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First report on the birds (Aves) from level TE7 of Sima del Elefante (Early Pleistocene) of Atapuerca (Spain)

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ABSTRACT

The sites of the Sierra de Atapuerca (Burgos, Spain) are renowned for providing a complete Quaternary record, both archaeological and paleontological. The record consists of cave filling sediments in a karst system, developed in carbonate rocks. The Sima del Elefante site is divided into three units, in accordance with its geological features: the lower red unit (TELRU) (Early Pleistocene), the middle white unit, and the upper red unit (TEURU) (Middle Pleistocene). In this work we present the first results of a study of the bird association from the lowest level of the TELRU, TE7. A first analysis of the avian remains from level TE7 shows sixteen avian taxa: Anseriformes indet., *Anas crecca*, *Haliaeetus albicilla*, Galliformes indet., *Coturnix coturnix*, Passeriformes indet., *Galerida cristata*, *Lullula arborea*, *Anthus campestris*, *Motacilla cinerea*, *Turdus pilaris/viscivorus, Turdus iliacus/merula/philomelos, Muscicapa* sp., *Corvus frugilegus, Corvus frugilegus/corone,* and *Corvus corax antecorax*. The present work represents the first paleontological record of *Motacilla cinerea and Corvus frugilegus*, and the first record in the Iberian Peninsula of *Anas crecca*, *Haliaeetus albicilla, Galerida cristata, Anthus campestris,* the genus *Muscicapa, and Corvus corax antecorax*. Unlike in other papers published on the Aves of Sima del Elefante, all the specimens studied were obtained by concentrating the sediment by a process of washing and sieving the sedimentary materials acquired from excavations of the site.

1. Introduction

The sites of the Sierra de Atapuerca (Burgos, Spain) (Fig. 1a) are renowned for providing a complete Quaternary record, both archaeological and paleontological, which covers more than the last million years of the Earth's history (Carbonell et al., 1995, 2008; López-García et al., 2010; Arsuaga et al., 2014; Rodriguez et al., 2014). Among the sites that make up the Sierra de Atapuerca complex, there are some internationally known localities of the Middle and Early Pleistocene, such as Gran Dolina, Galería, Sima de los Huesos, and Sima del Elefante, which is the focus of the present paper.

The Atapuerca sites were exposed as a result of to the construction of a railway cutting (Trinchera) in the 19th century. The sites are divided into two main cave systems (Fig. 1b): Trinchera, and the Cueva Mayor-Sima de los Huesos system (Ortega et al., 2013). The Sima de los Huesos site corresponds to the Trinchera localities, specifically to the Galería Baja system.

Thousands of vertebrate remains have been recovered in the Sima del Elefante site, including mammals, squamates, reptiles, amphibians and birds (Rosas et al., 2001, 2004, 2006; Blain et al., 2010; Cuenca-Bescós et al., 2010, 2013, 2015). Human remains and lithic industries have also appeared in Sima del Elefante, which corresponds to the first human occupation in western Europe (Carbonell et al., 2008; Cuenca-Bescós et al., 2013; Huguet et al., 2013; Lorenzo et al., 2015). These remains consist of an incomplete jawbone with some teeth and a phalanx, initially assigned to *Homo antecessor* (Carbonell et al., 2008; Bermúdez de Castro et al., 2010), but in a comparative morphological study of the hominin mandible ATE9-1 published by Bermúdez de Castro et al. (2011) state that it is preferable not to include specimen ATE9-1 in any named taxon and refer to it instead as *Homo* sp. These human

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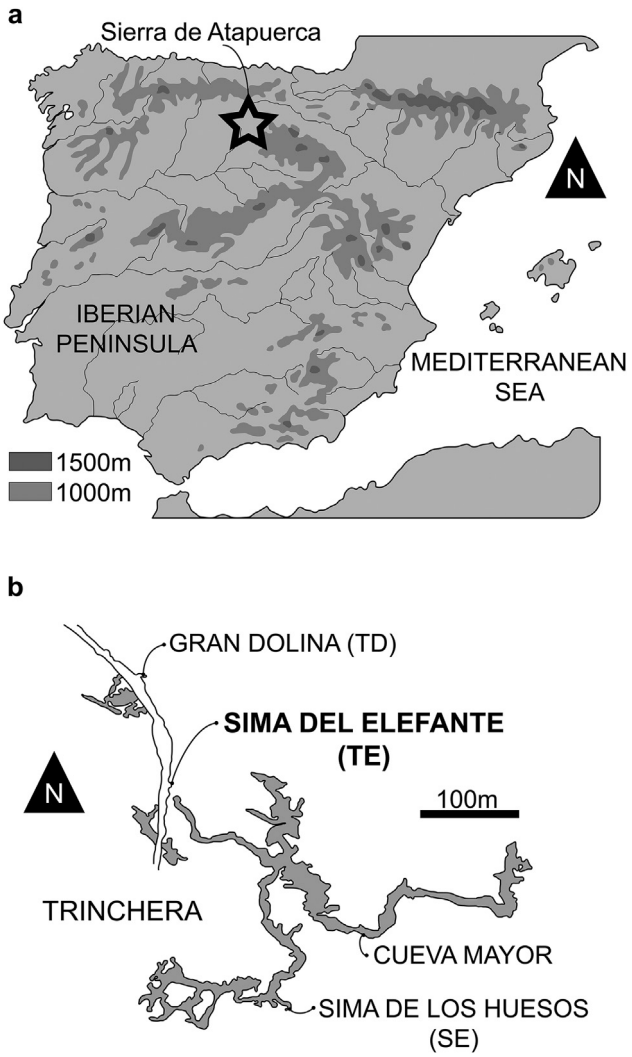

Fig. 1. Situation of the Atapuerca sites. a: geographical location of the Sierra de Atapuerca, in the north of the Iberian Peninsula. b: Map of the karstic system of the Arapuerca Hill, with the two main sets of localities (Trinchera and Cueva Mayor-Sima de los Huesos system). From Cuenca-Bescós et al. (2010).

remains have been dated as Early Pleistocene (approximately 1.2–1.1 Ma) (Carbonell et al., 2008).

Birds have been studied in Pleistocene sites as direct remains in the assemblages and also as major accumulators of small vertebrates (Andrews, 1990). They are the main agent involved in small-mammal accumulations, and also in bird accumulations (Fernández-Jalvo, 1995; Laroulandie, 2002; Bochenski, 2005; Laudet and Selva, 2005). Direct avian fossil remains have been studied (thanks to the osteological works of Eyton (1858), Milne-Edwards (1867), van Oort (1904) and Shufeldt (1909) among others) throughout Europe (Lambrecht, 1933; Mourer-Chauviré, 1975, 2004; Mourer-Chauviré and Weesie, 1986; Cassoli and Tagliacozzo, 1997; Döppes and Rabeder, 1997; Laroulandie, 2000; Boev, 2000b; Pavia, 2001; Gal, 2008; Bochenski et al., 2009; Domingues-Figuereido, 2010; Stewart, 2010; Bedetti and Pavia, 2013; Peresani et al., 2014) and throughout the world (Sagebiel, 2010; Wang et al., 2012; Lefèvre and Laroulandie, 2014; Val, 2015). In Spain, papers on the north of the Iberian Peninsula (Harlé, 1911; Villalta, 1964; Vilette, 1983; Altuna and Mariezkurrena, 1983; Eastham, 1984, 1985), and the works of Alcover, Sánchez-Marco and Elorza, among others (Sánchez-Marco, 1986, 1989; Alcover et al., 1988; Alcover, 1989; Alcover and Florit, 1989; Elorza, 1990; Elorza and Sánchez-Marco, 1993; Alcover and McMinn, 1995) were the precursors to an abundance of investigations into the avian assemblages of Spain (Elorza, 2000; Hernández-Carrasquilla, 2001; Castaños et al., 2006; Bochenski, 2007; Carrion et al., 2008; Blasco and Fernández-Peris, 2009, 2012; Guerra et al., 2012; Huguet et al., 2013; Núñez-Lahuerta et al., 2015).

Previous investigations into the avian assemblages of Atapuerca have been undertaken by Sánchez-Marco (Sánchez-Marco, 1987, 1995, 1999a, 1999b). Sánchez-Marco studied the avian assemblages of the Sima del Elefante site from level TE9 to TE14, and published two lists of taxa. The first of these (Rosas et al., 2001) reported seven different taxa: *Anas* sp., *Haliaeetus albicilla*, *Falco* sp., Charadriiformes indet., *Columba livia*, *Carduelis chloris* and *Corvus antecorax*. In 2004, a new revised list was published by the same author (Sánchez-Marco, 2004), reporting seventeen avian taxa: *Anas* sp., *Haliaeetus albicilla*, *Falco* cf. *tinnunculus*, *Lagopus muta*, *Perdix palaeoperdix*, *Coturnix coturnix*, *Vanellus vanellus*, *Lymnocryptes minimus*, *Columba livia/oenas*, *Phoenicurus ochruros*, *Turdus* spp., *Acanthis flammea*, *Carduelis carduelis*, *Carduelis chloris*, *Pyrrhocorax pyrrhocorax*, *Corvus corax/frugilegus* and *Corvus antecorax*. The main objective of this work is to complete the list with new results from an analysis of the avian remains recovered by washing and sieving, wich werw excluded from the previous works.

2. Sima del Elefante site

The Sima del Elefante site is located in the Sierra de Atapuerca, 14 km east of Burgos, in the northwest of the Iberian Peninsula. The site is a cave that belongs to the Las Torcas karst system, developed in the Late Cretaceous marine limestone that outcrops in the Sierra de Atapuerca during the Neogene and Early Pleistocene (Ortega et al., 2013). The archaeological and paleontological record consists of the cave-filling sediments in the karst system.

2.1. Sima del Elefante sequence

The 25 m-thick Sima del Elefante sequence is divided into 16 stratigraphic units: fromTE7 (the oldest, at the bottom of the sequence, the focus of the present work) to TE21 (Fig. 2b). These levels are divided into three sedimentary phases in accordance with their geological features: the lower red unit (TELRU), the middle white unit, and the upper red unit (TEURU) (Rosas et al., 2001, 2004, 2006; Carbonell et al., 2008; Blain et al., 2010; López-García et al., 2011; Cuenca-Bescós et al., 2013, 2015).

Level TE7, where the analyzed samples were recovered, is the oldest level of the lower red unit. The TELRU comprises levels TE7 to TE14, which are characterized by their red color and their paleontological richness (Cuenca-Bescós et al., 2013). The oldest human presence in Atapuerca is registered in this unit, specifically in level TE9 (Fig. 2a), comprising a hominin mandible and a phalanx; Mode 1 lithic tools and cut marks are also recorded in this level (Carbonell et al., 2008; Blasco et al., 2011; Huguet et al., 2013; Lorenzo et al., 2015).

The small-mammal assemblages of the TELRU display the same species composition from level TE7 to level TE14. In this work, we present the first results of a study of the bird association from the lowest level of the TELRU, TE7, which belongs to the *Allophaiomys lavocati* Biozone, dating to 1.5–1.1 Ma (Cuenca-Bescós et al., 2010, 2013, 2015).

The lower levels of Sima del Elefante were also dated using paleomagnetism and the radioactive decay of cosmogenic ^{26}Al and ^{10}Be. The reversed polarity from TE7 to TE16, and the inversion in

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