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The Late Miocene Mammal Faunas of the Mytilinii Basin, Samos Island, Greece: New Collection

7. Hyracoidea

by

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Abstract

The pliohyracids are relatively abundant in the old Samos late Miocene mammal collections, known from the beginning of the last century. Two species are referred to: a large-sized one named *Pliohyrax graecus* and a small-sized one named *P. kruppii*. Among the newly collected material from the Mytilinii Basin of Samos there is a mandible of a pliohyracid. It was found at the fossiliferous site Mytilinii-1C (MTLC) situated in the Adrianos ravine, a well-known fossiliferous area of Samos. In this article the MTLC mandible is described and compared to the old material of Samos as well as to the Eurasian pliohyracids. All its morphological and metrical characters allow the attribution to *P. graecus*. The fossiliferous site MTLC is dated to middle Turolian, MN 12 and more precisely to 7.1-7.0 Ma by the magnetostratigraphic data. The geographic and stratigraphic distribution of the Miocene hyraxes in Eurasia is also given in the present article.

Keywords: Late Miocene, Samos, Greece, Mammalia, Hyracoidea, Systematics.

Zusammenfassung

Die Pliohyraciden sind relativ häufig in den alten obermiozänen Säugetiersammlungen, die seit dem Beginn des letzten Jahrhunderts bekannt sind. Zwei Arten sind genannt: ein große Form, *Pliohyrax graecus*, und eine kleine Form, *P. kruppii*. Unter den Neufunden aus dem Mytilini Becken von Samos befindet sich ein Mandibel eines Pliohyraciden. Sie stammt aus Mytilinii-1C (MTLC) und liegt in der Adrianos Rinne, einem bekannten fossilführenden Gebiet in Samos. In dieser Arbeit wird eine Mandibel beschrieben und mit Altmaterial aus Samos und ebenso mit eurasiatischen Pliohyraciden verglichen. Die morphologischen wie auch die metrischen Daten erlauben eine Bestimmung in *P. graecus*. Dieser Fundpunkt, MTLC, ist ins mittlere Turolium (MN 12) eingestuft, also 7,1-7,0 Mill. J. mittels magnetostratigrapischer Ergebnisse. Es wird eine Übersicht über die geografische und stratigraphische Verbreitung der miozänen Klippschiefer gegeben.

Schlüsselwörter: Obermiozän, Samos, Griechenland, Mammalia, Hyracoidea, Systematik.

1. Introduction

The occurrence of hyracoids in the Miocene faunas of the Eastern Mediterranean is restricted to a dozen of localities, mainly of late Miocene age. The localities of Samos yielded the richest collection of hyraxes including some cranial and mandibular remains. A relatively good collection has been unearthed from the Turkish localities of Kemiklitepe (Baudry, 1994), while the rest of the known material was mainly found at the Greek localities of Pikermi and Halmyropotamos. Some fragmentary material is also known from few other localities. The first fossil remains of the Samos hyracoids were described by Osborn (1898), Forsyth Major (1899) and Schlosser (1899a, b). No new material of hyraxes has been recorded in the later excavations. For instance the Brown collection from Samos at the AMNH, which is quite rich, does not include remains of hyraxes. The group is also absent from the small collection Prof. J. Melentis set up in 1963, and housed at the NHMA.

During our excavations since 1994 in the Mytilinii basin (Samos), we collected a great amount of vertebrate fossils among which the hyraxes are represented by a single mandible. The specimen was found at the fossiliferous site Mytilinii-1C (MTLC). The locality Mytilinii-1 (MTL) of the Adrianos ravine contains several fossiliferous sites. The site A corresponds to the one where Prof. J.K. Melentis

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excavated in 1963. The sites B and C are new and the site D probably corresponds to the old Q1 of B. Brown (Koufos et al., 1997, 2004; Kostopoulos et al., this volume).
The present paper describes the single mandible of hyrax from MTLC and compares it to the old material from Samos as well as to the other known material of Eurasia. The age of MTLC is middle Turolian, MN 12, while the palaeomagnetic record suggests an age from 7.1-7.0 Ma (Kostopoulos et al., 2003; Koufos et al., 2004). More details about the stratigraphy and position of MTLC are given in Kostopoulos et al. (this volume). It is worth mentioning that the old collections from Samos often lack precise information about the locality of the specimens and their stratigraphic position. The new collection has the advantage to bear the exact location of the sites and their stratigraphy.

Abbreviations:
AMNH = American Museum of Natural History, New York
AMPG = Athens Museum of Geology and Palaeontology, University of Athens
BMNH = British Museum of Natural History, London (The Natural History Museum, London)
BSPM = Bayerische Staatssammlung für Paläontologie und Historische Geologie, München.
HAL = Halmyropotamos, Evia island, Greece
KT-A, B, D = Kemiklitepe-A, B, D, Turkey
LGPUT = Laboratory of Geology and Palaeontology, University of Thessaloniki
MNHN = Museum National d'Histoire Naturelle, Paris
MTLC = Mytilinii-1C, Samos, Greece
NHMA = Natural History Museum of the Aegean, Samos, Greece
NHMB = Naturhistorisches Museum Basel
NHMW = Naturhistorisches Museum, Wien
NOW = Neogene Old World database
PIK = Pikermi, Greece
Q1 = Quarry 1, Samos, Greece
PIMZ = Paläontologisches Institut und Museum, Universität Zürich
PIUW = Paläontologisches Institut, Universität Wien
SAM = Samos, old collections
SMNS = Staatliches Museum für Naturkunde, Stuttgart

The specimens of the various museums or institutes, except NHMA, are noted in the text by the abbreviation of the museum or institute, the locality and the serial number of the specimen.

2. Palaeontology

Order Hyracoidea Huxley, 1869
Family Pliohyracidae Osborn, 1899

Genus *Pliohyrax* Osborn, 1899

***Pliohyrax graecus* (Gaudry, 1862)**
(Plate 1)

Locality: Mytilinii-1C (MTLC), Adrianos ravine, Mytilinii Basin, Samos, Greece.
Material: Mandible, MTLC-39.
Measurements: The mandibular and dental measurements are given in Tabs. 1, 2.
Description: The studied mandible lacks both ascending rami and preserves the tooth rows i2, p1-m3 dex and c-m3 sin. The mandible was found near the surface, consequently damaged by erosion and plant roots. The bone of the mandible has many cracks and it is heavily fragmented (Pl. 1, figs 1a, b). The teeth show enduring wear, and in some of them the enamel has completely disappeared. The mandibular corpus is deep and thick (Tab. 1). All the measurements of the studied mandible are slightly larger than normally anticipated because of the bone fractures. From occlusal view, the distance between the tooth rows is large at the level of the i2, then it is being narrower to p2 and after it is again enlarged to m3 (Pl. 1, fig. 1c). The internal symphysis is wide, concave and inclines roughly backwards. The mandibular corpus has a relatively deep fossa below the c-p2 (Pl. 1, fig. 1b). The tooth row is concave from i2 to p2, but then it is straight in buccal direction. The cheek teeth are selenolophodont.
i2. It is elongated and strong with a long root which is directed across the symphysis to the inferior border of the mandibular corpus. It has a triangular section. The buccal wall is flat and a weak groove runs across it from the base to the top (Pl. 1, fig. 2). The lingual surface of the i2 is also flattened because of the attrition that makes a large wearing facet. There is a strong distolingual and buccal cingulum.
c. The canine is premolariform with a triangular occlusal outline (Fig. 1b); most of the enamel has vanished because of heavy wear. The buccal valley separating the protoconid and hypoconid is partially preserved; it is deep and open with a basal cingulum.
p1. It is heavily worn and has a sub-triangular occlusal outline. The paraconid, metaconid and entoconid are well developed and distinguished by deep and open valleys. The base of the valleys is closed by a strong lingual basal cingulum. The hypoconid is wider than the protoconid and the distal wall of the tooth is concave. There is a strong buccal cingulum.
p2. It is worn and its distal wall is slightly damaged. The paraconid is strong and well developed reaching the lingual wall of the tooth. The metaconid is stronger than the hypoconid but both are well distinguished. The lingual valleys between the lophs are deep and open, closed only at their base by a strong basal cingulum. The protoconid and hypoconid are separated by a relatively narrow, shallow and open buccal valley that is closed at its base only by a well developed cingulum.
p3. It is slightly broken distolingually and worn. Morphologically, it is similar to the p2 but larger.
p4. Both p4 are badly preserved and extremely worn but their general morphology is similar to that of the p2.
m1. Both m1 are heavily worn and lost their enamel morphology. The buccal valley is well distinguished and there is a strong buccal cingulum.

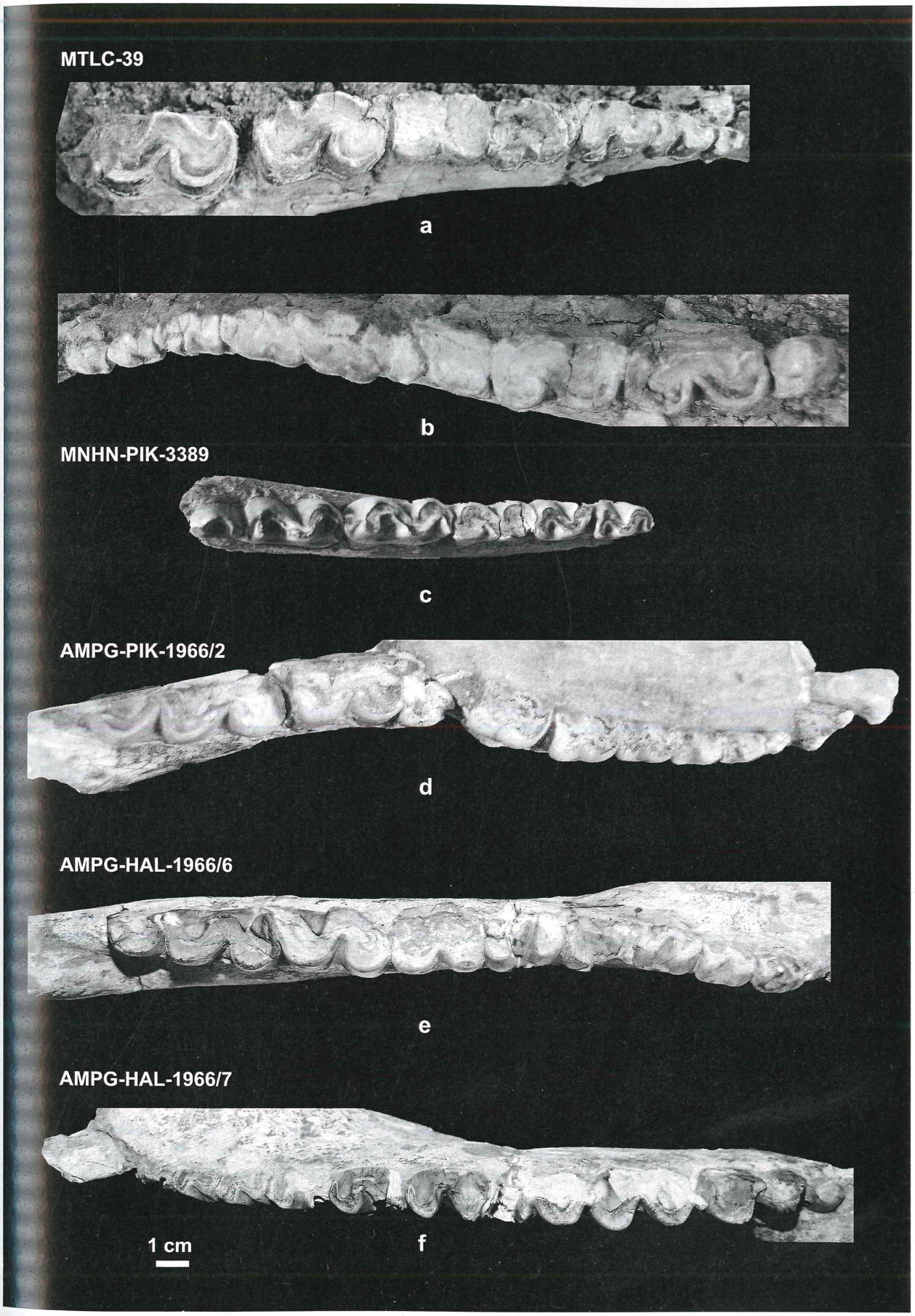

Figure 1: Lower dentition of *Pliohyrax graecus* from various localities. **a**. Right tooth row of the mandible MTLC-39; **b**. Left tooth row of the type mandible MNHN-PIK-3389; **c**. Left tooth row of the mandible MTLC-39; **d**. Right tooth row of the mandible AMPG-PIK-1966/2; **e**. Right tooth row of the mandible AMPG-HAL-1966/6; **f**. Right tooth row of the mandible AMPG-HAL-1966/7.

m2. It is also very worn and larger than the m1. The buccal valley is narrow, deep and directed mesially. The lingual valleys are well recognizable, large and open; only their base is closed by the lingual basal cingulum.

m3. It is elongated and longer than all teeth having a third lobe (talonid). The morphology is similar to that of the other molars.

Discussion: The Hyracoidea are a peculiar group retaining several primitive characteristics related to the proboscideans, sirenians and other orders. Their close relationships with the perissodactyls is indicated by the pattern of the cheek-teeth which is similar to that of horses, rhinocerosses, chalicotheres and palaeotheres. Thus, it is quite possible that all these groups developed from the same ancestral stock. The family Pliohyracidae is characterized by high crowned cheek teeth, spatulated and triangular i1, i2, reduction of the i3, premolariform canine and sub-molariform premolars (Meyer, 1978). The presence of these characteristics in MTLC-39 allows its attribution to the family Pliohyracidae. On the other hand, the significantly larger i2 relative to the i3, the molarized premolars with V-shaped hypoconid, the central or lingual position of the paraconid in the premolars, the absence of the mesoconid and the selenodont teeth of the MTLC-39 are the characteristics shared with the sub-family Pliohyracinae (Meyer, 1978). The genera included in this sub-family are:

***Meroehyrax* Withworth, 1954.** The studied specimen differs by the marked hypsodonty and the selenolophodont dentition.

***Postschizotherium* Koenigswald, 1932.** It differs from MTLC-39 in the absence of the i3 and the more trapezoid section of the i2.

***Sogdohyrax* Dubrovo, 1978.** It is a Pliocene species known by a fragmentary skull and thus impossible to be compared with the studied mandible. It is known by a single species *S. soricus* from Tadzhikistan.

***Kvabebihyrax* Gabunia & Vekua, 1966.** The studied material differs in having a more rounded section in the i2, double rooted canines and p1 versus four-rooted in *Kvabebihyrax*, and larger teeth (Fig. 2).

***Pliohyrax* Osborn, 1899.** The presence of the basal cingulum in the buccal wall of the canines and premolars, the presence of the i1, 2 and the similarity of MTLC-39 to the material from Pikermi and Halmyropotamos (Fig. 1) indicate its attribution to the genus *Pliohyrax*.

The first evidence of the presence of pliohyracids originates from Pikermi, Greece when Gaudry (1862-67) described two mandibular fragments under the name *Leptodon graecus*. Some decades later, three almost simultaneous references mention their presence in Samos too.

- A facial fragment of a skull (SMNS-SAM-44302), housed at the Museum of Stuttgart, was described as *Pliohyrax graecus* by Osborn (1898).
- A partial skull (BMNH-SAM-M.5419), housed at London's museum, was described originally as *Leptodon graecus* and one month later as *Pliohyrax graecus* by Forsyth Major (1899).
- A mandible, stored at BSPM, was described under the name *Leptodon graecus* by Schlosser (1899a, b).

The comparison of these four specimens from Pikermi and Samos indicates that all of them belong to the same genus. The type mandible from Pikermi (MNHN-PIK-3389) and the skull from Samos (BMNH-SAM-M.5419) belong to *Pliohyrax graecus*. The other two specimens, the skull of the Stuttgart museum (SMNS-SAM-44302) and the mandible of the München collection belong to another species different from *P. graecus* (Forsyth Major, 1899). The old material of Samos is grouped into two species: *P. graecus* and *P. kruppii* (Solounias, 1981; NOW, 2007).

Later on, the pliohyracids were recognized at the locality of Halmyropotamos (Evia Island, Greece) by some cranial and mandibular remains (Melentis, 1967). It is noteworthy mentioning that the Greek late Miocene localities (Axios valley, Nikiti, Perivolaki, Kerassia), as well as those of the rest of the Balkans did not yield remains of hyracoids (Koufos, 2006; NOW, 2007). Even in Pikermi and Samos, as well as in some Turkish localities, the hyracoid remains are few in comparison to other ungulates. The studied mandible from Samos is compared to the known material from the Eastern Mediterranean. It is directly compared to the type mandible of the species stored at the MNHN, as well as with the material of *Pliohyrax* at the PIUW and AMGP.

P. graecus is well known at the type locality of Pikermi. In addition to the type mandible (MNHN-PIK-3389), there is one fragmentary skull (AMPG-PIK-1966/1) and one mandible (AMPG-PIK-1966/2) at the University of Athens, as well as two mandibular fragments (PIUW-PIK-unumb. C, D) stored at the University of Vienna. The direct comparison of the mandible MTLC-39 to the type of *P. graecus* indicates that they are morphologically similar (Fig. 1). However, the type mandible has narrower teeth (Tab. 2). The mandible AMPG-PIK-1966/2 is deformed and broken at the inferior border of the mandibular corpus but the morphology of the symphysis and the teeth resembles that of MTLC-39 (Fig. 1d). The dental proportions of MTLC-39 are close to those from Pikermi (parallel lines) although slightly larger. There is also a significant difference in the size of the i2 which is larger in the studied mandible (Fig. 2).

A skull and some mandibular remains of a hyrax, housed at the University of Athens, are known from Halmyropotamos (Evia Island, Greece), (Melentis, 1967). The mandible AMPG-HAL-1966/7 shows similar preservation of bone and teeth as the studied one (Fig. 1f). The morphological similarity of both specimens is quite clear. The symphysis has the same characteristics and features. The dental morphology is also similar, while the dental size of MTLC-39 is slightly larger; only the i2 of MTLC-39 is significantly larger than that of Halmyropotamos (Fig. 2). The comparison of MTLC-39 to the other two mandibular remains (AMPG-HAL-1966/6, 10) confirms the similarity of MTLC-39 to Halmyropotamos *Pliohyrax*.

As was mentioned above *P. graecus* is also known from the late Miocene of Turkey. The best known material is that from the localities of Kemiklitepe-A, B, D (KTA-B, KTD) which includes several specimens stored at the MNHN (Baudry, 1994). The direct comparison of the

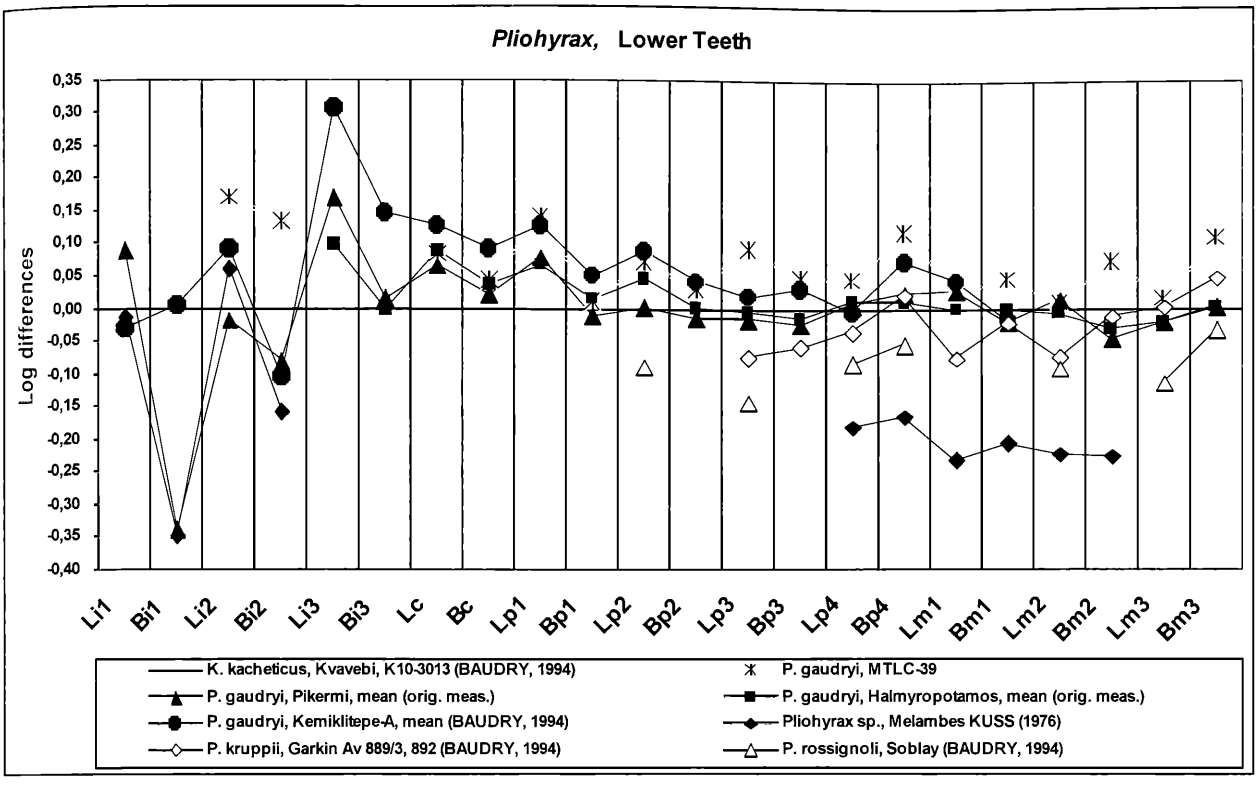

Figure 2: Logarithmic ratio diagram comparing the lower teeth of various pliohyracids.

studied mandible MTLC-39 to the Kemiklitepe sample suggests that it resembles the Kemiklitepe *Pliohyrax*, having similar symphysial and dental morphology. The dental dimensions of both samples are similar and larger than those from Pikermi and Halmyropotamos (Fig. 2). The Kemiklitepe i1 seems to be wider than that of Pikermi but this is probably due to the attrition (Fig. 2). The i2 of MTLC-39 is significantly larger than that of Kemiklitepe but the i3 and c from MTLC and Pikermi are smaller than those of Kemiklitepe (Fig. 2). Considering all these size differences, as well as the fact that the age of all these localities is not remarkably different (middle Turolian, MN 12), it is clear that the eastern sample of *Pliohyrax graecus* (Samos, Kemiklitepe) is larger than the western one (Pikermi, Halmyropotamos). This difference could be related to different palaeoecological conditions. Another observation is that incisor size, especially that of the i2, varies strongly in the various samples of *P. graecus* (Fig. 2), while the rest of the teeth are of almost similar size. This difference in incisor size could be related to sexual dimorphism but this needs more material, detailed study and comparison with the extant hyracoids to be proved.

Another known pliohyracid from Samos is *P. kruppii*. The taxon was created on a fragmentary skull stored at the Stuttgart museum (SMNS-SAM-44302), coming from an unknown locality on Samos (Osborn, 1898). This skull is characterized by an elevation in the connection of the premaxillae, the elevated position of the orbits and the extreme posterior extension of the posterior nasals by the broad union of the palatines (Osborn, 1898). More recent diagnosis for *P. kruppii* suggests that it is a small form of *Pliohyrax* with elevated premaxillae between both I1 and without buccal cingulum in I2, 3 (Fischer & Heizmann, 1992). *P. kruppii* is also known from Pikermi by a maxillary fragment with C-M3 sin and P1-M3 dex (NHMB-Pk-116) which are housed at the Basel museum (Fischer & Heizmann, 1992). A mandible, stored at the BSPM, has been originally described as *Leptodon graecus* by Schlosser (1899a, b). This mandible and the skull SMNS-SAM-44302 belong to the same species (Schlosser, 1899a, b), although Forsyth Major (1899) considers that more data is necessary for this systematic assignment. According to Fischer & Heizmann (1992), the skull SMNS-SAM-44302 belongs to *P. kruppii*, but no reference exists for the BSPM mandible. In the BSPM mandible the length of p4 is 16 mm and of m1 20+ mm (Schlosser, 1899b). These measurements are in the range of variation for *P. graecus*. Generally *P. kruppii* is smaller than *P. graecus* (Fischer & Heizmann, 1992). In a mandible assigned to *P. kruppii* from Garkin (Turkey) the length of p4 and m1 is 15.7 mm and 18.05 mm respectively (Baudry, 1994), measurements which do not diverge much from those of the BSPM mandible. Thus, this mandible could belong to *P. kruppii*. A skull associated with the mandible is known from the locality of Garkin, Turkey (PIMZ-A/V 889, 891-893) and it is attributed to *P. kruppii*. The Garkin material was originally described as *P. graecus* (Hünermann, 1985) but later it was transferred to *P. kruppii*; the determination was mainly based on the cranial characteristics (Fischer & Heizmann, 1992). The MTLC-39 teeth are larger than those of the PIMZ-A/V 889, 891-893 and thus from *P. kruppii* (Fig. 2).

A hyracoid mandibular fragment is known from the locality Melambes (Crete, Greece) which was described

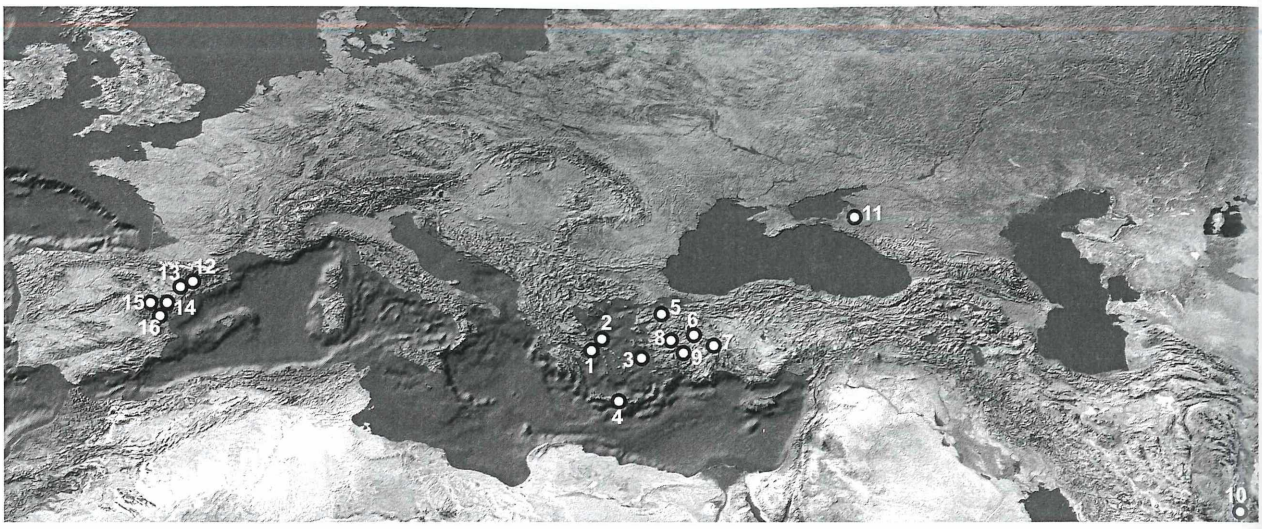

Figure 3: Geographic distribution of the pliohyracids in Eurasia. **1.** Pikermi, **2.** Halmyropotamos, **3.** Samos, **4.** Melambes, **5.** Paşalar, **6.** Kayadibi, **7.** Garkin, **8.** Esme Akçaköy, **9.** Kemiklitepe, **10.** Molayan, **11.** Kvabebi, **12.** Soblay, **13.** Montpellier, **14.** La Cantera, **15.** Almenara, **16.** Las Casiones.

as *Pliohyrax* sp. (Kuss, 1976). Later on, the Melambes hyrax was referred to as ?*Prohyrax hendeyi* (Fischer & Heizmann, 1992; van der Made, 1996). The size of the mandible and teeth are significantly smaller than the studied mandible and differ from it clearly (Fig. 2). The sole known Melambes specimen, the rareness of the accompanying fauna and the quite doubtful age of the locality (Koufos, 2006) cannot allow a certain determination of the mandible and thus the original determination of Kuss (1976) as *Pliohyrax* sp. should remain.

Hünermann (1985) assigned a mandibular fragment from Paşalar (middle Miocene, Turkey) to *P. graecus*. According to Fortelius (1990), who studied other hyracoid remains from Paşalar collected in the 1980's, the preservation of Hünermann's specimen is completely different from that of the Paşalar material and this mandibular fragment may come from another locality. Based on the new material, Fortelius (1990) named the Paşalar hyracoid as *Pliohyrax* sp. The new material is quite poor, including some upper teeth which cannot be compared with the studied mandible. However, these teeth are smaller than those of *P. graecus* (Fortelius, 1990) and they are referred to as *P.* cf. *kruppii* by Fischer & Heizmann (1992).

P. rossignoli is known from the locality of Soblay (France) by some isolated teeth (Viret & Mazenot, 1948). The teeth of Soblay lack cement, the mesial lobe is significantly smaller than the distal one in the lower premolars which are significantly smaller than those of *P. graecus* (Fig. 2). The diagnostic features except the size, as well as the fragmentary and poor state of the material indicate that its systematic status needs a revision. The dental size of the teeth is quite similar to that of *P. kruppii* (Fig. 2). Another species named *P. orientalis* is known from China by a dP4 and an M3, but the available material from Samos cannot be compared to this species. The Chinese material was found in a drug store and its origin and age are doubtful. It is mentioned that it comes from Paote, Shansi (Tung & Huang, 1973).

3. Biostratigraphy-Palaeobiogeography

Although *Pliohyrax* is rare, it has a wide geographic distribution across the whole of Eurasia (Fig. 3). However its main domain is the Eastern Mediterranean (Greece and Turkey). It was iniatially recognized in Pikermi (Gaudry, 1862-67) and later it was traced on Samos and Halmyropotamos (Osborn, 1898; Forsyth Major, 1899; Melentis, 1967). Although it is present in Southern Greece it is absent in northern Greek late Miocene faunas, as well as in those of the other Balkan countries (Bulgaria, former Yugoslavia, Romania). The late Miocene collection of Axios valley (Greece), one of the richest in the area, does not include hyraxes (Koufos, 2006). The Bulgarian fauna of Hadjidimovo, which is also very rich, lacks *Pliohyrax* (Spassov, 2002). On the other hand it is well known from Turkey where it was traced in several localities during middle-late Miocene (Fig. 3). *Pliohyrax* was also recognized far east in Afganistan and China (Sen, 1998; Tung & Huang, 1973). It is unknown in Central Europe, but it is recorded in France (Soblay, Montpellier) and in the Spanish localities of La Cantera, Almenara and Las Casiones (NOW, 2007).

The taxon also has a long stratigraphic distribution in Eurasia, known from middle Miocene to Pliocene (Fig. 4). Its oldest occurrence is known from the Turkish locality of Paşalar, dated to MN 5-6. The available material is very poor, and is determined as *P.* cf. *kruppii* (Fischer & Heizmann, 1992).

During that period, MN 5-6, several migration waves of mammals from Africa arrived in Eurasia over the "Gomphotherium landbridge" which was alternatively open and closed (Rögl, 1999). *Pliohyrax* probably arrived during one of these migration waves in Turkey and then dispersed in Europe and Asia. The taxon must be rare in the Miocene faunas, even in big collections (Pikermi, Samos) its specimens are few. The first representatives of *Pliohyrax* in Eurasia were small-sized forms from Turkey

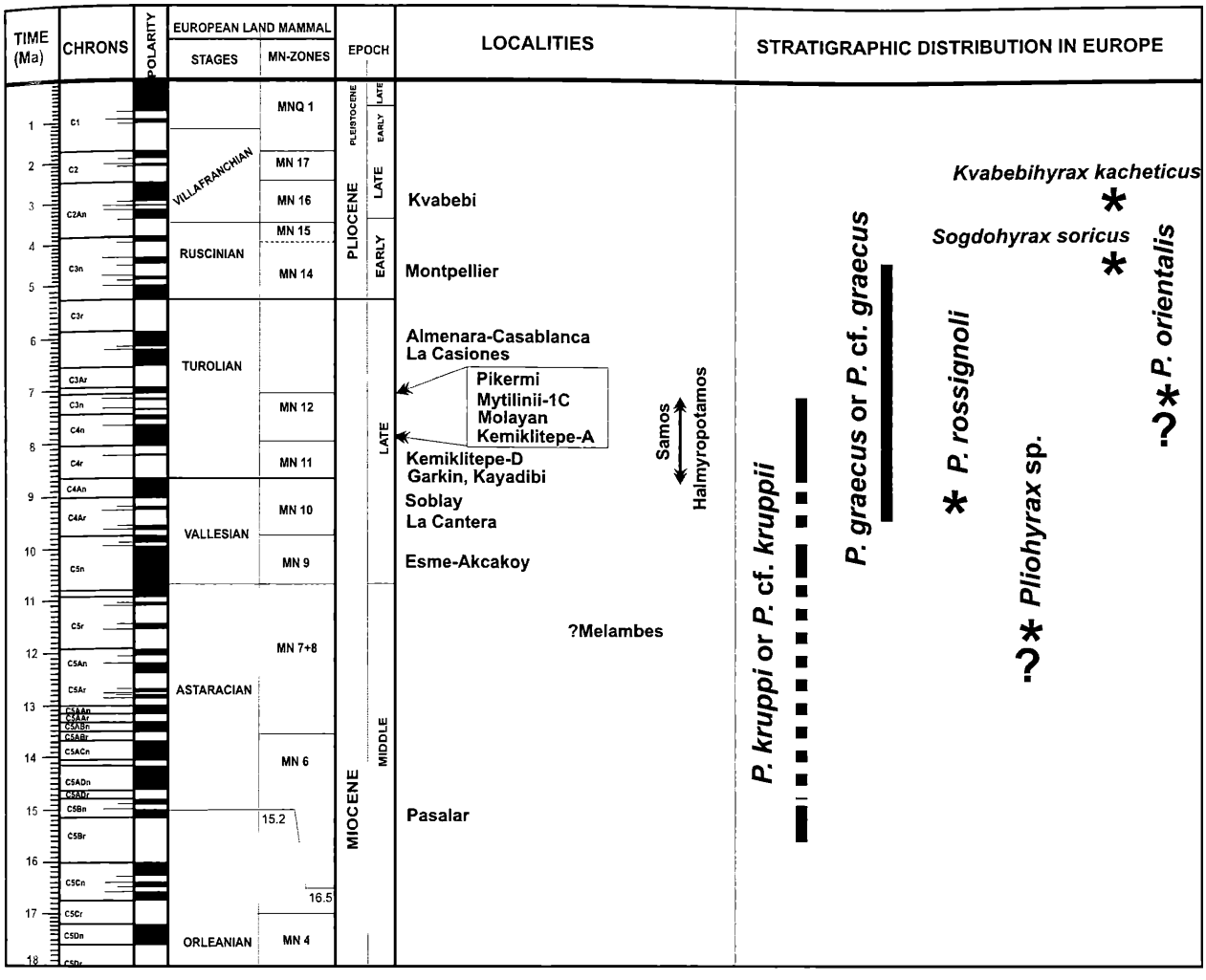

Figure 4: Age of the localities and stratigraphic distribution of the pliohyracids in Eurasia.

and Samos and they are referred to as *P. kruppii* or *P.* cf. *kruppii*. The last appearance of this group is recorded in the late Miocene of Samos from an unknown locality (Fig. 4). The oldest levels of Samos are dated to the end of MN 11 and the youngest ones to the base of MN 13 (Kostopoulos et al., 2003; Koufos et al., this volume). A small-sized form is recorded from the locality of Melambes (Crete, Greece) whose age is questionable (Koufos, 2006). It was originally dated to Vallesian (Bonneau & Ginsburg, 1974). According to van der Made (1996) this form should be determined as ?*Prohyrax hendeyi* and it is dated to Astaracian-Turolian (MN 6-MN 12). However, the size of the Melambes mandible is similar to that from Garkin attributed to *P. kruppii* (Fig. 2). In my opinion both systematic and age assignments for the Melambes hyrax are questionable, and the poor material is best referred to as *Pliohyrax* sp. (Fig. 4).

During late Miocene (MN 10), *P. graecus* appeared in the Eastern Mediterranean as well as in Spain. The last occurrence of the taxon is known from the locality of Montpellier (France) dated to Ruscinian, MN 14 (Fig. 4). *P. graecus* is the most common and best known hyrax in the Eastern Mediterranean. Another late Miocene taxon is *P. rossignoli*, known from the single locality of Soblay, France (Viret & Mazenot, 1948). It is known by some isolated teeth and its attribution and comparison with the other two better known taxons are limited. This is also the case for the Chinese *P. orientalis* (limited material, unknown locality and age). In the Eastern Mediterranean a late Pliocene species *Kvabebihyrax kacheticus* is known from the single locality of Kvabebi in Georgia (NOW, 2007). Another hyrax named *Sogdohyrax soricus* is known from the Pliocene of Tadzhikistan (Dubrovo, 1978).

Bearing in mind all the above mentioned facts, two main *Pliohyrax* groups can be distinguished in Eastern Mediterranean:

- the *P. kruppii* group, small-sized hyraxes, which lived during the Astaracian-Turolian interval (MN 5- MN12), and
- the *P. graecus* group, large-sized hyraxes, which lived during the Vallesian-Ruscinian interval (MN 10-MN 14).

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	Pliohyrax graecus					
MANDIBULAR MEASUREMENTS	MTLC-39	MNHN-PIK-3389	AMPG-PIK-1966/2	AMPG-HAL-1966/6	AMPG-HAL-1966/7	AMPG-HAL-1966/10
	Mytilinii-1C	Pikermi		Halmyropotamos		
		TYPE				
External symphysis length	66.5	—	—	60.0	58.0	[60]
Buccal height of the mandibular		—	—	—	—	—
corpus below the middle of the p1	72.5	—	—	58.7	57.5	—
Idem below p4	78.7	—	—	57.5	—	—
Idem below m3	84.0	—	—	62.5	—	—
Internal breadth between the middle of the i2	30'	—	26.5''	17.0	—	—
Idem in the p2	31.5	—	23''	26.0	35.0	38.5
Idem in the m1	36.0	31.0	23''	26.5	40.0	—
Idem in the m3	48.5	—	33''		43.0	—
Premolar's length	65.0	—	54.5	53.5	58.0	—
Molar's length	100.0	98.0	86.0	86.5	90.5	—

Table 1: Mandibular dimensions of *Pliohyrax graecus*.

	Pliohyrax gaudryi												
LOWER TEETH	MTLC-39		MNHN-PIK-3389, TYPE		PIK-1966/2		PIUW-PIK-nn	HAL-1966-7		HAL-1966/6		HAL-1966/10	
	Mytilinii-1C		Pikermi					Halmyropotamos					
	dex	sin	dex	sin	dex	sin	sin	dex	sin	dex	sin	dex	sin
Li2	22.2	—	—	—	14.8	14.0	—	—	—	—	—	—	—
Bi2	17.0	—	—	—	—	10.4	—	—	—	—	—	—	—
Lc	—	10.3	—	—	9.9	9.9	—	—	10.5	11.3	9.2	11.7	9.3
Bc	—	8.0	—	—	7.4	7.9	—	—	7.2	8.3	7.07	8.6	7.5
Lp1	—	13.1	—	—	10.7	10.5	—	—	10.9	10.9	12.0	12.1	9.6
Bp1	7.9	9.0	—	—	7.2	8.0	—	—	8.0	8.7	8.9	9.6	7.6
Bp1ant	—	7.8	—	—	8.0	8.0	—	—	7.6	8.5	8.7	8.7	7.5
Bp1post	—	8.9	—	—	8.2	8.3	—	—	8.0	8.4	8.7	9.4	8.0
Lp2	14.5	[15]	—	—	11.8	11.2	—	13.3	—	13.4	15.5	14.5	11.3
Bp2	11.3	10.7	—	—	9.5	9.3	—	9.7	—	9.5	11.6	11.1	9.4
Bp2ant	10.0	9.7	—	—	9.1	9.3	—	8.9	—	9.2	10.9	10.3	8.4
Bp2post	11.3	10.6	—	—	9.2	9.2	—	9.2	—	—	11.9	10.0	9.4
Lp3	19.8	19.8	—	16.3	15.1	14.6	—	16.5	—	—	16.7	—	14.3
Bp3	13.7	13.0	—	11.6	11.2	11.3	—	11.3	—	—	12.7	—	10.8
Bp3ant	10.8	11.7	—	11.1	11.0	11.2	—	10.7	—	—	11.3	11.3	10.3
Bp3post	14.1	13.4	—	11.5	11.4	11.2	—	11.6	—	—	12.0	—	10.6
Lp4	19.2	18.5	18.9	18.2	18.5	—	18.7	18.8	17.9	—	17.3	—	16.0
Bp4	15.7	[15]	—	12.3	13.3	—	12.3	13.1	12.7	—	12.7	—	10.9
Bp4ant	13.5	14.8	—	11.7	13.0	12.6	11.3	11.1	11.3	—	11.2	—	10.1
Bp4post	15.8	—	—	12.3	12.0	—	13.2	13.0	12.4		12.2	—	12.2
Lm1	22.2	23.4	23.4	23.4	—	—	25.0	21.0	23.7	20.6	20.6	—	—
Bm1	15.0	—	13.0	12.6	—	—	—	12.1	—	15.3	12.8	—	—
Bm1ant	14.7	—	12.2	12.6	—	—	—	—	—		12.7	—	—
Bm1post	15.2	15.6	12.6	12.8	—	—	—	11.8	—	13.8	13.3	—	—
Lm2	27.8	28.9	28.8	30.5	28.5	28.5	31.3	29.3	—	25.4	26.4	—	—
Bm2	17.5	18.0	13.8	13.8	—	13.2	16.8	13.6	—	13.9	14.4	—	—
Bm2ant	17.5	19.0	13.6	13.7	—	12.8	16.9	13.6	—	14.0	14.1	—	—
Bm2post	[17.5]	19.0	13.5	13.6	—	12.5	17.0	13.3	—	13.3	13.5	—	—
Lm3	—	42.5	—	42.2	39.2	38.4	[40]	39.0	37.9	40.3	—	—	—
Bm3	—	18.0	—	14.3	—	14.2	16.9	13.4	14.0	14.9	—	—	—
Bm3ant	17.7	18.8	—	14.2	—	14.1	16.0	12.8	13.9	14.2	14.2	—	—
Bm3post	—	—	—	13.1	11.8	12.0	17.0	13.0	11.5	12.7	—	—	—
Bm3 tal	—	12.9	—	9.7	9.9	10.6	14.3	—	—	10.3	—	—	—

Table 2: Dental dimensions of *Pliohyrax gaudryi*.

PLATE 1

Pliohyrax graecus, Mytilinii-1A (MTLA), Samos, Greece, middle Turolian (MN 12).

Fig. 1. Mandible, MTLC-39; a. right lateral, b. left lateral, and c.occlusal view.

Fig. 2. Right i2 of the mandible, MTLC-39.

PLATE 1