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Milk Teeth of Quaternary Carnivores from Northern Greek Caves

Preliminary Report

Zusammenfassung:

Durch eingehende Untersuchungen an quartären Faunen wurde gefolgert, daß bestimmte Höhlen von Tieren (Raubtieren) bewohnt waren. Die Nutzung wird unzweifelhaft belegt durch das Vorhandensein von Milchzähnen und Knochen mit noch nicht geschlossenen Epiphysen, den Fraßresten und den Koprolithen. Die bedeutendste Fundstelle Griechenlands, die viele fossile Milchzähne enthält - trotz ihrer Zerbrechlichkeit - ist die oberpleistozäne Bärenhöhle von Loutra Arideas (Pella, Macedonia). Tausende isolierte Milchzähne, davon sehr wenige *in situ*, wurden bei systematischen Grabungen in der Höhle gesammelt. Obwohl auch in der mittelpleistozänen Höhle von Petralona Bären-Material zahlreich ist, kommen Milchzähne dort ziemlich selten vor. Andererseits finden sich dort Hyänen-Unterkiefer mit Milchzähnen, die zu den mittelpleistozänen Formen *Crocuta spelaea intermedia* and *Pliohyaena perrieri* gehören. Diese Milchzähne werden mit denen der oberpleistozänen Unterart *Crocuta crocuta spelaea* aus der Höhle von Agios Georgios (einem typischen Hyänenhorst in Kilkis, Macedonia) verglichen. Das Evolutionsniveau dieser Tiere wird noch diskutiert.

Abstract:

From extensional studies on Quaternary faunas it is concluded that certain caves were habited by animals (carnivores). The habitation is established by the presence of milk teeth and bones with infused epiphyses, the food remains and the coprolites. The most important site of Greece with abundant material of fossilized milk teeth, in spite of their fragility, is the Late Pleistocene Loutra Arideas (Pella, Macedonia) Bear-cave. Thousands of isolated deciduous teeth - very few *in situ* - have been collected from the systematic excavations that were carried out in the cave. In Middle Pleistocene Petralona cave, even though there is abundant ursid material, the presence of milk teeth is rather rare. On the other hand, there are hyaenid mandibles with milk teeth belonging to the Middle Pleistocene *Crocuta spelaea intermedia* and *Pliohyaena perrieri* as well. These milk teeth are compared with those of the Late Pleistocene *Crocuta crocuta spelaea* from Agios Georgios cave (a typical hyaenid den in Kilkis,

Macedonia). The evolutionary stage of these animals is preliminarily under discussion.

Résumé:

L'étude de faunes quaternaires dans une vaste région a permis de conclure que certaines grottes ont été habitées par des carnivores, dont la présence est révélée par des dents de laits et des ossements à épiphyses brisées, des restes de nourriture et des coprolithes. Le site le plus important de Grèce, contenant une collection importante de dents de laits du Pléistocène final, fossilisées en dépit de leur fragilité, est la grotte Loutra Arideas (Pella, Macédoine). Des milliers de dents le laits isolées - très peu in situ - ont été récoltées lors des fouilles systématiques faites dans la grotte. Dans la grotte de Pétralona, également datée du Pléistocène moyen, les dents de laits sont rares malgré la présence de nombreux restes osseux d'ursidés. Des mandibules d'hyènes portant encore des dents de lait pouvant être attribuées aux espèces du Pléistocène moyen *Crocuta spelaea intermedia* et *Pliohyaena perrieri* ont été découvertes. Ces dents de lait ont été comparées à celle de l'espèce du Pléistocène supérieur *Crocuta crocuta spelaea* en provenance de la grotte Agios Georgios (un refuge d'hyène caractéristique à Kilkis, Macédoine). Le stade évolutif de ces animaux est discuté de façon préliminaire.

Key words: milk teeth, carnivores, Quaternary, Northern Greek caves

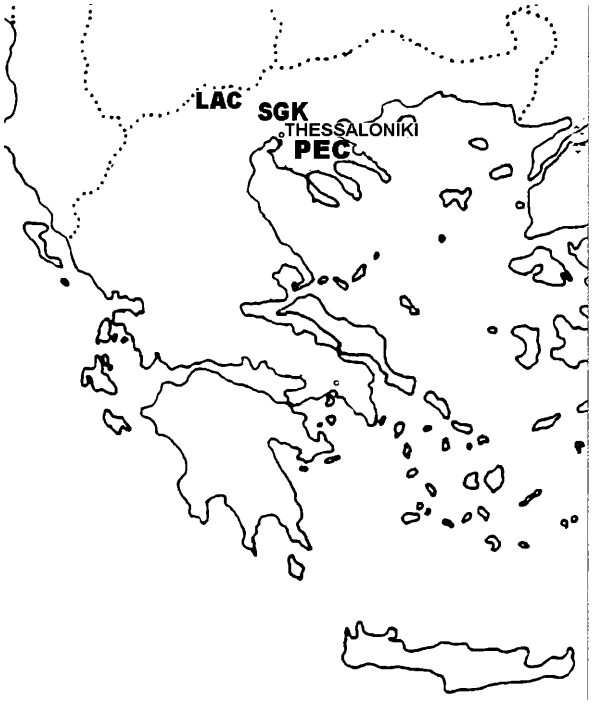


Figure 1. Map of Greece with the three localities (PEC: Petralona Cave, SGK: Agios Georgios-Kilkis Cave, LAC: Loutra Arideas Cave) depicted.

Introduction

Three caves of Macedonia (N. Greece) with milk teeth are referred in the present study: The Petralona cave (PEC), 45 km SE, the Agios Georgios-Kilkis (SGK), 45 km NNW and the Loutra Arideas Bear-Cave (LAC), 120 km NW of Thessaloniki (Fig. 1). The Petralona material of juveniles comes from the „old excavation" and surface collections by professors of the Thessaloniki University, which was found in association with the famous hominid skull. The milk teeth are very few in contrast to the rest findings that are thousands of well preserved specimens, representing 22 different species of Middle Pleistocene large mammals (Tsoukala 1989/1991). The Agios Georgios-Kilkis cave is the unique up to now, exclusively hyaenid den of Greece of Latest Pleistocene, as

the most specialized scavenger, the real cave hyaena, lived in. The presence of the milk teeth, the coprolites and the food remains establish the habitation. The juveniles are represented either by milk teeth or by postcranial skeleton (TSOUKALA 1992 a, b). The investigation in the Loutra Arideas area started in 1990 and the first excavation circle in the Bear Cave started in 1992. The sieving process and the systematic collection of the milk teeth started in 1993 up to now. Ten systematic excavation circles, under strictly archaeological rules, including micromammalian research took place. All the sediments of the 189 levels (about 5 cm of thickness each) have been washed into a system of double sieves, one for micromammals (CHATZOPOULOU, this volume) with a mesh of 0.8 mm and the other of 3 mm for large mammalian remains, both with milk teeth. Then the material was dried out, conserved and recorded for further study. Additionally few bigger specimens were numbered and collected in place with their coordinates during the excavation (TSOUKALA 1994, 1996, TSOUKALA et al. 1998, 2001, PAPPA 2004). All the material above is stored in the Paleontological Museum of Aristotle University of Thessaloniki.

Paleontology

a) Petralona Cave, Middle Pleistocene

Taxonomy

Order: CARNIVORA BOWDISH, 1821
Sub-order: Canoidea SIMPSON, 1931/Arctoidea FLOWER, 1969
Family: Ursidae GRAY, 1825
Genus: *Ursus* LINNAEUS, 1758
U. deningeri v. REICHENAU, 1906
Material: dC PEC 1028, dI^3 PEC 1040 dex, D^4 PEC 1020 dex.
Description: The milk canine is little worn and the root is broken, the third upper milk incisor is slightly worn and most of the root is preserved. The upper milk carnassial is well preserved (D^4, fig. 2a) as only little part of the roots is missing. The external cones are pointed and straight on their labial side, the paracone is well developed and the metacone bears longitudinal palatinal crest. There is a small parastyle, while there is trace of a cingulum like metastyle. The morphotype seems to be a simple one.

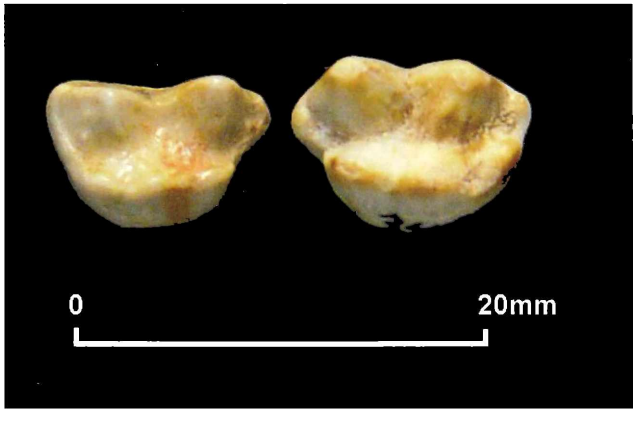


Figure 2.
D^4 occlusal view: a) Left, Petralona cave, *U. deningeri* PEC 1020 dex and b) Right, Loutra Arideas Bear cave, *U. ingressus* LAC 12557 sin.

Sub-order Feloidea SIMPSON, 1931
Family: Hyaenidae GRAY, 1869
1) Genus: *Crocuta* KAUP, 1828
Crocuta spelaea intermedia M. de SERRES, 1828
Material: Mandible fragment with D_3 - D_4 PEC 15 dex.
Description: Of the brachygnath mandible most part is preserved with the D_3 and D_4 both slightly worn (fig. 4.1). Of the D_3 the

Table 1. *Pliohyaena perrieri - Crocuta spelaea intermedia* PEC Measurements of milk teeth (in mm).

Pliohyaena perrieri								
Cranium	PEC 28		PEC 35					
LdC^s	8.12	LD_3	16.99					
BdC^s	5.90	BD_3	7.35					
LD^1alv.	6.50		PEC 44					
BD^1alv.	6.40	LD_4	19.89					
LD^2	16.00	BD_4	8.82					
BD^2	7.54	LD_4tr^d	15.15					
LD^3	25.50	LD_4ta^d	4.61					
BD^3	14.00	HD_4crown	10.82					
LD^4	9.60	**Md** PEC14, PEC13	n	$\bar{x}$	min	max	s	v
BD^4	15.64	LD_2-D_4	2	50.00	49.50	50.50	-	
LM^1	7.40	LD_2	2	13.65	13.60	13.70		
BM^1	14.17	BD_2	2	6.25	6.20	6.30	-	
Ldiastema	2.87	LD_3	3	17.20	16.90	17.60	0.35	2.03
LD^1alv.-D^4	52.00	BD_3	3	7.56	7.50	7.70	0.11	1.46
LdC^sant.-M^1post.	85.00	LD_4	3	20.50	19.90	21.00	0.56	2.73
LdC-D^4	67.49	BD_4	3	8.47	8.40	8.60	0.12	1.43
LD^2-D^4	42.76	***Crocuta spelaea intermedia***						
LD^2	16.00		PEC15					
BD^2	7.83	LD_2-D_4	43.00					
LD^3	25.70	LD_2	al.9.60					
BD^3	15.53	BD_2	al.5.20					
LD^4	9.68	LD_3	12.90					
BD^4	15.70	BD_3	6.50					
DTD^3-D^3post.	85.30	LD_4	20.10					
DTD^2-D^2ant.	43.60	BD_4	7.70					
Abbreviations: L=length, B=breadth, alv.=alveolus, md=mandible								

protoconid is intense, and there are an anterior and two posterior small accessory cuspids. Of the milk carnassial, the paraconid and protoconid are pointed, the metaconid is absent and the large talonid is bicuspid as the hypoconid is reduced, but well developed the entoconid and hypoconulid. The M_1 is unerupted.

2) Genus: *Pliohyaena* KRETZOI, 1938

Pliohyaena perrieri CROIZET & JOBERT, 1828

Material: Cranium with dC^s sin, D^2 - D^4 sin+dex, P^4 dex, M^1 sin PEC 28, 2 mandible fragments with D_2 - D_4, M_1 PEC 14 dex and 13 sin, D_3 PEC 35 sin, D_4 PEC 44 sin.

Description: The skull is almost well preserved and it bears almost all the slightly worn milk teeth and the unerupted left carnassial and the right M^1 as well. The I^2 dex and the C^s sin are under eruption (fig. 3). The milk canine is slender, with an intense posterior and an anteropalatinal crest with a well developed cingulum on the base of the latter. There are only the alveoli of the single root D^1. The D^2 is elongated and its longitudinal axis is directed palatinal. There are a small anterior and a well distinguished posterior accessory cuspid and an intense palatinal cingulum. The D^3 is the largest tooth with well separated parastyle, long metastyle and a very low protocone in the middle. On the basis of the amphicone there is an intense triangular cuspid. The molar like D^4 is small, triangular, transversally developed.

Of the hypsognath mandible, most part is preserved with the slightly worn D_2, D_3 and D_4 (fig. 4.2,3). Of the long D_3 the protoconid is intense and posterior inclined, and there are anterior and posterior accessory cuspids. Of the milk carnassial D_4 that is clearly distinguished the paraconid and protoconid are less pointed, the metaconid is present and the large talonid

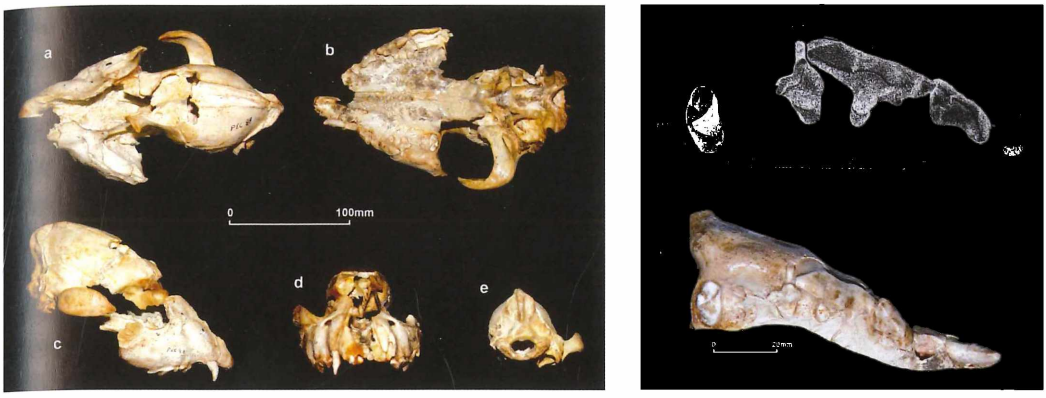


Figure 3. *Pliohyaena perrieri,* Cranium with dC, D^2 - D^4, M^1 PEC 28, Left: a) dorsal, b) basal, c) right lateral, d) anterior and e) posterior (occipital region) view. Right: Detail of the right tooth-row, occlusal view.

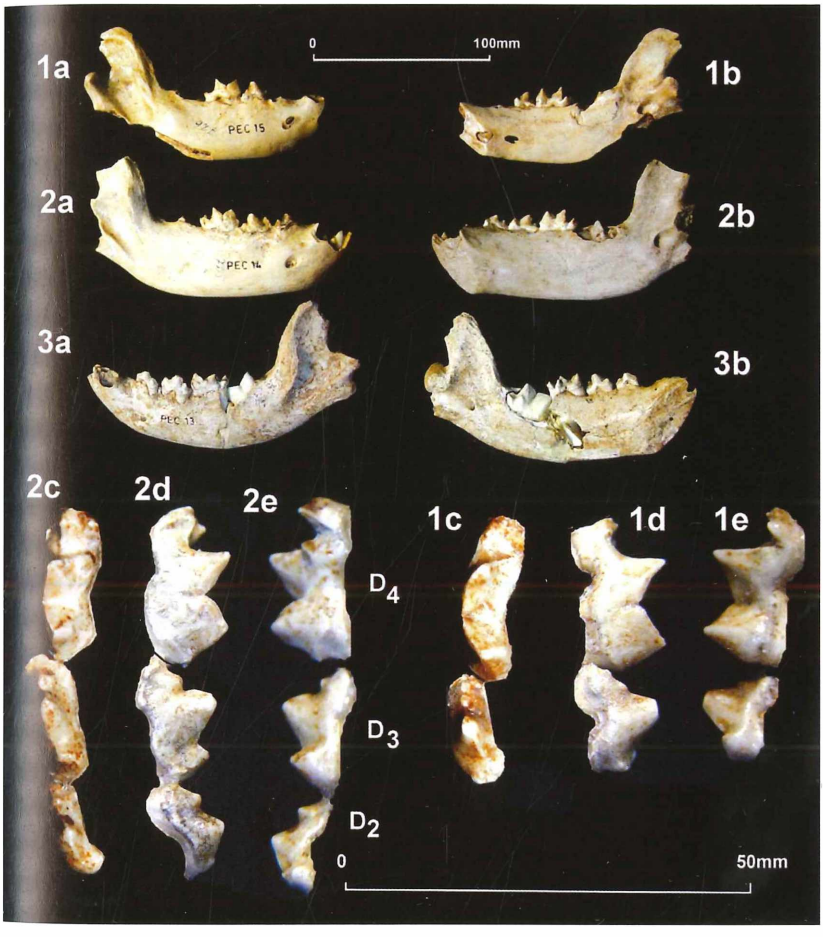


Figure 4. *Crocuta spelaea intermedia:*
1) mandible fragment with D_3 - D_4 PEC 15 dex, *Pliohyaena perrieri*,
2) mandible fragment with D_2 - D_4, M_1 PEC 14 dex and
3) mandible fragments with PEC 13 sin.
a,d) labial,
b,e) lingual,
c) occlusal view.

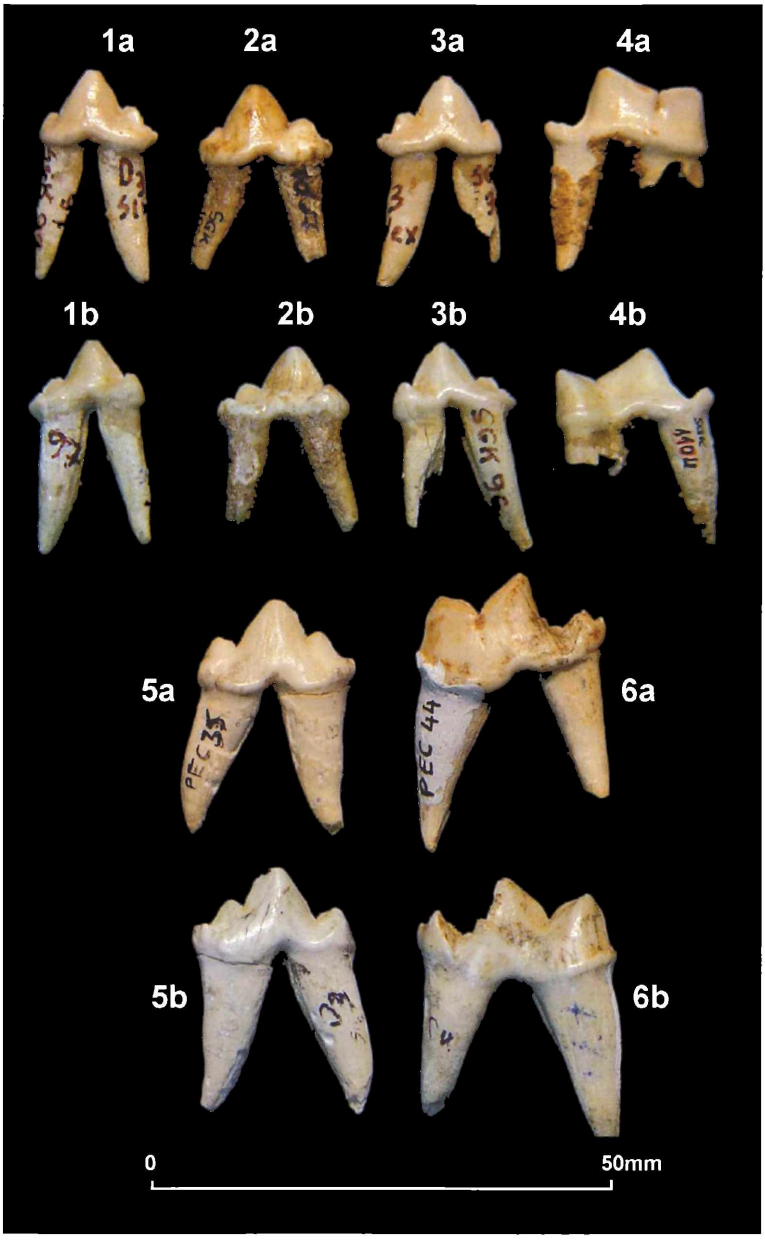


Figure 5. *Crocuta crocuta spelaea:* D_3 1) SGK 97 dex, 2) SGK 1067 sin, 3) SGK 96 dex, 4) D_4 SGK 1104 dex. *Pliohyaena perrieri*: 5) D_3 PEC 35 sin, 6) D_4 PEC 44 sin. a) labial, b) lingual view.

is tricuspid as the hypoconid, hypoconulid and entoconid are well developed, with the latter one being the most strong. The M_1 is unerupted, with the metaconid well distinguished. It must be noted that in all milk teeth there is an intense labial cingulum. Only two isolated well preserved teeth have been found (fig. 5.5,6). The dimensions of the specimens are given in tab. 1.

b) Agios Georgios (Kilkis) cave

3) ***Crocuta crocuta spelaea*** (GOLDFUSS, 1823)

Material: Mandible fragment with D_4 SGK 90 sin, 3 D_3 SGK 96, 97 dex, 1067 sin, D_4 SGK 1104 dex, 2 D_4 fragm. SGK 689, 690 dex.

Description: Of the mandible only the posterior part with condylus, the processus coronoideus as well as the lower slightly worn milk carnassial are preserved (fig. 6). There are also isolated teeth, D_3 and D_4, very well preserved (fig. 5.1-4). Of the D_3 the protoconid is intense, and there are anterior and posterior accessory cuspids. Of the milk carnassial, the paraconid and protoconid are less pointed, the metaconid is absent and on the large talonid not well distinguished cuspids were observed. The dimensions of the specimens are given in tab. 2. Furthermore, post cranial bones with infused epiphyses were found.

	SGK 906		
LdC	6.47		
BdC	4.79		
	SGK 96	SGK 97	SGK1067
LD_3	13.95	13.30	14.66
BD_3	6.57	6.58	7.09
	SGK 1104	SGK 689	SGK 690
LD_4	18.10	-	-
BD_4	7.92	7.04	6.72
Md	SGK 90		
LD_4	17.62		
BD_4	8.11		
H md D_4 post.	28.78		
H md proc.coron.	44.19		
H md cond	12.16		
Abbreviations: see tab.1and H=height, proc.coron.=processus coronoideus, cond.=condylus			

Table 2. *Crocuta crocuta spelaea* SGK: measurements of milk teeth (in mm).

c) Loutra Arideas Bear cave

Ursus ingressus RABEDER et al., 2004

Material: Mandible fragment with dC_1, D_4, M_1 unerupted LAC 1389 dex, 12 dI^1, 105 dI^2, 695 dI^3, 6 D^2, 26 D^3, 240 D^4, 52 dI_1, 29 dI_2, 180 dI_3, 7 D_2, 62 D_3, 285 D_4, 1600 dC.

Description: In spite of the abundance of the milk teeth, among of which 3.259 are studied and measured (tab. 3) the mandibles are extremely rare, as only one is almost well preserved. The dC is slightly worn, as well as the lower milk carnassial; on the other hand the M_1 is germ and unerupted (fig. 7). The mandible with I_3, C, M_1, M_2 and M_3 unerupted LAC 4114 belongs to a sixteen months bear (after DITTRICH in ANDREWS & TURNER 1992) (fig. 8). The dI^1 is a small and slender tooth. There is a palatinal well developed cingulum and the root is elongated, slightly curved and conical. The dI^2 is much stronger than the first one, and also bears a well developed palatinal cingulum. The crown is curved and the root is conical and anterior flattened. The dI^3 is the largest upper milk incisor

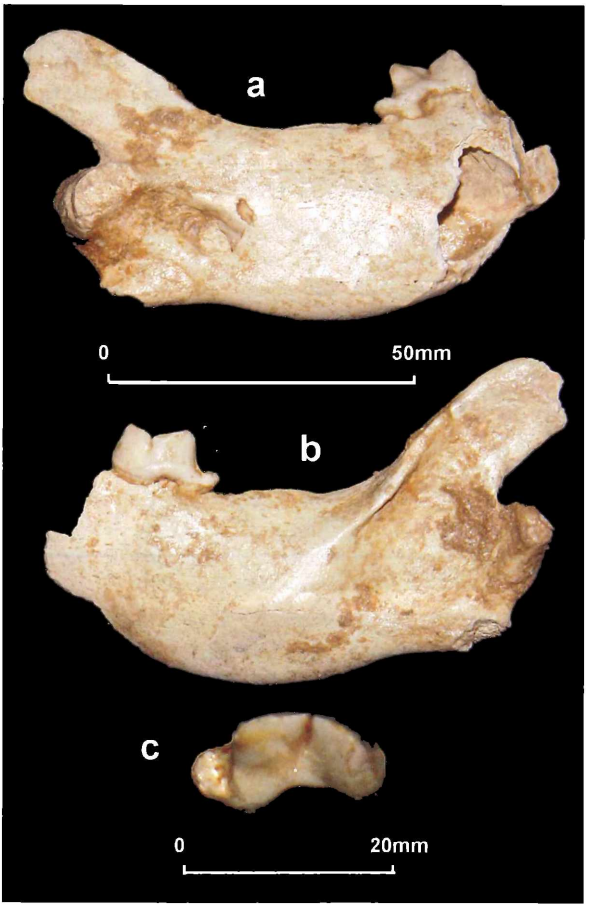


Figure 6. *Crocuta crocuta spelaea*: SGK 90. a) lingual, b) labial, c) D_4 occlusal view.

Figure 7. *Ursus ingressus* LAC. Mandible fragment with dC_1, D_4, M_1 unerupted LAC 1389 dex.

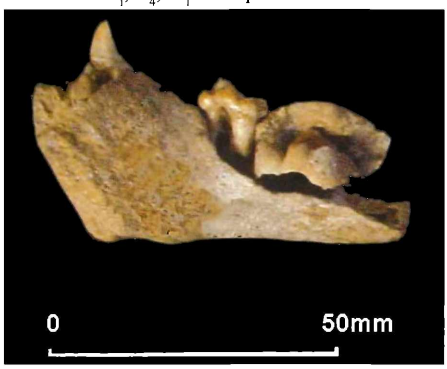
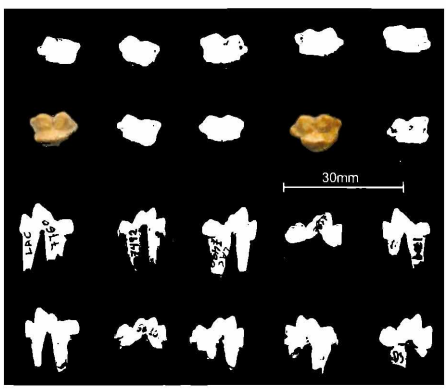


Figure 8. *Ursus ingressus* LAC Mandible with I_3, C, M_1, M_2 and M_3 unerupted LAC 4114.



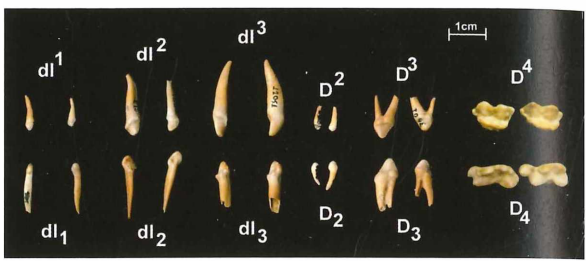


Figure 9. *Ursus ingressus* LAC: Representative material of the milk carnassials showing the variability of the morphotype. Left: Two upper the D^4 and two lower rows the D_4. Right: First upper and second row lower milk teeth.

Figure 10. *Ursus ingressus* LAC. Deciduous canines.

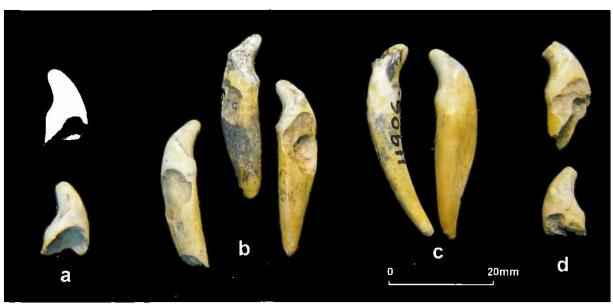


Figure 11. *Ursus ingressus* LAC. Various categories of deciduous canines (KURTEN 1976). a) Germs, b) Full teeth with root showing resumptions marks, c) Full teeth, d) Shed canines.

that is similar with the milk canine, except the more convex crown and the intense palatinal cingulum. This tooth seems to be the most abundant among the LAC material. The D^2 is the smallest of the cheek milk teeth, the less differentiated. The root is small and conical. The D^3 is more differentiated with developed talon and two roots. The upper milk carnassial D^4 is the most important tooth because it contributes to the study of the evolutionary stage according to its morphotype (RABEDER 1983, 1991, 1999). It is molar like and has one palatinal and two labial roots. The occlusal shape is rounded and sometimes there is a palatinal cuspid-like cingulum (fig. 9).

The dI_1 is very small tooth, with small crown and cylindrical root, the end of which is slightly convex. The dI_2 is much stronger than the first one, with triangular crown and elongated root. The dI_3 is the largest lower milk incisor with triangular crown and well developed root. There are two lingual accessory cuspids, jointed with a small cingulum.

The D_2 is the smallest of the cheek milk teeth and the less differentiated. It grows inclined, with no root. The D_3 are of elongated crown and have two roots that are well separated or fused in some specimens (RADULESCU & SAMSON 1959). The lower carnassials D_4 are much more various than that of the maxillar one, with crown bearing at least 5 cusps and two roots (fig. 9).

The milk canines are large and abundant, but difficult to be distinguished in maxillars and mandibulars, thus both are described as long and flattened teeth (fig. 10).

NORDMANN was the first who studied the bear milk teeth in 1858, afterwards SCHLOSSER 1909, KORMOS 1916, POHLE 1923, EHRENBERG 1931, FRIANT & STEHLIN 1933, MOTTL 1934, 1939, ZAPFE 1946, KOBY 1952, ERDBRINK 1953,

	n	min - max	x	s_{n-1}	v
LdI^1	12	1.77-2.95	2.44	0.32	13.15
BdI^1	12	1.57-2.68	2.21	0.35	15.58
LdI^2	103	3.02-4.63	3.85	0.32	9.46
BdI^2	103	2.72-4.97	3.35	0.32	8.24
LdI^3	671	4.03-6.62	5.23	0.38	7.30
BdI^3	671	4.01-6.77	5.05	0.42	8.31
LdC	1507	5.08-9.58	7.31	0.60	8.23
BdC	1507	3.96-7.25	5.52	0.45	8.23
LD^2	6	2.10-2.76	2.40	0.25	10.60
BD^2	6	1.99-2.65	2.25	0.26	11.75
LD^3	26	3.97-7.30	6.21	0.62	9.96
BD^3	26	3.07-4.17	3.72	0.26	7.04
LD^4	124	9.20-12.85	11.13	0.74	6.69
BD^4	124	6.42-11.60	7.56	0.64	8.43
LdI_1	52	1.45-2.73	2.17	0.29	13.54
BdI_1	52	1.21-2.09	1.73	0.21	11.87
LdI_2	27	3.50-4.76	4.02	0.29	7.25
BdI_2	27	2.42-3.83	2.94	0.36	12.32
LdI_3	173	4.10-6.32	5.21	0.47	9.12
BdI_3	173	3.02-5.33	4.05	0.37	9.23
LD_2	6	2.12-2.82	2.43	0.29	11.80
BD_2	6	2.12-2.57	2.29	0.18	7.97
LD_3	59	2.98-6.49	4.98	0.94	18.94
BD_3	59	2.38-4.02	3.29	0.38	11.69
LD_4	242	10.21-14.98	12.76	0.77	5.10
BD_4	242	5.03-9.70	6.31	0.58	9.17

Table 3. *Ursus ingressus* LAC: Measurements of the milk teeth (in mm).

RADULESCU & SAMSON 1959, EHRENBERG 1964, KURTEN 1968, TERZEA 1969, TORRES 1988, ANDREWS & TURNER 1992, DEBELJAK 1996, 1997 etc.

The study of the milk teeth and bones showed the presence even more of unborned bears. On the other hand, completely worn milk teeth were also observed, thus there was difficulty in chewing so the individuals could not survive a long winter, as this last glacial period of Würm. These animals died exhausted at the end of the winter, even though they could survive more (KURTEN 1968, 1976). The milk carnassials D^4 and D_4 are the most important deciduous teeth as the study of the morphotype can give evidence for their evolutionary stage (RABEDER 1983). The D^4 LAC is molar like with one palatinal and two labial roots. The occlusal shape is rounded and sometimes there is a palatinal cuspid-like cingulum. The Paracone is well developed and the metacone bears longitudinal palatinal crest. There is small parastyle while there is a trace of cingulum like metastyle. Finally there is hypocone crest like. It is similar to the Gamssulzenhöhle (Austria) morphotype (fig. 12). The lower carnassials D_4 LAC are much more variable than those of the upper ones, with crown bearing at least 5 cuspids. Paraconid, metaconid and protoconid are well developed. There is a small hypoconid and endoconid. Apart from some differences D_4 is similar to the Gamssulzenhöhle as well (fig. 13).

Figure 12. *Ursus ingressus* D^4 LAC 12557 sin, occlusal, with the morphotype.

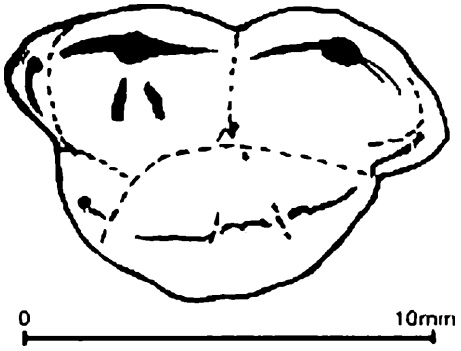
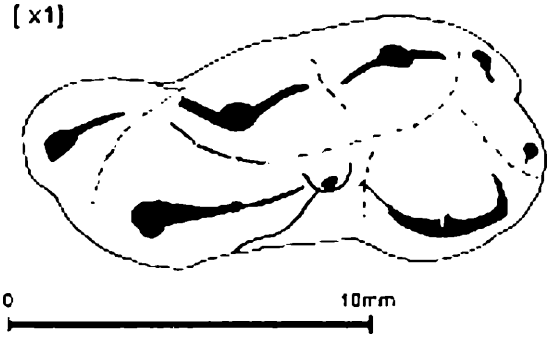


Figure 13. *Ursus ingressus* D_4 LAC 12560 sin, occlusal, with the morphotype.



Concerning the milk canines, the material can be attributed to categories (KURTEN 1976) (tab. 4): (A) by few germs - milk canines consisting by an enamel cap and a root that has barely started to form (fig. 11a), (B) by few complete teeth with unworn occlusal and fully formed roots (fig. 11c), (C) by complete teeth with root showing resumptions marks (fig. 11b). This is a preliminary stage to the tooth being shed and as the root is gradually dissolved by the osteoclast (KOBY 1952). There is a very large crop of shed milk canines (D) in which the root has dissolved completely (fig. 11d). The (E) category includes the heavy wear stage of deciduous. Finally the (F) includes worn deciduous canines with resorbed root.

From the distinction of the dI^3, D^4 and D_4 in rights and lefts the MNI (minimum number of individuals) can be calculated to 355 individuals based on dI^3 (the left ones) and 400 (not reliable, based on milk canines with the total 1600 rights and lefts plus uppers and lowers divided to 4) (tab. 5).

Wear stage (dC)	Description		Number of specimens LAC	Westbury ANDREWS & TURNER 1992	Odessa KURTEN 1976
A	Unerupted	Neonates	132	22	13
B	Erupted		500	10	26
C	Unworn		83	32	
D	Slightly wear	Yearlings	130	39	165
E	Heavy wear		600	80	
F	Worn with resorbed root		155	8	
Unerupted, when the crown is formed but the root is not; erupting, when some root development has taken place; unworn, when the root is fully formed but the crown has no wear; slight to moderate wear; heavy wear.					

Table 4. *Ursus ingressus* LAC: Wear stages of cave-bear deciduous canines.

Category of Teeth	Number of lefts (sin)	Number of rights (dex)
dI^3	355	340
D^4	120	120
D_4	139	146

Table 5. *Ursus ingressus* LAC: Distinction of the dI^3, D^4 and D_4 in rights (dex) and lefts (sin) for calculation of the minimum number of individuals (MNI).

Discussion, Conclusions

Three caves of northern Greece present the most important milk teeth material of Pleistocene: the Petralona cave (PEC) with hyaenids and bears, the Agios Georgios, Kilkis cave (SGK) with hyaenids and Loutra Arideas Bear-cave (LAC) with bears.

The most important remarks are preliminarily shown in table 6, as the research is in progress.

In Middle Pleistocene Petralona Cave, the material representing the hyaenids comprises well preserved skull with almost all the slightly worn milk teeth and the unerupted left carnassial and the right M^1 as well as mandibles with the milk cheek teeth that give evidence, parallel to adults, the two genera crocuta and hyaena to be distinguished. For example the presence (*Pliohyaena*) or not (*Crocuta*) of the metaconid in the lower carnassials M_1 follows the milk carnassials D_4 respectively. For the bears only the upper carnassial can be compared with that of LAC and the main remark is that the morphotype is more complicated in LAC specimens than that from PEC.

The Agios Georgios-Kilkis cave is the unique, up to now, exclusively hyaenid den of Greece, as the most specialized scavenger - *Crocuta crocuta spelaea* - the real cave hyaena, lived in. The presence of the milk teeth, the coprolites and the food remains establish the habitation. In other caves with Quaternary faunas, the presence of the most common cave bear is notable. A sample of hyaena tooth (upper carnassial) enamel was ESR dated giving an age in the range 12.2+2,5 Kyr BP. This indicates Greece as a refugee for the hyaenas, when they were largely excluded from northern and central Europe during last glacial. Furthermore, postcranial bones with infused epiphyses were found.

	U. deningeri	*Crocuta spelaea intermedia*	*Pliohyaena perrieri*	*Crocuta crocuta spelaea*	*Ursus ingressus*
	Petralona Middle Pleistocene			**Agios Georgios, Kilkis Latest Pleistocene**	**Loutra Arideas Bear-cave Late Pleistocene**
Mandible		brachygnath	hypsognath		
D^4 occlusal	More squarish				More rounded
paracone-metacone	More pointed and diverged				Lesser pointed and lesser diverged
Morphotype	Lesser complicated				More complicated
D_3 protoconid		Lesser intense More erect	More intense Inclined posterior	Lesser intense More erect	
Accessory cuspid		Anterior and two posteriors, all small	Anterior and posterior, clearly more developed	Anterior and two posterior small clearly lesser developed	
D_4 paraconid and protoconid		Pointed Open angle	Pointed Lesser open angle	Lesser pointed More open angle	
metaconid		absent	present	absent	
talonid		Bicuspid: hypoconid reduced, but entoconid & hypoconulid well developed	Tricuspid All well developed	Not developed	
cingulum			labial intense in all milk teeth		
Morphotype	Lesser complicated				More complicated

Table 6. Some morphological characters on milk teeth of Pleistocene carnivores from Greek caves for comparison.

The Late Pleistocene Loutra Arideas bear-cave is very rich in paleontological material of ursid milk teeth. Thus the site can be considered as the unique place of Greece where so abundant and well stratified deciduous teeth from 189 excavated layers (5 cm of thickness each) have been collected. The abundance of the milk teeth, in spite their fragility, is very remarkable. The majority of the tooth and bone remains belong to juveniles and sub-adults, while very few belong to very old individuals and few to adults. Among the material there are specimens such as skull and mandibles with deciduous teeth and postcranial bones, especially metapodials with the distal epiphysis infused. Therefore all ages from juvenile to senate individuals are represented. The majority of the tooth and bone remains belongs to juveniles and sub-adults, while very few belong to very old individuals and few to adults, indicating thus an extremely high incidence of young and neonate mortality.

The study of the milk teeth proved the presence either of unborn bears. There are many bear carcasses as a result of death during hibernation. All this evidence establishes the inhabitation. On the other hand, many milk teeth must have been brought into the cave with the sediments.

The morphotype of the milk carnassials from Loutraki is similar to those from Gamssulzenhöhle (Austria).

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