Alectrosaurus vs gigantoraptor

GigantoraptorTemporal range: Late Cretaceous,~96 Ma PreЄ Є O S D C P J K Pg N ↓ Mounted reconstructed skeleton of Gigantoraptor in Japan Scientific Classification Kingdom: Animalia Phylum: Chordata Clade: Dinosauria Clade: Saurischia Clade: Theropod Superfamily: †Caenagnathoidea Family: †Caenagnathidae Genus: †GigantoraptorXu et al., 2007 Typarter †Gigantoraptor erlianensisXu et al., 2007 Gigantoraptor (meaning giant seizer) is a genus of large oviraptorosaurs that lived in Asia during the Late Cretaceous Period. It is known from the Iren Dabasu Formation in Inner Mongolia, where the first remains were found in 2005. Gigantoraptor reached massive sizes; it is estimated to have coverage of 8-8.9 m (26-29 feet) in length, and has weighed about 2 to 2.7 t (2,000 to 2,700 kg). It had an extensive pneumatized vertebral column and elongated arms with legs. Both the femur and tibia measured over 1 m (3.3 feet) in length, an unusual trait among giant roof sposes. The lower jaws were toothless and ended in a keratinous beak, which can be seen in other oviraptorosaurs. Although several oviraptorosaur species are known to have developed a whole coat of feathers, Gigantoraptor, due to its size, may have lost some of this integument. The genus is classified as an oviraptorosaurian dinosaur, a group of generally small feathered animals. Although it was originally found to represent a basal oviraptorid, subsequent analyses have shown that it is a caenagnathid. It was a giant, terrestrial bipedal omnivore with a clipping bite indicated by the preserved underdible. The shape of the beak indicates a generalistic diet with a potentially temporary carnivory. The holotype-and-only known specimen-has been determined to represent a young adult who died at the age of 11, and it reached a young adult age around 7 years of life. Such a development indicates accelerated growth compared to other major theropods. The discovery and investigation of large oviraptorosaur eggs, Macroelongatoolithus, indicates that large species like Gigantoraptor built their nests with centers missing eggs to avoid crushing. History of discovery In a quarry in Saihangaobi, Iren Dabasu Formation, Erlian Basin, Sonid Left Banner (Inner Mongolia), many remains of sauropod Sonidosaurus have been discovered since 2001. Chinese paleontologist Xu Xing was asked to revisit the discovery of Sonidosaurus in April 2005 for a Japanese documentary. Xu forced them by digging out a femur. When he wiped his leg clean, he suddenly realized that it was not from a sauropod, but from an unidentified albertosaurus size class theropod. He then stopped the recording to secure the serendipitous find. In this way, the discovery of the Gigantoraptor holotype fossil was documented on film. [1] [2] That holotype, LH V0011, consists of the incomplete and disassociated remains a single adult individual, preserving an almost complete submfär, a partial isolated cervical vertebra, vertebrae, caudal vertebrae, right scapula, right humerus, right radius and ulna, almost complete right script, partial ilium with an almost complete pubis and hind legs, including both femur, tibia and fibula with a very complete pes. [1] In 2007, the tycoons gigantoraptor erlianensis was named by Xu, Tan Qingwei, Wang Jianmin, Zhao Xijin and Tan Lin. The generic name, Gigantoraptor, is derived from the Latin gigas, gigantis, meaning giant and raptor, meaning seizer. The specific name, erlianensis, refers to the Erlian Basin. [1] The holotype is currently housed at the Longhao Institute of Geology and Paleontology, Inner Mongolia. [3] Description The size of the holotype and a potential egg compared to a human Gigantoraptor is the largest known oviraptorosaur for which skeletal material is available. Approximately 3 times as long and 35 times more heavy than the largest previously detected oviraptorosaur Citipati, the holotype of Gigantoraptor has been estimated at 8 m (26 ft) long with a height of 3.5 m (11 ft) at the hips, and a heavy weight of 1.4 t (1,400 kg). [1] Other estimates have suggested a length of 8.9 m (29 feet) and a mass ranging from 2 to 2.7 t (2,000 to 2,700 kg). [4] [5] [6] Oviraptorosaurs are quite known to have developed feathers, as seen on feathered specimens of Caudipteryx and pygostyle of several oviraptorids. [1] As an oviraptorosaur, Gigantoraptor was likely feathered as well, however, given its massive size, it may have been partially nude. [1] Skull Holotype mandible of Gigantoraptor in lateral, dorsal, anterior and posterior views preserved, the total length of the lower jaws is 46 cm (460 mm). This element fused into a wide shovel-like shape, suggesting that the unknown skull was over half a meter long and toothless, likely equipped with a rhamphotheca (horny beak). Compared to the right side, the left side of the jaws is well preserved with an almost intact shape. The dice legs are very deep and toothless, and have a pair of heavily developed shelves on the upper edges. These structures are relatively flat. The anterior end of the dentary is rounded, more similar to caenagnathids and different to the chin-shaped one of some oviraptorids. From a top view, the symphyseal (bone union) region is on the front of the dentary U-shaped. Along the lateral surfaces of this bone, some nutrient foramina can be found, which likely supported a rhamphotheca. [3] Both angular and articular-surangicular coronoid (ASC) complexes are comparatively smaller than dentary. Angular is solidly fused to the ASC complex and gives shape to the lower margin of the outer mandibular fenestra. The angular shape has a curved shape and is mainly forward-stretched with a large lateral depression with the rear lower process (bony projection/extension) of dentary. The ASC complex consists of the fusion of the articular and surangular bones with the coronoid process of the lower heal. This complex extends forwards to articulate with the posterior upper process of dentary and gives shape to the upper margin of the outer mandibular fenestra. The coronoid process prominent is low and clearly rounded. At the posterior end of the underdibles the articular glenoid can be located. It is relatively large, convex, and bowl-shaped. [3] Postcranial skeletal Manual juvenile of LH V0011 The anterior caudal vertebrae have very long neural spines and are heavily pneumatic with deep pleurocoels. The middle part of the relatively short tail is slightly solidified by long prezygapophyses. The caudal vertebrae are heavily pneumatized with a spongeous-like bone filling. The forelimbs are quite long due to an elongated humerus (73.5 cm (735 mm) long) and slender script. The humerus bends outwards to an exceptional extent and has a very rounded head, similar to some birds. The first metacarpal is very short and carries a strongly divergent thumb. The back bars are well developed and very elongated: the femur is slender with a distinctive head and neck, measuring 1.10 m (110 cm); The tibia has similar top and bottom edges and measures 1.10 m (110 cm) long, and metatarsus is 58.3 cm (583 mm) long with metatarsal III being the largest. The pes are sturdy with large and strongly curved pedal unguals. [1] [8] Distinctive features According to Xu et al. In 2007, Gigantoraptor can be recognized by the following characteristics: impaired underpower by 45% less length compared to the femur; anterior caudal vertebrae with elongated neural spines and posterior located stocky, rod-like transverse processes; dentary with elongated postero-ventral process reach to the level of glenoid; reduced posterior tapered retro articular process much deeper than its wide; anterior and middle caudal vertebrae with a large pneumatic opening on the ventral surface; dentary with two fossa on the lateral surface and near the outer mandibular fenestra; anterior caudal center with postero-ventral margin stretching ventrally; advanced laminal system of the anterior caudal vertebrae; vertical prezygapophyseal articular facets lie proximal to the distal end of the process in the middle caudal vertebrae; scapula with prominent convexity ventral to the acromion process on the lateral surface; reduced calcaneum is obscured from the front sieve of the expanded astragalus; distal tarsal IV with proximal projection on the lateral margin; anterior caudal vertebrae composed of opisthocoelous, amphicoelous and procoelous; pleurocoels present on most caudal vertebrae; front caudal kottor center with a pair of vertically arranged openings on the lateral surface, bowed humerus with a prominent, spherical top and a curved delto-chest comb; the proximal part of the humerus with a centrally penetrated thick ridge running along the posterior margin; sub-circular, concave proximal articular surface present in the straight ulna; metatarsal III with ginglymoid distal end; constricted proximal articular surface and two lateral splines found in the pedal unguals; radius with a subspherical distal end; the bixent medial margin of the proximal end and a medial condyle three times elongated and extends further more distal than the lateral end of metacarpal I; prominent dorso-lateral process on the proximal end and a longitudinal spline on the ventral margin of the proximal third of the end in metacarpal II; narrow spline-medial to the trochanteric head extends down to the posterior margin of the femoral end, and a patellar spline present on the anterior surface of the distal end; manual unguals with triangular lateral splines; pubis in the latert compressed; femur with straight end; neck ate between the postero-medial oriented spherical femoral peak and anteroposteriorly expanded trochanteric crest slower and higher anterior than posteriorly. [1] Classification I 2007, Xu et al. assigned Gigantoraptor to Oviraptoridae, in a basal position. The anatomy of Gigantoraptor includes the diagnostic features of Oviraptorosaurs. However, it also contains several features found in more derived eumaniraptoran dinosaurs, such as a forelimb/hindlimb ratio of 60%, a lack of expansion of the distal scapula and the absence of a fourth trochanter on the femur. Thus, despite its size, Gigantoraptor would have been more bird-like than its smaller oviraptorosaurian relatives. [1] In 2010, a second analysis of Gigantoraptor relationships found it to be a member of Caenagnathidae rather than an oviraptorid. [9] Phylogenetic analysis performed by Lamanna et al. (2014), supported gigantoraptor being a basal caenagnathid. [10] Comparison between gigantoraptorscript and other caenagnathoids Below is the phylogenetic analysis performed by Funston & Currie in 2016, which found Gigantoraptor as a Caenagnathid. [11] Caenagnathidae Microvenator Gigantoraptor Hagryphus Epichirostenotes Anzu Caenagnathus Elmisaurinae Caenagnathasia Chirostenotes Leptorhynchos Monkey Toraptor Elmisaurus Paleobiology Growth and Development Life restoration of holotype A histological analysis performed on the holotype fibula by Xu and colleagues in 2007 showed that the specimen had 7 lines of arrested growth (LAG or growth rings) that were preserved. Due to the absence of several LAGs, the team reverse calculations to determine them, giving a total of 11. The amount of LAGs indicates that the holotype was about 11 years old at death stupage and had an average growth of 128-140 kg (282-309 lb) per year. The performed histology also suggests that this individual was an adult, as there was extensive development of the secondary osteons, tightly packed LACs near the periphery of the bone, and a poorly vascularized layer of lamellar bone in the outer circumferential layer, indicating a relatively sloppy growth rate. However, given that the fourth to seventh sets of THE LAG were not very tightly packed, Xu and colleagues concluded that the individual reached his young adulthood at the age of 7. In addition, the specimen was still found to be a relatively young adult and thus it would have become larger by the time it reached the adult stage. This indicates that Gigantoraptor had a growth rate much faster than most large non-avian theropods, such as tyrannosaurids. [1] Another unusual development in Gigantoraptor is the elongated hindlimbs. Xu and colleagues pointed out the larger theropod becomes, the shorter and the stockier the legs become to withstand the increasing mass. This is contrasted by Gigantoraptor with both the femur and tibia being over 1 m (3.3 ft), a combination not usually found in theropods of this size. The elongation of these limbs indicates that it was one of the most markerial—an animal adapted to run or maintain some speed during a large time-sized theropod. Furthermore, Gigantoraptor had an extensive pneumatized vertebral column, which may have helped in weight loss. The team also suggested that Gigantoraptor may have been naked because it is 300 times as heavy as species like Caudipteryx, and large animals tend to rely more on mass for temperature regulation, leading to loss of insulating coatings found on their smaller relatives. However, they suggested that at least arm feathers were probably still present on Gigantoraptor, as their primary features, such as viewing behavior and covering the eggs while brooding, are not related to the regulation of body heat. [1] Feeding the lower jaw of the holotype In 2017, Waisum Ma and colleagues re-examined the preserved jaws of Gigantoraptor and found that it had the deepest beak among caenagnathids and a relatively different diet than other oviraptorosaurs. For example, the articular region of gigantoraptors shows convergence with the modern tuatara. The articular region of this reptile allows for propalinal jaw movement (a forward and backward movement) during feeding, and based on the similarities between their jaws, Ma and colleagues suggested that Gigantoraptor could have used propalinal jaw movement as well. This movement using the edged shelves on the dentary indicates a cutting bite that can be through plants (and potentially meat). This is comparable to other caenagnathids and contrasts with the jaws of oviraptorids, whose jaws seem better suited for crushing food. The depth of the mandible indicates the presence of a large tongue, which could have helped the animal in food proccesing, and possibly improve feeding efficiency. [3] Since the shape and size of the pulpit in large herbivores is related to dietary habits, the strongly U-shaped dentären of Gigantoraptor may suggest that this oviraptorosaur was a very non-selective feeder, an adaptation that could have been useful in the variable environmental settings of the Iren Dabasu Formation. The team based this hypothesis on comparisons with several herbivorous animals, including other dinosaurs. While sharply developed and narrow rostra are more correlated with a selective diet, such as the case of some ceratopsians, broad and rounded rostra are more linked to a generalistic diet, which can be seen in morphology Gigantoraptor, Euoplocephalus and hadrosaurids. Ma and colleagues also pointed out that its large size, and thus greater energy needs, could have affected its dietary habits as larger animals tend to consume lower-quality food because it is found in larger amounts on the environment, and has a more stable supply. However, it is not known whether the intestines of Gigantoraptor were specialized in processing this larger intake. The team could not ignore a temporary carnivorous diet that the strong beak along with a propalinal jaw movement may have allowed meat processing. [3] Reproduction Fossilized Makroelongatoolithusbo, with the large center region lacking eggs The presence of giant oviraptorosaurs, such as Gigantoraptor, explains several previous Asian finds of very large, up to 53 centimeters long, oviraptorosaurian eggs, assigned to oospecies Macroelongatoolithus carlylensis. These were laid in huge rings with a diameter of three meters. The presence of Macroelongatoolithus in North America indicates that giant oviraptorosaurs were there as well, although no fossilskeletal remains have been found. [12] In 2018, Kohei Tanaka and the team examined the egg connections of several oviraptorosaur specimens, including egg couplings of Macroelongatoolithus, to correlate the nest configuration and body size to the incubation behavior. Their results showed that egg shell porosity indicates that the eggs of almost certainly all oviraptorosaurs were exposed in the nest without an external coating. Although most oviraptorosaur nests have eggs arranged in a circular way, bots morphology is different in smaller and larger species in that the middle of the nest is much reduced in the previous species, and becomes significantly larger in the latter species. This boconfiguration suggests that while the smallest oviraptorosaurs sat directly on the eggs, a large, Gigantoraptor-sized animal likely sat on the area devoid of eggs. Tanaka and colleagues pointed out that this adaptation was beneficial in avoiding egg-crushing and could have allowed some body-contact during incubation in these gigantic oviraptorosaurs. [13] Paleoenvironment Restoration of a Gigantoraptor protecting pair their nest from two Archaeornithomimus and an Alectrosaurus Gigantoraptor is known from the Iren Dabasu Formation of Inner Mongolia. This formation has been dated to 95.8 ± 6.2 million years ago based on U-Pb and stratigraphic analyses. [14] The environments around this formation were very damp, existing a large braided river valley with floodplains. A semi-arid climate is also indicated by caliche-based sedimentation. The Iren Dabasu formation had extensive vegetation and foliage, as evidenced by the paleosol development, the remains of many herbivorous dinosaurs found in both the river flange and the sediments of the river plains. A rich diversity of charophytes and ostracods inhabited floodplain systems. [15] The dinosaur fauna in this formation includes the fast-running tyrannosaurur Alectrosaurus, ornithomimosauren Archaeornithomimus, therizinosaurids Erliansaurus and Neimongosaurus, sauropode Sonidosaurus and hadrosauroids Bactrosaurus and Gilmoreosaurus. [16] Both Iren Dabasu and Bayan Shireh formations have been correlated on the basis of their similar fossil record on vertebrates. This correlation can be further supported by the presence of a giant, Gigantoraptor-sized caenagnathid in the Bayan Shireh Formation. However, given that this specimen is highly fragmentary, its attribution to Gigantoraptor cannot be confirmed. The presence of Bayan Shireh caenagnathid and Gigantoraptor in fluvial-based sedimentation formations like the Iren Dabasu and Bayan Shireh formations suggests a preference over mesic habitats in giant oviraptorosaur species, rather than xeric habitats. [18] See also Timeline of oviraptorosaur research References ^ a b c d e f g h i j k Xing, X.; Tan, Q.; Wang, J.; Zhao, X.; Tan, L. (2007). A giant bird-like dinosaur from the Late Cretaceous in China. Nature. 447 (7146): 844−847. Bibcode:2007Nature.447.. 844X. doi:10.1038/nature05849. PMID 17565365. Additional information ^ Pickrell, N. (2014). Flying Dinosaurs: How fearsome reptiles became birds. NewSouth Publishing. 256 pp. ^ a b c d e Ma, W.; Wang, J.; Pittman, M.; Tan, Q.; Tan., L.; Guo, B.; Xu, X. (2017). Functional anatomy of a giant toothless mandible from a bird-like dinosaur: Gigantoraptor and the evolution of the oviraptorosaurian jaw. scientific reports. 7 (1): 16247. Bibkod:2017NatSR... 716247M. doi:10.1038/s41598-017-15709-7. PMC 5701234. PMID 29176627. ^ Campione, N. E.; Evans, D.C.; Brown, C.M.; Carrano, M. T. (2014). Body mass estimation in non-avian bipeds using conversion to quadrupled stylopodial proportions. 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Chalk research. 56: 60−65. doi:10.1016/j.cretres.2015.03.007. External links Media related to Gigantoraptor on Wikimedia Commons Data related to Gigantoraptor at Wikispecies news@nature.com: Giant bird-like dinosaur found. Wired Science Scientists Discover the 3,000-Pound Gigantoraptor Dinosaur in Mongolia Fleshed-out restoration of a Gigantoraptor erlianensis. Credit: Julius T. Csotonyi Yahoo! News: China finds new species of large, bird-like dinosaur retrieved from