

New Bryozoa from the Sarmatian (Middle Miocene) deposits of the Cerna-Strei Depression, Romania

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ABSTRACT. A new species of the Sarmatian bryozoan, *Crisia romanica* sp. nov., is described from Sarmatian (Middle Miocene) sediments of the Cerna-Strei Depression, near Răcăştia, Romania. The new species differs from all other known species of *Crisia* by having a frontal elongated gonozoecium with a prominent oeciopore situated on a short oeciostome. *Crisia romanica* sp. nov. is accompanied by *Annectocyma corrugata* (REUSS, 1869) occurring in a section nearby. The bryozoans found indicate normal marine conditions in the Cerna-Strei Depression during the Sarmatian.

Key words: Bryozoa, taxonomy, new species, Sarmatian, Middle Miocene.

INTRODUCTION

The first systematic account of the early Sarmatian (late Middle Miocene) bryozoans from Romania was prepared by Ghiurcă and Stancu (1974). They described a small number of species, such as *Annectocyma corrugata* (REUSS, 1869), *Schizoporella montifera* (ULRICH and BASSLER, 1904), *Cryptosula terebrata* (SINZOV, 1892), and *Crisiella carnuntina* BOBIES, 1957, from the following Romanian localities: Benesad, Berca, Buciumi, Copăcel, Morilor, Soceni, Trestia, Tusa, Valea, and Valea Politonai.

New sections with Sarmatian bryozoans were discovered in the vicinity of Răcăştia (Hunedoara County). The area was described in details by Gaál (1911), who however, did not report any bryozoans from there. During recent field work two of us (LS and BSz) examined these outcrops and found rare fragments of bryozoans.

Although these bryozoan assemblages are characterized by very low diversity (only two taxa could be identified), one of their components is a new species of *Crisia*.

In our opinion, the identification of these taxa is very important for deciphering the Sarmatian palaeogeography of Carpathian-Pannonian system, and fits very well to the results of the recent studies published by Fordinál et al. (2006), Zágoršek (2007), and Zágoršek and Fordinál (2006).

GEOLOGICAL BACKGROUND

In the studied area (Fig 1), the outcropping sediments are mainly fine to coarse-grained Middle Miocene (Badenian and Sarmatian) siliciclastics (Koch, 1900; Halaváts, 1903; Gaál, 1911; Popescu, 1977), however in the neighbourhoods of Răcăştia some small patches of Sarmatian limestones also occur (Halaváts, 1903; Gaál, 1911).

According to Gaál (1911) the thickness of the sediments around Răcăştia is about 170 m, and it was deposited during the Early Sarmatian in continental (e.g., fresh water) to shallow water brackish environments.

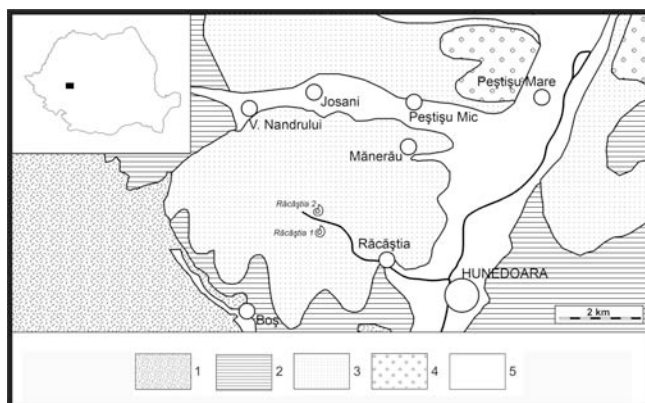


Fig. 1. Simplified geological map showing the location of sampled outcrops: 1. metamorphic rocks, 2. Badenian, 3. Sarmatian, 4. Pleistocene, 5. Holocene (based on Gherasi et al., 1968).

MATERIALS AND METHODS

We collected five samples (numbered 1-5) from Răcăştia 1 and four samples (numbered 6-9) from Răcăştia 2 (see Fig. 2). They were processed by standard methods, i.e. dried, boiled in water with sodium carbonate (Na₂CO₃), and then washed over a 63-µm sieve. The bryozoans (and other fossils i.e. foraminifers, ostracods, and molluscs), were picked from the >63-µm residue, and photographed using a JEOL JSM 5510 LV scanning electron microscope at Electron Microscopic Centre, „Babeş-Bolyai” University, Cluj Napoca, Romania.

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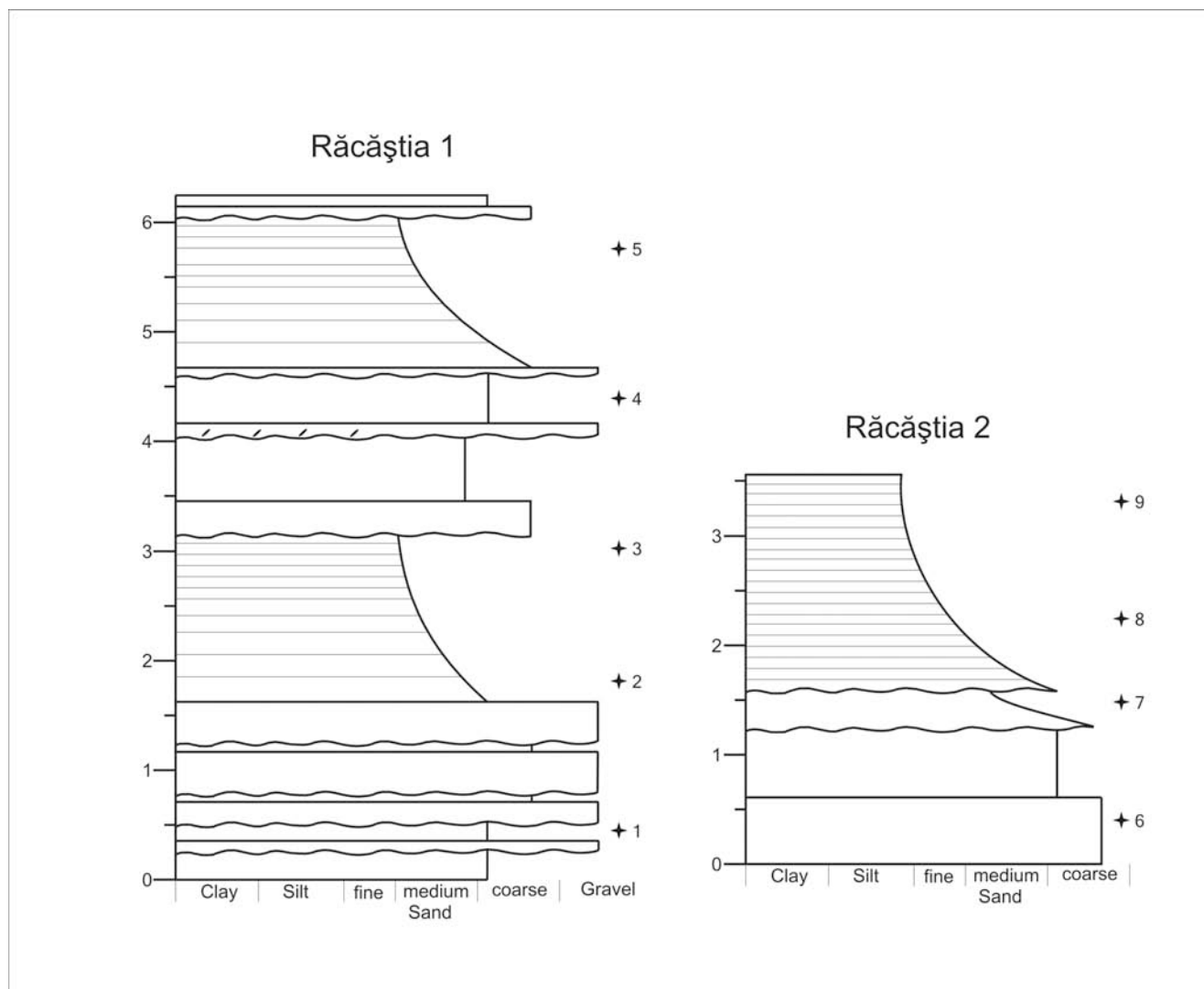


Fig. 2. Lithological section of the studied localities. Position of samples indicated by asterisks and numbers (for detailed explanations concerning lithology see the text).

RESULTS

Studied localities

Two small outcrops (Răcăștia 1 and 2) were accessible near Răcăștia for micropaleontological sampling during autumn 2007. Their sedimentological records resemble the characteristics of the VIth (Răcăștia 1, and the lower part of Răcăștia 2), and VIIth (the upper part of Răcăștia 2) layers of Gaál (1911).

Răcăștia 1 is located at 45°46'23.477952''N, 22°51'52.791624''E, on the right side of a creek which crosses Răcăștia (Fig. 1).

The section is about 6m high, and is made up of coarse to fine grain siliciclastics *i.e.*, sand to gravel (Fig. 2). The coarse sand to gravel units (mostly incised gravel filled lags with erosional lower boundaries, and sometimes contain rip-up clasts) are dominant at the base of the section. The upper part of the section is formed by thin layers of fine to medium grain sand. The thickness of the layers is about 5 - 10 cm.

Moreover, at least two well-developed fining upward parasequences can be recognized at this section.

Răcăștia 2 is located at 45°46'28.609392''N, 22°51'52.305588''E, about 200 m north-west from Răcăștia 1, on the side of road, which leads to Nandrului Valley (Fig. 1). At this outcrop (Figs. 2 & 3) three sedimentary units can be recognized:

- a lower unit formed by massive coarse grained sandstones, rich in randomly distributed gastropods (mainly *Cerithium*);
- the middle unit, which consists of thin bedded fine to medium sandstone, interrupted at the middle part by small lags;
- an upper unit which consist of a fining upward series of medium-size grain sands to clayish fine silts.

Fossil content and palaeoecology

Calcareous benthic foraminifera fauna are known from both outcrops, which are dominated at Răcăștia 1 by species of *Ammonia*, and *Elphidium*, whilst at Răcăștia 2 the species diversity is higher because miliolids are also present.

These assemblages belong to the *Elphidium regium* Biozone (Popescu, 1995) and indicate an Early Sarmatian shallow-water depositional environment for the studied samples (Silye and Szabó, 2007).

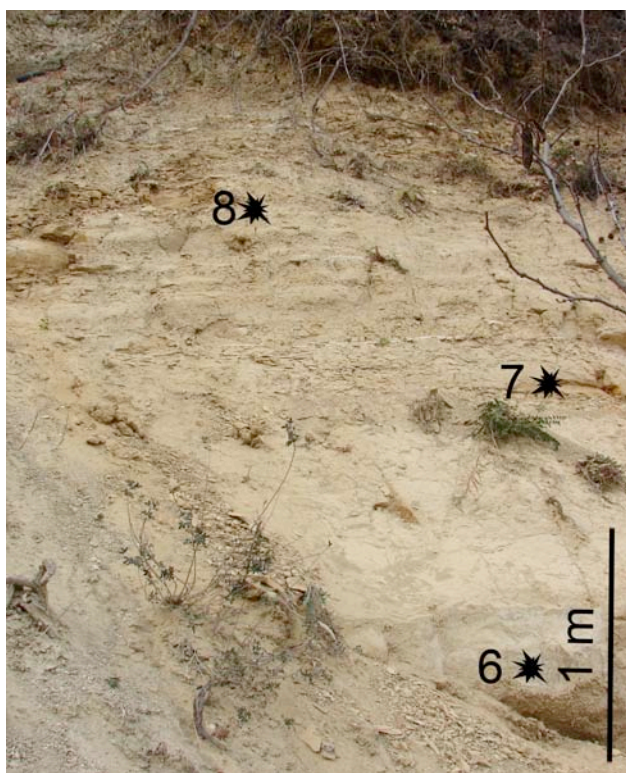


Fig. 3. Photograph of section Răcăștia 2, showing the main lithological features and the position of the samples 6 to 8.

Systematic Palaeontology

Phylum Bryozoa EHRENBERG, 1831
 Class Stenolaemata BORG, 1926
 Order Cyclostomatida BUSK, 1852
 Suborder Articulata BUSK, 1859
 Family Crisiidae JOHNSTON, 1838
 Genus *Crisia* LAMOUREUX, 1812

Crisia romanica nov. sp. (Plate 1, Figs. 1 – 5)

1958 *Crisia eburnea* (Lin.) – Bobies p. 151, pl. 13, Figs. 2-3.

Diagnosis: Colony erect. Zoecial tubes long, no more than two tubes one to each other forming the colonial branch, with terminal aperture. The gonozoecium is small, elongated, with a terminal oeciostome.

Holotype: Specimen from Răcăștia 2, sample 7, illustrated on Pl. 1, Fig. 1 and 2, deposited in the collection of the Museum of Paleontology, Department of Geology, „Babeș-Bolyai” University, Cluj Napoca, under the registration number 23483.

Paratypes: Four specimens from Răcăștia 2, sample 7, depicted on Pl. 1, Figs. 3 - 5, deposited in the collection of the Museum of Department of Geology, „Babeș-Bolyai” University, Cluj-Napoca, under the registration number 23484.

Other specimens are deposited in authors' collections.

Derivatio nominis: After the name of the country Romania.

Locus typicus: Răcăștia, Hunedoara County, Romania.

Stratum typicum: Lower Sarmatian (Middle Miocene) fine-medium grained sands.

Dimensions:

– length of the preserved part of the colony: 1266-1847 μm ;

- maximum width of the preserved part of the colony: average 217 μm ;
- maximum width of the zoecial tubes: 157 μm ;
- distance between apertures: 430-807 μm
- diameter of the apertures: 77-97 μm
- length of gonozoecium: 405 μm
- width of gonozoecium: 238 μm
- diameter of oeciopore: 63 μm
- length of oeciostome: 87-101 μm

Description: Colony erect. The preserved parts of the colony consist always of 4-5 zoecial tubes, which suggest articulate structure of the colony and flexible growth form. The width of the colonial branch (internode) is about 0.2 mm, which is about one and half the width of a zoecial tube. Zoecial tubes are long, with alternating terminal apertures. No more than two tubes are arranged one to each other, base of internode is formed by only one tube. Apertures are circular, situated on the top of the peristome slightly being curved laterally from the colony branch axis. The zoecial frontal wall is smooth, slightly ribbed and little convex. The dorsal wall is smooth, porous and convex.

Gonozoecia are small, oval with width little larger than the width of the colonial branch. The gonozoecium is situated in the lower half of the branch on the frontal wall of the autozoecial tube. The circular to slightly oval oeciopore is situated on the top of the terminal oeciostome, slightly curved from the branch axis.

Comparison: The most similar species is *Crisia eburnea* (LINNAEUS, 1758), which has almost similar structure of the colony (one to two autozoecial tubes forming the colonial branch), but differs in having a much larger gonozoecium with short oeciostome.

An other similar species is *Crisiella carnuntina* BOBIES, 1957 as described in Bobies (1957), p. 92, Pl. 9, Figs. 19-20. It differs mainly in having the gonozoecium situated at the top of the colonial branch between autozoecial apertures. Moreover, *Crisiella carnuntina* BOBIES, 1957 developed larger colonies with sometimes more than three zoecial tubes one to each other.

Crisia eburnea as described by Bobies (1958) shows same characteristic features as established new species. Although we are unable to find the original material of Bobies (personal investigation of KZ and personal communication with Prof. Vavra and Dr. Ostrovsky), the photography (mainly shape of the gonozoecium and oeciopore) of the Bobies specimen allows us to include it in our new species.

Remarks: Although the growth form of the *Crisia romanica* sp. nov. is not certain, the general habitus is very similar to the species of *Crisia* and therefore it is listed under this name.

Suborder Tubuliporina MILNE EDWARDS, 1838
 Family Annectocymidae HAYWARD & RYLAND, 1985
 Genus *Annectocyma* HAYWARD & RYLAND, 1985

Annectocyma corrugata (REUSS, 1869). Plate 1, Fig. 6

1869 *Distopora corrugata* m., Reuss p. 510-511, Pl. 1, Figs. 6-7, Pl. 2, Figs. 1-5.

1957 *Distopora corrugata* REUSS, Bobies p. 93, Pl. 10, Figs. 25-26.

1974 *Distopora corrugata* REUSS, Ghiurcă and Stancu p. 303, Pl. 1, Figs. 3-4.

Material: Two specimens, found at Răcăștia 1, in the medium-fine sands of sample 3 and 5.

Diagnosis: The preserved part of the colony is erect, unilamellar with 5 to 10 zooecial rows obliquely parallel to each other. The zooecial tubes are short. The apertures are circular, situated on a short but wide peristome. The gonozooecium is situated on the proximal end of the colony. It is large with porous frontal wall, spread between 3 to 4 autozooecial tubes. The oeciopore has not been preserved. The dorsal wall of the colony is smooth.

Remarks: Because of the encrusting base, chaotic growth of zooecial tubes and gonozooecium situated on the top of the colony it resembles very much the genus *Annectocyma*, even no ancenstrula have been found.

The type specimen illustrated by REUSS shows almost identical growth pattern, but does not show a developed gonozooecium. Gonozooecium have been described by Bobies (1957), which is identical with those found in Romanian specimen.

The species is similar to *Tubulipora cumulus* SINZOV, 1892 as described by Zágoršek and Fordinál (2006), but differs in having unilamellar growth form and in shape and the position of the gonozooecia.

Occurrence: Already reported from Romania from the localities Soceni and Valea Politonai (Ghiurcă and Stancu, 1974).

CONCLUSIONS

Crisia romanica sp. nov. a new species of Sarmatian Bryozoa has been described from sediments of the Cerna-Strei Depression, near Răcăștia, Romania. The new species differs from all other fossil known species of *Crisia* by having a frontal small, oval gonozooecium with prominent oeciostome.

The bryozoans found as well as the associated foraminiferal assemblages are typical components of a normal marine fauna (Zágoršek and Fordinál, 2006), which leads us to point out, that the character of the environment of the Cerna-Strei Depression, near Răcăștia (Romania) was probably normal shallow-marine during Early Sarmatian. This result is contrary to conclusions of Gaál (1911), who suggested brackish water environments for the same strata. As shown by recent palaeoecological and isotopic studies (Latal et al., 2004; Piller and Harzhauser, 2005; Fordinál et al., 2006), normal marine conditions during Sarmatian can be expected also in neighbour countries (Slovakia, Austria).

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PLATE I

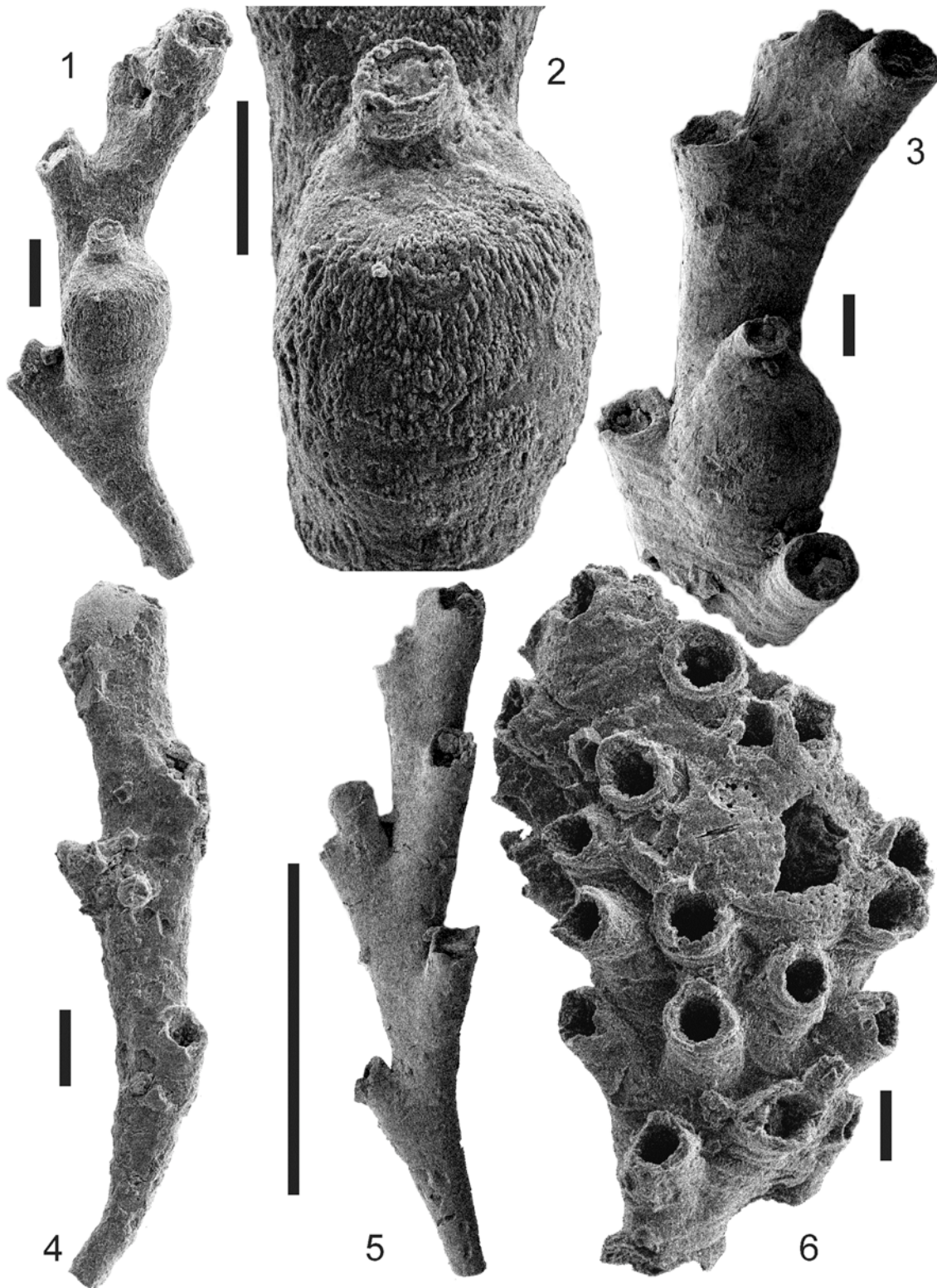


Plate I. *Crisia romanica* sp. nov. from the Răcăștia 2, sample 7

Fig. 1. General view of the holotype (registration number 23483) development of gonozoecium. Scale bar 1 mm.

Fig. 2. Detail of the gonozoecium of the holotype showing elongated oeciostome with oeciopore. Scale bar 100 μ m.

Fig. 3. General view of paratype (registration number 23484) showing gonozoecium with showing slightly curved oeciostome and oeciopore. Scale bar 1 mm.

Fig. 4. General view of paratype (registration number 23484) showing alternating autozoecial tubes. Scale bar 100 μ m.

Fig. 5. Frontal view of paratype (registration number 23484) showing denser alternating autozoecial tubes. Scale bar 1 mm.

Fig. 6. *Annectocyma corrugata* (REUSS, 1869). General view of specimen from the Răcăștia 1, sample 5 showing development of gonozoecium. Scale bar 1 mm.