

First Triassic tetrapod (Sauropterygia, Nothosauridae) from Castilla y León: evidence of an unknown taxon for the Spanish record

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Abstract

Several vertebrae of a sauropterygian specimen have been recovered in Fuencaliente de Medinaceli (Soria Province, Castilla y León, Spain). The remains come from late Middle Triassic levels (late Ladinian) of the upper Muschelkalk Facies. This finding represents the first documented evidence of a Triassic tetrapod in Castilla y León. The vertebrae belong to *Nothosaurus*, a sauropterygian genus found in Europe, Middle East, North of Africa and China. This genus is poorly-known in the Iberian record. The new remains constitute the first evidence of the species *Nothosaurus giganteus*, or a related taxon, in the Iberian Peninsula, being referred as *Nothosaurus* cf. *giganteus*. This study reveals the occurrence of at least two species of the sauropterygian *Nothosaurus* in the Iberian record.

Keywords: Muschelkalk, Nothosauria, *Nothosaurus*, Iberian Ranges, Spain

Resumen

Varias vértebras de un ejemplar de sauropterigio han sido encontradas en Fuencaliente de Medinaceli (Provincia de Soria, Castilla y León, España). Los restos provienen de niveles del Triásico Medio tardío (Ladiniense superior) de la parte superior de las Facies Muschelkalk. Estos elementos representan la primera evidencia documentada de un tetrápodo triásico en Castilla y León. Las vértebras pertenecen a *Nothosaurus*, un género de sauropterigio encontrado en Europa, Oriente Próximo, el norte de África y China. Este género es mal conocido en el registro ibérico. Los nuevos restos constituyen la primera evidencia de la especie *Nothosaurus giganteus*, o de un taxón emparentado, en la Península Ibérica, siendo atribuidos a *Nothosaurus* cf. *giganteus*. Este estudio revela la presencia de, al menos, dos especies diferentes de *Nothosaurus* en el registro ibérico.

Palabras clave: Muschelkalk, Nothosauria, *Nothosaurus*, Iberian Ranges, España

1. Introduction

Remains of Spanish Triassic sauropterygians have been found at several localities from the eastern half of the Iberian Peninsula, and at the Balearic Islands. These elements, most of them being isolated or fragmentary remains, were recovered from Aragon (Kuhn-Schnyder, 1966; Lapparent, 1966; Sanz, 1976; Rubio *et al.*, 2003; Miguel Chaves *et al.*, 2015), Andalusia (Sanz, 1991; Alafont, 1992; Niemeyer, 2002; Reolid *et al.*, 2013); Balearic Islands (Bauza Rullán, 1955); Castilla-La Mancha (Lapparent, 1966; Westphal, 1975; Sanz, 1980; 1983; 1991; Alférez *et al.*, 1983; López-

Gómez, 1985; Alafont, 1992; 1999; Quesada *et al.*, 2009), and Catalonia (Almela and Llopis, 1947; Sanz, 1980; 1983; Alafont and Sanz, 1996; Rieppel and Hagdorn, 1998; Quesada and Aguera González, 2005; Fortuny *et al.*, 2011). The study of most of these fragmentary sauropterygian remains only provided a poorly-detailed systematic determination, allowing the identification of indeterminate pachypleurosaurs, nothosauroids and pistosauroids, as well as cyamodontoid and no cyamodontoid placodonts. However, some findings were determined at generic or specific level: the placodont *Paraplocodus* Peyer 1931a (Pinna, 1990); the nothosauroid *Simosaurus* Meyer 1842 (Miguel Chaves *et al.*, 2015); and

the nothosaurs *Lariosaurus balsami* Curioni 1847 (Sanz, 1976), “*Ceresiosaurus*” sp. Peyer 1931b (a junior synonym of the genus *Lariosaurus* sensu Rieppel, 1998a) (Quesada and Agüera González, 2005), *Nothosaurus cymatosauroides* Sanz 1983 (the validity of which was doubted by Rieppel, 2000) (Sanz, 1980; 1983), as well as several sauropterygian remains classified as *Nothosaurus* sp. (Kuhn-Schnyder, 1966; Alférez et al., 1983; Niemeyer, 2002; Reolid et al., 2013).

A new finding corresponding to material of a Spanish sauropterygian individual is described here. Its morphology is not compatible with other Iberian Triassic sauropterygians, so it cannot be assigned to any of the previously identified taxa in the Iberian Peninsula. The new specimen is represented by several vertebral elements, recovered from late Ladinian levels (Middle Triassic) of Fuencaiente de Medinaceli (Soria Province, Castilla y León) (Fig. 1A–B). It represents the first reference to a Triassic tetrapod in Castilla y León, the largest Autonomous Community of Spain, located in the northern half of the Iberian Peninsula. For sampling abbreviations: UPUAM, Unidad de Paleontología, Universidad Autónoma de Madrid, Madrid, Spain.

2. Geological context

The vertebrate remains studied here were found in Fuencaiente de Medinaceli (Medinaceli, Soria Province, Castilla y León; latitude 41° 8' 10" N, longitude 2° 27' 30" W), a locality situated in the northwestern region of the Iberian

Ranges, near the limit with the Central System (Fig. 1). This is an important region due to the limit between the Iberian-type Triassic and Hesperian-type Triassic is identified there (García-Gil, 1991). For this reason, the stratigraphic succession recorded in this area varies from the eastern part (Iberian Triassic) to the West (Hesperian Triassic). The Iberian-type is characterized by the presence of a single carbonate bar in the Muschelkalk Facies, and more specifically corresponding to the upper Muschelkalk Facies or M3 in the Catalanides (Virgili, 1958). This bar is not identified in the Hesperian-type Triassic, being mainly siliciclastic.

The vertical succession of the Triassic in this region is similar to the Germanic-Type Triassic, i.e. composed of a detrital red lower section or Buntsandstein, an intermediate carbonate section or Muschelkalk, and an upper terrigenous-evaporitic one or Keuper. The top of the Buntsandstein Facies corresponds to an unconformity surface, of gentle erosive relief (García-Gil, 1990; 1991) (Fig. 2A). Sedimentation restarted with the Torete variegated Siltstones and Sandstones Formation (Ramos, 1979), and the Cuesta del Castillo Sandstones and Siltstones Formation (García-Gil, 1990; 1991). The latter laterally passes to the upper Muschelkalk Facies in the western area (i.e. to the Tramacastilla Dolostones Formation, and the Royuela Dolostones, Marls and Limestones Formation,); both formations overlapping the above mentioned unconformity surface (García-Gil, 1990). The source area for the siliciclastic sediment was located in a region of high relief, located to the west.

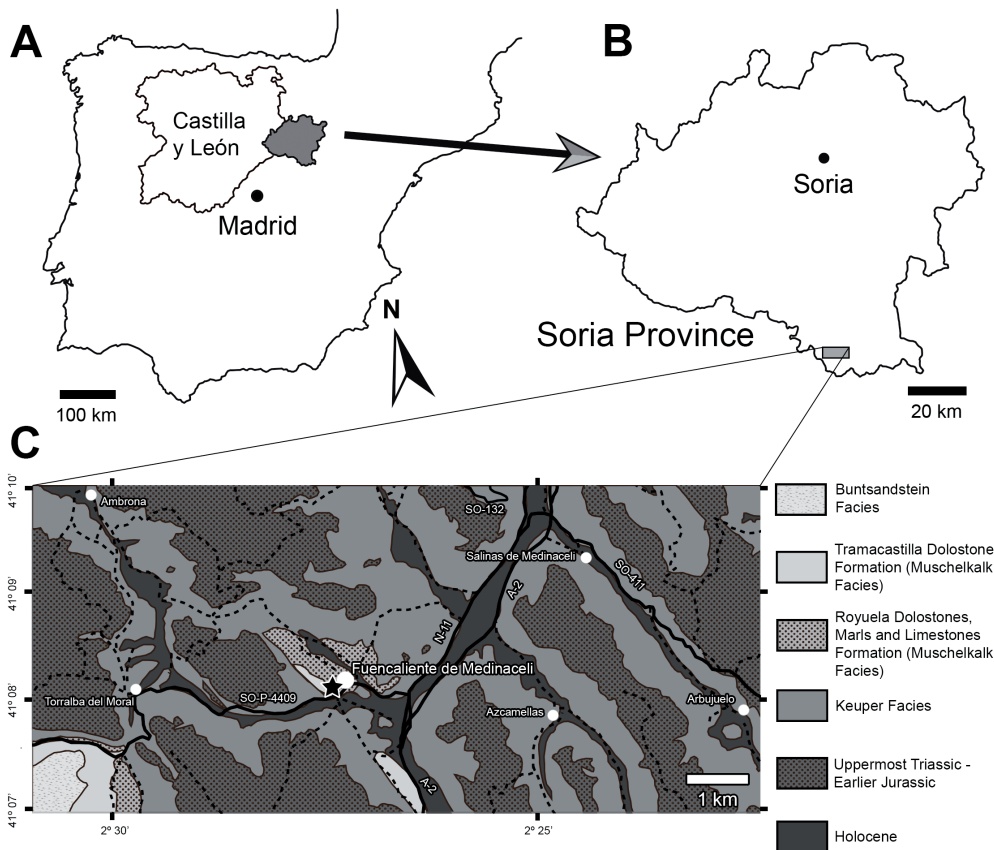


Fig. 1.- Geographical and geological situation of the upper Ladinian outcrop of Fuencaiente de Medinaceli (Soria Province, Spain) where the remains of *Nothosaurus* cf. *giganteus* studied here were found. A, situation of the Soria Province (grey) in Castilla y León and in the Iberian Peninsula. B, situation of Fuencaiente de Medinaceli in the Soria Province. C, geological map of the area of Fuencaiente de Medinaceli. Solid lines in C represent the main roads, and dashed lines indicate secondary unnamed roads. The star indicates the outcrop. Geological map modified from Adell Argiles et al. (1981).

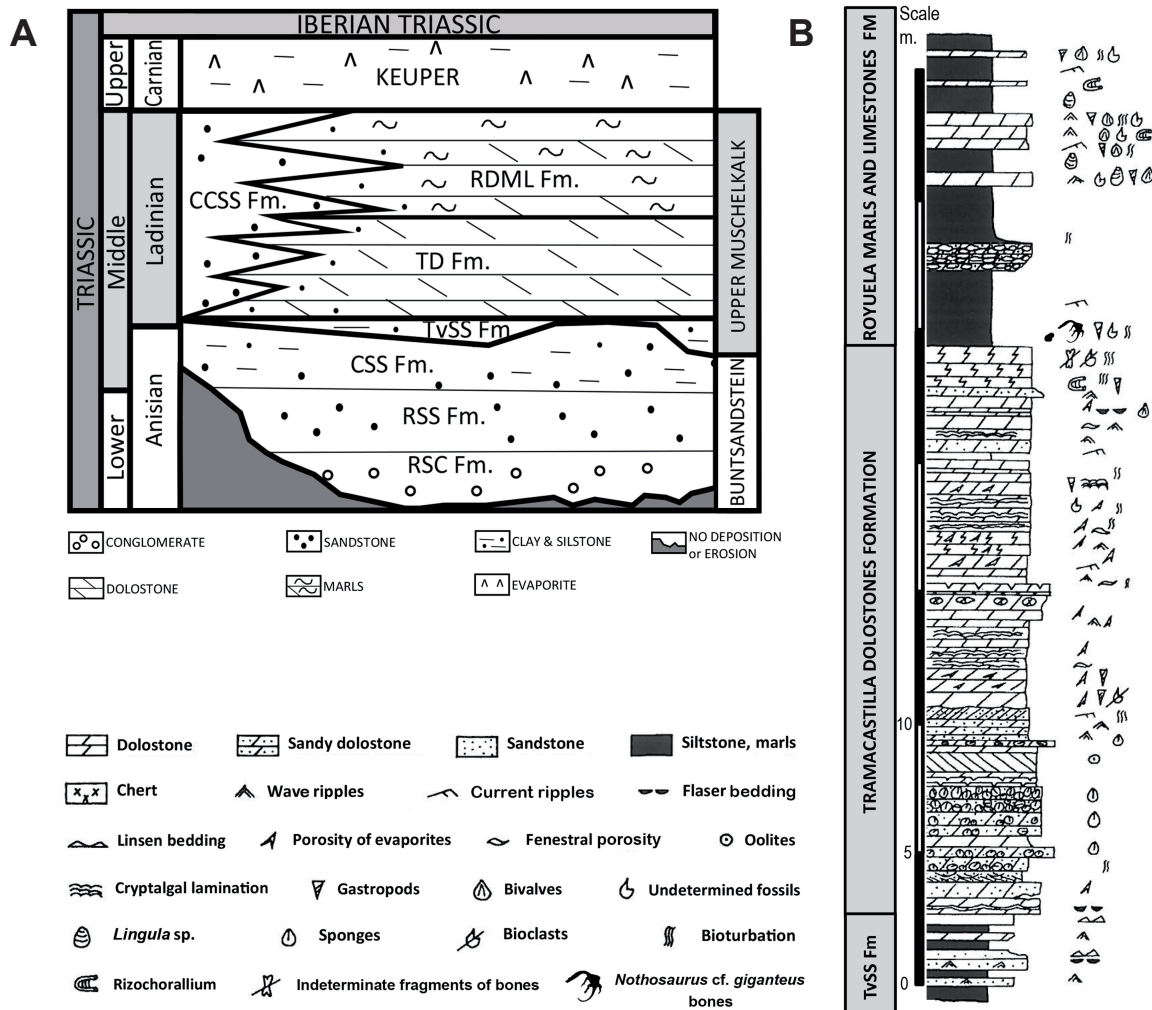


Fig. 2.- Stratigraphic context relative to the upper Ladinian outcrop of Fuencaliente de Medinaceli (Soria Province, Spain) where the remains of *Nothosaurus cf. giganteus* studied here were found. A, chronostratigraphic chart of the Triassic Formations in the NW Iberian Ranges. The formations are: Riba de Santiuste Conglomerates (RSC), Riba de Santiuste Sandstones (RSS), Cercadillo Sandstones and Siltstones (CSS), Torete variegated Sandstones and Siltstones (TvSS), Tramacastilla Dolostones (TD), Royuela Dolostones, Marls and Limestones (RDML), and Cuesta del Castillo Sandstones and Siltstones (CCSS). Based on García-Gil (1990; 1991). B, stratigraphic section of “Fuencaliente de Medina” (sensu García-Gil, 1990) where the position of the outcrop with the *Nothosaurus cf. giganteus* remains is indicated. Modified from García-Gil, 1990.

The vertebrate remains described here were found in the “Fuencaliente de Medina section” (sensu García-Gil, 1990), a geological section located in Fuencaliente de Medinaceli (Fig. 2B). It is situated in the upper Muschelkalk Facies. This section comprises two Formations, the Tramacastilla Dolostones Formation and the Royuela Dolostones, Marls and Limestones Formation (Pérez-Arlucea and Sopena, 1985), recording the northwestern-most sedimentation of the large shallow carbonate ramp from eastern Iberia (Escudero-Mozo et al., 2015). The fossil remains were recovered close to the bottom of the last mentioned Formation, within a marl horizon. These marls are grey, and appear in layers of about 2 meters thickness, with a typical polyhedral disjunction and nodular aspect. The most abundant sedimentary structures within these marls are parallel and ripple laminations, both of current and wavy type. Interbedded layers, less than 1 meter

thick, of micrite dolostones with cryptalgal lamination and desiccation cracks, are also identified. Dolomitic marls and dolostones constitute shallowing upwards sequences, characteristic from sedimentation in a shallow marine carbonate environment, although they also follow by holding is mixed with carbonate terrigenous sedimentation and the fluvial influx in the North-West sector of the region (García-Gil, 1990). The marls correspond to the subtidal, while the dolostones represent the intertidal to supratidal environments.

The paleontological content described so far for these levels is composed mostly of bivalves, relatively abundant brachiopods and some gastropods (see García-Gil, 1990; 1991). Márquez-Aliaga and García-Gil (1991) grouped these fossils in three large associations: *Costatoria-Lyriomyophoria*, Teruel Fauna and *Lingula-Pseudocorbula*. They concluded that, although most of these taxa have a wide chronostratigraphic

range (Middle Triassic), the presence of *Costatoria goldfussi* indicates an upper Ladinian–lower Carnian age. The study of palynological associations, and also the stratigraphic correlation, provide the same age (upper Ladinian–lower Carnian) (García-Gil, 1990; 1991), the boundary between both stages being situated close to the top of the Royuela Dolostones, Marls and Limestones Formation. Therefore, the fossil remains studied here, found at the bottom of this formation, come from the upper Ladinian (Fig 2).

3. Systematic paleontology

Sauropsida Huxley, 1864
 Sauropterygia Owen, 1860
 Eosauropterygia Rieppel, 1994
 Nothosauroida Baur, 1889
 Nothosauria Baur, 1889
 Nothosauridae Baur, 1889
Nothosaurus Münster, 1834
Nothosaurus cf. *giganteus* Münster, 1834
 (Figs. 3–4)

3.1. Material

The vertebrate remains from Fuencaliente de Medinaceli consist of a partial axial skeleton of a single individual (UPUAM 14072), preserved in several small blocks of rock (Figs. 3–4). In addition to indeterminate fragments of bones, several vertebral remains from the cervico–dorsal region are preserved. These blocks were next to each other, forming part of a partial vertebral series that was exposed by erosion. Thus, several of the bones are broken or partially altered. The precise anatomical position of each of them is not known. This finding was the result of geological works performed in this area during the Ph.D. research of one of us (García-Gil, 1990). These remains have been partially prepared for this study. UPUAM 14072a corresponds to a block with two articulated and incomplete vertebrae (Fig. 3), and a small fragment of the neural arch of the contiguous anterior vertebra. UPUAM 14072b is a block with a partial vertebra (Fig. 4A–D), and a thin layer of bone from another centrum. UPUAM 14072c contains a partial vertebra, and the centrum and cast of the anterior vertebral element (Fig. 4E–H). Therefore, there is evidence of, at least, seven vertebrae.

3.2. Description

The vertebrae from Fuencaliente de Medinaceli, especially those in UPUAM 14702a, have a robust construction. Both vertebrae in UPUAM 14702a present the neural arch and the dorsal portion of the centrum (Fig. 3). Due to the preservation, the morphology of the centra is unknown. The neurocentral sutures between the neural arch and the centrum can be recognized in both vertebrae (Fig. 3A). The neural spines are thin and oriented backwards. Although they are broken, the

cast of the vertebrae in the matrix shows that the spines are low (Fig. 3A). The partially conserved second neural spine is weakly inflated apically, as can be observed in cranial and caudal views. The neural canal is filled with sediment and its morphology cannot be recognized. The transverse processes are compact, not very prominent, and tall. They are part of the neurocentral suture. The surface of articulation with the ribs constitutes an angle with the axial plane slightly less than 30°. The ventral region of UPUAM 14702a is medially oriented. The zygosphene can be seen in the cranial side of the anterior vertebra in UPUAM 14072a. It is well developed, with two prominent blades that conform a bipartite structure (Fig. 3B, D). The zygantrum of the anterior vertebra, and the zygosphene of the posterior vertebra, cannot be recognized, due to the articulation of both vertebrae prevents their observation. The caudal side of the second vertebra is broken and eroded. Thus, the zygantrum is lost. The anterior vertebra preserves the left prezygapophysis (Fig. 3A–C). Both prezygapophyses of the posterior one can be observed. The prezygapophyses are thin, pointed and laterally oriented both outwards as upwards. The anterior vertebra also shows most of the left postzygapophysis, but only a portion of the right one is preserved. The postzygapophyses are dome-shaped (Fig. 3A, B, D). The postzygapophysis–prezygapophysis articulation can be observed in the left side of both vertebrae (Fig. 3A). Prezygapophyses and postzygapophyses are situated in the upper part of the neural arch.

The vertebrae in UPUAM 14072b (Fig. 4A–D) and UPUAM 14072c (Fig. 4E–H) are smaller than the two vertebrae that conform UPUAM 14072a. They are broken. Thus, they lack the neural spine, the zygantrum and all the zygapophyses. Although most part of the centra are lost, their morphology can be recognized in ventral view (Fig. 4D, H). The centra of the vertebrae in UPUAM 14072b and UPUAM 14072c are platycoelous. UPUAM 14072b preserves the left blade of the zygosphene, and also the left transverse process (Fig. 4A–C). This transverse process is smaller and less prominent than those in UPUAM 14072a. As in UPUAM 14072a, the ventral region of the articular surface in the transverse process in UPUAM 14072b is medially oriented, conforming an angle of 30° with the axial plane. The neurocentral suture can be seen in the left side of this vertebra, under the transverse process. A thin layer of bone is also present in the matrix, corresponding to the contiguous anterior vertebra. UPUAM 14072c presents the right blade of the zygosphene and the base of the left prezygapophysis (Fig. 4E–G). A partial eroded centrum of the contiguous anterior vertebra is also present in UPUAM 14072c (Fig. 4H).

Due to this material was exposed when found, several elements were lost. Therefore, the available percentage of the originally preserved skeleton is not known. The preserved remains correspond to a minimum number of seven vertebrae. However, due to their preservation, the exact position of them in the vertebral series cannot be determined.

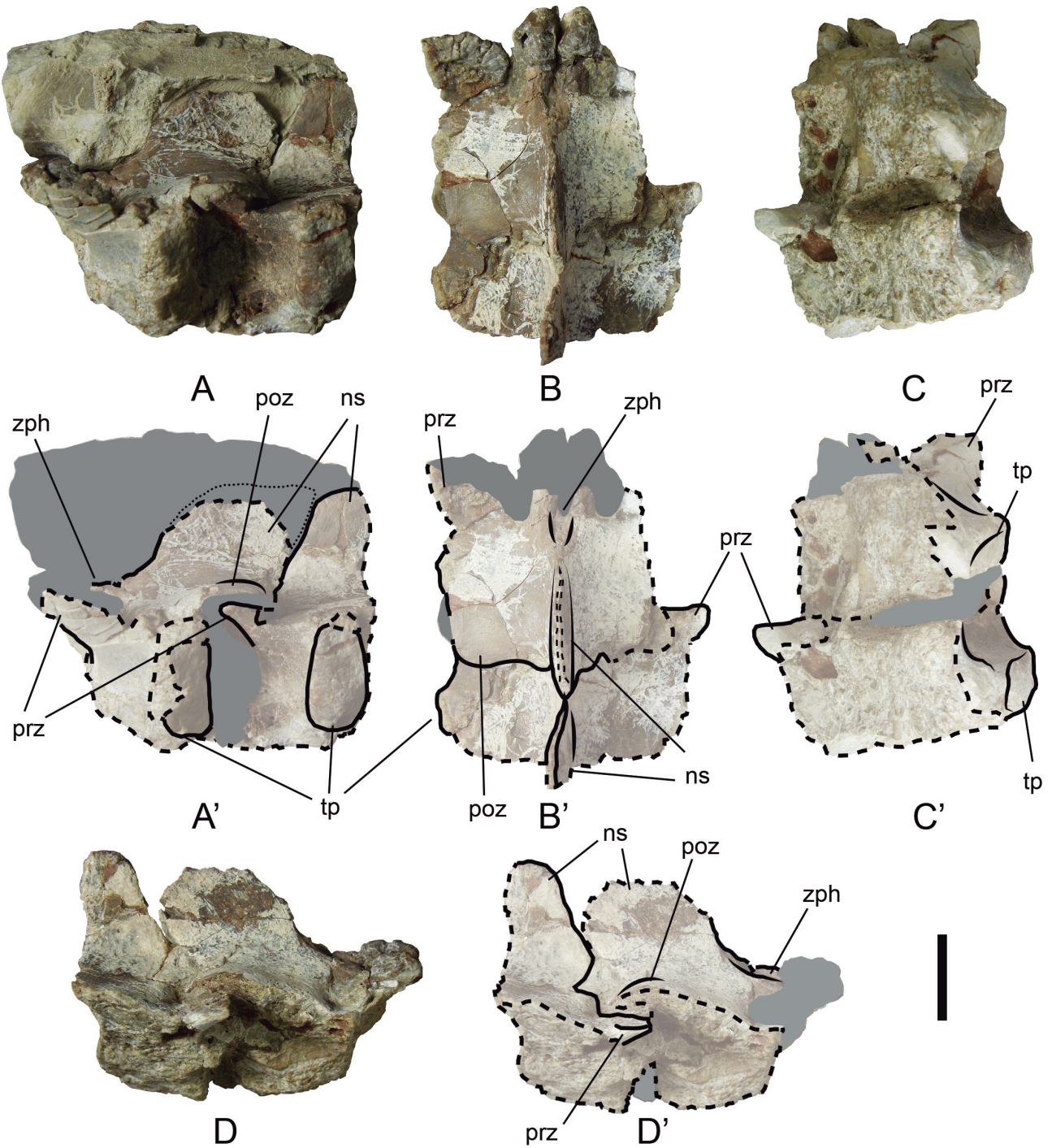


Fig. 3.- UPUAM 14702a, *Nothosaurus cf. giganteus* dorsal vertebrae from the upper Ladinian of Fuencaliente de Medinaceli (Soria Province, Spain), in left lateral (A), dorsal (B), ventral (C) and right lateral (D) views. A'-D', schematic interpretations of the vertebrae, in the same views. Grey areas represent sediment, dashed lines indicate broken surfaces of bone, and the line composed by points shows the silhouette of the neural spine. Anatomical abbreviations: ns, neural spine; poz, postzygapophysis; prz, prezygapophysis; tp, transverse process; zph, zygosphene. Scale bar equals 20 mm.

4. Discussion and conclusions

All the vertebral elements found in the upper Muschelkalk Facies of Fuencaliente de Medinaceli belong to a cervico-dorsal series of a single individual, preserved in several blocks. Some of them show elements in articulation. The members of Sauropterygia presents double-headed cervical ribs contact-

ing with the parapophyses in the cervical centra, and with the diapophyses in the cervical neural arches. However, the dorsal ribs are holocephalous, and contact with the well-developed transverse processes of the dorsal neural arches (Rieppel, 2000). UPUAM 14072b and UPUAM 14072c are slightly smaller than UPUAM 14072a, and their transverse processes are smaller, indicating that they are situated ante-

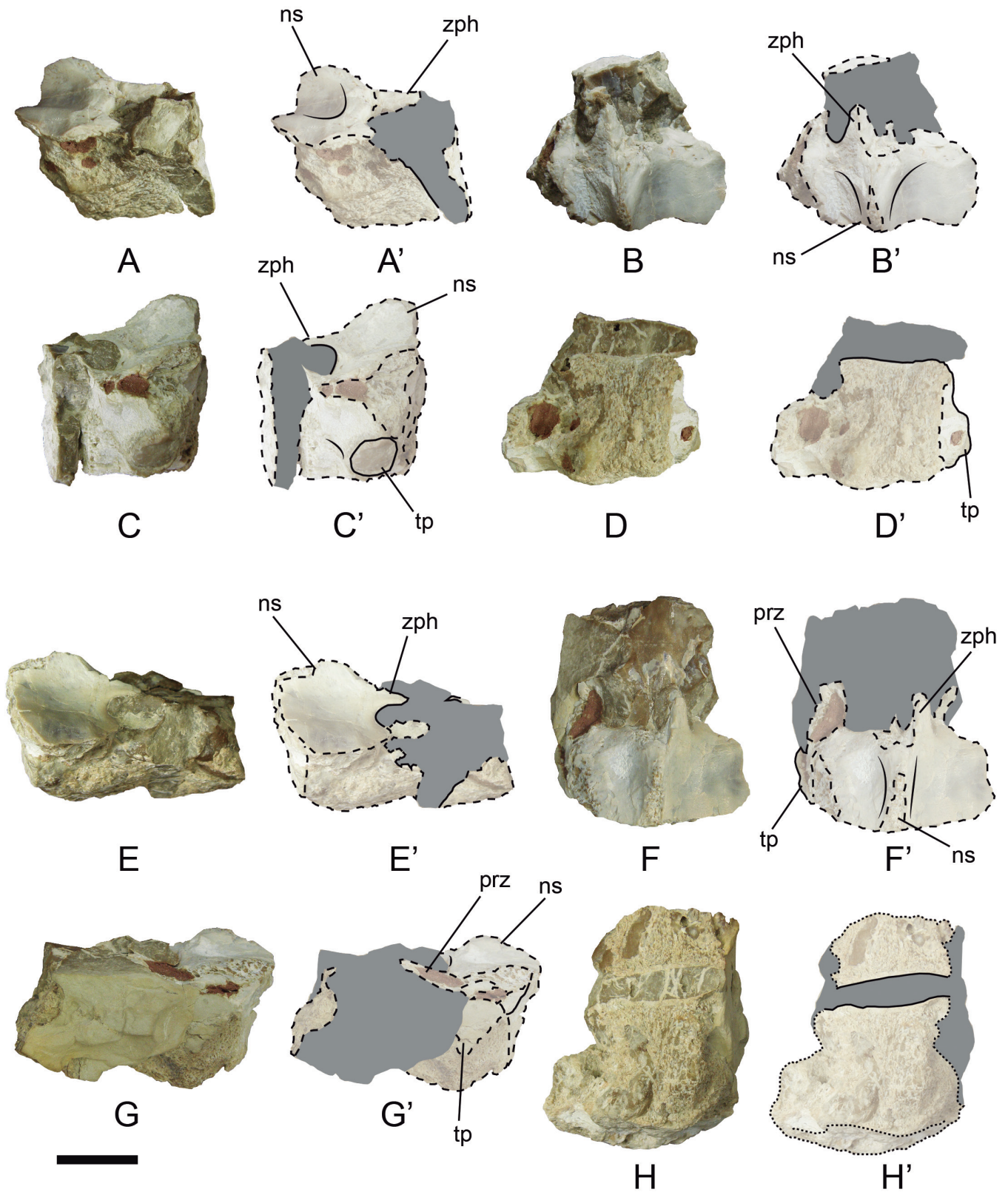


Fig. 4.- Cervico-dorsal vertebrae of *Nothosaurus* cf. *giganteus* from the upper Ladinian of Fuencaliente de Medinaceli (Soria Province, Spain). A-D, UPUAM 14702b vertebral remains in right lateral (A), dorsal (B), left lateral (C) and ventral (D) views. A'-D', schematic interpretations, in the same views. E-H, UPUAM 14702c vertebral remains in right lateral (E), dorsal (F), left lateral (G) and ventral (H) views. E'-H', their schematic interpretations, in the same views. Grey areas represent sediment, and dashed lines indicate broken surfaces of bone. Anatomical abbreviations: ns, neural spine; prz, prezygapophysis; tp, transverse process; zph, zygosphenes. Scale bar equals 20 mm.

riorly in the axial series. The preservation of the vertebrae from Fuencaliente de Medinaceli does not allow to know if the centra had parapophyses, a structure present in the cervical vertebrae but not in the dorsals. However, relative small transverse processes, which increase in size from the anterior to the posterior vertebrae position, are identified in the neural arches. Since well-developed transverse processes are present in the dorsal vertebrae of Sauropterygia, the described transverse processes allow to recognize the vertebrae from Fuencaliente de Medinaceli as situated at the posterior region of the cervical series or representing the anterior dorsals.

Several diagnostic characters allow the systematic determination of the vertebral remains studied here. The presence of a zygosphenes–zygantrum articulation in addition to the prezygapophysis and postzygapophysis is an exclusive character for the members of Eosauroptrygia (Rieppel, 1994). The platycoelous centra recognized in UPUAM 14072 allow to exclude its assignment to the European pachypleurosaur, which present amphicoelous centra and pachyostotic zygapophyses (Rieppel, 2000). Some eosauroptrygian taxa of problematic phylogenetic position can also be excluded. Several small forms from China, like *Keichousaurus hui* Young 1958, *Dianopachysaurus dingi* Liu, Rieppel, Jiang, Aitchinson, Motani, Zhang, Zhou and Sun 2011, and *Qianxisaurus chajiangensis* Cheng, Wu, Sato and Shan 2012, present zygapophyseal pachyostosis, like the European pachypleurosaur (Lin and Rieppel, 1998; Liu et al., 2011; Cheng et al., 2012). This character is absent in the vertebrae from Fuencaliente de Medinaceli. *Keichousaurus hui* and *Q. chajiangensis* also presents amphicoelous centra, as well as the Chinese taxon *Wumengosaurus delicatmandibularis* Jiang, Rieppel, Motani, Hao, Sun, Schmitz and Sun 2008 (Jiang et al., 2008). *Diandongosaurus acutidentatus* Shang, Wu and Li 2011, from China, presents rhomboidal neural spines and elongated centra, this last character also being shared with the Chinese eosauroptrygians *Hanosaurus hupehensis* Young 1972, and *Majiashanosaurus discocoracoidis* Jiang, Motani, Tintori, Rieppel, Chen, Huang, Zhang, Sun and Ji 2014 (Rieppel 1998b; Shang et al., 2011; Sato et al., 2014; Jiang et al., 2014), but not with UPUAM 14072. In addition, *M. discocoracoidis* presents laterally constrained centra in ventral view, not consistent with the Fuencaliente de Medinaceli vertebrae. The poor known taxa from China *Chinchenia sungi* Young 1965, *Kwangisaurus orientalis* Young 1959, and *Sanchiaosaurus dengi* Young 1965, have prominent transverse processes and, again, amphicoelous centra (Rieppel, 1999), unlike UPUAM 14072. The vertebrae from Fuencaliente de Medinaceli are not compatible with the members of Pistosauroidea, which present well-developed transverse processes in the neural arches (Sues, 1987; Sander et al., 1997; Rieppel, 2000; Ma et al., 2015). The vertebrae of *Corosaurus alcovensis* Case 1936, from the Lower Triassic of Wyoming (USA), and of the genus *Cymatosaurus* Fritsch 1894, from the Lower–Middle Triassic of Germany, do not present the same morphology that those from Fuencaliente de Medi-

neli. These two eosauroptrygian taxa, previously classified as pistosauroids, have recently been excluded from this clade, having an uncertain systematic position (Ma et al., 2015; Liu et al., 2015). The vertebrae of *C. alcovensis* are amphicoelous, with long transverse processes, not consistent with UPUAM 14072 (Storrs, 1991; Rieppel, 1998c). The only probable postcranial material assigned to the genus *Cymatosaurus* also shows amphicoelous centra and prominent transverse process (Sander et al., 2014). The nothosauroid *Simosaurus gaillardoti* Meyer 1842 (i.e. the so far only known member of Simosauridae), from the Middle–Upper Triassic of Europe, Israel and Arabia, presents infraprezygapophyses and infrapostzygapophyses, additional articular elements in the neural arches that are exclusive for this taxon (Rieppel, 2000). UPUAM 14072 lacks infrazygapophyses, so these remains do not belong to a simosaurian nothosauroid. The neural arches of the members of Nothosauria are characterized by a well-developed bipartite zygosphenes (Rieppel and Wild, 1996; Rieppel et al., 1997). The presence of a prominent bipartite zygosphenes in the vertebrae from Fuencaliente de Medinaceli confirms that these remains belong to this clade. The nothosaur genus *Lariosaurus* (including its junior synonym *Ceresiosaurus* sensu Rieppel 1998a), presents, like the pachypleurosaur, zygapophyseal pachyostosis, and very low neural spines (Rieppel, 1998a; 2000). As indicated, the vertebrae from Fuencaliente de Medinaceli lack these characters. The non-pachyostotic centra and neural arches in UPUAM 14072 are shared with the genus *Nothosaurus* within the clade Nothosauria, as well as the presence of platycoelous centra (Bickelmann and Sander, 2008).

Nothosaurus is a sauropterygian taxon known by several species, whose fossils have been found in the Middle and lower Upper Triassic of Europe, China, Israel and Tunisia (Rieppel and Wild, 1996; Rieppel et al., 1997; 1999; Rieppel, 2000; 2001; Albers and Rieppel, 2003; Li and Rieppel, 2004; Albers, 2005; Jiang et al., 2006; Shang, 2006; Bickelmann and Sander, 2008; Klein and Albers, 2009; Ji et al., 2014; Liu et al., 2014; Klein et al., 2015). Within this genus, the species *Nothosaurus giganteus* Münster 1834, presents autapomorphic neural arches according to Rieppel and Wild (1996) and Rieppel et al. (1999). In contrast with other *Nothosaurus* species known by postcranial elements, the neural arches in *N. giganteus* have low neural spines (Peyer, 1939; Rieppel and Wild, 1996). The height of the neural spines is a character that experiences interspecific variability within the genus *Nothosaurus*. In this sense, low neural spines are considered as a plesiomorphic character for this genus, whereas species with high neural spines are considered as more derived for this character (Rieppel and Wild, 1996). The neural arches in *N. giganteus* are massive, and present dome-shaped postzygapophyses, whereas the prezygapophyses are not pachyostotic. The transverse processes are high but not prominent, reaching the pedicels of the neural arch and the neurocentral suture. Therefore, the transverse processes do not project beyond the zygapophyses. The vertebrae recovered from Fuen-

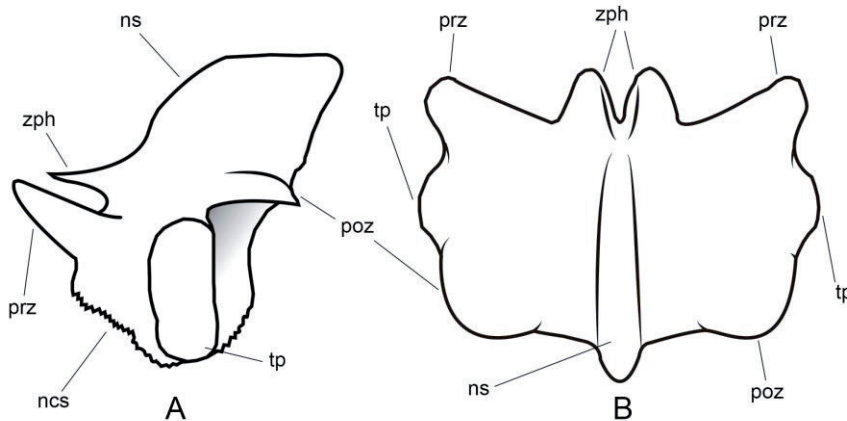


Fig. 5.- Hypothetical reconstruction of a *Nothosaurus* cf. *giganteus* complete and not-deformed neural arch of a dorsal vertebrae, from the upper Ladinian of Fuencaliente de Medinaceli (Soria Province, Spain). A, left lateral view. B, dorsal view. Anatomical abbreviations: ncs, neurocentral suture; ns, neural spine; poz, postzygapophysis; prz, prezygapophysis; tp, transverse process; zph, zygosphenes.

caliente de Medinaceli share all these exclusive characters (Fig. 5). *Nothosaurus giganteus* is a large nothosaur found in the upper Muschelkalk and the lower Keuper (in Anisian, Ladinian and Carnian levels, i.e. Middle–Upper Triassic) of Central Europe (mainly Germany), the Italian Alps and Israel (Dalla Vecchia, 1994; Rieppel and Wild, 1996; Rieppel *et al.*, 1999; Rieppel and Dalla Vecchia, 2001; Diedrich, 2013). Although several species of *Nothosaurus* have been described, most of them are based mostly on cranial remains. Therefore, in spite of the remains of Fuencaliente de Medinaceli share a combination of vertebral characters so far only known in *N. giganteus*, we classify them as *Nothosaurus* cf. *giganteus* considering that the vertebrae of several of the described *Nothosaurus* species are poorly known or even unknown (e.g. *Nothosaurus winterswijkensis* Albers and Rieppel 2003, *Nothosaurus rostellatus* Shang 2006, *Nothosaurus yangjua-nensis* Jiang, Masich, Hao, Sun and Sun 2006, *Nothosaurus winkelhorsti* Klein and Albers 2009).

Remains attributed to the genus *Nothosaurus* have been recovered from several localities of Spain, including the Muschelkalk of Royuela, Teruel (Kuhn-Schnyder, 1966); Siles, Jaén (Niemeyer, 2002); and Puente Génave–Villarodrigo, Jaén (Reolid *et al.*, 2013). In addition, a new species of *Nothosaurus* was described, based on cranial material recovered from the Muschelkalk of Alcover (Tarragona Province), *Nothosaurus cymatosauroides* (Sanz, 1980; 1983), although the validity of the species was subsequently discussed (Rieppel, 2000). Although vertebral remains have been assigned to *N. cymatosauroides*, only their casts have been recognized, being poorly informative. Furthermore, some remains of questionable attribution to *Nothosaurus* have been recovered from the Spanish record. In this sense, a tooth and a partial dentary found at the Muschelkalk of the area of Bienservida–Villarodrigo (Albacete–Jaén) was indicated as compatible with the genus *Nothosaurus* (Sanz, 1991). Elements putatively assigned to cf. *Nothosaurus* were found in the Muschelkalk of Canales de Molina, Guadalajara (Alfárez *et al.*, 1983), but they have not been studied yet, and that identification was not justified. In addition, Bauza Rullán (1955) described a vertebra assigned to *Nothosaurus* from the Muschelkalk of Sóller (Mallorca). This classification was posteriorly con-

sidered as doubtful (Sanz, 1980; 1983). Based on Rubio *et al.* (2003), Knoll *et al.* (2004) suggested that the nothosaur vertebrae from several outcrops of the Keuper of Manzanera (Teruel) probably belong to *Nothosaurus*. However, this material presents infrazygapophyses that allows to refute this assignment, and to assign it to *Simosaurus* (Miguel Chaves *et al.*, 2015). The nothosaur vertebrae found at Royuela, Siles and Puente Génave–Villarodrigo, the sites where confirmed *Nothosaurus* vertebral elements have been recovered (Kuhn-Schnyder, 1966; Niemeyer, 2002; Reolid *et al.*, 2013), present high neural spines and relatively prominent and dorsoventrally short transverse processes. This morphology is not compatible with those of the vertebrae of *N. giganteus* nor with those from Fuencaliente de Medinaceli. Non-vertebral remains of *Nothosaurus* from the Iberian Peninsula cannot be assigned to *N. giganteus* either, due to they are not compatible with those of that taxon (e.g., the skull of *N. cymatosauroides*), or due to they are not informative enough at species level (e.g., appendicular elements from Siles and Puente Génave–Villarodrigo). Therefore, no element assigned to *N. giganteus* was hitherto found in the Spanish record.

The remains from Fuencaliente de Medinaceli represent the first potential finding of *N. giganteus* in the Iberian Peninsula. Its identification in Spain would be consistent with the wide geographical distribution of *N. giganteus* in the Western Tethys. The morphological incompatibility of the vertebrae from Fuencaliente de Medinaceli with other Spanish vertebral elements indisputably attributed to *Nothosaurus* (i.e., those from Royuela, Siles and Puente Génave–Villarodrigo), implies the presence of, at least, two different species of the sauropterygian *Nothosaurus* in the Middle Triassic of the Iberian Peninsula.

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