REPERTOIRE OF THE LATE CRETACEOUS VERTEBRATE LOCALITIES FROM SEBEŞ AREA, ALBA COUNTY (ROMANIA)*

Mátyás VREMIR**
Gareth DYKE***
Radu TOTOIANU****

Introduction

The Sebeş area (Alba County, SW Transylvanian Basin) is already well-known for the very diverse Late Cretaceous vertebrate assemblages that have been identified in this region, mostly in various Maastrichtian continental deposits. Although the history of paleontological discoveries in this area dates back to the mid 19th century,[2] arguably the most significant finds have been made only in recent years.[3] The importance of such discoveries is their crucial role in the relative dating of various stratigraphic formations, mostly lithologically uninformative continental units, the age of which has been long debated. Due to our ongoing systematic paleontological research, the controversial geological and stratigraphical context of the Sebeş area continental formations is now well-outlined, and a number of vertebrate assemblages have been identified that substantially contribute to our understanding of the paleobiogeographic evolution of the Central-East European domain during the Late Cretaceous.[4]

In this paper we synthesize the most recent data on latest Cretaceous vertebrate localities in the Sebeş area; their conservation status, their stratigraphical context, relative age, fossil content, taphonomy and paleoenvironmental-paleoecological information. Fossil vertebrate localities (and their coding in local

* *Acknowledgements:* Field work was partially supported by The National Geographic Society (Grant. No. GEFNE-98-13 and 1381-5); the American Museum of Natural History - New York; the "Ioan Raica" Municipal Museum of Sebeş and the Transylvanian Museum Society - Cluj-Napoca (Bethlen Gábor Alap: MKO-KP-1-2015/1-00047). We are very grateful to Zoltán Csiki-Sava (University of Bucharest, Romania) and Stephen Brusatte (University of Edinburgh, UK) for their reviews and useful comments, which improved the paper.

** Transylvanian Museum Society, Cluj-Napoca, Romania; e-mail: vremirmatyi@gmail.com.

*** Ocean and Earth Science, National Oceanography Centre, University of Southampton, UK; University of Debrecen, Hungary; e-mail: garethdyke@gmail.com.

**** "Ioan Raica" Municipal Museum of Sebeş, Romania; e-mail: rtotoianu@yahoo.com.

[2] Various Cretaceous and Tertiary vertebrate fossils were collected in the 1860s by Herepey Károly, at that time a teacher at the "Bethlen Gábor" College in Aiud, where most of his collection is presently curated ("Bethlen Gábor" Natural History Museum, Aiud). Various Late Cretaceous vertebrate fossils (crocodile tooth, dinosaur bones) were later collected by Baron Nopcsa Ferenc during his 1902 Transylvanian summer field-expedition (Nopcsa 1905).

[3] Delfino et al. 2008; Csiki et al. 2010; Codrea et al. 2010a; Codrea et al. 2010b; Vremir 2010; Dyke et al. 2012; Brusatte et al. 2013a; Brusatte et al. 2013b; Vremir et al. 2013; Vremir et al. 2014; Ösi et al. 2014; etc.

[4] Benton et al. 2010; Csiki, Benton 2010; Csiki-Sava et al. 2015; Csiki-Sava et al. 2016.

maps) are listed here in alphabetical order; however precise localization is not always given, mainly for reasons of site conservation.

In most of these vertebrate localities, systematic explorations were performed by a team from the Sebeş Municipal Museum (Romania), in collaboration with the Transylvanian Museum Society - Cluj-Napoca (Romania), the University of Southampton (UK), the American Museum of Natural History - New York (USA), the University of Edinburgh (UK), the University of Debrecen (Hungary) and the University of Bucharest (Romania).

The fossil specimens/collections we refer to are housed in various institutions as indicated in the text.[5] Collecting and field data (when available) are also listed, as well as bibliographical references. The Romanian names of the localities are given in alphabetical order, along with synonymous Hungarian (h) and/or German (g)/Sachsish (s) or old Romanian (r) locality names[6] used mainly in the older geological and paleontological literature, or the older geological and military maps, respectively.

Summary of the local geology and stratigraphy

The Sebeş sedimentary area (Alba County, Romania) is located in the southwestern part of the Transylvanian Basin, between the Trascău and Metaliferi Mountains with the Munceii Vinţului foothills to the north and west and the northern Şureanu Mountains and the Secaş plateau to the south and east (**fig. 1**).

Because the local geological and stratigraphical context has already been widely discussed in several publications,[7] here we present and summarize new stratigraphic and paleontological data from several informative key outcrops (noted in the descriptive section).

During the first orogenic phases of Carpathian mountain building, the region was tectonically active and several extensional/collapsed basins were formed and filled by molasse sediments. The Transylvanian Basin represents a post-Cenomanian intra-Carpathian sedimentary basin developed on the basement nappes of the *Tisza-Dacia* intra-Carpathian blocks (the convergence and merging of which resulted from the closure of the *Transylvanides* oceanic domain).[8] In Late Cretaceous times (Santonian-Maastrichtian), the Sebeş area (including the newly uplifted sections of the Şureanu Mountains), formed the central and southern part of the Transylvanian (Haţeg) island/sub-archipelago,[9] upon which a variety of continental deposits were accumulated.

The spatially restricted exposures of continental formations in the Sebeş area belong to two Late Cretaceous-Paleogene tectonostratigraphic megasequences (as part of the pre-Miocene rift/sag basin), lying mainly on top of the metamorphic *Getic-Supragetic* nappe system of the *Dacia* terrane (along the Mureş and Sebeş

[5] The institutional acronyms are listed at the end of the paper.
[6] Szabó, Szabó 1992.
[7] Vremir 2010; Codrea et al. 2010a; Codrea et al. 2010b; Brusatte et al. 2013a; Brusatte et al. 2013b; Vremir et al. 2013; Vremir et al. 2014; Csiki-Sava et al. 2016.
[8] Csontos, Vörös 2004; Krézsek, Bally 2006; Krézsek et al. 2010.
[9] Csiki, Benton 2010; Csiki-Sava et al. 2015; Csiki-Sava et al. 2016.

Rivers) and on the ophiolite-bearing *Mureş* nappe system of the *Tisza* (or *Tisia*) terrane (along and north-east of Ampoi River). Particularly in the south-eastern part of the Apuseni Mountains (part of *Tisia*), the Jurassic-Lower Cretaceous basement units are thrusted over Aptian-Cenomanian deep marine sediments (a flexural basin succession), unconformably sealed by various Santonian-Maastrichtian sediments.[10]

The Upper Cretaceous (Santonian-upper Campanian/lower Maastrichtian) synrift megasequence (corresponding to the rift and gravitational collapse stages) that covers the basement nappes, in the Sebeş area was built up by locally developed red continental and coal-bearing coastal-plain deposits ("*Săsciori* Formation" = *Sebeşel* strata; lower? Santonian),[11] conformably overlain by shallow to deep marine sediments (*Bozeş* Formation; upper Santonian-upper Campanian/basalmost Maastrichtian towards the north).[12] The base of the conformably overlaying continental sequence of the *Sebeş* Formation (uppermost Campanian-Maastrichtian)[13] bounds the Upper Cretaceous rift megasequence.

The latest Campanian/earliest Maastrichtian regional tectonic inversion and uplift (diachronously continuing up into the late Maastrichtian towards the NW, and into the Paleocene toward the central Transylvanian Basin), particularly in the Sebeş area, introduced a second extensive continental depositional setting, related to the Upper Cretaceous-Paleogene sag megasequence, which includes two 3rd order sequence boundaries.[14] Three sag-basin sequences can be recognised (*Sag 1-3* of Krézsek and Bally, 2006), separated by unconformities related to minor tectonic inversions.

The *Sebeş* Formation, with its type section at Râpa Roşie near Sebeş[15] (uppermost Campanian - upper Maastrichtian/Paleocene?) and being over 1,000 m in local thickness, represents the infill of *Sag-1*. It is correlative to the *Sînpetru* and *Densuş-Ciula* formations (lower Maastrichtian-Paleogene?) from the Haţeg Basin, and diachronously to the base of the *Jibou* Formation (upper Maastrichtian-Ypresian/Lutetian) in the NW Transylvanian Basin. Interbedded between the flyschoid *Bozeş* Fm. and the continental *Sebeş* Fm., a transitional sandy-conglomeratic unit was defined in the Vinţu de Jos area (*Vurpăr* Formation; lower Maastrichtian),[16] which represents a spatially restricted local facies variation (agradational fan-delta) at the base of the red continental unit.[17] The *Sebeş*

[10] Krézsek, Bally 2006.

[11] Marincaş 1965; Marincaş 1966; Marincaş 1973; Ianovici et al. 1976 allocate this unit to the base of the Bozeş Fm., referring it to the 'lower Gosau'.

[12] The Bozeş Fm. was considered to represent the main component of the Bozeş Nappe, as the uppermost unit of the Western Transylvanides. Recently, the Bozeş Fm. (along the Bejan Fm. and the Rapolt and Poiana Ruscă crystalline units) was transferred, from a tectonic viewpoint, to the Southern Carpathians (Balintoni 2003).

[13] Vremir et al. 2014.

[14] Krézsek, Bally 2006.

[15] Codrea et al. 2003; Codrea et al. 2008; Codrea et al. 2010a; Codrea, Dica 2005.

[16] Codrea, Dica 2005.

[17] Ianovici et al. 1976, allocate this unit to the top of the Bozeş Fm. The upper boundary of the Bozeş Fm. can be identified in several sections (Petreşti-*Arini*, Mihaiului, Stăuinii and Pâclişa valleys) in the

Formation is unconformably covered by the Upper Eocene deposits of the *Sag-2* sequence in north (Şard and Bărăbanţ area) and by Middle Miocene marine deposits to east and south (in the Teleac - Oarda - Sebeş area). An angular unconformity and important erosional and temporal discontinuity (at least 15 Mya) locally separate the *Sebeş* Formation from the overlaying *Sag-2* sequence.

The ca. 50 m thick Upper Eocene (Priabonian) sequence (*Sag-2*) is represented by the continental *Şard* Formation in the base (exposed in the Tuişului Valley north of Bărăbanţ and in the Ighiu and Cricău areas) and by the conformably overlaying shallow marine deposits of the *Ighiu* Formation (late Priabonian).[18] This transgrading succession is correlative to the *Valea Nadăşului* Formation (lower Priabonian; continental) and *Turea* Group (upper Priabonian-lower Rupelian; shallow to deep marine) from the NW Transylvanian Basin.

Finally, the 30-40 m thick Oligocene (Rupelian-Chattian?) sequence (*Sag-3*) is locally represented by the continental *Bărăbanţ* Formation, unconformably capped by Lower Miocene[19] (Aquitanian; *Sîntimbru* Formation) or Middle Miocene (Badenian; correlative to the *Tălmaciu?* and *Dej* Formations). These are referred to the Lower Miocene flexural and Middle Miocene back-arc megasequences.

From a structural perspective, on the right flank of the Mureş River, between Vinţu de Jos (south) and Şard (north), the continental deposits form a normal-faulted monocline stripe that widens towards the north.[20] Restricted exposures at Vurpăr, Mihai Valley, Stăuini Valley, Cuptorului Hill and Seacă Creek areas (regional dip 22-40° E) allow us to estimate the maximum preserved thickness of these sediments to around 300 m, whereas in the Pâclişa (regional dip 25-35° E), Şard (regional dip 35-40° NE) and Micești (regional dip 15-20° ENE) areas, depending on the extent of faulting, the whole succession exceeds 1,000 m in thickness between Mamutu and Sălişte hills and the Ampoi Valley.

On the left flank of the Mureş Valley, along the Sebeş and Secaş Rivers between Sebeşel, Petreşti (south) and the Oarda de Jos locality (north), both the *Bozeş* Fm. and the overlying continental deposits are folded forming couplets of roughly E-W oriented synclines and anticlines.[21] These couplets are associated with numerous NW-SE oriented faults. The dip of these strata varies significantly on the Petreşti-Sebeş flank of the "Daia" syncline (regional dip 65-20° NW), whereas on the limbs of the "Lancrăm-*Pleşii Hill*" anticline strata are less inclined (regional dip 15-20° SE/10-20° NE/N between Sebeş and the Oarda de Jos locality). The total thickness of the continental *Sebeş* Formation is estimated to be approximately 450 m between Sebeş and Râpa Roşie (Red Cliff),[22] however, a greater vertical extent is predicted towards north (in the Hăpria-Teleac area).

---

lower third of the so-called "Vurpăr" Fm., being marked by the last occurrence of beds with oligohaline influences, dominated by a marine and brackish fauna.

[18] Băluţă 1972; Băluţă 1987.

[19] Şuraru, Băluţă 1983.

[20] Vremir 2010.

[21] Ibid.

[22] Ibid.; Vremir et al. 2013; Brusatte et al. 2013a.

Within the upper section of the *Sebeş* Formation, the Cretaceous-Paleogene boundary is presently not identified.

Controversies regarding the Upper Cretaceous vertebrate-bearing units

The regionally very important and major Middle Miocene (Badenian) unconformity is marked in the Sebeş area by a 5-15 m thick basal conglomerate (correlative to the *Tălmaciu* Formation?) and a thick succession of marls with volcanic tuff intercalations (*Dej* Formation), which variably cuts into older deposits along a south-to-north gradient. Thus, the Badenian erosional base can be identified in the middle section of the *Sebeş* Formation (to the east and south at Râpa Roşie and Sebeş) and the Oligocene and Lower Miocene units (to the north at Dumbrava - Bilag hills and Bărăbanţ).

Due to the insufficiently documented or variable stratigraphic-spatial relationships recorded in the Sebeş region between various poorly dated units, confusing stratigraphic charts and models were recently built.[23] In order to clarify the local stratigraphic scheme,[24] Codrea and his team erected or renamed several stratigraphic units, including four continental formations, ranging in time from the early Maastrichtian (*Vurpăr* Formation) up to the Lower Miocene (*Sebeş* Formation). Based on this model, the Miocene *Sebeş* Formation (= *Rotherberg schichten* or *Râpa Roşie* strata)[25] with its stratotype at Râpa Roşie,[26] was interpreted as cutting into older formations, in a similar manner to the overlaying middle Middle Miocene deposits, locally overlaying Upper Cretaceous continental units (formalized as the *Vurpăr* and *Şard* formations). The very rare and fragmentary dinosaur fossils were erroneously interpreted as being reworked from the Upper Cretaceous units, during an Oligo-Miocene erosional-depositional event.[27]

A Late Cretaceous age for the *Sebeş* Fm. was independently inferred at the beginning of the 20th century by Gyula Halaváts and Ferenc Nopcsa,[28] but these interpretations were almost completely ignored for more than a century. Based on some relevant and well preserved fossils (complete dinosaur and pterosaur bones), this point of view was recently confirmed, undoubtedly indicating a Maastrichtian age of the *Sebeş* Formation.[29] Consequently, in the Sebeş region, three Maastrichtian continental formations were artificially erected as roughly coeval

[23] Codrea, Dica 2005; Codrea et al. 2003; Codrea et al. 2008; Codrea et al. 2010a; Codrea et al. 2010b.
[24] For the research history and debates, see Grigorescu 1987; Codrea, Dica 2005; Codrea et al. 2003; Codrea et al. 2008; Vremir 2010; etc.
[25] First named by L. Lóczy in 1913, later adopted by I. Gherman in 1943 and translated as *Râpa Roşie* strata (Lower Miocene), then formalized as the *Sebeş* Formation by Marinescu et al. in 1998. The nomenclature was followed by Codrea, Dica 2005; Codrea et al. 2003; Codrea et al. 2008; Codrea et al. 2010a; Csiki et al. 2010; Vremir 2010; Vremir et al. 2009; Vremir et al. 2013; Vremir et al. 2014; Csiki, Vremir 2011; Csiki-Sava et al. 2016.
[26] Codrea, Dica 2005; Codrea et al. 2003, Codrea et al. 2008.
[27] Grigorescu 1987; Grigorescu 1992; Jianu et al. 1997; Codrea, Vremir 1997; Codrea, Dica 2005; Codrea et al. 2008; Codrea et al. 2010a.
[28] Halaváts 1905; Nopcsa 1905.
[29] Vremir et al. 2009; Vremir 2010. Based on well preserved dinosaur fossils and footprints identified in Sebeş-*Glod* and Lancrăm areas, a Maastrichtian age was suggested even earlier, at least for the lower section of the continental succession along the Sebeş River (Vremir 2001; Vremir, Codrea 2002).

units (e.g. the *Vurpăr* and *Şard* Formations on the right side of Mureş River and the *Sebeş* Formation on the left side of Mureş).[30] In order to avoid further confusions produced by the new stratigraphic model, in some of the subsequent publications the *Sebeş* Fm. name was abandoned in favor of the newly erected *Şard* Fm.,[31] whereas in other papers the conservation of the priority-bearing *Sebeş* Fm. name was preferred,[32] restricting the spatial extent of the *Şard* Fm. to north-west of Alba-Iulia area between the Bilag Hill, Ighiu and Cricău localities.

As discussed above, the rank and validity of the lower Maastrichtian *Vurpăr* Formation is also questionable. In our opinion, it represents a local facies variation in the base of the *Sebeş* Formation (the upper two-third of its ca. 90 m thickness in Vinţu de Jos area), whereas its lower third can be allocated to the top of the *Bozeş* Fm, as documented in the much better exposed Petreşti-Arini section, near Sebeş.[33]

Due to the ongoing confusion regarding the formal naming, spatial-temporal extent and the relationship between the various Maastrichtian continental units, over the past several years detailed mapping and extensive logging has been performed. On the basis of this work some preliminary conclusions have emerged.

Based on the available data, we question the referral of the *Şard* Formation to the Upper Cretaceous (Maastrichtian) for the following reasons:

a. As defined,[34] the *Şard* Fm. type section is located in the upper course of the Tuişului Valley (east of Şard locality) where only Eocene-Oligocene sedimentary deposits occur; the "type section" is represented by two small and uninformative outcrops situated on the dirt-road and next to it, close to the Dumbrava forest limit, which exhibit the uppermost section of the unit. Here the uppermost section of a continental unit alone is exposed, conformably overlapped by transgrading Upper Eocene (upper Priabonian) shallow marine deposits.[35] The lower boundary at this outcrop is marked by an important erosional and angular unconformity, recently exposed in the middle course of Tuişului Valley.[36] The dip and strike of the *Şard* Fm., recorded in the Tuişului Valley type-section, is concordant to that of the *Ighiu* Fm. (upper Priabonian-lower Rupelian) exposed up-section in the same place, a few meters above (regional dip 25-27° N), and discordant with respect to the underlying Upper Cretaceous (Maastrichtian) continental unit (15-19° ENE), outcropping between Bărăbanţ and Şard localities. As indicated by the local mapping data, the *Şard* Fm. is separated from the underlying Upper Cretaceous continental sequence by a major unconformity (also noted by Băluţă in 1987) and was probably deposited during the Eocene (Priabonian). From this point of view, its stratigraphic position suggests this unit to

[30] Codrea et al. 2010a.
[31] Codrea et al. 2010b; Codrea et al. 2014; Mariş 2012; Grellet-Tinner, Codrea 2014, etc.
[32] Vremir 2010; Csiki et al. 2010; Dyke et al. 2012; Brusatte et al. 2013a; Brusatte et al. 2013b; Vremir et al. 2013; Vremir et al. 2014; Csiki-Sava et al. 2016.
[33] Vremir 2010; Csiki-Sava et al. 2012; Brusatte et al. 2013b; Vremir et al. 2014.
[34] Codrea, Dica 2005.
[35] Băluţă 1972; Băluţă 1987; Moisescu, Mészáros 1995.
[36] Agro-technical land-work performed in the Spring of 2014.

be instead a synchronous equivalent of the continental *Valea Nadăşului* Formation (lower Priabonian) well-exposed in the north-western Transylvanian Basin.[37]

b. In contrast to the underlying *Sebeş* Formation, the *Şard* Formation is completely devoid of any diagnostic vertebrate fossils, especially dinosaur bones or footprints, which would confirm its Late Cretaceous age. Morever, an Eocene charophyte and freshwater mollusk assemblage was identified in the topmost section of the unit, in the Ighiu and Bărăbanţ area.[38]

c. At present, is impossible to explain how, in a tectonically very active region (as were the southern Apuseni Mountains), a continuous continental succession, ranging in time from the latest Campanian up to the late Eocene (thus encompassing more than 30 Mya)[39] was deposited and survived the repeated erosional and depositional cycles that characterized this region.

We conclude that in the Sebeş area, most of the Paleocene-Eocene succession is missing and that, subsequently, two facially similar continental formations belonging to different tectono-stratigraphic sequences have been sharply merged together (the Maastrichtian *Sebeş* Fm. basally and the Upper Eocene *Şard* Fm. at the top). The similar facies-level appearance of the two distinct units is responsible for the confusion which surrounds the Upper Cretaceous continental formations exposed in the Şebes region. In our interpretation, the *Şard* Fm. is restricted to the Upper Eocene continental unit, exposed only in the Bărăbanţ - Şard - Ighiu - Cricău area, whereas the upper section of the "*Vurpăr* Fm." (conformably overlying the *Bozeş* Fm.) represents a locally developed delta-facies at the base of the *Sebeş* Fm., outcropping between Vurpăr and Valea Seacă toward Pâclişa.

In sum, in the Sebeş region, several distinct continental stratigraphic units are exposed, ranging in age from the Santonian up to the Oligocene:

1. The "*Săsciori* Formation" (or "*Sebeşel* strata"); resting on the metamorphic basement and conformably underlying the *Bozeş* Fm.; locally developed south and south-west of Sebeş - Santonian;

2. The *Sebeş* Formation (or "*Râpa Roşie* strata," including the upper third of the "*Vurpăr* Formation" or "*Sabal major* strata")[40]; conformably overlaying the *Bozeş* Fm.; well-exposed on the left flank of the Mureş River, between Cugir Valley at the Vinerea locality in the south and the Teleac locality in the north, as well as between the Vurpăr and Şard localities on the right flank of the Mureş River - uppermost Campanian - upper Maastrichtian/Paleocene?;

3. The *Şard* Formation; conformably underlying the *Ighiu* Fm.; locally exposed in the Tuişului Valley and Dâmbu Rotund hill north of Bărăbanţ and the Ighiu and Cricău area - Upper Eocene (Priabonian);

[37] Hosu 1999.

[38] Telegdi-Roth 1905; Codrea et al. 2003.

[39] A Maastrichtian-Priabonian age of the Şard Fm. is stated by Codrea et al. in 2008; in 1987 C. Băluţă distinguished the unconformity between the Şard Fm. and the underlying Late Cretaceous unit (Codrea et al. 2008; Băluţă 1987).

[40] Pálfy 1902; Telegdy-Roth 1906.

4. The *Bărăbanț* Formation; unconformably overlying the *Ighiu* Fm. and locally exposed in Ighiu area and Dâmbu Rotund - Bilag hills, north of Bărăbanț locality - Oligocene (Rupelian-Chattian?);

The latest Cretaceous vertebrate localities listed in this repertoire are stratigraphically localized in the top *Bozeș* Formation (upper Campanian) and most of the *Sebeș* Formation, including the "*Vurpăr* Fm." (lower and upper Maastrichtian).

Localities and sites with latest Cretaceous fossil vertebrate discoveries

1. Bărăbanț (Bd); Borbánd (h); Weindorf, Borbant (g).

Localization: "between the village upper end and the flour-mill" or "above the flour mill,"[41] an outcrop presently impossible to identify in the field. Based on the 19th century military maps,[42] two flour-mills were functioning upstream from the village, along the Crișeni stream, the closest one located a hundred meters upstream from the junction with the Ampoi River. Since then, the village has extended further and presently the area is known as Bărăbanțu-Nou. In the upper end of the village where the old flour-mill was located, several small outcrops are exposed along the road in private estates, at the base of the hill-slope.

Conservation: no data available; only historical interests are presented, as the first dinosaur-bearing site was discovered in the 1860s in Transylvania. Most outcrops are partially covered by vegetation or recent slope deposits.

Facies: meters thick, cross-laminated sandy and pebbly channel deposits, subordinate brownish-red overbank, silty-claystone interbeddings, related to a meandering fluvial system. Based on the original description of Herepey, the fossil was discovered in a red sandstone layer.

Unit: top of the Sebeș Fm.

Age: late (possibly latest) Maastrichtian.

Fauna: a single badly preserved fossil bone (AiM 1026), tibia(?) of a sauropod dinosaur[43] (collected by Herepey K. in the mid-19th century),[44] which was initially assigned to an Eocene large mammal (*Anoplotherium*) or an Oligocene anthracothere (*Anthracotherium*),[45] and later to a sauropod dinosaur.[46] Recently, its dinosaurian nature was confirmed, and it was considered to originate from the *Șard* Formation (actually top of the *Sebeș* Fm.).[47] Because the relatively large bone seems to be rather complete, although crushed, it is reasonable to consider its autochthonous status, and that most likely it was not reworked or substantially transported before burial. The specimen has a pale pinkish-grey to reddish colour,

[41] Localization after the original label of AiM 1026 (ca. 1860) and Herepey 1896, p. 138.

[42] Austro-Hungarian Military Survey of the Hungarian Kingdom: 2nd edition (1806-1869) and 3rd edition 1:25,000 and 1:75,000 (1869-1887).

[43] Nopcsa 1905; Codrea, Mărginean 2007; Codrea et al. 2010a, fig. 10.

[44] Herepey 1865; Herepey 1896, p. 138.

[45] G. Téglás and K. Herepey regarded it as originating from the Eocene continental strata (= *Șard* Formation), whereas Koch 1894 assumed that the specimen was collected from the upper Oligocene *Sárd-Borbánd Red Clays*, equal *Bărăbanț* Formation (Téglás 1886; Herepey 1896).

[46] Nopcsa 1905; *Társulati ügyek* 1909.

[47] Codrea, Mărginean 2007; Codrea et al. 2010a.

indicating a red-coloured host rock. Specimen AiM 1026 most likely represents one of the first dinosaur fossils ever discovered in the Transylvanian Basin and present-day Romania.

2. Ciugud (Cd); Maroscsüged (h).

Localization: several small outcrops are known at the southern limit of the village along the Pârâul Ciugudului creek and towards Limba village, exposing the mid-upper section of the *Şebes* Formation. It is not presently possible to locate the original fossil-bearing site.

Conservation: no data available; only historical interest.

Facies: reddish calcareous silty-claystone and subordinate greenish-gray or bluish sandstone beds.

Unit: Sebeş Fm.

Age: late? Maastrichtian.

Fauna: the only fossil specimen known from this locality (AiM 1025; collected by Herepey Károly in the mid 19th century) is a long bone shaft fragment, identified as belonging to a sauropod dinosaur.[48] The fossil has a white-pinkish gray colour and shows numerous predepositional cracks. The greenish-grey sandy matrix suggests that it originated from a sandy channel-fill facies and most likely has a para-autochthonous status.

3. Dealul Cuptorului (DC)

Localization: 300 to 400 m north-east from the Stăuini Valley, on the eastern slope of Cuptorului Hill (relative altitude of 70 to 90 m).[49] Here several small outcrops (coded DC 1-3) expose the basal section of the *Sebeş* Formation.[50]

Conservation: in the past 15 years, the dinosaur track-site DC 1 (cca. 85 m^2) was mostly eroded away, while the other smaller outcrops and ravines (DC 2 and 3) are progressively covered by vegetation.

Facies: mainly red coloured claystone-siltstone overbank deposits and bioturbated calcareous paleosols, with subordinate shallow sandy-pebbly channel fills and point-bar deposits, related to a meandering river system. The site is correlative to the Vurpăr ravine section and is situated ca. 100 to 150 m above the formation base.

Unit: lower part of the Sebeş Fm.

Age: early Maastrichtian.

Fauna: the dinoturbated bedding plane of DC-1 sub-site preserved a few dozens of hardly recognizable footprints and possible footprints, allocated to two or possibly three morphotypes.[51] The best preserved medium-sized footprints were

[48] Nopcsa 1905; Codrea, Mărginean 2007; K. Herepey considered it to belong to a late Eocene mammal (Herepey 1896).

[49] Vremir 2001; the dinosaur track-site was discovered and mapped by MV in May 2000, since when it has been weathered and eroded away.

[50] Vremir 2001; Therrien et al. 2002; Therrien 2005; Codrea et al. 2010a; Codrea et al. 2010b.

[51] Vremir 2001; Therrien et al. 2002. Local stratigraphic log and position of the dinoturbated layer in Codrea et al. 2010a, fig. 14, incorrectly referred to Lancrăm LcB site.

allocated to an unidentified ornithopod and several plaster-casts were produced of them.[52] In the same dinoturbated layer, a nodosaurid (*Struthiosaurus*?) osteodermal plate (UBBG) was also found.[53] In DC 2 and 3 sub-sites, the dominant fossils (IRMMS, MDRC) are represented by turtle shell elements referred to *Kallokibotion*, together with very rare pan-pleurodiran dortokids and mostly fragmentary dinosaur bones (some of them referred to *Zalmoxes*). Most fossil bones show predepositional breakage and are pinkish-white, brownish-red and rarely dark-gray in colour. Over 20% of the vertebrate fossil sample bears various and abundant insect (mostly termite) related traces and, more rarely, toothmarks (crocodyliforms?), suggesting longterm pre-burial subaerial exposure.[54]

4. Hăpria (Hp); Herepe (h); Harpen (g)
Localization: a suite of small outcrops is located ca. 1 km west from Hăpria village, one of which is rather well exposed on the left bank of the stream. Occasional field-prospections were done only recently (2006-2009). No other published data are available.

Conservation: minor landslides and/or rock falls, as well as overgrowing vegetation, progressively cover the exposures.

Facies: dominantly meters thick reddish calcareous silty-claystone units, with subordinate bluish-gray sandy channel fill interbeddings.

Unit: Top *Sebeş* Formation, ca. 100 to 150 m under the base of the Teleac ravines section, exposed to the north.

Age: late Maastrichtian.

Fauna: the vertebrate fossils are represented by a limb-bone fragment (TMS), allocated to an unidentified ornithopod dinosaur.

5. La Cutină-Dealul Feţii (DF); Szölöhegy (h)
Localization: the site is located at the junction of the Sebeş and Secaş Rivers on the south-western slope of Feţilor Hill, exposing more than 65 m from the lower-middle section of the *Sebeş* Formation.

Conservation: the bottom of the outcrop is heavily eroded by the Sebeş River, producing minor landslides and rock-falls.

Facies: the succession is characterized by coarse channel deposits in the base and subordinate fine-grained red overbank sediments in the top.[55]

Unit: lower third of the Sebeş Formation, correlative to the Lancrăm A-C sections (see below).

Age: probably early or early late Maastrichtian.

Fauna: occasional prospecting revealed that various vertebrate fossils (IRMMS), mainly fragmentary dinosaurian limb-bones and vertebrae (*Zalmoxes*, *Telmatosaurus*; Titanosauria indet.) and turtle shell elements (*Kallokibotion* sp.,

[52] The footprint casts were deposited in the Geological Department of "Babeş-Bolyai" University, Cluj-Napoca (UBBG).
[53] Vremir 2001.
[54] Vremir 2009.
[55] Detailed description and stratigraphic log is given in Vremir 2010, p. 642, fig. 5.

dortokidae) occur in the sandy channel fills and red overbank deposits, whereas these are very scarce in the coarse conglomeratic units, in which fossilized/incarbonised wood fragments and logs are commonly found. The colour of the fossil bones is white and yellowish-brown; they mostly show many cracks or syndepositional breaks which suggest long-term subaerial exposure and weathering, and possible intraformational reworking (especially in the upper section).

6-8. Lancrăm A-C (Lc/A-C); Lámkerék (h); Langendorf (g)

Localization: an almost continuous series of three main outcrops (coded upstream from A to C) are situated 0.5-0.8 km north from the Secaş-Sebeş river junction. These are exposed mainly on the right bank of the Sebeş River, north-east from Lancrăm village. This outcrop suite has been known since the beginning of the 20th century,[56] but more detailed investigations and fossil collecting started only in 1998.

Conservation: the bottom of the outcrops LcA and LcB are heavily eroded by the Sebeş River, producing dangerous rock-falls, while outcrop LcC is progressively covered by slope deposits.

Facies: the 40 m thick succession is characterized by greenish-brown or blueish-gray lacustrine mudstones in the base, followed by several coarse, mainly cross-bedded fluvial bar conglomerates, with tabular or cross-laminated sand and sandstone interbeddings in the middle section, and occasional reddish overbank fines in the top.[57] The three major beds of coarse channel deposits contain dozens of variously oriented silicified or incarbonised tree logs and stumps, some of them 16-18 m in length with diameters up to 1.5 m. As their spatial distribution and orientation indicates, such megafossils accumulated during periodic heavy floods. The dominant paleocurrent directions point towards a north and north-east flowing, high-energy braided river. A swampy streamside gallery-woodland and forested inter-channel overbank environment can be reconstructed, where the rich vegetation probably attracted a large number of sauropod and ornithopod dinosaurs.

Unit: lower third of the *Sebeş* Fm.

Age: probably early or early late Maastrichtian.

Fauna: the vertebrate fossil material (UBBG; IRMMS) is represented by hydrodinamically sorted para-autochthonous skeletal elements, mainly massive limb bones and vertebrae belonging to various dinosaurs. Besides a few stem turtle (*Kallokibotion*) and eusuchian crocodyliform (*Allodaposuchus*) remains, most of the specimens are represented by titanosaurs (cf. *Magyarosaurus*) and ornithopods (*Telmatosaurus*, *Zalmoxes*), accumulated mainly in medium to coarse channel deposits.[58] In the basalmost lacustrine mudstones, frequent plant remains, occasional gastropods and microvertebrates (disarticulated fish bones) occur. In the lower section of LcB, a dinoturbated layer was identified: the relatively well

[56] Nopcsa 1905; *Társulati ügyek* 1909.
[57] Vremir 2010, p. 643, fig. 6; Codrea et al. 2010a.
[58] Vremir 2001; Vremir 2010; Codrea et al. 2010; Jipa 2012.

preserved footprints were allocated to *Iguanodontichnus* ichnotaxon, probably related to the euornithopod dinosaur *Zalmoxes*.[59] The fossil bones are of dark colour, mostly black, and often show predepositional breaks and erosion marks. In LcC outcrop, the fossils are light brownish or whitish-red in colour and, especially in the overbank facies, they show many cracks and syndepositional breaks.

9. MI6

Localization: the outcrop was identified in 2010 and explored in detail during the following years. Due to its major scientific importance, for conservation reasons a precise localization is not given.

Conservation: slight erosion is progressively enlarging the exposure.

Facies: the section is dominantly formed by red-coloured calcareous and bioturbated claystone-siltstone overbank deposits, sandy-silty crevasse splays, occasional gray lacustrine mudstones and cross-laminated pebbly-sandstone and conglomerate bodies, related to a shallow and meandering river system.

Unit: top of the Sebeş Fm.

Age: late (possibly late late) Maastrichtian.

Fauna: the fossil vertebrate fauna (IRMMS) is relatively diverse, represented by turtles, small-sized azhdarchid pterosaurs and various ornithopod and sauropod dinosaurs. Several dinosaur egg-clutches and nest structures were also recorded, representing the first Transylvanian dinosaur nesting site identified so far outside the Upper Cretaceous of the Haţeg Basin.[60] The dark-coloured bones (including articulated elements) are often well preserved, especially in the sandy channel fills. In the red overbank facies and in the nesting horizons, the mostly weathered and fragmentary bones are pinkish-white or pale brownish in colour, usually being covered by a thick, greenish calcareous crust. A detailed description of the local fossil assemblage will be provided in a forthcoming paper.

10-11. Oarda de Jos A and B (Od/A-B); Alsóváradja (h); Salzporten (g)

Localization: the outcrop suite (coded Od/A-C) is located next to Oarda de Jos village on the edge of Dublihanul Hill, on the right bank of the Sebeş River, 0.5 to 1.2 km upstream from the Sebeş-Mureş river junction.

Conservation: heavy river erosion progressively cuts into the outcrops, resulting in landslides and rock-falls. Because the very dynamic nature of the exposures, periodic monitoring and surveillance is required.

Facies: the section is characterized by laterally extensive sandy channel fills, silty crevasse splays, locally developed ponded calcareous mudstones with thin coal layers, and brownish-red fine overbank deposits related to a meandering fluvial system.[61] The dominant paleocurrent orientation indicates a north-east to east direction of flow. Numerous leaf imprints, fruits and incarbonised tree fragments are recorded especially in the bottom part of the section, in the lacustrine and fine-

[59] Vremir, Codrea 2002.

[60] Barta et al. 2015.

[61] Detailed logs and lithological descriptions are given in: Vremir 2001; Vremir 2010; Codrea et al. 2010a; Jipa 2012; Dyke et al. 2012.

grained channel facies. Aquatic invertebrates are also numerous, represented by freshwater snails.

Unit: middle section of the *Sebeş* Fm.

Age: probably early late Maastrichtian.

Fauna: the site has been known for more than a century,[62] but systematic investigations started only in Spring of 1994 (at which time the site was considered to probably be from the Oligocene), when the first fossil bone (a partial humerus of *Zalmoxes*) and various plant remains were collected by one of us (MV).[63] Subsequent prospecting and detailed investigation revealed its Late Cretaceous age, and numerous additional vertebrate and invertebrate fossils were recovered (TMS; IRMMS; UBBG). The mostly isolated macrovertebrate fossils occur especially in the overbank deposits and occasionally in the sandy channel fills. Two lens-like micro- and macro-vertebrate bone accumulations were identified in shallow abandoned channels and calcareous pond deposits. Very few associated and/or articulated skeletal elements (e.g. ornithopod hind-limb elements and articulated vertebrae of a large lizard) were recovered, originating exclusively from the basal reddish overbank facies. Overall, the vertebrate assemblage includes fish (*Lepisosteus*), allocaudatan amphibians (*Albanerpeton*), indeterminate lizards, various crocodyliforms (*Allodaposuchus*, *Doratodon?*, *Acynodon?*), abundant pan-pleurodiran dortokids[64] and stem-turtles (*Kallokibotion*), small sized azhdarchid pterosaurs, various dinosaurs (*Telmatosaurus*, *Zalmoxes*, titanosaurs and small theropods), enantiornithin birds and kogaionid multituberculate mammals (*Barbatodon*). A huge accumulation of avialan eggs and eggshells associated with hatchling and adult enantiornithin bird skeletal elements was also recorded.[65] Other eggshell fragments recovered by screen-washing documents the presence of *Pseudogeckoolithus?* and *Megaloolithus* ootypes[66] as well.

12. Pâclişa (Pc); Poklos (h)

Localization: more than a dozen outcrops occur upstream along Pâclişii Valley, Pârâul cel Mare Valley as well as on Sălişte Hill. Dinosaur bones were collected in 1902,[67] but a precise localization of the fossiliferous sites is presently impossible. Based on the description of the stratigraphic log,[68] the fossiliferous site might be located along Pâclişii Valley, upstream from the village in the upper course and close to the base of the continental formation.

Conservation: the outcrops are mostly overgrown by vegetation.

Facies: various red-coloured siliciclastic deposits. As described by Nopcsa, from top to bottom (down-section), the log is composed of:

[62] Koch 1894; Nopcsa 1905.
[63] Givulescu et al. 1995; Vremir 2001.
[64] Rabi et al. 2013.
[65] Vremir 2010; Dyke et al. 2012.
[66] Codrea et al. 2010a.
[67] Nopcsa 1905.
[68] Ibid., p. 162.

> […] brownish-red sandstone and claystone layers with subordinate bluish-gray interbeddings, followed southward by yellowish and red variegated and well stratified sandstone layers, covered by greenish-gray conglomerates […] followed by a thin brick-red calcareous claystone layer, yellowish conglomerates and finally gray marl and sandstone.

He also notes that the brick-red claystone layers - very characteristic for other sites - are almost completely missing, and that the gray marl and sandstone layers observed upstream represent the same unit as that described from the Stăuinii Valley entrance.[69]

Unit: lower section of the *Sebeş* Fm.

Age: probably early Maastrichtian.[70]

Fauna: Dinosauria indet. The fossil material collected by Nopcsa in 1902 is unavailable for study (unknown collection).

13. Petreşti-Arini (PT); Péterfalva (h); Petersdorf/Piterschterf (g/s); Petrifalău (r). *Localization*: the PT section is localized along the Sebeş River, between the downstream, northern end of Petreşti village and the southern end of Sebeş town, near the "Arini" sport resort and park.

Conservation: represents mainly an artificial channel outcrop-suite, exposed in spring 2007 during the construction of a hydrotechnical project, and in sections of the old riverbed downstream from the dam. The artificial channel and widened riverbed, of ca. 1 km in length, are now partially covered by concrete (upstream), while the lower section (which includes most of the fossil sites) will be sealed and filled up in the near future in order to re-divert the river course.

Facies: the lower half of the section preserves deep to shallow marine deposits and a transitional coastal-brackish estuarine facies representing the top Bozeş Formation, followed by paludo-fluvial and fully terrestrial deposits of the base Sebeş Formation.[71]

Unit: topmost *Bozeş* Fm. and the lower section of the *Sebeş* Fm.

Age: late Campanian (L0/a-c) to latest Campanian? - basalmost earliest Maastrichtian (L1-5).

Fauna: In total, nine fossiliferous layers have been identified, most of them already described in detail.[72] The upper Campanian fossiliferous beds (PT-L0/a-c) contain a para-autochthonous vertebrate assemblage, with various lepisosteid and myliobathid? fish scales and teeth, abundant anurans and lizards, various crocodyliforms (*Doratodon*, *Acynodon*, *Theriosuchus*?), small and large sized pterosaurs, turtles (*Kallokibotion*?), frequent nodosaurid and euornithopod (*Zalmoxes*) dinosaurs, and multituberculate mammals (IRMMS).[73] The latest Campanian? - earliest Maastrichtian Sebeş Formation fauna, identified in fossiliferous layers PT L1-5, are

[69] Pálfy 1902 (marine-littoral deposits, here referred to the Top Bozeş Formation).

[70] Based on the pollen assemblage, a Maastrichtian age is given by E. Antonescu (Antonescu 1973).

[71] Detailed log description and interpretation is given in Csiki-Sava et al. 2012, Brusatte et al. 2013b and Vremir et al. 2014.

[72] Vremir et al. 2014.

[73] Vremir et al. 2015. A detailed description of the late Campanian PT-L0/c vertebrate assemblage will be presented in a forthcoming paper.

apparently less diverse, but contain frequent dinosaurs (*Zalmoxes*) and pan-pleurodiran dortokid turtles ("Muelbachia"), a medium sized pterosaur, anurans, and a peculiar small sized multituberculate mammal (IRMMS).[74] It is important to note that the late Campanian-earliest Maastrichtian vertebrate assemblages identified in the PT site completely lack hadrosauroid and titanosaur sauropod dinosaurs[75]; this bias seems to represent a biostratigraphic trend, characterizing the late Campanian-early Maastrichtian time interval in the Sebeş area, documented by the top Bozeş Formation and basal Sebeş Formation (as also seen in the lower Maastrichtian sites of the Vurpăr ravines, Stăuinii Valley and Cuptorului Hill sections (**table 1**).[76]

14. Râpa Lancrămului (RL); Lámkeréki szölöhegy/szakadék (h); Roterberg bei Langendorf (g)

Localization: a huge erosional ravine situated on the western slope of Pleşii Hill, 4.0 - 4.3 km north of Sebeş town, ca. 200 meters above the Trişca meadow and old terraced vineyard. The site exhibits an over 80 m thick succession of the upper section of *Sebeş* Fm.

Conservation: the exposure has been documented on various maps since the late 18th century. The ravine complex is progressively eroded by rainfalls. Occasional landslides cover parts of the bottom section. Most of the outcrop is inaccessible without climbing equipment.

Facies: the lithology is similar to that of Râpa Roşie outcrop, showing large-scale superimposed sandy-pebbly cross-bedded channel bodies, and occasional silty-claystone interbeddings. The top section of the local succession, however, is characterized by extensive overbank deposits, with pedogenised calcretic red silty-claystone layers up to several meters thick, which are missing (eroded away?) from the Râpa Roşie type section.

Unit: middle-upper part of the *Sebeş* Fm.

Age: late Maastrichtian.

Fauna: vertebrate fossils (TMS, IRMMS, UBBG) are less commonly found, partly because of the limited accessibility. Scattered stem-turtle (*Kallokibotion*) remains, as well as titanosaur sauropod (including *Magyarosaurus*?)[77] and euornithopod (*Zalmoxes*) dinosaur fossils, are embedded in the medium to coarse channel-lag deposits. As in the Râpa Roşie outcrop, the most frequent identifiable skeletal elements are represented by massive titanosaur limbbones and vertebral centra, which were less affected by the fluvial transport. Most bone fragments exhibit extensive longitudinal or mosaic cracking, which indicates long-term subaerial exposure (weathering stage 3-4) prior to burial, and some degree of intraformational reworking, supporting the occurence of repeated erosional and redepositional processes.

[74] Vremir et al. 2014.
[75] Brusatte et al. 2013b.
[76] Csiki-Sava et al. 2016.
[77] Csiki, Vremir 2011.

15. Râpa Roşie (RR); Vörösmart/Vörösdomb (h); Roterberg bei Mühlbach (g); Dealu Roşu (r).

Localization: the ca. 800 m wide and almost 200 high ravine complex known as the "Red Cliffs" is situated 3 km north-east from Sebeş town, on the south-western slope of Pleşii Hill.

Conservation: the ravine complex and the plateau above is part of a "Natura 2000" natural reserve (with geological, geomorphological, biological, archeological landmarks) and is protected by Romanian legislation. Except for a few small sections at the base and lateal parts, most of the exposures are inaccesible without climbing equipment.

Facies: the exposed section is ca. 200 m in thickness (including the overlying, transgressive Badenian deposits). The lower part of the section is dominated by extensively developed red overbank deposits with coarse channel-fill interbeddings; the middle part is characterized by numerous superimposed massive or cross-laminated reddish sandy-gravelly channels. Towards the top of the section, a fining-upward tendency can be noticed, with predominant loose sandy-pebbly deposits and a series of thin silty-claystone interbeddings in the uppermost part. The dominant large-scale, broad and shallow channel bodies with sheet-like geometries observed in the middle section are commonly derived from braided stream deposits with repeated erosional events. The fining-upward trend observed in the upper part of the profile indicates a greater stratigraphic completeness, represented by progressive abandonment and lateral migration in a high-sinuosity and low-gradient fluvial channel system.

Unit: middle-upper part and type section of the *Sebeş* Fm.

Age: late Maastrichtian.

Fauna: vertebrate fossils are common through the whole section, and in the past decade, over 150 specimens have been collected. The vertebrate assemblage (TMS, IRMMS, FGGUB, UBBG) includes rare crocodyliforms (*Allodaposuchus*, cf. *Doratodon*), turtles (*Kallokibotion*),[78] middle-size and giant pterosaurs, and various dinosaurs, represented by titanosaur sauropods (possibly *Magyarosaurus* and another particular large-sized form),[79] ornithopods (*Zalmoxes*, *Telmatosaurus*), and possibly a medium sized theropod.[80] Taphonomic characteristics indicate scattered and transported (even abraded and moderately rounded) and weathered bone fragments/splinters (in channel-fill and channel-lag facies), as well as occasional autochthonous, more complete specimens, including fragile skeletal elements (in point-bar and overbank facies). The fossils have a white-pinkish, or more rarely a brownish or yellowish-brown colour, depending on the nature of the host rock and the timing of recent weathering that affects most of the exposed fossils.

[78] Vremir 2010.

[79] Codrea et al. 2008; Csiki, Vremir 2011.

[80] Grigorescu 1987; see also Jianu et al. 1997; Codrea, Vremir 1997; Codrea et al. 2003; Codrea, Dica 2005; Codrea et al. 2008; Codrea et al. 2010a; Codrea et al. 2010b. The presence of ankylosaurs at Râpa Roşie (Grigorescu 1987: a fragmentary humerus - FGGUB) was not confirmed (Z. Csiki-Sava, written comunication to M. Vremir in 2015).

16-18. Şard 1-3 (Sd/1-3); Sárd (h)
Localization: a series of outcrops situated south and south-east of Şard village exposes a more than 300 m thick section from the lower half of the Sebeş Formation. This is exposed near the bridge that crosses the Ampoi River (Sd/1), several hundred meters upstream along the river (Sd/2) and uphill on a small creek between the previous two locales (Sd/3).

Conservation: moderate river erosion cuts into the base of Sd/1, while Sd/2 and Sd/3 are progressively covered by slope deposits and vegetation.

Facies: mainly oblique or cross-laminated brownish-red sandstone (channel, point-bar) and coarse parallel-stratified conglomerate (coarse gravel bars), with subordinate and relic brick-red carbonatic paleosoils (overbank) or laminated purple-red micaceous siltstone-claystone interbeddings, related to a braided river depositional system.[81] Sd/3 exposes a bluish-spotted, purple-red silty-claystone unit, which is interpreted as a moderately drained proximal floodplain facies. *Unit*: lower third of the *Sebeş* Fm.

Age: Maastrichtian.[82]

Fauna: due to their dominantly coarse facies, these deposits are not conductive for fossil preservation. A small and fragmentary long-bone shaft was collected here in 1970 by the late Prof. Miklós Mészáros, from the base of Sd/1 site (UBBG), which was identified as the femur of a juvenile titanosaur sauropod (with a reconstructed length of ca. 15 cm). From Sd/2 an ornithopod dinosaur (*Zalmoxes*) femur shaft fragment (IRMMS) was collected. Sd/3 site yielded several vertebrate and invertebrate (snail) specimens, which currently are under study. In Sd/1-2, the fossil bones are yellowish-white or gray in colour and show many abrasion marks and syndepositional breaks, suggesting their parautochthonous nature.

19-23. Sebeş-Glod A-E (SbG/A-E); Szászsebes (h); Mühlbach, Rosenfeld (g); Melnbach (s)
Localization: a suite of riverbed outcrops (coded towards upstream as SbG/A-E), located 1.0 to 3.0 kilometers north of Sebeş town, downstream and along the Sebeş River. SbG/A is located in the Sebeş riverbed 100 m east and 200 m upstream from the local football-field of Lancrăm village. SbG/B, C and D are exposed close to each other upstream from the cattle farm of Lancrăm village, along the river and 200 to 300 m east from the Sibiu-Orăştie-Sebeş motorway junction, while SbG/E is located downstream from the railway bridge crossing the river to south-east direction.

Conservation: When discovered and first explored in 1998,[83] the outcrops were rather well exposed along the banks and often in the riverbed. In the recent years however, the red clay deposits have been mostly eroded away or covered by recent alluvium derived from the banks and from road construction works. Heavy

[81] Vremir 2001; Codrea et al. 2010a; Jipa 2012; Mariş 2012.
[82] Suciu-Kraus et al. 2006; Mariş 2012. The red continental formation was considered to be of the Paleogene age by I. Gherman and V. Ianovici et al. (Gherman 1943; Ianovici et al. 1976).
[83] Vremir 2001.

erosion cuts into the river banks in SbG/B, C and D sub-sites, whereas SbG/A and E are progressively covered by gravel.

Facies: each of the sub-sites are hosted by red overbank claystone and siltstone units (overbank-facies OF 1-5; numbered from down-section/upstream) with subordinate cross-laminated sandy-pebbly and conglomeratic channel sediment interbeddings, related to a high-sinuosity meandering river system.

Unit: the lower third of the *Sebeş* Fm.

Age: early Maastrichtian.

Fauna: In sub-site SbG/A (OF 1) the scarce vertebrate fossils are represented mainly by various well preserved dinosaur bones, including cranial, axial and appendicular elements, belonging to ornithopod (*Zalmoxes*, *Telmatosaurus*) and titanosaur sauropod (cf. *Magyarosaurus*) dinosaurs (UBBG, IRMMS). A few turtle shell elements were also collected, assigned to *Kallokibotion*. During the last decade a large number of vertebrate fossils have been found in sub-site SbG/B (OF 2). Most of these are fragmentary or isolated bones, some referable to dinosaurs *Zalmoxes*, *Telmatosaurus*, titanosaurs and velociraptorine theropods (*Balaur*), and others to turtles (*Kallokibotion*; dortokid), crocodyliforms, azhdarchid pterosaurs (*Eurazhdarcho*), anurans and a multituberculate mammal.[84] We note that the SbG/B sub-site represents the type locality of the velociraptorin theropod *Balaur bondoc*,[85] and of the medium sized azhdarchid pterosaur *Eurazhdarcho langendorfensis*.[86] The sedimentologic and taphonomic evidence suggests a generally attritional taphofacies of largely isolated and evenly distributed bone fragments. More complete specimens or partial skeletons are rare, and usually are grouped in paleo-depressions and crevasse splays functioning as "feeding spots". The bones suffered long-term prefossilization weathering, disarticulation (sometimes associated with scavenging activity) and subaerial biodegradation, including occasional insect-related surficial modifications.[87] Sub-sites SbG/C and D (OF 3 and 4) contain fewer vertebrate fossils, which occur mainly in lens-like accumulations, usually within silty-sandy crevasse splay deposits or minor sandy-pebbly channels. The faunal composition is similar to the other sub-sites, commonly with various dinosaurs (*Zalmoxes*, *Telmatosaurus*, titanosaurs), freshwater and semi-terrestrial turtles (dortokid, *Kallokibotion*), crocodyliforms (*Allodaposuchus*, cf. *Doratodon*) and various pterosaurs, including middle-sized and giant azhdarchids.[88] Some eggshell fragments (*geckonoid* type) and other microfossils were also recovered through screen-washing from a very rich bone-lens (SbG/D-L1), which also contains numerous plant remains. SbG/E (OF 5) sub-site is spatially more restricted, and the recovered fossils are represented by several ornithopod and sauropod dinosaur limb bones and vertebrae. In general, the Sebeş-*Glod*

[84] Ibid.; Codrea et al. 2009; Csiki et al. 2010.

[85] Csiki et al. 2010; Vremir 2010; Brusatte et al. 2013a; see also Cau et al. 2015.

[86] Vremir et al. 2013.

[87] Vremir 2009. Most insect-related bone modifications are produced by isopterans (termites) and possible coleopterans (Dermestidae?), pointing to long-term subaerial exposure, a low water table, a not densely vegetated environment, and relatively dry climatic conditions.

[88] Vremir et al. 2011. An evaluation and description of the SbG/C and D fossil assemblages is in progress.

vertebrate fossils (TMS, IRMMS, UBBG) are white or pinkish-gray, or rarely dark-brown in colour.

24. Secaş-Straco (SS)

Localization: was exposed on the top of a hill, along the Sebeş-Sibiu motorway construction site, ca. 2.5 to 3.0 km south-east from Sebeş town.

Conservation: the SS section of approximately haf a kilometer in length was exposed in 2012-2013 during the construction of the Sebeş-Sibiu motorway and is presently completely covered, thus not available for study any longer.

Facies: coarse channel deposits of a predominantly red colour, with subordinate silt-clay overbank interbeddings, reminiscent of those in the middle section of Râpa-Roşie (RR) section. In all older geological surveys, the sub-surface of SS area and the middle course of Secaş Valley were mapped as middle Miocene marine deposits.

Unit: *Sebeş* Fm.

Age: possibly late Maastrichtian.

Fauna: a single vertebrate fossil was collected from SS site (IRMMS) and represents the corpus of a mid-distal caudal vertebra (slightly dorso-ventrally compressed) referred to a titanosaurian dinosaur (possibly *Magyarosaurus*). The autochthonous fossil is well preserved (although the neural arch was broken off) and has a dark brownish-red colour.

25. Teleac (Tc); Telek (h)

Localization: the Tc ravine and torrent complex is located 1 km north of Teleac village, on the right side of and under the road to Totoi and Drâmbar villages, on the left bank of the Mureş River.

Conservation: the upper section exposed along several ravines is being progressively covered by vegetation, while the lower section, along and under the road, has been opened by small-scale landslides. The access road has also been affected by landslides. The base of the ravines was heavily eroded in 1970 by a major flood of the Mureş River.

Facies: the lithology is similar to that of Râpa Roşie and Râpa Lancrămului outcrops, showing numerous cross-bedded, coarse sandy-pebbly channel bodies and silty-claystone units in the basal section.

Unit: top of the *Sebeş* Fm.

Age: late Maastrichtian.

Fauna: The fossiliferous site was discovered in 1998, when the first fossils were found, and has been investigated occasionally since then. The fossil assemblage is represented by scarce and mostly fragmentary bones belonging to the stem turtle *Kallokibotion* (articulated peripheral plates - UBBG), the euornithopod *Zalmoxes* (tibia shaft - UBBG) and a relatively large titanosaur sauropod (anterior mid-caudal vertebra - IRMMS). Unidentified bone splinters or larger fragments are common mainly in the upper section of the exposure. The fossils are pale-brown or light-gray in colour and usually show signs of weathering. From a stratigraphic point of view, the Tc site can be correlated with Râpa Roşie

and Râpa Lancrămului sections and is situated ca. 150 m above the Hăpria section, located to the south-east.

26. Valea lui Mihai (VM); Mihály árka (h)
Localization: one kilometer west of Cîmpuţ village, on both hillsides and along the Mihaiului Valley.

Conservation: the small hill-slope outcrops are mostly covered by grass.

Facies: yellowish or gray sandy-pebbly channel fills and subordinate red-coloured calcareous claystone-siltstone overbank deposits. The site is correlative to the upper part of Valea Stăuinii and lower part of Dealul Cuptorului sections, and is situated ca. 50 to 100 m above the *Sebeş* Formation base.

Unit: base of the *Sebeş* Fm.

Age: early Maastrichtian.

Fauna: from the weathered surface of the hill-slope, a very small number of scattered and fragmentary vertebrate fossils and silicified wood fragments were collected (IRMMS). These indicate the presence of turtles and dinosaurs. Without more complete specimens, their precise identification is impossible. The colour of the fossils is light gray or pinkish-white and they display signs of advanced weathering.

27. Valea Stăuinii (VS); Kolcspatak (h); Valea Stoineloru, Valea Cheii (r).
Localization: one km long outcrop suite, exposed at the entrance and along the Stăuinii Valley, about 3 km north from Vurpăr and Vinţu de Jos localities.

Conservation: at present, most outcrops at the valley entrance area and valley flanks are covered by debris and vegetation. At the beginning of the 20th century, on the left bank of the vally entrance a sand-pit was functioning, which delivered the first vertebrate fossil.

Facies: red or brownish-red silty-claystone and sandstone layers are cropping out on the northern flank of the valley (overbank and minor channel deposits), followed upstream by yellowish and greenish-gray massive sandstone and conglomerate bodies (aggradational fan-delta), representing the local base of the *Sebeş* Fm. Following the valley upstream (down-section, due to the dip and strike of the stratigraphic succession), dark grey or pale yellowish-grey marl and sandstone units occur, with thin coaly-clay interbeddings (a brackish littoral/lagoonal facies), lying on top of neritic, fossiliferous marl-sandstone couplets, with occasional coarser interbeddings of turbidites, representing the top *Bozeş* Formation of the late Campanian age.[89] The *Bozeş*/*Sebeş* Fm. transitional stratigraphic section was studied in detail by various authors in the late 19th and beginning of the 20th century.[90]

Unit: topmost *Bozeş* Fm. and the lower section of the *Sebeş* Fm.

Age: late Campanian - early Maastrichtian.[91]

[89] Bălc, Zaharia 2013.
[90] Herepey 1896; Pálfy 1902; Nopcsa 1905; Telegdi-Roth 1906.
[91] Age constraints of the Bozeş Fm. after Bălc et al. 2007; Bălc et al. 2012 and Bălc, Zaharia 2013.

Fauna: very few vertebrate fossils were discovered: in the (now covered) sand-pit in which Herepey found parallel oriented incarbonised tree logs, including the trunk and several leaves of a *Sabal major* palm-tree,[92] a large crocodyliform tooth (possibly *Allodaposuchus*) was found in 1902 by Nopcsa (specimen impossible to relocate).[93] An unidentified long bone shaft and a fragmentary ornithopod ischium (referred to *Zalmoxes*)[94] were later found in the yellowish sandy-pebbly unit exposed at the valley entrance (IRMMS). A small and reworked unidentified turtle shell (IRMMS) was also found in the upper Campanian *Acteonella* (*Trochacteon*)- and *Inoceramus*-bearing turbiditic unit in the top *Bozeş* Formation, exposed on a creek in the right flank of the valley.[95] In the dark-coloured, coal-bearing brackish mudstone unit in the top-*Bozeş* Fm. (the "*Cerithium* strata" of Pálfy), unidentified small fish bones also occur. The macro-fossils are dark-brown or yellowish brown in colour and all of them show signs of rolling and abrasion marks, suggesting a long transport in a high-energy fluvial environment. In age and stratigraphic position, this poorly known assemblage is correlative to the latest Campanian and earliest Maastrichtian Petreşti-Arini fauna (PT).[96]

28. Vinerea (Vi); Felkenyér (h); Ober-Brodsdorf (g) Britsderf (s)

Localization: a suite of poorly investigated outcrops exposed more than 3 km in length along the right bank of Cugir Valley near Vinerea village, north from Cugir town.

Conservation: moderate river erosion progressively cuts into the outcrops, resulting in occasional rock-falls or minor landslides. The access to the main exposures is limited by the abrupt terrain and water depth.

Facies: cross-laminated sandy and pebbly channel-fill deposits with subordinate brick-red overbank claystone-siltstone interbeddings. Occasionally gray claystone-mudstone lenses and thin coal layers occur. In several places, and unconformably above the fluvial beds, transgrading middle Miocene (Badenian) marine deposits as well as Quaternary sandy gravels are exposed. Geological field investigations and coal prospecting along the Cugir Valley were performed at the end of the 19th and beginning of 20th century, and the red continental deposits were considered as Late Cretaceous in age.[97]

Unit: *Sebeş* Fm.

Age: Maastrichtian.

Fauna: occasional field prospecting revealed very similar sedimentary facies to those exposed along the Sebeş River in Petreşti, Sebeş-Glod and Oarda de Jos; nevertheless, the fossil content is extremely poor. Several smaller fossil bone fragments were recovered from both the channel fills and red overbank deposits,

[92] Staub 1889; Herepey 1896.
[93] Nopcsa 1905.
[94] Identified by Z. Csiki-Sava (verbal communication to M. Vremir in 2015).
[95] Vremir 2001; Vremir 2004.
[96] Vremir et al. 2014; Vremir et al. 2015.
[97] Primics 1891; Halaváts 1905. Later, in 1906, Gy. Halaváts reconsidered the age of the red continental strata cropping out between Şibot, Vinerea and Sebeş as Oligocene-early Miocene (Halaváts 1906).

but their taxonomic affinity remains uncertain. The bone fragments are white or brownish-red in colour and are usually are fragmented and weathered.

29-30. Vurpăr 1-2 (Vp1-2); Borberek (h); Burgberg (g) Burprich (s)
Localization: Vp1 is located about 700 m north from Vurpăr village and the local pub, on the left side along the rural road to Pâclişa and Alba Iulia. Vp2 is located on the hillslope above the northern end of the village, ca. 400 m south-west from Vp1.

Conservation: from a geomorphological point of view, the Vurpăr ravines (Vp1) were formed before the 18th century and were active until ca. 1860, being eroded by a wide meander of the Mureş River (later artificially diverted). Subsequent remodeling due to landsliding took place in 1970, after a major flood. In the past 10 years, large surfaces were covered by vegetation and slope deposits. Being located on a private estate since 2012, Vp1 is functioning as paleontological conservation site (as the type locality of the euornithopod dinosaur *Zalmoxes shqiperorum*), which is constantly monitored, and where only surface fossil collecting is permitted. The Vp2 site is represented by a suite of small exposures opened by recent landslides, and is located in another private land (a vineyard). Presently, most of the exposures are covered by vegetation and recent slope deposits.

Facies: the ca. 70 m thick stratigraphic section is dominated by pedogenetically modified red and brownish calcareous claystone/mudstone units, interrupted by laterally extensive brownish-gray or greenish-gray cross-laminated sandstone sheets. The section is interpreted as a floodplain-dominated meandering fluvial system. A more detailed description and interpretation is given in several other publications.[98]

Unit: base of the *Sebeş* Fm.

Age: early Maastrichtian.

Fauna: the first vertebrate fossils (associated lower jaw, scapula, sacrum, ilium, ischium and femur; NHMUK) were collected by Ferenc Nopcsa in 1902, and were allocated to the genus "Mochlodon."[99] Recently, this specimen was defined as the holotype of the euornithopod *Zalmoxes shqiperorum*.[100] Other fossils were occasionally collected in the 1960-70s by Prof. Miklós Mészáros and his student Rolf Speck, and then a decade later by Prof. Dan Grigorescu.[101] These are represented by a rib and a proximal femur referable to *Zalmoxes* (UBBG) and some other fragmentary bones (FGGUB). More intensive field-prospecting started in 1997, and since then several hundred fossil specimens have been collected and identified (UBBG, TMS, IRMMS). The local faunal composition is relatively poor: it includes rare basal eusuchian crocodyliforms (*Allodaposuchus*),[102] semi-terrestrial and freshwater turtles (*Kallokibotion* and the pan-pleurodiran dortokid

[98] Therrien et al. 2002; Codrea et al. 2001; Codrea et al. 2003; Codrea et al. 2010a; Codrea et al. 2010b; Therrien 2005.
[99] Nopcsa 1905; Grigorescu 1987.
[100] Weishampel et al. 2003.
[101] M. Mészáros verbal communication to M. Vremir (1999); Grigorescu 1987; Grigorescu 1992.
[102] Vremir 2001.

"Muelbachia"),[103] as well as numerous dinosaur fossils, represented mainly by scattered elements, but also by several partial skeletons belonging to ornithopod (*Zalmoxes*) and nodosaurid (possibly *Struthiosaurus*) dinosaurs.[104] From this site, a partial skeleton of a small-sized theropod dinosaur was mentioned,[105] which, however, was never published, figured or subsequently referred in the literature (we suspect a possible case of misidentification). The fossils are light gray, bluish-white or yellowish-brown in colour and present various stages of weathering, frequent cracking, predepositional breaks and occasional puncture marks, as well as diverse insect-related traces.[106] The fossil distribution is uneven, the bones being more frequent in certain layers of the pedogenised overbank deposits. At least six more or less articulated partial skeletons were recovered from three distinct layers[107]: these belong to young and adult *Zalmoxes* individuals (five specimens - including the *Z. shqiperorum* type specimen) as well as to a young/subadult nodosaurid.[108] Most of these skeletons were partially dispersed by scavengers (based on some associated shed teeth, probably by the basal eusuchian *Allodaposuchus*), and subaerially exposed for various periods of time.

Repertoire of the Late Cretaceous Vertebrate Localities from Sebeş Area, Alba County (Romania)

(Abstract)

In the present paper, we review the actual status, stratigraphic position, relative age, lithology and fossil content of thirty Late Cretaceous vertebrate-bearing continental localities of the Sebeş area (SW Transylvanian Basin, Romania; see **table 1**). Vertebrate assemblages are recorded in the Late (possibly latest) Campanian Bozeş Formation (2 sites), from the lower Maastrichtian (8 sites) and the "middle"-upper Maastrichtian (20 sites) of the Sebeş Formation. Vertebrate fossils (bones, eggs, footprints), although not abundant, are widespread throughout the whole thickness (over 1,000 m) of the Late Cretaceous continental succession. The Late Campanian and Maastrichtian vertebrate fauna succession comprises a variety of fish, anurans, lizards, pterosaurs, crocodylimorphs, turtles, dinosaurs, birds and multituberculate mammals. Their geographic and stratigraphic distribution is given in **table 1**. The best dated sites are localized in the base of the continental succession (Petreşti-Arini and Stăuinii Valley sites) and represent the Late Campanian and lowermost Maastrichtian interval. Most of the remaining sites, are stratigraphically localized based on their relative position to each other (considering the depositional setting, thickness, stratigraphic completeness and presumed sedimentation rates), yet lacking any precise age determination. The youngest occurrences are considered to represent the Late Maastrichtian (MI6, Bărăbanţ and perheps Teleac), because of their very high position in the stratigraphic succession, close to the formation top (more than 1,000 m above the formation base).

Bibliographical Abbreviations

Antonescu 1973 - E. Antonescu, *Asociaţii palinologice caracteristice unor formaţiuni cretacice din Munţii Metaliferi*, in *Dări de seamă*, LIX, 1973, 3, p. 115-169.

[103] Vremir 2004; Vremir, Codrea 2009; Vremir, Rabi 2011; Rabi et al. 2013.
[104] Vremir 2001; Weishampel et al. 2003; Therrien 2005; Codrea et al. 2010a, Codrea et al. 2010b; Brusatte et al. 2013; Ösi et al. 2014.
[105] Therrien et al. 2002.
[106] Vremir 2009; Jipa 2012.
[107] The precise localisation of the *Z. shqiperorum* type material found by Nopcsa is unknown.
[108] Vremir 2001; Codrea et al. 2010a; Brusatte et al. 2013; Ösi et al. 2014.

Balintoni 2003 - I. Balintoni, *Towards an Improved Model of the Laramian Transylvanides*, in *StudiaUBBG*, Special Issue, 2003, p. 13-20.

Barta et al. 2015 - Daniel E. Barta, Akinobu Watanabe, Mátyás Vremir, Radu Totoianu, Mark A. Norell, *The First Dinosaur Eggs from a New Vertebrate Locality in the Upper Cretaceous Sebeș Formation, Romania*, in *3rd International Symposium on Paleohistology*, Bonn, 2-5 July 2015, program and abstract, p. 30.

Bălc, Zaharia 2013 - Ramona Bălc, Luminița Zaharia, *Sedimentary Deposition of Bozeș Formation (Apuseni Mts., Romania) - Detrital Zircon Dating and Micropaleontological Ages*, in *StudiaUBBG*, 58, 2013, 2, p. 29-40.

Bălc et al. 2007 - Ramona Bălc, Erica Suciu-Krausz, Florin Borbei, *Biostratigraphy of the Cretaceous Deposits in the Western Transylvanides from Ampoi Valley (Southern Apuseni Mountains, Romania)*, in *StudiaUBBG*, 52, 2007, 2, p. 37-43.

Bălc et al. 2012 - Ramona Bălc, Lóránd Silye, Luminița Zaharia, *Calcareous Nannofossils and Sedimentary Facies in the Upper Cretaceous Bozeș Formation (Southern Apuseni Mountains, Romania)*, in *StudiaUBBG*, 57, 2012, 1, p. 23-32.

Băluță 1972 - C. Băluță, *Stratigrafia și microfauna Eocenului superior de la est de Șard, jud. Alba*, in *StudiaUBBGM*, 1, 1972, p. 73-79.

Băluță 1987 - C. Băluță, *Contributions biostratigraphiques concernant le Priabonien et le ruppelien basal situés au Nord d'Alba Iulia*, in I. Petrescu, L. Ghergari, N. Mészáros, E. Nicorici (eds), *The Eocene from the Transylvanian Basin*, Cluj-Napoca, 1987, p. 183-187.

Benton et al. 2010 - Michael J. Benton, Zoltán Csiki, Dan Grigorescu, Ragna Redelstorff, Martin Sander, Koen Stein, David B. Weishampel, *Dinosaurs and the Island Rule: The Dwarfed Dinosaurs from Hațeg Island*, in *PPP*, 293, 2010, 3, p. 438-454.

Brusatte et al. 2013a - Stephen L. Brusatte, Mátyás Vremir, Zoltán Csiki-Sava, Alan H. Turner, Akinobu Watanabe, Gregory M. Erickson, Mark A. Norell, *The Osteology of Balaur Bondoc, an Island-Dwelling Dromaeosaurid (Dinosauria, Theropoda) from the Late Cretaceous of Romania*, in *BAMNH*, 374, 2013, p. 3-100.

Brusatte et al. 2013b - Stephen L. Brusatte, Mátyás Vremir, Akinobu Watanabe, Zoltán Csiki-Sava, Darren Naish, Gareth Dyke, Gregory M. Erickson, Mark A. Norell, *An Infant Ornithopod Dinosaur Tibia from the Late Cretaceous of Sebeș, Romania*, in *Terra Sebus*, 5, 2013, p. 627-644.

Cau et al. 2015 - A. Cau, T. Brougham, D. Naish, *The Phylogenetic Affinities of the Bizarre Late Cretaceous Romanian Theropod Balaur Bondoc (Dinosauria, Maniraptora): Dromaeosaurid or Flightless Bird?*, in PeerJ. DOI 10.7717/peerj.1032, p. 1-36.

Codrea, Dica 2005 - Vlad Codrea, Emanuel Paul Dica, *Upper Cretaceous - Lowermost Miocene Lithostratigraphic Units Exposed in Alba Iulia - Sebeș - Vințu de Jos Area (SW Transylvanian Basin)*, in *StudiaUBBG*, 50, 2005, 1-2, p. 19-26.

Codrea, Mărginean 2007 - Vlad Codrea, Ramona Mărginean, *A Catalogue of Fossil Vertebrates from Aiud Natural Sciences Museum*, in *OlteniaŞtNat*, XXIII, 2007, p. 177-186.

Codrea, Vremir 1997 - V. Codrea, M. Vremir, *Kallokibotion bajazidi Nopcsa (Testudines, Kallokibotidae) in the Red Strata of Râpa Roșie (Alba County)*, in *Sargetia Naturae*, XVII, 1997, p. 233-238.

Codrea et al. 2001 - V. Codrea, Al. Hosu, S. Filipescu, M. Vremir, P. Dica, E. Săsăran, I. Tanțău, *Aspecte ale sedimentației cretacic superioare din aria Alba-Iulia - Sebeș (jud. Alba)*, in *SCGG*, 6, 2001, p. 63-68.

Codrea et al. 2003 - V. Codrea, P. Dica, C. Fărcaș, O. Barbu, *Late Cretaceous-Early Miocene Formations from Alba Iulia - Sebeș Area (Transylvanian Depression, Alba District)*, in *OlteniaŞtNat*, XIX, 2003, p. 22-27.

Codrea et al. 2008	- Vlad Codrea, Cătălin Murzea-Jipa, Márton Venczel, *A Sauropod Vertebra at Râpa Roşie (Alba District)*, in *APR*, 6, 2008, p. 43-48.
Codrea et al. 2010a	- Vlad Codrea, Mátyás Vremir, Cătălin Jipa, Pascal Godefroit, Zoltán Csiki, Thierry Smith, Cristina Fărcaş, *More than Just Nopcsa's Transylvanian Dinosaurs: A Look Outside the Haţeg Basin*, in *PPP*, 293, 2009, 3, p. 391-405.
Codrea et al. 2010b	- V. Codrea, O. Barbu, C. Jipa-Murzea, *Upper Cretaceous (Maastrichtian) Land Vertebrate Diversity in Alba District (Romania)*, in *BGSG*, XLIII, 2010, 2, p. 594-601.
Codrea et al. 2014	- V. Codrea, A. Solomon, M. Venczel, T. Smith, *A New Kogaionid Multituberculate Mammal from the Maastrichtian of the Transylvanian Basin, Romania*, in *CRP*, 13, 2014, p. 489-499.
Csiki, Benton 2010	- Zoltan Csiki, Michael J. Benton, *An Island of Dwarfs - Reconstructing the Late Cretaceous Haţeg Paleoecosystem*, in *PPP*, 293, 2010, p. 265-270.
Csiki, Vremir 2011	- Zoltán Csiki, Mátyás Vremir, *A Large Sized (?) Late Maastrichtian Titanosaur from Râpa Roşie, Sebeş*, in *The 8th Romanian Symposium on Paleontology*, Bucharest, 29-30 September 2011, abstract, p. 28-29.
Csiki et al. 2010	- Zoltán Csiki, Mátyás Vremir, Stephen Brusatte, Mark A. Norell, *An Aberrant Island-Dwelling Theropod Dinosaur from the Late Cretaceous of Romania*, in *PNAUSA*, 107, 2010, 35, p. 15357-15361.
Csiki-Sava et al. 2012	- Zoltán Csiki-Sava, Ramona Bălc, Stephen L. Brusatte, Gareth Dyke, Darren Naish, Mark A. Norell, Mátyás Vremir, *Petreşti-Arini (Transylvanian Basin, Romania) - A Very Important but Ephemeral Late Cretaceous (Early Maastrichtian) Vertebrate Site*, in Rafael Royo-Torres, Francisco Gascó, Luis Alcalá (eds), *10th Annual Meeting of the European Association of Vertebrate Palaeontologists*, Teruel, 19-24 June 2012, p. 53-55.
Csiki-Sava et al. 2015	- Zoltán Csiki-Sava, Eric Buffetaut, Attila Ősi, Xabier Pereda-Suberbiola, Stephen L. Brusatte, *Island Life in the Cretaceous - Faunal Composition, Biogeography, Evolution, and Extinction of Land-Living Vertebrates on the Late Cretaceous European Archipelago*, in *ZooKeys*, 469, 2015, p. 1-161.
Csiki-Sava et al. 2016	- Zoltán Csiki-Sava, Mátyás Vremir, Ştefan Vasile, Stephen L. Brusatte, Gareth J. Dyke, Darren Naish, Mark A. Norell, Radu Totoianu, *The East Side Story - The Transylvanian Latest Cretaceous Continental Vertebrate Record and Its Implications for Understanding Cretaceous-Paleogene Boundary Events*, in *CretaceousRes*, 57, 2016, p. 662-698.
Csontos, Vörös 2004	- László Csontos, Attila Vörös, *Mesozoic Plate Tectonic Reconstruction of the Carpathian Region*, in *PPP*, 210, 2004, 1, p. 1-56.
Delfino et al. 2008	- Massimo Delfino, Vlad Codrea, Annelise Folie, Paul Dica, Pascal Godefroit, Thierry Smith, *A Complete Skull of Allodaposuchus Precedens Nopcsa, 1928 (Eusuchia) and a Reassessment of the Morphology of the Taxon Based on the Romanian Remains*, in *JVP*, 28, 2008, 1, p. 111-122.
Dyke et al. 2012	- Gareth Dyke, Mátyás Vremir, Garry Kaiser, Darren Naish, *A Drowned Mesozoic Bird Breeding Colony from the Late Cretaceous of Transylvania*, in *Naturwissenschaften*, 99, 2012, 6, p. 435-442.
Gherman 1943	- I. Gherman, *Cercetări geologice în colţul de SW al Depresiunii Transilvaniei (între Valea Stremţului şi Valea Ampoiului)*, in *RMMG*, VII (1-2), 1943, p. 1-110.
Givulescu et al. 1995	- R. Givulescu, V. Codrea, M. Vremir, *A New Contribution to Knowledge of Romanian Fossil Flora*, in *ActaPal*, 35, 1995, 2, p. 233-236.
Grellet-Tinner, Codrea 2014	- Gerald Grellet-Tinner, Vlad A. Codrea, *Thalassodromeus Sebesensis, an Out of Place and Out of Time Gondwanan Tapejarid Pterosaur*, in *GR*, 27, 2014, 4, p. 1673-1679.

Grigorescu 1987 - D. Grigorescu, *Considerations on the Age of the "Red Beds" Continental Formations in SW Transylvanian Depression*, in I. Petrescu, L. Ghergari, N. Mészáros, E. Nicorici (eds), *The Eocene from the Transylvanian Basin*, Cluj-Napoca, 1987, p. 189-196.

Grigorescu 1992 - D. Grigorescu, *Nonmarine Cretaceous Formations of Romania*, in Niall J. Mater, Chen Pei-ji (eds), *Aspects of Nonmarine Cretaceous Geology*, Beijing, 1992, p. 142-164.

Halaváts 1905 - Gy. Halaváts, *Kudzsir, Csóra, Felsöpian környékének földtani alkotása*, in *A Magyar királyi Földtani Intézet Évi Jelentése, 1904-röl*, Budapest, 1905, p. 109-120.

Halaváts 1906 - Gy. Halaváts, *Szászsebes környékének földtani alkotása*, in *A Magyar királyi Földani Intezet Évi Jelentése, 1905-röl*, Budapest 1906, p. 70-83.

Herepey 1865 - K. Herepey, *Geológiai és paleontológiai magismertetése Erdély azon részének, mely a keleti hossz. 41-41/3 északi szélesség 46-46, 34 fokai között fekszik*, in *Magyar Orvosok és Természet vizsgálók Maros-Vásárhelyt tartott nagyűlésének munkálatai*, vol. X, Pest 1865.

Herepey 1896 - K. Herepey, *Alsófehér vármegye földtani leirása* in Herepey K., Gáspár I., *Alsófehér vármegye monográfiája*, vol. 1, pars. 5, Nagy Enyed, 1896, p. 115-175.

Hosu 1999 - Alexandru Hosu, *Arhitectura sedimentaţiei depozitelor eocene din nord-vestul Depresiunii Transilvaniei*, Cluj-Napoca, 1999.

Ianovici et al. 1976 - V. Ianovici, M. Borcoş, M. Bleahu, D. Patrulius, M. Lupu, R. Dimitrescu, H. Savu, *Geologia Munţilor Apuseni*, Bucharest, 1976.

Jianu et al. 1997 - C. M. Jianu, N. Mészíros, V. Codrea, *A New Collection of Haţeg and Râpa Roşie Material (Dinosauria, Crocodilia, Chelonia) in the Cluj-Napoca University*, in *Sargetia*, 17, 1997, p. 219-232.

Jipa 2012 - C. Jipa, *Upper Cretaceous Continental Vertebrate Assemblages from Metaliferi Sedimentary Area: Systematics, Paleoecology and Paleobiogeography*, PhD thesis, "Babeş Bolyai" University of Cluj-Napoca, Romania, 2012.

Koch 1894 - A. Koch, *Die Tertiärbildungen des Beckens der Siebenbürgischen Landestheile. I. Paläogene Abtheilung*, in *Mitteilungen aus den Jahrbuch der Kön. Ungarische Geologischen Anstalt*, X, Budapest, 1894, 6, p. 177-399.

Krézsek, Bally 2006 - Csaba Krézsek, Albert W. Bally, *The Transylvanian Basin (Romania) and Its Relation to the Carpathian Fold and Thrust Belt: Insights in Gravitational Salt Tectonics*, in *MPG*, 23, 2006, 4, p. 405-442.

Krézsek et al. 2010 - Cs. Krézsek, S. Filipescu, L. Silye, L. Maţenco, H. Doust, *Miocene Facies Associations and Sedimentary Evolution of the Southern Transylvanian Basin (Romania): Implications for Hydrocarbon Exploration*, in *MPG*, 27, 2010, p. 191-214.

Lóczy 1913 - L. Lóczy, *Direktionsbericht für jahre 1912*, in *Jahresbericht der Ungarisches Geologisches Anstalt*, Budapest, 1913, p. 9-27.

Marinescu et al. 1998 - Fl. Marinescu, M. Mărunţeanu, I. Papaianopol, Gh. Popescu, *Tables with the Correlation of the Neogene Deposits in Romania*, in *RJS*, 78, 1998, p. 181-186.

Marincaş 1965 - Valeria Marincaş, *Studii geologice în regiunea Sebeş - Cîlnic - Săsciori-Răchita - Pianu de Sus - Cioara cu privire specială asupra depozitelor cretacice*, PhD thesis, University of Bucharest, 1965.

Marincaş 1966 - Valeria Marincaş, *Revizuirea acteonelelor din regiunea Sebeş*, in *StudiaUBBGG*, 11, 1966, 1, p. 21-31.

Marincaş 1973 - V. Marincaş, *Vârsta stratelor de Bozeş*, in *StudiaUBBGG*, 18, 1973, p. 39-46.

Mariş 2012 - Izabela Mariş, *The Sedimentology of the Upper Cretaceous Continental Deposits from the South-Western Part of the Transylvanian Basin, the Şard Formation*, in *Geo-Eco-Marina*, 18, 2012, p. 35-44.

Moisescu, Mészáros 1995 - V. Moisescu, N. Mészáros, *Contributions to the Knowledge of the*

Molluscan and Echinoid Faunas from the Ighiu Beds in the Bilag Hill (Alba Iulia, SW Transylvania), in *RJP*, 76, 1995, p. 43-46.

Nopcsa 1905 - F. Nopcsa, *A Gyulafehérvár, Déva, Ruszkabánya és a Romániai határ közé eső vidék geológiája*, in *A magyar Királyi földtáni Intézet Évkonyve*, XIV, Budapest, 1905, p. 82-254.

Ösi et al. 2014 - Attila Ösi, Vlad Codrea, Edina Prondvai, Zoltán Csiki-Sava, *New Ankylosaurian Material from the Upper Cretaceous of Transylvania*, in *AP*, 100, 2014, 3, p. 257-271.

Pálfy 1902 - M. Pálfy, *Die oberen Kreideschichten in der Umgebung von Alvincz*, in *Mitteilungen aus dem Jahrbuche der Königliche Ungarischen Geologischen Anstalt*, XXIII, Budapest, 1902, 6, p. 243-348.

Primics 1891 - Gy. Primics *A köszén elöfordulása Kudzsir-Felkenyér környékén*, in *Erdélyi Múzeum*, 1891, p. 133-136.

Rabi et al. 2013 - Márton Rabi, Mátyás Vremir, Haiyan Tong, *Preliminary Overview of Late Cretaceous Turtle Diversity in Eastern Central Europe (Austria, Hungary, and Romania)*, in Donald B. Brinkman, Patricia A. Holroyd, James D. Gardner (eds), *Morphology and Evolution of Turtles: Proceedings of the Gaffney Turtle Symposium (2009) in Honor of Eugene S. Gaffney*, Springer, Dordrecht, Heidelberg, New York, London, 2013, p. 307-336.

Staub 1889 - M. Staub, *Sabal major Unger a Maros völgyéből*, in *FK*, 19, 1889, p. 258-264.

Suciu-Kraus et al. 2006 - Erika Suciu-Krausz, Ramona Bălc, Florin Borbei, *New Data on the Western Transylvanides along Ampoi Valley (Southern Apuseni Mountains, Romania)*, in *StudiaUBBG*, 51, 2006, 1-2, p. 55-60.

Szabó, Szabó 1992 - Attila M. Szabó, Erszébet M. Szabó, *Dicţionar de localităţi din Transilvania*, Cluj-Napoca, 1992.

Şuraru, Băluţă 1983 - N. Şuraru, C. Băluţă, *Contribuţii la cunoaşterea Acvitanianului din Dealul Bilag la nord de Bărăbanţ (jud. Alba)*, in *StudiaUBBGG*, 28, 1983, p. 36-48.

Társulati ügyek 1909 - *Társulati ügyek*, in *FK*, 39, 1909, 1-2, p. 57-58.

Téglás 1886 - G. Téglás, *Ujabb adatok az erdélyi medence ösemlőseihez*, in *FK*, 16, 1886, p. 39-44.

Telegdi-Roth 1905 - L. Telegdi-Roth *Az Erdélyrészi Érczhegység K-i széle Sárd, Metesd, Ompoly, Preszáka, Rakató és Gyulafehérvár Környékén*, in *A Magyar kiralyi Földani Intezet Évi Jelentése, 1904-röl*, Budapest, 1905, p. 92-108.

Telegdi-Roth 1906 - L. Telegdi-Roth, *Az Erdélyrészi Érczhegység K-iszéle Poklos, Borberek, Karna kornyekén es a csatlakozó Maros balparti dombvidék*, in *A Magyar Kiralyi Földani Intézet Évi Jelentése, 1905-röl*, Budapest, 1906, p. 68-69.

Therrien 2005 - François Therrien, *Palaeoenvironments of the Latest Cretaceous (Maastrichtian) Dinosaurs of Romania: Insights from Fluvial Deposits and Paleosols of the Transylvanian and Haţeg Basins*, in *PPP*, 218, 2005, 1-2, p. 15-56.

Therrien et al. 2002 - F. Therrien, C. M. Jianu, B. Scarlat, D. B. Weishampel, J. W. King, *Palaeoenvironmental Reconstruction of Latest Cretaceous Dinosaur-Bearing Formations of Romania: Preliminary Results*, in *Sargetia Naturae*, XIX, 2002, p. 33-59.

Vremir 2001 - Mátyás Vremir, *Paleontologia, paleoecologia şi tafonomia macrovertebratelor Cretacice superioare din zona Alba Iulia - Sebeş (Depresiunea Transilvaniei)*, MSc thesis, "Babeş-Bolyai" University of Cluj-Napoca, 2001.

Vremir 2004 - Mátyás Vremir, *Fossil Turtle Found in Romania - Overview*, in *A Magyar Földtani Intézet Évi Jelentése a 2002 évre*, Budapest, 2004, p. 143-152.

Vremir 2009 - Mátyás Vremir, *Insect Related Traces Associated to the Maastrichtian Vertebrate Assemblages of Alba-Iulia and Haţeg Areas (Romania)*, in *The 7th International Symposium of Paleontology*, abstract volume, Cluj-Napoca, 2009, p. 122-124.

Vremir 2010 - Mátyás Vremir, *New Faunal Elements from the Late Cretaceous (Maastrichtian) Continental Deposits of Sebeș Area (Transylvania)*, in *Terra Sebus*, 2, 2010, p. 635-684.

Vremir, Codrea 2002 - Mátyás Vremir, Vlad A. Codrea, *The First Late Cretaceous (Maastrichtian) Dinosaur Footprints from Transylvania (Romania)*, in *StudiaUBBG*, 47, 2002, 2, p. 27-36.

Vremir, Codrea 2009 - M. Vremir, V. Codrea, *Late Cretaceous Turtle Diversity in Transylvanian and Hațeg Basins (Romania)*, in *The 7th International Symposium of Paleontology*, abstract volume, Cluj-Napoca, 2009, p. 122-124.

Vremir, Rabi 2011 - M. M. Vremir, M. Rabi, *Primitive Pleurodiran Turtles (Dortokidae) in the Late Cretaceous-Early Paleogene of Central-East Europe*, in Zoltán Csiki (ed.), *The 8th Romanian Symposium of Paleontology*, abstract volume, Bucharest, 29-30 September 2011, p. 133-134.

Vremir et al. 2009 - M. Vremir, D. M. Unwin, V. Codrea, *A Giant Azhdarchid (Reptilia, Pterosauria) and Other Upper Cretaceous Reptiles from Râpa Roșie - Sebeș (Transylvanian Basin, Romania) with a Reassessment of the Age of the "Sebeș Formation"*, in *The 7th International Symposium of Paleontology*, abstract volume, Cluj-Napoca, 2009, p. 125-128.

Vremir et al. 2011 - M. Vremir, G. Dyke, Z. Csiki, *Late Cretaceous Pterosaurian Diversity in the Transylvanian and Hațeg Basins (Romania): New Results*, in Zoltán Csiki (ed.), *The 8th Romanian Symposium on Palaeontology*, abstract volume, Bucharest, 29-30 September 2011, p. 131-132.

Vremir et al. 2013 - Mátyás Vremir, Alexander W. A. Kellner, Darren Naish, Gareth J. Dyke, *A New Azhdarchid Pterosaur from the Late Cretaceous of the Transylvanian Basin, Romania: Implications for Azhdarchid Diversity and Distribution*, in *PLOS ONE*, 8, 2013, 1, p. 1-15.

Vremir et al. 2014 - Mátyás Vremir, Ramona Bălc, Zoltán Csiki-Sava, Stephen L. Brusatte, Gareth Dyke, Darren Naish, Mark A. Norell, *Petreşti-Arini - An Important but Ephemeral Upper Cretaceous Continental Vertebrate Site in the Southwestern Transylvanian Basin, Romania*, in *CretaceousRes*, 49, 2014, p. 13-38.

Vremir et al. 2015 - M. Vremir, S. Vasile, R. Totoianu, G. Dyke, Z. Csiki-Sava, *Never Say Never - New Additions to the Composition of the Oldest Latest Cretaceous Continental Vertebrate Assemblage in Transylvania, Western Romania*, in *The 13th Annual Meeting of EAVP*, abstract volume, Opole, 8-12 July 2015, p. 73.

Weishampel et al. 2003 - David B. Weishampel, Coralia-Maria Jianu, Zoltán Csiki, David B. Norman, *Osteology and Phylogeny of Zalmoxes (n.g.), an Unusual Euornithopod Dinosaur from the Latest Cretaceous of Romania*, in *JSP*, 1, 2003, 2, p. 65-123.

Institutional Acronyms

AiM - "Bethlen Gábor" Natural History Museum, Aiud, Romania.
FGGUB - Faculty of Geology and Geophysics, University of Bucharest, Romania.
IRMMS - "Ioan Raica" Municipal Museum, Sebeș, Romania.
MDRC - Museum of Dacian and Roman Civilisation, Deva, Romania.
NHMUK - Natural History Museum, London, UK.
TMS - Transylvanian Museum Society, Cluj-Napoca, Romania.
UBBG - Faculty of Biology and Geology, "Babeș-Bolyai" University, Cluj-Napoca, Romania.

Keywords: vertebrate paleontology, Late Cretaceous, repertoire, Sebeș area, Romania.

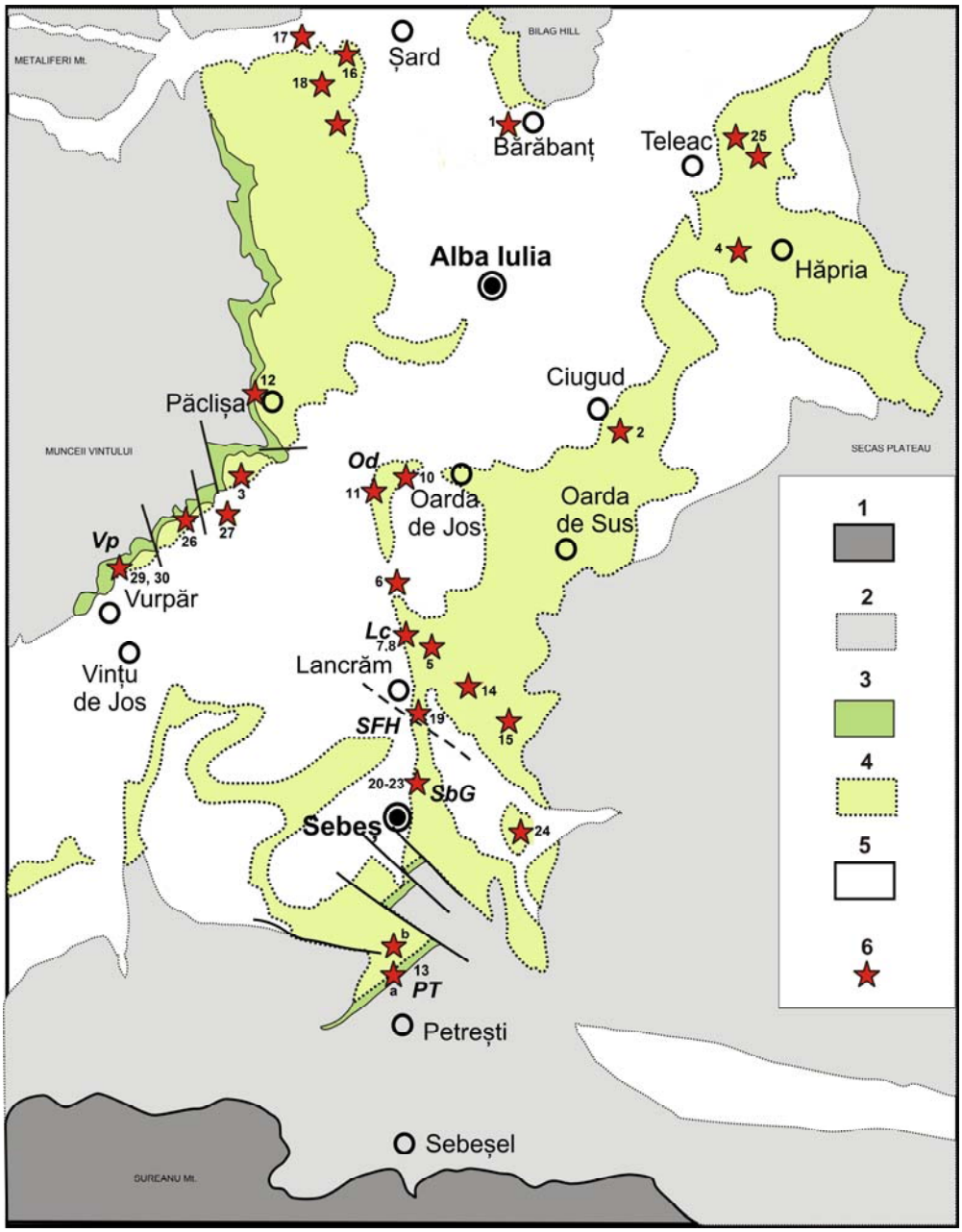

Fig. 1. Simplified geological map of the Sebeş region (Romania), showing the Late Cretaceous vertebrate-bearing localities listed in the present repertoire (after Csiki-Sava et al. 2016 - modified). Legend: 1 - crystalline basement; 2 - sedimentary cover of the Transylvanian Basin; 3 - uppermost Campanian-lowermost Maastrichtian transitional-continental deposits; 4 - Maastrichtian continental deposits; 5 - Quaternary terraces and alluvia; 6 - fossil sites, numbered according to the text.

SITE CODING	PT0	PT1	VS	VM	VP	Dc	Pc	Sd	SbG	Lc	Od	DF	Vi	SS	RR	RL	Cd	Hp	Tc	MI6	Bd
fish	X		X							X	X										
anurans	X	X							X		X										
lizards	X										X										
Crocodyliformes	X		X						X		X									X	
Doratodon	X								?		X				X						
Acynodon	X										?										
Theriosuchus?	X																				
Allodaposuchus	?				X				X	X	X				X						
Dortokidae		X			X	X			X		X	X			?						
Kallokibotion	X				X	X			X	X	X	X			X	X			X	X	
Chelonii indet.	X		X	X		X				X		X			X	X				X	
Azhdarchidae	X	?							X		X				X					X	
Hatzegopteryx?									X						X						
Eurazhdarcho									X												
Dinosauria indet.	X	X	X	X		X	X	X	X			X	X		X	X		X	X	X	
Zalmoxes	X	X	X		X	X		?	X	X	X	X			X	X		?	X	X	
Telmatosaurus									X	X	X	X			X					X	
Titanosauria								X	X	X	X	X		X	X	X	X		X	X	X
Magyarosaurus?									X	X	X				X						
Nodosauridae	X				X	X					?										
Theropoda indet.	X										X				X						
Velociraptorinae											X										
Balaur									X												
Enantiornithes											X										
Multituberculata	X	X							X		X										
eggs											X									X	
eggshells	X								X		X									X	
footprints						X				X										?	
AGE	Cmp2	Ma1	Cmp2 Ma1	Ma1	Ma1	Ma1	Ma1	Ma1	Ma1-Ma2	Ma1-Ma2	Ma2	Ma2	Ma	Ma2	Ma2	Ma2	Ma2	Ma2	Ma2	Ma2	Ma2

Table 1. Stratigraphic and geographic distribution of the Late Cretaceous vertebrates in Sebeş region, south-western Transylvanian Basin (Romania). Cmp2 = upper Campanian; Ma1 = lower Maastrichtian; Ma2 = upper Maastrichtian

LISTA ABREVIERILOR

AAR-SI	- Analele Academiei Române. Memoriile Secţiunii Istorice. Academia Română. Bucureşti.
AAust	- Archaeologia Austriaca, Beiträge zur Paläanthropologie, Ur- und Frühgeschichte Österreichs. Wien.
AB	- Altarul Banatului. Arhiepiscopia Timişoarei şi Caransebeşului şi Episcopia Aradului. Timişoara.
ActaArchCarp	- Acta Archaeologica Carpathica. Cracovia.
ActaArchHung	- Acta Archaeologica. Academiae Scientiarum Hungaricae. Budapest.
ActaMN	- Acta Musei Napocensis. Cluj-Napoca.
ActaMP	- Acta Musei Porolissensis. Muzeul Judeţean de Istorie şi Artă Zalău.
ActaPal	- Acta Paleobotanica. Polish Academy of Sciences. Krakow.
AÉ	- Archaeologiai Értesitö a Magyar régészeti, müvésytörténeti és éremtani társulat tudományos folyóirata. Budapest.
AHA	- Acta Historiae Artium. Akadémiai Kiadó. Budapest.
AIIC(N)	- Anuarul Institutului de Istorie „George Bariţ". Cluj-Napoca.
AIIAC	- Anuarul Institutului de Istorie şi Arheologie Cluj. Cluj-Napoca (din 1990 Anuarul Institutului de Istorie „George Bariţ").
AIIAI/AIIX	- Anuarul Institutului de Istorie şi Arheologie „A. D. Xenopol" Iaşi. (din 1990 Anuarul Institutului de Istorie „A. D. Xenopol" Iaşi).
AISC	- Anuarul Institutului de Studii Clasice. Cluj.
AJA	- American Journal of Archaeology. New York.
AJPA	- American Journal of Physical Anthropology. The Official Journal of the American Association of Physical Anthropologist. Baltimore.
Almanahul graficei române	- Almanahul graficei române. Craiova.
Aluta	- Aluta. (Studii şi comunicări - Tanulmányok és Közlemények). Sfântu Gheorghe.
AnB	- Analele Banatului (serie nouă). Timişoara.
Angustia	- Angustia. Muzeul Carpaţilor Răsăriteni. Sfântu Gheorghe.
Antaeus	- Antaeus. Communicationes ex Instituto Archaeologico Academiae Scientiarum Hungaricae. Budapest.
AnthAnzeiger	- Anthropologischen Anzeiger. Journal of Biological and Clinical Anthropology.
Antiquity	- Antiquity. A Quartely Review of World Archaeology. York.
AnUB-LLS	- Analele Universităţii din Bucureşti - Limba şi literatura străină. Universitatea din Bucureşti.
AO	- Arhivele Olteniei. Craiova; serie nouă (Institutul de Cercetări Socio-Umane. Craiova).

AP	- Annales de Paléontologie. L'Association paléontologique française.
APR	- Acta Palaeontologica Romaniae. Romanian Society of Paleontologists. Bucharest.
Apulum	- Apulum. Acta Musei Apulensis. Muzeul Naţional al Unirii Alba Iulia.
Archaeologia Bulgarica	- Archaeologia Bulgarica. Sofia.
Archaeometry	- Archaeometry. Research Laboratory for Archaeology & the History of Art. Oxford.
ArchMűhely	- Archeometriai Műhely. Budapest.
Arheologia	- Archeologia. Organ na Archeologičeskija Institut i Muzei pri Bulgarskata Akademija na Naukite. Sofia.
ArkhSb	- Arkheologicheskiy sbornik. Muzey Ermitazh. Moskva.
AS	- American Studies. Mid-America American Studies Association. Cambridge (USA).
ASS	- Asian Social Science. Canadian Center of Science and Education. Toronto.
ASUAIC-L	- Analele Ştiinţifice ale Universităţii „Alexandru Ioan Cuza" din Iaşi (serie nouă). Secţiunea IIIe. Lingvistică. Universitatea „Alexandru Ioan Cuza" din Iaşi.
AT	- Ars Transsilvaniae. Institutul de Istorie şi Arheologie Cluj-Napoca. Cluj-Napoca
ATS	- Acta Terrae Septemcastrensis. Sibiu.
AUASH	- Annales Universitatis Apulensis. Series Historica. Universitatea „1 Decembrie 1918" din Alba Iulia.
AUASP	- Annales Universitatis Apulensis. Series Philologica. Universitatea „1 Decembrie 1918" din Alba Iulia.
AUCSI	- Analele Universităţii din Craiova. Seria Istorie. Universitatea din Craiova.
Australiada	- Australiada: A Russian Chronicle. New South Wales. Woy Woy (Australia).
AUVT	- Annales d'Université „Valahia" Târgovişte. Section d'Archaéologie et d'Histoire. Universitatea Valahia din Târgovişte.
AVSL	- Archiv des Vereins für Siebenbürgische Landeskunde. Sibiu.
BA	- Biblioteca de arheologie. Bucureşti.
Banatica	- Banatica. Muzeul de Istorie al judeţului Caraş-Severin. Reşiţa.
Balcanica	- Balcanica. Annuaire de l'Institut des Études Balkaniques. Belgrad.
BAMNH	- Bulletin of the American Museum of Natural History. American Museum of Natural History. New York.
BAR	- British Archaeological Reports (International Series). Oxford.
BB	- Bibliotheca Brukenthal. Muzeul Naţional Brukenthal. Sibiu.
BCMI	- Buletinul Comisiunii Monumentelor Istorice / Buletinul Comisiei Monumentelor istorice. Bucureşti.

BerRGK	- Bericht der Römisch-Germanischen Kommission des Deutschen Archäologischen Instituts. Frankfurt am Main.
BF	- Bosporskij fenomen. Gosudarstvennyj Ermitazh Sankt-Peterburg.
BGSG	- Bulletin of the Geological Society of Greece. Geological Society of Greece. Patras.
BHAB	- Bibliotheca Historica et Archaeologica Banatica. Muzeul Banatului Timişoara.
BI	- Bosporskie issledovanija. Krymskoe Otdelenie Instituta Vostokovedenija, Nacional'na akademija nauk Ukraïni. Simferopol, Kerch.
BMA	- Bibliotheca Musei Apulensis. Muzeul Naţional al Unirii Alba Iulia.
BMAntiq	- Bibliotheca Memoriae Antiquitatis. Piatra Neamţ.
BMN	- Bibliotheca Musei Napocensis. Muzeul de Istorie a Transilvaniei. Cluj-Napoca.
BMS	- Bibliotheca Musei Sabesiensis. Muzeul Municipal „Ioan Raica". Sebeş.
BOR	- Biserica Ortodoxă Română. Patriarhia Română. Bucureşti.
BospCht	- Bosporskie chtenija. Bospor Kimmerijskij i varvarskij mir v period antichnosti i srednevekov'ja. Militaria. Krymskoe Otdelenie Instituta Vostokovedenija. Nacional'na akademija nauk Ukraïni. Simferopol, Kerch.
Das Börsenblatt	- Börsenblatt für den Deutschen Buchhandel-Frankfurter Ausgabe. Börsenverein des Deutschen Buchhandels. Frankfurt pe Main.
Br J Ind Med	- British Journal of Industrial Medicine. London.
Brukenthal	- Brukenthal. Acta Musei. Muzeul Naţional Brukenthal. Sibiu.
BTh	- Bibliotheca Thracologica. Institutul Român de Tracologie. Bucureşti.
Bucureşti	- Bucureşti. Materiale de istorie şi muzeografie. Bucureşti.
Bucureştii vechi	- Bucureştii vechi. Buletinul Societăţii Istorico-Arheologice. Bucureşti.
BUS	- Birka Untersuchungen und Studien. Stockholm.
CA	- Current Anthropology. University of Chicago.
Caietele ASER	- Caietele ASER. Asociaţia de Ştiinţe Etnologice din România. Bucureşti.
Carpica	- Carpica. Complexul Muzeal „Iulian Antonescu" Bacău.
CCA	- Cronica cercetărilor arheologice. Bucureşti.
CCJ	- Chemistry Central Journal. London.
Cele Trei Crişuri	- Cele Trei Crişuri. Oradea.
Cetatea Bihariei	- Cetatea Bihariei. Institutul de Istorie şi Teorie Militară din Bucureşti, Secţia Teritorială Oradea.
CIRIR	- Cercetări istorice. Revistă de istorie românească. Iaşi.
CL	- Cercetări literare. Universitatea Bucureşti.
Codrul Cosminului	- Codrul Cosminului, seria nouă. Analele Ştiinţifice de Istorie, Universitatea „Ştefan cel Mare" Suceava.
ComŞtMediaş	- Comunicări Ştiinţifice. Mediaş.
ConspNum	- Conspecte numismatice. Chişinău.

Convieţuirea-Együttélés - Convieţuirea-Együttélés. Catedra de limbă şi literatura română a Institutului Pedagogic „Juhász Gyula", Szeged.
Corviniana - Corviniana. Acta Musei Corvinensis. Hunedoara.
CPF - Cahiers des Portes de Fer. Beograd.
CretaceousRes - Cretaceous Research. Elsevier.
Crisia - Crisia. Culegere de materiale şi studii. Muzeul Ţării Crişurilor. Oradea.
CRP - Comptes Rendus Palevol. Comptes Rendus de l'Académie des Sciences France.
Cultura creştină - Cultura creştină. Publicaţie apărută sub egida Mitropoliei Române Unite cu Roma Greco-Catolică şi a Facultăţii de Teologie Greco-Catolice din Universitatea „Babeş-Bolyai" Cluj-Napoca, Departamentul Blaj.
Dacia - Dacia. Recherches et découvertes archéologiques en Roumanie. Bucureşti, I, (1924) - XII (1948). Nouvelle série: Revue d'archéologie et d'historie ancienne. Bucureşti.
Dări de seamă - Dări de seamă ale şedinţelor. Paleontologie. Institutul Geologic al României. Bucureşti.
DB - Drevnosti Bospora. Rossiyskaya Akademiya Nauk. Moskva.
De Antiquitate - De Antiquitate. Asociaţia Virtus Antiqua. Cluj-Napoca.
DFS - Deutsche Forschung im Südosten. Sibiu.
DP - Documenta Praehistorica. Poročilo o raziskovanju paleolitika, neolitika in eneolitika v sloveniji. Ljubljana.
Drevnosti Altaja - Drevnosti Altaja. Gorno-Altajskij gosudarstvennyj universitet. Gorno-Altajsk (Respublika Altaj).
EHQ - European History Quarterly. Sage Publications. New York.
EphNap - Ephemeris Napocensis. Institutul de Arheologie şi Istoria Artei, Cluj-Napoca.
EVNE - Etnokul'turnoe vzaimodeystvie narodov Evrazii. Institut Arheologii i Etnografii Sibirskogo otdeleniya Rossiyskoy Akademii Nauk. Novosibirsk.
FK - Földtani közlöny. Magyarhoni foldtani tarsulat folyóirata. Budapest.
FU - Finno-Ugrika. Institut Istorii imeni Sh. Mardzhani. Akademiya Nauk Tatarstana. Kasan'.
FVL - Forschungen zur Volks- und Landeskunde. Sibiu.
Geo-Eco-Marina - Geo-Eco-Marina. Institutul Naţional de Cercetare-Dezvoltare pentru Geologie şi Geoecologie Marină. Bucureşti.
Glasnik - Glasnik Srpskog arheološkog društva. Journal of the Serbian Archaeological Society. Beograd.
Glasul Bisericii - Glasul Bisericii. Mitropolia Munteniei şi Dobrogei. Bucureşti.
Godišnjak - Godišnjak. Jahrbuch Knjiga. Sarajevo-Heidelberg.
GR - Gondwana Research. International Association for Gondwana Research, Journal Center, China University of Geosciences. Beijing.
HistArchaeol - Historical Archaeology. Society for Historical Archaeology.
HistMet - Historical Metallurgy, The Historical Metallurgy Society.

HJ	- The Historical Journal. University of Cambridge (UK).
HSCE	- History & Society in Central Europe. István Hajnal Society of Historians. Medium Ævum Quotidianum Society. Budapest. Krems.
IJAM	- International Journal of Arts Management. École des Hautes Études Commerciales (HEC) in Montreal.
IJO	- International Journal of Osteoarchaeology. United States.
IPH	- Inventaria Praehistorica Hungarie. Budapest.
Istros	- Istros. Muzeul Brăilei. Brăila.
JACerS	- Journal of the American Ceramic Society. The American Ceramic Society, Ohio.
JAS	- Journal of Archaeological Science. Academic Press. United States.
JFA	- Journal of Field Archaeology. Boston University.
JLS	- Journal of Lithic Studies. Edinburgh.
JMH	- Journal of Modern History. University of Chicago.
JOB	- Jarbuch der Ősterreichschen Byzantinistik. Institut für Byzantinistik und Neogräzistik der Universität Wien.
JPSP	- Journal of Personality and Social Psychology. American Psychological Association. Washington DC.
JRGZM	- Jahrbuch des Römisch-Germanischen Zentralmuseums zu Mainz. Mainz.
JSP	- Journal of Systematic Palaeontology. British Natural History Museum. London.
JSSR	- Journal for the Scientific Study of Religion. The Society for the Scientific Study of Religion. South-Carolina.
JVP	- Journal of Vertebrate Paleontology. Society of Vertebrate Paleontology (SVP) in partnership with the Taylor & Francis Group. Abingdon, Oxfordshire (UK).
Közlemények	- Közlemények az Erdélyi Nemzeti Múzeum Érem - és Régiségtárából, Cluj.
Le Glob	- Le Globe. Revue genevoise de géographie. Paris.
LSJ	- Life Science Journal. Acta Zhengzhou University. Zhengzhou (China).
LŞ	- Lucrări ştiinţifice. Institutul de Învăţământ Superior Oradea.
MA	- Mitropolia Ardealului. Revista oficială a Arhiepiscopiei Sibiului, Arhiepiscopiei Vadului, Feleacului şi Clujului. Episcopiei Alba Iuliei şi Episcopiei Oradiei. Sibiu (1956-1991). A continuat *Revista Teologică*, (1907-1947) şi este continuată de aceeaşi revistă.
Marisia	- Marisia. Studii şi Materiale. Târgu Mureş.
Marmatia	- Marmatia. Muzeul Judeţean de Istorie şi Arheologie. Baia Mare.
Materiale	- Materiale şi cercetări arheologice. Bucureşti.
MBGAEU	- Mitteilungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte. Berlin.
MCA	- Materiale şi cercetări arheologice. Bucureşti.

ME	- Memoria Ethnologica. Centrul Judeţean pentru Conservarea şi Promovarea Culturii Tradiţionale Maramureş. Baia Mare.
MEJSR	- Middle-East Journal of Scientific Research. International Digital Organization for Scientific Information. Deira, Dubai (United Arab Emirates).
MemAntiq	- Memoria Antiquitatis. Complexul Muzeal Judeţean Neamţ. Piatra Neamţ.
MIA	- Materialy i issledovaniya po arkheologii SSSR. Akademiya Nauk SSSR. Moskva.
MJSS	- Mediterranean Journal of Social Sciences. Mediterranean Center of Social and Eductional Research. Rome.
Monumente Istorice	- Monumente Istorice. Studii şi lucrări de restaurare. Direcţia Monumentelor Istorice. Bucureşti.
Monumente şi muzee	- Monumente şi muzee. Buletinul Comisiei Ştiinţifice a Muzeelor, Monumentelor Istorice şi Artistice. Bucureşti.
MPG	- Marine and Petroleum Geology. Elsevier.
MSIAR	- Memoriile Secţiunii Istorice a Academiei Române, seria a II-a. Academia Română. Bucureşti.
MTE	- Magyar Történelmi Eletrajzok. Budapest.
Naturwissenschaften	- Naturwissenschaften. Springer-Verlag. Berlin, Heidelberg.
OlteniaŞtNat	- Oltenia. Studii şi Comunicări. Ştiinţele Naturii. Muzeul Olteniei. Craiova.
ŐL	- Őrsrégészeti Levelek. Prehistoric newsletter. Budapest.
PA	- Patrimonium Apulense. Direcţia Judeţeană pentru Cultură Alba. Alba Iulia.
PAPS	- Proceedings of the American Philosophical Society. American Philosophical Society. Philadelphia.
PAS	- Prähistorische Archäologie in Südosteuropa. Berlin.
PAT	- Patrimonium Archaeologicum Transylvanicum. Cluj-Napoca.
PBF	- Präehistorische Bronzefunde. München.
PLOS ONE	- PLOS ONE. International, peer-reviewed, open-access, online publication.
PM	- Publics et musées. Association Publics et Musées - PUL (Presses universitaires de Lyon). Lyon.
PNAUSA	- Proceedings of the National Academy of the United States of America. National Academy of the United States of America.
Pogrebal'nyj obrjad	- Pogrebal'nyj obrjad rannih kochevnikov Evrazii. Juzhnyj nauchnyj centr Rossijskoj Akademii nauk. Rostov-na-Donu.
Pontica	- Pontica. Muzeul de Istorie Naţională şi Arheologie Constanţa.
PPP	- Palaeogeography, Palaeoclimatology, Palaeoecology ("Palaeo3"). An International Journal for the Geo-Sciences. Elsevier.
ProblemyArh	- Problemy arheologii, jetnografii, antropologii Sibiri i sopredel'nyh territorij. Institut arheologii i jetnografii Rossijskoj Akademii nauk. Novosibirsk.

Programm Mühlbach	- Programm des evaghelischen Untergymnasium in Mühlbach und der damit verbundenen Lehranstalten. Mühlbach (Sebeş).
PZ	- Prähistorische Zeitschrift. Deutsche Gesellschaft fuer Anthropologie, Ethnologie und Urgeschichte, Institut für Prähistorische Archäologie. Berlin.
QG	- Quaternary Geochronology. The International Research and Review Journal on Advances in Quaternary Dating Techniques.
QSA	- Quaderni di Studi Arabi. Istituto per l'Oriente C. A. Nallino. Roma.
Quartär	- Quartär. International Yearbook for Ice Age and Stone Age Research.
RA	- Revista Arheologică. Institutul de Arheologie şi Istorie Veche. Chişinău.
RArhiv	- Revista Arhivelor. Arhivele Naţionale ale României. Bucureşti.
Radiocarbon	- Radiocarbon. University of Arizona. Department of Geosciences.
RB	- Revista Bistriţei. Complexul Muzeal Bistriţa-Năsăud. Bistriţa.
REF	- Revista de etnografie şi folclor. Institutul de Etnografie şi Folclor „Constantin Brăiloiu". Bucureşti.
RESEE	- Revue des études sud-est européennes. Academia Română. Bucureşti.
RHMC	- Revue d'histoire moderne et contemporaine. Société d'histoire moderne et contemporaine. Paris.
RHSEE/RESEE	- Revue historique du sud-est européen. Academia Română. Bucureşti, Paris (din 1963 Revue des études sud-est européennes.
RI	- Revista de Istorie (din 1990 Revista istorică). Academia Română. Bucureşti.
RIR	- Revista istorică română. Institutul de Istorie Naţională din Bucureşti.
RJP	- Romanian Journal of Paleontology. Geological Institute of Romania. Bucharest.
RJS	- Romanian Journal of Stratigraphy. Geological Institute of Romania. Bucharest.
RM	- Revista Muzeelor. Bucureşti.
RMMG	- Revista Muzeul Mineralogic-Geologic, al Universităţii din Cluj la Timişoara. Sibiu.
RMM-M	- Revista Muzeelor şi Monumentelor. Muzee. Bucureşti.
RP	- Revista de Pedagogie. Institutul de Ştiinţe ale Educaţiei. Bucureşti.
RRH	- Revue Roumaine d'Histoire. Academia Română. Bucureşti.
RT	- Revista Teologică. Sibiu.
SA	- Sovetskaya arkheologiya. Akademiya Nauk SSSR. Moskva.
SAI	- Studii şi articole de istorie. Societatea de Ştiinţe Istorice şi Filologice a RPR. Bucureşti.

SAO	- Studia et Acta Orientalia. Société des Sciences Historiques et Philologiques de la RPR., Section d'Etudes Orientales. Bucarest.
Sargetia	- Sargetia. Acta Musei Devensis. Muzeul Civilizaţiei Dacice şi Romane Deva.
Sargetia Naturae	- Sargetia. Acta Musei Devensis. Series Scientia Naturae. Muzeul Civilizaţiei Dacice şi Romane Deva.
SCE	- Studii şi comunicări de etnologie. Institutul de Cercetări Socio-Umane Sibiu.
SCCI	- Studii, conferinţe şi comunicări istorice. Sibiu.
SCIA	- Studii şi cercetări de istoria artei. Academia Română. Bucureşti.
SciAm	- Scientific American. New York.
SCGG	- Studii şi Cercetări. Geologie-Geografie. Complexul Muzeal Judeţean Bistriţa-Năsăud. Bistriţa.
SCIV(A)	- Studii şi cercetări de istoria veche. Bucureşti (din 1974, Studii şi cercetări de istorie veche şi arheologie).
SGJ	- Soobshhenija Gosudarstvennogo Jermitazha. Gosudarstvennyj Jermitazh. Leningrad.
SMIM	- Studii şi materiale de istorie modernă. Institutul de Istorie „Nicolae Iorga" Bucureşti.
SP	- Studii de Preistorie. Bucureşti.
SPACA	- Stratum Plus: Archaeology and Cultural Anthropology. Superior Council on Science and Technical Development of Moldavian Academy of Sciences. Saint Petersburg, Kishinev, Odessa, Bucharest.
SPPF	- Società Preistoria Protostoria Friuli-V.G. Trieste.
SSK	- Studien zur Siebenbürgischen Kunstgeschichte, Köln. Wien.
Starinar	- Starinar, Tređa Serija. Arheološki Institut. Beograd.
Stâna	- Stâna. Sibiu.
StComSibiu	- Studii şi comunicări. Arheologie-istorie. Muzeul Brukenthal. Sibiu.
StComSM	- Studii şi comunicări. Muzeul Judeţean Satu Mare.
StRI	- Studii. Revistă de istorie (din 1974 Revista de istorie şi din 1990 Revista istorică). Academia Română. Bucureşti.
StudiaUBBG	- Studia Universitatis Babeş-Bolyai. Geologia. Universitatea „Babeş-Bolyai" Cluj-Napoca.
StudiaUBBGG	- Studia Universitatis Babeş-Bolyai. Geologia-Geographia. Universitatea „Babeş-Bolyai" Cluj-Napoca.
StudiaUBBGM	- Studia Universitatis Babeş-Bolyai. Geologia-Mineralogia. Universitatea „Babeş-Bolyai" Cluj-Napoca.
StudiaUBBH	- Studia Universitatis Babeş-Bolyai. Series Historia. Universitatea „Babeş-Bolyai" Cluj-Napoca.
Suceava	- Anuarul Muzeului Judeţean Suceava.
SUCH	- Studia Universitatis Cibiniensis, Serie Historica. Universitatea „Lucian Blaga" Sibiu.
SUPMPh	- Studia Universitatis Petru Maior. Philologia. Târgu-Mureş.
SV	- Siebenbürgische Vierteljahrschrift. Hermannstadt (Sibiu).

SympThrac	- Symposia Thracologica. Institutul Român de Tracologie. Bucureşti.
TEA	- TEA. The European Archaeologist.
Terra Sebus	- Terra Sebus. Acta Musei Sabesiensis. Muzeul Municipal „Ioan Raica" Sebeş.
TESG	- Tijdschrift voor Economische en Sociale Geografie. Royal Dutch Geographical Society. Oxford (UK), Malden (USA).
Thraco-Dacica	- Thraco-Dacica. Institutul Român de Tracologie. Bucureşti.
Transilvania	- Transilvania. Foaia Asociaţiunii Transilvane pentru Literatura Română şi Cultura Poporului Român. Braşov.
Transsylvania Nostra	- Transsylvania Nostra. Fundaţia Transsylvania Nostra. Cluj-Napoca.
Trudy nauchnogo	- Trudy nauchnogo Karel'skogo tsentra Rossiyskoy akademii nauk. Karel'skiy tsentr Rossiyskoy akademii Nauk. Moskva.
TT	- Történeti Tár. Akadémia történelmi bizottságának. Budapest.
Tyragetia	- Tyragetia. Muzeul Naţional de Arheologie şi Istorie a Moldovei. Chişinău.
Ţara Bârsei	- Ţara Bârsei. Muzeul „Casa Mureşenilor" Braşov.
Ungarische Revue	- Ungarische Revue, Herausg. von P. Hunfalvy. Budapest.
UPA	- Universitätsforschungen zur Prähistorischen Archäologie. Berlin.
Vestnik arkheologii	- Vestnik arkheologii, antropologii i etnografii. Institute problem osvoyeniya Severa Sibirskogo otdeleniya Rossiyskoj akademii nauk. Tyumen.
Vestnik Novosibirskogo	- Vestnik Novosibirskogo gosudarstvennogo universiteta. Serija: Istorija, filologija. Novosibirskij gosudarstvennyj universitet. Novosibirsk.
VLC	- Victorian Literature and Culture. Cambridge University Press. Cambridge (UK).
VPUI	- Vestnik permskogo universiteta. Istoriya. Permskiy Gosudarstvennyi Universitet. Perm'.
VR	- Victorian Review. Victorian Studies Association of Western Canada. Toronto.
WASJ	- World Applied Sciences Journal. International Digital Organization for Scientific Information. Deira, Dubai (United Arab Emirates).
WorldArch	- World Archaeology. London.
Xenopoliana	- Xenopoliana. Buletin al Fundaţiei Academice „A. D. Xenopol" Iaşi.
Yearb. Phys. Anthropol.	- Yearbook of Physical Anthropology. New York.
Yezhegodnik gubernskogo	- Yezhegodnik gubernskogo muzeya Tobol'ska. Tobol'sk Khistori Muzeum. Tobol'sk.
ZfSL	- Zeitschrift für Siebenbürgische Landeskunde. Gundelsheim.
Ziridava	- Ziridava. Muzeul Judeţean Arad.
ZooKeys	- ZooKeys. Sofia.