



Article

Chelonians from the Middle Palaeolithic Site of Mealhada (Coimbra, Portugal): An Update

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Abstract: The results of a review of the chelonian remains retrieved in the excavations carried out in Mealhada (Coimbra, central Portugal) are presented here. Mealhada is a Portuguese Middle Palaeolithic classical site, discovered at the end of the 19th century, and chronologically ascribed to the interglacial Riss-Würm (ca. 120 ka BP). This study has allowed the identification, justification, and figuration of remains attributed to three Iberian chelonian taxa, Testudinidae indet., *Mauremys leprosa*, and *Emys orbicularis*, the last one being recognized for the first time in this site. Thus, an update on the data concerning the chelonian record from Mealhada has been achieved, offering new justified taxonomic evidence regarding Iberian chelonian taxa distribution during the Upper Pleistocene. Furthermore, chelonian consumption amongst pre-Upper Palaeolithic hunter-gatherer groups has been documented worldwide. Frequently a locally captured resource, archaeological turtle remains offer relevant information concerning the role that small prey has played in hominid nutritional choices. The potential presence of anthropic alterations (e.g., cutmarks) in some of the chelonian remains from Mealhada is here analysed and the human consumption hypothesis assessed.

Keywords: Upper Pleistocene; Testudinidae; freshwater terrapins; *Mauremys leprosa*; *Emys orbicularis*; archaeozoology



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1. Introduction

The study of tortoise remains (e.g., *Chersine hermanni*, *Testudo graeca*) recovered in the Iberian Peninsula and other Middle Palaeolithic sites worldwide as a dietary resource has been a subject of debate [1–13]. Framed within a broader discussion regarding the consumption of small prey (e.g., leporids, birds) in the pre-Upper Palaeolithic contexts, tortoises have provided relevant data that has proved its significance in the Neanderthal palaeodiet, not being an exclusive resource for the anatomically modern humans [1–13] (see Blasco et al. [13] for an extended lecture on the topic). In contrast the potential role of terrapins (e.g., *Mauremys leprosa*, *Emys orbicularis*) as a dietary resource has not been assessed in Iberian Peninsula Middle Palaeolithic contexts, mainly due to its low incidence and scarce number of remains.

The Middle Palaeolithic (ca. 120 ka BP) site of Mealhada is located 14 km north of the city of Coimbra, in Portugal (Western Europe), in the alluvial deposits of the lower terrace of the Cértima River (Figure 1). It was first excavated in the late 19th century and presented by C. Ribeiro to the scientific community at the International Congress of Geology held in Paris in 1878, emphasizing the presence of mammal remains identified as *Elephas antiquus*. Soon after, Ribeiro [14] reported the presence of faunal remnants and lithic artefacts similar to those recovered in the classical Lower Palaeolithic site of Saint-Acheul (Northern France). Mealhada was studied, among others, by Fontes [15], and Zbyszewski [16,17] (see Cunha-Ribeiro [18] for a summary of the investigations performed there).

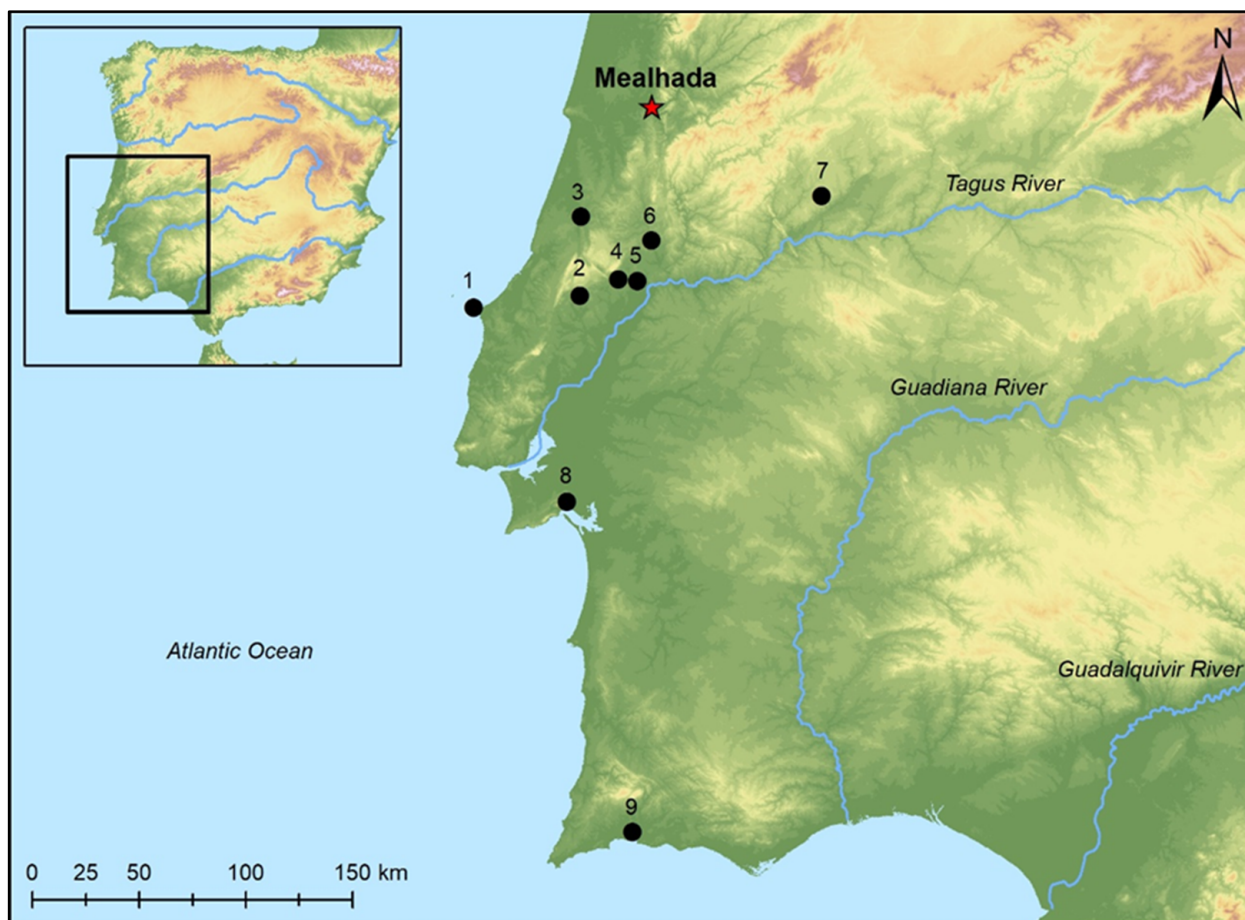


Figure 1. Mealhada Middle Palaeolithic site location on the Iberian Atlantic Coast (Coimbra, central Portugal). Other Portuguese Palaeolithic archaeological turtle records mentioned in the text are: (1) Gruta da Furninha (Peniche); (2) Lapa do Picareiro (Alcanede); (3) Gruta Nova da Columbeira (Bombarral); (4) Galeria Pesada (Almonda); (5) Gruta da Oliveira/Gruta da Aroeira (Torres Novas); (6) Gruta do Caldeirão I/ Gruta do Morgado Superior (Tomar); (7) Foz do Enxarrique (Vila Velha de Ródão); (8) Gruta da Figueira Brava (Arrábida); (9) Gruta Ibn Amar (Lagoa) (Map: Pablo Paniego Díaz).

Zbyszewski [19] made a recapitulation of all the previous studies and a description of the stratigraphy, fauna, flora, and lithic industries recovered in Mealhada. The author also reported the presence of Upper Acheulean industries, which led him to date the deposits as belonging to the Riss glaciation. However, the presence of certain taxa, such as, *Hippopotamus incognitus* (as well as *Elephas antiquus*, *Homotherium latidens*, and large individuals of *Equus caballus*) forced him to exclude the colder periods, which led to the relative assignment of the deposit to the interglacial Riss-Würm (ca. 120 ka BP) [20–22]. Pioneering studies of plant remains and pollens were carried out, and, together with the faunal assemblage, reinforced the proposed chronology [23]. The relative dating was also supported by a U date (80,886 + 42,423 – 31,265 BP) [24] (p. 112), although no stratigraphic association was provided for the sample. The climatic conditions inferred from the fauna ensemble are temperate with warm temperatures, although humid, and closely related to lake or river plain areas [25] (pp. 135–136).

The first reference of turtle remains recovered at the site of Mealhada was provided by Zbyszewski [19], who cited the presence of *Testudo* sp. and included a figure showing some remains [19] (p. 22). The author mentioned the existence of 77 shell plates deposited in the Museu dos Serviços Geológicos (Museu Geológico de Lisboa—MG), indicating the size of the largest and smallest remain, as well as its stratigraphical location in level 4 [19] (p. 26).

Antunes and colleagues [21] (p. 166) referred again to the aforementioned remains, being cited as Chélonien indet. (sic) by them, noting that, although previously cited as *Testudo* sp. (see Zbyszewski [19]), an accurate systematic attribution required detailed future study. Jiménez Fuentes and colleagues [25] collected the data described above in their study of turtle remains from Gruta Nova da Columbeira site. They suggested that if it was confirmed that the remains of Mealhada were *A. (Agrionemys) hermanni* (sic), their presence on the Portuguese Atlantic coast would go back at least until $-80,000$ to $-150,000$ years, and its northern distribution limit would rise considerably [25] (p. 137). Crespo [26] updated the published information on Portuguese paleoherpetofauna including the turtle remains of Mealhada and identifying the taxa *Agrionemys* sp. (sic) and *Mauremys leprosa* in the site. Crespo [26] (p. 28) cited the presence of *M. leprosa* for the first time at the site and suggested that the record was the oldest one in the Iberian Peninsula, doubting the identification of the species in the Pliocene/Lower Pleistocene of Barranco León 5 (Guadix-Baza basin, south-eastern Spain) [27]. Regarding the specimens attributed to *Agrionemys* (sic), the author stated that the remains probably belonged to *A. hermanni* (sic) since there were no reliable records of the presence of *A. graeca* (sic) in Portugal [26] (p. 28).

The aim of this study is to review the turtle remains recovered in the Mealhada site during the excavations performed in the 19th century, and deposited in the MG, in order to confirm or update the taxonomic identification and to perform an archaeozoological and taphonomical traditional analysis. The results of our study have provided new justified taxonomic identifications including the identification of three forms, Testudinidae indet., *Mauremys leprosa* (Geoemydidae), and *Emys orbicularis* (Emydidae) (identified here for the first time). Also, possible anthropic modifications are characterized whereas the dubious material contextualization leads to caution in developing related hypotheses.

2. Materials and Methods

The material studied here are turtle remains from Mealhada deposited in MG (Lisbon, Portugal). The site presents the museum registration number 788. Remains are placed in two boxes labelled 42-A-1 and numbered MG 8217.1 and MG 8217.2. In addition, they present a note indicating 'Galeria Sul do Praça de Augusto Ferreira. A 6.0 m prof. 1880'. In box MG 8217.1 the material is marked as 'Cam. 4' (meaning 'camada' or level 4).

The applied methodology is the standard for archaeozoological traditional analysis. The material was first-hand revised, figured, and photographed (using a camera Canon Ixus 107), providing here an illustrative selection of the identified genera and species (Figures 2 and 3). Potential human taphonomical evidence was examined with a hand loupe with $10\times$, $15\times$, and $20\times$ magnifications. All the figures presented here have been elaborated with the software Adobe Photoshop® and CorelDRAW®. In the material figures (Figures 2 and 3), plates are drawn in black, and scutes in grey. Discontinuous lines in these figures indicate fractured margins. Striped fill represents suture areas or ligamentous union areas in Figure 2, and fractured surfaces in Figure 3.

The diagnostic criteria used for the taxonomical identification of the remains was selected from various works [27–33]. The quantification of the remains performed here includes the number of remains (NR), the number of identified specimens (NISP) and the minimum number of individuals (MNI) [34,35]; all percentages are from the NR total (see Table 1). The relative age determination (defining its ontogenetic stage as juvenile or adult) is based on the straight carapace length (SCL) [36–39], the shell plates size and/or the ossification degree. The sex determination is based on the criteria proposed by various authors for the taxa identified here [36–39].

Human and natural taphonomic evidences have been defined following different publications [40–47]. Incisions, scratches, and fractures are characterized and defined following various works [40,41]. Possible carnivore and other predator actions and alterations have been analysed following Pérez-Ripoll and Sampson [41,42]. Burning damage degree is described based on coloration [44,45], and its location within the turtle shell [46]. The

potential confusion of alterations origin with postdepositional processes was assessed following Fernández-Jalvo and Andrews [47].

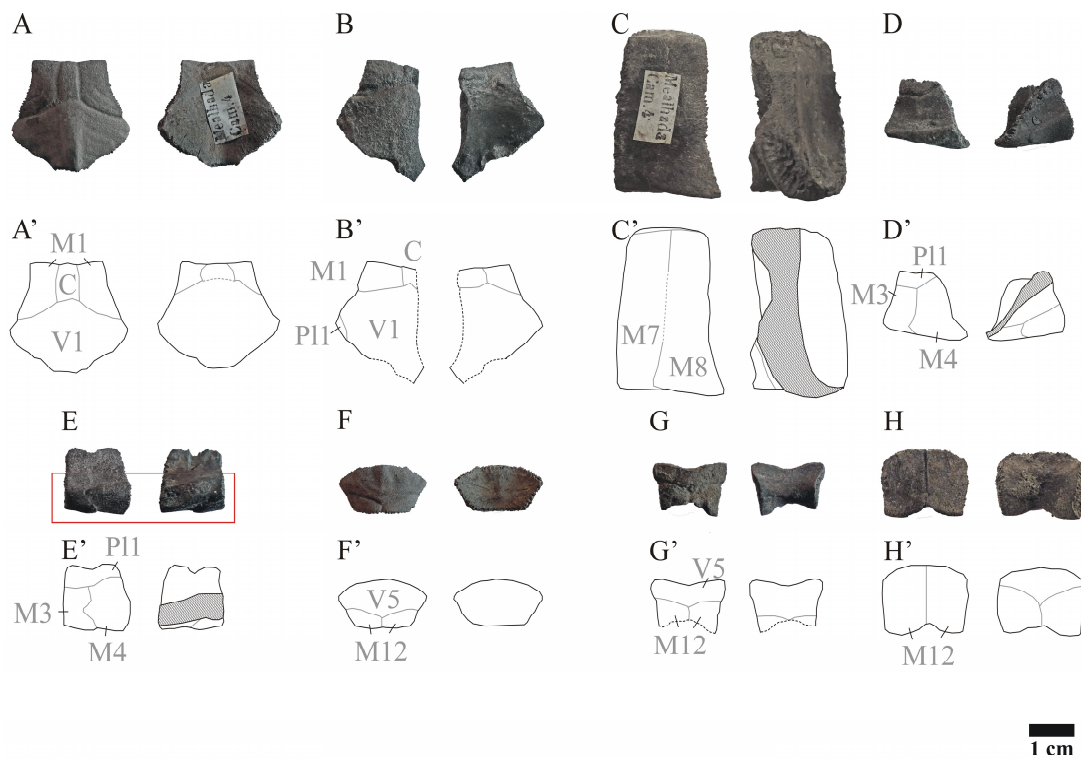


Figure 2. MG 8217.1/MG 8217.2 Carapacial turtle plates selection from the Middle Palaeolithic site of Mealhada (Coimbra, central Portugal) in dorsal (left) and ventral (right) views. *Mauremys leprosa* plates selection (A,D,F,H): (A), nuchal; (D), left 3 peripheral; (F), suprapygal 2; (H), pygal. *Emys orbicularis* plates selection (B,E,G): (B), nuchal; (E), left 3 peripheral; (G), pygal. (C), left 7 peripheral of Testudinidae indet. (A'–H'), plates figuration. Red rectangle indicates a burned area.

Table 1. Turtle remains from the Middle Paleolithic site of Mealhada (Coimbra, central Portugal) identified in the Museu Geológico de Lisboa (Lisbon, Portugal). The number of shell skeletal elements identified (and indeterminate) by taxon, NISP and percentage are indicated.

	Testudinidae Indet.				<i>Mauremys leprosa</i>				<i>Emys orbicularis</i>				Testudines Indet.		
	Left	Right	NISP	%	Left	Right	NISP	%	Left	Right	NISP	%	NR	%	
Carapace	Nuchal														
		1			3		3	7.8		1		1	3.8		
		2			1		1	2.6		1		1	3.8		
		3			1		1	2.6		1	1	2	7.6		
		4													
		5													
	Peripheral														
		6								1	3	4	15.3		
		7	1		1	100	3	3	7.8		2	2	7.6		
		8													
		9					1	1	2.6						
	10						2	5.2							
	11						1	2.6							
Suprapygal															
	1														
	2					2	2	5.2							
Pygal															
						1	1	2.6		1	1	3.8			

Table 1. Cont.

Plastron	Testudinidae Indet.				<i>Mauremys leprosa</i>				<i>Emys orbicularis</i>				Testudines Indet.	
	Left	Right	NISP	%	Left	Right	NISP	%	Left	Right	NISP	%	NR	%
Epiplastron					1	3	4	10.5		2	2	7.6		
Entoplastron						1	1	2.6	1		1	3.8		
Hyoplastron					4	3	7	18.4	4	1	5	19.2		
Hypoplastron					3	1	4	10.5	1	2	3	11.5		
Xiphiplastron					6	1	7	18.4	2	1	3	11.5		
Costal indet.													23	35.9
Neural indet.													6	9.4
Peripheral indet.					2				1				11*	17.2
Testudines indet.													24	37.5
TOTAL			1	0.7			38	29.5			26	20.2	64	49.6

* Total NR of indeterminate peripheral plates, including those identified at species level.

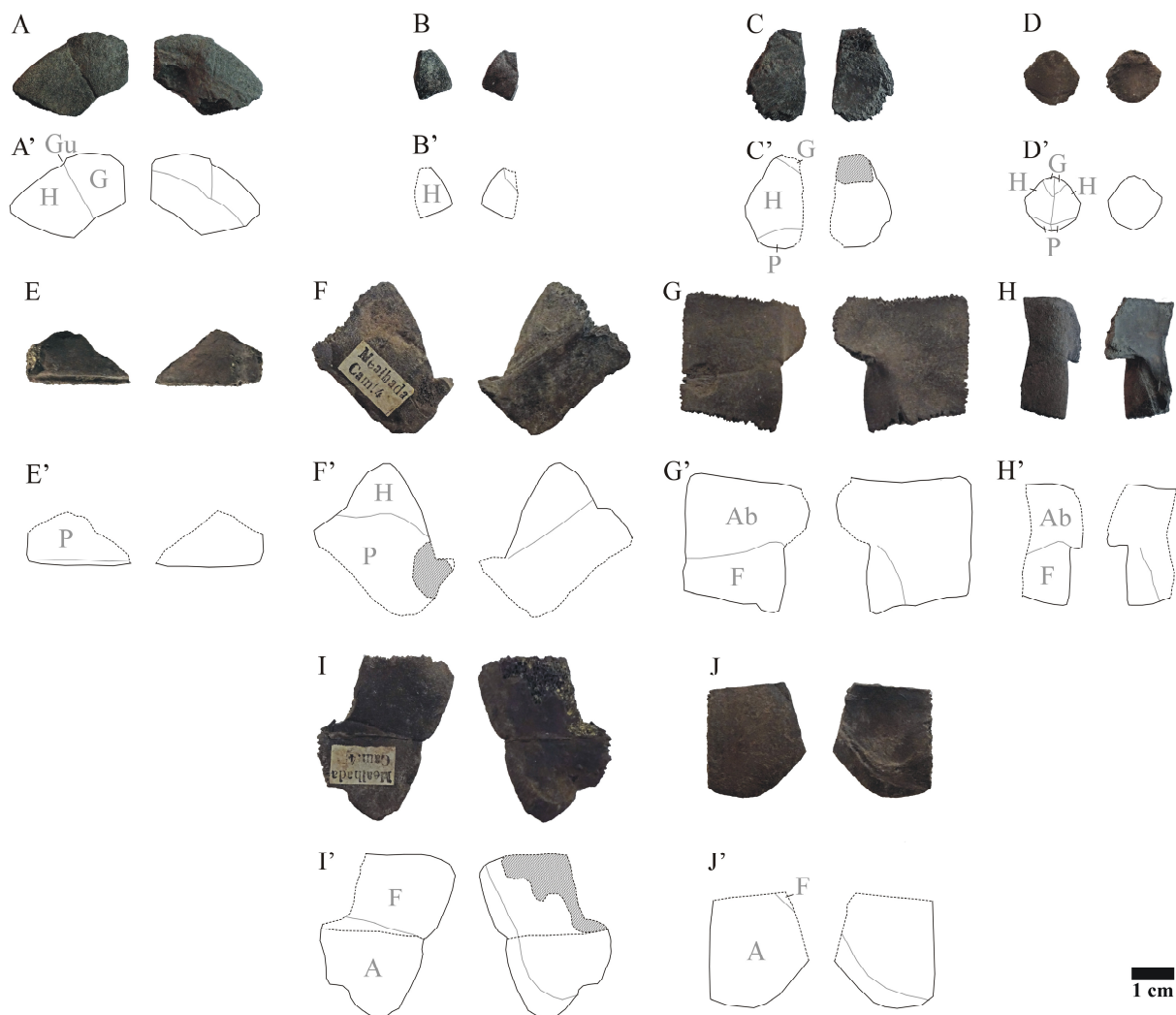


Figure 3. MG 8217.1/MG 8217.2 Plastral turtle plates selection from the Middle Palaeolithic site of Mealhada (Coimbra, central Portugal) in dorsal (left) and ventral (right) views. *Mauremys leprosa* plates selection (A,C,F,G,I): (A), right epiplastron; (C), entoplastron; (F), left hyoplastron; (G), left hypoplastron; (I), left xiphiplastron. *Emys orbicularis* plates selection (B,D,E,H,J): (B), left epiplastron; (D), entoplastron; (E), left hyoplastron; (H), left hypoplastron; (J), left xiphiplastron. (A'–J'), plates figuration.

3. Results

The first-hand review of the Mealhada material deposited in MG has yielded the identification of 129 turtle remains (NR), which conceded a NISP of 65 (50.5%), 64 remaining unidentified (49.6%) (see Table 1). All the specimens correspond to carapacial and plastral plates. The total MNI is 11 specimens, one specimen assigned to Testudinidae indet., six to *Mauremys leprosa*, and four to *Emys orbicularis*. Within the *Mauremys leprosa* specimens, three are identified as males, and only one as a female. Both ontogenetic stages, juvenile and adult, have been recognised in the ensemble.

The set shows a substantial fragmentation value (76.7%) (complete/incomplete), the majority of which corresponds to a postdepositional origin. Potential anthropogenic alterations have been recognized in a very low percentage (13.2%). Seven remains present incisions and scratches groups (5.4%) (Table 2, Figures 4 and 5), at least eight burning traces (6.2%), and two fractures (1.5%). Most of the documented incisions and scratches are characterized by being very slight and by their location in the carapace ventral side and in the plastron dorsal side (except those from the right hyoplastron, located on the ventral side, see 7 in Table 2). Black burned traces have been here found mainly on peripheral *Emys orbicularis* plates in its posterior/lateral side. Fresh fractures are identified in the dorsal part of two right hyoplastra, one of them with a short and slight incision in the ventral side (Figure 5E). No carnivore or other predator activity has been identified.

Table 2. Potential anthropic alterations description and location on turtle remains from the Middle Paleolithic site of Mealhada (Coimbra, central Portugal).

Specimen	Taxon	Taphonomic Evidence
1 Right peripheral 10 (Figure 4A)	<i>Mauremys leprosa</i>	Short and slight scratches on the ventral side of the anterior right edge.
2 Left xiphiplastron (Figure 4B)	<i>Mauremys leprosa</i>	A group of small, parallel incisions at the anterior right dorsal side.
3 Right epiplastron (Figure 4C,D)	<i>Emys orbicularis</i>	Several groups of short and slight scratches on the dorsal side. Possible red pigment.
4 Left peripheral 7 (Figure 5A)	Testudinidae indet.	Short and slight incision in the ventral side.
5 Peripheral indet. (Figure 5B)	Freshwater terrapin indet.	Short and slight incision in the ventral side.
6 Left hyoplastron (Figure 5C,D)	<i>Mauremys leprosa</i>	Group of short and slight incisions in the dorsal side. One presents a loss of bone matter of unknown origin.
7 Right hyoplastron (Figure 5E)	<i>Mauremys leprosa</i>	Short and slight incisions in the ventral side.

In the ensemble, two nuchal plate morphologies are identified (Figure 2A,B). Among the four preserved nuchal plates, three have a long cervical scute that medially overlaps the plate anterior half and lack of sulcus on their lateral regions (Figure 2A). In contrast, the remaining nuchal has a short cervical scute and shows the sulcus between vertebral 1 and left pleural 1 on its left lateral edge (Figure 2B).

Within the peripheral plates, three differentiated morphologies are observed (Figure 2C–E). Some of them have the pleuro-marginal sulcus close or next to the costal-peripheral suture (Figure 2C,D), while others present this sulcus on the plate lateral margin (Figure 2E). In addition, some bridge peripheral plates (3 to 7) show a sutured contact with the plastron (Figure 2C,D), the connection being ligamentous in others (Figure 2E). In contrast, a left peripheral plate 7 is relatively high and thin, and the pleuro-marginal sulcus overlaps the region corresponding to the costal-peripheral suture (Figure 2C). In ventral view, it shows the suture with the left hyoplastral process. The suprapygal plates present both the sulcus between the vertebral scute 5 and the marginals 12, as well as the medial sulcus present between this last pair of scutes (Figure 2F). Two morphotypes of pygal plates are observed (Figure 2G,H). One displays the sulcus between the vertebral scute 5 and the marginal scutes 12, as well as the medial sulcus between the latter (Figure 2G). The other, only displays the medial sulcus between marginals 12 (Figure 2H).

Two epiplastra morphologies are noted (Figure 3A,B). Some have a well-developed gular notch and the epi-hyoplastron suture is anteriorly directed at its lateral end (Figure 3A). Others have this suture straight (Figure 3B). One entoplastron (Figure 3C) is rhomboid shaped; the other (Figure 3D) is hexagonal. Some hyoplastra have a contact surface with a hinge in its posterior end (Figure 3E), but others have well-developed osseous bridges (Figure 3F). Some hypoplastra present well-developed bridges (Figure 3G), but others show a hinge at their anterior end (Figure 3H). The xiphiplastra present a pointed posterior end in some cases (Figure 3I), that region being rounded in others (Figure 3J).

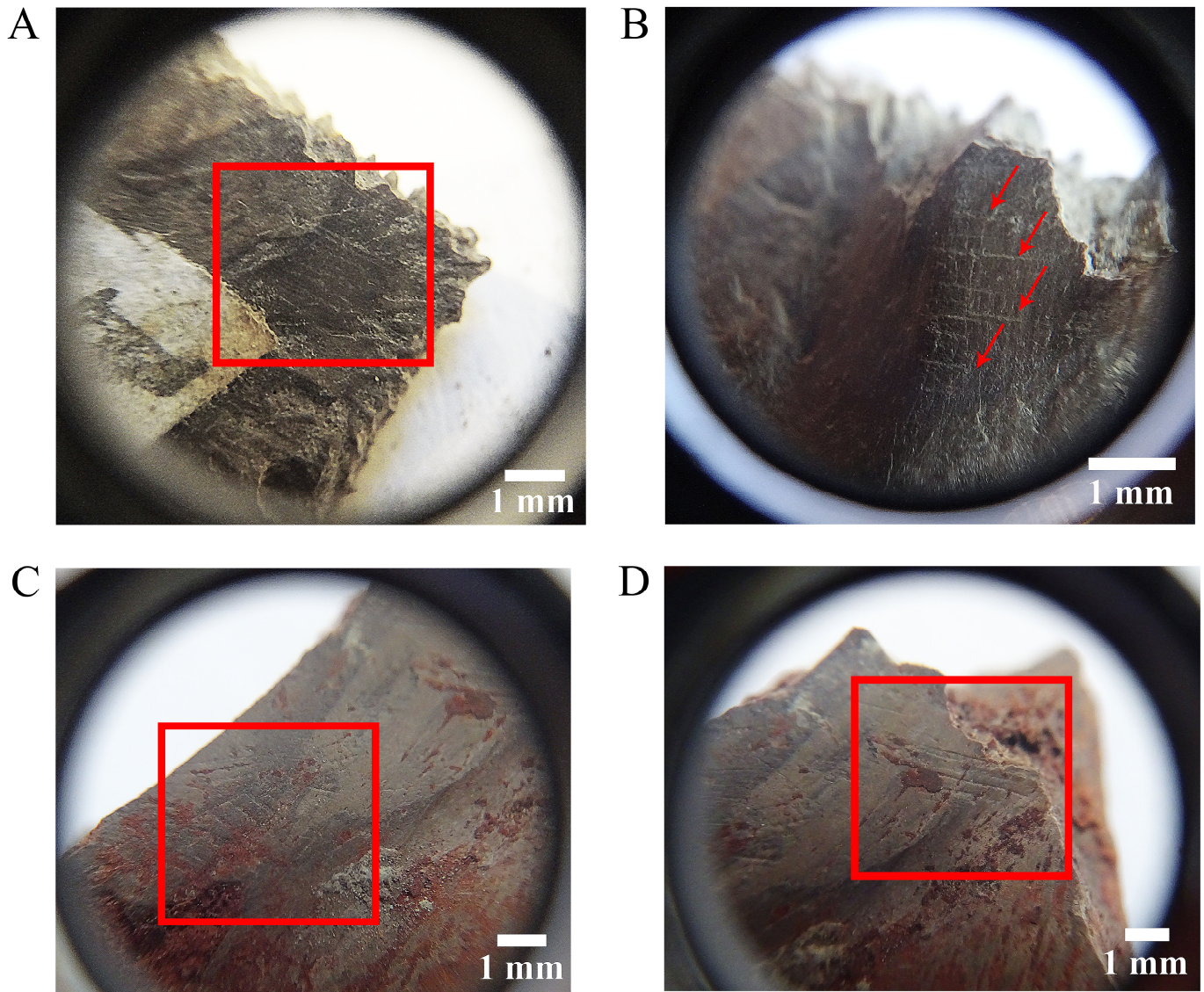


Figure 4. Details of incisions and scratches groups in turtle remains from the Middle Palaeolithic site of Mealhada (Coimbra, central Portugal). Arrows and boxes mark the identified alterations. For each specimen alteration type, see Table 2. *Mauremys leprosa* right peripheral 10 detail (A) and left xiphiplastron detail (B). *Emys orbicularis* right epiplastron detail (C,D).

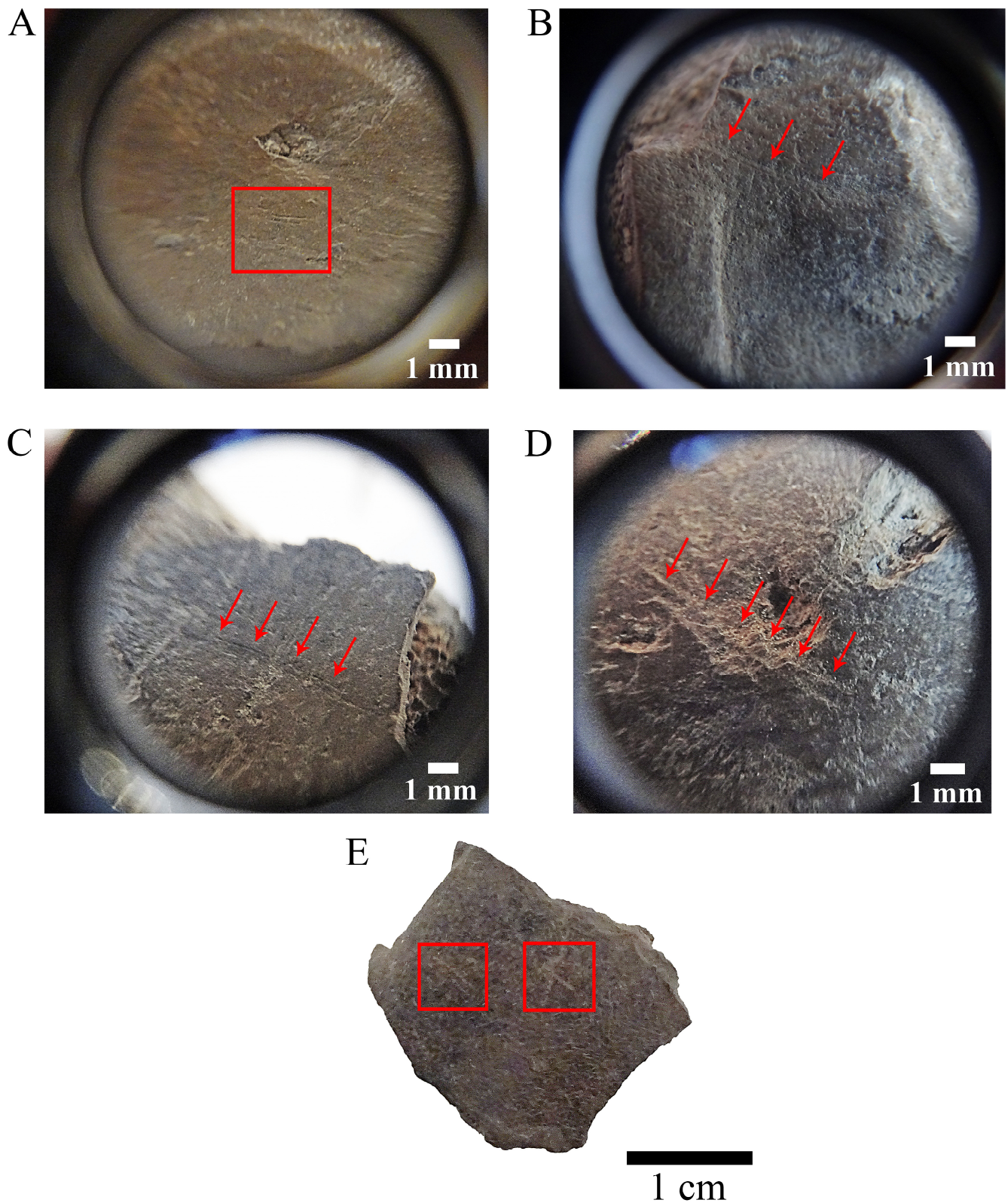


Figure 5. Details of incisions and scratches groups in turtle remains from the Middle Palaeolithic site of Mealhada (Coimbra, central Portugal). Arrows and boxes mark the identified alterations. For each specimen alteration type, see Table 2. Testudinidae indet. left peripheral 7 detail (A). Freshwater terrapin indet. peripheral indet. Detail (B). *Mauremys leprosa* left hyoplastron detail (C,D) and right hyoplastron (E).

4. Discussion

4.1. Systematic Discussion

The presence of Testudinidae in Mealhada is justified by several criteria observed in one of the identified peripheral plates (see Figure 2C). These are: the plate greater thickness in relation to the rest of the turtle shell remains from the site, the comparatively deeper sulcus, its considerably greater length than width, and the position of its pleuro-marginal sulcus on the costal-peripheral suture. These character states are shared, among other members of the lineage, between the Iberian taxa *Chersine hermanni* and *Testudo graeca* [30–33]. No diagnostic criteria for an identification at species level are present in the analysed plate, being recognized as Testudinidae indet. Therefore, the previously proposed attribution as *Testudo* sp. (sic) [19] and *Agrionemys* sp. (sic), even *A. hermanni* (sic) [25,26], is not justified and cannot be substantiated. The tortoise remain probably belongs to the taxon *Chersine hermanni*, as previously proposed [25,26], hence considering the Iberian record as there is no justified evidence of *Testudo graeca* until the first/second century AD [48]. Therefore, due to the lack of sufficient anatomical criteria to support the species identification, it is only considered justified to confirm the presence of Testudinidae indet.

The presence of *Mauremys leprosa* in the Mealhada site, previously proposed but not justified by Crespo [26], is confirmed by certain characters observed in the remains. These are: a cervical scute that medially overlaps the nuchal plate anterior half; peripheral plates with the pleuro-marginal sulcus situated in the plate's upper half, without overlapping the costal-peripheral sutures; peripheral plates displaying an osseous contact with the plastron; the presence of the medial sulcus between the marginals 12 on the pygal plate; a rhomboid entoplastron; a well-developed gular notch in the epiplastra and an anteriorly directed epi-hyoplastron suture; well-developed osseous hyoplastral and hypoplastral buttresses; a suture joint between carapace and plastron; and a pointed posterior end in the xiphiplastra. An exclusive character combination for *Emys orbicularis* within the European record of turtles allows us its identification for the first time in the site: a relatively short cervical scute, being wider than higher; the presence of the sulcus between the first vertebral and first pleural scutes on the nuchal plate left edge; the pleuro-marginal sulcus on the peripheral plate's anterior half; a ligamentous contact between the carapace and the plastron; a hexagonal entoplastron; a hyo-hyoplastra connection by hinge; and xiphiplastra with a rounded posterior end.

All these aspects allow us to recognize the identification of three different Iberian turtle taxa in the Mealhada site (Coimbra, central Portugal). Two forms correspond to freshwater terrapins, *Mauremys leprosa* and *Emys orbicularis*, and the third is attributable to a terrestrial tortoise (Testudinidae indet.). Regarding the Iberian turtle taxa record during the Upper Pleistocene, Mealhada is identified here as the oldest Iberian Peninsula archaeological site in which three turtle forms are recognized. Even though the presence of the species *Chersine hermanni* cannot be substantiated, the identified presence of tortoises raises the northern limit of the Testudinidae distribution for the Upper Pleistocene (ca. 120 ka BP) as previously noted [25] (p. 137). In this context, *Chersine hermanni* has been identified in central Portugal in the following archaeological sites (see Figure 1): Gruta da Aroeira (Torres Novas) (ca. 428–362 ka BP) [49]; Galeria Pesada (Almonda) (241 ± 30/22 ka BP) [50]; Gruta da Figueira Brava (Arrábida) (ca. 80–110 ka BP) [6]; Gruta da Oliveira (Torres Novas) (ca. 100–35 ka BP) [4,6]; Foz do Enxarrique (Vila Velha de Ródão) (44 ± 3 ka BP) [3]; Lapa do Picareiro (Alcanede) (45 ka BP) [51]; Gruta Nova da Columbeira (Bombarral) (35.9–101.5 ka BP) [25]; and Gruta da Furninha (Peniche) (31,265 ka BP) [52,53]. One more reference of the species can be found on the southern Iberian Atlantic coast in Gruta Ibn Amar (Lagoa, southern Portugal) (ca. 80 ka BP) [54,55].

Concerning the freshwater terrapins, Mealhada also offers the oldest and farthest northern archaeological reference for both *Mauremys leprosa* and *Emys orbicularis* on the Iberian Atlantic coast for the Upper Pleistocene. *Emys orbicularis* is also identified in Gruta Nova da Columbeira (Bombarral, central Portugal) (35.9–101.5 ka BP) [25] and in Gruta da Figueira Brava (Arrábida, central Portugal), although the recovered remain in this last site

is considered as a Holocene intrusion [4]. The Mealhada archaeological record of *Mauremys leprosa* is the oldest for Portugal and the Iberian Atlantic coast, with no other reference of the species in that area until the Upper Palaeolithic, in two sites located in Tomar (Santarém, central Portugal): Gruta do Caldeirão I (ca. 40–26.5 ka BP) [4,26,56] and Gruta do Morgado Superior [51]. The scepticism regarding the identification of *Mauremys leprosa* remains in Barranco León 5 (Guadix-Baza basin, south-eastern Spain) expressed by Crespo [26] was already cleared by Bailón [27]. In this last study, which includes the remains figuration and systematic justification, the author proposed the identification of *Mauremys* cf. *M. leprosa*, waiting for more evidence to confirm certain characteristics whose differences could be justified by population variability [27] (p. 189).

4.2. Archaeozoological Discussion

The Middle Paleolithic site of Mealhada offers an exceptional turtle record, considering the presence of three Iberian turtle taxa. However, as recovered in an early dig, the contextualization of these remains is problematic. Thanks to the information gathered by Zbyszewski [19], together with the material notes and labels at MG, we recognize that the turtle remains studied here were yielded on the interventions made before 1880. Level 4, from which the material probably comes, is described as clayey grey sandstone of medium to thick grain with bones [19] (p. 9). However, there is no mention of the remains association with the lithic material. The bone and lithic industry described by Zbyszewski [19] belongs to interventions made after 1897, although some worked bone and flakes come from the mentioned Level 4.

At a taphonomic level, cutmarks located inside the turtle shell, as in this case, have been associated in other sites to a secondary processing (i.e., defleshing) for consumption [1,2,4–6,46,51]. These evidence locations (see 1–6 in Table 2) may correspond to actions related to skinning, eviscerating, and defleshing (Figures 4 and 5). In contrast, one of these alterations groups is located in the ventral side of a hyoplastron (Table 2; Figure 5E). The group is formed by two parallel, short, and slight incisions, and a third short and slight incision of unknown origin, that perhaps may be associated to postdepositional processes. Burning damage location corresponds with that documented in experimental roasting [46,51]. These evidences could indicate that a particular specimen was roasted by contacting coals for consumption, as documented in other Middle Palaeolithic Iberian sites [1,2,4–6]. Fresh fractures located in two hyoplastra could be related to shell opening [38]. It also should be noted that all the material has a homogeneous dark grey colour scheme (Figures 2 and 3), as described for Level 4. In contrast, a single plate has red ochre sediment residues (Figure 4C,D). This could probably indicate a different stratigraphic origin for this plate, or, perhaps, the presence of a pigment associated with an unknown concrete functionality that resulted in the groups of scratches observed on the plate.

Human consumption of tortoises is relatively well documented in the Middle Palaeolithic Iberian Peninsula [1,2,4–6]. In these sites, anthropic evidence (e.g., cutmarks, burning, or fractures) identification and characterization has been proved as relevant in supporting the consumption hypothesis as its specific location within the turtle shell, and its association to precise butchering and cooking actions [1,2,4–6,51]. Regarding Mealhada, the low percentage of potential anthropic evidence is similar to that documented in other sites [6,51]. Only cutmarks (or incisions), fractures, and burning marks have been recognised by the analysis of the remains studied here, but its location can be clearly associated with specific butchery and cooking actions.

Even though the taphonomic analysis performed here suggests the presence of anthropic alterations in turtle remains found in Mealhada, these evidences should be considered with caution. As recognised in other archaeological sites (e.g., Gruta Nova da Columbeira, see [57]), the remains here examined have the information constraints associated with antique excavation methodologies (e.g., destructive dig methods, uncertain stratigraphic association, relative site dating, lack of absolute dating, selective material collection). The absence of appendicular bones may perhaps be indicative of selective

material collection, or the intervention of birds [42]. Consequently, the studied ensemble may be biased or may not be analogous, belonging to different chronological moments. The identified incisions could also have been the result of other taphonomic processes (e.g., trampling) [47]. Although trampling and anthropic origin hypotheses cannot be assessed here due to the lack, at the time of the study, of better analysis instruments (e.g., microscopes, ESEM), the location of some of the identified marks may reinforce the anthropic origin. Even so, it is considered that the human consumption hypothesis should be contemplated with the appropriate caution.

Among small prey, tortoises are relatively easy-to-catch animals that do not require a particular technology, compared to fast prey (such as leporids or birds [58,59]), and can be caught circumstantially [60]. In contrast, terrapins are more elusive. On the one hand, *Mauremys leprosa* escapes from a human observer at an average distance of 19 m. This distance may be larger if the observer is on the opposite shore, and smaller on shores without vegetation [61]. On the other hand, *Emys orbicularis* avoids shores to sunbathe [39], therefore, their capture requires relatively elaborate techniques. The Iberian Peninsula Middle Palaeolithic record offers a clear predominance of tortoise versus terrapin remains [1,2,4–6,51]. This prevalence may be indicative of a Neanderthal preference for tortoise capture and consumption due to its low energy investment. It may also reflect a relative abundance of tortoise versus a scarce terrapin presence, making the development of capture techniques for the latter unnecessary. In this sense, the possible presence of anthropic alterations in terrapin remains found in Mealhada constitutes a novelty in the Iberian Peninsula Middle Palaeolithic record. Possible Neanderthal interest in this type of resource may also be indicative of a greater presence of terrapins in the area.

4.3. Paleoenvironmental Discussion

Although turtles are less favourable paleoenvironmental and climatic indicators [27,62] compared to other reptiles, and especially to amphibians, its presence may imply certain climatic conditions. Currently, two forms of Testudinidae live in the Iberian Peninsula, *Chersine hermanni* (sensu [63]; i.e., the Hermann's Tortoise), and *Testudo graeca* (i.e., the Greek Tortoise or Spur-thighed Tortoise) [64]. These forms inhabit a great diversity of habitats in areas of Mediterranean and sub-Mediterranean climate, preferably in areas of clarified Mediterranean forest: holm oak, cork oak, steppe, and brush, very often inhabiting the garrigue [36,37]. Two forms of freshwater terrapins currently inhabit the Iberian Peninsula. *Mauremys leprosa* inhabits large and permanent wet areas with fresh water or with low salinity, preferring stagnant or low-current rivers, with abundant perimeter and aquatic vegetation, and high insolation [65]. *Emys orbicularis* occupies all types of clean water bodies, both fresh and brackish, temporary, or not, although it prefers those with little or no current and abundant perimetral and aquatic vegetation cover [39,66].

On the one hand, tortoises (Testudinidae) and *Mauremys leprosa* are Mediterranean forms with a marked thermophilic character [27,62]. On the other hand, *Emys orbicularis* needs warm summers with an average temperature in July above 18 °C for the successful development of egg-laying [67]. Freshwater terrapins (*Mauremys leprosa* and *Emys orbicularis*) are also indicative of nearby large, permanent, or temporary stagnant, or low-current, wet areas with fresh water, or with low salinity, and abundant perimeter and aquatic vegetation [39,65,66]. The nearby wet areas were formerly inferred from the presence of freshwater molluscs remains in the site [19].

5. Conclusions

The presence of three Iberian turtle forms in the Middle Palaeolithic (ca. 120 ka BP) archaeological Mealhada site (Coimbra, central Portugal) is here recognized: two freshwater terrapins (*Mauremys leprosa* and *Emys orbicularis*) and an indeterminate terrestrial tortoise (Testudinidae indet.). The previous reference of *Mauremys leprosa* [26] in the site is now verified and justified; the hitherto presence of *Emys orbicularis* is here stated and justified, and, while the formerly suggested identification of *Chersine hermanni* [19,25,26] in the site

cannot be supported, the presence of Testudinidae indet. is recognized. The Mealhada record is here established as the oldest Iberian Peninsula archaeological site in which three turtle forms are identified. The northern limit of the Testudinidae distribution on the Iberian Atlantic coast for the Upper Pleistocene (ca. 120 ka BP) has been considerably increased. Mealhada shows also the oldest and farthest northern archaeological reference for both terrapin species (*Mauremys leprosa* and *Emys orbicularis*) on the Iberian Atlantic coast for the Upper Pleistocene. Thus, an update of the data concerning the archaeological turtle record from Mealhada has been achieved, offering new justified taxonomic evidence regarding the Iberian turtle taxa distribution on the Portuguese Atlantic coast during the Upper Pleistocene.

Additionally, the presence of possible anthropic manipulation evidence on terrapin remains has been assessed for the first time here and related to human consumption. However, the absence of reliable stratigraphic information, and the lack, at the time of the study, of better analysis instruments (e.g., microscopes, ESEM), should lead to caution in reaching this conclusion.

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Abbreviations

Ab: abdominal scute; A: anal scute; C: cervical scute; F: femoral scute; G: gular scute; Gu: gular notch; H: humeral scute; M: marginal scute; P: pectoral scute; Pl: pleural scute; V: vertebral scute.

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