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A new European Albian turtle that extends the known stratigraphic range of the Pleurosternidae (Paracryptodira)

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ABSTRACT

Postcranial material corresponding to three specimens of freshwater turtles, from the lower Albian (upper Lower Cretaceous) of Ariño (Teruel Province, Spain), is analysed in this paper. This study allows us to identify the presence of Pleurosternidae (Paracryptodira) outside its known stratigraphic range, from Kimmeridgian to Barremian, and extends its distribution to the Albian. The species from Ariño represents a new taxon, *Toremys cassiopeia* gen. et sp. nov., which is the only pleurosternid described so far in post-Berriasian levels. *Toremys cassiopeia* is closely related to other taxa from Europe, to which the Cretaceous pleurosternids are restricted. Knowledge about the European freshwater turtle faunas distributed between the Barremian and the uppermost Cretaceous is very limited. The new finding provides relevant data on these poorly understood faunas.

1. Introduction

Pleurosternidae (Paracryptodira) is the only group of freshwater turtles recognized in the Upper Jurassic of North America and Europe. This clade is identified as the sister group of the North American Baenidae (Pérez-García et al., in press). Pleurosternidae are restricted in North America to the Upper Jurassic, whereas they occur in Europe in the Upper Jurassic and in the Lower Cretaceous. The type species, *Pleurosternon bullockii* (Owen, 1842), was described from the Lower Cretaceous (Berriasian) of the Purbeck Limestone Group of United Kingdom. This genus is also known in the Upper Jurassic. The new combination *Dorsetochelys typocardium* (Seeley, 1869) has recently been proposed for other pleurosternid species, also described in the same British levels (Purbeck Limestone Group) (Pérez-García, 2014). Recent findings of two new Iberian Late Jurassic pleurosternid taxa improved the knowledge about the diversity of Pleurosternidae in Europe (Portuguese *Selenemys lusitanica* Pérez-García and Ortega, 2011; Spanish *Riodevemys inumbragigas* Pérez-García, Royo-Torres and Cobos, in press). Therefore, the so far described members of Pleurosternidae from Europe come from Upper Jurassic levels (Kimmeridgian and Tithonian), and from the oldest stage of the Lower Cretaceous (Berriasian). The presence of fragmentary plates of indeterminate pleurosternids has recently been recognized in several European Lower Cretaceous locations, including some findings in post-Berriasian levels such as in the French locality of Angeac (Charente; Hauterivian–Barremian) and the Spanish locality of Galve (Teruel; Hauterivian and Barremian levels) (Neraudeau et al., 2012; Pérez-García et al., 2013). Considering these new findings, Pérez-García et al. (in press) postulated that the known stratigraphic distribution of Pleurosternidae must be extended and reaches now from the Kimmeridgian (Upper Jurassic) to the Barremian (Lower Cretaceous).

The finding of a new bonebed, in the lower Albian of the Spanish town of Ariño (Teruel Province), has recently been reported (Alcalá et al., 2012) (Fig. 1). This bonebed has yielded thousands of fossils, including abundant material of several groups of vertebrates. This discovery immensely expanded the knowledge on the vertebrate faunas from the Albian of Europe, and especially, from the Iberian Peninsula, which was so far very limited. Several new taxa of crocodilians (the most recent European goniopholidids: *Hulkepholis plotos* Buscalioni, Alcalá, Espílez and Mampel, 2013, and *Anteophthalmosuchus escuchae* Buscalioni, Alcalá, Espílez and Mampel, 2013) and dinosaurs (basal nodosaurid ankylosaur *Europelta carbonensis* Kirkland, Alcalá, Loewen, Espílez, Mampel and Wiersma, 2013; basal iguanodont ornithopod *Proa valdearinnoensis*

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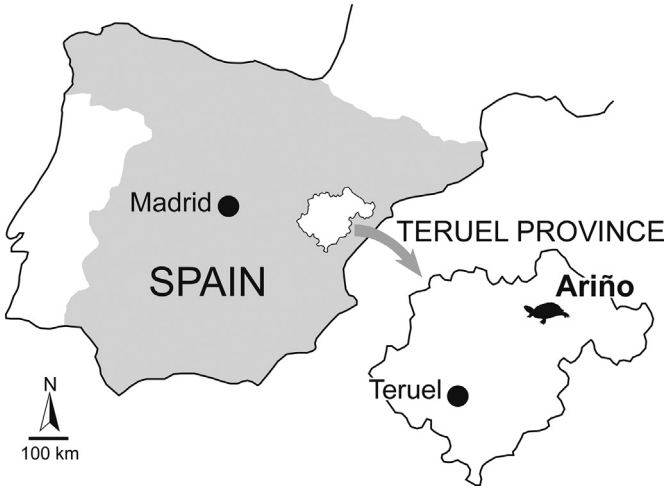

Fig. 1. Geographical location of Ariño (Teruel Province, Spain), the type locality of *Toremys cassiopeia*, gen. et sp. nov.

McDonald, Espílez, Mampel, Kirkland and Alcala, 2012) have currently been described (McDonald et al., 2012; Buscalioni et al., 2013; Kirkland et al., 2013).

The remains of turtles, hitherto unpublished, are very abundant in Ariño. Most of them can be attributed to Solemydidae, a group of primitive turtles (stem Testudines) recently recognized as terrestrial forms (Scheyer et al., in press). However, three of the turtle specimens found in Ariño do not correspond to Solemydidae. These specimens are studied here. They are assigned to a new taxon of Pleurosternidae, representing the worldwide most recent record of this clade.

Collection abbreviations. AR, Ariño collection, deposited in the Museo Aragonés de Paleontología (Fundación Conjunto Paleontológico de Teruel-Dinópolis), Teruel, Spain.

Anatomical abbreviations. Plates: c, costal; en, entoplastron; ep, epiplastron; hp, hypoplastron; hy, hyoplastron; ms, mesoplastron; n, neural; nu, nuchal; p, peripheral; py, pygal; spy, suprapygal; xi, xiphiplastron. Scutes: Ab, abdominal; An, anal; Fe, femoral; Gu, gular; Hu, humeral; Ig, intergular; Inf, inframarginal; M, marginal; Pc, pectoral; Pl, pleural; V, vertebral.

2. Systematic paleontology

Testudines Batsch, 1788
Paracryptodira Gaffney, 1975
Baenoidea Williams, 1950
Pleurosternidae Cope, 1868

Toremys cassiopeia, gen. et sp. nov.
Figs. 2–5

Holotype. AR-1-4893, a nearly complete and articulated shell, and some appendicular elements (Fig. 2).

Paratypes. AR-1-4863, a relatively complete and partially articulated shell, and several appendicular elements (Fig. 3). AR-1-3923, a partial and disarticulated shell (Fig. 4).

Locality and horizon. Site AR-1, Santa María Quarry, Ariño, Teruel Province, Northeastern Spain. Oliete Geological Sub-basin, South Iberian Range. Lower Escucha Formation, lower Albian (Alcalá et al., 2012; Tibert et al., 2013).

Etymology. The generic name is composed by Tor-, from the Spanish word toro (bull in English), an animal closely linked in several legends and traditions to Teruel Province; and -emys (Greek), meaning turtle. The specific name refers to Cassiopeia, the turtle of the fantasy novel Momo (Ende, 1973), which could see the future and knew the way to travel to the place where the administrator of the time worked, alluding to the fact that the new pleurosternid lived outside the stratigraphical range known for the other representatives of this clade. In addition, Cassiopeia is a star constellation and a bull and a star are integrated in the emblem of Teruel Province.

Diagnosis. Pleurosternid with the following autapomorphies: maximum width of the anterior edge of the nuchal plate (constituting the anterior margin of the carapace) being less than four times the maximum width of this plate; maximum width of the vertebral 1 greater than twice the width of its posterior edge. It is distinguished from other pleurosternids by an exclusive character combination: shallow emargination of the anterior carapace region (shared with *Dinochelys whitei*, *Glyptops plicatulus*, *Riodevemys inumbragigas* and some specimens of *Pleurosternon bullockii*); absence of notched posterior carapace rim (shared with *Di. whitei*, *G. plicatulus*, *Dorsetochelys typocardium*, *P. bullockii*, and *Selenemys lusitanica*); absence of carapace sagittal keel (shared with *Di. whitei*, *G. plicatulus*, *R. inumbragigas*, *P. bullockii*, and *S. lusitanica*); width of the nuchal less than twice its maximum length (shared with *G. plicatulus*, *R. inumbragigas*, and *P. bullockii*); straight latero-anterior nuchal margins (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, and *P. bullockii*); neural 1 rectangular, neurals 2–8 hexagonal (shared with *G. plicatulus*, *R. inumbragigas*, and some specimens of *Do. typocardium* and *P. bullockii*); suprapygal 1 much narrower than suprapygal 2 (shared with *R. inumbragigas*, *P. bullockii*, and *S. lusitanica*); slight dorsal curvature of the lateral part of the anterior and bridge peripherals (shared with *G. plicatulus*, *Do. typocardium*, and *R. inumbragigas*); peripherals 11 longer than wide (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, *P. bullockii*, and *S. lusitanica*); absence of cervical scute (shared with *P. bullockii* and *S. lusitanica*); vertebrals relatively narrow, pleurals wider than long (shared with *G. plicatulus*, *Do. typocardium*, *R. inumbragigas*, *P. bullockii*, and *S. lusitanica*); straight anterior margin of the vertebral 1 (shared with *Di. whitei*, *G. plicatulus*, *R. inumbragigas*, *P. bullockii*, and *S. lusitanica*); vertebral 1 wider than the nuchal (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, and *P. bullockii*); suprapygal 1 carrying the sulcus between vertebrals 4 and 5 (shared with *Di. whitei* and *S. lusitanica*); vertebral 1 overlapping on the peripheral series (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, *R. inumbragigas*, and *P. bullockii*); pleuro-marginal sulci near the costo-peripheral sutures (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, *P. bullockii*, and *S. lusitanica*); marginals 1 wider than long (shared with *Di. whitei*, *G. plicatulus*, *Do. typocardium*, *R. inumbragigas*, and *P. bullockii*); marginals 2 exclusively located at the peripheral series (shared with *Di. whitei*, *G. plicatulus*, and *Do. typocardium*); marginals 11 not overlapping on the suprapygal 2 (shared with *Di. whitei*, *R. inumbragigas*, and *P. bullockii*); marginals 12 overlapping on the suprapygal 2 (shared with *Do. typocardium*, *P. bullockii*, and *S. lusitanica*); subrounded lateral and anterior margins of the anterior plastral lobe (shared with *G. plicatulus*, *Do. typocardium*, *P. bullockii*, and *S. lusitanica*); absence of well-developed gular protrusions (shared with *G. plicatulus*, *Do. typocardium*, *R. inumbragigas*, *P. bullockii*, and *S. lusitanica*); entoplastron rhomboidal and wider than long (shared with *Do. typocardium*,