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The rhinoceroses of the genus *Elasmotherium* in the biochronology of Eastern Europe

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The associations of large mammals, combined by V. I. Gromov (1948) in the faunistic complexes, are used for the stratigraphy of Pleistocene continental sediments of Eastern Europe. In their characterization Gromov and his followers pay special attention to the chronospecies / subspecies of the elephants of mammoth line. Along with other animals the representatives of genus *Elasmotherium* are also important elements for the paleontological characterization of the faunistic complexes. Modern level of knowledge allows us to offer the representatives of genus *Elasmotherium* as the guiding forms in mammalian biochronology of Eastern Europe, because all species have a clear diagnostic features, they lived in a very short time, as well every species of elasmoteriums corresponds only with one biozone of the elephants of mammoth line.

The interval of existence of genus *Elasmotherium* in Eastern Europe contains approximately 2.5 million years. They appear in the early Pleistocene and disappear in the Middle Pleistocene in the epoch of the development of maximum Dnieper glaciation. The evolution of elasmoteriums was directed towards improving the dental system and organs of locomotion in the direction of adaptation to the rapid running in the open landscapes and to the nutrition of tough plant food. The development of dental system is reflected in the reduction of incisors, canines, in the reduction the amount premolars, in increase of the length of the series of molars, in complication of the folds of the enamel, in the development absolute hypsodontia. Improving of the locomotion ensured of the overall limb lengthening, especially their distal departments. Four stages of speciation can be clearly seen in the evolution of elasmotheriums.

The earliest representative of the elasmoteriums *Elasmotherium chaprovicum* Shvyreva is fixed in the composition of the haprovsky faunistic assemblage in the whereabouts in the North Caucasus and Moldova. The elasmoteriums of that time are characterized by the relative massiveness, they have a low talus with a narrow trochlea of talus and with a wide distal portion, massive metapodiums. Their teeth have the thick rough enamel with irregular folding. The haprovsky faunistic complex corresponds to the biochron of the archaic elephant *Archidiskodon meridionalis gromovi*. Constancy finds of *Elasmotherium chaprovicum* Shvyreva with *Archidiskodon meridionalis gromovi* in the whereabouts of the haprovsky faunistic assemblage give reason to think *Elasmotherium chaprovicum* as the chronospecies of this complex. The taxonomic composition of the haprovsky fauna has a resemblance with faunas of the middle Villafranchian of Italy. (Vangengeim & Zazhigin, 1982). The interval of existence of the haprovsky complex of mammals can limit 2.6 - 2.2 million years ago.

The psekupsky faunistic complex is known from many whereabouts of the Northern Black Sea, Moldova, Northern Caucasus. This complex corresponds to the biozone *Archidiskodon meridionalis meridionalis*. In whereabouts of the psekupsky faunistic complex *Elasmotherium peii* Chow is found in combination with the southern elephant, close to the typical form of the Upper Valdarno in Italy. Its teeth have early closure of the roots, the prolonged existence open of posterior hollow (postfossette), the presence of the collar on the back wall of the tooth, a strong deflexion back of transversal protolof and metalof, a clear differentiation of the crown and roots. The interval of development of the psekupsky complex is 2,2 - 1,1 million years ago. Fauna of this type corresponds to the stages of development of faunas Tasso and Olivola of Upper Villafranchian from Italy (Azzaroli, 1977; Vangengeim etc, 1990).

According to faunal data the age limit of the Taman fauna is limited by biozone of progressive southern elephant *Archidiskodon meridionalis tamanensis*. The characteristic form of this complex is *Elasmotherium caucasicum* Boriss. Compared with the more ancient forms the teeth of *Elasmotherium caucasicum* lose a collar, have more pronounced prismatic shape, as well later closure of the pulp and of posterior hollow (postfossette), disorderly growth and greater tortuosity of enamel. Judging by the size of the teeth and astragalus, *Elasmotherium caucasicum* inherited the large size of his ancestors.

However, among researchers there is still no consensus on the exact geological age of the Taman faunistic complex. According to E.A. Vangengeim etc (1991), the time interval of its development is 1.1 - 0.8 million years. The probable analogues of the Taman fauna are Western transitional faunas between Villafranchian and Galerian by scheme of A. Azzaroli (Azzaroli, 1983).

Several researchers (Titov etc, 2012) offer to lower the lower boundary of the Taman faunistic complex by the composition of rodents and determine its age limits 1.55 - 0.85 million years. It corresponds to the second half of the Late Villafranchian and most part of Biharian (with *Allophaiomys pliocaenicus*).

Stratotype of the Tiraspol faunistic complex is located in the outskirts of the town of Tiraspol (Kolkotova Balka). The chronospecies of this complex is the elephant *Mammuthus trogontherii* (= *Elephas wüsti*). In whereabouts of the Tiraspol fauna in Eastern Europe, coeval with typal, it is usual the large form *Elasmotherium sibiricum* Fischer. This elasmoterium detects a reduction dental formula by reducing the amount of premolars Its molars despite the great wear have the open roots. The enamel of the upper and the lower teeth gets thinner and acquire strong folding. For this type it is typical of the early closure and disappearance of posterior hollow (postfossette). All teeth have a slightly curved shape of the prism, differentiation of the crown and the root can not be traced. Time of the

Tiraspol complex is estimated interval 0.8 - 0.4 million years. Approximate analogy of Tiraspol fauna is considered faunas of the Galerian Italy.

The singilsky faunistic complex is included in the stratigraphic scale of the Eastern Paratethys in the 60-ies of the 20th century. It was highlighted between layers of Baku and of the Lower Khazars on based findings of the fauna in deposits of kosozhsky and singilsky formations. Its development is limited to the time of Likhvin interglacial. During the propagation of singilsky fauna *Palaeoloxodon antiquus* is the chronospecies. In addition, it includes the numerous finds of small form *Elasmotherium sibiricum*. Its teeth are characterized by more thin enamel and still more depth and randomness of its folds, especially on the lower teeth. The length of the complex is estimated 0.4 - 0.3 million years.

In the Volga-Ural region very often finds elasmoteriums meet with representatives of the Khazar faunistic assemblage: *Camelus knoblochi*, *Bison priscus longicornis*, *Megaloceros giganteus*, *Saiga borealis*, early mammoth *Mammuthus chosaricus* etc. All of them were find not in situ. But the constancy of such faunal combination suggests that *Elasmotherium sibiricum* was the representative of the Khazar faunistic complex. During the development of the maximum Dnieper glaciation it has already not found. Time of the Khazar complex covers 0.3-0.2 million years.

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