DIATOM BIOSTRATIGRAPHY OF GABROVITSA FORMATION, KOSTENETS BASIN, SOUTH BULGARIA

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Kostenets Basin is situated in SW Bulgaria, northerly from Rila Mountain. It consists of two adjecent grabens – Kostenets and Sestrimo ones, which are filled with Neogene sedimentary rocks. The Neogene sediments discordantly cover Palaeogene terrigenic and Proterozoic metamorphic rocks. Vatsev & Jordanov (1996) introduced the following lithostratigraphic units, namely:

Belidol Formation - composed of cobble to pebble conglomerates interbedded by coarse-grained sandstones and gravellites with thickness of 100-120m and probably of Meotian age;

Gabrovitsa Formation - composed of an alteration of coarse to fine-grained sandstones, clayey siltstones, silty clays, coal shales, and lignite coal beds (thickness 100-170m; Pontian age according to vertebral fauna);

Dolnopole Formation – composed of a gradual transition of sandstones and gravelites to sandstones and conglomerates (thickness 100-250m; probable Pontian age);

Drandaritsa Formation - composed of cobble to boulder breccia-conglomerates, conglomerates and layers of coarse to medium grained sandstones (thickness 50-100; probable Pliocene age)

The present paper presents refined biostratigraphy based on rich diatom fossil flora in order to perform more precise dating and correlation within the basin.

Material and methods

The sediments studied were collected from two boreholes C-2 and C-3 (Gabrovitsa formation), situated on both sides of the river Gabrovitsa. Borehole C-2 was sampled from 207 to 283 m and borehole C-2 – from 28,40 to 295 m. The two boreholes crosscut the Gabrovitsa Formation. Borehole C-3 is represented by irregular alternation of clayey sand and sandy clays at its upper part (207-268,80 m), followed downwards by diatom clays (268,80-275,00 m), and gray-greenish clays and silty clays enriched in organic matter. Borehole C-2 crosscuts along 28 m quaternary clays (not sampled), light gray diatom clays (28,40-41,00 m), sandy beige-brownish sandy clays (41,00-43,50), beige diatom clays (43,50-44,13 m), followed downwards by alternation of green-grayish to light gray clayey sands, silty and sandy clays with rare gravel to pebble clasts and clays (44,13-287,00 m).

The diatom bearing sediments of borehole C-2 (28.40 m – 41.00m) and borehole C-3 (268.80 m – 275.00 m) are investigated. The samples were prepared for diatom analyses following the standard laboratory procedures (Ognjanova-Rumenova, 1991). The relative abundance of each taxon was given according to Schrader's scale (Schrader, 1973). Some of the specimens were examined with Jeol JSM T300 scanning electron microscope (SEM) at the Institute of Geology, Bulgarian Academy of Sciences.

Results and discussion

This report represents the first biostratigraphic study of diatom fossils from the Kostenets basin. The fossil diatom flora consists of 109 species, varieties and forms, which belong to 29 genera. The studied profiles are generally dominated by genus *Aulacoseira* Thw. of class Centrophyceae. However, one very interesting small form of genus *Cyclotella* (Kutz.) Breb. is determined at different levels of borehole C-2, and at 29.40m it has highest abundance (Fig. 1). The taxonomic diversity of the diatom flora is due to class Pennatophyceae, which comprises 93.6% of the composition. The richest genera are *Fragilaria* Lyngb. (16 taxa), *Navicula* Bory (sensu lato) (14) and *Cymbella* C.Ag. (sensu lato) (13). The other genera are established by less than 10 species each. The dominant and subdominant diatoms are planktonic forms of genus *Aulacoseira* Thw. - *A. granulata* (Ehr.) Sim., *A. muzzanensis* (Meist.) Krammer and *A. ambigua* (O.Mull.) Sim. (Figs. 1, 2) The accompanying species from class Pennatophyceae are of genus *Fragilaria* Lyngb.: *F. construens* (Ehr.) Grun., *F. construens* f. *venter* (Ehr.) Hust., *F. bituminosa* Pant., *F. martyi* (Herib.) L-Bert., *F. virescens* Ralfs, and of genus *Tetracyclus* Ralfs with subdominants *T. peragallo* Herib. and *T. glans* (Ehr.) Mills. The mass development of *Cymbella silesiaca* Bleisch. in the uppermost part of borehole C-2 is remarkable. Very interesting is the determination of a few tropical species *Actinella brasiliensis* Grun. and *Desmogonium rabenhorstianum* Grun.

Three thanatocenoses can be distinguished in the diatom flora in depth (Figs. 1, 2):

Within the ranges 43.70 –36.50m (C-2) and 274.00 – 271.50m (C-3) development of rich *Aulacoseira* Thw. flora is observed. The accompanying species are *Fragilaria bituminosa* Pant., *F. construens* (Ehr.) Grun., *F. construens* f. *venter* (Ehr.) Hust., *Navicula amphibola* Cl. and *Sellaphora pupula* (Kutz.) Mann.

From 35.80 to 35.20m (C-2) the diatom flora is not so diverse – only species *Aulacoseira* Thw. are abundant and most of the subdominants are rare or absent.

The third thanatocenoses was observed in the sediments at levels 31.16 – 28.40m (C-2) and 269.85 – 268.80m (C-3). Species *Aulacoseira* Thw. are again the most diverse at these levels, being widely developed: *Tetracyclus glans* (Ehr.) Mills, *T. peragalli* Herib., *Fragilaria martyi* (Herib.) L-Bert., *F. leptostauron* (Ehr.) Hust., *F. virescens* Ralfs and *F. heidenii* Oestr. At the uppermost level of C-2 (29.40-28.40m) the high abundance of *Gomphobema grovei* var. *hermanniana* (Patr.)Koc., Yang, Stoerm. and *Cymbella silesiaca* Bleish. is remarkable.

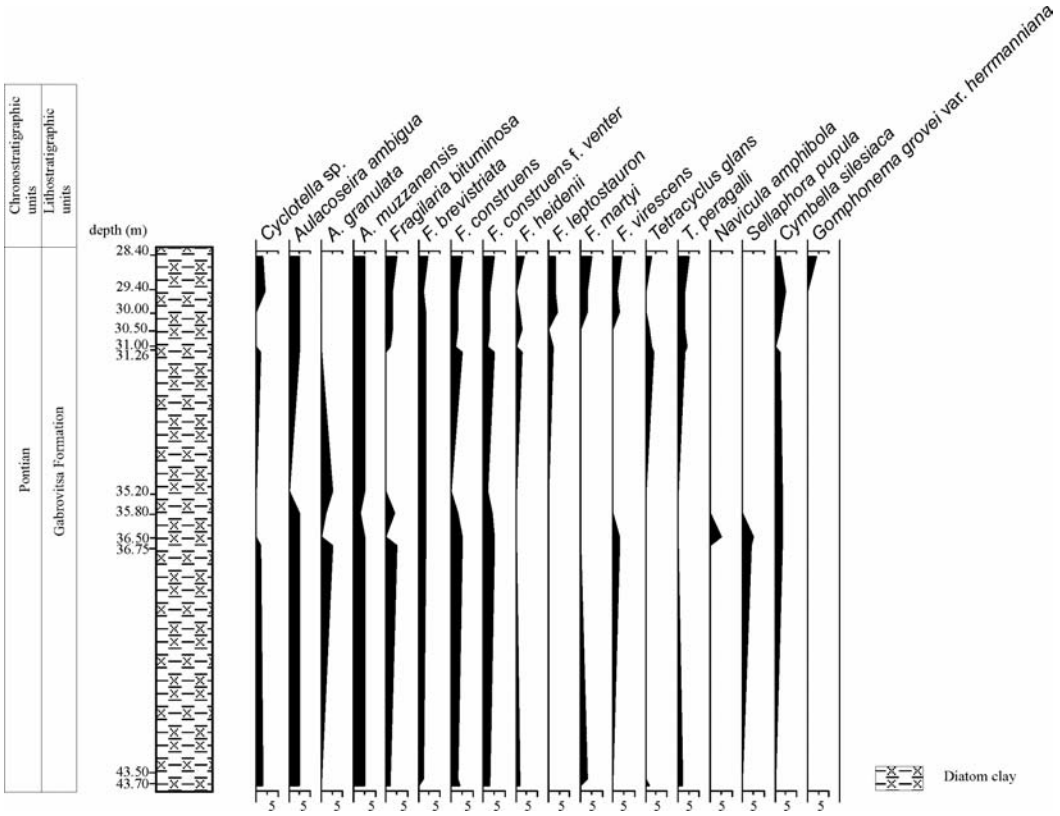

Fig. 1. Diatom diagram, showing the succession of the abundant diatom taxa in borehole C-2, Gabrovitsa.

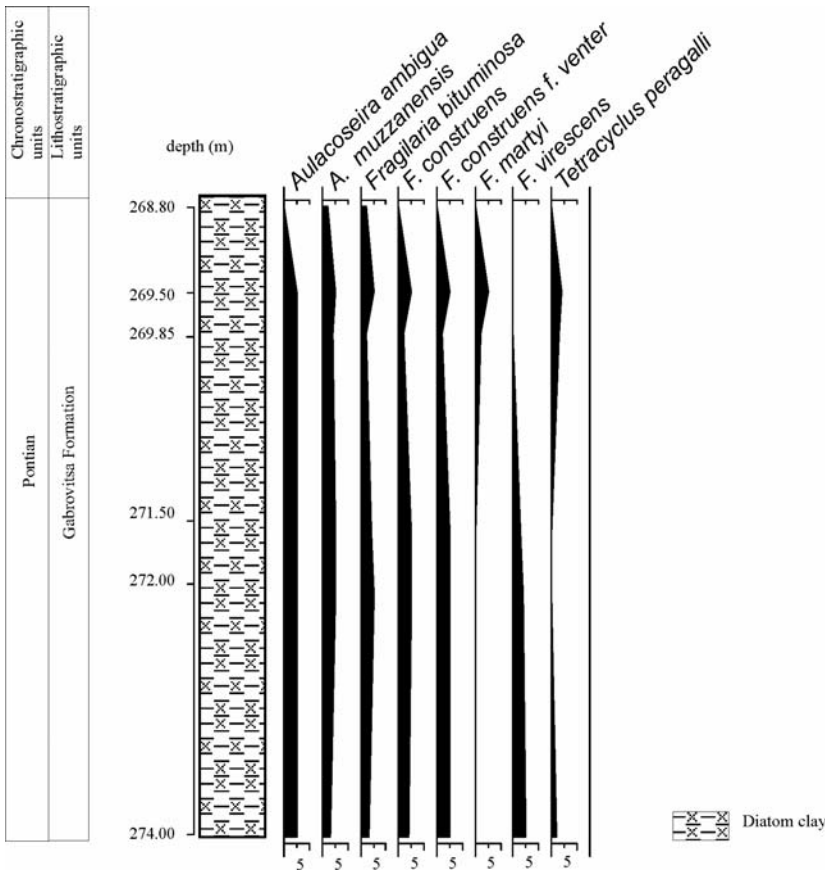

Fig. 2. Diatom diagram, showing the succession of the abundant diatom taxa in borehole C-3 (Gabrovitsa).

Seven extinct species of stratigraphic interest are detected: *Aulacoseira distans* var. *scala* (Ehr.) Ognjan., *Fragilaria bituminosa* Pant., *F. nitida* Herib., *Tetracyclus peragallo* Herib., *T. tripartitus* Brun.& Herib., *Eunotia polyglyphoides* Sheshuk., *Cymbella obtusa* Pant., and *Rhopalodia gracilis* O.Mull. They can be considered as biostratigraphic markers for Late Miocene (Pontian) age (Temniskova-Topalova, Ognjanova-Rumenova, 1997).

Conclusions

• The dominat complex of the investigated diatom flora consists of different recent *Aulacoseira* species.

• The flora comprises some typical species for the Late Miocene lakes and is dated as Late Miocene (Pontian). (Ognjanova-Rumenova, 2000)

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References

Ognjanova-Rumenova, N. 1991. *Diatoms in Neogene sediments from the Sofia valley and their stratigraphic significance*. – Ph.D. Thesis, Institute of Geology, Bulgarian Academy of Sciences, Sofia, 305pp. (in Bulgarian)

Ognjanova-Rumenova N. 2000. Lacustrine diatom flora from Neogene basins on the Balkan Peninsula: preliminary biostratigraphical data. In: Witkowski A. & Sieminska J. (Eds.): *The origin and early evolution of diatoms: fossil, molecular and biostratigraphical approaches*, Krakow, 137-143.

Schrader, 1973. Proposal for a Standardized Method of Cleaning Diatom-bearing Deep sea and Land-exposed Marine Sediments. - *Nova Hedwigia*, *Beiheft*, **45**, 403-409.

Temniskova-Topalova, D., N. Ognjanova-Rumenova. 1997. Description, comparison and biostratigraphy of the nonmarine Neogene diatom floras from Southern Bulgaria. – *Geologica Balcanica*, **27**, 1-2, 57-81.

Vatsev, M., K. Jordanov. 1996. Lithostratigraphy of the neogene rocks in the Kostenets basin. – *Annual of the University of Mining and Geology*, **41**, 1, 7-12. (in Bulgarian)