

# SOME NORTH AMERICAN SPECIES OF THE DEVONIAN TETRACORAL *SMITHIPHYLLUM*

by A. E. H. PEDDER

ABSTRACT. The tetracoral genus *Smithiphyllum* is emended. It is shown to be closely related to *Tabulophyllum* and consequently is transferred from the Spongophyllidae to the Endophyllidae.

Additional material of the type species, *S. imperfectum* (Smith), is described and three new Frasnian species, *S. belanskii* from Iowa, *S. kindlei* from Alberta, and *S. whittakeri* from the Northwest Territories, are erected.

SPECIES now assigned to *Smithiphyllum* were first erected for specimens from Timan, at the turn of the century. Since then, others have been named for North American specimens, but recent workers have referred these to quite different genera and even families.

Apart from the description of new species, the purpose of this paper is to redefine the genus and elucidate its relationships.

The following abbreviations are used:

GSC for Geological Survey of Canada (Ottawa) type number  
SUI for State University of Iowa (Iowa City) type number  
N.W.T. for Northwest Territories.

## SYSTEMATIC PALAEOLOGY

Family ENDOPHYLLIDAE Torley 1933

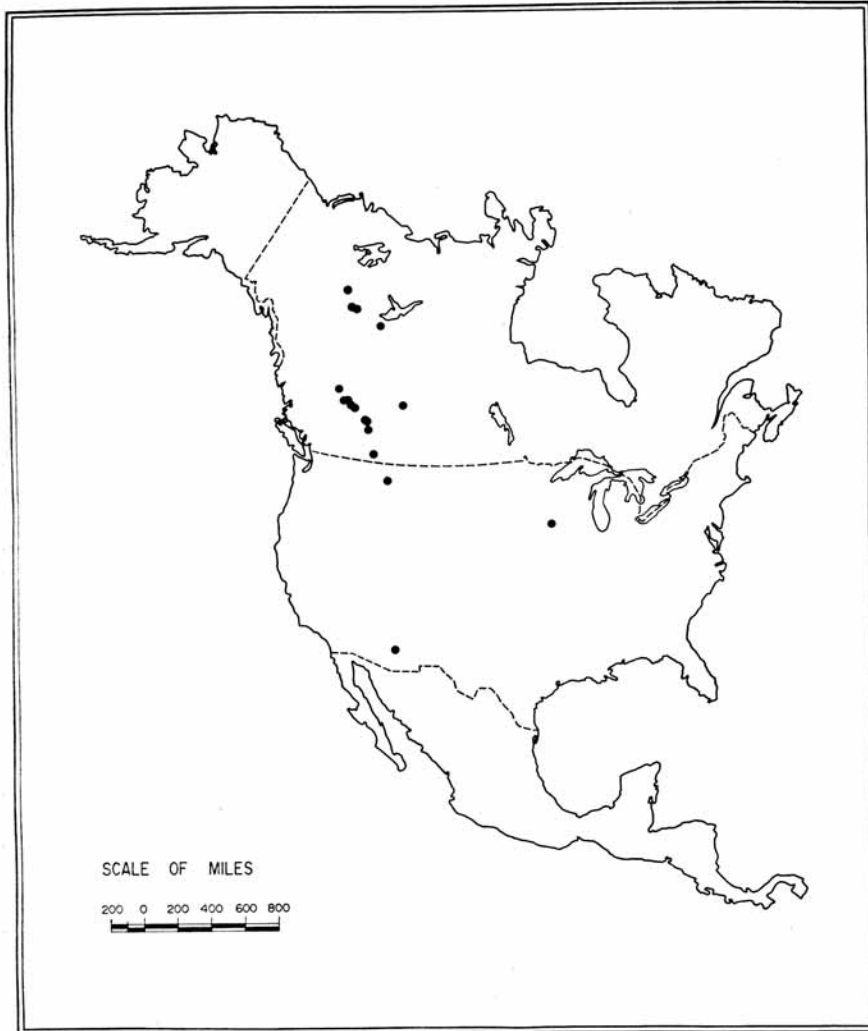
Genus SMITHIPHYLLUM Birenheide 1962, emend.

*Type species (original designation).* *Spongophyllum imperfectum* Smith. See below, p. 622.

*Description.* Fasciculate to subcerioid tetracorals with a relatively thick wall. The septa are radially arranged, typically smooth and clearly differentiated into two orders. The major may be withdrawn both axially and peripherally and the minor are commonly represented merely by ridges on the interior of the wall and short crests on the dissepiments. The dissepimentarium is narrow and may be lonsdaleoid; in some species, including the type, it is only intermittently developed. The tabulae are broad and in narrow corallites many are complete. They are generally gently sinuous in longitudinal section and are commonly downturned peripherally.

The minute skeletal structure is imperfectly preserved in much of the material studied. The skeletal material of the wall is almost entirely lamellar. As seen in transverse section the lamellae are deflected towards the axis at the bases of the septa and in longitudinal section they lie oblique to the wall surfaces with their upper edge away from the periphery. A thin dark line (axial plate of Flower 1961, p. 28) separates contiguous corallites; however, no trace of this is present in most free corallites. Fibre fascicles have not been observed, but sparse, dark, and apparently structureless spine-like bodies within the septa and walls may represent trabeculae.

[Palaeontology, Vol. 8, Part 4, 1965, pp. 618-28, pls. 88-89.]



TEXT-FIG. 1. Known distribution of *Smithiphyllum* in North American Frasnian beds. Occurrences indicated by a black circle.

*Additional species assigned*

- Smithiphyllum belanskii* sp. nov. See below, p. 623.  
*Smithiphyllum kindlei* sp. nov. See below, p. 625.  
*Spongophyllum lituus* Smith 1945, p. 56, pl. 11, figs. 5a-d. Redknife Formation (late Frasnian), Jean Marie River, N.W.T.  
*Spongophyllum martinense* Stumm 1948, p. 41, pl. 11, figs. 9, 12; pl. 12, fig. 6. Martin Limestone (Middle Frasnian), Dear Creek Valley, Arizona.  
*Cyathophyllum stuckenbergii* Lebedew 1902, pp. 179, 180, pl. 2, figs. 21-24. Uchta River, Timan. Probably Frasnian.  
*Cyathophyllum weberi* Lebedew 1902, p. 178, pl. 4, figs. 49-53. Uchta River, Timan. According to Soshkina (1952, p. 70) this occurs in the Middle Frasnian D<sub>3</sub> 2-3 beds.  
*Smithiphyllum whittakeri* sp. nov. See below, p. 626.

*Species requiring further description*

- Spongophyllum expansum* Stumm 1937, pp. 436, 437, pl. 53, fig. 11; pl. 55, figs. 6a, b. Basal 500 feet of the Nevada Limestone, Eureka region, Nevada. Stumm considered this to be a lower Middle Devonian species; it is now thought to be Emsian (Johnson 1962).  
*Spongophyllum nevadense* Stumm 1937, pp. 435, 436, pl. 53, fig. 10; pl. 55, figs. 5a, b. Basal 500 feet of the Nevada Limestone (Emsian), Eureka region, Nevada.  
*Calophyllum tschernyschewi* Lebedew 1902, p. 148, pl. 2, figs. 29-31. Uchta River, Timan. Probably Frasnian. See under the discussion of *S. imperfectum*.

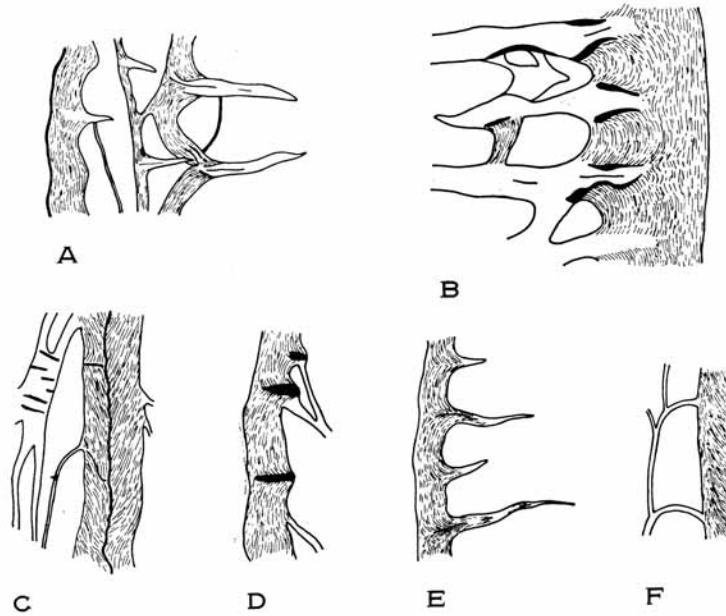
*Distribution.* At present the genus is known definitely only from the Frasnian of North America and Timan. Its distribution in the former is indicated in text-fig. 1. In addition to the described species the figure indicates the occurrence of some undescribed forms as well as others listed by Sloss and Laird (1945), Crickmay (1962, p. 4), and by McLaren and Mountjoy (1962, pp. 8, 23).

*Discussion.* Birenheide (1962, p. 82) included completely cerioid species, such as *Spongophyllum alpenense* Ehlers and Stumm, *S. brevisseptatum* Stumm, and *S. missouriense* Ehlers and Stumm, in the genus. The present writer prefers to regard these species as constituting either a new genus, or at least a subgenus. Another species included in *Smithiphyllum* by Birenheide is *Spongophyllum pax* Smith. This is based on a specimen found in a river boulder and is therefore of unknown stratigraphical origin. Crickmay (1960, pp. 878, 879) listed it in Givetian faunas from British Columbia, but Norford (1962, p. 27) has suggested that the species is Silurian and placed it in *Columnaria*.

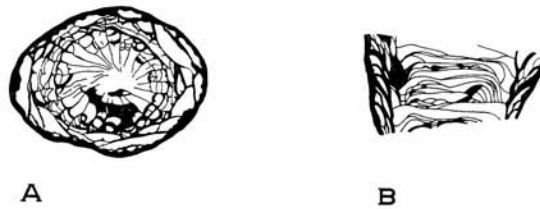
In recent years the species now grouped in *Smithiphyllum* have most frequently been referred to *Spongophyllum*. The latter cannot be said to be a fully understood genus since the minute structure of the type species is imperfectly known, but it does differ from *Smithiphyllum* in being cerioid and by having essentially concave tabulae and a well-developed dissepimentarium, even in very narrow corallites.

*Smithiphyllum* is close to *Tabulophyllum* (text-figs. 2B, D; 3A, B) and in fact Soshkina (1952, p. 70) assigned *S. weberi* to *Tabulophyllum*. Both genera possess a lamellar wall, broad typically peripherally downturned tabulae, and similar septa. Furthermore, the discontinuity, which is seen in the dissepimentarium of such species as *Smithiphyllum imperfectum* and *S. belanskii*, has also been figured in various species of *Tabulophyllum* (e.g. Frech 1885, pl. 10, fig. 2; Sloss 1939, pl. 11, fig. 18). *Smithiphyllum* is distinguished from *Tabulophyllum*, which is solitary, by its fasciculate to subcerioid form.

Birenheide (1962, p. 69) placed *Smithiphlym*, and also doubtfully *Tabellaephyllum*, in the Spongophyllidae. However, this writer feels that the discontinuous crest-like septa and the peripherally downturned tabulae indicate a closer relationship with the Endophyllidae.



TEXT-FIG. 2. Minute skeletal structure (as far as preserved) in *Smithiphyllum* and *Tabulophyllum*. All  $\times 15$ . A, C. *Smithiphyllum belanskii* sp. nov., A from a transverse section of the paratype, SUI 11617, C from a longitudinal section of the holotype, SUI 11616. B, D. *Tabulophyllum mcconnelli* (Whiteaves), B from a transverse section of toptype, GSC 17547, from the Escarpment Formation (middle Frasnian) on Hay River, N.W.T. D from a longitudinal section of GSC 17548 from the Ferques Limestone (middle Frasnian) in the Parisienne Quarry, near Ferques, Boulogne region, France. E, F. *Smithiphyllum imperfectum* (Smith), from transverse and longitudinal sections, respectively, of GSC 17543.



TEXT-FIG. 3. *Tabulophyllum rotundum* Fenton & Fenton,  $\times 2$ . Based on toptype GSC 17549 from Cerro Gordo Member of the Lime Creek Formation at Rockford, Iowa. This specimen combines features considered by Fenton and Fenton (1924) as being diagnostic of both *T. rectum*, the type species of *Tabulophyllum*, and *T. rotundum*. A, transverse section. B, longitudinal section.

*Smithiphyllum imperfectum* (Smith 1945)

Plate 88, fig. 7; Plate 89, figs. 1-3, 10-12; text-figs. 2E, F, 4A-I

1945 *Spongophyllum imperfectum* Smith, pp. 55, 56, pl. 11, figs. 3a-g.

*Holotype.* GSC 6307. Upper Devonian, about one mile below the upper end of the middle gorge of Jean Marie River, N.W.T. In current stratigraphical terms (Belyea and McLaren 1962, pp. 6, 7) this specimen was obtained from the Redknife Formation (late Frasnian).

*Other material.* GSC 17543. Kakisa Formation (late Frasnian), 4 miles (direct) above the mouth of Poplar River, N.W.T. Collected by the writer in 1960 with *Endothyra* sp., *Mictophyllum modicum* Smith, *M. semidilatatum* Smith, *Hexagonaria magna* (Webster and Fenton), *Disphyllum* sp., *Tabulophyllum* sp. close to *T. mcconnelli* (Whiteaves), *Thamnopora* spp., *Alveolites* sp., *Syringopora* sp., *Schizophoria* sp., *Nervostrophia* sp., *Atrypa* sp., *Cyrtospirifer* sp., *Cranaena* sp., and *Scutellum* sp.

*Description.* The growth form is dendroid; in most cases the offsets diverge widely from the parent corallite so that the corallum has the appearance of being well spread out. Specimen GSC 17543, which was not completely collected, measured about 150×100×70 mm. before sectioning. The corallites are sub-cylindrical and have an adult diameter of between 7 and 9 mm. Increase is lateral. The exterior of the exposed corallites bear rugae, but not interseptal ridges.

Although the wall is generally about 0.4 mm. thick, it varies between 0.25 and 0.75 mm. (Smith gives the range as 0.5 to 0.75 in the holotype); it consists of a very thin dark outer axial plate and an inner much thicker lamellar layer.

The septa are smooth, radially disposed and well differentiated into two orders. The major taper towards their axial extremity where they are very thin; most are continuous lamellae typically extending from one- to two-thirds the distance to the axis; some are peripherally withdrawn. The minor septa are very short, most are less than 0.5 mm. long and in young corallites they may be almost imperceptible. Number of major septa ranges from nineteen at 6.5 mm. diameter to twenty-two at 9.0 mm. diameter.

The dissepimentarium is intermittently developed and is entirely absent in some longitudinal sections; where it is developed it consists of a single row of elongate dissepiments numbering about ten in 10 mm.

The tabulae are broad and may be predominantly complete. Some are very nearly flat, but most are very gently sinuous as seen in longitudinal section.

*Discussion.* The synonymy and distribution of the species is fully treated elsewhere (Predder in press) and is not repeated here.

The cylindrical corallite described by Lebedew (1902, p. 148, pl. 2, figs. 29-31) under the name *Calophyllum tchernyschewi* is similar to isolated corallites of *S. imperfectum*.

## EXPLANATION OF PLATE 88

All figures ×2

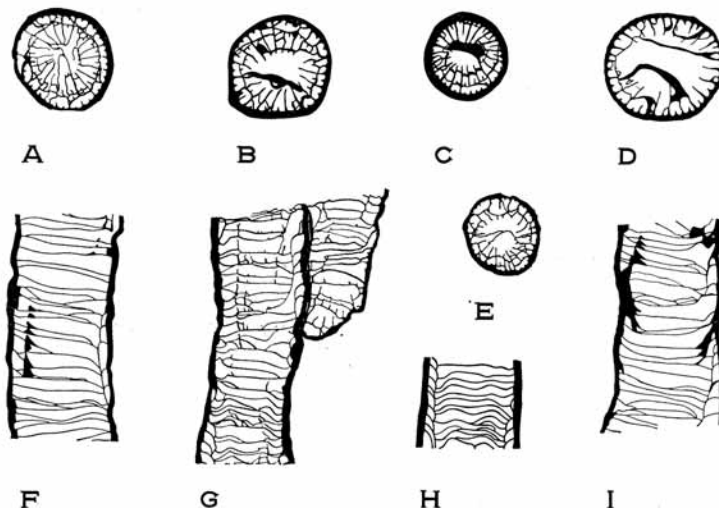
Figs. 1-3, 5. *Smithiphyllum belanskii* sp. nov. from the Shellrock Formation, Iowa. 1-3, Holotype, SUI 11616. 5, Paratype, SUI 11617.

Fig. 4. *Smithiphyllum whittakeri* sp. nov. from the Redknife Formation, N.W.T. Holotype, GSC 17545.

Fig. 6. *Smithiphyllum kindlei* sp. nov. from the Mount Hawk Formation, Alberta. Holotype, GSC 17544.

Fig. 7. *Smithiphyllum imperfectum* (Smith) from the Redknife Formation, N.W.T. GSC 17543.

If Lebedew's species is based on an individual corallite of a fasciculate corallum, it appears to differ from *S. imperfectum* only in having as many as twenty-seven major septa at its full diameter of 9 mm.



TEXT-FIG. 4. *Smithiphyllum imperfectum* (Smith),  $\times 2$ . Based on figures given by Smith and Birenheide of the holotype, GSC 6307, and original figures based on GSC 17543. A-C, E, transverse sections of the holotype. D, transverse section of GSC 17543. F, I, longitudinal sections of GSC 17543. G, H, longitudinal sections of the holotype.

*Smithiphyllum belanskii* sp. nov.

Plate 88, figs. 1-3, 5; Plate 89, figs. 13, 16; text-figs. 2A, C; 5A-D

*Name derivation.* The species is named for the late C. H. Belanski in recognition of his contribution to the study of the Shellrock Formation and its fauna.

*Holotype.* SUI 11616. Mason City Member of the Shellrock Formation (early Frasnian) at Nora Springs, Floyd County, Iowa. Collected by the writer in 1956 with calcispheres, stromatoporoids and *Phillipsastrea websteri* (Belanski).

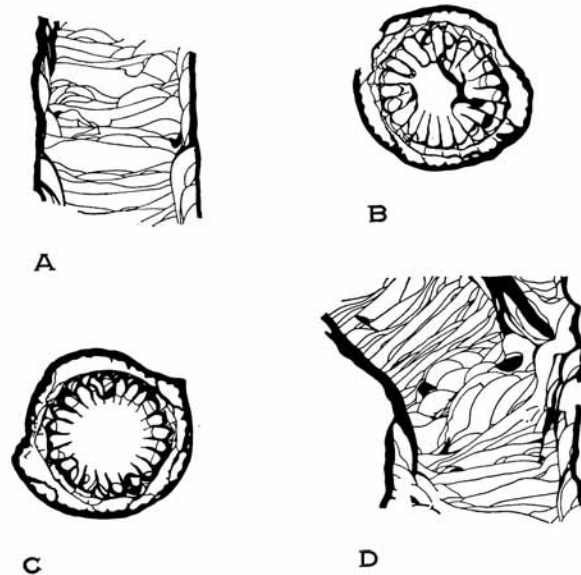
*Paratype.* SUI 11617. Same horizon, locality, and collector as the holotype.

*Diagnosis.* Maximum corallite diameter about 14 mm. Major septa up to twenty-five in number and withdrawn both axially and peripherally. Minor septa very suppressed. Dissepimentarium discontinuous.

*Description.* The corallum is dendroid to phaceloid. The largest specimen studied is the holotype, which was incompletely collected and measured about  $100 \times 90 \times 60$  mm. before sectioning. Free corallites are subcylindrical, but contiguous ones may have their shape modified by pressure from adjacent corallites. They appear to have attained their full diameter of from 14 to 16 mm. slowly, so that most transverse sections show numerous

corallites of less than maximum diameter. Increase is lateral. The external features of the type specimens are completely masked by matrix.

The wall consists of an inner lamellar layer and a dark outer axial plate; the latter is extremely thin and only clearly visible between touching corallites. The thickness of the wall varies between 0.2 and 1 mm.



TEXT-FIG. 5. *Smithiphyllum belanskii* sp. nov.,  $\times 2$ . Based on the holotype, SUI 11616 and the paratype, SUI 11617. A, D, longitudinal sections of the holotype. B, transverse section of the holotype. C, transverse section of the paratype.

The septa are meagrely developed, radially arranged, and are highly differentiated into two orders. The major are smooth and spring from either the interior of the wall or a dissepiment; in addition to being peripherally discontinuous, they are withdrawn axially, so that few extend more than two-thirds the distance to the axis and many

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EXPLANATION OF PLATE 89

All figures  $\times 2$

Figs. 1-3, 10-12. *Smithiphyllum imperfectum* (Smith) from the Redknife Formation, N.W.T. GSC 17543.

Figs. 4, 6, 19, 20. *Smithiphyllum whittakeri* sp. nov. from Redknife Formation, N.W.T. 4, 6, 20, Paratype, GSC 17546. 19, Holotype, GSC 17545.

Figs. 5, 7-9, 14, 15, 17, 18. *Smithiphyllum kindlei* sp. nov. from the Mount Hawk Formation, Alberta. Holotype, GSC 17544.

Figs. 13, 16. *Smithiphyllum belanskii* sp. nov. from the Shellrock Formation, Iowa. 13, Paratype, SUI 11617. 16, Holotype, SUI 11616.

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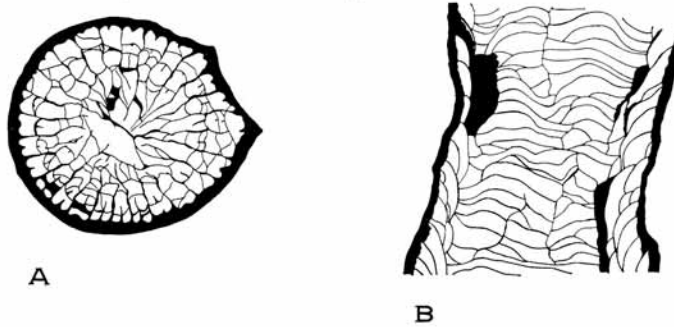
considerably less. The minor septa are mere ridges on the interior of the wall and some are totally suppressed. Number of major septa ranges from none at 3 mm. diameter to twenty-five at 15.5 mm. diameter.

The dissepimentarium is lonsdaleoid and as viewed in longitudinal section typically consists of a single row of elongate dissepiments; two rows occur in parts of some corallites and in places the dissepimentarium is entirely absent.

The tabulae are broad and many are quite complete; in longitudinal section they are mostly very slightly convex or slightly sinuous.

*Discussion.* The new species resembles *Smithiphyllum weberi* (Lebedew), particularly specimens figured by Soshkina (1952, pl. 4, fig. 16). It is distinguished by having a slightly more persistent dissepimentarium and by having fewer septa, which number up to seventy in *S. weberi*.

*S. martinense* (Stumm) differs from *S. belanskii* in being slightly smaller and having fewer and considerably less differentiated septa.



TEXT-FIG. 6. *Smithiphyllum kindlei* sp. nov.,  $\times 2$ . Based on the holotype, GSC 17544. A, transverse section. B, longitudinal section.

*Smithiphyllum kindlei* sp. nov.

Plate 88, fig. 6; Plate 89, figs. 5, 7-9, 14, 15, 17, 18; text-figs. 6A, B

*Name derivation.* From the late E. M. Kindle in recognition of his work on the succession of faunas in the Jasper Park region.

*Holotype.* GSC 17544. Mount Hawk Formation, 350 to 370 feet above base, Roche Ronde, Bosche Range, Jasper National Park, Alberta, 53° 14' N., 118° 01' W. Collected by P. B. Jones in 1960. Elements of the *Calvinaria albertensis* fauna, including *Thamnophyllum colemanense* (Warren) and *Smithiphyllum imperfectum* (Smith) were collected above and below the type horizon.

*Diagnosis.* Known maximum width of corallite 15 mm. Maximum septal count fifty. Major septa long and commonly not withdrawn. Dissepimentarium well developed.

*Description.* The corallum is dendroid. Before sectioning the incomplete fragment of the holotype measured about 90  $\times$  65  $\times$  55 mm. The corallites are subcylindrical where free and have adult diameters of from 12 to 15 mm. Increase is lateral. External features in the type material are largely obscured by matrix but the poorly preserved surface of one corallite bears traces of rugae.



The wall, consisting of a very thin axial plate and an inner lamellar layer, is about 0.4 or 0.5 mm. thick in the regions farthest from the septal bases.

The septa are thin, smooth, and gently to moderately sinuous; their arrangement is radial and they are strongly differentiated into two orders. The major septa are generally well developed, some are peripherally discontinuous, and a few are entirely withdrawn from the dissepimentarium. Most, however, are continuous lamellae extending variably from about one-half to the entire distance to the axis. The feebly developed minor septa are typically represented by low crests on the dissepiments and to a lesser extent the tabulae, or by ridges on the interior of the wall. Numbers of major septa range from fourteen at 4 mm. diameter to twenty-five at 15 mm. diameter.

The dissepimentarium is from 1 to 3 mm. wide; in places the dissepiments are limited to a single row as seen in longitudinal section, elsewhere they may be up to three deep; they number about ten in 10 mm.

The tabulae are broad and may be quite complete; in some cases their median profile is irregularly sinuous, in others it is peripherally downturned, or there is a peripheral trough.

*Discussion.* *Smithiphyllum kindlei* does not closely resemble any previously described species. It is, however, close to an undescribed species also occurring in the Frasnian of Alberta. *S. kindlei* is smaller, has fewer septa and a less pronounced dissepimentarium, furthermore the septa in *S. kindlei* are less withdrawn both axially and peripherally.

*Smithiphyllum whittakeri* sp. nov.

Plate 88, fig. 4; Plate 89, figs. 4, 6, 19, 20; text-figs. 7A, B

*Name derivation.* From the late E. J. Whittaker, the pioneer geologist and collector on Jean Marie and neighbouring rivers.

*Holotype.* GSC 17545. Redknife Formation (late Frasnian), middle Jean Marie Gorge, N.W.T., about 60° 24' N., 121° 10' W. Collected by R. de Wit in 1957. Specimens of *Tabulophyllum* sp. close to *T. mcconnelli* (Whiteaves), *Smithiphyllum imperfectum* (Smith), *Devonoproductus* sp., *Atrypa ciliipes* Crickmay, *Spinatrypa* sp., *Vandergrachtella kobayashii* Crickmay, and *Paracyclas?* sp. were also present in the collection.

*Paratype.* GSC 17546. Same horizon, &c. as holotype.

*Diagnosis.* Corallum probably loosely aggregate. Corallite wall thin. Corallites up to 14.5 mm. in diameter. Major septa number up to twenty-seven, regularly withdrawn axially. Minor septa comparatively well developed. Dissepimentarium narrow, but regular.

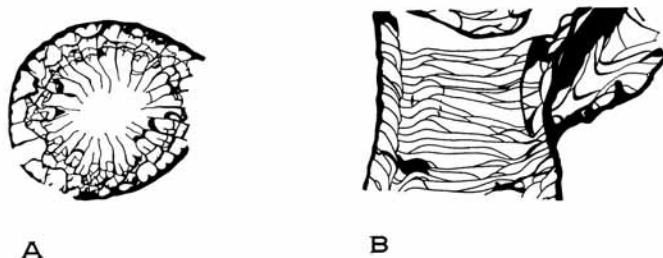
*Description.* Fragments only of the corallum are available and it is not known whether the coral is weakly aggregate or truly fasciculate. The corallites are subcylindrical and have an adult diameter of from 12 to 14.5 mm. Increase is lateral. Fine rugae are present on the exterior, but there are no interseptal ridges.

The wall consists of a very narrow exterior axial plate and a lamellar layer; in the parts furthest from the septal bases it is about 0.5 mm. thick.

The septa are thin, smooth, and most are gently sinuous as seen in transverse section; a few, however, are crenulate. They are radially arranged and clearly differentiated into two orders. The major septa are typically continuous lamellae, although some are

discontinuous in the dissepimentarium; they are withdrawn from the axis leaving a region from 2 to 4 mm. wide devoid of septa. The minor septa, which are mere ridges in young stages, become well developed in later stages; in adult corallites they are about one-half as long as the major and occur as discontinuous crests on the dissepiments and tabulae. Numbers of major septa range from nineteen at 4.5 mm. diameter to twenty-seven at 14.5 mm. diameter.

As seen in longitudinal section the dissepimentarium is typically a single row of comparatively large dissepiments, numbering from ten to twelve in 10 mm.; it is about 2 mm.



TEXT-FIG. 7. *Smithiphyllum whittakeri* sp. nov.  $\times 2$ . Based on the holotype, GSC 17545. A, transverse section. B, longitudinal section.

wide and fairly constant, although it is absent immediately below a lateral offset in the holotype.

The tabulae are broad and many are quite complete; in median profile they tend to be flat, or gently sloping, in the axial region, and sigmoidal at the periphery.

*Discussion.* The species is reminiscent of *Smithiphyllum weberi* (Lebedew), but differs in having considerably more prominent minor septa and a less lonsdaleoid dissepimentarium.

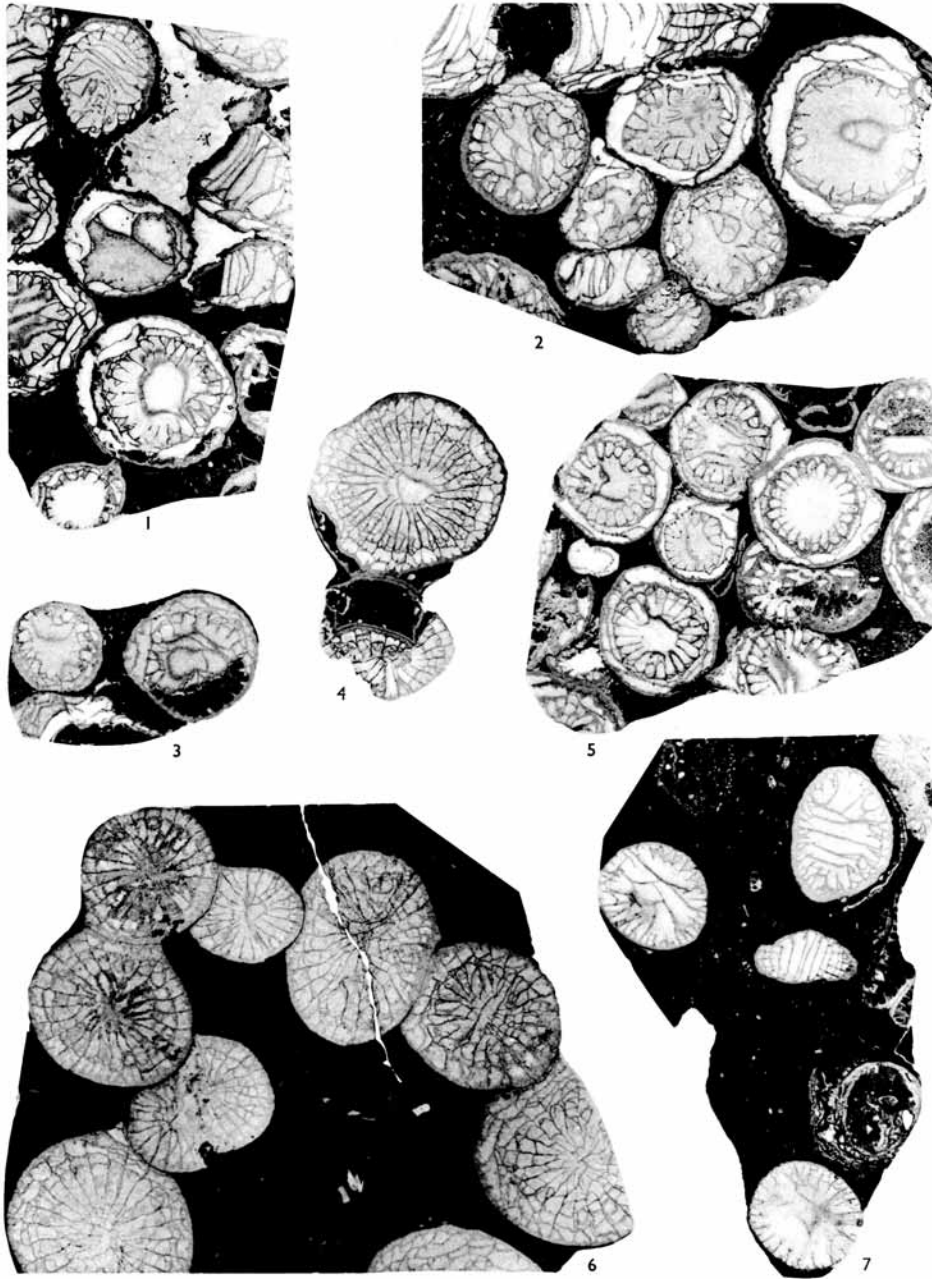
*Acknowledgements.* The Canadian specimens described in this paper were collected by geologists working for Triad Oil Co. Ltd., Calgary, Alberta, and were originally studied by the writer while employed by the same company. The management of the company has consented to the publication of this work and has kindly allowed the type specimens to be transferred to the collection of the Geological Survey of Canada. B. Whan of the technical staff of the Department of Geology of the University of New England drafted text-fig. 1.

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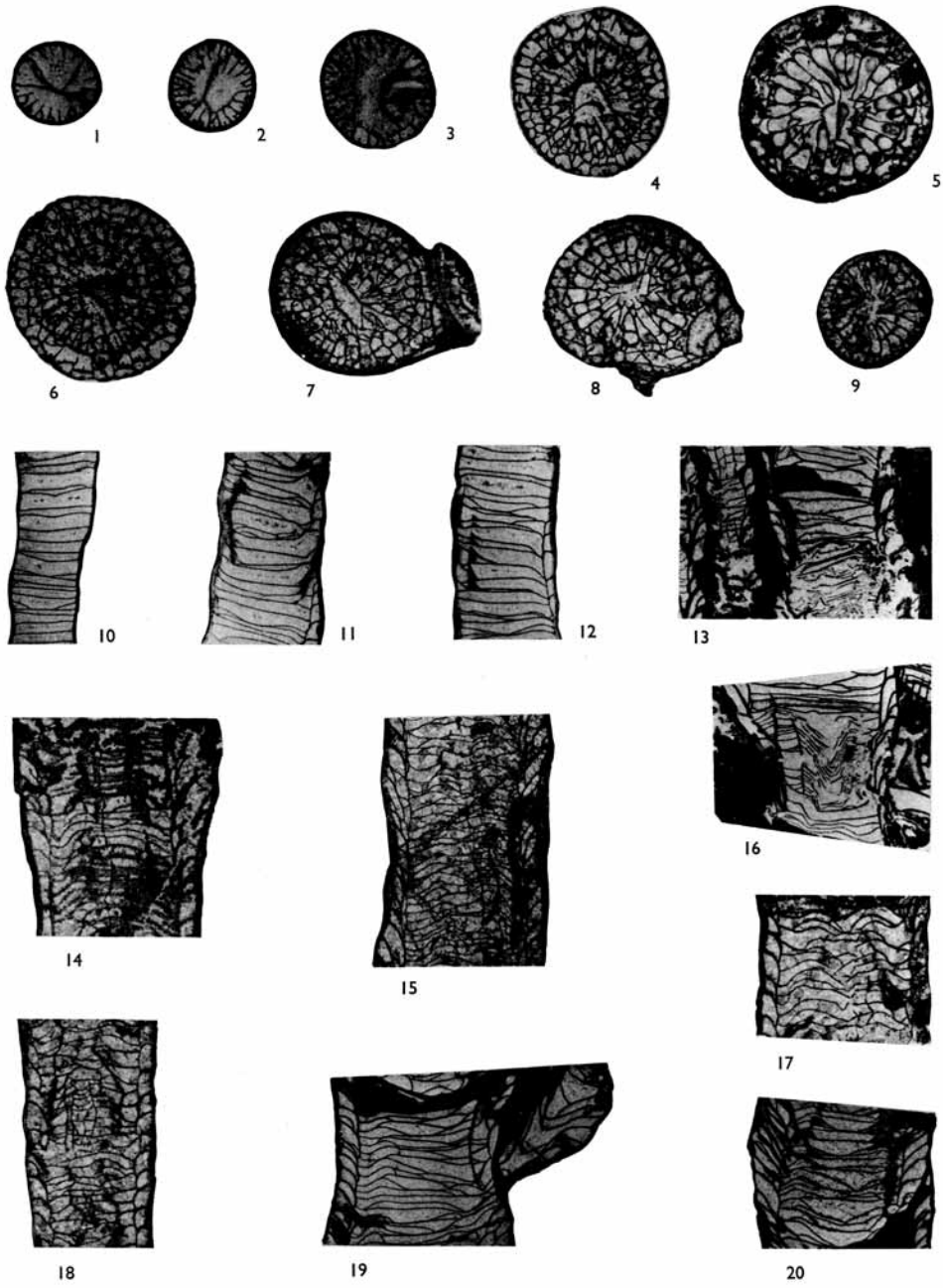
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