

A Comparative Study of Su's Qiaolong in Inner Mongolia and Su's Qiaolong in Xinjiang

Junyou Wang*, Bin Guo, Lei Wang and Jiongqing Sun

Inner Mongolia Natural History Museum, Hohhot, Inner Mongolia, 010010, China

Email: 594924646@qq.com

*corresponding author

Keywords: Su's Qiaolong; Dinosaur Fossil; Structure Features

Abstract: With the development of history, the interpretation of the extinct paleontological dinosaurs can only be left as fossils by studying them. By comparing and analyzing the fossils of Su's Qiaolong in Xinjiang and Inner Mongolia, their fossil structures are very similar, but they appear in different periods and in different regions. This discovery enriches and improves the information of Su's Qiaolong. The discovery of new material dinosaur fossils is of great scientific significance for us to trace history, study historical organisms and ancient ecological environment.

Introduction

The discovery of Su's Qiaolong in Inner Mongolia and the comparative study of dinosaur fossils help us understand history, speculate on the evolution of the earth, and understand climate change. In the Inner Mongolia region, new materials discovered by Su's Qiaolong in Xinjiang have further expanded Su's The survival time and geographical distribution range of the dragon not only supplemented the anatomical characteristics of Su's Qiaolong, but also provided new reference information for studying the evolutionary distribution of Su's Qiaolong. The study of dinosaurs has great historical significance.

1. Su's Qiaolong fossil discovery

1.1 Xinjiang Su's Qiaolong

The Xinjiang Su's Qiaolong fossils were mined in the Jurassic in 1983 by the Xinjiang Paleontology Investigation Team of the Institute of Paleontology and Paleontology, Chinese Academy of Sciences in 1983. Professor Dong Zhiming judged from the shape and size of the specimen that it was a small group of minor sauropods. They are the same age and size and belong to the same species. The closeness and closeness of the inter-species relationship is reflected in the similarities and differences of morphological structure, and the closely related species have more similarities in their morphological structure. According to this principle, referring to the characteristics of the Pachycephalosaurus subfamily: such as the shape of the skull, the number of vertebrae in the central column, etc., the sauropods in the fossil pit No. 83003 were restored and racked, and two comprehensive skeletons were obtained; of which IVPP .V8299 specimen is selected as the positive type, and IVPP.V8300 specimen is selected as the subtype specimen. Among them: the positive type, including broken bone fragments and teeth of the skull; the secondary type specimen is a comprehensive skeleton, lacking the skull and part of the tail vertebra.

1.2 Inner Mongolia Su's Qiaolong

The Su's Qiaolong in Inner Mongolia was discovered in 2019. A small short-necked sauropod dinosaur was also found in the strata of the Lower Cretaceous Xinminba Group in the Mazongshan area, northwestern Inner Mongolia Autonomous Region in 2019. The characteristics of Shi Qiaolong are the closest, and they are identified as new materials of Su Qiaolong, which are now collected in Inner Mongolia Natural Museum.

The fossil structure of the new material of Su's Qiaolong is relatively complete, and the integrity is 70%, including 11 cervical vertebrae, 12 dorsal vertebrae, 5 sacral vertebrae, 39 caudal vertebrae, some cervical ribs, dorsal ribs, and pulse arcs. Pairs of scapula, ebony, humerus, ulna and radius, basically complete left and right forefoot phalanges, paired intestines, femurs, tibia, fibula, talus, basically complete right hind metatarsal and phalanges

2. Comparative Analysis Of Xinjiang And Inner Mongolia Su's Qiaolong

2.1 Active Era and Geographical Distribution

Xinjiang's Su's Qiaolong and Inner Mongolia's Su's Qiaolong are a type of dinosaurs that obviously exist in different geographical locations. Xinjiang Su's Qiaolong survived in the Middle-Late Jurassic, the main active area is the Kelameishan area in the Junggar Basin, Xinjiang. Fossils were found in the formation of the Middle Jurassic Wucaiwan Formation in the Karamay area of the Junggar Basin, Xinjiang. 36 years later, archaeologists discovered that the new material of Su's Qiaolong is a small short-necked type that is particularly similar to Xinjiang's Su Qiaolong in the strata of the Lower Cretaceous Xinminbao Group in the Mazongshan area, Ejin Banner, northwestern Inner Mongolia. Sauropod dinosaur. The study found that the survival of the new materials and the Early Cretaceous are mainly active in the Mazongshan area of Alxa Ejin Banner in Inner Mongolia.

2.2 Structural Characteristics of Dinosaur Fossils

We compared the vertebrae, ribs, and bones of the existing Su's Qiaolong fossils in Xinjiang and Inner Mongolia one by one to analyze and compare Xinjiang Su's Qiaolong and Inner Mongolia's Su Qiaolong. The following is an analysis of each feature:

The characteristics of the first cervical spine are all of the posterior concave type of the cervical spine, the lateral concave is developed, the ventral surface is flat, there is no abdominal crest, and the nerve spine is longitudinal. The vertebral body of the anterior cervical spine of Su's Qiaolong in Inner Mongolia changed from short to long, the nerve arch and nerve spine changed from low to high, and the undercut changed from shallow to deeper and longer. The vertebral body of the posterior cervical spine gradually decreases from long to high, and the nerve arch and spine gradually increase from low to high, and then gradually widens laterally.

The characteristics of the second stiffener. Observing the fossils, we can see that both are short neck ribs, three-headed neck ribs, the anterior protrusion is tapered, the rib head and rib nodules, and the cervical rib nodules as the lateral protrusion rises backward The section is also lengthened accordingly and the angle is increased. The distal end of the neck rib is thin and pointed. The similarity is very large.

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The characteristics of the fourth dorsal rib, the analysis of the shape is a two-headed dorsal rib, the structure is simple, as the transverse process of the dorsal vertebrae rises, the angle of the rib head and rib nodule of the rib increases. The distal end of the rib is relatively round, and is close to the rib of the original sauropod in shape.

The fifth sacral vertebrae characteristics, because of the limitations of dinosaur fossils, it can still be seen that both sacral vertebrae are double flat, with two ends extended, the vertebral body is slightly longer than the height, no scoliosis, and there are thick abdominal crests on the ventral The transverse process and the sacral rib healed to form a plate-shaped sacral rib plate. The two ends expanded, the backbone was twisted, and the distal ends were not connected to each other. The three sacral spines in the middle healed in a flat plate shape. There are obvious notches on the top of the Su's Qiaolong in Xinjiang to distinguish them, and there are parallel vertical prisms on the side

of the Su's Qiaolong in Inner Mongolia.

The fifth caudal vertebrae characteristics: both are anterior caudal vertebrae anterior concave type, the concavity gradually becomes shallower backward, the vertebral body has no lateral concavity, and there are residual transverse processes on it, which weakens backwards until it disappears, the residual caudal rib Healing with it, there are fan-shaped caudal ribs formed on the first four vertebral bodies. Nerve spine is high, rod-shaped; the mid-segment tail vertebral body is double flat, without scoliosis, the center is contracted, the anterior and posterior ends are widened, the height is equal to the length, the posterior vertebral body is elongated, the nerve spine becomes lower, and it is inclined backward in a plate shape The top is thick; the tail caudal vertebral body is double concave, shallowly concave, and the vertebral body is long. The nerve spines become longitudinally elongated, and the small spines are inclined backwards.

The sixth scapula has common features. The scapula is thick, the distal scapula plate is narrow, curved sideways, flat on the medial side, raised on the lateral center, thin on the leading edge, and widened on the distal end (distal end). The proximal scapula is enlarged, with a lateral elliptical depression on the outer side. The thickened posterior edge is connected with the black beak bone to form a humerus concavity (scapula concave), and the lower edge is straighter with the upper beak bone.

The seventh coracoid bone has in common a sub-round shape, a disc shape, convex and concave, thin lateral edges, the upper edge is straight with the scapula, and the lower medial (posterior edge) is a thickened deep concave The humerus concave of the shoulder blade connects to form a semicircular joint socket.

The eighth humerus is characterized by a straight backbone, a sub-circular cut surface, expanded ends, and a wide and thick proximal end. Humeral head trochanter, triangular crest expansion, distal condyles, trochanter between the two condyles, a small traumatic condyle on the lateral edge, a smooth pulley concave on the elbow. The upper articular surface of the Su's Qiaolong in Xinjiang is a triangular nodular surface, and there is a ridge extending from the side of the elbow and disappearing at the humerus.

The ninth analysis of the characteristics of both the ulna is that the ulna is straight, the proximal end is enlarged, the end face is triangular, the articular surface has a knot, the elbow is not developed, and the distal extension is not obvious.

The tenth radius features, both radius performance. It is slightly shorter than the ulna, the backbone is straight, the ends are slightly expanded, and the articular surface is concave to form a dimple.

The eleventh intestinal bone is characterized by a fan shape, the anterior lobe is developed, extending forward and outward, the posterior leaflet is not developed, and the outer side of the intestinal bone is slightly concave inward. The pubic bone suddenly reached a plate shape, extending forward and downward. The ischial process is not developed and only has an oblong nodule. At the upper edge of the acetabular cavity, a small ridge rises along the edge of the acetabulum to form a crest. There are three nodules from the front to the back of the intestinal bone of the Su's Qiaolong in Xinjiang, and there are longitudinal rib spaces between each nodule. These nodules are connected to the sacral rib process.

The twelfth pubic feature, both of which are thick at the front and outer edges, laterally bulged, thin at the back, and wide at the bone. The proximal anterior articular surface has a long nodular surface, which is connected to the pubic process of the intestinal bone, thins toward the posterior pubic plate, and begins to twist laterally, forming an arc, forming the anterior lower edge of the acetabulum. There is a large recess on the edge of the posterior side of the pubis, which is a closed hole. This hole is obliquely long and open. Judging from the broken edge, the closed hole may be closed. The distal pubis is widened, and the trochanteric crest on the medial side forms the pubic symphysis, which is a corresponding union.

The thirteen ischial bones have the same characteristics. Both ischial bones are shorter than the pubic bone and have a simple structure. This long bone is convex on the outside, flat on the inside, and has a meniscus-shaped concave edge near the turbulence. The face is connected to the ischial

process of the intestinal bone, and the inferior node is connected to the ischial process of the pubic bone to form the posterior side wall of the acetabulum. The distal end of the ischium of Su's Qiaolong in Inner Mongolia does not expand, and the inner side has a rough connecting junction. The two ischioms are connected by ligaments.

The fourteenth femoral characteristic, both of which are straight femur, oblong diaphysis, semicircular femoral head, inward extension, and no obvious neck. The fourth knuckle is located in the posterior side of the middle of the backbone, showing a tuberosity. Xinjiang Su's Qiaolong has a longitudinal shallow groove on the outside, which is a contraction muscle concave. Distal femoral extension is obvious, the medial condyle is subcircular, larger than the lateral condyle, the intercondylar recess is deep, a shallow longitudinal groove separates the lateral condyle and the epicondyle on the lateral side of the lateral condyle, and there is a deep pulley between the medial and lateral condyles on the anterior side of the distal femur. The distal end of the femur in Inner Mongolia is expanded with two condyle joints. The medial condyle (tibial condyle) is sub-circular and larger than the lateral condyle (instant condyle). There is a deep intercondylar recess between the two condyles. There is a shallow outer lateral condyle. The longitudinal groove separates the lateral condyle and the epicondyle. There is a deep pulley between the medial and lateral condyles of the anterior side of the distal femur.

The fifteenth characteristics of both tibias are straight and sturdy, with enlarged proximal end and a concave in the ellipse of the end face to accommodate the femoral tibial condyle. On the anterolateral side (fibular surface), a long wing-like process-a tibial process, this sharp process disappears forward at 1/3 of the backbone, the inner guillotine of this process of Xinjiang Su's Qiaolong has a long and concave, concave two. There is one nodular process on each side, and the two processes are connected with the concave of the proximal end of the ribs. The enlarged proximal end of the tibia shaft tapers downwards until the distal end thickens again. There is a deep concave on the distal surface of the two-talus concave, in which the talus is embedded. The outer side of the talar concavity of Su's Qiaolong in Inner Mongolia is a large calcaneal process, which is half-moon shaped.

The structural characteristics of the sixteenth fibula fossil. Both fibula are slender and slightly shorter than the tibia. The structure is simple. The two ends are slightly expanded. The proximal end is slightly larger than the distal end.

3. Research On The Application Value Of Su Qiaolong

The discovery of Su's Qiaolong fossils enriched the paleontological dinosaur fossils and provided an important scientific basis for studying the evolution of the earth, the origin of life, biological evolution, paleoclimate and paleoenvironment. One of the witnesses of the history of the earth.

3.1 Value of Scientific Research

Through comparative analysis of the fossils, it is obvious that they are very similar in body structure, but they lived in different periods and positions, which is of great significance to our study of crustal movement. The new style of the fossil of qiaolong su can effectively assist the study of the movement track of the earth plates, and also provide materials for the study of the evolution rules of the ancient ecology and ancient environment, which has high scientific research value.

3.2 Socio-Economic Value

Dinosaurs have been extinct for tens of millions of years. Their fossils are non-renewable and are especially precious. They record history and have a strong collection value. The new material discovered in Inner Mongolia after the Xinjiang Su's Qiaolong not only provides more materials for dinosaur research, but also enriches the collection of dinosaur fossils in the museum. It not only has scientific educational significance, but also drives the heat of the dinosaur culture and has strong economic benefits.

Conclusion

The new materials of Su's Qiaolong were found in the Cretaceous strata under Ejina in the northwestern Inner Mongolia Autonomous Region, while the previously discovered Su's Qiaolong were all produced in the Middle and Upper Jurassic strata in the Junggar Basin, Xinjiang. The comparative study of Su's Qiaolong in Inner Mongolia and Su's Qiaolong in Xinjiang has enriched the survival time and paleogeographic distribution range of Su's Qiaolong, not only of great significance to the study of paleontological dinosaur fossils, but also of great significance to the study of ancient environment and paleoecology significance.

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