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ON *INDOBRACHYOPS PANCHETENSIS* GEN. ET SP. NOV.
FROM THE UPPER PANCHETS (LOWER TRIAS) OF THE
RANIGANJ COALFIELD.

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CONTENTS

	PAGE.
ABSTRACT	1
INTRODUCTION	1
STRATIGRAPHIC POSITION OF THE FOSSIL LOCALITY : AGE OF THE PANCHET BEDS	2
SYSTEMATIC DESCRIPTION	4
SUBORDER STEREOSPONDYLI	4
FAMILY BRACHYOPIDAE	4
SUBFAMILY BRACHYOPINAE	4
GENUS INDOBRACHYOPS, nov.	4
<i>Indobrachyops panchetensis</i> gen. et. sp. nov.	4
BRIEF DIAGNOSIS	8
COMPARISON	9
CONCLUSION	10

ON *INDOBRACHYOPS PANCHETENSIS* GEN. ET SP. NOV.
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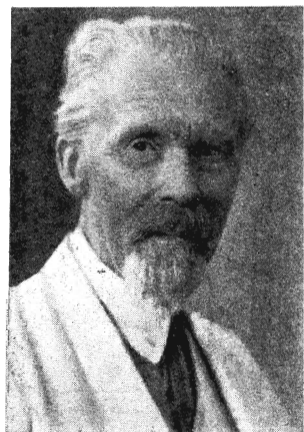
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ABSTRACT.—The authors discuss the age of the Panchet series and give detailed description and relationships of a new Labyrinthodont *Indobrachyops panchetensis* gen. et sp. nov. Though exploration of the beds containing Tetrapods has been in progress under the direction of M. R. Sahni since 1953 the need for further investigation of these beds is stressed. The Brachyopid *Indobrachyops panchetensis* is assigned to the Upper Panchets which are included in the Lower Trias, but may be uppermost Permian, in part.

INTRODUCTION

FROM the palaeontological as, indeed, from the economic viewpoint, few areas of the Indian continent are so important as the Bengal-Bihar Gondwana basin. Here lie



F. von Huene

entombed not only the diverse fossil plants composing the Gondwana flora, but a host of tetrapods including Labyrinthodonts and Reptiles. Some of the earliest members of these groups occurring in India come from these parts and were described by Huxley and Lydekker. The great significance of these remains lies in the fact that they take us sufficiently far back to the era that holds the secrets of reptilian and mammalian origins. And yet for nearly a hundred years no new collections have been made. The precise age of some of these deposits has also been somewhat uncertain. Indeed as will be seen in due course, the Panchet series



M. R. Sahni

in which the fossil skull was found have been assigned ages varying from the late Carboniferous to Lower Trias. According to the present authors a Lower Triassic age is most likely for the beds whence the fossil under description was obtained.

The recent collections of Panchet vertebrate fossils, Labyrinthodont and Reptiles, include those made by S. N. Puri of the Geological Survey of India the skull under description being the prize specimen found by Puri near Dhenua (1952). Reference to its systematic position as a member of the Brachyopidae was made in the Geological Survey of India reports and later in the Inaugural Number of the Journal of the Palaeontological Society of India, (Sahni, 1956 and 1957). Subsequent to the find of the Brachyopid under review by S. N. Puri in 1952, systematic exploration of beds containing Tetrapod fossils was recommenced in 1953-54 (after lapse of almost a century), under the direction of M. R. Sahni. Further work was carried out in 1957 under the same direction. These investigations have led to important fossil discoveries including *Pachygonia*, *Lystrosaurus* and other genera.

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STRATIGRAPHIC POSITION OF THE FOSSIL LOCALITY :
AGE OF THE PANCHET BEDS

Before giving a detailed description of the new genus *Indobrachyops*, the stratigraphic position of the fossil may be discussed in detail.

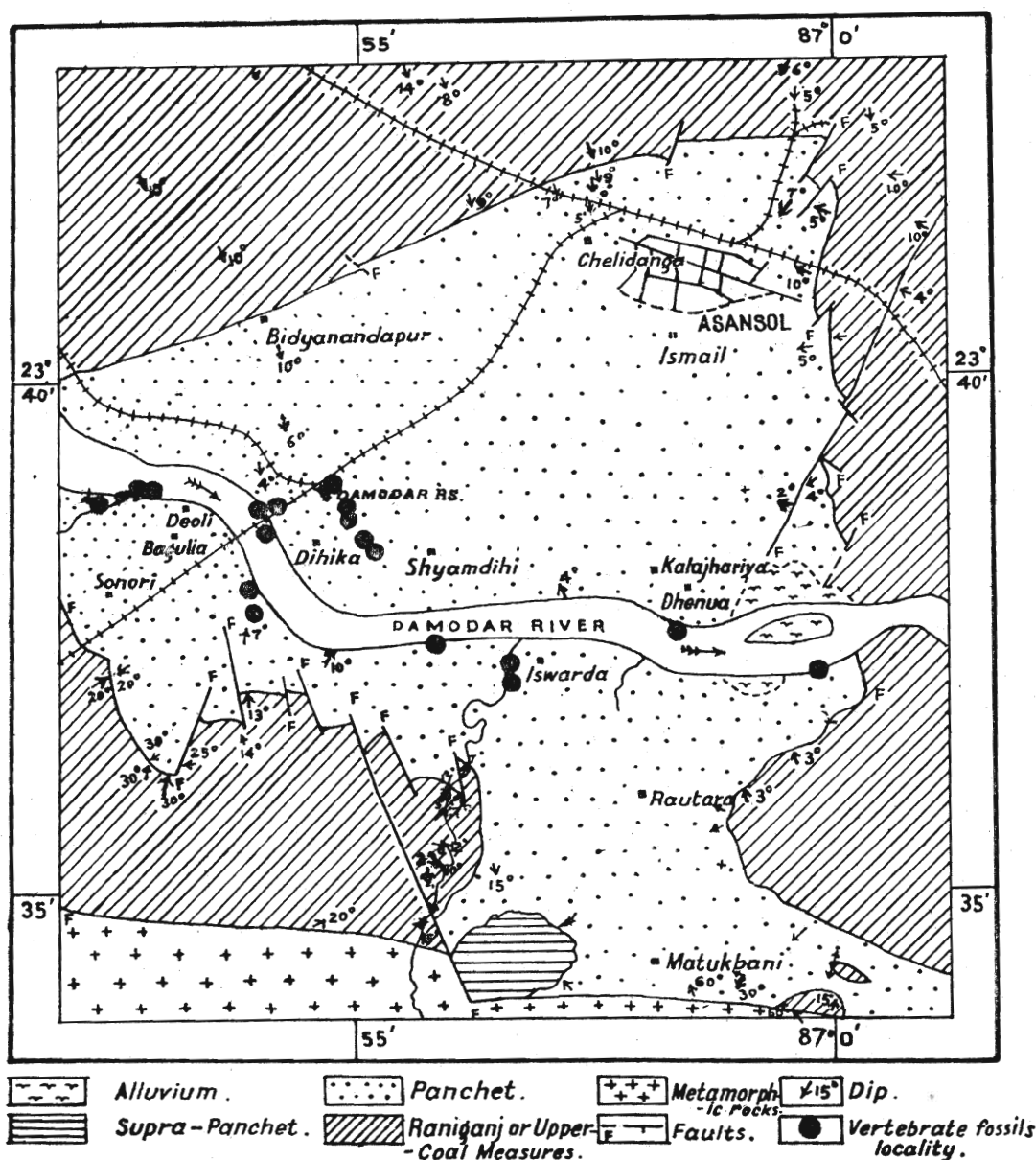
The Panchet series of the Raniganj coalfield area whence the fossil skull was obtained, overlies the Raniganj stage of the Gondwana system and is divided as follows :—

Upper Panchets : Hirapur stage ;

Lower Panchets : Maitur stage ;

Raniganj beds : Raniganj stage.

The Panchets which succeed the Raniganj stage with a slight unconformity are about 2,000 ft. thick. They are represented by a basal zone—the Maitur stage (Lower Panchets) and an upper group, the Hirapur stage. The lower division, i.e., the Maitur stage is from 300-400 ft. in thickness and includes thick khaki-green, silty shales and greenish brown mudstones. They are interbedded with brown,



TEXT-FIG. 1—Vertebrate fossil localities in the Panchets, Raniganj coalfield. Dhenua whence *Indobrachyops panchetensis* gen. et. sp. nov. was collected, lies on the left bank of the Damodar river. (After S. N. Puri.)

micaceous, sandy shales and shaly sandstones, together with fine to medium grained soft, false-bedded sandstones of yellowish or greenish grey colour. Intercalated in the argillaceous strata are, at intervals, hard calcareous lenticles. Bands of limestone have also been recorded. It may be remarked that these limestone bands have never been properly explored for fossil content. In view of the hitherto controversial, or at least uncertain, nature of the evidence bearing on the age of the Panchets, an examination of these limestones for fossil content is very desirable.

The Upper Panchets known as the Hirapur stage, consist of soft, micaceous sandstones. The sandstones vary in colour from grey to yellow or rusty brown and contain intercalated pebble beds, consisting of (a) khaki or green pebbles composed of shales or (b) pebbles of coal or shale. Sometimes nodules are also common, besides patches of sandstone with a spongy appearance (on a large scale) resulting from removal of embedded pebbles. The other lithological group is red clays, very characteristic of the Upper Panchets.

The vertebrate fossils appear to occur mainly in the Upper Panchets. During their field work in the season 1953-54 M. R. Sahní and S. N. Puri confirmed that these remains were mostly associated with those pebbly beds which contain pieces of *khaki* shales and coal, etc. Furthermore, when the number of pebbles in the pebble bed decreases, there is a relative decrease in the abundance of the fossils also. Considering the rolled condition of most of the bones and the presence of the pebbles themselves, Blanford (*Pal. Ind.*, Series IV, vol. I, pt. 1, 1865) had suggested that the Panchet reptiles and amphibians lived not in the broad river valleys where their fossils are found but in the tributaries of the main river, or at least not far from them. Their mode of occurrence throws significant light on this ecological aspect.

As pointed out by E. R. Gee (1934) the evidence regarding the age of the Panchets is conflicting. It is known that T. Oldham (1861) favoured an age near that of Buntersandstein and Keuper basing his conclusions on the evidence of the limited number of plant fossil genera, tetrapod (Dicynodont and Labyrinthodont) bones and the ostracod—*Estheria minuta*. G. de P. Cotter (1917) on the other hand suggested a Lower Triassic age. The identification by E. I. White of the fish scales from the Panchets as belonging to the genus *Amblypterus* found in the Carboniferous and Permian in other parts of the world, gives a Palaeozoic aspect to these rocks, suggesting an earlier age.

On the whole as a result of certain identifications which suggest the basal zone of the Trias we favour the Lower Triassic age, but perhaps the latest Permian cannot be entirely excluded.

A considerable expanse of sandstones belonging to the Upper Panchets is exposed in the bed of the Damodar river, near its left bank, about $\frac{1}{2}$ mile ssw of Dhenua ($23^{\circ} 38' : 86^{\circ} 58' 30''$). This sandstone is slightly micaceous, yellowish in colour and medium grained in texture. In some portions it is pebbly, the pebbles being of coal, shale, etc. It is from this stratum of sandstone that the fossil under investigation was collected, the co-ordinates of the locality being $23^{\circ} 37' 36'' : 86^{\circ} 58' 15''$. The bed from which the fossil was collected would occupy, according to S. N. Puri, a position roughly about 1,500 ft. above the base of the series. This is determined by him as follows :

The thickness of the strata between the sandstone bed containing the fossil and the base of the Panchets has been calculated on the basis of the structure, dip data of the Panchets between the fossil locality and the Panchet-Raniganj boundary in the north, given by A. K. Banerjee in his unpublished Progress Report (p. 13) for the Field Season 1926-27, sufficient data for this calculation being given on available maps. The portion concerned is quoted below :

"Throughout the northern part of the Panchet area, dip is steadily to the SSE. On the *nala* near the village Junut ($23^{\circ} 40' : 86^{\circ} 52'$) I got the angle of dip to be about 9° but near Bidyanandapur ($23^{\circ} 40' 40'' : 86^{\circ} 34'$) the value obtained was about 5° . In the area south of Asansol ($23^{\circ} 41' : 86^{\circ} 59'$) the dip continues the same as one proceeds to the south but about the latitude of Hirapur village, the inclination of the beds become less, the dip being about 4° . The beds get horizontal about the latitude of the village of Shyamadih ($23^{\circ} 38' 20'' : 86^{\circ} 55' 50''$) and a little north of the bank of the Damodar river the dip is found to have reversed to NNW".

Now due to synclinal structure of the Panchets between Asansol and the Damodar river, the sandstone bed from which the above fossil was collected would be expected to crop out near about the latitude of Hirapur ($23^{\circ} 39' 30'' : 86^{\circ} 56' 20''$) in the north. Taking an average dip of 6° , on the basis of the foregoing data, between the latitude of Hirapur and the Panchet-Raniganj boundary in the NNW, the thickness of the strata comes to about 1,400 ft. The locality thus lies in the U. Panchets.

SYSTEMATIC DESCRIPTION

Suborder STEREOSPONDYLI

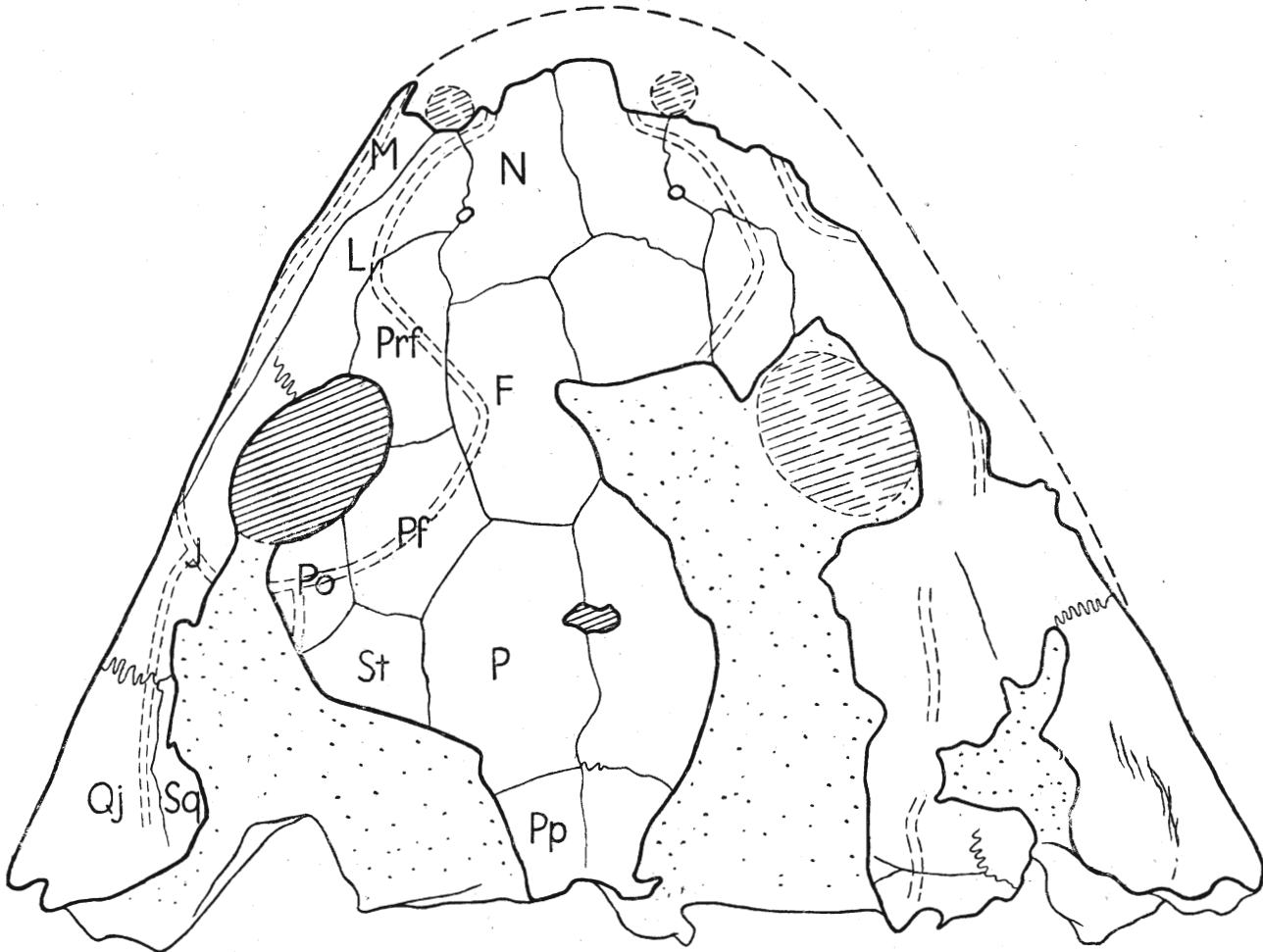
Family BRACHYOPIDAE

Subfamily BRACHYOPINAE

GENUS INDOBRACHYOPS nov.

INDOBRACHYOPS PANCHETENSIS sp. nov.

The skull is of triangular shape though broader than long (170/120 mm), and becomes higher in posterior direction. The snout is somewhat rounded. The orbits, of not very large size, are situated in the middle of the sides. The small nostrils are far in front and well separated from each other. Of nearly equal size is the *parietal foramen*; its position is farther back than the posterior border of the orbit, 30 mm from the posterior border of the skull. The exterior sculpture consists of pits and gutters separated by faveolate or vermiculose elevations, passing one into the other.



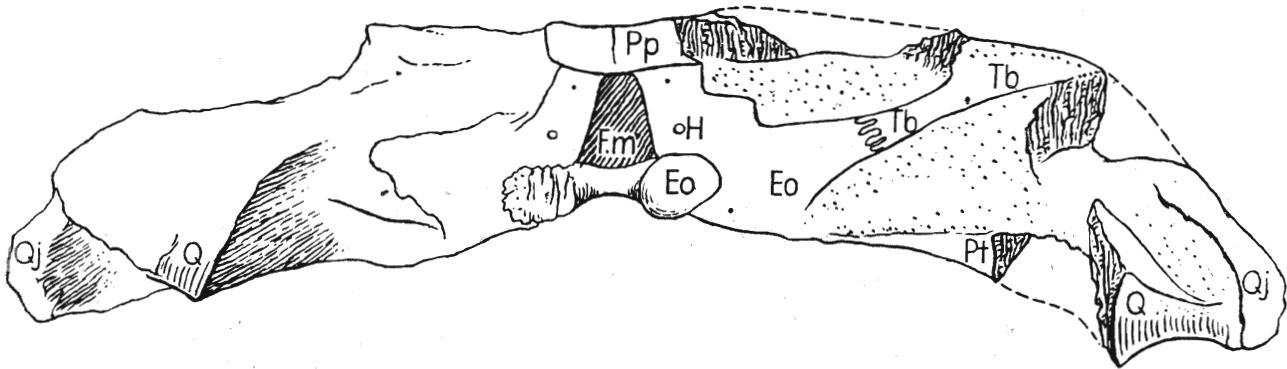
TEXT-FIG. 2—*Indobrachyops panchetensis* gen. et. sp. nov. dorsal view of skull; natural size.

F=Frontal, Fm=Foramen magnum, J=Jugal, M=Maxilla, N=Nasal, L=Lacrymal, Pf=Postfrontal, P=Parietal, Pp=Postparietal, Po=Postorbital, Prf=Prefrontal, Q=Quadrate, Qj=Quadratojugal, Sq=Squamosal, St=Supratemporal.

The lateral line grooves make their way through the sculptural ornamentation as shallow furrows (Pl. I.). They go round the nostril for some distance, and from about their middle, take a strong curve round the orbit, straightening again towards the nostril. From the orbital bow the line passes backwards straight through the *supratemporal* to the *tabular* and another through the *squamosal*, the latter making a small bend at the beginning of the squamosal.

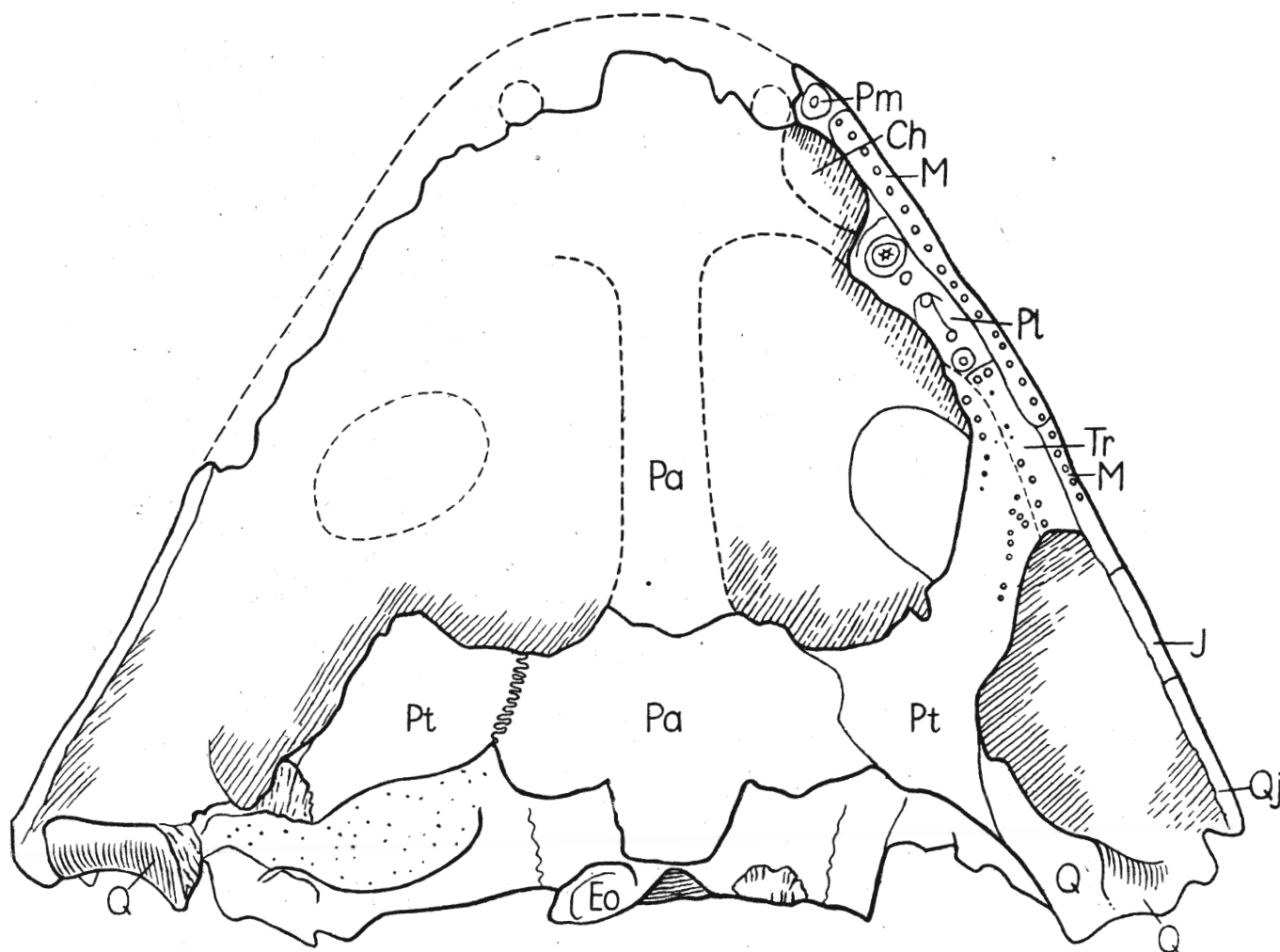
On the dorsal surface of the skull (Pl. I and text-figs. 2 and 5), the limits of the single bone elements are not everywhere very clearly visible and are often recognizable only with some difficulty. One impediment is that parts of the bony skull roof are missing, among these the anterior border of the snout and various parts of the posterior half of the bony roof. Fortunately, however, complementary parts are missing on the two sides, which enables one to complete the observations. The right side is less complete than the left.

The *parietals* are easily recognizable. Between them is the *parietal foramen* with a diameter of 4.5 mm. Its distance from the posterior border of the skull is 30 mm. About



TEXT-FIG. 3—*Indobrachyops panchetensis* gen. et sp. nov. Posterior view of skull; natural size. See text fig. 2. Eo=Exoccipital, Fm=Foramen magnum, H=exit of Hypoglossus nerve, Pf=Postfrontal, Pp=Postparietal, Pt=Pterygoid, Q=Quadrate, Qj=Quadratojugal, Tb=Tabular.

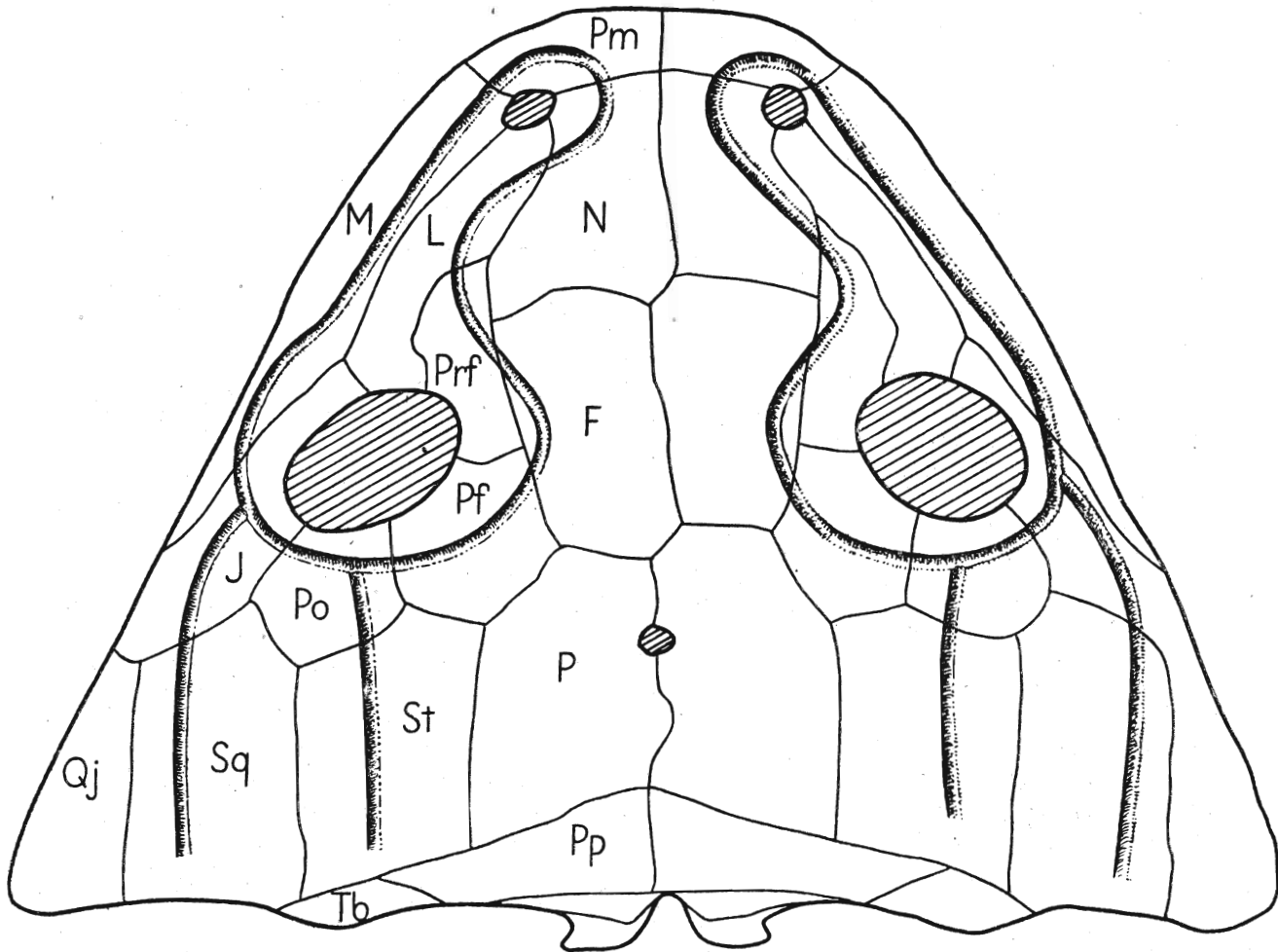
2/5 of the length of the bone is in front of the foramen. Only the lateral posterior angle of the left parietal is missing, while the major part of the mesial longitudinal half of the right one is preserved. The anterior border of the parietal forms a prominent angle against the prefrontal and the frontal. The median boundary between the parietals behind the foramen makes a shallow curve to the right. Behind the parietals is visible a small median part of the *postparietals* with the median suture and the posterior border of the skull-roof. This median suture appears to be 8.5 mm. long. In front of the parietals are the *frontals* of about the same length. They are somewhat less broad than the former. Their anterior and posterior borders are angulated. The angles are irregular and the median suture is a little oblique and displaced against that of the parietals. The bow of the circumorbital "lateral line" groove is on the frontal. This is not visible on the right side. The *nasals*, of nearly the same length as the frontals, become a little broader in the posterior part than the latter, but anteriorly they are narrower. They touch the nostrils as can be seen on the left side. The anterior limit of the left nasal is broken off in the straight suture itself, so that the *premaxilla* would have touched the nostril in front, but it is not preserved. On the right side, this part is missing. About half the border of the left nostril is preserved; the right one being a little in front of the fracture. The oval orbit with diameters of 26/19 mm. is limited on the mesial side by the *postfrontal*. At a small angle, it touches the frontal and the parietal as seen on the left side. The orbit borders the prefrontal along the narrow anterior part. From the anterior limit of the orbit, the prefrontal extends along the frontal and the posterior part of the nasal with a broad pointed portion which is laterally bordered by the lacrymal. This line contains an angle. The *lacrymal* is a long narrow bone between the orbit and the nostril. At its lateral side it is touched by the *maxilla*. This is the longest bone of the skull. Its anterior end reaching to the premaxilla is not preserved. Backwards, and following the jugal, it extends farther than the orbit. In



TEXT-FIG. 4—*Indobrachyops panchetensis* gen. et. sp. nov.; ventral view of skull; natural size. Ch=Choana, E=Exoccipital, J=Jugal, M=Maxilla, Pl=Palatine, Pa=Parasphenoid, Pm=Premaxilla, Pt=Pterygoid, Q=Quadrates, Qj=Quadratojugal, Tr=Transversal.

front, the maxilla touches the nostril, but not the orbit. It becomes very narrow at the posterior end. The whole lateral border of the orbit is formed by the *jugal*. Behind the maxilla the jugal forms the lateral border of the skull. 33 mm in front of the reconstructed posterior corner of the skull, the jugal abuts against the *quadratojugal* with a jagged suture. At the posterior border of the orbit, the jugal is limited by the postorbital which touches the postfrontal at the same orbital border. Only a few parts of the *postorbital* are preserved at the left side, the whole posterior border being missing. It must have formed an arch or an angle. A part of it is visible on the right side of the skull. The two elements behind the postorbital are only very incompletely preserved on either side. Only on the left side of the skull is the anterior part of the *supratemporal* seen touching the postorbital, postfrontal and parietal. Also, a part of its mesial limit is preserved. The lateral part of the *squamosal* is preserved, touching the jugal and quadratojugal. On the right side of the skull, more of the supratemporal is preserved but not the orbital border; at the posterior end, the limit of the incomplete *tabular* is visible. This is narrower than the part of the postparietals which is visible along the median line. The long, backwardly directed groove of the "lateral line" is visible on the right side of the skull; so also on the left side, but not very satisfactorily. Only very little of this lateral line is recognizable on the left side. This is better seen on the cast of the skull which was made earlier than the final preparation.

Posteriorly the skull is incomplete (text-fig. 3). In the middle is the high, triangular and rather narrow *foramen magnum*, bordered above by the *postparietals* and, at



TEXT FIG. 5—*Indobrachyops panchetensis* gen. et sp. nov. Restored dorsal view of skull ; natural size. F=Frontal, J=Jugal, L=Lacrymal, M=Maxilla, N=Nasal, P=Parietal, Pf=Postfrontal, Pm=Premaxilla, Po=Postorbital, Pp=Postparietal, Prf=Prefrontal, Qj=Quadratojugal, Sq=Squamosal, St=Supratemporal.

the sides, by the *exoccipitals* rising from the condyles which are separated from each other by a distance of 3 mm., the left one being broken off. The distance of the lateral borders from one condyle to the other (restored) is 19 mm. A little above the left condyle is the foramen for the hypoglossal nerve. On the right side, this region is not quite distinct. At the upper border, against the postparietal on both sides, there is a very small foramen, probably for a small blood vessel. No trace of a *supraoccipital* is present, the bone does not exist in this genus. In the large lateral part of the *exoccipital*, 6 mm. from the condyle, there is a large foramen, probably for the *vena jugularis interna*, and below it another small foramen which cannot be identified. The part of the bone surrounding the *foramen venae jugularis internae* in lateral direction forms a beam, 25 mm. long, rising slightly against the *tabular*; in the middle of that beam is the denticulated suture separating the *exoccipital* and the *tabular*. The posterior border of the upper *tabular*-plate is somewhat damaged. This beam is only visible on the right side. At the right posterior corner of the skull, the *quadrate* is preserved with its whole articular *trochlea*, 18 mm. in length and a lateral diameter of about 10 mm. From the *trochlea* the *quadrate* rises 15 mm. following the *quadrato-jugal*. Only at the left side is the mesial half of the *trochlea* preserved.

On the ventral side of the skull the skullbase and most of the left side of the palate is visible, besides the articular part (Pl. 2 and text-fig. 5). A straight line connecting both *quadrates* also goes through the condyles. No trace of a *basioccipital* can be seen near the condyles. The whole base of the skull is covered by the broad

parasphenoid with a confused, slightly pitted surface. Its posterior border is directly below the condyles, but only in a breadth of 12 mm. In a distance of 13 mm. from the condyles, it becomes 40 mm. broad. On both sides of the *parasphenoid*, before it becomes so broad, the *exoccipitals* are visible and, as it seems, in the corner on both sides, a very small part of the *basisphenoid*, but not the *basioccipital*. The *parasphenoid* touches the *pterygoid* in a length of 14 mm. laterally to the point where the very large palatal opening begins. This opening must have been about 55 mm. long and 30 mm. broad. The narrow anterior part of the *parasphenoid* separating the palatal openings is broken off. The left *pterygoid* is well preserved and is in contact with the quadrate, *parasphenoid* and transversal. A pointed branch of it extends towards the posterior face of the quadrate; the anterior branch against the transversal is 14 mm. broad, the posterior border of this branch forms a corner against the prequadrate opening of the palate. At the lateral end, the *pterygoid* touches the transversal in oblique manner, so that its most anterior point is besides the anterior end of the transversal. The *pterygoid* bears quite a number of very small teeth on both its longitudinal borders; four can be counted on the posterior and 5 or 6 on the anterior border and 1 in the middle of the contact with the transversal. The sutures of the *transversal* cannot be seen on account of a mended fracture. It must have had a length of 22 mm. A longitudinal series of 8 small teeth is probably present on the transversal though the suture is invisible. On its anterior end are 2 small teeth in transverse direction. The *palatine* is very narrow, only 4 mm. broad in the middle, a little more at both ends. It bears one big tooth at each end and near each of these a deepened face for another. There is an elevated longitudinal ridge in the space between these teeth. Just in front of the anterior big tooth, where the *palatine* is 10 mm. broad, it suddenly becomes very narrow. Also present is the thick vaulted lateral border of the left *choana*, formed by a small point of the *palatine*, but principally consisting of the *vomer*. This is the only part of this bone preserved. The length of this choanal border is 12 mm.; the outer limit of the palatal view, in front of the quadrate, consists of the sharp edge of the quadratojugal, the jugal and the narrow border of the teeth-bearing *maxilla*. The latter is 75 mm. long. In front of this *maxilla* border there is still 7 mm. of the *premaxilla* with one big tooth whose point is broken off and therefore shows the frilled structure. The *maxilla* bears a great number of small peglike teeth, probably there may have been about 25, the greater number of them being preserved.

BRIEF DIAGNOSIS

Skull triangular, a little broader than long; without otical notch, double condyles, no intertemporal; orbit not large, and situated at the middle of the sidelength; very large and broad palatal openings; base of skull covered by *parasphenoid*; *pterygoid* and *palatine* very narrow, prequadrate palatal opening relatively small, *choana* very small and situated far in front.

All these characters of the skull belong to the family *Brachyopidae* and the name *Indobrachyops panchetensis* gen. et sp. nov. is proposed.

Holotype—G. s. i. type no. 17754

Horizon—Upper Panchets (Lower Trias, vide also p. 3)

Locality—near Dhenua (23° 38' : 86° 58' 30") topo-sheet—Raniganj coalfield.

COMPARISON

In *Eobrachyops* Watson (2 species) from the lower Permian of Texas there is no otic notch as in all Brachyopids. There is a tripartite condyle and small parts of the basioccipital are visible besides the parasphenoid. The orbits are farther in front than in *Indobrachyops*. An intertemporal is present in the roof of the skull, therefore, the supratemporal is relatively short; the postorbital is long and pointed behind, and touches the supratemporal in a point. The squamosal is much larger than the supratemporal. The postparietals are a good deal broader than in *Indobrachyops*. The upper face of the tabular is extremely small and narrow and the posterior border of the roof of the skull forms a straight line in dorsal view, but the curvature of the height of the skull—seen from behind—is much more than in *Indobrachyops*. In the palate, the pterygoid with narrow anterior branch and the prequadrate opening behind it, is a good deal longer than in *Indobrachyops*, also the shape of the parasphenoid at the base of the skull with narrow side branches is absolutely different, the quadrate-branch of the pterygoid much broader and the sculpture of the roof of skull with more ray-like grooves on most of the single bones than in *Indobrachyops*.

In *Bothriceps australis* Huxley from the Upper Permian of New South Wales the orbits are also relatively small, the parietals are longer than in *Indobrachyops*. The postparietals are a good deal broader (longer) and the tabular has the same narrow process against the exoccipital on the posterior side of the skull as in *Indobrachyops*. The intertemporal is absent. The sides of the skull in posterior view are more curved downwards than in *Indobrachyops*, but not quite so much as in *Eobrachyops*. On the ventral side, the parasphenoid and exoccipital are rather similar to those in *Indobrachyops*. The pterygoid is much broader than in the latter, otherwise there is much similarity.

Tracheosaurus Watson (*Bothriceps major* A. S. Woodward) from the Upper Permian coal measures of New Castle in New South Wales has the same shape of the tabular at the posterior side of the skull, but is dorsally larger than in *Bothriceps australis*. The shape of the skull is the same as in *Bothriceps australis*, but the orbits are smaller.

Very similar in proportions is *Dvinosaurus* Amalitzki from the north Russian Upper Permian according to Bystrow's excellent figures and descriptions. The outline is more rounded and the tabulars are a little bigger. The branchial apparatus is not preserved in *Indobrachyops*, but the pterygoid and palatinum are broader in *Dvinosaurus*. Its basisphenoid is visible in front of the condyles, also a supraoccipital is still present. This latter is missing in *Bothriceps* and probably in *Tracheosaurus* and *Brachyops* as in *Indobrachyops*.

Chalcosaurus H. v. Meyer from the Upper Permian Kupferschiefer of Germany is very similar to *Dvinosaurus*.

Brachyops laticeps Owen probably from the Lower Trias of Mangli in India, has a skull of similar shape as in *Indobrachyops*, but the occiput projects backwards a good deal more. The parasphenoid seems to be longer than in *Indobrachyops* and the postorbital and squamosal are broader.

Pachygonia incurvata Huxley from the Panchet formation of India is only part of a lower jaw with a somewhat similar sculpture as in *Indobrachyops*, but the curvature demonstrates a different shape of the skull.

The small skull of *Platycephalus wilkinsoni* Stephens from the Lower Trias of New South Wales is possibly a larval form. It has big postparietals, big squamosal and small supratemporals. The eyes are rather large.

Tungussogyrinus Efremov from the North Siberian Lower Trias is a very small and incomplete skull of Brachyopid shape with the posterior part of the parasphenoid broadened and with large palatal openings.

Batrachosuchus watsoni Haughton from the Middle Triassic *Cynognathus* zone of South Africa has a broader and more rounded shape of the skull, and the condyles project more backwards than the quadrate. Also viewed from behind, the skull is much more curved downward, than in *Indobrachyops*. The palatal openings have different shape and the pterygoid is broader in its posterior part. The lateral line grooves of the dorsal side are very much broader than in *Indobrachyops*, also their arrangement is different behind the eyes. The orbits are far more in front than in *Indobrachyops*.

Xestorhytias H. v. Meyer from the Upper Muschelkalk of Lothringen consists only of fragments of skull with ornamentation similar to *Plagiosuchus*.

Chigutisaurus Rusconi from the Middle Trias of Mendoza in Argentina is similar to *Pelorocephalus*.

Taphrognathus Welles from the Middle Trias of Arizona has also a similar shape of skull to *Pelorocephalus*.

Pelorocephalus Cabrera from the Middle Trias of Mendoza in Argentina only demonstrates a skull of similar shape to that of *Batrachosuchus*, and the much projecting condyles.

Plagiosternum E. Fraas from the uppermost Muschelkalk of southern Germany has an extremely broad skull with very large orbits filling most part of the face and likewise large palatal openings, and the condyles projecting backwards a great deal.

Plagiosuchus Huene from the Lettenkohle of the lowest Keuper in South Germany is of similar shape, but has very broad pterygoids.

Gerrothorax Nilsson from the Upper Keuper of Sweden and Germany is of exceptional breadth, with enormous orbits and palatal openings, and the condyles project backwards more than the quadrates.

The aforementioned specialized genera (from *Batrachosuchus* to *Gerrothorax*) constitute the subfamily Plagiosaurinae of the Brachyopidae. *Indobrachyops* is a typical Brachyopid standing between *Bothriceps*, *Dvinosaurus* and *Brachyops* as the nearest relatives. But *Dvinosaurus* still retains the supraoccipital as in *Eobrachyops* and is, therefore, more primitive than *Indobrachyops*. Though *Bothriceps* and *Brachyops* are rather similar, they possess minor differences too.

Among the earlier Labyrinthodonts there is a striking similarity in shape with the Upper Carboniferous *Tutidanus sculptilis* Moodie from Pennsylvania (*Journ of Geol.*, xvii. 1909, p. 62, fig. 12). This might possibly be the earliest Brachyopid, though some of the roof-bones have different proportions, and, as in later Brachyopids, there is no intertemporal. Two other species of this genus described by Moodie have a very slight tendency towards forming an otic notch. But *Micrerpeton caudatum* Moodie (in the same paper) from the Upper Carboniferous of Mazon Creek in Illinois has quite a Brachyopid structure and shape of skull. It therefore seems that the Brachyopids had already originated in Carboniferous times.

In Permian and Triassic times the distribution of the Brachyopid genera is as follows :—

Permian	Lower	—	<i>Eobrachyops</i>	..	..	Texas
			<i>Bothriceps</i>	..	..	Australia
	Upper	—	<i>Tracheosaurus</i>	..	..	Australia
			<i>Dvinosaurus</i>	..	..	Russia
			? <i>Chalcosaurus</i>	..	..	France
Triassic	Lower	—	<i>Indobrachyops</i>	..	..	India
			<i>Pachygonia</i>	..	..	India
			<i>Brachyops</i>	..	..	India
			<i>Platyceps</i>	..	..	Australia
			<i>Tungussogyrinus</i>	..	..	Siberia
			<i>Batrachosuchus</i>	..	..	South Africa
			? <i>Xestorhytias</i>	..	..	France
	Middle	—	? <i>Taphrognathus</i>	..	..	Ohio
			<i>Pelorocephalus</i>	..	..	Argentina
			? <i>Chigutisaurus</i>	..	..	Argentina
			<i>Plagiosternum</i>	..	..	Germany
			<i>Plagiosuchus</i>	..	..	Germany
			<i>Plagiosaurus</i>	..	..	Germany
	Upper	—	<i>Gerrothorax</i>	..	..	Germany, Sweden

Some other Carboniferous and Lower Permian Labyrinthodonts also demonstrate certain similarities with Brachyopids. Some of them have only a little backwards projecting tabular row in the roof of the skull and so an incipient otic notch. Amongst others might be mentioned *Erpetosuchus* Moodie, *Pelion* Wyman, *Dawsonia* Fritsch and *Trimerorhachis* Cope. Another such genus is *Platystegos* Dawson (non *Platystega* Wiman). They cannot be taken as being Brachyopids, but they might possibly be grouped near their root. Some of them have no intertemporal. It is not proposed here to classify and value all the numerous Carboniferous Labyrinthodonts and to arrange their families phylogenetically.

CONCLUSION

The Brachyopids are known as a family of worldwide distribution in Permian and Triassic times, clearly separated from other contemporary families by the missing otic notch. *Indobrachyops panchetensis* gen. et sp. nov. described here is one of the most primitive forms of the Lower Trias of India.

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EXPLANATION OF PLATE I

INDOBACHYOPS PANCHETENSIS GEN. ET SP. NOV.

DORSAL VIEW OF SKULL; NATURAL SIZE.



VON HUENE AND SAHNI : INDOBRACHYOPS PANCHETENSIS GEN. ET SP. NOV. DORSAL VIEW OF SKULL ; NATURAL SIZE.

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