

Tournaisian and Viséan *Lophophyllum* of Gorskiy (1932) from the Kirghiz Steppe and a possible ancestor of a new Bashkirian rugose coral genus from the Donets Basin (Ukraine)

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Abstract

All specimens assigned by Gorskiy (1932) to the genus *Lophophyllum* Milne Edwards and Haime, 1850 are revised, redescribed and reillustrated. The corallite identified by him as a second, specifically indeterminate species of *Lophophyllum* is here questionably included in *Amygdalophyllum* Dun and Benson, 1920. For the reminding specimens two new, unnamed genera are suggested. "*Lophophyllum*" *subtortuosum* Gorskiy, 1932 belongs to a new, non-dissepimented genus of an unknown family. A possible relationship between gen. nov. 1, sp. nov. 1 and the new Bashkirian genus from the Donets Basin (Ukraine) is proposed.

Key words: Kyrgyzstan, "*Lophophyllum*", Rugosa, Lower Carboniferous, revision

1. Introduction

The rugose corals redescribed in the present note form a small part of the diversified coral fauna described by Gorskiy (1932) from the Devonian/Carboniferous passage beds and from Tournaisian to lower Viséan strata of the Kirghiz Steppe of the former USSR, now in Kyrgyzstan. Specimens described in Gorskiy's (1932) paper were collected by several geologists (Gorskiy 1932, p. 3), who measured various sections that were tabulated by Gorskiy (1932, pp. 56, 57). The stratigraphic provenance of taxa was indicated by him in very general terms, such as Tournaisian and lower Viséan. I do not have any opportunity to specify these further.

The coral identifications done by Gorskiy (1932) are at a level that is typical of his time, which means that most names of genera and some of the species

applied by him cannot be adopted without revision. In addition, his conclusions concerning the relationships of the Kirghiz Steppe coral fauna cannot be accepted without such a revision. The close similarity or relationship of the coral fauna from the Kirghiz Steppe to corals from the United States mentioned by Gorskiy (1932, p. 58) is particularly doubtful. In the light of subsequent revisions (e.g., Easton 1944; Sando 1965; Sando & Bamber 1985), his conclusions (as based on nineteenth and twentieth century descriptions by American palaeontologists), cannot be ascribed to today.

The editing of Gorskiy's (1932) paper is extremely poor, precluding any reliable discussion based solely on his illustrations. The illustrations of individual species do not cover all growth stages of the corals described. Moreover, their quality does not permit the recognition of several details that are

mentioned in the text. Therefore, any redescription and reillustration of the species introduced by Gorskiy (1932) would improve our knowledge of this important rugose coral fauna. In fact, this is the first reason for publishing the present note.

Clarification of the taxonomic position of specimens included by Gorskiy (1932) in *Lophophyllum* Milne Edwards and Haime, 1850 is the second reason. Following Carruthers (1913), Gorskiy lumped both dissepimented and non-dissepimented corals. Such an approach was common at the time, despite the availability of the generic name *Eostroton* Vaughan, 1915 for dissepimented forms. Lecompte (1955) restudied five syntypes of *Lophophyllum konincki* Milne Edwards and Haime, 1850, the type species of the genus, and recognised their non-dissepimented morphology. My restudy of those syntypes (Fedorowski, 1974) confirmed the absence of dissepiments in *L. konincki*. Hill (1981), who designated the lectotype of that species, considered *Lophophyllum* as a non-dissepimented genus as well. The approach discussed and the reinvestigation of the morphology of specimens included by Gorskiy (1932) in *Lophophyllum*, allow to divide them into four taxa, none of which is here accepted as belonging to *Lophophyllum*. Formal names are not proposed for any of them. This should be done only on the basis of much more complete material than that available for the present preliminary redescription.

To draw attention to some of Gorskiy's (1932) species as resembling a potential ancestor of a new early Bashkirian rugose coral genus from the Donets Basin (Ukraine) is the third and main reason for the present note. The genus mentioned, introduced in a publication issued parallel to this one (Fedorowski 2018), lacks an obvious ancestor among existing, well-established taxa such as *Cyathoclisia* Dingwall, 1926 or *Spirophyllum* Fedorowski, 1970. Peels taken from Gorskiy's (1932) specimens allow two specimens of his *Lophophyllum* lot to be recognised as bearing characteristics similar to features that are diagnostic of that Bashkirian genus. However, my attempt to publish the redescription of the Kirghiz Steppe specimens, together with the comprehensive paper devoted to early Bashkirian Aulophyllidae from the Donets Basin (Fedorowski 2018), was criticised by the reviewers of that paper. Thus, the present supplementary note is published in order to follow the suggestion of one of the critics, Dr J. Denayer.

2. Material

Specimens constituting Gorskiy's (1932) collection, housed in the Gornyi Institute at Leningrad (Sankt

Petersburg) was restudied by myself in 1969. Photography of thin sections was prohibited, but peeling was allowed. Thus, all reasonably preserved fragments of specimens were peeled. Nine peels were taken from remains of five specimens identified by Gorskiy (1932) as *Lophophyllum*. Those peels and my early notes form the basis for the present note.

Two specimens, bearing the collection number 393, were described by Gorskiy (1932, p. 54) as a new species, *Lophophyllum subtortuosum*. However, three corallites bearing that number were stored in the Gornyi Institute Museum at the time of my restudy. Despite extremely poor illustrations, two of these are identified here as having been included in *L. subtortuosum*. Some characters described by Gorskiy (1932, pp. 54, 85) were helpful in that identification. He wrote (translated from Russian by Gorskiy), "The columella laterally compressed and oval in cross section, its dimensions being 1.5x0.5 mm, has in certain sections where septa do not reach the centre (which depends on the position in respect to the tabulae) a number of excrescences owing to which it appears stellate in outline". This description matches the specimen illustrated by Gorskiy (1932, pl. 5, figs 20, 21) and reillustrated here (Fig. 3A–D).

The second specimen, numbered 393, was included in *L. subtortuosum* with doubts. Gorskiy (1932, p. 54) wrote (translated here from Russian), "One slightly larger specimen (8 mm) I include in that species with some doubts. The transverse section of its pseudocolumella, large in diameter, is rounded in the outline." That specimen, not illustrated by Gorskiy (1932), is here illustrated in Figure 2C–G. Its morphology resembles that of specimen no. 396 identified by Gorskiy (1932, p. 55, pl. 5, fig. 22) as *Lophophyllum* sp. He possessed three thin sections of the specimen 396, but described and illustrated only its ontogenetically most advanced growth stage. The earliest growth stage of that corallite that remained after thin sectioning is illustrated here in Figure 2A, B.

The third specimen, bearing the collection number 393, closely resembles the first one in morphology (Fig. 3E, F). However, it is partially embedded in rock, whereas two fragments of the first specimen are not. Gorskiy (1932) did not mention the dual preservational characters of his specimens. Thus, the third specimen may either be part of the lectotype (designated here), or a mature fragment of another specimen.

The fifth specimen bearing the collection number 398), described by Gorskiy (1932, p. 55, pl. 5, fig. 23) as a second *Lophophyllum* sp., differs considerably from the remaining four corallites (Figure 1). Its

brief redescription and reillustration is included in the present paper as a kind of a supplement to the knowledge of the Kirghiz Steppe coral fauna.

3. Systematic palaeontology

Order Stauriida Verrill, 1865

Suborder Aulophyllina Hill, 1981

Family Aulophyllidae? Dybowski, 1873

Remarks. None of the specimens described here can be assigned confidently to the family Aulophyllidae. However, that family allows to utilise at least such characters as a distinct pseudocolumella and dissepimentarium that do occur in some of Gorskiy's (1932) specimens. Specimen 398, which resembles both *Amygdalophyllum* Dun and Benson, 1920 and some specimens of *Arachnolasmella* Bykova, 1966 from Kazakhstan, may belong to that family, if the Mississippian *Amygdalophyllum* from Australia is truly related to the European and North African taxa included in that genus. My doubts in that respect are expressed in the other paper (Fedorowski 2018) and are not repeated here. Also, the relationship with Aulophyllidae of specimens described here as gen. nov., sp. nov. 1 and 2 can be contested. However, the main characters of those unnamed species, especially the first one, point to that family, rather than to any other family of rugose corals described to date.

Genus *Amygdalophyllum*? Dun and Benson, 1920

Amygdalophyllum? sp.

Figure 1

Material. Peel taken from a transverse section of a fragmentary, partially dolomitised corallite with external surface in part eroded.

Description. Corallite with n:d value 38:22 mm (diameter slightly incomplete). Major septa long, spindle shaped, thickest in outer tabularium and inner dissepimentarium, most reaching pseudocolumella; their inner margins either straight or slightly curved. Four pairs of major septa successively, but slightly shortened towards long, thin cardinal septum. Direct connection of that septum with pseudocolumella very probable, but corallite broken in this part. Counter septum broken, but probably joining pseudocolumella as indicated by short knob attached to pseudocolumella opposite to that septum (Fig. 1, upper). Minor septa, much thinner than major septa, intersect approximately three quarters of dissepimentarium. Cardinal fossula indistinct or absent. Alar pseudofossulae absent, but last major septa inserted in counter quadrants underdeveloped. Pseudocolumella strong, oval; morphology uncertain. May be monoseptal, i.e., may not incorporate septal lamellae. Gorskiy (1932, p. 55) wrote (translated here

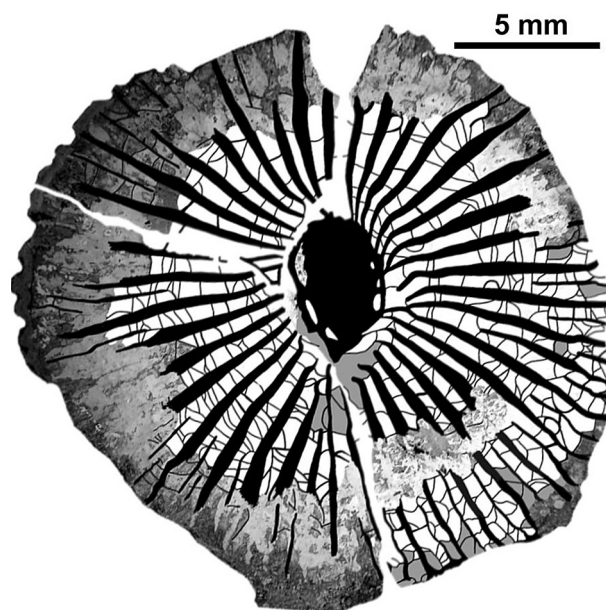


Fig. 1. *Amygdalophyllum*? sp. Transverse section, mature growth stage. Adelben-saya Hills (Yagovkin's section 33/519), lower Viséan, compared by Gorskiy (1932, p. 57) to the *Seminula* Zone in old British terminology.

from Russian), "a dark strip observed along the long axis divides the pseudocolumella into two symmetrical halves." Thus, he did not observe details in the morphology seen by him in the pseudocolumella of another *Lophophyllum* sp., here described as gen. nov. 1, sp. nov. 2. Dissepimentarium occupies approximately half of corallite radius. Lack of visible dissepimentarium/tabularium boundary, i.e., occurrence of distabularium makes that width uncertain. Preserved dissepiments exclusively interseptal, mostly regular, resembling irregular herringbone pattern in part. Rare lateral dissepiments occur. Numerous sections of tabulae suggest their elevation to pseudocolumella.

Remarks. The small size of the fragment of the corallite present in the collection and its poor preservation preclude any reliable identification. The lack of indisputable data concerning the inner morphology of the pseudocolumella is especially important in that respect. The direct connection of the cardinal and counter major septa with the pseudocolumella is almost certain, despite fissures in those fragments of the corallite. Doubts mentioned preclude a closer comparison of the specimen discussed either to the Australian type species of the genus *Amygdalophyllum*, or to the European and North African species of similar morphology.

Occurrence. Adelben-saya Hills (Yagovkin's section 33/519); lower Viséan, compared by Gorskiy (1932, p. 57) to the *Seminula* Zone in old British terminology.

Gen. nov. 1, sp. nov. 1

Figure 2C–G

1932. *Lophophyllum subtortuosum* Gorskiy, p. 54 (second specimen).

Material. Fragment of one corallite. Three peels available for study.

Description. In what probably is the late neanic/early mature growth stage (Fig. 2C–E), with n:d value 26:6.0 mm, major septa are thickest at external wall, twist around a thick, almond-shaped pseudocolumella. Thin inner margins of almost all major septa, cardinal and counter septa included, meet pseudocolumella; some pressed into its peripheral part. Minor septa very short, extending slightly from thickness of external wall. Dissepiments appear in some septal loculi. Cardinal fossula absent. In mature growth stage (Fig. 2F, G), with n:d value 36:8.0 mm, vortex of major septa more distinct than in earlier growth stage. Thin inner margins of major

septa meet, but not penetrate thick, oval pseudocolumella. Peripheral part of corallite, approximately one-sixth of corallite radius in width, occupied by very thin-walled irregular and herringbone dissepiments. Inner wall thick. Margins of major septa outside inner wall thin. Some minor septa may be interrupted in dissepimentarium, but inner margins of all thick in tabularium. Minor septa adjacent to counter septum contraclined or contratingent. Tabularium clearly biform as indicated by arrangement of peripheral sections of tabulae.

Remarks. The main differences between gen. nov. 1, sp. nov. 1 and gen. nov. 1, sp. nov. 2 are listed below; these are large enough for distinction not only at the species level, but also at a higher taxonomic level. The specimen identified as gen. nov. 1, sp. nov. 1 resembles the new Bashkirian genus from the Donets Basin in possessing a simple pseudocolumella, i.e., not incorporating septal lamellae and in a distinct

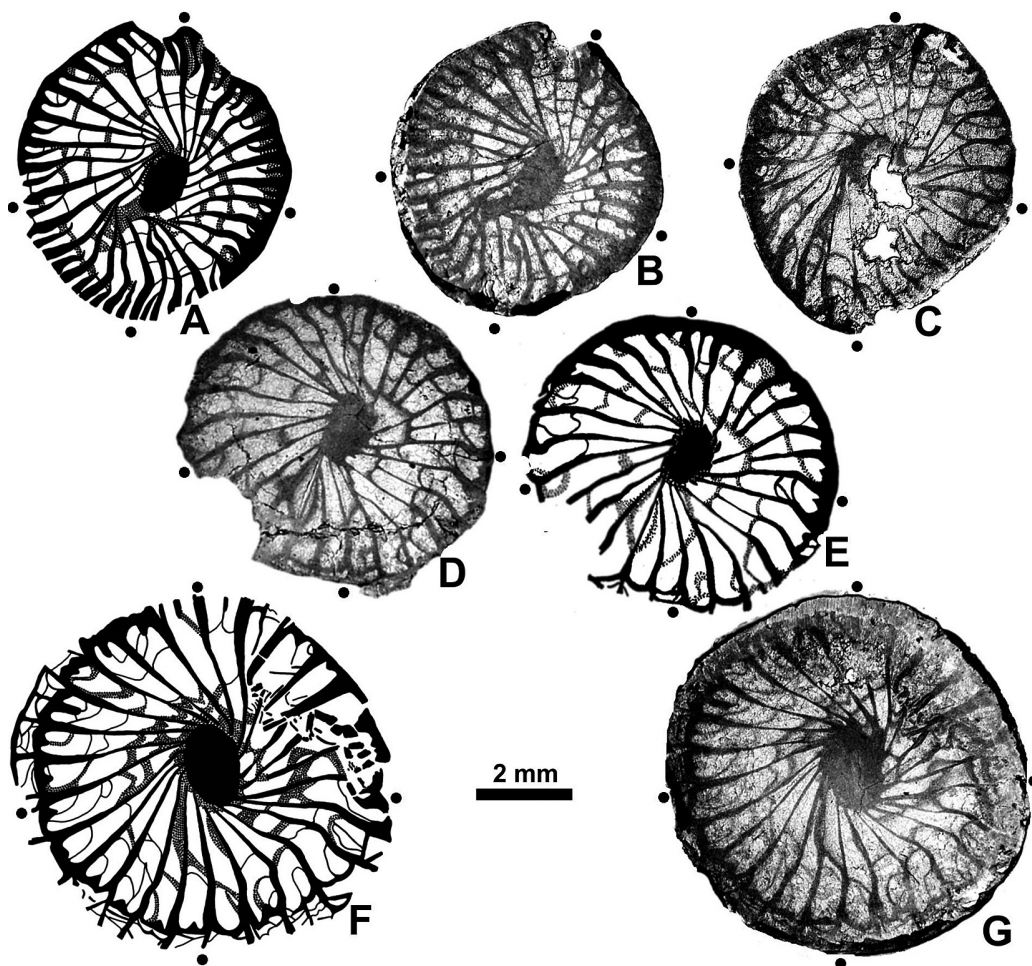


Fig. 2. A, B – Gen. nov. 1, sp. nov. 2. Specimen 396. Late neanic/early mature growth stage. Transverse sections; C–G – Gen. nov. 1, sp. nov. 1. Specimen 393. Second corallite described by Gorskiy (1932) as *Lophophyllum subtortuosum*; C–E – late neanic/early mature growth stage; G, H – mature growth stage. A, E and F are computer drawings of B, D and G, respectively. Both from Kozyrev's section no. 34, Tournaisian. Cardinal, counter and alar septa marked by dots. Scale bar (between F and G) for all images.

vortex of the major septa surrounding the pseudocolumella. The species discussed differs from the Donets Basin species in possessing the tabularium biform and the cardinal fossula absent. However, a distant relationship of those two taxa looks more probable than the relationship of the Donets Basin species to any other rugose coral taxon.

Occurrence. Kozyrev's section 34, Tournaisian (see Gorskiy 1932, table on p. 57).

Gen. nov. 1, sp. nov. 2

Figure 2A, B

1932. *Lophophyllum* sp. Gorskiy, p. 55, pl. 5, fig. 22.

Material. Small fragment of an immature part of corallite. One peel available for study.

Description. In what possibly is the late neanic growth stage with n:d value 28:6.0 mm, major septa wedge shaped, thickest near external wall, twisted distinctly around pseudocolumella. In right corallite half of all major septa directed towards cardinal septum side of thick, almond-shaped pseudocolumella. Some of them meet pseudocolumella. In left corallite half of all major septa grouped near counter septum side of pseudocolumella. Cardinal septum long, intersecting narrow, indistinct cardinal fossula, but not meeting pseudocolumella. It terminates in sclerenchymal thickening of tabula that closes cardinal fossula. Counter septum joins pseudocolumella. Minor septa slightly thinner than peripheral parts of major septa, contratingent and contraclined, form distinct peripheral margin of corallite. Dissepimentarium probably developed in part of corallite (Fig. 2A, lower left). Sections of biform tabulae present in other corallite parts imitate dissepiments.

Mature growth stage with n:d value 32:12 mm known only from description and one picture published by Gorskiy (1932, p. 55, pl. 5, fig. 22). The following sentences of Gorskiy's (1932) description should be cited as important, "...inner margins of major septa sink into the thickness of the pseudocolumella without reaching its center. That result in the star-shaped morphology of the pseudocolumella." This is here interpreted as a pseudocolumella complex, i.e., composed of median lamella and contiguous septal lamellae. "Twisted arrangement of major septa is observed." "...one - two rows of dissepiments,..." "Minor septa penetrate the intermediate zone [= tabularium] slightly deeper than the width of the peripheral zone [=dissepimentarium], 1-2 mm thick." The minor septa are here interpreted as being free ended, i.e., not contratingent. [All sentences translated here from Russian]. Only some of those statements can be determined from poor Gorskiy's (1932) illustration cited and none can be documented by new illustration.

Remarks. All data cited above from Gorskiy's (1932) description of the mature growth stage of the specimen discussed are accepted. My confidence in that respect rely on the reliability of his observations, checked by me in many other species described by I.I. Gorskiy in the cited and in several later papers published by him. His identifications of taxa may be disputable, but not the morphological details he described.

Three characters of the species described, i.e., the pseudocolumella complex, the minor septa contratingent in the early ontogeny and the tabularium biform are of special taxonomic value. They distinguish this specimen from both the specimen described above as Gen. nov. 1, sp. nov. 1 and from the Bashkirian new genus of the Donets Basin. The major septa twist around the thick pseudocolumellae in all three taxa, but the pseudocolumella is complex, i.e., it incorporates septal lamellae only in gen. nov. 1, sp. nov. 2. The occurrence of the contratingent minor septa in the early ontogeny makes any relationship of the latter species to indisputable representatives of the family Aulophyllidae unlikely.

Occurrence. Kozyrev's section 34, Tournaisian (see Gorskiy 1932, table on p. 57).

Incertae familis

Gen. nov. 2 *subtortuosum* (Gorskiy, 1932)

Figure 3A-F

1932. *Lophophyllum subtortuosum* Gorskiy, pp. 54, 85, pl. 5, figs 20, 21.

Lectotype. Specimen 393a, Kozyrev's section no. 34; Tournaisian.

Material. Incomplete specimen indicated as lectotype and either another specimen numbered 393 or a fragment of the lectotype. Three peels taken from transverse sections available for study.

Description. Ontogenetically earliest (n:d 19:4.0 mm) and most advanced (n:d 27:6.0 mm) growth stages preserved similar in morphology. Major septa amplexoid, pinnately arranged, wedge shaped, thick near external wall, thread like thin in inner margins. Most meet thick pseudocolumella. Counter-lateral septa meet counter septum, last pair of major septa in cardinal quadrants meet cardinal septum. Most major septa, except for two pairs mentioned, but including protosepta, permanently connected to median lamella. That attachment documented either directly by their continuous blades or by apparently separated inner margins sticking out from pseudocolumella when sectioned immediately below tabula. Division of major septa mentioned already by Gorskiy (1932, p. 54). Inner morphology of pseudocolumella unknown. Cardinal fossula either absent, or appear as shallow and short depression near external wall. Its probable oc-

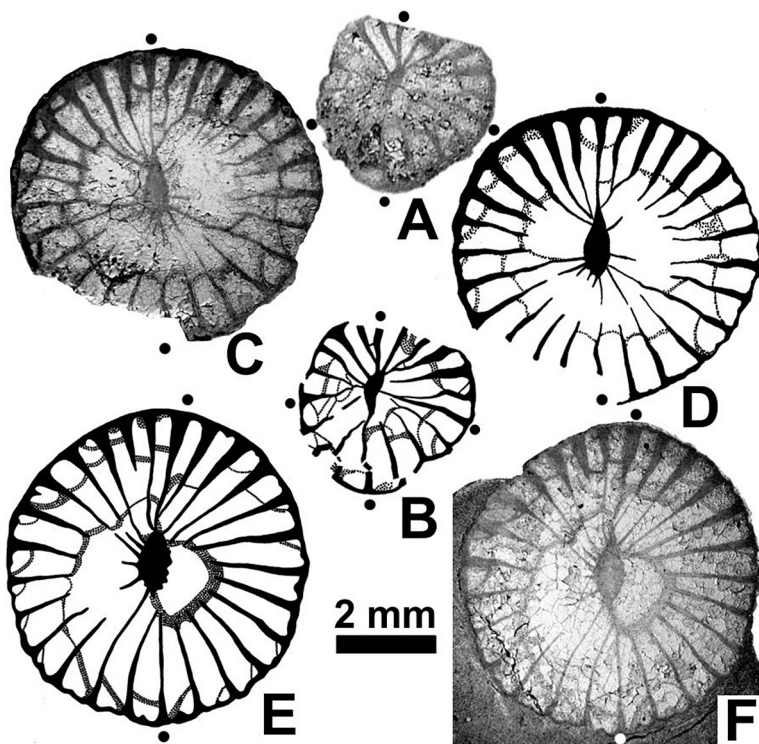


Fig. 3. Gen. nov. 2 *subtertiosum* (Gorskiy, 1932). Transverse sections. A–D – specimen 393, lectotype; A, B – neanic growth stage; C, D – mature growth stage; E, F – specimen 393, either part of the lectotype or of another specimen not mentioned by Gorskiy (1932). Mature growth stage. B, D and E are computer drawings of A, C and F, respectively. Kozyrev's section no. 34, Tournaisian. Scale bar (between E and F) for all images.

currence documented by arrangement of peripheral sections of tabulae (Fig. 3E lower). Alar pseudofossulae absent. Minor septa as short protuberations of external wall at most. Dissepimentarium absent. Gorskiy (1932, p. 54) considered the occurrence of dissepiments and described them as follows: "In the counter quadrants, at places where the septa are not thickened, there is one row, sometimes (near the counter quadrant) two rows of obliquely arranged dissepiments." [p. 85, his own English translation]. The arrangement and thickening of major septa in early growth stage (Fig. 3A, B) suggest orientation of specimens opposite to that described by Gorskiy (1932). Direction of dissepiment-like skeletal structures at peripheries of mature growth stage (Fig. 3C–F) allows to consider those bodies as sections of peripheral parts of tabulae.

Remarks. To some extent, the absence of a longitudinal section complicates comparison of this species to other taxa. It certainly does not belong either to *Lophophyllum* or to *Lophophyllidium* Grabau, 1928. The radial arrangement of the major septa, the absence of distinct cardinal fossula and the connection of the pseudocolumella to both the cardinal and the counter septum, i.e., the cardinal septum long, rules out any relationship of that specimen to *Lophophyllum*. The radial arrangement of the major septa of the species discussed may point to *Lophophyllidium*, but this is the only character in common for those two taxa, certainly not sufficient for suggesting a closer relationship. The morphology in the trans-

verse section of gen. nov. *subtertiosum* resembles that of the Brigantian and early Serpukhovian *Siphonodendron junceum* (Fleming, 1828). However, its most probably solitary growth form suggested by Gorskiy (1932, p. 54) and confirmed here on the basis of the morphology of the early growth stage, rules out such a relationship. The restriction of the material available for the present study does not allow to assign that species to genus and family.

Occurrence. As for the lectotype.

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