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MICROFACIES AND MICROBIOSTRATIGRAPHY OF THE OXFORDIAN - LOWER KIMMERIDGIAN, ON THE BASIS OF CADOSINIDS AND STOMIOSPHAERIDS IN THE CZESTOCHOWA REGION OF POLAND

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Abstract: The structural microscopic characteristics of six microfacial developments of the Oxfordian - Lower Kimmeridgian at nine localities in the Czestochowa region. The microbiostratigraphy of samples was based on the distribution of cadosinid and stomiosphaerid microfossils in thin-sections. Details of the micropaleontological description of the new species *Committosphaera czestochowiensis* n. sp. are given.

Key words: Poland, Malm, microfacies, microbiostratigraphy, cadosinids, stomiosphaerids.

Introduction

Two regions exist in southern Poland with surface outcrops of carbonates of the Upper Jurassic. The first district is the so called Polish Jura Chain, which includes three geographical units: the Kraków region, the Czestochowa region, and the Wieluńská Hills. The second region is part of the Mesozoic core of the Holy Cross Mts. Between them, in the zone of the so called Nida Trough, the Upper Jurassic rocks are covered by thick sediments of the Cretaceous and Tertiary (Fig. 1).

The Jurassic rocks are pressure damaged, but with the exception of syneclise, are placed almost flat. More intensive tectonic movements affected the rocks of only part of the Mesozoic margin of the Holy Cross Mts. In the course of the Upper Jurassic, sedimentation occurred in parallel with subsidence. Paleotectonic maps of the Upper Jurassic, illustrating the configuration from the base of the Upper Jurassic to the end of the Jurassic period, show maximum subsidence in the present day area of the Holy Cross Mts. (Niemczycka et al. 1988). We can actually observe different thicknesses of Upper Jurassic deposits, with a maximum in the central part of the so-called Nida Trough. Here the Jurassic beds reach a thickness of up to 1100 m. However it appears that the present day differences in thickness were partly caused by erosion of sediments in the course of the Lower Cretaceous and Tertiary (Kutek & Glazek 1972). In the zone of the so-called Polish Jura Chain, rocks of the Lower Kimmeridgian occur only in the Wieluńská Hills, as a result of this erosion. In the central part of the Polish Jura Chain, beds of the Upper Jurassic are represented exclusively by Oxfordian sediments.

We have sufficient lithological and biostratigraphic information from many parts of the Polish Jura Chain, just as from the margin of the Holy Cross Mts., where Jurassic rocks outcrop on the surface (Kutek 1968, 1969). Nevertheless complete information concerning the Jurassic of the Nida Trough is based on study of borehole cores. However the quantity of boreholes is insufficient especially in the northern part of the Nida Trough. From the majority of boreholes, a few segments of borehole cores were taken at intervals from 50 to 100 m. Generally speaking this fact is unfavourable for determining biostratigraphy on the basis of ammonite fauna. For this reason other biostratigraphical methods were sought, which would allow us to correlate the Jurassic from different localities and districts. According to experience from borehole profiles in south Moravia (Řehánek 1985, 1987a, 1987b), associations of cadosinids and stomiosphaerids studied in thin section samples finally appeared to be most effective for our purpose.

Lithology

In southern Poland, the sedimentation of Upper Jurassic carbonates occurred in gradually shallowing basins. In the Lower and Middle Oxfordian deeper neritic sedimentation prevailed. The whole region was then characterized by more or less uniform facial development. Proceeding from the base to the overlying rocks, the stratigraphy includes the following lithological types: bedded sponge limestones, tuberolithic and micritic limestones (Figs. 2 - 5). An important environmental change occurred in the lower part of the Upper Oxfordian. The succession of micritic limestones was covered by massive cherty micritic limestones which represent a facial transition. Numerous algal structures and siliceous sponges are very characteristic of these massive, so-called "petrean" limestones. Their sedimentation occurred in the form of so-called mud mounds. At the same time this caused the beginning of levelling of the sea bed. Considering the available results, the development of the typical massive limestones in the Nida Trough was less intensive. Micritic limestones with numerous silici-sponges were deposited in their place. After

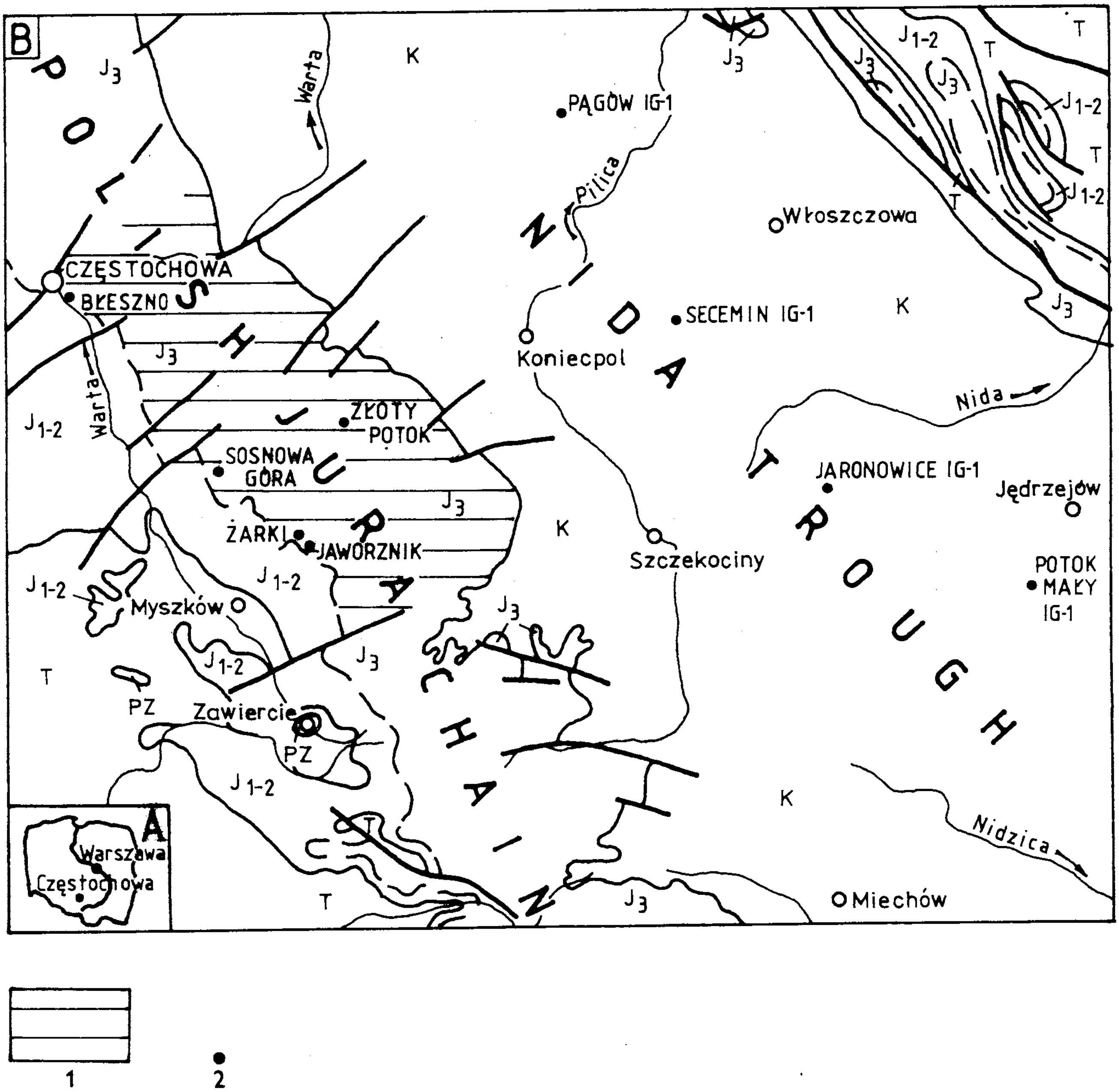


Fig. 1. Location of the profiles studied in the Czestochowa region. Map without Tertiary cover (Pozaryski 1979), scale 1 : 500 000. Legend: 1 - Czestochowa Upland; 2 - Jurassic localities studied.

the sedimentation of the massive limestones or their partial facial equivalent, sedimentation of marly limestones or marlites began. They could probably be considered representative of a calm, shallow water environment, and judging by many features, were associated with a weakly Euxine environment.

Further lowering of the sea level during the upper part of the Upper Oxfordian caused a significant shallowing of the environment in the area. This change is shown by the appearance of organodetrital partially decalcified limestones with hermatypic corals. Similar conditions existed during the Lower Kimmeridgian. The result was sedimentation of limestones, marly limestones and marlites with ooids, oncoids and calcareous algae (Figs. 3 -5). These sediments, as was said above, up to now exist only in the area of the Nida Trough.

Microfacies and micropaleontology

The evaluation put forward here arises from detailed thin section analysis of nine localities in the region discussed. The collection of analysed material formed a total of seventeen samples from lithological horizons (Fig. 1):

Bleszno Hill	1 sample
Zarki-Jaworznik	2 samples
Zloty Potok	1 sample
Sosnowa Góra	1 sample
Zarki	1 sample
Secemin IG-1	2 samples
Jaronowice IG-1	2 samples
Pagów IG-1	3 samples
Potok Maly IG-1	4 samples

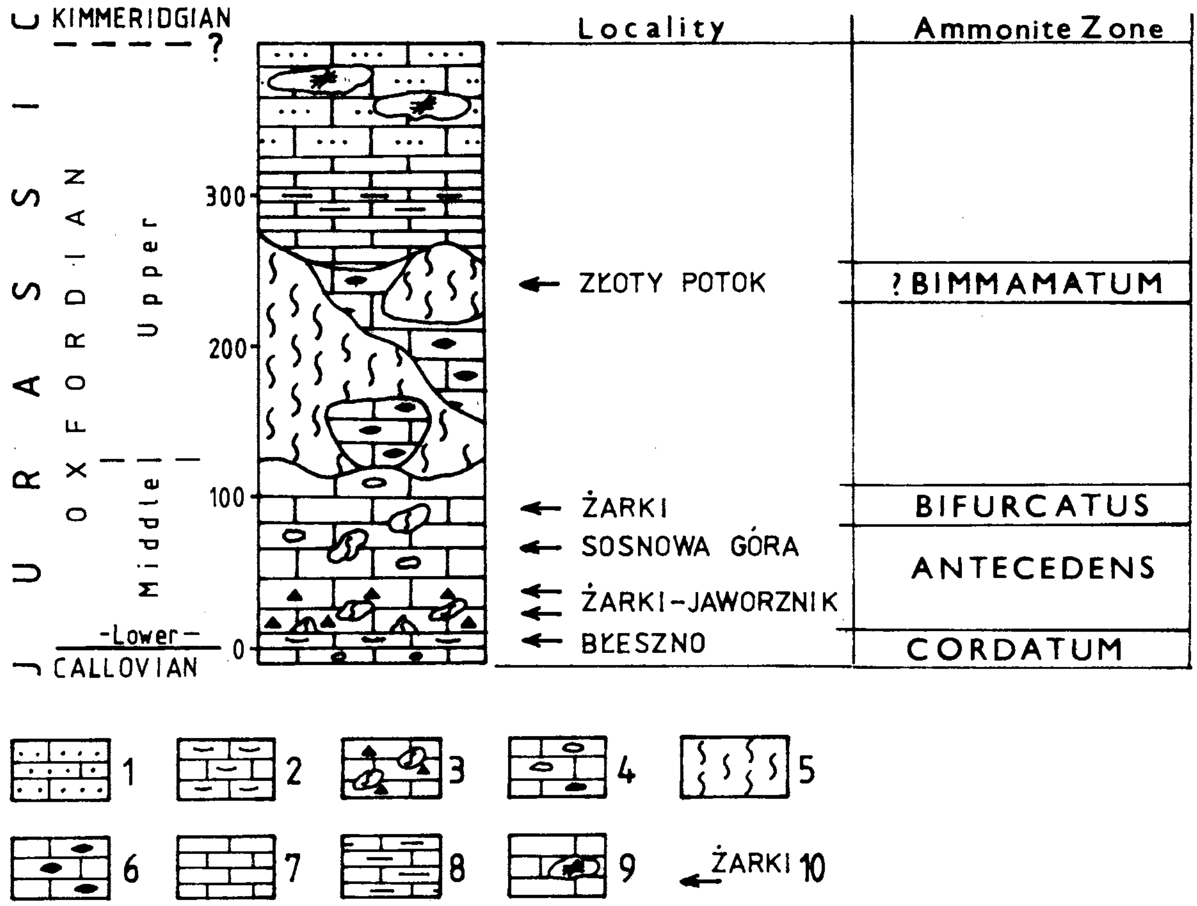


Fig. 2. General lithological scheme of the central part of the Polish Jura Chain.
Legend: 1 - sandy limestones with ooids; 2 - layered sponge limestones; 3 - tuberolithic limestones with sponge bioherms; 4 - micritic limestones with cherts; 5 - massive limestones; 6 - friable micritic limestones with flints; 7 - platy limestones; 8 - marls; 9 - chalky limestones with coral patch reefs; 10 - position in profile and locality of investigated samles.

Understandably this collection cannot be considered representative in relation to the area covered and the thickness of the carbonate beds in the Czestochowa region. The samples studied from the Czestochowa Upland come mostly from quarries with documented biostratigraphy (see map in: Brochowicz & Lewinski 1976). Our aim was to make earlier results locally more exact or to contribute further to knowledge of the facial development and biostratigraphy of the Jurassic rocks (Heliasz 1990). We especially devoted attention to localities with an absence of traditional biostratigraphically conclusive fossil forms (ammonites, foraminifers etc.). In this connection, verified associations of cadosinid and stomiosphaerid microfossils obtained at the above mentioned localities were a help in gaining positive results.

The microfacial developments distinguished here and briefly described in the following section result from our information on the character of the microscopic structure (Dunham 1962; Folk 1962) and the changes in the composition of the fossil content of the sediments studied.

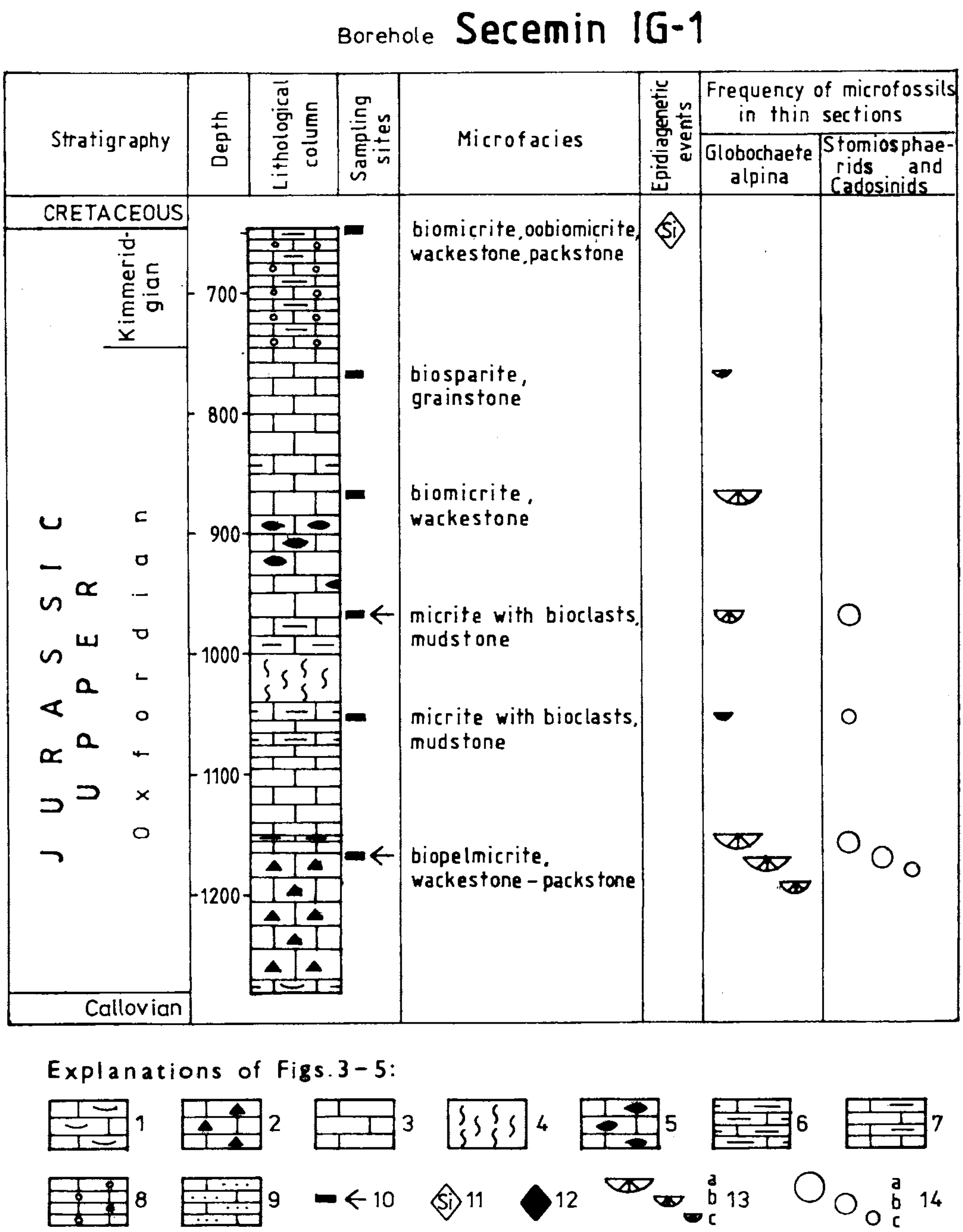
A - Microfacies of sponge fossiliferous micrites and biomicrites (mudstones to wackestones) (Pl.I, Fig. 2)

S t r u c t u r e : muddy sediments, with a variable fine organodetritic and microorganogennic portion, in thin sections with a quantitative predominance of ground mass over allochem components.

Light brown micrite forms the ground mass, and is mixed with an insignificant, dispersed clayey admixture. Fine-grained, mainly limonitized pyrite occurs sporadically. Grains of terrigennous quartz (0.05 - 0.10 mm) and autigennous glauconite (about 0.05 mm) are accessories.

Calcified rhaxes and one axial sponge spicules, relicts of the skeletons of silicisponges often with growth of blue algae and small colonies of sessile foraminifers on their surface represent the majority of the allochem component of the limestones. Echinoderm segments, small fragments of pelecypods and cyano-peloids are not numerous. Ostracod tests, foraminifers (*Textulariidae, Miliolidae, Protoglobigerinae, Dentalina* sp., *Cornuspira* sp., *Lenticulina* sp., *Spirillina* sp. *Nodosaria* sp., *Patellina* sp.), relicts of solitary bryozoa, formations of the Tubiphytes type, holoturian spines, relicts of planktonic crinoids (*Saccocoma* sp.), calcified radiolarian tests (*Spumellaria*), short calcite fibres, small fragments of aptychi, algal relicts (*?Halicoryne* sp.), tests of microproblematics - *Didemnoides moreti* (Durand Delga), *Didemnum carpaticum* Mišík et Borza, *Gemeridella minuta* Borza et Mišík, the calcisphaeres of *Cadosina parvula* Nagy, *Cadosina* sp., *Colomisphaera minutissima* (Colom), *C. fibrata* (Nagy), *Committosphaera czestochowiensis* n. sp. are scarce.

Samples studied: Bleszno Hill, Zarki-Jaworznik 6/1, Zarki 45/2.



Figs. 3-5. Stratigraphic, lithological and microfacial relations in the borehole profiles Secemin IG-1, Jaronowice IG-1, Potok Maly IG-1, with indications of the main diagenetic changes and the frequency of some microfossils in the thin sections studied.
Legend: 1 - layered sponge limestones; 2 - tuberolithic limestones; 3 - micritic limestones; 4 - massive limestones; 5 - friable micritic limestones with flints; 6 - marls; 7 - marly limestones; 8 - oolitic and oncolitic limestones; 9 - sandy limestones; 10 - cored fragments, arrows indicate the detail investigated samples; 11 - silicification events; 12 - dolomitization events; 13 - frequency of *Globochaete alpina* in standard thin-sections: a-abundant (more than 8 sp.), b-common (4-7 sp.), c-rare (1-3 sp.); 14 - frequency of stomiosphaerids and cadosinids in standard thin-sections: a-abundant (more than 8 sp.), b-common (4-7 sp.), c-rare (1-3 sp.).

B - Microfacies of biopelmicrites (packstones)

S t r u c t u r e : sediments with a dominance of the allochem components over the ground mass.

Among the allochem components the peloids and microoncoids of *Cyanophyceae* (0.10 - 0.40 mm) dominate, often in an almost rock-forming extent. There are isolated occurrences of formations of the type *Tubiphytes obscurus* Maslov, scarce relicts of solitary bryozoa, small fragments of thin shelled bivalves, tests of juvenile ostracods, calcified sponge spicules, echinoderm segments, small fragments of hydrozoa, segments of *Saccocoma* Agassiz, calcite fibres, calcified tests of radiolarians (*Spumellaria*) sea urchin spines, foraminifer tests (*Miliolidae, Textularia* sp., *Protoglobigerinae, Lenticulina* sp., *Nodosaria* sp., *Patellina* sp., *Spirillina* sp.), tests of microproblematics - *Didemnoides moreti* (Durand Delga), calcispheres - *Cadosina* sp., *Crustocadosina semiradiata* (Wanner), *Colomisphaera minutissima* (Colom), *C. lapidosa* (Vogler), *C. carpathica* (Borza).

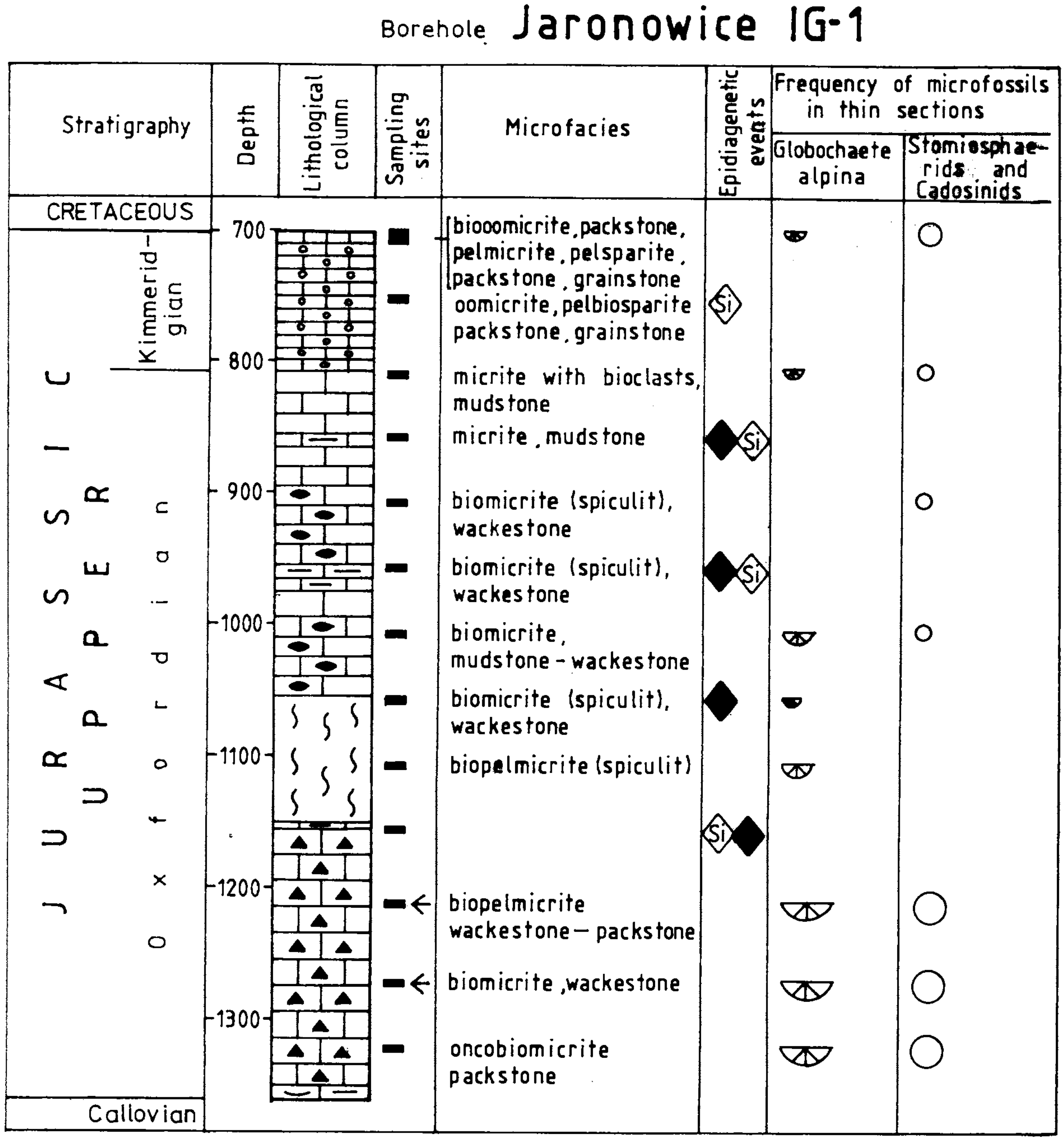


Fig. 4. Explanations see Fig. 3.

The matrix material of the limestones of the microfacies described is formed by light grey-brown, sporadically moderately recrystallized micrite, with scarce small rhombohedra of diagenetic dolomite. Very occasionally there is fine-grained pyrite. Local microstylolites are demonstrated by limonite pigment.

Samples studied: Jaronowice IG-1, depth 1213.5 m, Zloty Potok 18/3.

C - Microfacies of sponge biopelmicrites (wackestones to packstones)

S t r u c t u r e : in thin sections limestone is mostly finely biocalcarenitic, with an uneven horizontal distribution of allochem components (a usual lateral transition from wackestones to packstones). From the structural point of view, this development represents a transition between microfacial types A and B.

The allochem component is formed by numerous oval and spherical cyano-peloids, fewer pellets, calcified rhaxes and monaxon sponges, scarce calcite "fibres", small echinoderm segments, relicts of solitary bryozoa, angular fragments of bivalves, foraminifer tests (*Miliolidae, Textulariidae, Ammodiscus* sp., *Lenticulina* sp., *Nodosaria* sp., *Ophthalmidium* sp., *Protoglobigerinae, Spirillina* sp., *Trocholina* sp.), relicts of juvenile ostracods, small relicts of *Dasycladaceae*, calcified radiolarian tests, very scarce fragments of aptychi, relicts of *Saccocoma* Agassiz, globochaets, tests of microproblematics, cadosinids and stomiosphaerid microfossils:

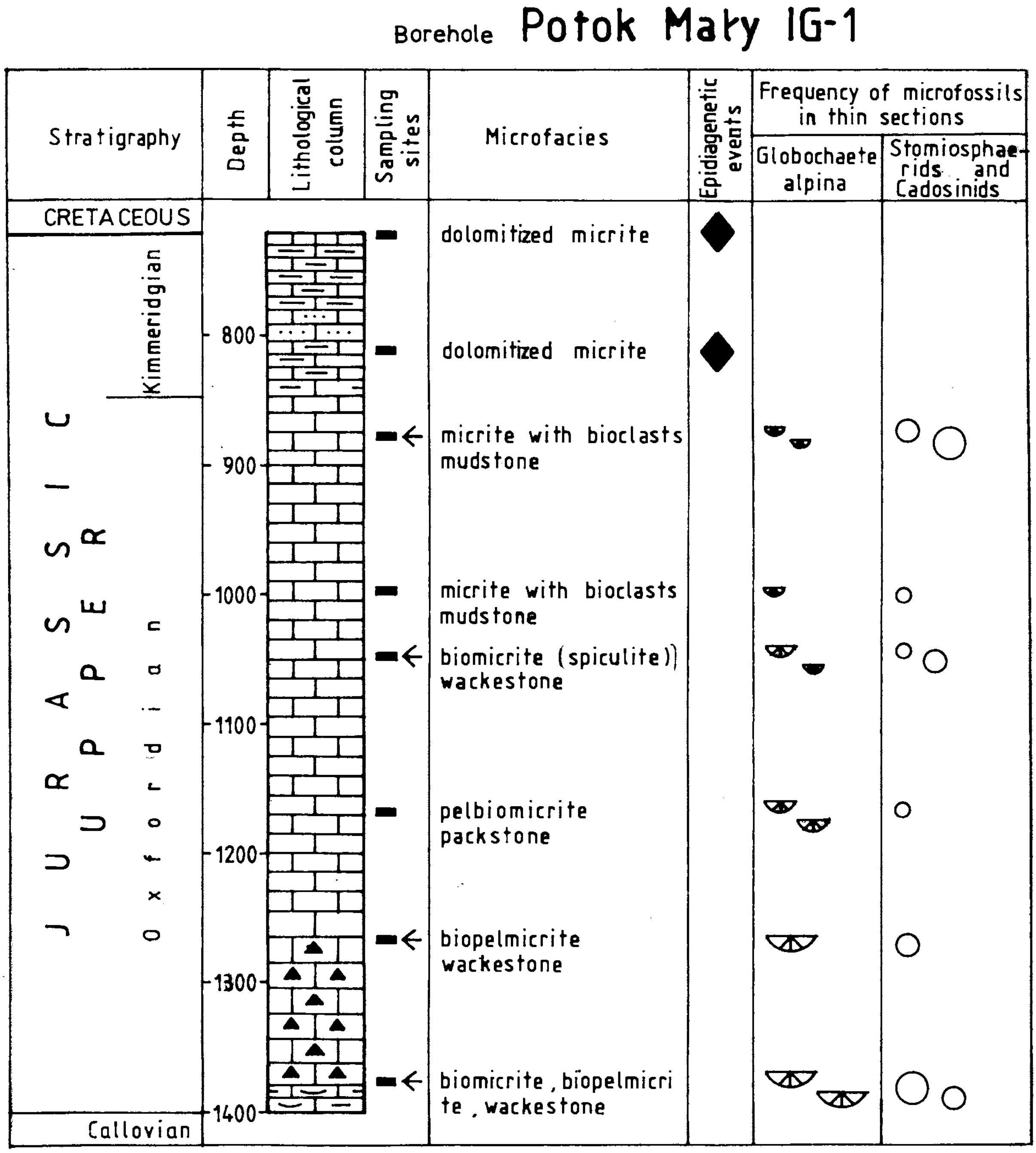


Fig. 5. Explanations see Fig. 3.

a - Didemnoides moreti (Durand Delga), *Didemnum carpaticum* Mišík et Borza, *Cadosina* sp., *Colomisphaera minutissima* (Colom), *C. fibrata* (Nagy), *C. lapidosa* (Vogler), *C. carpathica* (Borza), *Committosphaera czestochowiensis* n. sp. - localities Zarki-Jaworznik 6A/1, Sosnowa Góra 14/7 A, Potok Mały IG-1, depth 1375 m;

b - Cadosina sp., *Crustocadosina semiradiata* (Wanner) - locality Jaronowice IG-1, depth 1273 m.

Light brown micrite with sporadic fine grained pyrite form the matrix material of the limestones. Accessory grains of terrigennous quartz (maximum up 0.25 mm), autigennous glauconite (0.05 - 0.10 mm) and in addition accessory small rhombohedra of diagenetic dolomite were identified only at the locality Potok Mały IG-1, depth 1375 m.

The samples studied of the microfacies described are mentioned above with both the associations of microproblematics distinguished.

D - Tubiphytes - peloidal biomicrite microfacies (wackestones to packstones) (Pl. I, Fig. 4)

Structure: fine to medium biocalcarenite, packed or with approximately equal representation of the allochem component and matrix material.

Besides numerous peloids and microoncoids, the allochem component also includes the usual forms of *Tubiphytes morronensis* Crescenti and *T. obscurus* Maslov, scarce foraminifers (*Miliolidae, Textulariidae, Protiglobigerinae, Lenticulina* sp., *No-*

dosaria sp., *Patellina* sp., *Spirillina* sp.), fragments of bryozoa and pelecypods, juvenile stages of gastropods, echinoderm segments, calcified rhaxes and monaxon sponges, ostracods, sea urchin spines, relicts of *Globochaete alpina* Lombard, tests of cadosinids and stomiosphaerids - *Cadosina parvula* Nagy, *Cadosina* sp., *Crustocadosina semiradiata* (Wanner), *Colomisphaera lapidosa* (Vogler), *C. minutissima* (Colom), *C. carpathica* (Borza).

Light brown micrite, with sporadic and irregular sparite parts ("eyes") forms the matrix material of the limestones. Grains of limonitized pyrite and scarce microstylolites occur occasionally.

Samples studied: Secemin IG-1, depth 1167.4 m, Potok Maly IG-1, depth 1263.4 m.

E - Pelmicrite microfacies with a bioclastic admixture (mudstones to wackestones) (Pl. I, Fig. 3)

S t r u c t u r e : microscopic granularly unequal, muddy with a fine biocalcarenitic admixture up to a medium biocalcarenite with a biocalcruditic admixture, with a variable mutual quantitative share of allochem components and matrix material.

The allochem component is formed by the common spherical and asymmetrical *Cyanophyceae* formations (cyano-peloids, microoncoids, pseudo-ooids), individual fragments of bivalves, calcified sponge spicules, echinoderm segments, sea urchin spines, small relicts of Dasycladaceae, very scarce segments of *Saccocoma* Agassiz, foraminifers (*Textulariidae, Haplophragmium* sp., *Lenticulina* sp., *Patellina* sp.), microproblematics - *Didemnoides moreti* (Durand Delga), *Didemnum carpaticum* Mišík et Borza, calcispheres - *Colomisphaera minutissima* (Colom), *C. carpathica* (Borza), *C. lapidosa* (Vogler), *C. fibrata* (Nagy), *Committosphaera czestochowiensis* n. sp.

Light grey-brown micrite with individual fine grained pyrite forms the matrix material in thin sections.

Samples studied: Pagów IG-1, depth 633 m.

F - Fossiliferous micrites (mudstones) microfacies (Pl. I, Fig. 1)

S t r u c t u r e : in the thin-sections sediments are muddy with an insignificant biocalcarenitic admixture.

Microscopic light brown micrite with isolated fine-grained pyrite forms the ground mass of the limestones. Silty grains of terrigennous quartz are accessory (1 - 2 grains in the thin section). There are sporadic thin veins of diagenetic calcite and microstylolites, the seams of which are filled by clay minerals (chlorite, sericite) and limonitized pyrite. Small rhombohedra of diagenetic dolomite with a size of 0.03 - 0.10 mm are very scarce.

The allochem component forms only 1 - 2% of the composition of the limestones and is made up of echinoderm segments, relicts of juvenile ostracods, calcified sponge spicules, thin walled fragments of bivalves, calcified radiolarians, foraminifers (*Textulariidae, Lituolidae, Lenticulina* sp., *Nodosaria* sp., *Patellina* sp., *Spirillina* sp.), relicts of *Globochaete alpina* Lombard, microproblematics and relicts of cadosinids and stomiosphaerids:

a - *Didemnoides moreti* (Durand Delga), *Gemeridella minuta* Borza et Mišík, *Aeolisaccus dunningtoni* Elliott, *Cadosina* sp., *Crustocadosina semiradiata* (Wanner), *C. semiradiata olzae* (Nowak), *Colomisphaera minutissima* (Colom), *Committosphaera czestochowiensis* n. sp. - Secemin IG-1, depth 965 m, Potok Maly IG-1, depth 880 m, Potok Maly IG-1 depth 1046.4 m;

b - *Didemnoides moreti* (Durand Delga), *Colomisphaera fibrata* (Nagy), *C. minutissima* (Colom), *C. carpathica* (Borza), *Cadosina* sp., *Committosphaera czestochowiensis* n. sp. - Pagów IG-1, depth 742 m, 1190 m.

Systematic part
(by J. Řehánek)

Calciodinellaceae Deflandre 1947 emend. Bujak et Davies 1983

Committosphaera Řehánek 1985
Committosphaera czestochowiensis n. sp. Řehánek
Pl. II, Figs. 1 - 5

H o l o t y p e : specimen in Pl. II, Fig. 1, deposited in the thin section collection of the Laboratory of Geological Cartography, Silesian University, Sosnowiec. Thin section No.6/1, Zarki - Jaworznik, coordinates x = 58.0, y = 0.6.

P a r a t y p e s : specimens in Pl. II, Figs. 2 - 5.

D e r i v a t i o n o m i n i s : according to the occurrence of the species at localities in southern Poland, in the region of Czestochowa.

S t r a t u m t y p i c u m : Middle Oxfordian, sponge muddy limestone (mudstone to wackestone), sponge fossiliferous micrite and biomicrite microfacies, biozone "Fibrata".

L o c u s t y p i c u s : the locality Zarki-Jaworznik, about 30 km south-east of Czestochowa.

M a t e r i a l : a total of 24 thin-section specimens from the localities Zarki-Jaworznik, Bleszno Hill, Pagów IG-1, Potok Maly IG-1.

D i a g n o s i s : a spherical one-chambered test with unhomogeneous two-layered calcite wall. An outer stronger light calcite layer of the wall has a fine radial lamellar structure. The inner thinner layer of the wall is brown, with a radial fine crystalline structure.

D e s c r i p t i o n : A one-chambered calcite test of spherical form with an unhomogeneous structure of two-layered wall. The outer relatively stronger layer is composed of light finely lamelar calcite. This layer easily undergoes recrystallization, which is reflected at the initial stage in relatively coarsened wall calcite lamellae, and at a more advanced stage in complete granular breakdown (Pl. II, Figs. 4 - 5). The inner, perceptibly thinner layer of wall is composed of fine, radially arranged calcite crystals, in transmitted light brown to dark brown in colour. In one quarter of the circumference of this layer we registered 15 - 18 of these calcite grains of relatively uneven width. Generally the thickness of the outer and inner layers of the wall is of constant cross-section around the circumference of the test. The outer margin of the cross-section of the test is usually moderately uneven, as a result of moderate peripheral corrosion. The inner margin, the wall of the chamber, is even. Up to now, the aperture of the test has not been noted on any of the cross-sections studied. The optical behaviour of the structural parts of the outer and inner layer of the wall in reflected and polarized light is a characteristic feature of the genus. In reflected light the outer layer of the wall is vitreous, in polarized light the calcite lamellae extinguish discordantly without an axial cross. In reflected light, the inner layer of the wall is white-grey, in polarized light the individual calcite grains extinguish chaotically, without an axial cross. The diameters of the tests of the species described, studied in cross sections (D) vary in the range 58.1 - 61.6 μm, the diameter of the chamber (CH) from 44.4 - 48.1 μm, the

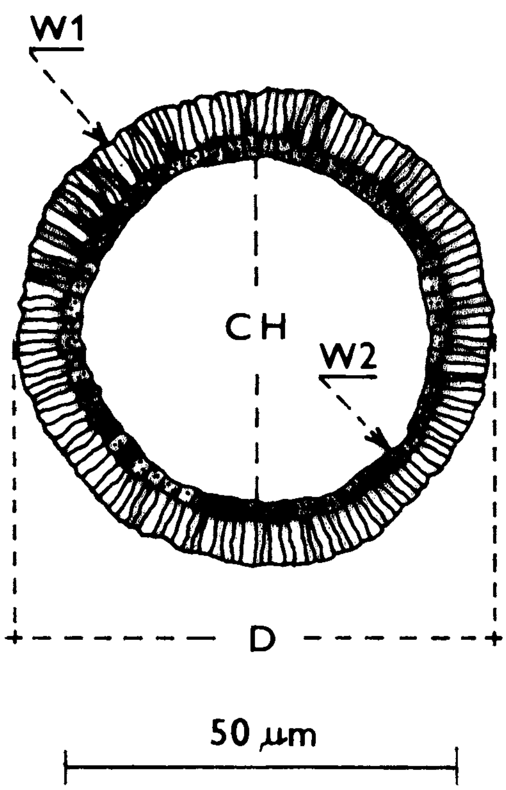


Fig. 6. Schematic drawing of the structure of the test of *Committosphaera czestochowiensis* n. sp. Řehánek and the method of measuring the principal parameters in thin sections: D - diameter of the test, CH - diameter of the chamber, W1 - outer layer of the wall, W2 - inner layer of the wall.

thickness of the outer layer of the wall (W1) in the range 5.1 - 6.8 μm, the thickness of the inner layer (W2) 1.0 - 3.0 μm. The majority of cross-sections studied up to now have the following parameters: D = 61.6 μm, CH = 44.4 - 47.8 μm, W1 = 6.8 μm, W2 = 1.0 - 2.0 μm. The method of measuring the parameters of the test cross-sections of the newly described species is represented in Fig. 6. The micrometric characteristics of the given species are completed with the values for the proportion of the diameter of the test cross-section (D) and the total thickness of the non- homogeneous wall of the test (W), which together with values for the proportion of the thickness of the inner and outer layers of the wall are the following: D/W = 6.28 - 9.05, W2/W1 = 0.14 - 0.44.

Parameters of the holotype: D = 61.6 μm, CH = 44.4 μm, W1 = 6.8 μm, W2 = 1.0 μm, D/W = 7.89, W2/W1 = 0.14.

Association: the occurrence of the newly described species in association with other studied finds of microfossils is presented in detail in the microfacial characteristics at other localities in the region mentioned.

Stratigraphic range: up to now the newly described species has been verified only in Oxfordian - Lower Kimmeridgian sediments.

Distinctions: *Committosphaera czestochowiensis* n. sp. is close to some already described species of cadosinids and stomiosphaerids in the structure of the cross-section of its test (Fig. 7).

Crustocadosina fragilis Řehánek (Fig. 7/B) is distinguished aboove all by the thickness of the outer layer and the structure of the inner layer of the wall of the test and by the stratigraphic position of the species.

Committosphaera pulla (Borza) (Fig. 7/C) differs by the character of the constructional parts of the light outer layer of wall, by the structure of the inner layer of wall and the stratigraphic position of the species.

Committosphaera ornata (Nowak) (Fig. 7/D) differs by the parameters of the test, the thickness and character of the constructional parts of the outer layer of wall and the stratigraphic position of the species.

Note: Garlicka (1974, Pl. I, Fig. 5) published a photograph of an alleged example of the species *Colomisphaera minutissima* (Colom), which is noticeably close to the newly described species *Committosphaera czestochowiensis* n. sp. in the structure of its wall and the whole character of the cross-section of the test.

Biostratigraphy

The state of biostratigraphical research is significantly different between the two parts of the region studied. As already noted, all the information about the Jurassic from the Nida Trough and the Carpathian Foreland is based on research on occasional bore-hole cores. The Upper Jurassic formation was divided on the basis of macroscopic observations and microfacies. Since the diagnostic fossils are rare, the lithostratigraphic units can be compared only partly with the conventional time scale. As a result, the Upper Jurassic sequence in the majority

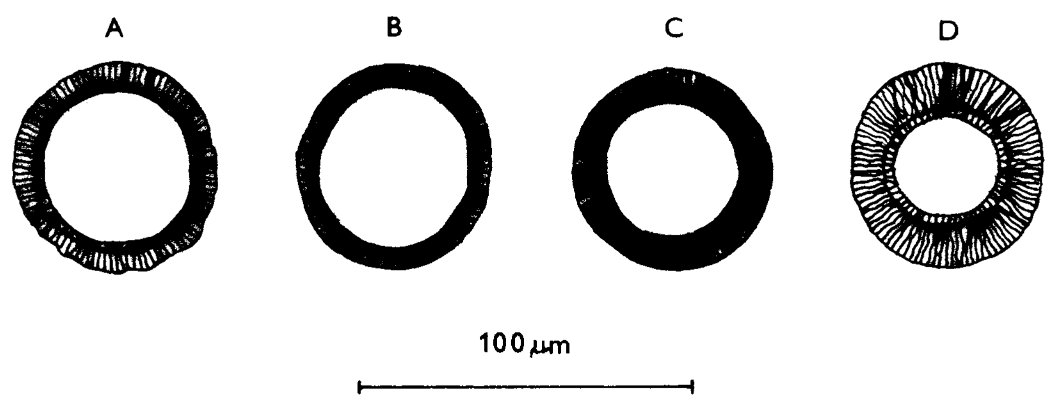


Fig. 7. Comparison of the main structural features of some two layered cadosinids and stomiosphaerids (*Calciodinellaceae* Defandre 1947 emend. Bujak et Davies 1983). **A** - *Committosphaera czestochowiensis* n. sp. Řehánek; **B** - *Crustocadosina fragilis* Řehánek; **C** - *Committosphaera pulla* (Borza); D - *Committosphaera ornata* (Nowak).

Table 1: The distribution of some stratigraphically important species of cadosinids and stomiosphaerids (*Calciodinellaceae* Deflandre emend. Bujak et Davies) in the studied thin-sections of Oxfordian - Lower Kimmeridgian, with indication of their biozonal relevance.

Sample	Biozone	Microfacies	*Colomisphaera minutissima*	*Colomisphaera lapidosa*	*Colomisphaera fibrata*	*Colomisphaera carpathica*	*Committosphaera czestochowiensis* n.sp.	*Cadosina parvula*	*Crustocadosina semiradiata*	*Crustocadosina semiradiata olzae*
Potok Maly 880	Parvula	FM	+						+	
Potok Maly 1046.4		FM	+						+	
Secemin 965		FM	+				+		+	+
Pogów 1190		FM	+				+		+	
Secemin 1167.4		Tu-Pe	+			+		+		
Potok Maly 1263.4		Tu-Pe	+	+					+	
Zloty Potok 18/3		Pe				+				
Jaronowice 1213.5		Pe	+	+					+	
Jaronowice 1273		Sp-Pe							+	
Pagów 633	Fibrata	Bi-Pe	+	+	+	+	+			
Pagów 742		FM	+		+	+	+			
Potok Maly 1375		Sp-Pe	+	+	+	+	+			
SosnowaGóra 14/7 A		Sp-Pe	+							
Zarki-Jaworznik 6A		Sp-Pe	+		+		+			
Zarki45/2		Sp	+		+		+	+		
Zarki-Jaworznik 6		Sp			+		+	+		
Bleszno Hill		Sp	+		+		+	+		

Explanations: Sp - sponge microfacies, Sp-Pe - sponge-biopelmicrite microfacies, Pe - biopelmicrite microfacies, Tu-Pe - tubiphyte-peloidal microfacies, Bi-Pe - pelmicrite with a bioclastic admixture microfacies, FM - fossiliferous micrite microfacies.

of boreholes from the Nida Trough, was divided only into Oxfordian and Kimmeridgian (Jurkiewicz et al. 1973; Jurkiewicz 1976a, 1976b, 1980).

Conditions are different in the region of the Czestochowa Hills, where Upper Jurassic rocks outcrop on the surface. A rich ammonite fauna in the beds distinguishes lower and Middle Oxfordian, allowing us to define the biostratigraphic position of almost every quarry. The situation is more complicated in the case of beds of the Upper Oxfordian. To start with, the ammonite fauna is very insufficient and finally extremely scarce in the marly limestones and marlstones. Apart from this, strong recrystallization of the massive limestones makes preparation and identification of the scarce ammonites very difficult. Nevertheless, the majority of traditional lithostratigraphic units may be compared with ammonite zones (Kutek et al. 1977).

Data concerning microfossils in epicontinental deposits of the Upper Jurassic are not numerous in Polish literature, although Garlicka (1974) proposed the establishment of horizon with stomiosphaerids in the lower part of the Oxfordian. Morycowa et Moryc (1976) and Golonka (1978) also mentioned the presence of microfossils in Upper Jurassic rocks from the Carpathian Foreland. In addition the latter author identified the calcareous planktonic series distinguishing the Lower and Middle Oxfordian.

The present studies of Upper Jurassic rocks from southern Poland show that microfossils were quite a common component of the sediments (Figs. 3 - 5). Nevertheless, it is necessary to say that they became significantly rarer above the lower part of the Middle Oxfordian beds. The lack of microfossils in some horizons appears to be a result of the processes of silicification and dolomitization they have undergone, rather than a primary feature.

In this connection we decided to apply the biostratigraphical method of study of the Jurassic beds with the help of relics of cysts of cadosinid and stomiosphaerid microfossils, belonging to the systematic family *Calciodinellaceae* Deflandre 1947 emend. Bujak et Davies 1983, to the chosen localities in the given region.

In relation to morphology and the type of structure of test walls, the microfossils mentioned resist some common diagenetic processes in sediments, better than, for example, the thin walled calcite tests of foraminifer plankton, the tests of ostracods and relics of infusories are able to. In the past, the forms of plankton mentioned were biostratigraphically effective at many Jurassic and Cretaceous localities and the results achieved have an undisputed interregional importance today.

The microscopically evaluated collection of thin section samples from the above mentioned localities yielded finds of six stomiosphaerid species, five cadosinid species and six species of the microfossils examined with a different systematic position.

In the group of verified stomiosphaerids representatives of the genus *Colomisphaera* Nowak with a simple radial structure and single layered walls were completely dominant over representatives of the genus *Committosphaera* Řehánek with double layered test walls. A few examples of *Colomispaera minutissima* (Colom), *C. lapidosa* (Vogler) (Pl. II/8), *C. fibrata* (Nagy) (Pl. II/6-7), *C. carpathica* (Borza) (Pl. II/9), *Committosphaera czestochowiensis* n. sp. (Pl. II/1-5), *Colomisphaera* sp. (Pl. II/10) were identified.

In the group of cadosinids relatively scarce examples of *Cadosina parvula* Nagy (Pl. II/13), *Cadosina* sp. (Pl. II/14), *Crustocadosina semiradiata* (Wanner) (Pl. II/15-16), *C. semiradiata olzae* (Nowak) (Pl. II/12), ?*Crustocadosina* sp. (Pl. II/11) were identified.

Finds of *Saccocoma* Agassiz, *Globochaete alpina* Lombard, *Aeolisaccus dunningtoni* Elliott, *Didemnum carpaticum* Mišík et Borza, *Gemeridella minuta* Borza et Mišík, *Didemnoides moreti* (Durand Delga) form the group of other microfossils examined.

In each of the three groups of microfossils mentioned we can find a certain species with a positive contribution to resolving the biostratigraphic evaluation of the beds.

The following species give us biostratigraphically valuable information, especially by the lower boundary of their time span: *Cadosina parvula* Nagy - highest part of the Upper Oxfordian - Middle Tithonian, *Colomisphaera lapidosa* (Vogler) - Upper Oxfordian - Lower Cretaceous, *Colomisphaera carpathica* (Borza) - Oxfordian to Berriasian, *Saccocoma* Agassiz - highest Oxfordian to Berriasian (Borza 1969; Nagy 1971).

Finds of *Colomisphaera fibrata* (Nagy) specimens have fundamental importance for the biostratification of studied samples with the help of cadosinid and stomiosphaerid assemblages. This species with the two maxima of its time span in the Middle and Upper Oxfordian, also has an important application to the biozonation of Jurassic sediments by the biostratigraphic method mentioned.

Individual finds of *Crustocadosina semiradiata* (Wanner) (Tithonian to Valanginian according to Borza 1969) and *Crustocadosina semiradiata olzae* (Nowak) (Berriasian to Barremian according to Nowak 1965, Valanginian to Aptian according to Samuel et al. 1972) in the microfossil association described are noteworthy. In addition both the taxons named were also identified in other stratigraphic levels. *Crustocadosina semiradiata olzae* (Nowak) was described from the Upper Albian (Řehánek 1985) and according to the author cited, there is reliable evidence of its occurrence in Kimmeridgian sediments on the south eastern slope of the Bohemian Massif. Both taxons were even identified in the Turonian - Coniacian (Řehánek 1978). Garlicka (1974) first mentioned the species *Crustocadosina semiradiata* (Wanner) from the Oxfordian. All the information given above confirms our view on the need for a taxonomic revision of both these unprofitably widely defined species and their further division into single taxonomic units, after detailed evaluation of the complementary micrometric characteristics and test parameters of specimens coming from different stratigraphic levels.

Figs. 2 - 5 represent the stratigraphic position of the evaluated samples in the submitted work. The present state of the biozonation of the Upper Jurassic, based on the distribution of cadosinids and stomiosphaerids is the result of numerous studies of biostratigraphical relations in borehole and field profiles in the region of the Polish Carpathians (Nowak 1968, 1976), the Western Carpathians of Slovakia (Borza 1969, 1984), the Meczek Mts. in Hungary (Nagy 1971), in the region of the south-eastern slopes of the Bohemian Massif and some surface localities in the Central Apennines (Řehánek, in print and the present results of borehole research of the autochthonous Mesozoic in Moravia). The resulting, still not published in a complete form, biostratigraphic scale includes two biozones - "Fibrata" Zone (Lower Oxfordian to lower part of Upper Oxfordian) and "Parvula" Zone (upper part of Upper Oxfordian to middle part of Lower Kimmeridgian) in the evaluated stratigraphic interval Oxfordian - Lower Kimmeridgian. Representation of the biozone "Fibrata" in the collection of samples studied is indisputable (Tab. 1). The biozone "Parvula" has relatively less evidence, especially because of the limited range of documented material. However its presence here has the highest level of probability and this is in relation to the qualitative character of the accompanying microfossil assemblage and verified finds of the nominal species.

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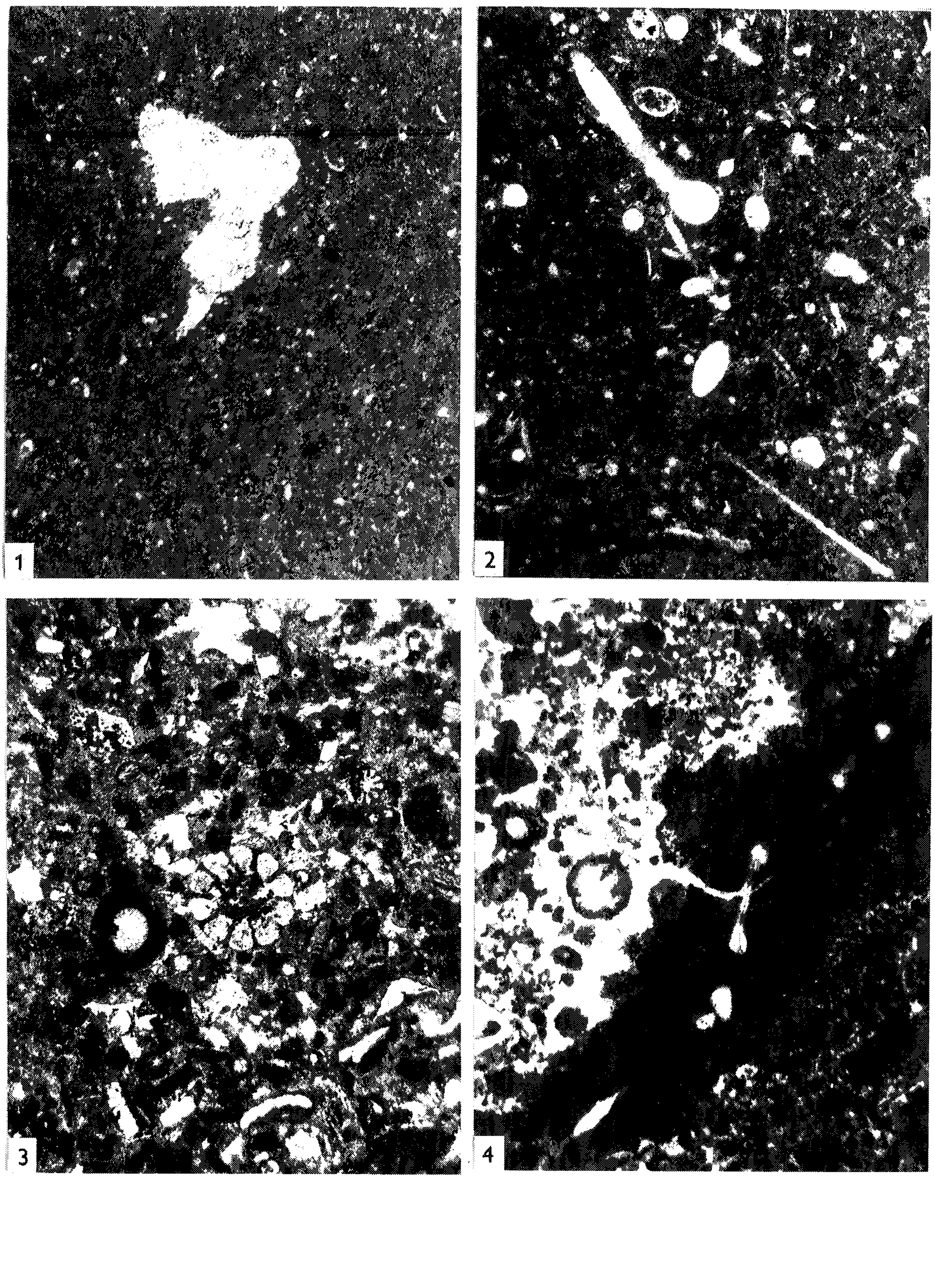

Plate I: Fig. 1 - fossiliferous micrite (mudstone) with rare echinodermal articles. Secemin IG 1, depth 965 m, sample 139, x 48. Fig. 2 - sponge biomicrite (wackestone) with common calcified sponge spicules and cyano-peloids. Zarki, sample H-45/2, x 48. Fig. 3 - bioclastic - peloidal biomicrite (wackestone) with common cyano-peloids and micro-oncoids, debris of lamellibranchs, calcified sponge spicules, tests of foraminifers, echinoid spines. Pagów IG 1, depth 633 m, sample 136, x 48. Fig. 4 - Tubiphytes - peloidal biomicrite (packstone). Dominant cyano-peloids, micro-oncoids, *Tubiphytes morronensis* Crescenti, *T. obscurus* Maslov occur together with foraminifers (*Miliolidae*, *Lenticulina* sp.), juvenile gastropods, sponge spicules and different bioclastic elements in locally recrystallized micrite (the left side of the picture). Secemin IG 1, depth 1167.4 m, sample 117, x 48.

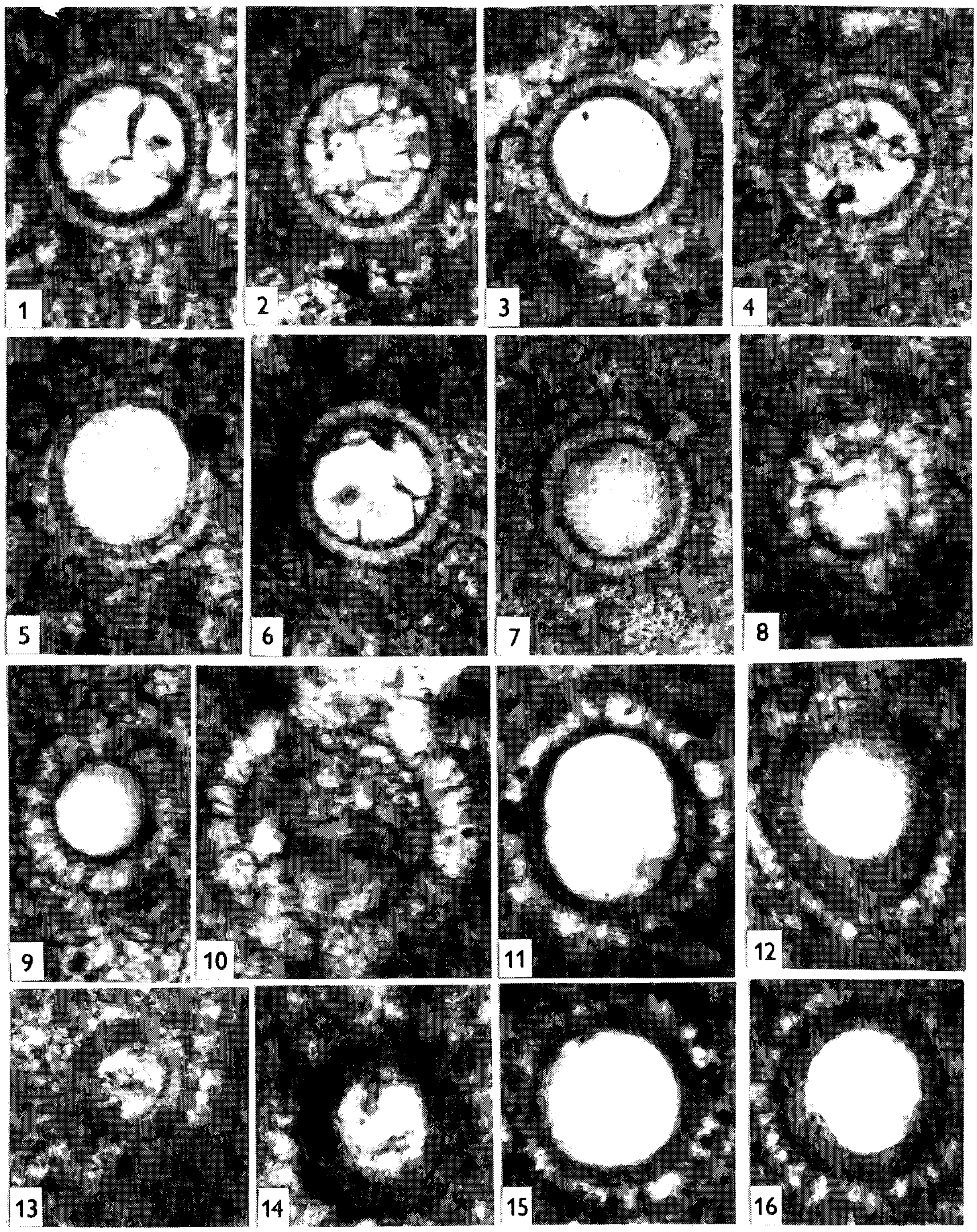

Plate II: Figs. 1-5 - *Committosphaera czestochowiensis* n. sp., x 378; 1 - holotypus, 2-5 - paratypes, 1-3 - Zarki-Jawornik, sample 6/1, 4 - Zarki, sample H-45/2, 5 - Pagów IG 1, depth 742 m, sample 129. Figs. 6, 7 - *Colomisphaera fibrata* (Nagy), x 378; 6 - Bleszno Hill, sample B-1, 7 - Zarki-Jaworznik, sample 6/1. Fig. 8 - *Colomispahera lapidosa* (Vogler), x 378. Jaronowice IG 1, depth 1213.5 m, sample 90. Fig. 9 - *Colomisphaera carpathica* (Borza), x 378. Pagów IG 1, depth 633 m, sample 136. Fig. 10 - *Colomisphaera* sp., x 378; Zloty Potok, sample 18/3. Fig. 11 - ?*Crustocadosina* sp., x 378; Zarki-Jaworznik, sample 6A/1. Fig. 12 - *Crustocadosina semiradiata olzae* (Nowak), x 378, Secemin IG 1, depth 965 m, sample 139. Fig. 13 - *Cadosina parvula* Nagy, x 378, Zarki-Jaworznik, sample 6/1. Fig. 14 - *Cadosina* sp., x 378, Secemin IG 1, depth 1167.4 m, sample 117. Figs. 15-16 - *Crustocadosina semiradiata* (Wanner), x 378; 15 - Pagów IG 1, depth 1190 m, sample 134; 16 - Secemin IG 1, depth 965 m, sample 139.

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