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Middle Miocene Subseries in part of Northeastern Bulgaria — chronostratigraphy and correlations

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Introduction

Franz Toula (1890, 1892) expressed his opinion that the rocks in the vicinity of Varna and southernly of the town are similar to those from the Kerch Peninsula. Therefore all the rest investigators accepted these rocks as formed in the Euxinian basin during the Middle Miocene subage.

The Middle Miocene Subseries in Northeastern Bulgaria is comparatively well studied. The Regional Stages according to the scheme of the Eastern Paratethys, and namely the Tarkhanian, Chokrakian, Karaganian, Konkian and Sarmatian (s.l.) Regional Stage are distinguished.

In the last years extensive research has been done in a part of Northeastern Bulgaria (Fig. 1). The presence of some species in the gathered collection of molluscs, and some referred to in the publications, request a revision of the concepts concerning the presence and volume of some stages and substages as well as their correlation.

Material and method

The rock sequences from 29 sections (Fig. 1: 1-29) within the Karapelit, Galata and Euxinograd Formations were studied, and they are representative for the chronostratigraphic range considered. The Karaganian, Konkian and Sarmatian Regional Stage are not found south of the river of Kamchya. The comparative gradient analysis is based on the stratigraphic and palaeogeographic distribution of the determined 88 species of Bivalvia and 82 species of Gastropoda, and also on the synecological features of the molluscan assemblages and their succession. All literature data for this kind of fauna in the studied region is also used.

Chronostratigraphy and correlations

Among the molluscs from the biogenic limestones of the Karapelit Formation species as *Aequipecten scabrellus* (Lmk), *Pododesmus squamulus* (L.), *Periglypta miocaenica* (Michelotti), *Crassatina moravica* (Hörnes), *Bittium schwartzi* (Hörnes), *Sinum striatum* (De Serres), *Amyclina auingeri* (Hoernes, Auinger), *Xenophora deshayesi* (Michelotti) are present. The fauna belongs to the palaeobioarea of the Central Paratethys (Николов, 1999b). It inhabited the region west of Dobrich (Fig. 1: 1-4) during the Early Badenian subage. Considered until now as a Middle Substage of the Tarkhanian Regional Stage (Коюмджиева et al., 1989), these rocks should be regarded as a Lower (Moravian) Substage of the Badenian Regional Stage. It is correlated with the lower part of the Upper Substage, probably also with the upper part of the Middle Substage of the Tarkhanian Regional Stage.

According to the known facts the clayey rocks near the railway overheard crossing in Varna (Коюмджиева, Попов, 1968) and those from the boreholes in the southern part of the Avren Highland (Страшимиров, 1974), previously considered as Tarkhanian, could not be

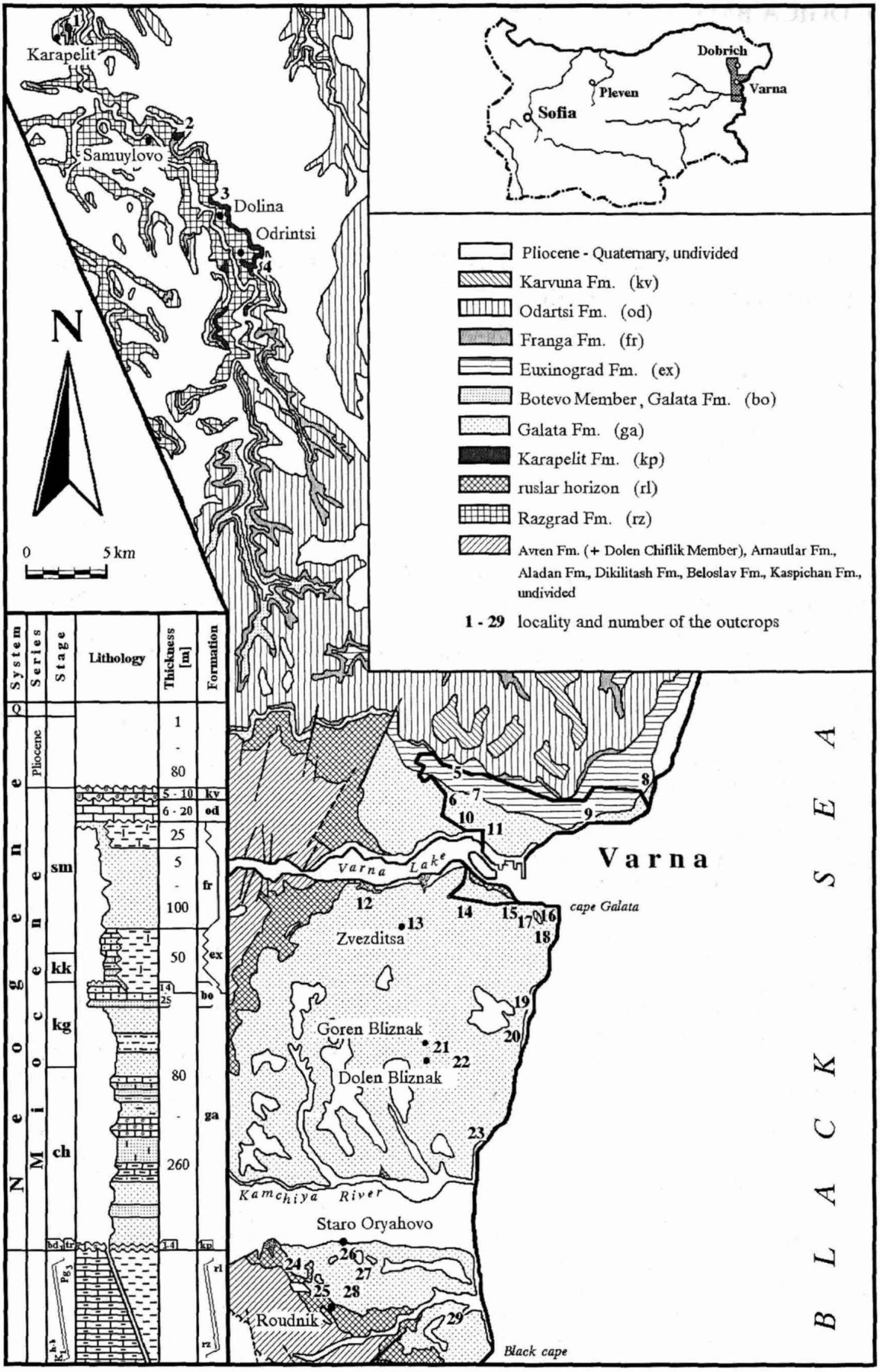

Fig. 1. Sketch-map of the studied area

strictly assigned to any of the chronostratigraphic schemes (for Central and Eastern Paratethys). If we accept conventionally, that they are deposited in a basin of the Eastern Paratethys, they should be correlated with the Tarkhanian Regional Stage, although the substage cannot be specified. The possibility that they are a temporal analogue of the lower part of the Lower (Moravian) Substage of the Badenian Regional Stage (M5a *Praeorbulina glomerosa* Zone) is not excluded, too.

Just few species — not typical *Nucula (Nucula) nucleus* (L.), *Loripes (Loripes) dujardini* (Desh.), *Aporrhais pespelicani* (L.) and perhaps *Peronaea planata* (L.), reported by Toula (1890) from the sandy-clayey marls northern from the village of Roudnik could descend from hypotetical Tarkhanian (according to Златарски, 1908 and Гочев, 1935) Regional Stage. This fossil find was partially confirmed only by Yaranov (Яранов, 1939). Recent studies proved the presence of Tarkhanian rocks in the same region.

In the molluscan assemblage from the sandstone fragments between Detelina and Roudnik (Fig. 1: 24, 25) similarly some species which are known from the Central Paratethys only are present. On the basis of the dominating state of the Eastern Paratethys endemic species *Isognomon varnensis* (Toula) and the presence of the inherited from the Kotsakhurian basin *Rzehakia dubiosa* (Hörnes), I consider conventionally the fauna as a part of the palaeobioarea of the Eastern Paratethys (Николов, 1999a). It occurred here at the end of the Middle subage and beginning of the Late Tarkhanian subage.

Until now there are no strong evidences of presence of the upper part of the Upper Tarkhanian as well as the lower part of the Lower Chokrakian (Lower Substage according to the understandings of Багдасарян, 1965 and Жгенти, 1981) Substage.

The Lower Substage of the Chokrakian Regional Stage is represented in this region by its middle and upper parts. It is situated transgressively over clayey and marly deposits of the Ruslar horizon (Oligocene) and parts of the Tarkhanian Regional Stage. It is rich in molluscan fossil fauna including 5 endemical Bivalvia — *Aequipecten varnensis* (Toula), *Ervilia praepodolica* Andrus., *E. megalodon* Andrus., *Angulus fuchsi* (Toula), *Donax tarchanensis* Bajar. as well as some Gastropoda of the genera *Acmaea* Eschscholtz, *Skenea* Fleming, *Obtortio* Hedley, *Genota* H. Adams & A. Adams, *Philbertia* Monterosato and *Ringicula* Deshayes that had migrated in the Euxinian basin during the Early Chokrakian subage. The Upper Chokrakian Substage is almost lacking such a fauna. Only in several places south of cape of Galata, *Ervilia* cf. *praepodolica* Andrus. (in the lower part of the Substage) and *Lutetia intermedia* (Bajar.) (Коюмджиева, Попов, 1985; Коюмджиева et al., 1989) have been recorded.

During our studies no considerable new data have been established regarding the volume and the substage subdivision of the Karaganian Regional Stage. It is represented by its three substages according to the scheme of Коюмджиева & Попов, 1985: Arhashenian Substage with *Lutetia gentilis* (Eichw.), *Mohrensternia grandis* Andrus., *M. barboti* Andrus., *M. subglobosa* Zhgenti, *Obtortio* (?) *aciculare* (Andrus.); Varnian Substage with *Lutetia gentilis* (Eichw.), *L. umbonata* (Andrus.), *Savanella andrussovi* (Toula), *Ervilia pusilla* (Philippi), *Barnea ujratamica* Andrus., *Mohrensternia barboti* Andrus., *M. subglobosa* Zhgenti, *Archaschenia ilynae* Zhgenti, *A. merklini* Zhgenti, *Natica tigrina* Röding, *Nassarius karaganicus* Iljina etc.; Kartvelian Substage — exclusively *Barnea ustjurtensis* (Eichw.) and very rarely *B. ujratamica* Andrus., *Ervilia* cf. *pusilla* (Phil.) and *Retusa* sp. indet. in the lowermost part of the Substage. In the section below the area called Dolna Traka (Fig. 1: 8), the upper part of the Varnian Substage is reduced, probably by a subaquatic washout. There are no grounds neither for an integration of the "*Ervilia*-beds" (= "Melitopolian beds") and the "*Pholas*-beds" (=Kartvelian Substage) as a chronostratigraphic unit with a substage rank of the Konkian Regional Stage, as considered by Барг, Иванова (2000) nor to distinguish them as a Regional Stage, as considered by Белокрыс (1980) and Жгенти (1981).

According to Ильина (2000), the clear stratification and reliable dating of the sediments of the Konkian Regional Stage are impeded by a multiple (at least three times) infiltration of the polyhaline fauna in the Konkian basin, and by the fragmentation of the sections. According to her the subdivision of the stage into substages is worthless at the present level of knowledge. In spite of the necessary conventionality caused by this opinion, I believe that the substages detached here are in accordance with the stages of development of the basin and its molluscan fauna in the studied region.

At the top of the Domuz dere section (Fig. 1: 14) limestones could be distinguished where along with the everyhaline endemical species *Musculus sarmaticus* (Gat.), *Acanthocardia andrussovi* (Sok.), *Plicatiforma praeplicata* (Hilb.),

Inaequicostata elegantis (Steklov), *Ervilia trigonula* (Sokolov) also recurrent polyhaline species as *Striarca lactea* (L.), *Chama gryphoides* (L.), *Loripes dujardini* (Desh.), *Irus irus* (L.) and others have been encountered. This assemblage reflects a relatively late stage of the development of the konkian fauna. I consider the limestones as a middle part of the "Sartaganian Substage". The Konkian deposits reported by Коюмджиева, Дикова (1978) and Попов et al. (1986) in the northwestern quarter of Varna could be considered as the upper part of the "Sartaganian" (proven with foraminifers) and lower part of the "Vesselyanian Substage" (*Mactra basteroti konkensis* Sokolov in present). The upper part of the "Vesselyanian Substage" crops out in the section below the area Dolna Traka (Fig. 1: 8) without an obvious break of the sedimentation and transition to the Volhynian Substage.

The molluscan fauna gradually acquire the typical "sarmatian" appearance. Majority of the polyhaline species perish. The populations of the *Plicatiforma praeplicata* (Hilb.) and *Ervilia trigonula* (Sok.) are growing considerably. The sarmatian endemic taxa *Obsoletiforma lithopodolica lithopodolica* (du Bois), *Ervilia podolica podolica* (Eichw.), *Mactra eichwaldi crassa* (Sid.), *Musculus sarmaticus naviculoides* (Koles.), *Abra alba scythica* Sok., *Dorsanum akburunense* (Andrus.), *Acteocina lajonkaireana sinzovi* (Koles.) appear. In the part of the section undisturbed by landslides (Galata and Euxinograd Formations), the Sarmatian Regional Stage is represented by the lower part and the base of the upper part of the Volhynian Substage in the area of Varna and west-northwestern of it. The lowermost part of the substage is established in sections 7 and 8 (Fig. 1). The middle part is exposed in the sand quarry Galata (Fig. 1: 17), as well as in section 7. In the section near the Varna Powerplant (Fig. 1: 5) the base of the upper part of the Volhynian Substage is established.

Conclusions

On the basis of the specific molluscan fauna, the distinguishing of the chronostratigraphic units with a regional stage rank from Middle Miocene Subseries is not dificult. For their correlations and substage subdivision it is necessary to take into consideration the development of this fauna (inheriting, migrating, endemism, perish etc.) during the subages as well as its palaeoecological succession in the conditions of the basins with variable hydrological regime.

The following chronostratigraphic units were established in the studied region:

- The Lower (Moravian) Substage of the Badenian Regional Stage or any part of it;
- The upper part of the Middle Substage and lower part of the Upper Substage of the Tarkhanian Regional Stage;
- Chokrakian Regional Stage without the lower part of the Lower Chokrakian Substage;
- Karaganian Regional Stage including its three substages according to the scheme of Коюмджиева, Попов (1985) — Archashenian, Varnian and Kartvelian Substages;
- Konkian Regional Stage in the sense by Ильина (2000). The middle and the upper parts of the "Archashenian Substage" as well as "Vesselyanian Substage" are conditionally detached;
- In the part of the section undisturbed by landslides, the Sarmatian Regional Stage is represented by the lower part and the base of the upper part of the Lower (Volhynian) Substage only.

References

Toula, F. 1890. *Denksch., d. k., Ak. Wissenschaften, Math.-Nath. Classe*, 57.

Toula, F. 1892. *Denksch., d. k., Ak. Wissenschaften, Math.-Nath. Classe*, 59.

Багдасарян, К. 1965. Мецниереба, Тбилиси; 3-231.

Барг, И., Иванова, Т. 2000. *Стратиграфия. Геол. корреляция*, 8, 3; 83-93.

Белокрыс, Л. 1980. *Геол. журнал*, 40, 1; 112-121.

Гочев, П. 1935. *Сп. Бълг. геол. д-во*, 7, 2; 115-139.

Жгенти, Е. 1981. Мецниереба, Тбилиси; 3-162.

Златарски, Г. 1908. *Период. спис. Бълг. книжовно д-во*, 68; 667-748.

Ильина, Л. 2000. *Стратиграфия. Геол. корреляция*, 8, 4; 59-64.

Коюмджиева, Е., Дикова, П. 1978. *Палеонт., стратигр. и литол.*, 8; 69-75.

Коюмджиева, Е., Попов, Н. 1968. Наука и изкуство, София; 357-368.

Коюмджиева, Е., Попов, Н. 1985. *Geologica Balc.*, 15, 1; 75-82.

Коюмджиева, Е., Попов, Н., Станчева, М., Даракчиева, С. 1989. *Geologica Balc.*, 19, 3; 9-22.

Николов, П. 1999a. *Сп. Бълг. геол. д-во*, 60, 1-3; 39-47.

Николов, П. 1999b. *Сп. Бълг. геол. д-во*, 60, 1-3; 119-126.

Попов, Н., Станчева, М., Даракчиева, С. 1986. *Палеонт., стратигр. и литол.*, 23; 25-45.

Страшимиров, Б. 1974. *Год. ВМГИ. Св. II-геол.*, 18 (1971-1972); 271-286.

Яранов, Д. 1939. *Геол. на Балк.*, 3, 2; 63-81.