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## The last Antilopini bovids from the Early Pleistocene of Italy

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### ABSTRACT

Recent fieldwork in the Coste San Giacomo site (Early Pleistocene – Gelasian; central Italy) led us to discover new fossils of the Antilopini bovids *Gazella borbonica* and *Gazellospira torticornis* that are presented and discussed in this paper. These taxa have important palaeoenvironmental and biochronological significance during the Early Pleistocene. They were the last Antilopinae that inhabited the Italian peninsula, characterizing the middle Villafranchian large mammal assemblages living in arid and open environments. *Gazella* is one of the most diverse and widespread genus among Antilopinae subfamily, living today in Africa and in Asia. *G. borbonica* was the last species that inhabited Europe. In the Italian peninsula, it has been found in three sites: Montopoli, Dianella and Coste San Giacomo. The spiral horn-cored *G. torticornis*, larger in size than *G. borbonica*, has been found in the Italian sites of Montecarlo and Coste San Giacomo. Here, we present the study of the Italian record, based in particular on the horn cores. Finally, this material is compared with the remains coming from the coeval European localities.

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### 1. Introduction

Bovids are the most diverse, widespread and abundant family of hoofed mammals living today in a wide variety of habitats, from tropical rain forest to woodland, grassland and desert. Their body masses span from the 2 kg royal antelope (*Neotragus moschatus*) to the 900 kg African buffalo (*Syncerus caffer*) (Nowak, 1991). Dietary preferences of these herbivores are equally varied, with some species specializing on either fresh grass, leaves, or fruits, and others having more generalized mixed diets (Grzimek, 1990). Table 1.

The Antilopinae subfamily is one of the most diverse and widespread among bovids. Within Antilopinae, the genus *Gazella* includes 16 species, living at present day in Africa and in Asia. *Gazella* inhabits a wide range of climates, from extreme deserts to steppes, to more mesial Mediterranean systems, harsher Eurasian steppes and equatorial types (Martin, 2000). The most ancient fossils attributed to this taxon were found in late Middle Miocene (about 14 Ma) site of Fort Ternan, Kenya (Gentry, 1970). Despite this, gazelles do not form a common component in African mammal assemblage until the Pliocene. By contrast, in Europe the genus

*Gazella* is represented from the Late Miocene to the Early Pleistocene. In Western Europe, the most representative Mio-Pliocene species are *Gazella deperdita*, *Gazella baturra* and *Gazella soriae*; in Eastern Europe are *Gazella capricornis* e *Gazella dorcadoides* and in Asia is *Gazella lydekkeri*. *Gazella borbonica* is the last species that inhabited Europe.

The main purpose of this study is to describe the antelope bovids (*G. borbonica* and *Gazellospira torticornis*) recently unearthed from the Early Pleistocene (Gelasian) site of Coste San Giacomo (Anagni, central Italy) and to revise the horn cores coming from the Early Pleistocene Italian sites of Dianella and Montecarlo. All the Italian record of *G. borbonica* has been compared with the European sites of Etouaries (France) and La Puebla de Valverde (Spain) that have yielded the most abundant remains whereas the horn core of *G. torticornis* from Montecarlo has been compared with those from French (Senèze and Le Coupet) and Spanish (Villaroya, Fanelas P-1, Huèlago and La Puebla de Valverde) sites.

### 2. Historical background

In the present paper the horn cores from three Italian Early Pleistocene sites are considered: Coste San Giacomo (CSG) (Anagni Basin, Latium), Dianella (Empoli, Tuscany) and Montecarlo (S. Giovanni Valdarno, Tuscany) (Fig. 1).

The site of Coste San Giacomo was discovered by the Italian Institute of Human Paleontology (IsIPU) researchers, in particular by

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**Table 1**  
Dimensions in mm of the antero–posterior and transversal diameters at the base of the horn cores.

Inventory number	Locality	DAP	DT
<i>Gazella borbonica</i>			
CSG 56692	Coste San Giacomo (Italy)	41.8	32.9
CSG 56693	Coste San Giacomo (Italy)	48.47	46.87
CSG 80-2	Coste San Giacomo (Italy)	41.26	39.62
CSG 981113	Coste San Giacomo (Italy)	35.51	29.3
CSG 981114	Coste San Giacomo (Italy)	44.55	53.21
CSG 11-44	Coste San Giacomo (Italy)	38.31	38.65
IGF 14568	Dianella (Italy)	42.59	37.8
IGF 14569	Dianella (Italy)	41.53	37.65
Holotype left	Etouaires (France)	46.4	36.75
Holotype right	Etouaires (France)	38.42	39.67
Min value	La Puebla de Valverde (Spain)	39.52	39.32
Max value	La Puebla de Valverde (Spain)	37.96	32.42
Min value	Saint-Vallier (France)	38.08	34.33
Max value	Saint-Vallier (France)	35.61	35.86
<i>Gazellospira torticornis</i>			
890	La Rigiaia (Upper Valdarno)	41.8	32.9
1008M	Villaroya (Spain)	48.47	46.87
1060M	Villaroya (Spain)	41.26	39.62
MNCN-47163	Villaroya (Spain)	35.51	29.3
MNCN-47166	Villaroya (Spain)	44.55	53.21
MNCN-47167	Villaroya (Spain)	38.31	38.65
1921-9 right	Senèze (France)	42.59	37.8
1921-9 left	Senèze (France)	41.53	37.65
COU-101	Le Coupet (France)	46.4	36.75
2001-0094 right	Fonelas P-1 (Spain)	38.42	39.67
2001-0094 left	Fonelas P-1 (Spain)	39.52	39.32
2001-0164 right	Fonelas P-1 (Spain)	37.96	32.42
2001-0164 left	Fonelas P-1 (Spain)	38.08	34.33
2002-1393 left	Fonelas P-1 (Spain)	35.61	35.86
2002-1393 right	Fonelas P-1 (Spain)	35.88	35.38
2001-0357 left	Fonelas P-1 (Spain)	35.88	29.51
2001-0357 right	Fonelas P-1 (Spain)	34.56	29.25
2002-1452	Fonelas P-1 (Spain)	37.28	34.19
2007-3084 right	Fonelas P-1 (Spain)	32.89	34.94
2007-3084 left	Fonelas P-1 (Spain)	32.34	36.49
2001-0570 right	Fonelas P-1 (Spain)	39.44	39.14
2001-0570 left	Fonelas P-1 (Spain)	38.72	37.87
2007-3042	Fonelas P-1 (Spain)	35.01	36.1
MNCN-13250	Huelago (Spain)	37.86	38.5
MNCN-12270 right	La Puebla de Valverde (Spain)	46.11	43.6
MNCN-12270 left	La Puebla de Valverde (Spain)	45.93	42.87



**Fig. 1.** Geographic position of the palaeontological sites of Coste San Giacomo, Dianella and Montecarlo in the Italian peninsula.

same author attributed to a “Narrow teeth Mastodon” or *Mastodon* (= *Gomphotherium*) *angustidens* (Rook et al., 2013). Now, this specimen is ascribed to *Anancus arvernensis* (Azzaroli, 2002–2003). According to Ghinassi et al. (2005), the occurrence of vole *Mimomys polonicus* from an horizon referable to the lower part of Montecarlo section is in agreement with the correlation of these deposits to a time interval preceding the Reunion paleo-magnetic event.

### 3. Systematic Palaeontology

The horn cores of *G. borbonica* and *G. torticornis* from CSG are housed at the Istituto Italiano di Paleontologia Umana (IsIPU) Laboratory (Anagni, Latium). The horn cores of *G. borbonica* from Dianella and of *G. torticornis* from Montecarlo are housed at “Museo di Paleontologia” of University of Florence. The anteroposterior (DAP) and transversal (DT) diameters of the horn cores of both *G. borbonica* and *G. torticornis* have been measured at the base according to the scheme of Heintz (1971). The DAP/DT ratios have been compared with those from Early Pleistocene European sites of Etouaires and Saint Vallier (France) and La Puebla de Valverde (Spain) (data from De Giuli and Heintz, 1974). Furthermore, according to Andrés Rodrigo (2011) it is possible distinguish male and female horn cores. The male horn cores have a more elliptic cross section, are somewhat curved, the faces are plane and the surface has narrow grooves. On the other hand, the female horn cores have a more rounded section, are not curved and have a lower number of grooves. Finally the DAP/DT ratio of the *G. torticornis* horn core from Montecarlo has been compared with those from Villaroya, Fonelas

Italo Biddittu, during a survey carried out in 1978 along the Fosso delle Mole Valley and its terraces. Several field campaigns during the 1980s and recent excavations (2011 and 2013) carried out by IsIPU and Earth Science Department team of “Sapienza Università di Roma” provided a rich collection of large mammal remains. Bellucci et al. (2012, 2013) started the study of all the fauna, including also small mammal remains, and gave a possible age of the faunal assemblage around 2.1 Ma.

The site of Dianella is located 15 km NE of the classic Early Villafranchian (~2.6 Ma) locality of Montopoli (Lower Valdarno). According to De Giuli and Heintz (1974), the sediment-bearing fossils of Dianella have a similar age of those of Montopoli. In 1888, Alberto Fucini discovered and donated to Palaeontology Museum of Florence three horn cores of a gazelle that Del Campana (1918) described and figured as a new species, *Gazella fucinii*.

Forsyth Major (1884) reported and Weithofer briefly described (1889) a right spiral horn core of an antelope from the locality of “La Rigiaia” in the surroundings of Montecarlo, (a monastery 2 km south of San Giovanni Valdarno where sediments of the Pliocene Castelnuovo dei Sabbioni Synthem crop out) ascribing to the new species *Palaeoreas Montis-Caroli*. In the Montecarlo locality Nesti, 1808–1826) gave also a detailed analysis of a skeleton that the

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