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ALGAL NATURE OF THE ORDOVICIAN PRESUMED POLYCHAETE EGGS

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An enigmatic Ordovician organic microfossil, previously interpreted as polychaete eggs accumulation, is reexamined with TEM methods and reinterpreted as presumably blue-green algae rests.

Key words: organic microfossil, Cyanophyta, Polychaeta, ultrastructure, Ordovician, glacial boulders.

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INTRODUCTION

A number of authors have described many enigmatic organic microfossils of more or less sphaerical shape from the Palaeozoic beds. These forms belong to various groups of plants and invertebrates. Determination of their systematic position is highly troublesome in many cases. Among various organic microfossils there are concentrations of vesicles about 25 μm in size from the Beyrichienkalk described by Eisenack (1955). He interpreted them as eggs or algae. Subsequently, Kozłowski (1974) reported accumulations of vesicles from Ordovician glacial boulders, regarding them as eggs of polychaete annelids. The diameter of these vesicles varies between 10 and 40 μm.

The aim of my work was to reexamined Kozłowski's material with the TEM methods as well as to discuss its biological nature.

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MATERIAL AND METHODS

The specimens investigated were etched with acetic acid from the glacial Ordovician boulder (Kozłowski's no. 0.642) from Poland. They were dried in the standard graded alcohol series and propylene oxide. After embedding the specimens in Epon 812 the trimmed blocks were sectioned with a L.K.B. III ultramicrotome. Ultrathin sections were studied with a Tesla BS 500 transmission electron microscope. Sixty kV were used for viewing and taking micrographs.

RESULTS AND DISCUSSION

Light microscopy observations showed that each specimen, about 1 mm in size, represents irregular accumulation of fine (15—30 μm) vesicles. Vesicles are sphaerical, ellipsoidal or irregular in shape and seem to be glued togather by a mucus-like matter (see also Kozłowski 1974).

TEM studies showed that the vesicles are formed of membrane with some external coatings (pl. 15). The membrane material is a homogeneous or, sporadically, granular in some areas, substance of a high electron density (pl. 15: 2). The thickness of membrane is usually within 0.3—2.5 μm in a single vesicle. So high variability may be due to differences in orientation of sections, from transversal to more or less oblique. The coating of the vesicle displays markedly lower electron density than membrane and it is clearly laminated (pl. 15: 2). Laminae, up to four in number, differ from one another in density of basic matter and size and number of granules. Vesicles are empty inside.

SEM micrographs figured by Kozłowski (1974) and my TEM micrographs failed to show any mucus-like substance which would be independent of individual vesicles and acting as a glue. Each vesicle has its own external coatings.

The microfossils under study appear somewhat similar to some fossil blue-green algae. Concentrations of vesicles of the discussed form resemble closely colonies of lower Carboniferous blue-green alga *Aphanocapsites granulosus* Maslov, 1956. That alga presents sphaerical or discoidal colonies in the form of irregular concentration of cells 15—30 μm in size and resembles the Recent Microcystidae. Similarly as "eggs" described by Kozłowski (1974) the cells of *Aphanocapsites* form sometimes short chains (Maslov 1963). One could not exclude that Eisenack's microfossils mentioned above and Kozłowski's "eggs" are closely related or even congeneric with the genus *Aphanocapsites*.

There is also similarity to Precambrian blue-green alga *Myxococcoides minor* Schopf, 1968 in morphology and ultrastructure. *M. minor* forms colonies in the shape of irregular concentrations of sphaerical to ovate

cells. Ultrathin section of colonies in TEM micrographs resemble images here obtained (compare Schopf 1970, pl. 15: 2—3 and here in pl. 15). *M. minor* is characterized by cell wall built of electron dense inner layer and markedly less dense outer one (Schopf 1970), similarly as in the case of the studied form. Both forms are empty inside but this may be disregarded in the light of studies on fossilization of blue-green algae (see Golubić and Hofman 1976.

Affiliation of the studied microfossils to blue-green algae may be, however, questioned. The presumed "polychaete eggs" of Kozłowski (1974) are several times larger than cells of contemporary (but not all fossil) Cyanophyta. However, their similarity to *A. granulosus* and *M. minor* in a shape of cell concentrations and the structure of cell wall sugest their blue-green algae character. It is also worth of notice, that studied forms appear somewhat similar to the Silurian algae described by Kaźmierczak and Golubić (1976), despite of marked differences in ultrastructure of cell walls (layered in the former and non-layered in the latter).

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ALGOWY CHARAKTER ORDOWICKICH „JAJ WIELOSZCZETÓW"
(pl. 15)

Streszczenie

Kozłowski (1974) opisał z ordowickich głazów narzutowych skupiska pęcherzyków organicznych o średnicy 10—40 μm, które interpretował jako skupiska jaj wieloszczetów. Zbadano ultrastrukturę tych pęcherzyków metodami transmisyjnej mikroskopii

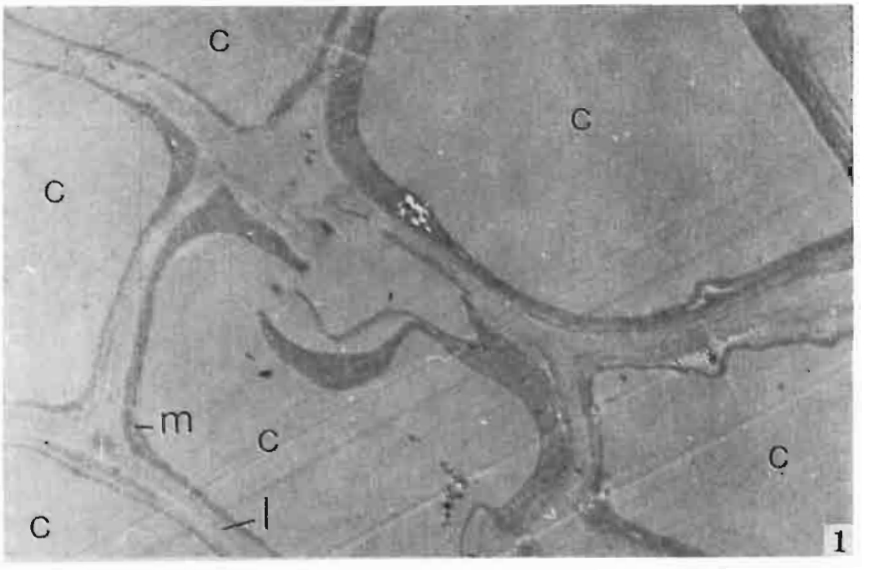
elektronowej. Wykazano, iż ścianki pęcherzyków mają budowę kilkuwarstwową, czym przypominają otoczki sinic. Porównano rzekome „jaja" z sinicami *Myxococcoides minor* Schopf, 1968 (prekambr) i *Aphanocapsites granulosus* Maslov, 1956 (karbon). Wyrażono pogląd, iż badane mikroskamieniałości stanowią szczątki alg, najprawdopodobniej sinic.

EXPLANATION OF PLATE 15

Gen. et sp. indet. (?Cyanophyta) from the Ordovician glacial boulder 0.642 (Poland), TEM micrographs

1. Section through the accumulation of vesicles, ×2800.
2. Ultrastructure of the vesicle wall, ×1140.

Explanations: *c* cavity of the vesicle (cell), *l* outer linings, l_1—l_4 succesive outer linings, *m* membrane.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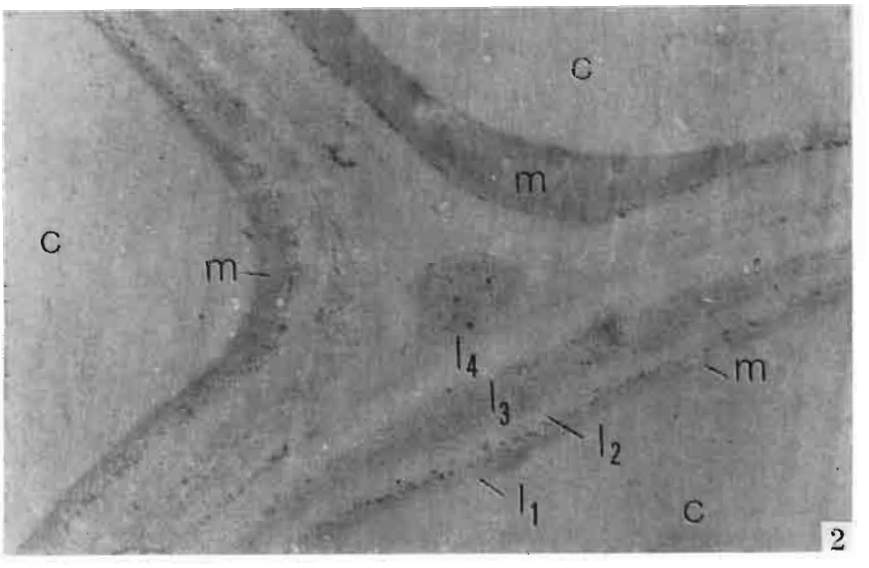
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