

Elasmotherians - evolution, distribution and ecology

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SUMMARY: Elasmotherians from an Early Pleistocene, Tamanian mammal assemblage at Sinaya Balka (Black Sea area, Russia) were studied in order to (1) assess the evolution and distribution of this genus, and (2) evaluate the likelihood that *Elasmotherium caucasicum* is a bona fide species. In this region, *Elasmotherium caucasicum* Borissjak, 1914, is commonly associated to the Tamanian elephant (*Archidiskodon meridionalis tamanensis*). It has a more primitive dental morphology than *E. sibiricum* Fisher, 1808, with which it was formerly considered to be synonymous, and therefore constitutes a separate species. Ecological peculiarities and paleoenvironmental conditions, proposed for *E. caucasicum*, could be useful for understanding the biogeography of the region at the time of *Archidiskodon meridionalis tamanensis*.

1. INTRODUCTION

Elasmotheriums are giant rhinoceroses which lived in the Early Pleistocene of Southern Russia. After the Tamanian elephant (*Archidiskodon meridionalis tamanensis*), *Elasmotherium caucasicum* is the most frequently found mammal in the Tamanian assemblage. They form the most typical assemblage of large herbivores for the interval 1.1-0.8 My. This assemblage is found in Sinaya Balka and Tsybmal localities. Moreover, *Elasmotherium* is known from Akhtanisovskaya and Fontalovskaya localities and Archidiskodon from Kuchuguri locality (Fig. 1).

2. DISCUSSION

A new genus and species, *Elasmotherium sibiricum*, was established by Fisher von Valdeim (1808). A second species, *E. caucasicum* was distinguished by A. Borissjak (1914) on the basis of its large and morphologically-distinct teeth from Sinaya Balka. *E. caucasicum* was considered to have more primitive "rhinoceros-like" teeth morphology, due to presence of the postfossette basin on the upper teeth. The validity of this species, however, was subsequently challenged by V.A. Terjaev (1948), who equated it with *E. sibiricum* on the grounds that the presence of the postfossette

basin is typical for slightly worn teeth only.

Two more species, which represent the earliest record of the genus, were described from China by Chow (1959): *E. inexpectatum* and *E. peii* (Shansi). Chinese species were considered by Chow (1959) to be ancestral for *E. caucasicum* and *E. sibiricum*, which were widely distributed in the Eastern Europe (e.g., Russia), there being only two questionable records of *Elasmotherium* sp. thus far recorded in western Europe (Shvireva 1995).

Investigation of new material from an Early Pleistocene Tamanian mammal assemblage at Sinaya Balka, near the Black Sea, shows that *E. caucasicum* differs from *E. sibiricum* by its relatively longer teeth-row and P4, bigger teeth, and an s-shaped metaconid. It is likely that *E. caucasicum* is ancestral to *E. sibiricum* as it retains some primitive dental features, notably (1) a postfossette basin on the upper teeth, (2) a less sinuous enamel layer of the external wall of ectoloph, (3) irregular fold of the enamel (the peaks of the fold have the different height).

The genus *Elasmotherium* appeared in Central Asia during the Late Pliocene. Its origin appears to be connected to the genus *Sinootherium* (Upper Miocene – Lower Pliocene), although certain species of *Sinootherium*, which could be ancestral to *Elasmotherium*, is unknown. *E. inexpectatum* and *E. peii* inhabited Eastern China during the

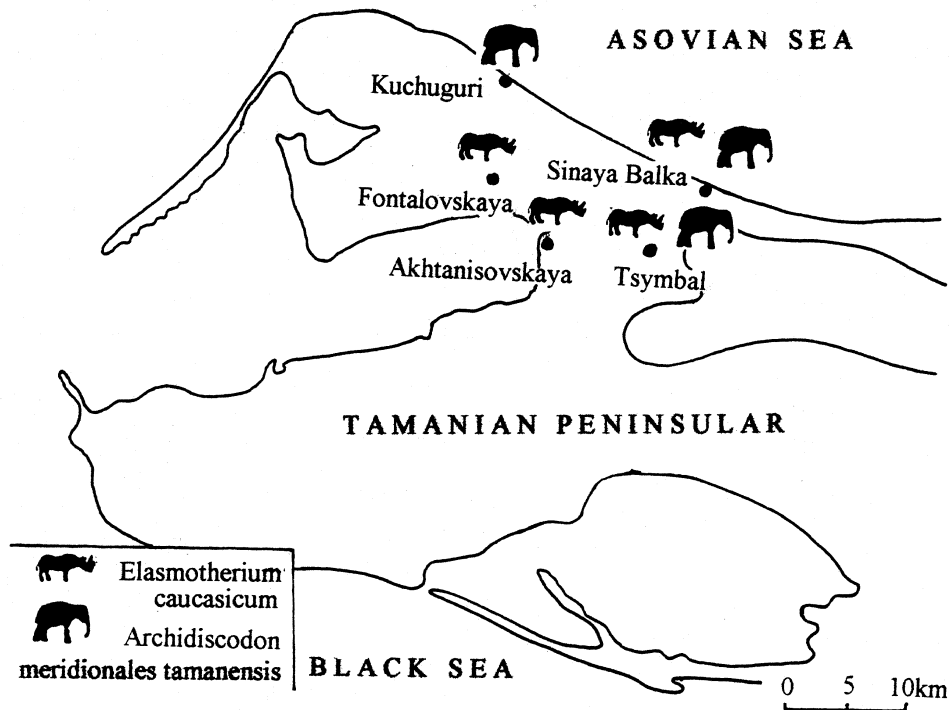


Fig.1 - The distribution with the localities of Tamanian mammal assemblages.

Upper Pliocene - Lower Pleistocene. They disappeared c. 1.6 Ma ago (Qui & Qui 1995). The earliest records of *Elasmotherium* sp. in Russia are known from the Upper Pliocene assemblages near the Black Sea. This area evidently became a second center of their radiation. This suggests that *Elasmotherium* sp. may have developed separately in Russia and China.

E. caucasicum was widely distributed in this area 1.1 Ma and 0.8 Ma. The more advanced *E. sibiricum* appeared in the Middle Pleistocene. It occupied all of the southwestern part of Russia, reaching eastward to western Siberia. Elasmotherians persisted in the eastern Europe until the end of the Middle Pleistocene. The records of elasmotherians in the western Europe, however, is problematic, thus the western limit of their migration remains to be documented.

Morphological peculiarities of elasmotherians have generated two main hypotheses concerning their appearance and the character of their habitat. The first, most widely accepted

view portrays them as large wooley animals with a large forehead horn that thrived on an open steppe. The other view, proposed by V.A. Terjaev (1948), assigned elasmotherians to riparian biotopes.

Our work indicates that elasmotherians dwelt in both riparian and steppe biotopes. The riparian biotope is suggested by dental and skull morphology. The combination of such characters as the absence of canines and strongly developed lateral processes of the atlas implies lateral movements of the head, presumably for grasping grass. The hypsodont dentition indicates presence of mineral grains in the food. Such food could be obtained by pulling out dense plants from the moist soil. These conditions are typical for riparian biotopes. On the other hand, a steppe biotope is indicated by their rather long and slender limbs, which would have served well for creatures grazing over vast areas. Thus, the available data suggest that the habitats of elasmotherians could have included both riparian biotopes and the

adjacent high grass steppe. Given that elasmotherians coexisted with *Archidiskodon*, the same ecological conditions can be inferred for the latter.

3. CONCLUSION

Sinaya Balka (Early Pleistocene, Black Sea area, Russia) is the type locality of Tamanian mammal assemblage as well as of *Elasmotherium caucasicum* and *Archidiskodon meridionalis tamanensis*. The Early Pleistocene *E. caucasicum* is confirmed as a valid species. It may be regarded as a likely morphological ancestor for *E. sibiricum* due to its primitive dental characteristics. *E. caucasicum* was dispersed in the upper part of the Early Pleistocene. Its upper stratigraphical range is limited by Matuyama chron. The assemblage *E. caucasicum* and *A. meridionalis tamanensis* is of characteristic this time interval in south-western Russia.

Habitats of elasmotherians included both riparian biotopes and contiguous high grass steppes.

4. REFERENCES

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