
751. MAZAPHYLLUM (RUGOSA) FROM THE SILURIAN OF JAPAN*

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Abstract. Mazaphyllum is a thamnasterioid, cystiphyllid rugose coral recorded first from Australia. It is now known also from Kazachstan, Arctic Canada and Japan, and ranges from ?Wenlockian to Lower Devonian. A new species, M. mirum is described from the Silurian Kawauchi Formation in the Kitakami mountains, N.E. Japan.

Introduction

A small fossil collected by Mr. F. Murakami of Ohfunato several years ago in the Higuchizawa valley, Ohfunato city, Iwate Prefecture was later presented to Dr. H. Kimura of Ohfunato, who considered the specimen a Silurian stromatoporoid. In looking through Kimura’s collection of stromatoporoids Dr. K. Mori of Tohoku University found that the specimen was not a stromatoporoid but might be a rugose coral. I was then asked to identify it, and the specimen turned out to be a new species of Mazaphyllum. This genus was originally established from Australia, but has not been commonly known from elsewhere. The occurrence of Mazaphyllum in Japan is therefore interesting. The systematic position of Mazaphyllum is discussed below.

Acknowledgements

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Systematic description

Phylum Coelenterata Frey & Leuckart, 1847
Subphylum Cnidaria Hatschek, 1888
Class Anthozoa Ehrenberg, 1834
Order Rugosa Milne-Edwards & Haime, 1850
Suborder Cystiphyllina Nicholson, 1889

I recognize eight families within the suborder Cystiphyllina. They are listed in the following tabular key:

Rugose corals with acanthine septa ............
................................. Cystiphyllina
Without tabulae, without dissepiments.

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Septal spines sparse and irregular. Corallum small, ceratoid. .......... Family Primitophyllidae

Septal spines regular. Corallum small, discolid or patellate. .......... Family Palaeocyclidae

With tabulæ, without dissepiments. Tabulæ may be complete or incomplete. .......... Family Tryplasmatidae

With cystosepiments.

Operculate.

Corallum calcæolid. .......... Family Calceolidae

Corallum pyramidal. .......... Family Goniophyllidae

Non-operculate.

Septal spines short. Tabularium and dissepimentarium may be differentiated .......... Family Cystiphyllidae

Septal spines fused to form partly platy septa. .......... Family Digonophyllidae

With tabularium and dissepimentarium differentiated.

With long septal spines. Differentiation between tabularium and dissepimentarium may be not clear. .......... Family Holmophyllidae

Family Holmophyllidae Wang, 1947

(nom. transl. Ivanovsky, 1968:
pro Holmophyllinae Wang, 1947)

Diagnosis: Cystiphyllid rugose corals typically with tabularium clearly differentiated from dissepimentarium. Septal spines are relatively long and pierce dissepiments.

Genera: Within the limit of the above definition, the following genera appear to be referable to the Holmophyllidae. The possibility that several of these genera may be synonymous is noted.

Solitary .......... Holomophyllum Wedekind, 1927

?Hedstroemophyllum Wedekind, 1927

?Gyalophyllum Wedekind, 1927

Spinolasma Ivanovsky, 1965

Gukoviphyllum Sytova, 1966

Holmophyllia Sytova, 1966

Mesouralinita Shurygina, 1971

Fasciculate .......... Nipponophyllum Sugiyama, 1940

Baeophyllum Hill, 1940

Dendroholenia Spassky & Kravtsov, 1974

Ceroid .......... Storothygophyllum Weissermel, 1894

Xiphelasma Smith & Lang, 1931

Plocoid .......... ?Cystiphorolites Miller, 1889

Mazaphyllum Crook, 1955

Aksarlinia Kaplan, 1975

Genus Mazaphyllum Crook, 1955

1955 Mazaphyllum Crook, p. 1052
1973 Mazaphyllum, Cotton, p. 125
1975 Aksarlinia Kaplan, p. 67
1976 Mazaphyllum, McLean, p. 298
1977 Mazaphyllum, Spassky, p. 70
1981 Mazaphyllum, Hill, F. 107

Type species (by original designation):

Mazaphyllum cortisjonesi Crook, 1955

Generic diagnosis: Thamnasterioid Holmophyllidae.

Included species:

Mazaphyllum cortisjonesi Crook ?Wenlockian to ?Ludovian of New South Wales, Australia (Crook, 1955; McLean, 1974, 1976)

Aksarlinia concavotabulata Kaplan ?Gedinnian of Central Kazakhstan (Kaplan in Menner (ed.), 1975)

Mazaphyllum mirum Kato, n. sp. Silurian, Kawachi Formation, Kitakami mountains, N.E. Japan (this paper).

Distribution: ?Wenlockian to Lower Devonian. East Australia, Kazakhstan, Japan and Arctic Canada (Pridolian according to McLean, 1976).

Discussion: Crook (1955) clearly indicates that Mazaphyllum is a member of cystiphyllid corals. It is characterized by
thamnasteriod corallum, dimorphacanthine septa and sagging tabulæ. Although Crook does not assign the genus to any family, he suggests some relationship exists between *Mazaphylum*, *Holmophyllum* and *Hedstroemophyllum*.

Ivanovsky (1965) merged *Mazaphylum* with query to *Palaearaea* of the Calo-

McLean (1974) put *Mazaphylum* in the Cystiphyllidae. Later, he (1976) recognized two subfamilies of the Cystiphyllidae, namely the Cystiphyllinae and Digono-
phyllinae, and placed *Mazaphylum* in the former subfamily, which Hill (1981) and I would divide into two families, the Cystiphyllidae and Holmophyllidae.

Spassky saw the importance of coloniality in rugosan classification and in 1977 relegated the position of *Mazaphylum* to his Superorder Associata, Order Zon-
astreida, Suborder Zonastreina, Family Microplasmatidae, Subfamily Micro-
plasmatinae. But, this procedure results in a seemingly unnatural grouping. My classification of cystiphyllids is tabulated above.

Crook (1955) compared his *Mazaphylum* with other plocoid rugosa of the Silurian such as *Arachnophyllum* and *Zenophylla*. The completely thamnasteriid corallum and sagging tabulæ of *Zenophylla* are similar to those of *Mazaphylum*, but the former has platy septa. *Arachnophyllum* also typically has platy septa and uparched tabulæ, so it is distinguishable from *Mazaphylum*. The problem is that in some forms of *Arachnophyllum* the peripheral part of the septa may be split into series of discrete trabeculae (see for example McLean, 1975). Whether acan-

thine septa are stable and reliable morphological features or not should be tested further. We can name another example in the Cystiphyllidae and Digono-
phyllidae.

McLean (1974, 1976) compared his *Angullophyllum* with *Mazaphylum*, but the former has a ceroid corallum, short acanthine septa and uparched tabulæ. *Angullophyllum* is thus closer to *Arachno-
phyllum* than to *Mazaphylum*.

Kaplan (1975) recognized *Aksartinia* to be rather closely related, and distinguished *Aksartinia* on the basis of the possession of holacanthine septa, as compared to the dimorphacanthine septa of *Mazaphylum*. In my opinion, fine structural pattern of acanthine septa cannot be taken alone as a reliable character to classify Rugosa in genus ranks. *Aksartinia* has a plocoid corallum, acanthine septa, sagging tabulæ and is best considered as a synonym of *Mazaphylum*.

*Cystiphorolettes* Miller (=*Vesicularia* Rominger) has thamnasteriid, partly aphroid corallum and is included in the Holmophyllidae by Hill (1981). The genus appears to be more similar to *Arachno-
phyllum*. Further examination of the form in thin section is necessary to clarify its true systematic position (McLean, 1974). If it has genuine acanthine septa, it could possibly be a synonym of *Mazaphylum*.

As mentioned above, Crook (1955) stated that *Mazaphylum* has both holacanthine and rhabdacanthine septa. This dimorphacanthine nature of *Mazaphylum* is confirmed also by McLean (1974). The Japanese form of *Mazaphylum* cannot be described with certainty as to its fine acanthine septal structure because of poor preservation. It may be completely holacanthine, but the possibility of the initial presence of rhabdacansths cannot be excluded, since the external configu-
ration of each septal spine is sometimes irregular and crenulated. At any rate, it is difficult to distinguish genera and species of Rugosa by the nature of the fine structure of septa alone. Besides, I believe that monocanthine to rhabdocanthine septal trends operated in a number of lineages of cystiphyllids.

More interesting is the pattern of septal insertion in Mazaphyllum. Septa are arranged more or less radially in the type species of both Mazaphyllum and Aksartinia. But in the new Japanese form septa are often bundled (Text-figure 1, A–C). The distinction between major and minor septa is not clear. A long septum appears to bifurcate repeatedly, or, short septa were inserted by intercalation, leaning upon long septa. Thus septal arrangement as a whole is not cyclical, yet it is not clearly bilateral or tetrameral. I am unable to decipher any regularity in septal insertion. However the overall pattern is rather similar to that described by Erina and Kim (1980) for some corals from the Ordovician of Tienshan. They say that for Tjanshanophyllum and Sumsarophyllum epitheca is lacking and septa are porous, showing peculiar arrangement what they call “fan-like coalescence”. They assign these corals to the Fungiida of the Scleractinia; the lack of epitheca might be the result of peripheral erosion, and “porous septa” may be a kind of acanthine septa. I have seen a very similar mode of septal arrangement on the weathered calicular surface of a specimen of Arachnophyllum typus collected from Wenlock Edge. I would therefore hesitate to call these Ordovician corals from Tienshan genuine members of the Scleractinia. Lavrusewitsch (1971) originally placed his genus Sumsarophyllum in the family Paliphylliidae. In this connection, the septal arrangement in the genus Idiophyllum Cao (Lee et al., 1975) is very interesting. In this Chinese Silurian coral the presence of tertiary septa is recorded. But, in fact an overall pattern of septal arrangement in Idiophyllum is quite similar to that of Sumsarophyllum. Real tertiary septa should be distinguished from the septal pattern now in discussion (Text-figure 2).

Text-fig. 1, A–C. Mazaphyllum mirum Kato. Diagrams showing the pattern of septal arrangement as it appears in transverse section.
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Text-fig. 2. Diagrams showing the difference between the genuine tertiary septa (A) and bundled septa (B).

What appears to be a peculiar mode of septal insertion in Mazaphyllum is now known to occur at least in some other ancient corals, and the mode may have originated in corals as old as Ordovician. Septal arrangement should be traced ontogenetically in each coral in order to clearly understand the true mode of septal insertion.

Crook (1955) commented originally that the range of the genus Mazaphyllum is from the Lower to Middle Silurian. But McLean (1974) later stated that the genus is common in East Australia from ?Wenlockian through ?Ludlovian strata. Further he mentioned (1976) on the occurrence of the genus from Arctic Canada in rocks of ?Pridolian age. This latter occurrence is not described or illustrated as yet. Taking Aksarlinia and the present Japanese form, the genus is now known from Australia, Kazakhstan, Arctic Canada and Japan, in rocks from ?Wenlockian to Lower Devonian age.

The phylogeny of Mazaphyllum is not known. Holmophyllids in general may have been derived from some type of tryploplasmatic. This course is suggested by observing ontogenetical changes in Nipponophyllum (Kato, in press). As stratigraphical range of holmophyllid genera compiled by McLean (1976) would indicate, solitary, cerioid and plocoid holmophyllids may have branched from tryploplasmatic ancestor(s) at or nearly the same time in the Early Silurian.

Mazaphyllum mirum Kato, sp. nov.

Plate 61, Figs. 1–2; Text-fig. 1A–C.

Material: A small, peripherally weathered fragment of a colony, UHR 30519 (Holotype), with black limestone matrix. Preserved portion of the colony measures 8×4×2 cm. Collected by F. Murakami, as a float derived from the Silurian Kawauchi Formation, at Sugiyama Ono, Higuchizawa, Ohfunato city, Iwate Prefecture, Japan.

Derivation of the specific name: mira (Latin)—wonderful.

Specific diagnosis: Mazaphyllum with small tabularia (d=1–1.5 mm).

Description: Corallum small, compound, massive and thamnasteriid. External shape and surface character of the complete corallum unknown. Holotheca not preserved.

In transverse section, series of acanthine septa are confluent from one corallite to the other to reveal the completely thamnasteriid nature of the corallum. The polygonal configuration of a corallite may only be realized by tracing the middle or junction parts of these series of confluent acanthine septa. The size of each corallite thus outlined may reach as long as 14 mm in minimum diameter. Tabularia appear as calicular pits on the surface of the corallum: eight such pits are counted in a space of 8×3 cm. Diameter of the tabularium is 1 to 1.5 mm, but it is generally not very well differentiated from the dissepimentarium. Septa are acanthine. As many as 93 series of acanthine septa are counted in a
corallite. They are protruded into the tabularium. Their septal arrangement is difficult to decipher, but it is not typically rugosan, in which four places of new septal insertion are usually clearly indicated. Instead, septal series are apparently bifurcated peripherally or with one series often leaning on another, thus multiplying the total number of the series of acanthine septa. Fine structure of septa is not clear, but it appears to be holacanthine. In places each spiny rod has a slightly indented surface suggesting that they may have originally been rhabdocalathine. No axial structure is present.

In longitudinal section, the dissepimentarium is wide, consisting of globose or slightly flattened, small dissepiments which are pierced by vertically straight, long septal spines. Spines are sometimes a little divergent in their arrangement especially near the boundary between the tabularium and dissepimentarium, where dissepiments are somewhat arched upwards. Dissepiments become smaller near the septal spines, so that they are insociating between septal spines. Spines are occasionally seen bifurcating. Axial portion of septal spines protrudes for a relatively long distance into the tabularium, and steeply dipping outwards. Tabularium is not well differentiated from the dissepimentarium, and is composed of incomplete, sagging tabulae. No trace of corallite wall is observed.

Comparison: Assignment of the Japanese species to the genus Mazaphyllum is clear. The new species is readily distinguishable from other species of the genus, namely M. cortisjonesi and Aksarlinia concavotabulata, in having much smaller tabularia, which are only 1–1.5 mm in diameter, compared to 4–4.5 mm in the type species and 3–3.5 mm in Aksarlinia. Also septal spines fall short of the centre of corallite, thus leaving a wide open space in the tabularia in the other two species; in the new species septal spines protrude distantly into the tabularium. Peculiar septal arrangement is not so conspicuous in the other two species, in which it is more radial in nature.

References


岩手県大船渡市柳沢のシルル系川内層より、四射サンゴの1新種、Mazaphyllum mirum Kato を記載。Mazaphyllum 属が Cystiphyllid であることを論じ、Cystiphyllina 亜目の分類についてもふれた。新種にみられる隔壁摂入法は特異なものである。Mazaphyllum 属は、日本、カナダ、オーストラリア、ソ連の中部シルル系 (?)〜下部デボン系より知られる。

**Explanation of Plate 61**

Figs. 1-2. *Mazaphyllum mirum* Kato, sp. nov.; all figures ×4. 1: Longitudinal section. 2: Transverse section showing completely thamnasterioid corallum. Note the type of septal insertion. UHR 30519 (Holotype), Silurian, Kawauchi Formation.