

**A new species of Middle Jurassic Carnosauria from Dashanpu,
Zigong, Sichuan Province, *Szechuanosaurus zigongensis* sp. nov.**

by

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Abstract

A description is hereby provided for new specimens of Carnosauria from the *Shunosaurus* Fauna of Zigong Municipality: *Szechuanosaurus zigongensis* sp. nov.

Introduction

In 1984 a large amount of dinosaur specimens were recovered during the construction of the Zigong Dinosaur Museum, among which was an incomplete skeleton which was quite distinct and initially described as *Gasosaurus constructus* Dong and Tang 1985. An appended description is hereby conducted.

Description

Theropoda Marsh, 1881

Carnosauria Huene, 1920

Megalosauridae Huxley, 1869

***Szechuanosaurus* Young, 1942**

***Szechuanosaurus zigongensis* sp. nov.**

Diagnosis: The species is moderate in size with an approximate length of six meters. Cervical vertebra count is 10, with opisthocoelous anterior and median centra and platycoelous posterior centra. Cervical ribs are gracile and long. Dorsal vertebral count is 13, centra are amphiplatyan, and plate-shaped neural spines are moderately high. The five sacral neural spines are unfused. Anterior caudal neural spines are narrow, and the prezygapophyses on the posterior caudals are elongated. The scapula is moderately broad. The deltopectoral crest on the humerus is particularly well developed. Radius is 56% the length of the humerus. Metatarsal IV is vestigial. The ilium is particularly low, the distal pubis is booted, and a muscular attachment crest on the distal ischium is well developed.

Locality and stratigraphic position: Middle Jurassic Lower Xiaoximiao (also known as “Xiashaximiao”) Fm. at the town of Dashanpu, Zigong Municipality, Sichuan Province.

Type: ZDM 9011 includes 10 articulated cervicals, 13 dorsals, 5 sacals, 25 disarticulated caudals, left humerus, ulna, radius, carpals, metacarpals, phalanges, right scapula, and a complete articulated pelvic girdle.

Hypodigm: A left maxilla with dentition (ZDM 9012 [KI-8]); 10 isolated theropod teeth (ZDM 9013); and a right femur, tibia, and fibula (ZDM 9014[I-U]) which may be conspecific due to their size.

Etymology: For the town of Zigong, from which it was excavated.

Description: The axial odontoid process is semispherical, the centrum is opisthocoelous and conspicuously laterally constricted, and pleurocoels are well developed. The neural spine is broken but the neural arch is low. Prezygapophyseal facets are small, semicircular, and located on the anterolateral neural arch. The diapophyses are small and located anteriorly. The parapophyses are ventral and in close proximity to the diapophyses.

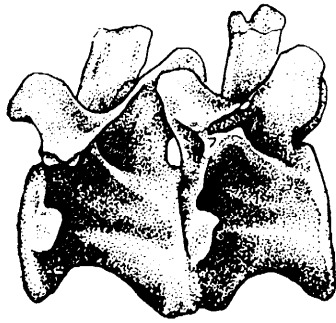


Figure 1. Left lateral view of Cv9-10 of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011)

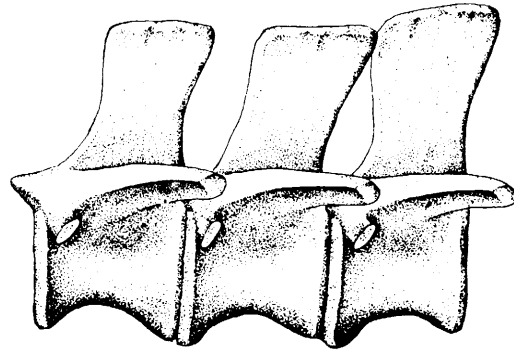


Figure 2. Left lateral view of D6-8 of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011)

Cervical vertebrae 3-8 are opisthocoelous with well-developed pleurocoels but lack a ventral keel. The centra on Cv3-5 are distinctly laterally constricted but are not so on Cv6-8. Neural spines are plate-shaped, pre- and postzygapophyses are large and oval, and epipophyses on the postzygapophyses are well developed. The diapophyses are anterior on the centra and gradually elevate posteriorly. The parapophyses lie anteroventrally on the centra.

Cervical vertebrae 9-10 have centra that are flat anteriorly and gently concave posteriorly, the pleurocoels are distinct, and a ventral keel is present. The Cv9 neural spine is plate-shaped but the anteroposterior breadth is reduced. The Cv10 neural spine is baton-shaped. The pre- and postzygapophyseal distance has become closer, the prezygapophyses are medially oriented, and the postzygapophyses are laterally oriented. The diapophyses are ascended and the parapophyses are located anteriorly on the centrum approaching the midsection.

The length of the 13 articulated dorsals is 117 cm. D1-3 are amphiplatyan with short centra that are distinctly medially constricted, the pleurocoels are moderately developed, and a ventral keel is present. Neural spines are baton-shaped. The pre- and postzygapophyseal articular facets are nearly horizontal. The diapophyses are oriented dorsally, and the parapophyses gradually ascend.

D4-13 are also amphiplatyan but centra length has increased, medial constriction is still present, pleurocoels are not well developed, and the ventral keel has become lost. Neural spines are plate-shaped, anteroposteriorly constricted at their midsection, and with slightly rugose apices. The diapophyses are conspicuously posteriorly oriented, and the parapophyses ascend nearly to the dorsal margin of the centra. On the posterior dorsals, the parapophyseal stems gradually lengthen.

The cervical ribs on the mid-series are relatively well-preserved, being tricapitular with a short and small capitulum and tuberculum. Shafts are gracile and long with acute termini, and in cross-section are laterally convex and medially very slightly concave. Lengths of Cvr5-7 all exceed 40 cm.

There are 12 left and right dorsal ribs represented on the Type that are bicapitular, the shafts have very slight medial curvature, and in cross-section they are elliptical. Anterior and median ribs are relatively robust with flat termini. The length of D1 is 45 cm, lengths in the midsection are 64 cm, the tuberculum on the posterior ribs is extremely short, and termini are all acute.

Five amphiplatyan sacral vertebrae are present, the centra on S3-5 being relatively short. Posterior diameter on S5 is more expanded. Neural spines are plate-shaped and on S2 its apex is in contact with the apex of S3, but the remaining spines are all isolated.

The caudal vertebrae are platycoelous. Anterior caudal neural spines are plate-shaped, narrow, and high. Caudal ribs are long and posterolaterally oriented. Centra in the mid-series are shorter with low plate-shaped neural spines. The posterior caudals are thin and elongated, their lengths being two to three times their posterior breadth. Neural spines are absent and pre- and postzygapophyses are elongated.

The proximal end of the right scapula has been damaged but the ventral margin shows thickening with a 5 cm glenoid. The shaft is moderate in breadth and is very slightly medially embayed. The distal end is relatively thin and slightly expanded with a 11.6 cm breadth. Minimum breadth of the shaft is 7 cm and length is approximately 55 cm.

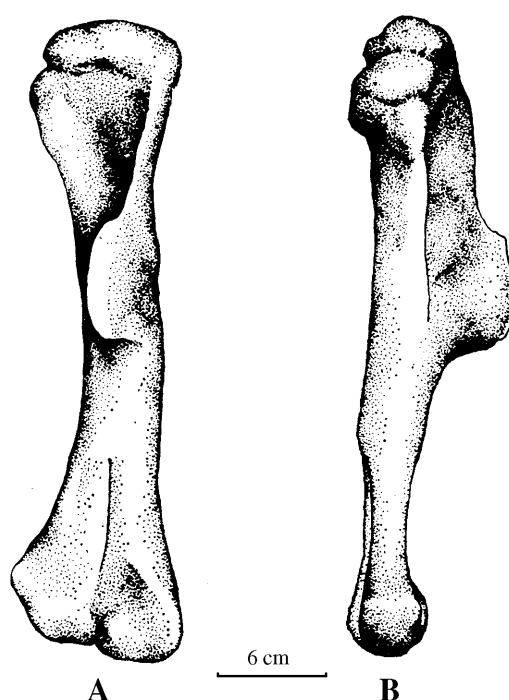


Figure 3. Left humerus of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011).
A. Anterior view; B. Medial view

The left forelimb is relatively complete. The humerus shaft is relatively straight, proximal end is unexpanded, a medial tuberosity is distinct, and the deltopectoral crest is particularly well developed with anterior curvature and its posterior margin descending to the midsection of the shaft. The distal end of the humerus is very slightly expanded, thin, and flat. The lateral condyle is slightly larger than the medial condyle, and an anterior intercondylar groove is rather narrow. Humerus length is 36 cm, proximal breadth is 9 cm, distal breadth is 11 cm, and minimum shaft diameter is 3.5 cm.

The ulna is conspicuously expanded proximally and in posterior view is triangular. Posteriorly there is a fossa for articulation with the lateral humeral condyle and an olecranon process is well developed. The ulna gradually attenuates distally, the shaft is semicircular in cross-section, and its terminus is very slightly expanded. Ulna length is 24 cm, proximal breadth is 8.8 cm, distal breadth is 5.4 cm, and shaft minimum diameter is 2.2 cm.

The radius is shorter than the ulna, its proximal end is very slightly expanded, and in posterior view it is nearly elliptical. Posteriorly there is an articular facet for the medial condyle of the humerus. The shaft is relatively flat, the distal end is very slightly expanded, and in cross-section it is semicircular. Radius length is 20 cm, proximal breadth is 5.4 cm, distal breadth is 4.8 cm, and minimum diameter is 1.8 cm.

Only a single plate-shaped carpal, identified as the radiale, is present. Its anteroventral margin ascends, and there is a short crest dividing it into two shallow articular facets. The right facet articulates with the posteromedial side of metacarpal I and left facet with the posterior side of metacarpal II. There is a large and shallow posterior facet for the radius. Breadth is 4.6 cm, ventral thickness is 1.6 cm, and dorsal thickness is .8 cm.

Four complete left metacarpals are present. McI is short and thick, approximately 1/2 the length of McII, its proximal end is expanded, and posteriorly there is a longitudinal median crest. The distal trochlea is deep for appropriate dorsoventral flexion of the digit, and anterolaterally there is a pair of ligament fossae. Length is 6.2 cm, proximal breadth is 3.7 cm, distal breadth is 3.3 cm, and minimum diameter of the shaft is 2 cm.

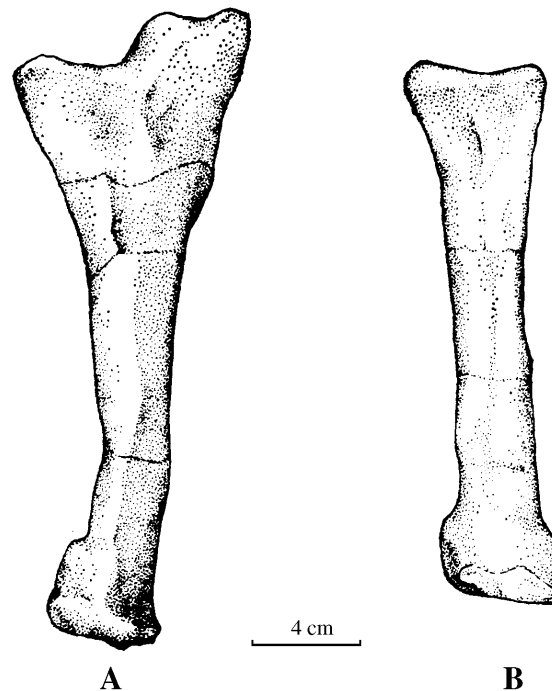


Figure 4. Lateral view of left ulna (A) and medial view of left radius (B) of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011).

McII is the largest in the series. Its proximal end is conspicuously expanded, at its midsection it is very slightly convex posteriorly, the trochlea on the expanded distal end is relatively broad, and there are two distinct ligament fossae laterally. Length is 11.8 cm, proximal breadth is 5.8 cm, distal breadth is 4.9 cm, and the minimum diameter of the shaft is 2.0 cm.

McIII has a relatively slender shaft, expanded proximal end, in posterior view is triangular, and the distal end has a shallow trochlea and two ligament fossae. Its length is 10.7 cm, proximal breadth is 3.1 cm, distal breadth is 2.4 cm, and minimum diameter of the shaft is 1.2 diameter.

McIV is slender and short, its proximal end is triangular in cross-section, and posteriorly it is very slightly convex. The shaft gradually attenuates distally and its terminus lacks a trochlea. Length is 5.2 cm, proximal breadth is 1.5 cm, distal breadth is .8 cm, and minimum diameter is .8 cm.

The first phalanx of digit I (McI-1) has a slender and short shaft, its proximal end is expanded and there is a median longitudinal crest in the posterior articular facet dividing it into two differentially sized facets for the metacarpal. The distal trochlea is deep and there are two conspicuous lateral ligament facets. Length is 9.2 cm, proximal breadth is 3.3 cm, distal breadth is 3.1 cm, and minimum diameter is 1.9 cm.

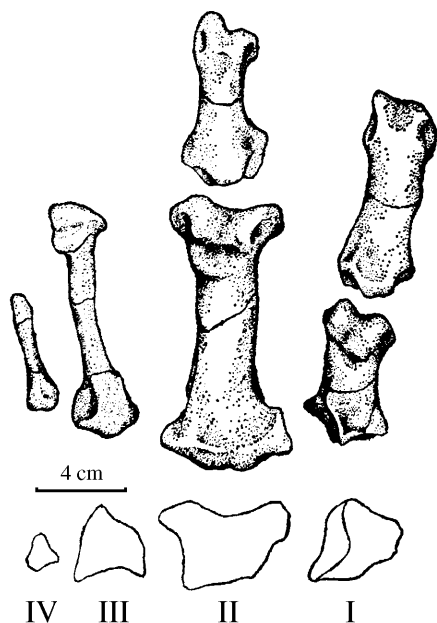


Figure 5. Dorsal and posterior view of left metacarpals and phalanges of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011)

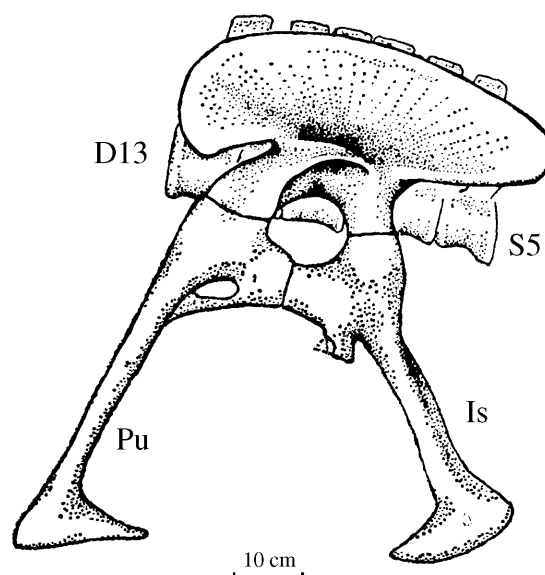


Figure 6. Lateral view of pelvic girdle and sacral vertebrae of *Szechuanosaurus zigongensis* sp. nov. (ZDM 9011)
D. Dorsal; Is. Ischium; Pu. Pubis; S. Sacral.

The first phalanx of digit II (McII-1) has a short and thick shaft, expanded proximal end, a distinct median longitudinal crest in the posterior articular facet, and distal lateral ligament facets. Its length is 7.5 cm, proximal breadth is 3.7 cm, distal breadth is 2.7 cm, and shaft minimum diameter is 2.0 cm.

The pelvic girdle is complete. The ilium is exceptionally low, as its height is less than half its length. The sacral vertebrae lie extremely close to the ilia, the preacetabular process curves ventrally to create a low angle with the pubic peduncle, and the postacetabular process is longer and narrower than the preacetabular process. The pubic peduncle is slightly longer than the ischial peduncle, and the dorsal marginal crest of the acetabulum is well developed. Ilium length is 55 cm and height at the acetabulum is 21 cm.

The proximal pubis is expanded, the obturator foramen is elliptical, the shaft is gracile and long, and both left and right elements are fused along their entire lengths with the exception of the most dorsal ends, and thus they represent a Y-configuration. The shaft is anteriorly flat but the posterior margin is acute and the distal boot is not extremely projected. Length is 58 cm, proximal breadth is 20 cm, distal boot is 19.8 cm in length, and minimum diameter is 4 cm.

The ischium is thicker and shorter than the pubis with an expanded proximal end and an obturator process on its anteroventral margin. The ischial shafts are fused distally from the process, in cross section the shafts are triangular, the medial side is flat, the lateral margin is acute, and there is a well-developed distal crest to facilitate musculature attachment. Length is 51 cm, proximal breadth is 20 cm, distal breadth is 19 cm, and minimum shaft diameter is 5 cm.

Discussion: The new species shares several characters with *Szechuanosaurus campi* (Dong et al., 1983; He, 1984) including opisthocoelous anterior and median cervicals with plate shaped neural spines; 13 amphiplatyan dorsals with moderately high plate-shaped neural spines that are constricted at their midsection; 5 fused sacrals; platycoelous caudals; ilium being low, pubic shaft being slender and long with an undeveloped distal boot; and there is an expanded distal ischial crest for muscle attachment. Thus, the Dashanpu specimens are undoubtedly assigned to the genus *Szechuanosaurus*.

The Dashanpu specimens are excluded from the species *S. campi* due to the following characters: ZDM 9011 posterior cervicals are platycoelous with a ventral keel; there is a well-developed deltopectoral crest on the humerus; and the presence of a vestigial McIV. Thus it is erected as *Szechuanosaurus zigongensis* sp. nov.

Acknowledgments

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Explanation of Plates

Plate I

1. Lateral view of left maxilla. ZDM 9012, x 1/3.
2. Lateral view of teeth. ZDM 9013, x 1.
3. Right lateral view of axis. ZDM 9011, x 1/4.
4. Anterior view of Cv9. ZDM 9011, x 1/4.
5. Left lateral view of Cv9-10. ZDM 9011, x 1/4.
6. Ventral view of Cv4-7 and cervical ribs. ZDM 9011, x 1/6.

Plate II

1. Left lateral view of D4-8. ZDM 9011, x 1/5.
2. Left lateral view of sacrum and ilium. ZDM 9011, x 1/6.
3. Lateral view of anterior caudals. ZDM 9011, x 1/5.
4. Right lateral view of posterior caudals. ZDM 9011, x 1/6.
5. Left lateral view of ischium. ZDM 9011, x 1/6.
6. Left lateral view of pubis. ZDM 9011, x 1/6.

Plate III

1. Medial view of right scapula. ZDM 9011, x 1/8.
2. Medial and anterior views of left humerus. ZDM 9011, x 1/5.
3. Lateral view of left ulna. ZDM 9011, x 1/4.
4. Medial view of left radius. ZDM 9011, x 1/4.
5. Dorsal view of left metacarpus and phalanges. ZDM 9011, x 1/3.
6. Anterior view of left radiale ZDM 9011, x 1/3.
7. Posterior view of right femur. ZDM 9014, x 1/7.
8. Anterior view of right tibia. ZDM 9014, x 1/7.
9. Medial view of right fibula. ZDM 9014, x 1/7.

Plate I

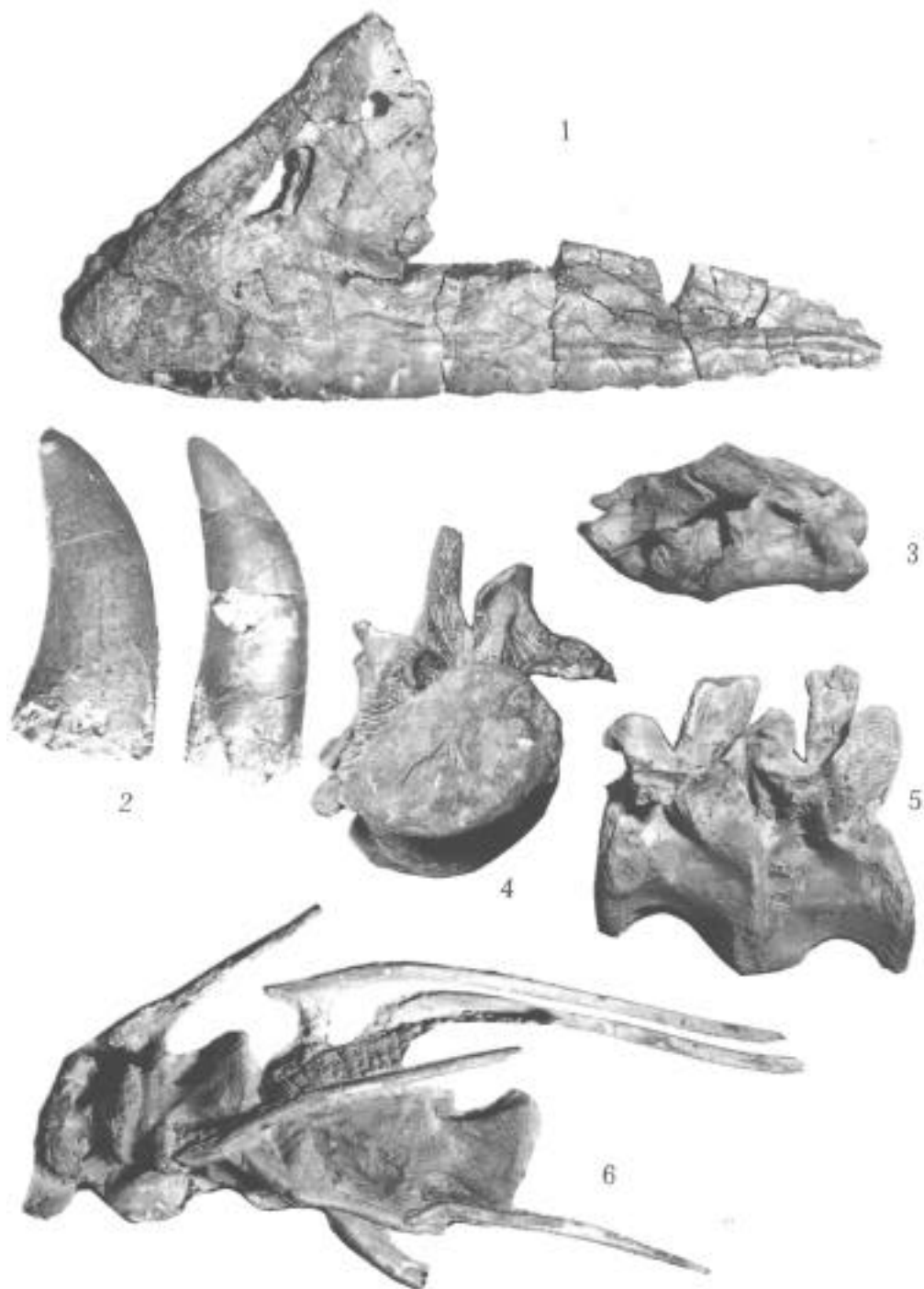


Plate II

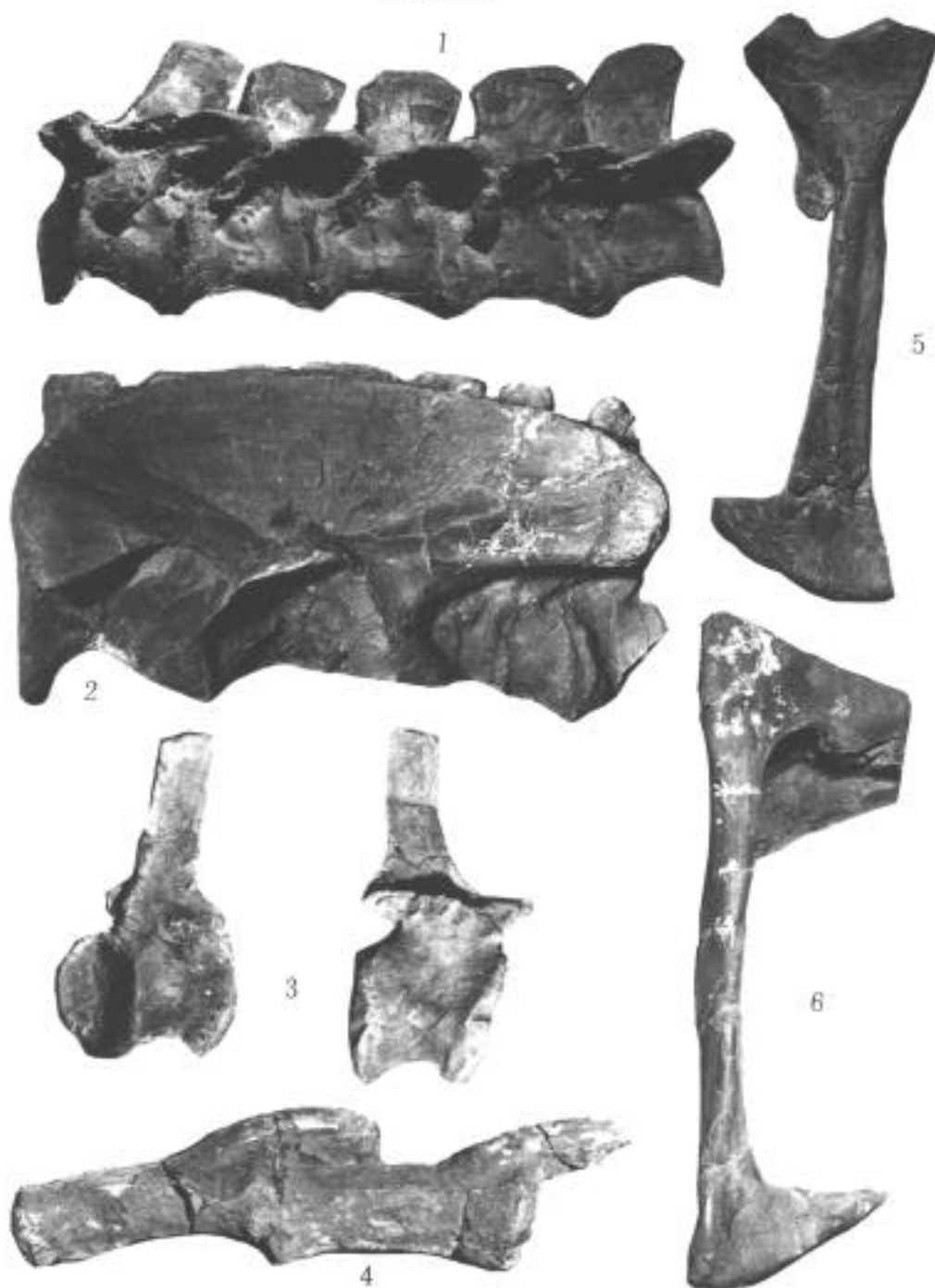


Plate III

