

First evidence of *Mesopithecus monspessulanus* (Mammalia: Cercopithecidae) in the Late Miocene of Macedonia, Greece

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Introduction - Fossiliferous site

The cercopithecoid *Mesopithecus* is common in the late Miocene of Greece, recognized in several localities of the country. It was found in all Turolian localities of Axios Valley (Macedonia, Greece); two certain taxa *M. delsoni* and *M. pentelicus*, as well as a third one *M. cf. monspessulanus* have been described (Koufos, 2009a and references therein). The latter taxon was recognized in the material from the locality Dytiko 2 (DIT) by the mandibular fragment DIT-22 (Fig. 1c), which has smaller mandibular and dental dimensions than the typical *M. pentelicus*. The single known specimen and the badly preserved rest material from Dytiko 2 prevented a definite attribution and thus it was described as *M. cf. monspessulanus* (see Bonis et al., 1990; Koufos, 2009a, b). A re-examination of the Dytiko *Mesopithecus* sample allowed the recognition of another small-sized specimen from the locality Dytiko 1 (DTK). The specimen DTK-276 (it is wrongly mentioned as DTK-240 in Bonis et al., 1990: fig. 7, appendix 1) is a maxillary fragment in functional connection with the corresponding mandibular fragment and was not described. Recently, the maxillary and mandibular fragments of DTK-276 were separated (Fig. 1a, b), making possible to see their morphology, measure the teeth and make detailed comparisons.

Three different fossiliferous sites are known from the area of Dytiko village, about 65 km northeast of Thessaloniki city, and all are situated into the Dytiko Formation, which consists of alternating yellowish-gray marls, sandy marls, gravels, and fresh-water massive marly limestones at the top (Koufos, 1990). They were biochronologically correlated to the late Turolian, MN 13; more exactly the faunal comparison with the well dated Late Miocene-Early Pliocene localities of Ptolemais Basin suggested an age between 7.0-6.0 Ma (Koufos & Vassileiadou, 2015 and references therein).

The cercopithecoids originated from Victoriapithecidae (Frost et al., 2017) and migrated to Eurasia from Africa during late Miocene; there are some discussed indications for their Vallesian presence, but they are certainly present at the beginning of the Turolian. The main Eurasian Late Miocene cercopithecoid is *Mesopithecus*, expanded from the Iberian Peninsula to China. The earliest presence of *Mesopithecus* in Greece is mentioned from the locality Nikiti 2, NIK (Macedonia, Greece), dated at the beginning of early Turolian, MN 11 (8.7-8.2 Ma) (Koufos et al., 2016). The open, warm and dry environment of the Mediterranean region during Turolian was suitable for *Mesopithecus*, a semiterrestrial and opportunistic feeder, that often-consumed hard seeds (Merceron et al., 2009; Youlatos et al., 2012). The small and more arboreal form *M. monspessulanus* appeared later in the Pliocene (Szalay & Delson, 1979).



Figure 1. *Mesopithecus monspessulanus*, Dytiko, Axios Valley, Macedonia, Greece; Late Turolian, MN 13; a-b. Left maxillary (a) and mandibular (b) fragment, DTK-276 and c. mandibular fragment, DIT-22.

Description

The maxillary fragment of DTK-276 preserves part of the left maxilla with the tooth row P3-M3 (Fig. 1a); the dentition is moderately worn, indicating an adult individual; the base of the zygomatic arc is well distinguished, and its anterior margin is situated above the M1 and M2 contact; the premolars are asymmetric (the P3 more than the P4) and bears two main cusps; the molars have the typical morphology of *Mesopithecus* with four main cusps. The mandibular fragment of DTK-276 preserves a small part of the mandibular corpus with the tooth row M1-M3 and that of DIT-22 the left mandibular corpus with i1-m3 and the beginning of the right mandibular corpus without teeth (Fig. 1b, c). The height of the mandibular corpus is small (~10.0 mm below the middle of the m2); the transverse torus is weak; the incisors are smaller than those of *M. pentelicus*; the premolars are asymmetric; the p3 has a single main cuspid; the p4 has two cusps; large honing facet in the p3; the molars are not well preserved but they bear the *Mesopithecus* morphology and are smaller than those of *M. pentelicus*.

Comparisons

The dental morphology of the Dytiko specimens is like that of *Mesopithecus pentelicus* and the differences are mainly restricted in the size between the two species. A principal component analysis of the lower dental dimensions of the Dytiko specimens in comparison with *M. pentelicus* from Pikerni and *M. monspessulanus* from Europe helps the attribution of the studied material. PC2 separates *M. pentelicus* from *M. monspessulanus*, while PC1 separates males from

females in both taxa (Fig. 2a). The specimens DTK-276 and DIT 22 match with the males of *M. monspessulanus*. Therefore, the small-sized *Mesopithecus* from Dytiko can be definitely attributed to *M. monspessulanus* and the available material belongs to male individuals. Although the available sample of the upper dentition of *M. monspessulanus* is small, a similar analysis indicates that DTK-276 is out of the convex hulls of males and females of *M. pentelicus* from Pikermi. Moreover, the dimensions of the preserved lower canine of DIT-22 are close to the males of *M. monspessulanus* and smaller than the corresponding ones of male *M. pentelicus* (Fig. 2b), confirming the above attribution.

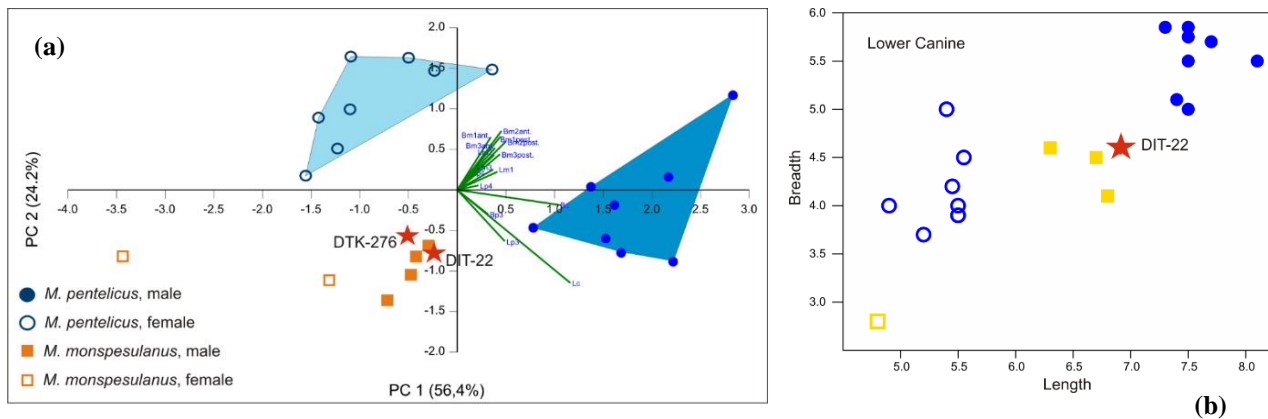


Figure 2. a. Principal component analysis comparing the lower dental dimensions of DTK-276 and DIT-22 with *M. pentelicus* and *M. monspessulanus*; b. Scatter plot comparing the lower canine of DTK-22 with *M. pentelicus* and *M. monspessulanus*, symbols as in Fig. 2a. Data sources: PRIMO (<https://primo.nycep.org/>) for *M. monspessulanus*; personal dataset for *M. pentelicus*.

Remarks

The re-consideration of the Dytiko small-sized *Mesopithecus* indicated that this material belongs to the small-sized *M. monspessulanus* a species which was unknown in Greece. Considering that: a) *M. monspessulanus* is known from the Pliocene of Europe, and b) the age of the Dytiko localities is late Turolian, MN 13, the studied material represents the earliest evidence of this species in Greece. Based on the Turolian material of *Mesopithecus* in the Balkan Peninsula, there is a decrease in the size of the genus during that time span. The large-sized early Turolian *M. delsoni* continues with the middle Turolian *M. pentelicus* and then with the small-sized *M. monspessulanus* from late Turolian to Pliocene (Bonis et al., 1990; Koufos, 2009a, b). This early occurrence of the more arboreal form *M. monspessulanus* (see Szalay & Delson, 1979) agrees with the estimated environmental conditions (wetter with more closed microhabitats) in Macedonia, Greece during late Turolian and became more wet at the Miocene/Pliocene transition (Bonis et al., 1992; Koufos & Vasileiadou, 2015 and references therein).

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