

SOME MAASTRICHTIAN VERTEBRATES FROM FLUVIAL CHANNEL FILL DEPOSITS AT PUI (HAȚEG BASIN)

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Abstract. Latest Cretaceous deposits are cropping out in various localities of the Hațeg basin (Romania). Among these localities Pui is of peculiar interest, being the southeastern most one where Maastrichtian fluvial deposits are exposed. These terrestrial deposits are represented mainly by red beds, which yielded since the end of the 19th century, rich vertebrate assemblages. From a channel fill block discovered *ex situ*, a diverse fossil vertebrate assemblage was recovered (turtles, crocodylians, pterosaurs, and various herbivore and carnivore dinosaurs). This study is focused on the fossil taxa collected from this block and their fossilization processes.

Keywords: latest Cretaceous, fluvial deposits, vertebrates, Hațeg basin, Romania.

Rezumat. Câteva vertebrate maastrichtiene din depozite de canal fluvial de la Pui (Bazinul Hațeg). Depozite cretacic terminale aflorază în varii localități din Bazinul Hațeg (România). Dintre acestea, Pui este localizată în extremitatea sud-estică a bazinului, unde apar la zi depozite fluviale maastrichtiene. Aceste depozite sunt dominate de *red beds*, din care au fost colectate, încă de la finele secolului XIX, bogate asociații de vertebrate fosile. Dintr-un bloc cu umplutură de canal descoperit *ex situ* a fost extrasă o asociație diversă de vertebrate fosile (țestoase, crocodili, pterosauri și variații dinozauri erbivori și carnivori). Asociația de fosile din acest bloc și procesele de fosilizare evidențiate sunt descrise în acest studiu.

Cuvinte cheie: Cretacic terminal, depozite fluviale, vertebrate, Bazinul Hațeg, România.

INTRODUCTION

In latest Cretaceous, an emerged land occurred in the actual Transylvania named the "Hațeg Island". It was part of a larger Tethyan archipelago, in southern Europe (DERCOURT et al., 2000; CSONTOS & VÖRÖS, 2004). Geological evidence of this paleogeography can be noticed in Transylvania: besides the already notorious Hațeg basin, other data related on the Maastrichtian terrestrial deposits are found in the Transylvanian and Rusca Montană basins (NOPCSA, 1905; CODREA & DICA, 2005; CODREA & GODEFROIT, 2008; CODREA et al., 2010; 2012). It is estimated that the whole island had almost 80,000 km² (BENTON et al., 2010, and references therein). The island is known all over the world due its vertebrate fauna, which evolved in endemic (?insular) environment (NOPCSA, 1914; CODREA et al., 2014).

Within the "Hațeg Island", the Hațeg basin (Figs. 1A; 1B) is the most studied, due to the peculiar sedimentary Maastrichtian deposits (NOPCSA, 1905; GRIGORESCU et al., 1985; GRIGORESCU & ANASTASIU, 1990; GRIGORESCU, 1992; THERRIEN, 2005, 2006; VAN ITTERBEECK et al., 2005; THERRIEN et al., 2009; PANAIOTU & PANAIOTU, 2010) bearing rich fossil assemblages - mainly vertebrates - and among these ones, peculiar endemic dwarf dinosaurs, reported both by baron Francisc Nopcsa and Gyula Halaváts since the end of the 19th (NOPCSA, 1897; HALAVÁTS, 1897; GRIGORESCU, 2010). Apart their systematic, biodiversity and ecology, very important data refer to their taphonomy and fossilization processes (CSIKI et al., 2010a).

The majority of the Maastrichtian terrestrial deposits concerns *red beds*. The most illustrative ones are exposed in the southeastern side of the basin at Pui (Figs. 1B; 1C), a commune located 20 km from Hațeg town, on the road connecting Hațeg to Petroșani. The locality is crossed by the Bărbat River (Fig. 1C). The red beds can be best observed when the river water plane is low, in dry seasons.

GEOLOGICAL SETTING

In Hațeg basin two Maastrichtian terrestrial formations were coined (GRIGORESCU & ANASTASIU, 1990): Densuș-Ciula Formation, exposed in the northern sectors of the basin (ANASTASIU & CSOBUKA, 1989; GRIGORESCU et al., 1990; BOJAR et al., 2005), and Sânpetru Formation in the southern basin areas, as the Sibișel or the Râul Mare rivers (CODREA et al., 2002; SMITH et al., 2002; VAN ITTERBEECK et al., 2004, 2005; BOJAR et al., 2005; THERRIEN, 2005, 2006; THERRIEN et al., 2009). Both formations are of same fluvial origin (GRIGORESCU & ANASTASIU, 1990; GRIGORESCU, 1992; THERRIEN, 2005, 2006; VAN ITTERBEECK et al., 2004, 2005; THERRIEN et al., 2009; PANAIOTU & PANAIOTU, 2010). VAN ITTERBEECK et al. (2004, 2005) and THERRIEN (2005, 2006) considered that these sediments accumulated in well drained floodplain environments.

The deposits from Pui were related to Sânpetru Formation (NOPCSA, 1905; GRIGORESCU et al., 1985, 1999; GRIGORESCU, 1992; etc.). However, THERRIEN's work (2005) points out the differences between the Sibișel type-section and the one exposed at Pui, underlining even the major dominance in colour of the rocks: while in Sânpetru the fluvial deposits are gray-yellow-greenish, in Pui the red mudstones are in prevalence. For this reason he called the deposits from Pui "Pui beds", suggesting even a possible distinct formation, "Bărbat Formation".

As in the others fluvial Maastrichtian deposits from the Hațeg basin, in Pui ones, one can outline sequences of fines marking overbank sediments vs. channel filling rocks - conglomerates, microconglomerates and mainly sandstones (VAN ITTERBEECK et al., 2004, 2005; THERRIEN, 2005, 2006; THERRIEN et al., 2009).

Another kind of deposits can be also noticed, interpreted as oxbow ponds. Such deposits are in sharp contrast with the red beds, dominated by dark colour mudstones with white mica flakes and pyrite nodules (CODREA & SOLOMON, 2012; VASILE & PANAITESCU, 2012; CODREA et al., 2013; SILYE et al., 2014). CODREA & SOLOMON (2012) reported three stratigraphic successive levels of this kind, calling them Pui Gater, Pui Depozit and Pui Islaz, but possibly some others could be also present into the Maastrichtian succession from the Bărbat River. The fossil assemblages of the oxbows are also different from the ones of the red beds, the fossilization being peculiar too (dark coloured bones and teeth).

Inside the red beds, the channel filling rocks were a specific fossilization environment. The channel deposits are common mainly in the basal part of the Bărbat River section. To the top they are not absent, but the vertebrate fossils are rather rare, compared to the basal ones. They are filled by coarse conglomerates and sandstones. The main clasts are represented by quartzite and other metamorphic rocks, but intra-formation reworked mudstones can be noticed too.

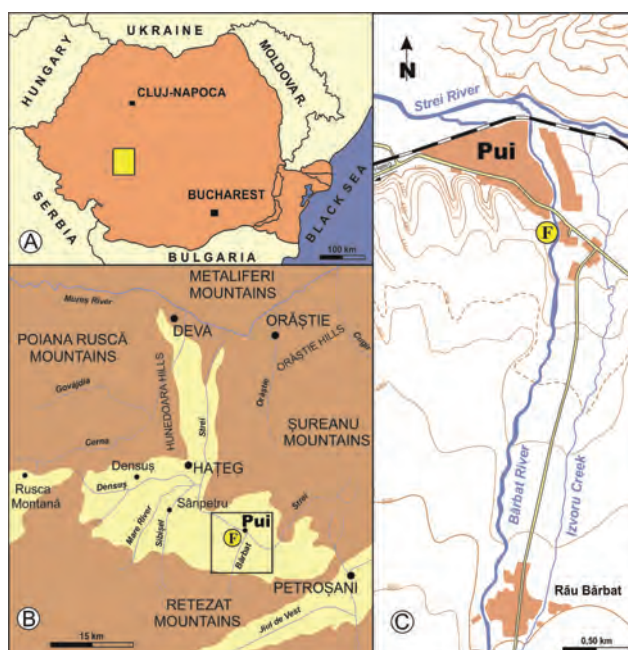


Figure 1. A. The yellow rectangle indicates the position of Hațeg basin on the map of Romania; B. Location of Pui locality - marked by rectangle - in the Hațeg basin; "F" indicates the place where the block originated from; C. Map of Pui locality; "F" indicates the place where the block was found *ex situ*.

MATERIAL AND METHODS

This work is focused on the vertebrate fossils recovered from a channel fill block collected at Pui, on the Bărbat River. The block was found *ex situ* in the river alluvia, at Pui Gater (Fig. 2A). According to the natives' statements, this block was extracted several years ago from its original bed, when a concrete bank was erected in order to protect the mill saw. It worth mentioning that several decades ago, probably in the first half of the 20th, two similar blocks bearing large bones (probably dinosaur bones) had been brought in the geological collection of Babeș-Bolyai University of Cluj-Napoca by an anonymous donor (inventory numbers: V508, V509).

The rock has a gray-faint greenish colour. The full rock block (Fig. 2C), estimated at 250-300 kg was extracted from the alluvia (Fig. 2A), than carried in the Laboratory of Vertebrate Paleontology of Cluj-Napoca university (Figs. 2B; 2C). The block was turned into small pieces using classical tools as chisels and hammers, but also electric bore hammer (Borehammer Z1C-DI05-26; Fig. 2D) and microengraver (Dremel engraver 290). The vertebrate fossils from the smaller pieces of rocks were extracted from their matrix by classical methods, using chisels, hammer and microengraver. Professional polymers such as paraloid and mowillite consolidated the bones, when necessary. The cleaned bones were measured with professional calipers, than photographed with Nikon Coolpix P520 (18.1 megapixels). The photos were processed in Adobe Photoshop CS2.

The material is hosted at the Laboratory of Vertebrate Paleontology at "Babeș-Bolyai" University of Cluj-Napoca. The material was labelled as PB1-X, where PB is the abbreviation for "Pui Block", "1" represents the fact that this is the first block of this type that was discovered, and "X" represents the number of each fossil extracted from the block.

RESULTS

Inside the block matrix several bones - most broken - and teeth belonging to various reptiles were recovered. The majority of these remains belongs to crocodylians, especially to *Allodaposuchus precedens* Nopcsa 1928 (NOPCSA, 1928). Other remains by far less numerous, are documenting the crocodylian *Acynodon*. Various dinosaur remains are present in this block too. This study is focused on the description of the faunal material recovered from the block, and on some taphonomic processes, which took place before the final burial of the vertebrate remains.



Figure 2. A. The place where the block was found *ex situ*; B. Preparing the transport of the block to the Laboratory of Vertebrate Paleontology at Babeș-Bolyai University of Cluj-Napoca; C. The block in the laboratory; D. One of us (A.I.S.) working on the block.

SYSTEMATIC PALAEOLOGY

Reptilia Laurenti 1768

Chelonii Brogniard (Latreille) 1800

Testudines Linnaeus 1758

Chelonia indet. (Plate I, Figs. 2a; 2b; 3)

Turtle carapace fragments were extracted from the block (e.g. PB1-38, PB-1-39). These remains are poorly preserved and a lot of cracks are crossing their surfaces. Due to the water stream transport and subsequent taphonomic processes, the ornamentation of external surfaces is almost lost.

In the “Hațeg Island” turtles were several times reported (NOPCSA, 1923; GAFFNEY & MEYLAN, 1992; DE LAPPARENT et al., 2009; VREMIR & CODREA, 2009; RABI & VREMIR, 2011; CODREA & SOLOMON, 2012; etc.), referring both to pleurodira and cryptodira. The poor state of preservation of the fragments does not allow assigning these remains to one or another of these groups.

Remains of turtles are widespread in the “Hațeg Island”, being common elements in the Maastrichtian continental biota. The most common turtle in the “Hațeg Island” is *Kallokibotion bajazidi* Nopcsa 1923 (NOPCSA, 1923), but as we underlined above, *Dortokidae* representatives were also present.

Crocodylomorpha Walker 1970 (*sensu* Benton & Clark 1988)

Eusuchia Huxley 1875 (*sensu* Benton & Clark 1988)

Alligatoroidea Gray 1844 (*sensu* Norell et al. 1994)

Allodaposuchus Nopcsa 1928

Allodaposuchus precedens Nopcsa 1928 (Plate II, Figs. 1a; 1b; 1c; 2; 3)

This species is documented by numerous isolated teeth of various sizes, ranging from 11.34 to 25.30 mm in height and from 8.40 to 14.20 mm in wide. Following BUSCALIONI et al. (1986), these teeth tentatively can be separated into morphotypes. The first morphotype (morphotype B, in BUSCALIONI et al., 1986) is represented by a conical, slender, and pointed tooth crown, medially twisted, with well-developed mesial and distal keels, both continuous from the base to the top of the crown. The keels are devoid of serrations. The cross section of these teeth is sub-rounded. Some teeth preserve parts of

their roots, the missing parts being removed by the water stream transport before their definitive burial in the sediment. On the medial side, fine vertical enamel ridges can be noticed. The largest tooth from the available sample (PB1-1) is longitudinally broken: in this manner the crown of the new replacing tooth, can be observed inside the older crown. This type of tooth was already noticed by DELFINO et al. (2008a) in the *A. precedens* skull collected from the Maastrichtian deposits at Oarda de Jos (Alba District), considering it to be placed on premaxilla. The second morphotype (morphotype C, in BUSCALIONI et al., 1986) is less frequent in the sample. The crown is robust, less elongated and slender compared to the previous morphotype, and the apex of the crown is less pointed. The cross section of the crown is sub-rounded. The mesial and distal keels are present, and fine enamel ridges can be also noticed on both sides, starker on the medial one. This morphotype is also reported on the *A. precedens* skull, assigned to maxillary teeth (DELFINO et al., 2008a).

Acynodon Buscalioni, Ortega & Vasse 1997

Acynodon sp. (Plate II, Figs. 4a; 4b; 5a; 5b; 6a; 6b)

This crocodylian is documented by several isolated teeth. BUSCALIONI et al. (1997, 1999), and DELFINO et al. (2008b) coined two types of teeth for this genus. The anterior teeth are spatula-like, while the posterior ones are molariform. In our sample, four anterior (PB1-15, 16, 17, 19) and a single posterior one (PB1-18) are present. The size of the anterior teeth varies from 4.10 mm to 6.50 mm in height, and 3.47 mm to 6.95 in wide. The crown is bulbous and the apex is rounded. Fine enamel wrinkles are present on both the labial and lingual sides of the crown. As in our sample there are exclusively isolated teeth, we are devoid of enough arguments to separate the upper from the lower ones. The rear molariform tooth has wider than higher crown, with oval outline in crown view, apically worn. The crown is ornamented by numerous fine pustules, as in *A. adriaticus* Delfino, Martin & Buffetaut 2008.

Crocodylia indet.

Mandible - a surangular articulation fragment (PB1-24) and an indeterminate mandible fragment (PB1-25) were recovered. The preserved portion of the surangular articulation is elongated, the total preserved length being 81.96 mm. In outer view, the lateral surface is completely sculptured by pits and grooves (Plate II, Fig. 7a), while in inner view the bone is less ornamented (Plate II, Fig. 7b). The dorsal surface is almost smooth. The dorsal edge is caudally ascendant. Due to its size, it may belong to the eusuchian *A. precedens*. The other mandible fragment (PB1-24) presents the same sculptured surface in outer view, while in inner view the surface is almost smooth.

Vertebrae - two caudal vertebrae are available. One of them is much damaged (PB1-23), preserving only the centrum, in a very poor condition. Therefore, only the other vertebra worth a detailed description (PB1-22; Plate II, Figs. 8a; 8b; 8c; 8d). It is a caudal vertebra, probably coming from the proximal half of the tail. It is procoelous, with an elongated centrum. The total length of the centrum is 47.48 mm. The centrum is strongly transversally compressed. The neural arch is much higher than the centrum, a feature already observed in the caudal vertebra described by CODREA et al. (2012) from Rusca Montană Basin. The prezygapophyses and postzygapophyses are well developed. The neural spine is broken, as well as the left postzygapophysis, which is partially broken too. One of the transverse processes is almost complete, while the other one is partially broken. The transverse processes are dorsally trended. In lateral view a groove can be noticed under the transverse processes. The condyle is damaged, while the cotyle is better preserved. The neural canal is round-shaped, still filled by sediment. The prezygapophyses are larger than the postzygapophyses, all of them having the articular surface oval-elongated.

Tibia - one fragmentary young crocodylian tibia (PB1-26; Plate II, Fig. 9) was recovered from the block. Unfortunately, the proximal epiphysis is damaged, lacking the medial and lateral condyles. The distal epiphysis is damaged too. In dorsal view, the proximal extremity has a subtriangular outline, as in *Allodaposuchus palustris* Blanco, Puértolas-Pascual, Marmi, Vila & Sellés 2014. The shaft has an elliptic outline, being similar to *A. palustris* (BLANCO et al., 2014). The proximal and distal epiphysis of the bone is expanded, while the shaft is slender.

Osteoderms - a rich sample of osteoderms, complete or fragmentary, was extracted from the block (Plate II, Figs. 10; 11; 12; 13; 14). Two morphotypes were recognized: oval-shaped and subrectangular. The majority of the osteoderms exposes a keel on the surface, but there are some devoid of keel (ie. PB1-46; Plate II, Fig. 11). None of the osteoderms has such a high keel as in the Spanish eusuchian presented by BUSCALIONI et al. (1986). The whole dorsal surface of the osteoderms is ornamented by circular or sub-circular pits, while the ventral surface is smooth, with nutritional foramina.

Pterosauria Kaup 1834

Pterodactyloidea Plieninger 1901

Pterosauria indet. (Plate I, Figs. 4a; 4b; 5a; 5b)

Two pterosaur bone fragments were recovered from the block (PB1-27, PB1-28). Pterosaurs are rather rare in the Romanian Maastrichtian deposits (NOPCSA, 1899; BUFFETAUT et al., 2002; VREMIR et al., 2013; GRELLET-TINNER & CODREA, 2014). The cortex of the bone is thin, and due to this fact, in both bones the cortex was broken and the filling sediment can be observed (Plate I, Figs. 4a; 5a; 5b). These fragments could originate from the wings, based on their shapes and bone structure. Based on this scarce sample and the fragmentary state of the bones, we cannot assign these remains to any of the known pterosaurs from the "Hațeg Island".

Dinosauria Owen 1842
 Saurischia Seeley 1888
 Theropoda Marsh 1881
 Theropoda indet. (Plate I, Figs. 6a; 6b; 6c; 7a; 7b)

Two fragmentary theropod phalanges (PB1-33, PB1-34) were recovered from the block. The maximum length of PB1-33 is 26.11 mm, while in PB1-34 is 31.57 mm. The fragmentary state of the preservation is due to the fact that the theropod bones are very fragile and could be easily broken by water transport. The non-ungual phalanges have extensor pits, a typical feature for theropods. In both phalanges, the distal condyles are damaged; the extensor groove between the condyles is shallow. The distal condyles are better preserved in PB1-33, and its distal articular surface has a typical theropod outline (Plate I, Fig. 6b). The proximal articular surface is broken in both cases, but the general outline is typical for theropods. These phalanges could originate from a paravian theropod.

Two theropod species are documented by postcranial bones in the “Hațeg Island”: *Elopteryx nopcsai* Andrews 1913, and *Balaur bondoc* Csiki, Vremir, Brusatte & Norell 2010 (CSIKI et al. 2010b; BRUSATTE et al., 2013). Various isolated teeth (e.g. GRIGORESCU et al., 1985; CSIKI & GRIGORESCU, 1998; CODREA et al., 2002; SMITH et al., 2002; CSIKI et al., 2008; VASILE, 2008; CODREA & SOLOMON, 2012) are indicative for a high diversity of theropods in this Maastrichtian biota. Besides crocodylians, the theropods were top predators in “Hațeg Island”.

Sauropoda Marsh 1878
 Titanosauriformes Salgado, Coria & Calvo 1997
 Titanosauria Bonaparte & Coria 1993
 Titanosauria indet. (Plate I, Figs. 10; 10b; 11a; 11b; 11c)

Sauropod remains recovered from the block are represented by an unguual phalanx (PB1-36) and a femur mid-shaft fragment (PB1-30). The unguual phalanx is gracile and asymmetrical in dorsal view. Its length is around 49 mm. It is crescent-shaped, with a convex dorsal surface and a relatively flat ventral side. The medial side is convex, while the lateral side is almost flat. A groove is visible on the medial side, near the proximal part of the phalanx. The articular proximal surface (Plate I, Fig. 11c) is concave, and a central ridge divides this surface in two distinct lateral parts. In proximal view, the unguual phalanx has a round-triangle shape. The lateral side is damaged in its distal part; the apex is pointed and ventrally trended. Other unguual sauropod phalanges from the Hațeg basin were reported by NOPCSA (1915) and CSIKI et al. (2010c). By comparison with an unguual phalanx (UBB NVM1-11) of *Paludititan natalziensis* Csiki, Codrea, Jipa-Murzea & Godefroit 2010 (CSIKI et al., 2010c), which is a left unguual phalanx, the one from the block it is a right unguual phalanx, probably the third one.

The femur mid-shaft fragment is broken and a lot of cracks are visible on its surface, probably due to the water transport.

Until now, the sauropods from the “Hațeg Island” were assigned to two genera, *Magyarosaurus* von Heune 1932 (VON HUENE, 1932) and *Paludititan*, but recent unpublished discoveries could evidence a higher sauropod diversity in the Maastrichtian of Transylvania.

Ornithischia Seeley 1887
 Hadrosauridae Cope 1869
Telmatosaurus Nopcsa 1903
Telmatosaurus transsylvanicus Nopcsa 1900 (Plate I, Fig. 9)

The presence of duck-bill dinosaurs (hadrosaurs) in this channel fill deposit is documented only by a tooth fragment (PB1-21). The tooth is highly damaged, but the preserved part of the crown is completely covered by enamel. A strong medial carina is present on the crown, but the secondary ridges are absent. Relatively large denticles are disposed along the preserved margin, but without the marginal ridges reaching them. The apex is broken. The general morphology of the tooth is concordant with the teeth of *Telmatosaurus transsylvanicus* Nopcsa 1900 (NOPCSA, 1900) described by WEISHAMPEL et al. (1993).

Ornithopoda Marsh 1881
 Euornithopoda (*sensu* Weishampel 1990)
 Iguanodontia Sereno 1986
 Rhabdodontidae Weishampel, Jianu, Csiki & Norman 2003
Zalmoxes Weishampel, Jianu, Csiki & Norman 2003
Zalmoxes sp. (Plate I, Figs. 8a; 8b)

The euornithopod *Zalmoxes* Weishampel, Jianu, Csiki & Norman 2003 (WEISHAMPEL et al., 2003), is documented by a single isolated and highly damaged tooth. The crown is slightly taller than wide. The enamel is distributed on both sides of the crown, but it is much damaged. The root is higher than the crown and labially curved, as in the *Zalmoxes* specimen from Nălaț-Vad described by GODEFROIT et al. (2009). Despite the fact that the tooth is

heavily damaged, in buccal view (Plate I, Fig. 8a) slightly divergent vertical ridges can still be noticed on the crown. The remains of *Zalmoxes* are the most abundant in the Maastrichtian of the “Hațeg Island”. Two species were coined, *Z. shquiperorum* Weishampel, Jianu, Csiki & Norman 2003 (WEISHAMPEL et al., 2003), and *Z. robustus* Nopcsa 1902 (NOPCSA, 1902). As CODREA & SOLOMON (2012) pointed out, isolated teeth are not indicative for one or another of these species.

Reptilia indet. (Plate II, Figs. 12; 13)

Apart the reptiles described above, a lot of indeterminate fragments belonging to various reptiles were extracted from the block. The majority bear roll marks (e.g. Plate II, Fig. 12), or are broken (e.g. Plate II, Fig. 13) due to taphonomic processes.

TAPHONOMY

The remains are isolated, broken and some of them rounded, indicating a pre-burial transport. Usually, the vertebrate fossils found at Pui in the red beds, are white coloured. The ones from this channel fill block are dark coloured, resembling the teeth and bones reported (CODREA & SOLOMON, 2012; CODREA et al., 2013) from the dark mudstone deposits. Dark-coloured bones and teeth are indicative for fossilization processes that took place in poor oxygen content environments, where the bones were soon buried into the sediment. No microvertebrate remains were found in the block because the channel fill consists of coarse clasts which do not represent a proper environment for the fossilization of micro remains.

Following CSIKI et al. (2010a), the sedimentary facies of the block is in concordance with “massive, structureless conglomerates and coarse conglomeratic sandstones, cross-bedded coarse and medium grained sandstones”, a near-channel facies, coded “CH”, and interpreted as a channel fill. Also following their hierarchical classification of the taphonomic modes, in the block are present two groups of fossils: complete isolated bones, coded “A1” (e.g. teeth and one of the vertebrae), and incomplete isolated bones, coded “A2” (in dominance). The remains from the block bear marking features for these two taphonomic modes, such as: for A1 - low degrees of weathering, abrasion, breakage; for A2 - advanced weathering, breakage, rarely identifiable taxonomically. However, a difference between the fossil assemblages from this block and the above mentioned taphonomic modes consist in the mix of taxa in the block, while in the coined modes there is only a mono-taxon.

CONCLUSIONS

The block extracted near the location called “Pui Gater” (CODREA & SOLOMON, 2012) contained at least eight reptiles taxa, documented either by teeth, or cranial and postcranial bones. The majority of the remains belongs to crocodylians, an unusual aspect at Pui where the presence of crocodylians is usually, poor. At least two crocodylians, *A. precedens* and *Acynodon* sp. are documented in the fossil assemblage from the block. The vertebrate remains include also turtles, pterosaurs and various dinosaurs. No small vertebrates were found inside the block. Therefore, this channel fill may be interpreted as a high-energy deposit (storm deposit). It is possible that a flood took place bringing together teeth and bones originating from several skeletons. Obviously, no anatomical connection could be observed. The teeth and bones were carried by the water stream on various distances, but we cannot think to a very long lasting transport, as far as some bones were extremely fragile (i.e. pterosaurs). This taphonomic context could have been possible due the fact that the climate in “Hațeg Island” was subtropical, characterized by alternation of dry and rainy seasons (VAN ITTERBEECK et al., 2004; THERRIEN, 2005).

CSIKI et al. (2010a) even suggested that the genesis of some fossil assemblages from the Hațeg basin could be related to flooding events, and that these events preferentially concentrated the bones.

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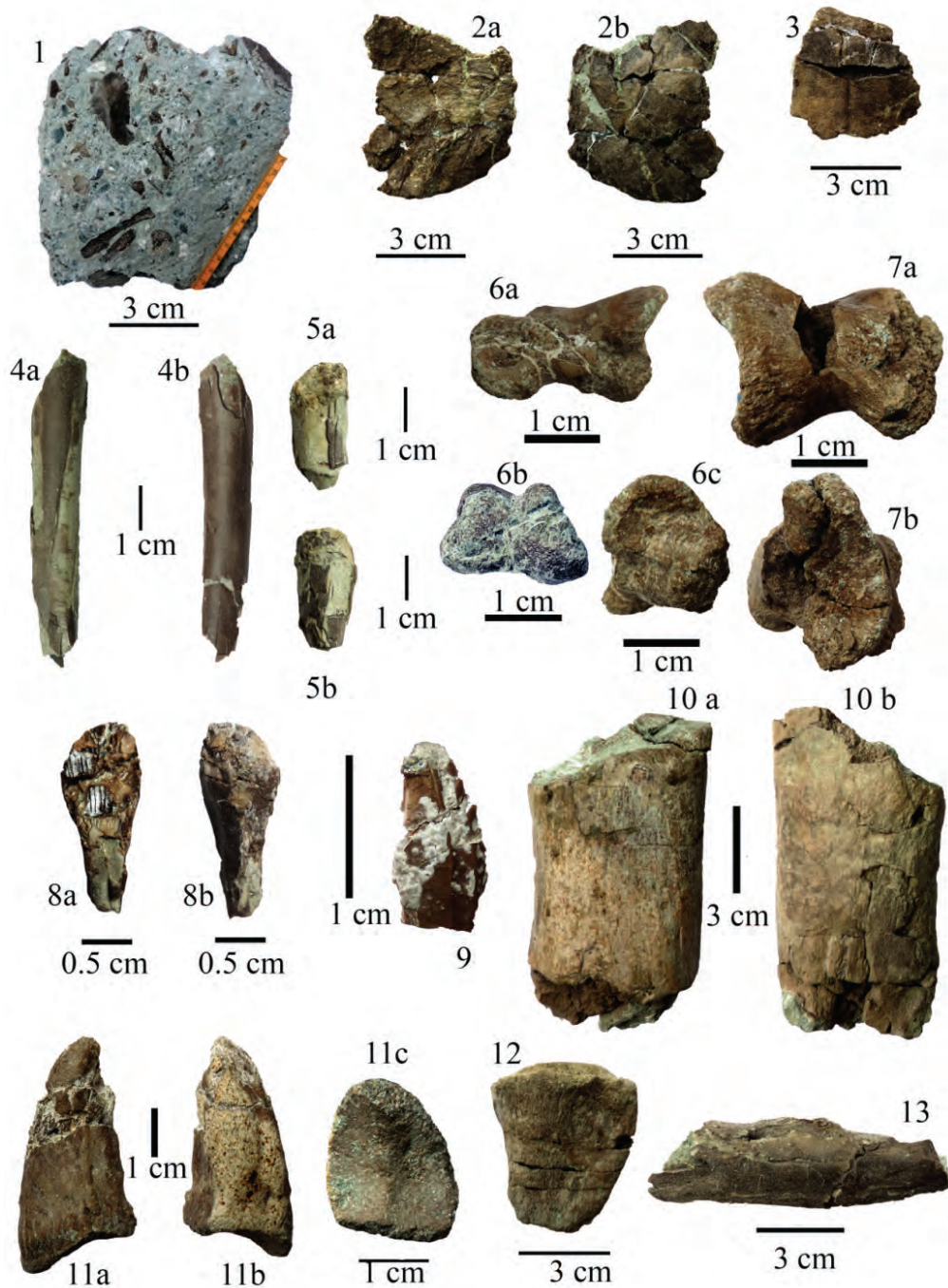
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Plate I: Maastrichtian terrestrial reptiles from Pui



- Figure 1. A block fragment illustrating the high concentration of fossils;
- Figure 2. a - *Chelonia* indet., carapace fragment, internal view (PB1-38); b - carapace fragment, external view (PB1-38);
- Figure 3. *Chelonia* indet., carapace fragment external view (PB1-39);
- Figures 4a, b. *Pterosauria* indet., bone fragment (PB1-27);
- Figures 5a, 5b. *Pterosauria* indet., bone fragment (PB1-28);
- Figure 6. *Theropoda* indet., fragmentary phalanx (PB1-33): a. lateral view, b. distal view, c. proximal view;
- Figure 7. *Theropoda* indet., fragmentary phalanx (PB1-34): a. lateral view, b. proximal view;
- Figure 8. *Zalmoxes* sp., isolated tooth (PB1-20): a. buccal view, b. lingual view;
- Figure 9. *Telmatosaurus transsylvanicus*, isolated tooth fragment, buccal view (PB1-21);
- Figure 10. *Titanosauria* indet., mid-shaft fragment (PB1-30): a. caudal view, b. cranial view;
- Figure 11. *Titanosauria* indet., ungual phalanx (PB1-36): a. lateral view, b. medial view, c. proximal view;
- Figure 12. *Reptilia* indet., bone fragment (PB1-40);
- Figure 13. *Reptilia* indet., bone fragment (PB1-41).

Plate II: Maastrichtian crocodiles from Pui

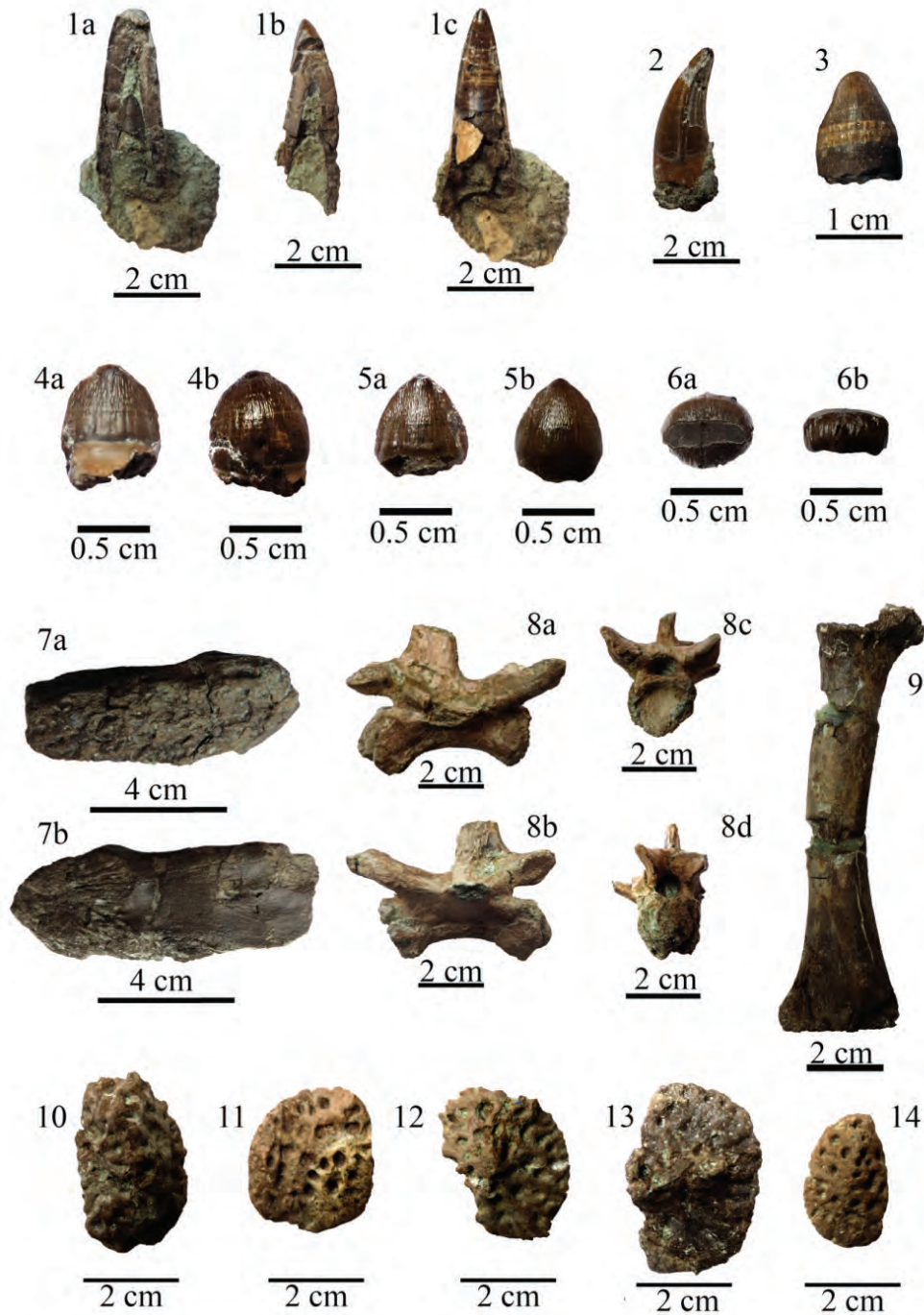


Figure 1. *Allodaposuchus precedens*, isolated tooth (Pb1-1): a, b. the broken tooth with the replacing tooth inside; c. lingual view;

Figure 2. *A. precedens*, isolated tooth, mesial view (Pb1-2);

Figure 3. *A. precedens*, isolated tooth, labial view (Pb1-7);

Figure 4. *Acynodon* sp., isolated tooth (Pb1-15): a. lingual view, b. labial view;

Figure 5. *Acynodon* sp., isolated tooth (Pb1-16): a. lingual view, b. labial view;

Figure 6. *Acynodon* sp., isolated tooth (Pb1-18): a. dorsal view, b. lateral view;

Figure 7. *Crocodylia* indet., surangular articular fragment (PB1-28): a. outer view, b. inner view;

Figure 8. *Crocodylia* indet., caudal vertebra (PP1-22): a, b. lateral views, c. anterior view, d. posterior view;

Figure 9. *Crocodylia* indet., tibia in caudal view (PB1-26);

Figure 10. *Crocodylia* indet., osteoderm in dorsal view (PB1-45);

Figure 11. *Crocodylia* indet., osteoderm in dorsal view (PB1-46);

Figure 12. *Crocodylia* indet., osteoderm in dorsal view (PB1-47);

Figure 13. *Crocodylia* indet., osteoderm in dorsal view (PB1-49);

Figure 14. *Crocodylia* indet., osteoderm in dorsal view (PB1-52).