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Preliminary report on the Late Pleistocene small mammal fauna from the Loutraki Bear-cave (Pella, Macedonia, Greece)

Estudio preliminar de micromamíferos del Pleistoceno Superior de la cueva de Loutraki (Pella, Macedonia, Grecia)

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ABSTRACT

The Loutraki Bear-cave (Northern Greece) yielded a rich Pleistocene fauna including mammals, amphibians and reptiles. In the present study the small mammal fauna associated with cave-bear remains is studied. The material comes from a long-time excavation project, which is still in progress. This study allows us to propose a Late Pleistocene age for the Loutraki fauna. The composition of the LAC-micromammalin fauna suggests a complex environment.

Key words: Rodents, Late Pleistocene, Greece, Macedonia, Loutraki, Paleoecology

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INTRODUCTION-METHODOLOGY

The cave-site of Loutraki (LAC: Loutraki Almopia Caves) is located in North Greece on the slopes of the Voras mountain, very close to the former Jugoslavian border, about 120km north-west of Thessaloniki (figure 1). The investigation of this area started in 1990 due to the great palaeontological interest. Five systematic excavation circles took place in 1993, 1994, 1996, 1999 and 2000 by School of Geology of Aristotle University in cooperation with Ephoria of Palaeoanthropology and Speleology, Ministry of Culture and Vienna University. All the material is stored both in the Aristotle University of Thessaloniki and the local Physiographical Museum of Almopia. There are three excavation-blocks of squares in three chambers (LAC I, LAC II and LAC Ib) of the cave. During the excavation in 2000 a new square-trench was opened in the chamber LAC III in order to add data to the study. The aim of the research is the sediments as well as the palaeontological material of all chambers to be correlated. Two dating projects of the sediments are in progress, one in cooperation with Laboratory of Archaeometry of "Demokritos", Athens (ESR method) by Bassiakos and the second in cooperation with Vienna University (U/Th method). About 10.000

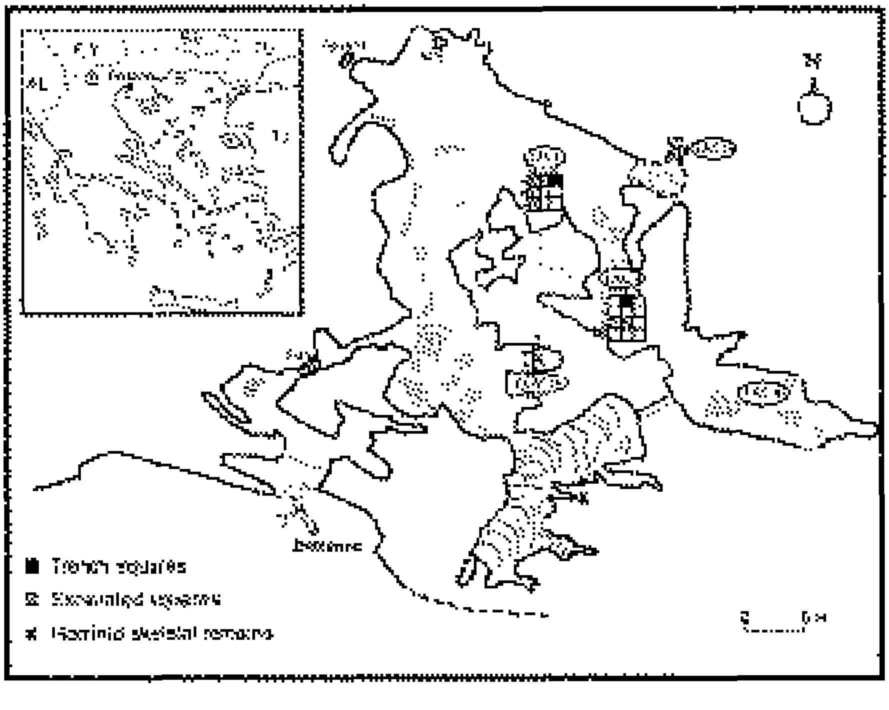

Figure 1. Loutraki Bear-cave, location and ground-plan. On the ground-plan the excavated trench squares are shown.

ursid remains, which are described and analysed from three blocks of squares, are determined as *Ursus spelaeus* (TSOUKALA E., 1994, 1996; TSOUKALA *et al*., 1998). Other large mammalian fauna remains found in association with cave-bears, confer to: *Panthera pardus*, *Crocuta spelaea*, *Capra ibex*, *Dama* sp.

In order to study the micromammalian fauna from the chosen trench squares D10 (LAC II chamber) and N10 (LAC I chamber) (figure1), the sediments were first put into water and perhydrol (H_2O_2) and then all the material was washed through two double system of sieves, one for micromammals (1mm) and the other (3mm) for larger, mainly ursid remains. Then the material was dried, packed up and transported to the Aristotle University's labs for further processing, such as dry sieving through a set of sieves with diameters of 1.6mm, 1.0mm, 0.63mm and 0.35mm for easier sorting. Then the teeth were placed in special plates and they were numbered. The measurements of the teeth were taken at University of Vienna, with Video Measuring System (VIA-100) microscope.

The teeth were figured in the University of Vienna as well as in the Aristotle University.

STRATIGRAPHY

Two stratigraphical columns are presented from the two square-trenches D10 and N10 of the Chambers LAC II and LAC I respectively (figure 2). The excavation in the third trench is in progress. The accumulation of sediments in Bear-cave was in cyclic intervals. The alternation of clastic and chemical sediments is evident in both columns. The calc-crust layers (oblique stripes) were deposited during warm and humid intervals, while the clastic sediments (sand, clay, silt) were accumulated during colder periods. The study of the small grain size of the clastic sedimentation of the floor of the Bear-cave is an evidence of slow water flow in the deposition site. This is the result of the increase of water mass surface flowing inside the cave, as well as of probable climate change from wet to dry (TSIRAMBIDIS, 1998). The micro and macromammal remains were found in brown clay, between the two first calc-crust layers (D10). The ESR-absolute dating of the second crust indicated an age more recent than 50.000 years (KAMBOUROGLOU & CHATZITHEODOROU, 1999). The U/Th absolute age of the fossiliferous layer ranges from 35.000 to 30.000 (dating of the two first crust layers).

PALAEONTOLOGY

Among rodents, the abundance of bone remains is remarkable, as well as the number of isolated teeth, especially from square D10. In N10 the number of teeth and bones was reduced. In contrary no complete mandibles were found, only very few broken parts of them, with few teeth. The teeth of arvicolids (plate I) are in remarkable abundance. For the determination only the M_1 were used, but M^3 have also been described. The murids (plate II) are following in abundance and all the teeth from both jaws were found and used for the determination of the species. The same thing applies to the crice-

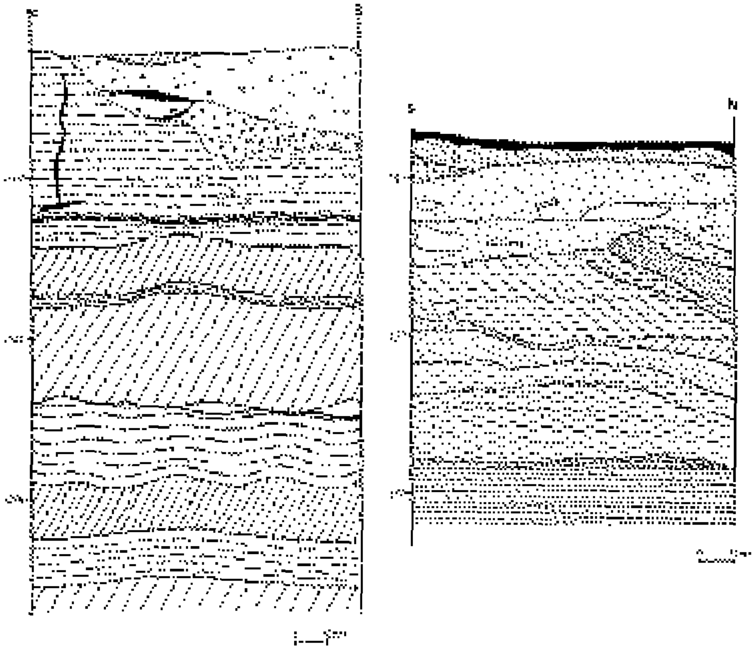

Figure 2. Stratigraphical sections of trench square D10 and N10.

tids (plate II) as well. The glirids (plate III) are relatively few but well representative. The spalacids (plate III) are even fewer but also well representative. Only one tooth was found from the family of sciurids (plate I) (CHATZOPOULOU & VASILEIADOU, 1998). The chiropters and insectivors are under preliminary study. In the microfauna were also found few remains of amphibians, reptiles and fish, which could not be interpreted in this paper. The following taxa were found from Bear-cave:

CHIROPTERA
Rhinolophidae
Rhinolophus sp.
Miniopterus sp.

Vespertilionidae
Myotis sp.

INSECTIVORA
Soricidae
Sorex sp.

RODENTIA
Sciuridae
Spermophilus sp.
Arvicolidae
Arvicola terrestris (LINNAEUS, 1758)
Microtus arvalis (PALLAS, 1778)
Microtus nivalis (MARTINS, 1842)
Pitymys cf. *subterraneus*
Clethrionomys sp.

Muridae

Apodemus mystacinus (DANFORD & ALSTON, 1877)

Apodemus sylvaticus/flavicollis

Cricetidae

Cricetulus migratorius (PALLAS, 1773)

Mesocricetus cf. *newtoni*

Gliridae

Dryomys nitedula (PALLAS, 1778)

Muscardinus sp.

Glis sp.

Spalacidae

Spalax cf. *leucodon*

DISCUSSION-CONCLUSIONS

The faunal list shows a remarkable abundance of the small mammals: 19 species belonging to 9 families. The LAC assemblage, only for rodents, shows a diversity of 14 species belonging to 6 families. Such a variable diversity is also common in recent faunas. The material from the Vraona cave near Athens does not show such diversity (RABEDER, 1995). The LAC microfauna has a very similar composition to that from the Smolucka cave in Southwest Serbia (DIMITRIJEVIC, 1991). The LAC assemblage is compared to the material from the fissure-filling near Arnissa (MAYHEW, 1977) and the absence of *Sisista sutilis*, *Lagurus lagurus*, *Microtus guentheri* and *Ochotona pusilla* is observed. The absence of *Sisista*, *Allactaga* and *Ochotona* shows a less steppe environment in view of its presence in the fossil fauna from the Bacho Kiro cave in Bulgaria (KOWALSKI & NADACHOWSKI, 1982). The LAC-material compared to Middle Pleistocene faunas of Chios (STORCH, 1975) and Emirkaya-2 (MONTUIRE et al., 1994) is composed by species that show a much more advanced evolutionary stage.

The provenance of the microfauna fossils is being discussed. Micromammals probably got into the cave from the surface through fissures with claysilt material. Some teeth and bones show traces of transportation by water. This observation related to the taphonomy of the macromammals could be the result of the increase of water mass surface flowing inside the cave. Finally, they could be the remains of meals of various predators-owls and others raptors that primarily feed on small mammals hunting over a variety of habitats and returning to the cave to digest and regurgitate their meals, and mammal carnivores which carried carcasse of their pray into the cave. Among the numerous bones and teeth, there were sometimes more or less complete mandibles, but no complete skull is found, which is characteristic for owl pellets. This source of origin is also supported by the presence of erosion on the enamel and dentine of many of the teeth due to digestion by predatory birds. Bats inhabited the cave. A small curved drain found in B11 indicates that some species of small mammals, dwellers of forests and rocky slopes could have visited seasonally the cave on their own.

The composition of the micromammal fauna concludes a Late Pleistocene age. Most of the species show an advanced evolutionary stage. This conclusion is confirmed by the age that macromammal fauna indicates as well as by the absolute dating of ESR (KAMBOUROGLOU & CHAT-

ZITHEODOROU, 1999) and U/Th methods.

The surroundings of the Bear-cave are geomorphologicaly very complex-forest peaks, rocky slopes, vast fields and mountain plateaus alternate in a small area (figure 3). Just like today, in the Late Pleistocene geomorphological density had to result in vegetational and faunal variety.

On the rocky slopes and neighboring mountain peaks lived high mountain species such as the snow vole (*Microtus nivalis*). The common vole (*Microtus arvalis*) inhabited mountain meadows, while the rock mouse (*Apodemus mystacinus*) lived in dry woodland and calcareous rocky scrubby hillsides. In the vicinity of rivers the water vole (*Arvicola terrestris*) could have been occasionally found.

In the surroundings of the cave and on the nearby mountains, deciduous and coniferous forest and bushy vegetation was developed, which was inhabited by numerous species such as the wood mouse (*Apodemus sylvaticus/flavicollis*), the pine vole (*Pitymys* cf. *subterraneus*), three species of glirids (*Dryomys nitedula*, *Muscardinus* sp. and *Glis* sp.) and the bank vole (*Clethrionomys* sp.).

In the mountain plateaus and fields some species lived related to drier climate and grassy vegetational cover, like the souslic (*Spermophilus* sp.), the common vole (*Microtus arvalis*), the golden hamster (*Mesocricetus* cf. *newtoni*) as well as the mole rat (*Spalax* cf. *leucodon*) (ONDRIAS, 1966).

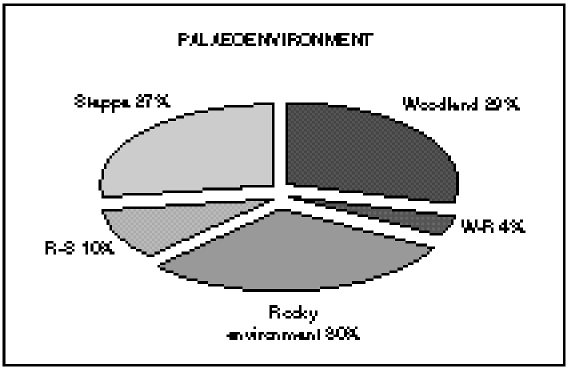

Figure 3. Composition of the LAC assemblage according to ecological indicators.

PLATE I

LOUTRAKI BEAR CAVE
Arvicola terrestris **1. M_1dex.**
Microtus arvalis **2. M_1dex. 3. M_1dex. 4. M_1sin. 5. M_1sin. 6. M^3dex. 7. M^3sin.**
Microtus nivalis **8. M_1dex. 9. M_1dex. 10. M_1dex. 11. M_1sin. 12. M^3sin. 13. M^3sin.**
Microtus **(*Pitymys*) cf. *subterraneus*** **14. M_1dex. 15. M_1sin 16. M_1sin 17. M_1sin. 18. M^3 sin 19. M^3sin.**
Clethrionomys **sp. 20a. M_2dex. 20b. labial view. 21a. M^2dex. 21b. labial view.**
Spermophilus **sp. 22a. M_3sin. 22b. posterior view.**

PLATE II

LOUTRAKI BEAR CAVE
Apodemus mystacinus **1. M^1sin. 2. M^1sin, 3. M^1dex. 4. M^2dex. 5. M^3sin. 6. M_1sin. 7. M_1dex. 8. M_2sin. 9. M_3dex**
Apodemus sylvaticus/flavicollis **10. M^1sin. 11. M^1sin. 12. M^2sin. 13. M^3dex. 14. M_1dex, 15. M_1dex. 16. M_2sin. 17. M_3dex.**
Cricetulus migratorius **18. M^1sin. 19. M^2, M^3sin. 20. M_1sin. 21. M_2sin. 22. M_3sin.**
Mesocricetus **cf. *newtoni*** **23. M^3sin. 24a. M_1dex. 24b. labial view. 25. M_2sin. 26. M_3sin.**

PLATE III

LOUTRAKI BEAR CAVE
Dryomys nitedula **1. P^4dex, 2. P^4dex, 3. M^1sin, 4. M^2sin. 5. M_1dex. 6. M_2 sin, 7 M_3sin, 8. M_3sin.**
Muscardinus **sp. 9. P_4dex. 10. M^2 dex**
Glis **sp. 11. M^3dex.**
Spalax **cf. *leucodon*** **12a. M^1dex. 12b. labial view. 12c. lingual view. 13. M^3sin. 14a. M_1dex. 14b. labial view. 14c. lingual view. 15. M_3dex.**

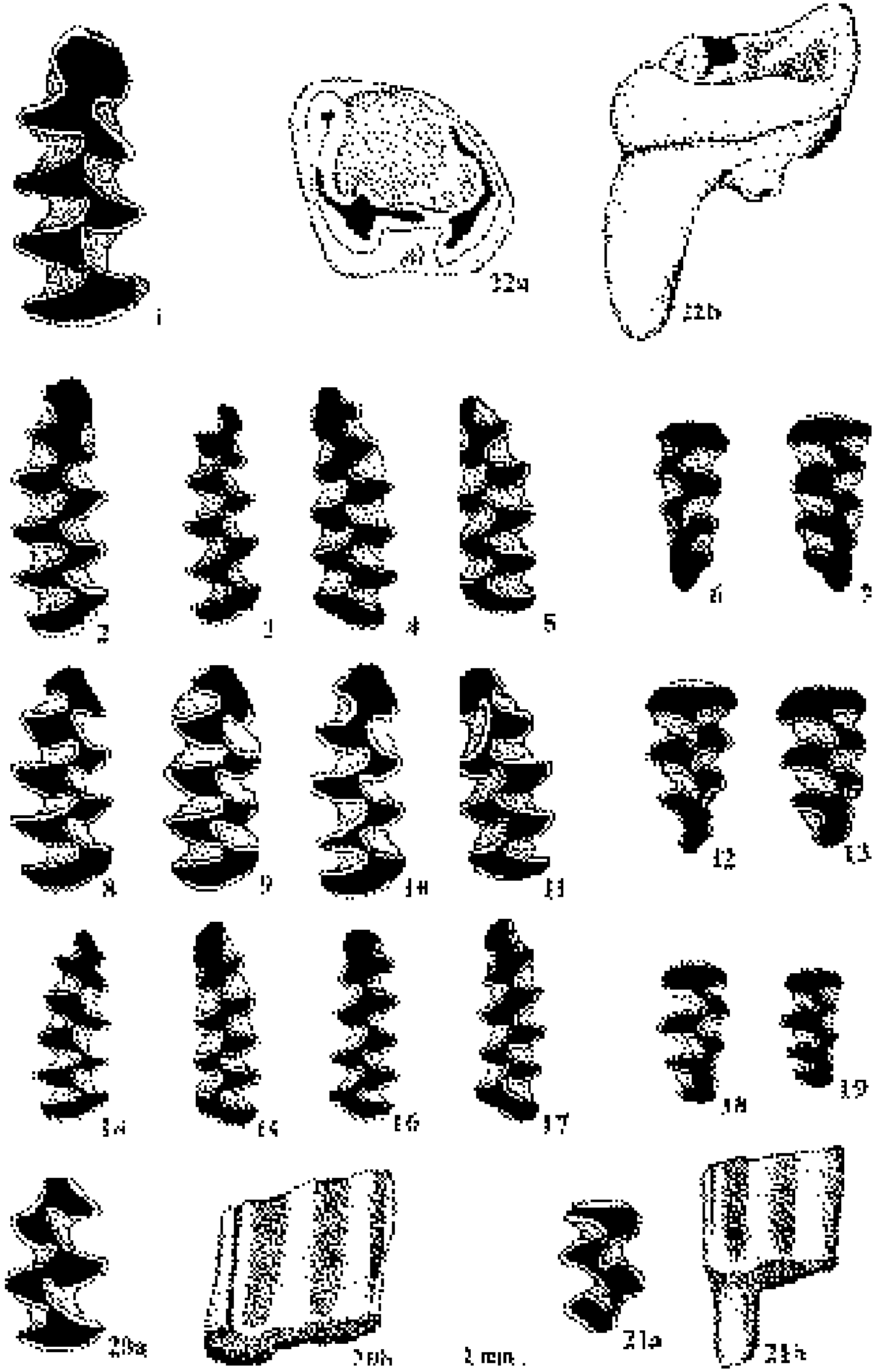

PLATE I

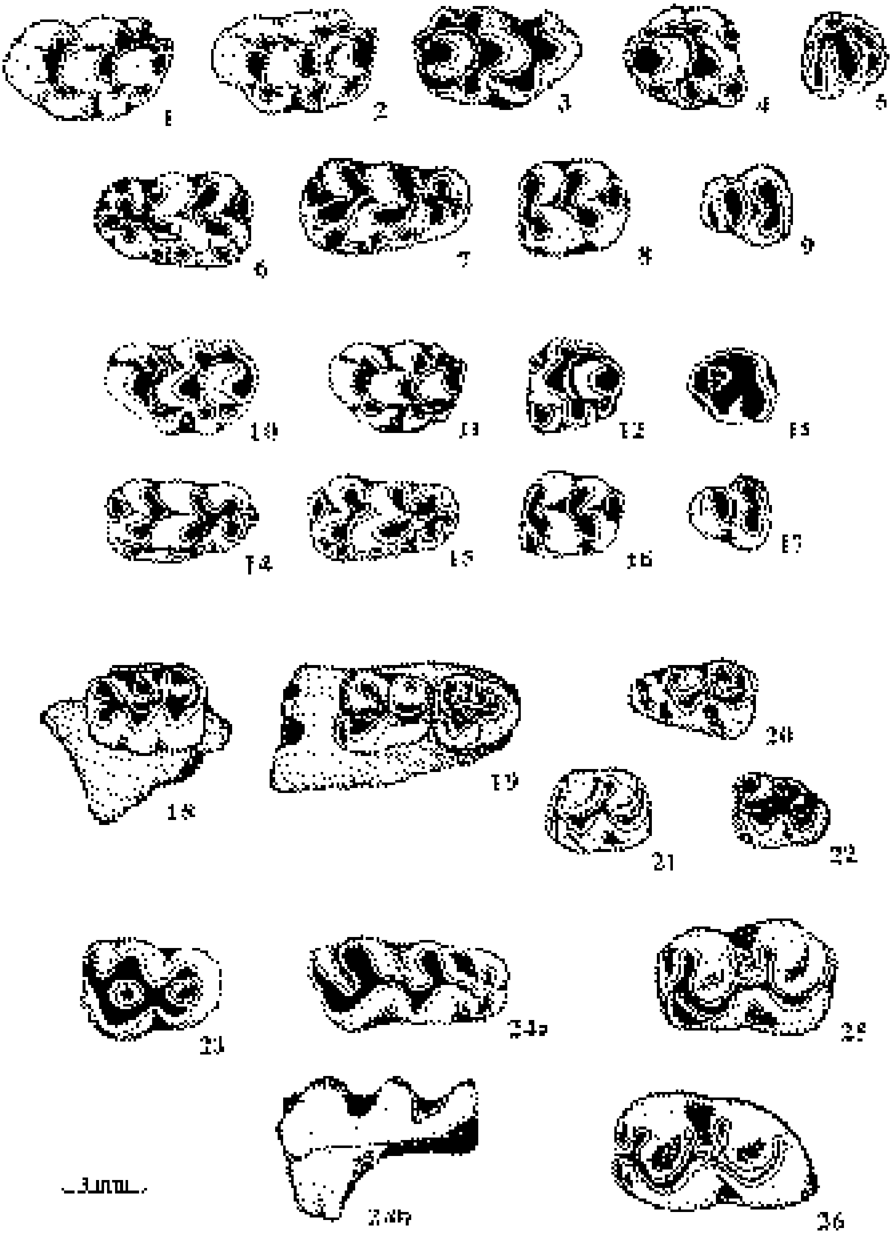

PLATE II

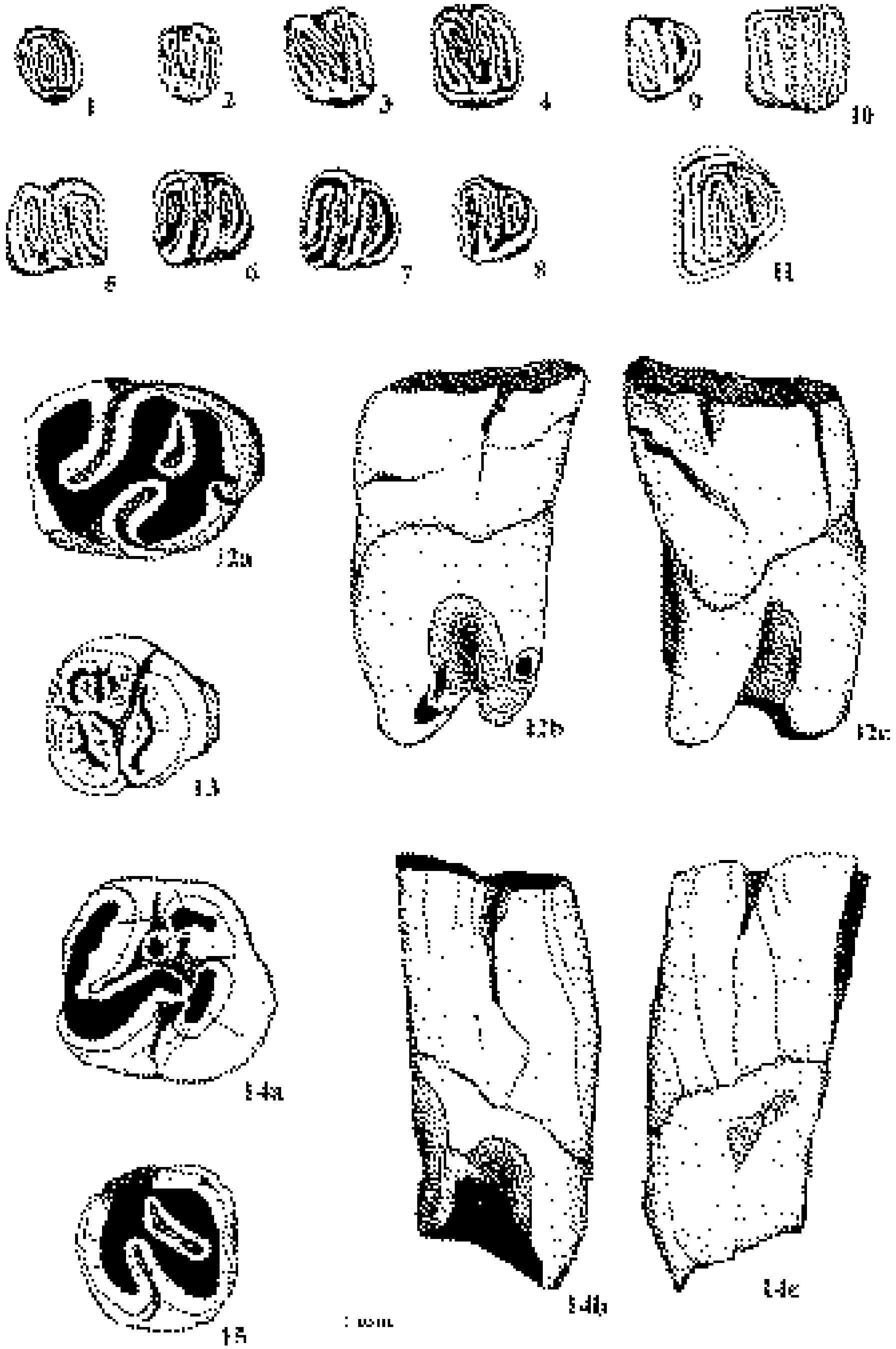

PLATE III

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