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FIRST RESULTS OF THE PALAEONTOLOGICAL STUDY OF THE FISSURE FILLINGS IN THE AREA OF HALYKES, MAGNESIA

By

A. ATHANASSIOU

ABSTRACT

In this paper a fossil fauna found in Mesozoic marble fissure fillings is described. The locality was found by Dr. G. Theodorou, who collected the first material. The fauna consists of Micromammals (Leporidae and Arvicolidae) and big Mammals (Elephantidae, Bovidae and representatives of the genera *Equus*, *Canis* and *Panthera*). A brief description of these findings is given, with emphasis on the carnivores. The locality is considered to be of Lower Pleistocene age.

ΣΥΝΟΨΗ

Η απολιθωμένη πανίδα που περιγράφεται στην εργασία αυτή, βρέθηκε σε αργιλικό πλήρωμα χάσματος, εντός μαρμάρων μεσοζωικής ηλικίας, στην περιοχή Αλυκών Μαγνησίας. Η θέση εντοπίστηκε από τον Επ. Καθηγητή του Πανεπιστημίου Αθηνών Γ. Θεοδώρου, ο οποίος έκανε και την πρώτη συλλογή υλικού. Η πανίδα περιλαμβάνει Μικροθηλαστικά (αντιπροσώπους των οικογενειών Leporidae και Arvicolidae) και μεγάλα Θηλαστικά (Elephantidae, Bovidae, αντιπροσώπους των γενών *Equus*, *Canis* και *Panthera*), για τα οποία παρατίθενται τα πρώτα αποτελέσματα, με έμφαση στα ευρήματα των Σαρκοφάγων. Η ηλικία της τοποθετείται στο Κατ. Πλειστόκαινο.

INTRODUCTION

The District of Magnesia (Thessaly – Central Greece) is an area of great importance for the continental Pleistocene of Greece, as a big part of its surface is occupied by clays rich in fossil Vertebrates. A part of these sediments and their fauna were studied by ΣΥΜΕΩΝΙΔΗΣ & ΤΑΤΑΡΗΣ (1982) and ΣΥΜΕΩΝΙΔΗΣ (1992), both papers concerning the petrology and palaeontology of the basin of Sesklon. Another study, VAN DER MEULEN & VAN KOLFSCHOTEN (1988), cites a faunal list for the fissure filling locality Volos, without giving any data about the exact location of the site. The present paper is a preliminary report on the fossil vertebrates of the locality Halykes, near the town of Volos, and it is a part of a general study on the Plio-Pleistocene fossil Vertebrates of Thessaly.

*** Πρώτα αποτελέσματα της παλαιοντολογικής μελέτης χάσματος της περιοχής Αλυκών Μαγνησίας.**

**** A. Athanassiou. University of Athens, Subfaculty of Geology, Department of Historical Geology and Palaeontology. Panepistimioupolis, 157 84 Athens, Greece.**

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The site is situated on the road Athens–Volos by the small village Halykes (fig. 1). It is an old marble quarry where the marble is already taken away while the clay that filled its fissures is left in place as useless. The first material was collected by Dr. G. Theodorou who discovered the locality in 1990. In the following years fossil material was also collected many times by the present author during field work in the area. Unfortunately, the toughness of the sediment, as well as the fragility and the bad conservation of the fossil bone remains made the whole work very difficult and time consuming. Most of the material was carried as clay blocks to the Laboratory of the Museum of Geology and Palaeontology of the Athens University, in order to be prepared using techniques which cannot be applied in the field.

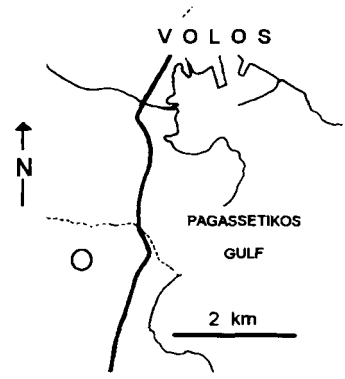

Fig. 1: Geographical position (circle) of Halykes locality

FAUNAL COMPOSITION

The fauna is variant including remains of small Mammals, Carnivora, Proboscidea, Bovidae and Equidae:

Order: Lagomorpha BRANDT, 1855
Family: Leporidae FISCHER, 1817

Leporidae gen. et sp. indet.

A great number of leporid long bones, mainly metapodials, was found. The dental remains are rather scarce, which is quite unusual. Nevertheless there is a small number of very poorly preserved skulls, mandibles and isolated teeth. Although the leporid material is abundant, a generic, or even more a specific, determination of the findings is at the moment impossible because the long bones, as well as the anterior cheek teeth, P^3 and P_4, which are of great importance for the determination of the lagomorphs, are broken or seriously damaged, so that they cannot give any reliable result. Thus it is very difficult to distinguish whether we are dealing with the genus *Lepus* or *Oryctolagus*.

We hope that we will find some good specimens in the material that is still under preparation, although the very bad condition of the fossils does not make us very hopeful.

Order: Rodentia BOWDICH, 1821
Family: Arvicolidae GRAY, 1821

Arvicolidae gen. et sp. indet.

A skull of large size, having both dental rows, is the only find that belongs to that family. The specimen is very bad preserved. The preparation has not been completed, so it cannot yet be determined. We tentatively assign it to a *Mimomys* species.

Order: Carnivora BOWDICH, 1821
Family: Canidae GRAY, 1821
Genus: *Canis* LINNAEUS, 1758

The material that is attributed to the genus *Canis* consists of some mandibular and maxillary fragments, that permit a specific determination. Some long bone remains are found as well. The following species were found:

Canis etruscus FORSYTH MAJOR, 1877

Material: Left maxilla fragment (Aλ-60) having the teeth P^3, P^4, M^1 and M^2; left maxilla fragment (Aλ-59), perhaps of the same individual as the two specimens are very similar, whose all teeth are broken; left mandibular ramous (Aλ-150) having the teeth C, P_3 (only a part), P_4 and M_1.

Measurements [max. length × max. width (× max. height, were available), in mm]:

Upper jaw – P^3: 15.6 × 6.0 ; P^4: 23.5 × 11.5 ; M^1: 15.9 × 18.1 ; M^2: 8.7 × 11.2 ; M^1-M^2-length: 25.0.

Lower jaw – C: 11.8 × 7.8; P_3: 13.8 × 5.1; P_4: 14.8 × 6.6 × 10.2; M_1: 25.4 × 9.1 × 17.5 (trigonid length: 18.9); M_1-M_2-length: 37.7; P_1-M_2-length: 85.3;
Height of jaw: below the P_4 (max., under the protoconid, labial side): 25.0
in front of the P_1: 17.5

(The measured lengths of P_3, M_1-M_2 and P_1-M_2 are not accurate, as they were partly taken on the alveoli. However they are not far from the real ones, because, as it can be easily observed on recent and fossil *Canis* mandibles, the proximal or distal ends of these teeth coincide with the proximal or distal ends of their alveoli respectively).

These measurements were compared with others taken by the present author on Valdarno and Olivola material in the collections of the Museums of Natural History of Florence (Italy) and of Basle (Switzerland) and with those given by KOUFOS (1987 & 1992b) for the fossils of Mygdonia basin (Macedonia, Greece).

The lower Pleistocene wolf *Canis etruscus* is represented in our material by fairly well preserved specimens, except for the Aλ-150 mandible which was broken into many pieces.

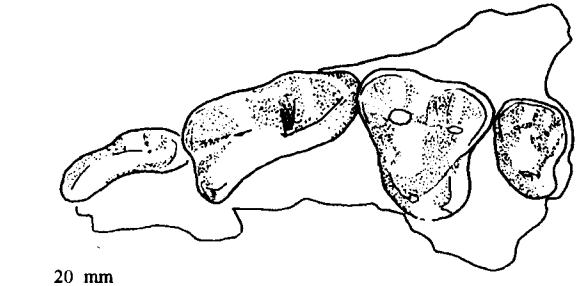

Fig. 2: The maxilla fragment Aλ-60.

The Aλ-60 maxillary fragment (fig. 2) belongs to a fairly old animal. Although its teeth are considerably worn, it is possible to observe some of their characters. M^1 has a week cingulum that forms a fairly big lingual cusp. The cingulum of M^2 is however well developed, while the whole tooth is rather long. The protocone of P^4 is rather small. P^3 is extremely long, being much longer than the maximum value measured on *Canis etruscus* material. All teeth have in general large dimensions and they are always bigger than the species mean values. This can be seen in the ratio diagram (fig. 4) where the Aλ-60 and the *Canis etruscus* mean values are plotted as log-differences from the *Canis arnensis* mean values (n = 3–6, Upper Valdarno).

Despite the bad condition of the mandible Aλ-150 (fig. 3, top), some observations on the teeth characters can be made: Its most prominent feature is the fairly long M_1, although this is not quite uncommon in the Florence material. The hypoconid and the entoconid are well developed. The metaconid is broken. P_4 has a very well developed posterior accessory cusp (metastylid), while the cingulum tends to form another smaller cuspid at the posterior edge of the tooth. P_3 is broken but a week accessory cusp and a cingulum can be easily observed. All teeth have high crowns. The mandible is curved (occlusal view) and the teeth are set very close to each other, both being characteristic for *Canis etruscus* (DEL CAMPANA, 1913). Some differences from the mean *Canis etruscus* can be easily seen in the ratio diagram (fig. 5), where the two lower jaws of the genus *Canis* from Halykes are plotted together with the mean values of *Canis etruscus* and *Canis arnensis* from Valdarno and Olivola. (This comparison is of course only indicative of the dimensions of our material as the specimens of Florence and Basle Museums derive from different localities and unknown horizons and therefore they cannot be considered as a sample of a unique population). The mean *Canis arnensis* (n = 3–8, Florence collection) is used as standard. The narrowness of P_3, P_4 and M_1 is easily observed, as their points are quite divergent from the mean, but they fall within the range of variation of *Canis etruscus*, being comparable to the minimum values of the species. On the contrary the length of the Aλ-150 teeth is considerably higher of the mean, but always lower from the maximum values of the species. The only difference from the *Canis etruscus* mean is in the height of the mandibular ramous in front of P_1, which in the case of Aλ-150 is lower than the minimum of the Italian material, being in the range of *Canis arnensis*. Despite this difference, we think that a mandible of such dimensions with high crowned teeth that form a curved tooth-row can be surely attributed to *Canis etruscus*.

Compared with the *Canis etruscus* material from Mygdonia basin, Macedonia, studied by KOUFOS (1992b), the Aλ-150 mandible has relatively longer and narrower P_3, longer P_4 and narrower M_1. All these differences are about 10 %.

The relative size of the Aλ-150 carnassial tooth compared with already known specimens of *Canis etruscus* and *Canis arnensis* is given in the scatter diagram between M_1-length and M_1-trigonid length (fig. 6). The diagram shows a very good specific distinction, better than the one of M_1 and M_2-lengths proposed by TORRE (1967) for this purpose. Despite the small sample, it seems to be a good chart for taxonomic purposes. It is clearly seen that the M_1 of the *Canis etruscus* from Halykes is one of the longest in the sample. The measurements of *Canis etruscus* from Mygdonia basin (GER-166 and GER-167) given by KOUFOS (1992b) are also plotted.

Canis arnensis DEL CAMPANA, 1913

Material: Skull fragment (Aλ-19) having the right M^1 and M^2; left mandibular ramous (Aλ-130) having the teeth P_2 (only a small part), P_3, P_4 and M_1.

Measurements (max. length × max. width, in mm):

Upper jaw – M^1: 12.8 × 15.0; M^2: 7.2 × 10.7; M^1-M^2-length: 21.7.

Lower jaw – P_3: 11.1 × 5.0; P_4: 12.9 × 5.8; M_1: 22.1 × 9.0 (trigonid length: 15.8)
Height of jaw below the P_4: 23.0.
(The poor preservation of the skull fragment didn't allow us to take any measurements).

The skull fragment Aλ-19 has only two teeth, M^1 and M^2. Both are so much worn that it is impossible to make any observation on their morphology. The only prominent cusps are the paracone and the metacone on M^1, while on M^2 even the metacone is completely worn out, leaving only a trace. The dimensions are small, placing this specimen in the range of *Canis arnensis* (fig. 4), although the great abrasion makes all measurements inaccurate (the tooth dimensions are smaller at the base of the crown). However, it isn't probable that the original dimensions would be comparable with those of *Canis etruscus*.

The Aλ-130 mandible (fig. 3, bottom) belongs to an aged individual, as its teeth are fairly worn. Both preserved premolars, P_3 and P_4, have only posterior accessory cusps and a small cuspid formed by the cingulum. On P_3 a vestigial anterior cusp is also observed. The mandibular ramous is rather low and the teeth are well aligned. The teeth dimensions match well with those of the *Canis arnensis* material (see ratio diagram, fig. 5). Some deviation from the mean *Canis arnensis* values is observed mainly in the width of P_3 and M_1, but all these values fall in the range of variation of the species. In the scatter diagram between the length of M_1 and the length of its trigonid (fig. 6) Aλ-130 lies almost on the trendline of the *Canis arnensis* sample. Compared with the mandibles of *Canis arnensis* from Apollonia (APL) and Gerakarou (GER) localities in Macedonia (studied by KOUFOS, 1987 & 1992b) our specimen appears to have practically the same dimensions.

Family: Felidae GRAY, 1821
Genus: *Panthera* OKEN, 1818

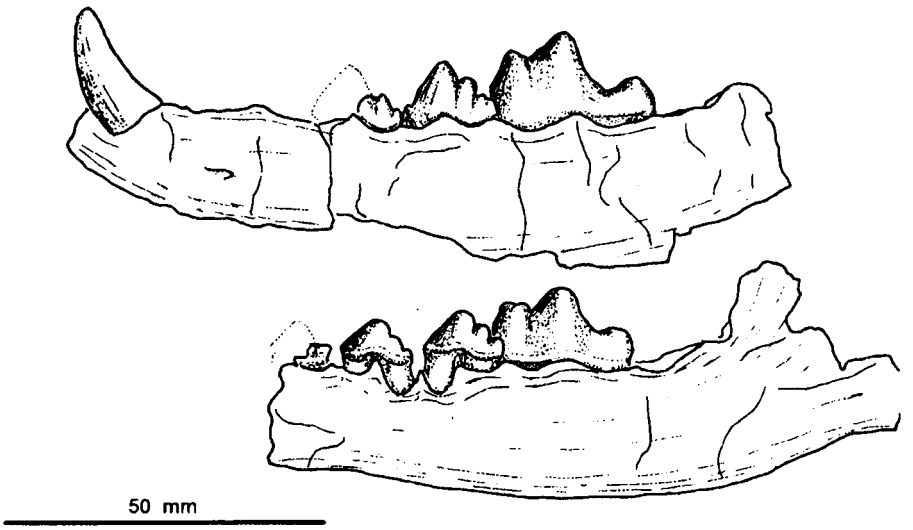

Fig. 3: The mandibles Aλ-150 (top) and Aλ-130 (bottom).

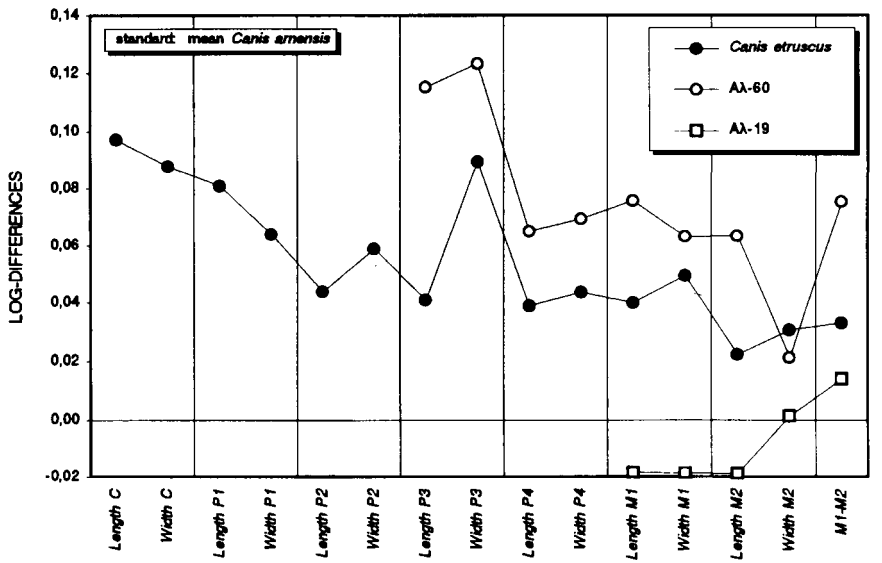

Fig. 4: Upper jaw log-differences from the mean *Canis arnensis* (Florence Collection).

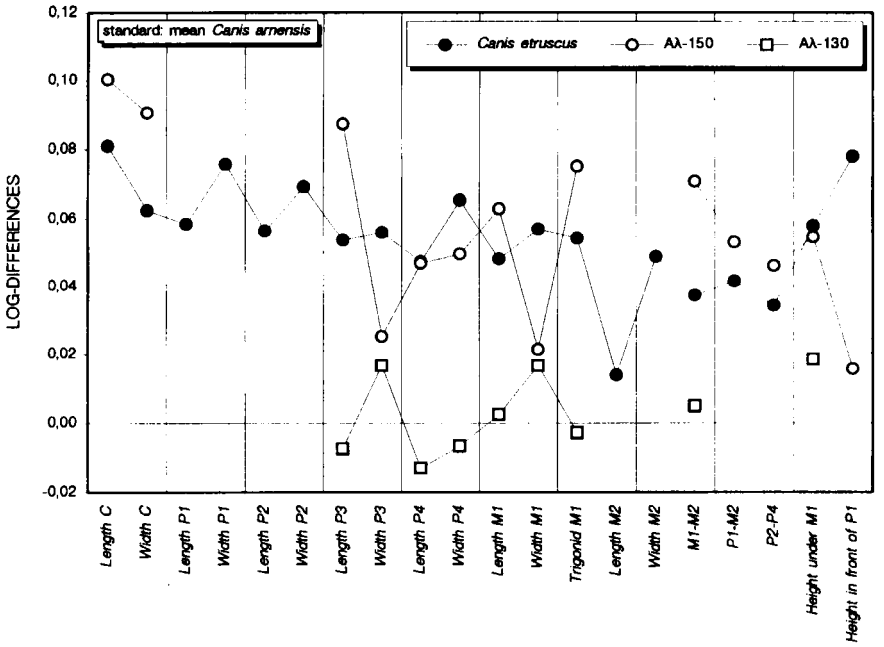

Fig. 5: Lower jaw log-differences from the mean *Canis arnensis* (Florence Collection).

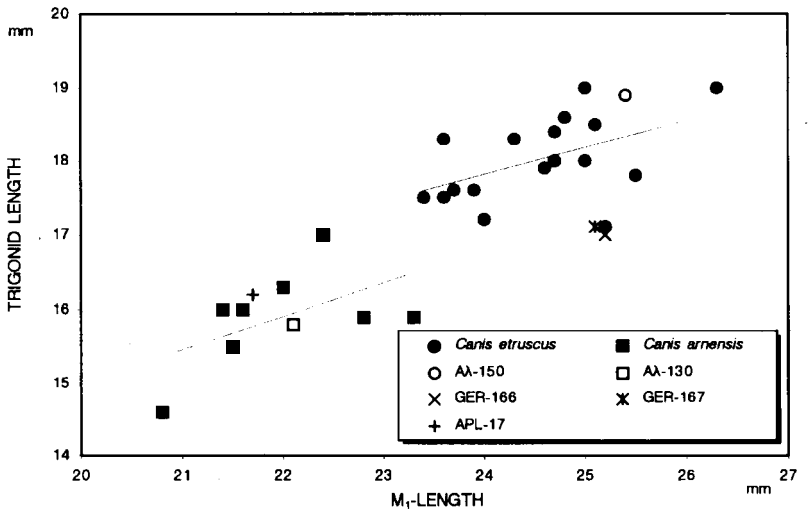

Fig. 6: Scatter diagram of M_1-length and the length of its trigonid.

Panthera gombaszoegensis (KRETZOI, 1938)

This species is represented in our material by a very poorly preserved mandible fragment (Aλ-7), having the teeth P_4 and M_1, as well as a small fragment of the P_3. The protoconid of M_1 is broken.

Measurements (max. length × max. width, in mm):

P_4: 22 × 11; M_1: 23 × 12
Height of the mandible behind M_1: 42; in front of P^4: 39

All teeth measurements, especially that of the M_1-length, are inaccurate because of the very poor preservation of them. However, they are indicative of the specimen size, placing it well within the variation of *Panthera gombaszoegensis*, as we see in the following table:

Author	P_4-Length	P_4-Width	M_1-Length	M_1-Width	Mand. height in front of P_4	Mand. height behind M_1
DEL CAMPANA (1915)	18.8-21.3	9.7-10.8	21.2-23.3	8.6-9.0	27-34	—
SCHAUB (1949)	20.2	10.5	24.5	10.6	—	—
BONIFAY (1971)	22.6-24.5	10.6-12.1	24.8-26.3	11.6-13.4	30.2-32.0	—
ARGANT (1991)	22.8-24.3	10.0-11.8	24.0-25.1	11.4-12.0	44.0	44.5

*** *Note:* the above cited authors use different specific or even generic names, but all were considered latter as synonyms of *Panthera gombaszoegensis* (SCHAUB, 1949; FICCARELLI & TORRE, 1968; HEMMER, 1971; HEMMER, 1972).**

The species is also known from Volos locality, Magnesia, Thessaly (VAN DER MEULEN & VAN KOLFSCHOTEN, 1988), and from Gerakarou, Mygdonia basin, Macedonia (skull; KOUFOS, 1992b).

Order: Proboscidea ILLIGER, 1811
Family: Elephantidae GRAY, 1821

Elephantidae gen. et sp. indet.

A fragment of a small unworn deciduous molar that possess the characteristic lamellar structure of Elephantidae was found in Halykes. Due to the lack of diagnostic characters this specimen cannot be further determined.[1]

Equus cf. *stenonis* COCCHI, 1867

The presence of a horse in Halykes is proved by a single find (Aλ-160), a mandible that has both rami and all teeth except I_3 dext. The specimen is laterally compressed; the rami are almost in contact. All teeth are worn, so their morphology cannot be studied in detail. However the cheek teeth (fig. 7) are clearly of stenonid type

[1] This deciduous molar is actually very similar with a specimen from Saint-Vallier (Basle collection), labelled D_2 of *Elephas meridionalis*.

(EISENMANN, 1981): the metaconid and metastylid (double knot) have generally rather convex lingual sides (that show minor folding in certain teeth) leaving a narrow and fairly deep linguaflexid (lingual groove) in between. The ectoflexid (vestibular groove) is very deep on the molars, reaching the point of the linguaflexid. There is not any pli caballinid. The enamel is thin and its folding is not intensive or complicated. Despite the general stenonid appearance of the teeth, some characters, as the not typically convex vestibular side of protoconid and hypoconid, are not in accordance with the typical stenonid pattern. These are however not uncommon in the *Equus stenonis* material. Some measurements (according to EISENMANN *et al.*, 1988, fig. 4) are given in the following table (in mm):

	1	2	3	4	5	10	11	12	13
Aλ-160	513	(130)	95	96	189	122	94	76	84

1: length (from the point between the alveoli of the I_1 to the back of the condyle); 2: muzzle length (from the point between the alveoli of the I_1 to the anterior border of P_2); 3: premolar length (alveolar, on vestibular side); 4: molar length (alveolar, on vestibular side); 5: lower cheek teeth length (alveolar); 10: height of the jaw posterior to M_3; 11: height of the jaw between P_4 and M_1; 12: height of the jaw in front of P_2; 13: length of the symphysis (from the point between the alveoli of the I_1 to the back of the symphysis).

The P/M ratio (premolar-length × 100 / molar-length) is 99 (cement excluded) or 104 (cement included in the measurements).

The length and width measurements for each tooth are given in the following table (cement excluded):

	P_2		P_3		P_4		M_1		M_2		M_3	
Aλ-160	L	W	L	W	L	W	L	W	L	W	L	W
left	33.7	17.0	29.5	15.5	29.5	18.2	26.0	16.8	27.2	15.5	36.0	14.8
right	—	17.2	29.6	15.9	29.7	17.7	25.7	15.7	27.4	15.3	36.3	14.0

Because of the teeth wear it is not possible to calculate any postflexid index.

The cheek teeth row length (measurement 5), the premolar and molar length (3 and 4 respectively), as well as the dimensions of each tooth are comparable to the size of fairly large individuals of *Equus stenonis*, especially to that of the larger *Equus stenonis* subspecies, *E. st. vireti* and *E. st. stenonis* (DE GIULI, 1972; PRAT, 1980; EISENMANN, 1981). Compared to the *Equus stenonis* cf. *senezensis* from Libakos, W. Macedonia (STEENSMA, 1988), the teeth of Aλ-160 are always among the larger specimens of the Libakos material. Nevertheless M_3 is distinctly larger than the maximum values from Libakos (length: 32.2 mm; width: 13.7 mm). The equids of Gerakarou, Mygdonia basin, Macedonia (KOUFOS, 1992a), also appear to be smaller, having maximum values that are often lower than those of Aλ-160. M_3 is much smaller measuring 26.2–32.2 mm in length and 10.6–13.4 mm in width. Both equid samples, from Libakos and Gerakarou, are referred by KOUFOS (1992a) to a new subspecies (*Equus stenonis mygdoniensis*).

In conclusion, it seems that the Aλ-160 mandible belongs to a stenonid horse with some more advanced characteristics. Nevertheless the lack of other equid remains, as well as the great abrasion of the teeth, do not allow any definitive specific determination. It is surely better to wait for more material.

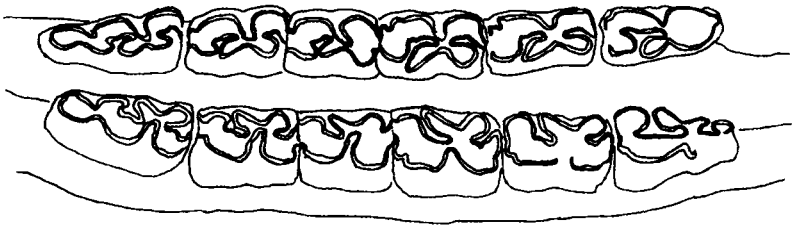

Fig. 7: Left and right dental series of the mandible Aλ-160.

Order: Artiodactyla OWEN, 1848

Family: Bovidae GRAY, 1821

Genus: *Gazellospira* PILGRIM & SHAUB, 1939

Gazellospira torticornis (AYMARD, 1854)

The presence of *Gazellospira torticornis* is indicated in the Halykes material by a single find, a mandibular fragment having the M_2 and M_3 (Aλ-33). The very large goatfold at the anterior part of M_3, the hypsodont molars, the almost flat lingual side, that are observed on the Aλ-33 specimen, are all characters of this species (PILGRIM & SHAUB, 1939). Both teeth are not much worn, especially M_3, which has an unworn talonid.

Measurements (max. length × max. width, in mm): M_2: •25 × 12.8; M_3: 32.0 × 13.0.

Order: Artiodactyla OWEN, 1848

Family: Bovidae GRAY, 1821

Bovidae gen. et sp. indet.

Numerous fragments of long bones that belong to a small animal of the family of Bovidae were found in Halykes, but the poor preservation and the lack of sufficient determinable material do not allow any generic determination.

BIOSTRATIGRAPHY

The taxa identified in Halykes can give useful information about the stratigraphic position of the locality. Canids of the form of *Canis etruscus* are typical for the Upper Villafranchian faunas, arriving in Europe at the beginning of the Olivola faunal unit (AZZAROLI, 1983; AZZAROLI *et al.*, 1988; TORRE *et al.*, 1992). *Canis arnensis* is a later immigrant; its dispersal in Europe is dated at the beginning of Tasso faunal unit. At the same time the large panther *Panthera gombaszoegensis* appeared in the fossil record.

The stratigraphic range of the horse *Equus stenonis* extends till the lower part of the Middle Pleistocene according to PRAT (1980). BONADONNA & ALBERDI (1987) consider the species as indicative of the Middle and Upper Villafranchian. According to AZZAROLI (1990) it survived until the end of the Early Pleistocene. The rather progressive characters of the specimen from Halykes could place it at the upper part of this range.

The antelope *Gazellospira torticornis* has a fairly wider stratigraphic range surviving throughout the Villafranchian, probably till the beginning of the Middle Pleistocene (DUVERNOIS & GUÉRIN, 1989).

The above mentioned data suggest a Lower Pleistocene (Upper Villafranchian) age for the fauna of Halykes, comparable with the age of the localities Gerakarou (KOUFOS, 1992a & 1992b) and Pyrgos (VAN DER MEULEN & VAN KOLFSCHOTEN, 1988), although the former has a fairly different Equid population. Volos locality (mentioned by the latter authors) is somewhat younger (Early Galerian). Halykes fauna may be synchronous to the Italian Tasso faunal unit (about 1.6–1.3 Ma old, according to TORRE, 1987); however it is better to wait for more and better preserved material in order to make such conclusions.

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