRODUCTION	I
GENERAL DESCRIPTION OF THE SKELETON	I
OSTEOLOGY	3
Skull	3
Lower jaw	5
Dentition	5
Detailed description of different elements of the skull and lower jaw	6
Vertebrae, ribs etc.	11
Pectoral girdle and fore limbs	20
Pelvic girdle and posterior limbs	34
DETERMINATION AND SYSTEMATIC RELATIONSHIPS	49
PALAEONTOLOGICAL AND PALAEOBIOLOGICAL DISCUSSIONS	51
GEOLOGICAL AGE	52
LITERATURES	53
EXPLANATIONS OF PLATES	55-59

A COMPLETE OSTEOLOGY OF *LUFENGOSAURUS HUENEI* YOUNG (GEN. ET SP. NOV.) FROM LUFENG, YUNNAN, CHINA

By

YOUNG CHUNG-CHIEN

INTRODUCTION

The Upper Triassic Saurischian fauna in association with *Tritylodon*-like remains (*Bienotherium yunnanense* Young) in Lufeng, Yunnan, is highly important both from the points of view of vertebrate palaeontology and those of stratigraphy. It marks an epoch-making step in the progress of our present knowledge of Chinese geology. For a detailed description of the *Bienotherium* remains I have to wait for more available literatures and better equipment. Under the present undesirable conditions, a full and correct description of the Saurischian remains is also not to be expected on account of the complete lack of a better library. Both the library of the Survey and my own collection of books are not available now. Fortunately, Professor F. v. Huene in Tuebingen has kindly sent me his monographic work, "Die Fossile Reptil-Ordnung Saurischia, ihre Entwicklung und Geschichte", and some other related literatures which make my work possible. In addition, a few important references have been sent by post from the main office of the Geological Survey. I beg to be excused therefore for any unintentional omissions of literature.

Up to now, only a few preliminary articles have been published, (Young, 1939, 1939a, 1940 and Bien, 1940) giving some general accounts of the discovery and a preliminary description of a few leading forms. Since the preparation of the entire collection is not yet finished, we prefer to describe the best preserved skeleton (V15) which is already prepared.

Before I am going to deal with the real specimen, I should like to express my sincere thanks to Professor F. v. Huene in Tuebingen not only for his kindness in sending me his own copy of the above-mentioned monograph, but also for his enthusiastic interest in the present study which has led to his giving me much valuable information. To my teacher Professor F. Broili in Munich and to Dr. R. Broom in Transvaal I am also deeply indebted for his valuable suggestions and advice. Finally, it is a great pleasure to express here my best thanks to Mr. M. N. Bien, the discoverer of the remains, for constant discussions regarding the field condition, age of the deposits, etc. during the course of the present study.

GENERAL DESCRIPTION OF THE SKELETON

The fossil described in the present memoir is a nearly complete skeleton including the skull, vertebrae, ribs, pectoral and pelvic girdles and four limbs representing the most complete skeleton among the Lufeng collection. It was found near a small village Shawan' about 3 km. N. of the Lufeng city.

The neck part was first exposed and is therefore less well preserved. Thanks to the skilfulness and carefullness of the excavation under the leadership of Mr. Bien, all the remains were rightly unearthed and brought to the laboratory. The preparation was then undertaken by our experienced technician, Mr. C. Y. Wang.

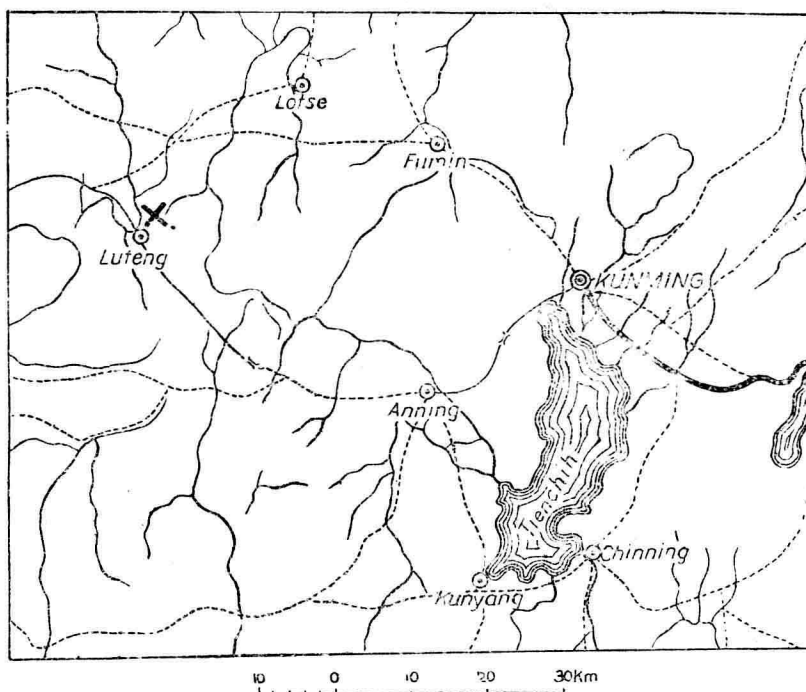


Fig. 1. Sketch map between Kunming, the capital of Yunnan Province, and Lufeng showing the fossiliferous site Shawan (marked as X) from where the complete skeleton was unearthed. Scale of the map 1:1,000,000.

As a whole, the skeleton has only the tip of the skull and lower jaws, the dorsal part of neck vertebrae, and their ribs (last two neck vertebrae incomplete) and a few other bones more or less damaged, but most of which are sufficiently preserved for the purposes of a reliable description. The last tail vertebra is missing, probably also the next to the last one. Most of the ribs and gastralia are preserved, but the latter one is very fragmentary.

The fossils are embedded in the dark red (in the field rather bright) clayish sandstone of homogeneous texture. The bone is bluish gray sometimes dark gray or light gray in coloration. It is completely mineralized and very hard, sometimes as hard as the matrix. The work of the preparation is therefore not very easy.

The Shawan site represents the lower part of the fossiliferous deposits and is regarded by us as the lower part of the lower Lufeng Series (Young, 1940, Bien, 1940). By the determination of the fossil, the site, from which the fossil occurred, is undoubtedly Upper Triassic in age.

OSTEOLOGY

Order SAURISCHIA Seeley

Sub-Order PROSAUROPODA v. Huene

Family PLATEOSAURIDAE v. Huene

Genus LUFENGOSAURUS Young (gen. nov.)

With the type species *L. huenei**Lufengosaurus huenei* Young (sp. nov.)*Material.* A nearly complete skeleton, Cat. no. V15.*Locality.* Shawan, 3 km. N. of Lufeng city, Yunnan.*Age.* Upper Trias, probably lower part of Upper Trias.

Diagnosis. A *Plateosaurus* closely related Prosauropoda. Skull small ca. 3.5 length of the anterior tail vertebrae. Skull less elongated. Nasal opening triangular. Anteorbital opening short and high, very small. Orbits rounded and large. Upper temporal opening directs upwards. Teeth weakly compressed and serrated of very generalized type. Neck very long. Neck and dorsal vertebrae very strongly built. Tail massive. Number of vertebrae: neck 10?, dorsal 14?, sacrum 3 and tail 45. Pectoral girdle with completely ossified sternum. Pelvic girdle with rather weakly constricted pubis. Tibia comparatively short. Mt. III rather long. Anterior limb rather short. Hand and foot with the first claw especially strong.

Skull

Only the large part of the premaxillaria and the left squamosa and the posterior part of the prefrontal are missing. The skull was only slightly subjected to mountain-making pressure without, however,

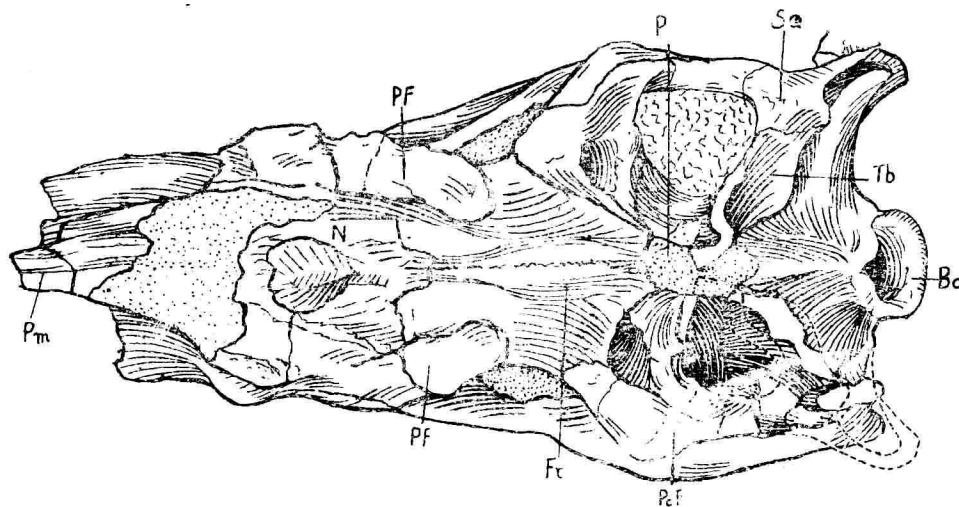


Fig. 2. *Lufengosaurus huenei* Young (gen. et sp. nov.). Skull in parietal aspect. Explanation of different bone elements of Figures 2—5: An., angular; Art., articular; Bo., basioccipital; D., dental; Eo., exoccipital; Fr., frontal; Ip., interparietal; J., jugal; L., lacrymal; Mx., maxilla; N., nasal; Opo., opierthuticum; P., parietal; Pm., praemaxilla; Pf., praefrontal; Po., postorbital; Pof., postfrontal; Q., quadratum; Qj., quadrato-jugal; Sa., suprangular; So., supraoccipital; Sq., squamosum; Tb., tabular. 1/2 nat. size.

the original shape of different elements as well as the general outline of the skull becoming deformed. The palatinal part is still covered by matrix. For the sake of safety, the removal of the lower jaws and the matrix of the lower part of the skull have to be given up for the present.

The skull is less elongated, the median length is much more than twice that of the maximum breadth (Breadth: Length 4:3); while in *Plateosaurus fraasianus* (Huene, 1926, pp. 6-41, plates I-VII and 1932, p. 140) the skull is distinctly longer (Breadth: Length 3:8). The general structure of the skull shows rather massive architecture, as compared with its size. The premaxillare are much largely broken but must be bent steeply downwards in order to form a pointed muzzle as in the case of *Plateosaurus fraasianus*. The anterior border of the nasal opening is also partly damaged. The general outline of it is a right triangle with the right angle at the lower posterior corner. The upper angle is about 60 degrees, with a weak embayment extending upwards. The shape of the nearly equi-lateral triangle of the anteorbital opening is quite peculiar. It is considerably short and high, representing the smallest opening as compared with the nasal and orbital openings. The orbit is elongated oval in outline, longer than height, with the upper part more expanded. It is the largest opening of the skull. The small upper temporal opening directs upwards, being entirely concealed when a lateral view of the skull is taken. The parietalia between

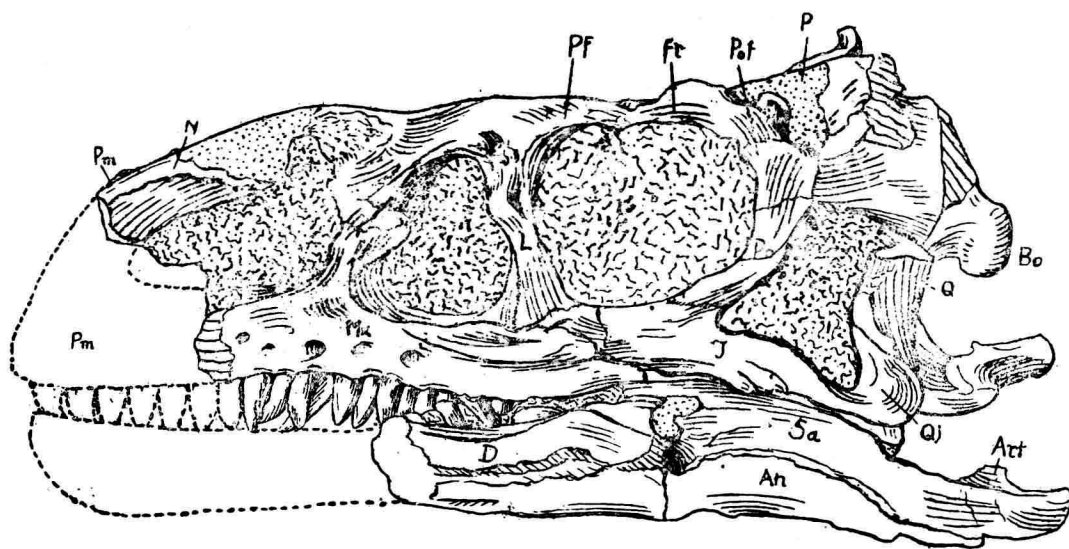


Fig. 3. *Lufengosaurus huenei* Young (gen. et sp. nov.). Skull in left side aspect. 1/2 nat. size.

both the temporal openings is very narrow. The general outline of the temporal opening is triangular with, however, the anterior inner corner very less distinct. The orientation of it is also very different from that of *Plateosaurus fraasianus*. The anterior edge goes obliquely to the longitudinal axis of the skull and the posterior angle situates more externally, so that the external border is parallel to the longitudinal axis of the skull. (In *P. fraasianus* posterior angle situates more medially and the anterior border is perpendicular to the longitudinal axis of the skull.) At the anterior border of the temporal opening, there is a bony protuberance; and immediately before it, an oval depression about 10 mm. long and 15 mm. wide is developed. The lower temporal opening is high and narrow, diverging into two embayments at the lower end, the anterior one being small and less extended but very sharp and distinct. The relative position and general

shape of different openings afford many marked differences if they are compared closely with those of the related forms. The most characteristic feature of our skull is the considerable backward projecting of the condyle which can be seen both in a top and a lateral view of the skull. This same is, however, entirely concealed in all forms of *Plateosaurus*. The depression at the nasal part of the skull which is only weakly indicated in *Plateosaurus fraasianus* is rather prominent in our specimen. The orbital skeletal ring is present, but has been removed during the preparation.

Lower Jaw

Both lower jaws have lost their anterior part but are still in natural connection with the skull. The jaw is slender with dental foramen rather small. The lower border forms a rather straight line instead of a weakly ascending concave outline as in the case of *Plateosaurus fraasianus*. Posterior part of the articulation is rather slender.

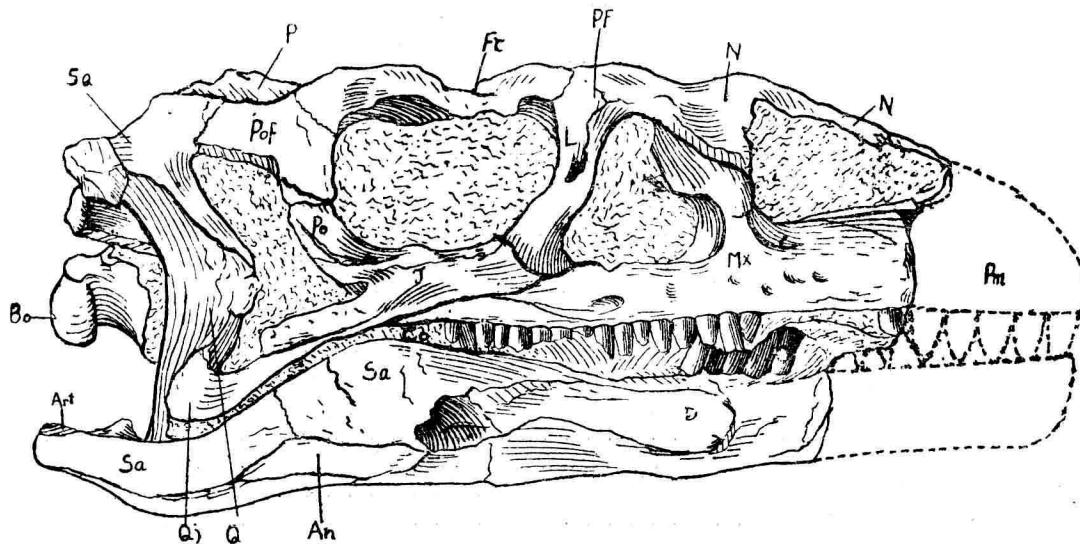


Fig. 4. *Lufengosaurus huenei* Young (gen. et sp. nov.). Skull in right side aspect. 1/2 nat size.

Dentition

Since both the anterior part of the upper and lower jaws are not preserved, the exact number of the teeth can not be given with confidence. In any case, it must be about one third less in number than that of *Plateosaurus fraasianus*, being ca. 27 in upper and 20 in lower. The general structure of the teeth resembles that of the above-mentioned form. The teeth are closely situated and in the upper row they start approximately from the point at the middle part below the orbit. Although there are only 18 teeth in the right and 7 in the left upper jaw and 5 in the right and 4 in the lower jaw actually preserved, the structure of the teeth is well displayed by several well preserved ones. It is only weakly laterally compressed and pointed. Both anterior and posterior edges are characterized by rather coarse serrations. The lower teeth seem to be still less compressed. All the teeth are rather straight and plump and of a primitive appearance. On the whole, they represent a very generalized dentition.

Measurements (in millimeter)

Length between the condyle and the premaxillaria	2250
Length between left quadratum and premaxillaria	225
Length between right squamosa and premaxillaria	2250
Length between the right teeth row and the premaxillaria	2150
Length of the left nasal opening	50
Height of the left nasal opening	35
Length of the left preorbital opening	44
Height of the left preorbital opening	39
Length of the left orbit	63
Height of the left orbit	52
Length of the right supratemporal opening	31
Breadth of the right supratemporal opening	29
Anterior height of the infratemporal opening	43
Posterior height of the infratemporal opening	56
Supralength of the infratemporal opening	23
Infralength of the infratemporal opening	41
Breadth of the skull between the prefrontalia	80
Breadth of the skull between the orbits	54
Breadth of the skull between the postfrontalia	107
Breadth of the skull between the posterior end of the squamosa	2100
Maximum at the quadratum joint surface	89
Maximum breadth at the jugalia	2100
Height of the skull behind the nasal opening	68
Height of the skull between the preorbital opening and the orbit	75
Height of the skull at the posterior end of maxilla	76
Height of the skull between the quadratum joint surface and the posterior end of squamosa	76
Height of the skull between the quadratum joint surface and the parietalia	85
Distance between the upper part of the condylus and upper part of parietalia	42
Distance between the upper part of the condylus and upper quadratum joint surface	38
Length of the right lower jaw	2260
Maximum height of the right lower jaw	40
Maximum breadth of the left lower jaw at the joint	28
Length of the right dental foramen	25
Breadth of the right dental foramen	19

Detailed description of the different bone elements

Since a part of the skull, the palatinal aspect, is still covered by matrix, the structure of a few bones can not be described. As many sutures between different bones are sometimes difficult to trace, some of the outlines are only tentative ones.

Basioccipital. The boundary between the basioccipital and adjacent bones is not clear. Compared with the sketches given by v. Huene for *Plateosaurus fraasianus*, it must afford the same general structure. The valley between the condylus and transversal ridge-like crista at the anterior part of the basioccipital is very deep. The transversal crista (posterior part of the tubera) is rather broad, being a little broader than the condylus. The most strange fact is that there is no trace of the foramen for carotis interna which can not be seen both in the palatinal and occipital aspects. It is probably concealed at the upper and anterior part of the transversal crista. Maximum breadth of the condylus 28 mm. Length of the basioccipital at the upper edge

of the condylus ?24 mm., at the lower edge ?28 mm. Breadth of the transversal crista 33 mm. As in *P. fransianus* the condylus lies at the plane of the palatinum-praemaxillaria, but the longitudinal axis through the median line of condyle seems to form a much lesser angle than the German form (only ca. 10 degrees).

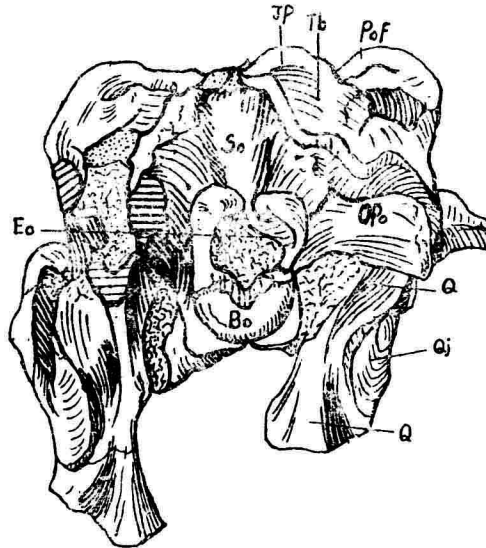


Fig. 5. *Lufengosaurus huenei* Young (gen. et sp. nov.). Skull in occipital aspect. 1/2 nat. size.

The bone elements from basisphenoid up to the palatal part of the maxillaria can not be described under the present state of preparation.

Exoccipital and opisthoticum. The boundary between these two bones and especially the former one with the condylus is distinctly indicated. The exoccipital forms the most part of the lateral border of the foramen magnum. The opisthoticum is a wing-like bone, bending weakly backwards. The upper part of the tip is in contact with the squamosa. Transversal breadth of foramen magnum is 20 mm, sagital 19 mm. Breadth of opisthoticum 32 mm., minimum height 14, at the tip 23; thickness at the tip 7 mm.

The stapes and proticum as well as the orbitosphenoid are still concealed in the matrix.

Supraoccipital. The structure of this bone is the most peculiar one among the occipital bones, being characterized by a slit bordered by the continuous swelling of the condylus, so that it forms the only upward opening along the border of the foramen magnum. The supraoccipital proper forms a rather sharp slope (about 45 degrees to the palatal-premaxillaria plane). Immediately above the mentioned slit, there is a median swelling very close to the foramen magnum, expanding anterior-upwards up to the interparietalia border. Laterally from this swelling, the bone is depressed a little in order to form again a small swelling and then to keep in connection with the opisthoticum. This opening at the uppermost part of the supraoccipital can not be seen clearly. The post temporal opening seems to be clearly indicated just at the side of the supraoccipital and above the opisthoticum.

Tabular and interparietal. These two bones are only preserved in the right side of which the supramargin is unfortunately broken. It is therefore probable that just the interparietal is gone. The exact boundary between these two bones is, however, not traceable. The tabular overhangs the opisthoticum considerably and its upwards-lateral connection with the squamosa can be seen from the top view of the skull.

Parietalia. The superior surface of the parietalia is damaged and covered by gypsum, so that an account of the detailed structure can not be given. The foramen parietale can not be traced with certainty either. The general position between the upper temporal openings is, however, doubtless the same as in the case of *P. fraasianus*. The minimum breadth is 11 mm. and both sides are indicated by a weak longitudinal ridges. The anterior border in connection with the frontal is at the line of the anterior margin of the upper temporal opening. The muscle attachment at the medial side of the upper temporal opening is distinct. The posterior and lateral extension of the parietalia passes to the interparietalia or upper part of tabular, in order to connect the squamosa.

Frontal. The median part of the frontal is a longitudinal swelling, both sides of which are characterized by a depression. Its posterior and lateral extension does not seem to reach the border of superior temporal opening. The boundary line marking off the nasalia is quite peculiar, with its middle part concave and lateral part convex. The boundary with the prefrontal is at first straight and then bends laterally in a right angle and then extends to the superior border of the orbit. The transversal process before the post frontal is missing but the lateral part of the frontal between the postfrontal and frontal takes a considerable part in forming the superior border of the orbit. Median length of the frontal 57 mm. Minimum breadth between praefrontal 26 mm.

Praefrontal. This bone is comparatively small, overhanging the upper and anterior part of the orbit with a distinct angular process. The posterior and inner sides are in connection with the frontal. The distinct posterior tip observed in *P. fraasianus* is absent in our form. The boundary with the nasalia seems to be represented by a transversally situated straight line. The anterior part of the praefrontal extends downwards, but apparently not so much as that of *P. fraasianus*. Length: 35 mm.

Nasalia. The anterior part of the skull is largely covered by nasalia. Posterior border is in connection with the frontal and praefrontal as described above. The maximum expansion of it is at the posterior of the bone above the upper corner of the preorbital opening. From there, the nasalia narrows gradually anteriorwards and forms a sharp point for inserting into the posterior part of the premaxillaria. The upper and most part of posterior border of the nasal opening are entirely edged by nasalia, but the bone does not extend so low and the posterior and lower corners of the nasal opening are thus confined by maxilla. For the upper and anterior part of the preorbital opening, the nasal takes only as a small portion as the boundary of the mentioned opening. The upper part of the nasalia is somewhat depressed, the middle of which is indicated by an opening where the matrix is exposed. The bone there is apparently very thin. Such an appearance, as explained by v. Huene, is due to the delicate structure of the bone. The nasal slopes from the middle portion and goes gradually downwards in order to reach the premaxillaria. Anterior part of the bone is damaged and was reconstructed with gypsum.

Premaxilla. A large part of this bone is unfortunately broken. In the right side, the bone seems to be gone just at the connection with the maxilla and the anterior part of the left maxilla seems to be even more damaged. A trace of premaxilla is only to be seen at the anterior part of the nasal, as posterior median process inserting into the nasalia. Although the muzzle is imperfectly preserved, the general structure of it can not be different in any considerable way from that of *P. fraasianus*, as reconstructed in the accompanying sketch. It is sharply pointed and laterally compressed.

Maxilla. As mentioned above, the anterior part of the left maxilla is partly broken. The posterior extension of the bone stretches to a point below the middle portion of the orbit under the anterior

process of the jugal. The lower margin is perfectly straight, about 37 mm. long below the nasal opening which is bordered anteriorly and superiorly by the premaxilla. The maxilla is comparatively high, about 16 mm., below the orbit and the preorbital opening. Between the nasal and the preorbital opening, the maxilla extends superior- and posteriorwards as an elongated process below the nasal, and forms the anterior border of the preorbital opening. Along the external side of the maxilla above the teeth, there is a series of blood canals (about 7 each side). The last tooth begins a short distance immediately before the posterior point of the maxilla. The other part of the bone is still concealed in the matrix.

Jugal. The jugal is composed of three processus meeting at the middle point of the bone. The remarkable difference from the other related form is that the middle part of the bone pushes considerably forward to, almost below the middle of the orbit, while in *P. fraasianus*, it is formed below the postorbital. The anterior process which is largely underlain by the posterior extension of the maxilla, slopes only below the lower end of lacrymal instead of reaching the posterior corner of the preorbital opening as in the case of the German form. The upper process, which is covered by postorbital, extends posterior- and superiorwards and fades away at the middle part of the anterior border of the lower temporal opening. Finally, the posterior process, extends only slightly downwards and is in connection with the quadratum-jugal. The last two processus form a very acute angle, less than 40 degrees, with lower anterior embayment of the inferior temporal opening, a point considerably different from other closely related forms which are indicated by a nearly right or even obtuse angle.

The jugal thus represents one of the most characteristic bones among the bones of the skull.

Lacrymal. This bone is also very characteristic. It bends less obtusely than other forms and the lower end seems to be still partly in connection with the maxilla, preventing the anterior process of the jugal from reaching the border of the preorbital opening. The minimum constriction is at the middle part of the pillar-like bone and the infralacrymal foramen lies rather high, the posterior opening of which can be seen clearly in lateral aspect of the skull. The lacrymal forms the entire posterior border of the preorbital opening and the large portion of the anterior edge of the orbit. The prefrontal at the superior and anterior border of the orbit extends only a little distance downwards.

Postfrontal. This three branched bone has its center of the bone considerably highly situated, near the upper and posterior corner of the orbit. The posterior branch is in connection with the anterior process of the squamosa, situating rather high so as to prevent the appearance of the superior temporal opening from the lateral aspect of the skull. The lower process of the postfrontal extends only 22 mm. from the superior margin of the skull downwards and is then in connection with the postorbital. The anterior process turns anteriorly and weakly upwards. It is separated by the lateral extension of the frontal about 10 mm. from the prefrontal.

Postorbital. This is the bone separating the orbit from the lower temporal opening and as an intermediated bone connecting the postfrontal and the jugal. Both the upper and lower sutures run in a parallel way from superior-posterior to anterior-inferior direction. It is a rather short element as compared with that of *P. fraasianus*.

Squamosa. Only the right squamosum is in good condition. It is a three-branched bone, the middle of which meets at the point approximately (slightly forwards) above the joint for the quadratum. This joint can not be well seen (as it is partly covered by gypsum), but probably has the same structure as

that of *P. fraasianus*. The anterior process takes half of the bridge separating upper and lower temporal opening and is in connection with the postfrontal by a oblique suture. The posterior process is the shortest one among the three and is in direct contact with the opisthoticum for the most part. The lower process directs down and anteriorly, forming the upper posterior border of the infratemporal opening. The posterior margin is in close connection with the quadratum.

Quadrato-jugal. This is a flat bone with two processus forming an acute embayment. It makes the lower posterior embayment of the infra temporal opening. The lower posterior part is flat with a well rounded angle directing down- and posteriorwards which prevent the appearance of the lower part of the quadratum from the lateral aspect. The upper process extends superior- and anteriorwards in order to meet the lower process of the squamosa and to form the lower posterior of the lower temporal opening. The lower process directs almost straight anteriorly (only slightly upwards) for meeting the posterior process of the jugal anteriorly and medially.

Quadratum. It is a broad and elongated bone in an outline similar to the humerus. It is convex medially and anteriorly with maximum breadth at the middle point of the bone. The ridge-like thickening along the inner side extends rather high and is prominent. The upper joint with the squamosa can not be seen clearly as it lies still in natural position in the right side, the very part of the left side being broken. Owing to a slight dislocation of the left lower jaw, the lower joint of the quadratum with the lower jaw is entirely exposed. It is about 20 mm. long and 7 mm. broad. The total length of the quadratum is about 77 mm.

Pterygoid. It is still largely covered by matrix; only the left and posterior part is exposed, which is composed of the left transverse process and the quadratum process. The latter one is still in connection with the quadratum. Below this, the basipterygoid process is also partly exposed.

The *Epipterygoid*, *Transversum*, *Palatinum* and *Vomer* can not be seen at present, as before mounting the skeleton in a permanent place, I dare not remove the matrix for fear that to do so may endanger the specimen in question during future transportation.

Sclerotical ring. From the right orbit, a nearly complete sclerotical ring is freely removed. It is an elongated oval opening, convexing outwards. It is a 45 mm. long and 26 mm. broad shell with the oval opening 26 mm. long and 16 mm. broad. Both the outer and inner margins are partly damaged. The maximum breadth of the ring is 13 mm. The specimen is composed of calcitic element with the external and the inner surface rather smooth. The supposed lower margin is more flat while the opposite side is more or less perpendicular to the longitudinal axis of the ring. Since the scale-like structure as described by v. Huene for *P. fraasianus* can not be observed, it is probable that the real sclerotical bone was gone and either only the cast of the ring is preserved or the ring was largely removed by mineralization after the death of the animal.

Lower jaw. The anterior parts of both jaws are broken. The right one is preserved only up to 80 mm. and the left one 60 mm. before the dental foramen. Whether the anterior missing part has the slight downwards bending as in the case of *P. fraasianus* can not be ascertained. The lower margin of the jaw, with the exception of the articular-angular border which is projecting downwards, is perfectly straight. Owing to the presence of numerous fractures caused by deformation, the sutures of different bones are difficult to trace with confidence. With the help of the sketch of *P. fraasianus* by v. Huene, they are tentatively