



Late Silurian Rugose Corals from the Cellon and Rauchkofelboden Sections (Carnic Alps, Austria)

JOHN W. PICKETT*)

1 Text-Figure, 1 Plate

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Kärnten
Karnische Alpen
Silur
Ludlow
Přídolí
Rugose Korallen

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Rugose Korallen des Obersilur aus dem Cellon- und Rauchkofelboden-Profil (Karnische Alpen, Österreich)

Zusammenfassung

Die erste aus dem Cellon-Profil der Karnischen Alpen stammende Koralle wird vom untersten Teil der Cardiola-Formation (Ludlow) als *Spongophyllum coeni* sp. nov. beschrieben. Zusätzlich werden kleine Einzelkorallen (*Metriophyllum* und *Laccophyllum*) aus verschiedenen Banken des Alticola-Kalkes im Rauchkofel-Boden-Profil (Ludlow-Přídolí) beschrieben.

Abstract

The first coral to be reported from the Cellon Section of the Carnic Alps, *Spongophyllum coeni* sp. nov., is described from the base of the Ludlovian Cardiola Formation. Additionally, small solitary corals referred to *Metriophyllum* and *Laccophyllum* are reported from different levels in the Ludlovian–Pridolian Alticola Limestone of the Rauchkofel Boden Section.

1. Introduction

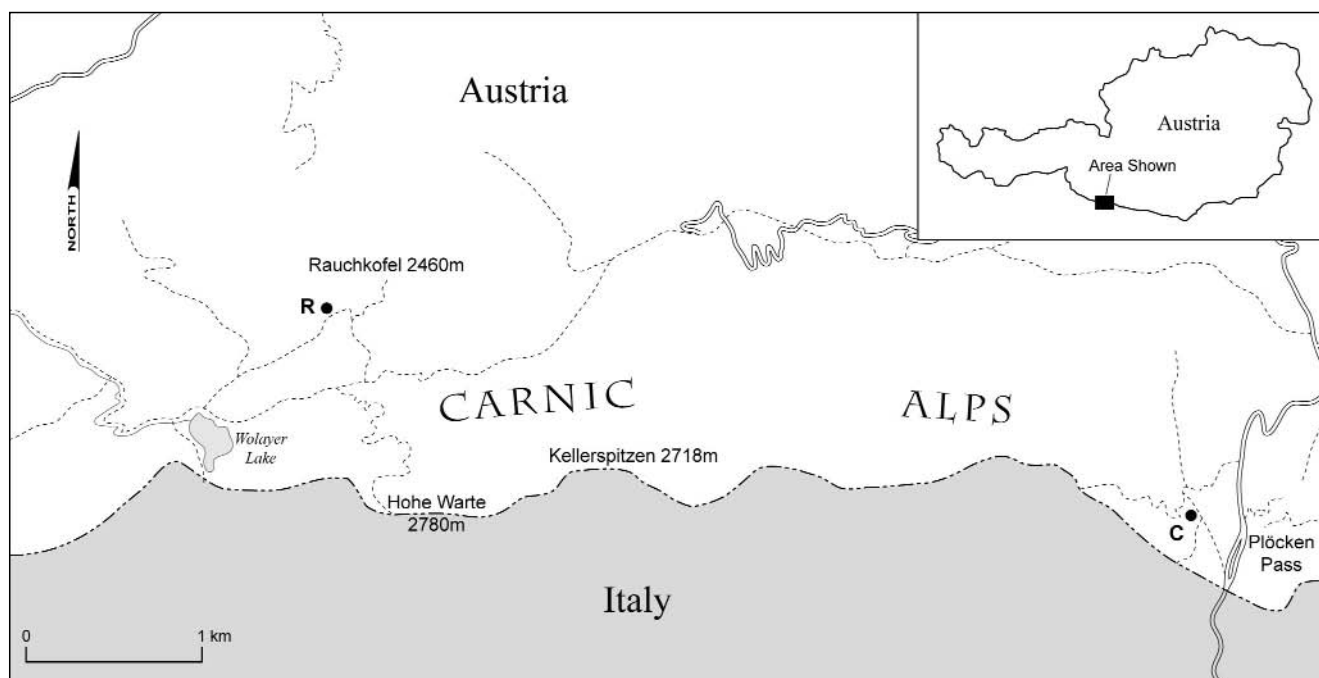
The Cellon profile in the Carnic Alps has played a significant role in international correlation almost since the early work of GEYER (1894), and certainly since the detailed work of VON GAERTNER (1931). The seminal conodont work of WALLISER (1964) served to focus interest more sharply, providing as it did the first major conodont biostratigraphy for the Silurian.

The profile lies in an area of generally pelagic facies (SCHÖNLAUB, 1997); the Kok Formation in its upper part consists of brownish-red ferruginous limestone with nau-tiloids and stylolites; the onset of the overlying Cardiola

Formation marks a deepening event and the facies of this unit is practically the deepest in the whole Silurian profile (SCHÖNLAUB, 1997). The fauna of the Cardiola Formation is dominated by vagile forms: cephalopods, trilobites, ostracods and crinoids occurring in soft micritic sediments (HUBMANN et al., 2003), although, as suggested by its name, there are also pavements of *Cardiola docens* valves (HUBMANN & SUTTNER, 2007), which provided potential settlement points for coral larvae.

Nonetheless, the presence of the cerioid coral reported here from near the base of the formation is difficult to

*) Dr. JOHN W. PICKETT, Research Associate, Geological Survey of New South Wales, State Geoscience Centre, 947-953 Londonderry Road, Londonderry NSW 2753, Australia.
pickettj@bigpond.net.au.



Text-Fig. 1.
 Locality diagram (after FERRETTI, 2005). The two sections are indicated by black dots.
 R = Rauchkofelboden section, C = Cellon section.

explain, as it would appear to be allochthonous, yet the regime is not one which would lead to transport of a calcareous skeleton of such size. At its interfaces with the surrounding sediment, where this can be observed, the skeleton is either eroded or corroded, or there is a narrow zone of crushing. Regrettably, the original attitude of the specimen was not recorded. Preservation within the fragment is excellent.

Anomalous cases of coral occurrences are not unknown (e.g. OLIVER, 2001). In that case, however, the anomalous coral is the nearly complete corallum of a cerioid *Prismatophyllum*, only the lower surface of which is eroded or corroded. It is suggested that the specimen was rafted to its preserved location in black shales. The matrix of the Cellon specimen, although dark, is from a formation in which

banks of small bivalves form benthic pavements, so the bottom conditions were, at least not always, as inhospitable as those in the New York State occurrence.

Within the area of the Carnic Alps a shallower facies of the Silurian is represented in the Wolayer Facies of the Rauchkofel Boden section. Here, the Alticola Limestone has yielded small, solitary corals from two levels: a single specimen from bed 327, in the range latest Ludlow–earliest Pridoli, and a small suite from almost the top, above the *Scyphocrinites* bed, and latest Pridoli in age. The Rauchkofel Boden section lies at about 2175 m to the northeast of Lake Wolayer in the southern slope of the Rauchkofel (FERRETTI, 2005, fig. 1; fig. 2 gives the location of bed 327 in the section).

2. Systematic Palaeontology

Phylum: Coelenterata
 FREY & LEUCKART, 1847
Class: Anthozoa EHRENBERG, 1834
Subclass: Rugosa
 MILNE-EDWARDS & HAIME, 1850
Order: Stauriida VERRILL, 1865
Suborder: Metriophyllina SPASSKIY, 1965
Family: Metriophyllidae HILL, 1939
Genus: *Metriophyllum*
 MILNE-EDWARDS & HAIME, 1850

Type species: *Metriophyllum bouchardi* MILNE-EDWARDS & HAIME, 1850.

***Metriophyllum* sp.**
 (Plate 1, Figs 1–3)

Material: Fourteen incomplete individuals on 11 specimens (GBA 2007/12/2–12). Four sections are high in the calyx and show no details. The small size of the coralla makes sectioning difficult, and only two thin sections

were prepared (GBA 2007/12/5). All specimens come from Level 199 + 20 cm near the top of the Alticola Limestone of the Rauchkofelboden section

Description: Corallite small, solitary, ceratoid, apparently straight. External details unknown; no external processes of any kind were observed. Diameters range from 2.7 to 4.5 mm, with an average at 3.4 mm. None of the specimens is complete, but the maximum length must be less than 10 mm. The appearance of one specimen (GBA 2007/12/3) suggests that the proximal portion is more strongly conical than most of the younger part. There are approximately 12 major septa which join at the axis to form an axial structure, an aulos which may be hollow in the calyx but is filled in older parts of the corallite. Major septa bear conspicuous flanges which are directed back towards the epitheca. Minor septa not present in all loculi, but usually contratingent. Tabulae and dissepiments are lacking.

Remarks: In a revision of the genus, HOLWILL (1964) discussed fourteen taxa which had been referred to *Metriophyllum* species. None of these is older than Early Devon-

ian. The small size of the present material differentiates it from all taxa discussed by HOLWILL, except *Metriophyllum gracile* (SOSHKINA, 1928), which is, however of Early Permian age. *Duncanella* NICHOLSON, 1874, with its type species *D. borealis*, was described from Silurian strata of Ohio, and although small in size does not appear to have the septal flanges of *Metriophyllum*. WEYER (1972) has illustrated Silurian and Devonian species of *Duncanella*, which are similar in size (4.8 mm, 4.0 mm) to the present material, one of which is referred to the type species, but is not from the type locality. Both of these have septa which bear lateral projections which are more like carinae than the flanges of typical *Metriophyllum*, and which may number as many as five per septum in any section; both species have contratingent minor septa which lie so close to the adjacent major septum that there is scarcely any locus between them. The septal flanges of the present material are directed quite strongly backwards to the epitheca, with only one or two at any particular level on the septum, and there is a distinct locus between the minor septa and their associated major septa. The morphology of the material examined by WEYER (1972) thus suggests that the present material lies better in *Metriophyllum*.

Family: Laccophyllidae GRABAU, 1928
Genus: *Laccophyllum* SIMPSON, 1900

Type species: *Laccophyllum acuminatum* SIMPSON, 1900.

? *Laccophyllum* sp.

(Plate 1, Figs 4, 5)

Material: A single specimen (GBA 2007/12/13) from Level 327, Rauchkofelboden section. This level lies within the Alticola Limestone (FERRETTI, 2005) and is of latest Ludlow–earliest Pridolian age. Preparation of a thin section has removed most of the septate portion.

Description: The solitary, trochoid corallum is straight, slightly flared at the base to form an attachment plate, and has a (reconstructed) height of 17 mm and a maximum diameter of 12 mm, the minimum diameter is 3 mm, and the attachment reaches 5.5 mm. The epitheca bears a number of shallow depressions parallel to the calyx margin, about 1.2 mm apart. The calyx is deep, septa being confined to the lowest 6 mm of the corallite, or even less. The single section shows 18 major septa which form a hollow aulos at the axis. The hollow is 0.2 mm in diameter. Minor septa about one-third the length of the major septa, contratingent. No horizontal elements were observed, and, if present, are confined to the lowermost parts of the corallite.

Suborder: Ptenophyllina WEDEKIND, 1927
Family: Spongophyllidae DYBOWSKI, 1873
Genus: *Spongophyllum*
MILNE-EDWARDS & HAIME, 1851

Type species: *Spongophyllum sedgwicki* MILNE-EDWARDS & HAIME, 1851.

***Spongophyllum coeni* sp. nov.**

(Plate 1, Figs 6–10)

Material: A single specimen (GBA 2007/12/1) from 55 cm above the base of the Cardiola Formation, Cellon profile, Plöcken Pass, Carnic Alps, Austria. The species is named for the late Michel Coen, who discovered the specimen. The age is Ludlovian, *siluricus* Zone.

Description: The specimen is a somewhat tabular fragment of a cerioid corallum, measuring approximately 7 × 3 × 2 cm prior to sectioning. It has undergone erosion before burial, but the internal preservation is excellent. Corallites irregularly three- to eight-sided, the sides straight or only slightly curved. Walls thin, 0.05–0.1 mm, with median dark line. Maximum observed corallite diameter is 4.2 mm, the minimum is 1.2 mm, in a corallite in which no septa are present. The relative number of immature corallites is high, indicating that the corallum was sectioned at a level of rapid increase. Major septa long, 11–16 in adult corallites, reaching almost to the centre, with one frequently extending just beyond the axis. This is presumably either the cardinal or counter septum, but there is no observable evidence on which to base a decision.

The major septa are slender, gently tapered, slightly thinner than the corallite wall near their bases. Occasionally they may be separated from the wall by blister-like dissepiments, which may be large enough to interrupt two adjacent major septa. Minor septa much reduced, either missing altogether or forming low ridges on the wall. The reduction of the minor septa has resulted in the dissepiments often showing a weak herringbone pattern in transverse section.

In longitudinal section the dissepiments are globose, generally in 2–3 rows, rarely 4. Tabulae mostly complete, horizontal and slightly undulating, 11 or 12 in 5 mm. Septa apparently trabeculate, the trabecular axes being 0.1–0.2 mm apart and making an angle of close to 30° with the epitheca (Pl. 1, Fig. 8). The calyx is unusually deep in the tabularium: one corallite which was overgrown after the death of the polyp has a diameter of 2.4 mm, a tabularium 0.8 mm wide, yet the youngest tabula lies 3.1 mm below the highest part of the youngest dissepiment.

The appearance of small corallites in the transverse section suggests that increase might be intermural. The longitudinal section, however, shows two adjacent corallites in the process of division, which occurs axially and parricidally.

Remarks: The type species of *Spongophyllum*, *S. sedgwicki* MILNE-EDWARDS & HAIME, 1851, is a pebble collected from the beach at Torquay, so that the formation from which it was derived is unknown. C.T. SCRUTTON (pers. comm. 29. 1. 2007) has indicated that *S. sedgwicki* has not been recognised in situ in the Torquay area, although it occurs in the Plymouth Limestone in a disused quarry at Brixton, near Plymouth. The strata there are Eifelian in age. At Torquay, the Eifelian unit is the Daddyhole Limestone Formation, which is a possible source, as is the overlying Walls Hill Limestone of lower Givetian age; a possible, though less likely contender is the next unit, the Barton Limestone, upper Givetian to Frasnian in age. So an accurate age for the type species remains equivocal. Most Silurian species formerly referred to *Spongophyllum* have been re-assigned to *Carlinastraea*, *Australophyllum* or *Toquimaphyllum*. The latter two genera are currently placed in the family Ptenophyllidae rather than Spongophyllidae, and have tabulae and septa which are relatively crowded in the tabularium. The diagnosis of Spongophyllidae (HILL, 1981) draws attention to minor septa which are “commonly discontinuous longitudinally or withdrawn from the wall” (p. F231), which is certainly the case in the present material, and the wall is thinner than that of most forms referred to the other genera. One of the most striking features of the present specimen is its light construction, without crowding of either tabulae or septa, emphasised by the absence of the minor septa. European spongophyllids of Silurian age are unusual. The best known is

Spongophyllum inficetum POČTA, 1902, redescribed and referred to the Siberian genus *Kozlowiaphyllum* RUKHIN, 1938 by GALLE (1983), which is larger (diameter 5.12–7.06) than *S. coeni*, has a similar, though slightly larger septal number ([14–17] x 2), much more conspicuous minor septa and a thicker wall. *Kozlowiaphyllum* has been considered a possible synonym of *Xystriphyllum* HILL, 1939 by HILL herself (1981, p. 244), and indeed, the tabulae of *S. inficetum* in the material illustrated by GALLE are much more crowded than those of *S. coeni*, the inter-tabular spaces of the former being 5–12 times wider than high, while those of *S. coeni* lie in the range 2–5.

From just a few kilometres away, in the Seewarte section, KODSI (1971) has attributed a Devonian form to the Australian species *Spongophyllum halysitoides* ETHERIDGE, 1918. This report introduces nomenclatural problems, since the original spelling is as above; KODSI uses the spelling *halysitoides*, and cites the name as an unnamed new subspecies, apparently following SOSHKINA (1949), who reported the species from the Urals. KODSI's figures are dark, and it is difficult to judge how close the material is to that from Australia; his description indicates that the septa of his subspecies are more strongly developed than in the type material. *S. halysitoides* is now referred to *Carlinastraea* MERRIAM, 1976; the type material comes from the Nemingha Limestone Member of the Drik Drik Formation, of Lochkovian (*woschmidti* Zone) age (FUREY-GREIG, 1995), so it is considerably older than the Austrian material.

The Tibetan Early Devonian species *Spongophyllum deriangmaense* (HE [2004] in FAN et al., 2004) is similar in size, septal number, and the much reduced minor septa, but has a very thick epitheca, in contrast to the rather thin wall of *S. coeni*. PEDDER (2006, Appendix C, p. 38) has suggested that *S. deriangmaense*, originally placed in *Loyolophyllum*, should be referred to *Spongophyllum*.

Spongophyllum originalis ZHMAEV (in KRAEVSKAYA, 1955), from the Early Devonian of the southwestern part of the Kuznets Basin, is somewhat smaller, has a thicker wall, and mostly one, rarely two rows of dissepiments.

Acknowledgements

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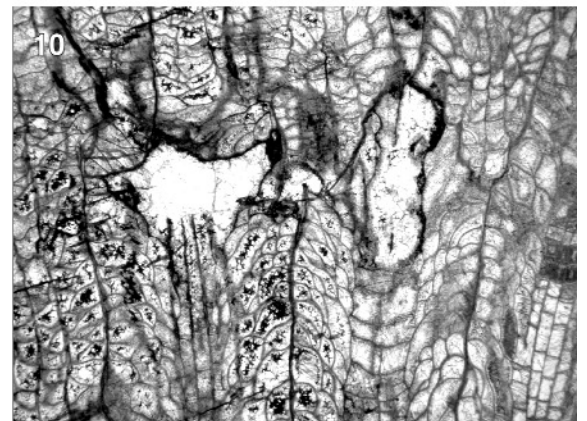
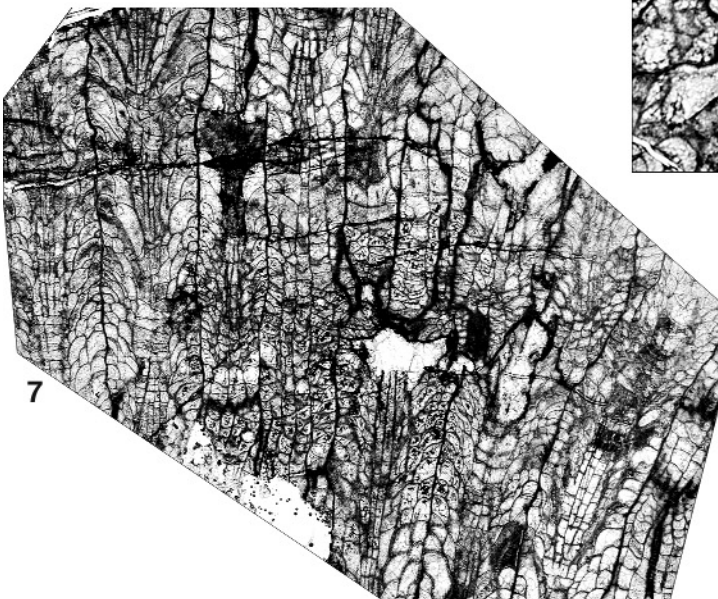
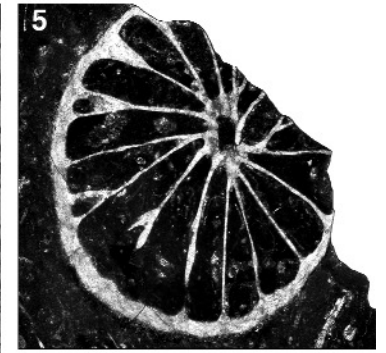
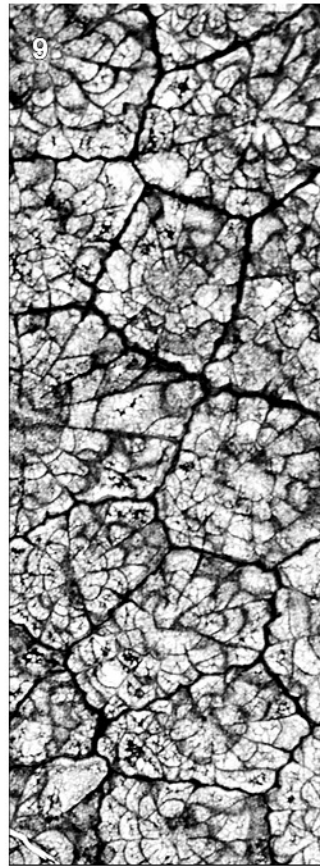
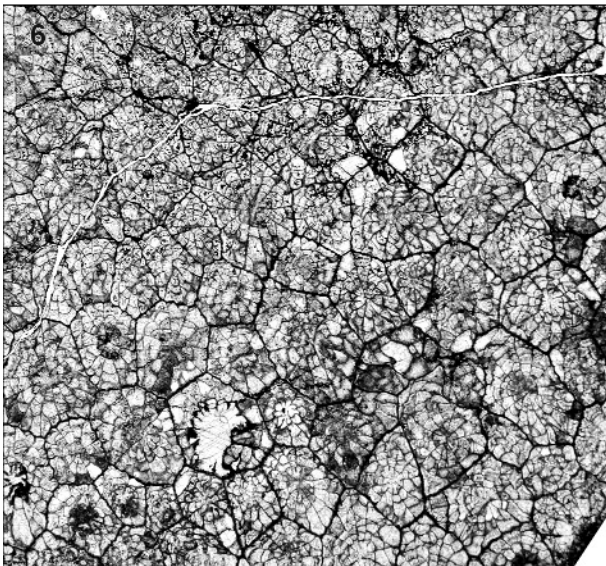
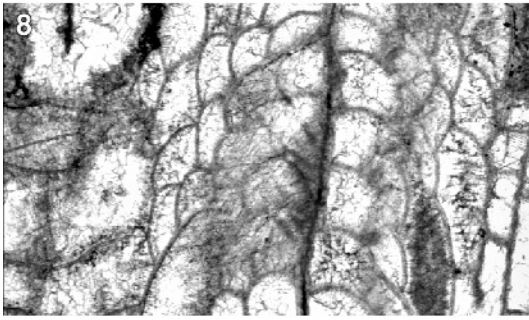
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Plate 1

Rugose corals from the Carnic Alps.

- Fig. 1– 3: *Metriophyllum* sp.
Alticola Limestone, level 199, Rauchkofelboden section.
Figs. 1,2: Slightly oblique sections from the same corallite.
GBA 2007/12/5, x 9.5.
Fig. 3: Oblique section of specimen on surface.
GBA 2007/12/2, x 8.5.
- Figs. 4– 5: *Laccophyllum* sp.
GBA 2007/12/13 from the Alticola Limestone, level 327, Rauchkofelboden section.
Fig. 4, Entire specimen before sectioning, x 3.5.
Fig. 5: Transverse section from near base, x 9.
- Figs. 6–10: *Spongophyllum coeni* sp. nov.
Holotype GBA 2007/12/1 from 55 cm above the base of the Cardiola Formation, Cellon profile.
Fig. 6: Transverse section, x 3.9.
Fig. 7: Longitudinal section, x 3.9.
Fig. 8: Detail of trabeculae in longitudinal section, x 19.
Fig. 9: Detail of transverse section, x 10.
Fig. 10: Detail of longitudinal section, showing overgrowth of dead corallite, x 7.



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