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ASPECTS OF PALAEOENVIRONMENT – ACRITARCHS AND CHITINOZOANS IN LOWER PALEOZOIC OF EASTERN CARPATHIANS FORMATIONS

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Abstract

The present briefly presents some essential aspects of the palaeoenvironment and of palaeoecology of the Lower Paleozoic based on the determination of *Acritarchs and Chitinozoans*. The introduction presents some general but basic aspects of the palaeoenvironment of the Lower Paleozoic namely: the palaeomagnetic data, epirogenetic phenomena, orogenetic phenomena, facial phenomena. The considerations refer to the analysis of two groups, maybe less present in the analysis of the palaeoecology of the Lower Paleozoic, namely the *Acritarchs and Chitinozoans.*

Key words: palaeoenvironment, Lower Paleozoic, Acritarchs, Chitinozoans, Eastern Carpathians, Romania

Introduction

The present paper presents synthetically, even briefly, some essential aspects of palaeoenvironment and palaeoecology of the Lower Paleozoic.

The paleogeographic aspects which determine a certain palaeoecology of this interval of about 200 M.y. (the Cambrian, the Ordovician and the Silurian), are steady to a certain extent of the laws of evolution (from the principle of actualism or of the actual causes to the principles of global tectonics).

The papers with the similar aspects are few, but we can quote the papers of Olaru (1991, 2001) concerning the palaeobiology and palaeoecology of *acritarchs* in metamorphic formations from Romania.

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The palaeoenvironment conditions are obviously determined in this very old stage too of our blue planet.

General considerations

Palaeomagnetic data: based on this data, the positions of the continental masses and of the magnetic poles were established. Most researches consider that in the northern hemisphere there was the Proto-Atlantic, separating Laurentia (Canada + Greenland) of Fenno-Sarmatia (the Baltic Shield up to the Urals); then, to the East, the domain or the Urals, separating the Baltic Shield from the Siberian one, and the domain or the Altai belt, separating the Siberian Shield from the Sinic one.

In the southern hemisphere there was that megacontinent Gondwana and in the median area of the present-day continents of Africa and South American there was the South Pole of the Earth (it has even been thought to have been located in the West of the Sahara till the end of the Ordovician, after which it started to move towards the south of the present-day African continent).

The North Pole was somewhere in the northern part of the Pacific Ocean.(Scotese, 2001).

Epirogenetic phenomena: the regressions and the transgressions of the Lower

Paleozoic were numerous, being determined by the isostatic movements of the terrestrial crust, but this is valid especially for the regressions and phases of the orogenetic paroxysms (Caledonian orogenesis), the most important being the regressions from the Upper Cambrian / Lower Ordovician and of Upper Silurian, and the transgression of the Lower Silurian (Llandovery) (Tătărâm, 1988).

Orogenetic phenomena: the Caledonian orogenesis took place in the Lower Paleozoic, the one which totally determined the orogenetic phenomena; for instance, in the northern hemisphere the North-Atlantic continent between the Cordilleras and the Urals was formed then, and in the southern hemisphere the Australian Caledonides and the Transarctic belt were very active (Scotese, 2001).

The facial phenomena: as it is well-known, they are highly active in the so-called period of geosynclines, going on during the phases of mobile belt, but present also as continental facies, at the formation of the facies, of those typical of geosynclines, from abyssal to epi-continental ones, and till the continental facies were completed with magmatic effusions; the volcanoes making archipelagos along and near the geosynclines (Tătărâm, 1988).

The palaeoenvironment conditions of the geological evolution determine the biostratigraphical development and importance of the groups of living beings.

For the Lower Paleozoic the main groups of living beings, that also have a biostratigraphical importance, are: *Thallophyta, Archaeocyatha, Cnidaria, Briozoa, Brachiopoda, Palaeocrustacea (Trilobita), Graptholitina, Agnata* and *Arthropoda*, to which are added, sometimes with specific importance (mainly in the metamorphic rocks) *Acritarcha* and *Chitinozoa.* Our considerations also focus on these last two groups for the researched areas, especially in the Eastern Carpathians.

Considerations on some determinations of acritarchs and chitinozoans in Eastern Carpathians

The ***Acritarcha group,*** which is not considered an artificial group, being attached to the order of Algae, is still a group of organic microfossils with an uncertain origin.

The rich associations of *acritarcha* are described in the reef calcareous areas, but also in non-reef areas alongside the fossil micro-plankton. However, the thorn shapes mark reef distanced areas, while the shapes thornless, smooth and papillary shapes show the semi-continental areas (Dragastan et al., 1980)

The genera evolution of *acritarchs* presents a specific biostratigraphic importance for the Cambrian-Devonian interval.

The subgroups that confer this biostratigraphic importance are: *Acanthomorphitae, Polygonomorphitae, Herkomorphitae, Sphaeromorphitae, Netromorphitae and Diacromorphitae*.

Acanthomorphitae are represented in our determinations mainly by the genera *Baltisphaeridium sp.* (fig. 1, 2; Pl. I) and *Micrhystridium sp.* (fig. 3; Pl. I), while *Polygonomorphitae* are represented mainly by the genera *Pulvinosphaeridium sp*. (fig. 4; Pl. I) and *Striathoteca sp*. (fig. 5; Pl. I).

Herkomorphitae are represented mainly by the genus *Cymatiosphaera sp.* (fig. 6; Pl. I) and *Sphaeromorphitae* are represented the genus *Leiosphaeridia sp.* (fig. 7; Pl. I).

Netromorphitae are represented by the genus *Dactylofusa sp*. (fig. 13; Pl. I) and *Diacromorphitae* mainly by the genus *Acanthodiacrodium sp.* (fig. 9; Pl. I) (Horaicu, 2000).

The conclusions of the considerations on determination of *acritachs* in the metamorphic rocks of the Eastern Carpathians (Negrişoara, Tulgheş groups and sub-group of Stiol (former "series of Repedea") are the following:

- the genera present in these determinations belong to the second (the appearance of the thorns, chains and polarity of *acritachs*) and third (the appearance of pylom) periods of the evolution of *acritarchs* (Lower Cambrian – Lower Ordovician- Tremadocian) (Dragastan et al., 1980).
- the preponderant presence of the thornless, smooth and papillary (with small thorns) forms would indicate an initial formation of the rocks from the sampled formations, in a cvasicontinental palaeoenvironment.

The ***Chitinozoan*** **group**, first described in the Baltic Shield (Eisenack, 1968) includes Paleozoic marine organisms that appear at the limit of Upper Cambrian – Lower Ordovician and definitively disappear in Upper Devonian.

These organisms have been assigned to *fungi, algae, flagellates, rizopodes*, *graptolites* or even to some eggs of *metazoans*

The palaeoenvironment of this group can be shown by the tabular thorns of the organisms, that suggest a planktonic or pseudo-planktonic life, and by the wall thickness of these organisms, the thick walls indicating a bentonic life.

The genera evolution of the *chitinozoans* shows a specific biostratigraphical importane for the Lower Ordovician - Upper Devonian interval.

This evolution took place in 3 theoretical stages (Paris, 1998):

- the Cambrian-Ordovician limit with big-sized genera, (e.g. *Amphorachitina sp., Clavachitina sp.);*
- the Lower Ordovician, when the colonial forms emerge (e.g. *Desmochitina sp*.);
- the Devonian*,* as a final stage in which these organisms disappear, the typical genera now being, for instance, *Angochitina sp., Bursachitina sp*. and *Urochitina sp*. (Paris et al., 1998).

Our determinations, made especially on the rocks of the Stiol subgroup, more frequently pointed out the following genera *Desmochitina sp.* (fig. 10; Pl. I), *Sphaerochitina sp.* (fig. 11; Pl. I), *Eremochitina sp.* (fig. 12; Pl. I), *Clavachitina sp*. (fig. 13; Pl. I) (Horaicu, 2000).

The conclusions of these considerations on the determination of *chitinizoans* in the rocks of the Stiol subgroup rocks should be the following:

- the genera presented in these determinations belongs to the first (the Cambrian-Ordovician limit with big-sized genera) and second (the Lower Ordovician, when the colonial forms emerge stages) of the evolution of *chitinozoans* (Late Cambrian – Ordovician-Silurian),
- the striking presence of the forms with thick walls would suggest the formation of the sampled rocks in a palaeoenvironment similar to the actual bentonic sequence.

The conclusions are similar to the ones regarding the associations of *chitinozoans* in the crystalline of Rodnei mountains (Iliescu et al., 1976) and of the ones in the crystalline of the Southern Carpathians.

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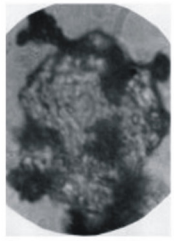
CAPTION OF PLATE

Plate I

1, 2 - *Baltisphaeridium* sp.x 1000
3 - *Micrhystridium* sp.x 500
4 - *Pulvinosphaeridium* sp.x 500
5 - *Striathoteca* sp.x 1000
6 - *Cymatiosphaera* sp.x 1000
7 - *Leiosphaeridia* sp.x 1000
8 - *Dactylofusa* sp.x 500
9 - *Acanthodiacrodium* sp.x 1000
10 - *Desmochitina* sp.x 320
11 - *Sphaerochitina* sp.x 200
12 - *Eremochitina* sp.x 200
13 - *Clavachitina* sp.x 200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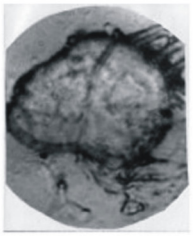
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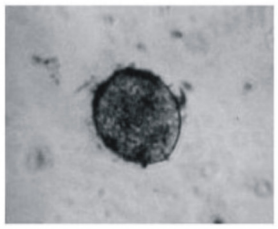
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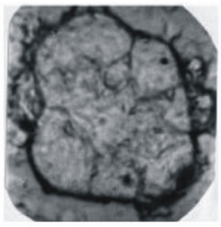
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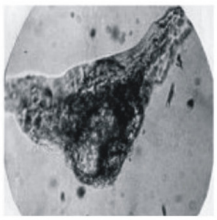
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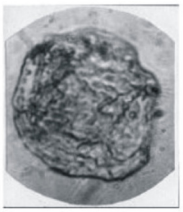
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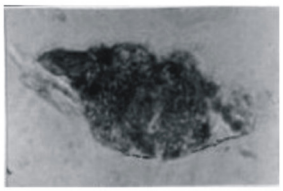
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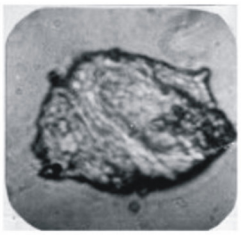
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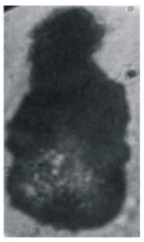
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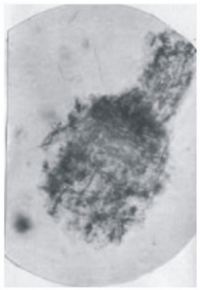
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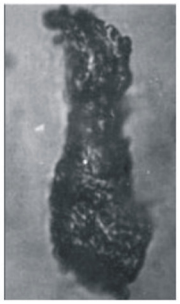
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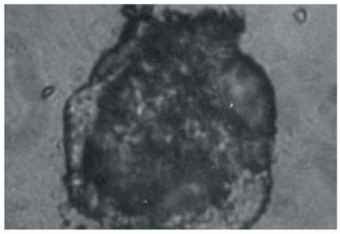
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