# 15 PRELIMINARY RESULTS ON THE REPTILES FROM THE MIDDLE PLEISTOCENE OF MARATHOUSA 1, MEGALOPOLIS BASIN (GREECE)

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http://dx.doi.org/10.15496/publikation-97650

Keywords: lizards; snakes; Squamata; Testudines; turtles

## 15.1 INTRODUCTION

Marathousa 1 (MAR-1) is a Middle Pleistocene (Lower Palaeolithic) locality situated in the Megalopolis Basin (Arcadia, Peloponnese), an area known since the early 20th century for its mammalian fossils. It was discovered in 2013 during a targeted Palaeolithic survey within the lacustrine sediments of the basin, and excavated from 2013 to 2019 in two large pits, dubbed 'Area A' and 'Area B' (Panagopoulou et al., 2018). MAR-1 yielded important archaeological and paleontological finds, including a partial elephant skeleton and other vertebrate fossils in close stratigraphic association with evidence of human activity (lithic and bone artifacts, cut and percussion marks on bones) (Konidaris et al., 2018; Tourloukis et al., 2018). The identified macromammalian fauna consists of *Macaca sylvanus* cf. *pliocena* (macaque), *Palaeoloxodon antiquus* (straight-tusked elephant), *Castor fiber* (beaver), *Vulpes* sp. (fox), *Canis* sp. (wolf-sized canid), *Mustela* sp. (weasel), *Lutra simplicidens* (otter), *Felis* sp. (wildcat), *Hippopotamus antiquus* (hippo), *Bison* sp. (bison), *Dama* sp. (fallow deer), and *Cervus elaphus* (red deer) (Konidaris et al., 2018, 2022). Moreover, the locality produced abundant fossils of plants, insects, ostracods, molluscs, fishes, amphibians, reptiles, birds, and micromammals, which offer valuable evidence about the locality's paleoenvironment and biochronology (Doukas et al., 2018; Field et al., 2018; Michailidis et al., 2018; Bludau et al., 2021; Boni et al., this volume). MAR-1 is radiometrically, magnetostratigraphically and biochronologically dated to



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500–400 ka, and is correlated to the glacial Marine Isotope Stage MIS 12 (Panagopoulou et al. 2018, and references therein).

Until recently, our knowledge of the fossil record of squamates and turtles in Greece has been limited to isolated findings. However, focused research during the last decade has led to a complete re-evaluation of the known fossils, as well as to numerous new discoveries, new occurrences, and even new taxa (summarized in Georgalis and Delfino, 2022, and Vlachos, 2022; and references therein). In the Megalopolis Basin, turtle fossils are

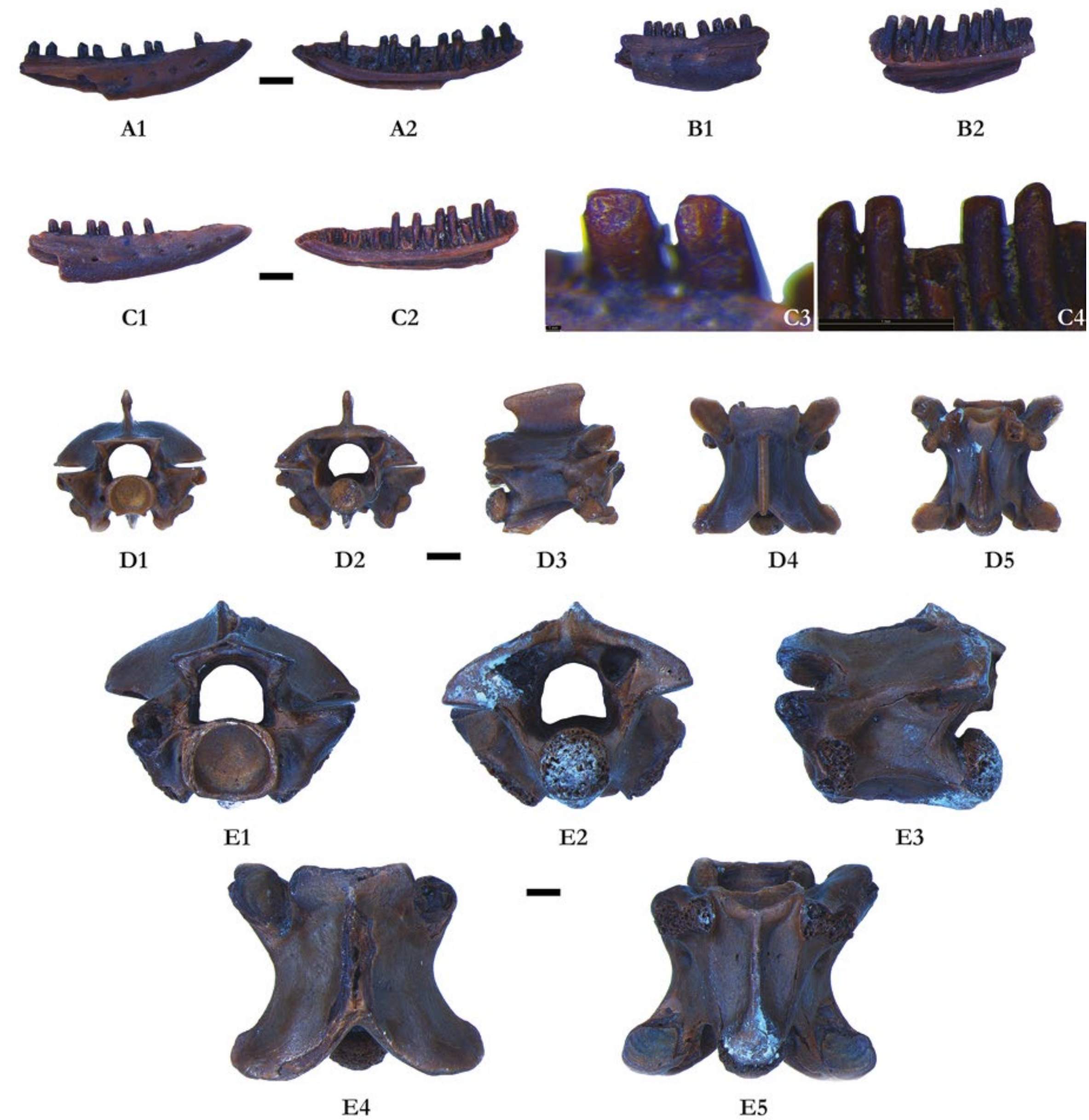


**Figure 1:** Selected specimens of lizards and snakes from Marathousa 1. A) Right dentary (937.677 5a) of Lacertidae indet. (morphotype A) in labial (A1) and lingual (A2) views. B) Left dentary (939.671 13a) of Lacertidae indet. (morphotype B) in labial (B1) and lingual (B2) views. C) Right dentary (936.671 2m) of Lacertidae indet. (morphotype A) in labial (C1) and lingual (C2) views and close up photographs of the teeth in labial (C3) and lingual (C4) views. D) Trunk vertebra (940.671 8a) of *Natrix natrix* in anterior (D1), posterior (D2), right lateral (D3), dorsal (D4), and ventral (D5) views. E) Mid-trunk vertebra (941.671 15a) of *Malpolon insignitus* in anterior (E1), posterior (E2), left lateral (E3), dorsal (E4), and ventral (E5) views.

known from historical collections in Megalopolis (Melentis, 1966; Vlachos and Delfino, 2016), as well as from the more recent systematic investigations in the Kyparissia localities (Athanassiou et al., 2018). The purpose of this communication is to present our preliminary results of the study of the squamate and turtle specimens recovered in the Marathousa 1 locality.

## 15.2 LIZARDS

Lizards are relatively rare, represented by isolated teeth and fragmentary dentaries, bearing elements pertaining to indeterminate Lacertidae (Fig. 1A-C).

The best preserved lacertid specimens are dentaries that bear teeth with pleurodont dentition, with typical bicuspid or tricuspid teeth, and an open Meckel's groove (Fig. 1A-B) (Čerňanský and Syromyatnikova, 2019; Villa and Delfino, 2019). In some of the lacertid dentaries, the tooth crowns are heavily worn, and the cusps cannot be clearly discerned (Fig. 1C). A more precise identification is not possible due to the fragmentary nature of the specimens and the inadequate knowledge of the skeletal anatomy of extant lacertids. Nevertheless, it seems that the MAR-1 fossil material corresponds to two different lacertid species, judging from differences in the tooth morphology and the degree of slenderness of the dentaries (Fig. 1A and 1C vs. 1B), but this could only be ascertained upon more complete material.

Several different lacertids occur today in Peloponnese.

## 15.3 SNAKES

Snakes are by far the most abundant squamates, represented by numerous isolated trunk and caudal vertebrae (Fig. 1D-E). Almost all pertain to the natricid *Natrix natrix* (common grass snake). The absence of colubrids (which are the dominant snake group today) and viperids is notorious, but still a number of rather fragmentary vertebrae can only be referred to as Colubriformes indet. and therefore, some of them could pertain to these families.

*Natrix natrix* is by far the most abundant squamate in Marathousa 1; perhaps, even more than 90% of the identified specimens pertain to this species (Fig. 1D). Its taxonomic identification is confirmed by several characters: hypapophyses are present throughout the trunk vertebrae, being sigmoid and with a rounded tip; a moderately depressed neural arch; a neural spine that is overhanging both anteriorly and posteriorly; prezygapophyseal accessory processes that are moderately long; parapophyseal processes that are directed anteriorly; and an elongated centrum (see Szyndlar, 1984, 1991; Georgalis et al., 2019).

Additional fragmentary *Natrix* vertebrae occur in the sample, not preserving their hypapophyses and/or neural spines. Although most likely they too pertain to *Natrix natrix*, the missing relevant diagnostic structures cannot exclude a referral to the other species of the genus that occurs in modern Greek herpetofaunas, i.e., *Natrix tessellata*. They are treated here as *Natrix* sp.

*Natrix natrix* is a clear indicator of some nearby water habitat, although the species can also occur relatively far from water. *Natrix* is also a common inhabitant of the extant herpetofauna of the area (both *N. natrix* and *N. tessellata* occur today in Peloponnese) and has also a relatively widespread and relatively continuous fossil record in Greece, spanning since the Miocene (Georgalis and Delfino, 2022). The other snakes and lizards from MAR-1 could probably pertain to taxa already present in the broader area today but this cannot be securely asserted with the available fossil material.

A single large vertebra can be tentatively referred to the psammophiid *Malpolon insignitus* (Eastern Montpellier snake) (Fig. 1E) based on its large size and sharp haemal keel (see Georgalis and Szyndlar, 2022). However, there are some differences with other known *Malpolon* specimens, most importantly the very low ratio of centrum length (CL) to neural arch width (NAW) (CL/NAW less than 1.1), while this value is usually slightly higher in extant *Malpolon* specimens (CL/NAW above 1.3). Unfortunately, important features, such as the length of the prezygapophyseal accessory processes and the height of the neural spine, cannot be observed in this specimen due to its preservational status.

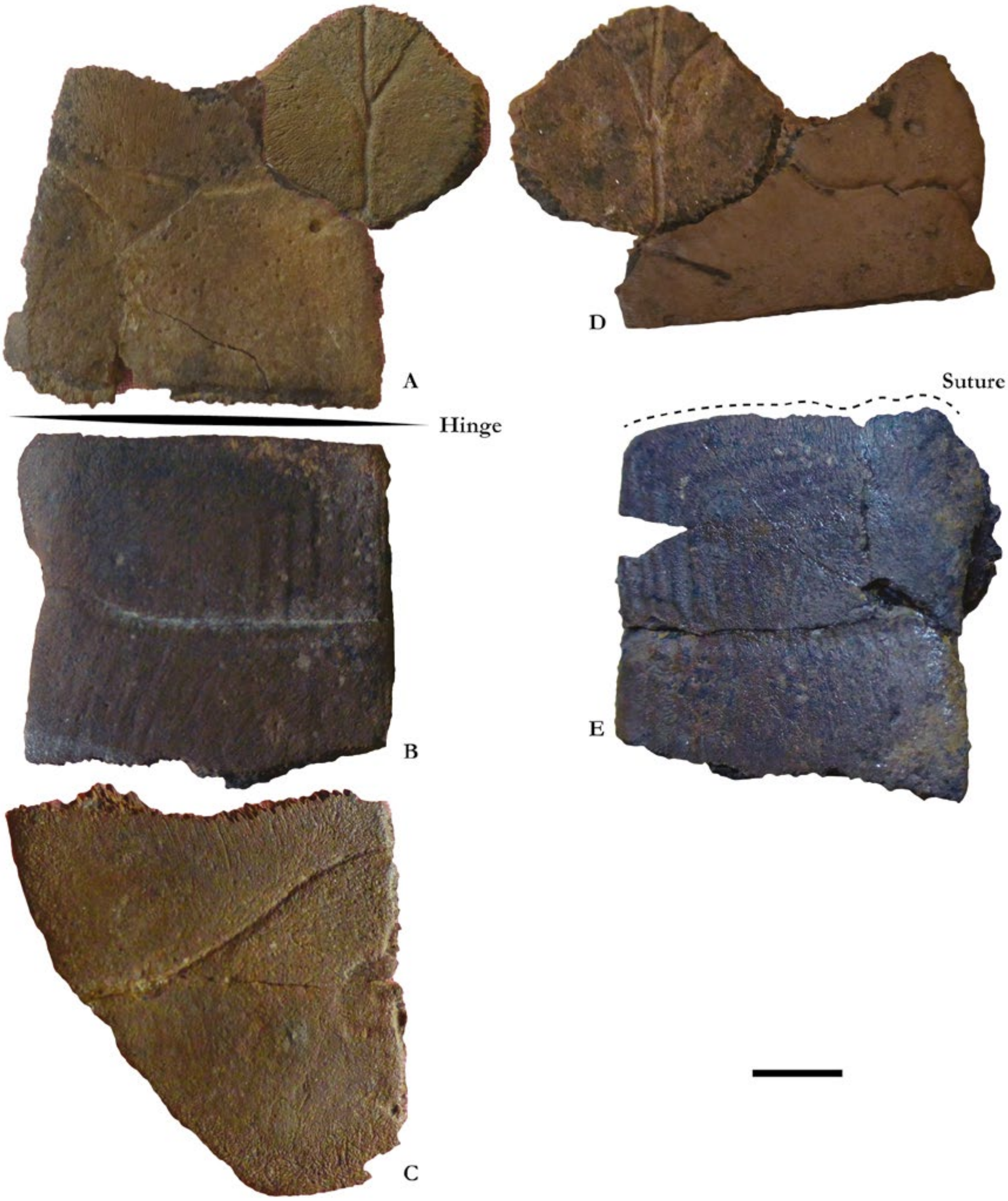


**Figure 2:** Selected plastral elements of the turtles from Marathousa 1. A–C, *Emys orbicularis*: A, associated entoplastron and right hyoplastron; B, right hypoplastron; C, right xiphiplastron. D–E, *Mauremys rivulata*: D, associated entoplastron and left hyoplastron; E, left xiphiplastron. Scale bar equals 1 cm.

## 15.4 TURTLES

Turtles are the most abundant reptile fossils in MAR-1, being more abundant in Area A with at least 750 specimens, compared to the approximately 100 specimens in Area B. They comprise, mostly, isolated elements of the carapace and plastron found dispersed, without any anatomical association (Fig. 2). Nevertheless, a few elements are found in articulation, including successive neural plates, suprapygal/pygal area, successive peripherals, and parts of the plastron. Additionally, some appendicular elements are identified, including fragmented humeri, parts of the pelvis, a complete tibia, and a phalanx. Their preservation is quite good, allowing taxonomic identification of many diagnostic elements of the turtle shell.

Although the extant herpetofauna and the fossil record in Peloponnesus include both aquatic and terrestrial testudine taxa, all studied specimens in Marathousa 1 clearly belong to the freshwater species that currently inhabit the area: the European pond turtle *Emys orbicularis* (Testudinoidea: Emydidae) and the Balkan terrapin *Mauremys rivulata* (Testudinoidea: Geoemydidae). Although the shells of these taxa are similar in many aspects, the presence of a movable hinge between the hyoplastra and the hypoplastra, the connection of the carapace and plastron with connective tissues, and the absence of a medially-directed pivoting process on the fifth peripheral bone (see Joyce and Bell, 2004) in *Emys orbicularis* allow a clear distinction of many isolated fragments of the plastra of these species (Fig. 2).

Additional characters allow to further identify the European pond turtle in the isolated fragments of the Marathousa 1 turtle material: several of the entoplastra are hexagonal and longer than wide, the xiphiplastra show a rounded end with a small anal notch, anal scutes are much longer medially compared to the femorals, and the expansion of the vertebral 5 to the pygal (see more in Vlachos and Delfino 2016). However, some comparable elements show characters that are more compatible with the anatomy of the Balkan terrapin. In particular, an associated wider than long entoplastron and hyoplastron show a humero-pectoral sulcus that crosses the posterior part of the entoplastron, several hypoplastra show a clear suture with the bridge, the presence of keels in some isolated neurals, and minute differences in the morphology and orientation of the suture between the epiplastra and the hyoplastra are characters that are typically and consistently found in *Mauremys*.

The plastral elements of turtles are ideal for providing some initial estimations on the skeletal element representation and taxonomic abundance, because plastra have—compared to the carapace—fewer and clearly identifiable elements both in terms of side and position. Based on the initial identifications of the Marathousa 1 material in both Areas A and B, xiphiplastra prove to be the most abundant element for *Emys*, whereas the entoplastron is the most abundant element for *Mauremys*. This allows us to estimate the presence of at least 15 *Emys* and 4 *Mauremys* in Area A, and 7 *Emys* and 2 *Mauremys* in Area B (based on the Minimum Number of Individuals, MNI). Not only is *Emys* always more abundant compared to *Mauremys*, but their relative abundances are similar in both Areas and overall: the European pond turtle represents at least two-thirds of the turtle material in Marathousa 1.

Based on all the above, we can safely identify the presence of two aquatic (freshwater) turtles, which indicate the presence of important and permanent water bodies in the area, both rivers and ponds. Their presence also indicates that during winter the average temperature should be above freezing, whereas average summer temperatures should be high enough to allow the sexual differentiation based on temperature. In fact, Peloponnesus has been considered as a glacial refuge of *Emys orbicularis* in the Balkans (see Vlachos and Delfino, 2016, and references therein). Both aquatic turtle species identified in Marathousa 1 are known in the extant and extinct herpetofauna of the region (Vlachos and Delfino, 2016; Athanassiou et al., 2018; Vlachos, 2022). Finally, and as these two species can be adapted to different environmental conditions including different pollution and salinity levels, some degree of niche differentiation can be hypothesized for Marathousa 1. Further niche differentiation could be speculated geographically and/or temporally in the region, compared to the nearby, but stratigraphically lower Kyparissia localities, collectively and preliminarily dated to the early Middle Pleistocene (see Athanassiou et al., 2018). Besides the common presence of the European pond turtle, Kyparissia material does not contain any *Mauremys* specimens, but it does contain elements of a terrestrial species, the tortoise *Testudo marginata* that is so far missing from Marathousa 1.

## 15.5 CONCLUSIONS

The preliminary analysis of the MAR-1 reptiles identified the presence of lizards, snakes, and turtles. Lizards are represented by Lacertidae indet. (possibly two species), snakes by *Natrix natrix* and *Malpolon insignitus*, and turtles by *Emys orbicularis* and *Mauremys rivulata*. In particular, the presence and abundance of *Natrix natrix*, *Emys orbicularis* and *Mauremys rivulata* support the existence of a nearby and permanent water source throughout the year, and altogether highlight the importance of the paleolake system, in agreement with the existing paleoenvironmental reconstruction of the locality. All identified reptile species are recorded in today's Peloponnese, but the precise chronostratigraphic and paleoenvironmental context of Marathousa 1 allows more detailed analyses. Therefore, future research will focus on the comprehensive analysis of the MAR-1 reptiles, including detailed descriptions, paleoecology, as well as the horizontal and vertical distribution of the specimens at the site.

## ACKNOWLEDGMENTS

Excavation at Marathousa 1 was conducted under a permit granted to the Ephorate of Palaeoanthropology–Speleology, Hellenic Ministry of Culture. It was supported by the ERC Consolidator Grant ERC-CoG-724703 ("CROSSROADS") and the ERC Starting Grant ERC-StG-283503 ("PaGE"), both awarded to K.H. K.H. is also supported by the ERC Advanced Grant ERC-AdG-101019659 ("FIRSTSTEPS"). G.L.G. acknowledges funding from the Ulam Program of the Polish National Agency for Academic Exchange (PPN/ULM/2020/1/00022/U/00001). G.E.K., V.T. K.H. are also supported by the Deutsche Forschungsgemeinschaft (DFG Project no. 463225251, "MEGALOPOLIS"). We thank all field team members, and especially those that participated in the washing and sorting of the sediment in the field and the lab. We would like to deeply thank the reviewers for helpful comments that helped improving this manuscript and the editorial team for the editorial and production tasks.

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