A New Early Pleistocene (Latest Villafranchian) Site with Mammals in Kalamotó (Mygdonia Basin, Macedonia, Greece) – Preliminary Report

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Abstract

Two new mammalian localities (KAL and KLT) of Kalamotó in Mygdonia basin have yielded several remains of carnivores - hyaenids and canids, equids, rhinocerotids, elephants, hippopotamids, 3-sized cervids, 2 bovids, and as well as micromammals. These are preliminarily attributed to: *Pachycrocuta brevirostris* (AYMARD, 1846), *Canis* sp., *Equus stenonis* COCCHI, *Dicerorhinus etruscus* (FALCONER, 1859), *Mammuthus* (*Archidiskodon*) *meridionalis* (NESTI, 1825), *Hippopotamus amphibius antiquus* DESMAREST, 1822 (= *H. major* CUVIER, 1824), *Praemegaceros pliotarandoides* (DE ALESSANDRI, 1903), *Cervus* sp., *Dama* sp., *Bison* (*Eobison*) sp., cf. *Leptobos etruscus* (FALCONER, 1859) and *Mimomys savini* HINTON, 1910. The best-preserved and most representative specimens are presented, as extensional excavations in this area are still in progress, since 2000. The age of this fauna is calculated to be of the Latest Villafranchian (MNQ 20). The paleonvironment is also discussed.

Key words: Mammals, Early Pleistocene (Latest Villafranchian), Kalamotó, Macedonia, Greece

1. Introduction-Historical Overview

The research in the broader area of Mygdonia basin started in 1977, when mammalian fossils of Villafranchian were found in Krimni (Sakellariou et al., 1979) and later in 1978 in Gerakarou (ZAMANIS et al., 1980, KOUFOS & MELENTIS, 1983). Since 1988 extensional excavations have been carried out by Prof. G. Koufos and his team in several sites (in Chrysavgi - CHR of Late Miocene, in a red-bed Formation including Gerakarou - GER, Vassiloudi - VSL and Krimni - KRI of Late Villafranchian, in Platanochori Formation including "ravin of Voulgarakis" - RVL, Marathousa - MAR, Riza - RIZ and Apollonia - APL of Latest Villafranchian) of the Mygdonia Basin (fig. 1). It must be noted that the MNQ 20 period is little known in Greece, and the most close to Mygdonia paleofauna is that found in the Aliakmon river deposits from various localities of the Grevena-Kastoria basin (West Macedonia) (Steensma, 1988).

Kalamotó village is situated 50 km far from Thessaloniki, and 5 km far from Zagliveri – the capital center of the Kalindia Prefecture. The research in the Kalamotó area started in 2000, after information given by Mr. Nikos Kyriazidis to the archaeologists K. Sismanidis (16th Ephorate of Antiquities, Ministry of Culture), who is the responsible of the archaeological research in this area and to Professor Dr. K. Kotsakis about fossils that were found and collected by the villager Giannis Gakis.

After five substantial excavating sessions, several fossils have been brought to light and a small exhibition of them has been created into a public building of the village. The Kalamotó includes two localities the Kalamotó 1 (KAL) and Kalamotó 2 (KLT). The former consists of lacustrine deposits, gray marls and silt-sands with mollusks *Planorbis* sp., *Unio* sp., etc), and it is situated 1 km south of the Kalamotó village, in the broader archaeological site of "Chiliodentra" (fig. 2), while the latter consists of red-brown-yellowish terrestrial deposits and it is situated 2 Km SW of the same village, very close to the well-known archaeological site of "Toumbes", in Vasmouras Rema (fig. 3). Both localities belong to the broader area of Mygdonia Basin, which have yielded several fossil remains of Villafranchian large mammalian fauna. The KAL-site consists of lacustrine deposits with gray marls and silt-sands and belongs to Platanochori Formation. The KLT locality has been systematically excavated in three local sites: the main site A in a vertical to main stream small ravine with abundant material, while there are other two B and C, very close to A, on the Vasmouras stream with findings in more consolidated sediment. On the other hand, most of the KAL findings are diversed into the sediments and they have been brought to light into the stream mainly after raining. Kalamotó tectonically belongs to Zagliveri graben, which is part of the Mygdonia basin. The Neogene / Quaternary deposits of the Mygdonia basin can be distinguished in two main groups: the fluvio-terrestrial Premygdonian one with conglomerates, sandstones, silt-sand sediments, red

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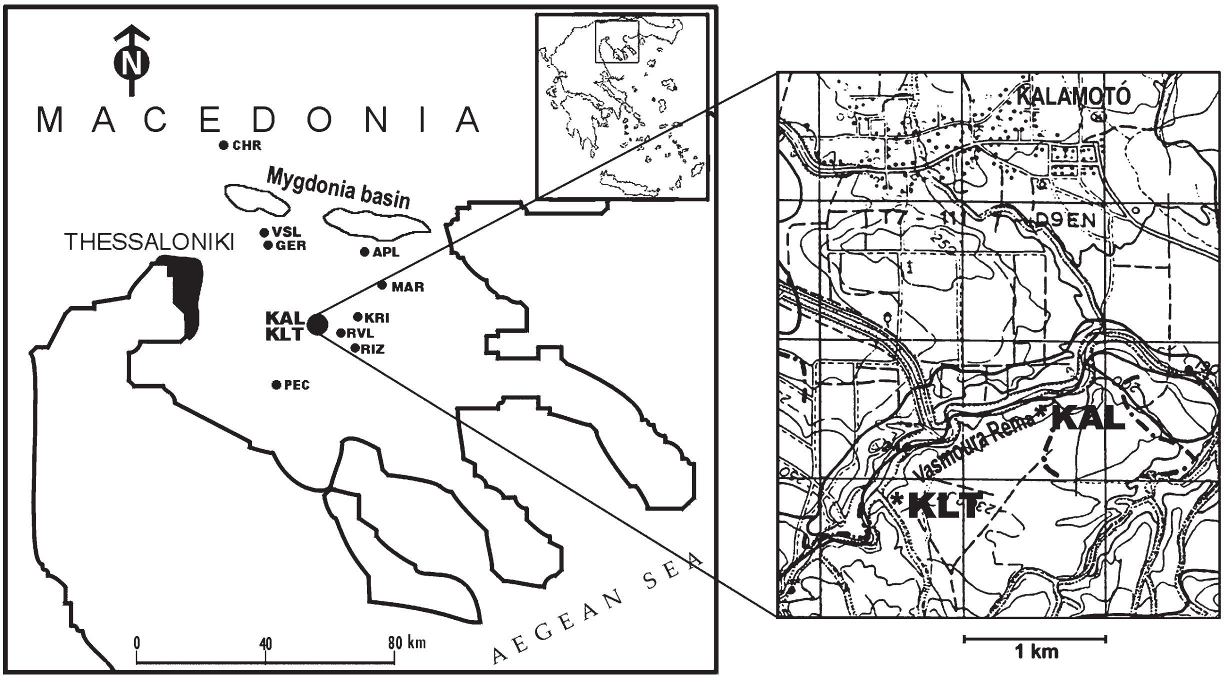


Figure 1: Map of Mygdonia Basin (North Greece) with the fossiliferous localities: Chrysavgi - CHR, Marathousa - MAR, Gerakarou - GER, Apollonia - APL, "ravin of Voulgarakis" - RVL, Riza - RIZ, Krimni - KRI, Vassiloudi - VSL excavated by Prof. G. Koufos and his team. The Kalamotó includes two localities KLT and KAL of different sedimentation. Their coordinates, measured with GPS, are: KLT - N 400 32,000' E 023 22,098' and altitude 215 m, KAL - N 400 32,423' E 023 22,804' and altitude 188 m. PEC: Petralona cave.

beds of Neogene - Lower Pleistocene age and the mainly lacustrine Mygdonian one with gravels, sands, sand-silts and alluvial deposits as the lake was gradually drained up during Middle-Late Pleistocene leaving the present lakes of Langada and Volvi as remnants of the initial Mygdonia Lake (Psilovikos, 1977; Psilovikos & Sotiriadis, 1983; Koufos et al., 1989, 1992, 1995).

2. Systematic Palaeontology

Order: Carnivora Bowdich, 1821
Superfamily: Feloidea Simpson, 1931
Family: Hyaenidae Gray, 1869

Pachycrocuta Kretzoi, 1938

***Pachycrocuta brevirostris* (Aymard, 1846)**

Material: Part of maxilla with dC^S, D^2 and P^4 KLT 201, 2 semi mandibles with D_2, P_4, M_1 KLT 214 sin and KLT 215 dex of the same individual with maxilla, mandible frag. with D_2, P_4 KLT 213 sin, dC^S KLT 201a sin, 5 isolated teeth: 2 I^2 KLT 272 sin, 273 dex, I_3 KLT 102 dex, 2 P frags. KLT 88, 101.

The giant hyaena is represented by part of the cranium of a juvenile with the two semi-mandibles that bear milk and unerupted teeth. The maxilla bears the D^2 and the unrisen P^4 and the mandibles the dC_i, D_2, P_3 unerupted, P_4 and M_1 in both sides (table 1, plate 1, fig. 1, 2).

Koufos (1992) describes young individual specimens of the short-faced hyaena from Gerakarou (GER - older Formation) that have many similarities either on dimensions, or on morphology and biological age with those from Kalamotó. Also the same species, poorly represented by 2 specimens, is referred in Apollonia (Platanochori - younger Formation) (Koufos & Kostopoulos, 1997). In Petralona, the reference of this species in the rich Middle Pleistocene fauna (Kurtén & Poulianos, 1977) is questionable, as only a fragment of a germ P2 was described among the relatively abundant material representing at least three different species of hyaenids (Tsoukala, 1989). Comparing the Kalamotó hyaena with some selected European sites, it is little more robust than that from Ceyssaguet (personal data, Bonifay et al., 1984), and of the same dimensions either of milk or of permanent teeth with that from Untermassfeld (Turner, 2001).

	Mandible KLT 215, dex.					Maxilla KLT 201	
	M_1	P_4	D_2	dC_i	D_2-M_1	D^2	P^4
L	29.8	27.0	16.3	9.0	81.0	17.0	-
B	15.6	17.0	9.0	7.2		10.0	25.4
Ltr^d/tl^d	24.0/6.0						

Table 1: *Pachycrocuta brevirostris* ex Kalamotó: Measurements of teeth. Abbreviations: Teeth. L: Length, B: Breadth, trd : trigonid, tld : talonid. Bones. L: Length, H: Height or length of the bone, D: Diameter, dia.: diaphysis, tr.: trochlea, DT: Transversal diameter or breadth, DAP: Antero-posterior diameter, art.: articulation, int.: internal, ext.: external, prox., pr.: proximal, dist. or d.: distal, a.: anterior, p.: posterior.

Figure 2: Kalamotó, KAL locality: Photo of a natural section on the Vasmouras stream, where the fossiliferous with large and small mammal layer, is shown.

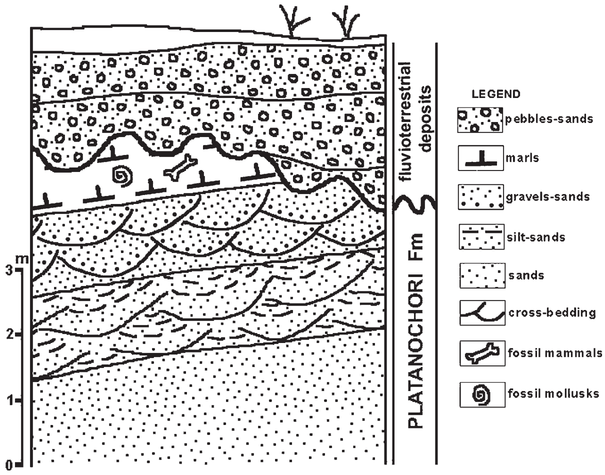


Figure 3: The stratigraphic column of the locality KAL of Kalamotó.

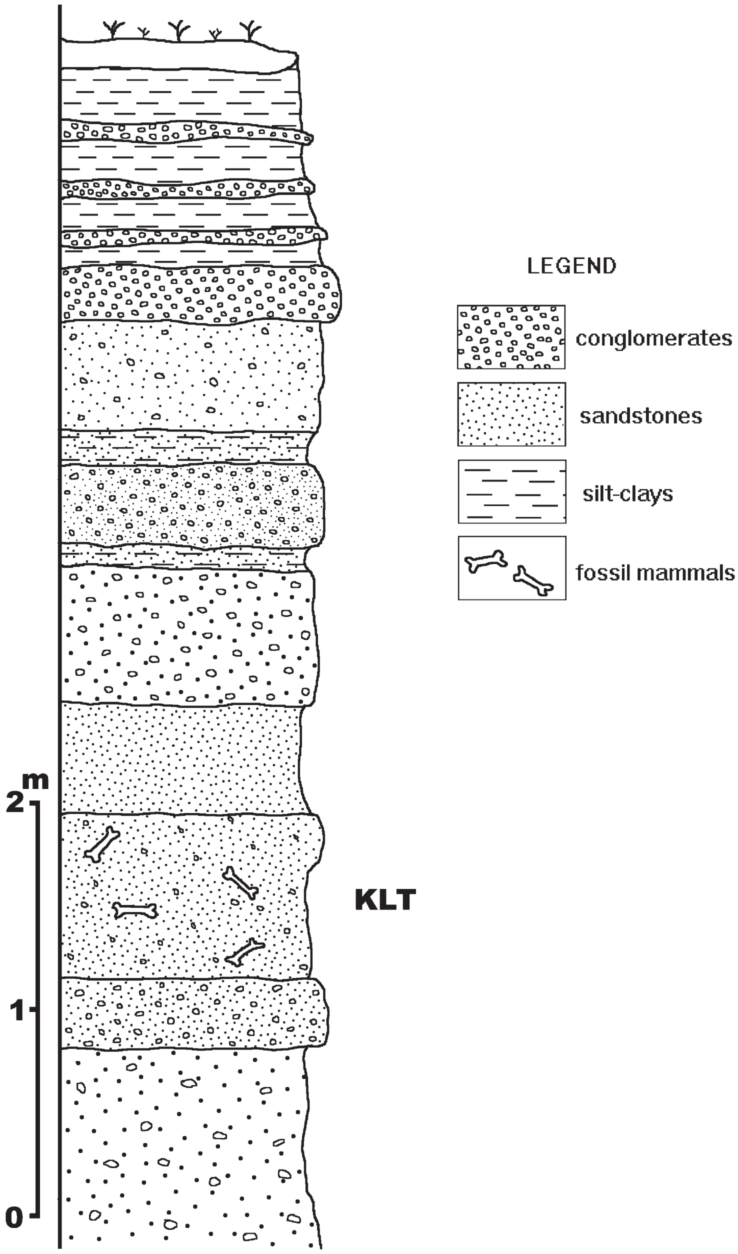


Figure 4: Kalamotó, stratigraphic column of the KLT locality with the fossil layer.

Superfamily: Canoidea Simpson 1931
Family: Canidae Gray 1821

Canis Linnaeus, 1758

***Canis* sp.**

Material: a distal radius, KLT 200, sin.

It is the poorest material in the Kalamotó fauna and the size of the radius (DTxDAP-distal = 19.87 x 11.24 mm) shows a rather slender wolf, may be of female. On the other hand, from the broader area of Mygdonia, Koufos (1992), Koufos, & Kostopoulos (1997) distinguish 3 species *Canis etruscus* (APL, GER), *C. arnensis* (APL, GER) and *C. apolloniensis* (APL), while for the latter one, they note similarities with the Petralona wolf.

Order: Perissodactyla Owen 1848
Suborder: Hippomorpha Wood 1937
Family: Equidae Gray 1821

Equus Linnaeus, 1758

***Equus stenonis* Cocchi, 1867**

Material: Cranium frag. and maxilla with D^1 dex and D^2-D^4 , M^1 unerupted sin+dex (large), KLT 350, 8 maxilla frags.: with D^2-D^4 KLT 336 sin, 2 with I^1-I^3 KLT 165, 298b sin, with I^2,I^3 KLT 282 dex, with P^3-M^1 KLT 30b sin, with M^1-M^3 KLT 29dex, with P^2,P^3 KLT 30a dex, with P^3, P^4 KLT 63, 24 isolated upper teeth: D^2 KLT 332 dex, 5 $D^{3,4}$ KLT 64, 192, 193, 329, 331, 2 $I^{1,2}$ KLT 166,167, 4 P^2 KLT 206, 208, 209 (unworn) sin, 316 dex, P^4 KLT 189 (large), 9 $P^{3,4}/M^{1,2}$ KLT 19 (frag. unworn), 191 (frag.), 207, 233 (unworn), 284, KAL 2, 83 sin (large), 90, 190, 2 M^3 KLT 194, 259 dex, 14 mandible frag.: with D_2-M_2 KLT 320 (large, hypsognath), 5 with D_2-D_4 KLT 124, 262, 280 (3 frags, a, b, c), 325 dex, 185 sin, with D_2,D_3 KLT 187 sin, with D_2 KLT 263 sin, with P_2, P_3 sin, I_{1-3} sin, $I_{2,3}$ dex KAL 100, with C_i dex, $I_{2,3}$ sin+dex KLT 291, with P_2-M_2 KLT 184 sin, with M_1-M_3 KLT 294, with P_2, P_3 KLT 186 sin, with M_3 KAL 101 sin, 14 isolated lower teeth: 2 D_4 KLT 253, 264 dex, D_i KAL 50, 4 $I_{1,2}$ KLT 26, 65, 66, 210, I_3 KAL 51 dex, 5 $P_{3,4}$ / $M_{1,2}$ KLT 188 (long), 292, KAL 3, 52, 53, tooth frags KLT 20(a-d).

5 scapulae: KLT 168 sin (almost complete), 4 homocotyle frags. KLT 21, 22 dex, 269, frag. KLT 227, 3 pelvis: KLT 157 dex (almost complete anonymus), 23 (acetabulum), 55 (frag.), 17 humerus: 16 distal frags. KLT 7, 27 (juv.), 45, 51, 118, 119, 120, 226 (small trochlea frag.), 236, 268, 303, 310, 339, 341, 342, KAL 14 (a,b), diaphysis frag. KLT 92, 7 femur: 2 almost complete KLT 340 (frag.) and 347, caput KLT 11, proximal frag.+1/3 dia. KLT 302, diaphysis frag. KLT 327, 2 distal frags KLT 97 115 sin, 10 radius: 3 complete KLT 239 dex (well preserved), KLT 2, 121 sin, 2 proximal frag. KLT 85 sin, KAL 43 sin, 5 distal frags: KLT 122, 228, 285, 287, KAL 99, Ulna: proximal frags KLT 32, 16 tibiae: 2 complete KLT 150 and 151 dex, 2 prox.+distal frags., KLT 229, 311 dex, (both destroyed), 2 proximal frags. KLT 123 sin, 346 (destroyed), 10 distal frags: 44, 152, 153, 154 dex, 155, 156, Error! Not a valid link.234 sin, 343, KAL 96 sin (dist.), 12 astragali: KLT 52 (rolled), 89, 107, 110, 111 283, 297 dex, 108, 109 sin, 266 (frag.), 323 (half frag.), KAL 6 (frag.), 8 calcanei: 3 complete KLT 164 dex, 299 dex (well preserved), 112 sin, 3 proximal frags.: KLT 86 dex, 288, KAL 97, 2 distal frag. KLT 113, 114 dex, 10 Mc3: 6 complete KLT 270, 92, 93(+Mc2) dex, 99* (+Mc2+mc4), 91 (+Mc2) sin, KAL 1, 2 almost complete KLT 242, KAL 49 (both eroded), prox. frag. KLT 237, distal frag. KLT 59, 10 Mt3: 4 complete KLT 1, 94, 271 sin, 304 dex, 2 almost complete KLT 104 dex, 225, 3 proximal frag. KLT 68 (+Mt2+tarsal), 103, 298a (both+Mt2) sin, distal frag. KLT 300, 5 Mp3: distal frags. KLT 57, 58, 95, KAL 17, Mp3: dia. frag. KLT 265, Mp3+Mp2 frag.: KLT 28, 7 Ph1: KLT 3a, 33, 34 (juv.), 60*, 260, KAL 55, 60, 4 Ph2: KLT 3b, 35*, 36, 61, 5 Ph3: KLT 37*, 38, 54(frag.), 261, 333 frag.

Besides there are many tooth fragments, about 8 carpal and tarsal bones, 11 metapodials (Mp 2 / 4), vertebrae, ribs, 2 ossa sesamoidea and many bone fragments. * same individual (in connection, plate 1.10). Rich material (more than 200 specimens), the most abundant from both KLT and KAL localities (plate 3/7,8), represents the Kalamotó stenonoid horses. It consists of cranium, maxilla and mandible fragments, milk and permanent teeth and elements of the entire postcranial skeleton. Some of the specimens belong to the same individual such as carpals/ tarsals-metapodia-phalanges (plate 1.10), humerus-radius-ulna, astragalus-calcaneus, all in anatomical connection. Many specimens belong to juveniles, as there are also maxillas or mandibles with milk teeth.

On the table 1, there are indicative measurements (taken by V. Eisenmann) of the best preserved metapodials, which are the most significant and representative elements of the horse skeleton. The Kalamotó stenonoid horse seems to be less robust than the large-sized *Equus apolloniensis* (MNQ 20), but more robust (lesser the KAL specimen) than the small-sized *E. s. mygdoniensis* (MNQ 18/19) (Koufos et al., 1997). The study of the Kalamotó horse is in progress (Eisenman & Tsoukala, in preparation).

Suborder: Ceratomorpha Wood, 1973
Family: Rhinocerotidae Owen, 1841

Dicerorhinus Gloger, 1841

Dicerorhinus etruscus **(Falconer, 1859)**

Material: P^2 KLT 149 sin, M_1 KAL 44 sin, rib fr. KAL 45, 2 ulnas KLT 117 dex, 293 sin, femur distal frag. KLT 349 sin.

Few specimens - six are the most characteristic - represent the Kalamotó rhino: an upper worn premolar (P^2 sin, LxB = 32.76 x 36.96 mm) and a lower middle worn (M_1 sin, LxB = 42.73 x 27.05 mm) molar, two ulnas –right and left, probably of the same individual (DTxH prox. art. = 80.03 x 67.08 mm) and a rib fragment. The profil of the ectoloph is flattened with well distinguished mesostyle, the pre-fosset is closed, the post-fosset is small and open posteriorly and there is an antero-palatinal cingulum. Compared with that from Petralona Middle Pleistocene *D. hemitoechus* (Tsoukala, 1989) the premolars are of the same length, while the KLT is slightly broader than the latter.

On the lower molar the paralophid is well developed and the posterior valley is of U shape. The ulna proximal articulation is slightly asymmetric with intense beak of

Mc3	1	2	3	4	5	6	7	8	8’	9	10	11	12	13	14
KAL 1	220.0	212.0	32.0	25.5	44.0	29.0	35.0	15.0	—	0	44.0	42.5	32.0	25.6	27.5
KLT 31	230.0	221.0	32.1	28.0	49.0	32.5	40.0	17.0	8.0	0	44.7	—	34.0	27.0	29.9
Mt3									13b						
KLT 1	273.0	266.0	31.0	29.5	47.0	39.0	44.5	10.0	26.9	10.5	43.0	44.0	(35.0)	27.0	28.0
KLT 94	263.0	256.0	29.0	33.0	44.0	39.0	41.0	11.0	24.0	9.0	42.0	42.5	35.0	26.0	28.5

Table 2: *Equus stenonis* ex Kalamotó: Measurements of the third metapodials. Abbreviations: 1. L, 2. Lext., 3. DTdia., 4. DAPdia., 5*. DTpr.art., 6*. DAPpr.art., 7*. DTpr.art.(magnum), 8*. DTpr.art.(hamatum), 8’*. DTpr.art. (hamatum-post.), 9*. DTpr.art. (trapzoid), 10. DTdist. supra art., 11. DTdist. art., 12. DAPdist.art., 13. DAPmin int.cond., 14. DAP max.int. cond.,*for Mc3, for Mt3: 5. DTprox., 6. DAPprox., 7. DTpr.art.(ectocun.), 8. DTpr.art.(cuboid), 13b. DAPmin ext.cond. (Eisenmann, 1979).

olecranon (Plate 3.1-4). The femur is rather long and robust. The anterior distal trochlea is missing, while the condylii are well preserved. Most part of diaphysis from trochanter minor, including the third trochanter is preserved. The dimensions of femur are: DTdistal = 130, DAPdistal = (135), DTdia.min = 67, DAPdia. = 50, DTdia. at 3^{rd} trochanter = 108 mm. The dimensions and the morphology of the specimens described above, allow the KLT and KAL rhino to be attributed to *D. etruscus* of 19/20 zone, when the large-sized Pleistocene *D. mercki* first appeared (Guerin, 1980).

Order: Proboscidea Illiger, 1811
Suborder: Elephantoiformes Tassy, 1988, 1921
Family: Elephantidae Gray, 1821

Mammuthus (*Archidiskodon*) (Pohlig, 1885, 1888)

M. (*A.*) *meridionalis* (Nesti, 1825)

Material: I^2 KAL 59, M_i frag. KAL 85, 2 plate frags KAL 56, 57, 2 rib frags KAL 81, KLT 90, humerus dia. KAL 47, femur - caput KAL 15, ulna prox. frag. KAL 48, tibia prox. frag. KLT 4, fibula frag. KAL 22, carpal and tarsal frags KAL 29, metapodial frags KAL 10, 11, 13, 94.

The tusk (plate 2, fig. 7) was found into the water of the Vasmoura Rema after raining, therefore it is poorly preserved (crashed in small pieces), preserved in a plaster mold. It is curved and slightly torsioned. The preserved length is 2200 mm, and the diameters, measured on the open surface of the mold, from the proximal end of the tooth to the middle (every ~15 cm) are: 115, 121, 115.5, 112.5, 80 and 66 mm about the middle of the tooth. The lower molar was found in the grey sediments (KAL) as well as the tusks, next to the megacerini skull with the antlers. It is destroyed and only 6,5 plates are preserved (the preserved dimensions are: L = 145 mm, B = 83 mm and the enamel thickness varies among 2.78, 3.14, 3.66 mm). Of the molar (plate 2, fig. 8, 9) the thickness of the cement, the shape of the plates and the number of the plates per 10 cm (~ 5/10 cm), as well the slightly curved and torsioned tusks indicate the *M.* (*A.*) *meridionalis*. The dimensions of the tusk compared with those of the same species from Megalopolis (Melentis, 1961) show a female individual. The post cranial skeleton is represented by various bones, mainly small fragments, on which no measurements can be taken. The most indicative is the caput femori of a juvenile (Dmax = 158, Dmin = 145 mm). It is notable that very few specimens come from the KLT site, while the most are from the gray marls of KAL site.
M. (*A.*) *meridionalis* is frequently present in the typical Villafranchian faunas of Greece, represented mainly by molars. The Apollonia elephant is scanty represented by a maxilla fragment with milk teeth (Koufos & Kostopoulos, 1997).

Order: Artiodactyla Owen, 1848
Family: Hippopotamidae Gray, 1821

Hippopotamus Linnaeus, 1758

H. amphibius Linnaeus, 1758

H. amphibius antiquus Desmarest, 1822 (= *H. major* Cuvier, 1824)

Material: Tooth frag. KAL 9, humerus-radius et ulna KLT 62 dex, humerus prox. KLT 12 dex, 2 radius et ulna KLT 224, 348, tibia distal KLT sin, 9 Carpal bones: unciform KLT 125 dex, 2 magnum KLT 126 sin, 145 dex, scaphoid KLT 130 sin, 2 pyramidal KLT 128 dex, 143 sin, 3 semilunaris KLT 219 sin, KLT 127, KLT 144 dex, 6 tarsal bones: 2 astragalus KLT 220 dex, 106 and calcaneus KLT 105 dex of the same individual, calcaneus KLT173 sin, cuboid KLT 138b, navicular KLT 129 sin, 12 metapodials: Mc 2 KLT 134+24 dex, 3Mc3 KLT 69 dex, 131sin (same individual), 221 dex, Mc4 KLT 132 sin (slender), Mc5 KLT 135 dex, Mt2 KLT 223 dex, Mt4 KLT133dex, 2Mt5 KLT 136 dex, 137sin (same individual), 2 metapodia distal frags. KLT 6,

	Semilunaris, Lunatum			Magnum	Pyramidal	Unciform	Scaphoid	Astragalus	Calcaneus	Navicular	Cuboid
	KLT 144	KLT 127	KLT 219	KLT 145	KLT128	KLT 125	Klt 130	KLT 134+24	KLT 105	KLT129	KLT 138b
L	75.0	73.5	74.5	58.5	60.5	62.0	58.5	117.0	218.0	68.5	87.0
DT	63.5	67.0	68.0	62.5	73.2	85.8	37.0	106.5	102.0	53.5	90.0
DAP	98.0	100.0	98.5	101.0	46.0	95.5	81.3	75.5	91.0	74.5	86.0

	Mc2	Mc3			Mc4	Mc5	Mt2	Mt4	Mt5	
	KLT 134+24	KLT 221	Klt 69	KLT 131	KLT132	KLT135	KLT 223	KLT 133	KLT 136	KLT 137
L	140.0	170.0	166.5	166.8	149.8	115.5	101	142.0	96.2	99.6
DT prox.	—	66.0	64.5	62.0	59.0	49.9	31.5	(52.0)	(34.0)	33.5
DAP prox.	46.9	63.0	61.3	64.5	62.3	(44.6)	—	65.0	48.0	50.2
DT dia.	37.4	55.5	49.0	49.2	48.5	46.0	32.5	48.0	35.7	33.8
DAP dia.	25.8	35.0	28.2	30.0	29.5	32.0	28.5	29.0	27.1	32.8
DT dist.	47.5	63.0	62.0	64.8	59.0	54.5	41.5	60.0	43.5	43.0
DT d.art.	47.5	59.0	60.5	63.8	56.5	47.0	37.0	57.2	38.2	38.2
DAP dist.	40.3	51.0	44.5	46.3	45.0	43.5	38.0	45.5	46.0	44.5

Table 3: *H. amphibius antiquus* ex Kalamotó: Measurements of carpal and tarsal bones and metapodials.

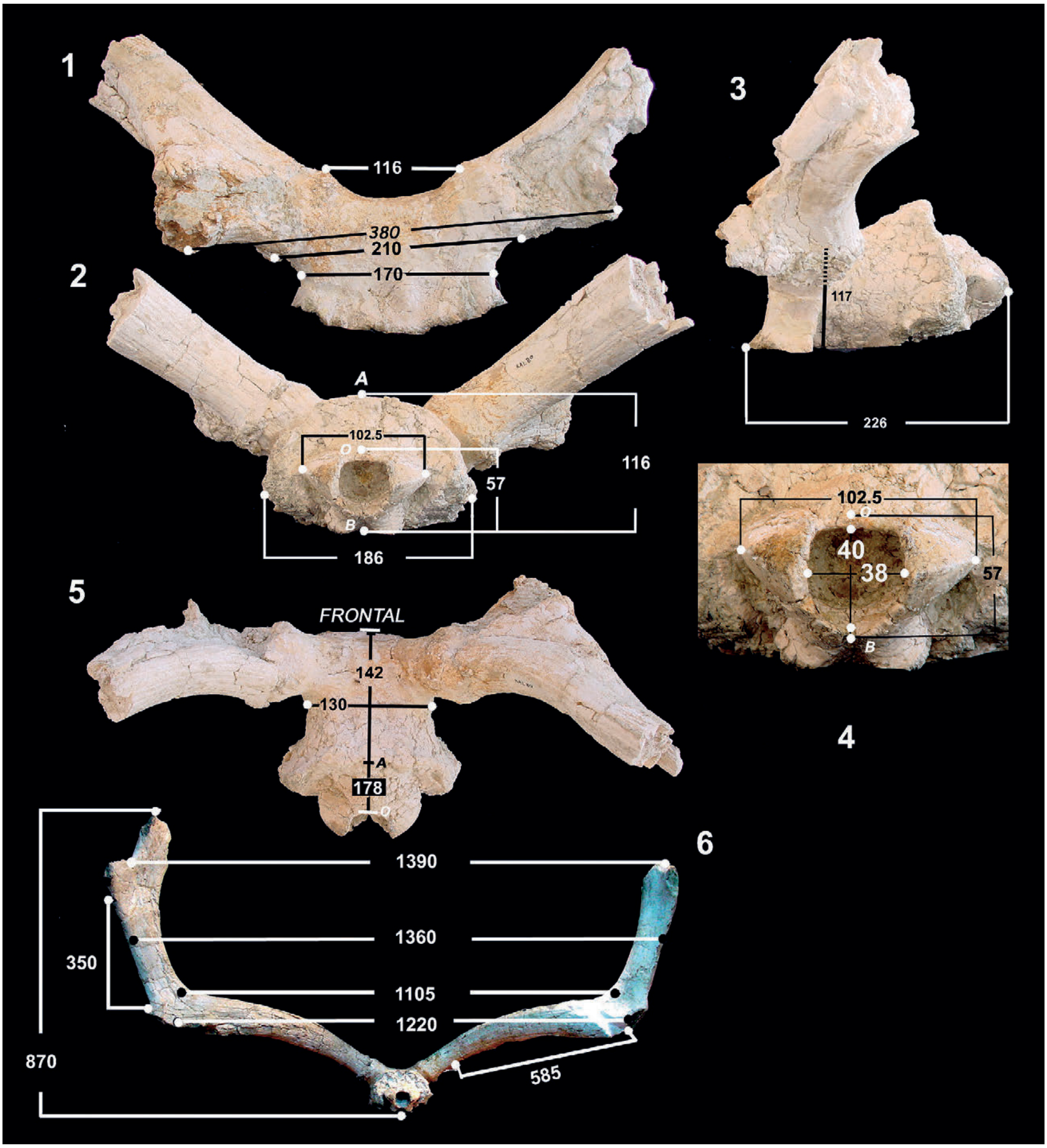


Figure 5: *P. pliotarandoides* ex Kalamotó: Antlered skull KAL 80, with measurements. 1) Anterior view – inner distance between the burrs (116 mm), distance between the first (outer) tines (380 mm), external distance between the burrs (210 mm), least frontal breadth (170 mm). 2) Posterior view – height (Basion-Acrocranion = 116mm) and breadth (186 mm) of the occipital region. 3) Left view – height of the cranium between the pedicels (117 mm), length of the specimen (frontal-occipital condyles = 226 mm). 4) Occipital view – detail of the area with condyli and foramen magnum - greatest breadth of the occipital condyles (102.5 mm), height (40 mm) and greatest breadth (38 mm) of the foramen magnum, height Opisthion-Basion (57 mm). 5) Dorsal view – least breadth of the parietals behind the pedicels (130 mm), Acrocranion-frontal (142 mm), Opisthion-frontal (178 mm), 6) Posterior view of the antlered skull – total height of the specimen (870 mm), distance between the posterior and distal tine (350 mm), distance between the posterior tines: externally (1220 mm) and internally (1105 mm), distance between the vertical parts of the beams (in the middle = 1360 mm), and distance between the dichotomies of the first bifurcation (1390 mm).

69, 4Ph1 KLT 139, 140, 141 (frag.), 351, Ph2 KLT 142.

Relatively rich material (~39 specimens) represents the hippos: Humerus-radius et ulna-carpals-metapodia and phalanges in anatomical connection show the death area. There are also two calcanei and astragali, another radius-ulna, carpals and tarsals (plate 1, fig. 3-9).
Of the teeth only a small fragment has been found up to now. Owing to the large size of the limbs, the humerus is very stout indeed for an artiodactyl. The deltoid and

supinator ridges are marked. The shaft is rather slender and the tuberosities even more prominent and the trochlea are clearly more like a double sheave pulley block. The deltoid ridge rises into a prominence rather triangular, seen in sagittal profile. The dimensions are: L = 490.0, DTprox. = 135.0, DAPprox. = 232.0, DTdia. at tubeositas deltoidea = 114.0, DTdia.min. = 74.0, DAPdia. = 82.0, DTdistal = 183.0, DAPdistal = 155.0 mm. The radius and ulna are extraordinarily short and stout, being almost rectangular in profile. Owing to its shortness, the ulnar shaft has marked posteriorly concave curve and a long relatively slender olecranon. The incisura semilunaris is very open. The dimensions are: ulna L = 430.0, DT art. cavitas sigmoides major = 99.0, DAPdia. = 43.0, DTdistal = 44.0, DAPdistal = 62.0 mm, radius L = 300.0, DTproximal = 124.0, DAPdia. = 56.0, DTdistal = 113.0, DAPdistal = 94.0 mm, radius et ulna: DT distal = 180.0, DT d.art. = 153.5 mm. These dimensions, as well as these of carpal and tarsal bones and metapodials given in table 3, correspond well with those of the hippo from Untermassfeld (KAHLKE, 1997a), Saint Prest (GUÉRIN et al., 2003) and its synonym *H. major* described by FAURÉ (1985), showing the Kalamotó hippo slightly less robust than the formers.

Suborder: Ruminantia SCOPOLI, 1777
Family: Cervidae GRAY, 1821

The cervid material consists of about 50 specimens. Further more; one of the most impressive specimens is the skull fragment with the antlers of the giant deer. Also there are enough mandibles and maxillas with permanent and milk teeth, as well as isolated teeth and metapodials that show the presence of at least three-sized deer. Many localities presents three or more different species (and sizes) of cervids: Petralona (TSOUKALA, 1989, 1991), Megalopolis (MELENTIS, 1964), Vallonet (LUMLEY et al., 1988, MOULLÉ, 1997-98), Saint Prest (GUÉRIN et al., 2003), Untermassfeld (KAHLKE, 1997).

Praemegaceros PORTIS, 1920

P. pliotarandoides (DE ALESSANDRI, 1903)

Material: 2 Skull frags with the antlers KAL 80 and KLT 301, maxilla with M_1-M_3 sin, mandible with P_2-M_3 KLT 267 dex, M_2 KAL 54 dex, 3 astragali KLT 254 dex, 314, 174 sin, calcaneus KLT 337 dex, 3Mt3+4 KLT 321 (with the cuboscaphoideum in situ), 258 dex (prox. frag.) and KAL 16, Ph1 KAL 4.

The almost complete frontal with the large robust antlers is one of the more significant specimen found up to now in Kalamotó (plate 2, fig. 1-5). It was found in 2004 in the grey argils of KAL (plate 2, fig. 6) and smaller fragment of the cranium the part of the antlers another was also found in 2003 in the KLT site. It is the second so complete skull with antlers found in Greece, while the first one was found in Aliakmon river deposits and described by MELENTIS (1967). The dimensions are given on fig. 5. The maximum span of the antlers is 238 mm. The clear right angle of the antlers confer to *verticornis*-group (according to AZZAROLI, 1979, *P. pliotarandoides* and *P. verticornis* are synonyms), on the other hand the absence of the middle tine, that exists always in this group, allows the Kalamotó specimen to be attributed to *P. pliotarandoides*. The Kalamotó giant deer differs from that of Aliakmon to the absence of an accessory small basal prong situated very close to the burr The KLT skull is more fragmentary, and only short part of the antlers is preserved. Some measurements are: DT cond. occip. = 100, Hcond.occip. = 46, DT foram. occip. = 36, H foram. occip. = 37, D max burr = 86, Dmin burr = 57.5, Circumference of burr = 225, H first tine = 77, DT first tine = 39 mm. The maxilla bears worn molars, while the mandible is very well preserved with all little to middle worn cheek teeth, the P4 of which has open valleys (table 4, plate 3, fig. 12,13). The calcaneus has dimensions L = 159.0, DT 54.0, DAP = 58.0, DT tuber = 40.67, DAPtuber = 45.0, H art. (for ct) = 43.3 (very long), H art. (for malleolus) = 32.4 mm. The metatarsals are poorly preserved (table 5, plate 1, fig. 15-17).
The Kalamotó *Premegaceros* presents more similar dimensions with that from Voigtstedt (KAHLKE, 1965) of Early Pleistocene, than that from Süssenborn (KAHLKE, 1969). Concerning the large-sized deer of the broader area of Mygdonia basin, CROITOR & KOSTOPOULOS (2004) described two different species, *P. pliotarandoides* and *Arvernoceros* cf. *verestchagini*, from Apollonia.

Cervus LINNAEUS, 1758

Cervus sp.

Material: Tibia distal KLT 322 sin, Mc 3+4 KAL 7 dex.

Very few specimens represent up to now the middle-sized cervid. Only the distal part of tibia, poorly preserved and the proximal part of the metacarpal have been brought to light up to now. The metacarpal's dimensions (table 5, plate 1, fig. 14) are quite close to *Cervus elaphus* from Petralona (TSOUKALA, 1989), and it is much smaller than that of *Eucladoceros* from Untermassfeld (KAHLKE, 1997).

Dama FRISCH, 1775

Dama sp.

Material: Antler frag. KAL 46, maxilla frag. with P^4-M^3 KLT 276 sin, D^2 KLT 279 dex, $M^{1,2}$ KLT 78, 2 mandibles with P_2-M_3 KLT 178, 179 sin, mandible frag. with P_3-M_3 KLT 277 dex, mandible frag. with P_4-M_3 KLT 180 dex, 2 mandible frag. with P_2-M_2 KLT 181 dex, 171 sin, mandible frag. with M_1, M_2 KLT 324 sin, mandible frag. with M_2, M_3 KLT 252 sin, mandible with M_3 KLT 278 dex, $M_{1,2}$ KLT 76,77,79, tibia distal frag. KLT 308 dex, 116 sin, 2 Mt 3+4 KLT 295, 296 sin.

The antlers are represented by small fragments that give poor information for the species. The maxilla and mandi-

Bovidae-Cervidae

Upper teeth	L M^3	B M^3	L M^2	B M^2	L M^1	B M^1	L P^4	B P^4	LM^S
Praemegaceros	28.78	27.00	28.67	25.00	24.50	21.00	—	—	83.27
Dama	18.83	17.81	19.57	17.79	17.48	17.42	10.68	13.65	55.27
Bison (*Eobison*)	20.40	20.00	28.73	21.70	31.30	22.00	31.40	22.90	90.00

Lower teeth	L M_3	B M_3	L M_2	B M_2	L M_1	B M_1	L P_4	B P_4	L P_3	B P_3	L P_2	B P_2	LP_I	LM_I	LPM
Praemegaceros	37.19	17.60	27.84	17.42	23.60	16.16	22.20	14.08	20.30	12.34	17.26	9.36	60.00	90.00	150.00
Dama	25.26	11.54	19.66	11.80	(17.0)	—	13.23	9.50	14.43	8.35	10.16	6.62	36.90	63.29	102.50
	25.20	13.62	20.83	12.65	18.22	12.25	13.40	9.90	12.17	8.16	9.65	6.40	36.60	65.48	99.00
Bison (*Eobison*)	45.53	18.53	29.50	20.00	27.00	18.00	23.50	14.66	19.65	13.68	12.00	10.00	53.73	102.46	155.30

Table 4: Measurements of the teeth of the Kalamotó cervids and bovids.

bles bear almost all teeth most molars of them have well developed interlobular colonet-like cingulum. The dimensions of the teeth are given on Table 4. The corpus of the mandible is of height 16.16 (min.) to diastema, 18.45 at P2 ant., 24.65 mm at P4/M1 (plate 3, fig. 14, 15). The two metarsals are the most characteristic specimens concerning the smaller deer (plate 1, fig. 12, 13). The dimensions (table 5) are close to Middle Pleistocene *Dama* from Megalopolis (Melentis, 1964) and less robust than that from Petralona. The tibia is rather robust and only the distal and part of diaphysis are preserved (DTxDAP diaphysis = 21.7 x 16.5, DTxDap distal = 33.77 x 27.5, DTxDAP d.art. for astragalus = 25.5 x 23.0 mm).
These dimensions are typical in the range of *Dama dama* and much smaller than the Pleistocene *D. d. clactoniana* (Leonardi & Petronio, 1976), but larger than that from Saint Prest (Guérin et al., 2003).

Family: Bovidae Gray, 1821
Sub-family: Bovinae Gill, 1872

Bison (*Eobison*) Flerov, 1972

***Bison* (*Eobison*) sp.**

Material: Maxilla frag. with P^4-M^3 KLT 319 sin, mandible frag. with P_2-M_3 KLT 318 sin, mandible frag. with P_3-M_3 KLT 177 sin, tibia distal KLT 67 dex, calcaneus KAL 82sin, 2 Mc 3+4 KLT 305 and prox. frag. KLT 25 dex, Mt 3+4 KLT 345 dex, trochlea frag. KLT 72, Ph1 KAL 95, Ph3 frag. KAL 5.

The maxilla is almost destroyed and only the cheek teeth are better preserved (Table 4). The premolar is unerupted but strong and the molars are slightly to little worn. The molars are rather robust (LM = 90 mm) and hypsodont (H M^3 = 54 mm). There is strong - high and wide - entostyle (on M3 the height is ~ 29 mm) and the parastyle of the M^2 is well developed, as well as the metastyle of the M^3. Their enamel is palatinally rippled. Of the two mandibles the KLT 318 bears all the cheek teeth (plate 3, fig. 5, 6) and belongs to a very robust individual as, it is very long and broad, especially the last molar, very close to the dimensions of the middle Pleistocene *Bison priscus* from Petralona. The P_2 is destroyed, P_3 and P_4 are elongated and relatively narrow, and the protoconid is separated from the hypoconid by a swallow furrow that is filled with cement. Of the molars the M_1 is worn, while the other two are little worn. There are ectostylids and cement between all lobes that are labially rounded / flattened. The parastylid is well developed and the talonid of the M_3 is almost circular, distally projected with well developed posterior stylid, that is much lesser developed on the M_3 of the mandible KLT 177. The morphology of the teeth on both jaws is quite similar but there is difference in the dimensions of the last molar of the second one, that is similar with the *Bison* (*Eobison*) from Apollonia (Kostopoulos, 1997). The poorly preserved distal tibia is robust, as well as the well preserved calcaneus. Of the metapodials, there is an almost well preserved complete metacarpal (Mc 3+4, plate 1, fig. 11) and a proximal part of another metacarpal. The dimensions of the former are given in table 5. The index "DT distal x 100/L" of the metacarpal shows that it is very close

	Praemegaceros			*Cervus*	*Dama*		*Bison* (*Eobison*)		
	Mt 3+4 dex		Ph1	Mc 3+4 dex	Mt 3+4 sin		Mc 3+4 dex	Mt 3+4 dex	Ph1
	KLT 321	KLT 258	KAL 4	KAL 7	KLT 295	KLT 296	KLT 305	KLT 345	KAL 95
L	(350.00)	—	75.00	—	230.50	—	226.50	—	(65.0)
DT prox.	58.00		30.00	42.43	28.90	23.98	65.00	53.34	(30.0)
DAP prox.	61.50		37.00	33.90	29.32	26.66	39.80	51.70	(36.0)
DT diaphysis	35.00	(35.0)	22.80	(30.5)	16.82	15.81	41.00	(34.0)	28.60
DAP diaphysis	(38.0)	(42.0)	—	(27.8)	20.02	18.69	27.75	(33.5)	—
DT distal	(59.0)		26.12	—	31.32	29.13	69.80	—	31.1
DAP distal	(39.0)		24.10	—	(19.87)	18.83	38.20	—	22.6
DT d. supra art.							65.00	—	

Table 5: Measurements of the metapodials and phalanges of the Kalamotó cervids and bovids.

to the Apollonia primitive bison (KOSTOPOULOS, 1997). Of the metatarsal the proximal part and most of the diaphysis are well preserved. Of the phalanges the proximal parts are destroyed or missing.

Leptobos RÜTIMEYER, 1877-1878

cf. *L. etruscus* (FALCONER, 1859)

Material: Mandible frag. with D_2-M_2 KLT 175 sin.

The mandible is well preserved as the anterior part from diastema and part of the angle are missing (plate 3, fig. 9-11). It belongs to a juvenile as there are the milk teeth that are robust. The processus coronoideus and condylus are preserved and the corpus is hypsognathic.

The dimensions of the mandible and the teeth are the following (in brackets the range of the measurements of *L. etruscus* after DUNEROIS, 1990):

Mandible-height-H max. = 184 [191.5-213.5], H at condylus = 131 [133-171], Length-L of the ascending branch = 60.32 [57.5-82.5], H corpus at D_4 / M_1 = 48.8 [39.5-57], DT at the same point 22.2 [22-28.5], L/B-breadth M_1 = 25.28 / 12.8 [18-25.5 / 13-17]. The M_2 is unerupted.

The dimensions of the milk teeth are L/B D_2 = 9.3 / 5.67, D_3 = 17.11 / 8.06, D_4 = 27.64 / 10.3 ant., 12.6 med., 12.9 post. (mm).

The M_1 is more long and slender, the parastylid is projected, the entostylid is well developed, the ectostylid is enlarged to the basis of the crown, the labial wall of the lobes is rounded.

Although the most characteristic elements for the determination of this species are absent, as the only specimen preserved is a juvenile mandible with the milk teeth, the morphology of the mandible, as well as the relatively large size of the first molar (the second molar is unerupted), allow it to be attributed to *Leptobos* and conferably to the large sized *L. etruscus*.

Order: Rodentia BOWDICH, 1821
Family: Arvicolidae GRAY, 1821
Subfamily: Arvicolinae GRAY, 1821
Tribe: Arvicolini KRETZOI, 1955

Mimomys FORSYTH-MAJOR, 1902

Mimomys savini HINTON, 1910

Material: Mandible with M_{1-2}, KAL 79, sin.

Measurements: The measurements of the teeth were taken using a Wild Photomakroskop M400 stereoscope. The mandible was photographed and figured in the Aristotle University. The measurements and terminology are according to VAN DER MEULEN, 1973 and RABEDER, 1981 (table 6).

Description: The material consists of a mandible fragment bearing the middle worn first and second molars and the inferior incisor. The latter is well preserved, while part of the root is missing. Both molars have two roots. Crowncementum is present. The differentiation of enamel thickness is typical for *Mimomys* (the thinner cover is at the concave sides of the anticlines, the thicker parts are at the convex sides). The molars are large (fig. 6).

M_1: There are four lingual and three buccal synclines. The occlusal surface shows a PL. three well-closed triangles, and ACC. The anteroconid complex consists of T4, T5 and AC. The AC is asymmetrical and T7 is well developed (LSA5). LRA4 is rather deep and bears cement. The *Mimomys*-ridge is virtually absent and no enamel ring is present. The tiny fold in the anterior part of BSA3 in the specimen may be interpreted as the trace of a Mimomys-ridge, which does not extend farther down the crown. An incipient re-entrant angle (BSA4) is observed.

M_2: This molar has two lingual and two buccal synclines. T3 and T4 are somewhat confluent, while T1 and T2 are well separated.

Discussion: The specimen from Kalamotó has molars with roots, crown-cement in the synclines and enamel-thickness differentiation of the *Mimomys*-type. All these features characterize the genus *Mimomys* FORSYTH-MAJOR,1902 of the tribe Arvicolini (KOLIADIMOU, 1996).

The lineage of *Mimomys-Arvicola* provides data on phyletic gradualism showing the major stages of progressive development of trends: hypsodonty increase, growth of enamel track height, appearance of cement, enamel disappearance, root disappearance and acquisition of continuous growth, size increase (CHALINE, 1990).

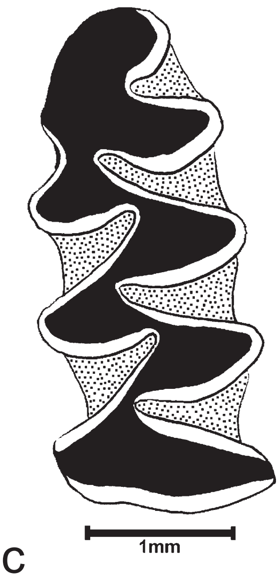
The specimen from Kalamotó belongs to a phylogenetically advanced, large-sized *Mimomys* species (fig. 7). The primitive forms of *M. davakosi*, *M. occitanus* and *M. gracilis* have smaller teeth that are low crowned, have no cement in the synclines and have a well developed *Mimomys*-ridge and an enamel islet (VAN DE WEERD, 1976, 1979; ÜNAY & DE BRUIJN, 1998).

M. pliocaenicus FORSYTH-MAJOR, 1902 is a large-sized *Mimomys*. In M_1 the anteroconid complex is simple, the islet of enamel is always present and there is abundant cement. The molars of *M. pliocaenicus* are very close metrically to those of Kalamotó. However, the absence of an enamel islet in M_1 of the studied material distinguishes it from *M. pliocaenicus* (SALA et al., 1994).

M. blanci VAN DER MEULEN, 1973 and *M. pusillus* (MEHELY, 1914) are small-sized species and they have a broad communication between T1 and T2 in M2 (VAN DER MEULEN, 1973). Therefore, Kalamotó *Mimomys* can't be attributed to this species. The absence of an enamel islet in M1 and the larger size of the Kalamotó specimen differentiate the

Maximal occlusal length (l-l')	3.535 mm
Length of the anteroconid complex (a-l')	1.414 mm
Width of the anteroconid complex (w-w')	1.462 mm
Shorter distance between BRA3 and LRA4 (b-b')	0.595 mm
Shorter distance between BRA3 and LRA3 (c-c')	0.186 mm
Width of the posterior lobe (n-n')	1.501 mm

Table 6: *Mimomys savini*, Kalamotó (KAL). Dimensions of the lower first molar.



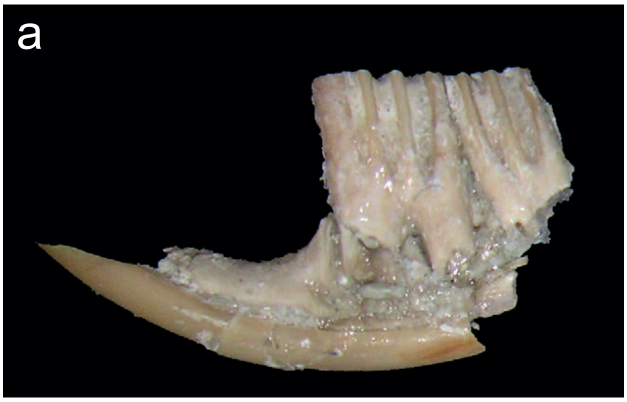


Figure 6: a) Photo of mandible with M_1, M_2 sin. and incisor, buccal view, b) photo of mandible with M_1, M_2 sin., occlusal view and c) drawing of M_1 sin., occlusal view, *Mimomys savini*, Kalamotó (KAL 79).

latter from *M. coelodus* Kretzoi, 1954 and *M. reidi* Hinton, 1926 (Radulesco & Samson, 1986). In the first lower molar of *M. jota* Rabeder, 1981, T2 and T3 are confluent (Rabeder, 1981). This difference distinguishes this species from the KAL-specimen.

On the basis of their dimensions, KAL-remains fall within the range of *M. ostramosensis* Jánossy & van der Meulen, 1975. The absence of the enamel islet of the middle-worn M_1, which in *M. ostramosensis* is common at the same wear-stage, excludes its attribution to this species. The mandible from Kalamotó cannot be identified as *M. tornensis* Jánossy & van der Meulen, 1975 because of the lack of broad communication between the dentine fields of T4 and T5 in M_1. *M. pitymyoides* Jánossy & van der Meulen, 1975 is characterized by the confluence of T2 and T3 in M_1 (Janossy & van der Meulen, 1975). Therefore, *Mimomys* from Kalamotó does not belong to this species.

In Europe the large-sized *M. savini* Hinton, 1910 appeared probably as immigrant from the east at the Early Biharian (Repenning et al., 1990). The enamel islands of M_1 in *M. savini* disappear through wear before the roots are developed (Ünay & de Bruijn, 1998). The enamel islet in first lower molars is a feature of Lower Pleistocene *Mimomys* species and occurs very rarely only in young individuals of *M. savini*. The increase of size also suggests more advanced phylogenetically forms (Stuart, 1981).

M. intermedius (Newton, 1881) from Early Biharian sites of Russia and Ukraine (Markova, 1990) has medium-sized teeth and the occlusal of M_1 is similar to *Arvicola*. Some researchers believe that *M. intermedius* and *M. savini* are synonyms. They say that *M. intermedius* is a smaller form, with similar morphological features, however simpler, that inhabited the Eastern Europe during Biharian (Koliadimou, 1996). *M. intermedius* (= *savini*) from Romania lacks the *Mimomys*-ridge and has rather symmetrical anteroconid (Radulescu & Samson, 1993).

The dental pattern of *Mimomys* from Kalamotó resembles to *M. savini* from Bavel (Early Biharian). However, the KAL teeth are larger (van Kolfschoten, 1990). The dental features of these teeth are similar to those of *M. savini* from Monte Peglia (van der Meulen, 1973) although they are slightly larger. The anteroconid complex of M_1 from Monte Peglia consists of T4, T5 and AC, which is variable. According to shape and symmetry of the anteroconid there are three types of ACC. M_1 from Kalamotó can be attributed better to milleri-type.

The dental features of the Kalamotó teeth are similar to those of *M. savini*, described by Koliadimou (1996) from Rema Voulgarakis-RVL (Koufos et al., 1989). According

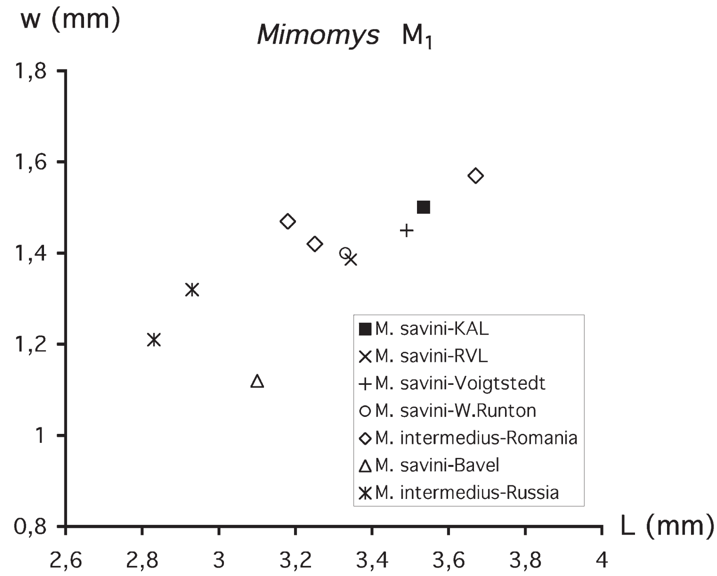


Figure 7: Scatter diagram comparing the dimensions of the M_1 of *M. savini* from Kalamotó, Rema Voulgarakis (Greece, Koliadimou, 1996), Voigtstedt (Germany), West Runton (Great Britain, Stuart, 1981), Bavel (The Netherlands, van Kolfschoten, 1990) and *M. intermedius* from sites of Romania (Radulescu & Samson, 1993) and Russian Plains (Markova, 1990).

to her descriptions, LRA 4 of M_1 is rather deep giving an asymmetric form to the anteroconid. In several samples a lingual salient angle is well developed (T7). Both molars from KAL are a little larger than those from RVL.

M. savini was also reported from Emirkaya-2, Turkey (Late Biharian) (MONTUIRE et al., 1994) and Untermassfeld (about 1.0 my, KAHLKE, 1997). MALEZ & RABEDER (1984) have determined *M.* cf. *savini* in Podumci 1 (Late Biharian).

In Greece, *M. savini* has been reported from Zeli 2, 2A+B, Kaiafas (VAN DER MEULEN & VAN KOLFSCHOTEN, 1986). An advanced form of *Mimomys* is referred in Marathousa assemblage (KOUFOS et al., 2001) as *Mimomys* sp. due to the scarce material.

3. Conclusions

• The preliminary study of the Kalamotó fauna, from the two localities KAL and KLT, showed the presence of the following species:

Species	KLT	KAL
Pachycrocuta brevirostris (AYMARD, 1846)	+	
Canis sp.	+	
Equus stenonis COCCHI, 1867	+	+
Dicerorhinus etruscus (FALCONER, 1859)	+	+
Mammuthus (*Archidiskodon*) *meridionalis* (NESTI, 1825)	+	+
Hippopotamus amphibius antiquus DESMAREST, 1822 (= *H. major* CUVIER, 1824)	+	+
Praemegaceros pliotarandoides (DE ALESSANDRI, 1903)	+	+
Cervus sp.	+	+
Dama sp.	+	?
Bison (*Eobison*) sp.	+	+
cf. *Leptobos etruscus* (FALCONER, 1859)	+	
Mimomys savini HINTON, 1910		+

• The comparative study showed that most of the species above were found both in Kalamotó 1 (KAL) and Kalamotó 2 (KLT) localities, therefore we can assume the same or close geological age.

• The absence up to now of specific taxa such as suids, small bovids and carnivores, as well as primates is notable.

• Some of the specimens are significant ones, such as the almost complete antlered skull of *Praemegaceros*, the part of the skull with the mandible of the *Pachycrocuta* juvenile, the elephant tusk, the front limb bones in connection of *Hippopotamus*, the rich equid material as well. All material is stored and exhibited in the local Museum of Kalamotó.

• The participation of the specimens of each species is approximately shown on the pie-diagram (fig. 8).

• The widespread and distinctive short-faced hyaena *Pachycrocuta brevirostris*, which is the largest and heaviest known hyaena, and in Kalamotó can be considered among the terminal occurrences of this typical Villafranchian species, as the Pleistocene spotted hyaena (*Crocuta crocuta*) progressively replaced it. The reference of this species in the Middle Pleistocene fauna of Petralona is questionable, as only a fragment of a germ P_2 was described among the relatively abundant material representing at least three different species of hyaenids.

• The frequent occurrence of *Hippopotamus* indicates an aquatic environment, rather warm climatic conditions and especially mild winters.

• Concerning micromammals, the preliminary research in Kalamotó showed the presence of *Mimomys savini* HINTON, 1910, the occurrence of which indicates an Early Pleistocene/ Latest Villafranchian - Early Biharian age for the KAL site. It can be correlated with that of Rema Voulgarakis-RVL of the same Mygdonia basin.

• The KLT and KAL-localities consist of terrestrial reddish sediments with white to reddish fossils the former and lacustrine deposits with gray marls and silt-sands with gray- brownish fossils the latter, both belonging to Platanochori Formation. The transition from the Premygdonian to the overlying fluvioterrestrial sediments is an undulate erosionnal surface, as it well shown on the KAL stratigraphical section. It seems that at the end of Villafranchian small lakes were remained of the broader Mygdonia Lake. The KAL- site belongs to one of these lakes. The presence of the lake in KAL site is confirmed by the presence of lacustrine mollusks *Planorbis* sp. and *Unio* sp. as well as by hippopotamids, which lived near it.

• Taphonomically, the spatial disposition of the mammalian

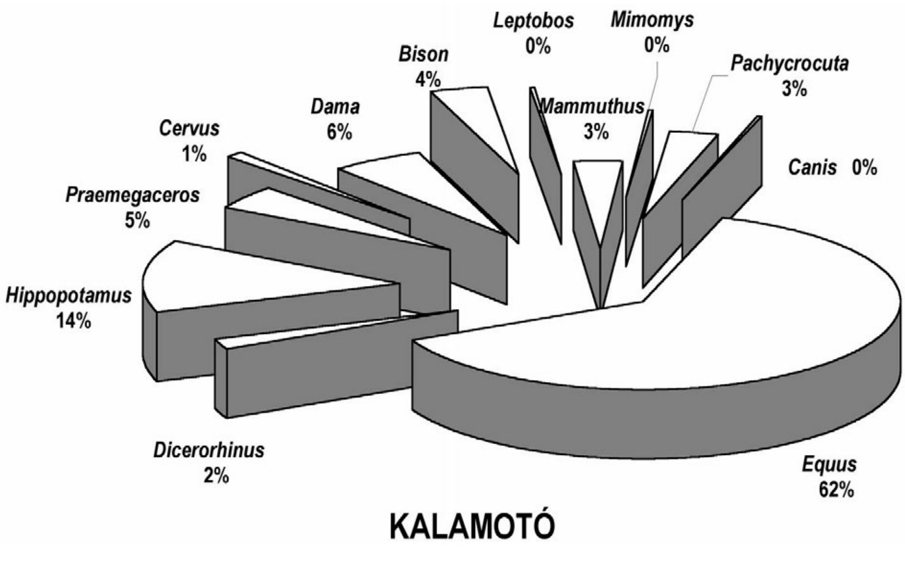


Figure 8: Kalamotó: pie-diagram with the relative proportions of the bones of each species. It is clearly shown that the horses are the predominant animals, followed by the hippos, while, up to now, the poorest representation is that of the wolf.

material within the site is determined by the following patterns of distribution: isolated specimens and anatomically connected finds. The later ones can be mainly conferred to the hyaena, hippo and horse. Concerning the breakage of the Kalamotó bones it seems that the scavengers did not affect this accumulation, as it is clearly shown on the hyaenid food remains of the Middle Pleistocene Petralona fauna and of the Late Pleistocene Agios Georgios (Kilkis) cave fauna, which was the unique exclusively hyaena den of Greece.

• The vertebrate deposits at Kalamotó (in both sites KLT and KAL) produce new evidence for the completeness of our knowledge about Mygdonia basin. It seems that the tra-nsition from the typical Villafranchian to the archaic-type Quaternary faunas (Bonifay, 1996) has already been advanced. It must be noted that the fossiliferous horizon completely lacks of any form of early human modification on the paleontological assemblage.

• The age of this fauna can be calculated of Early Pleistocene / Latest Villafranchian (MNQ 20) (Epivillafranchian, in comparison with the fauna from Untermassfeld as European reference horizon, Kahlke, 2000). Further study and comparisons can show correlations with that of Apollonia of the same basin, of the same age (Koufos et al., 1992). Comparison between the Kalamotó and the rich archaic Middle Pleistocene Petralona fauna, in which forms with Villafranchian affinities are including, can drive to remarkable conclusions about transitions and extinctions of certain species in Greece.

• Further excavations that are still in progress and study of the material will provide evidence about the more detailed evolutionary stage and biochronological position of Kalamotó new site among the other localities of the same age

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PLATE 1

Pachycrocuta brevirostris (Aymard, 1846)

Fig. 1. Part of cranium with the maxilla KLT 201 with dCS, D^2 and P^4 with the two semi mandibles with D_2, P_3 (unerupted), P_4, M_1 KLT 214, sin. and KLT 215, dex. of the same individual as it is exhibited in the Museum of Kalamotó.

Fig. 2. The right mandible KLT 215 in situ.

Hippopotamus amphibius antiquus Desmarest, 1822 (= *H. major* Cuvier, 1824)

Fig. 3. Radius et ulna KLT 348, dex., craniolateral view

Fig. 4. Humerus, radius et ulna in anatomical connection, KLT 62, dex., mediocaudal view

Fig. 5. Mc3, KLT 69, dex., anterior view

Fig. 6. Mc3, KLT 131, sin., anterior view

Fig. 7. Mc3, KLT 221, dex., posterior view

Fig. 8. Astragalus, KLT 220, dex., anterior view

Fig. 9. Astragalus, KLT 106, dex., anterior view

Equus stenonis Cocchi, 1867

Fig. 10. Mc3, KLT 99, sin., Ph1, KLT 60, Ph2, KLT 35, Ph3, KLT 37 in anatomical connection

Bison (*Eobison*) sp.

Fig. 11. Mc 3+4, KLT 305, dex., anterior view

Dama sp.

Fig. 12. Mt 3+4, KLT 296, caudal view

Fig. 13. Mt 3+4, KLT 295, sin., caudal view

Cervus sp.

Fig. 14. Mc 3+4 proximal frag., KAL 7, dex., caudal view

Premegaceros pliotarandoides (de Alessandri, 1903)

Fig. 15. Mt 3+4 proximal frag., KLT 258, dex., caudal view

Fig. 16. Mt 3+4, centrotarsal in situ, KLT 321, dex., caudal view

Fig. 17. Mt 3+4 proximal frag., KAL 16, dex., caudal view

PLATE 1

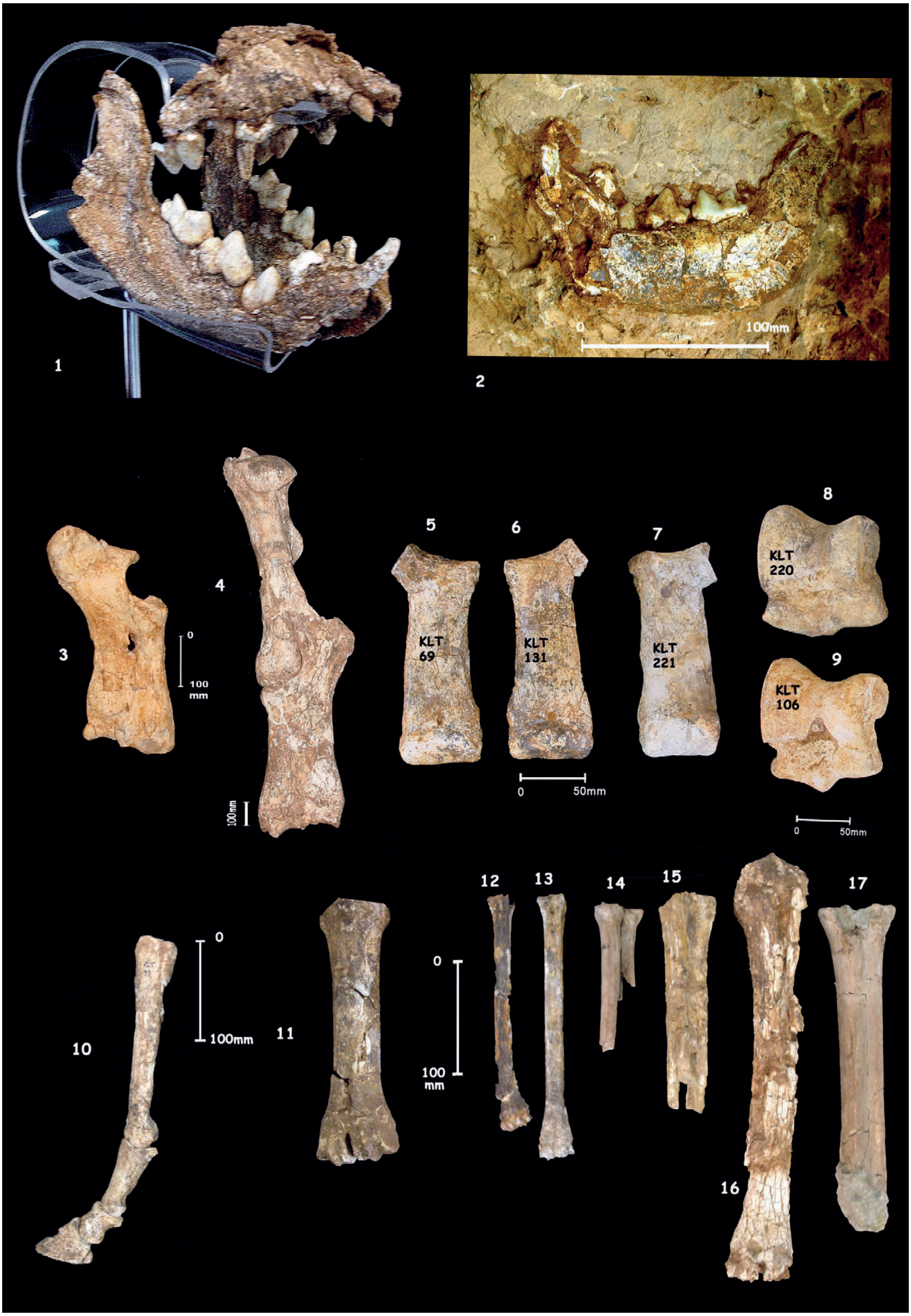
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PLATE 2

Premegaceros pliotarandoides (*verticornis*): Skull with antlers, KAL 80

Fig. 1. Cranial view

Fig. 2. Left view

Fig. 3. Right view

Fig. 4. Anterior view

Fig. 5. Posterior view

Fig. 6. The specimen in situ in the grey sediments of KAL-site, where it was found in June 2004.

Mammuthus (*Archidiskodon*) *meridionalis*

Fig. 7. I^2 (Tusk), KAL 59

Fig. 8. Lower molar, KAL 85, labial view

Fig. 9. Lower molar, KAL 85, occlusal view

PLATE 2


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PLATE 3

Dicerorhinus etruscus (Falconer, 1859)

Fig. 1. Ulna, KLT 117, dex., medial view

Fig. 2. Ulna, KLT 117, dex., lateral view

Fig. 3. P^2 KLT 149 dex., occlusal view

Fig. 4. M_1 KAL 44 sin., occlusal view

Bison (*Eobison*) sp.: Mandible frag. with P_2-M_3, KLT 318, sin.

Fig. 5. Labial view

Fig. 6. Occlusal view

Equus stenonis Cocchi, 1867: Mandible frag. with I_{1-3}, P_2, P_3 sin., I_2, I_3 dex., KAL 100

Fig. 7. Occlusal view

Fig. 8. Detail of the premolars

cf. *Leptobos etruscus* (Falconer, 1859): Mandible frag. with D_2-M_2, KLT 175, sin.

Fig. 9. Labial view

Fig. 10. Cranial view

Fig. 11. Tooth-row, occlusal view

Premegaceros pliotarandoides (de Alessandri, 1903): Mandible frag. with P_2-M_3, KLT 267, dex.

Fig. 12. Labial view

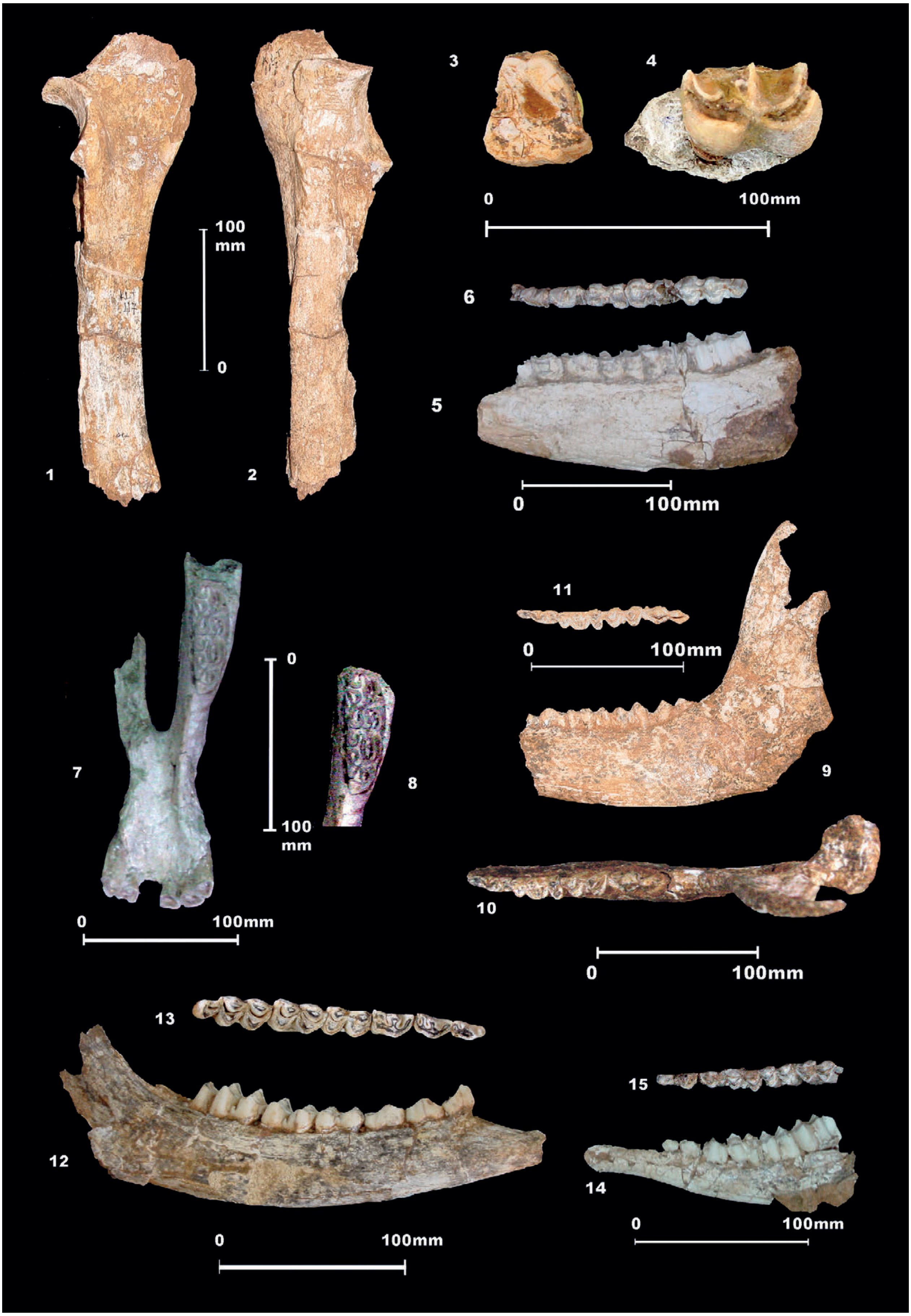
Fig. 13. Tooth-row, occlusal view

Dama sp.: Mandible frag. with P_2-M_3, KLT 178, sin.

Fig. 14. Labial view

Fig. 15. Tooth-row, occlusal view

PLATE 3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