

ANNALES GÉOLOGIQUES DES PAYS HELLÉNIQUES
PUBLIÉES SOUS LA DIRECTION DE DÉPARTEMENT DE GÉOLOGIE DE L' UNIVERSITÉ D' ATHÈNES

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A NEW GAZELLE SPECIES (ARTIODACTYLA, BOVIDAE)
FROM THE LATE PLIOCENE OF GREECE

ΑΘΑΝΑΣΙΟΥ, Α.

ΕΝΑ ΝΕΟ ΕΙΔΟΣ ΓΑΖΕΛΛΑΣ (ΑΡΤΙΟΔΑΚΤΥΛΑ, ΒΟΟΕΙΔΗ)
ΑΠΟ ΤΟ ΑΝΩΤΕΡΟ ΠΛΕΙΟΚΑΙΝΟ ΤΗΣ ΕΛΛΑΔΑΣ



ATHÈNES
DÉPARTEMENT DE GÉOLOGIE
Panepistimiopolis, Athènes (157 84)
2002

Ανάτυπον εκ των «Γεωλογικών Χρονικών των Ελληνικών Χωρών», 39, Fasc. A., 2002
Extrait des «Annales Géologiques des Pays Helléniques», 39, Fasc. A., 2002

A NEW GAZELLE SPECIES (ARTIODACTYLA, BOVIDAE) FROM THE LATE PLIOCENE OF GREECE*

by
ATHANASSIOS ATHANASSIOU**

I. INTRODUCTION

Recent studies on the plio-pleistocene faunas of Greece have shown that the genus *Gazella* has developed a remarkable diversity of forms during the Late Pliocene of South-Eastern Europe (ΚΟΥΦΟΣ, 1986; ΑΘΑΝΑΣΙΟΥ, 1996; ΚΩΣΤΟΠΟΥΛΟΣ 1996; ΚΟΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ, 1997). The Plio-Pleistocene gazelles of Greece were described recently by ΚΟΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ (1997), who assigned them to three species: *Gazella borbonica* DEPÉRET, 1884, *Gazella bouvrinae* ΚΟΣΤΟΠΟΥΛΟΣ, 1996 and *Gazella* sp. B. However, a revision of the largest one of these forms, namely *Gazella* sp. B, was necessary after the discovery of new material at the locality of Vatera. This form was previously known only from Sesklo (Thessaly) (ΑΘΑΝΑΣΙΟΥ, 1996; ΚΟΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ, 1997). The cranial anatomy, as well as the biochronological implication of the revised *Gazella* species are described and discussed in this article.

II. SYSTEMATICS

ORDER: Artiodactyla OWEN, 1848
FAMILY: Bovidae GRAY, 1821
SUBFAMILY: Antilopinae BAIRD, 1857
GENUS: *Gazella* BLAINVILLE, 1816

Gazella aegaea n. sp.

SYNONYMY: *Gazella* sp. B — ΑΘΑΝΑΣΙΟΥ (1996: 109, Fig. 50, 51, 55, 56, Plate Z')
Gazella sp. B — ΚΟΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ (1997: 421, Fig. 4).

* Ένα νέο είδος γαζέλλας (Αρτιοδάκτυλα, Βοοειδή) από το Ανώτερο Πλειόκαινο της Ελλάδος.

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TYPE LOCALITY: Sesklo (Magnesia, Thessaly, Greece).

OTHER LOCALITIES: Vatera, F-site (Lesbos Island, Greece).

AGE: Late Pliocene (MN17).

HOLOTYPE: Frontlet Σ -350 from Sesklo.

REFERRED MATERIAL FROM SESKLO: Frontlet: Σ -72, Σ -379; right horn core: Σ -91; left horn core: Σ -92; part of right horn core: Σ -960.

REFERRED MATERIAL FROM VATERA: Frontlet PO-077 F.

ETYMOLOGY: The species is named after the Aegean Sea.

DIAGNOSIS: A gazelle of very large size. Slightly curved, long and divergent horn cores of elliptical cross-section that retains its shape towards the apex. The core surface is rugged and sharply separated from the pedicle. The cranial roof is characterised by high and very plicate sutures, and deep postcornual fossae. The supraorbital foramina are very large and deep, triangular in shape.

CONSERVATION OF THE MATERIAL: The material from Sesklo belongs to the collections of the Museum of Geology and Palaeontology, National and Kapodistrian University of Athens, Greece. The material from Vatera is conserved in the Natural History Collection at Vrissa (Lesbos Island).

III. DESCRIPTION

The available material comprises several horn cores, some of which retain parts of the cranial roof. The locality of Sesklo has yielded six specimens that plausibly belong to five individuals (the specimens Σ -91 and Σ -92 are identical metrically, morphologically and also lithologically, suggesting that they belong to the same individual), while only a single specimen is known currently from Vatera. The skull morphology is not well known, as only the frontal region is preserved. It is characterised by very strong, high and intensively plicate sutures, especially the frontoparietal one. Because of the high sutures, the frontals are concave between the horn cores. The postcornual fossae are deep. The supraorbital foramina are very large (especially in PO-077 F), ending into deep, triangular fossae on the facial side. The horn cores are inserted directly above the orbits on long pedicles (maximal length 30 mm). The cores are long, laterally compressed in cross-section and situated close to each other. They are inclined and slightly curved to the rear, forming an angle of about 50° with the cranial roof. They show a divergence of about $20\text{--}25^\circ$ from each other in the material from Sesklo and somewhat more, about 30° , in PO-077 F. A measurement of their length is not possible, as they are broken in all available specimens; however, it can be estimated to about 200 mm for the specimens from Sesklo. Their surface is strongly rugged. The cross-section at the base of the core is of large size, especially in the specimen from Vatera. Its shape is elliptical, more or less symmetrical, the mesial side being a little more convex (Fig. 1, 2). Anteriorly, the horn core bases are closer to each other, as their maximal diameter axes are not parallel to the sagittal plane (Fig. 2). The cross-section shape remains almost constant in the whole retained length, being a little more compressed towards the apex. The index DT/DAP (that is minimal/maximal diameter) at the base varies from 61.6% to 70.5%, while the same index at 7 cm above the base is 58.4%–61.4%. The specimen from Vatera, though not morphologically different, appears to be distinctly larger, especially in the dimensions of the horn core cross-sections (Table 2). However, the differences are much smaller in other measurements, as the distance between the horn cores and the distance between

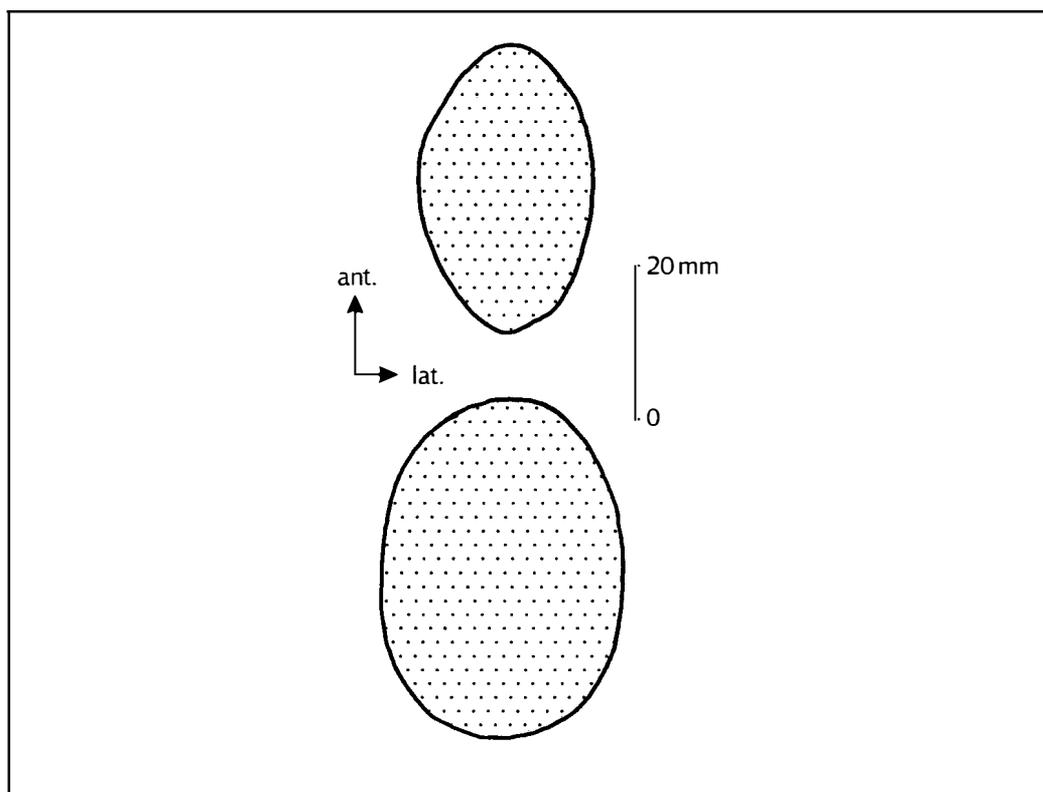


Fig. 1: *Gazella aegaea* n. sp.: right horn core cross-sections of the holotype Σ -350, taken at the base and at 7 cm above the base.

the supraorbital foramens (less than 10%), implying similar cranial size. The big difference in the horn core cross-section size can be partly attributed to the extremely rugged surface of PO-077 F.

The fragmentary state of the studied frontlet and horn core material does not allow any connection with the gazellin dental and –far more– postcranial material found at Sesklo and Vatera. Also any attribution based on size criteria is impossible, as other *Gazella* species of fairly large size are present at both localities. In general the available dental material is characterised by relatively long premolar section, absence of enamel islets, entostyles and ectostylids, and presence of goatfold in the lower molars. The P_4 is not molarised, but its paraconid and metaconid are often fused.

IV. DISCUSSION

The gazelles are represented in the Late Pliocene of Greece by three species: *Gazella borbonica* DEPÉRET, 1884, *Gazella bouvrinae* KOSTOPOULOS, 1996 and *Gazella aegaea*

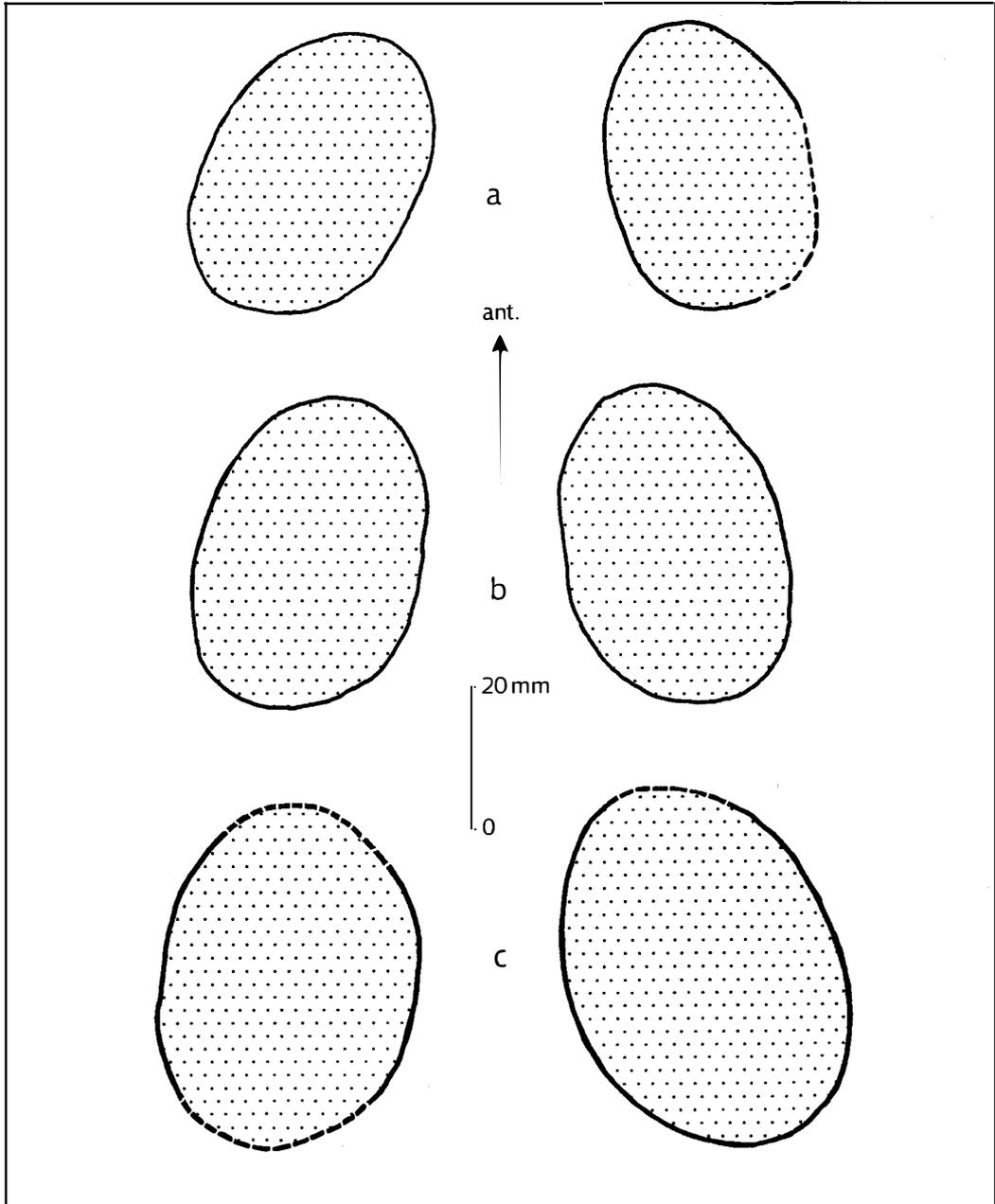


Fig. 2: *Gazella aegaea* n. sp.: comparison of the relative placement and orientation of the horn cores (cross-sections taken at the base); a: Σ -379, b: Σ -350 (holotype), c: PO-077 F.

Table 1

<i>Gazella aegaea</i> n. sp.	Σ-350	Σ-379	PO-077 F
Distance between the mesial sides of the horn cores	17.7	22.8	20.0
Distance between the lateral sides of the horn cores	76.3	—	83.0
Distance between the supraorbital foramens, measured at their lateral margins	—	35.8	37.2

Table 1: Cranial measurements of *Gazella aegaea* n. sp. from Sesklo and Vatera.

Table 2

<i>G. aegaea</i> n. sp.	DAP _p	DT _p	DAP _b	DT _b	DAP ₇	DT ₇	DT _b /DAP _b %	DT ₇ /DAP ₇ %
Σ-72	—	—	44.0	28.5	—	—	64.8	—
Σ-91	—	—	44.7	27.5	—	—	61.5	—
Σ-92	—	—	44.0	27.7	—	—	63.0	—
Σ-350 sin.	40.2	26.5	45.5	30.0	38.0	23.0	65.9	60,5
Σ-350 dext.	40.0	26.8	44.5	31.0	37.7	22.0	69.7	58,4
Σ-379 sin.	38.5	26.8	43.5	28.5	35.0	21.5	65.5	61,4
Σ-379 dext.	38.8	—	43.5	27.5	—	—	63.2	—
PO-077 F sin.	45.4	28.8	—	34.2	—	—	—	—
PO-077 F dext.	44.4	28.5	56	34.5	—	—	61.6	—

Table 2: Horn core cross-section measurements of *Gazella aegaea* n. sp. from Sesklo and Vatera. DAP_p, DT_p, DAP_b, DT_b, DAP₇ and DT₇ denote diameter measurements at the pedicle, at the base of the horn core and at 7 cm above the base, respectively. DAP and DT are the maximal and the minimal diameter of the cross-sections, respectively.

n. sp. This diversity of forms is quite unlike the situation seen in Western Europe, where the genus is only represented by the first species. More species are, however, described from Asian localities. *Gazella borbonica* is a rare element in the Greek faunas; it is present in the fossil record from MN15 to the lower MN17 (MNQ17) (ΑΘΑΝΑΣΙΟΥ, 1996; ΚΩΣΤΟΠΟΥΛΟΣ, 1996; ΚΩΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ, 1997), having the same stratigraphic range with the samples of Western Europe. *Gazella bouvrainae* is a fairly large species, characterised by short horn cores of oval–circular cross-section (weakly laterally compressed). It is a frequent species, known from several Late Pliocene (MN17) localities (ΚΩΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ, 1997).

The species under study, *Gazella aegaea* n. sp., is clearly distinguished from *G. borbonica* and *G. bouvrainae* by its very strong horn cores and the generally robust aspect of the skull. The considerable metrical difference is seen in the diagrams of the Figures 3–5. The general morphology of the cross-sections is close to those of the males of *Gazella borbonica* (according to the measurements of HEINTZ, 1975), as the corresponding DT/DAP ratios are similar. In mean values, the basal cross-section of *Gazella aegaea* n. sp. appears to be slightly more laterally compressed, while the section at 7 cm above the base is a little less laterally compressed (Fig. 3). In cranial morphology, *Gazella aegaea* n. sp. is distinguished from *Gazella borbonica* by the much-developed postcornual fossae and supraorbital foramina. Compared to *Gazella bouvrainae*, it shares with it the rugged surface of the cores, as well as the pronounced postcornual fossae and supraorbital foramina. The short and not laterally compressed horn cores of *Gazella bouvrainae* are, however, quite unlike those of *Gazella aegaea* n. sp.

The Asian Pliocene species are usually much smaller than the studied specimens and they generally have horn cores, which are not laterally compressed (BOHLIN, 1935; TEILHARD DE CHARDIN & TRASSAERT, 1938; BOUVRAIN, 1998). The large sized *Gazella sinensis* TEILHARD DE CHARDIN & PIVETEAU, 1930 has short, curved horn cores of oval cross-section. The horn core minimal diameters (DT) cited for this species are quite comparable to those of *Gazella aegaea* n. sp. (TEILHARD DE CHARDIN & PIVETEAU, 1930; TEILHARD DE CHARDIN & TRASSAERT, 1938). However, the corresponding maximal diameters (DAP) are distinctly smaller, reflecting the rounder cross-section of its horn cores. This metrical comparison is also seen in Figures 3–5. *Gazella sinensis* resembles *G. aegaea* n. sp. in the presence of well-developed postcornual fossae and supraorbital foramina, as well as in the morphology of the core surface, which is also rugged.

The fairly big metrical difference of *Gazella aegaea* n. sp. in the two available samples (Sesklo and Vatera) may raise some questions about their taxonomic relationship. As already mentioned, the two samples are much different in the diameters of the cores, but they have considerably smaller differences in other cranial measurements (Table 1), even in the diameters of the pedicle (Table 2). The cross-section morphology (DT/DAP ratio) is also similar in the two samples. The increased robustness of PO-077 F could be attributed either to a small chronological and/or ecological difference between the two localities, or to a pronounced sexual dimorphism, which is common in the genus (GENTRY, 1966). In the latter case the PO-077 F should be attributed to a male individual, while the sample from Sesklo to females. However, this hypothesis does not explain the absence of the alleged males at Sesklo, as the sample there (five individuals) is not so poor. The hypothesis of a small chronological and/or ecological difference between the two localities seems more likely, as similar size differences are also found in other taxa (mainly in *Nyctereutes*, but also in *Equus* in a certain degree). Certainly some more material, especially from Vatera, will solve this problem. Anyway, the metrical

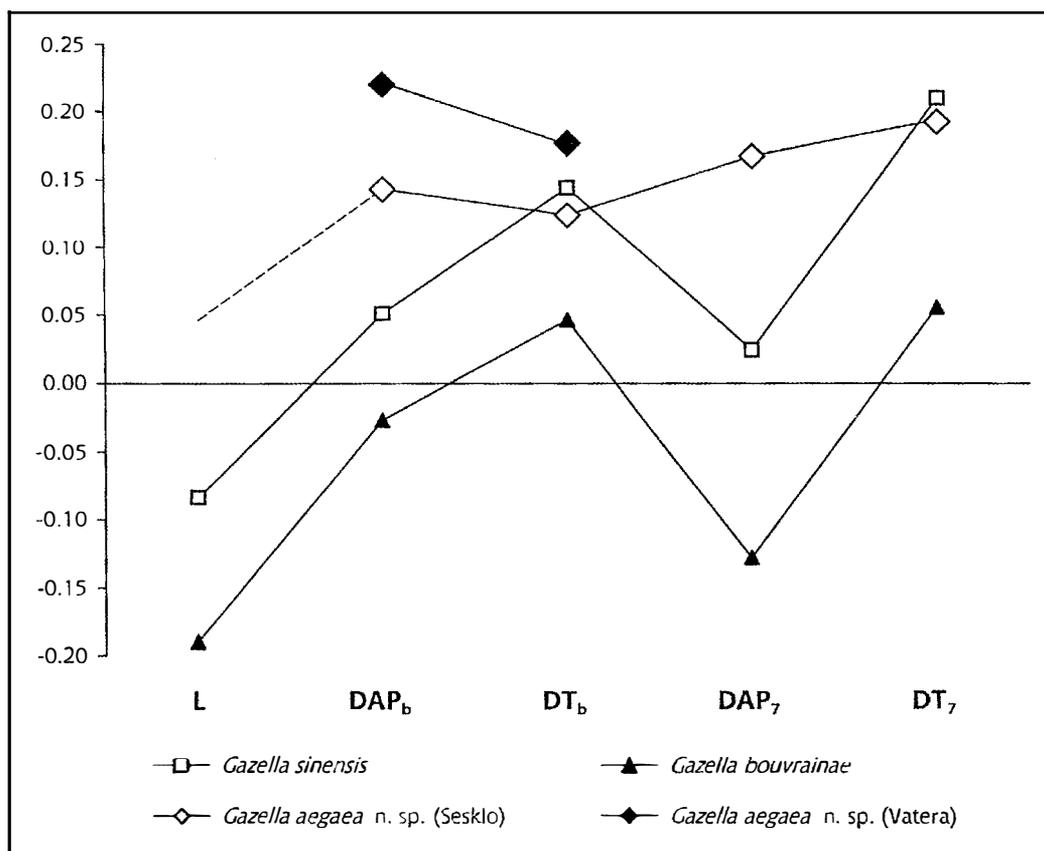


Fig. 3: Logarithmic ratio diagram comparing the horn core dimensions of Eurasian *Gazella* species. Data according to ΑΘΑΝΑΣΙΟΥ (1996), ΚΩΣΤΟΠΟΥΛΟΣ (1996) and ΚΩΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΣΙΟΥ (1997). Standard: male *Gazella borbonica* from La Puebla de Valverde (according to ΗΕΙΝΤΖ, 1975). The dashed line is approximate.

divergence between the minimal measurements from Sesklo and the maximal from Vatera (PO-077 F) is not larger compared to the range of the good *Gazella borbonica* sample from La Puebla de Valverde, or the total range of the *Gazella bouvrinae* samples from Gerakarou, Sesklo and Dafnero (Fig. 4). PO-077 F could represent an extreme individual of the population.

Some other *Gazella* horn cores from Vatera, which are not referred to *Gazella aegaea* n. sp., are also plotted in Figures 4 and 5. Four specimens are comparable to *Gazella borbonica* regarding their cross-section diameters, but seem to be shorter than the minimum of this species (DE VOS *et al.*, this volume). Another badly preserved horn core has the morphology of *Gazella bouvrinae*. As the available specimens are quite few and not well preserved, their attribution to these species is not sure. If *Gazella borbonica* and *G. bouvrinae* are really present together with *G. aegaea* n. sp. at Vatera, then this locality will be the second one (apart from Sesklo), where these three species occur together. Other Late Pliocene localities of Greece do not show this variation of gazellin forms (ΚΩΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΣΙΟΥ, 1997); however, the available samples are usually poor.

Apart from the similarity in their gazellin forms, the fossil faunas of Sesklo and Vatera also show a general faunal resemblance (Table 3). Both faunas are of “Middle Villafranchian” type. Sesklo has been dated to lower MN17 (MNQ17) (ΑΘΑΝΑΣΙΟΥ, 1996). The faunal assemblage at the F-Site of Vatera indicates a similar age (MN17), mainly because of the simultaneous presence of *Anancus arvernensis*, *Nyctereutes megamastoides* and *Equus*. *Nyctereutes* is smaller than the one from Sesklo, but the horse samples from both localities – apart from small metrical differences – are similar, representing large sized and relatively slender animals. The biochronological setting of Sesklo and Vatera in MN17 implies that the stratigraphic range of *Gazella aegaea* n. sp. is currently confined to this biozone.

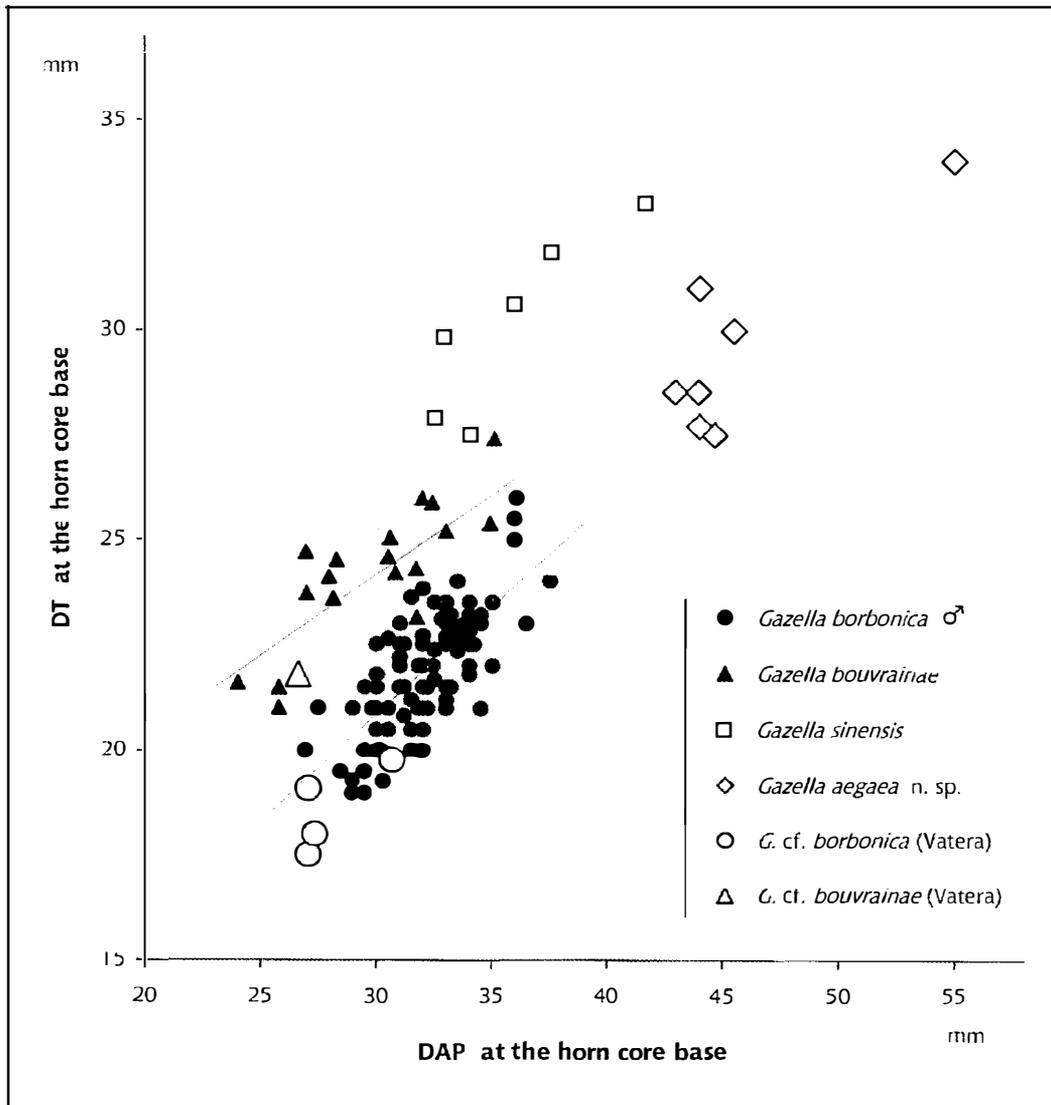


Fig. 4: Scatter-diagram comparing the dimensions of the cross-sections at the horn core base of Eurasian *Gazella* species. Measurements of *G. borbonica* (from La Puebla de Valverde, Spain) according to HEINTZ (1975). All other data according to ΑΘΑΝΑΣΙΟΥ (1996), ΚΩΣΤΟΠΟΥΛΟΣ (1996) and ΚΟΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ (1997).

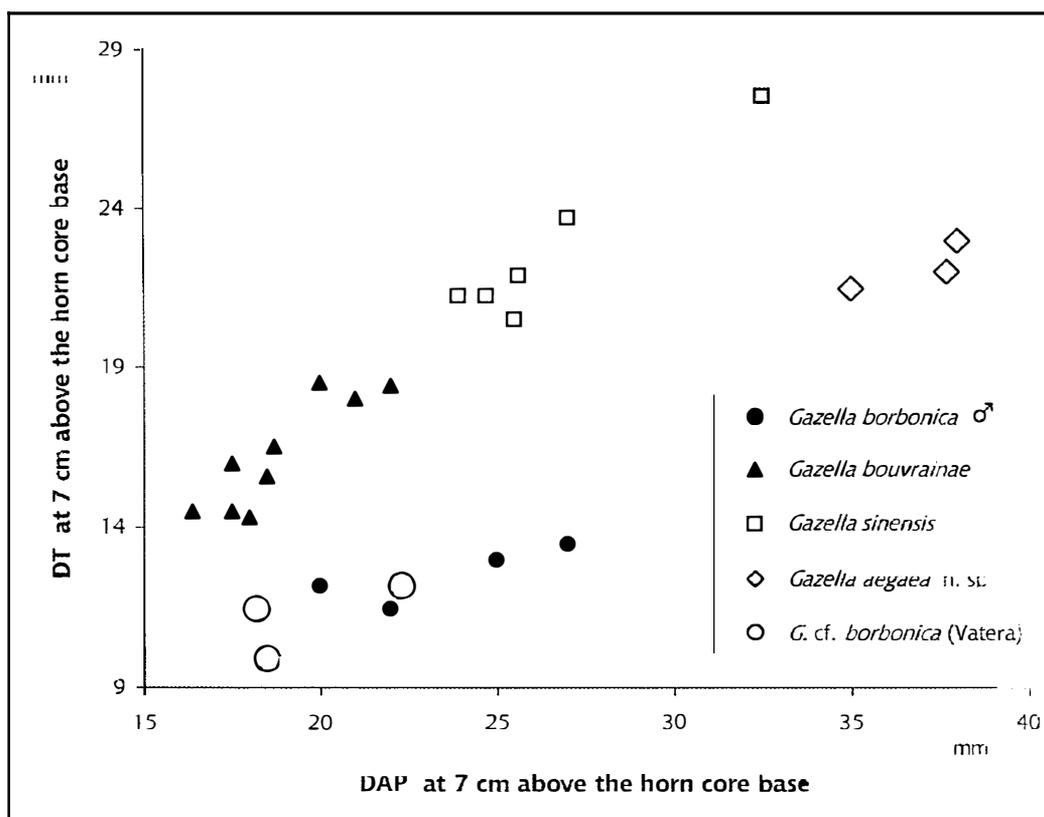


Fig. 5: Scatter-diagram comparing the dimensions of the cross-sections at 7 cm above the horn core base of Eurasian *Gazella* species. Data according to ΑΘΑΝΑΣΙΟΥ (1996), ΚΩΣΤΟΠΟΥΛΟΣ (1996) and ΚΩΣΤΟΠΟΥΛΟΣ & ΑΘΑΝΑΣΙΟΥ (1997).

ABSTRACT

A new gazellin species, *Gazella aegaea* n. sp., is described in the present paper. The studied specimens come from the localities Sesklo (Magnesia, Thessaly) and Vatera (Lesbos Island). The species is characterised by large size, horn cores with rugged surface and elliptical cross-section, strong and plicate sutures and large, triangular shaped supraorbital foramens. Stratigraphically it is confined to the biozone MN17 (Late Pliocene).

ΠΕΡΙΛΗΨΗ

Στην παρούσα εργασία περιγράφεται ένα νέο είδος γαζέλλας από τις θέσεις Σέσκλο (Μαγνησία) και Βατερά (Λέσβος). Η *Gazella aegaea* n. sp. χαρακτηρίζεται από μεγάλο μέγεθος, ισχυρούς γόμφους κεράτων ελλειπτικής διατομής, με ανώμαλη επιφάνεια, ανορθωμένες και πτυχωμένες ραφές στα οστά του κρανίου και μεγάλου μεγέθους, τριγωνικά υπερκόγχια τρήματα. Στρωματογραφικώς περιορίζεται στη βιοζώνη MN17 (Ανώτερο Πλειόκαινο).

Table 3

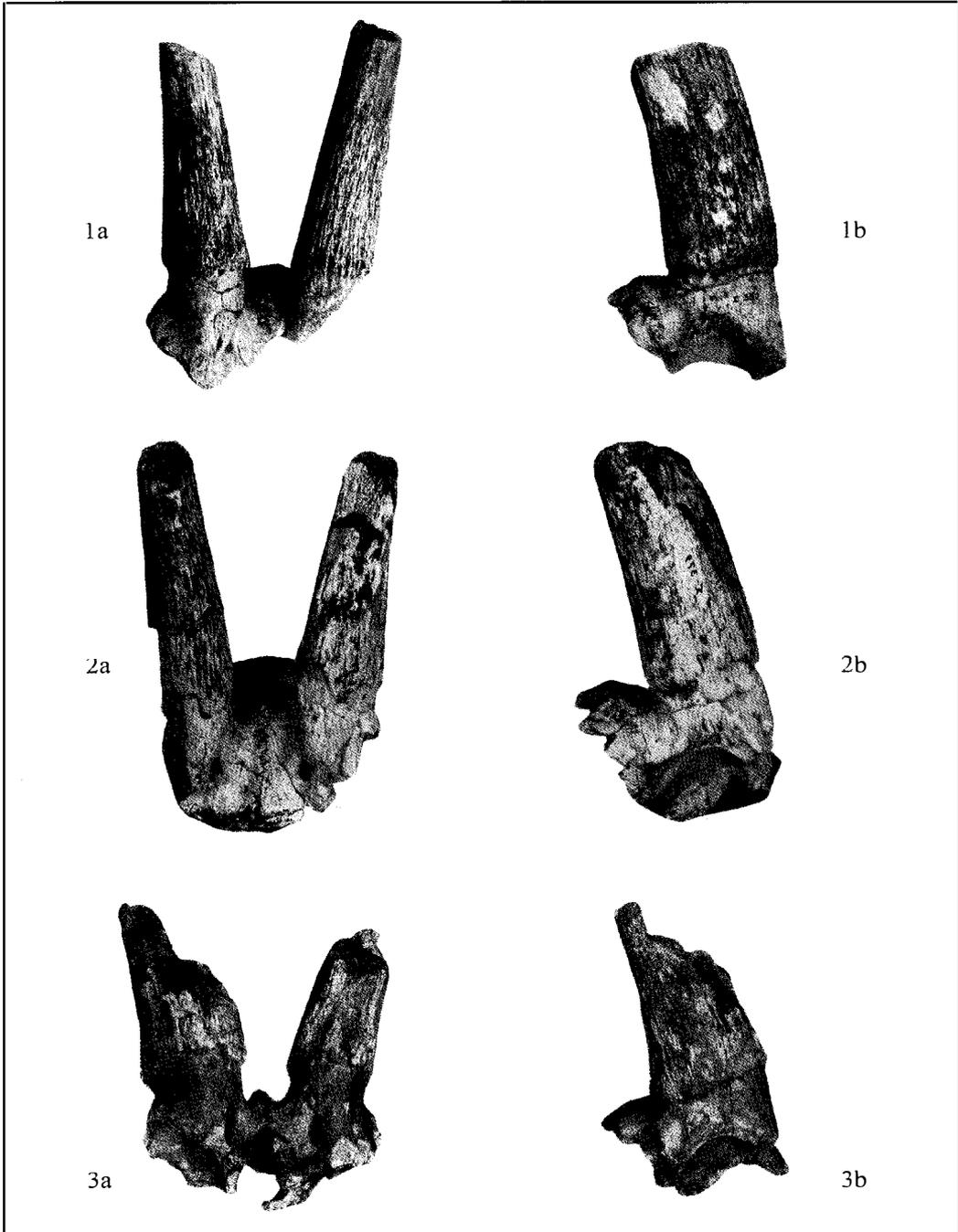
	SESKLO	VATERA F-Site
PRIMATES		
<i>Paradolichopithecus</i> sp.	—	+
CARNIVORA		
<i>Meles thoralis</i> VIRET, 1951	—	+
<i>Nyctereutes megamastoides</i> (POMEL, 1843)	+	+
<i>Vulpes alopecoides</i> FORSYTH MAJOR, 1875	cf.	—
<i>Ursus etruscus</i> CUVIER, 1823	cf.	—
<i>Pachycrocuta perrieri</i> (CROIZET & JOBERT, 1828)	+	—
<i>Homotherium crenatidens</i> (FABRINI, 1890)	+	—
PROBOSCIDEA		
<i>Anancus arvernensis</i> (CROIZET & JOBERT, 1828)	+	cf.
<i>Mammuthus meridionalis</i> (NESTI, 1825)	+	—
ARTIODACTYLA		
<i>Croizetoceros ramosus</i> (CROIZET & JOBERT, 1828)	cf.	—
<i>Dama rhenana</i> (DUBOIS, 1904)	cf.	+
<i>Eucladoceros</i> sp.	cf.	—
<i>Mitilanotherium inexpectatum</i> SAMSON & RADULESCO, 1966	+	cf.
<i>Gazella borbonica</i> DEPÉRET, 1884	+	cf.
<i>Gazella bouvrinae</i> KOSTOPOULOS, 1996	+	cf.
<i>Gazella aegaea</i> n. sp.	+	+
<i>Gazellospira torticornis</i> (AYMARD, 1854)	+	+
<i>Gallogoral meneghini</i> (RÜTIMEYER, 1878)	+	—
<i>Leptobos</i> sp.	—	cf.
PERISSODACTYLA		
<i>Equus stenonis</i> COCCHI, 1867	+	cf.
<i>Stephanorhinus</i> sp.	+	—

Table 3: Mammal fauna comparison of the localities Sesklo and Vatera F-Site (data according to ΣΥΜΕΩΝΙΔΗΣ, 1992; ΑΘΑΝΑΣΙΟΥ, 1996; DE VOS *et al.*, this volume).

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PLATE I



Gazella aegaea n. sp.

1: Σ-350 from Sesklo (holotype); a: anterior view, b: lateral view

2: Σ-379 from Sesklo; a: anterior view, b: lateral view (reversed)

3: PO-077 F from Vatera; a: anterior view, b: lateral view

all figures x ½ approximately