Yimenosaurus, a new genus of Prosauropoda from Yimen County, Yunnan Province

by

Ziqi Bai, Jie Yang, and Guohui Wang

Yuxi Regional Administrative Academy of Yunnan Province

Yuxiwenbo (Yuxi Culture and Scholarship)
Volume 1
October, 1990
pp. 14-23

Authorized and Published by the Yunnan Administrative
Office of Cultural Affairs and Information

Translated By Will Downs
Bilby Research Center
Northern Arizona University
October, 1999

Abstract

The text describes a new genus and species of Prosauropoda assigned to the family Plateosauridae from a basin in Central Yunnan Province: *Yimenosaurus youngi* gen. et sp. nov.

Introduction

In August of 1987, Mr. Xingyong Zhang, a research assistant from the Yunnan Provincial Museum led a consortion of provincial, county, and local excavators to the Jiaojiadian region of Yimen Co. for a preliminary collection of data on dinosaurs resulting in over ten individual skeletons from approximately three tons of matrix. Preliminary preparation of the specimens were undertaken by members of the Academy of Regional Culture with the combined efforts and support of local individuals. Subsequently, a preliminary diagnosis and comparison were made on two large and more complete specimens (field numbers 2087 and 9087).

Description

Prosauropoda Huene, 1920

Plateosauridae Marsh, 1896

Yimenosaurus gen. nov.

Yimenosaurus youngi gen. et sp. nov.

(Text Figures 1-3, Plate I)

Diagnosis: A moderate to large prosauropod which may attain nine meters in length, skull height-length proportion is moderate with length of skull approximately 1.65 its height (including mandible), and cranial construction is relatively delicate with elements composing the skull, being relatively long and gracile. External nares are elliptical and relatively large, orbits are subcircular and moderate in size, and antorbital fenestra is triangular and large. Premaxilla and ascending process of the maxilla are relatively well developed but the ventral dental margin is rather shortened anteroposteriorly. The mandible is relatively delicately constructed, medial portion of the ramus is relatively high, mandibular fenestra is well developed, articular process lies ventral to the plane of the dentition, and the articular is relatively weak but well developed. Dentition is relatively long with dental formula as: Premaxilla: 4, Maxilla: 17-18, Dentary: 21-23.

Dentition is compact, crowns are relatively high, slightly spoon-shaped with a gently convex labial margin, gently concave lingual margin, medial ridge is not well developed, but teeth are all conspicuously striated, and anterior and posterior margins have well developed denticles.

Presacral vertebral endochondral construction is compact and with the exception of the atlas and axis, all vertebrae are amphicoelous. A proatlas is present, associated with a slightly elongated intercentrum, and the neural arch and two well developed lophs of the postzygopophyses are relatively well developed. Cervical vertebrae are relatively elongated, medial cervicals are rather reduced, pleurocoels are undeveloped, there is a conspicuous ventral keel, and neural arch and spine are low and simply constructed. Dorsal vertebrae are relatively long and rather laterally compressed with low neural arches and spines shaped as thin plated crests. Three amphiplatyan sacral vertebrae are present with strong centra which maintain low and thinly walled neural arches and spines, while ribs and zygopophyses are fused to compose a robust sacral yoke supporting a powerful ilium. Anterior caudals are short, robust, and amphicoelous; neural arches and spines are

relatively low, diapophyses are relatively well developed, haemal arches are particularly well developed, anterior haemal arches are spinous and particularly robust with club-shaped distal ends.

Scapula is straight and thick but with an intense medial curvature and a relatively narrow anterior oblique depression. The coracoid is short with a thickened margin. Its proximal end contacts the anterior scapula to compose a broad and spacious glenoid fossa. Humerus is short three-fifths the length of the femur, thick, lacks curvature, has a well developed medial head, and a strong deltopectoral crest.

The sacrum is robust with a relatively low ilium that maintains well developed pubic and ischiac peduncles. Pubis and ischium are long, obturator foramen is large and open, and a relatively large and inflated distal crest on the pubis is present for enhanced muscle attachment. Ischium is relatively short and thick, possesses a well developed proximal puboischiatic plate for contact with the pubis, distal ends are relatively elongated, expanded, and fused, and there is a coarsened crest for enhanced muscle attachment.

The femur is robust with a conspicuous sinuous curvature, shaft is subcircular in cross section with thickened walls, a distinct neck between head and shaft is absent, greater trochanter is well developed, lesser trochanter is inconspicuous, fourth trochanter is well developed and located posterodorsally on the midshaft, distal condyles are not exceptionally defined, and intercondylar notch is shallow. Tibia and fibula are nearly equivalent in length, and the tibia is two-thirds the length of the femur. The astragalus is massive, the two proximal articular facets are relatively well developed, the distal astragalar process is well developed, and the mediolateral breadth of the foot exceeds the anteroposterior length. Calcaneum is small and thick with a long and spherical proximal end. Five long and robust metatarsals are present but phalanges are rather short and thick. Pes formula is 1-2-3-4-1. Digit V is reduced, the ungual on digit I is robust but unguals on the remaining digits II, III, and IV are weakened and reduced.

Material: The type is a damaged skeleton with an incomplete skull and mandible. The postcranial skeleton includes an incomplete atlas, axis, Cv4, Cv8, four medial articulated dorsals, several fragmentary dorsal vertebra, three complete sacrals, a relatively complete medial portion of the caudals, several fragmentary caudals, a complete anterior haemal arch, a relatively complete ilium, a pair of relatively complete ischia, a complete femur, and several incomplete ribs (specimen No. YXV8701, field No. 9087).

The paratype is a damaged skull and partial skeleton which is larger than the type although thepostcranial morphology is identical. It is represented by five rather damaged medial and posterior cervicals, five articulated dorsals, three relatively complete sacrals, six relatively complete and articulated anterior caudals, a relatively complete scapula-coracoid, a pair of relatively complete ilia, pubi, and ischia; a pair of complete femora; a pair of complete tibiae, fibulae, astragali, calcaneae, and a complete left pes (specimen No. YXV8702, field No. 2087).

Type and paratype are housed in the Yuxi Regional Administrative Academy of Yunnan Province.

Locality and stratigraphic position: Early Jurassic Fengjiahe Fm. at Jiaojiadian, Yimen Co., Yunnan Province.

Etymology: Genus name from the type locality being within the county of “Yimen” in Yunnan Province and “saurus” Greek for reptile. Species name from the surname romanization of Professor Yang Zhongjian (C.C. Young) the founder of vertebrate paleontology in China and a provider of outstanding contributions to prosauropod research in Yunnan Province.

Occurrence: Specimens are produced near the surface from a silty mudstone, although complete material is generally difficult to preserve after being subjected to intense weathering. Therefore, although several complete specimens were recovered, they were easily damaged during the process of excavation and preparation, creating difficulties for those attempting to diagnose the data. Consequently, in order to facilitate research, a certain amount of restoration was conducted on several specimens.

Postmortem disarticulation occurred prior to preservation and the specimens were also subjected to a certain amount of compressional distortion although the degree of deformation is slight. A number of cranial elements were lost due to weathering, including the occipital portion, parietal, squamosal, left frontal, prefrontal, and jugal. Well preserved elements include the premaxilla, maxilla, nasal, postorbital, right frontal, prefrontal, lacrimal, quadrate, and nearly complete mandible. It was based upon these specimens that cranial reconstruction was made such that the size and morphology of the skull is considered basically accurate.

Description: The skull is rather delicate in construction, moderate in size, and its height is one half its length. If one includes the mandible, the complete skull height is approximately two-thirds its length. Cranial reconstruction is based upon the morphology of the following elements.

The premaxillae are two relatively thick, parallel, and nearly rectangular elements with rather narrow ventral margins and thin anterior margins connected by an anteriorly curved medial suture line that is at a 70° angle to the horizontal ventral margin. The elements are anteriorly oblique with a posterior margin that contacts the maxilla with a thick suture that is also slightly anteriorly oblique. The lateral surface is smooth and glossy with a very slight lateral curvature and with several small nutrient foramina upon it. The distance between anterior and posterior margins is less than between dorsal and ventral margins. The medial surface is concave, anterior suture line is straight, a posterior vomer appears to be absent, the lingual margin of the dental trough is much more dorsal than the labial margin, and there are four relatively strong, slender, and long premaxillary teeth present. The dorsal margin of the premaxilla composes the rather small Y-shaped aperture of the anterior margin of the external nares in addition to forming the rather well developed anterodorsal process that forms the lateral arch of the external nares.

The maxilla is triradiate with relatively long anterior and posterior processes: the ascending process is particularly gracile, elongated, and diverges from the posterior process at a 60° angle. The dorsal margin of the anterior process is relatively narrow, laterally oblique, and combines with the premaxilla to form a portion of the external nares. The posterior portion of the maxilla is arched with a slight posterodorsal curvature and composes the broad ventral margin of the antorbital fenestra. The ventrolateral margin forms the lateral side of the dental trough, is very slightly curved, and the entire midportion of the lateral surface is slightly laterally inflated with a smooth and glossy texture. Near the dental margin is a series of irregularly sized nutrient foramina. The medial side of the maxilla has a very slight curvature, relatively coarsened surficial texture, and its ventral portion constitutes the lingual side of the dental trough. There are 17 teeth in the maxilla.

The nasal is thin, and together with the ascending process of the maxilla forms the anterior apex of the anteroventrally curved nasal arch. Its lateral process is relatively broad and composes the dorsal gently rounded Y-shaped aperture of the external nares. The entire dorsal surface is very slightly convexly inflated. Posteriorly, there is a distinct suture line for contact with the prefrontal and lacrimal but it does not contact the frontal.

The lacrimal is somewhat crescentic with a thin anterior process in contact with the nasal. Its anterior margin is hooked, its contact with the posterior process of the prefrontal is weak, and at

this point is very slightly laterally concave. The ventral process is relatively thin, long, and resembles a crescentic baton that separates the antorbital fenenstra from the orbit.

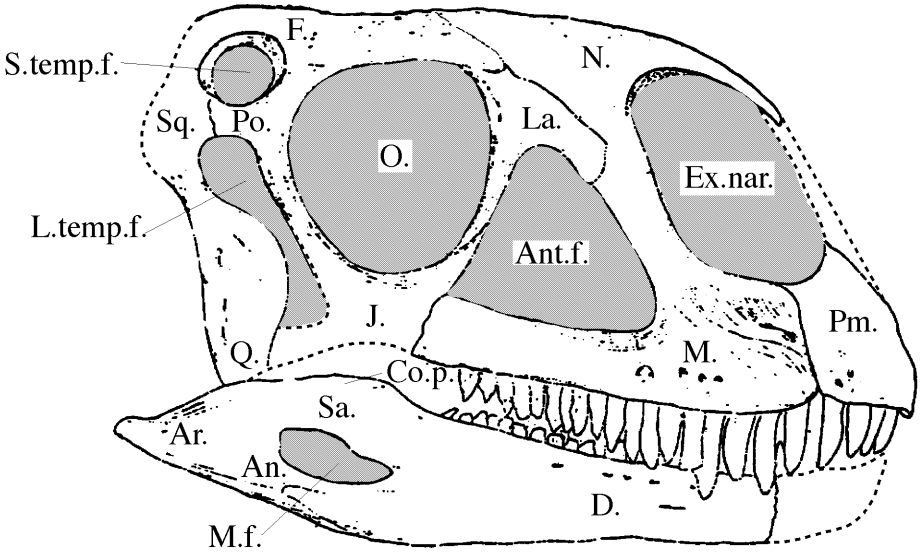

Figure 1. Cranial reconstruction of *Yimenosaurus youngi* gen. et sp. nov. in lateral cranial view and medial mandibular view (YXV8701, x 1/3). An.-angular; Ant.f.-antorbital fenestra; Ar.-articular; Co.p.-coronoid process; D.-dentary; Ex.nar.-external nares; F.-frontal; J.-jugal; L.temp.f.-lateral temporal fenestra; La.-lacrimal; M.-maxilla; M.f.-mandibular fenestra; N.-nasal; O.-orbit; Pm.-premaxilla; Po.-postorbital; Q.-quadrate; S.temp.f.-supratemporal fenestra; Sa.-surangular; Sq.-squamosal.

The frontal is short but very broad, with only its posterolateral margin in contact with the anterolateral process of the parietal. The entire dorsal aspect is relatively flat while the contacts at the midsection of the ventrolateral aspects are dorsally concave, the surface is coarsened, and is in direct contact with the orbitosphenoid. Its ventrolateral margin is very slightly concave and forms the principle element of the orbit with a smooth and glossy surface to house the eye. A lateral projection of the lateral margin contacts the postorbital but this projection is much thinner compared to its counterpart on*Lufengosaurus.* The entire element is conspicuously planar indicating that the dorsal cranium retains the primitive character of being relatively flat.

The postorbital is a triradial claviform element with a relatively thick anterior process that is very slightly laterally convex and is in distinct contact with the posterolateral process of the frontal and the anterolateral process of the parietal to form the dorsal margin of the orbit. The ventral process is relatively short and claviform with its posterior margin in contact with the posterodorsal process of the jugal relatively high on the skull indicating a rather small diameter of the orbit. The medial sides of the anterior and posterior processes are rather curved indicating a narrow supratemporal fenestra.

The quadrate is short, substantial, and bluntly aliform. Although the element is lacking its dorsal and ventral portions, its length can basically be determined based upon the configuration of the postorbital, maxilla, and mandible. Only the dorsal process of the quadratojugal is preserved which contacts the anterolateral side of the quadrate, and although its anterior portion is broken, it is clear that the anterior process can not be very long and as such the lateral temporal fenestra must be relatively narrow based upon the location of the quadrate-maxillary contact, length of the posterior process of the maxilla, and short posterior process of the pterygoid.

The pterygoid is short and broad with a posterolateral spoon-shaped projection that forms a small aperture by its overlapping of the quadrate wing. The medial side of the spoon-shaped projection is concave to facilitate the distal process of the basipterygoid. The anterior pterygoid is particularly short and maintains a plicated contact with the jugal and ectopterygoid.

External nares are elliptical and anteriorly placed; the antorbital fenestra is large and triangular; orbit is moderately large and subcircular; supratemporal fenestra is circular and small; and lateral temporal fenestra is narrow, long, and small.

The mandible is incompletely preserved with only the left elements represented. Four centimeters of the anterior end are missing, and although the entire mandible is relatively short, the dentary appears to be distinctly narrow and long. The articular is weakly developed but its fossa is relatively broad, simply constructed and positioned ventral to the level of the dentition. The retroarticular process is rather thin and weak. The location of the spacious mandibular fenestra is higher than on both *Lufengosaurus* and *Plateosaurus*. The mandible gradually attenuates from the posterior dentary anteriorly and in general morphology resembles *Shunosaurus lii*.

The angular is narrow and long, constitutes approximately one-quarter the length of the mandible, and is medially curved ventrolaterally. The surangular is thin with its dorsal margin expressed as a medially rotated rim while its anterior contact with the dentary is weak but nevertheless participates in forming the relatively large elliptical mandibular fenestra.

The condition of the symphyseal region is unknown due to breakage and no compressional distortion has occurred. The dentary is narrow, long, and gradually reduces posteroanteriorly. Its lateral side is very slightly laterally curved, the dorsal labial margin is vague, and there are only three relatively large nutrient foramina visible close to the dental margin as other foramina are unobservable. The ventral midportion of the dentary is slightly reduced dorsally while anterolaterally it is slightly laterally curved. A Meckelian groove is weak. Anteromedially, the alveolae are relatively low but their positions ascend gradually posteriorly. Dentition is compact with 23 teeth presumed to be present, although there are only 19 documented teeth, which are fully erupted (to the posterior end of the dentary).

The splenial is a thin, relatively narrow, elongated triangle that extends from the ventral angular directly to the midportion of the dentary.

Upper and lower tooth morphologies resemble both *Plateosaurus* and *Lufengosaurus*, in that the dentition is relatively long and compact, although the tooth count is less than in the former genera. Premaxillary teeth are relatively robust with narrow and tall crowns. The first premaxillary tooth is 33 mm in length and 10 mm in breadth; the second tooth is in the process of eruption, is 25 mm in length, and 12 mm in breadth; and the third and fourth teeth are broken but from their basal portions, they may be determined to be the most robust teeth in the premaxilla. The dentition has not suffered compressional distortion; tooth roots are circular in cross-section, crowns are slightly laterally compressed with a gently convex labial side, and at the apices there are numerous striations. Lingually the teeth are shallowly spoon-shaped with a slightly convex midportion and they are distinctly striated. Anterior and posterior margins are symmetrical and possess conspicuous small denticles.

Maxillary dental morphology generally resembles that on the premaxilla as in *Plateosaurus* and *Lufengosaurus,* but is also distinct in several characters. The tooth crowns are longer, slightly curved lingually, and anterior and posterior margins are not precisely symmetrical. Complete specimens on the anterior right maxilla display a relatively convexly inflated labial side that lacks longitudinal grooving but maintains distinct surficial striations. Lingually they are distinctly spoon-shaped, crowns are slightly more acute than in *Lufengosaurus,* and the dentition gradually becomes shorter posteriorly, decreases in size, and becomes progressively laterally compressed.

The lower dentition shares several characters with the upper dentition but is somewhat reduced in height. The tooth row is compact, at the midsection of the dentition the anterior and posterior margins overlap, anterior dentary teeth are rather robust, are gently convex labially, not conspicuously spoon-shaped lingually, and have distinct anterior and posterior denticles. At the midsection the dentition is slightly laterally compressed, longitudinal grooves appear near the antero- and posterolabial margins, the midportion of the lingual sides are slightly convex, apices are rather flattened, and there are distinct denticles anteriorly and posteriorly. The posterior mandibular dentition is even more laterally compressed and oval in cross-section with gently convex labial sides, flattened lingual sides, inconspicuous longitudinal grooves, and thin anterior and posterior margins which still maintain denticles.

Table 1. Cranial and mandibular measurements of *Yimenosaurus youngi* gen. et sp. nov. (mm).

Skull length (restored)	315(?)
Anterior margin of nares to ventral margin of premaxilla	52
Length of ventral of premaxilla	48
Length of ventral maxilla	161
Ventral margin to dorsal branch of maxilla	131
Mediolateral breadth of nasal	61
Anteroposterior length of nasal	138
Mediolateral breadth of frontal (max.)	91
Mediolateral breadth of frontal (min.)	83
Length of frontal	75
Distance between anterior and posterior postorbital processes	60
Length of dorsal margin to ventral process of Postorbital	66(?)
Distance between anterior and posterior processes of lacrimal	64
Distance between dorsal margin to ventral process of lacrimal	75(?)
Quadrate height	113(?)
Mandible length	303(?)
Mandible height	62
Angular length	160(?)
Dentary length	200(?)

Vertebrae are incompletely preserved on both specimens, but from those represented, their morphology appears to be quite distinct from *Anchisaurus* and rather similar to *Lufengosaurus* and *Plateosaurus.*

On the type specimen YXV8701 the first and second cervicals are completely preserved articulated to the skull, of which the atlas is particularly complete and composed of an odontoid process, intercentrum, and neural arch. The intercentrum is a heavy semicircular element with a circular and smooth articular facet for the occipital condyle, at the center of which is a small foramen which may facilitate the secretion of synovial fluid. A small semicircular articular facet lies dorsomedially which is in tight articulation with the odontoid process. Its posterior articular facet is rimmed and preserved out of contact with the proximal axis which perhaps reflects ability for dorsoventral and lateral rotation of the cranium. The anteroventral margin of the intercentrum is thin. Near the posterior margin there is a rounded transverse groove which possibly facilitates

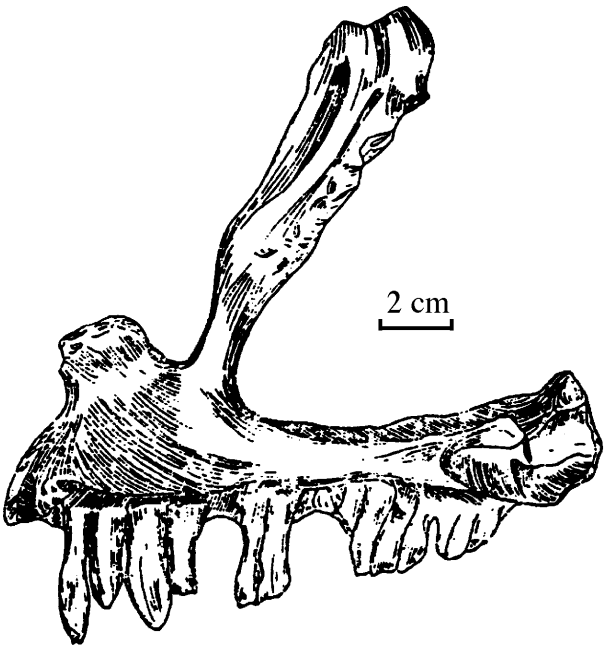

Figure 2. Medial view of *Yimenosaurus youngi* gen. et sp. nov. maxilla (YXV8701, x 1/2).

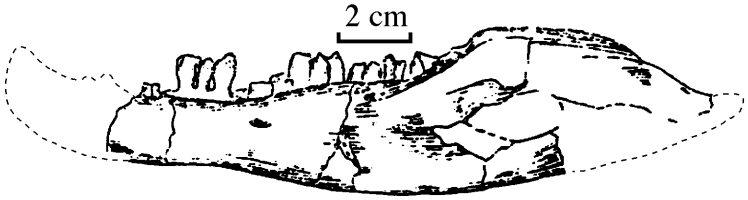

Figure 3. Lateral view of *Yimenosaurus youngi* gen et sp. nov. left mandible (VXY8701, x 1/3).

articulation with the axis and musculature. The ventral midpoint of the intercentrum is concave while the lateral sides are anterolaterally oblique. Undulating vestigial scars are present on the dorsal intercentrum at the contacts for the left and right lobes of the neural arch, the contact plane is anteriorly oblique, and the basal lobes of the neural arch are short, thick, and elliptical in cross-section. On the dorsal portion of the arch there is a small anterior process that articulates with the dorsolateral margins of the occipital condyle. The dorsal medial curvature of the arch composes the neural canal. The posterior arch extends posteriorly with its ventral portion forming an elliptical articular facet to facilitate articulation with the prezygopophyses of the axis. The odontoid process is genuinely part of the atlas with relatively derived construction composed of the atlas and proatlas. The atlas is in contact with the anterior axis as is the proatlas which is a small semicircular element that articulates tightly with a small articular facet at the midpoint of the dorsal intercentrum (Plate I). Between the atlas and proatlas is a small cervical element that articulates with the posterior intercentrum articulation facet. The atlas centrum is short, circular, and coarsened anteroventrally while its dorsal trough is in contact with the axis neural arch. The atlas is not fused with the axis and instead maintains an articular relationship with a relatively round and smooth posteroventral articular facet.

The axis is nearly completely preserved with an elongated opisthocoelous centrum that displays a posteriorly oblique posterior articular surface, it is constricted anteromedially, is laterally compressed, lacks pleurocoels, and displays a ventral keel. At the anteroventral centrum there is a distinctly fused suture line with a tricapitular tubercle at its anterior end that appears to represent

contact with a small intercentrum. The neural arch and neural spine are low but the neural canal is large. Well developed elliptical prezygopophyses lie on the lateral arch posterior to the anterior plane of the centrum. Postzygopophyses are relatively high, rather large, and elliptical. Diapophyses are low and weakly developed on the anteromedial centrum. Parapophyses are small rounded rhomboid facets extremely close to the ventral diapophyses.

There are four posterior cervicals preserved on YXV8701 and five damaged posterior cervicals on YXV8702 that are basically similar to *Plateosaurus* and *Lufengosaurus,* being amphicoelous with relatively long centra, possess distinct ventral keels, and have low neural arches and spines. The only distinctions are that the neural spines and arches are even lower, while diapophyses and parapophyses are developed more medially than on the two former taxa.

Four gently amphicoelous medial dorsal vertebrae are preserved on the type and five posterior dorsals are preserved on the paratype, all of which are fundamentally similar to *Lufengosaurus.* Anterior dorsals are large and high with centra that are slightly medially constricted and relatively flat ventrally, neural arches are relatively low, spines are lamelliform, parapophyses are located anterodorsally, diapophyses are simple in structure with subcircular articular facets, and pre- and postzygopophyses are low with weakly developed articular facets. Within the transition phase from anterior to posterior dorsal morphology, centra gradually become shortened, height increases, and neural spines ascend slightly while becoming slightly anteriorly oblique.

Three complete sacrals are preserved on YXV8702 with the anterior two fused. The first sacral has a relatively long centrum and third sacral has the shortest centrum in the series, approaching caudal morphology. Centra are slightly compressed, transversely broadened and high with a well developed neural canal but low neural spines. Ribs and diapophyses compose a well developed yoke. Specimen YXV8701 preserves two fused sacrals that resemble the former specimen.

Caudals are amphicoelous. Anterior caudals are short, high, and generally resemble *Lufengosaurus magnus.* Pre- and postzygopophyseal articular facets are circular with rimmed margins, haemal arch facets are distinct, and neural spines are lamelliform. Medial caudals are relatively laterally compressed with rather constricted midsections, pre- and postzygopophyses are elevated, and neural spines have become relatively high, narrow, and slightly anteriorly oblique.

Cervical and dorsal ribs are all poorly preserved, but from observations of those preserved on the axis and fourth cervical, it appears that they are weak, capitulum and tuberculum are closely spaced, an anterior process is absent, and shafts are short and gracile. Dorsal ribs two, three, four, and five are relatively well developed with rather robust capitula, well developed tubercula, relatively circular proximal shafts, and rather flattened distal ends. Distance between tuberculum and capitulum gradually decreases anteroposteriorly as does capitulum development, which becomes more crescentic and claviform while tubercula consistently increase in size. Haemal arches are particularly well developed with large elliptical canals that become laterally compressed and more constricted distally. Haemal spines are claviform, become expanded distally, and beginning with the third haemal arch they gradually become more constricted but do not bifurcate.

The pectoral girdle and forelimbs are incompletely preserved but YXV8702 possesses a scapula and coracoid which is typical for a prosauropod. The scapula exhibits extreme curvature with an expanded distal end, a massive body, an anterior crest that does not project very extensively, and a narrow obliquely depressed region. The coracoid is thick, heavyset, clam-shaped in outline, and at its proximal end with the scapula forms a wide and spacious glenoid.

The ilium is low and in general morphology resembles *Lufengosaurus,* only its pubic peduncle is distinctly longer causing the acetabulum to be spaciously broadened. Pubic and ischiac

morphology also resemble *Lufengosaurus* although there are precise distinctions on YXV8702 in which the pubis and ischium are of equivalent length, pubis is heavyset with a particularly robust proximal contact with the ischium, obturator foramen is circular, pubic plate is narrow and thick, pubic shaft is narrow with a claviform proximal end and expanded distal crest for facilitating muscle attachment. The ischium is relatively long, constructs a massive boney plate with the pubis, the midportion of the shaft is constricted, and an expanded distal crest for facilitating muscle attachment is present. Characters that are rarely noted in the Prosauropoda include the equivalent length of pubis and ischium, rather constricted medial shafts, and particularly expanded distal ends.

YXV8701 preserves a right femur while YXV8702 preserves both femora with all morphological characters completely consistent between the two, the only variation being in size. The entire femoral shaft is robust and subcircular in cross-section with a conspicuous sinuous curvature and distinct greater trochanter, but a well defined neck on the femoral head and lesser trochanter are vague. The fourth trochanter is well developed and located on the dorsal midshaft. Medial and lateral distal condyles are relatively distinct and the intercondylar notch still retains the primitive morphology of being relatively shallow.

On the paratype, the tibiae and fibulae are completely preserved, with the tibia distinctly straight and heavyset with an undulating proximal articular surface that is medially obliquely inclined and a lateral margin that is nearly triangular. The proximal cnemial crest and crest on the midshaft are weakly developed, the shaft constricts distally, at its midpoint is subcircular in cross-section, becomes very slightly expanded distally, and the astragalar depression is distinct. The fibula is simple in construction with a straight and slender shaft, is nearly equivalent in length to the tibia, its proximal end is slightly expanded with a very slightly convex subcircular articular surface, the shaft gradually constricts distally, cross-section at midshaft is subcircular, and the distal end is very slightly expanded.

The astragalus and calcaneum are heavy, massive, and resemble *Lufengosaurus.* Metatarsals and phalanges are quite distinct from *Anchisaurus* as the metatarsals are relatively long while the phalanges are rather short. In general morphology they resemble *Plateosaurus* but compared to *Lufengosaurus* the metatarsal-phalangeal proportions are slightly smaller.

Diagnosis and discussion

Characters undoubtedly shared with the suborder Prosauropoda include, the small skull, elongated dentition with slender teeth, jaw articulation ventral to the tooth row, relatively heavyset post-crania, amphicoelous cervical and dorsal vertebrae with low neural spines, heavy and strongly curved scapula, low ilium, intensely sinuously curved femur, relatively high placement of the fourth trochanter, and vague lesser trochanter. This suborder currently contains the two broad families: the Anchisauridae, which represent the slender-footed forms and the Plateosauridae, which represent the broad-footed forms. There is currently much controversy regarding the phylogenetic position of the family Melanorosauridae, for a number of workers consider this family comparable to bipeds although it is more possible that they represent large-scale quadrupeds. There are also workers who believe that this family is in a transition stage between the Theropoda and Sauropoda due to the presence of hyposphene-hypantra articulations on the dorsal vertebrae, the femur's low degree of sinuosity, and the position of the fourth trochanter on the midshaft. All the vertebrae from the specimens in this text are amphicoelous, lack hypantra, the femur has distinct sinuosity, and the fourth trochanter is placed dorsomedially on the midshaft, excluding them from the Melanorosauridae.

The Anchisauridae is a typical prosauropod group that is represented predominantly by agile, gracile, and small Late Triassic forms with moderately pneumaticised limbs, long and laterally compressed cervical vertebrae, relatively short forelimbs, fourth trochanter positioned high

on the femur, short dentition with relatively low tooth count, and a posture that retains characters from more primitive archosaurs. But the Yimen specimens are produced from sediments that are relatively stratigraphically high, or from the Early Jurassic Fengjiahe Fm. of central Yunnan Province, and both the type and paratype are exceptionally large specimens with a heavyset skeletal structure, strong and massive limbs, and a long dentition with a high tooth count creating difficulties in assigning them to the Anchisauridae.

The Plateosauridae are typical prosauropods with a rather large and heavyset torso, strong and rather thickened limb bones, a long dentition with nearly 25 maxillary teeth and nearly equivalent mandibular count, a relatively small skull, and a mandibular articulation ventral to the plane of the dentition. The Yimen specimens are large, with the largest specimen exceeding nine meters and smallest exceeding six meters. With the exception of the relatively delicately constructed skull, the remaining skeletal elements are rather robust, the dentition is relatively long, upper premaxillary tooth count is four, maxillary count is 17-18, and mandibular count is approximately 23. Consequently, there is no doubt that the Yimen specimens may be assigned to the Plateosauridae.

Currently, the family Plateosauridae contains the two genera *Plateosaurus* and *Lufengosaurus*. Formerly, several workers also included the genera *Gresslyosaurus* and *Herrerasaurus* although this data is depauperate, prohibiting a comparison with the Yimen specimens, and furthermore there is skepticism regarding their assignment to this family.

Plateosaurus is produced from the Late Triassic of Europe, with the largest specimen attaining eight meters in length, it bears an acute laterally compressed dentition with a tendency to be spoon-shaped, cervical ribs are exceptionally gracile and long, dorsal vertebrae are gently amphicoelous, and metatarsals are relatively short. The Early Jurassic Yimen specimens are more derived cranially and postcranially in their skulls being relatively high, rather delicately constructed, dentition is rather blunt, not compressed labially, and metatarsals are comparatively long, excluding them from this genus.

Lufengosaurus is produced from the Late Triassic Lower Lufeng Fm. of the Lufeng Basin in Central Yunnan Province. It has a relatively long, low, and flattened skull; large and triangular external nares; a short and high antorbital fenestra; large and circular orbits; a dentition that is laterally compressed, consisting of rather straight teeth with denticles on the anterior and posterior margins, medial dentition displays some overlapping, and lateral side is compressed; cervical vertebrae are short, amphicoelous, and have relatively high centra; hind limbs are strong and robust; and metatarsals are relatively long. Although the type locality for the Yimen specimens is proximal to the Lufeng Basin, the Early Jurassic Fengjiahe Fm. is stratigraphically slightly younger than the Lower Lufeng Fm, and in general skeletal construction the Yimen specimens are more derived than *Lufengosaurus* as exemplified by the delicate construction of the cranium with each of the relatively large cranial fenestra being surrounded by gracile and long claviform elements, external nares are exceptionally large and elliptical, skull is relatively short with a slightly gently rounded rostrum, skull length/height proportion is more moderate at 1.65, teeth are rather robust with long and acute crowns, four premaxillary teeth are present, crowns are labially convex with distinct striations, lingual side is slightly flattened with a very slightly convex midportion, and denticles are still present on the anterior and posterior margin. Of the 17 maxillary teeth the anterior are high crowned with gently convex labial sides and extremely distinct surficial striations, while the lingual sides are slightly flattened, basically spoon-shaped, and lack a conspicuous medial ridge. The mandible is relatively short and also rather delicately constructed with approximately 23 teeth, which in the anterior dentition, approach the morphology of their maxillary counterparts and the crowns are relatively narrow and long. These cranial characters are all distinct from both *L. huenei* and *L. magnus*. Postcranial characters also display several discrepancies in the relatively weakly developed cervical ribs, weakly developed parapophyses and diapophyses on the anterior cervical centra, dorsals being relatively flattened ventrally, particularly well developed

caudal haemal arches, rather robust pectoral girdle, pubis and ischium nearly equivalent in length, strong and robust hindlimb with a more inferiorly placed fourth trochanter, and shorter metatarsals. These characters indicate the Yimen specimens represent a post Late Triassic, or Early Jurassic, rather derived and large prosauropod. Consequently, a new genus and species in the family Plateosauridae is erected as *Yimenosaurus youngi* gen. et sp. nov.

Acknowledgments

During the process of research and compilation of data for this manuscript, assistance and guidance was provided by Professor Xingyong Zhang from the Yunnan Provincial Museum and Professor Yihong Zhang from the Chungking (Zhongqing) Municipal Museum, Sichuan Province. Colleagues Guirong Wang and Aimin Bi assisted with the text's illustrations. The authors hereby express their deep appreciation.

Bibliography

Dong, Z.M., 1984; A record of the Lufeng Saurischian Fauna from the Sichuan Basin. *Vert. PalAs.* **22**(4), pp. 310-312 (in Chinese with English abstract).

Dong, Z.M., and Tang, Z.L., 1984; A *Shunosaurus* Fauna from Zigong, Dashanpu Co., Sichuan. *Vert. PalAs.* **22**(1), pp. 69-73 (in Chinese with English abstract).

Dong, Z.M., Zhou, S.W., and Zhang Y.Y., 1983; The dinosaurian remains from the Sichuan Basin, China. *Pal. Sin. Whole No. 162, N. Ser. C., No. 23.* (in Chinese with English abstract).

Sun, A.L., Cui, G.H., Li, Y.H., and Wu, X.C., 1985; A verified list of the Lufeng Saurischian Fauna. *Vert. PalAs.* **23**(1), pp. 1-10 (in Chinese with English abstract).

Young, C.C., 1982; New development on the study of the Lufeng Saurischian fauna. *Selected works of Yang Zhungjian.* Science Press. pp. 14-20 (in Chinese).

Young, C.C., 1951; The Lufeng Saurischian Fauna in China. *Palaeontol. Sin., New Ser. C,* (13), p. 1-94 (in English with Chinese summary).

Young, C.C., 1947; On *Lufengosaurus magnus* Young (sp. nov.) and additional finds of *Lufengosaurus huenei* Young. *Palaeontol. Sin., New Ser. C,* (12), pp. 1-49, (in English with Chinese summary).

Young, C.C., 1941; A complete osteology of *Lufengosaurus huenei* Young (gen. et sp. nov.) from Lufeng, Yunnan, China. *Palaeontol. Sin, New Ser. C,* (7), pp. 1-53 (in English with Chinese summary).

Zhang, X.Y., 1987; Discovery of a dinosaur fauna in Ximen Co., *Yunnan Daily,* Sept. 8, First Ed. (in Chinese).

Zhang, Y.Y., 1988; *Shunosaurus*. The Middle Jurassic dinosaurian fauna from Dashanpu, Zigong Co., Sichuan (III). pp. 1-63.

Explanation of Plates

I. Medial view of left mandible (x2.5).
II. Dorsal view of frontal (x3).
III. Lateral view of right maxilla (x2.5).
IV. Dorsal view of nasal (x3).
V. Lateral view of left and right premaxilla (x2.5).
VI. Right lateral view of axis (x2.5).
VII. Dorsal view of YXV8701 axis (x2.5).