

## Antilopinae (Bovidae, Mammalia) from the Lower Pliocene of Teruel Basin (Spain)

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### ABSTRACT

Two genera of Antilopinae are identified in the Lower Pliocene localities of the Teruel Basin: *Hispanodorcas* and *Gazella*. *Hispanodorcas* is represented at La Calera by a new species, *Hispanodorcas heintzi* nov. sp., which is characterised by the development of a strong anterior keel in the horn cores. *Gazella* is represented in La Calera and Villalba Alta localities by a new species, *Gazella soriae* nov. sp., which is defined by its small size and weak transversal compression of the horn cores. A species smaller than *Gazella soriae*, *Gazella baturra* nov. sp. is identified at La Gloria 4.

**Key words:** Antilopinae, *Gazella*, *Hispanodorcas*, Lower Pliocene, Teruel Basin, Spain.

### RESUMEN

En los yacimientos del Plioceno inferior de la Fosa de Teruel se han identificado dos géneros de Antilopinae: *Hispanodorcas* y *Gazella*. *Hispanodorcas* está representado en La Calera por una nueva especie: *Hispanodorcas heintzi* nov. sp., que está caracterizada por el desarrollo de una fuerte quilla anterior en sus núcleos óseos de cuerno. *Gazella* está representada en La Calera y Villalba Alta por una nueva especie, *Gazella soriae* nov. sp., que está definida por su pequeña talla y escasa compresión transversal de los núcleos óseos de cuerno. Una especie de menor talla todavía que *Gazella soriae* se clasifica como *Gazella baturra* nov. sp. en La Gloria 4.

**Palabras clave:** Antilopinae, *Gazella*, *Hispanodorcas*, Plioceno Inferior, cuenca de Teruel, España.

### Introduction

Bovids and *Hipparrison* are the most important components of the Spanish large mammal associations from the beginning of the Upper Miocene until the end of the Pliocene (Alcalá, 1994). The bovid assemblage recognised in the Lower Pliocene localities of the Teruel Basin consists mainly of species belonging to the subfamilies Hippotraginae and Antilopinae. The association of these two bovid groups seems constant during the Early Pliocene. Nevertheless, in the Upper Pliocene localities, the Hippotraginae disappears and *Gazella*, represented by the typical Villafranchian species *Gazella borbonica*, remains as the most frequent bovid. The study of the Lower Pliocene Antilopinae is the aim of this work.

### Systematic palaeontology

Family Bovidae GRAY, 1821

Subfamily Antilopinae GRAY, 1821

Tribe Antilopini GRAY, 1821

Genus *Hispanodorcas* THOMAS, MORALES

& HEINTZ, 1982

Type species: *Hispanodorcas torrubiae* THOMAS,

MORALES & HEINTZ, 1982.

Generic diagnosis: In Thomas *et al.*, 1982.

*Hispanodorcas heintzi* nov. sp.

Fig. 1; Pl. 1.

1992 - *Hispanodorcas* sp. n., Alcalá, p. 224-227; text-fig. 4.41, 4.42; pl. 4.21, fig. a-e.

1994 - *Hispanodorcas* sp. n., Alcalá, p. 241-245; text-fig. 4.41, 4.42; pl. 23, fig. a-e.

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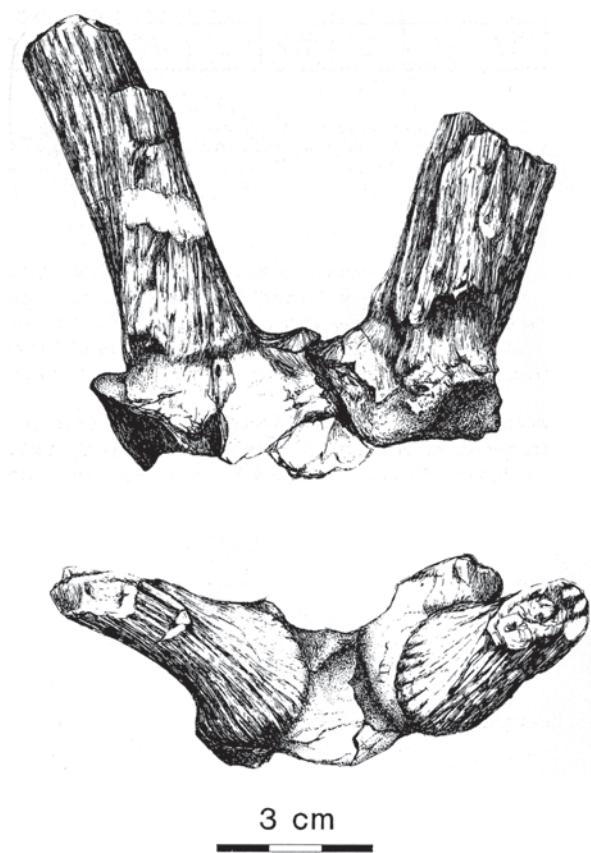


Fig. 1.—Frontlet of *Hispanodorcas heintzi* nov. sp. from La Calera, LCA-81-234 (holotype).

*Type locality* - La Calera, Teruel (Aragón, Spain).

*Age* - Lower Alfambrian (Lower Pliocene). Unit MN 14 (cf. Mein, 1990; Bruijn *et al.*, 1992).

*Holotype* - Frontlet with the two horn cores (LCA-81-234). Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain.

*Derivatio nominis* - In honour to Emile Heintz.

*Diagnosis* - *Hispanodorcas heintzi* is a species larger than *Hispanodorcas torrubiae*. Horn cores with torsion of *Oioceros* type, inserted on the frontal with a curvature backwards and towards the exterior part. The cross-section is elliptic with a strong medio-lateral compression. It also shows a strong anterior keel and smooth external groove.

*Differential diagnosis* - *Hispanodorcas heintzi* differs from *H. torrubiae* and *H. orientalis* by the development of an anterior keel and the smaller size of the external groove in the horn cores. Additionally, it differs from *H. torrubiae* by the strong medio-lateral compression of the horn cores and its cross-section of elliptical shape.

### Description

*Holotype* (LCA-81-234): Frontal bone fragment with the two horn cores (fig. 1; Pl. 1, fig. 1). These are inserted directly above the orbits and their pedicle is very short. The frontal is thick. The supraorbital foramen is strong and placed near the base of the horn core. The horn cores are separated by 27 mm. The cross-section of the horn core at the base is elliptical, with a strong transversal compression and with the antero-posterior axis oblique with respect to the sagittal axis of the frontal bone. The insertions of the horn cores on the frontal are inclined backwards and laterally. The horn cores, with torsion of *Oioceros* type, have a strong anterior keel and a smooth external groove, but they do not complete a turn. Other specimens of horn cores, such as LCA-81-229 and LCA-81-159, show a similar developed anterior keel and weak grooves on both sides (Pl. 1, figs. 2-3).

*Dentition*: The dental morphology of *Hispanodorcas heintzi* (Pl. 1, fig. 4-5) is remarkably close to that known for the gazelles found in the same locality (Pl. 2, fig. 4-5, table 1), differing mainly by its greater size and lesser hypsodonty, the reduction of the premolar row with respect to the molars and the presence of a distinct metaconid in  $P_4$ .

### Discussion

*Hispanodorcas heintzi* shares several characters with *H. torrubiae*: moderate torsion of *Oioceros* type, presence of a continuous groove in the external face, and *Gazella* type dentition - with the other two known species of the genus, *H. torrubiae*, the type species, defined by Thomas *et al.* (1982) in the Middle Turolian Spanish locality of Concad and *H. orientalis* from the Upper Turolian of Dytiko in Greece (Bouvrain & Bonis, 1988). It further shares with *H. orientalis* the curvature of the horn cores inclined backwards and their basal divergence. These characters are not known with precision in *H. torrubiae*.

The new species from La Calera differs mainly from the other two mentioned species in the development of an anterior keel in the horn cores and, in some specimens, of a posterior one, too. Additionally, the continuous groove of the external side is less developed, and the transversal compression of the horn cores is clearly greater than in *H. torrubiae*, but in this character it is not different from *H. orientalis*.

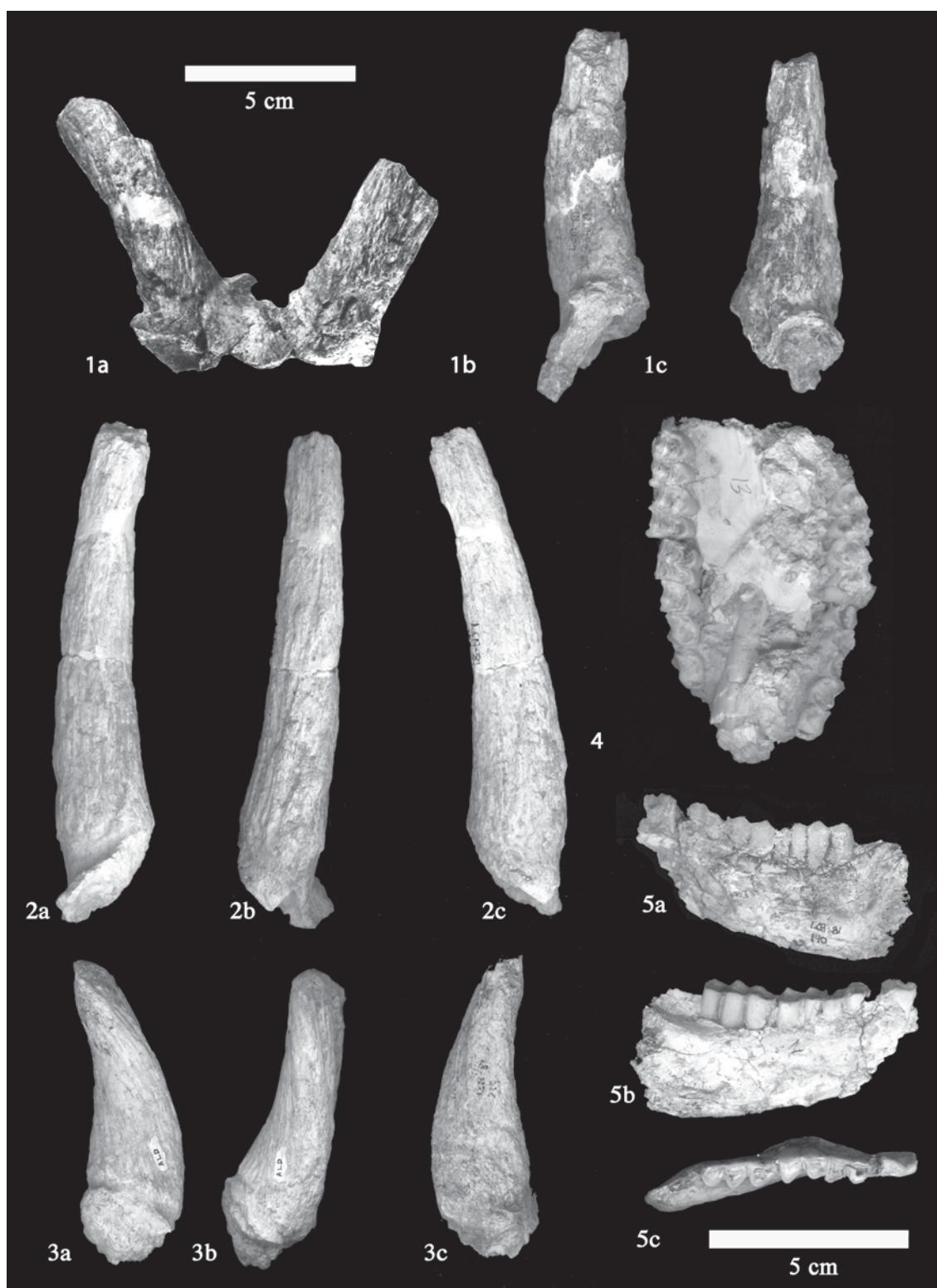


Plate 1.—*Hispanodorcus heintzi* nov. sp., La Calera. 1.- LCA-81-234, frontlet (holotype). a) anterior view, b) right horn core, medial view, c) right horn core, lateral view. 2.- LCA-81-159, right horn core. a) medial view, b) anterior view, c) lateral view. 3.- LCA-81-229, left horn core. a) medial view, b) anterior view, c) lateral view. 4.- LCA-81-168, maxilla in occlusal view. 5.- LCA-81-190, right mandible with P<sub>4</sub>-M<sub>3</sub>. a) lingual view, b) buccal view, c) occlusal view.

Table 1.—Measurements in mm of the dentition of *Hispanodorcas heintzi* nov. sp. and *Gazella soriae* nov. sp. from La Calera

N. <sup>o</sup>	P <sub>2</sub>		P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
	L	B	L	B	L	B	L	B	L	B	L	B
LCA-81-169	7.1	4.0	8.3	4.8	10.3	5.4	13.6	7.1	13.0	7.3		
LCA-81-170					9.2	5.4	11.0	7.3	13.0	8.0	19.2	7.2
LCA-81-172									14.4	7.7	19.2	7.4
LCA-81-174					9.3	5.2	12.0	7.5?	12.9	7.7		
LCA-81-178			8.1	4.8	9.5	5.7						
LA-528									11.4	7.8	16.9	6.3
LCA-81-180					10.1	5.6						
LCA-81-176							11.0	6.5				
LCA-81-179							11.1	6.2				
LA-544							9.9	5.9				
N-1197									13.5	7.8		
LCA-81-171											18.3	7.7
LCA-81-175											18.8	7.1
LCA-81-177											18.9	7.1
LA-581											18.3	7.2
N-1205											17.4	6.5
N-1197									13.5	7.8		
N. <sup>o</sup>	P <sup>2</sup>		P <sup>3</sup>		P <sup>4</sup>		M <sup>1</sup>		M <sup>2</sup>		M <sup>3</sup>	
	L	B	L	B	L	B	L	B	L	B	L	B
LCA-81-11									14.5	14.0	15.1	10.7
LCA-81-12	8.7	7.2	8.6	7.9	8.3	9.1	10.5	2.7	15.8	12.0	15.6	9.6
LCA-81-168d	8.9	6.7	9.0	7.2	—	—	11.4	9.8	14.9	11.9	16.3	10.3
LCA-81-168i	9.3	7.0	8.3	8.0	8.5	10.1	10.6	11.7	13.5	11.4	17.1	11.2
LCA-81-S/S							9.1	7.1	10.9	8.0		
N-1196			7.7	5.9	7.5	6.0?	11.5	7.5	12.5	10.0	13.0	7.9?

L: Length; B: Breadth.

#### Genus *Gazella* DE BLAINVILLE, 1816

##### *Gazella soriae* nov. sp.

Pl. 2.

1992 - *Gazella* sp. n., Alcalá, p. 209-212; pl. 4.20, fig. a-d.

1994 - *Gazella* sp. n., Alcalá, p. 227-229; pl. 22, fig. a-d.

Type locality - La Calera, Teruel (Aragón, Spain).

Age - Lower Alfambrian (Lower Pliocene). Unit MN 14 (cf. Mein, 1990; Bruijn *et al.*, 1992).

Holotype - Left horn core (LA-471). Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain.

Derivatio nominis – Dedicated to M<sup>a</sup> Dolores Soria.

Diagnosis - *Gazella* with small horn cores of a rounded cross-section. Females with smaller horn cores, which are straighter and with a more rounded transversal section than the male ones.

Differential diagnosis - *Gazella soriae* differs from *Gazella borbonica* and *Gazella deperdita* by the

smaller size of the male horn cores, and the lesser degree of transversal compression; it differs from *Gazella deperdita* by the presence of horn cores in the female specimens, it differs from *Gazella batarrua* and *Gazella thomasi* by its larger size.

#### Description

Holotype (LA-471): Horn core belonging to a male animal, it has the pedicle but lacks the apex (Pl. 2, fig. 1). As in the rest of the specimens, it is remarkable for its gracility. The cross-section is oval-shaped, with the lateral side a bit more flattened than the medial one. The horn core is slightly curved backwards and the compression increases slightly towards the apex. The surface is ornamented with many grooves and wrinkles of different sizes.

Horn core LA-463/464 (Pl. 2, fig. 3): It belongs to a male animal. It differs from the holotype because it is straighter and by its less compressed cross-sec-



Plate 2.—*Gazella soriae* nov. sp., La Calera. 1.- LA-471, left male horn core (holotype). a) lateral view, b) anterior view, c) medial view. 2.- LA-465, left female horn core. a) lateral view, b) anterior view, c) medial view. 3.- LA-463/464, right horn core. a) lateral view, b) anterior view, c) medial view. 4.- LA-N1196, right maxilla with  $P^3-M^3$ . a) occlusal view, b) buccal view. 5.- LA-528, fragment of right mandible with  $M_2-M_3$ . a) buccal view, b) lingual view, c) occlusal view.

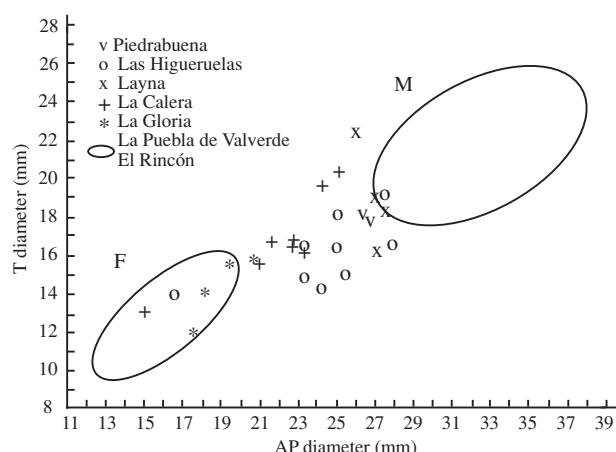


Fig. 2.—Scatter diagram of the horn core base dimensions from Spanish *Gazella*. Data from: Alberdi *et al.* (1997)<sup>1</sup>, Alberdi *et al.* (1984)<sup>2</sup>, Mazo & Torres (1989-1990)<sup>3</sup> and Heintz (1975)<sup>4</sup>; ○: Cloud of points of *Gazella borbonica* from La Puebla de Valverde and El Rincón. F (female specimens); M (male specimens). The individual points have been omitted for the benefit of clarity.

tion. Other male horn cores fall within the range of variation of the two specimens described above, except in size, the range of which is represented in figure 2 and table 2.

**Horn core LA-465:** Horn core of a female animal, which is easily distinguished from the male specimens because of its much smaller size, a more rounded section, a lesser backward curvature and smoother ornamentation (Pl. 2, fig. 2).

**Dentition:** See *Hispanodorcas heintzi* nov. sp.

**Other localities:** Villalba Alta (Teruel, Spain, MN 15): a horn core corresponding to a male animal. It is morphologically similar to LA-463 from La Calera, except for its larger size (DAP Base = 25.8 mm, DT Base = 20.2 mm) which reaches the maximum known size for this species. Montpellier (France, MN 14): an incomplete horn core described by Heintz (1970) could probably be included in this new species.

#### *Gazella baturra* nov. sp.

Pl. 3, fig. 1-10.

1992 - *Gazella* aff. *Gazella* sp. n., Alcalá; p. 212-214; pl. 4.20, fig. e-p.

1994 - *Gazella* aff. *Gazella* sp. n., Alcalá; p. 229-232; pl. 22, fig. e-p.

**Type locality - La Gloria 4.**

**Age - Lower Alfambrian (Lower Pliocene).** Unit MN 14 (cf. Mein, 1990; Bruijn *et al.*, 1992).

Table 2.—**Measurements in mm of the horn cores from La Calera, La Gloria 4 and Villalba Alta**

	DAP base	DT base	DAP + 7 cm	DT + 7 cm
<i>Hispanodorcas heintzi</i> nov. sp., La Calera				
LCA-81-159	30.2	22.7	20.8	14.8
LCA-81-167	21.3	16.0	—	—
LCA-80-228	28.9	24.8	—	—
LCA-81-229	30.8	24.6	23.6	13.8
LCA-81-234(1)	29.7	23.7	—	—
LCA-81-234(2)	29.6	24.0	20.5?	14.6
LCA-81-235(1)	30.2	24.7	—	—
LCA-81-235(2)	29.3	25.5	—	—
<i>Gazella soriae</i> nov. sp., La Calera				
LCA-81-164	22.6	16.8	—	—
LA-364	20.9	15.6	11.6	8.1
LA-365	24.1	19.7	—	—
LA-463	23.2	16.2	14.7	11.3
LA-465	15.0	13.0	7.3	5.8
LA-471	22.6	16.6	16.6	10.5
LA-473	21.5	16.8	—	—
LA-480	25.0	20.5	—	—
<i>Gazella soriae</i> nov. sp., Villalba Alta				
VA-10	25.8	20.2	—	—
<i>Gazella baturra</i> nov. sp., La Gloria 4				
GL-231*	18.1	14.3	11.6	9.5
GL-408	20.6	16.0	10.9	9.7
GL-411	19.4	15.8	10.4	8.8
GL-445	17.6	12.1	—	—

DAP: anteroposterior diameter; DP: tranverse diameter.

**Holotype** - Horn core GL-231\*. Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain.

**Derivatio nominis** - From baturra (fem.), familiar name for Aragonian people.

**Diagnosis** - *Gazella* with horn cores of small size, rounded cross-section, and small lateral compression.

**Differential diagnosis** - *Gazella baturra* differs from the other known Miocene and Pliocene gazelles by its smaller horn cores, teeth and postcranial bones. *Gazella baturra* differs from *Gazella thomasi* of the Upper Pliocene of North Africa by the lesser lateral compression of its horn cores.

#### Description

**Holotype GL-231:** Nearly complete right horn core. It is almost rectilinear, with a weak backward curvature. The external side is a bit flatter than the internal one. The cross-section is weakly compressed and oval-shaped. The horn core is ornamented with grooves and wrinkles, particularly the external side (Pl. 3, fig. 1).

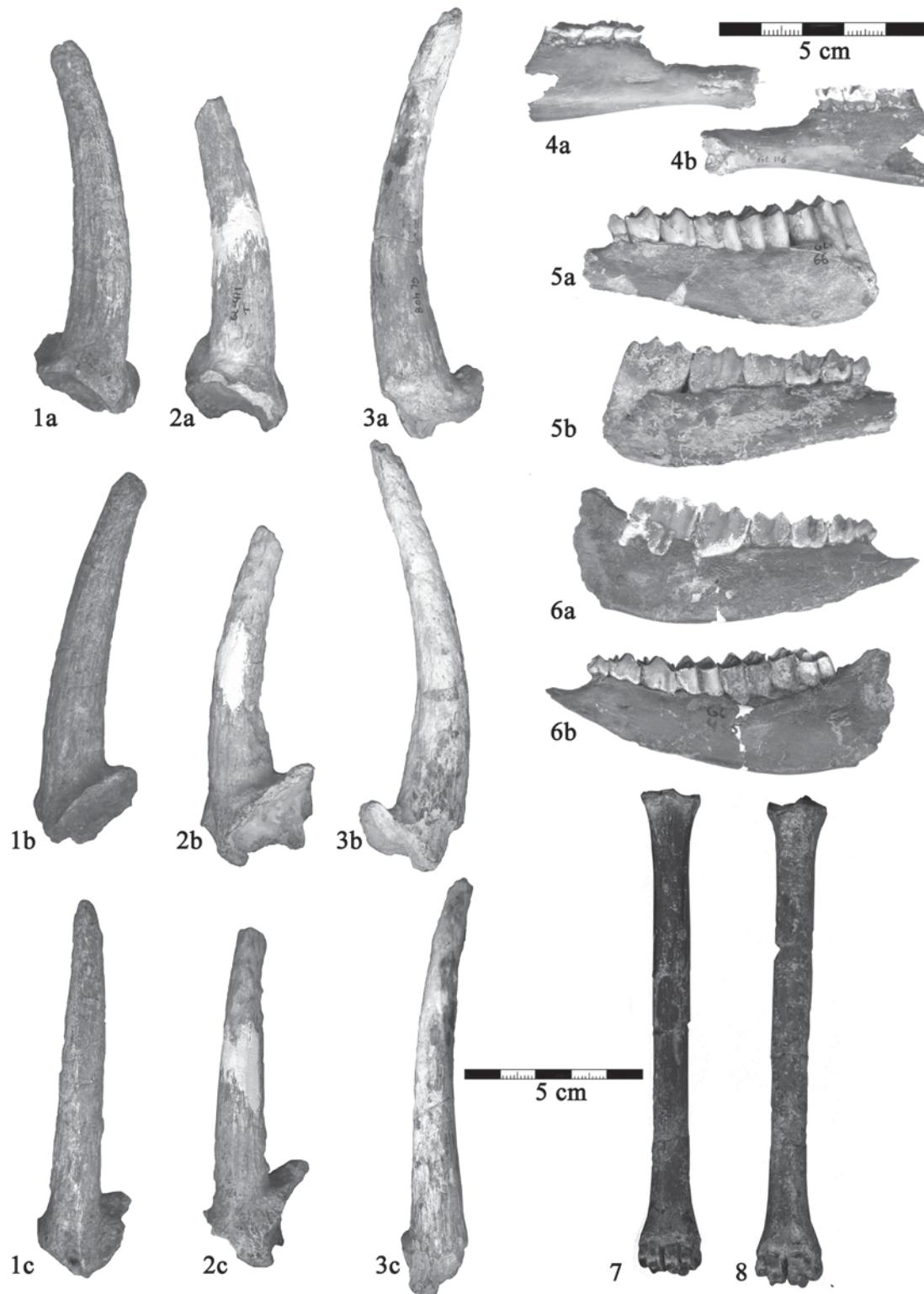


Plate 3.—*Gazella baturra* nov. sp., La Gloria 4. 1.- GL-231, left horn core (holotype). a) lateral view, b) medial view, c) anterior view. 2.- GL-411, left horn core. a) lateral view, b) medial view, c) anterior view. 3.- GL-408, right horn core. a) lateral view, b) medial view, c) anterior view. 4.- GL-19, fragment of mandible with  $P_2-P_3$ . a) buccal view, b) lingual view. 5.- GL-66, left mandible with  $P_2-M_3$ . a) buccal view, b) lingual view. 6.- GL-435, left mandible with  $P_2-M_3$ . a) lingual view, b) buccal view. 7.- GL-88, metacarpal. 8.- GL-230, metatarsal.

Table 3a.—Measurements in mm of the lower dentition of *Gazella baturra nov. sp.* from La Gloria

N. <sup>o</sup>	P <sub>2</sub>		P <sub>3</sub>		*D <sub>3</sub>		P <sub>4</sub>		*D <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
	L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B
GL-9*									11.5	5.7	—	—				
GL-12			7.0	3.8	8.7	4.8	8.7	6.3	11.4	6.5						
GL-18*							9.1	5.9	11.0	6.3	15.5	5.9				
GL-19*	4.7	2.8	7.3	4.0	7.8	3.8			10.1	6.5	12.0	6.8	17.2	6.1		
GL-20*					8.8	5.0	8.8	6.7	10.5	6.4						
GL-61*																
GL-66	4.4	3.0	8.2	4.3	9.2	4.8	10.0	7.0	12.4	6.6	16.1	6.1				
GL-86					8.6	4.9	10.0	6.3	12.1	6.5						
GL-90			6.2	5.1	8.4	5.1	8.0	6.9	10.9	7.0	16.9	6.4				
GL-97	8.2	3.0	6.9	4.2	8.2	5.1	7.6	5.8	10.3	6.5	17.0	6.7				
GL-98			8.2	4.5	8.5	5.3	9.2	6.5	11.6	6.8	17.0	6.1				
GL-102			7.7	4.3	8.4	4.8	8.1	6.0	10.7	6.9	16.2	6.3				
GL-116			7.0	4.6	8.1	5.5	9.3	6.4								
GL-117			7.5	4.7	7.8	5.7	8.5	6.4	11.0	6.7	16.0	5.9				
GL-130*	5.0	2.8	6.7	3.6	7.2	4.3	8.4	5.6	10.4	5.7	14.9	5.7				
GL-153			7.6	4.9	—	—	—	6.3	10.3	6.5						
GL-211							10.1	5.8	12.7	6.4	—	—				
GL-329					9.0	4.3	10.1	5.7	11.6	6.0						
GL-353							8.7	6.0	10.2	6.7	14.8	5.7				
GL-368							—	—	12.0	6.3	15.6	6.2				
GL-388									10.0	6.6	17.5	6.2				
GL-389							10.2	6.5	11.3	6.8	16.8	6.5				
GL-392							8.9	7.0	11.0	7.5	16.5	6.4				
GL-433			7.5	4.2	7.3	4.4	8.8	5.8	10.4	5.5	—	5.4				
GL-435	5.9	3.8	8.4	4.8	9.1	5.1	10.0	6.0	12.3	6.3	15.6	5.9				
GL-447			7.1	4.1	7.6	4.3	—	—	10.0	6.6	15.4	5.7				
GL-467			*8.8	4.3	*14.3	5.3	11.7	6.5	14.5	6.6						
GL-528	5.4	3.4	8.0	4.3	8.8	5.1	8.5	6.3	10.5	6.8	16.8	6.5				
GL-177	5.0	3.0														
GL-418	6.0	3.7														
GL-570	4.7	3.5									M <sub>1</sub> or M <sub>2</sub> indif.					
GL-571																
GL-95								10.6	5.8							
GL-414								10.8	6.1							
GL-416b								8.8	6.1							
GL-425								10.7	7.0							
GL-558								12.7	6.4							
GL-38											16.1	6.0				
GL-73											16.3	6.3				
GL-103a											15.5	5.5				
GL-103b											17.1	6.3				
GL-145											17.7	6.6				
GL-173											15.5	5.7				
GL-238*											17.0	5.9				
GL-321											14.8	6.3				
GL-450											16.1	6.3				

L: Length; B: Breadth.

*Horn core GL-408:* Specimen similar to the previous one, except the ornamentation, which is smoother and there is a small medial keel near the apex (Pl. 3, fig. 3). The other horn cores are morphologically similar to these ones (Pl. 3, fig. 2).

*Dentition:* It is the typical of the genus *Gazella*, differing from *Gazella borbonica* by its smaller size (Pl. 3, figs. 4-6, table 3a-b).

### Discussion

The new gazelle species - Lower Pliocene in age - differ clearly from the two previously well-known species in Spain, *Gazella deperdita* of the Upper Miocene (Alcalá, 1994) and *Gazella borbonica* of the Upper Pliocene (Alberdi *et al.*, 1984, 1997; Nieto *et al.*, 1997).

Table 3b.—Measurements in mm of the upper dentition of *Gazella baturra* nov. sp. from La Gloria

N. <sup>o</sup>	P <sup>2</sup>		P <sup>3</sup>		P <sup>4</sup>		M <sup>1</sup>		M <sup>2</sup>		M <sup>3</sup>	
	L	B	L	B	L	B	L	B	L	B	L	B
GL-58*									11.0	10.3	13.3	9.8
GL-70							8.9	10.9	11.7	11.9	12.2	10.2
GL-255*									10.8	11.0	13.1	9.8
GL-319			8.0	7.2	6.5	8.4	9.9	10.4	12.5	11.1		
GL-519					6.0	6.7	8.0	9.3	9.5	10.1		
GL-50	7.3	4.3										
GL-423	8.4	6.0										
GL-185			7.7	8.1								
GL-193			7.7	6.2								
GL-212			8.6	7.2								
GL-257*			7.5	7.4								
GL-259*			7.2	6.5								
GL-260*			7.8	7.4								
GL-320			8.8	6.9								
GL-106					7.9	8.5						
GL-162					7.2	7.2						
GL-190					7.2	7.3						
GL-258*					7.4	8.7						
GL-489												
GL-49							12.4	9.4				
GL-78*							9.1	9.1				
GL-106a							11.4	10.7				
GL-106b							12.9	10.6				
GL-121							11.5	11.1				
GL-200							10.8	8.9				
GL-256*							10.9	8.1				
GL-297*							12.2	11.4				
GL-305*							12.2	11.4				
GL-336							9.3	8.3				
GL-338							12.5	10.2				
GL-380							9.2	7.5				
GL-404							11.8	8.9				
GL-569							11.7	8.8				
GL-39											13.2	10.5
GL-77*											12.2	9.2
GL-111											13.0	11.0
GL-112											13.7	9.8
GL-255											13.6	10.2
GL-264*											13.2	10.0
GL-301*											13.3	11.2
GL-339											12.3	9.2
GL-340											13.3	10.8

L: Length; B: Breadth.

*Gazella deperdita* is present in the localities of the Upper Miocene of Concud and Los Mansuetos (Middle Turolian, MN 12) and El Arquillo (Upper Turolian, MN 13), but it is not abundant in any of these localities.

*Gazella baturra* and *Gazella soriae*, together with *Gazella thomasi* (see Geraads & Amani, 1998), are among the smallest species of the genus, in particular the first of them, which is probably the smallest species known until now. Apart from size, the morphology of the horns is similar

(rounded section, with weak transversal compression, strong ornamentation, etc.). In these characters they are closer to *Gazella deperdita*, but this species has a sexual dimorphism in which female animals lack horns (Heintz, 1969). In contrast, *Gazella soriae* - as in most of the extant species - males and females have different sized horns. We do not have information about sexual dimorphism in *Gazella baturra* or *Gazella thomasi* because all the available horns are interpreted as belonging to male animals.

*Gazella soriae* and *Gazella baturra* share with *Gazella deperdita* the small size of both the postcranial skeleton (Pl. 3, fig. 9-11) and the dentition. For example, the length of the metatarsal in *Gazella baturra* is 135 mm, in *Gazella soriae* 148 mm and in *Gazella deperdita* it ranges between 146 and 150 mm. In addition, the mean length of the M<sub>3</sub> is 16.23 mm in *Gazella baturra* and 15.86 mm in *Gazella deperdita* (Alcalá, 1994 and Heintz, 1971, respectively). The evidence that *Gazella baturra* is not only a gazelle of small size, but also that it has small horns, seems clear.

The male horn cores of *Gazella borbonica* from Las Higueruelas (Heintz, 1975; Alberdi *et al.*, 1984) have a smaller size with respect to the range recorded for the populations of *Gazella borbonica* from other localities, such as El Rincón 1, La Puebla de Valverde or Saint Vallier (France). Nevertheless, although it is situated in position intermediate between *Gazella soriae* from La Calera and typical *Gazella borbonica*, the transversal compression is similar that presented by *Gazella borbonica*, clearly distinguishable from the group of gazelles from La Gloria and La Calera. The classification of Las Higueruelas material as *Gazella* aff. *G. borbonica* is preferable pending a detailed study of the new material collected by Mazo (1993).

The gazelle horn cores from Piedrabuena and Layna were also classified as *Gazella borbonica* by Mazo & Torres, (1989-1990) and Torres & Mazo (1991). According to their size, in this study they are placed at the boundary of the variation of *Gazella* aff. *G. borbonica* from Las Higueruelas and the typical *Gazella borbonica*, their attribution to one or the other form being difficult. The specimens from Piedrabuena can be included in the same group of *Gazella* aff. *G. borbonica* without difficulty, but for those from Layna there is no clear criterion, except that the locality is older - Upper Alfambrian, MN 15 - than the typical localities with *Gazella borbonica* (Lower and Upper Villafranchian MN 16/17). Provisionally, the gazelle from Layna can be included in the same group as the gazelles from Piedrabuena and Las Higueruelas.

Other species of Pliocene gazelles such as *Gazella postmytilini* (Vekua, 1972), *Gazella bouvrainae* (Kostopoulos, 1996; Kostopoulos & Athanassiou, 1997) and *Gazella emiliae* (Bouvrain, 1998), have horns similar in size to those of *Gazella borbonica*, but with a notably less compressed transversal section, such as that of *Gazella sinensis*. In this character *Gazella baturra* and *Gazella soriae* differ very

much not only from these oriental species, but also from *Gazella borbonica*.

*Gazella borbonica* can be considered a typical species of the Villafranchian with a very wide geographical range spanning from Spain to Greece (Kostopoulos & Athanassiou, 1997). However, the other described species of the Spanish Pliocene are not known outside Spain; the only exception is the possible presence of *Gazella soriae* at Montpellier (France).

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