ADDITIONAL UPPER PLEISTOCENE MAMMALS AT MOVILENI (VASLUI COUNTY, ROMANIA)

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Abstract. Situated on the Scythian Platform, the locality of Movileni (Vaslui County, Eastern Romania) yielded few years ago a fragmentary skull of the Upper Pleistocene steppe bison (*Bison priscus*), unearthed on the Hreasca Creek. Subsequent systematic surveys and diggings carried out in this locality added few new fossil vertebrates. They refer to large mammals as: cave hyena (*Crocuta spelaea*), mammoth (*Mammuthus* sp.), giant deer (*Megaloceros giganteus*) and horse (*Equus* sp.). All these mammals are documenting an Upper Pleistocene (the glacial Würm/ Weichsel) steppe cold environment, with large open areas. Among these mammals, the cave hyena is found in an open-air locality, a rather rare case in Romania. All the bones and teeth have been found isolated, in fluvial sand channel fills.

Keywords: Late Pleistocene, large mammals, Scythian Platform, Moldavia, Romania.

Rezumat. Mamifere pleistocen superioare adiţionale de la Movileni (judeţul Vaslui, România). Situată în Platforma Scitică, localitatea Movileni (judeţul Vaslui, Romania estică) a furnizat cu un număr de ani în urmă un craniu fragmentar al bizonului de stepă pleistocen superior *Bison priscus*, adus la zi în Ogaşul Hreasca. Monitorizarea sistematică şi săpăturile efectuate subsecvent în această localitate au adăugat noi resturi de vertebrate fosile. Sunt in discuţie o serie de mamifere mari: hiena de peşteră (*Crocuta spelaea*), mamut (*Mammuthus* sp.), cerb gigant (*Megaloceros giganteus*) şi cal (*Equus* sp.). Toate aceste mamifere dovedesc existenţa unui mediu stepic pleistocen superior (glaciarul Würm/Weischsel), cu extinse spaţii deschise. Între aceste mamifere, hiena de peşteră este semnalată dintr-un sit non-cavernicol, caz mai degrabă rar în România. Resturile au fost în totalitate descoperite izolate, în umplutura nisipoasă a unor canale fluviale.

Cuvinte cheie: Pleistocen Superior, mamifere mari, Platforma Scitică, Moldova, România.

INTRODUCTION

Pleistocene sedimentary deposits are largely exposed on various areas of the Scythian Platform (SĂNDULESCU, 1984, RĂILEANU et al., 2012). Although their thickness is rather low, the areal distribution is important. These geologically young rocks cover the older formations (Miocene and Pliocene) of the last sedimentary megasequence (Badenian-Pleistocene; 'megacycle' in IONESI, 1994). Frequently, such deposits form the river terraces in this area of Moldavia (Eastern Romania). They bear various Pleistocene invertebrate and vertebrate fossils, the last ones being sometimes unearthed either fortuitously, or rarely, by systematic diggings. Therefore, in Moldavia the Upper Pleistocene large mammal remains (mainly large herbivores as mammoth, rhinoceros, bison, giant deer etc.) are found either on the Scythian Platform, or to northwest, on the Moldavian Platform. There are several localities that have yielded vertebrate fossils. Among these Movileni (Vaslui District), located on the Scythian Platform (Fig. 1; more precisely, in the sector so-called the 'Bârlad Platform' by IONESI, 1994; in fact, nothing but a local name for the south-western area of the Scythian Platform), is a Pleistocene locality from where a steppe bison (*Bison priscus* Bojanus, 1827) fragmentary skull has been reported by CODREA & URSACHI (2010) on the Hreasca Creek at the Hreasca Ravine, about 2.5 km north to the centre of the village (Fig. 2). Subsequent field works carried out in this locality in the last years supplied few additional bones and teeth documenting other Upper Pleistocene mammals, reported herein.

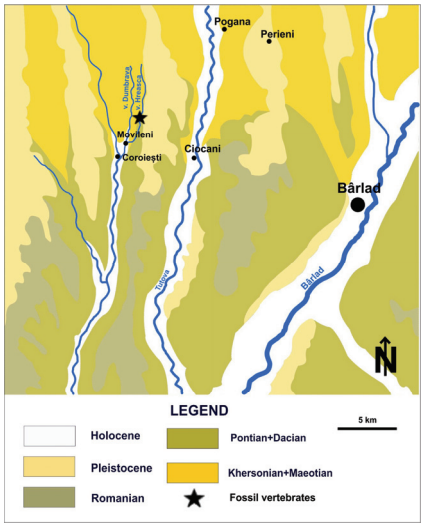

Figure 1. Location of Movileni locality on the geological map.

Figure 2. General view of Hreasca Ravine, on Hreasca Creek; forward, a bone unearthed from the Pleistocene limonitic sand.

The regional as well as the local geology of the area were discussed in the aforementioned paper. However, a closer look on the lithology of Hreasca Creek reveals the following succession (Fig. 3): i. in the basal most portion (ca. 2 m) there are gray-yellowish cross-bedding gravels and micro-gravels composed mainly by white quartzite lithoclasts, and sands; this level is the richest in bone remains, occurring mainly inside a channel infill; ii. ca. 1.5 m of yellowish sands with convolute lamination and plan-parallel stratification; these rocks bear vertebrate remains, but fewer compared to the previous level; iii. ca. 1 m of sands with ripple cross-lamination; iv. 0.6 m of sands with plan-parallel stratification; v. 1.5 m of yellowish loess-like deposits, covered by soil.

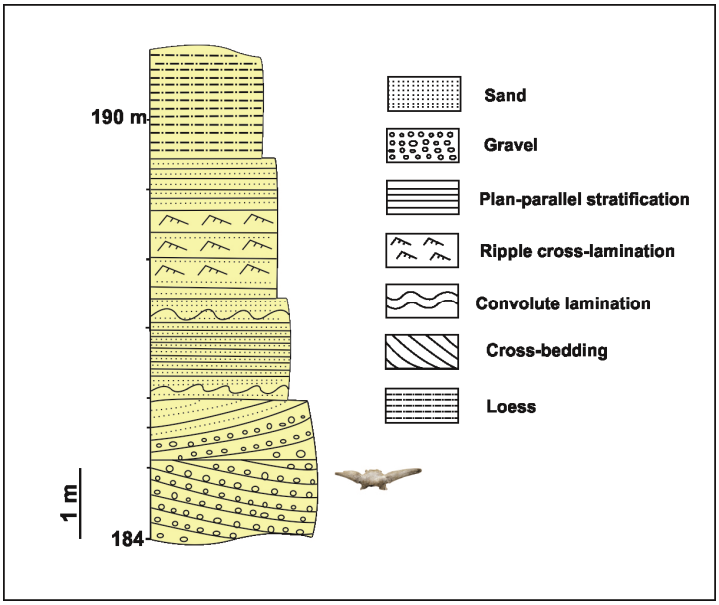

Figure 3. Lithologic log at Movileni, Hreasca Ravine; the bison skull fragment indicates the vertebrates bearing level.

It is worth to mention that the monocline dipping NNW-SSE of the Scythian Platform controlled the sediment distribution probably since the Miocene, as well as later, when the entire region became emerged, along with the river flow directions and their erosion tendencies.

MATERIAL AND METHODS

All the fossils are curated by the "Vasile Pârvan" Museum of Bârlad, Natural Science Branch (hereinafter, abbreviated VPMNS). The fossils did not require special preparation, being cleaned in the VPMNS laboratory. The rock matrix still remaining on bones and teeth surfaces was removed by basic mechanic techniques (professional chisels), then reinforced and/or glued by professional polymer (mowillit) at different concentrations.

Photographs were taken with a Nikon D-7000 camera and a 50 mm fl.8 lens and processed in Photoshop in order to sharpen the bone texture.

The lower cheek teeth herein are reported as p*x* (premolars) and m*x* (molars), *x* meaning the position of the tooth inside the teeth row, while the upper ones as P*x* and M*x*. The terminology and measurements follow for cave hyena those of BONIFAY (1971) and WERDELIN & SOLUNIAS (1991), for mammoth SHOSHANI & TASSY (1997), for horse those of SAMSON (1975), and EISENMAN (1981, 1986), and for 'giant deer' those of GUÉRIN (1996) and DRIESH (1976).

Systematic paleontology

Class Mammalia Linnaeus 1758
Order Carnivora Bowdich 1821
Suborder Feliformia Kretzoi 1945
Family Hyaenidae Gray 1821
Genus *Crocuta* Kaup 1828
Species *Crocuta crocuta* Erxleben 1777
Crocuta crocuta spelaea (Goldfuss 1823)
Plate 1, A, B.

Material: fragment of left mandible with p3 – p4 (VPMNS C5542).

The single specimen documenting the 'cave hyena' at Movileni is a jaw fragment still nesting the couple of the rear premolars. It documents a prime adult (wear stage VII of p3 in STINER, 2004), but not far from the first stage of

an old individual (stage VIII). The teeth wears are nearly at same stage illustrated by DIEDRICH (2012, Fig. 6A) from the Moravian Karst or in Baranica Cave by DIMITRIEVIĆ (2011, Fig. 2c).

Both premolars are typical for this species, robust and powerful, mainly due to the presence in each one of a large protoconid. The p4 has a small paraconid near to the anterior cingulum, being distinct from the protoconid; ȘTIUCĂ et al. (2007) mentioned this character as a 'spelaean feature'. The bone is devoid of marks of scavenging or cannibalistic activities.

Measurements (mm): mandible, breadth of the horizontal ramus under p3 – ca. 25.0, same under p4 – ca. 19.5; teeth, p3 – length: 22.5, breadth: 16.0, p4 – length: 23.0, breadth: 15.2.

Discussions. Compared to the mandible from the Igrița Cave (HMT III 8481 in CODREA, 1990), the sizes in both premolars are nearly similar (however, the last one is shorter in Movileni). Although the p3 length is smaller than in Muierilor Cave (ȘTIUCĂ et al., 2007), it remains enough illustrative for a Weichsel/Würm representative than for an older one from the Eemian interglacial, such specimens having a smaller third premolar (KURTÉN, 1963; BONIFAY, 1971), feature underlined also by ȘTIUCĂ et al. (2007). The mandibles from Râpa (Bihor County, in CSÁK, 1978) expose p3 of higher or of equal length, but broader, while p4 are all longer and broader (in a single specimen the breath is smaller). According to JURCSÁK et al. (1983, 1984) the fauna from Râpa documents a mild climate phase of Würm. In Baranica Cave (DIMITRIEVIĆ, 2011) most premolars are longer, but inside the sample one can find also similar sizes as in Movileni. On the other hand, in Rösenbeck Cave (KEMPE & DÖPPES, 2009), the p3 is smaller and the p4 less broad. These both sites document Weichsel/Würm representatives. The increase in size of the Middle-Upper Pleistocene large carnivores is well known for a rather long time (KURTÉN, 1968). The increase in size of the hyenas from this geological time span during the cold episodes *vs*. smaller sized specimens in warmer ones was underlined also by BARYSHNIKOV (1999). In this respect the Movileni specimen is rather illustrative for the last glacial.

It is already known that the so-called 'cave hyena' is not specific at all for cave environments, but cave environments offered the best taphonomy for preserving the remains of this carnivore. This rule is the same in Romania too, where most fossils have been found in caves (see a repertory of finds with related references in CODREA, 1990). Nonetheless, the presence of the 'cave hyena' in open-air sites is rare. Apart from Movileni, open air sites that yielded hyena remains are represented by the gravel open pits located around Bucharest (mostly in Băneasa), in northwestern Romania at Domănești (Satu Mare District), or in Drăghici (Argeș District), Feldioara (Brașov District), Jucu de Jos (Cluj District), Râpa (Bihor District), Cetea (Alba District), Streisângeorgiu (Hunedoara District) and probably at Cetea (Alba District). For instance, Movileni is the single open-air locality with 'cave hyena' in Moldavia. In this region, the single locality that has yielded hyena remains is Ripiceni, at Stânca Ripiceni Cave (on Prut River). There, into an Aurignacian layer few skeletal remains were unearthed mainly in the first half of the 20th (CODREA, 1990 and references therein).

In Romania, the most outstanding find is the one from the Weichsel/Würm locality of Râpa, Burzău Hill, where a hyena den (17 m long) excavated in Upper Miocene sands was unearthed, preserving both hyena remains (eight skulls, numerous postcranial bones and a large amount of coprolites) and their prey bones [large herbivores as mammoth - *Mammuthus primigenius* (Blumenbach, 1799), wooly rhinoceros – *Coelodonta antiquitatis* Blumenbach, 1807, horse – *Equus germanicus* Nehring, 1884 as well as micromammals (HAMAR & CSÁK, 1969), birds (KESSLER, 1974), amphibians and reptiles (VENCZEL, 1989) and fish]. Unfortunately, the paleontological diggings at Râpa initiated by CSÁK (1978) never continued, despite the peculiar rich paleontological message of this locality.

Order Proboscidea Illiger 1821
Suborder Elephantiformes Tassy 1988
Family Elephantidae Gray 1821
Subfamily Elephantinae Gray 1821
Plesion *Mammuthus* Brookes 1828
Mammuthus sp.
Plate 1, C.

Material: fragment of a tusk (VPMNS C5536).

Only a tusk fragment meaning a limited portion of the external wall is available from this site. This poor sample affords only to evidence the presence of a mammoth in this assemblage, but a closer assignment would be speculative. As a matter of course, such a presence is natural in this deposit. Probably, this tusk fragment originated from a specimen of wooly mammoth (*Mammuthus primigenius*).

Discussions. The Pleistocene localities with mammoth are numerous in Moldavia. Some repertories of these localities already issued in various references (*e.g.* APOSTOL, 1968; SIMIONESCU, 1990), but very few of them have clear stratigraphy. A lot of such fossils (mainly cheek teeth, tusks or tusk fragments) are hosted in various museum collections but, in a lot of cases, even the name of the locality of origin is missing from the inventories. Numerous fossils are originating either from river terraces or were found already reworked into recent alluvia. Surprisingly, even the geological unit they originated from is sometimes wrongly named (e.g., "Carpathian Basin" in HAIDUC et al., 2018 for several fossils found in fact, in the Dacian Basin).

Order Perissodactyla Owen 1848
Family Equidae Gray 1821
Genus *Equus* Linnaeus 1758
Equus sp.
Plate 1, D, E.

Material: left M3 (VPMNS C5000), left m3 (VPMNS C5002), a fragmentary Mt III (VPMNS C5537).

The fossils documenting the horse are not numerous. They refer to three isolated teeth, subject of pre-burial hydrotaphonomy, and an isolated fragmentary Mt III.

Measurements (mm): teeth, M3 (VPMNS C5000) – length: 32, breadth: 26, height: 38.5, m3 (P 342) – length: 31.2; breadth: 13; height: 70; m3 (VPMNS C5002) – length: 34.8; breadth: 15; height: 76.5; hind leg: Mt III (VPMNS C5537) – proximal antero-posterior diameter (Dp): 60.0; proximal transverse diameter (lp): 58; antero-posterior diameter of the diaphysis (Dm): 41; transverse diameter of the diaphysis (lm): 38.5.

Discussions. The size of the metatarsal is very close to the Late Würm *Equus* sp. reported from La Adam Cave, in Dobrogea (SAMSON, 1975). *E.* cf. *transilvanicus*, *E. spelaeus* and *E. spelaeus cibinensis* are of smaller sizes.
In an overview of the Pleistocene horses from Central Balkans FORSTEN & DIMITRIEVIĆ (2004) underlined the difficulties in the assignment to a species in the Upper Pleistocene horses. These difficulties are the same in Romania, and basically, we agree that for the presence of different sympatric species of horses in a locality one should find credible paleoenvironmental arguments, *i.e.* different ecological niches as FORSTEN & DIMITRIEVIĆ (2004) underlined. In a lot of cases, such detailed interpretations were not done (e.g. MUNTEANU et al., 2008). For instance, at Movileni we can presume the presence of a single horse species, based on this rather restricted sample.

Order Artiodactyla Owen 1848
Family Cervidae Goldfuss 1820
Subfamily Cervinae Goldfuss 1820
Genus *Megaloceros* Brookes 1828
Megaloceros giganteus (Blumenbach 1803)
Plate I, F, G, H.

Material: fragment of a right mandible horizontal branch with p4-m3 (VPMNS C5596).

The mandible fragment concerns a portion of the horizontal ramus nesting into the alveoli of the p4 (the mesial prism, damaged) - m3. The bone is massive due to pachyostosis, with highest effect under m3. The distal alveoli of p3 are also preserved, but this tooth is missing. The advanced tooth wear documents an adult or senior individual. On the m2 and m3, well expressed metaconids can be noticed. Ectostylids are present in all molars, the m3 with a post-hypoconide one too, but very faintly expressed. On the first molar the advanced wear made the ectostylid confluent with the wear surface of the hypoconide. Only small portions of weak cingulum can be noticed mesially on the labial and lingual walls, as prolongations of the mesial cingulum. The most obvious external cingulum is on m2, but it is also very weak.

Measurements (mm): mandible horizontal ramus, height of the dentary, lingual – ante - p4 - 43.8, p4/m1 - 43.2, m1/m2 - 49.5, m2/m3 - 53.4, post-m3 - 61.0; same, labial, ante - p4 - 44.6, p4/m1 - 44.1, m1/m2 - 49.0, m2/m3 - 52,0, post-m3 - 59.5, maximal transverse diameter: 39.5, minimal transverse diameter: 29.2; teeth, p4 - breadth (distal): 15.5, m1 – length: 25.5, breadth, 20.0, m2 – length : 34.5, breadth - 20.4, m3 – length: 48.0, breadth : 19.1, length m1 – m3 = 105.5

Discussions. The size of the mandible of the 'giant deer' from Movileni is extremely close to the one reported from Seleuş, in Transylvania (CODREA & SOLOMON, 2011). Therefore, following LISTER (1994) and CROITOR (2008), we are interpreting this mandible as originating from a male.

In Romania, there are several reports concerning this species. The oldest ones are from the 19th century, being usually devoid of clear stratigraphy, originated from scattered and fortuitous finds (CODREA & SOLOMON, 2011 and references therein). However, in these early reports are often mentioned that these finds refer to Würm/Weichsel representatives. Same ages are reported in 20th century in northwestern Romania by JURCSÁK (1974) or in southeastern Transylvania (Braşov Depression) by RĂDULESCU & SAMSON (1985). In this last region, the geological history of the 'giant deer' can be followed in older times too, until Riss/Saale (Bodoc-3).

In Moldavia, this large herbivore was reported from various localities, but all are concerning exclusively the last glacial: Ripiceni Izvor (Botoşani County; Mousterian I-IV), Iaşi (Iaşi County, in the so-called 'Ciric sands'), Hulubăţ (Vaslui County, in the lower terrace of Vasluieţ river) (SIMIONESCU, 1990 and references therein). Obviously, in none of the localities of Moldavia, as well as in none of Romania, there is no evidence about the survival of this species into the Holocene. Moreover, this Upper Pleistocene extinction (AARIS-SØRENSEN & LILJEGREN, 2004) is valid for the whole European continent, and our country follows the same rule. In Asia, the survival of the 'giant deer' was longer lasting, as showed by STUART et al. (2004).

Unfortunately, this single cranial bone offers too few data (*e.g.*, the length of premolar series is incomplete, so it is not clear if it is a primitive or an advanced specimen; CROITOR, 2008; CROITOR et al., 2014) to advance a better stratigraphy for Movileni based on this large herbivore.

CONCLUSIONS

The vertebrates collected from the deposits exposed on the Hreasca Ravine can be added now to the previous steppe bison find (CODREA & URSACHI, 2010). Only the 'giant deer' mandible fragment was found reworked in the recent alluvia, about eight hundred meters downstream on Hreasca Valley. All the other fossils were unearthed from the same level, where white-yellowish limonitic sand is in dominance. The presence of a mammoth, as well as of the other large herbivores is indicative for a Weichsel/Würm assemblage, documenting a cold stadial. There is no evidence for an older age (*e.g.* the "cave hyaena" features, a steppe bison is smaller compared to the Elster/Mindel or Saale/Riss specimens reported by RĂDULESCU & SAMSON, 1985 from Braşov sedimentary basin).

All the fossils were found isolated, without any anatomical connection. It is presumed that all these teeth and bones were carried by water streams before their definitive burial. The long bones were trended in such manner as one may presume a SW-NE direction of the stream that accumulated the pile of sands from Hreasca Creek (Fig. 4). Such a direction would be very different compared to the actual course of the rivers in the area, but it could be simply explained if one considers a meandering Pleistocene river. For a conclusion about the Pleistocene river network in Moldavia, a more detailed sedimentology would be desirable, but for instance the number of outcrops on Hreasca Creek is too few for an extended work.

Figure 4. A steppe bison (*Bison priscus*) vertebra in situ at Hreasca Ravine, illustrating the Pleistocene stream orientation.

Obviously, this locality still has a high potential in yielding vertebrate remains and a systematic survey should continue. Eventually, an extended digging could reveal much more vertebrate fossils and additional sedimentological details that could offer a better understanding of the local Upper Pleistocene environment.

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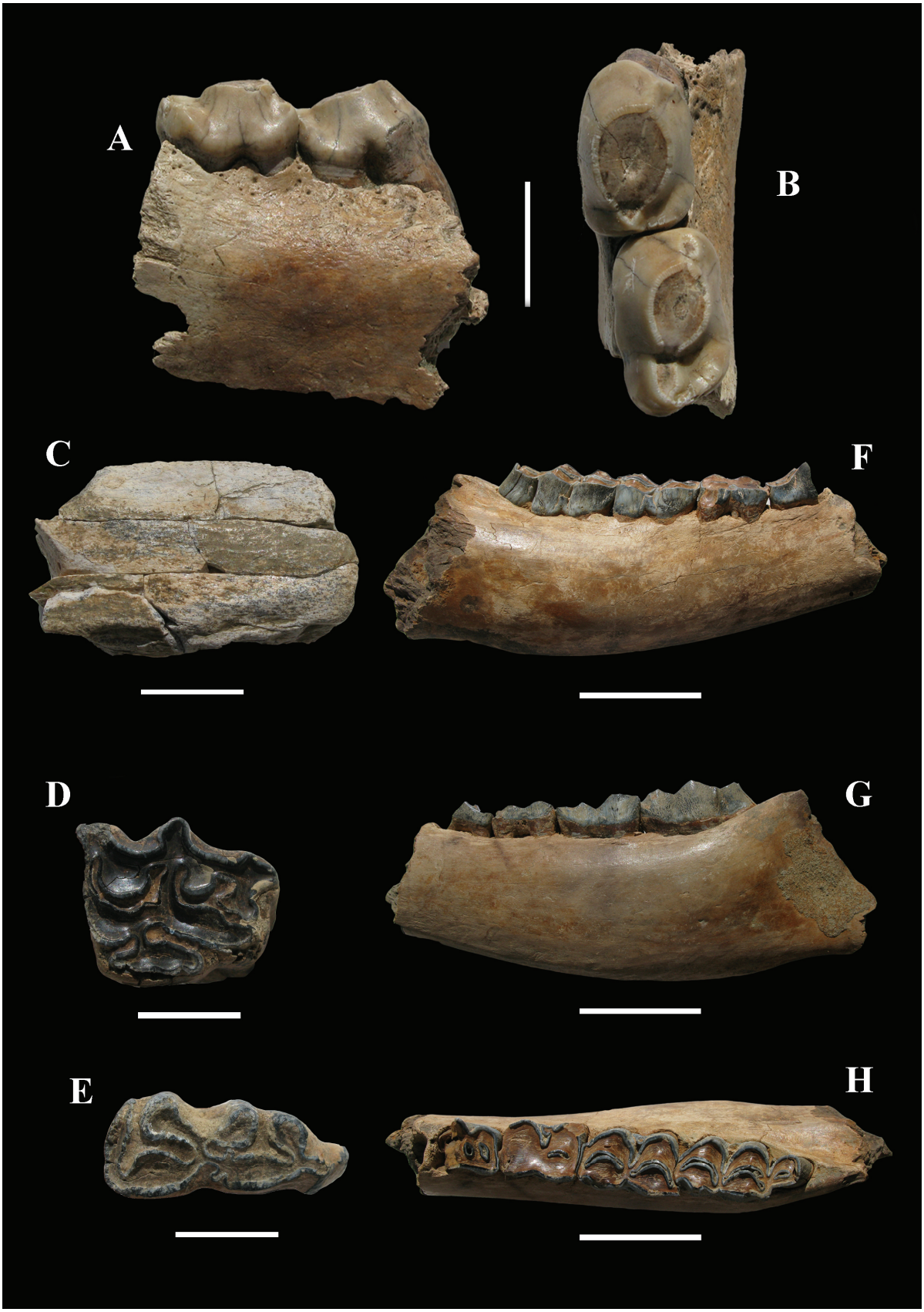
Plate I



Upper Pleistocene vertebrates from Movileni. *Crocuta crocuta spelaea*, mandible fragment: A - lateral view, B – occlusal view. ?*Mammuthus*, tusk fragment: C – external view. *Equus* sp.: D – M3 occlusal view, E – m3 occlusal view. *Megaloceros giganteus*, mandible fragment with p4 - m3: F – labial view, G – lingual view, H – occlusal view. Scale bars: 20 mm.

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