

Lower Pliocene rodents of Ukraine and problems of Pontian biostratigraphy

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Abstract. This paper presents a review of fossil rodents from Lower Pliocene localities, continental analogues of the south Ukraine Pontian layer. Problems of biostratigraphy and correlation with continental Mio-Pliocene deposits are discussed.

Key words: Biostratigraphy, Pontian, rodents, south Ukraine.

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I. INTRODUCTION

Palaeontologists currently display great interest in the study of the Lower Pliocene (Pontian) deposits of the eastern Paratethys. This interest is caused by the controversial data related to the marine deposits, as well as the scanty synchronous continental Pontian deposits and their equivocal interpretation. The subject of the present discussion is not only the duration of the Pontian stage, suggested by some researchers to be 1-2 million years, but also its position within the standard stratigraphy of the interval between 7 and 4 Ma (GOZHIK 1992; VANGENGHEIM & PEVZNER 1993). An insufficient body of inconsistently dated larger mammal remains provides no reliable basis for the resolution of these problems, and a micromammal survey of the Pontian layer by N. I. BARBOT-DE-MORNY still remains almost completely unknown. In the only locality so far known from the eastern Paratethys, Shkodova Gora in the vicinity of Odessa, there has, in continental Pontian limestone streak layers been found deer and camel, as well as some rodent and lagomorph remains said to be poorly diagnostic (TOPACHEVSKI & SKORIK 1977a).

In view of the above, the value of small mammal remains from the coastal and fore-delta deposits of the stratotypic region becomes obvious as data for direct correlation of marine and continental deposits.

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II. RESULTS AND DISCUSSION

Several lower Pontian small mammal localities have been recently discovered in the Odesskaya oblast' (the Ukraine): Vinogradovka-1 (PRISYAZHNIUK & SHEVCHENKO 1987), Bolshoi Fontan

16th Station (lectostratotype of the Pontian) (TOPACHEVSKI et al. 1988), as well as the Crimea: Sokolovka (MOS'KINA & MATSUI 1992). The deposits of Frunzovka-2 containing micromammal remains were formerly assigned to the Pontian (TOPACHEVSKI & SKORIK 1977b, 1979; TOPACHEVSKI et al. 1978, 1992). Numerous localities from the well known Kuchurgan gravels, e. g., Krasnopol, Trudomyrovka, Novo-Petrovka and Frunzovka-1 also belong to the upper Pontian. The most complete profile in the vicinity of Krasnopol village in the Frunzovsky region of Odesskaya oblast' has been designated as the stratotype. It is here, in extensive deposits of the Kuchurgan gravels, that the most important small mammal material was collected. An analysis of the paleontological material from this locality in most cases allowed an exact stratigraphic positioning of the fossils, a reconstruction of the geochronological succession of the smaller mammal faunal events, and a filling of the existing gap between the Meotian and the Kimmerian.

The oldest Pontian fauna is from a locality situated within urban Odessa, in a coastal step of the Bol'shoi Fontan 16th Station, designated as the Pontian lectostratotype. The vertebrate remains, in which rodents predominate, were found in a gravelite layer in clay and aleurite strata overlain by lower Pontian Odessa limestones of the Novorossiisk sublayer. According to its nannoplakton and mollusc content, the bone bearing clay stratum represents the lowermost lower Pontian (TOPACHEVSKI et al. 1988). In this lectostratotypic assemblage the following rodents have been identified: *Pliopetaurista* sp., *Sciurotamias* sp., *Muscardinus* sp., *Myomimus* sp., *Nannospalax compositodontus* (TOPACHEVSKI, 1969), *Apodemus* sp. (a large form), *Apodemus* aff. *jeanteti* MICHAUX, 1967, *Castilomys* (?) sp., *Pseudocricetus kormosi* (SCHAUB, 1930), *Polonomys* sp., *Monosaulax savinovi* LITSHEV, 1977, and *Palaeomys* sp. (here and below the Castoridae have been identified by G. F. LITSHEV, while the Cricetidae are after TOPACHEVSKI & SKORIK 1992).

In Odesskaya Oblast', on the right bank of Yalpug Lake near Vinogradovka Village in deposits characterized by Pontian mollusks of the Novorossiisk horizon, a vertebrate fauna we call Vinogradovka-1 has been found (PRISYAZHNYUK & SHEVCHENKO 1987). Among the small mammals, lagomorphs and rodents are predominant, the latter being represented by the following forms: *Pliopetaurista* sp., *Tamias* sp., *Eliomys* sp., *Glis* sp., *Prospalax rumanus* SIMIONESCU, 1930, *Apodemus* sp. (a large form), *Micromys* sp., *Kowalskia* aff. *magna* FAHLBUSCH, 1969, *Kowalskia* sp. (a small form), *Polonomys* sp., and *Monosaulax* aff. *savinovi* LITSHEV, 1977.

A comparison of the Fontan (Pontian lectostratotype) rodent association with that of Vinogradovka indicates an important difference in qualitative composition. The primitive Cricetidae are represented in the Fontan association by *Pseudocricetus kormosi*, the Spalacidae by *N. compositodontus*, and the Muridae by large *Apodemus* KAUP, 1829, all of which are characteristic elements of the older Meotian micromammal faunas of southern Ukraine (TOPACHEVSKI & SKORIK 1992). In the Vinogradovka rodent association, primitive Cricetids are represented by a species close to the late representatives of the genus *Kowalskia* FAHLBUSCH, 1969, Spalacidae by *Prospalax rumanus*, while among the Muridae, *Micromys* DEHNE, 1841 is found in addition to *Apodemus*. Thus, the Fontan assemblage still retains continuity with the late Meotian communities, whereas the Vinogradovka assemblage is more similar to the subsequent Kuchurgan one. However, the appearance of the first primitive representative of the Arvicolidae, *Polonomys* KRETZOI, 1959, unites these faunistic assemblages and distinguishes them from the Meotian ones. *Polonomys*, which is preserved in upper Pontian faunas of the Kuchurgan stage apparently is an indicator of the Pontian.

The rodent species composition of the Kuchurgan deposits as seen in Krasnopol and Frunzovka-1 is as follows: *Pliopetaurista* sp., *Tamias* sp., *Prospalax rumanus*, *Nannospalax macoveii* (SIMIONESCU, 1930), *Occitanomys* sp., *Apodemus* cf. *dominans* KRETZOI, 1959, *Kowalskia* sp., *Cricetus* (?) sp., *Odessamys* sp., and *Polonomys* cf. *insuliferus* (KOWALSKI 1958). A characteristic feature of the Kuchurgan mammal faunas, that distinguishes them from the older sequences, is a lower rodent/lagomorph ratio. Predominant among the rodents are the true spalacid *Nannospalax*

PALMER, 1903, and the oldest arvicolid, *Polonomys*. Among cricetids *Kowalskia* is still present. However, the first *Odessamys* TOPACHEVSKI & SKORIK, 1992, appears, along with a small-sized *Cricetus* LESKE, 1779 close to *C. barrierei* MEIN & MICHAUX, 1970. Though it retains continuity and similarity with the older assemblages, the Kuchurgan fauna looks considerably younger when compared with the Vinogradovka one, due to the appearance of younger cricetid and spalacid forms. The rodent associations of the Kuchurgan age conclude the Pontian stage. Younger communities, known from the locality Obukhovka-1 (NESIN & REKOVETS 1993) and others, are referred to the so-called "Moldavian Roussillon", the Kimmerian. Their most characteristic feature is the appearance and rapid diversification of true Arvicolidae, first *Promimomys* KRETZOI, 1955 and then other older taxa of the family.

Comparison of the Pontian associations with Early Pliocene small mammal assemblages from other parts of Eurasia provides no opportunity to establish their apparent chronological succession and stratigraphic position within the Pontian due to the lack of common taxa.

The localities of Vendargues, France, Podlesice, Poland, and Antipovka and Chugunovka, Russia (MICHAUX 1971; AGADZHANIAN & KOWALSKI 1978) and others are referred to the Pontian. The correlation between them is complicated by the lack of common forms and insufficient knowledge of analogous taxa in these faunal assemblages. This problem demands considerable study and thus represents a subject for future research.

However, reliable malacological dating and morphological analysis of finds from regionally uniform localities of the eastern Paratethys will enable not only their succession, but also their place within the biostratigraphic scheme, to be determined. This may allow them to form a standard for large scale regional comparisons. The Fontan assemblage occupies the lower, and Vinogradovka the upper part of the lower Pontian, while we refer the Kuchurgan to the upper part of the Pontian. All of these lie in MN14 (Table I).

As stated above, the small mammal fauna of Frunzovka-2 is referred to the lower Pontian. The following rodent species are found there: *Cryptopterus* sp., *Sciurotamias* sp., *Myomimus* sp.,

Table I
Stratigraphic distribution of Mio-Pliocene Ukrainian rodent localities

Department	Sub-division	Stages of fauna development	MN zones	Regiostages	Substages	Investigated sections
PLIOCENE	middle	Ruscinian	15	Klimmerian	lower	Obukhovka-1 Grebeniki-2
	lower		14	Pontian	upper	Krasnopol Frunzovka-1
					lower	Vinogradovka-1 Shkodova Gora 16th station of Bolshoi Fontan
MIOCENE	upper	Turolian	13	Meotian	upper	Orekhovka, Andreevka
			12		lower	Cherevichnoe (lower level)
			11	Sarmatian	upper	Frunzovka-2 Mikhailovka-2
		Vallesian	10		middle	Mikhailovka-1

Lophocricetus cf. *vinogradovi* SAVINOV, 1970, *Parallactaga* sp., *Parapodemus* sp., *Occitanomys* sp., *Kowalskia complicidens* TOPACHEVSKI & SKORIK, 1992, *Kowalskia* aff. *fahlbuschi* BACHMAYER & WILSON, 1970, *Pseudocricetus* cf. *kormosi*, *Ischymomys ponticus* TOPACHEVSKI, SKORIK & REKOVETS, 1978.

Since there are no comparable analogues among the known assemblages of Europe, the Frunzovka rodent association has been compared with Mio-Pliocene faunas of Asia. Its similarity to the "early Pliocene" fauna of Kazakhstan, in particular Gusiny Perelyot near Pavlodar (SAVINOV 1988) is evidence of synchronicity and fixes its biostratigraphic position. The referral of the Frunzovka-2 fauna to the lower part of the Pontian has been made on indirect evidence.

A stage of strong aridization has been identified at Shkodova Gora. In the layers of the lower Pontian Odessa limestone at this locality the oldest east European finds of Camelidae have been recorded. The arid nature of this zone with camel remains can be verified by the rodent assemblages, which incorporate jerboas (Dipodidae), especially five-toed jerboas (the oldest finds in Eurasia of which are suggested to be Lower Pliocene in age). Unfortunately, the time of first appearance of five-toed jerboas in Eurasia remains an open question. Therefore, the find of a similar association with jerboas at Sokolovka in the Crimea loses some of its significance. The bone-bearing horizon is here overlain by lower Pontian limestone, and can also be referred to the lower Pontian (MOS'KINA & MATSUI 1992). However, no *Ischymomys* ZAZHIGIN, 1977, which is co-dominant in Frunzovka-2 and comparable Asian localities, nor *Microtus* SCHAUUB 1934, a common background genus in the latter, have been found in the Crimea. *Polonomys*, so characteristic of the Pontian, has also not been found there. Therefore, as can be concluded from the faunal list, the Sokolovka fauna, though it looks somewhat younger than that of Frunzovka-2, could equally well be either Pontian or Meotian in age.

On the other hand, it could represent an island fauna, and this would change the whole situation. Further material from the Crimea is required to find a definitive solution to this problem.

After the discovery of a new faunal level in the Mikhailovka locality (TOPACHEVSKI et al. 1992), a new and better substantiated interpretation of the distribution of localities with co-dominant vole-toothed hamsters has become possible. At Mikhailovka, in continental layers alternating with middle and upper Sarmatian marine deposits, fossil remains of small mammals were found with *Ischymomys* predominant among them. Apart from its significance to the study of the distribution and evolution of this small mammal group, the first exactly dated find raises the question of the reliability of the geochronological dating of similar Eurasian localities. A comparison of the Frunzovka-2 micromammal faunas with known Mio-Pliocene (Sarmatian, Meotian, Pontian) associations indicates that it is older than the Pontian: it shows an absence of advanced rodent taxa and presence of others that had become extinct long before the Pontian. The earliest vole, *Polonomys*, characteristic of the Pontian, is absent in Frunzovka-2. Genus *Apodemus*, which first appeared in the upper Meotian, is present in Pontian and younger localities, but is absent from Frunzovka-2. Instead, *Parapodemus* SCHAUUB, 1938, characteristic of the middle Sarmatian to first half of the Meotian, is present. Spalacidae, known in this region from localities of the middle Meotian, has not been found. Other taxa absent in the Frunzovka-2 association are *Stylocricetus* TOPACHEVSKI & SKORIK, 1992, present in the Meotian, and *Microtus*, which is found in the lower Meotian (Cherevichnoe). All these data indicate that the Frunzovka-2 fauna can not be younger than the upper Sarmatian. Further, it can not be older, since rooted Palaeolagidae, present in the middle Sarmatian, have not been found in Frunzovka-2.

These new data on the distribution of *Ischymomys* faunas provide evidence of the ages of numerous localities in Kazakhstan (SAVINOV 1988). For instance, the Petropavlovsk "Meotian" association with rooted-tooth hares can be assigned to the middle Sarmatian, and a variety of small mammal faunas of the Pavlodar suite that are similar to Frunzovka-2 may be dated to the upper

Sarmatian rather than Pontian. More exact stratigraphic placement of the small mammal associations will not be possible until the small mammal remains found in Kazakhstan have been fully described.

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