

RINCHEN BARSBOLD

## SAURORNITHOIDIDAE, A NEW FAMILY OF SMALL THEROPOD DINOSAURS FROM CENTRAL ASIA AND NORTH AMERICA

(Plates I-IV)

*Abstract.* — *Saurornithoides junior* n.sp. from the Nemegt Formation (Maastrichtian) of the Gobi Desert (Mongolia) is described on the basis of a nearly complete skull and fragmentary postcranial skeleton. The genera *Saurornithoides* OSBORN, 1924 and *Stenonychosaurus* STERNBERG, 1932 have much in common and the new family Saurornithoididae is proposed for them; it is characterized by the presence of parasphenoid capsule or „bulbous” structure known elsewhere only in the Ornithomimidae, a deep lateral depression on the lateral wall of the braincase, a part of which is occupied by the middle ear cavity, and the modification of the second digit in the pes as a weapon, known elsewhere only in the Dromaeosauridae. The teeth of *Saurornithoides* OSBORN differ strongly from those of *Troödon* LEIDY, forming the basis for removing *Saurornithoides* and *Stenonychosaurus* from the Troödontidae. The family Troödontidae with a single genus *Troödon* known only from fragments, is poorly defined and of uncertain validity.

### INTRODUCTION

During the field work carried out in 1964 by a group of Mongolian and Soviet palaeontologists<sup>1</sup> at the locality of Bugeen Tsav, situated some 50 km north west of the Nemegt Basin in the Gobi Desert, a nearly complete skull associated with some fragments of the postcranial skeleton of a small theropod dinosaur was found. The specimen closely resembles the type of *Saurornithoides mongoliensis* OSBORN, 1924, discovered by the Central Asiatic Expedition of the American Museum of Natural History in New York in 1923 at Bayn Dzak (Shabarakh Usu) in the Upper Cretaceous Djadokhta Formation (OSBORN, 1924; BERKEY & MORRIS, 1927). The new small theropod from Bugeen Tsav is assigned to the genus *Saurornithoides* OSBORN, 1924 and described in the present paper as *Saurornithoides junior* n.sp.

The age of the Djadokhta Formation has been estimated on the basis of the differentiation of the multituberculate fauna as Coniacian or Santonian (KIELAN-JAWOROWSKA, 1970). The deposits of Bugeen Tsav in which *S. junior* was found also yielded a fauna of large dinosaurs such as *Tarbosaurus bataar* (MALEYEV), *Saurolophus angustirostris* ROZHDESTVENSKY, as well as ornithomimid and armoured dinosaurs, which is characteristic of the Upper Nemegt Beds (GRADZIŃSKI *et al.*, 1969). Those deposits were designated by MARTINSON *et al.* (1969) as the

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<sup>1</sup> In the field work took part the following persons from the Academy of Sciences, Mongolian People's Republic, Ulan Bator: Dr. NAMNANDORGE, leader (Geographical Institute), Dr. D. DASHZEVEG, Dr. P. KHOSBAYAR (both Geological Institute), Mr. N. DOVCHIN (Biological Institute) also Dr. P. K. CHUDINOV and Dr. B. A. TROFIMOV (both Palaeontological Institute, Academy of Sciences, USSR, Moscow).

Nemegt Formation. It therefore seems quite reasonable to assign the deposits of Bugeen Tsav, in which *S. junior* was found, to the Nemegt Formation.

Conformably underlying the Nemegt Formation within the Nemegt Basin are the Lower Nemegt Beds (GRADZIŃSKI, 1970), which were regarded by EFREMOV (1954) as „the unfossiliferous series” and designated by MARTINSON *et al.* (1969) as the Barun Goyot Formation. An abundant and diversified fauna of mammals, lizards, dinosaurs and dinosaur eggs was found in this unit by the Polish-Mongolian Palaeontological Expeditions in 1970 and 1971 (KIELAN-JAWOROWSKA & BARSBOLD, 1972). The age of the Barun Goyot Formation has been estimated by KIELAN-JAWOROWSKA (1974) on the basis of the differentiation of the multituberculate fauna as Campanian, while the Nemegt Formation (Upper Nemegt Beds) is regarded by various authors as of Maastrichtian or Latest Campanian and Early Maastrichtian age (MARTINSON *et al.*, 1969; OSMÓLSKA *et al.*, 1972; KIELAN-JAWOROWSKA & BARSBOLD, 1972; KIELAN-JAWOROWSKA, 1974). Remains of *Protoceratops* sp. and *Velociraptor* sp., known previously from the Djadokhta Formation, were recently found (KIELAN-JAWOROWSKA & BARSBOLD, 1972) in the Barun Goyot Formation. Remains of *Saurornithoides* OSBORN, 1924 have not yet been recovered from this formation. Presumably, further collecting in the various localities of the Barun Goyot Formation will yield remains of this genus as it is known to occur in the older Djadokhta Formation and younger Nemegt Formation in the same region.

The Asiatic genus *Saurornithoides* OSBORN, 1924 appears to be related to the North American genus *Stenonychosaurus* STERNBERG, 1932. COLBERT & D. RUSSELL (1969) and OSTROM (1969) were the first to draw attention to the similarities between *Saurornithoides mongoliensis* OSBORN, 1924 and *Stenonychosaurus inequalis* STERNBERG, 1932, although D. RUSSELL (1969) referred them to the family Troödontidae in sense of L. RUSSELL (1948), whereas OSTROM (1969) referred them to the family Dromaeosauridae MATTHEW & BROWN, 1922. *Saurornithoides* OSBORN and *Stenonychosaurus* STERNBERG are closely related, and the former differs significantly in tooth structure from the type of *Troödon formosus* LEIDY. On the other hand, *Saurornithoides* and *Stenonychosaurus* show some important peculiarities which distinguish them from all other known theropods. For this reason a new family, the *Saurornithoididae*, is here created for their inclusion.

The existence of closely related representatives of this family in Late Cretaceous deposits in Central Asia and North America appears to constitute additional evidence of the similarity between the Late Cretaceous dinosaur faunas of both continents.

The type specimen of *Saurornithoides junior* n. sp., described in the present paper, is housed in the Section of Palaeontology and Stratigraphy of the Geological Institute, Academy of Sciences, Ulan Bator.

The following abbreviations indicate the place of storage of specimens:

- A. M. N. H. — American Museum of Natural History,
- ANSP — Academy of Natural Sciences of Philadelphia,
- GI — Geological Institute, Ulan Bator,
- NMC — National Museum of Natural Sciences, National Museums of Canada,
- ROM — Royal Ontario Museum.

#### ACKNOWLEDGMENTS

I wish to express my deep gratitude to Prof. Z. KIELAN-JAWOROWSKA, Director of the Palaeozoological Institute of the Polish Academy of Sciences in Warsaw, and Dr. H. OSMÓLSKA, of the same Institute, for their kind assistance and interest in my studies. I am also grateful

to Dr. T. MARYAŃSKA (Museum of the Earth, Polish Academy of Sciences), Dr. E. RONIOWICZ (Palaeozoological Institute, Polish Academy of Sciences) and Mr. A. PERLE (Geological Institute, Ulan Bator), for valuable discussion regarding some aspects of the morphology of theropod dinosaurs.

Special thanks are due to Dr. D. A. RUSSELL (National Museum of Canada, Ottawa), and Dr. J. H. OSTROM (Peabody Museum, Yale University, New Haven) who kindly read the English text of the present paper and offered helpful criticism.

During my visit in the Palaeozoological Institute of the Polish Academy of Sciences in Warsaw in 1972, I was able to examine the skull of the type specimen of *Saurornithoides mongoliensis* OSBORN, 1924 (A. M. N. H. 6516), which was made available to the Palaeozoological Institute in Warsaw through the courtesy of Dr. E. S. GAFFNEY (Department of Vertebrate Paleontology, American Museum of Natural History) and transported to Warsaw by Prof. Z. KIELAN-JAWOROWSKA. The American Museum of Natural History generously approved further preparation of the specimen, which was skillfully carried out by Mrs. J. SKARŻYŃSKA, and also allowed it to be figured in the present paper. The photographs were taken by Mr. W. SKARŻYŃSKI and the present author. Figure 5 was drawn by Mrs. K. BUDZYŃSKA. Mr. B. NAMSRAY (Geological Institute, Ulan Bator) prepared all of the material of *Saurornithoides junior* n.sp. I am grateful to all for their valuable assistance.

## SYSTEMATICS

### Suborder THEROPODA

### Family SAURORNITHOIDIDAE nov.

**Diagnosis.** — Small to moderate-sized, lightly built theropods. Skull with parasphenoid capsule and deep lateral depression, part of which is occupied by middle ear cavity (both characters known only in *Saurornithoides junior* n.sp.). Teeth relatively small, closely spaced. Six sacral vertebrae; first caudal vertebra included functionally into sacrum and firmly fused with it. Caudal prezygapophyses comparatively short, ossified tendons in tail not developed. Pes functionally didactyl. Metatarsal IV more robust than metatarsal II; metatarsal III strongly pinched proximally. Digit II modified as an offensive or predatory weapon; trenchant claw lightly developed. Digits III and IV normal and subequal in size, digits I and V reduced.

Referred genera: *Saurornithoides* OSBORN, 1924; *Stenonychosaurus* STERNBERG, 1932 (it is possible that *Stenonychosaurus* is a junior synonym of *Saurornithoides*).

**Distribution.** — ?Coniacian or Santonian to Maastrichtian, Central Asia and North America.

**Discussion** — See p. 18.

### Genus SAURORNITHOIDES OSBORN, 1924

**Diagnosis.** — As for the family.

Species assigned: *Saurornithoides mongoliensis* OSBORN, 1924 and *Saurornithoides junior* n.sp.

**Distribution.** — ?Coniacian or Santonian to Maastrichtian, Gobi Desert, Mongolia,

**Saurornithoides junior** n.sp.(Pl. I, Fig. 1; Pl. II, Fig. 2; Pl. III; Pl. IV, Figs. 2-3; Text-figs. 1-5, 6, *d-l*)

*Type specimen*: GI No. SPS 100—1, including a skull in which the palatal region; quadrates, quadratojugals, the left jugal, postorbital and squamosal are absent; anterior parts of both lower jaws, the sacrum, an incomplete series of caudal vertebrae, the proximal end of the right metatarsus and adjoining tarsals, the distal end of the right tibia and fibula, and adjoining astragalus and calcaneum.

*Type horizon and locality*: Maastrichtian, Nemegt Formation (Upper Nemegt Beds), zone of *Tarbosaurus bataar* (MALEYEV) and *Saurolophus angustirostris* ROZHDESTVENSKY, Bugeen Tsav, Gobi Desert, Mongolia.

**Diagnosis.** — Comparatively large *Saurornithoides* with 20 maxillary and 35 dentary teeth.

**Description.** — *General shape of skull*: The snout (Pl. I, Fig. 1; Pl. II, Fig. 2; Pl. III, Fig. 2; Text-figs. 1, 2*a*) is strongly elongated and gradually tapers anteriorly from the temporal region of the skull. The occipital region is broad, and the supraoccipital is high and rectangular. The braincase includes the parasphenoid capsule and contains deep lateral depressions. The jugal is not enlarged at the point where it sends two processes posteriorly. The external nares are bounded posteroventrally by the maxillae, which medially form the broad floor of the nares. The premaxillae lack inferior processes, but bound the nares anteroventrally; the internarial ramii of the premaxillae are wedged between nasals. The dentary is long and shallow. The splenial with long, wedge-shaped anterior lamina which overlaps the most part of the postero-medial half of the dentary<sup>2</sup>.

*Braincase*: The most remarkable features of the braincase are the presence of the parasphenoid capsule, or „bulbous” structure (OSMÓLSKA *et al.*, 1972), and the unusual development of the deep lateral depression (Pl. III, Fig. 2; Text-fig. 1). The latter structure is associated with the middle ear cavity. The capsule has been described only in the braincase of the Mongolian ornithomimid *Gallimimus bullatus* by OSMÓLSKA *et al.*, 1972. Because it is found in *Saurornithoides junior* n.sp. as well, it must have developed in parallel fashion within the braincases of the two separated theropod families, the Ornithomimidae and the Saurornithoididae. Many of the sutures between the bones of the braincase are clearly visible, but the precise limits of some elements are difficult to trace.

The basioccipital (Text-fig. 1) seems to form only the small part of the lower margin of the foramen magnum and possibly extends from the occipital condyle medially to the exoccipital, although the suture between basioccipital and exoccipital is not visible here. If this is the case, *Saurornithoides junior* n.sp. would not differ in this respect from all of the known theropods, where both the basioccipital and the exoccipital participate in the structure of condyle and form the lower part of the foramen magnum. The condylar neck is well-developed. Ventrally the suture between basioccipital and basisphenoid is not visible. The basioccipital tubera are relatively smaller and less robust than the same structures in ornithomimids, resembling those in the dromaeosaurids in this respect. In ventral view the lateral wing of the basioccipital forms the inferior wall of the lateral depression.

The exoccipital (Text-figs. 1*b*, 2*a*) is narrow and deep and contributes to the lateral margin of the strongly vertically elongated foramen magnum. The suture between the exoccipital and supraoccipital is obscure, and it is impossible to discern whether or not the supraoccipital enters the dorsal margin of the foramen magnum. It seems that two exoccipitals are closely situated on the upper surface of the occipital condyle, in contrast to the condition in *Dromaeosaurus*, in which they are widely separated (COLBERT & RUSSELL, 1969). A cluster of the

<sup>2</sup> As the bones of the snout in *S. junior* do not differ from those in *S. mongoliensis*, they are not described in detail in the present paper.

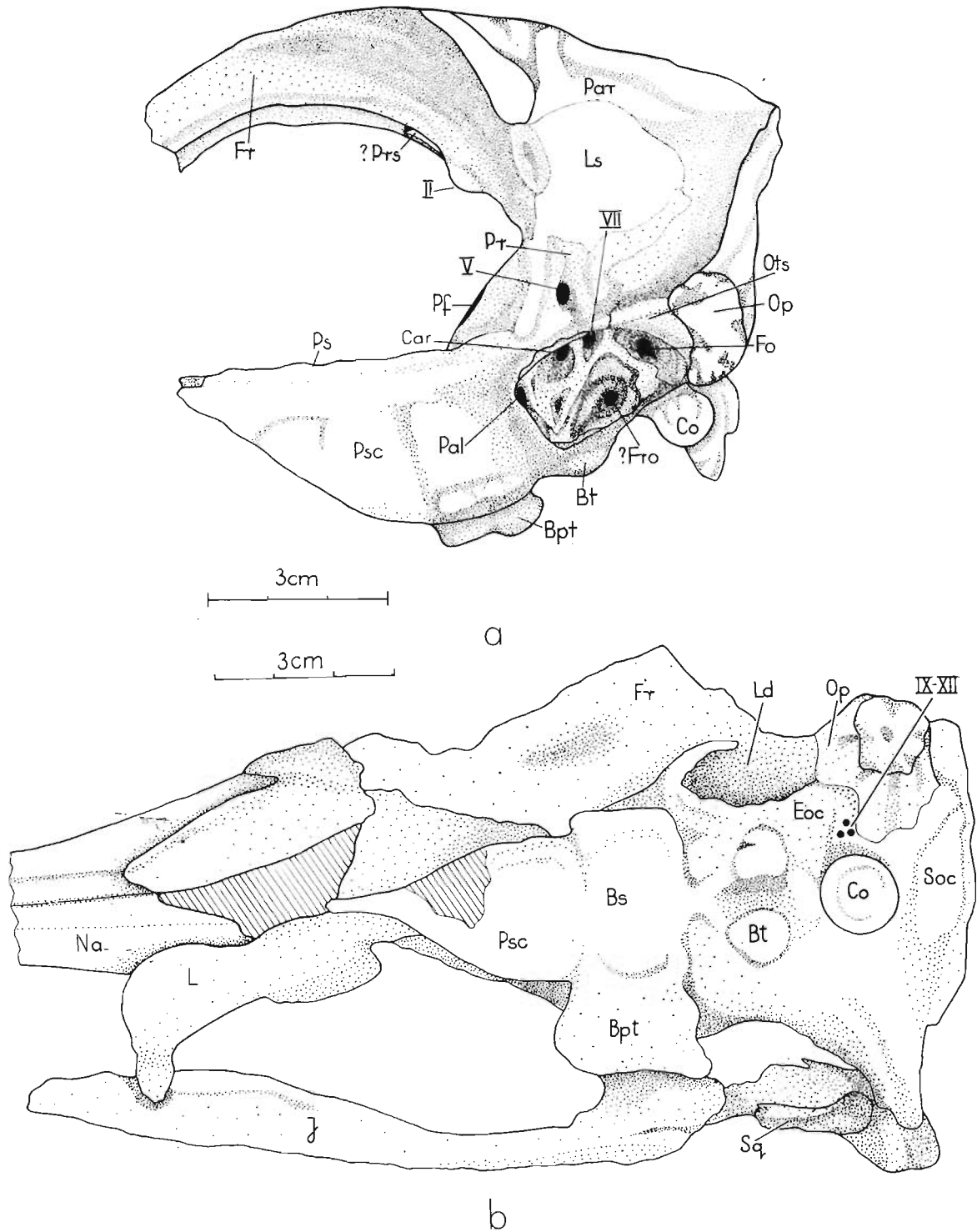


Fig. 1

*Saurornithoides junior* n. sp., type specimen, GI No. SPS 100-1

*a* braincase in lateral view, *b* posterior part of the skull in ventral view (broken surfaces indicated by inclined lines)  
 Abbreviations: *Bo* — basioccipital, *Bpt* — basipterygoid, *Bs* — basisphenoid, *Bt* — basal tuber, *Car* — internal carotid foramen, *Co* — occipital condyle, *D* — dentary, *Eoc* — exoccipital, *Fm* — foramen magnum, *Fo* — fenestra ovalis, *Fr* — frontal, *?Fro* — fenestra rotunda, *If* — infratemporal fenestra, *J* — jugal, *L* — lacrimal, *Ld* — lateral depression, *Ls* — laterosphenoid, *?Mco* — opening of Meckelian canal, *Mg* — groove carrying Meckelian cartilage, *Ms* — mandibular symphysis, *Op* — opisthotic, *Ots* — otosphenoidal crest, *Pal* — foramen for palatine artery, *Par* — parietal, *Pf* — pituitary fossa, *Po* — postorbital, *Pr* — prootic, *?Prs* — presphenoid, *Ps* — parasphenoid, *Psc* — parasphenoid capsule, *Soc* — supraoccipital, *Sp* — splenial, *Sq* — squamosal, *Stf* — supratemporal fenestra, II, V, VII, IX-XII — exits of cranial nerves.

three foramina opens directly onto the surface of the exoccipital near the base of the condylar neck, representing the exits for nerves IX—XII. In the occipital region (Text-fig. 2a) the exoccipital meets the supraoccipital dorsally and slightly invades the lower margin of this element; lateroventrally the exoccipital contacts the opisthotic and probably extends as far as the posteroventral border of the middle ear cavity where it participates to a minor extent in its wall (Text-fig. 1b).

The basisphenoid (Text-figs. 1, 2b) has a rather complicated configuration, especially dorsally where its exact limits cannot be defined. Evidently the basisphenoid participates in the anterior wall of the lateral depression, extending far upwards across the adjacent part of the parasphenoid capsule and forming most of the anterior wall of the braincase in the vicinity of the pituitary fossa (Text-figs. 1a, 2b). The basisphenoid contacts the prootic near the vertical buttress where the anterior and lateral walls of the braincase meet. The dorsal part of the basisphenoid does not differ from that in *Gallimimus bullatus* (see OSMÓLSKA *et al.*, 1972), but it is rather differently developed ventrally, especially in the region of the basal tubera. In ventral aspect there is an extensive rectangular platform formed from the basisphenoid, in front of a relatively broad and deep furrow which is developed just anterior to the basal tubera (Text-fig. 1b). This platform abuts against the posterior part of the parasphenoid capsule without any visible suture and merges with the flattened, stoutly built basipterygoid processes laterally. In *Gallimimus bullatus* the rectangular platform, which is similarly situated behind the parasphenoid capsule or „bulbous” structure, is much lower than the basioccipital tubera. In *Saurornithoides junior* n.sp. this platform lies nearly at the level of the basal tubera, as is also

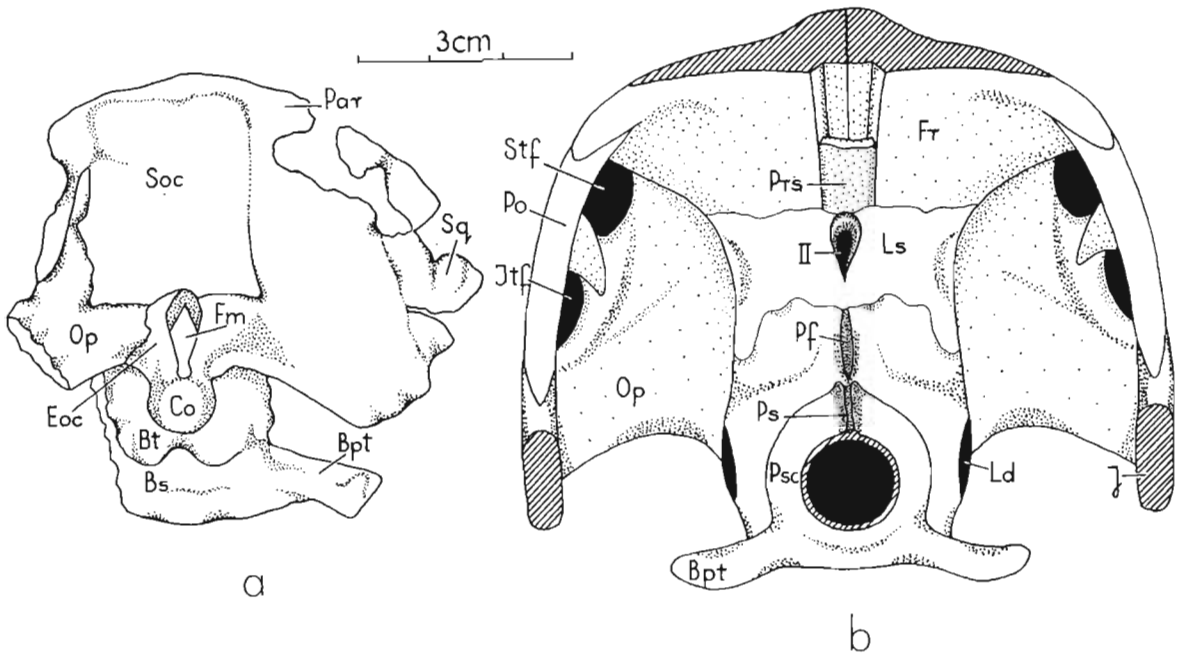


Fig. 2

*Saurornithoides junior* n.sp., type specimen, GI No. SPS 100-1

a occipital region of the skull in posteroventral view; b anterior view of the braincase, as seen from the level of a transversal section through the parasphenoid capsule (surfaces of the sectioned bones indicated by inclined lines). Abbreviations — as in Text-fig. 1.

the case in *Dromaeosaurus* (COLBERT & RUSSELL, 1969). The structure identified as RATHKE'S pouch which is situated in this place in *Gallimimus bullatus*, is lacking in *Saurornithoides junior* n.sp.

Presumably the posterior part of the basisphenoid, which extends above the basioccipital in the region of the basal tubera, participates in the medial wall of the lateral depression. If it is the case, the basisphenoid contacts the opisthotic posterodorsally, and the ventral part of the prootic anteroventrally. Thus, the limits between the mentioned elements extend along the two oblique ridges which diverge from the point on the medial wall of the lateral depression just below its upper wall (Pl. III, Fig. 2; Text-fig. 1a).

The pituitary fossa (Text-figs. 1a, 2b) is shallow, slit-like, and its lower regions are not visible. However, the fossa probably communicates with the above mentioned lateral depression, as there is a fenestra present in this depression on its anteromedial wall. This fenestra is tentatively interpreted as the conduit for the internal carotid artery, which reaches the pituitary fossa as in *Gallimimus bullatus*. The deepest portion of the lateral depression nearly underlies the pituitary fossa, whereas its anterior wall abuts against the posterolateral part of the parasphenoid capsule.

The parasphenoid capsule (Text-figs. 1, 2b) or „bulbous” structure (OSMÓLSKA *et al.* 1972) is developed in *Saurornithoides junior* as a thin-walled, pear-shaped hollow structure, the greater part of the external surface of which is probably formed from the parasphenoid as in ornithomimids. Its anterior end rapidly narrows and is prolonged into a delicate, laterally compressed cultriform process which extends horizontally along the midline of the skull. Posteriorly, the rather prominent part of this capsule passes smoothly into the basisphenoid without any visible suture. Thus recognition of the parasphenoid and basisphenoid parts in the transitional region is not clear. In ventral aspect, the adjoining surfaces of the capsule and basisphenoid platform are divided by shallow sinus or furrow. A narrow, clearly defined sulcus extends forward from a point beneath the pituitary fossa, along the longitudinal axis of the capsule probably all the way to the anterior end of the cultriform process, although the latter structure was broken off.

The prootic (Text-figs. 1a, 2b) occupies a small part of the lateral wall of the braincase. Its anterior portion, which contains the fenestra, tentatively identified as the exit of the trigeminal nerve, is rather more expanded than the posterior, which is strongly narrowed and pinched between the opisthotic ventrally and laterosphenoid dorsally. The posterior terminus of the prootic nearly reaches the base of the transverse lateral crest of the parietal. The anteroventral part of the prootic apparently forms a small segment of the upper wall of the lateral depression immediately in front of the opisthotic. However, the prootic may participate in the medial wall of the lateral depression contacting the opisthotic and the basisphenoid. The suture between the opisthotic and prootic on the medial wall of the lateral depression is obscure and probably extends along the short vertical ridge which diverges below into the two oblique branches mentioned in the description of the basisphenoid (p. 10). The anterior branch divides the posterior part of the basisphenoid and the prootic if these elements extend within the lateral depression, whereas the posterior branch separates the opisthotic from the basisphenoid.

The anteroproximal portion of the opisthotic (Text-fig. 1) forms the entire posterior wall of the middle ear cavity. A clearly discernible suture extends anteroventrally along the oblique ridge which would separate the opisthotic from the basisphenoid if the latter element reaches this point, as mentioned above. The suture continues posteroventrally from the lateral depression nearly to the condylar neck, thereby separating the opisthotic and exoccipital. In the occipital

region the opisthotic is invaded by the lower corner of the rectangular supraoccipital (Text-fig. 2a).

The laterosphenoid (Text-figs. 1a, 2b) forms the anterior wall of the braincase, and is quite narrow immediately above the basisphenoid. Behind the prominent and robust crest which is formed by the juncture of the anterior and lateral braincase walls the laterosphenoid is strongly expanded and rounded in outline. Above the pituitary fossa and on the midline of the braincase between the laterosphenoids, there is a vertically elongated suboval fenestra with

Table 1

*Saurornithoides junior* n.sp. (measurements in mm)

Maximum length of the skull . . . . .	280.6
Maximum height of the skull in the postorbital region . . . . .	84.0
Maximum width of the skull in the same region. . . . .	90.4
Maximum length of the supratemporal fossa . . . . .	37.0
The orbit: length × height . . . . .	61.0 × 64.0
The antorbital fenestra: length × height . . . . .	58.5 × 33.0
Length of the alveolar margin of the maxilla . . . . .	114.0
Length of the alveolar margin of the dentary . . . . .	102.0

a thickened but lower margin, which seems to be the exit of the optic nerve (Text-fig. 2b). Above the laterosphenoids and within the proximal termination of the olfactory tract passage, a small unpaired lamina is present (Text-figs. 1a, 2b). This structure has been not observed in *Gallimimus bullatus*. Evidently it is one of the ossifications of the sphenethmoid region, perhaps the presphenoid.

*Ear region:* On the lower part of the lateral wall of the braincase there is a very deep and large depression referred to previously, which is apparently separated into two unequal parts by an oblique ridge (Text-fig. 1a). The sutures between the bones forming the medial wall of this depression are poorly defined and it is difficult to state which bones contribute to its structure. The configuration of this depression is most unusual for a theropod dinosaur, and its interpretation is extremely difficult. According to personal information from Dr. D. A. RUSSELL, the same structure evidently occurs in *Stenonychosaurus inequalis* (NMC 12340) but the preserved fragments of bone were so small that he was unable to interpret them in detail (see also D. RUSSELL, 1969, p. 599). Perhaps only the posterior part of the depression enters the middle ear cavity, and is separated from the greater part of the lateral depression by the ridge which extends obliquely backwards along the anteroventral boundary of the opisthotic. In the postero-dorsal part of the middle ear cavity the posterior wall of which is formed by the opisthotic, the fenestra ovalis can be recognized, in front of this there is a foramen presumably for nerve VII. Anteroventrally to the fenestra ovalis there is an enlarged opening which is very difficult to identify. It may be the fenestra rotundum or one of the sinuses of the ventral part of the braincase. In the anterolateral region of the prootic there is a large foramen evidently for an undivided nerve V. Within the lateral depression and near its anterodorsal wall there is an opening communicating with the pituitary fossa, which was previously identified as the entrance of the internal carotid artery. An opening situated anterolaterally and ventrally to this entrance and penetrating the posterior wall of the parasphenoid capsule, is possibly the foramen for the palatine artery. It seems that a stoutly built and prominent bar which extends from the



anteroproximal part of the opisthotic narrowing anteriorly to the entrance of the internal carotid artery, may be defined as the otosphenoidal crest. If it is the case, the otosphenoidal crest represents the development of the adjacent parts of the opisthotic and prootic which are situated above the fenestra ovalis, exit for nerve VII and entrance of the internal carotid artery in part.

*Mandible*: The lower jaws are known from the articulated anterior elements of two mandibular ramii (Pl. I, Fig. 1*b*; Text-fig. 3). The dentary and splenial are preserved.

The dentary is long and shallow, gradually deepening posteriorly. Its lateral surface is unsculptured, although slightly irregular in texture, and like the maxilla and premaxilla, is marked by numerous foramina which are approximately arranged in rows. The most obvious of these is an upper row of well-defined, circular foramina which are closely spaced anteriorly, but become progressively more elongated, widely spaced and enlarged in size posteriorly as in *Deinonychus antirrhopus*, *Velocipaptor mongoliensis* and "*Polyodontosaurus*" *grandis* (OSTROM, 1969; GILMORE, 1932; STERNBERG, 1951). Below this upper row are less distinct rows of more widely spaced foramina located for the most part on the anterior end of the dentary surface. Medially the anterior half of the dentary is distinctly prominent near its inferior margin. There is the deep but narrow Meckelian canal representing a well-defined, open groove which extends along the inferior margin of the dentary and terminates in the posteroventral angle of the symphyseal surface. Posteriorly this canal reaches the tapered end of the splenial (Text-fig. 3).

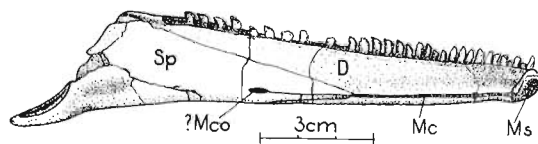


Fig. 3

*Saurornithoides junior* n.sp., type specimen, GI No. SPS 100-1  
Anterior part of the left lower jaw in lingual view. Abbreviations — as in Text-fig. 1.

The splenial (Text-fig. 3) is a long and thin, wedge-shaped bone with a rather strongly developed ventral margin. Anteriorly, a long triangular lamina of the splenial overlaps the inner surface of the dentary. The anterior tapered end of this lamina is divided into two parts which are unequal for their width and closely abut each other. The contact between these parts represents a narrow groove which terminates posteriorly in the deep, but narrow and elongated fenestra, representing evidently an opening of the Meckelian canal. The angular process of the splenial is stout, slightly curved and tapered. The posterodorsal part of the splenial was broken off.

The anterior part of the lower jaw exhibits several peculiarities. The long and slender dentary is characteristic of some small theropods such as *Deinonychus* and *Velociraptor*, but in *Saurornithoides junior* the dentary is more expanded posteriorly. The divided anterior terminus of the splenial is not described in the theropod mandible and functionally this structure is not clear. The anterior elements of the lower jaw in *S. junior* are developed as in *S. mongoliensis*, but more detailed comparison with the latter is difficult because of its poor state of preservation.

*Dentition*: In the type specimen of *Saurornithoides junior* n.sp. there are 4 premaxillary teeth, 19 maxillary teeth on the left side and 20 teeth on the right side (Pl. I, Fig. 1). The left dentary contains 33 and the right 35 teeth. The difference in the number of maxillary and dentary teeth is possibly related to a coalescing of a few adjacent alveoli in the left maxilla and

dentary, where there are 1 or 2 teeth less than in the right side of the snout. All the teeth are closely spaced.

All the premaxillary teeth, as well as the anteriormost 2 or 3 maxillary, and 6 or 7 dentary teeth, are subcylindrical, but not incisiform. With the exception of the anterior teeth of maxilla and dentary which are similar in form to those in the premaxilla, most maxillary and dentary teeth are very broad at the base, laterally compressed, sharply tapered and recurved. The maxillary teeth are approximately twice as long as those in the dentary. The dentary teeth increase in size posteriorly approximately to the 16 or 17<sup>th</sup> tooth, then remain constant in size and finally becoming smaller at the posterior end of the tooth row, decreasing again at the back. The maxillary teeth increase in size posteriorly in a somewhat irregular manner as the larger teeth alternate with smaller ones.

All the teeth possess a serrated posterior edge. In all the premaxillary teeth, the first 9 or 10 maxillary and 14 or 15 dentary teeth the anterior edge is serrated also. In the anteriormost premaxillary teeth the anterior and posterior serrations are subequal in number reaching to 10—12 per 5 mm, and occupy a more medial and lateral position. However, beginning from the first maxillary and dentary teeth, the anterior serrations are developed only near the base of the crowns, consisting of a few denticles which rapidly diminish in size distally. Above these, along the most of the anterior margin, a thin, blade-like keel is clearly developed. Its presence suggests that the denticles were not simply obliterated here through abrasion. It would seem that the denticles were never developed on the anterior margin, except at its basal part. In the anterior serration the number of the denticles in the maxillary teeth is equal to 14—16. In the dentary teeth this number approaches to 18—20 per 5 mm. In the posterior serration the number of the denticles in the maxillary teeth is equal to 12 per 5 mm, whereas in the dentary teeth their number reaches to 15—17 per 5 mm. The preceding number corresponds to the figure given by OSTROM (1969) for the dentition in *Saurornithoides mongoliensis*. The majority of the dentary teeth in *S. junior* are shorter than 5 mm and they bear 6—7 denticles per 2 mm, or about 15—17 denticles per 5 mm.

*Sacral vertebrae*: Sacrum (Pl. III, Fig. 1; Pl. IV, fig. 2) consists of six robust and ventrally flattened vertebrae. The first caudal vertebra is firmly fused to the fifth sacral. Functionally there were six sacrals in the sacrum. The ventral profile of the series of sacral centra descends slightly posteriorly. Ventrally, on the contacts between the fused sacral centra, the shallow, rounded furrows are present, which are more distinctly developed near the posterior terminations of the adjoining vertebrae. Their presence on the first and anterior half of the second vertebrae is not known because the ventral parts of these vertebrae are not preserved. The contacts between the centra of the second and third, third and fourth, and fourth and fifth sacral vertebrae are generally expanded ventrally. In the last vertebra the posterior articular surface is significantly broadened, which is not the case in the previous ones. No neural arch is completely preserved. The diapophyses are preserved on the first, second, third (in part) and fifth vertebrae only. In the first caudal vertebra the sites of their origin are visible. All evidence indicates that the diapophyses are stout and increase in length posteriorly. In the fifth vertebra the diapophyses are directed slightly upwards distally. The remains of the neural spines including that of the first caudal vertebra, show that they are fused with each other. Sacral ribs are preserved on the left side on the first and on the right side on the fifth vertebrae. Only the bases of the remaining sacral ribs are preserved, and the first caudal vertebra lacks ribs entirely. The ribs are stout, flattened dorsoventrally, and progressively increase in length caudally. The same is true of the diapophyses. In lateral aspect the ribs are usually

situated near the anterior edge of the centra, somewhat below and in front of the diapophyses. The prezygapophyses in the first sacral and postzygapophyses in the first caudal vertebrae are normally developed.

*Caudal vertebrae*: Fourteen vertebrae of the caudal series are preserved (Pl. IV, Fig. 3). A comparison of the present material with the caudal vertebrae of ornithomimids, tyrannosaurids and dromaeosaurids, based on completely preserved caudal vertebra series which have been recently excavated in Mongolia, suggests that the preserved caudal segment of *Saurornithoides junior* n. sp. begins probably with the 8th vertebra and continues to 21st. It is suggested that the first 6 vertebra of the preserved caudal segment bear chevrons with dorsoventrally elongated processes, but the chevrons of this type are preserved between 9th-10th and 10th-11th vertebrae only. Beginning with 15th vertebra ventrally flattened chevrons are developed. The first 6 vertebrae of the preserved segment including the 8th through the 13th caudals, are relatively short and approximately equal in length. They therefore belong to the proximal segment of the caudal series. The 14th vertebra is in some way transitional, for it is shorter than the previous vertebra, and resembles the 15th vertebra more closely in shape. The distal segment of the tail begins with the 15th caudal vertebra. These vertebrae progressively increase in length posteriorly. The transition between the proximal and distal parts of the tail thus probably occurs between the 14th and 15th vertebrae.

Table 2

*Saurornithoides junior* n.sp. (measurements in mm)

Sacral vertebrae		
Vertebra number	Maximum length of centrum	
1	34 *	
2	31 *	
3	31.0	
4	31.0	
5	36.0	
6	36.2	
Caudal vertebrae		
Vertebra number	Maximum length of centrum	Maximum width across centrum
8	31.5 *	23.2
9	33.0	21.6
10	32.0	20.5
11	32.0	19.8
12	33.0	20.5
13	32.8	19.8
14	31.5	19.0
15	34.0	18.2
16	37.0	17.7
17	38.0	16.6
18	38.0	15.1
19	39.0	14.5
20	39.5	14.0
21	39.5	16 *

\* approximate.

All centra of the caudal series are platycoelous. In front of the transitional region the articular surfaces of the centra are rectangular, whereas behind it they become significantly compressed laterally. A small longitudinal depression is developed ventrally on the centra of the proximal vertebrae, which is more distinct near the central articulations. Articular facets for chevrons are present on all of the caudals preserved. The neural arches are relatively high in the proximal caudals, and possess robust transverse processes and neural spines which slope posterodorsally. The neural spines become progressively shorter posteriorly, especially behind the transitional region, finally becoming low, distinctly bifurcated crests. Behind the transitional region the transverse processes also become gradually thinner and shorter, and from the 18th vertebra posteriorly they are but small, sharp tubercles which continue to diminish caudally.

The zygapophyses are short and stout in the proximal caudal vertebrae and possess oval articular facets which lie in an externally rising transverse plane. The prezygapophyses beginning from the 16th vertebra posteriorly, and postzygapophyses from the 14th vertebra, become progressively elongated and narrowed. The articular facets gradually occupy a more horizontal position relative to conditions anterior to the transitional region. In the distal caudals the postzygapophyses are usually relatively shorter than the prezygapophyses.

Chevrons are present between caudals 9th and 10th, 10th and 11th, 15th and 16th, and to the end of the preserved caudal segment. Though the anterior chevrons are relatively elongated dorsoventrally, they are not expanded longitudinally into a keel, as in dromaeosaurids (OSTROM, 1969). In sagittal aspect the proximal part of the chevrons is Y-shaped, with well-developed anteroproximal tuberosities. The articular facets do not meet in a bridge over the haemal canal, as is the case in *Stenonychosaurus inequalis* (D. RUSSELL, 1969). The chevrons gradually diminish in depth caudally, and haemal spines are not developed in the transitional region and in more distal regions of the caudal series. The distal chevrons differ strongly from the proximal ones. They are flattened ventrally, elongated longitudinally and bifurcated anteriorly where it embraces the posterior end of the preceding chevron. In dorsal aspect the distal chevrons bear two articular tubera which are relatively high and stout in the first few chevrons, but which rapidly diminish caudally. The general outline of these chevrons is similar to that in *Stenonychosaurus inequalis*.

*Hind-limb*: The distal end of the articulated right tibia, fibula, astragalus and calcaneum, as well as the part of the right metatarsus with the adjoining tarsals, are preserved (Text-figs. 4, 5). The preserved fragment of the tibia is flattened anteroposteriorly in the usual manner, and bears a well-defined edge along its posterolateral border. The distal end of the fibula was contained in a narrow groove between the lateral surface of the ascending process of the astragalus and the anterolateral edge of the tibia as in *Stenonychosaurus inequalis* (D. RUSSELL, 1969).

The calcaneum is thin, has a slightly convex lateral surface, and is fused to the astragalus without a trace of a suture. The articular notch for the tibia is shallow, and more vertically extended than in *Stenonychosaurus inequalis*.

As noted above, only the proximal end of the right metatarsus and the associated tarsals are preserved. A fragment of the proximal end of the fourth metatarsal is rather stout as compared with the same part of the metatarsal II, whereas metatarsal III is strongly compressed in its proximal part and pinched between the two adjacent metatarsals posteriorly. In anterior aspect its proximal end is entirely covered by the adjoining ends of metatarsals II and IV. In dorsal aspect, the articular surface of metatarsal IV occupies more than a half of the common area of the articulation extending far posteriorly and overlapping medially the constricted end of metatarsal III, which lies obliquely between the adjacent bones. Thus the metatarsus of *Saurornithoides junior* n.sp. clearly differs from that in ornithomimids and tyrannosaurids

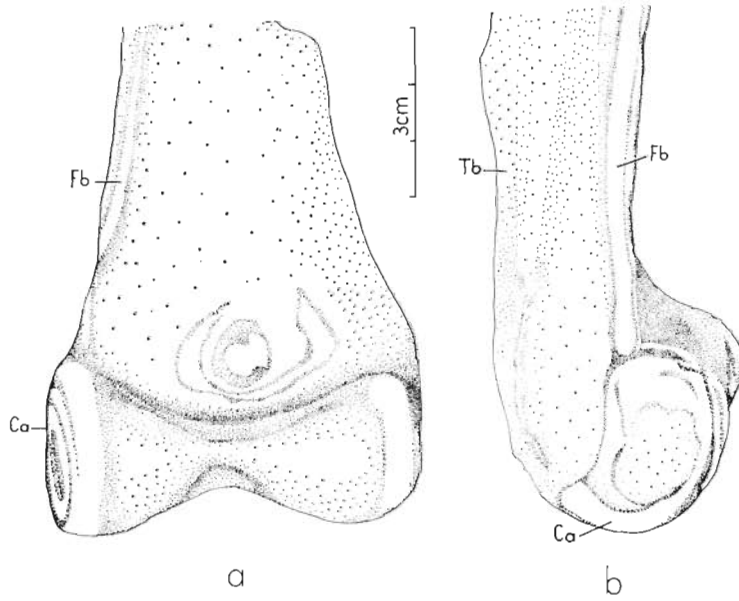


Fig. 4

*Saurornithoides junior*, n.sp., type specimen, GI No. SPS 100-1

Distal parts of the right tibia and fibula, articulated with astragalus and calcaneum; *a* anterior view, *b* lateral view. Abbreviations: *a.s Mt V* — attachment site for metatarsal V, *Ca* — calcaneum, *Fb* — fibula, *Mt* — metatarsal, *T* — tarsal, *Tb* — tibia.

(PARKS, 1928, 1933; OSBORN, 1917), which also possess a dorsally constricted metatarsal III, and is very like that in *Stenonychosaurus inequalis*.

An elongated suboval surface which is clearly indicated in the texture of the surface is situated proximally on the posterolateral angle of the metatarsal IV (Text-fig. 5*b*), probably represents the articulation for metatarsal V, which is lacking in the preserved material. It is very probable that metatarsal V was reduced, as is the case in many theropods.

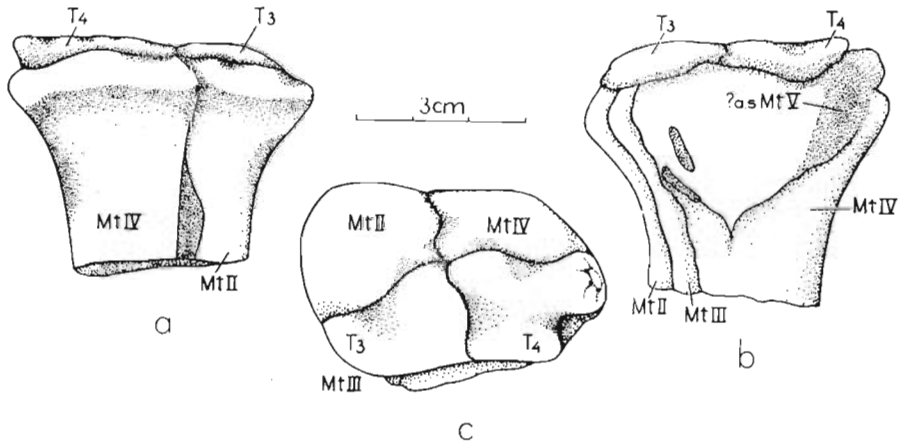


Fig. 5

*Saurornithoides junior* n.sp., type specimen, GI No. SPS 100-1

Proximal part of right metatarsus with tarsals; *a* — anterior view, *b* — posterior view, *c* — dorsal view. Abbreviations -- as in Text-fig. 4.

The tarsals (Text-fig. 5) are flat and subequal in size. The dorsal articular surface of tarsal III is slightly elevated posteriorly. A rather extensive shallow depression invades the anterior part of the tarsal III. Tarsal IV is approximately triangular in shape, and is slightly elevated along the radii between which irregular shaped shallow depressions are situated. A small deeper notch occurs directly above the presumed articulation of metatarsal V.

The outline of the tarsals in *Saurornithoides junior* n. sp. and their relationships with the metatarsals are more similar to conditions in ornithomimids than in dromaeosaurids (OSMÓLSKA *et al.* 1972; OSTROM, 1969).

## DISCUSSION

*Saurornithoides junior* n.sp. from the Nemegt Formation (Maastrichtian) of the Gobi Desert differs from *Saurornithoides mongoliensis* OSBORN, 1924 from the Djadokhta Formation (Coniacian or Santonian) of the same area, in being about of 1.3 times larger and in having a different dental formula (Pls. I—II). *S. mongoliensis* has 17—18 teeth in the maxilla and 27—28 in the dentary, while *S. junior* has 20 and 35 teeth respectively in the same elements. The number of denticles in the carina of the maxillary teeth in both species is equal to 12 per 5 mm. There are 15—17 denticles per 5 mm in the dentary teeth of *S. junior*, while in the type of *S. mongoliensis* the number of the posterior denticles in the dentary teeth cannot be determined because of its poor state of preservation (Pl. IV, Fig. 1).

The general shape of the snout and details of the nasal region and dentary are very similar in both species. The pes of *S. mongoliensis* in the collections of the American Museum of Natural History in New York, was preliminarily described and inadequately figured in OSBORN'S (1924) original description. OSTROM (1969) characterizes the pes of *S. mongoliensis* as of the dromaeosaurid type, with the second digit developed as in *Stenonychosaurus inequalis* STERNBERG, 1932. Of the type material of *Saurornithoides mongoliensis* I was able to examine only the skull, which was borrowed by the Palaeozoological Institute in Warsaw, but not the postcranial skeleton. On the basis of the preserved fragments of the hind-limb of *S. junior*, it is probable that the pes in this species was of the same structure as in *S. mongoliensis* and *St. inequalis*. The sacra of *S. mongoliensis* (see D. RUSSELL, 1969) and *S. junior* are similar in the number of the vertebrae and in fusion of the first caudal with the last sacral, thus six sacral vertebrae are present functionally in both species. It is very probable that there are additional skeletal differences between *S. mongoliensis* and *S. junior*, but the state of preservation of the only known specimens does not permit further comparison.

*Saurornithoides* OSBORN, 1924 shows many similarities to *Stenonychosaurus* STERNBERG, 1932 from the Oldman Formation (Campanian) of Canada. *Stenonychosaurus* is a monotypic genus represented by a single species *Stenonychosaurus inequalis* STERNBERG, 1932, which is known from a number of incomplete specimens. The comparable material of *St. inequalis* includes a dentary without teeth, a fragmentary skull (frontal, parietal and part of the laterosphenoid), a fragment of the basioccipital-basisphenoid, distal parts of the metatarsus and a tibia and calcaneum-astragalus, and some caudal vertebrae. All of these bones are very similar to those in *S. junior*, and the similarity is so great that one can hardly define the differences between the two genera. D. RUSSELL (1969) noted many similar features in the skeletons of *S. mongoliensis* and *St. inequalis* and concluded that they are virtually identical in morphology. It is not excluded (as already suggested tentatively by D. RUSSELL, 1969) that *Saurornithoides* OSBORN, 1924 is a senior synonym of *Stenonychosaurus* STERNBERG, 1932. Available material of *Stenonychosaurus* is, however, very incomplete and a more detailed comparison cannot be made at present. It is

impossible to prove that *Stenonychosaurus* and *Saurornithoides* are congeneric, and I regard it more reasonable to treat them as separate genera for the time being.

The similarity in the proximal phalanges of the second digit of the pes which are more elongated than in dromaeosaurids and in the morphology of the second digit in *S. mongoliensis* and *St. inequalis* relative to conditions in dromaeosaurids, was previously noted by OSTROM (1969) and COLBERT & D. RUSSELL (1969). OSTROM (1969) also stated that the resemblances between *S. mongoliensis* and *St. inequalis* may serve as a basis for assignment both taxa to a common subfamily rank within the family Dromaeosauridae. D. RUSSELL (1969, p. 607) stated that "The possibility that the two forms should prove to be distinguishable on a taxonomic level higher than that of a genus is here considered to be very remote".

Of the three species assigned to the new family Saurornithoididae, *Saurornithoides junior* is known from the most complete skeletal material. The unusual parasphenoid capsule or "bulbous" structure (known otherwise only in the Ornithomimidae, OSMÓLSKA *et al.*, 1972) and the lateral depression which is associated with the middle ear cavity, are regarded as characteristic features of the new family but are known only in *S. junior*. However, the great similarities in the general structure of the skull and postcranial skeleton of the three species lead one to assume that these peculiar structures were also present in two remaining species and are characteristic of the family as a whole.

The Saurornithoididae nov. show some similarities to a contemporaneous family of small theropods, the Dromaeosauridae, known from the Cretaceous of the same regions. The main similarity lies in the structure of the pes in both families, in which the second digit is modified into a peculiar predatory or offensive weapon. This specialization of the pes is known only in these two families. In the Dromaeosauridae the second digit is very powerfully developed, is terminated by a trenchant claw and the third metatarsus is not compressed proximally. In the Saurornithoididae the second digit is not as strong as in the Dromaeosauridae, and is provided with a relatively smaller claw. The second metatarsal is more slender than in the Dromaeosauridae, the third metatarsal strongly pinched proximally, and the fourth metatarsal much more robust than in the Dromaeosauridae.

The main difference between the two families lies in the structure of the tail. In the Dromaeosauridae the prezygapophyses are strongly elongated and the chevrons are provided with the rod-like tendons, while in the Saurornithoididae these structures are not developed.

The skull in the Saurornithoididae differs from that in the Ornithomimidae in shape and in the presence of teeth in the jaws. In spite of these differences there is a similarity between two families in the presence of the parasphenoid capsule, or "bulbous" structure. This character which is unknown in other theropod families indicates relatively more close relationship between the Saurornithoididae and the Ornithomimidae, possibly on the taxonomic level higher than the family rank. Other similarities include the compressed structure of the third metatarsal and the more normal development of the prezygapophyses and chevrons, which lack rod-like ossified tendons in the tail of both families. However, the general structure of the pes is different, for the Ornithomimidae do not have the peculiar dromaeosaurid specialization of the pes, which is present in the Saurornithoididae.

D. RUSSELL (1969) classified *Saurornithoides* OSBORN, *Stenonychosaurus* STERNBERG and *Troödon* LEIDY into the Troödontidae sensu L. RUSSELL (1948). In the present paper I remove the genera *Saurornithoides* and *Stenonychosaurus* from the Troödontidae and erect for them the new family Saurornithoididae, as defined above. The basis for this lays in the fact that the teeth of *Saurornithoides* (and probably also *Stenonychosaurus*) differ distinctly from that of *Troödon*.

*Troödon* LEIDY, 1856 is a monotypic, poorly known genus which was erected by LEIDY to include *Troödon formosus*, a species based on a single tooth (ANSP 9259, refigured in the present paper as Text-fig. 6, *a-c*). GILMORE (1924) concluded that the teeth of *Stegoceras* LAMBE 1902 are similar to the type specimen of *Troödon formosus*. BROWN & SHLAJKER (1943) followed GILMORE by proposing the family Troodontidae, including *Pachycephalosaurus* BROWN & SHLAJKER and *Troödon* LEIDY, as a senior synonym of *Stegoceras* LAMBE. STERNBERG (1945) demonstrated that the type tooth of *Troödon formosus* is quite different from the teeth of *Stegoceras*, regarded *Stegoceras* as a valid genus and proposed the family name Pachycephalosauridae to replace the Troodontidae, for the reception of the ornithischian genera *Stegoceras* and *Pachycephalosaurus*. STERNBERG (1945) has shown that the tooth of *Troödon formosus* has a theropod structure.

L. RUSSELL (1948) assigned a fragment of a small dentary (ROM 1445) with two teeth, from the Oldman Formation of Alberta, to *Troödon* sp. One of these teeth is almost complete, while the second is deeply imbedded within the alveolar region (L. RUSSELL, 1948, Figs. 4—6 and 8—10). L. RUSSELL placed *Troödon formosus* in the Troodontidae, and regarded the latter as a family of small theropod dinosaurs. STERNBERG (1951) noted that the above dentary (ROM 1445) is similar to another small dentary (NMC 8540) from the Oldman Formation referred previously by GILMORE (1932) to *Polyodontosaurus grandis*. However, D. RUSSELL (1969, p. 596) noted that “these dentaries are virtually identical to those of the type of *Saurornithoides mongoliensis* in their shape and diminishing length of the dental alveoli anteriorly, and are therefore probably also referable to the *Stenonychosaurus inequalis*”. On this basis, D. RUSSELL (1969, p. 596) assumed that “*Troödon* may indeed be a senior synonym of *Saurornithoides* and (or) *Stenonychosaurus*, but existing materials are still insufficient to resolve the question”.

As noted above, the type of *Troödon formosus* LEIDY, 1856 is a tooth of small size (about 4 mm in height), but the base of its crown has been broken off. The tooth is slender, laterally compressed, sharply tapered and distinctly recurved, with well-defined serrations on the anterior and posterior edges. The posterior and anterior denticles are subequal in shape and size. An enlarged figure of the tooth (L. RUSSELL, 1948, Figs. 1—3) shows approximately 3 denticles per 2 mm on its posterior edge, i.e. 7—8 denticles per 5 mm. D. RUSSELL (1969) stated that there are approximately two denticles per 1 mm, i.e. no more than 10 denticles per 5 mm. The estimated number of the anterior denticles is about 7—8 per 5 mm. Unfortunately, it is not known whether the type specimen of *Troödon formosus* is an upper or lower tooth.

It appears from the above comparison that the main difference between the teeth of *Troödon*<sup>3</sup> and *Saurornithoides* (see Text-fig. 6) is that in the former the denticles occur on both the anterior and posterior edges of the tooth, while in the latter the majority of teeth bear denticles only on the posterior edge. Some anterior teeth in both lower and upper jaws in *Saurornithoides junior* n.sp. bear a few denticles on the anterior edge, but only at the base of the crown, while in *Troödon formosus* the denticles extend along the whole length of the anterior edge, which never occurs in *Saurornithoides*. Another difference between the type specimen of *Troödon formosus* and the teeth of *Saurornithoides mongoliensis* and *S. junior* is seen in the number of denticles per 5 mm along the posterior edge of the teeth. In *Troödon formosus* there are approximately 7—8 denticles per 5 mm, while in the maxillary teeth of *Saurornithoides junior* n. sp. and *S. mongoliensis* there are 12 denticles per 5 mm. The dentary teeth of *S. junior* bear 15—17 denticles per 5 mm.

<sup>3</sup> As it is not certain whether the fragment of the dentary (ROM 1445) belongs in fact to *Troödon formosus*, this specimen is not considered in the comparison between the type specimen of *Troödon formosus* and the species of *Saurornithoides*.



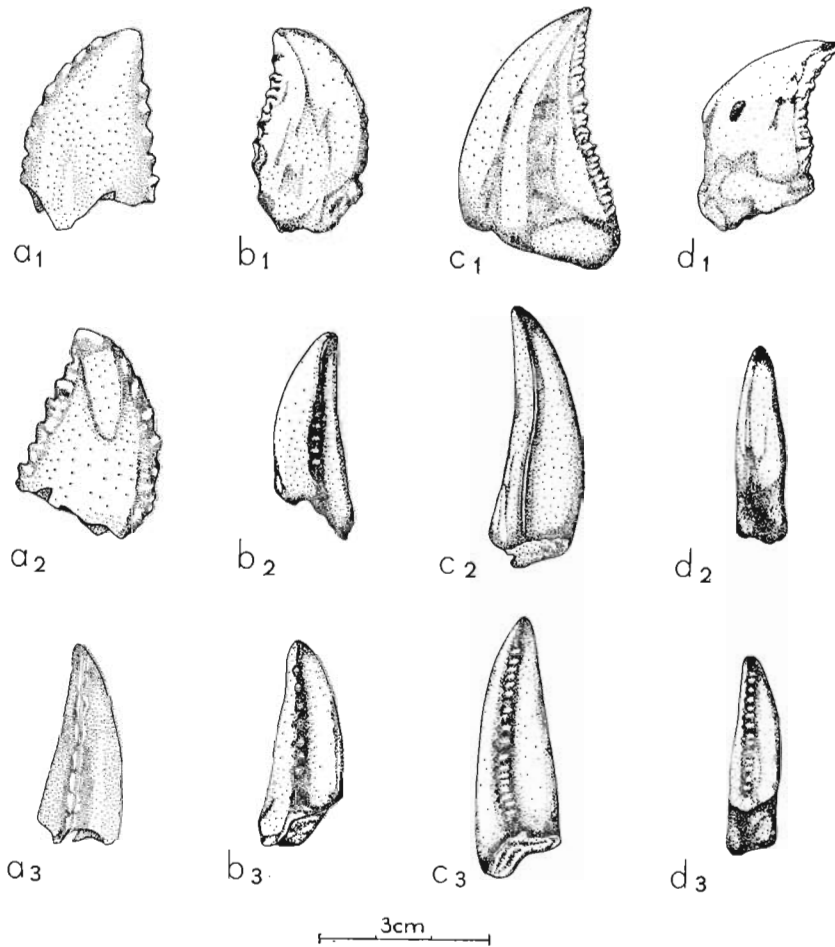


Fig. 6

*a-c Troödon formosus* LEIDY 1856, type specimen, ANSP No. 9259; line drawings of tooth (after L. RUSSELL, 1948 from ANC photographs): *a* lateral view, *b* medial view, *c* anterior view. *d-l Saurornithoides junior* n. sp., type specimen, GI No. SPS 100-1: *d* premaxillary tooth in lateral view, *e* the same in anterior view, *f* the same in posterior view, *g* maxillary tooth in lateral view, *h* the same in anterior view, *i* the same in posterior view, *j* dentary tooth in lateral view, *k* the same in anterior view, *l* the same in posterior view. All  $\times 6$ .

Thus, the family Troödontidae remains as a group of uncertain affinities which contains one but poorly understood genus *Troödon* LEIDY, 1856.

Geological Institute  
Academy of Sciences  
of the Mongolian People's Republic  
Ulan Bator, March 1971

## REFERENCES

- BERKEY, CH. P. & MORRIS, F. K. 1927. Geology of Mongolia. Natural History of Central Asia. — *Bull. Amer. Mus. Nat. Hist.*, 2, 1—475, New York.
- BROWN, B. & SCHLAIKJER, E. M. 1943. A study of the Troödon dinosaurs, with the description of a new genus and four new species. — *Ibidem*, 82, 5, 115—150.

- COLBERT, E. H. & RUSSELL, D. A. 1969. The small Cretaceous dinosaur *Dromaeosaurus*. — *Amer. Mus. Novit.*, 2380, 1-49, New York.
- ЕФРЕМОВ, И. А. — see ЕФРЕМОВ, И. А.
- GILMORE, C. W. 1924. On *Troödon validus*, an orthopodus dinosaur from the Belly River Cretaceous of Alberta. — *Bull. Univ. Alberta, Dept. Geol.*, 1, 1-43.
- 1932. A new fossil lizard from the Belly River Formation of Canada. — *Trans. Roy. Soc. Can.*, 26, 117-119.
- GRADZIŃSKI R. 1970. Sedimentation of dinosaur-bearing Upper Cretaceous deposits of the Nemegt Basin, Gobi Desert. Results Polish-Mongol. Palaeont. Exped., II. — *Palaeont. Pol.*, 21, 147-229. Warszawa.
- GRADZIŃSKI, R., KAŹMIERCZAK, J. & LEFELD, J. 1969. Geographical and geological data from the Polish-Mongolian Palaeontological Expeditions. Results..., I. — *Ibidem*, 19, 33-82.
- KIELAN-JAWOROWSKA, Z. 1970. New Upper Cretaceous multituberculate genera from Bayn Dzak, Gobi Desert. Results..., II. — *Ibidem*, 21, 35-39.
- 1974. Multituberculate succession in the Upper Cretaceous of the Gobi Desert. — Results..., V, *Ibidem*, 30, 23—44.
- KIELAN-JAWOROWSKA, Z. & BARSBOLD, R. 1972. Narrative of the Polish-Mongolian Palaeontological Expeditions 1967—1971. Results..., IV. — *Ibidem*, 27, 5-13.
- LEIDY, J. 1856. Notice on remains of extinct reptiles and fishes, discovered by Dr. F. V. Hayden in the bad lands of the Judith River, Nebraska Territory. — *Proc. Acad. Nat. Sci. Philadelphia*, 8, 72-73.
- MARTINSON, G. G. *et al.* — see МАРТИНСОН, Г. Г. и др.
- OSBORN, H. F. 1917. Skeletal adaptations of *Ornitholestes*, *Struthiomimus*, *Tyrannosaurus*. — *Bull. Amer. Mus. Nat. Hist.*, 35, 733—771, New York.
- 1924. Three new Theropoda, Protoceratops zone, central Mongolia. — *Amer. Mus. Novit.* 144, 1-12, New York.
- OSMÓLSKA, H., RONIEWICZ, E. & BARSBOLD, R. 1972. A new dinosaur *Gallimimus bullatus* n. gen., n. sp. (Ornithomimidae) from the Uppermost Cretaceous of Mongolia. Results..., IV. — *Palaeont. Pol.* 27, 95-143 Warszawa.
- OSTROM, J. H. 1969. Osteology of *Deinonychus antirrhopus*, an unusual theropod from the Lower Cretaceous of Montana. — *Bull. Peabody Mus. Nat. Hist.*, 30, 1-165.
- PARKS, W. A. 1928. *Struthiomimus samueli*, a new species of Ornithomimidae from the Belly River Formation of Alberta. — *Univ. Toronto Studies, Geol. Ser.*, 26, 3-24,
- 1933. New species of dinosaurs and turtles from the Upper Cretaceous formations of Alberta. — *Ibidem*, 34, 533-552.
- ROMER, A. S. 1956. Osteology of the reptiles. 1-772, Chicago.
- RUSSELL, D. A. 1969. A new specimen of *Stenonychosaurus* from the Oldman Formation (Cretaceous) of Alberta. — *Canadian Jour. Earth Sciences*, 6, 4, 595-612.
- RUSSELL, L. S. 1948. The dentary of *Troödon*, a genus of theropod dinosaurs. — *J. Palaeont.*, 22, 625-629, Menasha.
- STERNBERG, C. M. 1932. Two new theropod dinosaurs from the Belly River Formation of Alberta. — *Canad. Field-Naturalist*, 46, 99—105
- 1945. Pachycephalosauridae, proposed for domeheaded dinosaurs, *Stegoceras lambei* n. sp. described. — *J. Palaeont.* 19, 5, 534-538, Menasha.
- 1951. The lizard *Chamops* from the Wapiti Formation of northern Alberta: *Polyodontosaurus grandis* not a lizard. — *Nat. Mus. Can., Bull.*, 123, 256-258.
- ЕФРЕМОВ, И. А. 1954. Палеонтологические исследования в Монгольской Народной Республике (предварительные результаты экспедиций 1946, 1948 и 1949 гг.). — *Тр. Монг. КОМ. АН СССР*, 38, 5—28, Москва.
- МАРТИНСОН, Г. Г., СОЧАВА, А. В. & БАРСБОЛД Р. 1969. О стратиграфическом расчленении верхнемеловых отложений Монголии. — *Докл. АН СССР*, 189, 5, 1081—1084, Москва.

R. BARSBOLD: SAURORNITHOIDIDAE, NEW FAMILY

PLATE I

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<i>Saurornithoides junior</i> n. sp. . . . .	8
(see also Pl. II, Fig. 2; Pl. III; Pl. IV, Figs. 2-3)	
Upper Cretaceous, Nemegt Formation, Bugeen Tsav, Gobi Desert, Mongolia. Type specimen (GI No. SPS 100-1).	
Fig. 1a. Skull in the left lateral view. Jugal, postorbital and squamosal are not preserved; $\times 2/3$ .	
Fig. 1b. Skull in the right lateral view with the anterior part of the lower jaw; $\times 2/3$ .	
<i>Saurornithoides mongoliensis</i> OSBORN, 1924 . . . . .	18
(see also Pl. II, Fig. 1; Pl. IV, Fig. 1)	
Upper Cretaceous, Djadokhta Formation, Bayn Dzak, Gobi Desert, Mongolia. Type specimen (A. M. N. H. No. 6516).	
Fig. 2. Skull in lateral view; $\times 2/3$ .	

*Photo: R. Barsbold & W. Skarżyński*





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PLATE II

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<i>Saurornithoides mongoliensis</i> OSBORN, 1924 . . . . .	18
(see also Pl. I, Fig. 2; Pl. IV, Fig. 1)	
Upper Cretaceous, Djadokhta Formation, Bayn Dzak, Gobi Desert, Mongolia. Type specimen (A. M. N. H. No. 6516).	
Fig. 1. Skull in dorsal view; $\times 2/3$ .	
<i>Saurornithoides junior</i> n. sp. . . . .	8
(see also Pl. I, Fig. 1; Pl. III; Pl. IV, Figs. 2-3)	
Upper Cretaceous, Nemegt Formation, Bugeen Tsav, Gobi Desert, Mongolia. Type specimen (GI No. SPS 100-1)	
Fig. 2. Skull in dorsal view; $\times 2/3$ .	

*Photo: W. Skarżyński & R. Barsbold*





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PLATE III

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(see also Pl. IV, Fig. 2; Pl. I, Fig. 1a)	

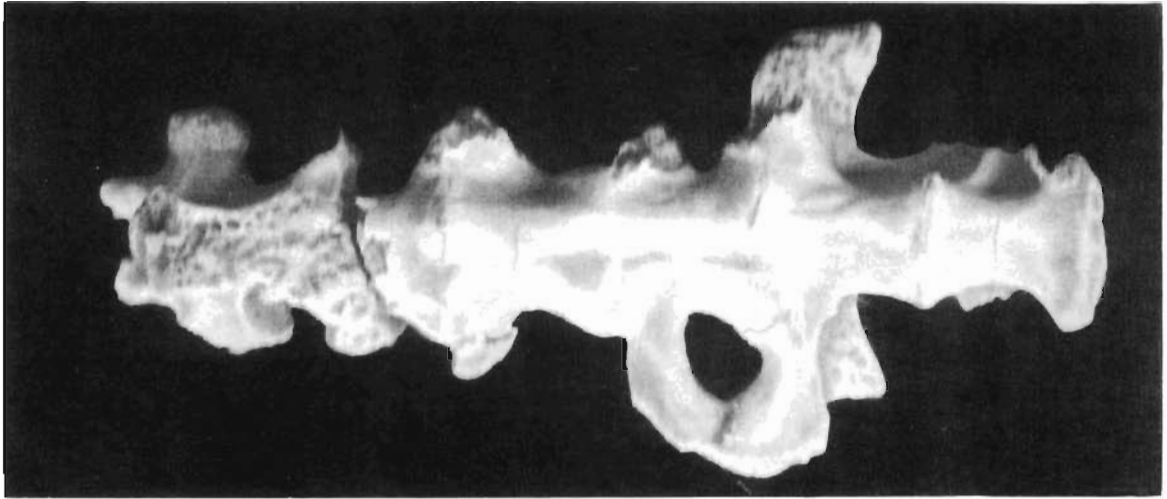
Upper Cretaceous, Nemegt Formation, Bugeen Tsav, Gobi Desert, Mongolia. Type specimen (GI No. SPS 100-1).

Fig. 1. Sacral vertebrae in ventral view (from left to right);  $\times 2/3$ .

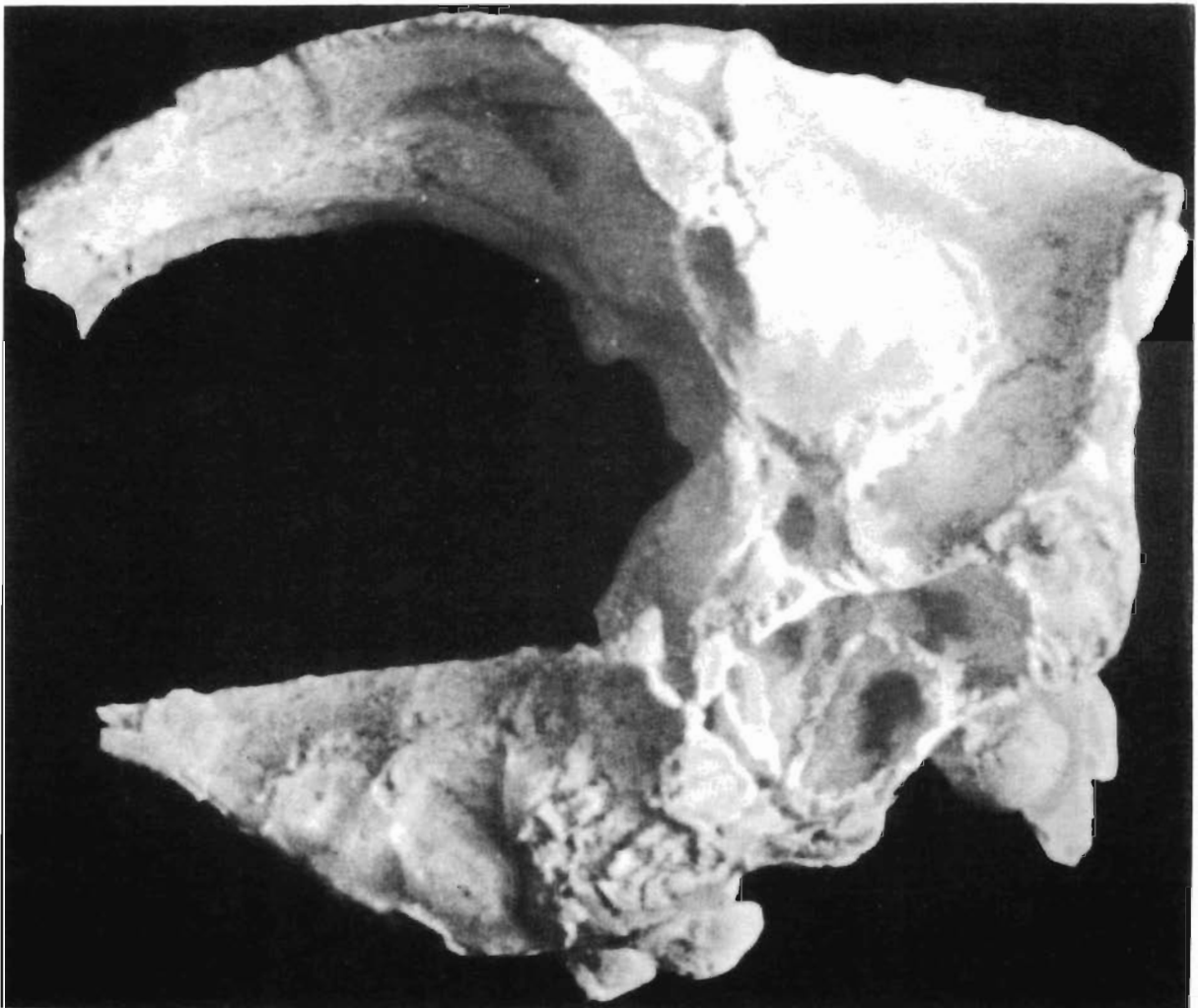
Fig. 2. Braincase in lateral view (see Text-fig. 1a).

*Photo: R. Barsbold*





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PLATE IV

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Upper Cretaceous, Djadokhta Formation, Bayn Dzak, Gobi Desert, Mongolia. Type specimen (A. M. N. H. No. 6516)	
Fig. 1. Stereo-photograph of the middle part of the left lower jaw (ventrolingual view); $\times 1$ .	
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Upper Cretaceous, Nemegt Formation, Bugeen Tsav, Gobi Desert, Mongolia. Type specimen (GI No. SPS 100-1).	
Fig. 2. Sacral vertebrae in lateral view (from right to left); $\times 1/2$ .	
Fig. 3a. Caudal vertebrae 8 <sup>th</sup> to 10 <sup>th</sup> in lateral view (from right to left); $\times 1/2$ .	
Fig. 3b. Caudal vertebrae 11 <sup>th</sup> to 16 <sup>th</sup> in lateral view (from right to left); $\times 1/2$ .	
Fig. 3c. Caudal vertebrae 17 <sup>th</sup> to 21 <sup>st</sup> in lateral view (from right to left); $\times 1/2$ .	

Photo: W. Skarżyński & R. Barsbold





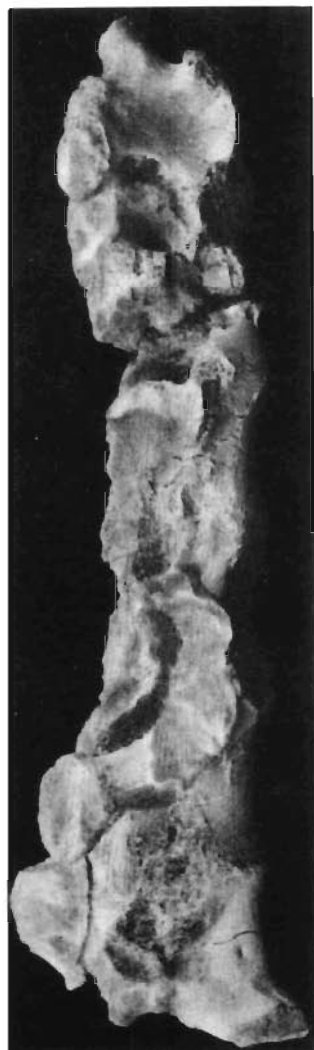
3a



3b



3c



2



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