

GIANT DEER *Megaloceros giganteus* (CERVIDAE: MAMMALIA) FROM LATE PLEISTOCENE OF MOLDOVA

CROITOR ROMAN

Abstract. *The paper presents description of giant deer remains from Upper Paleolithic (Late Pleistocene) sites of Moldova. The comparison of size and proportions of dentition and lower mandibles revealed the resemblance of Moldavian with giant deer from Germany and Holland. Both samples of giant deer share the relatively long upper premolar series. Unlike the giant deer from Ireland, the Moldavian form is characterised by poorly developed cingula in upper molars and relatively long upper and lower premolar series that are regarded here as a primitive condition. The tooth series of the Italian giant deer are similar in their proportions to the specimens of *Megaloceros giganteus* from Moldova, however the Italian form is significantly smaller.*

Keywords: *Megaloceros giganteus, morphology, Late Pleistocene, Moldova.*

Rezumat. Cerbul uriaș *Megaloceros giganteus* (Cervidae: Mammalia) din Pleistocenul Tardiv al Moldovei. *Articolul prezintă descrierea cerbului uriaș din Paleoliticul Superior (Pleistocenul Tardiv) al Moldovei. Compararea dimensiunilor unor proporții ale seriilor dentare și a mandibulei arată asemănarea clară a materialului din Moldova cu cel din Olanda și Germania. Aceste forme de cerb uriaș se caracterizează prin seria relativ lungă a premolarilor superiori. Spre deosebire de forma irlandeză, cerbul uriaș din Moldova se caracterizează prin cingulumul mai puțin dezvoltat la molari și lungimea relativă sporită a premolarilor inferiori și superiori ce pare se fie o caracteristică morfologică primitivă. *Megaloceros giganteus* din Italia are proporțiile seriilor dentare asemănătoare cu cele din Moldova, însă dimensiunile generale ale formei italiene sunt mai mici.*

Cuvinte cheie: *Megaloceros giganteus, morfologie, Pleistocenul Tardiv, Moldova.*

INTRODUCTION

The remains of giant deer from Moldova are not particularly numerous, nonetheless, the detailed description of Moldavian giant deer, its morphological affinities and ecomorphology are still missing. The most important fossils of giant deer were yielded by the Paleolithic sites Duruitoarea Veche and Brînzești-I.

The remains of *Megaloceros giganteus* from Duruitoarea Veche are excavated from the lowermost layers III and IV. The silicic artifacts from layers III and IV belongs to the oldest industry ever discovered in Moldova. The industry of this type is found also in the lower stratum of Ofatinți, Iarovo, Mersâna, Bobulești-5, Osâpca, and Șipot-2. The archaic industry of this type called "Duruitoarian" is analogous to a certain extent to the "Tayac of the Fonteschwad type" (CHETRARU, 1965, 1973; ANISIUTKIN, 2001). The age of lower layers from Duruitoarea Veche may correspond to the Riss glacial, since those strata had yielded remains of reindeer (DAVID & CHETRARU, 1970). The spore-pollen analysis indirectly supports this conclusion. MEDIANIK (*unpublished data*) has revealed in the layer III the pollen of some exotic Tertiary holdovers, which, normally, did not survive the maximal Riss glaciation. The layer could be dated by the early stage of Riss that is according with the archaeological age.

DAVID (1980) reports some remains of giant deer from the layer II of Duruitoarea Veche. The dating possibilities of the archaeological material from this layer are quite scarce. However, Chetraru (*personal communication*) believes that the older bones of giant deer could be admixed during the material sorting and the preliminary study of the osteological remains. The artifacts from the second layer show some analogies in blades and two-side worked points with the material from La Sărături (Moldova), while the spindle-shaped arrow-heads made of antlers bring some analogies with the 6-th layer of Molodova-1 (Ukraine), permitting to BORZIAC (1983) to assume the late Glacial age of the layer. CHETRARU (1965) believes that the presence of large Gravettian arrowheads in the layer II suggests the age of the early stage of Magdalenian.

The archaeological complex from the layer III of Brînzești-I has a confident dating that corresponds to early stage of Upper Palaeolithic. Nonetheless, the radiometric dating yielded a significant dispersion from 26 000 to 18 000 years, and some samples has yielded even younger age. This dispersion of dating may occur because the material is possible mixed. Typologically, the stone artifacts may be divided into two complexes: (a) the Middle Paleolithic with disk-shaped cores, points, scrapers, crenulated tools, knives with butt end, and (b) the Upper Palaeolithic with prism-shaped cores, the blade scrapers, cutters, arrowheads and micro-arrowheads. The bifacial tools compose a special category of artifacts, leaf-shaped arrow-heads and miniature hand-axe, which allow claiming the identity of Brînzești tools with Selet or, at list, with the Eastern variant of this culture. This affinity does not exclude the appurtenance of the industry of the layer III of Brînzești to the Interstadial W I-II or to the period W II, which is more appropriate. In this case, the industry from Brînzești, layer II, indicates the end of Middle and the beginning of Upper Paleolithic (CHETRARU, 1973; ROGACIOV & ANIKOVICH, 1984).

RESEARCH METHOD AND MATERIAL

The present work refers to detailed morphological and biometrical study of dental remains, as well as biometrical description of postcranial bones. The nomenclature of dental morphology is according GUERIN (1996).

The fossil material from Duruitoarea Veche (fragments of lower mandibles Nr. 279 *sin*; Nr. 280 *dex*; Nr. 281 *sin*; a talus Nr. 15; a distal fragment of metatarsus Nr. 399) and Brînzei-1 (a left upper tooth row with P²-M³ "A"; a left complete metatarsus "B"; a right talus Nr. 1-63) is stored in the Institute of Zoology, Academy of Science of Moldova (Chişinău). The left fragment of lower mandible with M₂-M₃ (Nr. 5-923) from Ofatişi is stored in the Museum of Ethnography and Natural History (Chişinău). The material is rather fragmentary and includes the fragments of lower mandibles, upper tooth row, and postcranial bones. The comparative material includes a large sample of skulls and mandibles of giant deer from Ireland stored in the Natural History Museum of London, a male skull from Tuscany, Italy (IGF11630), and a lower mandible from Val di Chiana, Italy (without number), stored in the Department of Geology and Paleontology of the University of Florence.

DESCRIPTION

Family Cervidae GOLDFUSS, 1820

Subfamily Cervinae GOLDFUSS, 1820

Genus *Megaloceros* BROOKES, 1828

Megaloceros giganteus (BLUMENBACH, 1803)

The upper molars of giant deer from Duruitoarea Veche and Brînzei-1 are characterized by comparatively weak cingulum (DAVID, 1980) if compared to the sample from Ireland. The enamel folds of protocone and metaconule are not present in upper molars. The measurements of upper tooth row from Brînzei-1 (Table 1) and lower tooth row from Duruitoarea Veche (Table 2) are very similar to the giant deer remains from Rhine Basin (Germany and Holland) and Ireland, and significantly larger than the measurements of giant deer findings from Italy (Fig. 1 A, B). The proportions of upper tooth row from Brînzei-1 are also very close to the sample from Rhine Basin. The Moldavian and Rhine samples are characterized by relatively long upper premolar series, unlike the sample from Ireland (Fig. 1 A).

The lower mandible Nr. 279 from Duruitoarea Veche (Fig. 2) belongs to a mature individual with an initial to medium stage of tooth wear. The paraconid and parastilid of lower fourth premolar (P₄) are not separated one from another. The metaconid of P₄ is extended anteroposteriorly and connected through a narrow isthmus with the paraconid-parastilid. The *Paleomeryx* fold is not present in lower molars. The lingual pillars (ectostylids) of lower molars are well-developed. The third molar (M₃) bears only one anterior ectostylid situated between protoconid and hipoconid. The mandible is characterized by relatively long premolar series that is quite similar to the specimen from Val di Chiana. The premolar series in Moldavian specimen is relatively longer than in the major part of the samples from Ireland. The thickness of lower mandibles from Duruitoarea Veche and Ofatişi is similar to the lower part of range of this measurement in the sample from Ireland (Fig. 1 C). However, the ratio of mandible robustness of the specimen from Ofatişi falls in the cluster of the most robust mandibles from Ireland (Fig. 1 D). The postcranial remains are very scanty and represented only by few isolated hind-limb bones (Table 3).

DISCUSSIONS

The well expressed sexual dimorphism and taphonomical biases of the samples are the major challenge in the study of paleozoological material from the Paleolithic archaeological site. BARNOSKY (1985) described the peculiar taphonomical conditions and sex ratio in the sample of the giant deer from Ireland. According him, the sex ratio of the sample is altered by the selective entrapping of the males in the bog. The remains of giant deer from Moldova had been accumulated by prehistoric hunters and thus must be affected by a different type of taphonomic bias, which, unfortunately, can not be revealed because of the scanty and fragmentary character of the material. Therefore, a cautious approach to the obtained results is suggested.

The unusually thick horizontal ramus of the mandible (pachyostosis) in giant deer is the most striking feature. The jaw thickening started with maturation of the animal and achieved by addition of lamellar bone (LISTER, 1994). It seems that this character was stronger expressed in males and thus was exposed to the sexual dimorphism (LISTER, 1994; CROITOR, 2006). The absolute thickness of mandibles belonging to the Ireland forms reveals two clearly separate clusters: a larger cluster of comparatively thicker mandibles, and two smaller specimens which are less robust. LISTER (1994) suggested that the numerous robust mandibles from Ireland belong to males, while two less robust mandibles belong to females. This interpretation is in accordance with the taphonomical observations made by BARNOSKY (1985). The diagram shows that the lower mandible Nr. 279 from Duruitoarea Veche is close to the presumed males from Ireland, while the mandibles Nr. 280, Nr. 281 from Duruitoarea Veche and Nr. 5-923 from Ofatişi are close to presumed females (Fig. 2 C). However, the picture is quite different if we plot the computed ratios of mandibular shape. The sample from Ireland forms two equal clusters and the specimen from Ofatişi falls into the „robust” type of mandibles (Fig. 2 D).

Many specimens from Ireland show strongly developed cingulum in upper molars. Sometimes, cingulum is developed in upper premolars and even in lower molars. CROITOR (2006) assumed that the broad variation of cingulum

development in upper molars also may be caused by sexual dimorphism. The cingulum is comparatively poor in specimens discovered in Moldova, probably because they belong to females. Perhaps, the labile development of cingulum in giant deer has the same nature as pachyostosis of mandible. The physiological adaptation of males to accumulate larger quantities of minerals could be a possible explanation for such bizarre features, as the mandibular pachyostosis, thickening of cranial bones, strong ossification of vomer, and, perhaps, the strong development of cingulum. The accumulation of minerals in the head skeleton of giant deer males could be an adaptation to the fast growing of enormous antlers during the short vegetation period (CROITOR, 2006)

The relatively long premolar series of upper and lower tooth rows is a primitive character that approaches the sample from Moldova to the giant deer from Italy, Germany and Holland and distinguishes it from the Irish giant deer. I do not believe that this difference may be caused by the domination of males in the sample from Ireland. The relative length of premolars may be correlated with the relative length of muzzle. According to my observations, males normally are characterized by somewhat longer muzzle than females in cervids. Nonetheless, the giant deer from Ireland is characterized by somewhat shortened anterior part of tooth row, but not lengthened as it might be expected. The remains of *Megaloceros giganteus* from Ireland represent one of the latest populations of this species (STUART et al., 2004), which apparently shows some advanced features in dentition morphology.

CONCLUSIONS

The systematics and taxonomy of *Megaloceros giganteus* is still unclear (VAN DER MADE, 2006). CALOI (1973) recognized three subspecies diagnosed by peculiarities in skull shape and proportions: *M. giganteus hiberniae* (POHLIG) (British Isles), *M. giganteus latifrons* (RAVEN) (Netherlands), and *M. giganteus germaniae* (POHLIG) (Italy, Germany, and Eastern Europe). However, LISTER (1994) found CALOI's (1973) conclusions unconvincing. Perhaps, the small-sized Italian form of giant deer should be kept as a separate subspecies. VAN DER MADE (2006) analyzed the proportions of metacarpals of *M. giganteus* from Rhine Basin and distinguished two morphological forms: the older *M. giganteus* "antecedents/*germaniae*" with slender metacarpals, and younger Eemian *M. giganteus ssp.* with robust metacarpals. He also assumed that the "typical" giant deer from Ireland arrived in Western Europe 10-13 Ka from Eastern Europe. The fragmented character of material and incomplete definitions of giant deer subspecies do not allow a subspecific determination of the giant deer from Moldova. *M. giganteus* from Moldova is characterized by relatively long upper and lower premolar series and rather weak molar cingulum if compared to the giant deer from Ireland. These results suggest that the giant deer from Moldova is similar to *M. giganteus* from Germany and Holland sharing with them the primitive condition of tooth row proportions. Therefore, the VAN DER MADE's hypothesis on direct relationship between Eastern European and Irish giant deer needs a further test with implication of cranial and dental characters.

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Table 1. Measurements of upper tooth row of giant deer from Moldova, Italy, and Ireland. L-tooth series length (mm).

Tabelul 1. Dimensiunile seriilor dentare superioare ale cerbului uriaș din Moldova, Italia și Irlanda. L-lungimea seriei dentare (mm).

Site	number	L P ² -M ³	L P ² -P ⁴	L M ¹ -M ³
Brînzeni	BR-A	151.7	66.0	85.0
Tuscany	IGF11630	140.5	61.2	83.2
Dublin	M2326	141.6	60.6	83.3
Dublin	no number	143.3	61.3	88.7
Dublin	M28968	150.0	60.0	90.0
Dublin	M48833	153.3	64.2	86.8
Dublin	no number	153.5	65.0	91.0
Dublin	no number	148.0	64.0	90.5

Table 2. Measurements of mandibles and lower tooth series of giant deer from Moldova, Italy and Ireland. L - tooth series length; D - mandibular thickness under M₂; PP/MM - premolar-molar ratio, %.

Tabelul 2. Dimensiunile mandibulelor și seriilor dentare inferioare ale cerbului uriaș din Moldova, Italia și Irlanda. L - lungimea seriei dentare; D - lățimea mandibulei în dreptul M₂; PP/MM - indexul lungimeii seriei premolarilor (%).

Site	number	L P ₂ -M ₃	L P ₂ -P ₄	LM ₁ -M ₃	D	PP/MM
Duruitoarea Veche	DV280	161.0	61.8	101.0	35.2	61.2
Duruitoarea Veche	DV281			102.3	36.3	
Duruitoarea Veche	DV278			103.6	38.0	
Duruitoarea Veche	OF-5-923			101.5	35.6	
Val di Chiana	no number	143.3	58.0	94.0	36.0	61.7
Dublin	M2328	164.0	61.0	104.0	37.8	58.7
Dublin	no number	168.6	62.1	115.8	39.6	53.6
Dublin	no number	166.0	62.7	102.6	38.0	61.1
Dublin	M26124	162.6	61.0	101.7		60.0
Dublin	no number	163.6	61.4	103.2	36.0	59.5
Dublin	M2972	161.1	60.1	99.6	35.5	60.3
Dublin	no number	166.8	61.6	105.0	38.1	58.7
Dublin	no number	167.3	62.7	106.4	38.8	58.9
Dublin	no number	169	61.2	106.1	38.8	57.7
Dublin	M14126	173.1	64.0	109.5	39.1	58.4
Dublin	M26124	170.1	61.1	106.6	38.8	57.3
Dublin	no number	163.0	58.5	104.0	38.2	56.3

Table 3. Measurements of postcranial bones from Palaeolithic sites Duruitoarea Veche (DV third layer) and Brînzeni-1 (BR third layer). L - length; DLM - latero-medial diameter; DAP - antero-posterior diameter.

Tabelul 3. Dimensiunile oaselor postcraniene din stațiunile paleolitice Duruitoarea Veche (stratul trei) și Brînzeni-1 (stratul trei). L - lungimea; DLM - diametrul latero-medial; DAP - diametrul antero-posterior.

Measurements (mm)	collection numbers and measurement values		
Metatarsus	BR-“B”	BR-1-63	DV-399
L	330.0		
DLM proximal	49.7		
DAP proximal	51.5		
DLM diaphysis	35.1		
DLM distal	62.5	62.2	57.5
DAP distal	38.0	38.5	37.9
Talus	BR-1-63C	DV-15	
L	77.6	73.4	
DLM distal	52.0	52.6	
DAP distal	38.6	41.4	

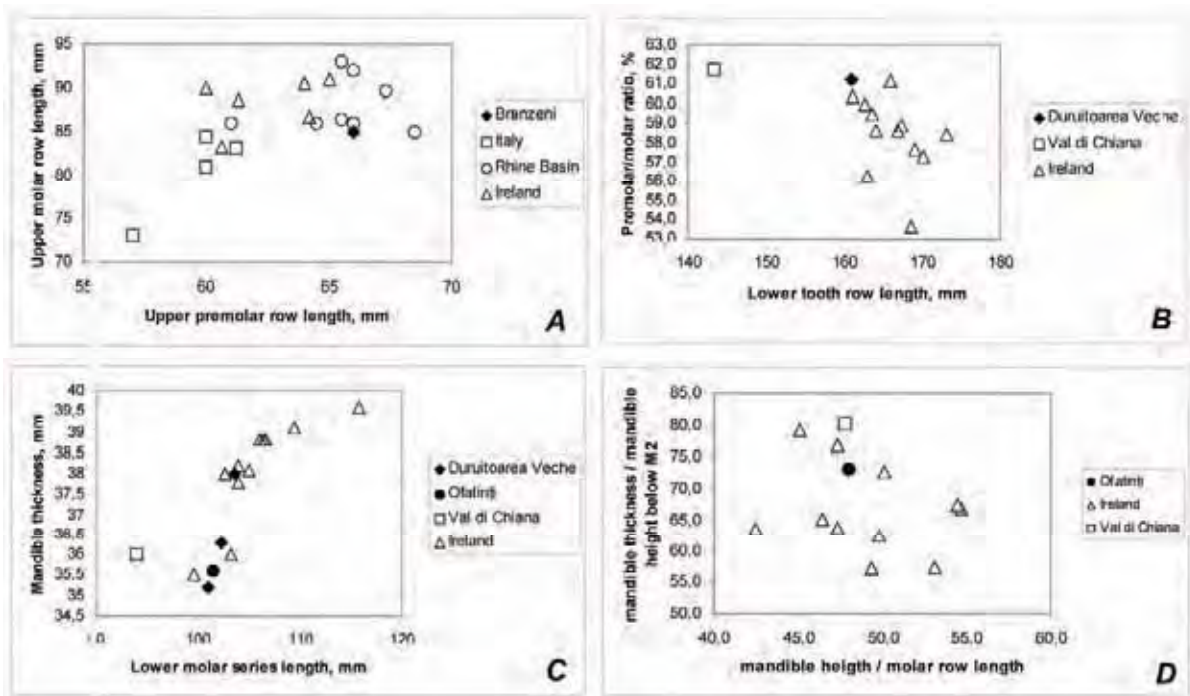


Fig. 1. Comparison of dental and mandibular measurements and proportions of giant deer remains from Moldova, Rhine Basin, Italy, and Ireland; A, length of upper molar and premolar series; B, length of lower tooth row and premolar/molar ratio (%); C, Mandible thickness and lower molar series length; D, proportions of lower mandible horizontal ramus. The data on giant deer from Rhine Basin and Italy are adapted from CALOI (1973).

Fig. 1. Dimensiunile și proporțiile seriilor dentare și mandibulelor cerbilor uriași din Moldova, Bazinul Fluviului Rin, Italia și Irlanda: A – măsurările molarilor și premolarilor superiori; B – lungimea seriei dentare inferioare și indexul lungimii relative a premolarilor (%); C – lățimea mandibulei și lungimea seriei molarilor inferiori; D – proporțiile părții orizontale a mandibulei. Datele despre cerbul uriaș din Bazinul Fluviului Rein și Italia, după CALOI (1973).

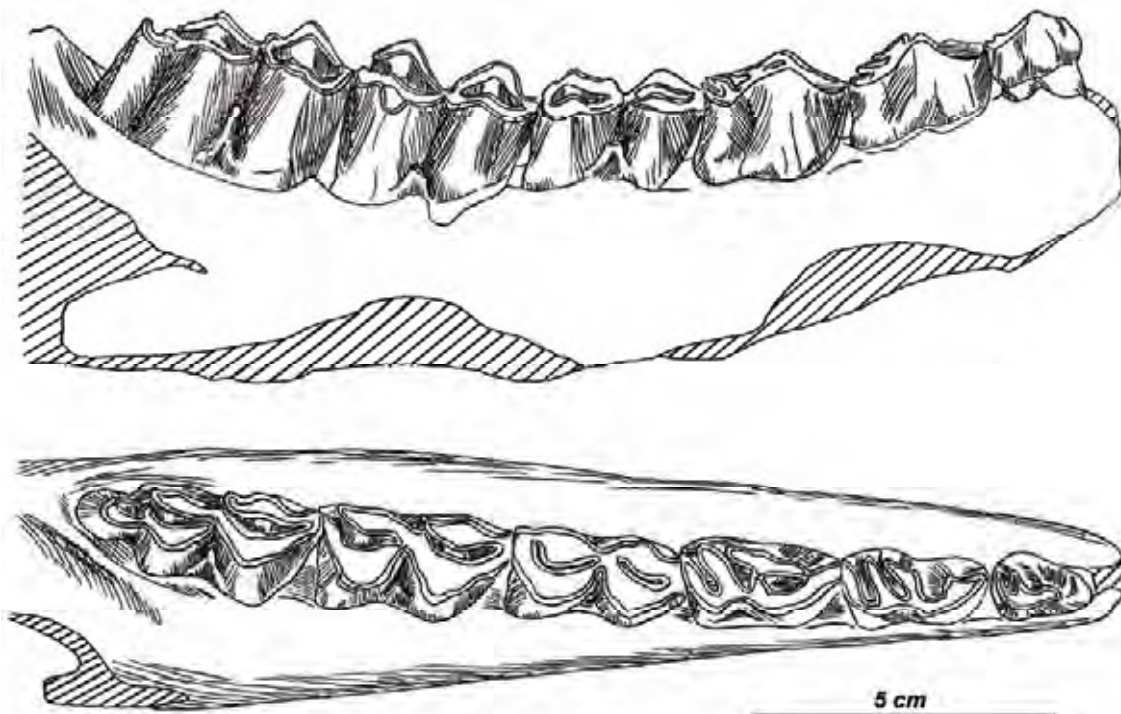


Fig. 2. The left ramus of mandible Nr. 279 from Palaeolithic sites Duruitoarea Veche; lateral and occlusion views.
Fig. 2. Hemimandibula stângă Nr. 279 din stațiunea paleolică Duruitoarea Veche; vederi laterala și superioara.

Roman Croitor
 Archeological Center, the Institute of Cultural Patrimony
 Bd. Ștefan Cel Mare, 1 – MD2001 – Chișinău, Republica Moldova.
 e-mail: roman.croitor@gmail.com