Advances in Vertebrate Paleontology

Hen to Panta

A tribute to
Constantin Rădulescu and Petre Mihai Samson

Edited by:
Alexandru Petculescu
Emanoil Ştiucă

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Constantin Rădulescu and Petre Mihai Samson

En memoire de
Constantin Radulesco et Petre Mihai Samson

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Findings of *Elasmotherium* cf. *peii* (Chow Minchen, 1958) from sediments of Early Pleistocene (Upper Villafranchian) at Salcia (Republic of Moldova)

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Abstract *- For the first time the findings of* Elasmotherium *cf.* peii *(Chow Minchen, 1958) bone remains (molars) are examined from Early Pleistocene sediments (Upper Villafranchian) at Salcia (Republic of Moldova). They extend the idea of western natural habitat of these species in Eastern Europe.*

Keywords - Rhinocerotidae, Perissodactyla, Mammalia, Early Pleistocene, Moldova, South-East Europe.

INTRODUCTION

Among numerous fossilized forms of Rhinocerotidae, a special branch is represented by Elasmotheriinae Dollo, 1885, which is characterized by the specific structure of cranium, teeth and bones of extremities. Included in this subfamily are three families *Sinotherium*, *Hispanotherium* and *Elasmotherium*. The last is represented on the territory of Moldova. Apparently, the origin and early history of this group of animals is connected with the territory of Asia, as the oldest representatives of the subfamily *Elasmotheriinae - sinotherium* - were known from Early Miocene (CHOW MINCHEN 1958). But taking into account the great extent of specialization of *Elasmotherium*, the evolution of this type of animals had already presumably begun in the Eocene period.

According to the structure of teeth apparatus, *Elasmotherium* differs greatly from other species of rhinoceros type. In its general structure, the rhinoceros molar represents a zygolophodont type, which characterizes ungulate herbivore animals with a lateral of maxilla in mastication. All this species of this rhinoceros type, from the early appearance of this family to the late representatives of modern fauna, have permanent brahiodont molars, *i.e.* low crown, distinct neck, without enamel and locking from below the pulp roots. Only the subfamily of *Elasmotheriinae*, originating from *Rhinocerotidae* in a separate branch, differs in its specialization of teeth from the rest of the rhinoceros type. This subfamily which has a common basic structure of teeth elements acquires full prizmodonts (TERYAEV 1929).

All these gradually appearing difficulties in dento-enamel rugosity of the masticatory teeth crown of rhinoceros type represent an attempt to accommodate a certain character of nutrition and long functioning in erasure with vegetative plants. Therefore prizmodont of all the masticatory teeth of *Elasmotherium*, lifelong and continuous growth of these teeth stratum represents another stage in this specialization.

Late forms have a well developed cement. The enamel is plicate.

According to SHVYREVA (1988), *E. peii* is similar to *E. caucasi*cum in development of the enamel rugosity, and in drawing back of cross loph, but it differs in size (it is smaller), in the presence of a collar at the back of the teeth, in a more refined structure of enamel folds and in a longer postmetaloph part of ectoloph in M^2 and M^3.

E. peii is similar in size to *E. sibiricum*, but it differs in the earlier locking of roots, the shape of the tooth revealing the differentiation of crown and root; more rhinoceros type of masticatory surface and the presence of postfossette (open or closed) even at the late stages of erasure. Lower jaw teeth have a more simple and thick enamel.

From the data on the distribution of these animals, it is evident that their natural habitat comprises regions of open areas. We can easily adhere to view points of FLEROV (1953), GROMOVA (1965) and SHVYREVA (1980), according to which Elasmotherium was an inhabitant of open landscapes and it preferred to live in suitably arid conditions (dry steppes). Presumably while peculiarities of ecology made *Elasmotherium* go westward in the beginning of Pleistocene, while in eastern regions climate became more humid. *Elasmotherium*, most likely, were rather thermophilic animals: conditions of the glacial period, starting with the beginning of the Dnieper period, led to the extinction, in a short period of time, of this highly specialized group of rhinoceros-type animals.

BASIC DIAGNOSTIC FEATURES OF *ELASMOTHERIUM PEII* SPECIES

Elasmotherium is considerably large in size. Maxillary molars have a distinct crown and root, long existence in open postfossette and an early locking of roots can be observed, at the back of the teeth in the first stages of erasure there is cingulum (Fig.1). The paracon is drawn forward and the hypocon projects inside (lingually) above the protocon. The teeth have an accurate structure of elements on the masticatory surface, cross crests are narrow and strongly drawn backward, the metaloph in early stages of erasure, does not have a sinus, squashing hypocon; mediofossette has wide paddles, edged with very folded enamel. The third upper jaw molar tooth has a long postmetaloph part ectoloph and a slightly produced metaloph. The cement is strongly developed (CHOW MINCHEN 1958, SHVYREVA 1988).

THE LOCALITIES AND GEOLOGICAL AGE

The localities are situated the north-eastern end of Salcia, approximately 30 km west from Chişinău. Early alluvial sediments, which contain mostly bone remnants of animals, mainly mammals, consist of two packs divided by a layer of loams (Fig. 2). At the base of each alluvial pack there is a big pebble, a shingle and a loam aleurite. Most of the bones of big animals are in these rough sediments. The bone remnants of small mammals are concentrated in the sands of the upper part of alluvial packs (DAVID *et al.* 1988).

In the upper pack, with a thickness 4-6 m were gathered *in situ* remnants of *Archidiskodon meridionalis meridionalis* Nesti, *Palaeoloxodon* sp., *Equus* ex. gr. *stenonis* Cocchi, *E.* cf. *livenzonensis* Baig., *Equus* sp., *Stephanorhinus etruscus* (Falc.),

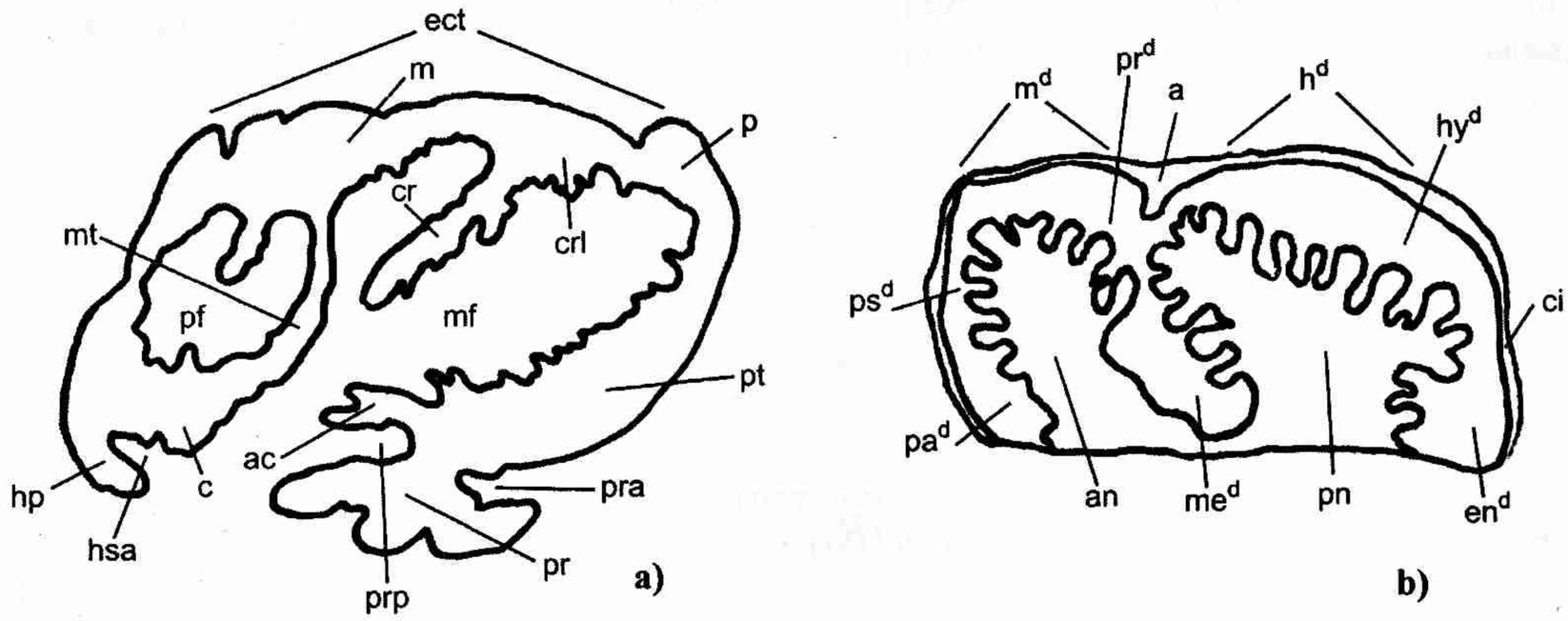

Fig. 1 - The scheme of structure of molars at elasmotheri (according to TERYAEV 1929, BELYAEVA 1966):
a) - M^2: ect - ectoloph, pt - protoloph, mt - metaloph, p - paracon, pr - protocon, m - metacon, hp - hypocon, mts - metastyl, cr - crista, crl - cristella, c- crochet, ac - antecrochet, pra - protosinus anterior, prp - protosinus posterior, hsa - hyposinus anterior, mf - mediofossette, pf - postfossette
b) - M_2: m^d - metalophid, h^d - hypolophid, pa^d - paraconid, ps^d - parastylid, me^d - metaconid, en^d - entoconid, pr^d - protoconid, hy^d - hypoconid, a- external fossette, an - front internal fossette, pn - back internal fossette, ci - cingulid

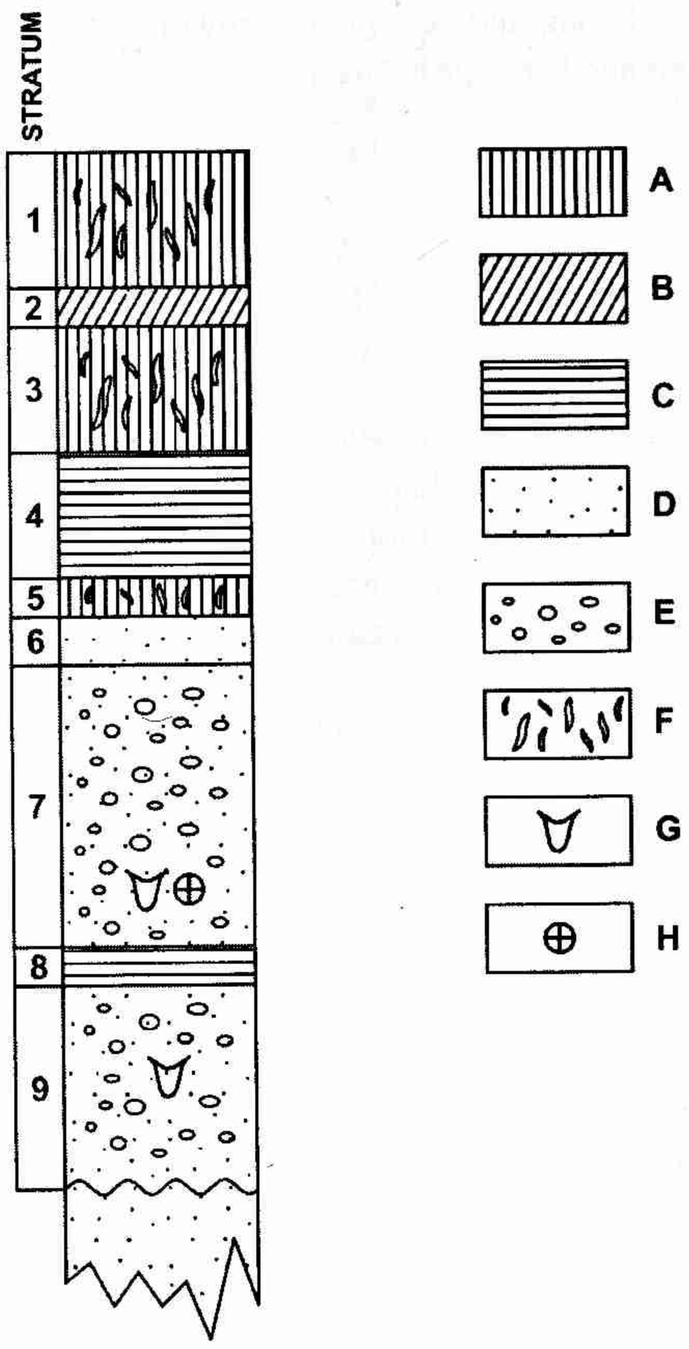

Fig. 2 - The cut of alluvial sediments at Salcia: A - loess-like loams, B - loams, C - clays, D - sands, E - gravel-pebble, F - large carbonate concretions, G - fauna of large mammals, H - fauna of small mammals.

Elasmotherium cf. *peii* (Chow Minchen), *Elasmotherium* sp., *Megaceroides obscurus* (Azz.), *Arvernoceros verestchagini* David, *Bison* cf. *tamanensis* (Ver.), *Praedama* sp., *Cervidae* (small form), *Proochotona eximia* Chom., *Trischizolagus dumitrescuae* Rad. et Sam., *Citellus* sp., *Spalax minor* Top., *Cricetus cricetus* L., *Cricetulus* sp., *Villania fejervaryi* Korm., *Prolagurus arankae* Kretz., *P. praepannonicus* Top., *Mimomys pussillus* Meh., *M. reidi* Hint., *M. intermedius* Newt., *Allophaiomys pliocaenicus* Korm., *Vulpes* sp., *Felis* (*Lynx*) sp., *Felidae* gen.?(big form) etc. (DAVID *et al.* 1988, DAVID 1989, SHUSHPANOV 1989, DAVID & OBADA 1993, DAVID *et al.* 1997, ABBAZZI *et al.* 1999).

In the lower pack with a width of about 3 m, were found in situ *Archidiskodon* cf. *gromovi* Garutt et Alexeeva, *Equus* cf. *livenzonensis* Baig., *Equus* sp., *Stephanorhinus etruscus* (Falconer), *Paracamelus gigas, Megaceroides* sp., *Bison* sp., *Desmana termalis* Kormos., *Erinaceus* sp., *Prolagus* sp., *Sicista* sp., *Allocricetus* cf. *ehiki* Schaub, *Villanyia* sp., *V. petenyii* Mehely, *Prolagurus pannonicus* Kormos, *Promimomys moldavicus* Kormos, *Mimomys hintoni* Kretzoi.

Based on the presence in the upper pack of *Archidiskodon meridionalis meridionalis, Elasmotherium* cf. *peii, Bison* cf. *tamanensis, Spalax minor, Cricetus cricetus, Prolagurus arankae, Allophaiomys pliocaenicus,* the fauna of mammals in these sediments can be attributed to the Odessa fauna complex (biozone MN 18), but according to the presence in the lower pack of *Archidiskodon* cf. *gromovi, Paracamelus gigas, Desmana termalis, Promimomys moldavicus* and some other more ancient representatives, this association of mammals can be attributed to the Hapr fauna complex (biozone MN 17).

Shushpanov (1989), who studied microterriofauna of the mentioned packs, thinks that all the fauna of rodent in Salcia should be attributed to the Odessa complex.

Geologists, who studied early alluvial sediments and fauna composition in Salcia, think that they were formed from Late Acchagy 1 to Early Apsheron inclusive (Anthropogen and Paleolithic of Moldovan Dniester region 1986, BILINKIS 1992).

SYSTEMATICS

Order: Perissodactyla
Family: Rhinocerotidae Owen, 1845
Subfamily: Elasmotheriinae Dollo, 1885
Genus: *Elasmotherium* Fischer, 1808
Elasmotherium cf. *peii* (Chow Minchen, 1958)
Elasmotherium sp., David et al., 1988
E. caucasicum Boris., David, 1989
E. cf. *peii* Chow Minchen, David, 1995.
E. cf. *peii* Chow Minchen, David, Shushpanov, Obada, Croitor, 1997.

M a t e r i a l. Teeth: three upper jaw molar teeth - catalogue number (cn) 52-1, 52-2, 52-3; three fragments of upper jaw molar teeth - cn 52-559, 52-560, 52-561; three lower jaw molar teeth - cn 52-557, 52-563, 52-564.

The findings were made by the staff of the *Department of Palaeozoology* and the *Institute of Geology and Geophysics* of the *Academy of Sciences of Moldova* (G. M. Bilinkis and V. L. Dubinovsky) in a sand-gravel pit to the north-east of Salcia and they are kept in the *Museum of Fossil Fauna Complexes* of the *Department of Palaeozoology* of the *Institute of Zoology* of the *Academy of Sciences of Moldova.*

C o m p a r a t i v e m a t e r i a l. Description and illustrations of the teeth of *Elasmotherium peii* from Rasshevatsky stanitsa Stavropol Territory (Northern Caucasia, Lower Pleistocene, Institute of Palaeontology RAN, cn 1305), Pinglo (Lower and Middle Pleistocene of China, PIN RAN, cn 1784), Tokmak (Ukraine, Institute of Zoology of the Academy of Sciences of Ukraine) (SHVYREVA 1988); *E. caucasicum* from Tamani (Ukraine, Epivillafranchian, PIN, cn 1256); *E. sibiricum* from Gaevsky stanitsa (Northern Caucasia, Middle Pleistocene, Stavropol museum of local lore, cn 19900) (SHVYREVA 1988 etc.).

D e s c r i p t i o n. Upper jaw molars.

Three fragments of upper jaw molars. The first tooth number 52-561 is very big (full height - 183 mm), but with a very decayed masticatory surface. Two small fragments: number 52-559 with a big cavity well-indented postfossette and hypocon; number 52-560 represents one of the paddles of mediofossette.

The highly erased upper jaw molar number 52-3. The enamel of all external surfaces is decayed and only a small fragment of front part protoloph remains. From the elements of masticatory surface, a part of postfossette and all mediofossette with two paddles and lanceolate crista remained. Antecrochet can also be distinguished. The enamel is rugulose. Although the tooth is in the last stage of erasure, postfossette is clearly observed on its masticatory surface. In a discussion about BORISYAK (1914) the distinguishing new species *E. caucasicum* Teryaev (1929) points out that "postfossette is represented in absolutely young and recently beginning to work teeth, it is absent in all teeth having long, many-year growth", that it is a temporary organ, which if liquidated, will no longer develop. This implies that the given tooth represents a species different from *E. caucasicum*.

The constant upper jaw molar M^2 number 52-2 (Fig. 3a) belongs to a relatively young animal. The length of masticatory surface is bigger than its width. The crown has a form of a clearly observed rhomb, with the acute front angle - approximately 57^0 (the angle size was measured by intersection of tangents

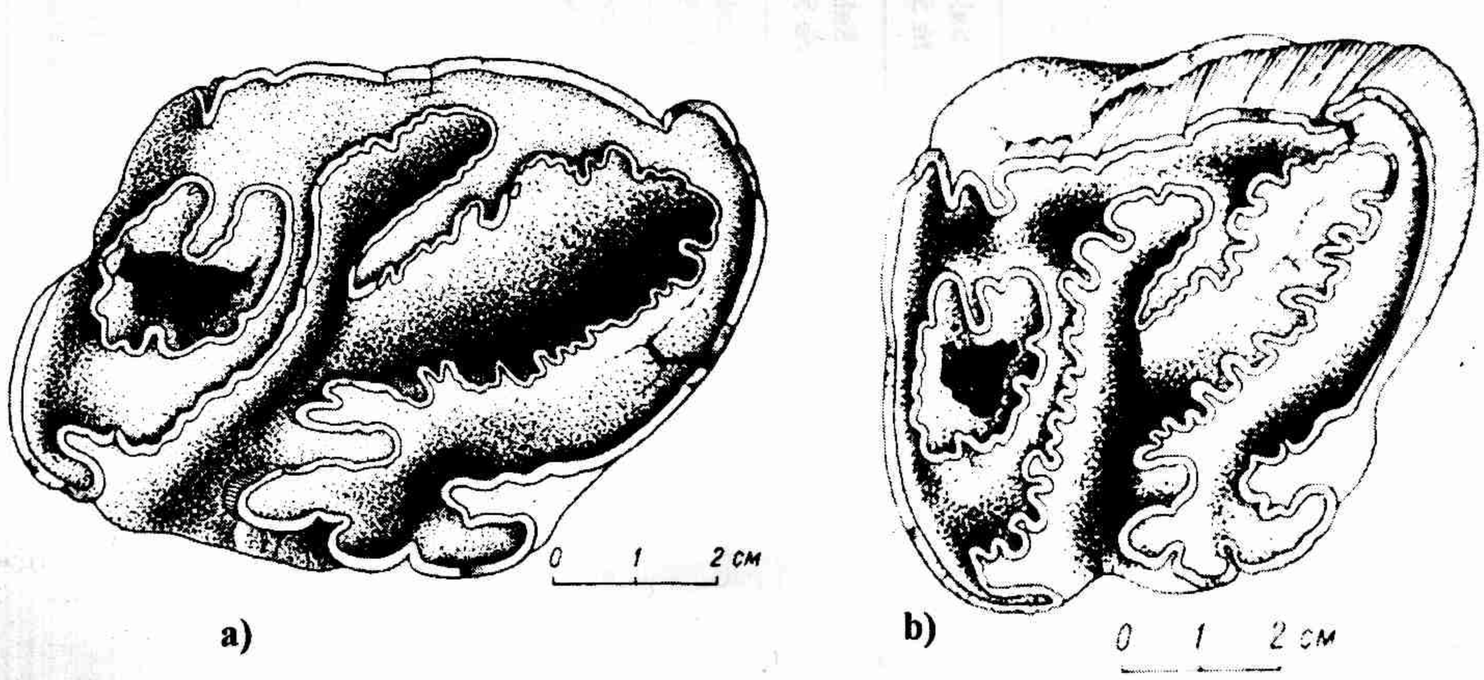

Fig. 3 - Upper jaw molars of *Elasmotherium* cf. *peii*:
a) right M^2 number 52-2;
b) right M^2 number 52-1.

of ectoloph and protoloph). The angle in similar teeth in cranium of *Elasmotherium* from Guriev is equal to 58°-59°, in cranium from Astrakhan - 68° - 77° (TERYAEV 1929). The tooth is in the last stage of erasure, as the crown height is 85 mm, and the crown height with roots 161 mm. The roots are closed and neatly differentiated from the crown (feature of *E. peii*).

Postfossette is filled with cement and closed; this is characteristic for teeth of both *E. caucasicum* and *E. sibiricum* (SHVYREVA 1988). The elements of masticatory surface are fully formed (Fig. 3a). Ectoloph is narrow, the external part is coarse-waved (enamel is 1.8 mm thick), the internal part is covered with shallow rugosity, and the postmetaloph part is short. Paracon is slightly retracted in the front. Protoloph is wider than the ectoloph; there is not a secondary rugosity in its front part. Protocon is three-paddled, it is rather sharply released by big sinuses - front (protosinus anterior) and back (protosinus posterior), its height is more than the width and is covered with secondary rugosity.

The metaloph begins a little further back from the middle of ectoloph. Its basement is narrow, with slight curves in enamel. In the central part, the metaloph widens; it has a thick folded enamel (enamel is 1.2 mm thick).

The hypocon is lingually retracted below the level of protocon and is separated from metaloph by enamel, forming the hyposinus anterior.

Transversal lophs are gaunt and, due to a certain narrowness and skewness of crown on the whole, they are displaced from the positions they have today in the teeth of modern rhinoceros. In connection with this, mediofossette has a rhomboid form.

In the middle of ectoloph begins a long narrow that divides the mediofossette into two unequal paddles (the front is bigger). Crista is acute lanceolate, it hangs out parallel to the protoloph to the middle of tooth in the direction of the big rhomb axis and is covered with secondary rugosity. From the front part of crista, at its base on the ectoloph, there is a fold of dentine - cristella. From the protoloph in mediofossette a two-paddled antecrochet bulge out. Its vertexes do not come out above the level of the back end of protocon.

The crochet is morphologically distinct; it is aimed at the proximal part of tooth by three paddle vertex and directed at almost a right angle to the antecrochet.

The mediofossette is filled to edges by cement, with a small cavity in the middle. The cavity on the internal part of tooth, which spreads to the height of the tooth, corresponds to the mouth of the mediofossette.

The form of the tooth, and the detailed structure of its elements almost completely corresponds to the described teeth of *E. peii* from Rasshevatsky Stanitsa Stavropol Territory (SHVYREVA 1988), it is particularly close to the description of the cut of tooth M^2 number 1305-3 of a young animal. The tooth from Salcia is almost at the same stage of erasure.

Constant upper jaw molar M^2 number 52-1 (Fig. 3b) belongs to an adult animal. The length of the tooth approaches the size of the width. The crown has an almost square shape, only the paracon is slightly retracted to the front, its angle is equal to 68. The tooth is in the later stage of erasure than tooth number 52-2, as the height of the crown is 68 mm, and the height of the crown with roots - 169 mm. The roots are closed and differentiated from the crown, which is characteristic to *E. peii*. The postfossette is closed and is filled up with cement.

The ectoloph is narrow. Both the internal and external part is covered with shallow rugosity. Metastyl is clearly distinguished - there is an external fold of enamel the behind metacon; feature for M^2 and M^3 at *E. peii*.

The protoloph is wider than the ectoloph. Its external (or front) part has a distinct trace of presence in the jaw of M^1, therefore it is absolutely smooth and very thick (the enamel is up to 0.4 mm thick). The lower part of the protoloph is separated by two sinuses, whose vertexes are aimed at each other in one line, parallel to the lingual part of the tooth, and forms a three-paddled protocon.

The metaloph is much more retracted to the back from the middle of the ectoloph, it is narrow with distinct folds of enamel. In the lower part, the metaloph widens. A pronounced hyposinus separates the hypocon slightly above the level of the protocon.

Mediofossette is relatively narrow, prolonged towards the paracon. It is divided by the two gaunt narrow cristainto paddles. The front paddle is bigger and they both have coarse-wave rugosity. The crista is not big - its length is only 18 mm. Many-paddled cristella separates from the basement of crista. On the internal side of the protoloph, in the mediofossette, the small antecrochet appears. The crochet slightly comes out of the front surface of the metaloph. The size of teeth is given in Table I.

Measurements (mm), index (%)	*E.* cf. *peii* (R. Moldova)			*E. peii* Chow (From Shvyreva, 1988)			*E. caucasicum* Boriss.		*E. sibiricum* Fisch.		
	Salcia № 52-1	Salcia № 52-2	Salcia № 52-3	Rasshevatskaya (PIN, №1305)	Pinglo (China)	Tokmak (Ukraina)	Tamani (PIN, №1256) (Shvyreva, 1988)	From A.A. Borissjac (1914)	From F. I. Brandt (1864)	From B. C. Kozhamkulova (1969)	Gaevskaya (SKM, №19900) (Shvyreva, 1988)
1. Length M^2	67	83	56	84,6; 89,7	84; 70	81	83; 75; 70	69-86	68	86	64,5
2. Breadth M^2	63	69	43	49,3; 61,2	63; 59	57	71; 65; 64	70-76	61	52	55
2:1	94,0	83,1	76,8	58,7; 68,2	75; 84,3	70,4	85,5; 86,6; 91,4	101,4-88,4	89,7	60,5	85,3

Table 1 - Upper jaw molars of *Elasmotherium*.

Lower jaw molars. They all are built according to the same type, *i.e.* in the same way as for the rhinoceroses. They consist of two clearly distinct crescents, the front one takes the form of a horseshoe because of its end which is curved towards the internal part of the tooth.

The folds are more intensively developed on the internal line of enamel, which is located in two directions - in the cross direction at the internal part and in lengthwise at the cross edges, where are usually more intensive.

The lower jaw molars are more clearly than the upper jaw molars divided into two types - big teeth with coarse enamel, giving regular folds, with widened and regularly rounded ends; - and smaller teeth with thick enamel, usually curved in irregular shape in acute folds. There are not other distinctions in the details of their structures between these two types of teeth. Specimen of both types of enamel are represented in our collection.

The left M_2 number 52-564 constitutes a tooth with coarse enamel; in some folds it is 2.7 mm thick. The tooth is in the last stage of erasure, the verge between crown and root is clearly seen. The height of crown is 44 mm, the height of root is 53 mm. The roots are closed. The length of tooth is 77 mm and the width is 34 mm. External enamel is coarse-waved. The internal fossettes are open-ended. The mediofossette is small with big folds, the back one is wide, curved in front-back direction. On the internal and external parts of the tooth there is an indentation, which divides the tooth into two parts, corresponding to the future roots. The middle internal cone (metaconid) of the tooth consists of a folded neck, which narrows towards the external part, and the head, which is drawn out in a front-back direction. The enamel on the entoconid makes a small acute angle in the shape of spur.

The left M_2 number 52-563, (Fig. 4). The type of enamel is thick. The enamel is from 0.7 to 1.5 mm thick. The tooth is on the middle stage of erasure. The height of crown is 77 mm, the height of roots is 76 mm. The length of tooth is 70 mm, the width is 36 mm. The external line of enamel is slightly corrugated. The postfossette is not deep, narrow, and retracted on the front and on the inside. There are some smoothly polished places from interaction with the former and the following teeth. The internal fossettes are open-ended.

Left M_1? number 52 -557. The type of enamel is thick. The enamel is from 0.5 to 1.4 mm thick. The tooth is on the early stage of erasure. The roots are already enclosed. The height of crown is 100 mm, the height of roots is 47 mm. The length of tooth is 66,5 mm, the width is 27 mm. The width of the tooth is not full, because there is no enamel on the external part along the full height. The metaconid curves in to a S shape and its walls are not many folded, which is characteristic for the teeth, which are slightly erased. The front part of the metalophida is destroyed.

NOTES AND CONCLUSIONS

Upper jaw molars from Salcia have both similarities and differences from the teeth from China or from Rasshevatsky stanitsa Stavropol Territory, which are determined as *E. peii* (SHVYREVA 1988), with which it was compared. They are similar in the fact that they have more or less a differentiated crown from the root, the paracon is front retracted and the teeth have rhombic form; there is an early closure of roots, and the mediofossette has wide paddles with strongly developed cement. The absence of cingulum on the back part of the teeth can not be considered a diagnostic feature of teeth from Salcia, as they are far from being on the initial stage of erasure.

An important similarity in pictures of the masticatory surfaces from Salcia is observed from the first cut M^2 - tooth *E. peii* from Rasshevatsky stanitsa, Stavropol Territory (Fig. 5c), and also M^2 from Tokmak (Ukraine) (Fig. 5d) (SHVYREVA 1988).

Nevertheless, according to their size, the teeth from Salcia are bigger than the specimen, determined as *E. peii*. Even if we take into consideration the fact that the teeth are in the later stage of erasure, the size of the teeth from Salcia is closer to the size of the teeth of *E. caucasicum*. A feature characteristic for *E. caucasicum* is the early closure of the postfossette. The rhombic form of crown and elements of the tooth surface number 52-2 from Salcia are very similar to the M^2 from Tamani (SHVYREVA 1988), belonging to *E. caucasicum*.

There are also features characteristic for both *E. peii* and for *E. caucasicum*. These are the development of enamel rugosity and the back retraction of the transverse loph. But based on the location of these specimen of teeth and fauna from Salcia, which belong to the Khaprovian - Odessa complexes, and the end of the Upper Pliocene - beginning of Lower Pleistocene, respectively. We can establish the most possible appearance of *Elasmotherium*, which was widely spread at that time in Asia. This is *E. peii* (SHVYREVA 1988). The long existence of the postfossette on the highly erased tooth number 52-3 casts doubts on belonging to an already known species (TERYAEV 1929).

The presence of features of *E. peii* and *E. caucasicum* in the teeth from Salcia can be attributed to individual variability, whose big way for *Elasmotherium* was noticed by a group of researchers (BORISSJAC 1914, TERYAEV 1929, SHVYREVA 1988). Taking into consideration the changeability of teeth and the age of the findings, we consider the teeth of *Elasmotherium* from Salcia to be ascribe to *E.* cf. *peii*. Nevertheless, the possibility of state in a new family (subfamily) of *Elasmotherium*, or probably a transitional form between *E. peii* and *E. caucasicum* must not be excluded. Perhaps new findings and new researches will yield a more precise definition of the material.

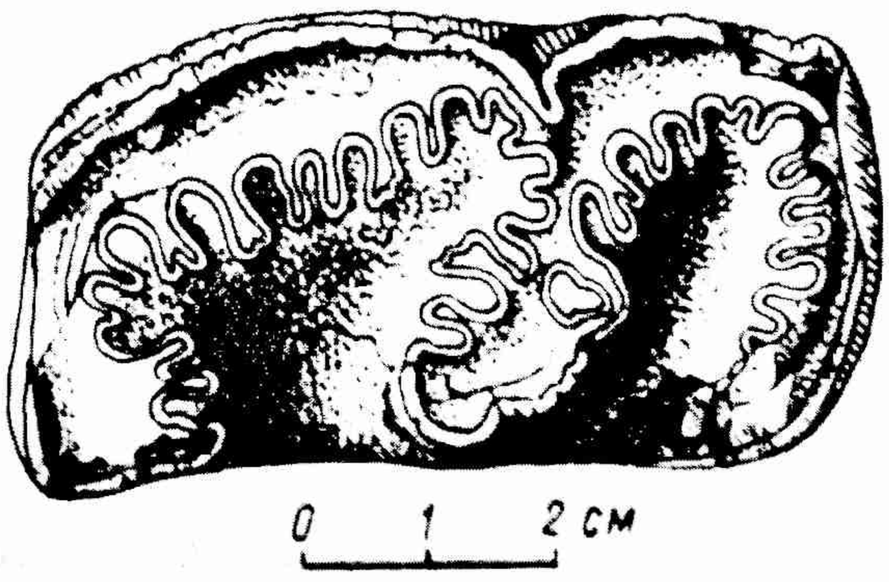

Fig. 4 - Lower jaw molar left M_2 number 52-563 *Elasmotherium* cf. *peii*.

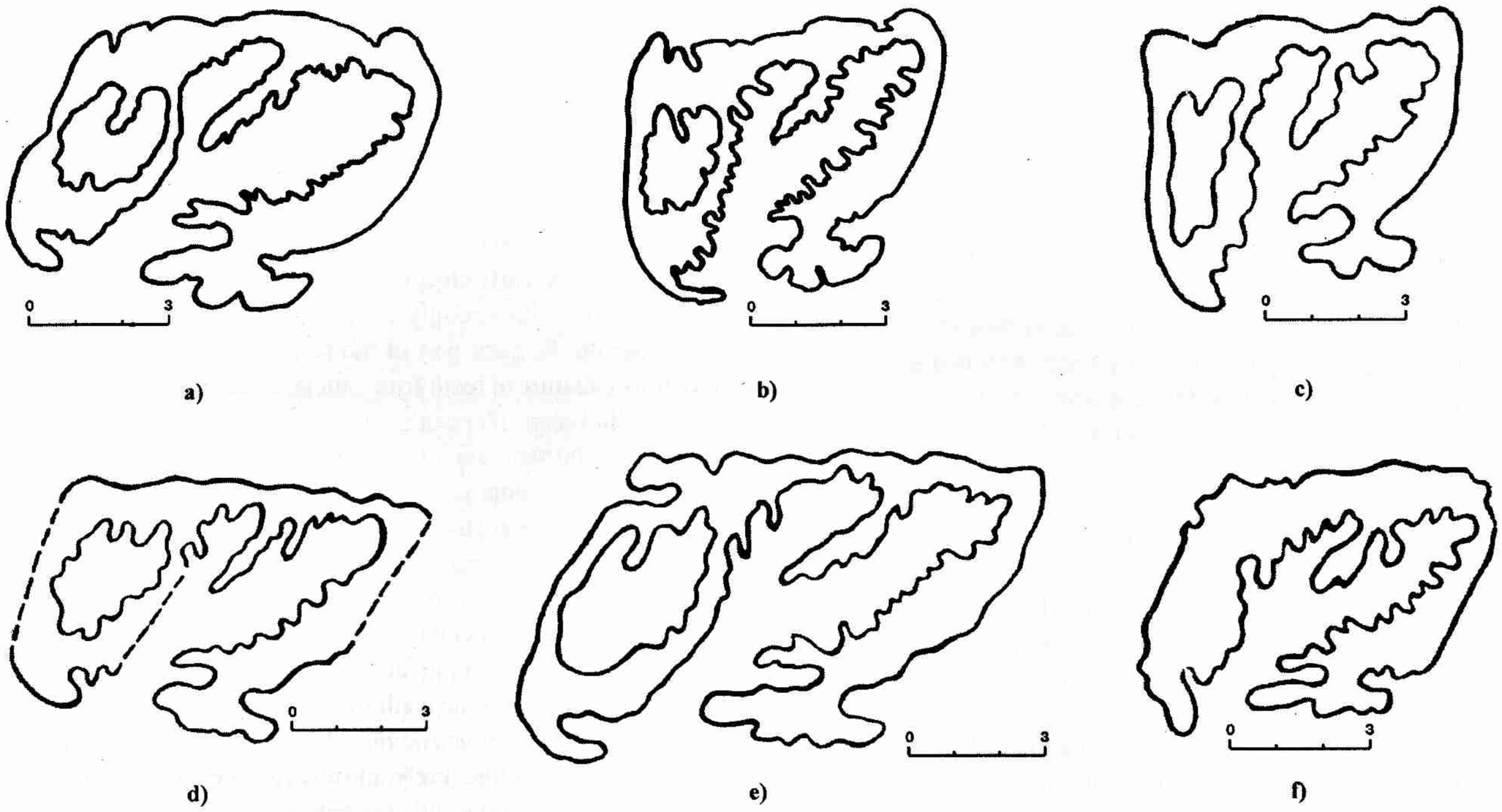

Fig. 5 - Teeth of *Elasmotherium*.
Elasmotherium peii: a) M^2 number 52-2 and b) - M^2 number 52-1 from Salcia; c) - M^2 from Rasshevatskaya stanitsa, d) - M^2 from Tokmak (Ukraine);
Elasmotherium caucasicum: e) M^2 from Tamani;
Elasmotherium sibiricum: f) M^2 from Gaevskaya stanitsa Stavropol Territory.

REFERENCES

Abbazzi L., Croitor R., David A. (1999) *Megaceroides obscurus* (Azzaroli, 1953) (Mammalia, Cervidae) from early Pleistocene sites of Eastern Moldova. *Acta zool. crac.* 42(3), :377-392.

Belyaeva E. I. (1966) Rhinocerotridae. *Mammals of eopleistocene of West Transbaikalia*, 92-143, Moskow. (In Russian).

Bilinskis G. M. (1992) *Geodynamic of South-Western part of East-European platform in the period of morphogenesis*, :47-49, Chişinău. (In Russian).

Borissjak A. (1914) The teeth of Elasmotherium caucasicum nov. sp. *Izvest. Rossiyskoy Akad. Nauk*, 6(9), :555-586. (In Russian).

Brandt J. F. (1864) Observations de *Elasmotherii reliquiis. Memoires de L'Academie de Sciences de St-Petersbourg*, 7(8), n.44.

Chow Minchen (1958) New elasmotherine Rhinoceroses from Shansi. *Vertebrate palasiatica*, Vol. 2, 2-3, :135-142.

David A. I. (1989) New data on hoof animals from Late Pleistocene of Moldova. *Operativno-inform. materialy k 1 vsesoyuznomu soveschaniyu po paleoteriologii*, :23-24, Moskow. (In Russian).

David A. (1995) Rinocerii pliocenului - pleistocenului mediu din Moldova. Protecţia, redresarea şi folosirea raţională a biodiversităţii lumii animale. ASM, Chişinău.

David A. I., Bilinskis G. M., Shushpanov C. I., Redcozubov O.I. (1988) Paleontological characteristics of the neostratotype of Firladeni terrace near of v. Salcia. *Buletinul al Acad. de Stinte a Rep. Mold., seria de biol. si chi.*, 3, :29-33. (In Russian).

David A. I., Obada T. F. (1993). Remains of elefants from Early Pleistocene deposits from Salcia. *Buletinul Acad. de Stince a Rep. Mold., seria de biol. si chim.*, 3, :29-33. (In Russian).

David A. I., Shushpanov K. I., Obada T. F., Croitor R. (1997) Evolutia teriofaunei Republicii Moldova in pliocenul superior - pleistocenul mediu. *Diversitatea si ecologia lumii animale in ecosisteme naturale si antropizate*, :205-217, Chişinău.

Flerov K. K. (1953) Unicorn - Elasmotherium . *Priroda*, 9: 110-112, Moskow. (In Russian).

Gromova V. I. (1965) *Survey of Quaternary mammals of Europe*, 123 p., Moskow. (In Russian).

Kozhamkulova B. S. (1969) *Anthropogen terriofauna of Kazakhstan.* Alma-Ata: Nauka (KazSSR), 150 p. (In Russian).

Shushpanov C. I. (1989) Fauna of small mammals of Late Pliocene site near v. Salcia (Moldova). *Operativno-inform. materialy k 1 vsesoyuznomu soveschaniyu po paleoteriologii*, :62-63, Moskow. (In Russian).

Shvyreva A. K. (1980) Paleogeographical and stratigraphical importance of Elasmotherium findings. *Tr. Zool. in-ta* AN USSR, 93, :21-25 (In Russian).

Shvyreva A. K. (1988) About Elasmotherium from eopleistocene sediments of Northern Caucasia. *Materialy po izucheniyu Stavropolskogo kraya*, vyp. 15-16, :156-167, Stavropol. (In Russian).

Teryaev V. A. (1929) About the structure of teeth and synonyms Elasmotherium Fisch, and Enigmatherium M. Pavlov. *Byulleten Moskovskogo ob-va ispyt. prirody, otd. geol.*, 7(37), :465-496.

***(1986) Anthropogen and palaeolith of Moldovian Dniester region. *Putevoditel excursii VI Vsesoyuznogo soveshchaniya po izucheniyu chetvertichnogo perioda.* Kishinau, 154 c. (In Russian).