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G.K. KHURSEVICH, S.A. FEDENYA

Institute of Geological Sciences, National Academy of Sciences of Belarus,
7, Kuprevich St., 220141 Minsk, Belarus

THALASSIOBECKIACEAE – A NEW FAMILY OF THE CLASS *CENTROPHYCEAE (BACILLARIOPHYTA)*

A new freshwater genus *Thalassiobeckia* studied in light (LM) and scanning electron microscope (SEM) from the Pliocene sediments of Lake Baikal has been considered in the composition of the new monotype family *Thalassiobeckiaceae* in the class *Centrophyceae* (*Bacillariophyta*). Both new taxa are diagnosed by a combination of following morphological features: a) the presence of loculate areolae with internal cribra and external foramina; b) the arrangement of areolae on the valve face in radiating non-fasciculated striae; c) the presence of the marginal ring of tubular processes on the valve mantle; d) the availability of several rimoportulae on the valve face/mantle junction and (e) the availability of one-several valve face fultoportula

K e y w o r d s : Thalassiobeckiaceae, a new family, *Thialassiobeckia*, a new genus, *Bacillariophyta*, Pliocene, Lake Baikal.

Introduction

Evolution of centric diatoms in Lake Baikal during the past 8 Ma (BDP-Members, 2000, 2001; Sapota et al., 2004) is associated with the processes of extinction and neogeneration. In the composition of the Late Miocene diatom flora of this basin 7 centric genera belong to dominants. Among them 4 genera *(Alveolophora* Moiss. & Nevretd., *Concentrodiscus* Khurs., Moiss. & Suchova, *Mesodictyon* Theriot & Bradbury, *Mesodictyopsis* Khursevich, Iwashita, Kocioiek & Fedenya) and freshwater species from the genus *Actinocyclus* Ehr. are extinct, and they are completely absent in the younger diatom communities of Lake Baikal (Khursevich et al., 2002a, 2003). The Pliocene diatom llora contains 6 dominant centric genera among which 3 (*Tertiariopsis* Khursevich & Kociolek, *Stephanopsis* Khursevich & Fedenya and *Tertiarius* Hakansson & Khursevich) belong to extinct members (Khursevich et al., 2000a, b, 2001, 2002b). The description of new centric taxa of a high rank (*Thalassiobeckiaceae* fam. nov. and *Thalassiobeckia* gen. nov.) from the Pliocene deposits of Lake Baikal is represented in this paper.

Material and methods

The 600 m long borehole BDP-98 was drilled by the Russian company "Nedra Enterprise" during winter 1998 using the Baikal-2000 drilling complex placed on a barge. The drilling was performed on the underwater Academician Ridge of Lake Baikal at 53°44'48" N and 108°24'34" E in water depth of 333 m. Continuous samples were collected to a depth of 600 m. The total core recovery was over 95%.

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Sediments consist of alternating biogenic diatomaceous ooze and terrigenous clay intervals. The age model for the BDP-98 section is based on the correlation of event/reversal boundaries with the reference polarity time scale (Cande, Kent, 1995) and ^{10}Be isotope chronology (Sapota et al., 2004). Proceeding from paleomagnetic and ^{10}Be isotope investigations from this section, sediments at a depth of 600 m were dated at 8 Ma (Sapota et al., 2004). The Upper Miocene deposits were laid down in the BDP-98 core in the depth interval between approximately 600 and 250 m, the Pliocene sediments – in the depth interval between approximately 250 and 70 m.

Permanent diatom slides were prepared with identical volumes of material according to the method described in Grachev et al. (1997). Diatoms were enumerated along the vertical and horizontal ti ansects of permanent slides in 50 or 200 fields of view depending upon diatom concentration. Specimens were examined and photographed by oil immersion light microscopy (Ergaval brightfield, 100× objective, NA = 1.25) and by scanning electron microscopy (JEOL JSM-35C). To describe a new fossil diatom genus, the terminology recommended by Ross et al. (1979) was used.

Results and discussion

Thalassiobeckiaceae Khursevich & Fedenya fam. nov.

Cellulae solitariae. Frustula disciformes, anulo intercalary praedita. Valvae circulares, in parte central! concavae vel convexae. Areolae loculares, cribrum internum et foramen externum. Areolae seriebus radialibus, fasciculorum non componunt. Centrum valvae habent 1-9 areolae, circumflexas anulo hyalinoso. Prope centri valvae ab uno ad quanuor rultoponulac cum tribus ports satelliticis positae. Rimoportulae (ab 2 ad 5) vulgo praesentes in limine facie valvari et limbo. Tuboprocessibus complexis in limbo positae.

Ty p u s: *Thalassiobeckia* Khursevich & Fedenya gen. nov.

Familia monotypa.

Cells are solitary. The frustula is discoid, with some intercalary bands. Valves circular, nearly flat with a slightly concave or convex central area. Areolae loculate with apparently internal cribra (often broken) and external foramina. They arranged in radiating non-fasciculated striae. Valve centre with one to nine areolae surrounded by a hyaline ring. One to four fultoportulae each with three satellite pores are located within the central area. Several rimoportulae (from 2 to 5) are usually present at the valve face/mantle junction. Valve mantle finely areolate, with a marginal ring of tubular processes.

T y p e : *Thalassiobeckia* Khursevich & Fedenya gen. nov.

New family differs from the family *Thalassiosiraceae* Lebour emend. Hasle (The diatoms ..., 1988: 56-57) by the presence of the marginal ring of tubular processes on the valve mantle and by the absence of marginal fultoportulae.

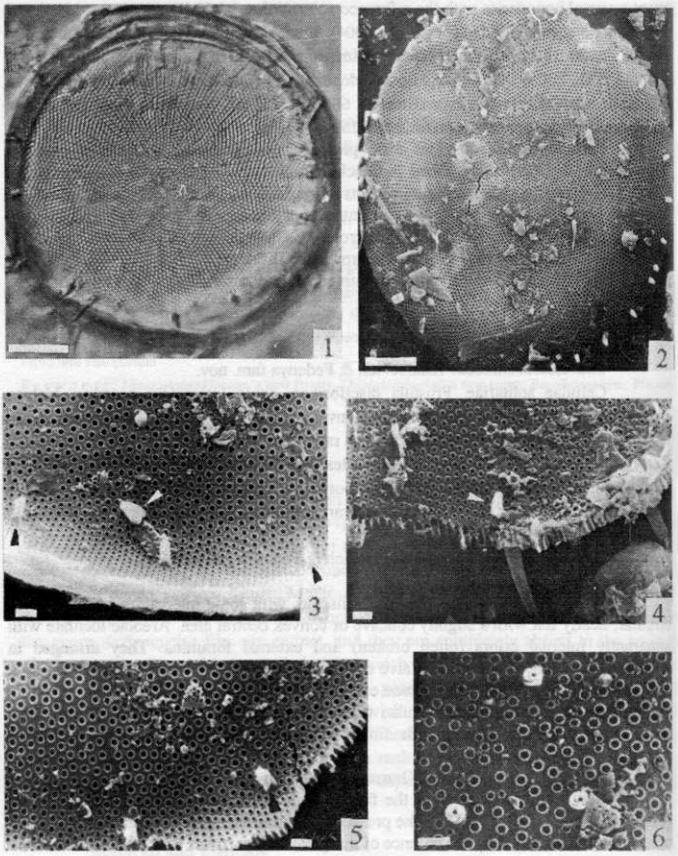
Genus ***Thalassiobeckia*** Khursevich & Fedenya gen. nov. The characteristics of the genus fully corresponds to the description of the family.

T y p u s : *Thalassiobecha siberica* Khursevich & Fedenya sp. nov.

T y p e : *Thalassioheckia sibenca* Khursevich & Fedenya sp. nov.

T y p e l o c a l i t y : The underwater Academician Ridge of Lake Baikal, Russia. The borehole BDP-98-1 (53°44'48'' N and 108°24'34'' E). Abundant in the Upper Pliocene deposits.

New genus differs from the genus *Thalassiosira* Cleve (Round et al., 1990: 132)



Thalassiobeckia siberica Khursevich & Fedenya gen. nov. from the holotype material of BDP-98-1, core 47-1 (47 cm): *1* – general view, LM; *2* – external view of the valve surface with a marginal ring of irregularly located spines; *3-6* – fragments of the interval view of the valve surface with a marginal ring of the tubular processes on the valve mantle (black arrows, *3*, *5*) with one rimoportula at the valve face/mantle junction (white arrow, *3*, *4*) and three valve face fultoportulae (*6*). SEM. Scale bars: *1*, *2* –10 μm; *3-6* – 1 μm.

by the presence of the tubular processes similar with those in the *Ellerbeckia* species on the valve mantle; from the genus *Ellerbeckia* Crawford (1988: 421) – by the availability of such important morphological elements on the valve surface as of rimoportulae and valve face fultoportulae.

Thalassiobeckia siberica Khursevich & Fedenya sp. nov. (Figure).

Valvae circulares 37.2-72.7 µm diametro. Areolae 12-18 in 10 µm sekundum radium ab centre valvae, sitac sum in radialis striis 13-20 in 10 µm. Prope centri valvae ab uno ad quattuor fultoportulae cum tribus poris satelliticis positae. Rimoportulae (ab 2 ad 5) vulgo praesentes in limine facie valvari et limbo. In facie intema valvari rimoportulae humilis, habent orientationem variam rimae; exteme sunt tubulae est aeque spinae conici. Limbo (ad 5 µm altitudine) et constat ex 8-12 subfiles areolas in serie verticali (26-32 serie verticali in 10 µm). Tuboprocessibus complexis (2 in 10 µm) in limbo positae.

H o l o t y p u s: praeparatum N 867a, BDP-98-1, core 47-1 (47 cm) est in Institute geol. scientarium (IGS) NASB, Minsk, figure, *1*.

I s o t y p u s: praeparatum N 867b, BDP-98-1, core 47-1 (47 cm) est in Instituto geochemiae SD RAS, Ircutsk.

Materia typica: in collectione G.K. Chursewitsch, IGS NASB, Minsk et in collectione projecti terebrati Baikalensis, Instituto geochemiae SD RAS, Ircutsk.

Valves are circular. 37.2-72.7 µm in diameter. Areolae. 12-18 in 10 µm along the valve radius, arranged mainly in radiate non-fasciculated striae, 13-20 in 10 µm. One to four fultoportulae each with three satellite pores are located within the central area in radial areolar rows. Several rimoportulae (from 2 to 5) are usually present at the valve face/mantle junction. On the internal valve surface shortly stalked rimoportulae luive various orientation of slit. Externally they are represented by long tubes at the same level with conic solid spines. Valve mantle, up to 5 µm in height, consists of 8-12 small areolae in a vertical row (26-32 areolae rows in 10 µm). A marginal ring of tubular processes, 2 in 10 µm, is positioned in the upper part of the mantle. Extremally tubular processes terminate by raised small openings.

H o l o t y p e : Slide No. 867a, BDP-98-1. core 47-1 (47 cm), deposited at the Institute of Geological Sciences, National Academy of Sciences of Belarus, Minsk, Belarus, figure, *1*.

I s o t y p e : Slide No. 867b, BDP-98-1, core 47-1 (47 cm), deposited at the Institute of Geochemistry, Siberian Branch of Russian Academy of Sciences, Irkutsk, Russia.

Type material: Housed in the G.K. Khursevich Collection at the Institute of Geological Sciences, National Academy of Sciences of Belarus, Minsk, Belarus, and Baikal Drilling Project Collection. Institute of Geochemistry, Siberian Branch of Russian Academy of Sciences; Irkutsk, Russia.

Type locality: The underwater Academician Ridge of Lake Baikal, Russia. The borehole BDP-98-1 (53°44'48'' N and 108°24'3'' E), depth 95.52-96.02 m below sediment surface.

Range: Late Pliocene.

Conclusion

The Late Miocene and Pliocene diatom flora from Lake Baikal is distinguished by the high rank of endemism not only on the generic level but also on the family level. The independence of the new endemic family *Thalassiobeckiaceae* and its type genus

Thalassiobeckia found in me Upper Pliocene sediments from the BDP-98 core is caused by the combination of such important morphological characters as me presence of loculate areolae with internal cribra and external foramina, of the marginal ring of tubular processes on the valve mantle, of several rimoportulae at the valve face/mantle junction and of valve face fultoportulae.

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Г.К. Хурсевич, С.А. Феденя

Ин-т геологических наук, НАН Беларуси,
Беларусь, 220141 Минск, ул. Купревича, 7

THALASSIOBECKIACEAE – НОВОЕ СЕМЕЙСТВО КЛАССА *CENTROPHYCEAE* (*BACILLARIOPHYTA*)

Новый пресноводный род *Thalassiobeckia,* изученный в световом (СМ) и сканирующем электронном микроскопе (СЭМ) из плиоценовых отложений озера Байкал, рассматривается в составе нового монотипного семейства *Thalassiobeckiaceae* в классе *Centrophyceae (Bacillariophyta).* Оба новых таксона характеризуются сочетанием следующих морфологических признаков: a) присутствием локулярных ареол с внутренним крибрумом и наружным фораменом; b) расположением ареол и лицевой поверхности створки в радиальных рядах, не образующих пучки; c) присутствием краевого кольца трубковидных выростов на загибе створки; d) наличием нескольких двугубых выростов на границе лицевой части створки и загиба и (e) одного-нескольких выростов с опорами на лицевой части створки.

Ключевые слова: *Thalassiobeckiaceae,* плиоцен, новое семейство, *Thalassiobeckia,* новый род, *Bacillariophyta,* озеро Байкал.

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