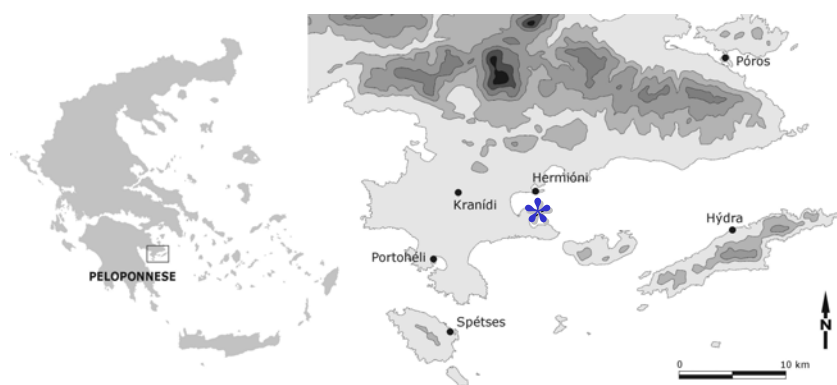
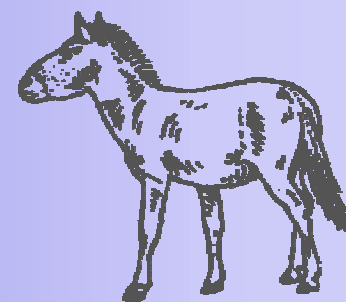


Description of *Hipparion* from Peloponnese and its palaeogeographical implications

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Location of the site (asterisk)

The material of a hipparion-bearing locality in Hermiōni area, Argolis, is described. This is the first so far Neogene land mammal site found in Peloponnese. The bones recovered include cranial and postcranial specimens of a presumably single juvenile individual of *Hipparion* sp. (the genus meant in its broader sense of hipparionine equid), as well as scarce bones of a small bovid.



a



b



d



c

Hipparion sp.

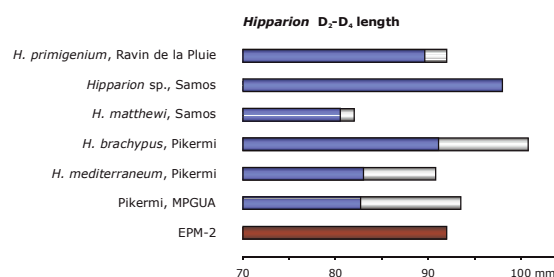
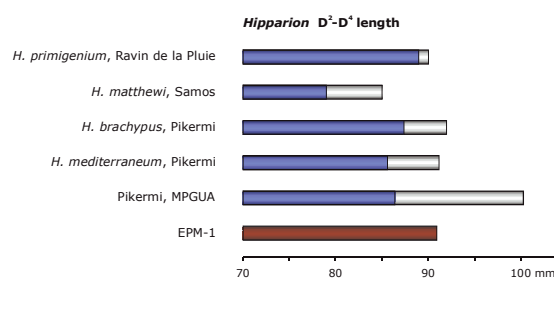
Juvenile skull part with the right D¹-D⁴, EPM-1, lateral (a) and ventral (b) view; juvenile mandible with left and right dl₃, left dl₂, left and right D₂-D₄, EPM-2, dorsal view (c); juvenile left carpus associated with the radius distal part and the proximal part of Mc III, EPM-3, dorsal view (d). Not to scale.

Description

The juvenile skull part is heavily crushed and fragmented, so that no observation can be made on its morphology. The upper deciduous teeth are only slightly worn and are preserved in good condition. They are characterised by moderately complex fossette plication and double or triple pli caballin. The plication numbers, counted according to the suggestions of Eisenmann *et al.* (1988), are 4-10-4-2/2 for D², 3-7-6-2/3 for D³ and 3-5-4-3/2 for D⁴. The hypocone is well developed (except for the D⁴, which is less worn than the other two teeth); a hypoconal constriction is present in all teeth, and it is particularly developed in D². The labial styles are prominent. The protocone is labially flattened and lingually rounded in D²; it becomes almost semicircular in D³, being almost straight lingually; in D⁴ is more elongate, triangular in shape, flat lingually. The D¹ is fairly strong (DAP: 7.8 mm, DT: 4.8 mm).

The lower dentition does not preserve a D₁. The existing left and right deciduous molars (D₂-D₄) are characterised by shallow and rounded linguoflexids, and deep ectoflexids that penetrate the isthmus. D₃ and D₄ have a well-developed ectostylid, as well as a still unworn protostylid that does not reach the occlusal surface. In D₂ the protostylid is open to protoconid forming a plication on its buccal wall. Generally, there is no pli caballinid, except for a very small one in the right D₃. The pre- and postflexids are very long. The deciduous incisors are simple without longitudinal crenulations or infundibula in the occlusal surface. The muzzle breadth at dl₃ is 64.5 mm.

The postcranial bones are very slender, as they are juvenile. The distal epiphysis of the radius is not fused to the shaft of the bone.



	EPM-1		EPM-2	Deciduous teeth measurements, according to Eisenmann <i>et al.</i> (1988).
D ² -D ⁴	90.9	D ₂ -D ₄	92.0	
D ²	2 35.9	D ₂	2 34.5	
	3 6.1		6 12.9	
	4 20.5			
D ³	2 28.2	D ₃	2 27.9	
	3 5.2		6 12.5	
	4 21.6			
D ⁴	2 29.4	D ₄	2 29.5	
	3 6.5		6 11.5	
	4 20			

Comparisons

Although the hipparionine horses are the most common elements of the Greek Neogene faunas. Nevertheless, the deciduous tooththrows are not so common as the permanent ones. Moreover, they are not suitable for specific determination, as their morphology is usually quite similar among different species (Eisenmann *et al.*, 1988). A metrical comparison to other known deciduous tooththrows shows that the Hermiōni fossils belong to a fairly large-sized hipparion,

larger than *H. matthewi* from the Toulouian of Sámos (Sondaar, 1971), *H. primigenium* and *H. macedonicum* from the Vallesian locality Ravin de la Pluie (Koufos, 1986). It is, however, smaller than *Hipparion* sp. from Sámos (Sondaar, 1971). In fact the size of the Hermiōni hipparion deciduous teeth falls within the metrical range of Gruppe 1-2 from Sámos (Wehrli, 1941), of *H. mediterraneum* (upper teeth) and *H. brachypus* from Pikermi (Koufos, 1987), as well as of a yet unpublished sample of juvenile maxillas and mandibles from the same locality, kept in the Museum of Palaeontology and Geology, University of Athens (MPGUA). The old pikermian collections are, however, most probably mixed, deriving from more than one stratigraphical level, and consequently comprise two or more hipparionine species (Theodorou & Nicolaïdes, 1988), which cannot be distinguished on the basis of the deciduous teeth characters.

Biochronology, palaeogeographic implications

Hipparionine horses have been widely used for biostratigraphic purposes. This very diverse equid group has a wide stratigraphical distribution in Europe that spans from the beginning of the Upper Miocene (Vallesian) to the beginning of the Upper Pliocene (early Villafranchian) (Sen, 1990; Woodburne *et al.*, 1996). The inadequacy of the available material for a specific determination results to the inference of a Late Miocene – Early Pliocene biochronological age for Hermiōni locality. A Pliocene age is, however, not probable, as the widespread Pliocene marine sediments that cover a great part of Peloponnese indicate a very extensive marine transgression during that epoch that turned Peloponnese to an island, not very suitable for a far ranging genus as *Hipparion*. Thus the assumption of a Late Miocene (Vallesian–Toulouian) age for Hermiōni locality seems quite plausible.

From a palaeogeographical point of view, the discovery of a Neogene continental fauna in Peloponnese indicates the existence of a wide land connecting it with the mainland. This land would allow terrestrial mammals without good swimming abilities, such as hipparions, to migrate and colonise remote peninsulas. It is interesting to note that Rögl *et al.* (1991) mention the presence of hipparion teeth on the nearby island of Aegina, while even Crete, situated further south, has yielded Miocene balanced continental faunas (van der Made, 1996). Moreover, the presence of very large proboscideans in Crete (Benda *et al.*, 1970; Athanassiou, 2004) denotes the existence of a very extensive terrestrial area in order to sustain such a population. This makes very probable the existence of an uninterrupted Miocene land in the area of southern Greece, possibly as a part of the Aegaeis.

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