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THE CENTROHELID HELIOZOANS (PROTISTA, CENTROHELIDA) OF ALGAL MATS FROM THE WATER BODY IN UKRAINIAN POLISSYA

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The Centrohelid Heliozoans (Protista, Centrohelida) of Algal Mats from the Water Body in Ukrainian Polissya. Gaponova L. P. — *Pterocystis foliacea* (Dürschmidt, 1985), *Raineriophrys erinaceoides* (Petersen et Hansen, 1960) and *Acanthocystis dresscheri* Siemensma et Roijackers, 1988 were observed in algal mats from the pond. All the three species are redescribed.

Key words: Centrohelida, Protista, algae, fauna, Ukraine.

Центрохелидные солнечники (Protista, Centrohelida) водорослевых матов из водоема в Украинском Полесье. Гапонова Л. П. — *Pterocystis foliacea* (Dürschmidt, 1985), *Raineriophrys erinaceoides* (Petersen et Hansen, 1960), *Acanthocystis dresscheri* Siemensma et Roijackers, 1988 наблюдали в водорослевых матах из пруда. Даны переписания этих трех видов.

Ключевые слова: Centrohelida, протисты, водоросли, фауна, Украина.

Introduction

The protozoan communities of algal mats in freshwaters have often been described, in particular with respect to ciliated protozoa (Pratt, Rosen, 1983; Kobayashi, Kotlash, 1994). However, the fauna of heliozoan-like organisms is less documented. T. Fenchel (1987) pointed out that actinophryid heliozoans such as *Actinosphaerium eichornii* (Ehrenberg, 1840) and *Actinophrys sol* (Müller, 1773) are revealed in samples of freshwater algae. However there are no evidences concerning inhabitation of the centrohelid heliozoans among algae mats from freshwaters.

In this paper the data about centrohelid heliozoans observed in the association with algae mats are presented.

Material and methods

The material was collected from a small pond in the region Kitaevo, at the vicinity of Kyiv (Ukraine) in August, 2006. The sample containing the aggregation of algae was taken at a depth of 15 cm into the glass vessel (0.5 l) and brought to the laboratory. The material was kept and observed at the room conditions during nine months. Over this period of time we didn't add anything into the glass vessel except boiled and precipitated water. During the September, 2006 – May, 2007 some amounts of water containing the algae and protists examined under the light microscope (Carl Zeiss-50). The living cells of centrohelids were isolated, air-dried without preliminary fixation and examined under the scanning electron microscope JSM-35 C.

The electron scanning microscopic investigations were carried out at the Laboratory of Electron Microscopy, Institute of Botany of National Academy of Sciences of Ukraine.

Results and discussion

Rhizoclonium hieroglyphicum (Ag.) Kütz. (Chlorophyta, Green Algae) and *Lyngbya kuetzingii* (Kütz.) Schmid (Cyanoprokaryota) were dominated in the investigated pond. Development of three species of centrohelid heliozoans such as *Pterocystis foliacea*

(Dürschmidt, 1985), *Rainieriophrys erinaceoides* (Petersen et Hansen, 1960) and *Acanthocystis dresscheri* Siemensma et Roijackers, 1988 was observed among filaments of these algae, which were collected and kept in laboratory.

According to Nicholls (1983), Dürschmidt (1985; 1987), Croome (1986; 1987), Siemensma and Roijackers (1988), Mikrjukov (1993; 1999; 2001; 2002) these species have a wide variety of habitats from a mountain stream, freshwater lagoon and lake to swamps and pools. They inhabit both freshwater and brackish habitats. *P. foliacea*, *R. erinaceoides* and *A. dresscheri* appear to have a wide tolerance of pH and trophic conditions. This is the first report of these species from algal mats. However, these species apparently are not specific to such habitat as algae mats.

Pterocystis foliacea (Dürschmidt, 1985) Siemensma 1991 (fig. 1, 2)

Redescription. Periplast 10–20 μm in diameter with one type of spicules. Spicules, 2.2–6.9 μm long, leaf-shaped. Shaft reduced to narrow ridge between two broad lateral wings, extending along whole shaft and tapering distally into small tip at terminal part of shaft. Lateral wings broaden towards proximal end, but, at short distance from there abruptly narrow, forming compact stalk. The more or less horizontal extension opposite shaft may be considered as modified basal wing. Wings pattern less; smooth with narrowly rimmed margins. Spicules often smaller than their plate-scales.

Plate-scales, 2.5–3.1 x 1.8–2.0 μm ellipsoidal, sometimes slightly curved or with medial constriction, thin and narrowly rimmed; central thickening visible sometimes only as thin rim.

Habitat. Freshwaters

Distribution. Australia, Chile, Japan, The Netherlands, New Zealand and Sri Lanka, (Mikrjukov, 2002), Ukraine (new record).

Rainieriophrys erinaceoides (Petersen et Hansen, 1960) Mikrjukov, 2001 (fig. 3, 4)

Redescription. Cells about 20–23.5 μm in diameter with one type of spicules in periplast. Spicules 6.3 – 9.4 μm long, slightly curved, tapered towards sharp apex; their base represented by basal wing, 1.7 x 0.7–1.1 μm , located at right angle to shaft and two lateral wings, extending by V-like shape along shaft, not reaching half of its length.

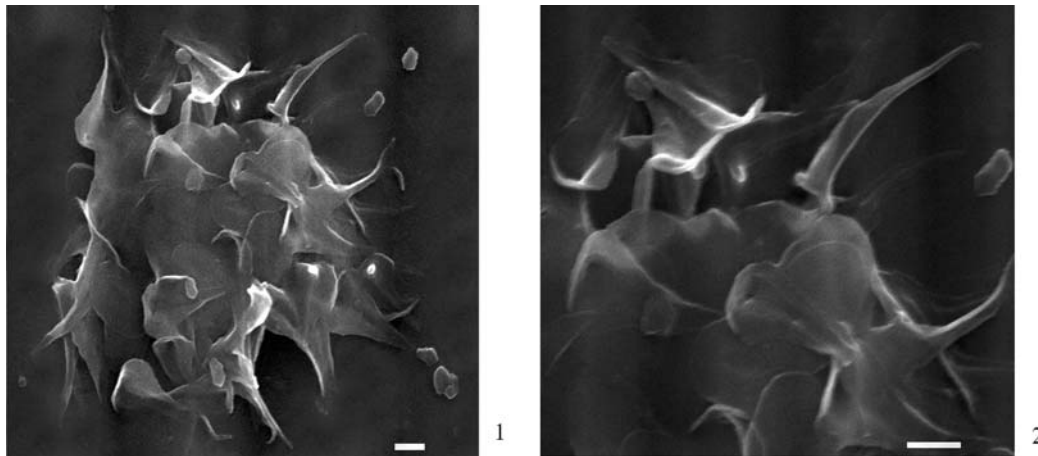


Fig. 1. *Pterocystis foliacea* (SEM). Entire periplast. Scale bar 1 μm .

Рис. 1. *Pterocystis foliacea* (СЭМ). Перипласт. Масштабная линейка 1 мкм.

Fig. 2. *Pterocystis foliacea* (SEM). Spicules and plate-scales. Scale bar 1 μm .

Рис. 2. *Pterocystis foliacea* (СЭМ). Спиккулы и пластинчатые чешуйки. Масштабная линейка 1 мкм.

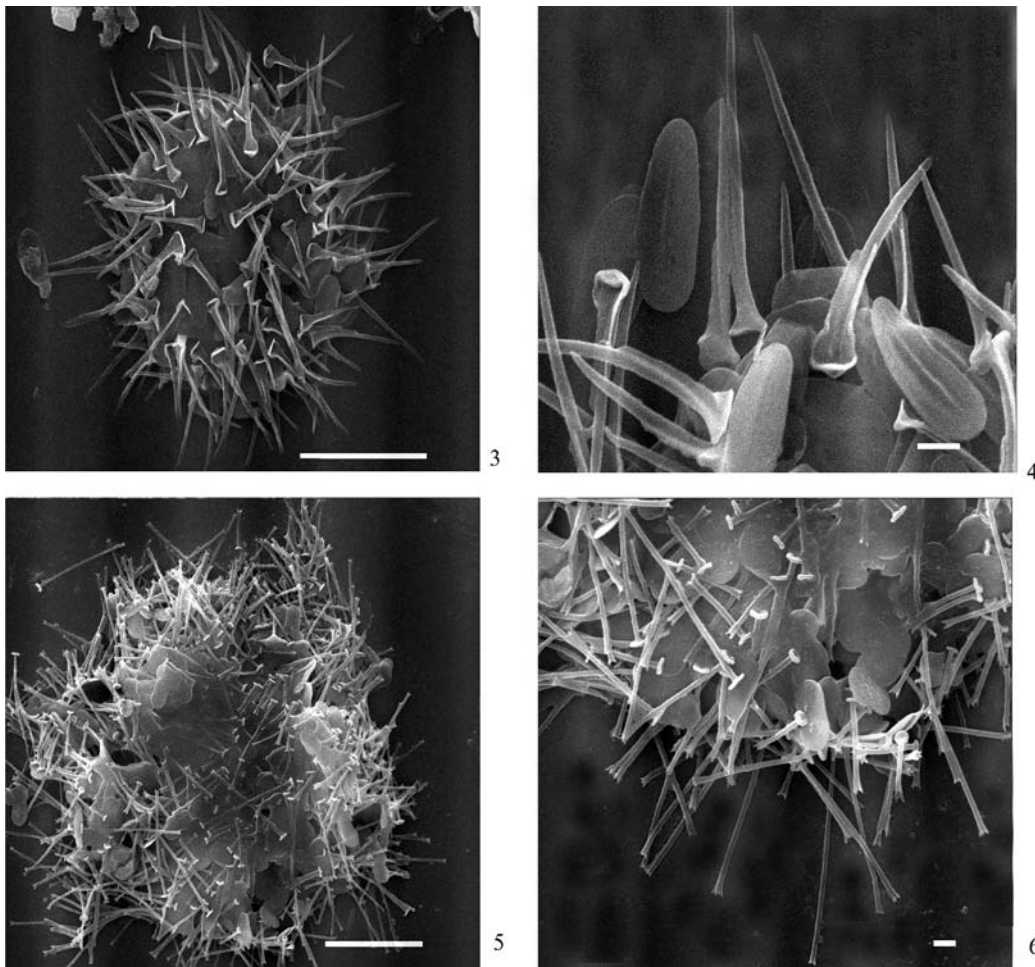


Fig. 3. *Rainieriophrys erinaceoides* (SEM). Entire periplast. Scale bar 10 μm .

Рис. 3. *Rainieriophrys erinaceoides* (СЭМ). Перипласт. Масштабная линейка 10 мкм.

Fig. 4. *Rainieriophrys erinaceoides* (SEM). Spicules and plate-scales. Scale bar 1 μm .

Рис. 4. *Rainieriophrys erinaceoides* (СЭМ). Спикулы и пластинчатые чешуйки. Масштабная линейка 1 мкм.

Fig. 5. *Acanthocystis dresscheri* (SEM). Entire periplast. Scale bar 10 μm .

Рис. 5. *Acanthocystis dresscheri* (СЭМ). Перипласт. Масштабная линейка 10 мкм.

Fig. 6. *Acanthocystis dresscheri* (SEM). Spicules and plate-scales. Scale bar 1 μm .

Рис. 6. *Acanthocystis dresscheri* (СЭМ). Спикулы и пластинчатые чешуйки. Масштабная линейка 1 мкм.

Plate-scales ovoid, 4.2–5.6 x 2.1–2.5 μm , with axial ridge.

Habitat. Fresh, occasionally brackish waters.

Distribution. freshwaters: Australia, Canada, Chile, Denmark, Estonia, Germany, Middle Russia, The Netherlands, Ukraine (Mikrjukov, 2002).

In brackish waters: Gulf of Finland (salinity 6‰), Karelian coast of the White Sea (salinity 6‰) (Mikrjukov, 2002).

Acanthocystis dresscheri Siemensma et Roijackers, 1988 (fig. 5, 6)

Redescription. Cell diameter 20 μm . Spine-scales 7.3–10.3 μm long, with straight, cylindrical and hollow shaft centrally set on circular basal plate. Apex of shaft slightly expanded, with 5–8 marginal sharply pointed teeth. Basal plate 1.4–2.2 μm in

diameter, flat, with upwardly bent rim. Plate-scales 4.7—5.5 x 2.3—3.0 μm , having concave sides with median constriction 1.5—2.4 μm wide; upper surface ornamented with distinct pattern of numerous small granules, more or less irregularly distributed, sometimes arranged in concentric rows; central area smooth with slight indication of longitudinal thickening. Lower surface smooth with protrusive axial rod-shaped thickening, distinctly separated from scale surface and only at both ends merging into scale. Protrusion 0.43 μm thick and ca. 1.3 μm long.

K. Mikrjukov (1997) mentioned *Acanthocystis dresscheri* as junior synonym of *A. penardi* without comments. But *A. dresscheri* differs from *A. penardi* by such sufficient characters as plate-scales morphology (Siemensma, Roijackers, 1988). We therefore consider *A. dresscheri* to be a separate species.

Habitat. Freshwater

Distribution. The Netherlands (Siemensma and Roijackers, 1988); Ukraine (new record).

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- Croome R. Observations of the heliozoan genera *Acanthocystis* and *Raphidocystis* from Australia // Arch. Protistenkd. — 1986. — **131**, N 3—4. — P. 189—201.
- Croome R. Observations of the genera *Acanthocystis*, *Raphidocystis*, *Clathrulina* and *Pompholyxophrys* (Protozoa, Sarcodina) from Australian freshwaters // Arch. Protistenkd. — 1987. — **133**, N 3—4. — P. 237—243.
- Dürschmidt M. Electron microscopic observations on scales of species of the genus *Acanthocystis* (Centrohelidia, Heliozoa) from Chile, I // Arch. Protistenkd. — 1985. — **129**, N 1—4. — P. 55—87.
- Dürschmidt M. An electron microscopical study on freshwater heliozoa (Genus *Acanthocystis*, Centrohelidia) from Chile, New Zealand, Malaysia and Sri Lanka. III // Arch. Protistenkd. — 1987. — **133**, N 1—2. — P. 49—80.
- Fenchel T. Ecology of protozoa: The biology of free-living phagotrophic protists. Berlin: Springer-Verlag, 1987. — 197 p.
- Kobayashi T., Kotlash A. Interactions between Vorticellids (Protozoa: Peritrichida) and planktonic algae in the Hawkesbury-Nepean River, New South Wales // Proc. Linn. Soc. N. S. W. — 1994. — **114**, N 2. — P. 61—67.
- Mikrjukov K. A. Observations on Centroheliozoa (Sarcodina, Protozoa) of the Volga basin // Zoosystematica Rossica. — 1993. — **2**, N 2. — P. 201—209.
- Микрюков К. А. Ревизия родового и видового состава семейства Acanthocystidae (Centroheliozoa, Sarcodina) // Зоол. журн. — 1997. — **76**, N 4. — P. 389—401
- Микрюков К. А. Интересные находки солнечных (Protista) в Чёрном море и Крыму: к вопросу о единстве морской и пресноводной фауны этих организмов // Зоол. журн. — 1999. — **78**, N 5. — С. 517—527.
- Mikrjukov K. A. Heliozoa as a component of marine microbenthos: a study of heliozoa of the White Sea // Ophelia. — 2001. — **54**, N 1. — P. 51—73.
- Микрюков К. А. Центрохелидные солнечники (Centroheliozoa). Москва: Товарищество научных изданий КМК, 2002. — 136 с.
- Nicholls K. H. Little-known and new heliozoans: the centrohelid genus *Acanthocystis*, including descriptions of nine new species // Can. J. Zool. — 1983. — **61**, N 6. — P. 1369—1386.
- Pratt J. R., Rosen B. H. Associations of species of *Vorticella* (Peritrichida) and planktonic algae // Trans. Am. Microsc. Soc. — 1983. — **102**, N 1. — P. 48—54
- Siemensma F. J., Roijackers R. M. M. A study of new and little-known acanthocystid heliozoans, and a proposed division of the genus *Acanthocystis* (Actinopoda, Heliozoa) // Arch. Protistenkd. — 1988. — **135**, N 1—4. — P. 197—212.