Losillasaurus giganteus, a new sauropod from the transitional Jurassic-Cretaceous of the Los Serranos basin (Valencia, Spain)

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ABSTRACT

The Late Jurassic-Early Cretaceous site of La Cañada (Barranco de Escáiz, Losilla, Aras de Alpuente, Valencia) has delivered several pieces of a new Sauropod dinosaur called *Losillasaurus giganteus*. The material includes a cranial fragment, several vertebral fragments and complete cervical, dorsal, sacral and caudal vertebrae; appendicular skeleton (humerus, ulna, radius, metacarpal); sternal plates; and pelvic elements (ilium, ischium and pubis).

The diagnosis of *Losillasaurus giganteus* is based on two autapomorphies and singular combination of synapomorphies. The two autapomorphies are: neural spine of the proximal caudal vertebrae with a laterally bowed outline in dorsal view (cutlass-like shape). Moreover, the ratio of the proximodistal dimension of the neural spine to the total height is around 0.5.

Key words: La Cañada (Los Serranos, Valencia), Late Jurassic-Early Cretaceous, Dinosauria, Sauropoda

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INTRODUCTION

The first knowledge we have of the existence of dinosaur remains from the Alto Turia area is due to Professor Beltrán, who, in 1920, during a meeting of the Real Academia de Historia Natural held in Valencia, discussed some fossils recovered in Benageber by a teacher from the town, highlighting among them "a tooth and a vertebra of *Iguanodon*," as well as a tooth of "an apparently new species of reptile."

In 1925, Professor Royo y Gómez cited the importance of a shipment of fossils from Professor Beltrán for his research. Among them he noted diverse remains of reptiles recovered from Benageber (Valencia) including a tooth fragment of a sauropod dinosaur, certainly the same one mentioned by Professor Beltrán as a tooth of "a (new) species of reptile" – plus two femoral heads of *Megalosaurus* and an assortment of dinosaur vertebrae.

At the XIV Congreso Geológico Internacional, Professor Royo y Gómez presented a communication that emphasized the important discoveries of dinosaurs and other vertebrates that had occurred in the preceding ten years in the purported continental Spanish Lower Cretaceous. On page 2040 of his review (1926a), he specified that it was between 1916 and 1919 that the teacher from Benageber, José Ma Catalá, who discovered the tooth fragment and vertebra that Professor Beltrán (1920) mentioned during a regular meeting of the Real Sociedad Española de Historia Natural mentioned above.

Professor Beltrán indicated that he later visited Benageber and found some bone fragments that allowed him to pinpoint the position of the localities discovered previously by Catalá. This discovery stimulated the Benageber teacher to continue searching for remains, resulting in the discovery of "a certain number of bones and vertebrae of dinosaurs."

In his synthesis on the discoveries of gigantic reptiles in Levante, Royo y Gómez (1926b) linked the discoveries of Benageber, explaining the many ups and downs of the discoveries, to specific and varied groups of dinosaurs. It was a summary of material discussed in previous works.

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After these publications and previous studies, work on the dinosaur remains and the expeditions in the Alto Turia region ceased, and was not renewed until in 1954 during a reconnaissance in the area by A.F. de Lapparent and B. Guérangé. For the most part, they did not obtain results, but between 1954 and 1964, some young geologists under the direction of Lapparent effected a detailed study of numerous areas in the provinces located to the east of the Meseta (Lapparent, 1966:103), and listed the new localities Alpuente and Titiguas, both in the district of Los Serranos (Alto Turia, Valencia). From the former, sauropod and theropod bones were recognized (Rothé, 1959); Titaguas produced a rib and sauropod bone fragments (Rothé, 1959).

The region was not revisited until 1989. In February of that year, Carles Santisteban of the Universidad de Valencia, and José Santafé of the Institut de Paleontologia "M. Crusafont" of Sabadell, carried out a preliminary exploration of the Aras de Alpuente area, during which they realized the potential the locality presented. In the spring of the same year the explorations were renewed by José Santafé and Lourdes Casanovas, both from the aforementioned institute, accompanied by a former teacher of the village of Aras de Alpuente, Francisco Moreno, an amateur archaeologist, who, in his frequent excursions to search for archaeological remains, had also found remains of dinosaurs. It was he who lent us two sauropod teeth plus one theropod tooth from the Benicatazara locality, that were presented at the Congreso de Montbéliard (France) and described by Casanovas and Santafé (1993).

During the same exploration, a large bone was found at the locality of Losilla, the first specimen of the sauropod that is the subject of the present paper. The sediments that produced this new sauropod span the Jurassic-Cretaceous transition (see Casanovas et al., 1999).

In the summer of 1989, the systematic excavation of this locality began; it continued through 1995 because the remains were both large and encased in an extremely hard sandy matrix that hindered their extraction. The consequent preparation of the material has been difficult and required a great deal of time, so research could not be accomplished until polyester replicas were manufactured that made the specimens more manageable.

While the excavation near the village of Losilla progressed, exploration of the area continued; simultaneously, we recruited local assistance Thanks to two of the workers (Pablo Albir de la Aldea de la Almeza and Luis Albir de la Aldea del Collado, both from the municipality of Alpuente) several localities were discovered, including Cerrito del Olmo that produced a large part of the stegosaurian material studied and published by Casanovas et al. (1995 a, b, c; 1999).

In the present paper, the sauropod from Losilla in the district of Los Serranos (Alto Turia, Valencia), is described.

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SYSTEMATIC PALEONTOLOGY

List of material

Lo-1. Fragment of a cranial cervical vertebra.
Lo-2. Fragment of a cranial cervical vertebra.
Lo-3. Fragment of a middle caudal cervical vertebra.
Lo-4. Fragment of a middle caudal cervical vertebra.
Lo-5. Proximal caudal vertebra.
Lo-6. Proximal caudal vertebra.
Lo-7. Nearly complete left humerus.
Lo-8. Distal fragment of the left ulna.
Lo-9. Distal fragment of the left radius.
Lo-10. Proximal caudal vertebra.
Lo-11. Middle dorsal vertebra.
Lo-12. Proximal caudal vertebra.
Lo-13. Proximal caudal vertebra.
Lo-14. Almost complete right sternal plate
Lo-15. Left sacral rib.
Lo-16. Proximal fragment of right metacarpal II.
Lo-17a. Caudal dorsal vertebral centrum with pedicels.

Lo-17b. Neural spine of a caudal dorsal vertebra.
Lo-17c. Fragment of the left transverse process of a caudal dorsal vertebra.
Lo-18a. Fragment of a vertebral centrum with pedicels, assigned to a caudal dorsal.
Lo-18b. Neural spine of a caudal dorsal vertebra.
Lo-19. Fragment of a left pubis.
Lo-20a. Proximal fragment of the left ischium.
Lo-20b. Middle fragment of the left ischium.
Lo-21a. Central fragment of the left ilium.
Lo-21b. Caudal fragment of the left ilium.
Lo-21c. Cranial fragment of the left ilium.
Lo-22. Almost complete left sternal plate
Lo-23. Neural spine of a proximal caudal vertebra.
Lo-24. Centrum of a dorsosacral vertebra.
Lo-25. Sacral ribs.
Lo-26 a and b. Caudal fragments of the skull.

Description

Skull (Plate I, Fig. 1)

Among the pieces discovered and figured is a caudal fragment of the skull (Lo-26a and Lo-26b). It consists of the basioccipital in contacts with the two exoccipitals plus incomplete paroccipital processes. Above the basioccipital and between the exoccipitals, part of the lower border of the foramen magnum is bordered by the medial process of the exoccipitals.

The basisphenoids contact the basioccipital ventrally and present a central depression that separates the two basipterygoid processes, of which the ends are broken in our specimen. These last have an approximate length of 7cm and form an angle of some 70° between them. Compared with the specimen figured by Calvo and Salgado of the holotype of *Rebbachisaurus tessonei* (1995, Fig. 5), our specimen has a shorter basisphenoid with a smaller transverse diameter and a dorsoventral curvature lacking in the holotype of *R. tessonei*. In the former, the basipterygoid processes are longer and present a greater angle between them than in the Losilla specimen. In the occipital views of *Diplodocus* and *Apatosaurus* presented by Berman and McIntosh (1978:Fig. 3), the basioccipital and the exoccipitals seem more robust than in *Losillasaurus*. Wilson and Sereno (1998, Figs. 7-8) pictured the crania of *Camarasaurus lentus* and *Brachiosaurus brancai*. In both, the basipterygoid processes are very short and thick, and the angles between the paroccipital processes are almost 180°, especially in *B. brancai*.

We were not able to compare with members of the family Cetiosauridae, and especially with *Haplocanthosaurus,* since the genera that comprise this family lack cranial remains.

Cranial and middle cervical vertebrae

We possess four cervical vertebrae, two of which can be considered cranial, and the two remaining are topographically situated in the middle caudal zone. The description of these vertebrae should be accepted with caution because they are heavily fractured and deformed. All are strongly opisthocoelous; the lengths of the cervical centra increase caudally. The cranial articular surfaces of the centra have a height/width relationship somewhat less than one. The lateral faces possess wide, simple pleurocoels without divisory septa, clearly different in this character from *Haplocanthosaurus*, *Diplodocus*, *Barosaurus*, *Dicraeosaurus*, *Brachiosaurus*, and *Camarasaurus*, but resembling that in *Cetiosaurus*. The ventral surface is slightly laterally convex, presenting a smooth craniocaudal crest. These characters are similar to *Haplocanthosaurus*, *Cetiosaurus*, and *Camarasaurus*, while separating it from the other three genera cited.

Vertebra Lo-1 (Plate 1., Fig. 2) is missing all of the left side and the caudal region. Its condyle is crushed transversely; the parapophysis is laterally oriented with a planar articular surface and rounded contour for the capitulum of the corresponding rib. In the dorsal area lies a large diapophysis with a small articular surface situated ventrally for the tuberculum of the cervical rib.

Three laminae emanate from the diapophysis: the first (prezygadiapophyseal) is directed cranially, forms the external face of the prezygapophysis. Internally, a large, flat, subquadrangular articular surface is present. The prezygapophyses project substantially (90mm) from the centrum. A fragmented postzygapophyseal lamina originates from the center of the diapophysis; the morphology of the articular facet cannot be determined. Below the caudal diapophyseal center is a pleurocoel. Another lamina, the suprapostzygapophyseal, extends dorsocaudally from the diapophysis.

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The centrum of Lo-2 (Plate I, Fig. 3) lacks its cranial region and a fragment of the caudoventral area. Cranially, the presence of the dorsally rounded neural canal is observed. The prezygapophysis, whose articular surface is smaller than in Lo-1, is flat and suboval. Compared with the previous vertebra, the prezygapophyses are shorter and would not project as far from the centrum. The two prezygapophyses are connected medially and form the roof of the neural canal. This point is also the base of the neural spine formed cranially by two neurapophyseal laminae that continue from the prezygapophyseal processes. Between these two sits a depression that might be interpreted as a trace of the hypantrum. The distal portion of the neural spine is damaged, so its length cannot be measured.

Laterally, the two large diapophyses display ventrally the small articular surfaces for the tubercula of the cervical ribs. Almost directly dorsal to the right diapophysis part of the articular surface of the postzygapophysis can be seen. The prezygapophyseal lamina maintains the same position as in Lo-1, but the caudal lamina that stems from the diapophysis does not connect with the postzygapophysis, which is instead positioned on the caudal face of the neural spine. The pleurocoels are of modest size, simple and only slightly deep. The observable part of the centrum indicates that its ventral surface is longitudinally concave and transversely convex, possessing a small longitudinal ridge. Caudally, lies the large concavity for the articulation with the condyle of the following vertebra.

The cervical vertebrae considered to be from the most caudal preserved positions (Lo-3 and Lo-4) are very similar to the cranial cervicals but are much larger, particularly in the size of the condyle and the large laminae that cranially form the prezygapophyseal structures. In Lo-4, the condyle is not preserved, but the neural canal and the large pedicels that surround it are present. In Lo-3, the position of the diapophysis is clearly observed, suspended from the neural arch toward the parapophysis. Laterally, the right prezygapophysis has an elongate articular surface whose craniocaudal diameter is approximately twice that of the transverse; the pleurocoels are simple.

The centrum is markedly opisthocoelous. On the right side, a prominent diapophysis is visible. Emanating radially and almost symmetrically from this structure are four laminae: 1) dorsocaudal (postzygapophyseal); 2) dorsocranial (prezygapophyseal); 3) ventrocaudal (caudal centrodiapophyseal); and 4) ventrocranial (cranial centrodiapophyseal). The morphology is very similar to that observed in the fifteenth cervical vertebra of *Haplocanthosaurus* (Hatcher, 1903, plate II).

Dorsal vertebrae

Lo-11 (Plate I, Fig. 4A and 4B) is a dorsal vertebra that preserves an almost complete neural arch but is missing all of the cranial portion of the centrum and the right lateral region. The element is transversely flat.

The centrum is opisthocoelous and its caudal face is regularly concave, indicating little change from the preceding condyle. Their morphology is oval, taller than wide. The length is the biggest dimension. The length index of Upchurch (1998:59), despite the transverse crushing of the centrum and the break, seems to be greater than 1.0.

Nevertheless, the centrum lacks almost the entire area corresponding to the condyle, preserving only the dorsal part and a small ventral area. A strong ventral constriction exists whose area is strongly concave craniocaudally, as are the lateral faces, but craniocaudally it is smoothly convex. Two large, craniocaudally elongate, moderately deep pleurocoels have rounded borders and are located on the upper part of the lateral face, reaching the floor of the vertebral canal that is only visible later on.

The neural arch is high, measuring 2.5 times the height of the centrum. This vertebra is transversely flat; the right lateral area is largely deformed and lacks part of the cranial infradiapophyseal lamina. In contrast, the specimen includes the caudal half of the neural spine belonging to the preceding cranial vertebra, including the postzygapophysis in articulation with the prezygapophysis of the present vertebra.

The transverse processes are smoothly and strongly directed laterally and dorsally. The left transverse process, the best preserved, attaches to the neural spine by means of a suprapostzygapophyseal-diapophyseal lamina whose upper end is U-shaped. The diapophyseal lamina is enlarged cranially and is very thin. On their upper ends, the diapophyseal articulations for the tubercula of the ribs are very rugose. Vertically, toward the diapophyseal articulation for the tuberculum and in the thinnest part in the diapophyseal lamina, is the parapophysis for the capitulum of the rib. The aforementioned parapophysis is supported by a lamina-like centroparapophyseal lamina, also present in *Haplocanthosaurus* (Hatcher, 1903).

From the upper end of the diapophysis emanate two laminae that surround a fossa. These laminae are called by Bonaparte (in press) diapophyseal-postzygapophyseal laminae: one unites the upper end of the diapophysis with the lateralmost part of the postzygapophysis, while the caudal infradiapophyseal lamina unites the cranial end of the diapophysis to a point on the pedicel at the level of the hyposphene. This is a well developed, dorsoventrally elongate, and continued ventrally by a furrow that extends to the vertebral canal and is bordered by the infrahyposphenal laminae.

Following the characters utilized by Upchurch (1998:59) the cranial face of the neural arch is deeply

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excavated, forming a great cavity above the vertebral canal (as in *Haplocanthosaurus*).

The postzygapophyses are short and wide and their articular surfaces are large and suboval. Below them is a cavity bordered by the hyposphene on the centrum and laterally by short and prominent lamina. According to Upchurch (1998:60) this lamina is the accessory lamina of the infrapostzygapophyseal cavity. In side view, next to the oblique lamina, is a deep cavity, bounded dorsally by the infraparapophyseal lamina and caudally by the caudal infradiapophyseal lamina.

The prezygapophysis cannot be observed due to the aforementioned presence of the neural spine of the previous vertebra. Nevertheless, one can perceive that their position is more ventral than that of the postzygapophysis, although they are relatively high with respect to the vertebral canal.

The neural spine is short and triangular in cross-section with the vertex of the triangle oriented cranially. It is more expanded transversely than craniocaudally; its wide and rough prespinal surface is bordered on its proximal two-thirds by two dorsoventral laminae that unite in the internal part of the middle of the diapophyseal lamina, forming an U-shape with very unequal branches. Caudally, the neural spine presents a very rough central part that extends in the shape of an isosceles triangle from the dorsal end to the postzygapophyseal articulations. Laterally this area expands forming two postspinal (postzygapophyseal of Hatcher, 1903) laminae. On the ventral part of this caudal face are cavities separated by the postzygapophyseal laminae. The distal end of the neural spine gets wider, forming a transversely triradiate and very rugose structure.

Similar to Lo-11 but from a more caudal position, is Lo-17, which possesses a less well-developed condyle and a shallow cotyle. The body is transversely flat with a height approximately twice its transverse diameter. Its length is somewhat less than that of Lo-11. Each side of the body displays a large, simple, deep, circular pleurocoel. Ventrally, the vertebral body is very concave lengthwise and smoothly convex transversely.

The pedicels are high and thick, extending the whole length of the vertebral body. One cannot observe the morphology of the vertebral canal. On the dorsal end of the right pedicel is the prezygapophyseal articular surface, which is suboval and very large.

In connection with the described piece we have two fragments that probably belong to the same vertebra. Lo-17b is an almost complete neural spine whose description matches that of Lo-11. Ventrally, this neural spine preserves the suprapostzygapophyseal lamina that possesses the articular surface of the left postzygapophysis at its end, plus part of the corresponding hyposphene. The second fragment (Lo-17c) is a right transverse process whose rugose, distal end preserves the contact with the tuberculum of the rib. From the distal end extend two laminae, called by Bonaparte diapophyseal-postzygapophyseal laminae, that bound a concave area that unites the end of the diapophysis with the postzygapophysis. In our specimen, only part of the right postzygapophyseal surface is preserved.

Also pertaining to a much further caudal dorsal vertebra is centrum Lo-18a (Plate II, Figs. 1A, 1B and 1C) whose characteristics match those of Lo-17. On it can be observed two prezygapophyseal articular surfaces similar in size and morphology to those of Lo-17a. A second part of this vertebra (Lo-18b) has a neural spine that has the basic characteristics of the remaining dorsal vertebrae, although it is transversely flat.

Sacral Vertebra

Lo-24 (Plate III, Fig. 1A and 1B) is tentatively identified as the last sacral vertebra. The articular surface of the centrum is taller than wide, similar to the situation in the dorsals, probably the result of transverse diagenetic pressure. The centrum is relatively longer that that of the dorsals and the ventral craniocaudal concavity is also wider than in the latter.

The morphology of the parapophysis is very different than that of Lo-15, which is similar to the parapophysis identified by Hatcher (1903) as pertaining to the first sacral. On the other hand, the parapophysis of sacrals 2 through 4, that the aforementioned author considered "true" sacrals, are much larger and are represented in the available material by Lo-25. The position of vertebra Lo-24 was determined by the fact that the parapophysis arises from the cranial region of the centrum.

Also, on the caudal face of the centrum, is a slight convexity that could be interpreted as incipient procoely in the first caudal.

The left, well developed and pronounced parapophysis is displaced cranially. Paradoxically, a clear zone of insertion is not observed on the right apophysis. This phenomenon could be due to a pathology; alternatively, deformation of the specimen impedes identification of its exact location.

Sacral Ribs (Parapophyses)

Lo-15 (Plate III, Fig. 2) it is a left sacral rib. The cranial face is convex medially and flat laterally. Further caudally, it is concave and, in the middle and in a mesiolateral direction, crossed by a thick ridge. Its distal extreme it is flat and thin.

In outline, it is triangular, emphasized on its lower, concave, relatively thick edge that is rounded externally but becoming sharper internally. Mesially is the articular surface with the sacral centrum. This area is thick and very rough. The remaining edges are thin, the internal straighter than the external one. On the upper and lower ends of the external side of the sacral rib, they meet the two articular surfaces for the ilium. The lower one is thicker and rougher than the upper, which is fractured.

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The parapophysis is comparable to that figured by Hatcher, (1903:36, Fig. 16a) for *Haplocanthosaurus utterbacki*, a species considered synonymous with *H. priscus* by McIntosh (1990). According to him, it would belong to the first sacral rib. Lo-25 (Plate III, Fig. 3) could also be a transverse apophysis of a more caudal sacral vertebra.

Caudal Vertebrae

We possess five proximal caudal vertebrae. Only in one of them can the general characteristics be observed since it is the only one that is compressed neither transversely nor lengthwise because its centrum is subround, while in the remaining specimens it is oval due to transverse compression suffered during fossilization, with its transverse axis shorter than its height (between 0.6 and 0.7 times the height). The length of the body is always the smallest dimension, attaining half the height in Lo-12.

The centra of all the caudal vertebrae that we possess are clearly procoelous, with poorly developed condyles and a shallow cotyla. The lateral faces are concave proximodistally and smoothly concave or almost flat dorsoventrally. The neural arch is poorly developed compared to the size of the vertebral body, and the vertebral canal is small and round. On either side of this is a short and massive prezygapophysis that projects beyond the proximal edge of the body, and whose subrounded or oval (the proximodistal dimension reaching up to double that of the transverse diameter) articular surfaces face dorsomedially.

Two supraprezygapophyseal laminae emerge from the prezygapophyses to form the proximal edges of the neural spine. Between them is a 20mm deep fissure that begins ventromedially very deep and wide but narrows dorsally. In Lo-12 and Lo-13, the edges are broken so their dorsal ends cannot be observed.

The postzygapophysis is located on the roof of the vertebral canal. The articular facets face ventrolaterally, forming a deep cavity between them. The postzygapophysis is continued by two suprapostzygapophyseal laminae that, dorsally, form the distal borders of the neural spine. In Lo-13, these are separated by a deep cavity that divides the base of the neural spine in two. The supraprezygapophyseal and suprapostzygapophyseal laminae form the distally oriented lateral faces of the neural spine. The spine widens distally, ultimately becoming rounded and extremely rugose. If we compare it with plate IX of *Diplodocus* (Hatcher, 1901), Lo-12 could be positioned between the ninth and eleventh vertebrae.

Lo-5 (Plate IV, Figs. 1A, 1B and 1C) lacks the postzygapophyseal articular surfaces due to breakage, but their positions can be deduced. In Lo-6, they appear at almost the same elevation as the prezygapophysis and their articular facets are large and oval, as are the articular facets of the prezygapophyses.

At the proximal and distal ends of the ventral side of Lo-12 (Plate V, Fig. 1A, 1B and 1C) are two large, transversely elongate facets for the articulation of the haemal arches whose upper end would be formed by a single facet on a bridge between the two branches of the arch. In Lo-6 and Lo-13, these facets can be detected.

The biggest differences between the recovered caudal vertebrae appear at the level of the caudal ribs and in the neural spines, so we have two distinct types:

a) The ribs are formed by large, thin alar laminae (wing-like or wing-shaped in the Anglo-Saxon nomenclature) (Lo-5) that extend dorsally as far as the prezygapophysis.

In Lo-5 they are broken, so that neither their morphology nor transverse limits can be discerned, but their insertions on the vertebral body, mainly in the left side, can. This area is thick becomes increasingly thin and as long transversely as high dorsally. In Lo-10, the presence of this laminar structure can be deduced on its left lateral face. It extends from the base of the vertebral canal to the middle of the centrum. Its morphology cannot be precisely determined, though it is very thick, especially ventrally.

Another of the remarkable differences, characteristic of the first caudals, is the tall, long and very narrow form of its neural spine, angled backward and cutlass-shaped (Lo-23 and Lo-5) (Plate IV, Fig. 2). The lateral faces of the neural spine progressively separate so that the distal surface is dominated by a concavity that extends the length of the spine. In this way, the distal side of the spine appears to be divided into two laminae. This neural spine morphology is characteristic of the genus.

b) In Lo-6, Lo-12 and possibly Lo-13, to the height of the dorsal part of the vertebral canal, appear some structures that extend from the lateral faces of the vertebral body and form right angles to them. They can be considered short and thick "ribs." They extend horizontally outward and slightly backward. Their upper surfaces are very rugged and they are conjoined to the most external part by means of a flat surface that forms a gentle arch. We can say that they have a morphology in cranial view very similar to that of vertebra c of *Camarasaurus supremus* as illustrated by McIntosh (1990:363, Fig. 16.7).

The neural spine of these caudal vertebrae, that we consider of proximal position, are subquadrangular with their widths almost equal to their lengths and only slightly inclined backward. They lack, at an rate, the division on the distal surface characteristic only of the most proximal.

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Keeping in mind the presence or absence of the facets for the haemal arches, the possession of lateral laminae or of "ribs," the thinness or robustness of the first ones and the situation of the seconds, as well as in the forms of the neural spine, we consider that the relative positions of the studied vertebrae would be: Lo-5, Lo-10, Lo-13, Lo-12 and Lo-6.

The first of the aforementioned characters is, according to the analysis of Upchurch (1998), present in *Diplodocus*, *Barosaurus* and *Dicraeosaurus* while *Haplocanthosaurus* and *Cetiosaurus* lack it.

Sternal plates (Plate VI, Fig. 3)

From the Cañada locality were recovered sternal plates that we attribute to the Losilla sauropod. Lo-14 and Lo-22 are the right and left sternal plates; they measure ca. 60cm x 49.5cm and ca. 56.7cm x 40.5cm, respectively.

In a previous work (Santafé et al., 1982:95), we discussed the problem of the orientation of the sternal plates. Following Huene (1929:36) and Hatcher (1901:40), we consider that the swollen border of the sternal lamina would be oriented laterally and that the medial border would be the thin and rough one, joined in life to its counterpart by means of a fibrocartilaginous structure.

In this work, however, we follow the ideas outlined by McIntosh and Williams (1988:15 and 1990:365): according to these authors, it seems that this question has already been elucidated that serves as a basis for the anatomical assignment of the plates.

Our specimens lack the cranial and caudal ends because they were broken during excavation and preparation. The plates are rectangular, greatly expanded mediolaterally and possessing a vast surface that is lightly concave internally and smoothly convex externally. The lateral and medial margins are almost parallel, the latter flat with a slight bend. The lateral margin, although fractured along its entire length, can be deduced as possessing a more marked bend that the medial one; it is abnormally rugose but according to McIntosh and Williams (1988:16), it is ideal for the cartilaginous union of the ribs of the breastbone.

Comparing the sternal plates of *Losillasaurus* with those figured by McIntosh and Williams (1988:18) and McIntosh (1990:365), we see that morphologically they are similar to those in figure 16.9c belonging to *Haplocanthosaurus delfsi*, although their mediolateral dimensions are smaller in this specimen. The sternal plates of *H. priscus* are unknown. On the contrary, they are very different from those of *Cetiosaurus*, but the aforementioned author recognizes that sauropod sternal plates vary greatly between genera. This variation may even be related to the individual's ontogenetic state; the similarity with other genera may be fortuitous.

Humerus (Plate VI, Figs. 1A and 1B)

Specimen Lo-7 it is an almost complete humerus; it lacks part of the external part of its proximal end and it possesses numerous fractures. The contour of the proximal edge is rounded with a large, rugose, well-developed articular head. On the caudal face of this end and near the middle appears an articular tuberosity of regular size and subrounded shape. Its medial edge is curved along its entire although its most pronounced concavity is along the upper half. The lateral edge is also curved, although less so.

The proximal end is greatly enlarged, emphasizing its internal tuberosity, while the external one cannot be seen due to the aforementioned breakage. The distal end, also enlarged with respect to the shaft, is narrower than the proximal. On the cranial face of this end there are some poorly developed, rough protuberances that correspond respectively to the ectepicondyle and entepicondyle; the latter is more developed, and the two are separated by a short and poorly developed crest, rendering the cranial face of this end practically rectilinear. On the caudal face, the ectepicondyle is much more developed than the internal epicondyle, which is fractured on its more distal end. Both condyles are separated by a wide but shallow trochlea that extends halfway up the shaft.

The rather short shaft is subelliptical in cross section, with a transverse axis of great magnitude. Cranially and externally, a large, deep deltopectoral crest is observed that is about 20cm at its deepest and whose length is approximately 62cm, so its distal end extends two-thirds the maximum length of the humerus. Cranially the crest is flat, while externally it is markedly rugose, especially on its caudal face.

On the cranial face, the proximal area plus a great part of the shaft forms a very deep concavity that disappears toward the distal end.

Length	1430mm
Proximal transverse diameter	-
Minimum shaft width	265mm
Distal transverse diameter	410mm
Deltoid crest length	60mm

Table 2. Dimensions of Lo-7 (taken from the original).

We have compared the Losilla humerus with those of other taxa. Of the family Cetiosauridae *sensu* McIntosh, the humerus of *Cetiosaurus oxoniensis* has been studied and figured by Huene (1927, Plate XIV, Fig. 28), that of *C. leedsi* figured by Woodward (1905:240) and that of *C. longus* figured by Owen (1875:33, Fig. 4), all have short and wide shafts, with strongly expanded proximal ends and short deltoid crests.

The minimum length/width ratio of the shaft is as follows:

C. oxoniensis: 880/160 = 5.50; *C. leedsi:* 910/182 = 5.0; *C. longus:* 1260/210 = 6.0

From the family Brachiosauridae, we compared it with the humerus of *Brachiosaurus brancai* figured by

Janensch (1961:186, Fig. 1A) and with that of *B. fraasi* (Janensch, 1914:13, Fig. 6). Both specimens are much more slender than Lo-7 and they have completely different distal outlines. The minimum length/width ratio of the shaft for *B. brancai* is 2370/225 = 10.5; and *B. fraasi* is 1690/195 = 8.6.

Other studied taxa are:

Camarasaurus grandis (McIntosh et al., 1996:20). The medial edge is strongly curved with its greatest bend halfway along of the shaft. The postaxial edge is straight. The minimum length/width ratio of the shaft, measured in three different specimens, is: 1130/170 = 6.64; 890/144 = 6.18; and 1128/171 = 6.59.

Barosaurus (Janensch, 1961:188, Fig. 1A). The humerus is short with a very wide proximal end. The minimum length/width ratio of the shaft is 940/130 = 7.23.

Dicraeosaurus (Janensch, 1961:188, Fig. 3B). It has a small humerus whose shaft's minimum length/width ratio is 740/120 = 6.16.

The ratio studied in the aforementioned taxa has been applied to the Losilla specimen, giving 1430/265 = 5.39, a value that attributes Lo-7 to the family Cetiosauridae, from the Middle Jurassic, that also includes to the genus *Haplocanthosaurus* from the Late Jurassic, with which it has not been possible to compare since no forelimb elements have been found of this taxon.

Ulna

A fragment of a left ulna (Lo-8) lacks the proximal end. The proximal end of the shaft is clearly triangular in cross section. The cranial face, on its upper end, retains the distal portion of the concavity that would house the radius. This face is proximally wide, narrowing progressively toward the distal end. Medially and laterally it is bordered by two blunt edges of which the external one extends to the distal end, although it becomes indistinct in this area; simultaneously, the cranial face is naturally curved cranially forming a well developed distal end. The medial border, very wide on its upper end, narrows and smoothly disappears, so the cross section at the lower end of the shaft is suboval.

The caudal face is subrectangular longitudinally and, along the greatest dimension, is marked by an arched crest that increases in size toward the distal end. The caudal edge is lightly concave, while the cranial one is rectilinear.

The medial face is flat, lightly convex, and presents a small rugged area at the dorsal end.

The distal end, enlarged cranially with respect to the shaft, is ovoid with the longer axis oriented craniocaudally. It is markedly rugose for the insert of ligaments.

Length of the ulnar fragment	810mm
Maximum proximal transverse diameter	-
Minimum transverse diameter of shaft	125mm
Distal craniocaudal diameter	250mm
Distal transverse diameter	173mm

Table 3. Dimensions of Lo-8 (taken from the original).

Radius

A distal fragment of left radius (Lo-9) measures 785mm long. In contrast to what happens in other sauropod radii, the fragment of our specimen is practically straight, widening at the proximal and distal ends. There are two basic sides distinguishable: a flat side that distally would contact the ulna and another, clearly convex side that would form the cranial face of the element. The margin of the shaft is variable. The proximal end is trapezoidal so the upper base of the trapezoid is circular, and the lateral sides are perpendicular to the lower base, which is straight. Distally, the cranial edges that form the upper vertices of this trapezoid disappear and the shaft's shape becomes approximately round.

The distal end is oval in shape with the articular surface for the ulna forming a vertex. The opposite end is clearly circular. The whole distal surface is covered by rugosity that extend dorsolaterally. The whole area is transversely convex.

Length of the radius fragment	785mm
Maximum proximal transverse diameter	-
Minimum transverse shaft diameter	126mm
Distal transverse diameter	245mm
Distal craniocaudal diameter	162mm

Table 4. Dimensions of Lo-9 (taken from the original).

Metacarpal II

A proximal fragment of a right metacarpal II (Lo-16) is 330mm long. The proximal end is lightly convex and triangular in shape, it forms, characteristic of this metacarpal, a sharp angle with the caudal and extremely rugose face. The cranial face is convex transversely and at its more proximal end presents a blunt edge that attenuates distally before disappearing. On its mesial face, in a proximal position, is a fracture that obscures the articular surface with metacarpal I in its fullest extent. Toward the more distal end, the fragment begins to expand for articulation with the corresponding phalanx. In this same area, and on the medial face, some rugosity stands out that forms the contact with Mc I.

The lateral face is almost flat proximally and convex distally. The proximal part of this face is entirely covered by the articular surface for Mc III. It is a rectangular strip of great vertical dimension and containing parallel furrows.

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The articular surfaces with the adjacent metacarpals (I and III) form a crest in the center of the caudal face that disappears distally.

Compared to the drawings of Janensch (1922) and reported by Wilson and Sereno (1998) for *Gigantosaurus* (= *Janenschia*) *robustus* and *Brachiosaurus brancai,* as well as the descriptions carried out by the first of the authors, we see that the proximal articular surface for the carpals, although triangular in all the specimens, is fundamentally different in the angulation of the caudal face.

Our specimen compares favorably with *Janenschia* in the similar robustness of their shafts for the short lengths of each specimen, while in *Brachiosaurus brancai* it is slender, long, and has a flat proximal surface. We cannot make comparison with *Haplocanthosaurus* since, as mentioned previously, no forelimb bones have been described from either of the two species of this genus.

		Proximal extreme		Shaft width	Minimum shaft circumference
			Long.	D. T. D. A. P.	
Janenschia	281	103ca	114	66	191
Brachiosaurus	634	121	170	89	265
Losillasaurus	-	112	148	71	240

Table 5. Dimensions of Mc II (in mm).

Ilium (Plate VI, Figs. 1A and 1B)

The specimen is formed by three deformed fragments (Lo-21a, 21b and 21c) belonging to a left ilium. Lo-21c is part of the dorsal lamina of the ilium. Lo-21a possesses a substantial part of the preacetabular process, a relatively complete pubic peduncle, and large part of the acetabular border. Lo-21b could be part of the postacetabular process.

Pieces 21a and 21c, lastly, when connected provide most of the cranial portion of the ilium. The exact location of 21b is problematic.

In the piece formed by the union of fragments 21a and 21c, one can see that the preacetabular opening is somewhat enclosed by the cranial inclination of a pubic process that, in turn, is subtriangular in cross section with a larger ventral face than it would require as a facet for the acetabulum.

On the internal face one can observe marks that correspond to the transverse processes of the sacral vertebrae. The cranial face of the piece suggests the bend of the iliac lamina.

Fracturing and deformation prevents comparison with figured specimens. Nevertheless, the body seems much larger than that of the ilium figured by Hatcher (1903, Plate IV, Fig. 3) for *Haplocanthosaurus*.

Pubis (Plate VI, Figs. 2A and 2B)

The left pubis (Lo-19) has been broken into many fragments. Its cranial margin forms a gently and broadly curved arch, while its proximal, caudal, and distal ends are incomplete although proximally the initial rugosity that would form the iliac peduncle can be seen.

The general shape of the fossil is subrectangular with longest dimension oriented dorsoventrally, but craniocaudally, where it's middle is greatly expanded, is the same along the whole piece. Laterally, it is dorsoventrally convex for its entirety, most strongly in the center. Caudally, it continues as a smoothly concave area. In medial view, all of it is lightly concave.

Contribution to the acetabular margin by the pubis is very small. The obturator foramen is ellipsoidal and opens to the exterior. It lacks a significant part of it caudal end for the whole length of the bone, so the shape of neither the ischiadic peduncle nor the distal end can be appreciated. Nevertheless, this extremity would have an expanded craniocaudal and mediolateral body, as indicated by the preserved part of this area.

Although the distal end of the pubis is incomplete, a flat area that probably pertains to the pubic symphysis is preserved. The outline and great robustness are typically primitive characters in sauropods.

Comparing our specimen with the pubis figured by McIntosh (1990:370), we observe that it is similar in shape only to *Cetiosaurus oxoniensis* and *Camarasaurus supremus*, although the latter is much larger. It differs completely from the two species of *Haplocanthosaurus*, as well as from *Brachiosaurus* and *Diplodocus*.

We could not obtain measurements of our specimen owing to its fragmentation.

Ischium (Plate VI, Fig. 2)

The ischium of the Losilla sauropod is composed of two fragments (Lo-20a and Lo-20b) that unquestionably belong to the same element. It is a fragmentary left ischium. The proximal end is dominated by the long and very thick iliac peduncle. In medial view, the shaft is very rugose. The acetabular arch is deep and thick and also has a thick surface for articulation with the pubis that is elongate dorsoventrally. The proximal end of the Losilla ischium seems similar to those of *Haplocanthosaurus priscus* and *H. delfsi* figured by McIntosh and Williams (1988:21), while it differs of *Cetiosaurus* and other ischia figured by McIntosh (1990:371).

The ischiadic shaft of *Losillasaurus* is wide and thick, but is cannot be determined whether or not it possessed a distal expansion due to breakage in this area. Its general morphology differs from *Haplocanthosaurus priscus* whose base is narrow and flat, with a rounded external

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surface (Hatcher 1903:26). In our specimen, the ischiadic shaft is flat medially and convex laterally, with a thick and rounded caudal border. The cranial margin of the shaft is broken along its distal two-thirds so the symphyseal surface for the right ischium cannot be appreciated. Its proximal third is thin. It is morphologically similar to that of *Cetiosaurus oxoniensis*.

Ontogenetic state of the specimen

Certain characteristics of the sacroiliac region seem to indicate that the individual is a subadult. On one hand, the transverse processes of the sacral ribs are not fused into an iliac lamina. However, the obturator foramen of the pubis is open. According to McIntosh (1990:370), this foramen closes in all mature forms.

We believe that the juvenile character of available *Losillasaurus* material does not interfere with the proposed formal diagnosis. That is to say, the two observed autapomorphies (sees below in "Diagnosis") would not be lost in later ontogenetic stages of the animal.

APPLICATION OF CHARACTERS UTILIZED BY MCINTOSH AND UPCHURCH TO *LOSILLASAURUS*

McIntosh (1992) mentions a series of vertebral characters that can be used to diagnose different families and genera. Since we do not possess enough remains to apply all these characters, we have selected those that can be ascertained in our specimen:

a) Degree of excavation of the articular and lateral faces of the presacral centra, in particular of the caudal dorsals.

b) Presence or absence of divided neural spines, in the caudal cervicals and cranial dorsals.

c) Presence or absence in the proximal caudal vertebrae of transverse processes (thin, wing-like caudal ribs similar to the sacral ribs.

d) Pleurocoels present on the proximal caudal vertebrae often associated with ventral excavations.

e) Presence of gently procoelous proximal caudal vertebral centra of some forms, or extremely procoelous centra with large caudal condyles in others.

f) Stronger or weaker development of strong chevron facets in the caudal centra.

g) Presence in the cervical and cranial and middle dorsal vertebrae of simple pleurocoels, without dividing septa, or of divided pleurocoels.

In our specimen we observe that:

a) The caudal articular faces are deeply excavated in the cervical and middle dorsal vertebrae, while they are only smoothly in the caudal dorsals.

b) Absence of divided neural spines.

c) Presence, in the proximal caudals, of wing-like ribs.

d) No pleurocoels in the proximal caudals.

e) Proximal caudals with gently procoelous centra.

f) Strong chevron facets on the caudal centra.

g) Presence in the cervical and middle dorsal vertebrae of simple, undivided pleurocoels.

The comparison of these characteristics with those applied by McIntosh (1992:60, table 4.1) for the different families and sauropod genera, we observe that *Losillasaurus* is identical in characters 8, 9,16 and 18 to *Haplocanthosaurus*; in 8,10 and 16 to *Brachiosaurus*; in 6,10 and 16 to *Camarasaurus*; in 9, 15 and 16 to *Apatosaurus*; in 9, 13, 14 and 15 to *Diplodocus,* and in 9, 13, 14 and 15 to *Barosaurus*. Thus, we can deduce that *Losillasaurus*, in principle, is more similar to *Haplocanthosaurus* and *Diplodocus* than with the families Brachiosauridae and Camarasauridae *sensu* McIntosh.

In 1998, Upchurch used 204 characters to establish the relationships among 26 genera in different families. As we did above, we were able to compare only those or Upchurch's characters represented in the extant remains of *Losillasaurus*:

Phylogenetic analysis

For the proposal of a phylogenetic hypothesis, the new Losilla sauropod has been compared with the genera *Barosaurus*, *Brachiosaurus*, *Camarasaurus*, *Cetiosaurus*, *Dicraeosaurus*, *Diplodocus*, *Haplocanthosaurus*, *Patagosaurus* and *Shunosaurus*. By means of polarity analysis of exposed characters we constructed the matrix presented in Table 6 and analyzed it using the computer program MacClade 3.1. The result was a single tree (Fig. 1) with a consistency index of 0.67 and 69 evolutionary steps. A hypothetical ancestor was used in the matrix.

Analysis of characters

1. The occipital condyle is oriented caudoventrally (0); or directed ventrally (1).
2. Articulations between the middle and caudal dorsal centra: amphicoelous/amphiplatyan (0); opisthocoelous (1).
3. Median keels on the ventral surfaces of the cervical centra: prominent (0); reduced or absent (1).
4. Ventral surface of each cervical centrum: flat or lightly convex transversely (0); transversely concave (1).
5. Height/width ratio of the cervical centra at their cranial ends: 1.0 or less (0): approximately 1.25 (1).
6. Cavity on the dorsal surface of each cervical parapophysis: absent (0); present (1).

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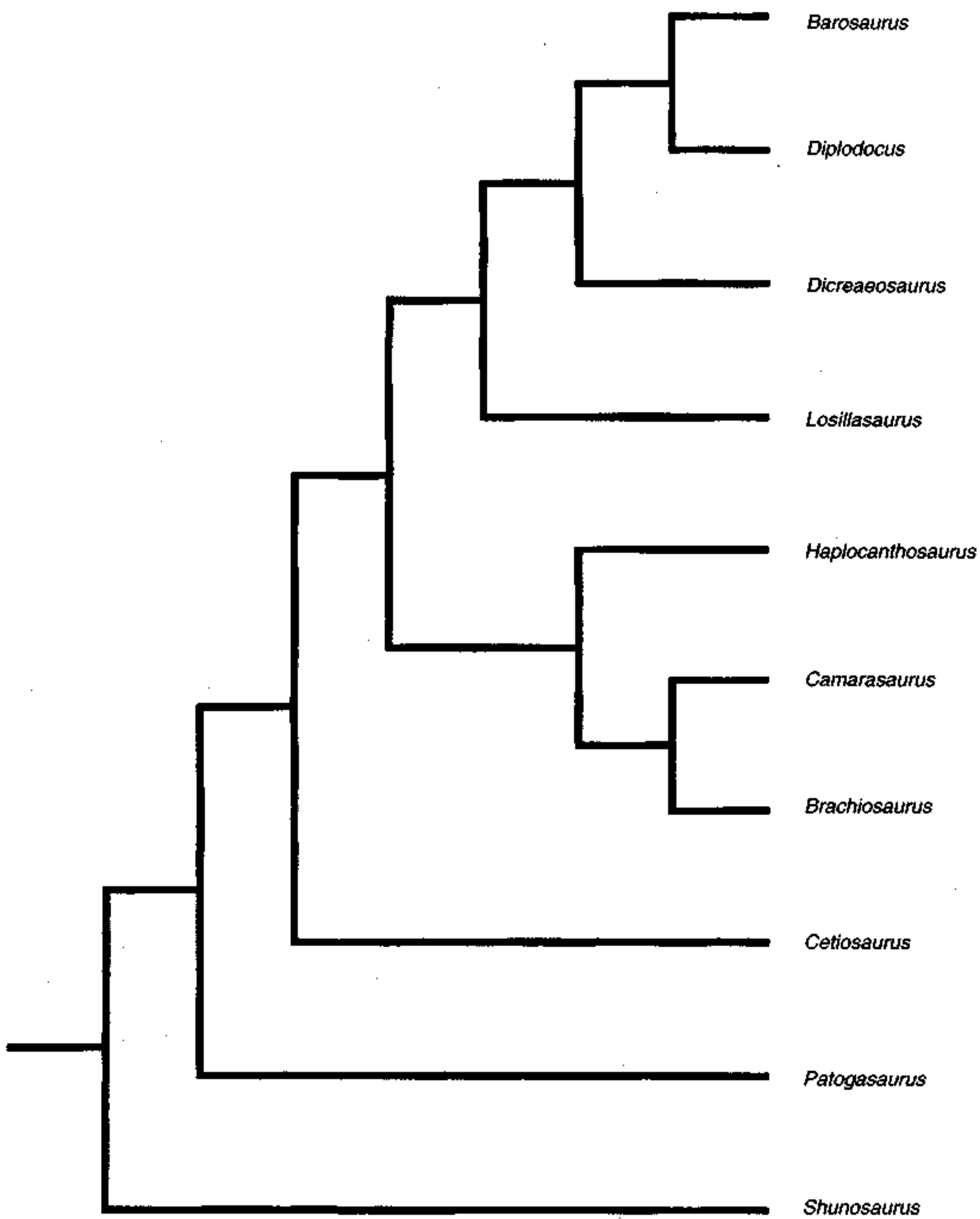

FIG. 1. Cladogram of the phylogenetic relationships of *Losillasaurus* and other sauropods.

7. Lateral surfaces of the cervical centra lacking lateral excavations or with only very weak depressions (0); deeply excavated but without an oblique accessory lamina (1); possessing a deep excavation that is divided into cranial and caudal portions by an oblique accessory lamina (2).
8. Infraprezygapophyseal laminae on the middle and caudal cervicals: simple (0); forked (1).
9. Articular surfaces of the prezygapophysis in the middle and caudal cervicals: flat (0); transversely convex (1).

10. Cervical neural spines: low (the height of the vertebra does not exceed the length of the centrum) (0); high (the height of the vertebra is at least 1.5 times the length of the centrum) (1).

11. Bifurcation of the presacral neural spines: absent (0); presents without a small process in the base of the bifurcation (1); presents, with a small process in the base of the bifurcation (2).

12. Pleurocoels in the cranial dorsal centra: with rounded caudal margins (0);with sharp, spindle-shaped caudal margins (1).

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13. Pleurocoels in the dorsal centra: absent (0); present (1).

14. Pleurocoels in the dorsal centra: moderately deep but simple fossae (0); deep, ramified extensively inside the centrum and the base of the neural arch (1).

15. Length index (length of the vertebral centrum/width of their caudal width) of the caudal dorsal centra: smaller than 1.0 (0); greater than 1.0 (1).

16. Dorsal vertebral transverse processes: directed laterally or slightly up (0); directed strongly dorsolaterally (1).

17. Caudal dorsal vertebral transverse processes: located caudally or caudodorsally with respect to the parapophysis (0); located directly dorsal to the parapophysis (1).

18. Laminae uniting the parapophysis to the transverse processes in the dorsal vertebrae: present (0); absent (1).

19. Centroparapophyseal lamina: absent (0); present (1).

20. Accessory lamina in the infrapostzygapophyseal cavity of the middle and caudal dorsals: absent (0); present (1).

21. Deep excavation under the transverse process that leaves only a thin septum along the midline, especially in the middle and caudal dorsal vertebrae: absent (0); present (1).

22. Simple lamina on the midline supporting the hyposphene ventrally in each of the dorsal neural arches: absent (0); present (1).

23. Prominent suprapostzygapophyseal laminae in the dorsal neural spines: absent (0); present (1).

24. Neural spines of the caudal dorsals: wider craniocaudally that transversely (0); craniocaudally compressed (1).

25. Triangular process on the dorsal neural spines: absent (0); present (1).

26. Dorsal neural spines in cranial view: lateral margins subparallel (0); lateral margins diverge distally (1).

27. Pleurocoels or very deep depressions in the sacral centra: absent (0); present (1).

28. Height of the neural spines in the caudal dorsals, sacrals, and proximal caudals: smaller or equal to1.5 times the height of the centrum (0); 2.0 times the height of the centrum (1). (Height defined following Upchurch, 1998:63.)

29. Articulations between the proximal caudal vertebrae: amphicoelous/amphiplatyan (0); slightly or strongly procoelous (1).

30. Articulations between the proximal caudal vertebrae: amphicoelous or only slightly procoelous (0); strongly procoelous (1).

31. Length of the centrum divided by its height (in the more proximal caudal vertebrae): approximately 1.0 or more (0); approximately 0.5-0.6. (The length of the centrum excludes the length of the articular "ball" in procoelous and opisthocoelous vertebrae.)

32. Pleurocoels in the proximal caudal vertebrae: absent (0); present (1).

33. Ventral surfaces of the proximal caudal centra: transversely rounded or developed in a sharp median keel (0); moderately or deeply excavated, with the excavation bounded by a ventrolateral crest on each side (1).

34. Neural arches of the middle dorsals [TRANSLATOR'S NOTE: *This should probably read "caudals"*]: located over the mid point of the centrum (0); located over the cranial half of the centrum (1).

35. "Dorsalization" of the neural spines of the proximal caudals: absent (spines are simple, laterally compressed, and lack laminae) (0); present (spines very similar to those of the dorsal vertebrae) (1).

36. Neural spines of the proximal caudal vertebrae: transversely compressed (0); compressed craniocaudally (1).

37. Wing-shaped ribs on the proximal caudal vertebrae: absent (0); present in the first 3-7 vertebrae (1).

38. Neural spine of the proximal caudal vertebrae: rectilinear in lateral view (0); distodorsally arched in lateral view (cutlass shaped) (1).

39. Neural spine of the proximal caudal vertebrae: ratio between the proximodistal dimension with respect to the total height: between 0.2 and 0.3 (0); around 0.5 (1).

40. Lateral margin of the sternal plate: straight or convex in dorsal profile (0); slightly or strongly concave (1).

41. Prominent process on the lateral portion of the proximal end of the humerus: absent (proximal end transversely convex in cranial view) (0); present (proximal end has a cranially sinusoidal profile) (1).

42. Cranial process of the ilium: located in a vertical plane and directed cranially or craniolaterally (0); directed laterally in such a way that is curves into a horizontal plane (1).

43. Lateral profile of the cranial process of the ilium: triangular and tapering to a point (0); wide with its caudal end rounded (1).

44. Lateral profile of the dorsal margin of the ilium: straight or sinuous (0); strongly convex (1).

45. Ischiadic peduncle of the ilium: wide (0); strongly reduced (1).

46. "Ambiens" process of the pubis hook-shaped: absent (0); present (1).

47. Distal and medial portions of the pubis: forming a transverse bony lamina that is rotated with respect to the proximal end (0); rests approximately in the same plane as the proximal end (1).

48. Length of the ischiadic articular surface of the pubis divided by the length of the pubis: 0.33 or less (0), 0.45 or more (1).

Comparing these characters with the elements of *Losillasaurus* that we possess produces the following table:

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GENERA	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-48
Barosaurus	?0110	22110	2?1??	0??1?	?1110	00110	?1101	1100?	00011	110
Brachiosaurus	01110	22100	0?111	00011	00101	011000	10010	00001	00111	011
Camarasaurus	01100	22000	10110	00001	00101	01000	10000	00000	00011	010
Cetiosaurus	??100	11000	0010?	10001	10100	0?000	10000	00000	00???	011
Dicraeosaurus	10010	00101	2?000	10111	00110	10110	10001	1100?	00011	110
Diplodocus	10110	22110	20110	00011	01110	01110	11101	11000	00011	110
Haplocanthosaurus	?0100	12000	01110	11111	00101	01000	10000	00001	?0011	010
Patagosaurus	?000?	11000	00100	10000	10100	00000	10000	0000?	00010	010
Shunosaurus	00001	00?00	00000	1001?	??000	00100	10000	00000	00010	010
Losillasaurus	01100	1110?	0?101	11011	?0101	10010	10000	01110	0000?	010

Distribution of character states for the relationships shown in the cladogram in Fig. 1. Sauropodomorpha Huene, 1932. Sauropoda Marsh, 1872. Neosauropoda Upchurch, 1995. Diplodocoidea Upchurch, 1995.

The phylogenetic hypothesis places *Losillasaurus* as a sister taxon to (*Barosaurus* + *Diplodocus*) + *Dicraeosaurus*. This clade is supported by the following evolutionary novelties: 1. Infraprezygapophyseal laminae in the cervicals and bifurcate caudals (character num. 8). 2. Neural spines of the proximal caudals are transversely compressed (laterally) and are cutlass shaped (character 35). 3. The first proximal caudal vertebrae have aliform lateral processes (character 37).

Losillasaurus gen. nov.

Type Species: *Losillasaurus giganteus*

Etymology: Losilla, village in the district of Serranos (Valencia, Spain). *Saurus*, from the Greek, lizard; complete meaning: "the lizard of Losilla."

Diagnosis: Diagnosed by two autapomorphies: neural spines of the proximal caudal vertebrae arched dorsocaudally in lateral view (cutlass shaped). Also, the ratio between the craniocaudal dimension of the base of the neural spine with respect to its total height is around 0.50. It is also diagnosed by the following combination of synapomorphies: middle and caudal dorsal vertebral centra opisthocoelous; ventral median keels on the cervical centra reduced or absent; presence of a cavity on the dorsal surface of each cervical parapophysis; lateral surfaces of the cervical centra deeply excavated but without oblique accessory lamina; infraprezygapophyseal laminae in the middle and caudal cervicals forked; pleurocoels present in the dorsal vertebral centra; length index (length of the vertebral centrum/width of its caudal face) of the caudal dorsal centra greater than 1; dorsal transverse processes directed strongly dorsolaterally; transverse processes of the caudal dorsal vertebrae located directly dorsal to the parapophysis; presence of centroparapophyseal lamina; presence of accessory lamina in the infrapostzygapophyseal cavity of the middle and caudal dorsals; presence of prominent suprapostzygapophyseal laminae in the dorsal neural spines; presence of triangular process in the dorsal neural spines; dorsal neural spines with lateral margins that diverge toward the distal end in cranial view; proximal caudal vertebrae moderately to strongly procoelous; ratio of the length of the more proximal caudal vertebral centra with to their height approximately between 0.5 and 0.6; "dorsalization" in the neural spines of the proximal caudals; neural spine transversely compressed and cutlass shaped; wing-shaped ribs on the proximal caudals; middle and distal portions of the pubis rest approximately in the same plane as the proximal end.

Losillasaurus giganteus sp. nov.

Etymology: From the Latin *giganteus* (giant). Due to its great size. The giant lizard of Losilla.

Holotype: Lo-5. Procoelous proximal caudal vertebral centrum; length/height ratio >0.5 < 0.6; neural spine transversely compressed and cutlass shaped; caudal ribs wing shaped.

Paratype: Lo-10. Proximal caudal vertebra similar to Lo-5. Lo-23. Neural spine of proximal caudal vertebra characteristic similar to that of the holotype.

Locality: Cañada (Barranco de Escáiz), 800m from the village of Losilla, belonging to the municipality of Aras de Alpuente (district of Los Serranos, Valencia).

Horizon: Levels of micaceous arenite.

Age: Traditionally considered Early Cretaceous. A more complete stratigraphic study of the area demonstrates that it is possibly at the Jurassic-Cretaceous boundary (Casanovas et al., 1999).

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