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## Los Batanes: A trap for the Pyrenean wild goat during the Late Pleistocene (Spain)

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### ABSTRACT

Los Batanes cave (1025 m.a.s.l.) is a karstic system formed by pressure ducts, near the locality of Biescas in the Upper Gallego Valley (Huesca, Spain). Many fossil remains were retrieved from the cave sediments. The minimum sediment calendar age was determined to be  $12.770 \pm 60$  BP. This date indicates that the deposit was formed before the Late Pleistocene–Early Holocene transition at the Pyrenees. Here we analyze the faunal assemblage of the site that is only conformed by remains of Pyrenean wild goat (*Capra pyrenaica pyrenaica*), which is a recently extinct subspecies of Iberian wild goat (*C. pyrenaica*). In the site, 1079 remains of Iberian wild goat have been recovered being one of the most numerous both in minimum number of individuals (MNI) and number of identified specimens (NISP) recovered until now in a natural trap in the Spanish Pyrenees. The population of Los Batanes shows a wide range of ages between juvenile and senile individuals and the MNI estimated from the number of right metatarsus is nine.

The taphonomic features indicate that the cave acted as a trap for the goats which inhabited the vicinity of the cave. These goats probably stumbled and fell to the bottom of the pit and they could not get out, dying inside. Due to the origin of the accumulation numerous complete bones have been recovered. These fossil allow us to perform a biometric analysis that indicates that population of Los Batanes is in the range size of other goats from Late Pleistocene of Iberian Peninsula.

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### 1. Introduction

The Pyrenean wild goat, *Capra pyrenaica pyrenaica* is a recently extinct subspecies of the Iberian wild goat. It has the popular name of “bucardo” in Spanish language and was scientifically defined by Schinz (1838). Cabrera (1911) reported the singularity and the little area of distribution of some Iberian subspecies, a fact that the author correlated with the intricate and diverse geography of the Iberian Peninsula. Unfortunately the last individual of the Pyrenean subspecies died in January 2000, leaving unstudied many of its biological and phylogenetic attributes (García-González and Herrero, 1999; García-González, 2012). Nevertheless, the taxonomy of extant *C. pyrenaica* at the subspecies level is still an open

topic of discussion (Acevedo and Cassinello, 2009).

Three other subspecies, all of which are endemic to the Iberian Peninsula, are generally accepted: the extinct *C. p. lusitanica* from northwestern Iberia, *C. p. victoriae*, which is found in the mountains of central Spain, and *C. p. hispanica* from the south and western sierras of Spain. In this work, the taxonomic terms follow the nomenclature by Shackleton (1997). Some authors (Crégut-Bonnoure, 1992; Rivals, 2002) hypothesized that *C. pyrenaica* evolved during the second half of the Late Pleistocene from an ancestor related to *C. caucasica*, which would have migrated from the Middle East to western Europe at the beginning of the last glacial period (120–80 ky). Eventually, it reached southern France and the Pyrenees, where it evolved into *C. pyrenaica* during the Würm III/IV transition (18 ky). That aforementioned ancestor, named *C. caucasica praepyrenaica* (Crégut-Bonnoure, 2002), did not have contact with the ibex of the Alps (*C. i. ibex*), which evolved there after a previous migration about 300 ky earlier (Crégut-Bonnoure, 2009). On the other hand, the molecular data of extant

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individuals indicates that *C. pyrenaica* and *C. ibex* do share a monophyletic origin (Manceau et al., 1999; Ureña et al., 2011).

Nowadays, there are very few paleontological sites analysed in the central part of Spanish Pyrenees: Coro Tracito (Rabal-Garcés et al., 2012; Rabal-Garcés, 2013), Brecha del Rincón (Rabal-Garcés and Sauqué, 2015), Chaves (Castaños, 1993), Gabasa (Blasco, 1995), Olopte B (Villalta, 1972), Ermitons (Maroto, 1993), L'Arbreda (Solier and Maroto, 1987), Cova 120 (Agustí et al., 1991) and Zatoya (Mariezkurrena and Altuna, 1989), and even some of them are not properly Pyrenean since they are located in the pre-Pyrenean chain, something more south. The scarcity of works shows a huge contrast with the enormous amount of sites analysed on the North Slope (French side) of the Pyrenean range (Clot, 1986; Clot and Evin, 1986) (Fig. 1). This asymmetry could be related with the lack of paleontological, archaeological and systematic studies until recent times, while in France this issue started being researched at the end of the XIX century (Philippe, 1852; Milne-Edwards, 1875).

In the last years, the research Group Aragosaurus, together with the Centro de Espeleología de Aragón (Speleology Centre of Aragon, CEA) discovered several fossil remains in different cavities of the Pyrenees of the Province of Huesca, in Aragon, Spain. The field work included in this paper took place during the summer campaign of 2015 (Sauqué et al., 2015). The collaboration between CEA speleologists and palaeontologists from Aragosaurus has been very successful in the Moncayo area, where interesting deposits have been discovered such as Los Rincones and Los Aprendices (Sauqué and Cuenca-Bescós, 2013; Sauqué et al., 2014, 2016a, 2016b). Also, in the last years, new discoveries have been done in their Pyrenean

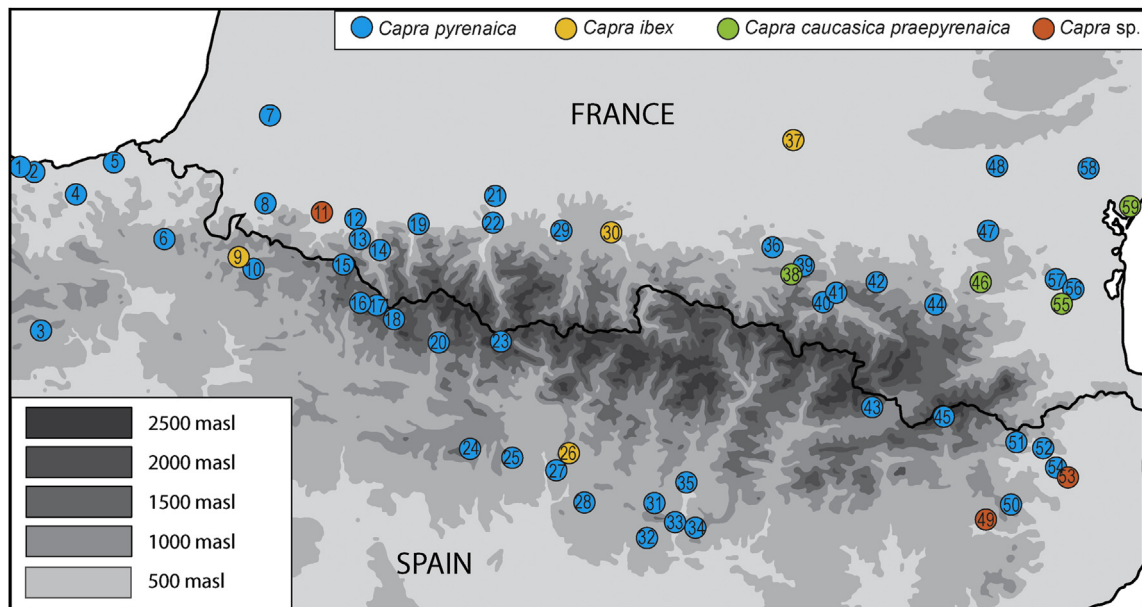
exploration zones (Sauqué et al., 2015).

The main objective of this study is to present a new fossiliferous site in the Spanish Pyrenees. This is of broad interest because paleontological (or archaeological) sites in high mountains are rarely preserved, although they provide important information of the paleoenvironment and paleobiology of the faunas in past times. In this case, Los Batanes presents an important fossil population *C. p. pyrenaica* in the Southern Pyrenees, a distinctive and almost unknown large mammal of the southern Pyrenean range. A palaeontological and taphonomical study of the *C. p. pyrenaica* remains was carried out with the aim of determining the accumulation and modification agent of the bone remains (natural trap or hunter accumulation). Also, we performed a biometrical comparison with bibliographic data from other *C. pyrenaica* remains in order to infer morphological similarity between Iberian lineages (or clades).

## 2. The karst-filling sediments from Los Batanes: geographical, geological and chronological location

Los Batanes cave (X: 720.080; Y: 4726.585. -WGS84-) is located at the east side of the Upper Gállego Valley and its entrance opens at 1025 m.a.s.l. It is a small karstic cavity, shaped as a narrow descending pressure tube (1–4 m width). The site is placed at 12 m under the level based in the main entrance, which was developed on Maastrichtian limestone and currently drains a complex jumble of main and secondary central-southern Pyrenees valleys (Palacios et al., 2015).

The excavation site is located at the bottom of the cavity, which



**Fig. 1.** Pyrenees site map. Dots represent the location of known paleontological sites with *Capra*: 1 Urtiaga (Altuna, 1990a), 2 Amalda (Altuna, 1990b), 3 Orcillas (Fernández et al., 2010), 4 Erralla (Altuna, 1990a), 5 Aitzbitarte IV (Altuna, 1963), 6 Abauntz (Altuna et al., 2001), 7 Duruthy (Delpech, 1983), 8 Grotte d'Har (Clot and Evin, 1986), 9 Aizpea (Utrilla and Mazo, 2014), 10 Zatoya (Mariezkurrena and Altuna, 1989), 11 Gatzarria (Ready, 2013), 12 Gouffre BSE21 (Clot and Evin, 1986), 13 Gouffre PT10 (Clot and Evin, 1986), 14 Gouffre des Bouquetins (Clot and Evin, 1986), 15 Larra (García-González, 2012), 16 J5 (Sauqué et al., 2015), 17 B8 (Sauqué et al., 2015), 18 Lecherines (Sauqué et al., 2015), 19 Marquisards (Clot and Duranthon, 1990), 20 Los Batanes (Sauqué et al., 2015), 21 Gouffre Béout (Clot and Evin, 1986), 22 Espélugues (Magniez, 2009), 23 Millaris (García-González, 2012), 24 Chaves (Castaños, 1993), 25 Fuente del Trucho (Mir and Salas, 2000), 26 Peña de las Forcas (Utrilla and Mazo, 2014), 27 Cueva del Moro (Castaños, 1991), 28 Gabasa (Utrilla et al., 2010), 29 bois de Cantet (Clot and Evin, 1986), 30 Gargas (Foucher et al., 2010), 31 Muricers (Yravedra, 2008), 32 Estret Tragó (Yravedra, 2008), 33 Cova Gran de Santa Linya (Martínez-Moreno et al., 2008), 34 Parco (Yravedra, 2002), 35 Muricecs (Yravedra, 2008), 36 Soulabé (Magniez, 2009), 37 L'Infernet (Fosse and Quiles, 2005), 38 Portel Ouest (Magniez, 2009), 39 La Vache (Pailhaugue, 1998), 40 Malarnaud (Magniez, 2009), 41 Grotte des Eglises, Rhodes II (Delpech, 1983), 42 Montségur (Crégut-Bonnoure, 1992), 43 Olopte B (Villalta, 1972), 44 Castel 2 (Pernaud et al., 2004), 45 Tut de Fustanyà (Álvarez and Lozano, 1999), 46 L'Arche (Rivals and Testu, 2006), 47 Belvis (Magniez, 2009), 48 Gazel (Magniez, 2009), 49 Roc del Migdia (Yll et al., 2015), 50 L'Arbreda (Solier and Maroto, 1987), 51 S'Espasa (Estévez, 1975–76), 52 Cova 120 (Agustí et al., 1991), Ermitons (Maroto, 1993), 53 Reclau Viver (Romero, 2009), 54 Bora Gran (Galobart et al., 1996), Roc Melca (Yravedra, 2002), 55 L'Arago (Magniez, 2009), 56 Conques (Magniez, 2009), 57 Padern (Magniez, 2009), 58 Tournal (Magniez, 2009), 59 Cruzade (Magniez, 2009).

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