

## Dinosaur Bones from the Maestrazgo UNESCO Global Geopark (Teruel, Spain)

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### Abstract

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The current territory of the Maestrazgo UNESCO Global Geopark has provided fossils that pioneered dinosaur research in Spain. The first Spanish dinosaur, *Aragosaurus ischiaticus* (published in 1987), five other new genera of dinosaurs and six species were described from fossils found at Geopark sites. These are the sauropod *Galveosaurus herreroi* (*Galvesaurus herreroi*) in 2005, the iguanodontians *Delaparentia turolensis* in 2011 and *Iguanodon galvensis* in 2015, the basal ornithomimid *Gideonmantellia amosanjuananae* in 2012, and the theropod *Camarillasaurus cirugedae* in 2014. This makes it one of the most relevant areas in Spain for dinosaur research and has given rise to numerous scientific publications on paleontology and the stratigraphy of the area. It has also led to the construction of several facilities to promote education and geotourism.

**Keywords:** Iberian Range, Jurassic, Cretaceous, Education, Geotourism, Geoconservation, Aragon.

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## Introduction

The Maestrazgo UNESCO Global Geopark has its roots in the Maestrazgo Cultural Park which is made up of 43 municipalities (Fig. 1), located in the province of Teruel (Autonomous Community of Aragon, Spain). It has an area of 2,622 km<sup>2</sup> and stands out for its sparse population (some 5.5 inhabitants per square kilometer on average) and its rich and varied geological and paleontological heritage due to a very complete sedimentary record of the last 200 million years of Earth his-

tory. This territory was ground-breaking for both geoparks and dinosaurs: in 2000 it was one of the four territories that founded the European Geoparks Network (Zouros & McKeever 2009), and the first new dinosaur in Spain was described in this territory. In this contribution we present the most relevant dinosaur milestones related to the Geopark, while details about it can be found in Simón *et al.* (2011), Alcalá (2017, 2018), Alcalá *et al.* (2015) and Mampel & Hernández (2016), among others.

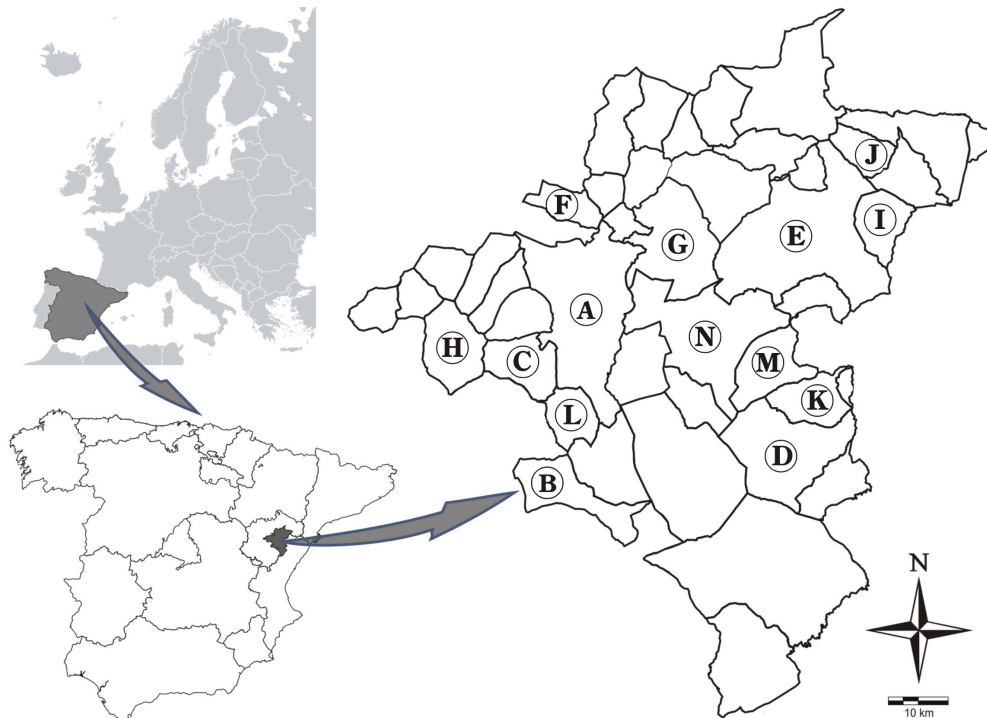


Figure 1. Locality map of Maestrazgo UNESCO Global Geopark. Code for municipalities mentioned in the text: A) Aliaga; B) Allepuz; C) Camarillas; D) Cantavieja; E) Castellote; F) Castel de Cabra; G) Ejulve; H) Galve; I) Las Parras de Castellote; J) Mas de las Matas; K) Mirambel; L) Miravete de la Sierra; M) Tronchón; N) Villarluengo.

The Geopark contains many extensive outcrops of continental facies ranging in age from Late Jurassic to Early Cretaceous. This, together with a noticeable relief and sparse vegetation, has led to the discovery of dinosaur remains in several municipalities: Aliaga, Allepuz, Camarillas, Cantavieja, Castellote, Castel de Cabra, Ejulve, Galve, Las Parras de Castellote, Mas de las Matas,

Mirambel, Miravete de la Sierra, Tronchón and Villarluengo (Lapparent *et al.* 1969; Sanz *et al.* 1987; Canudo *et al.* 1996, 2005; Ruiz-Omeñaca *et al.* 2004; Infante *et al.* 2005; Luque *et al.* 2006-2007; Sánchez-Hernández *et al.* 2007; Alcalá *et al.* 2009; Cobos 2011; Royo-Torres *et al.* 2014; Gasca *et al.* 2015; Rey *et al.* 2018, etc.). The ever-increasing scientific findings associated with

these discoveries illustrate the clear potential of this area for dinosaur study (Fig. 2). This contribution focuses on the most relevant fossils and their use (for their scientific, historical, educational or touristic value) in the promotion of geotourism in the Geopark. The chronostratigraphy of the sites with dinosaurs ranges from Kimmeridgian to Maastrichtian, with particular abundance from Tithonian to Barremian, spanning a number of geological formations that vary regionally (Díaz-Molina & Yébenes 1987; Ruiz-Omeñaca *et al.* 2004; Sánchez-Hernández *et al.* 2007; Royo-Torres *et al.* 2014; Aurell *et al.* 2019; Campos-Soto *et al.* 2019).

### The First Spanish Dinosaur

Although the first references of dinosaurs in Spain date back to the 19th century (Vilanova 1872, 1873), it was not until the end of the last century that the first new dinosaur taxon was described, and it came from a municipality in the Maestrazgo Geopark. In 1934, the construction of the old road to Galve led to the discovery of Las Zabacheras, the type locality of *Aragosaurus* (Fernández-Galiano 1958, 1960; Sanz *et al.* 1987; Royo-Torres *et al.* 2014). In 1958 a resident of the village, Mr

José María Herrero (1925–2012), reported his collection of dinosaur bones from Galve. At the same time, Albert F. de Lapparent (1905–1975), from the Institut Catholique de Paris, was the first paleontologist to suggest that some of the recovered fossils belonged to a new sauropod taxon related to camarasaur (Lapparent 1960). Subsequently, in 1982 a team of paleontologists made up of researchers from the Universidad Autónoma de Madrid and the Instituto de Paleontología de Sabadell (today the Institut Català de Paleontologia) excavated the type locality and the resulting research enabled the first dinosaur from Spain to be named: *Aragosaurus ischiaticus* (Sanz *et al.* 1987). The name refers to the Autonomous Community where Galve is located (Aragon) and to the large pubic peduncle of the ischium (Fig. 3). Despite being the first Spanish dinosaur, it had no impact on subsequent studies of sauropods. In 2014, work was carried out to complete the skeleton record (developing a new excavation at the type site) and update its dating and classification in light of the great progress since made in the stratigraphy of the area and in sauropod systematics. This medium-sized sauropod was thus adjudged to correspond to a basal macronarian that did not



Figure 2. Dinosaur finds in the Geopark have been continuously produced for decades: left, recovery of ornithomimid vertebrae, and right, the unearthing of ornithomimid ribs, in an excavation carried out by the Dinópolis Foundation in Galve on June-July, 2020.

belong to the Titanosauriformes clade (D’Emic 2012; Royo-Torres *et al.* 2014). Likewise, new chronostratigraphic data place the type locality of *Aragosaurus* in the Villar del Arzobispo Formation, which includes the Jurassic–Cretaceous transition; the site is likely to be Berriasian in age, a little less than 145 million years old (Santos *et al.* 2018; Aurell *et al.* 2019; Delvene *et al.* 2019; Campos-Soto *et al.* 2019).



Figure 3. The most peculiar bone of *Aragosaurus ichiaticus*, the ischium.

To combine research results with scientific dissemination, which is one of the main goals of the Dinópolis paleontological network from the Aragon Government (Alcalá 2018), the new *Aragosaurus* fossils were temporarily put on public display, immediately after their publication, in a special display case in the Dinosaurs Hall of Dinópolis.

From the Late Jurassic of Galve (Kimmeridg-

ian–early Tithonian) the remains of an incomplete individual of another new sauropod were defined with the name of *Galveosaurus herreroi* (Sánchez-Hernández 2005; *Galveosaurus herreroi* according to Barco *et al.* 2005). Its most recent cladistic analyses indicate that it is a brachiosaurid titanosauriform (Pérez-Pueyo *et al.* 2019).

#### **An *Iguanodon* Living and Breeding Area**

The *Iguanodon* found in Galve shares a story similar to that of *Aragosaurus*, but in this case from the Lower Cretaceous Camarillas Formation of the La Maca site. The first remains of this genus were also recognized by Lapparent and those same fossils were later described as belonging to a new genus and species, *Delapparentia turolensis*, by Ruiz-Omeñaca (2011). However, a detailed study of the intraspecific variability of *Iguanodon* found that all the characters regarded as diagnostic for this taxon fall within the range of variation found in *Iguanodon bernissartensis* (Verdú *et al.* 2017), so they consider the holotype of *Delapparentia* as belonging to an indeterminate species of *Iguanodon*. Besides, new fossils of another iguanodontian from Galve have been described as a new species, *Iguanodon galvensis* (characterized by: a prominent tuberosity on the articular surface of the iliac peduncle of the ischium; moderately compressed middle-to posterior dorsal vertebral centra without a ventral keel; and a rugose and inflated ridge on the lateral side of the femur shaft near the lateral condyle; Verdú *et al.* 2015, 2018). This new material unveiled a peculiar feature: the discovery of individuals at very different stages of development: embryos, perinates, juveniles and adults. Indeed, the paleontological survey carried out by the Foundation Dinópolis team in a clay quarry starting in 2008 (Verdú *et al.* 2015; Alcalá *et al.* 2016) led to the discovery of a group of thirteen specimens of *Iguanodon* babies (Fig. 4). Histological and osteological features indicate that they are early nestlings in their first year of life; they probably belong to the same breeding season and could even be part of the same clutch. Their association with embryonic specimens reveals that

this nestling-group remained close to the nest for a time, suggesting some kind of “nursery” behavior, and an adult might have provided some kind of parental care (Verdú *et al.* 2015).

Other iguanodontian remains found in the Aliaga Geological Park (Las Dehesillas site) are also attributed to *Iguanodon galvensis*. They consist of a partially articulated specimen of a 9–10-m-long ornithopod, of advanced age, found in the lower Barremian outcrops of the Camarillas Formation. The material comprises a cervical vertebra and ten dorsal vertebrae, several ribs, and some ossified tendons. The phylogenetic analysis indicates that it is closely related with the contemporary and sympatric species *Iguanodon galvensis* rather than with the type species of the genus, *Iguanodon bernissartensis* (Verdú *et al.* 2021). For this reason, it was assigned to *Iguanodon* cf. *galvensis*.

Iguanodontian fossils are abundant in many outcrops of the Lower Cretaceous of the Geopark, for example: in Miravete (upper Hauterivian–lower Barremian alluvial and fluvial facies in the El Castellar Formation, Luque *et al.* 2006–2007), Castellote (Ladruñán) and Tronchón (lower Barremi-

an-basal upper Barremian, Mirambel Formation, Gasca *et al.* 2015). Their range may have reached the Albian (Escucha Formation) where iguanodontians probably related to *Proa valdearinnensis* were documented in Castel de Cabra (Rey *et al.* 2018).

#### Other Remarkable Dinosaurs in the Geopark

The species *Gideonmantellia amosanjuanae* comes from the Early Cretaceous of Galve (Fig. 5), a small basal ornithopod described from the partial skeleton of a juvenile individual approximately 1 m long (Ruiz-Omeñaca *et al.* 2012).

Although theropod dinosaur remains are generally scarce, the discovery of several associated bones in the Barremian of Camarillas led to the description of a new genus and species of theropod, *Camarillasaurus cirugedae*, by Sánchez-Hernández & Benton (2014). These authors initially classified it as a ceratosaur placed near the base of the clade, but it was recently reinterpreted as belonging to a megalosauroid tentatively related to spinosaurids (Rauhut *et al.* 2019; Malafaia *et al.* 2020).

The continental Early Cretaceous of Allepuz,



Figure 4. Skeleton of an *Iguanodon* perinate from the Galve “nursery”.



Figure 5. Partial skeleton of *Gideonmantellia* from the municipal exhibition in Galve.

Ejulve, Mirambel and Villarluengo (where a vertebra from the Barremian is similar to the caudal ones of the sauropod *Tastavinsaurus*), among other localities, has provided isolated dinosaur remains. Some have been known for decades while others have been found recently. This confirms the potential of the Geopark outcrops to provide new dinosaur discoveries.

This summary of the Geopark dinosaur record should be completed with a fossil found in the Maastrichtian sediments of Cirugeda (Aliaga). It consists of an isolated fragment of a dorsal neural arch. It was attributed to a titanosaur sauropod (Canudo *et al.* 2005) of similar size and characteristics to *Lirainosaurus*. This represents the only direct dinosaur remains dated as Late Cretaceous documented to date in the province

of Teruel.

### Facilities Available to Visitors

The long recorded paleontological tradition in Galve (where, in addition to dinosaurs, new types of invertebrates, amphibians, mammals, turtles, and crocodylians have been found) was awarded the status of a “satellite” Dinópolis center (a public network of paleontological facilities) in 2003 (Fig. 6). Some original fossils of *Aragosaurus* and *Iguanodon* are exhibited there, as well as replicas of fossils found in the municipality and on similar sites from the Isle of Wight (from the Dinosaur Isle Museum in Sandown, UK). A life-sized reconstruction of four *Aragosaurus* dominates the exhibition area, which includes a small paleontological laboratory and explanations about the laborato-



Figure 6. Member of the staff of the Tumbler Ridge UNESCO Global Geopark in front of the Dinópolis satellite center in Galve.



Figure 7. "Cretaceous Park" in Galve.

ry techniques used to prepare dinosaur fossils before they are studied.

Fossils of *Aragosaurus* are also displayed in Galve, in a local exhibition under municipal management (consisting of dinosaur bones from a private collection and the Provincial Museum of Teruel). In addition, another type of material is also on display: holotypes of the sauropod *Galveosaurus* and the ornithomimid *Gideonmantellia*. Finally, since 1993 the vicinity of the town features some open air, life-sized, dinosaur reconstructions (Fig. 7).

The town of Castellote is another destination of interest to explore the dinosaurs of the Geopark with its Dinópolis facility which opened in 2006. Although its main focus is on paleobotany, it also refers to the dinosaurs that were found there (Lapparent *et al.* 1969), and later deposited in the National Museum of Natural History in Paris. Among them were *Iguanodon* remains. The in-

stallation offers different interpretations of their anatomy (Fig. 8). These range from the time of Gideon Mantell, reconstructed with a few bones, to the reconstruction under Richard Owen's direction for the Great Exhibition of London in 1851, and finally to the current consensus based on numerous complete skeletons and tracks.

In terms of paleontology dissemination, the Dinópolis facilities are the most visited and most important elements of the Geopark, and also of the province. This is due to the importance given to the project by the Government of Aragon. In the provincial headquarters in the city of Teruel, one can enjoy the exhibition of an outstanding fossil of the Geopark: the original partial skeleton of *Iguanodon* found in Aliaga (Fig. 9).

The local paleogeographic changes recorded from the marine Jurassic, its continental transition to the Cretaceous, the marine Aptian and its passage

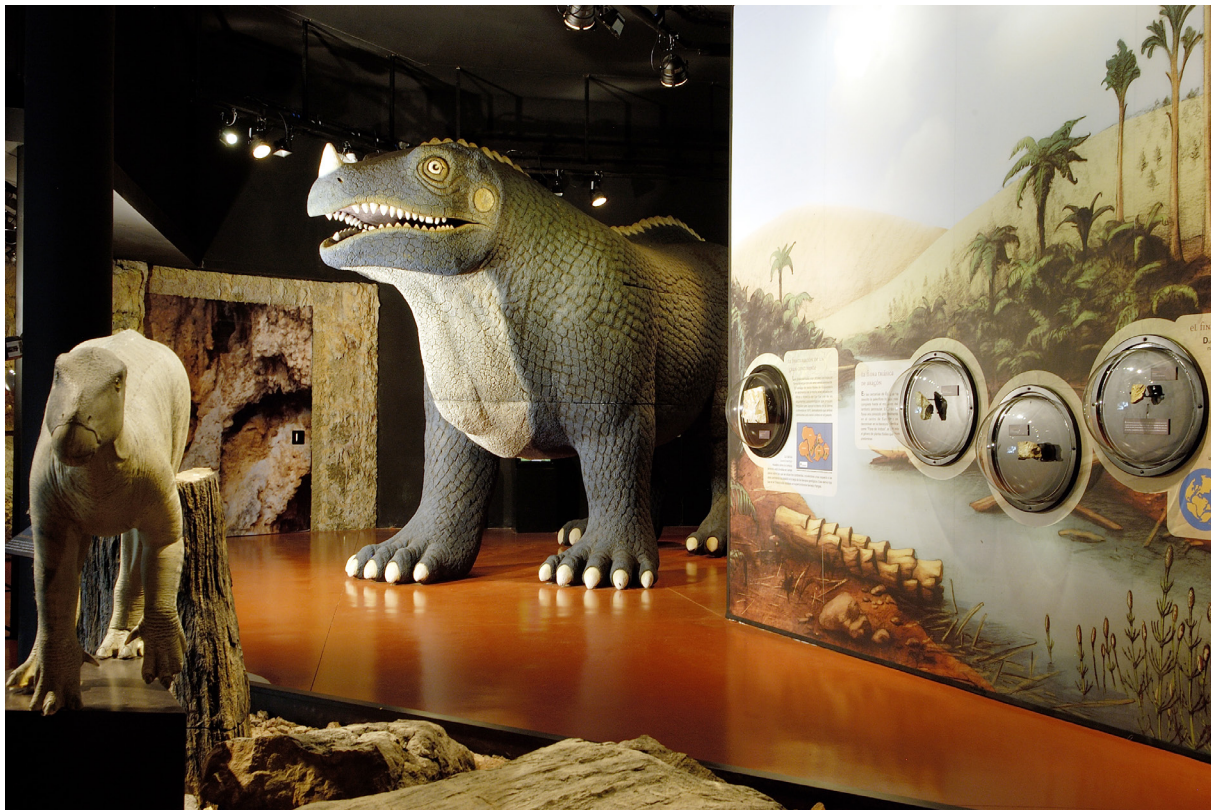


Figure 8. *Iguanodon* exhibition area in the Dinópolis satellite of Castellote.





Figure 9. *Iguanodon* from Aliaga in Dinópolis-Teruel headquarters.



Figure 10. *Iguanodon* area in the Aliaga Geological Park Visitor Center.

to the continental Albian are represented in the exhibition “Water, Time and Earth” of Mas de las Matas, a town very close to Castellote. These four episodes are illustrated with original fossils from the area and with various audiovisual resources.

There are two further Geopark visitor centers: the Aliaga Geological Park Visitor Center, which presents a replica of *Iguanodon* bones as they were found in the site (Fig. 10), and the Maestrazgo Cultural Park Visitors’ Center in Ejulve, which mentions the details of the dinosaur remains in the Geopark.

### Geoconservation

Concerning the conservation of dinosaur bones, the moveable nature of this public heritage means that its effective protection is not carried out *in situ* but rather in institutions such as museums. However, there are legal provisions that guide the preventive conservation of paleontological sites so that the fossils they contain are not damaged by public works or removed by people with private interests. Dinosaur bone sites are covered by a range of legal regulations. As they are included in the territory of a UNESCO Global Geopark, they form part of a protected area following Spanish Law 42/2007, of December 13, on Natural Heritage and Biodiversity. Likewise, as paleontological sites, the activities that can be carried out in them are regulated by the Aragonese Law 3/1999, of March 10, of the Aragonese Cultural Heritage, in which Title III specifically treats paleontological and archeological heritage. In this regard, there is an organization of the Spanish Civil Guard, SEPRONA (Servicio de Protección de la Naturaleza, Nature Protection Service) that monitors the main paleontological sites; to better achieve their objectives, training sessions for SEPRONA officers are given by the director of the Dinópolis Foundation, Ph.D. in paleontology. Furthermore, the Las Dehesillas site is included in the catalog of LIG (Lugares de Interés Geológico, Sites of Geological Interest of Aragon) as it is part of the Aliaga Geological Park (LIG number 85 in

the Areas of Geological Interest category). Additionally, five dinosaur bone sites are in the list of outstanding geosites of the Geopark: Ladruñán (geosite 29), La Maca-Galve (geosite 31), Ejulve (geosite 33), Las Dehesillas-Aliaga (geosite 40) and Las Zabacheras-Galve (geosite 41). It should be highlighted that conferences, school activities, guided visits, training courses, etc., are scheduled in the Geopark to develop societal knowledge and commitment among the residents concerning the importance of the conservation of their local paleontological resources.

### Conclusion

The territory of the Maestrazgo UNESCO Global Geopark contains a great wealth of sites that have yielded remains of dinosaurs, especially from the Late Jurassic and Early Cretaceous. This allows paleontologists to decipher their characteristics and their evolution in the south-western European context. So far, six new genera and seven species have been documented and defined (including the first dinosaur from Spain), comprising sauropods, ornithopods and theropods. All this confers a unique value to the body of geological and paleontological research developed in the Maestrazgo Geopark, which is now being leveraged to promote education and geotourism through visitor centers and Dinópolis satellite facilities.

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### Conflict of Interest

The authors declare that they have no conflicts of interest.

### References

- Alcalá L (2017). Quince años con geoparques españoles. In Valenzuela JI, Mediavilla R (Eds.), El Programa Internacional de Geociencias en España (pp. 157-175). Madrid: Cuadernos del Museo Geominero, 25, IGME.
- Alcalá L (2018). Dinópolis, Halfway between amusement park and science museum: How to develop geotourism in a region undergoing depopulation. *International Journal of Geoheritage and Parks*. 6:40–71.
- Alcalá L, Mampel L & Hernández A (2015). El Geoparque del Maestrazgo (Maestrazgo Cultural European & Global Geopark). In Hilario A, Mendia M, Monge M, Fernández E, Vegas J, Belmonte A (Eds.), Patrimonio geológico y Geoparques, avances de un camino para todos (pp. 529–534). Madrid: Cuadernos del Museo Geominero, 18, IGME.
- Alcalá L, Mampel L & Verdú FJ (2016). A dinosaur nursery in the Maestrazgo UNESCO Global Geopark (Teruel, Spain). *European Geoparks Network Magazine*. 13:28.
- Alcalá L, Royo-Torres R, Cobos A & Luque L (2009). Updating dinosaur record from Teruel (Aragón, Spain). *Journal of Vertebrate Paleontology*. 29(3):53A.
- Aurell M, Bádenas B, Canudo JI, Castanera D, García-Penas A, Gasca JM, Martín Closas C, Moliner L, Moreno-Azanza M, Rosales I, Santas L, Sequero C & Val J (2019). Kimmeridgian-Berriasian stratigraphy and sedimentary evolution of the central Iberian Rift System (NE Spain). *Cretaceous Research*. 103:104153
- Barco JL, Canudo JI, Cuenca-Bescós G & Ruiz-Omeñaca JI (2005). Un nuevo dinosaurio saurópodo *Galvesaurus herreroi* gen. nov., sp. nov., del tránsito Jurásico-Cretácico en Galve (Teruel, NE de España). *Naturaleza Aragonesa*. 15:4–17.
- Campos-Soto S, Benito MI, Cobos A, Caus E, Quijada IE, Suarez-Gonzalez P, Mas R, Royo-Torres R & Alcalá L (2019). Revisiting the age and palaeoenvironments of the Upper Jurassic–Lower Cretaceous? Dinosaur-bearing sedimentary record of Eastern Spain: implications for Iberian palaeogeography. *Journal of Iberian Geology*. 45:471-510.
- Canudo JI, Cuenca-Bescós G, Ruiz-Omeñaca JI & Soria AR (1996). Estratigrafía y paleoecología de los vertebrados del Barremiense Superior (Cretácico Inferior) de Vallipón (Castellote, Teruel). *Mas de las Matas*. 15:9–35.
- Canudo JI, Infante P & Murelaga X (2005). Primer registro de vertebrados continentales (Dinosauria y Quelonii) en el Maastrichtiense de Teruel (Cirugeda, Aliaga). *¡Fundamental!* 06:57-61.
- Cobos A (2011). Los dinosaurios de Teruel como recurso para el desarrollo territorial. Ph. Dissertation. Universidad del País Vasco.
- Delvene G, Lozano P, Munt M, Royo-Torres R, Cobos A & Alcalá L (2019). Bivalves and oncoids as palaeoenvironmental indicators at Late Jurassic and Early Cretaceous dinosaur sites from Spain. *Proceedings of the Geologists' Association*. 130:87–102.
- Díaz-Molina M & Yébenes A. (1987). La sedimentación litoral y continental durante el Cretácico inferior. Sinclinal de Galve, Teruel. *Estudios Geológicos*. Volumen extraordinario Galve-Tremp: 3–21.
- D'Emic MD (2012). The early evolution of titanosauriform sauropod dinosaurs. *Zoological Journal of the Linnean Society*. 166:624–671.
- Fernández-Galiano D (1958). Descubrimiento de restos de dinosaurios en Galve. *Teruel*. 20:1–3.
- Fernández-Galiano D (1960). Yacimientos de dinosaurios en Galve. *Teruel*. Boletín de la Real Sociedad

- Española de Historia Natural. 58:95–96.
- Gasca J.M, Ramón del Río D, Moreno-Azanza M & Canudo JI (2015). Fósiles aislados de dinosaurios ornitópodos (Iguanodontia) en la Formación Mirambel (Cretácico Inferior, Teruel, España). *Geogaceta*. 57:63–66.
- Infante P, Canudo JI & Ruiz-Omeñaca JI (2005). Primera evidencia de dinosaurios tetrápodos en la Formación Mirambel (Barremiense Inferior) en Castellet, Teruel. *Geogaceta*. 38:31–34.
- Lapparent AF (1960). Los dos Dinosaurios de Galve. Teruel. 24:177–198.
- Lapparent AF, Gurnelle R, Defaut B, Miroschedj, A & Pallard B (1969). Nouveaux gisements de Dinosaurios en Espagne centrale. *Estudios Geológicos*. 25:311–315.
- Luque L, Espilez E, Cobos A, Alcalá L, Royo-Torres R, Aberasturi A, Mampel L & González A (2006-2007). Iguanodóntidos y otros vertebrados cretácicos de Miravete de la Sierra (Teruel). Teruel. 91:57–87.
- Malafaia E, Gasulla JM, Escaso F, Narvaéz I & Ortega F (2020). An update of the spinosaurid (Dinosauria: Theropoda) fossil record from the Lower Cretaceous of the Iberian Peninsula: distribution, diversity, and evolutionary history. *Journal of Iberian Geology*. 46:431–444.
- Mampel L & Hernández A (2016). Guía Turística del Geoparque del Maestrazgo (Geoparque mundial de la UNESCO). Teruel: Asociación Parque Cultural del Maestrazgo.
- Pérez-Pueyo M, Moreno-Azanza M, Barco JL & Canudo JI (2019). New contributions to the phylogenetic position of the sauropod *Galvesaurus herreroi* from the late Kimmeridgian-early Tithonian (Jurassic) of Teruel (Spain). *Boletín Geológico y Minero*, 130:375–392.
- Rauhut OWM, Canudo JI & Castanera D (2019). A reappraisal of the Early Cretaceous theropod dinosaur *Camarillasaurus* from Spain. In European Association of Vertebrate Paleontologists (Ed.), Program and Abstracts XVII Conference of the EAVP (pp. 96). Brussels: EAVP.
- Rey G, Royo-Torres R & Alcalá L (2018). Nuevos restos de dinosaurios estiracosternos en el Albiense de la Cordillera Ibérica. *Geogaceta*. 63:83–86.
- Royo-Torres R, Upchurch P, Mannion PD, Mas R, Cobos A, Gascó F, Alcalá L & Sanz JL (2014). The anatomy, phylogenetic relationships, and stratigraphic position of the Tithonian–Berriasian Spanish sauropod dinosaur *Aragosaurus ischiaticus*. *Zoological Journal of the Linnean Society*. 171:623–655.
- Ruiz-Omeñaca JI, Canudo JI, Aurell M, Bádenas B, Barco JL, Cuenca-Bescós G & Ipas J (2004). Estado de las investigaciones sobre los vertebrados del Jurásico Superior y Cretácico Inferior de Galve (Teruel). *Estudios Geológicos*. 60:179–202.
- Ruiz-Omeñaca JI (2011). *Delapparentia turolensis* nov. gen. et sp., a new iguanodontoid dinosaur (Ornithischia: Ornithopoda) from the Lower Cretaceous of Galve (Spain). *Estudios Geológicos*. 67:83–110.
- Ruiz-Omeñaca JI, Canudo JI, Cuenca-Bescós G, Cruzado-Caballero P, Gasca JM & Moreno-Azanza M (2012). A new basal ornithopod dinosaur from the Barremian of Galve, Spain. *Comptes Rendus Palevol*. 11:435–444.
- Sánchez-Hernández B (2005). *Galvesaurus herreroi*, a new sauropod dinosaur from Villar del Arzobispo Formation (Tithonian-Berriasian) of Spain. *Zootaxa*. 1034:1–20.
- Sánchez-Hernández B, Benton MJ & Naish D (2007). Dinosaurs and other fossil vertebrates from the Late Jurassic and Early Cretaceous of the Galve area, NE Spain. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 249: 180–215.
- Sánchez-Hernández B & Benton MJ (2014). Filling the

- ceratosaur gap: A new ceratosaurian theropod from the Early Cretaceous of Spain. *Acta Palaeontologica Polonica*. 59:581–600.
- Santos AA, Villanueva-Amadoz U, Royo-Torres R, Sender LM, Cobos A, Alcalá L & Diez JB (2018). Palaeobotanical records associated with the first dinosaur defined in Spain: palynostratigraphy, taxonomy and palaeoenvironmental remarks. *Cretaceous Research*. 90:318–334.
- Sanz JL, Buscalioni AD, Casanovas ML & Santafé JV (1987). Dinosaurios del Cretácico Inferior de Galve (Teruel, España). *Estudios Geológicos. Volumen Extraordinario Galve-Tremp*: 45–64.
- Simón JL, Mampel L & Mallén D (2011). Lugares de interés geológico y paleontológico del Maestrazgo. Teruel: Centro de Estudios del Maestrazgo Turulense.
- Verdú FJ, Royo-Torres R, Cobos A & Alcalá L (2015). Perinates of a new species of *Iguanodon* (Ornithischia: Ornithopoda) from the lower Barremian of Galve (Teruel, Spain). *Cretaceous Research*. 56:250–264.
- Verdú FJ, Godefroit P, Royo-Torres R, Cobos A & Alcalá L (2017). Individual variation in the postcranial skeleton of *Iguanodon bernissartensis* (Dinosauria: Ornithopoda). *Cretaceous Research*. 74:65–86.
- Verdú FJ, Royo-Torres R, Cobos A & Alcalá L (2018). New systematic and phylogenetic data about the early Barremian *Iguanodon galvensis* (Ornithopoda: Iguanodontoidea) from Spain. *Historical Biology*. 30:437–474.
- Verdú FJ, Royo-Torres R, Cobos A & Alcalá L (2020). Systematics and paleobiology of a new articulated axial specimen referred to *Iguanodon* cf. *galvensis* (Ornithopoda, Iguanodontoidea). *Journal of Vertebrate Paleontology*. 41: e1878202
- Vilanova y Piera J (1872). *Compendio de Geología*. Madrid: Imprenta de Alejandro Gómez Fuentesbro.
- Vilanova y Piera J (1873). Sesión del 5 de febrero de 1873. *Actas de la Sociedad Española de Historia Natural [año 1873]*.1:8.
- Zouros N & McKeever P (2009). European Geoparks Network and Geotourism. In Neto de Carvalho C & Rodrigues J (Ed.), *New Challenges with Geotourism*. Proceedings of the VIII European Geoparks Conference (pp. 19–23). Idanha-a-Nova: Geopark Naturtejo da Meseta Meridional.