

***Aulacoseira hibschi* (Reichelt) Houk from its type locality and other diatomite localities in North Bohemia (Czech Republic and Germany)**

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INTRODUCTION

The first mention of diatoms from a locality in North Bohemia is in Ehrenberg (1836), when he described *Gallionella distans* from a diatomite at Kučlín near Bílina. This taxon was transferred later by Kützing (1844) to the genus *Melosira* C.Agardh and finally Simonsen (1979) included it into a redefined genus *Aulacoseira* Thwaites. More scientists dealt with these diatomites (eg. Kützing 1844, Rabenhorst 1863). At the end of the 19th century the Tertiary diatomites of North Bohemia had become well known especially thanks to Reichelt (1900), who identified many fossil diatom taxa in diatomite samples from this region. He described a new fossil centric diatom species, *Melosira hibschi* Reichelt which was recently recombined with *Aulacoseira* (Houk 2007), from Varnsdorf (Czech Republic). After that time other authors were also engaged in the fossil diatom flora from these localities (e.g. Procházka 1924, Procházka 1954, Řeháková in Malkovský 1985).

MATERIAL & METHODS

Samples of Paleogene diatomites from the following localities (see Fig. 1) in North Bohemia were used for LM and SEM investigations:

1. Varnsdorf, Hustedt Collection slide BRM A2/81 "Melosira Hibschi Reich." (Fig. 3)
2. Varnsdorf, Hustedt Collection raw material BRM E 1821 "Warnsdorf, braune Schicht, leg. Reichelt"
3. Varnsdorf, Weinzierl Collection slide M B1731 "Warnsdorf Böhmen (Elger 118)" (Fig. 4)
4. Bechlejovice, raw material, Charles University Praha
5. Kundratice MMg and Kundratice Nrgs124, raw material, Charles University Praha
6. Lochočice - Stadice M 33 52 Bc, raw material, Czech Geological Survey
7. Seifhennersdorf Sf 7781 (Germany, Zittauer Gebirge).

The diatomite localities Bechlejovice, Kundratice and Lochočice – Stadice represent the Early Oligocene interval between ca. 34.0 to 30.0 Ma (see Bellon et al. 1998, Kvaček & Walther 2003: 62; 2004: 12). The diatomite deposit of Seifhennersdorf is 30.44±1.52 MA old (Bellon et al. 1998) and so it also represents the Early Oligocene period.

Zeiss-Jena JENALUMAR light microscope equipped with HI 100x/1.35 planapochromate objective was used for LM observations. The raw material from localities No. 4–7 was cleaned by cooking in the mixture of hydrogen peroxide and hydrochloric acid, decanted and washed. The cleaned material was dried on glass cover slips, mounted in Pleurax for LM observations or mounted on aluminium stubs and coated with gold in a Polaron coating unit E 5000 for SEM investigations. A Hitachi S-3000 N scanning electron microscope and Jeol JSM-7401F were used for observations.

RESULTS

Vegetative cells are cylindrical, connected with conical spines to form short chains. Frustules are rectangular in girdle view, circular in valve view, valves 4.9–56.0 µm in diameter, mantle height 5.6–17.1 µm, mid-mantle wall thickness ca. 0.5–1.8 µm. The relationship between the valve mantle height and the valve diameter is plotted on the graph in Fig. 2. The valve mantle

has straight perivalvar rows of relatively coarse circular to nearly quadrate areolae, ca. 0.35–0.85 μm in diameter, sometimes they are perivalvar elongated in the first row below the valve face/valve mantle junction, 2-5(6) areolae in a row. When there are 2–3 areolae only in one perivalvar row, transversal rows are mostly also created. The areolae are occluded by complex vela, near surface supported at several points around areola, internally with individual rosettes of the vela. Interstriae distance is 1.2–1.8 μm and interareolar distance 0.7–1.6 μm . Two types of spines can be observed, the relatively long conical spines and spatulate linking spines.

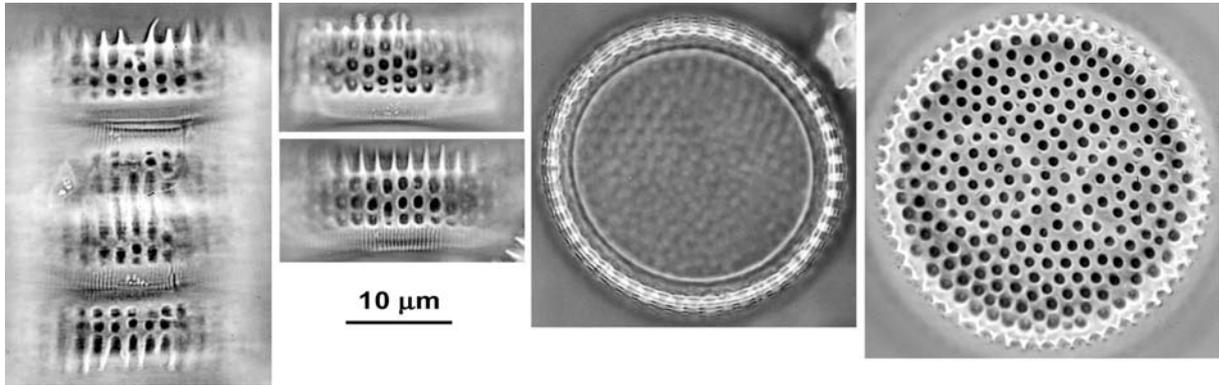


Fig. 1. LM pictures of *Aulacoseira hibschi* from the type locality in Varnsdorf (North Bohemia).

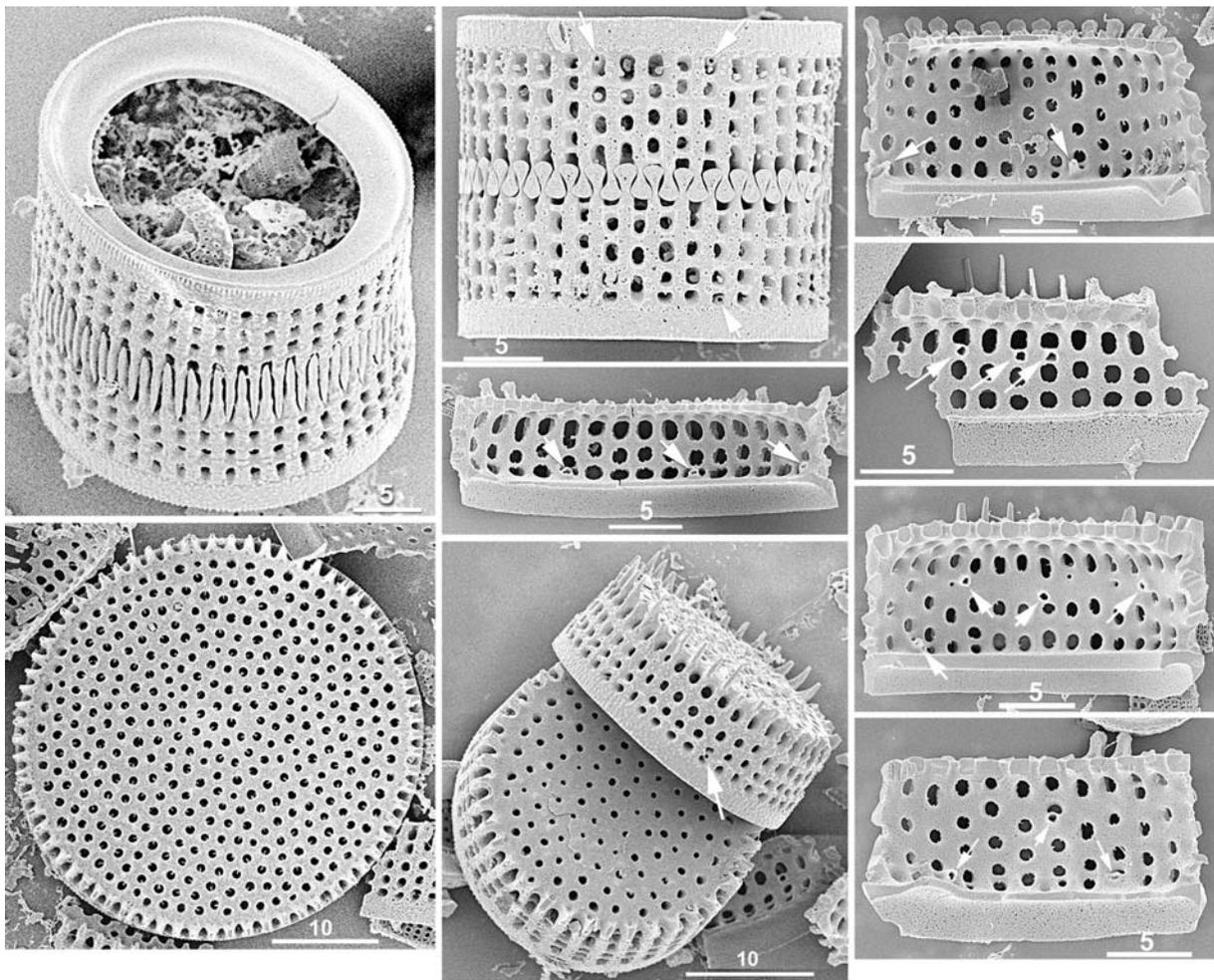


Fig. 2. SEM pictures of *Aulacoseira hibschi* from the type locality in Varnsdorf (North Bohemia).

The interstriae taper beneath the valve face into mostly ca. 2–4 µm long, conical buttressed spines or into spoon-shaped spines, creating thus a regular ring at the valve face/valve mantle junction. Rarely, an extra perivalvar row of areolae can run from a broadened base of one of the spines. The proximal part of the valve mantle is a collum, structureless or milled with short perivalvar wrinkles at the valve rim. The robust ringleist is projecting into the cell, extending $\frac{1}{8}$ (valves with large diameter) to $\frac{1}{2}$ (valves with small diameter) of the radius of the valve. Some valve mantles show the “Müller Step” (sensu Müller 1884 and Crawford & Likhoshway 1999). Rimoportulae are numerous, 4–14, internally with a short stalk, their small external openings are associated with areolae. Rimoportulae are spaced in a sparse ring near the ringleist, or in a sparse ring near to the middle of the valve mantle, or they are situated irregularly. The valve faces are flat, with areolae irregularly spaced or lying in more or less diagonal rows, sometimes papillae or rugosities are on the valve face. The girdle band is composed of several copulae. Initial cells were not observed.

The community of *Aulacoseira hibschi* constitutes about 70 % of the diatom population in the material from Varnsdorf, the rest are smaller *Aulacoseira*, with a little bit less than 30 %, morphologically similar to *A. distans* (Ehrenb.) Simonsen, and the rarely occurring *Melosira undulata* (Ehrenb.) Kütz. *A. hibschi* is not also rare in the raw material from the locality in Seiffhennersdorf Sf 7781. In the diatomite material from Kundratice in the České středohoří Mountains more than 99 % of the diatom population is constituted by *A. hibschi*. Except for this taxon, *Ellerbeckia* sp. (Centrales, Paraliaceae) can be also rarely observed there. *A. hibschi* was also seen in other diatomites from the České středohoří Mountains. First of all, it constitutes more than 99 % of the diatom population in the diatomite from the locality Lochočice-Stadice. Another locality where this species was observed is the diatomite from Bechlejovice, but it is very rare here and was not reliably identified and photographed in LM due to the presence of several similar *Aulacoseira* taxa in the sample. However, to find it and exactly identify it in the SEM was relatively easy.

DISCUSSION

During investigations it was discovered that this species belongs to the genus *Aulacoseira* Thwaites having the areolated valve mantle with the structureless collar. It differs from other related *Aulacoseira* taxa by its characteristic location of rimoportulae in the combination with the coarse areolar valve pattern, and by the characteristic shape of long conical spines and clavate linking spines. The rimoportulae are located in a sparse ring near the ringleist, or in a sparse ring near to the middle of the valve mantle, or they can be situated irregularly. The most similar taxa found in the literature are *Melosira youngi* Skvortsov, *M. praedistans* Jousé, *Aulacoseira praeislandica* (Jousé) Simonsen and *A. praegrnulata* (Jousé) Simonsen. However, the type material of *Melosira youngi* is absent (Haworth & Sabater 1993) and that of *Aulacoseira praeislandica*, *A. praegrnulata* and *Melosira praedistans* as well (Dr. N. Strelnikova pers. com.), and so it is impossible to directly compare the ultrastructures. The other similar species, *A. ceretana* E.Y.Haw. & Sabater and *A. canadensis* (Hust.) Simonsen, have their rimoportulae in the ringleist (Haworth & Sabater 1993), similarly as *A. paucistriata* Bradbury, *A. solida* (Eulens. in Van Heurck) Krammer and *A. krammeri* R.K. Edgar, Kociolek & S.M. Edgar (Bradbury 1991, Edgar et al. 2004), and they differ then in this feature from *Aulacoseira hibschi*. *A. distans* (Ehrenb.) Simonsen (see Crawford & Likhoshway 1999) similarly has its rimoportulae in a sparse ring near the ringleist, but it differs from *A. hibschi* by its smaller size and finer areolation.

It is clear from the SEM investigations of the Varnsdorf material and materials from other localities in the North Bohemia that *Aulacoseira hibschi* is a species with a high morphological variability, but it is clearly distinguishable from other similar taxa by its characteristic location of rimoportulae in combination with the coarse areolar valve pattern and with the characteristic shape of spines. The presented valve morphology and ultrastructure should help to clarify the taxonomy and nomenclature of this and related fossil *Aulacoseira* taxa. The formal transfer of Reichelt's species to the genus *Aulacoseira* Thwaites has been published elsewhere (Houk 2007).

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