

Siliceous microfossils in Holocene sediments from two peat bogs in Sredna gora Mt. (Bulgaria)

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Abstract:

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Представени са резултати от палеоекологично изследване на седименти от две торфища, разположени на 1000 - 1200 м н. в. в Средна гора (България). В седиментите на торфищата са установени 161 вида, 25 разновидности и три форми кремъчни водорасли. Изработени са екологични спектри на видовете кремъчни водорасли и е анализирано съотношението Кремъчни водорасли / Хризофитови цисти (SMOL 1985).

Key words: : Diatoms, Holocene, palaeoecology, peat bogs, Bulgaria

Introduction

Investigations on diatoms from Holocene sediments in Bulgaria have been limited to diatom analysis of sediments from Beloslavsko and Dourankoulak lakes on the Black sea coast (Temniskova, Dojceva, 1989; Temniskova, Atanassova, 1996), from the Bay of Sozopol (Ognjanova-Rumenova, 1995; Ognjanova-Rumenova, Zaprijanova 1998) and from Dalgoto Ezero in Northern Pirin Mts. (Ognjanova-Rumenova, 2001a, b). Stancheva (2001a, b, c) presents the species composition of the fossil diatom flora from sediments of two peat bogs in Central Sredna gora Mt.

The subject of the present study are fossil diatoms and Chrysophycean stomatocysts from Holocene sediments of two peat bogs, located in Sredna gora Mt..

Materials and methods

The *Sphagnum* peat bog "Koznitsa - 2" is situated in Ravni del locality of the mountainous hill Koznitsa, which orographically connects the Balkan Mts and Central Sredna gora Mt. The peat bog is located at 1200 m a. s. l. and has an area of about 1 ha. The peat bog "Barierata" is situated in Central Sredna gora Mt., 5 km southeast from the town of Klisoura, at 1000 m a. s. l. The vegetation cover of this peat bog does not include *Sphagnum*. Both peat bogs are characterized as heterotrophotypic complexes of mosaically arranged eutrophic and oligotrophic plant communities, depending on the ruggedness of the terrain (Filipovitch et al., 1998).

The materials are from two core-drills: "Barierata" has 0-70 cm in depth and the following lithological composition: 0-25 cm – peat, 25-50 cm – peat with sand; 50-70 cm - coarse detritus; and "Koznitsa - 2" which has 0-100 cm in depth with lithological composition as follows: 0-10 cm –

peat, 10–30 cm – coarse detritus, 30–35 cm – grey clay with sand, 35–50 cm – grey-greenish clay, 50–100 cm – clay with coarse sand and gravel.

The samples for diatom analysis were taken at intervals of 1–2 cm, 60 in all. Laboratory processing was done by the method of Hasle and Fryxell (1970), as modified by Ognjanova-Rumenova (1991). Microscopic slides were prepared by the method of Gleser et al. (1974). Quantitative reading of the diatoms follows the method for percentage counting of Battarbee (1986) in which 500 valves per slide are counted. The index of Diatom frustules/Chrysophycean stomatocystae was determined (Smol, 1985).

For the diatoms with known ecology were made ecological spectra after the method of Abbott and VanLandingham (1972) according to their: halobity, active water reaction, nutrient, specific habitat and geographic distribution.

The Binar proportional coefficient of Dice (1945) modified by Kojumdjieva (1976) was calculated for comparison of the two palaeofloras.

The nomenclature follows the flora of Krammer and Lange-Bertalot (1986, 1988, 1991a, b) and Round et al. (1990).

Results and discussion

The identified diatom flora in the sediments of the two peat bogs is formed only of recent species (100%). Taxonomic composition comprises 161 species, 25 varieties and 3 forms of diatoms, which belong to 30 genera. 8 taxa are left with an open nomenclature. In the sediments of the peat bog "Barrierata" are distributed 168 taxa, while in those of the peat bog "Koznitsa-2" - 111. In the sediments of both peat bogs, the most numerous in species are the following genera: *Pinnularia* Ehr., *Eunotia* Ehr., *Navicula* Bory, *Cymbella* Agardh, *Caloneis* Cleve and *Achnanthes* Bory. Genus *Aulacoseira* Thwaites reaches species abundance of 9 % in the peat bog "Barrierata" (figs. 1, 2). The genera *Amphora* Ehr., *Asterionella* Hassall, *Melosira* Agardh, *Cocconeis* Ehr., *Epithemia* Bréb., *Hantzschia* Grun., *Rhopalodia* O. Müller and *Stenopterobia* Bréb. are represented by only one species.

The coefficient of palaeofloristic comparison of the investigated diatom floras is 67,65 which characterizes the species composition of the two peat bogs as very similar. The highest percentage in the sediments of "Koznitsa - 2" reach: *Meridion circulare* (Grev.) Agardh and var. *constrictum* (Ralfs) Van Heurck, *Fragilaria virescens* Ralfs,

Gomphonema angustatum (Kütz.) Rab., *Achnanthes lanceolata* (Bréb.) Grun., *Cymbella gracilis* (Ehr.) Kütz., *C. minuta* Hilse ex Rab., *C. silesiaca* Bleisch, *Eunotia exigua* (Bréb. ex Kütz.) Rab., *Gomphonema clavatum* Ehr., *G. gracile* Ehr., *G. parvulum* (Kütz.) Kütz., *Luticola mutica* (Kütz.) D. G. Mann, *Nitzschia hantzschiana* Rab., *Pinnularia borealis* Ehr. Here in large numbers develops *Meridion circulare* (Grev.) Agardh and var. *constrictum* (Ralfs) Van Heurck - epiphytic form, characteristic for clean current waters in mountainous regions, which suggests that there was an inflow in the water basin (Temniskova-Topalova, Ognjanova-Rumenova, 1983).

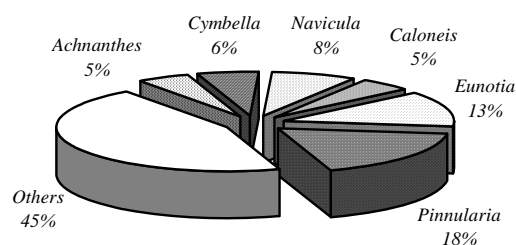


Fig. 1. Percentage ratio of the diatom genera in the sediments of "Koznitsa -2" peat bog

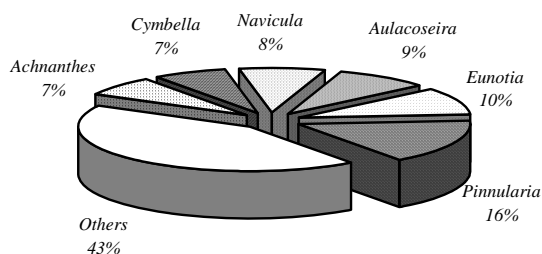


Fig. 2. Percentage ratio of the diatom genera in the sediments of "Barrierata" peat bog

In the sediments of "Barrierata" quantitatively dominate *Aulacoseira alpigena* (Grun.) Krammer, *A. tenuior* (Grun.) Krammer, *Cymbella silesiaca* Bleisch, *Eunotia implicata* Nörpel et al., *E. incisa* Gregory, *E. minor* (Kütz.) Grunow, *E. soleirolii* (Kütz.) Rab., *Fragilaria construens* f. *venter* (Ehr.) Hustedt and f. *subsalina* (Hust.) Hustedt, *F. virescens* Ralfs, *Gomphonema angustatum* (Kütz.) Rab., *G. clavatum* Ehr., *Hantzschia amphioxys* (Ehr.) Grunow, *Meridion circulare* var. *constrictum* (Ralfs) Van Heurck, *Navicula elginensis* (Greg.) Ralfs, *Nitzschia perminuta* (Grun.) M. Peragallo, *Pinnularia borealis* Ehr., *P. stomatophora* (Grun.) Cleve, *Tabellaria flocculosa* (Roth) Kütz.. Peat bog

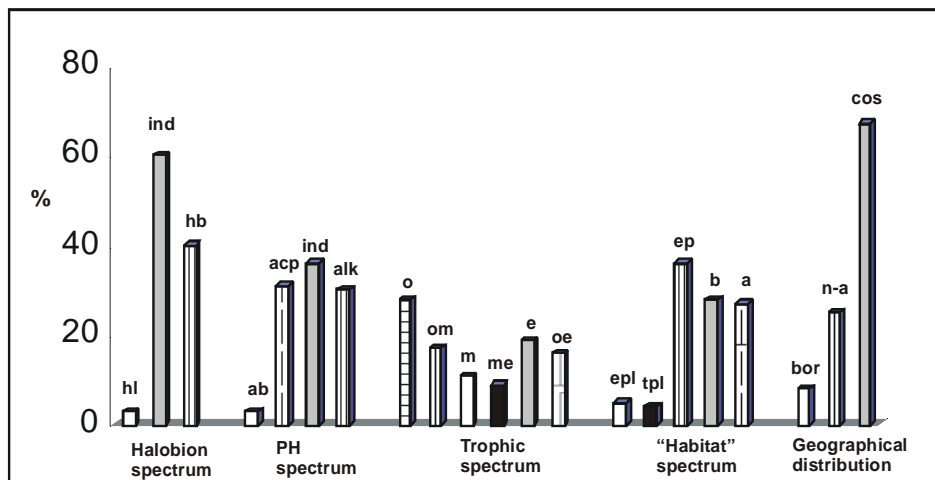


Fig. 3. Percentage ratio of the ecological groups of diatoms in the sediments of "Koznitsa - 2" peat bog.

Legend: **Halobion spectrum** (hl – oligohalobous-halophilous, ind – oligohalobous-indifferent, hb – oligohalobous-halophobous); **pH spectrum** (ab - acidobiontic, acp - acidophilous, ind - indifferent, alk - alkaliphilous); **Trophic spectrum** (o - oligotrophic, om – oligo-mesotrophic, m - mesotrophic, me – meso-eutrophic, eu - eutrophic, oe - oligo- to eutrophic); **"Habitat" spectrum** (epl - euplanktonic, tpl - tychoplanktonic, ep - epiphytic, b - benthic, a – aerophilous); **Geographical distribution** (c - cosmopolitan, n-a - north-alpine, bor - boreal)

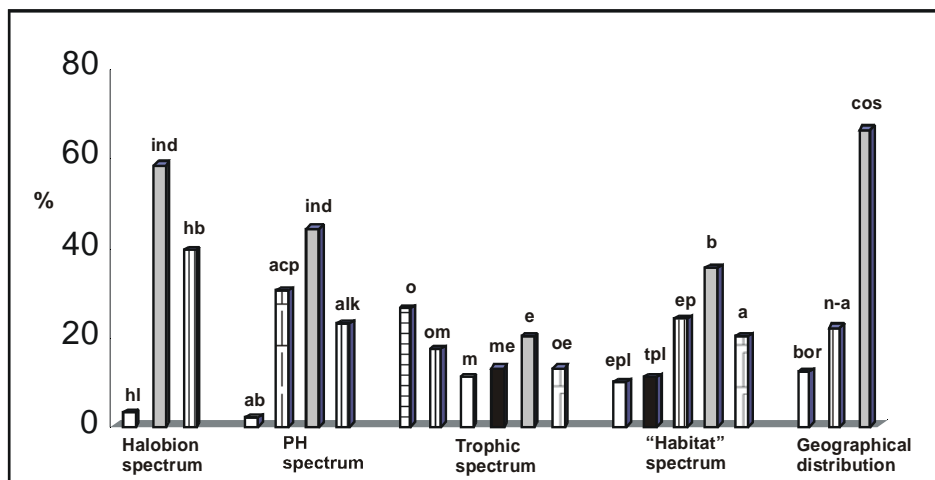


Fig. 4. Percentage ratio of the ecological groups of diatoms in the sediments of "Barrierata" peat bog

Legend: **Halobion spectrum** (hl – oligohalobous-halophilous, ind – oligohalobous-indifferent, hb – oligohalobous-halophobous); **pH spectrum** (ab - acidobiontic, acp - acidophilous, ind - indifferent, alk - alkaliphilous); **Trophic spectrum** (o - oligotrophic, om – oligo-mesotrophic, m - mesotrophic, me – meso-eutrophic, eu - eutrophic, oe - oligo- to eutrophic); **"Habitat" spectrum** (epl - euplanktonic, tpl - tychoplanktonic, ep - epiphytic, b - benthic, a – aerophilous); **Geographical distribution** (c - cosmopolitan, n-a - north-alpine, bor - boreal)

"Barrierata" is characteristic with development of *Stenopterobia curvula* (W. Sm.) Krammer. The investigations on genus *Stenopterobia* Bréb. in Bulgaria are scarce.

As a whole the pattern of the identified diatom flora in the sediments of both peat bogs is determined of rather specialized species capable of

living in conditions of well-developed peat bogs. These are different representatives of the genera *Eunotia* Ehr., *Pinnularia* Ehr., *Frustulia* Rab. and *Stenopterobia* Bréb. (Patrick, Reimer, 1966).

According to their ecological requirements diatoms are classified in 6 groups (figs. 3, 4). Only 15 of the determined algal species are with

unknown ecology. In the sediments of peat bog "Koznitsa - 2" dominate oligohalobous indifferents (57%), indifferents by the active water reaction (36%), oligotrophic (28%), epiphytic (35%), and cosmopolitan (67%) diatom species. The highest percentage representation in the sediments of "Barrierata" have oligohalobous indifferents (58%), indifferents by the active water reaction (44%), oligotrophic (26%), benthic (34%) and cosmopolitan (66%) diatom species. On the basis of these results we may say that the two investigated mountainous peat bogs were having similar conditions for development of diatoms.

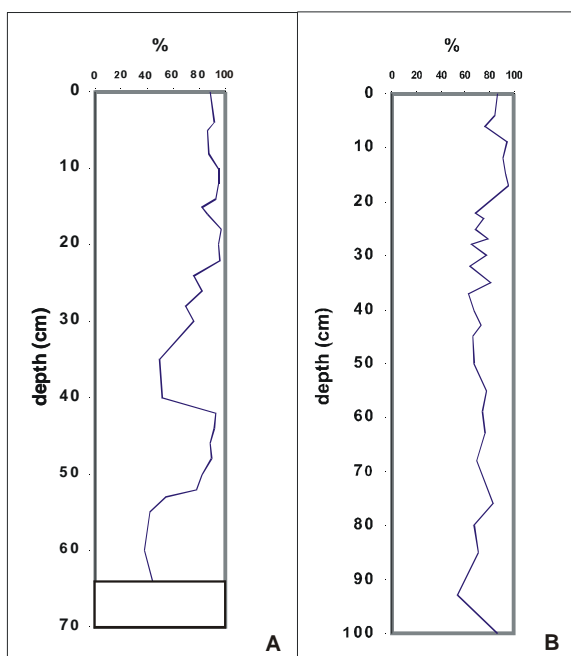


Fig. 5. The ratio Diatom frustules/ Chrysophycean stomatocystae in the sediments of the two peat bogs. Legend: A. Peat bog "Barrierata"; B. Peat bog "Koznitsa - 2".

The ratio Diatom frustules/Chrysophycean stomatocystae is an indicator for changes in trophic and hydrological conditions of the palaeobasins (Hall, Smol, 1993; Jacques et al., 2000). In the sediments of both peat bogs the ratio Diatom frustules/Chrysophycean stomatocystae (fig. 5) remain in the boundaries of 42 - 97%, which characterizes the palaeoenvironmental conditions as relatively stable and favourable for the studied algal groups. During the whole subsistence period in the late Holocene, the two peat bogs give favourable biotic conditions for the development of rich and varied diatom flora.

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