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THE LATE MIOCENE (TUROLIAN) MAMMALIAN FAUNA OF SAMOS ISLAND (GREECE)

STUDY OF THE COLLECTION OF PALAEONTOLOGICAL MUSEUM OF MYTILINII, SAMOS

2. Equidae

by

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Abstract: *The hipparions, stored in the Palaeontological Museum of Mytilinii, Samos, are studied. The material is coming from the Andrianos or Stefanidis ravine which is possibly the same to Q_1 of Brown. Four hipparions are recognized: the known species H. proboscideum and H. dietrichi and two different forms Hipparion sp. I and Hipparion sp. II. The first is characterized by short muzzle and long toothseries as in H. proboscideum, while Hipparion sp. II has long muzzle and short tootheries. The bones have been distinguished into two groups. The first with short and robust bones is refered to as H. cf. proboscideum and the other with long and slender bones as H. cf. dietrichi. The age of the locality and fauna is Lower Turolian, older than Pikermi.*

INTRODUCTION

Samos hipparions are known from the beggining of this century and they have been discussed a lot. Different generic (*Hemihipparion*, *Meryehippus*) and specific names have been proposed for them and many people have been worked on them. They are of great interest because they include forms, different than the eurasiatic ones. All the studies till now were made on the material coming from the old excavations. The old material is without locality indications except of Brown's collection, stored in the American Museum of Natural History (BROWN, 1927). Thus there are problems coming from the mixing of the material and the opinions about the age of the deposits differ a lot. Seven mammalian localities (Q_{1-6}, Qx) are refered by Brown,

situated northeastern of the village Mytilinii. The hipparions and aardwarks of Q_5 are more evolved and younger than those of the other localities (SONDAAR, 1971). The study of *Prostrepsiceros* gave the same results (GENTRY, 1971). The other opinion is that all the localities have the same age and the sediments were deposited in a period of 0.5my; the differences in the material are due to the ecological conditions and sampling and not to time (SOLOUNIAS, 1981).

In the present article the collection of the Palaeontological Museum of Mytilinii (PMMS) will be studied. The collection is coming from the «Andrianos or Stefanidis ravine» which is possibly the same to Q_1 of Brown. For informations about the locality and the deposits see KOUFOS-MELENTIS (1982). The studied material was collected from one well known locality and so it is not mixed with other material.

Thus it is interesting because it can be compared itself and with the material from the other localities as well as to be distinguished into species.

Methods: All measurements are in mm; estimated values into brackets; toothseries length at alveolar level. The measutements system is that proposed by EISENMANN and others but it is still unpublished.

DAP = anteroposterior diameter
DT = transverse diameter
AMNH = American Museum of Natural History
PMMS = Palaeontological Museum of Mytilinii, Samos.

n = number of the measured specimens; × = mean value; min. = minimum observed value; max. = maximum observed value; s = standard deviation.

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PALAEONTOLOGY

Order: Perissodactyla OWEN, 1848
Family: Equidae GRAY, 1821
Genus: *Hipparion* CHRISTOL, 1832

Hipparion dietrichi (WEHRLI, 1941)

Material: Part of the skull with associated mandible, PMMS-6; right and left p^2-m^3 toothseries of the same individual, PMMS-22,22a; maxilla with both dp^2-dp^4 toothseries, PMMS-19; part of the right mandible with p_3-m_3, PMMS-37; part of the right mandible with p_2-m_2, PMMS-42; part of the left mandible with p_2-m_1, PMMS-43.

Locality: «Stefanidis or Andrianos ravine», Mytilinii, Samos.

Measurements: 1. PMMS-6. (see Tab. 1, 2)

2. PMMS-22, 22a.

		right	left
Length	p^2-m^3	137.1	137.4
»	p^2-p^4	72.4	72.0
»	m^1-m^3	65.7	65.4

3. PMMS-19

Length	dp^2-dp^4	92.3	92.8

4. PMMS-37. Length m^1-m^3 = 66.5

5. PMMS-42, 43. (see Tab. 2).

Description:

1. Skull

The studied skull (PMMS-6) is in connection with the mandible (Pl. I) and it is difficult to distinguish these. A great part of the skul is broken. The preorbital fossa is single, and elliptical; its posterior border is well, while the anterior one is slightly, defined. It is situated far from the orbit and its posterior end is above m^2. The orbit is broken but from its remaining parts seems to be rounded. Crista facialis ends above the anterior border of m^1. The only two dimensions of the skull, we have, are the length m^1-m^3 and the distance orbit-preorbital fossa. Using these two in a diagram (Fig. 2) the skull PMMS-6 fits with *H. dietrichi* and it is near the type skull. The long distance orbit-preorbital fossa is characteristic for *H. dietrichi* (SONDAAR, 1971). This distance variates between 42-49 for *H. dietrichi* of Q_{1-4} and it is 39,5 for the type skull; for *H. mattheui* is 17-32 and for the type skull of *H. proboscideum* is 19,5 (data after SONDAAR, 1971). Thus PMMS -6 in this feature is more close to *H. dietrichi.*

2. Mandible

The mandible associated to the skull is broken anteriorly but it seems to have short muzzle comparatively to *H. proboscideum*. The height of the horizontal ramus is large. The toothseries length is moderate and the molar series is long compared to that of the premolars. The index Length molar series / Length premolars series $\times 100$ is 95 for PMMS-6 and for *H. dietrichi* of Q_1 89-97 (mean 93.5) (data after SONDAAR, 1971).

3. Upper cheek teeth

Fossettes free and closed; the prefossete of p^2 is open disto-lingually; enamel plication simple to moderate (11-18 plis); protocone oval in the premolars and elliptical-elongated in the molars, always free from the protoloph; pli caballin simple and small; hypocone elliptical and angular posteriorly with only a deep distal hypoponal groove.

4. Lower cheek teeth

p_2 with moderate anterostyle, smaller than that of the large hipparions of Q_1; protostylid average and in the very worn teeth (PMMS-37) there is a secondary one connected to the main; metaconid elliptical or rounded; metastylid triangular; entoconid rounded; flexid's enamel simple; vestibular groove narrow and deep especially in the molars in which touches the lingual one; lingual groove is shallow and open.

5. Upper milk teeth

Elongated with closed and free fossettes; high enamel plication especially in the prefossettes; protocone elliptical with a small spot anteriorly and free from the protoloph; pli caballin double-triple; hypocone narrow and angular posteriorly with deep and narrow distal and shallow lingual hypoconal groove.

Hipparion proboscideum STUDER, 1911

Material: Right maxilla with p^2-m^3, PMMS-26; maxilla with both p^2-m^1 toothseries, PMMS-25; part of the left maxilla with p^2-m^1, PMMS-40[a]; part of the left maxilla with p^3-m^2, PMMS-40; part of the left maxilla with m^1-m^3, PMMS-39; mandible PMMS-2; mandible, PMMS-5; mandible PMMS-12; part of the right mandible with p_2-m_1, PMMS-35.

Locality: «Stefanidis or Andrianos ravine», Mytilinii, Samos.

Measurements: 1. PMMS-26. Length p^2-m^3=155.4 p^2-p^4 = 88.5 m^1-m^3 = 70.0

2. PMMS-25.

	right	left
Length p^2-p^4	92.0	92.1

3. PMMS-40a. Length p^2-p^4 = 90.0
4. PMMS-40. Length p^3-p^4 = 54.0, m^1-m^2 = 45.0
5. PMMS-39. Length m^1-m^3 = 70.0
6. PMMS-2, 5, 12. (see Tab. 2).
7. PMMS-35. Length p_2-p_4 = 85.8

Description

1. Mandible

The mandible is large and with high horizontal branches. The muzzle is long, longer than that of *H. dietrichi*. The length of the toothseries is large. The index Length of diastema p_2-i_3/Length p_2-p_4x100 (we used the length p_2-p_4 because it is available to be measured for both the mandibles) is 143 for PMMS-2 and 133 for PMMS-5 versus 90-129 (mean 113) for *H. dietrichi* of Q_1 (data after SONDAAR, 1971). The toothseries length of the mandible PMMS-12 are into the range of variations for *H. proboscideum*. Thus we can consider that it is closed to this species and it is determined to as *H.* cf. *proboscideum*, because there is another large hipparion similar to *H. proboscideum* but with short muzzle (*Hipparion* sp. I).

2. Upper cheek teeth

All the studied specimens are parts of maxilla and no skull is available. They are determined to as *H.* cf. *proboscideum* for the above mentioned reason. Their toothseries length and morphology is similar to *H. proboscideum*.

p^2 with long anterostyle and connected fossettes; fossettes closed and free except for the p^2 of PMMS-25 and 40a in which prefossette is open distolingually; high enamel plication in the fossette's border; protocone elliptical, rounded and free from the protoloph; pli caballin simple-double; hypocone elliptical with a shallow distal hypoconal groove; lingual hypoconal groove only in m^3.

3. Lower cheek teeth

p_2 elongated; well developed protostylid with a secondary one in the worn teeth; metaconid elliptical or rounded; metastylid and entoconid elliptical; flexid's enamel is crenulated; vestibular groove narnow and deep especially in the molars; ptychostylid present; lingual groove open, shallow in the premolars and deep in the molars.

Hipparion sp. *I*

Material: Mandible with p_2-m_1 dex and p_2-p_4 sin, PMMS-18.

Locality: «Stefanidis or Andrianos ravine», Mytilinii, Samos.

Measurements: 1. PMMS-18. (see Tab. 2).

Description

1. Mandible

The mandible PMMS-18 belongs to a large hipparion (length p_2-$p_4 = 81.8$) like *H. proboscideum.* It differs from this species in the short muzzle. The muzzle is shorter than that of *H. dietrichi.* The index Length of diastema p_2-i_3 / Length p_2-$p_4 \times 100$ is 75, very small compared to those of *H. proboscideum* (133-143) and *H. dietrichi,* (90-129). The muzzle seems to be similar in dimensions to that of *H. matthewi* from Q_5. In absolute values is similar to that of the type and of the specimens A, B. S and C. S of *H. matthewi* (SONDAAR, 1971). Consequntly PMMS-18 must be a large hipparion form different than the typical *H. proboscideum.*

2. Lower cheek teeth

The dimensions and the morphology of the teeth are similar to *H. proboscideum,* as they have been previously described.

Hipparion sp. *II*

Material: Skull of an adult individual with both toothesries, PMMS-9; part of the left maxilla with p^3-m^2, PMMS-36; part of the right maxilla with m^2-m^3, PMMS-44; mandible with only the left horizontal branch, PMMS-27.

Locality: «Stefanidis or Andrianos ravine», Mytilinii, Samos.

Measurements: 1. PMMS-9. (see Tab. 1).
2. PMMS-36. Length p^3-p^4 = 37.0, m^1-m^2 = 36.8
3. PMMS-44. Length m^2-m^3 = 39.4
4. PMMS-27 (see Tab. 2).

Description:

1. Skull

The studied skull (Pl. II, III) belongs to an aged individual with, very worn teeth. The nasal notch and the braincase are broken. Crista facialis ends above the middle of m^1 and its distance from the alveolus of m^3 is 45.5 mm. The orbit is broken posteriorly but it seems to be rounded. The preorbital fossa is moderately developed, and situated near the orbit. The toothseries dimensions seem to be similar to those of *H. matthewi*. But the muzzle is elongated and it is like *H. proboscideum*. The index Length of diastema p^2-i^3/ Length p^2-m^3 x 100 is 83.5 for PMMS-9 versus 68-74 for *H. matthewi* of Q_5, 53-71 for *H. dietrichi* and 75-85 for *H. proboscideum* (data after SONDAAR, 1971). On the other hand the teeth morphology and their dimensions at the occlusal surface are close to *H. matthewi*, while the small distance orbit-preorbital fossa fits with that of *H. proboscideum*. Thus this skull represents a form different than the known species of Samos hipparions.

2. Mandible

PMMS-27 is the symphysial portion and the left horizontal branch of a mandible (Pl. IV, Fig. 3). The height of the branch as well as the toothseries length are similar to *H. matthewi*. Although the long snout differentiates this mandible from *H. matthewi*. In this aspect it is similar to *H. proboscideum*. The index Length of diastema p_2-i_3/Length p_2-p_4 × 100 is 147, for PMMS-27 versus 133-143 for *H. proboscideum*, 97-129 for *H. matthewi* and 90-130 for *H. dietrichi* (data after SONDAAR, 1971). Consequently this mandible has both the characters of *H. matthewi* and *H. proboscideum*.

3. Upper cheek teeht

All the specimens belong to adult individuals and they have very worn teeth (fourth wearing stage, GROMOVA, 1952).

Fossettes closed, free and semilunar in shape; enamel plication very simple; protocone oval connected to the protoloph, except of m^3; hypocone and distal hypoconal groove are dissappeared; only m^1 and m^2 with a very shallow distal hypoconal groove.

4. Lower cheek teeth

The teeth of the only studied specimen (PMMS-27) are extremely worn and not well preserved.

Protostylid moderate with a secondary one connected to the first; flexids usually isolated as enamel islets; vestibular groove narrow and deep touches the lingual one.

TABLE 1.

Skull measurements.

	PMMS-9	PMMS-6
1. Distance prosthion p^2-(in projection).	124	—
2. Distance p^2-posterior end of palate.	106	—
7. Length of premolars.	66.0	—
8. Length of molars.	56.4	63.0
9. Length of the toothseries.	122.1	—
14. Minimum width of diastema.	35.0	—
15. Width at the incisive's border.	54.0	—
18. Width of the skull at the posterior borders of the orbits.	—	—
23. Distance prosthion-posterior end of the orbit.	—	—
25. Height of the skull anterior of p^2.	97,5	—
29. Vertical diameter of the orbit.	53.5	—
30. Distance prosthion-posterior end of the narial opening.	142	—
31. Distance posterior end of the narial opening -anterior end of the orbit.	135	—
32. Distance orbit - preorbital fossa.	29	42
33. Anteroposterior diameter of the preorbital fossa.	—	63.3
35. Transverse diameter, idem.	—	39.0

POSTCRANIAL MATERIAL

The study of the bones and their distinguishing into species is very difficult because there are two large and two medium-sized hipparion forms in the material. Although we can distinguish the material into two groups based on their relative dimensions. Thus there is a

TABLE 2.

Mandible measurements.

	PMMS-42	PMMS-43	PMMS-6	PMMS-2	PMMS-5	PMMS-12	PMMS-18	PMMS-27
3. Length of premolars.	72.5	73.0	73.5	80.3	79.5	77.0	81.8	60.0
4. Length of molars.	—	—	70.0	—	75.6	76.3	—	59.2
5. Length of the toothseries.	—	—	143.5	—	155.3	152.0	—	120.0
7. Width at the incisive's border.	—	—	—	54.0	67.0	—	—	43.0
10. Height of the horizontal branch posterior of m^3.	—	—	—		—	—	—	
11. Idem between p_4-m_1	63	—	61.5	64.0	—	—	—	55.5
12. Idem anterior of p_2	45	47.5	45	53.5	—	—	50	45
13. Symphysis length.	—	—	—	80.0	—	—	(75)	72
14. Min. width of diastema.	—	—	—	32.0	—	—	34.5	28.3
16. Diastema p_2-i_3.	—	—	—	115.0	106.0	—	61.5	88.5

group with short and robust and another one with long and slender bones. The first is refered to as *H.* cf. *proboscideum* and the other as *H.* cf. *dietrichi*. This distinction is more clear in the metapodials as it is discussed in the following. The measurements for the bones are given in the following tables.

TABLE 3.

Measurements of the humerus.

	H. cf. *dietrichi*
	PMMS-45
DT dist.	65.6
DAP dist.	72.0

TABLE 4.

Measurements of the radius.

	H. cf. *dietrichi*		
	PMMS-46		PMMS-46
Height.	310.0	DT diaph. in the middle	41.0
DT prox.	65.0	DT dist.	61.5
DT prox. art. surf.	61.5	DAP dist.	37.2
DAP prox.	35.3	DAP dist. art. surf.	31.8
DAP prox. art. surf.	33.0		

TABLE 5.

Measurements of the third metacarpal.

	H. cf. *dietrichi*				
	n	$\bar{x}$	min	max	s
1. Height.	3	245.3	243.0	248.0	2.08
3. DT diaph. in the middle.	3	27.3	26.6	28.3	0.89
4. DAP idem.	1	24.0	—	—	—
5. DT prox.art.surf.	2	39.6	39.5	39.7	—
6. DAP idem.	2	28.0	27.5	28.5	—
7. DT art. surf. os magnum.	2	34.5	34.0	35.0	—
8. DT art. surf. os hamatum.	2	9.0	8.5	9.5	—
10. DT dist. at protub.	3	37.3	35.6	38.7	1.58,
11. DT dist. art. surf.	2	35.7	34.5	37.0	—
12. DAP dist. crest.	3	29.1	27.7	30.8	1.55

TABLE 6.

Measurements of the femur.

	H. cf. *dietriehi*				*H.* cf. *proboscideum*
	n	$\bar{x}$	min	max	PMMS-16
1. Height.	1	340.0	—	—	—
7. DT dist.	2	80.2	77.5	83.0	93.0
8. DAP max.dist.	2	97.8	91.5	104.0	110.0

TABLE 7.

Measurements of the tibia.

	H. cf. *dietrichi*				*H.* cf. *proboscideum*
	n	$\bar{x}$	min	max	PMMS-33
1. Height,	2	329.5	327.0	332.0	355.0
3. DT diap. in the middle.	2	40.7	40.0	41.5	46.0
5. DT prox.	1	81.5	—	—	—
6. DAP prox.	1	59.0,	—	—	—
7. DT dist.	2	59.5	58.0	61.0	70.0
8. DAP dist.	2	41.2	41.0	41.5	48.0

TABLE 8.

Measurements of the astragalus.

	H. cf. *dietrichi*				
	n	$\bar{x}$	min	max	s
Height external	3	52.1	49.5	54.0	2.36
Height internal	4	51.4	46.0	58.5	5.21
DT max (in projection).	4	50.9	45.0	56.0	4.73
DAP internal	4	44.0	39.8	48.0	3.61
DT dist. art. surf.	2	36.7	35.5	38.0	—
DAP idem	2	27.3	25.6	29.0	—
DT art. surf. cuboid.	2	8.5	8.0	9.0	—

TABLE 9.

Measurements of the third metatasral.

	H. cf. *dietrichi*					*H.* cf. *proboscidcum*
	n	$\bar{x}$	min	max	s	PMMS-14
1. IIeight.	3	262.7	252.0	270.0	9.45	260.0
3. DT diaph. in the middle	3	24.9	24.2	26.0	0.96	30.5
4. DAP idem	2	27.5	27.3	27.8	—	28.5
5. DT prox. art. surt.	1	35.7	—	—	—	42.5
6. DAP idem	1	29.7	—	—	—	28.7
7. DT facet. cuneif. II.	—	—	—	—	—	35.6
8. DT faced. cuboid.	—	—	—	—	—	11.4
10. DT dist. at protub.	3	34.5	33.8	35.2	0.70	38.8
11. DT dist. art. surf.	3	32.4	31.0	34.0	1.51	38.1
12. DAP dist. crest.	3	29.7	29.0	30.0	0.57	31.2

TABLE 10.

Measurements of the first phalanx.

	H. cf. *dietrichi*
	PMMS-23*
1. Height,	58.0
3. DT diaph. in the middle.	22.0
4. DT prox.	33.0
5. DAP prox.	26.0
7. DAP dist. art. surf.	17.3

DISCUSSION

The Samos hipparions have been studied by many palaeontologists and there are several opinions about them. We shall give some of these opinions in the following.

Four *Hipparion* groups have been distinguished in Samos material by WEHRLI (1941). The material is coming from different localities, mear Mytilinii. The first group is the large (p^2-m^3 = 155-167mm, p_2-m_3 = 152-172 mm), *H. proboscideum*; the fourth group is the small (p^2-m^3 = 103-114 mm, p_2-m_3 = 111-124 mm), *H. matthewi* and the other two groups represent two forms of the medium sized *H. dietrichi* (2nd group p^2-m^3 = 128-151 mm, p_2-m_3 = 122-137 mm; 3d group p^2-m^3 = 122-137 mm, p_2-m_3 = 130-137 mm).

Later GROMOVA (1952) studied again the Samos hipparions and distinguished a small hipparion (*H. matthewi*), a large one (*H. proboscideum*) and the questionable for her *H. dietrichi*. More later FORSTEN (1968) changed the systematic position of Samos hipparions and refers three forms under the names *H. matthewi, H. mediterraneum dietrichi* and *H. primigenium* (=*H. proboscideum*).

Later SONDAAR (1971) studied the Samos hipparions of the AMNH and he distinguished two different species in Q_1, *H. proboscideum* and *H. dietrichi*. More later FORSTÉN (1980) reconsidered the Samos hipparions and she refers four different forms in Q_1: *H. proboscideum, H. schlosseri* - H. *dietrichi, Hipparion* sp. large and *Hipparion* sp. middle sized. Recently the study of the material stored in the AMNH gave the following probable forms in Q_1: *H. dietrichi, H. proboscideum, H.* cf. *matthewi, Hipparion* sp. (size and narial opening medium) and *Hipparion* sp. (size medium, narial opening long and very long muzzle). This interpretation is based on he basic characteristics of the skull and the data were analysed in logarithmic comparing diagrams (EISENMANN - KOUFOS, in prep.).

All the authors agree that the mixing of the fossils from the different localities gives a false idea about the number and the variability of the species. The PMMS material represents a good sample, because it is coming from only one well known locality («Andrianos or Stefanidis ravine»), which is probably Q_1 of Brown.

Two skulls (PMMS-6, 9) are studied and they are morphologically different. The toothseries length of the skull PMMS-6 as well as the teeth morphology and dimensions are similar to those of *H. dietrichi*. One of the characters of *H. dietrichi* is the slightly develo-

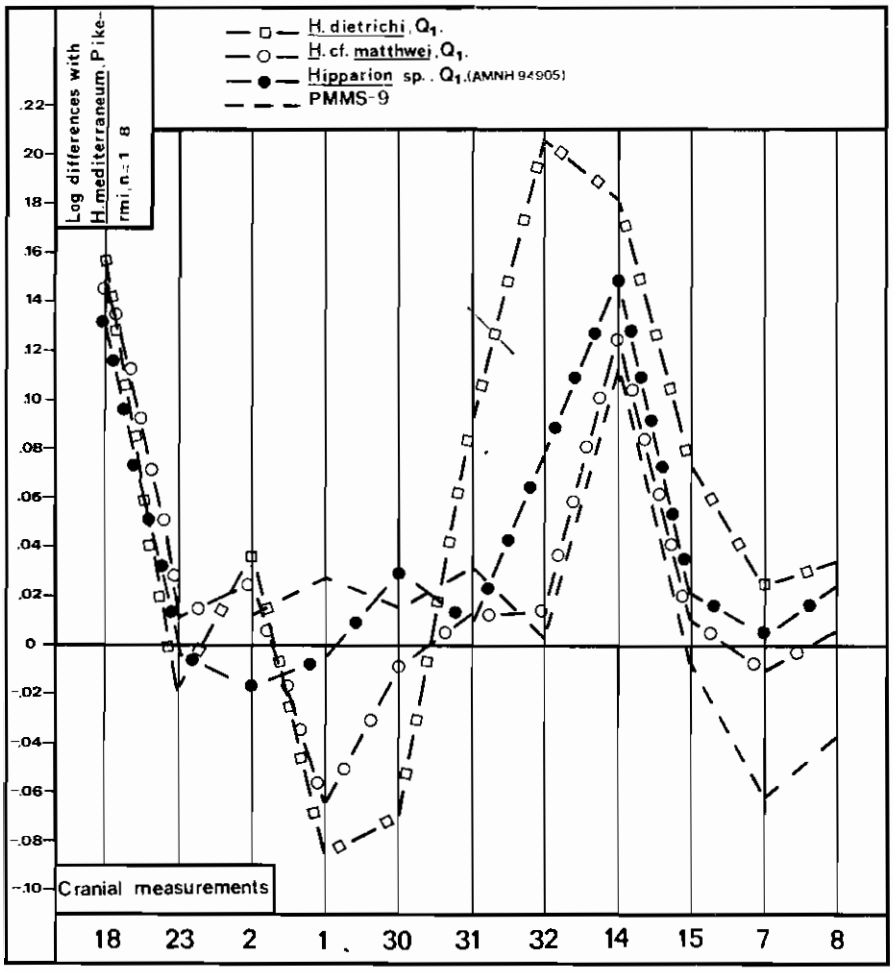


Fig. 1. Ratio diagram comparing the hipparions from Q_1; for the measurements see Tab. 1.

ped preorbital fossa (SONDAAR, 1971). The preorbital fossa of PMMS-6 is similar. The distance orbit-preorbital fossa in *H. dietrichi* is large and in this feature the PMMS-6 likes to this species. Thus we can consider this skull to *H. dietrichi.*

The other skull PMMS-9 has a confluent morphology. The toothseries length is very small like *H. matthewi,* the muzzle is long and the preorbital fossa is near the orbit as in *H. proboscideum.* A comparison of this skull to the groups from Q_1 (EISENMANN-KOUFOS, in

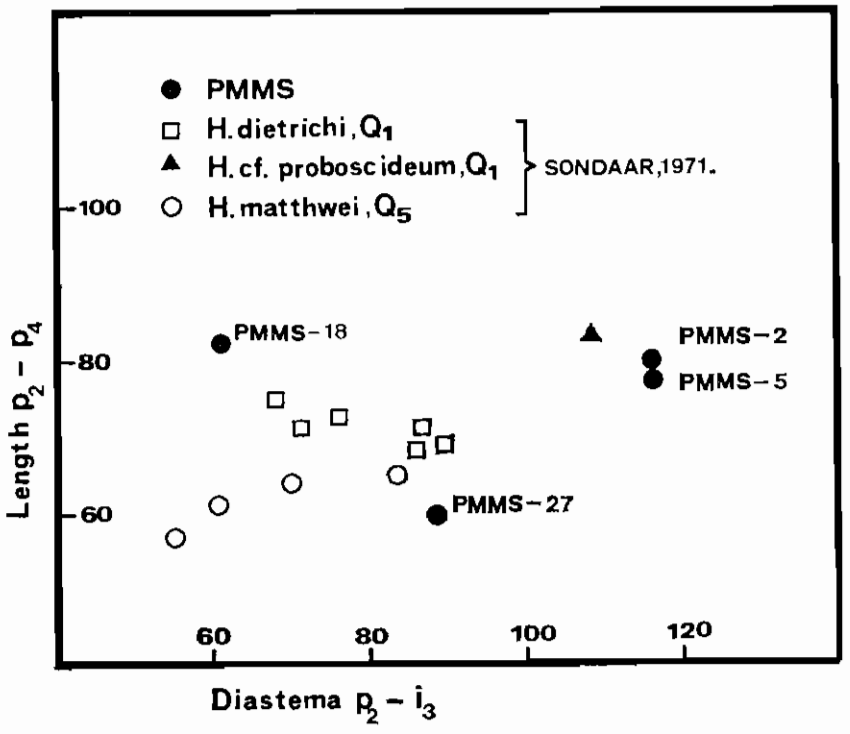


Fig. 2. Premolar's length plotted against length of diastema P_2-I_3 for Samos hipparions.

prep.) is given in the Fig. 1. PMMS-9 is different than *H. dietrichi* in the longer muzzle, longer narial opering and the very short distance orbit-preorbital fossa. It is very close to *Hipparion* sp. (AMNH 94905) and to *H.* cf. *matthewi* (*Hipparion* sp. middle-sized of FORSTÉN, 1980). The first differs from PMMS-9 at the shorter muzzle and the larger distance orbit-preorbital fossa. The second group has more shorter muzzle and not very deep narial opening. The very long muzzle, the deep narial opening and the short distance orbit-preorbital fossa are characteristics of *H. primigenium.* Although the very small toothseries length, smaller than all the forms forbids such a conclusion. The characteristics of *Hipparion* sp. (AMNH 94905) are: size medium, muzzle very long and long narial opening (EISENMANN-KOUFOS, in prep.) Thus PMMS-9 is more similar to this group and the additional data for it is the moderately developed preorbital fossa (possibly double), situated near the orbit.

The mandibles studied are well preserved and they give good results about the variability of the genus. Using the length of the diastema p_2-i_3 against premolar's length (Fig. 2) three groups can be distinguished (we used the length p_2-p_4 and not p_2-m_3 because it can be measured in the most specimens).

Two mandibles (PMMS-2, 5) have large dimensions and are similar to *H. proboscideum*. PMMS-18 has short muzzle like *H. dietrichi* or *H. matthewi* and elongated premolar series like *H. proboscideum*.

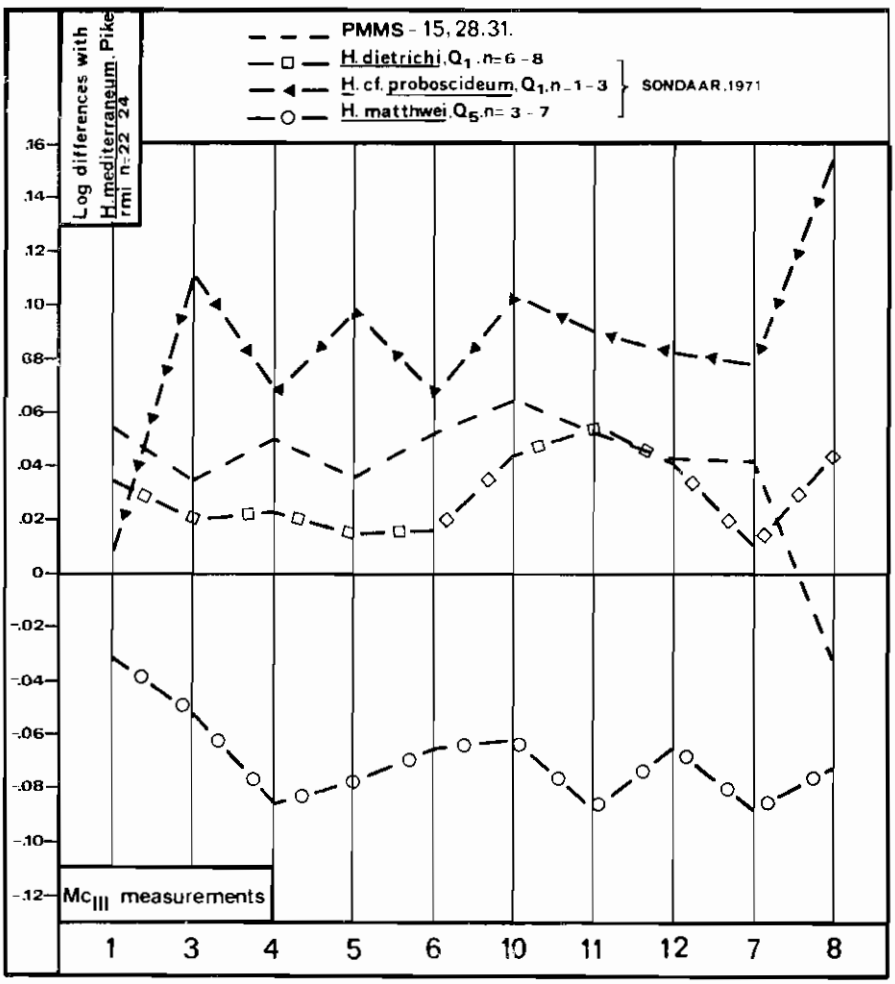


Fig. 3. Ratio diagram comparing the third metacarpal of Samos hipparions; for the measurements see Tab. 5.,

deum. It cannot be combined to one of the described skulls or to *H. proboscideum* because of the tootberies length. Thus we refer this to as *Hipparion* sp. I.

The other mandible (PMMS-27) is also different than the other material. It has long snout and short premolar series. It can be regarded similar to the described skull PMMS-9, which has long muzzle and short toothseries length. Thus we can put it to *Hipparion* sp. II. The rest mandibles are only pieces of the horizontal branches and PMMS-6, 42, 43 suppose to be *H. dietrichi* from their moderate tootheries length and teeth's morphology. It is impossible to belong to *Hipparion* sp. I or II because these two forms have long and short toothseries respectively.

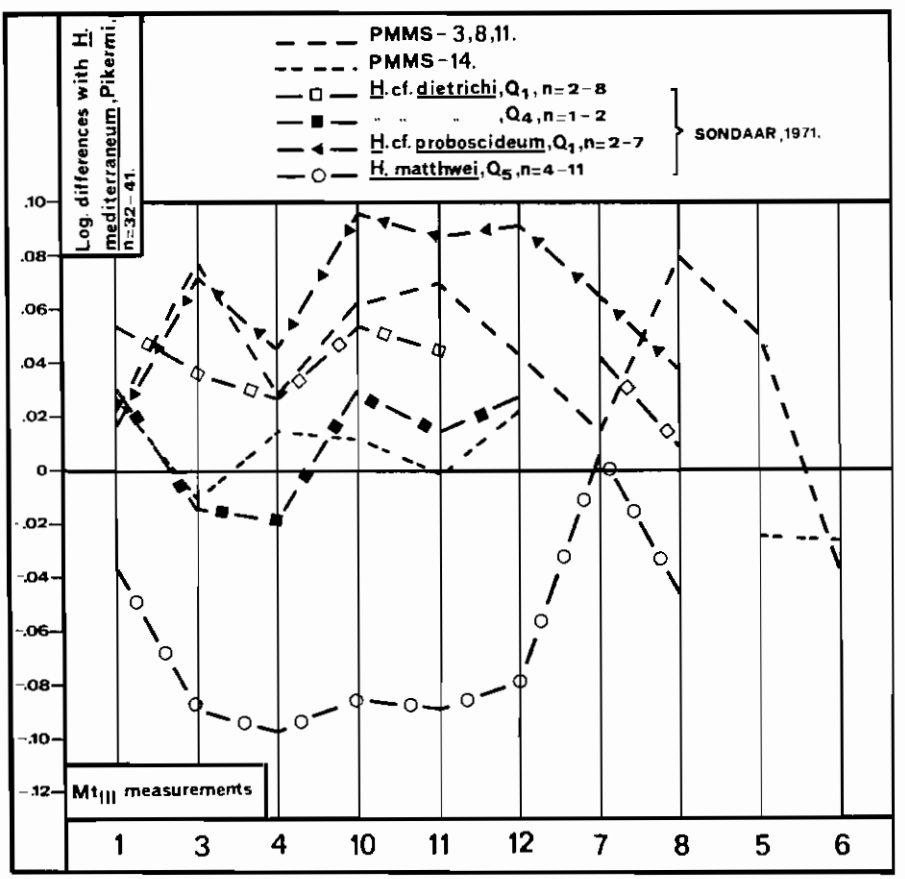


Fig. 4. Ratio diagram comparing the third metatarsal of Samos hipparions; for the measurements see Tab. 9.

The bone material is impossible to be distinguished in species, because the study of the skull and mandibles shows that there are two large and two small forms. The comparison of this material to the older collections is also difficult because the mixing is being larger in these collections.

Although a distinction of these bones is possible. Usually two groups can be separated: the one contains long and slender and the other shorter and robust bones. It is known that the large hipparions (*H. primigenium, H. koenigswaldi, H. catalaunicum*) usually have short and robust limb bones, while the smaller hipparions have slender and long. Thus the first group of the bone's material probably belongs to a large species and it is refered to as *H.* cf. *proboscideum.* The other group refered to as *H.* cf. *dietrichi* and possibly belongs to the other two smaller species.

The metapodials are good material for comparison and distinguishing of the material. The studied metacarpals of PMMS are all of similar dimensions and their mean values are compared (Fig. 3) to the material of Brown (SONDAAR, 1971). The Mc_{III} is absolutely different than that of *H. matthewi* as well as of *H.* cf. *proboscideum* of Q_1. Although it is near *H. dietrichi* of Q_1 and we can see that it is longer and more slender than *H.* cf. *proboscideum.* The same results are coming from the comparison of Mt_{III} (Fig. 4). Two groups can be distinguished in the PMMS material. The first has short and robust Mt_{III} similar to *H.* cf. *proboscideum* from Q_1 and the other long and slender similar to *H.* cf. *dietrichi* from $Q_{1,4}$. Both groups are different than *H. matthewi* of Q_5. After this comparison the above mentioned division of the bone material is confirmed and only two groups can be distinguished.

AGE OF THE HIPPARIONS

The age of the Samos hipparions is still under discussion and the opinions are different. As it is mentioned above, the quarries 1-4 are considered to be of Lower and quarry 5 of Upper Turolian age (SONDAAR, 1971; GENTRY, 1971); the other opinion is that all the fauna has the same age (SOLOUNIAS, 1981). The radiodating by Argon Isotope method gave ages from about 8-9 m.y. (VAN COUVERING-MILLER, 1971) and did not solve the problem.

The studied material is enough good for giving an idea about the age of the hipparions. In the Lower Turolian of the Mediterranean

Neogene (Zone-3 of hipparions, SEN et al., 1978) there are hipparions of different size. The type locality for this zone is Q_1 of Samos and the type species are *H. dietrichi* and *H. proboscideum*. In the Upper Turolian (Zone-4) the small hipparions are frequent (*H. matthewi, H. gromovae, H. periafricanum*). The determination of the two species of the Zone-3 gives an idea about the age of the fauna. The morphological features of the skulls are similar to those of the Lower Turolian hipparions. Especially the skull PMMS-6 is similar to one skull (VTK-26; KOUFOS, 1980) from the Lower Turolian of Axios valley (Macedonia). The morphology of the teeth in *H. proboscideum* is similar to the primitive forms (long dimensions, high enamel plication). Although the morphology of *H. dietrichi* teeth is more similar to that of Turolian hipparions. The bones are also gives an idea of the primitive hipparions (short and robust) as well as of the more evolved ones (long and slender).

The metapodials compared to those of Pikermi (Fig. 3, 4) are more robust. The robust metapodials characterize the primitive Vallesian hipparions and they are being slender in the more evolved Turolian forms. Thus we can consider that the PMMS metapodials are more primitive than Pikermi and thus the age of the fauna is older than Pikermi. The hyaena (*Adcrocuta eximia*) from the same locality has more primitive characters than Pikermi (KOUFOS - MELENTIS, 1982) and thus the above age is confirmed. It is impossible to suppose Upper Turolian age because *H. matthewi* is not present in the studied material. Based on the above mentioned, the locality and the fauna possibly belong to the Lower Turolian (MN-11) and they are older than Pikermi.

CONCLUSIONS

The study of the PMMS hipparions gave four different forms, which are refered with their diagnosis in the following.

H. dietrichi: size middle; single and slightly developed preorbital fossa, situated far from the orbit; simple to moderate enamel plication; moderate developed protostylid.

Hipparion sp. II: size middle; moderate developed preorbital fossa, situated near the orbit; long muzzle; short toothseries, closed to *H. matthewi*; simple enamel plication; protocone connected to the protoloph; moderate protostylid;

H. proboscideum: size large; very long muzzle; toothseries length large; well developed protostylid with secondary one; flexids with crenulated enamel; upper cheek teeth probably with high enamel plication, free protocone and connected fossettes in p^2.

Hipparion sp. I: size large; short muzzle like *H. matthewi*; long tothseries closed in size to *H. proboscideum*; lower cheek teeth like *H. proboscibeum.*

PLATE I

Hipparion dietrichi, Samos, PMMS-6.
Part of the skull and mandible.

PLATE II

Hipparion sp, II, Samos, PMMS-9.
Skull, lateral view.

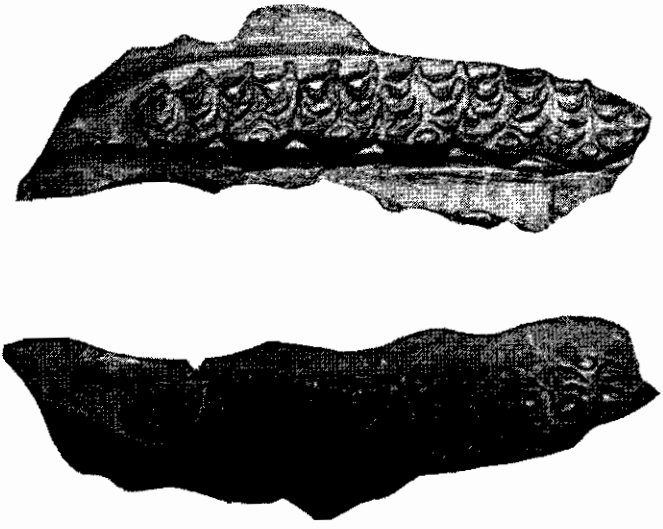
PLATE III

Hipparion sp. II, Samos, PMMS-9
Skull, occlusal view.

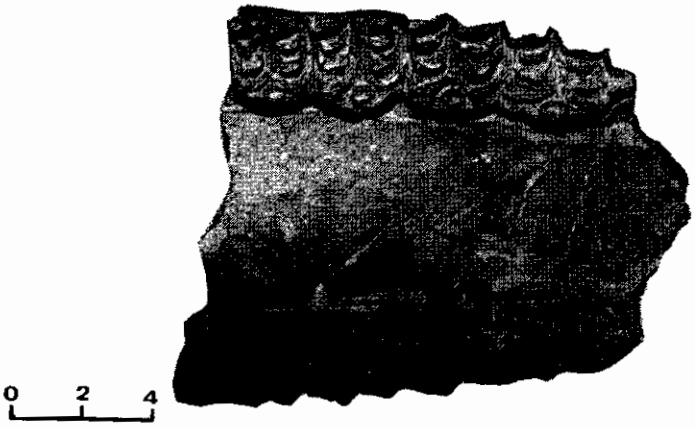
PLATE IV

Fig. 1. *Hipparion proboscideum,* Samos, PMMS-2. Mandible.
Fig. 2. *Hipparion* sp. 1, Samos, PMMS-18. Part of the mandible.
Fig. 3. *Hipparion* sp. II, Samos, PMMS-27. Part of the mandible.

PLATE V



1



2

Fig. 1. *Hipparion dietrichi*, Samos, PMMS-22, 22ª.
p^2-m^3 dex and sin.
Fig. 2. *Hipparion proboscideum*, Samos, PMMS-25.
p^2-m^1 dex and sin.

PLATE VI

Fig. 1. *Hipparion dietrichi,* Samos, PMMS-42, p_2-m_2 dex.
Fig. 2. *Hipparion proboscideum,* Samos, PMMS-5, p_2-m_3 dex.
Fig. 3. *Hipparion* sp. I, Samos, PMMS-18, p_2-m_1 dex.

PLATE VII

Hipparion cf. *dietrichi*, Samos, a) PMMS-15, b) PMMS-28. Third metacarpal, anterior view.

PLATE VIII

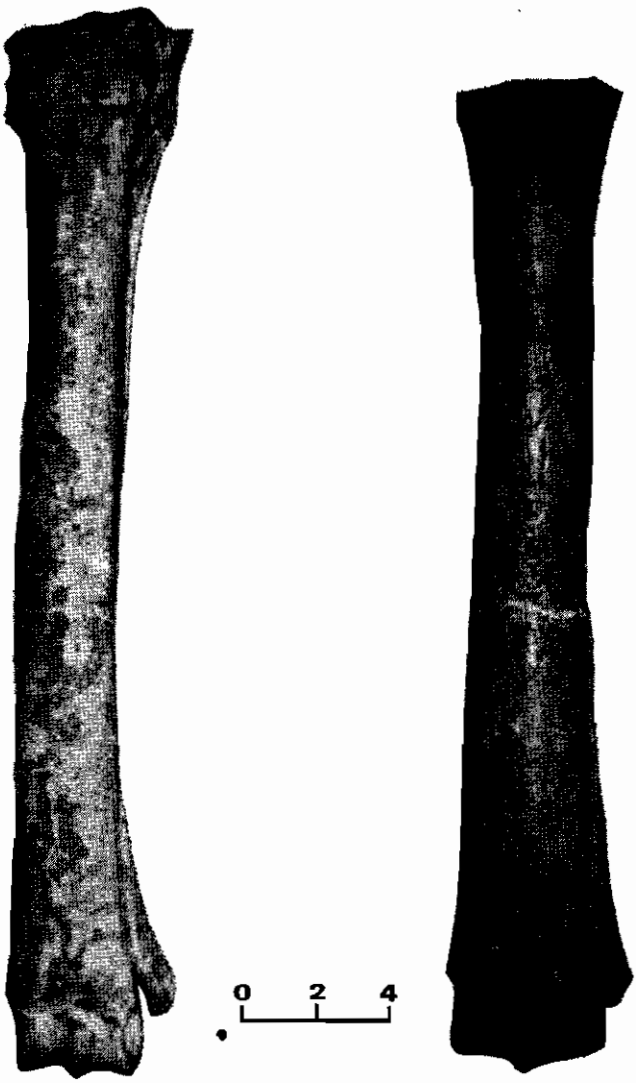


Fig. 1. *Hipparion* cf. *dietrichi*, Samos, PMMS-8.
Third metatarsal, anterior view.
Fig. 2. *Hipparion* cf. *proboscideum*, Samos, PMMS-14.
Third metatarsal, anterior view.

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ΠΕΡΙΛΗΨΗ

Η ΑΝΩ ΜΕΙΟΚΑΙΝΙΚΗ (ΤΟΥΡΟΛΙΑ) ΠΑΝΙΔΑ ΘΗΛΑΣΤΙΚΩΝ ΤΗΣ ΝΗΣΟΥ ΣΑΜΟΥ (ΕΛΛΑΔΑ)

ΜΕΛΕΤΗ ΤΗΣ ΣΥΛΛΟΓΗΣ ΤΟΥ ΠΑΛΑΙΟΝΤΟΛΟΓΙΚΟΥ ΜΟΥΣΕΙΟΥ ΤΩΝ ΜΥΤΙΛΙΝΙΩΝ ΣΑΜΟΥ

2. Equidae

Από

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Μελετώνται τα ιππάρια, που υπάρχουν στη συλλογή του Παλαιοντολογικού Μουσείου των Μυτιλινιών της Σάμου. Το υλικό είναι αρκετό και προέρχεται από τη θέση Ανδριανό ή Χαράδρα Στεφανίδη, βόρεια του χωριού Μυτιλινιοί. Στοιχεία για τη θέση εύρεσης και τη στρωματογραφία της δίνονται στην εργασία των KOUFOS-MELENTIS (1982). Η μελέτη του υλικού έδειξε τέσσερις διαφορετικές μορφές ιππαρίων. Οι δύο ανήκουν στα γνωστά είδη *H. proboscideum* και *H. dietrichi*. Οι άλλες δύο έχουν μορφολογικά χαρακτηριστικά ενδιάμεσα των προηγούμενων. Η πρώτη αναφέρεται ως *Hipparion* sp. I και χαρακτηρίζεται από μικρό ρύγχος όπως το *H. dietrichi*, ενώ αντίθετα έχει μεγάλο μήκος οδοντοσειράς και μορφολογία δοντιών όπως το *H. proboscideum*. Η άλλη μορφή που αναφέρεται ως *Hipparion* sp. II έχει επίμηκες ρύγχος και προοφθαλμική εμβάθυνση τοποθετημένη κοντά στον οφθαλμό όπως το *H. proboscideum*, ενώ αντίθετα το μήκος των οδοντοσειρών είναι μικρό, όπως στο *H. matthwei* Αυτές οι διαφορές μας οδήγησαν στο να θεωρήσουμε τα αντίστοιχα δείγματα ότι αποτελούν μορφές ξεχωριστές από τις προηγούμενες.

Τα οστά που μελετώνται δεν είναι δυνατόν να διαχωριστούν σε ανάλογες μορφές με τα κρανία και κάτω γνάθους. Η σύγκριση όμως μεταξύ τους όπως και η σύγκριση τους με το υλικό από τη Σάμο, που ήδη ήταν γνωστό, επέτρεψε να διαχωριστούν σε δύο ομάδες. Μια με οστά κοντά και ογκώδη που αναφέρεται ως *H.* cf. *proboscideum* και μια με επιμήκη και λεπτά, που αναφέρεται ως *H.* cf. *dietrichi*. Ο διαχωρισμός αυτός φαίνεται πολύ κα-

λά από τη σύγκριση των μεταπόδιων. Η σύγκριση των τελευταίων με το υλικό του Πικερμίου δείχνει, ότι αυτά είναι πιο ογκώδη από του Πικερμίου. Αυτό σε συνδυασμό με το γεγονός ότι γενικά παρατηρείται μια μετάβαση από ογκώδη σε πιο λεπτά μεταπόδια από το Βαλλέζιο στο Τουρόλιο δείχνει, ότι τα ιππάρια που μελετώνται είναι πιο πρωτόγονα από του Πικερμίου και συνεπώς το κοίτασμα απ' όπου προέρχονται έχει ηλικία παλαιότερη του Πικερμίου. Ακόμη η παρουσία των *H. proboscideum* και *H. dietrichi*, που θεωρούνται ως χαρακτηριστικά είδη του Κ. Τουρόλιου (SEN et al., 1978) επιβεβαιώνει τα παραπάνω. Έτσι για την πανίδα και το αντίστοιχο κοίτασμα πρέπει να θεωρήσουμε, ότι ανήκουν στο Κατώτερο Τουρόλιο και είναι παλαιότερα του Πικερμίου. Αυτό επιβεβαιώνεται και από τη μελέτη της ύαινας *Adcrocuta eximia*, που έχει μορφολογικά χαρακτηριστικά πιο πρωτόγονα από εκείνη του Πικερμίου.