Toothless Dinosaurs of Mongolia

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Until recently only one group of toothless theropods—Ornithomimidae Marsh, 1890 is well-known and consistently studied on the North American continent (Osborn, 1902, 1917; Parks, 1926, 1928, 1933; Gilmore, 1920; Sternberg, 1933). The discovery of Central Asian fauna opened up the borders of distribution of ornithomimids, the remains of which were fond in Northern China and Mongolia (Gilmore, 1933; Russell, 1972; Osmolska et al., 1972; Kielan-Jaworowska and Barsbold, 1972).

In recent years the collection of toothless theropods has widened considerably, especially due to the additions to the collection of the Soviet-Mongolian paleontological expedition, which facilitated a fuller examination of questions of systematics, morphology, and evolution of these specific carnivorous dinosaurs, currently classified as belonging to the infraorders Ornithomimosauria and Oviraptorosauria (Barsbold, 1976a, 1977). In the first group are found garudimimids, primitive ornithomimosaurs, which in the area of skull anatomy confirmed the specificity of the structure of the capsular basisphenoid, initially established in the Mongolian ornithomimids (Osmolska et al., 1972), which comprise a progressive branch. The second group includes *Oviraptor* (Barsbold, 1976a, b), which in the initial stage of investigation was classified with the ornithomimids (Osborn, 1924) mainly due to its toothlessness and having been preserved in a similar position (Rozhdectvenskiy and Tatrinov, 1961; Lapparent and Laocat, 1955; Huene, 1956; Romer, 1956; Kuhn, 1966; White, 1973). Beside the Oviraptor itself (Osborn, 1924), in the currently obtained new material with a high degree of preservation, stands out the specific genus Ingenia, classified in the new sub-family oviraptorid.

Similarities were shown recently (Osmolska, 1976) between the lower jaw of *Oviraptor* and *Caenagnathus* Sternberg, 1940 (in which this is the only part that is known), which was earlier identified as belonging to birds (Sternberg, 1940; Cracraft, 1971). H. Osmul'skaya (Osmolska, 1976) allows the possibility of unifying *Oviraptor* and *Caenagnathus* in an earlier identified family Caenagnathidae Sternberg, 1940. However, considerable differences in the structure of the lower jaw of *Caenagnathus* and *Oviraptor* make it necessary to assign them to different families, which enter the infra-order Oviraptorosauria. In sum, the number of branches of toothless theropods increases to four: Ornithomimidae Marsh, 1890, Garudimimidae Barsbold fam. Nov., Oviraptoridae Barsbold, 1976, Caenagnathidae Sternberg, 1940, examined below in the light of the new Mongolian collections of recent years.

INFRAORDER ORNITHOMIMOSAURIA

ORNITHOMIMOSAURIA: BARSBOLD, 1976a, P. 74

Diagnosis: Moderately large theropods with a small skull, elongated toothless jaws, equipped with a horny beak, with a capsular basisphenoid and parabasal canals. The palatal complex is of the reptilian type. The anterior limbs are not reduced, relatively weakly developed, with a non-pulley type wrist and hand of the non-grasping type.

All three metacarpal elements are approximately equal, the claw phalanges of the hand are more or less straight. The ilium is elongated in a different way, the pubis has a small "shoe-like" thickening, the ischium has a proximally displaced elongation, the proximal compression of its third elements is varied, the foot structure is three or four toed.

Composition: Family Ornithomimidae Marsh, 1890, Garudimimidae Barsbold, fam. nov.

Comparison: According to size, the ornithomimosaurs are approximately equal or somewhat larger than the “small” theropods, in one case the Mongolian specimen reached the dimensions of a tyrannosaurid (Osmolska et al., 1972). The basisphenoidal capsule is perforated posteriorly by a large opening, while in the saurornithoidids (Coelorosauria), the second group with such a capsule (Barsbold, 1974), it is of the closed type.

Parabasal canals among theropods were first found in the ornithomimosaurs and are connected with the development of the basisphenoidal capsule, that allows the presence of similar canals also in the saurornithoidids. The unreduced anterior limbs are characterized by a narrow humerus and antebrachium, that is a weak development of the deltopectoral crest and the ulnar join, which is also common to the Deinocheirids (Osmolska and Roniewicz, 1970) as opposed to other theropods with unreduced front limbs. The roughly equal metacarpal elements are found also in the deinocheirids, among other theropods the first element is usually highly reduced in length. The non-pulley type wrist joint was also characteristic to the non-grasping hand in the tyrannosaurids and supposedly in the deinocheirids (Barsbold, 1976c). The ornithomimosaural pelvis in general is similar to that of the carnosaurs (allosaurids, tyrannosaurids), but it is considerably smaller in size as well as mass. The distal “shoe-like” thickening of the pubis is considerably less than in the named groups. The wide amplitude of diversions in the structure of the foot in the ornithomimosaurs—the degree of the elongation of the metatarsus and the proximal compression of its third element, is observed in various theropods, but usually does not reach such a significant dimension inside a single group, most clearly illustrated by the loss of the first toe of the foot. The ventral flattening of the unguals of the foot is perceived as a distinguishing peculiarity of the ornithomimosaurs.

Distribution: Cretaceous, North America, Central Asia

FAMILY ORNITHOMIMIDAE MARSH, 1890

Ornithomimidae Marsh, 1890, p. 84

Genus type: *Ornithomimus* Marsh, 1890

Diagnosis: Progressive ornithomimosaurs with elongated ilia (longer than the pubis) and metatarsus, proximally highly compressed third metatarsal element and without the first toe (pollex). Pleurocoels are present.

Generic composition: *Ornithomimus* Marsh, 1890; *Struthiomimus* Osborn, 1917; *Dromiceiomimus* Russell, 1972; *Archaeornithomimus* Russell, 1972; *Gallimimus* Osmolska, Roniewicz and Barsbold, 1972.

Distribution: Early (upper Albian) and Late (Senonian) Cretaceous; North America, Central Asia (South Eastern and South Western Mongolia).

FAMILY GARUDIMIMIDAE BARSBOLD, FAM. NOV.

Generic type: *Garudimimus* Barsbold, gen. nov.

Diagnosis: Primitive ornithomimosaurs with shortened ilia (shorter than pubis) and metatarsus, proximally almost not compressed third metatarsal and first toe (pollex). Pleurocoels are absent.

Generic composition: Monotypic family.

Comparison: Primitive ornithomimosaurs are differentiated from progressive by the following features: ilia are shorter than pubis, third metatarsal is proximally almost not compressed, and this defines its considerable participation in the tarsal joint and the full separation of the second and fourth metatarsals which adjoin one another in the progressive representatives of the group.

Distribution: Late Cretaceous (Senonian), Central Asia (South Eastern Mongolia).

Genus *Garudimimus* Barsbold, gen. nov.

The name of the genus is taken after the bird Garudi in the mythology of eastern peoples.

Species type: *Garudimimus brevipes* Barsbold, gen. et sp. nov.

Genus composition: Monotypic species

Distribution: Early Senonian, South Eastern Mongolia.

Garudimimus brevipes Barsbold, sp. nov.

Fig. 1-4

Name of species from brevis, Latin “short”; pes, Latin “foot”.

Holotype: #100/13, GIN AN MNR; skull; fragments of axial skeleton, pelvis and incomplete posterior limbs; lower Senonian, Bayanshipensk suite, Bayshin-Tsav location, South Eastern Mongolia.

Material: Holotype

Description: Skull (Fig. 1). Ventral part of the base of the open basisphenoidal capsule in front of the basipterygoidal processes (to which it passed without interruption) connected with the medial edges of the pterygoids, dorsally, but covering the interpterygoidal cavity. Such additional articulation of the capsule with thepterygoids must have blocked the basipterygoidal articulation, denying it mobility. Interpterygoidal cavity is considerably reduced. Entering openings of the parabasal canals (Fig. 2) are located immediately in front of the horizontally directed and shortened basipterygoidal processes. Anteriorly and laterally from the openings, adjoin the pterygoids, lining their areas next to the edge. The epipterygoids in the shape of V-shaped lamella, are ventrally wider. In the lower jaw the lamella ends in a V-shape, without reaching the symphysis. The coronary is absent. The retroarticular process is widened, with dorsally open large recess, which attached m. depressor mandibulae. The medial edge of the process was highly thickened and, apparently, rested against the base of the quadrate, interfering, as in the case of the dromesaurid (Colbert and Russell, 1969) to the extreme displacement of the lower jaw.

The dorsal and sacral (caudal are not in the collection) vertebrae have no pleurocoels. There are six sacral vertebrae. The distal end of the left rib is separated from the diapophysis and leans against the medial surface of the ilium.

The ilium is high, a little shorter than the pubis, with narrowed posterior wing, the upper and lower edge of which are sub-parallel.

The femur is insignificantly shorter than the tibia. III tarsal element lay on the proximal articular surfaces of predominantly the III and only partially the II metatarsal bones. IV tarsal element fully articulated with same named metatarsal bone. In the foot (Fig. 3) three basic (II, III, IV) and two residual (I, V) metatarsals. I metatarsal has a reduced, distally V-shaped trunk, adjacent to the II metatarsal. Distal metatarsal is the shortest and thickest, its proximal end is anteriorly widened, posteriorly slightly compressed. The III is the most thickened and elongated, in the distal part slightly curved, in the proximal part slightly compressed. IV metatarsal in length occupied intermediary position between II and III, its proximal end is widened. Distal head of the bones with convex articular surfaces, are slightly divided sagitally by a furrow. V metatarsal is highly reduced to a narrow, laterally compressed residual element, attached to the IV metatarsal. The first toe (Fig. 4) is the most reduced, its ungula is noticeably compressed from the sides. Phalanges of each of the remaining toes decreased progressively in the distal direction, which is best expressed in the fourth toe, the ungula of which has a flattened ventral surface (in the second and third toes the unguals are not known).

Observations: According to the development of the basisphenoidal capsule, which is open posteriorly, the skull of *Garudimimus* is in many aspects similar to that of *Gallimimus*. It was possible to establish that in the latter that the so-called basipterygoidal branches of the pterygoids (Osmolska et al., 1972) in reality are the epipterygoids. The same type of skull structure in *Garudimimus* and *Gallimimus* allow the generalization of the development of the basisphenoidal capsule and the blocked basipterygoidal articulation for the whole group (there is a possibility of the presence of the capsule in one of the American species, see Parks, 1933; Osmolska et al., 1972). Parabasal canals have similar structures, and most likely were a distinguishing characteristic for the whole group. The capsule (closed type), the supposed blocked basipterygoidal articulation and the horizontal orientation of the basipterygoidal processes in the saurornithoidids (Barsbold, 1974) create an expectation of the development of the parabasal canals also in this family of theropods. The shortness of the ilium and the metatarsus, the lack of compression of the III metatarsal and the development of the first toe differentiate *Garudimimus* from all representatives of the progressive branch of the ornithomimosaurs.

Geologic age: Lower Senonian, Bayasirensk suite.

Location: South Eastern Mongolia, location Bay-shin-tsav.

INFRAORDER OVIRAPTOROSAURIA

Oviraptorosauria: Barsbold, 1975a, p.74

Diagnosis: Small and moderately large theropods with toothless jaws which formed a massive beak. Dental bone has two processes, separated by large lateral openings. The articular joint of the lower jaw has a massive longitudinal projection.

Composition: Family Oviraptoridae Barsbold, 1976; and Caenagnathidae Sternberg, 1940.

Comparison: Oviraptorosaurs are the second group of toothless theropods, basically differentiated from ornithomimosaurs by the development of a massive beak and the highly specific in configuration and structure of the lower jaw with the characteristic articular joint.

Distribution: Late Cretaceous, Central Asia.

FAMILY OVIRAPTORIDAE BARSBOLD, 1976

Oviraptoridae: Barsbold, 1976b, p. 685.

Generic type: *Oviraptor* Osborn, 1924.

Diagnosis: Small and moderately large oviraptorosaurs with intense fenestration of the skull and jaws with a reduced occlusive part, which formed a short beak. The basisphenoidal capsule is absent. Vomers, fused with the jaw bones, by means of a tooth-like projection connected with the pterygoids, by the dividing choanae. Ectopterygoids are highly displaced forward. Basipterygoidal articulation is immobile. Lower jaw with convex occlusal edge, large adductoral projection, short symphysis and large lateral opening. The dental has two posterior processes. Vertebrae, including the caudal, have pleurocoels. The clavicle articulated with the acromial process of the scapula. In the tridactyl hand with the pulley wrist the fingers are reduced in varying degrees. The pubis has a small distal "shoe-like" thickening, and is shorter than the ilium. Obturator process of the shortened ischium is displaced distally. The third metatarsal is not proximally compressed. The foot is structurally four-toed.

Composition: Subfamily Oviraptorinae Osborn, 1924; and Ingeniinae Barsbold, subfam. nov.

Distribution: Late Cretaceous (Senonian), South and Southwestern Mongolia.

Generic type: *Oviraptor* Osborn, 1924.

Diagnosis: Moderately large oviraptorids with unreduced second and third fingers.

Composition: Genus *Oviraptor* Osborn, 1924.

Distribution: Senonian, South and Southwestern Mongolia.

Genus *Oviraptor* Osborn, 1924

Oviraptor: Osborn, 1924, p. 7; Barsbold, 1976, p. 687.

Species type: *Oviraptor philoceratops* Osborn, 1924; Upper Cretaceous, Djdohya Formation, Shabarak-Usu (Bain-Dzak), South Mongolia.

Diagnosis: Oviraptorids with large curved and laterally compressed unguals of the second and third finger.

Composition: Monotypic genus

Distribution: Senonian, South and Southwestern Mongolia.

Oviraptor philoceratops Osborn, 1924

Fig. 5-9

Oviraptor philoceratops: Osborn, 1924, p. 7; Barsbold, 1976b, p. 687.

Holotype: AMNH 6517; incomplete skull and remains of the postcranial skeleton; Upper Cretaceous, Djdohta Formation, Shabarak-Usu (Bain-Dzak), South Mongolia.

Material: Skull and postcranial skeleton (#100/42) of an adult specimen in good preservation and remains of four supposedly young specimens, #100/36 has the best preserved skull).

Description: Premaxilla which composes the basis of the massive upper part of the beak, forms the major part of the highly projected longitudinal crest with anterior paired openings and cancelous walls (fig. 5). The maxilla and the nasal are considerably shortened, the latter is widened and to a great degree also has cancelous structure. The paired vomers have large longitudinal ridges, posteriorly they fuse completely with the maxilla forming in the area of fusion a paired tooth-like projection, which forms the articular connection with the vomer processes of the thickened pterygoids, which separated the large choanae. The ectopterygoids are highly displaced anteriorly, their lateral processes entered in the connection of the lacrimal, jugal, and maxilla in the antero-ventral sector of the orbit. The palatal as a result of considerable reduction had little participation in the structuring of the palatal region. The basisphenoidal capsule is absent. Basipterygoidal processes are not clearly defined, as a result of which the pterygoids are practically adjacent to the basicranium and we suppose fuse with it. The basal articular surface of the quadrate with two large convex condyles, divided by a deep cavity, participate in the formation of the reinforced quadrato-articular joint. The rising and the posteriorly directed processes of the dentary are divided by a lateral opening, which posteriorly is limited by the surangular, and a narrow process that subdivides the posterior edge of the opening into two unequal segments (fig. 6). The adductoral projection of the lower jaw has a high tubercular top.

Six sacral vertebrae. Caudal vertebrae are shortened, with pleurocoels with the exception of the very last ones. The sternum (fig. 7) is formed from lamellar paired elements, sagittally connected. The clavicle (furcula) is V-shaped (fig. 8), with widely diverging branches, each of which articulated with the flat end of the acromial process. The ilium has a wide anterior and narrow posterior flange. The distal thickening of the pubis, in spite of the small proportions, is characterized by the “shoe-like” configuration. The ischium is shortened, with a large V-shaped obturator process, located approximately in the middle of the length of the bone.

The first metacarpal is more than two times shorter than the second and third. The fingers are elongated (fig. 9), II and III are almost the same size; pre-claw phalanges in the latter are more elongated in comparison with the others. Unguals are highly curved, compressed from the sides, widened, with convex tubercles for the attachment of ligaments of finger flexors.

Observations: Among the younger specimens of oviraptors the skull supposedly has no longitudinal osseous crest. The best preserved skull (100/36) in such a specimen shows no signs of a crest. It is possible that it wasn't preserved in the fossilized state, especially if it was weakly expressed in the young forms. However, in the best preserved young specimen (100/36), the structure of the nasal and the frontal, which in part participated in the formation of the crest, does not show any signs in favor of its presence. The osseous crest of oviraptors in its general shape (not in terms of its composing elements and their location on the skull) in many ways is reminiscent of the crest of the casuarys and, possibly, was also covered by a horny cover, in favor of which testifies the cancelous walls of the crest, indicating an abundant blood supply. The osseous crest in oviraptors may have served as a sexual characteristic (which was present among the males). The development of the paired opening in the osseous base of the crest of oviraptors so far has not found a sufficiently consistent explanation.

Geologic age: Senonian, Djadoht Formaton, Djadohtsk and Barungoytsk suites.

Location: Mongolia, Bain-Dzak (Shabarak-Usu) and Hermin-tsav.

SUBFAMILY INGENIINAE BARSBOLD, SUBFAM. NOV.

Genus type: *Ingenia* Barsbold, gen. nov.

Diagnosis: Small oviraptorids with reduced second and third fingers.

Composition: Monotypic genus.

Comparison: Differentiated from oviraptorin by a smaller size and reduced second and third fingers.

Distribution: Late Senonian, Southwestern Mongolia.

Genus *Ingenia* Barsbold, gen. nov.

Species type. *Ingenia yanshini* Barsbold, sp. nov., Upper Senonian, Barungoysk suite, Hermin-tsav, Southwestern Mongolia.

Diagnosis: Oviraptorids with highly reduced, slightly curved and compressed unguals of the second and third fingers.

Comparison: *Ingenia* is differentiated from *Oviraptor* by the high reduction, compression and straightness of the unguals of the second and third fingers.

Distribution: Late Senonian, Southwestern Mongolia.

Ingenia yashini Barsbold, sp. nov.

Fig. 10

Species named in honor of academician A. L. Yanshin.

Holotype: GIN AN MNR, #100/30, lower jaw and in many respects full postcranial skeleton; upper Senonian, Barngoyotsk suite, (upper part), Hermin-tsav, Southwestern Mongolia.

Material: Besides the holotype, remains of a skull and postcranial skeleton, four specimens (#100/30-100/33).

Description: First metacarpal is almost twice as short as second and third, which consequently are highly reduced. In the tridactyl hand the second and third fingers are progressively shorter than the first and are much thinner, however the number of phalanges which compose it are fully preserved. In the distal direction these phalanges are shortened, but the unguals are insignificantly longer than the pre-claw ones. The ungual of the first finger is large, slightly laterally compressed and curved, while in the second and third finger they are greatly reduced, narrow and more straight.

Observation: The considerable similarity with *Oviraptor* makes it unnecessary to repeat those features that they share in common in the structure of the skull and the postcranial skeleton of *Ingenia*, which were already described for the first species. In *Ingenia* the bones are differentiated by greater massivity, disproportional to their smaller size. The degree of preservation of the skull material does not allow one to judge concerning an osseous crest of *Ingenia*.

Geologic age: Upper Senonian, Barungoyotsk suite (upper part).

Location: Hermin-tsav, Southwestern Mongolia.

FAMILY CAENAGNATHIDAE STERNBERG, 1940

Caenagnathidae: Sternberg, 1940, p. 81; Cracraft, 1971, p. 805.

Genus type: *Caenagnathus* Sternberg, 1940.

Diagnosis: Moderately large oviraptorosaurs, the lower jaw of which is elongated and concave in the occlusal part, low adductoral projection, elongated symphysis and narrowed lateral opening.

Composition: One genus *Caenagnathus* Sternberg, 1940.

Comparison: According to the type of lower jaw structure the caenagnathid is principally similar with that of the oviraptorid and does not have analogues among other toothless theropods. At the same time its general proportions and the character of the parts composing it are basically different from that of the lower jaw of oviraptorids. Among the characteristics that differentiate the caenagnathids are the size and configuration of the occlusal part, the degree of development of the adductoral extension, the character of the symphysis, and the shape and size of the lateral opening.

Remarks: During the first description of the caenagnathids were placed in an independent order of birds (Sternberg, 1940), which found support later (Russell, 1964; Cracraft, 1971), although ornithologists denied the presence of bird characteristics and stressed the common reptilian structure of the lower jaw (Wetmore, 1956, 1960). The new finds of the oviraptorids in Mongolia led to the placement of the caenagnathids with the theropods (Osmolska, 1976).

Distribution: Late Cretaceous, North America.

Genus *Caenagnathus* Sternberg, 1940

Caenagnathus: Sternberg, 1940, p. 81; Cracraft, 1971, p. 805.

Species type: *Caenagnathus collinsi* Sternberg, 1940; Upper Cretaceous, Oldman Formation, Alberta, Canada.

Caenagnathus collinsi Sternberg, 1940

Fig. 11

Caenagnathus collinsi: Sternberg, 1940, p. 81; Cracraft, 1971, p. 805.

Holotype: NMC P-3605/8776; partially damaged lower jaw; Upper Cretaceous, Oldman Formation, Alberta, Canada.

Material: Holotype.

Description: Dentary (fig. 11a, b) occupies at least two thirds of the length of the lower jaw. Its occlusal edge is equally concave throughout. The symphysis occupies a little less than half of the length of the dentary. The rostral part is flared, slightly concave, with longitudinal convex ridge-like crests, supposedly connected with the development of the thickened ramphothec

(????). The processes of the dentary are horizontally directed posteriorly. The top of the low adductoral projection is displaced posteriorly and is located on the middle of the length of the oblong lateral opening, the antero-ventral limited area the edges of which are formed by the dentary, upper edge almost completely by the surangular, the posterior by the surangular and angular. The articular joint surface has a rounded outline, with a longitudinal projection, which divides the articular processes, of which the medial is wider than the lateral, with a massive retroarticular process, slanted downwards.

Observation: In the framework of the general features of similarity of the lower jaw of caenagnathids and oviraptoris the basic differences between them are as follows:

Caenagnathids	Oviraptors
Gently sloping concavity along the entire occlusal edge.	Slight concavity only in the extreme anterior part of the edge, the rest is convex.
Symphysis elongated.	Symphysis shortened.
Lateral opening is displaced posteriorly, rounded, wide, consists of two sections.	Opening, displaced forward, narrow, elongated, undivided.
Upper edge of the opening is formed by the surangular and angular	Upper edge is formed by the dentary, posterior by the surangular.
Adductoral projection is located above the middle of the lateral opening.	Projection is located posteriorly to the opening.
Upper process of the dentary is directed horizontally to the Posterior.	Process is directed along an arch dorsally and posteriorly.

It is important to note, that in contrast to the original material on oviraptorids the study of *Caenagnathus* in this case was based only on written material, in many areas highly limited. This is why only the most basic, documented features were taken into consideration in the characterization of its lower jaw, in the background of similarity with the oviraptor characterization forming also considerable differences. In all likelihood, the detailed study of the original material will considerably broaden the basis of both the similarities and the differences between these animals.

Geologic age: Upper Cretaceous, Oldman Formation.

Location: Alberta, Canada.

Caenagnathus sternbergi Cracraft, 1971

Caenagnathus sternbergi: Cracraft, 1971, p. 806.

Holotype: NMC #2690; posterior end of the right lower jaw branch; Upper Cretaceous, Oldman Formation, Steveville, Alberta, Canada.

Material: Holotype.

The extreme limitedness of the existing material makes it difficult to examine. We can only note that the configuration of the articular surface is somewhat different from that of the species type.

Geologic age: Upper Cretaceous, Oldman formation.

Location: Steveville, Alberta, Canada.

Development of Toothless Theropods

Despite the high degree of specificity, the toothless carnivorous dinosaurs share the common theropod structure, which is especially easy to observe in the postcranial skeleton. At the same time, such peculiar features of the skull anatomy, as the recently discovered basisphenoidal capsule, the blockage of the basipterygoidal articulation, the development of the parabasal canals, were not exclusive to the ornithomimosaurs. Among other groups, the most remarkable in this sense are the saurornithoidids (Barsbold, 1974) and the segnosaurs (Perle, 1979). The establishment of the primitive ornithomimosaurs with the developed first toe and the specific differentiation from the better known progressive forms confirms the theory of development of this whole group from a basic theropod branch. The primitive ornithomimosaurs apparently developed for a long time in the zone of adaptation, fairly close to the basic progressive branch. We can allow the possibility that, that in the representatives of the latter occurred a displacement, which only deepened the "ornithomimid" specialization. The parallel evolution of the two lines occurred already in the Early Cretaceous of Mongolia, judging by the undescribed fine in the Southeast of the most ancient progressive ornithomimids (Hurenduh, upper Dzunbaysk suite; Aptian-Albian; another progressive ornithomimid is known from approximately the same time in the Cloverly Formation, USA (see Ostrom, 1970).

The development of oviraptorosaurs went by a path that demanded different adaptations, which are the most clearly expressed in the structure of the peculiar toothless jaw apparatus. The evolution of oviraptorosaurs was directed toward the strengthening compressing possibilities of their jaws, adapted for the squashing of hard objects (Barsbold, 1977).

We must particularly note the general principal similarity of the lower jaw of the oviraptorids and the caenagnathids, which suggests the possibility of kinship. Apparently, caenagnathids developed in the adaptive zone, different from that of the oviraptorids, but on the basis of a single original structural plan.

The absence of the clavicle and sternum (the remains of the poorly preserved one not taken into consideration) among the carnivorous dinosaurs always in the past served as negative proof of a possible connection with birds. Presently the oviraptorids—the first group of theropods, where the clavicles were not only present, but had bird structure, and the sternum was similar to the analogous structure in the keel-less birds. If one is to add to this the pneumatization of some of the skull bones (Osmolska, 1976) and the development of the crest, in general similar with the casuary's crest covered by a horny shield, then oviraptorids occupy one of the most interesting positions in the comparative morphology of birds and carnivorous dinosaurs, which is actively being developed in recent years (Ostrom, 1973, 1976).

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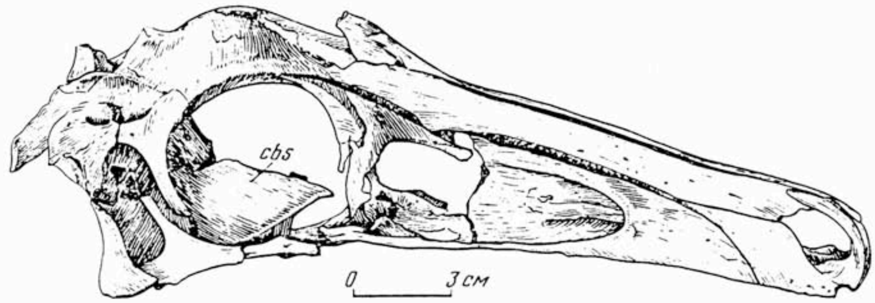
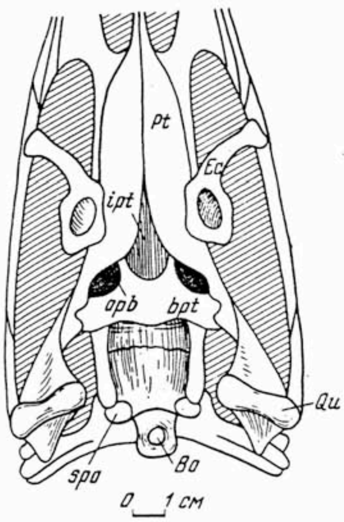


Рис. 1. Garudimimus brevipes Barsbold, sp. nov.; № 100/13, ГИН АН МНР; череп (без нижней челюсти) справа; Юго-Восточная Монголия, местонахождения Байшин-цав, верхний мел, баинширзинская свита

cbs — базисфеноидная капсула



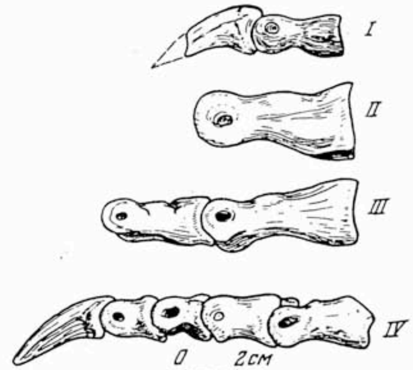


Рис. 2. Garudimimus brevipes Barsbold, sp. nov.; № 100/13, ГИН АН МНР; череп снизу (схематизировано)

Bo — основная затылочная, Ec — эктоптеригоид, Pt — птеригоид, Qu — квадратная, bpt — базиптеригоидный отросток, opb — входное отверстие парабазального канала, ipt — межптеригоидная яма, spo — сфенооккипитальный бугор

Рис. 3. Garudimimus brevipes Barshoid, sp. nov.; № 100/13, ГИН АН МНР; правая плюсна спереди

Рис. 4. Garudimimus brevipes Barsbold, sp. nov.; № 100/13, ГИН АН МНР; фаланги пальцев правой стопы изнутри

Fig. 1. *Garudimimus brevipes* Barsbold, sp. nov.; #100/13, GIN AN MNR: skull (without lower jaw) view from the right; Southeastern Mongolia, Bayshin-tsav, Upper Cretaceous, Bainshiereinsk suite. cbs—basispenoidal capsule.

Fig. 2. *Garudimimus brevipes* Barsbold, sp. nov.; #100/13, GIN AN MNR: skull, ventral view (schematized). Bo—basioccipital, Ec—ectopterygoid, Pt—pterygoid, Qu—quadrate, bpt—basipterygoidal process, opb—entrance opening of the parabasal canal, ipt—interpterygoidal cavity, spo—sphenoocipital tubercle.

Fig. 3. *Garudimimus brevipes* Barsbold, sp. nov.; #100/13, GIN AN MNR: first metatarsus, anterior view.

Fig. 4. Garudimimus brevipes Barsbold, sp. nov.; #100/13, GIN AN MNR: phalanges of the right foot, internal view.

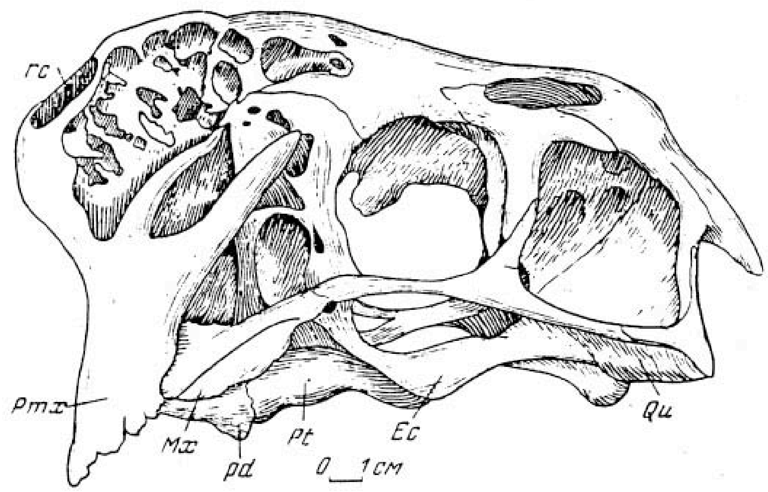


Рис. 5. Oviraptor philoceratops Osborn, 1924; № 100/42, ГИН АН МНР; череп (без нижней челюсти) слева; Южная Монголия, местонахождение Дзамын-Хонд, верхний мел, джадохтская свита (формация Джадохта)

Mx — челюстная, Pmx — предчелюстная, pd — зубовидный отросток в области срастания сошников и челюстных костей, rc — парное отверстие костного гребня. Остальные обозначения, как на рис. 2

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Fig. 5. *Oviraptor philoceratops* Osborn, 1924; #100/42, GIN AN MNR; skull (without lower jaw), left lateral view; South Mongolia, Dzamyn-Hond, Upper Cretaceous, Dzhahodsk suite (Dzhaohta Formation). Mx—maxilla, Pmx—premaxilla, pd-tooth-like processes in the area of fusion of vomers with maxilla, rc—paired openings of the osseous crest. Remaining designations are the same as in fig. 2.

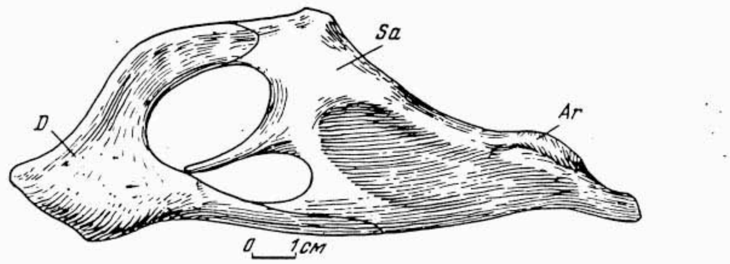

Рис. 6. Oviraptor philoceratops Osborn, 1924; № 100/42, ГИН АН МНР, нижняя челюсть слева
Ar — сочленовная, D — зубная, Sa — предсочленовная

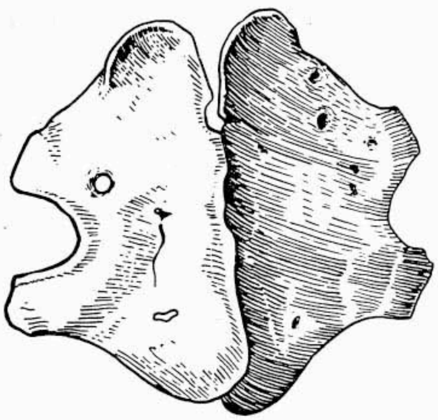

Рис. 7

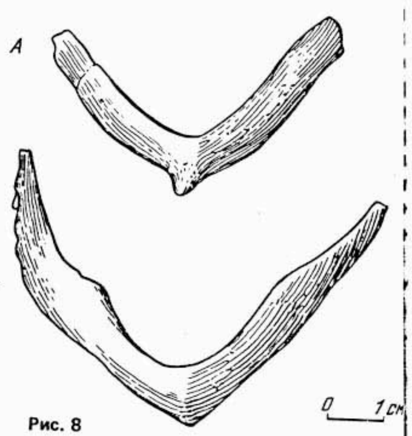

Рис. 8

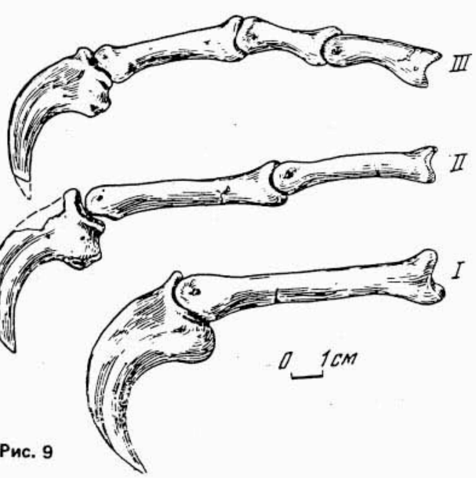

Рис. 9

Рис. 7. Oviraptor philoceratops Osborn, 1924; № 100/42, ГИН АН МНР; грудина спереди

Рис. 8. Oviraptor philoceratops Osborn, 1924; ключицы спереди
А — № 100/36, ГИН АН МНР, молодой экземпляр; Юго-Западная Монголия, местонахождение Хермин-Цав, барунгойотская свита (нижняя часть). Б — № 100/42, ГИН АН МНР; взрослый экземпляр; Южная Монголия, местонахождение Дзамын-Хонд, джадохтская свита (формация Джадохта)

Рис. 9. Oviraptor philoceratops Osborn, 1924; 100/42, ГИН АН МНР; фаланги пальцев правой кисти изнутри

Fig. 6. O*viraptor philoceratops* Osborn, 1924; #100/42, GIN AN MNR: lower jaw, left lateral view. Ar—articular, D—dentary, Sa—prearticular.

Fig 7. *Oviraptor philoceratops* Osborn, 1924; #100/42, GIN AN MNR: sternum, anterior view.

Fig 8. *Oviraptor philoceratops* Osborn, 1924; clavicles, anterior view. A--#100/36, GIN AN MNR, young specimen; Southwestern Mongolia, Hermin-Tsav, Barngoyotsk suite (lower part). B--#100/42, GIN AN MNR; adult specimen; South Mongolia, Dzamyn-Hond, Dzhadostsk suite, Dzhadohta Formation.

Fig. 9. *Oviraptor philoceratops* Osborn, 1924; #100/42, GIN AN MNR; phalanges of the right manus, internal view.

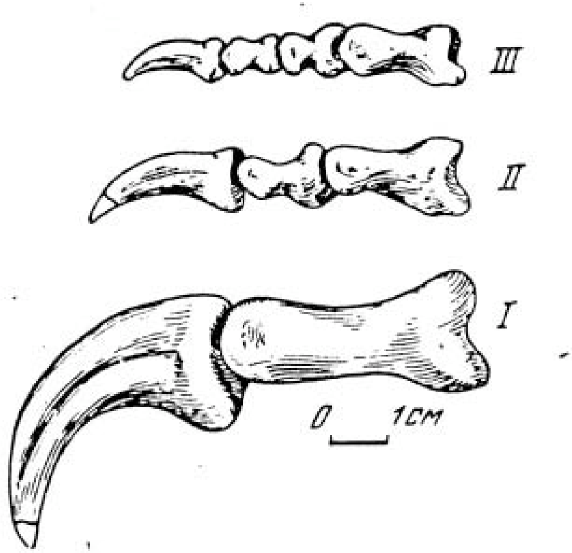

Рис. 10. Ingenia yanshini Barsbold, sp. nov.; 100/30, ГИН АН МНР; фаланги пальцев правой кисти изнутри; Юго-Западная Монголия, местонахождение Хермин-цав, верхний мел, барунгойотская свита (верхняя часть)

Fig. 10. *Ingenia yashini* Barsbold, sp. nov.; #100/30, GIN AN MNR; phalanges of the right manus, interior view; Southwestern Mongolia, Hermin-tsav, Upper Cretaceous, Barungoyotsk suite (upper part).

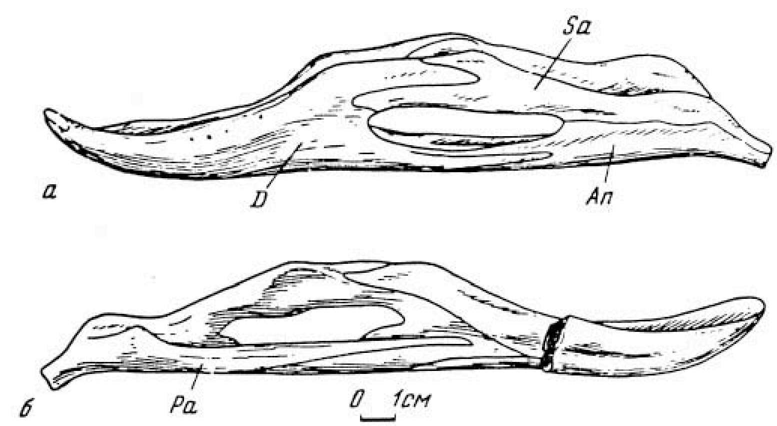

Рис. 11. Caenagnathus collinsi Sternberg, 1940; № P — 3605/8776, NMC, Музей Естественной истории Канады; нижняя челюсть; Канада, Альберта, верхний мел, формация Олдман
а — вид снаружи; б — вид изнутри (большая часть правой нижнечелюстной ветви удалена).
Ан — угловая. Остальные обозначения, как на рис. 6

Fig. 11. *Caenagnathus collinsi* Sternberg, 1940; #P—3605/8776, NMC, Museum of Natural History of Canada; lower jaw; Canada, Alberta, Upper Cretaceous, Oldman Formation. a—lateral view; b—medial view (the majority of the right lower jaw branch is eliminated), An—angular. Remaining designations are the same as in fig. 6.