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The tortoises from the Lower Pleistocene palaeontological site of Quibas (Región de Murcia, Spain)



Les tortues du site paléontologique du Pléistocène inférieur de Quibas (région de Murcie, Espagne)

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ARTICLE INFO

Article history:

Received 30 September 2014

Accepted after revision 16 January 2015

Keywords:

Lower Pleistocene

Quibas

Testudinidae

Hermann's Tortoise

Mots clés :

Pléistocène inférieur

Quibas

Testudinidae

Tortue d'Hermann

ABSTRACT

Turtle remains from the Lower Pleistocene palaeontological site of Quibas (Sierra de Quibas, Región de Murcia, Spain) are abundant, but they have not been analyzed taxonomically. Here we determine that all diagnostic specimens belong to Hermann's Tortoise (*Chersine hermanni* or *Testudo hermanni*) and they represent the oldest Iberian known occurrence of this taxon.

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RÉSUMÉ

Une grande diversité faunistique a été reconnue dans le site du Pléistocène inférieur de Quibas (Sierra de Quibas, Murcia, Espagne). Un abondant matériel de tortues a été trouvé dans ce site. Toutefois, les fossiles de ce clade n'ont pas été jusqu'à présent discutés et leur étude détaillée est faite ici. En conséquence, la seule référence justifiée de la Tortue d'Hermann (*Chersine hermanni* ou *Testudo hermanni*) dans le Pléistocène inférieur de la péninsule Ibérique, correspondant également à la plus ancienne référence de ce taxon dans cette région, est reconnue ici.

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1. Introduction

The Lower Pleistocene palaeontological site of Sierra de Quibas (Región de Murcia, Spain) is of great interest since a high diversity of species has been recognized there, comprising about 70 in number (including mollusks, crustaceans, myriapods, amphibians, reptiles, birds, and mammals) (Montoya et al., 1999, 2001). Many of the recorded taxa, including some reptiles (e.g., the youngest agamid lizards from Western Europe, see Blain et al., 2014), have been analyzed in detail. However, the information on the turtles represented there is extremely limited.

In the paper where the Quibas fauna was presented, Montoya et al. (1999) cited the find of a single turtle plate, corresponding to a neural. This specimen was attributed to *Testudinoidea* indet, but the systematic identification was not justified. In 2001, Montoya et al. presented a new list on the Quibas fauna. The turtle was referred as *Testudo hermanni* (Hermann's Tortoise). However, no other data was provided about this group of reptiles. Lapparent de Broin et al. (2006a) proposed that Hermann's Tortoise and other species closely related to it were part of a lineage separated from those of *Testudo* (the lineage including *Testudo graeca*) and *Agrionemys* (the lineage including Horsfield's Tortoise) probably since the Oligocene, and certainly from the Miocene. They reassigned this species to a new genus, *Eurotestudo*. In this regard, the presence of an ancient representative of the lineage of *hermanni*, *Paleotestudo*, has recently been confirmed in the Iberian Peninsula, having been recognized as a very abundant form in the Aragonian and Vallesian record (Pérez-García and Murelaga, 2013). Lapparent de Broin et al. (2006b) indicated that, although the material from Quibas and other Iberian sites could correspond to interesting specimens of the *hermanni* lineage, the extremely limited information available does not allow their comparison with other fossil specimens or with the current Hermann's Tortoise. Subsequently, Murelaga et al. (2007) alluded to the Quibas taxon as *Eurotestudo hermanni*. However, no new data on the material from that site was provided in that conference abstract, in which the known information about the turtles from the Región de Murcia was compiled and partially updated. One year later, Bour and Ohler (2008) justified the validity of a previously proposed name for that genus, *Chersine*, proposing the new combination *Chersine hermanni*. Fritz and Kraus (2008) confirmed that the type species of *Chersine Merrem, 1820* is Hermann's Tortoise. Due to the lack of congruence between the topologies found in several molecular phylogenies and those yielded by phylogenetic analyses based on morphological data, the Turtle Taxonomy Working Group (see van Dijk et al., 2014) refers to Hermann's Tortoise as both *T. hermanni* and *C. hermanni*. In this regard, the extant Horsfield's Tortoise is currently referred to as both *Testudo horsfieldii* and *Agrionemys horsfieldii* (van Dijk et al., 2014), even though there is no doubt about the generic allocation of the type species of the genus *Testudo* (i.e. *T. graeca*).

Therefore, no characters have so far been published allowing the systematic position of the taxon or taxa of turtles recorded in the Lower Pleistocene of Quibas to be determined. In fact, no turtle elements from that locality have even been figured or described. The only reference to

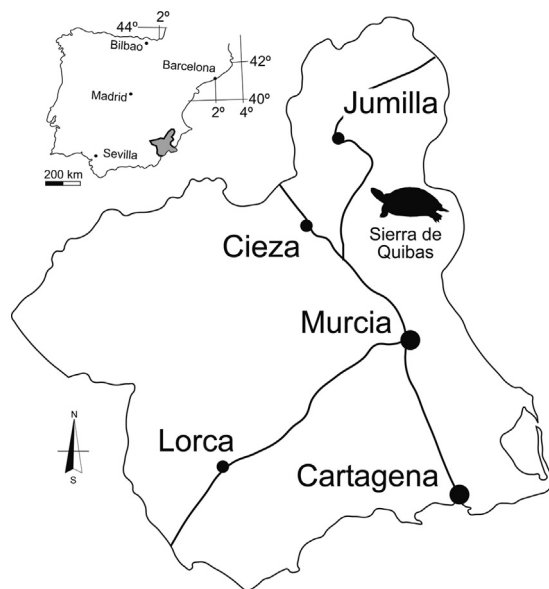


Fig. 1. Geographical location of the Quibas site (Región de Murcia, Spain). **Fig. 1.** Situation géographique du site de Quibas (région de Murcie, Espagne).

a specific element is that to an odd neural plate by Montoya et al. (1999). Abundant turtle material from Quibas is recognized here.

The Quibas deposits with fossil remains constitute the Pleistocene karstic infilling of several cavities inside Lower Jurassic dolomites. This site is situated in an abandoned quarry in the southeastern Sierra de Quibas (Región de Murcia, Spain), in a spot called Collado del Rey (Fig. 1) (Blain et al., 2014; Montoya et al., 2001). The Quibas vertebrate fossils come from two areas: a 5 m wide, 9 m high, and more than 30 m long gallery called Entrada Cueva (Ec), and a 20 m deep and 2 m wide chasm called Sima (S) (see Fig. 2). Fossil turtles have been found in Level I of Entrada Cueva and in Level IV of Sima. A magnetostratigraphic study indicates that the fossiliferous sediments correspond to the late Matuyama reversed polarity subchron (Carlos-Calero et al., 2006a, b), between 1770 and 1070 Ma. In an initial biochronological approximation, the presence of *Equus altidens granatensis* and of the rodents *Castillomys rivas rivas*, *Eliomys intermedius*, and *Arvicola deucalion* in Entrada Cueva suggested an Early Biharian age, between 1.3 and 1.0 Ma, most probably closer to 1.3 Ma (Montoya et al., 1999, 2001). The presence of a primitive form of *Allophaiomys* with Mimomian characteristics in Level III of Entrada Cueva, together with *A. mystacinus* and *C. rivas* populations larger than those from the Fuente Nueva 3 site (dated at 1.2 Ma approximately; see Agustí and Madurell, 2003; Duval et al., 2012), indicate an age between 1.1 and 1.2 Ma for this level (Piñero-García, 2012). Consequently, the turtle remains from Entrada Cueva, all from Level I, may have an age slightly older and probably close to 1.3 Ma. Those from the Sima Level IV are between 1.3 and 1.0 Ma, also probably closer to 1.3 Ma (Alba et al., 2011).

The turtle material found so far in Quibas is analyzed in detail here. The previously proposed specific systematic attribution to Hermann's Tortoise is confirmed and

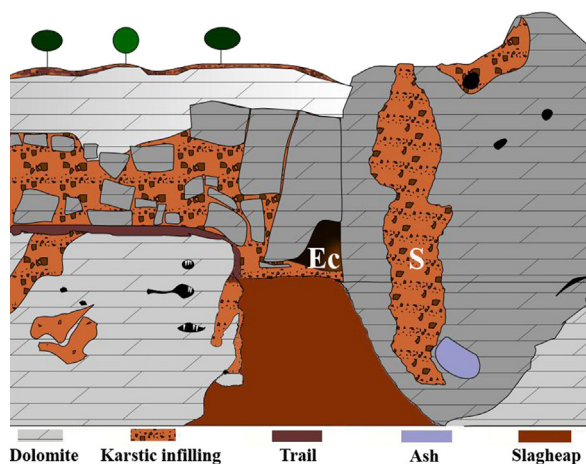


Fig. 2. (Color online.) Location of the two areas (Entrada Cueva, EC, and Sima, S) with turtle fossil remains from the Lower Pleistocene of Quibas (Región de Murcia, Spain).

Fig. 2. (Couleur en ligne.) Localisation des deux zones (Entrada Cueva, EC et Sima, S) où les fossiles de tortues du Pléistocène inférieur de Quibas (région de Murcie, Espagne) ont été trouvés.

Modified from Cuadros Casado (2010).

justified, constituting the oldest valid reference to this species in the Iberian record.

2. Systematic paleontology

CHELONII Latreille, 1800
CRYPTODIRA Cope, 1868

TESTUDINOIDEA Batsch, 1788

TESTUDINIDAE Batsch, 1788

CHERSINE Merrem, 1820 or TESTUDO Linnaeus, 1758

Chersine hermanni (Gmelin, 1789) or *Testudo hermanni* Gmelin, 1789

Figs. 3–10

Material: Most of the Quibas turtle specimens correspond to isolated elements of both the shell and the appendicular skeleton. However, a relatively complete specimen, which includes numerous carapace plates, all the plastron elements, and several bones of the shoulder and pelvic girdles, as well as of the forelimbs and hindlimbs, has been recognized (Figs. 3–5). The preservation of most of the Quibas turtle elements is relatively good, with many complete plates and bones, and with some gnawed plates being recognized (see Fig. 6c–e). Specimen GCP.CV-952 (Figs. 3–5) is part of the collection of the Palaeontological Museum of Elche (Elche, Spain). The other Quibas turtle specimens belong to the Archaeological Museum of Murcia (Murcia, Spain).

Locality and horizon: Lower Pleistocene. Level I of the Entrada Cueva area (1.3 Ma) and Level IV of the Sima area (between 1.3 and 1.0 Ma) at the Quibas site (Sierra de Quibas, Región de Murcia, Spain). Specimens in Figs. 3–5, Fig. 6a–b, h, l–q, Fig. 8a–b, g–i, and m–u are from Level I (Entrada Cueva). Those in Fig. 6c–g, i–k, Fig. 8c–f, j–l, and v–y are from Level IV (Sima).

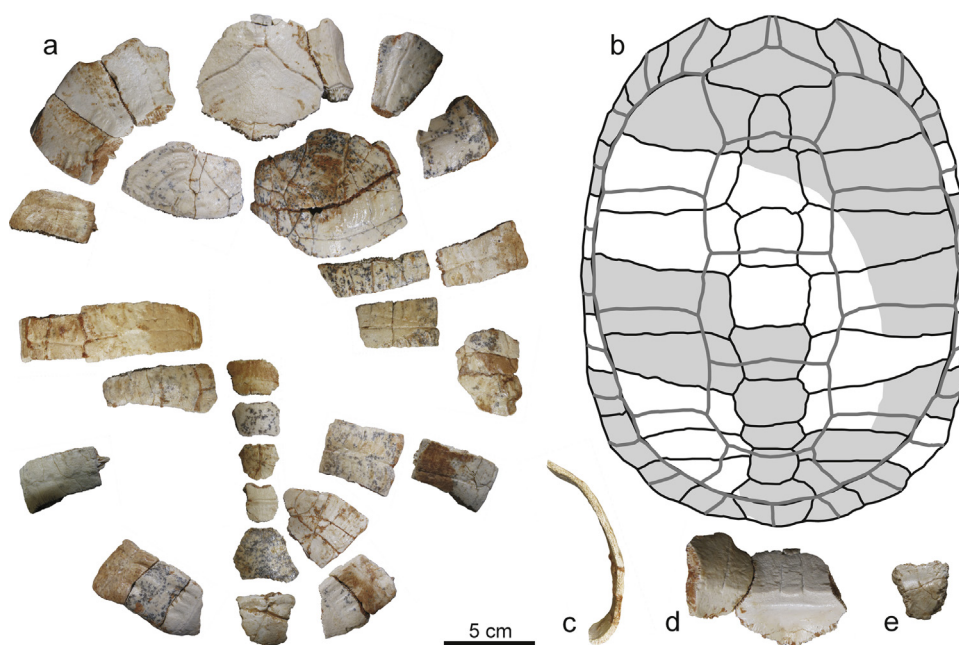


Fig. 3. (Color online.) Elements of the carapace of the Hermann's Tortoise specimen GCP.CV-952, from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–b**, Elements of the carapace in dorsal view. **c**, Articulated fourth costal and sixth peripheral, in anterior view. **d**, Nuchal and first right peripheral, in ventral view. **e**, pygal, in ventral view.

Fig. 3. (Couleur en ligne.) Tortue d'Hermann GCP.CV-952, Pléistocène inférieur de Quibas (région de Murcie, Espagne), éléments de la carapace. **a–b**, Éléments de la carapace, vue dorsale. **c**, Quatrième costale et sixième périphérique articulées, vue antérieure. **d**, Nuchale et première périphérique droite articulées, vue ventrale. **e**, Pygale, vue ventrale.

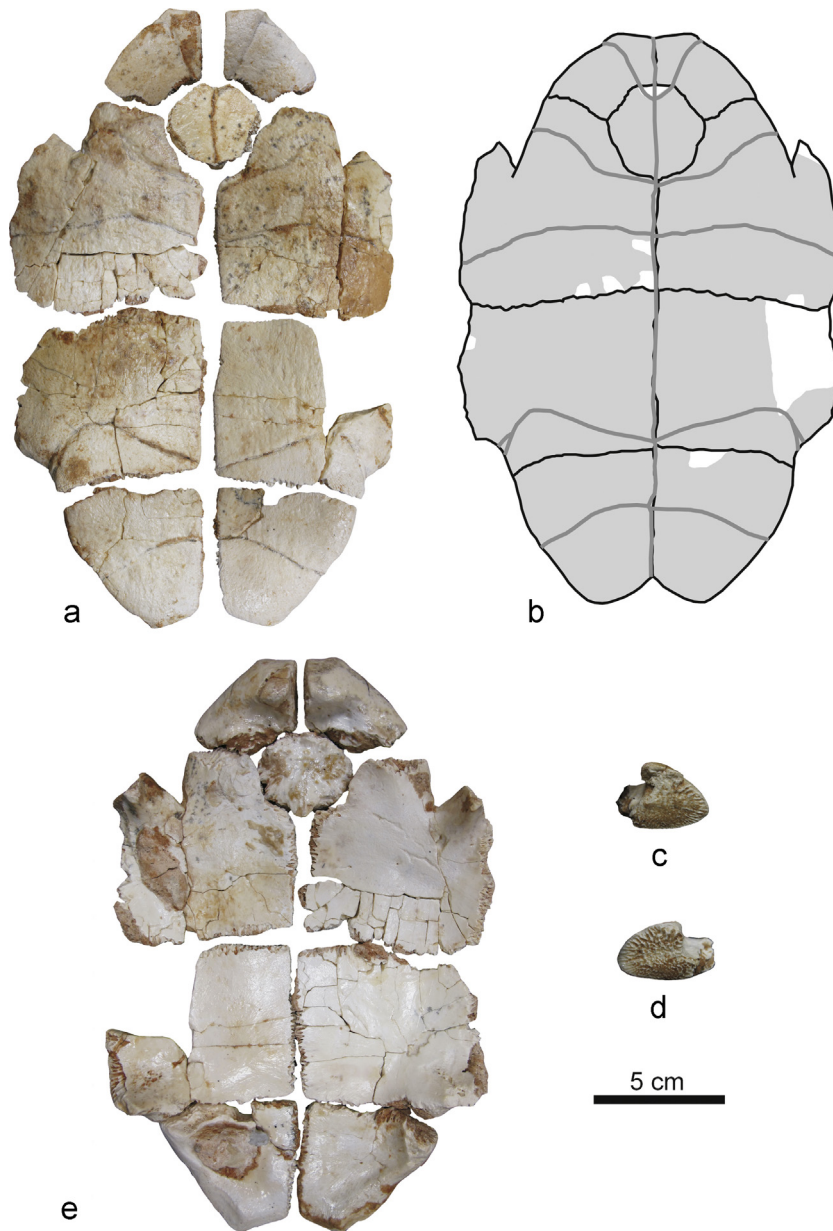


Fig. 4. (Color online.) Plastron elements of the Hermann's Tortoise specimen GCP.CV-952, from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–b.** Plastron elements in ventral view. **c.** Left epiplastron, in medial view. **d.** Right epiplastron, in medial view. **e.** Plastron elements in dorsal view.

Fig. 4. (Couleur en ligne.) Tortue d'Hermann GCP.CV-952, Pléistocène inférieur de Quibas (région de Murcie, Espagne), éléments du plastron. **a–b.** Éléments du plastron, vue ventrale. **c.** Épiplastron gauche, vue médiale. **d.** Épiplastron droit, vue médiale. **e.** Éléments du plastron, vue dorsale.

Description: The shell of the turtle taxon identified in Quibas is relatively high and narrow, with comparatively thick plates in both the carapace and plastron. The distal margins of the most posterior peripherals and, especially, those of the most anterior ones, are dorsally directed (Fig. 3a–b). Its outer surface is rough. Several growth rings are visible and well-developed in the region occupied by the vertebral scutes. The sulci between the scutes are relatively deep.

The visceral region of the nuchal plate near the posterior boundary of the cervical and of the first pair of marginals is

markedly thickened with respect to both its anterior and posterior margins (Fig. 3a, d, Fig. 6a–d, l–o). The nuchal plates of adult specimens are almost as wide as long (Fig. 3a, d, Fig. 6a–d, Fig. 7a–b). However, they are wider than long in juvenile individuals from this site (Fig. 6l–o, Fig. 7h–i). This plate lacks a well-developed anterior notch. A very narrow and shallow nuchal notch, in the medial region of that plate, is observed in some specimens (Fig. 6a–b, Fig. 7a) but not in others (Fig. 3a–b, d). The anterior and middle regions of the neural series are composed of alternating octagonal and rectangular plates. In contrast, the posterior



Fig. 5. (Color online.) Appendicular elements of the Hermann's Tortoise specimen GCP.CV-952, from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–b**, Left scapula, in anterior (a) and posterior (b) views. **c–d**, Left coracoid, in dorsal (c) and ventral (d) views. **e–f**, Right ilium, in anterior (e) and posterior (f) views. **g–h**, Right ischium, in ventral (g) and dorsal (h) views. **i–k**, Right humerus, in dorsal (i), ventral (j) and posterior (k) views. **l–o**, Right femur, in ventral (l), dorsal (m), anterior (n) and posterior (o) views. **p–s**, Left femur, in dorsal (p), ventral (q), posterior (r) and anterior (s) views.

Fig. 5. (Couleur en ligne.) Tortue d'Hermann GCP.CV-952, Pléistocène inférieur de Quibas (région de Murcia, Espagne), éléments appendiculaires. **a–b**, Scapule gauche, vues antérieure (a) et postérieure (b). **c–d**, Coracoïde gauche, vues dorsale (c) et ventrale (d). **e–f**, Ilium droit, vues antérieure (e) et postérieure (f). **g–h**, Ischion droit, vues ventrale (g) et dorsale (h). **i–k**, Humérus droit, vues dorsale (i), ventrale (j) et postérieure (k). **l–o**, Fémur droit, vues ventrale (l), dorsale (m), antérieure (n) et postérieure (o). **p–s**, Fémur gauche, vues dorsale (p), ventrale (q), postérieure (r) et antérieure (s).

neurals are both rectangular and hexagonal (Fig. 3a–b). The even costals are laterally longer than medially. However, the medial regions of the odd costals, from the third to the last one, are longer than the lateral ones (Fig. 3a–b). The proximal region of the ribs is markedly reduced. This taxon has anterior protrusions in the region of contact of the sulci between the marginal scutes and the anterior margin of the carapace (Fig. 3a–b, Fig. 6g, Fig. 7d). A single suprapygal, trapezoidal and with substraight margins, is observed in the adult specimens (Fig. 3a–b, Fig. 6i, Fig. 7f). This element is composed of two plates in at least some juveniles. The suture between them is subrounded (Fig. 6p–q, Fig. 7j). The pygal plate is subhexagonal, longer than wide, with very short latero-anterior margins compared to the latero-posterior ones (Fig. 3a, e, Fig. 6j–k, Fig. 7g).

The taxon analyzed here has a single cervical scute. This scute is more than twice as long as wide, both dorsally and ventrally (Fig. 3a–b, Fig. 6a–d, l–o, Fig. 7a–b, h–i). The vertebral scutes are narrow relative to the costal series (Fig. 3a–b). The fifth vertebral scute antero-laterally overlies the postero-medial region of the seventh pair of costals. The posterior margin of this scute coincides with the suture between the suprapygal and the pygal. The sulci between the pleural and the marginal scutes are placed on the sutures between the costals and the peripheral plates along its entire path. The anterior region of the sulci between the last two pairs of marginals is in contact with the antero-lateral margins of the pygal plate (Fig. 3a–b, Fig. 6h, Fig. 7e). This taxon lacks a supracaudal scute. In fact, a pair of marginals 12 is observed both dorsally and ventrally (Fig. 3a–b, e, Fig. 6j–k, Fig. 7g).

The anterior plastral lobe of this taxon is trapezoidal (Fig. 4a–e, Fig. 8a–l, n–q, Fig. 9a–c, j–l). The juvenile individuals have lateral points in this lobe (Fig. 8 c–f, Fig. 9k–l),

but no points are present in any of the preserved subadult or adult individuals (Fig. 4a–e, Fig. 8a–b, g–l, n–q, Fig. 9a–c, j). This lobe is not dorsally bent, but is relatively flat. The medial area of the dorsal epiplastral lip is convex. The posterior overhanging of the dorsal epiplastral lip remains anterior to the entoplastron. It lacks a gular pocket (Fig. 4a–e, Fig. 8a–l, n–q). The entoplastron ranges from subrhombic to subrounded (Fig. 4a–b, e, Fig. 8q, s, Fig. 9g). The Quibas taxon lacks plastral hinges. The plastral bridge is long relative to the lobes and relatively low (Fig. 4a–b, e). The xiphiplastra are as long as wide (Fig. 4a–b, e, Fig. 8u, Fig. 9e). The lateral margins of the posterior plastral lobe are subrounded. The anal notch is short but wide.

The gular scutes are in contact with the entoplastron or slightly overlap the most anterior region of this plate (Fig. 4a–b, Fig. 8a–l, n, Fig. 9a–c, j–l). The ventral surface of these scutes is placed on an elevation of the bone surface. The humero-pectoral sulci are in contact with the axillary notches (Fig. 4a–b, Fig. 8m–t, w–y, Fig. 9c–d, f, h, n–o). The humero-pectoral sulci of the preserved adult and subadult specimens are more sinuous than those of the juveniles. The studied specimens lack overlapping of the pectoral scutes on the entoplastra. The abdomino-femoral sulcus is markedly sinuous. It is anterior to the inguinal notch throughout most of its path. However, medially it is very close to the hypo-xiphiplastral suture. This taxon has inguinal scutes (Fig. 4a–b). The femoro-anal sulcus is medially convex. Its distance to the hypoplastra is relatively large (Fig. 4a–b, Fig. 8u–v, Fig. 9e, i).

Most of the left shoulder girdle of specimen GCP.CV-952 is preserved, with only a few parts of the scapula and coracoid missing (Fig. 5a–d). The shoulder girdle has the typical testudinid tri-radiate shape. The scapula is relatively long, with an elliptical cross-section (Fig. 5a–b)

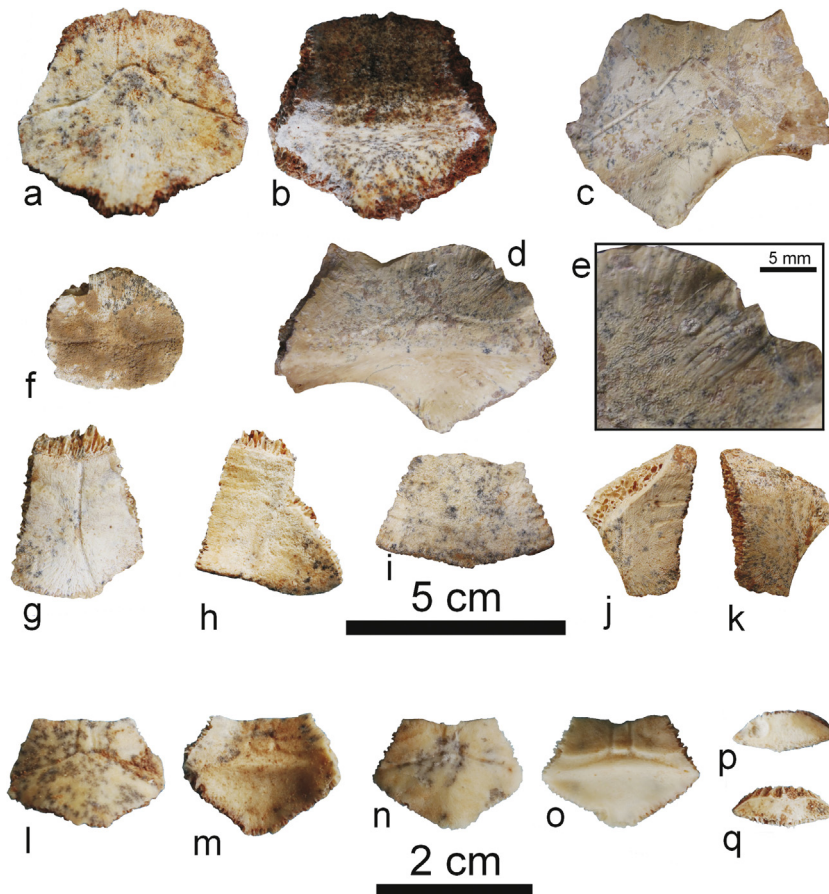


Fig. 6. (Color online.) Carapace plates of several specimens of Hermann's Tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–b**, Q07-Ect-112, nuchal, in dorsal (a) and ventral (b) views. **c–e**, S-IV-01, nuchal, in dorsal (c) and ventral (d) views, and details of a gnawed area (e), also in ventral view. **f**, Q07-Ect-a4, dorsal view of a neural. **g**, S-IV-02, dorsal view of a right anterior peripheral. **h**, Q07-Ect-a5, dorsal view of a left eleventh peripheral. **i**, S-IV-03, dorsal view of a suprapygal. **j–k**, S-IV-04, pygal, in dorsal (j) and ventral (k) views. **l–m**, Q07-Ect-a1, nuchal of a juvenile specimen, in dorsal (l) and ventral (m) views. **n–o**, Q07-Ect-a2, nuchal of a juvenile specimen, in dorsal (n) and ventral (o) views. **p–q**, Q07-Ect-a3, second suprapygal of a juvenile specimen, in dorsal (p) and ventral (q) views.

Fig. 6. (Couleur en ligne.) Tortue d'Hermann, Pléistocène inférieur de Quibas (région de Murcie, Espagne), plaques des carapaces de plusieurs spécimens. **a–b**, Q07-Ect-112, nuchale, vues dorsale (a) et ventrale (b). **c–e**, S-IV-01, nuchale, vues dorsale (c) et ventrale (d), et détails d'une région portant des traces produites par un rongeur (e), vue ventrale. **f**, Q07-Ect-a4, neurale, vue dorsale. **g**, S-IV-02, périphérique antérieure droite, vue dorsale. **h**, Q07-Ect-a5, onzième périphérique gauche, vue dorsale. **i**, S-IV-03, suprapygale, vue dorsale. **j–k**, S-IV-04, pygale, vues dorsale (j) et ventrale (k). **l–m**, Q07-Ect-a1, nuchale d'un spécimen juvénile, vues dorsale (l) et ventrale (m). **n–o**, Q07-Ect-a2, nuchale d'un spécimen juvénile, vues dorsale (n) et ventrale (o). **p–q**, Q07-Ect-a3, deuxième suprapygale d'un spécimen juvénile, vues dorsale (p) et ventrale (q).

and comparatively straight branches. The glenoid fossa is narrow, elongated, and shallow. The angle between the scapula and the acromion is about 120° . The coracoid has a long, narrow neck and a wide, very flat distal region (Fig. 5c–d). The acromion forms a small part of the articular surface for the humerus. The right complete ilium and the partial right ischium of the same specimen are also preserved (Fig. 5e–h). The ilium is straight (Fig. 5e–f), with a wide distal part containing a relatively large concave articular surface for the femoral head. The morphology of the ischium allows the development of a subrounded puboischiatric foramina (Fig. 5g–h). The proximal region of the right humerus of this individual and those of both femurs are preserved (Fig. 5i–s). Complete humeri and femora of other specimens, including juvenile and adults, have also been recognized (Fig. 10). The head of the humerus is more rounded than those of the femur. The diaphysis of the

humerus is more curved than that of the femur. A complete fusion of the trochanters of the femur can be observed.

3. Discussion

3.1. Identification of the Quibas Taxon as a Terrestrial Turtle

Members of both aquatic and terrestrial clades of Testudinoidea have been identified in the Pleistocene record of western Europe (see Hervet, 2000). Several characters observed in the material analyzed here are exclusive to terrestrial forms or constitute an exclusive combination of characters for most of the Neogene members of this group (Bailón, 2010; Gmira, 1995; Hervet, 2000, 2004; Pérez-García and Vlachos, 2014; Pérez-García et al., 2011): well-developed growth rings; granular outer surface;

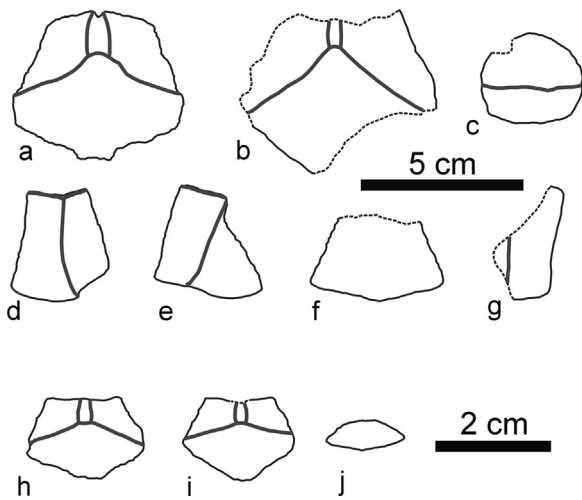


Fig. 7. Schematic representation of the dorsal view of some carapace plates of several specimens of Hermann's Tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a**, Q07-Ect-112, nuchal. **b**, S-IV-01, nuchal. **c**, Q07-Ect-a4, neural. **d**, S-IV-02, right anterior peripheral. **e**, Q07-Ect-a5, left eleventh peripheral. **f**, S-IV-03, suprapygal. **g**, S-IV-04, pygal. **h**, Q07-Ect-a1, nuchal of a juvenile specimen. **i**, Q07-Ect-a2, nuchal of a juvenile specimen. **j**, Q07-Ect-a3, second suprapygal of a juvenile specimen.

Fig. 7. Tortue d'Hermann, Pléistocène inférieur de Quibas (région de Murcie, Espagne), représentation schématique de la vue dorsale de certaines plaques des carapaces de plusieurs spécimens. **a**, Q07-Ect-112, nuchale. **b**, S-IV-01, nuchale. **c**, Q07-Ect-a4, neurale. **d**, S-IV-02, périphérique antérieure droite. **e**, Q07-Ect-a5, onzième périphérique gauche. **f**, S-IV-03, suprapygale. **g**, S-IV-04, pygale. **h**, Q07-Ect-a1, nuchale d'un spécimen juvénile. **i**, Q07-Ect-a2, nuchale d'un spécimen juvénile. **j**, Q07-Ect-a3, deuxième suprapygale d'un spécimen juvénile.

relatively thick plates; deep sulci between the scutes; very thick nuchal plate; alternation of rectangular and octagonal neurals composing the anterior half of the neural series; well-developed alternating pattern of costals consisting of medially alternating long and short plates versus laterally short and long ones; reduced proximal region of the ribs; coincidence of the pleuro-marginal sulci with the costo-peripheral sutures; eleventh pair of marginals next to or in contact with the antero-lateral margins of the pygal plate; presence of a medially thickened epiplastral lip; dorsally, considerable thickness of the antero-lateral region of the xiphiplastra; slight overlapping of the gular scutes on the entoplastron; humero-pectoral sulci laterally in contact with the axillary notches; and medially short pectoral scutes. Each of these character stages, but also others recognized in the Quibas taxon and in some other tortoises (e.g., relatively high shell, with high peripheral plates; protrusions in the anterior peripherals, in the region of contact of the sulci between the marginal scutes and the carapace margin; trapezoidal pygal plate; ventral overlapping of the cervical scute on the nuchal plate as long as that of the first pair of marginals on the same plate; fifth vertebral scute antero-laterally overlying the seventh pair of costals; absence of overlap of the fifth vertebral scute on the pygal plate; long plastral bridge relative to the lobes; xiphiplastra about as long as the posterior lobe; medially concave abdomino-femoral sulcus, almost in contact with the medial region of the hypo-xiphiplastral suture) allow

us to exclude the assignment of this taxon to the Western European freshwater turtles *Emys orbicularis* (Linnaeus, 1758) and *Mauremys leprosa* (Schweigger, 1912).

Given the configuration of characters (including an exclusive combination of characters for Hermann's Tortoise, recognized in the material from both levels, see below), all the turtle material heretofore found in Quibas can be attributed to a single taxon. The tortoise represented there is part of the group generally called *Testudo* s.l. (see Lapparent de Broin et al., 2006a), defined by Lapparent de Broin et al. (2006a) as a diverse group of terrestrial Palaearctic testudinids that includes the lineages of *Testudo* (i.e. *Testudo* s.s., whose type species is *T. graeca* Linnaeus, 1758), *Chersine* (the lineage of *hermanni*, i.e. Hermann's Tortoise), and *Agrionemys* (the lineage of *horsfieldii* Gray, 1844, i.e. Horsfield's Tortoise). In fact, this hypothesis is consistent with the determination of these forms currently proposed by the Turtle Taxonomy Working Group (see van Dijk et al., 2014), which uses *Testudo* for the extant representatives included by Lapparent de Broin et al. (2006a) in *Testudo* s.l., but they refer to Hermann's Tortoise as *Testudo* or *C. hermanni*, and to Horsfield's Tortoise as *T. horsfieldii* or *A. horsfieldii*. *T. graeca*, Hermann's Tortoise, and forms closely related with these two taxa, are known in Europe (including both western and eastern Europe) from the Miocene to the present. The presence of the *Agrionemys* lineage on this continent is restricted to its eastern region, not being part of the current diversity in this zone (Lapparent de Broin, 2001). In fact, the Quibas taxon shares an exclusive combination of characters with the members of the three lineages proposed by Lapparent de Broin et al. (2006a). These taxa share the presence of the suprapygal or suprapygals constituting a trapezoid structure, with straight margins, and with the posterior margin of the fifth vertebral scute overlying the suture between this structure and the elongated pygal. They lack a medial concavity in the dorsal epiplastral lip, but they have a slightly convex surface. This surface produces a relative uniform slope towards the back, all along the width. However, this elevation abruptly stops, which generates a more or less curved overhang above the unthickened posterior surface of the epiplastra. Moreover, the three lineages share the narrow overlap of the plastral scutes on the latero-dorsal region of the epiplastra. The anterior lobe of these taxa is subrounded to trapezoidal, with a generally protruding but relatively narrow anterior margin of the gulars. A sinuous abdomino-femoral sulcus, anterior to the inguinal notch throughout most of its path, but with a well-developed medial concavity, is present in all of them (see Lapparent de Broin et al., 2006a, b, c).

3.2. Systematic discussion

As indicated, the lineage of *T. graeca* (or *Testudo* s.s.) has been recognized in the fossil record of several sites in Western Europe (Broin, 1977; Lapparent de Broin, 2001). However, the taxon distinguished in Quibas is identified as not belonging to that clade based on several characters, including the absence of a plastral hinge. In *T. graeca*, and in forms closely related with this taxon, a hypo-xiphiplastral hinge is present in both sexes. The occurrence of this

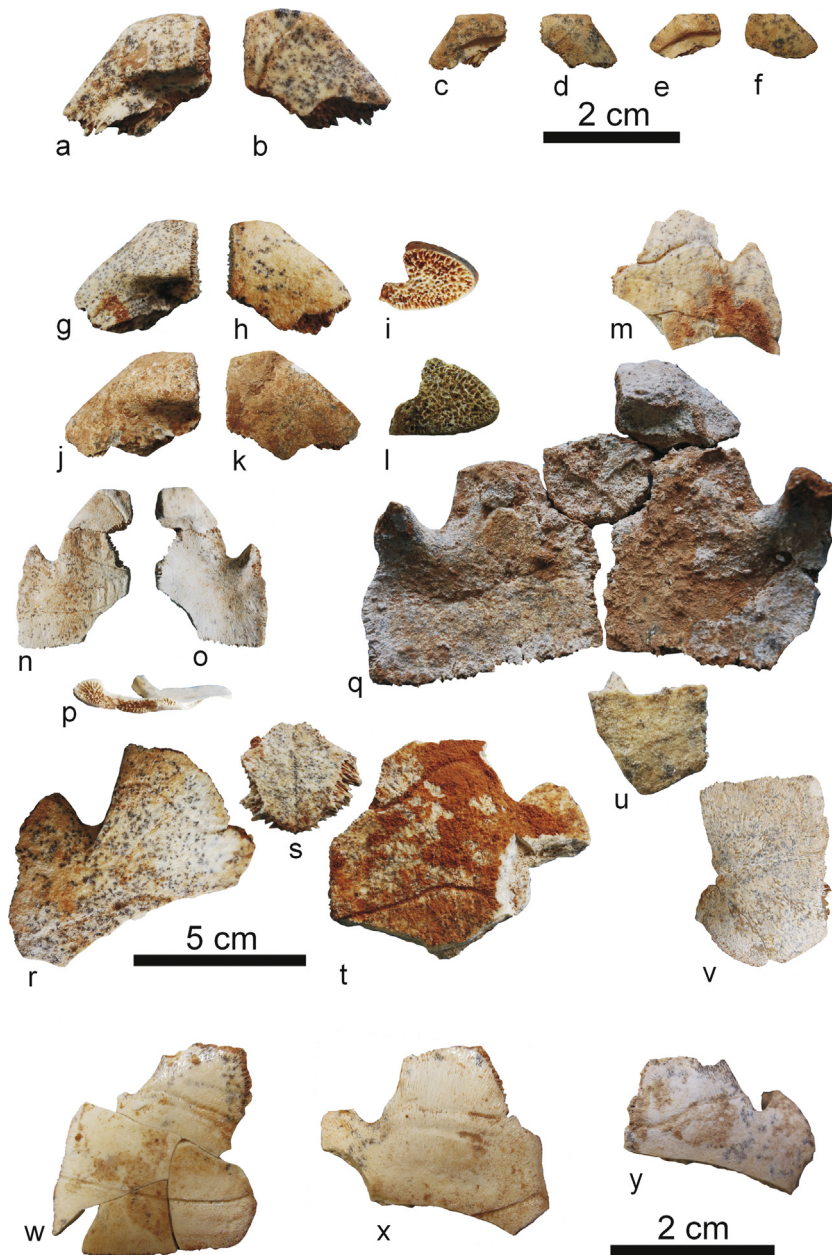


Fig. 8. (Color online.) Plastral plates of several specimens of Hermann's Tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–b**, Q07-Ect-a7, left epiplastron in dorsal (a) and ventral (b) views. **c–d**, S-IV-06, left epiplastron of a juvenile specimen, in dorsal (c) and ventral (d) views. **e–f**, S-IV-07, left epiplastron of a juvenile specimen, in dorsal (e) and ventral (f) views. **g–i**, Q07-Ect-a6, left epiplastron in dorsal (g), ventral (h) and medial (i) views. **j–l**, S-IV-05, left epiplastron in dorsal (j), ventral (k), and medial (l) views. **m**, Q07-Ect-129, ventral view of a left hyoplastron. **n–p**, Q07-Ect-a8, articulated right epiplastron and hyoplastron, in ventral (n), dorsal (o), and medial (p) views. **q**, Q07-Ect-118, dorsal view of most of an anterior lobe. **r**, Q07-Ect-111, ventral view of a right hyoplastron. **s**, Q07-Ect-a9, ventral view of an entoplastron. **t**, Q07-Ect-117, ventral view of a left hyoplastron. **u**, Q07-Ect-a10, ventral view of a right xiphiplastron. **v**, S-IV-11, ventral view of a right xiphiplastron. **w**, S-IV-09, ventral view of the right hyoplastron of a juvenile specimen. **x**, S-IV-10, ventral view of the right hyoplastron of a juvenile specimen. **y**, S-IV-08, ventral view of the left hyoplastron of a juvenile specimen.

Fig. 8. (Couleur en ligne.) Tortue d'Hermann, Pléistocène inférieur de Quibas (région de Murcie, Espagne), plaques des plastrons de plusieurs spécimens. **a–b**, Q07-Ect-a7, épiplastron gauche, vues dorsale (a) et ventrale (b). **c–d**, S-IV-06, épiplastron gauche d'un spécimen juvénile, vues dorsale (c) et ventrale (d). **e–f**, S-IV-07, épiplastron gauche d'un spécimen juvénile, vues dorsale (e) et ventrale (f). **g–i**, Q07-Ect-a6, épiplastron gauche, vues dorsale (g), ventrale (h) et médiale (i). **j–l**, S-IV-05, épiplastron gauche, vues dorsale (j), ventrale (k) et médiale (l). **m**, Q07-Ect-129, hyoplastron gauche, vue ventrale. **n–p**, Q07-Ect-a8, épiplastron et hyoplastron droits articulés, vues ventrale (n), dorsale (o), et médiale (p). **q**, Q07-Ect-118, la plus grande partie d'un lobe antérieur d'un plastron, vue dorsale. **r**, Q07-Ect-111, hyoplastron droit, vue ventrale. **s**, Q07-Ect-a9, entoplastron, vue ventrale. **t**, Q07-Ect-117, hyoplastron gauche, vue ventrale. **u**, Q07-Ect-a10, xiphiplastron droit, vue ventrale. **v**, S-IV-11, xiphiplastron droit, vue ventrale. **w**, S-IV-09, hyoplastron droit d'un spécimen juvénile, vue ventrale. **x**, S-IV-10, hyoplastron droit d'un spécimen juvénile, vue ventrale. **y**, S-IV-08, hyoplastron gauche d'un spécimen juvénile, vue ventrale.

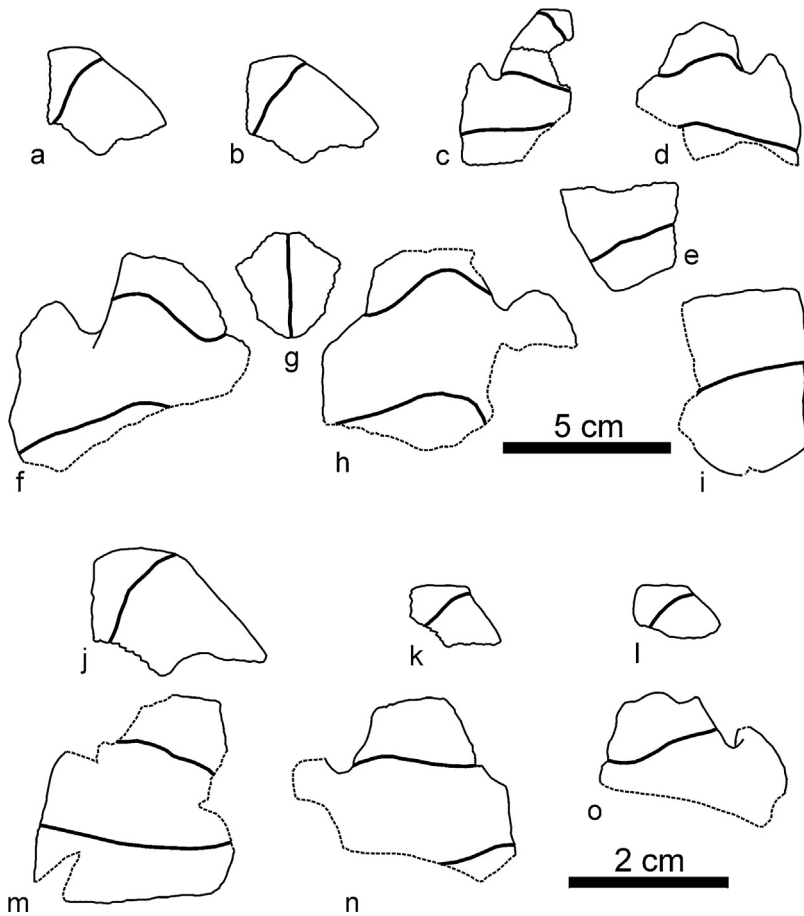


Fig. 9. Schematic representation of the ventral view of some plastral plates of several specimens of Hermann's Tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a**, Q07-Ect-a6, left epiplastron. **b**, S-IV-05, left epiplastron. **c**, Q07-Ect-a8, articulated right epiplastron and hyoplastron. **d**, Q07-Ect-129, left hyoplastron. **e**, Q07-Ect-a10, right xiphiplastron. **f**, Q07-Ect-111, right hyoplastron. **g**, Q07-Ect-a9, entoplastron. **h**, Q07-Ect-117, left hyoplastron. **i**, S-IV-11, right xiphiplastron. **j**, Q07-Ect-a7, left epiplastron. **k**, S-IV-06, left epiplastron of a juvenile specimen. **l**, S-IV-07, left epiplastron of a juvenile specimen. **m**, S-IV-09, right hyoplastron of a juvenile specimen. **n**, S-IV-10, right hyoplastron of a juvenile specimen. **o**, S-IV-08, left hyoplastron of a juvenile specimen.

Fig. 9. Tortue d'Hermann, Pléistocène inférieur de Quibas (région de Murcie, Espagne), représentation schématique de la vue ventrale de certaines plaques des plastrons de plusieurs spécimens. **a**, Q07-Ect-a6, épiplastron gauche. **b**, S-IV-05, épiplastron gauche. **c**, Q07-Ect-a8, épiplastron et hyoplastron droits articulés. **d**, Q07-Ect-129, hyoplastron gauche. **e**, Q07-Ect-a10, xiphiplastron droit. **f**, Q07-Ect-111, hyoplastron droit. **g**, Q07-Ect-a9, entoplastron. **h**, Q07-Ect-117, hyoplastron gauche. **i**, S-IV-11, xiphiplastron droit. **j**, Q07-Ect-a7, épiplastron gauche. **k**, S-IV-06, épiplastron gauche d'un spécimen juvénile. **l**, S-IV-07, épiplastron gauche d'un spécimen juvénile. **m**, S-IV-09, hyoplastron droit d'un spécimen juvénile. **n**, S-IV-10, hyoplastron droit d'un spécimen juvénile. **o**, S-IV-08, hyoplastron gauche d'un spécimen juvénile.

structure involves the development of several modifications, absent in the taxon studied here. One of them is a reduction in sinuosity between the abdominal and the femoral scutes. Thus, the sulcus between the two pairs of scutes of the members of the *T. graeca* lineage is more closely located, and more subparallel, to the contact between the hypoplastra and the xiphiplastra. Another modification is the elongation of the posterior plastral lobe. In addition, the posterior overhang of the dorsal epiplastral lip remains anterior to the entoplastron in the case of Hermann's Tortoise, Horsfield's Tortoise, and the taxa closely related with these species (the *Chersine* and *Agrionemys* lineages sensu Lapparent de Broin et al., 2006a). This is the case of the Quibas specimens. However, this structure generally reaches or projects beyond the anterior region of the entoplastron in the case of *Testudo* s.s. In addition, *Testudo*

s.s. differs from all these taxa in having a relatively well-developed gular pocket (Lapparent de Broin et al., 2006b). The presence of a pair of marginal scutes 12 in the Quibas material, both dorsally and ventrally, is shared by many of the representatives of the *Chersine* lineage, this condition generally being observed in most of the Hermann's Tortoise specimens. This condition is not shared with the members of the other two cited lineages (Hervet, 2000; Lapparent de Broin et al., 2006a). The presence of a single suprapygial (primitively corresponding to two suprapygals), noted in the Quibas adult specimens, is shared with most representatives of the Hermann's Tortoise lineage. However, both suprapygals are usually present in the adult specimens of both *Testudo* s.s. and Horsfield's Tortoise lineage. The presence of several quadrangular or hexagonal plates composing the posterior half of the neural series differs from the

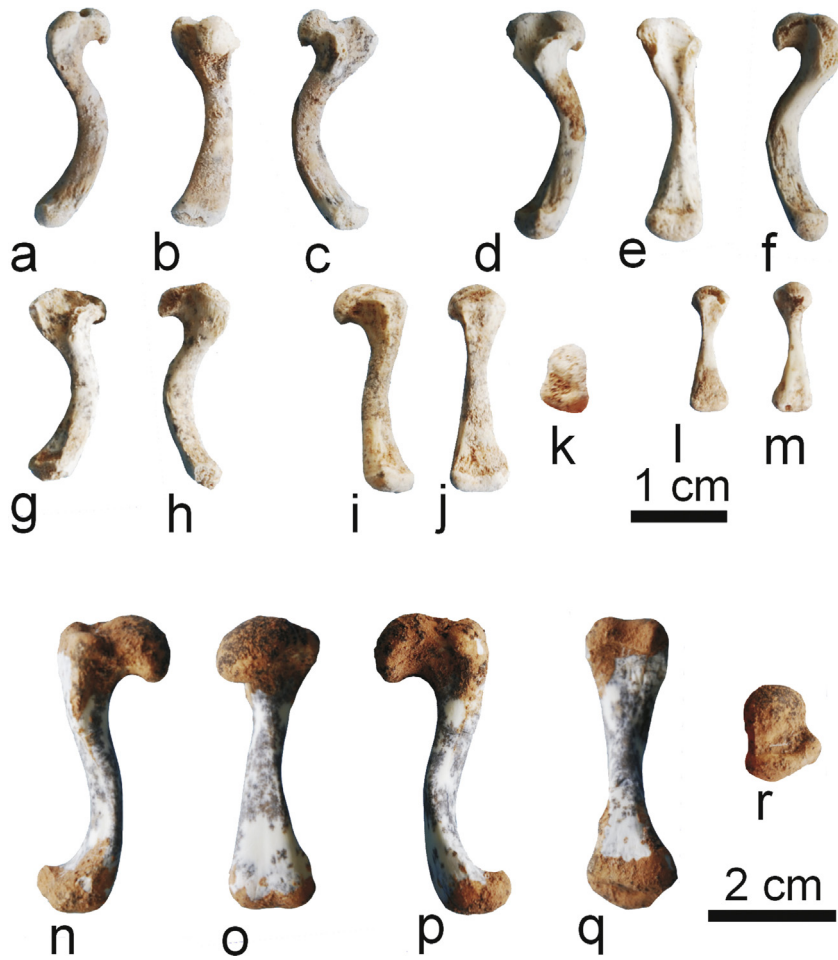


Fig. 10. (Color online.) Appendicular elements of several specimens of Hermann's Tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain). **a–c**, Q07-Ect-114, left humerus, in anterior (a), dorsal (b), and posterior (c) views. **d–f**, Q07-Ect-a11, right humerus, in posterior (d), ventral (e), and anterior (f) views. **g–h**, Q07-Ect-145, right humerus, in posterior (g) and anterior (h) views. **i–k**, Q07-Ect-a13, right femur, in anterior (i), ventral (j), and medial (k) views. **l–m**, Q07-Ect-a14, right femur, in ventral (l) and dorsal (m) views. **n–r**, Q07-Ect-a12, left femur, in anterior (n), dorsal (o), posterior (p), ventral (q), and medial (r) views.

Fig. 10. (Couleur en ligne.) Tortue d'Hermann, Pléistocène inférieur de Quibas (région de Murcie, Espagne), éléments appendiculaires. **a–c**, Q07-Ect-114, humérus gauche, vues antérieure (a), dorsale (b) et postérieure (c). **d–f**, Q07-Ect-a11, humérus droit, vues postérieure (d), ventrale (e) et antérieure (f). **g–h**, Q07-Ect-145, humérus droit, vues postérieure (g) et antérieure (h). **i–k**, Q07-Ect-a13, fémur droit, vues antérieure (i), ventrale (j), et médiale (k). **l–m**, Q07-Ect-a14, fémur droit, vues ventrale (l) et dorsale (m). **n–r**, Q07-Ect-a12, fémur gauche, vues antérieure (n), dorsale (o), postérieure (p), ventrale (q), et médiale (r).

condition generally observed in both lineages. That condition is shared with the members of the Hermann's Tortoise lineage (Lapparent de Broin et al., 2006c). The shell morphology of the Quibas taxon excludes its assignment to the Horsfield's Tortoise lineage, where an elevated plastral bridge, subequal to higher than the height of the marginals and peripherals, and a subrounded plastron are present (Lapparent de Broin et al., 2006b, c).

Thus the Quibas taxon cannot be assigned to the lineages of *T. graeca* (i.e. *Testudo* s.s.) or to that of Horsfield's Tortoise. The availability of characters allows its assignment to that of Hermann's Tortoise. The fusion of the femur trochanters is shared with some representatives of this lineage, such as the extant *C. hermanni* or *T. hermanni*. In fact, complete fusion is not present in all members of this lineage. In this regard, a trend towards fusion of the trochanters (but more complete than in the members of Horsfield's Tortoise

and *T. graeca* lineages) is known in the taxon *Paleotestudo canetotiana* (Lartet, 1851) from the Middle Miocene. Moreover, the trend towards the external division of the supracaudal, and that towards the fusion of suprapygals, not developed in *Paleotestudo canetotiana*, are recognized from "*Testudo*" *antiqua* Bronn, 1831, a Late Miocene representative of the lineage of Hermann's Tortoise (Lapparent de Broin et al., 2006b, c). The states for these three characters present in *C. hermanni* or *T. hermanni* are shared with those of the Quibas taxon. The supracaudal scutes of the Quibas specimens are not only dorsally divided but also ventrally, as commonly occurs in Hermann's Tortoise. Furthermore, the presence of narrow vertebrals relative to the costal series, observed in the Quibas taxon, has been considered as an autapomorphy of Hermann's Tortoise. The moderately developed gular pocket in *Paleotestudo*, the vertical posterior border of its shell, and the very thick

plates are also important differences in relation to the Quibas taxon (Lapparent de Broin, 2000; Pérez-García and Murelaga, 2013). The contact or small overlap between the mid-anterior region of the eleventh pair of marginals on the pygal plate, observed in the Quibas specimens, is shared with Hermann's Tortoise. In Hermann's Tortoise, the latero-anterior regions of this plate are sometimes covered by those scutes or, at least, they are in contact. Therefore, the combination of these characters, as well as the occurrence of the ventral surface of these scutes positioned on an elevation of the bone surface (these scutes forming a posteriorly pointed triangle), and that of a shallow antero-medial bend between the gulars, allow the material from the two Quibas levels to be attributed to the genus *Chersine* sensu Lapparent de Broin et al. (2006a, b, c) and Bour and Ohler (2008).

Lapparent de Broin et al. (2006c) considered three extant species as belonging to the genus *Chersine*: *C. hermanni*, *C. boettgeri* (Siebenrock, 1904), and *C. hercegovinensis* (Werner, 1899). In the latest turtle checklist of the Turtle Taxonomy Working Group (see van Dijk et al., 2014), the latter taxon is not considered valid, and the first two taxa are referred to, respectively, as *Testudo hermanni hermanni* or *Chersine hermanni hermanni*, and *Testudo hermanni boettgeri* or *Chersine hermanni boettgeri*. The former (i.e. Western Hermann's Tortoise) is the only one recognized in Western Europe. Lapparent de Broin et al. (2006c) determined two species in the fossil record as belonging to *Chersine*, *Ch. pyrenaica* (Depéret and Donnezan, 1890) and *Ch. lunellensis* (Almera and Bofill, 1903). The first one was recognized in the Middle Pliocene of southern France, in several sites near Perpignan (eastern Pyrenees). The other species was only recognized in the Middle Pleistocene of the Cova de Gràcia (Park Güell, Barcelona) in northeastern Spain. In addition, they recognized two possible new fossil species as belonging to this genus, both from the Middle Pleistocene: one from Soave (Verona, Italy) and the other from Lunel-Viel (Hérault, France).

The specimens from Soave and Lunel-Viel differ from those of Quibas, among other characters, by the derived progression of the pectorals on the entoplastron. In addition, the epiplastral lip of the Soave specimens is more developed. The presence of a relatively wide notched nuchal, and the absence of a cervical scute, differentiates *Ch.* or *T. pyrenaica* from the Quibas taxon. The recent review of *Ch.* or *T. lunellensis* (see Delfino et al., 2012) has resulted in the first diagnosis for this species. Some characters included in this diagnosis identify it as different from the Quibas species: a robust and markedly bent dorsally anterior plastral lobe, longer epiplastral lips reaching the entoplastron, and a shallow but evident gular pocket.

The Quibas taxon differs from the extant species recognized in Eastern Europe as well. Their femoral scutes are much longer than those of the Eastern Hermann's Tortoise (i.e. *C. hermanni boettgeri* or *T. hermanni boettgeri*). All the characters described in the Quibas material are shared with Hermann's Tortoise (i.e. *C. hermanni* or *T. hermanni*). As previously indicated, all the Quibas material can be attributed to a single taxon. In fact, the wide epiplastral lips (with an undulating anterior border and small lateral

points) observed in the Quibas juvenile specimens has been described in the juveniles of the Hermann's Tortoise lineage (Lapparent de Broin et al., 2006b). Although the fusion of the suprapygals is characteristic of this lineage, it was not present in primitive forms, as is the case of the representatives of *Paleotestudo*. In addition, there are specimens of Hermann's Tortoise where, exceptionally, the fusion is not present (Lapparent de Broin et al., 2006a, c). A single trapezoidal element, consisting of the fusion of the two suprapygals, is observed in all the Quibas adult specimens. However, the identification of an unfused second suprapygals in a juvenile, with a similar morphology to that found in some specimens of *Paleotestudo*, may be due to its ontogenetic stage or the result of an anomaly (Fig. 6p–q). In the median plane, the femoral scutes are usually considerably longer than the pectorals in most specimens of Hermann's Tortoise. However, both scutes are of similar length (see Fig. 4a–b), which falls within the known range of variability for this species, in which specimens with pectoral scutes longer than the femorals have also been recognized.

Therefore, taking into account all the analyzed information, the Quibas taxon is attributed to *C.* or *T. hermanni*, a tortoise that still currently inhabits the Iberian Peninsula.

3.3. Confirmation of the systematic allocation by cladistic analyses

Methodology: Several of the characters discussed above were considered in the phylogenetic hypothesis proposed by Lapparent de Broin et al. (2006b, 2006c). Many European extant terrestrial testudinids, many fossil forms recognized on this continent, as well as other representatives distributed outside Europe, were included in that analysis. Therefore, the Quibas taxon is encoded in the character matrix proposed by these authors. In addition, this taxon is also encoded in the modified version of that data matrix recently proposed by Corsini et al. (2014) (Appendix 1), although the encoding of the last character of their matrix cannot be taken into account. Therefore, it is employed using the coding of the remaining 18 characters. This is because the encoding of that character cannot be checked in the taxa coded by the authors, nor encoded in the Quibas material as these authors did not indicate to which of the two characters proposed in that paper (i.e. shape of vertebral scute 5 or anal-femoral sulcus contact with anal notch) it corresponds. In fact, characters 1 to 18 of the matrix published in that paper (see Appendix 2 in Corsini et al., 2014) correspond to those proposed by Lapparent de Broin et al. (2006b, 2006c) and, contrary to what Corsini et al. (2014) described, only the encoding of a single new character was included. The analyses are performed with TNT v. 1.0 (Goloboff et al., 2008) using a traditional search with a tree-bisection algorithm with 1000 replicates. All characters are considered unordered and equally weighted. Bootstrap frequencies (also with 1000 replicates) and Bremer support have also been calculated using the same software.

Results: The phylogenetic analysis based on the one proposed by Lapparent de Broin et al. (2006b, 2006c) results in 411 most parsimonious trees of 59 steps (CI=0.644, RI=0.764) (Fig. 11a). The analysis based on

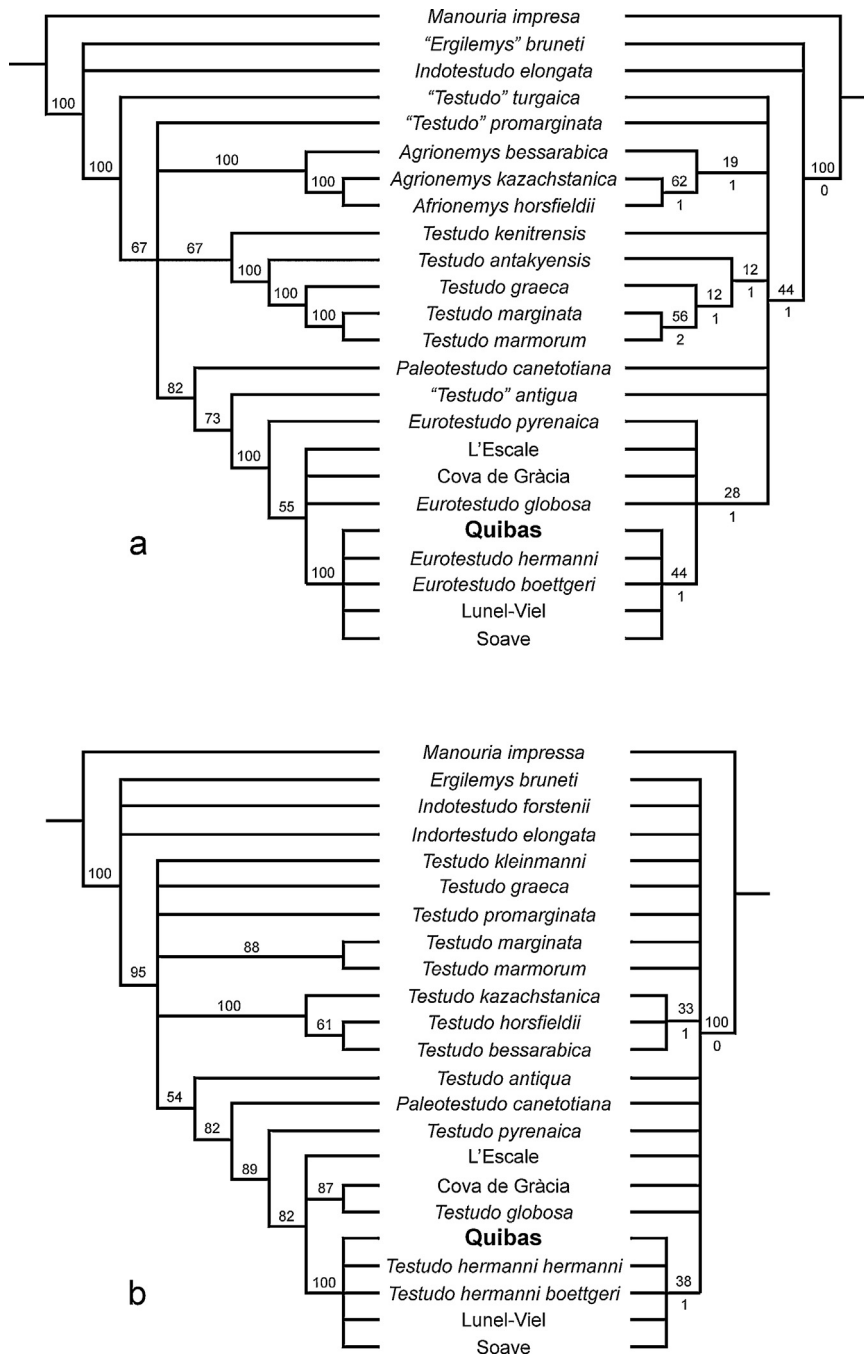


Fig. 11. Phylogenetic position of the tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain), obtained by the cladistic analyses performed here, based on those proposed by Lapparent de Broin et al. (2006b, 2006c) (a) and by Corsini et al. (2014) (b). The names of the taxa used in each of these analyses have been reproduced. The trees on the left correspond to the majority rule consensus. The values represented in these trees refer to percentages of under 100%. The trees on the right represent the strict consensus. Bootstrap frequencies (top) and Bremer support values (bottom) are shown in these trees.

Fig. 11. Position phylogénétique de la tortue du Pléistocène inférieur de Quibas (région de Murcie, Espagne), obtenue par les analyses cladistiques effectuées ici, sur la base de celles proposées par Lapparent de Broin et al. (2006b, 2006c) (a) et par Corsini et al. (2014) (b). Les noms des taxons utilisés dans chacune de ces analyses ont été reproduits. Les arbres de gauche correspondent au majority rule consensus. Les valeurs représentées dans ces arbres se réfèrent aux pourcentages inférieurs au 100%. Les arbres de droite représentent le strict consensus. Les bootstrap frequencies (en haut) et les valeurs de Bremer (en bas) sont présentées dans ces arbres.

the data matrix proposed by Corsini et al. (2014) results in 99 most parsimonious trees, with 52 steps (CI=0.692, RI=0.807) (Fig. 11b). Both the majority rule consensus as well as the strict consensus obtained in both analyses support the previously performed systematic identification. In fact, the Quibas taxon is grouped, in both the majority rule trees and the strict consensus trees, with the Western Hermann's Tortoise (i.e. *C. hermanni hermanni* or *T. hermanni hermanni* sensu van Dijk et al., 2014), the Eastern Hermann's Tortoise (i.e. *C. hermanni boettgeri* or *T. hermanni boettgeri* sensu van Dijk et al., 2014), as well as with the taxon from the Spanish site of Cova de Gràcia and with the as yet undefined taxa from the French site of Lunel-Viel, and the Italian site of Soave. The node grouping these taxa is defined by two characters in both analyses: a quadrangular or hexagonal pygal with small latero-anterior borders (character 8 of Lapparent de Broin et al., 2006b, state 1), and an often to always externally divided supracaudal scute (character 15, state 2). The Soave taxon is defined by the peculiar configuration of its suprapygal plates (character 7, state 2). Both the Western Hermann's Tortoise and the Eastern Hermann's Tortoise share a reduced neural series comprising seven plates (character 5, state 1). This last character is not known in the preserved Quibas material. The Quibas taxon shows no autapomorphies in these analyses.

3.4. The Iberian Lower Pleistocene record of Hermann's Tortoise

References to Hermann's Tortoise in the Lower Pleistocene of the Iberian Peninsula are very limited and are usually problematic. Undescribed but partially figured material corresponding to terrestrial testudinids (see Figures 2 and 3 in Blasco et al., 2011), from the Lower Pleistocene of Sima del Elefante (Sierra de Atapuerca, Burgos, Spain), was attributed to Hermann's Tortoise. This material comes from levels dated to about 1.2 million years ago (Blasco et al., 2011). The generic and specific attribution was poorly justified as it was based on the consideration that the humero-pectoral and the pectoro-abdominal sulcus of that material (as in *C. hermanni* or *T. hermanni*) is located more anteriorly than in *T. graeca*, and on the presence of a laterally pronounced curvature in both sulci. In addition, those authors indicated that the morphology of the entoplastron was triangular (presumably as in Hermann's Tortoise) but not rounded (presumably as in *T. graeca*). The morphology of the humero-pectoral sulcus is variable in both *C. hermanni* or *T. hermanni* and *T. graeca*. In fact, the morphology described (and possibly corresponding to the specimen in Figure 2A in Blasco et al., 2011, but not to that in Figure 2G in the same paper, where it is different) is recognized in both species. Similarly, the morphology of the pectoro-abdominal sulcus is not different comparing both taxa. These authors probably meant to refer to the abdomino-femoral sulcus and not to the pectoro-abdominal. It is markedly sinuous, being different from that in *Testudo* s.s., but similar to those observed in the members of the Hermann's Tortoise lineage. In fact, although not described, the absence of a hinge between the hypoplastra and the hypoplastra can be recognized. As seen,

the entoplastron morphology cannot be used as systematic difference between the two taxa due to its high degree of variability. The information provided in Blasco et al. (2011) cannot be used to differentiate the Sima del Elefante taxon from Hermann's Tortoise. However, a more detailed study, especially comparing its anterior plastral lobe with that of *Ch.* or *T. lunellensis*, is necessary to confirm and, if so, to justify that attribution. Therefore, it is herein recognized as belonging to an indeterminate member of the Hermann's Tortoise lineage (*Chersine* sp. sensu Bour and Ohler, 2008).

Morales Pérez and Sanchiz Serra (2009) collected most of the references to members of terrestrial testudinids previously performed in the Quaternary record of the Iberian Peninsula. As shown in that paper, several allusions to probable members of Hermann's Tortoise lacking confirmation of the specific attribution (i.e. *Testudo* cf. *hermanni*) were performed in the Pleistocene sites of the northeastern Iberian Mediterranean region. It is important to note that this is the area where the *Ch.* or *T. lunellensis* material was found. Such are the cases of the specimens from Incarcàl (Crespià, Girona) (Fèlix, 2002, 2003; Fèlix et al., 2006), Pedreres de Montjuïc (Barcelona) (Fèlix, 2002, 2003), and Avenç Marcel (Vallirana, Barcelona) (Daura et al., 2006). Only two references to Lower Pleistocene attributions to Hermann's Tortoise were indicated by these authors, both from the southwestern Iberian Peninsula: Cueva Victoria (Región de Murcia) (García-Porta, 2001) and Cueva Negra del Estrecho del Río Quípar (Región de Murcia) (Walker et al., 2006). Neither of these attributions was justified as both correspond to younger levels than those from Quibas.

Some of the generically and specifically indeterminate forms from the Lower Pleistocene sites may be compatible with Hermann's Tortoise or with close forms. For example, a pygal plate from Barranco León (Granada) was recognized as belonging to an indeterminate terrestrial testudinid, displaying several apparently strange character states (Bailón, 2010). The overlapping of the eleventh pair of marginals on the latero-anterior region of that pygal in the Barranco León specimen in addition to its hexagonal morphology are important characters to distinguish Hermann's Tortoise. In addition, the Barranco León plate is covered by a supracaudal scute, which has also been reported in some specimens of *C. hermanni* or *T. hermanni*. Therefore, this Barranco León plate can confidently be reassigned to cf. *C. hermanni* or *T. hermanni*. On the other hand, the presence of one of several possible different and so far undetermined terrestrial testudinids in some Lower Pleistocene sites of the Iberian Peninsula and, especially, in those from the Pliocene, suggested by some authors (see Jiménez-Fuentes, 1985; Jiménez-Fuentes and Martín de Jesús, 1989; Lapparent de Broin et al., 2006c) cannot be refuted. Further studies are needed to provide more information about the diversity of the tortoises represented in the Neogene record of the Iberian Peninsula.

4. Conclusions

The turtles from Quibas (Región de Murcia, Spain) are analyzed here for the first time. Abundant material is identified corresponding to both elements of the shell and appendicular bones. Although most of the remains

correspond to adult or subadult specimens, several juvenile individuals have also been found.

The Quibas turtle material comes from two levels, Level I from Entrada Cueva and Level IV from Sima, both deposited in the Lower Pleistocene. A single taxon has been recorded there, corresponding to a terrestrial testudinid recognized as a Hermann's Tortoise (*C. hermanni* or *T. hermanni*).

The available information on the Iberian Lower Pleistocene terrestrial testudinids has been compiled and analyzed. The identification of Hermann's Tortoise in Quibas recognized here represents the only justified reference to this species in the Lower Pleistocene of the Iberian Peninsula. In addition, its finding in levels dated at about 1.3 Ma ago indicates the Quibas turtle is the oldest known Iberian record of Hermann's Tortoise.

Acknowledgments

We would like to thank the curators of the fossil and extant turtle collections of the Muséum national d'Histoire naturelle (Paris, France), Museo Paleontológico de Elche (Alicante, Spain), and Museo Arqueológico de Murcia for providing access to collections; France de Lapparent de Broin for her tremendous support over the course of our studies on the European record of turtles; Christine Laurin for revising the English of this text; the editors of this volume (Michel Laurin and Nathalie Bardet) for the invitation to participate with this contribution; an anonymous reviewer and Joseph Corsini for comments and suggestions; and Project GUI12/35 of the Universidad del País Vasco UPV-EHU. The research of A.P.G. is funded by the Fundação para a Ciência e a Tecnologia (Grant No. SFRH/BPD/97806/2013).

Appendix 1.

Scored characters for the tortoise from the Lower Pleistocene of Quibas (Región de Murcia, Spain) into the two cladistic analysis performed here: 20001?2313 22101 221.

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