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Same taxonomic name, different species: a threat to stromatoporoid biodiversity research

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ABSTRACT. Taxonomic inconsistencies between two published collections on Devonian stromatoporoids were examined. The studied collections contain stromatoporoids sampled from the Middle and Upper Devonian from the Ardennes (collection by Lecompte) and the Holy Cross Mountains (collection by Kaźmierczak). The study was limited to stromatoporoid species that were assigned to the order Stromatoporellida. At least eight species which were described from the Devonian of both the Ardennes and the Holy Cross Mountains should be revised: *F. ruedemanni*, *H. crassum*, *H. porosum*, *H. perseptatum*, *S. lensiforme*, *S. socialis*, *T. laceratum*, *T. pingue*. Specimens that were assigned to *C. damnoniensis*, *C. spissa*, *H. episcopale*, *H. schlueteri*, *P. cellulosum* and *S. huronense* do not need to be revised. The inconsistencies may severely influence the outcome of palaeogeographic and biodiversity studies, since the error in not distributed randomly among stratigraphic intervals and it affects classification at the genus-level.

KEYWORDS: stromatoporoids, Devonian, palaeobiodiversity, Stromatoporellida.

1. Introduction

Recently developed global palaeontological databases allow researchers to analyze biodiversity patterns, extinction rates and to generate diversity curves. The data compiled into these databases are also used for global palaeogeographic studies. Projects such as the Paleobiology Database (http://paleodb.org/) provide instant access to occurrence and taxonomic data. Paleomapping tools are also available, allowing for plotting the locality palaeocoordinates on the palaeogeographic maps. In addition, changes in taxonomic nomenclature of fossil organisms are much easier to follow.

Unfortunately, the improvement in the availability of palaeontological data is accompanied by the decline in taxonomic studies. This general tendency is also observed in the case of Palaeozoic stromatoporoids. Some collections have not been revised for a period of over forty years. This suggests that at least some species diagnoses require further examination and revision. Moreover, many collections were studied and described in detail in times when no scientific databases existed. The access to scientific works was thus limited and the availability of palaeontological data was hampered by the limitations of the traditional printed media. In addition, the scientific community of the former Soviet bloc was further isolated from research work done in other countries. As a result, some species received taxonomic names different from those used in other countries (Ruban, 2011). Thus, it is likely that some specimens described by many authors under the different names indeed belong to the same species; and, conversely, that different species or genera were conglomerated under the same taxonomic name. Such ambiguous identifications can severely affect the biodiversity studies and result in incorrect conclusions.

Taxonomic inconsistencies between two published studies (Lecompte 1951, 1952 and Kaźmierczak, 1971) are discussed. Both collections include the Middle and Upper Devonian stromatoporoids, which were sampled from the Ardennes and the Holy Cross Mountains. The collections have not been substantially revised since 1971. However, the taxonomic position of some species established by Lecompte (1951, 1952) was changed by subsequent workers (eg. Stearn, 1966; Kaźmierczak, 1971; Mistiaen, 1980, 1988; May, 2005; Salerno, 2008). At least seven species described by Lecompte and Kaźmierczak are represented in the Paleobiology Database.

2. Material

Specimens used in this study, taken from collections made by Lecompte (1951, 1952) and Kaźmierczak (1971), were supplemented by specimens collected by the author. Stromatoporoids described by Lecompte are from the Ardennes (Belgium), while others were sampled in the Holy Cross Mountains (Poland). All specimens are Devonian (Givetian and Frasnian) in age. The collections studied are respectively deposited in the Royal Belgian Institute of Natural Sciences, Brussels, Belgium and in the Institute of Paleobiology, Polish Academy of Sciences, Warsaw, Poland.

The present study is limited to stromatoporoid species assigned by Lecompte and/or Kaźmierczak to the genera belonging to the order Stromatoporellida, established as an independent order by Stearn (1980), nearly ten years after the study by Kaźmierczak was published. It is very likely that taxonomic inconsistencies arose in clades that were not precisely defined when the studied collections were assembled; the order Stromatoporellida was therefore used as a test group. In total, 133 specimens representing 20 species were personally investigated by the author.

3. Systematic Palaeontology

A short morphological comparison of specimens assigned to the same species by Lecompte and Kaźmierczak is summarized in Table 1. Each of at least eight species of Stromatoporellida which were described from the Devonian of both the Ardennes and the Holy Cross Mountains should be revised and split into two different taxa. Skeletal features that were considered by the previous authors (Stearn et al., 1999; Stearn, 2011) to be of taxonomic value vary significantly, suggesting that specimens described under the same taxonomic name indeed belong to different species or even genera. The morphological differences between specimens from the Ardennes and the Holy Cross Mountains, assigned to the same species, are discussed below. The taxa that do not need a revision (differences between specimens are insignificant) are omitted. The chronostratigraphic ranges for all species were estimated after Racki (1993) and Bultynck & Dejonghe (2001).

Order Stromatoporida Stearn, 1980
Family Ferestromatoporidae Khromych, 1969

Genus *Ferestromatopora* Yavorsky, 1955

***Ferestromatopora ruedemanni* (Lecompte, 1952)**
(Plate 1 A-F)

1952 *Trupetostroma ruedemanni* Lecompte: 243-247, pl. 39, figs 4-5, pl. 40, fig. 3.
non 1952 *Trupetostroma ruedemanni* Lecompte: 243-247, pl. 40, figs 1-2.
non 1971 *Ferestromatopora talovensis* Yavorsky 1955; Kaźmierczak: 102-103, pl. 25, fig. 2.
non 1971 *Ferestromatopora krupiennikovi* Yavorsky 1955; Kaźmierczak: 103-104, pl. 25, fig. 3.

Material. Type specimens of *F. ruedemanni* (5281, 17120, 17173, 17184, 17274, 17462, 17687). Specimens not assigned to *F. ruedemanni*: type specimens 17092, 17318 and 17491 from the collection by Lecompte; specimens ST1 44 and 45, ST1 47, 48 and 49, ST1 141 and 142 from the collection by Kaźmierczak;

specimen UAM DEB 11 from the Givetian of Dębnik, southern Poland.

Emended diagnosis. Coenostromes densely spaced (2-4 per 1 mm); coenosteles coarsely cellular, straight or oblique, densely spaced (5 per 1 mm), 0.1-0.2 mm in diameter; astrorhizae present; astrorhizal canals between 0.4 and 0.5 mm in length; mamelons absent; intraskeletal variation significant.

Discussion. F. ruedemanni was moved by Galloway & St. Jean (1957) and Kaźmierczak (1971) to the order Stromatoporida. The structure dominated by coenostromes and coenosteles forming amalgamate network supports this conclusion. However, the presence of coarsely cellular pillars (Plate 1 A, lower part of the microphotograph) casts doubts on the assignment to the genus *Ferestromatopora*. According to Salerno (2008) *F. ruedemanni* should be moved to the genus *Pseudotrupetostroma*. Type specimens of *F. ruedemanni* differ significantly from one another suggesting that they belong to at least two species (Plate 1 A and C). The taxonomic decision of Kaźmierczak (1971), who splitted *F. ruedemanni* into three species (*F. ruedemanni*, *F. talovensis* and *F. krupiennikovi*), was therefore justified.

Specimens assigned by Kaźmierczak (1971) to the species *F. talovensis* and type specimens 17092, 17318 and 17491 show coarsely cellular coenosteles and/or microlaminae, diagnostic for the genus *Pseudotrupetostroma*. The structure is

Species under study	**Differences (S = significant, M = minor) between the specimens from collections by Lecompte (Ardennes) and Kaźmierczak (Poland)**		
	Ardennes	**Poland**	**Differ.**
Clathrocoilona damnoniensis (Nicholson, 1886) revised by Salerno (2008)	laminae thick (mean thickness 0.2 mm)	laminae of variable thickness	M
	foramina uncommon	foramina locally common	M
	autotubes present	autotubes absent	M
	intraskeletal variation low	intraskeletal variation significant	M
Clathrocoilona spissa (Lecompte, 1951) revised by Zukalová (1971)	in loose parts of the skeleton laminae thin, continuous	in loose parts of the skeleton laminae are reduced	M
	foramina absent	large foramina in places	M
	pillars thin, short, confined to a single interlaminar space	pillars thicker than laminae, short, confined to an interlaminar space or longer, intersecting 2-3 galleries	M
Ferestromatopora ruedemanni (Lecompte, 1952); synonymized by Kaźmierczak (1971) with *Ferestromatopora krupiennikovi* and *F. talovensis*	densely spaced paralaminae, reduced in places	densely spaced, continuous paralaminae	M
	coenosteles coarsely cellular, straight or oblique	coenosteles coarsely cellular, mostly straight	S
	structure dominated by coenosteles	structure dominated by paralaminae	S
	cassiculate networks build up of oblique structural elements in type specimen 17184 (supporting Kaźmierczak's synonymy)	cassiculate networks less prominent than in specimens from the Ardennes	S
	astrorhizae and astrorhizal canals present	astrorhizae rare or absent	S
	intraskeletal variation significant	intraskeletal variation medium to high (specimens from the Holy Cross Mountains belong to *Pseudotrupetostroma*)	M
Hermatoporella crassum (Lecompte, 1952)	microlaminae thin, continuous, locally replaced by dissepiments	microlaminae thicker, commonly reduced	S
	coenosteles thick, straight, superposed	coenosteles thinner than in specimen from the Ardennes, straight, superposed	S
	autotubes rare	autotubes numerous	S
Hermatoporella porosum (Lecompte, 1952); synonymized by Kaźmierczak (1971) with *Hermatoporella maillieuxi* (Lecompte, 1952) revised by May (2005)	microlaminae more prominent than in specimens from the Holy Cross Mountains	microlaminae locally reduced	S
	coenosteles straight, cellular in places	coenosteles coarsely cellular	S
	coenosteles intersected by microlaminae	coenosteles only locally intersected by microlaminae	S
	peripheral vacuoles apparent	peripheral vacuoles less apparent	S
	dissepiments present	dissepiments present, less common	M
	coenotubes common	coenotubes densely spaced, more prominent	S
	autotubes irregular, small	autotubes oval, large, more common than in specimen from the Ardennes (specimens from the Holy Cross Mountains belong to *Pseudotrupetostroma*)	S
Hermatostroma episcopale Nicholson, 1892	laminae continuous, reduced in places	laminae locally reduced	M
	dissepiments locally common	laminae pierced by foramina or replaced by dissepiments	M
	foramina present	foramina more common than in type specimen	M
Hermatostroma perseptatum Lecompte, 1952	laminae well developed	laminae reduced, replaced by dissepiments	S
	coenosteles straight, systematically superposed	coenosteles straight	M
	coenosteles forming a grid with the laminae	coenosteles irregular or oblique in longitudinal sections	S
	coenosteles oval or irregular in transverse thin section	coenosteles form amalgamated networks in transverse thin section	S
	peripheral membranes present	peripheral membranes well developed, more prominent	S
Hermatostroma schlueteri Nicholson, 1886	laminae prominent	laminae less prominent than in specimens from the Ardennes	M
	foramina absent	laminae locally pierced by foramina	M

Species under study	Differences (S = significant, M = minor) between the specimens from collections by Lecompte (Ardennes) and Kaźmierczak (Poland)		
	Ardennes	Poland	Differ.
Pseudotrupetostroma cellulosum (Lecompte, 1952) revised by Salerno (2008)	coarsely cellular structure of pillars	coarsely cellular structure of pillars less visible than in specimens from the Ardennes	M
Stictostroma lensiforme (Lecompte, 1951) revised by Galloway & St. Jean (1957)	laminae compact or cellular, darker than pillars, continuous, locally pierced by foramina, branching dichotomously, locally intersecting pillars	laminae cellular, usually not darker than pillars, foramina rare, dichotomous branchings absent	S
	pillars straight, short and superposed systematically	pillars short, confined to an interlaminar space, superposed	M
	pillars thicker than laminae	pillars of thickness comparable to laminae	S
	galleries angular or rounded, large (up to 0.4 mm in diameter)	galleries angular	M
	autotubes scattered within the skeleton	autotubes absent	S
Stictostroma socialis (Nicholson, 1892) Note: *Stictostroma socialis sensu* Kaźmierczak (1971) was synonimized by Salerno (2008) with *Stictostroma laminatum* (Bargatzky, 1881); the present study supports this concept	autotubes absent	autotubes present (as in *Stictostroma laminatum*)	S
	intraskeletal variation low	intraskeletal variation significant	M
Stromatoporella huronense (Parks, 1936); synonymized by Kaźmierczak (1971) with *Clathrocoilona saginata* (Lecompte, 1951) revised by Stearn et al. (1999)	laminae of variable thickness (> 0.1 mm), tripartite in places	laminae thin (< 0.1 mm), locally tripartite	M
	foramina rare	foramina common	M
Trupetostroma laceratum Lecompte, 1952; synonymized by Kaźmierczak (1971) with *T. tenuilamellatum* and *T. bassleri*	laminae continuous, reduced in places	laminae reduced, locally replaced by numerous dissepiments	S
	pillars short, superposed, forming a grid with the laminae	coarsely cellular pillars, straight or oblique, short, superposed	S
	autotubes common	autotubes numerous, more common than in specimen from the Ardennes	S
	dissepiments locally common	dissepiments common	M
	astrorhizae and astrorhizal canals present	astrorhizae rare or absent (specimen from the Holy Cross Mountains belongs to *Pseudotrupetostroma*)	M
Trupetostroma pingue Lecompte, 1952 Note: in places, type specimens show diagnostic features of the genus *Pseudotrupetostroma* (Stearn et al., 1999; Stearn, 2011).	laminae thin, continuous and compact or thick, pierced by foramina and tripartite, with lighter axial zone	laminae of variable thickness, darker than pillars, continuous, locally tripartite or coarsely cellular	S
	foramina common in dense parts of skeleton	foramina rare	M
	coenosteles compact, cellular or coarsely cellular, superposed systematically	coarsely cellular structure of coenosteles, diagnostic for genus *Pseudotrupetostroma*	S
	autotubes common, filled with dissepiments	autotubes absent	S
	dissepiments common	dissepiments absent	S
	astrorhizae and astrorhizal canals present in dense parts of skeleton	astrorhizae absent	S
	intraskeletal variation significant	intraskeletal variation low (specimens from the Holy Cross Mountains belong to *Pseudotrupetostroma*)	S

Table 1. Short morphological comparison of specimens assigned to the same species by Lecompte (1951, 1952) and Kaźmierczak (1971).

dominated by coenosteles (specimens from the Ardennes) or by paralaminae (specimens from the Holy Cross Mountains). The type specimens of *F. ruedemanni* differ significantly from *F. krupiennikovi*, showing densely spaced paralaminae (2-4 per 1 mm; Plate 1 C, upper part of the microphotograph). This suggests that specimens described by Kaźmierczak (1971) should not be synonymized with any species recognized by Lecompte (1951, 1952).

Distribution. Ardennes: middle to late Givetian, middle Frasnian.

Order Stromatoporellida Stearn, 1980
Family Stromatoporellidae Lecompte, 1951

Genus *Stictostroma* Parks, 1936

***Stictostroma lensiforme* (Lecompte, 1951)**
(Plate 1 G-J)

1951 *Syringostroma lensiforme* Lecompte: 211-212, pl. 34, figs 5, pl. 35, fig. 1.
non 1971 *Stictostroma lensiforme* Lecompte 1951; Kaźmierczak: 85-86, pl. 17, fig. 1.

Material. Holotype and a paratype (4802 and 5134 from the collection by Lecompte). Specimens not assigned to *S. lensiforme*: 15 specimens from the collection by Kaźmierczak (ST1-145 to ST1-152, ST1-199 to ST1-205); specimens UAM ZEL 1 and UAM ZEL 7 from Zelejowa Góra (Holy Cross Mountains).

Emended diagnosis. Laminae thin (thickness < 0.1 mm), compact or cellular, continuous, locally pierced by foramina, branching dichotomously; pillars straight, thicker than laminae, short and superposed systematically, cellular; ring pillars absent; galleries angular or rounded; numerous large (up to 0.4 mm in diameter) autotubes scattered within the skeleton.

Discussion. Stromatoporoids assigned by Kaźmierczak to. *S. lensiformis* differ significantly from the type specimens (Table 1). Those specimens should be therefore moved to other species. Moreover, the differences presumably affect features that are of taxonomic value at the genus level. Specimens the Holy Cross Mountains reveal diagnostic characteristics of the genus *Stictostroma*, although pillars are superposed in some places (Plate 1 J). Specimens from the Ardennes need to be revised. Their relationship to the genus *Stictostroma* remains unclear since the microlaminae intersecting pillars are visible in places (Plate 1 G, upper part of the photo). It is likely that the inconsistencies noted above affect taxonomic assignments at the species and at the genus level.

Kaźmierczak (1971) synonymized *S. lensiforme* and *Habrostroma percanaliculata* (Lecompte, 1951). However, the type specimen of *H. percanaliculata* shows prominent coenostromes and coenosteles forming an irregular network in tangential thin section, confirming that these two species belong to different genera and orders.

Distribution. Ardennes: early Givetian to middle Frasnian.

Family Trupetostromatidae Germovsek, 1954

Genus *Hermatoporella* Khromych, 1969

***Hermatoporella crassum* (Lecompte, 1952)**
(Plate 2 A-D)

1952 *Trupetostroma crassum* Lecompte: 239-240, pl. 43, fig. 4, pl. 44, fig. 1.
non 1971 *Hermatostroma crassum* Lecompte 1952; Kaźmierczak: 126-127, pl. 35, fig. 3.

Material. Holotype (5270). Specimens not assigned to *H. crassum*: four specimens from the collection by Kaźmierczak (ST1-115, ST1-116, ST1-117, ST1-130); specimens UAM STO 41-43 from Stokówka (Holy Cross Mountains).

Emended diagnosis. Thin (thickness < 0.05 mm) microlaminae, continuous, locally replaced by dissepiments, straight; coenosteles straight, superposed systematically, thick (thickness > 0.15 mm), peripheral vacuoles absent; autotubes rare, oval to irregular, visible in central parts of mamelons; dissepiments common; microstructure compact to cellular.

Discussion. Specimens described by Kaźmierczak (1971) differ significantly from the holotype. Microlaminae are commonly reduced. Coenotubes are numerous and highly variable in shape, ranging from oval to irregular and meandering (Plate 2 C, lower part of the photograph). The holotype of *H. crassum* reveals straight coenotubes, crossed by well developed microlaminae and dissepiments (Plate 2 A). The differences in features of taxonomic importance suggest that the specimens from the Holy Cross Mountains should not be assigned to *H. crassum*. Lecompte (1952) did not describe any specimens that resemble those studied by Kaźmierczak (1971). These specimens should be thus moved to other species within the genus *Hermatoporella*.

Distribution. Ardennes: early Givetian to middle Frasnian.

***Hermatoporella porosum* (Lecompte, 1952)**
(Plate 2 E-F)

1952 *Trupetostroma porosum* Lecompte: 236-237, pl. 42, fig. 3, pl. 43, fig. 1.
non 1952 *Trupetostroma maillieuxi* Lecompte: 237-239, pl. 43, figs 2-3.
non 1971 *Hermatostroma porosum* Lecompte 1952; Kaźmierczak: 123-124, pl. 8, fig. 5, pl. 34, fig. 1.

Material. Type specimen of *H. porosum* (5179 from the collection by Lecompte). Specimens not assigned to *H. porosum*; type specimens of *H. maillieuxi* (5760 and 17444 from the collection by Lecompte); four specimens from the collection by Kaźmierczak (ST1-111, ST1-112, ST1-128, ST1-129).

Emended diagnosis. Thin (thickness < 0.1 mm) microlaminae straight, reduced, replaced by dissepiments; coenosteles straight or oblique, short, superposed, thick (thickness > 0.15 mm), peripheral vacuoles numerous; autotubes common, irregular, filled with dissepiments in places; microstructure cellular.

Discussion. Specimens described by Kaźmierczak (1971) only in places reveal the diagnostic characteristics of the genus *Hermatoporella*: microlaminae intersecting coenosteles and superposed coenosteles with peripheral vacuoles (Plate 2 E). Most vertical thin sections show coarsely cellular coenosteles (Kaźmierczak, 1971, pl. 8, fig. 5) with numerous vacuoles (Kaźmierczak, 1971, pl. 34, fig. 1) which are less common in the type specimen. The cellular structure of pillars and laminae reveals similarity to the genus *Pseudotrupetostroma*. In addition, laminae are reduced and replaced by numerous foramina. Large, up to 1.0 mm in diameter, oval galleries, interconnected through foramina are common in specimens from the Holy Cross Mountains; however, in the type specimen such voids are smaller (less than 0.6 mm in diameter). Specimens described by Kaźmierczak (1971) do not belong to genus *Hermatoporella*; they reveal the diagnostic features of *Pseudotrupetostroma*. Those specimens therefore should not be assigned to *H. porosum*.

Kaźmierczak (1971) synonymized *H. porosum* with *Hermatoporella maillieuxi* (Lecompte, 1952). Both species are similar, differing only in thickness and spacing of coenosteles. Peripheral vacuoles are better developed in *H. maillieuxi* than in *H. porosum*. Specimens from the Holy Cross Mountains do not resemble type specimen of *H. maillieuxi* since they show the diagnostic features of *Pseudotrupetostroma,* their microlaminae are more reduced, coenosteles are thinner (mean diameter 0.2 mm) and peripheral vacuoles are more prominent. These specimens should not be therefore included in the same species, although Salerno (2008) suggested that specimens from the collection by Kaźmierczak are closely related to *H. maillieuxi*.

Distribution. Ardennes: middle to late Givetian.

Genus *Hermatostroma* Nicholson, 1886

***Hermatostroma perseptatum* Lecompte, 1952**
(Plate 2 G-H)

1952 *Hermatostroma perseptatum* Lecompte: 251, pl. 45, fig. 2.
non 1971 *Hermatostroma perseptatum* Lecompte 1952; Kaźmierczak: 124, pl. 8, fig. 6, pl. 34, fig. 2.

Material. Holotype 17175. Not assigned to *H. perseptatum*: two specimens from the collection by Kaźmierczak (ST1-131, ST1-138).

Emended diagnosis. Laminae well developed, regularly spaced (2-3 per 1 mm), variable in thickness; coenosteles straight, systematically superposed, forming a grid with the laminae, densely spaced (3-4 per 1 mm); peripheral membranes present; dissepiments common; astrorhizae and astrorhizal canals present.

Discussion. Specimens ST1-131 and ST1-138 differ from the holotype of *H. perseptatum* in having reduced laminae, commonly replaced by dissepiments. Coenosteles are long (up to 12 interlaminar spaces) and straight, but less regular than in the type specimen. Peripheral membranes are more prominent than in the holotype. Differences between specimens from the Ardennes and the Holy Cross Mountains are similar to those described for *Hermatoporella crassum*. The species of *Hermatostroma* and *Hermatoporella* from the Devonian of southern Poland reveal reduced laminae, irregular coenotubes and well developed peripheral vacuoles. Specimens described by Kaźmierczak (1971) clearly belong to the genus *Hermatostroma*. However, they should not be synonymized with any species described by Lecompte (1952).

Distribution. Ardennes: middle to late Givetian.

Genus *Trupetostroma* Parks, 1936

***Trupetostroma laceratum* Lecompte, 1952**

(Plate 2 I-J)

1952 *Trupetostroma laceratum* Lecompte: 228-230, pl. 38, fig. 1.

non 1952 *Trupetostroma tenuilamellatum* Lecompte: 223-225, pl. 36, figs 1-5.

1952 *Trupetostroma bassleri* Lecompte: 227-228, pl. 37, fig. 3.

non 1971 *Trupetostroma laceratum* Lecompte 1952; Kaźmierczak: 113-114, pl. 30, fig. 1.

Material. Holotype of *T. laceratum* (5170). Specimens not assigned to *T. laceratum*: holotype of *T. bassleri* (7260); type specimens of *T. tenuilamellatum* (17277, 17021, 17026, 17077, 17147, 17439); specimen ST1-132 (Kaźmierczak, 1971) from the Holy Cross Mountains.

Emended diagnosis. Laminae continuous, reduced in places, straight or irregular, cellular, densely spaced (4-5 per 1 mm), thin (<0.15 mm); pillars short, systematically superposed, straight, cellular, forming a grid with the laminae, variable in thickness (0.1-0.25 mm), round, oval or irregular in tangential thin section; dissepiments common in places; astrorhizae and astrorhizal canals present.

Discussion. Specimen from the Holy Cross Mountains reveals thick (up to 0.3 mm in diameter), coarsely cellular pillars. Thus, it differs significantly from the type specimen of *T. laceratum* and shows the characteristic features of the genus *Pseudotrupetostroma*. Taxonomic inconsistencies affect not only species but also genera, although Salerno (2008) suggested that specimen described by Lecompte (1952) also belongs to the genus *Pseudostrupetostroma*.

Kaźmierczak (1971) synonymized *T. laceratum* with *T. tenuilamellatum* Lecompte, 1952 and *T. bassleri* Lecompte, 1952. However, the type specimens of *T. tenuilamellatum* show features that are diagnostic for the genus *Hermatoporella* (laminae intersecting coenosteles, coenosteles forming a labyrinthine network in tangential thin sections). The taxonomic position of *T. bassleri* is unclear; Salerno (2008) suggested moving it to the genus *Pseudotrupetostroma*.

Distribution. Ardennes: middle Givetian to middle Frasnian.

***Trupetostroma pingue* Lecompte, 1952**

(Plate 3 A-D)

1952 *Trupetostroma pingue* Lecompte: 230-231, pl. 38, fig. 2, pl. 29, figs 1-3.

non 1971 *Trupetostroma pingue* Lecompte 1952; Kaźmierczak: 113, pl. 29, fig. 1, pl. 30, fig. 2.

Material. Type specimens 17199, 17020, 17187 and 17256. Specimens not assigned to *T. pingue*: specimen ST1-94 from the collection by Kaźmierczak; specimen UAM SOG 18 from Sowie Górki (the Holy Cross Mountains).

Emended diagnosis. Laminae thin, continuous and compact or thick, planar or undulated, densely spaced (4-6 per 1 mm), pierced by foramina and tripartite, with lighter axial zone; foramina common in dense parts of skeleton; autotubes common, filled with dissepiments; coenosteles compact or cellular, superposed systematically, oval or forming a labyrinthine network in tangential thin section, densely spaced (5-6 per 1 mm); astrorhizae present in dense parts of skeleton; astrorhizal canals well developed; intraskeletal variation significant.

Discussion. Specimen ST1-94, studied by Kaźmierczak (1971), shows coarsely cellular structure, diagnostic for genus *Pseudotrupetostroma*. However, the specimens from the collection by Lecompte also show cellular coenosteles in places (Plate 3 A, uppermost and lowermost parts of the microphotograph), which are forming a labyrinthine network in tangential thin sections (Plate 3 B). Thus the type specimens show in places diagnostic features of the genus *Pseudotrupetostroma* (Stearn et al., 1999; Stearn, 2011).

Distribution. Ardennes: middle to late Givetian, middle Frasnian.

4. General discussion

The inconsistencies observed in the present study affect mainly species that were established by Lecompte (1952). *Pseudotrupetostroma cellulosum* is an exception, however the dimensions of the skeletal elements vary between two studied collections (see Plate 3 E-H). Specimens that belong to species described earlier are strikingly similar to one another. The inconsistencies affect mainly species from the Givetian of the Holy Cross Mountains; species that were described both from the Frasnian of the Ardennes and the Holy Cross Mountains do not need to be revised, except for *Ferestromatopora ruedemanni*, *Hermatoporella crassum* and *Trupetostroma pingue*. Four out of eight taxa that reveal significant differences between the specimens from both studied collections (*Hermatoporella porosum*, *Hermatostroma perseptatum*, *Trupetostroma laceratum* and *Trupetostroma pingue*) were sampled by Kaźmierczak (1971) exclusively from the Early to Middle Givetian *Stringocephalus* Beds; three of them (*Hermatoporella porosum*, *Hermatostroma perseptatum*, *Trupetostroma laceratum*) were found at a single locality in Jurkowice-Budy quarry in the eastern part of the Holy Cross Mountains. The taxonomic inconsistencies are not therefore distributed randomly among stratigraphic intervals. A significant loss of the endemicity occurred at the end of the Givetian since only two Givetian representatives of the order Stromatoporellida are present in both studied collections. This supports earlier estimates of palaeobiodiversity at the global scale (Stock, 2005). In the Frasnian at least four stromatoporellid species appeared in both areas.

The present contribution shows that specimens assigned to the same species by different workers belong not only to different species, but also genera (*Stictostroma lensiforme*, *Hermatoporella porosum*, *Trupetostroma laceratum*). This can severely influence biodiversity, which is generally estimated at genus-level, considered as being more taxonomically robust (Alroy, 1996). Fortunately, if error is randomly distributed among genera and stratigraphic intervals, then the database, although rife with errors, can accurately estimate the large-scale patterns of biodiversity (eg. Adrain & Westrop, 2000). However, the present study shows that most of the species that should be revised were sampled from a single stratigraphic unit. Moreover, other studies indicate that even noisy data show periodicity that can affect biodiversity assessments (Patterson & Smith, 1987). Similar conclusions were reached by Stearn (1999), who noticed that 70% of invalid stromatoporoid genera were of Russian provenance. The taxonomic bias thus reveals clear geographical patterns. This also suggests that number of synonyms could have been increased due to limited scientific interchange between western and eastern palaeontologists.

5. Conclusions

The present study shows that at least eight stromatoporoid species described earlier from the Givetian and the Frasnian of both the Ardennes and the Holy Cross Mountains should be revised (*Ferestromatopora ruedemanni*, *Hermatoporella crassum*, *Hermatoporella porosum*, *Hermatostroma perseptatum*, *Stictostroma lensiforme*, *Stictostroma socialis*, *Trupetostroma laceratum* and *Trupetostroma pingue*). Specimens from the Holy Cross Mountains that were originally assigned to those species (Kaźmierczak, 1971) should not be synonymized with any species described by Lecompte (1951, 1952). *F. ruedemanni*, *H. porosum*, *T. laceratum* and *T. pingue* from the

collection by Kaźmierczak (1971) are here assigned to the genus *Pseudotrupetostroma*. Specimens that belong to *Clathrocoilona damnoniensis*, *Clathrocoilona spissa*, *Hermatostroma episcopale*, *Hermatostroma schlueteri*, *Pseudotrupetostroma cellulosum* and *Stromatoporella huronense* do not need to be revised.

Some specimens described under the same taxonomic name indeed belong not only to different species, but also genera (*Stictostroma lensiforme*, *Hermatoporella porosum*, *Trupetostroma laceratum*). This may severely affect the outcome of palaeogeographical and palaeobiodiversity studies, which are commonly based upon supra-species level data.

The taxonomic inconsistencies are not distributed randomly among stratigraphical units. This may further affect potential biodiversity estimations. The present study and earlier observations by Stearn (1999) therefore indicate that at least some of the stromatoporoid species described from the Devonian of western and central Europe should be revised. This should be done before entering data into any global palaeontological database.

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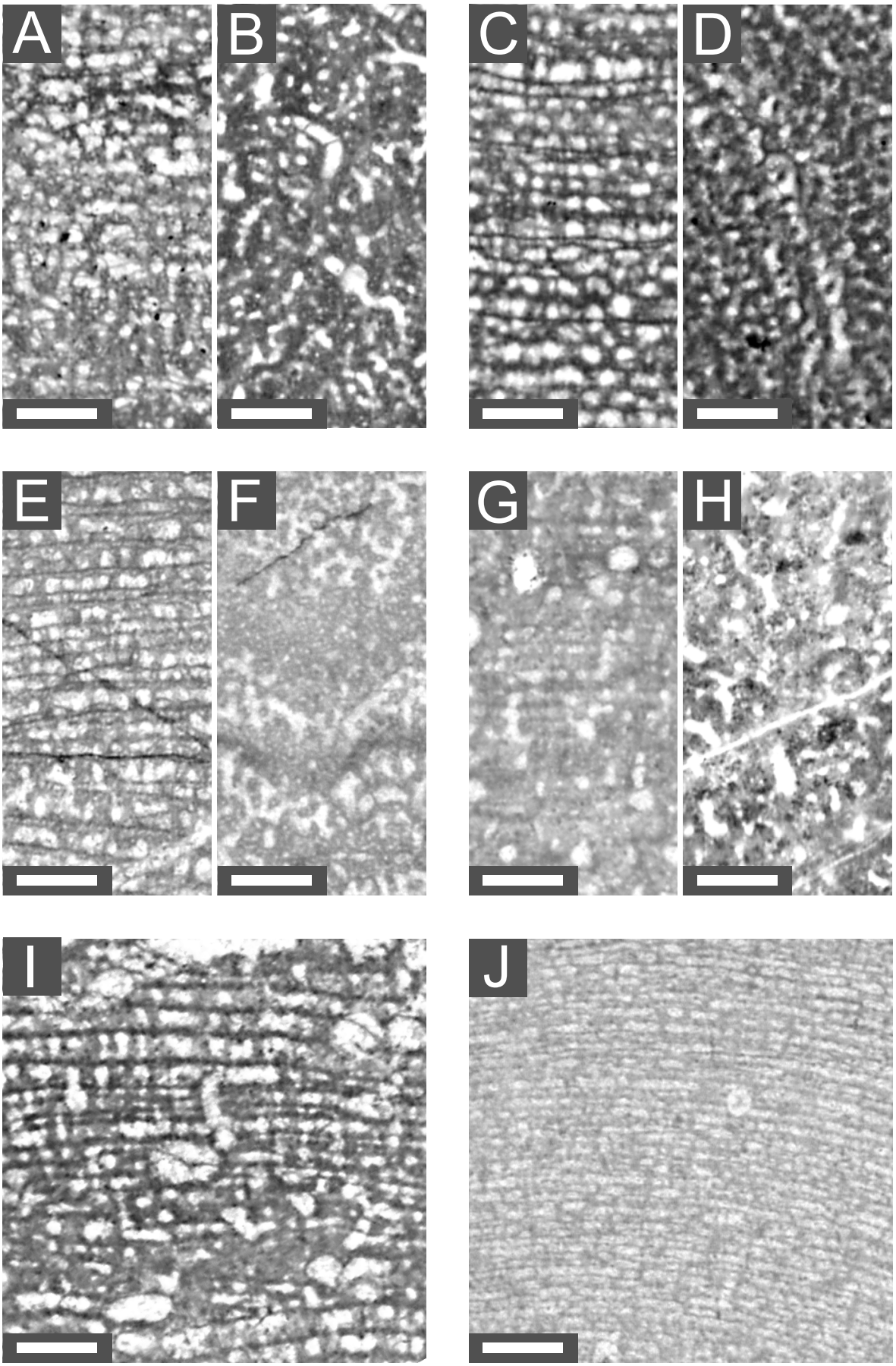

Plate 1. A-F: *Ferestromatopora ruedemanni*. G-J: *Stictostroma lensiforme*. A: Longitudinal section of the type specimen 17092 (Upper Givetian of the Ardennes), showing coarsely cellular coenosteles and microlaminae. B: Tangential section of the same specimen, with a closed network formed by coenosteles. C: Longitudinal thin section of the type specimen 17184 (Upper Givetian of the Ardennes), showing oblique skeletal elements and thin, continuous paralaminae. D: Tangential section of the same specimen. E: Specimen UAM DEB 11 from the Upper Givetian of the Dębnik Anticline, southern Poland, resembling *Ferestromatopora talovensis sensu* Kaźmierczak (1971); longitudinal thin section. F: Tangential thin section of the same specimen. G: Longitudinal thin section of the type specimen 5134. H: Tangential section of the same specimen. I: Longitudinal thin section of the same specimen, showing less dense part of the skeleton. J: Longitudinal thin section of specimen UAM ZEL 7 from Zelejowa Góra quarry, Early Frasnian of the Holy Cross Mountains. Scale bars: 1 mm.

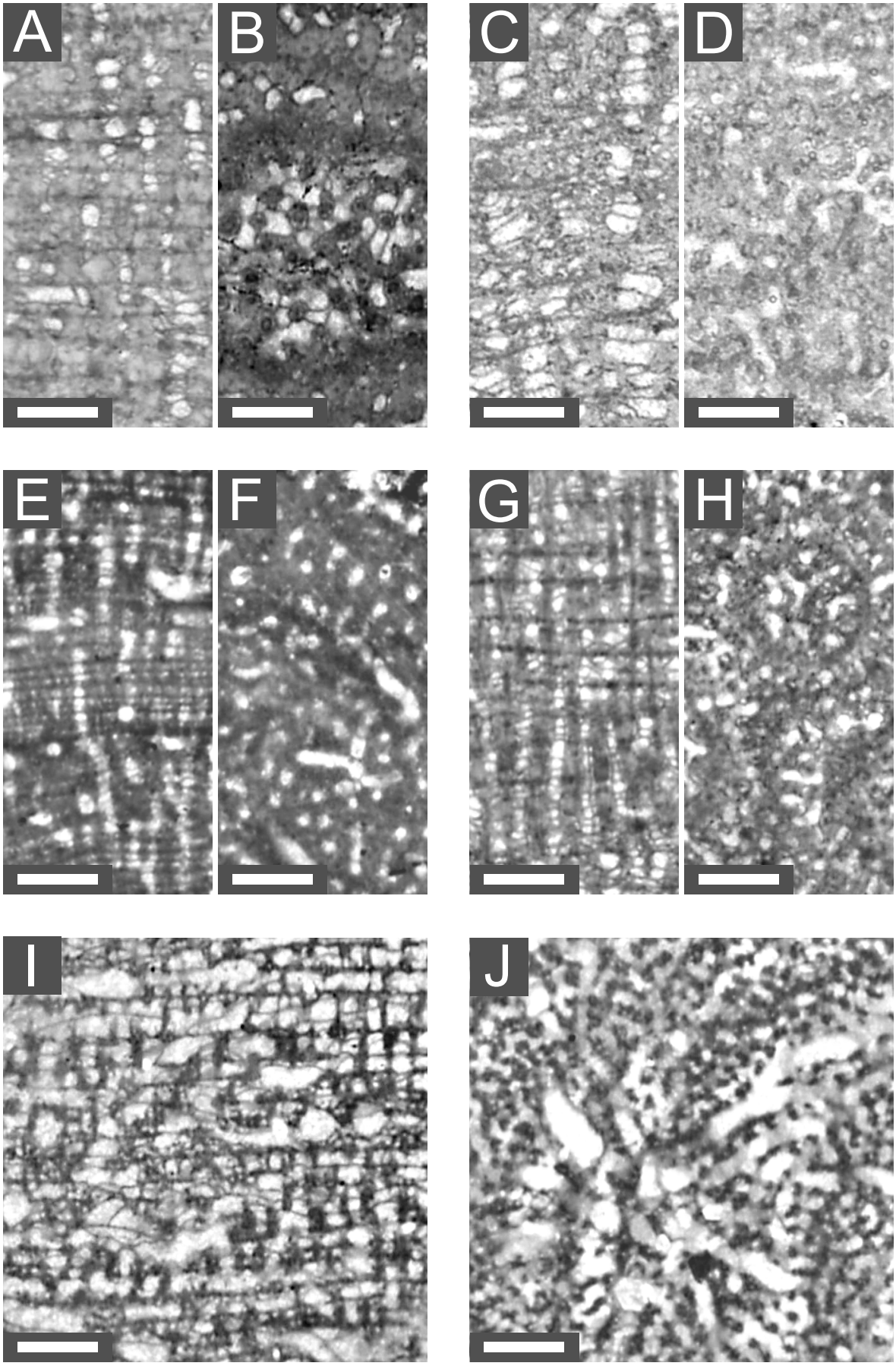

Plate 2. A-D: *Hermatoporella crassum*. E-F: *Hermatoporella porosum.* G-H: *Hermatostroma perseptatum.* I-J: *Trupetostroma laceratum*. A: Longitudinal thin section of the type specimen 5270. B: Tangential section of the same specimen. C: Longitudinal section of the specimen UAM STO 43 from Stokówka (Upper Givetian of the Holy Cross Mountains). D: Tangential thin section of the same specimen. E: Longitudinal thin section of the type specimen 5179. F: Tangential thin section of the same specimen. G: Longitudinal thin section of the type specimen 17175. H: Tangential thin section of the same specimen. I: Longitudinal thin section of the type specimen 5170. J: Tangential section of the same specimen. Scale bars: 1 mm.

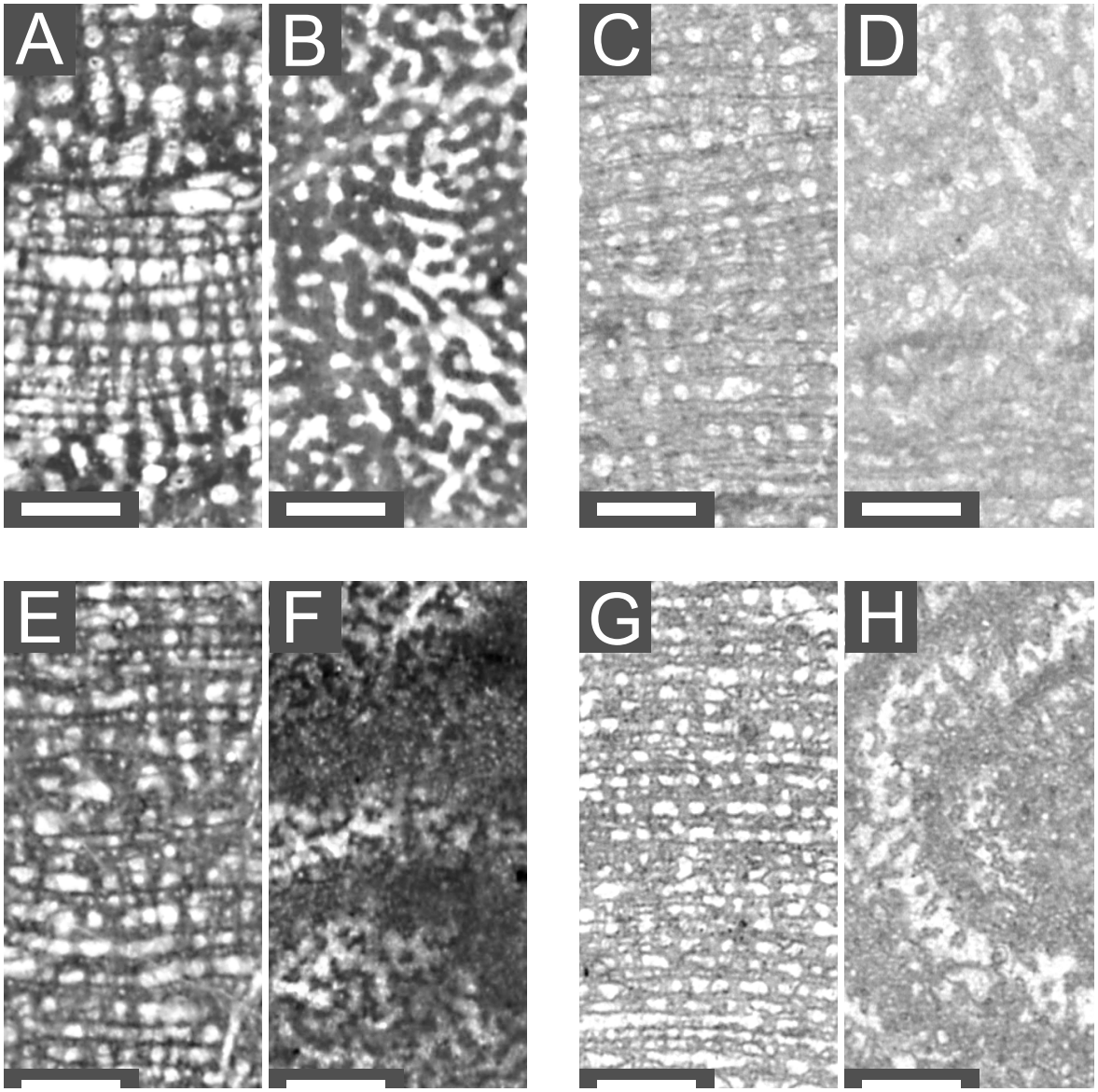

Plate 3. A-D: *Trupetostroma pingue.* E-H: *Pseudotrupetostroma cellulosum*. A: Longitudinal thin section of the paratype 17020. B: Tangential thin section of the same specimen. C: Longitudinal thin section of the specimen UAM SOG 18 from the Upper Givetian of Sowie Górki (Holy Cross Mountains). D: Tangential section of the same specimen. E: Longitudinal section of paratype 5136. F: Tangential thin section of the holotype (5267). G: Longitudinal section of the specimen UAM DEB 1; Upper Givetian of the Dębnik Anticline (southern Poland). H: Tangential section of the same specimen. Scale bars: 1 mm.