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A PERMIAN RUGOSE CORAL, *EURYPHYLLUM*  
FROM KASHMIR

by

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(with one plate)

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*Abstract*

A review of the genus *Euryphyllum* is given, with the description of a Permian species from Kashmir, India, the area once belonged to the northern rim of Gondwana.

Records on the occurrence of Palaeozoic corals in the Himalayan region have been rather scarce (Bassler, 1950; Branson, 1948; Flügel, 1966; Hill, 1948, 1957, 1959). They are more or less confined to the Tibetan zone or its extension, namely the Tethyan province (Gansser, 1964).

In 1969 a party of geologists led by Prof. K. Nakazawa of the Kyoto University engaged in a geological field survey of the Srinagar region, Kashmir. They found and collected with some brachiopods two fragmentary preserved, solitary rugose corals at a locality 3 km north of Barus, Srinagar region, Kashmir from a horizon named as Bed 19 (unit b<sub>2</sub>) of the Zewan Formation. These specimens were entrusted me for identification.

They turned up to be a known species of *Euryphyllum*, the genus which has been commonly found from the Permian of Australia, New Zealand and so on, in the area occupying the northern rim of the Gondwana.

The present article is to record the occurrence of *Euryphyllum* in the Himalayan region, and to give a review on the genus *Euryphyllum* and its allies.

The author acknowledges the members of the 1969 India – Japan Geological Expedition team to Kashmir for their kindness to let me study their collection.

He wishes to record his indebtedness to Professor M. Minato of the Hokkaido University for his warm encouragement and to Mr. S. Kumano of our Department for photographs herein illustrated.

Hill in Treatise (1956), placed her *Euryphyllum* in the family Hapsiphyllidae. However, *Hapsiphyllum* has a prominent keyhole fossula, contrasting minor septa, and presumably trabecular septa. In fact, a number of zaphrentid genera housed by Hill in the Hapsiphyllidae, including *Euryphyllum*, has no such characteristic features.

Likewise *Sychnoelasma* (= *Verneulia* = *Verneulites*) has sagging tabulae and probably trabecular septa, and may be better removed from common zaphrentids.

Family Zaphrentoididae is thus to contain at least the following genera and may be diagnosed as follows.

“Solitary rugose corals without dissepiments and axial structures. Septa are pinnately arranged with a large cardinal fossula, and are of diffuso-trabecular to fibro-normal fine structure. Counter septum may be relatively strongly developed. Minor septa present, and are not contrasting.”

Group A – Cardinal fossula on the concave side of corallum

*Zaphrentites* Hudson, 1941 = *Stereophrentis* Fomitchev, 1953

*Allotropiophyllum* Grabau, 1928

*Amplexizaphrentis* Vaughan, 1906

= *Triplophyllites* Easton, 1944

= *Enniskillenia* Kabakovitsh, 1962

= *Canadiphyllum* Sutherland, 1954

Group B – Cardinal fossula on the convex side of corallum

*Zaphrentoides* Stuckenberg, 1895

*Neozaphrentis* Grove, 1935

*Menophyllum* Edwards et Haime, 1850

*Homalophyllites* Easton, 1944

*Euryphyllum* Hill, 1937 may belong to the Group A of Zaphrentoididae.

#### Genus *Euryphyllum* Hill, 1937

1937 (April): *Euryphyllum* Hill, p.150

1937 (June): *Euryphyllum* Hill, p.50

1938: *Euryphyllum*, Hill, p.25

1942: *Euryphyllum*, Hill, p.61

1947: *Lytvelasma*, Wang, p.342

1956: *Euryphyllum*, Hill, F.267

1959: *Duplophyllum* (*Euryphyllum*), Schouppé & Stacul, S.253

1961: *Euryphyllum*, Fontaine, p.65

1963: *Euryphyllum*, de Groot, p.45

1969: *Euryphyllum*, Rozkowska, p.137

*Generic diagnosis*: Corallum solitary, erect turbinata, ceratoid to conico-cylindrical. Major septa are platy, long, thick especially in young stage, and are

pinnately arranged in transverse section. Cardinal fossula with a long cardinal septum is present. Minor septa absent or quite rudimentary if present. Septa are fibro-normal to diffusio-trabecular in fine structure. Tabulae domed. There are no dissepiments.

*Type species: Euryphyllum reidi* Hill, 1938

*Included species (provisionally):*

" <i>Strombodes</i> " <i>australis</i> McCoy, 1847	New South Wales
" <i>Zaphrentis</i> " <i>robusta</i> , Etheridge, 1891	New South Wales
" <i>Zaphrentis</i> " cfr. <i>Gregaryana</i> Trechman, 1917	New Zealand
" <i>Zaphrentis</i> " <i>cainodon</i> Koker, 1924	Timor
" <i>Stereolasma</i> " <i>minus</i> Sochkine, 1925	Ural
<i>Euryphyllum trizonatum</i> Hill, 1937	Victoria
<i>Euryphyllum minutum</i> Hill, 1937	Western Australia
<i>Euryphyllum reidi</i> Hill, 1938	Queensland
<i>Euryphyllum mautuani</i> Campbell, 1952	Australia
<i>Duplophyllum (Euryphyllum) coniculiforme</i> Schouppé et Stacul, 1959	Timor
<i>Duplophyllum (Euryphyllum) hilli</i> Schouppé et Stacul, 1969	Timor
<i>Duplophyllum (Euryphyllum) brevisseptatum</i> Schouppé et Stacul, 1959	Timor
<i>Euryphyllum Alloiteaui</i> Fontaine, 1961	Cambodia
<i>Euryphyllum minor</i> Fontaine, 1961	Cambodia
<i>Euryphyllum hispanicum</i> deGroot, 1963	Spain

*Distribution:* Upper Devonian to Upper Permian. New Zealand, Australia, Timor, Cambodia, Kashmir, Ural, Poland and Spain.

*Remarks:* Wang (1947, 1950) considered *Euryphyllum* synonymous with *Lytvolasma* Sochkina. However, in Osnoyvi (1962) Sochkina and Kabakovitch treated *Lytvolasma* as a synonym of *Bradyphyllum* Grabau. Schouppé and Stacul (1959) placed *Euryphyllum* as a subgenus of *Duplophyllum*, the major distinction between the two by them being the presence or absence of minor septa. *Duplophyllum* has, however, carinae on septa, and thus it should be clearly distinguished from *Euryphyllum*. deGroot (1963) and Rozkowska (1969) also considered *Euryphyllum* as independent from *Duplophyllum*.

In *Euryphyllum* septa are so much dilated in younger growth stage that they are laterally in contact. This is a very characteristic feature for the genus.

The distribution of *Euryphyllum* requires further comment. Devonian

(Rozkowska, 1969) and Carboniferous (deGroot, 1953) forms are not quite typical for *Euryphyllum*. And their geographical distribution is widely scattered (Poland and Spain).

But most other species are Permian in age and they have been reported to occur in a relatively narrow strip bordering the northern limit of Gondwana, where no typical Tethyan elements have been found to date.

*Euryphyllum* is undoubtedly an element of "Cyathaxonia" fauna (Hill, 1948), probably denoting somewhat colder, and somewhat deeper environment compared to such colonial corals commonly occur in the Tethyan faunal realm (Minato & Kato, 1965a, 1965b, 1970, 1973).

*Euryphyllum cainodon* (deKoninck)

Pl. 1, fig. 1a-d; 2a-b

1924 *Zaphrentis cainodon*, Koker, p.9, pl.1, figs.1-2; pl.3, figs.1-2.

1948 *Lytvelasma cainodon*, Wang, p.342-3, pl.IX, fig.7; Text-fig.4.

1959 *Duplophyllum (Euryphyllum) cainodon*, Schouppé & Stacul, S.258-262, Taf. IX, Fig.13; Taf.X, Fig.14-16; Abb.7a-e.

1961 ? *Euryphyllum* aff. *cainodon*, Fontaine, p.68, pl.31, figs.1-2.

1963 *Lytvelasma cainodon*, Kato, Text-fig.14-3, 9 & 10.

1969 ? *Euryphyllum* aff. *cainodon*, Rozkowska, p.137, Text-fig.55.

*Material*: Two fragmental corallites (collection number A-19), from basal limestone (6.5 mm thick) of b<sub>2</sub> member. Zewan formation UHR 19807, 19808. Locality: Three km. north of Barus, Srinagar region, Kashmir. Collected by the team of India – Japan Expedition to Kashmir.

*Description*: Of two specimens at my disposal, one is a calicular portion of a corallum, in which calice is filled with slaty matrix and peripheral part of corallite is much eroded. Another specimen lies on bedding plane of slate and a half of the corallite is eroded away to reveal longitudinal section of the corallite. Matrix was removed from the other side of corallite to study surface characters. A transverse and a longitudinal section were prepared for each corallite for identification.

Corallum simple, long, curved and ceratoid. The length of corallite exceeds 8 cm. Cardinal fossula is situated on the concave side of the corallite. Faint marking on the surface of corallite reveals the presence of longitudinal ridges. Other surface characters are unknown.

In transverse section, corallite is subround to elliptical in outline, and about 14 mm in diameter. Epitheca is largely eroded away, but may be seen partly preserved as forming a sort of wedge between two neighbouring and laterally coalesced major septa, at the periphery of corallite.

Major septa are pinnately arranged, long, may reach near the centre of

corallite. In one corallite (Pl. 1, fig. 2a) septa are somewhat rotated at the axial ends around cardinal fossula. Cardinal fossula is prominent, and is situated on the concave side of the corallum as above described. What appears to be a thick, long cardinal septum in a transverse section (Pl. 1, fig. 2a) is in fact the combination of thickened septa on both sides of the relatively thin, short cardinal septum and the cut edges of a down bent tabula between these septa. Septa are very thick and mostly laterally in contact with each other. Septa are however relatively thin to reveal tabulae in between in other corallite, the section of which is cut near the calicular portion of the corallite. Septa are all diffusio-trabecular type in their fine skeletal structure.

Septa are 34 in number, and their arrangement may be interpreted as follows: Ca-5-A-10-CI-K-CI-8-A-5. A new septum inserted on the counter side of an alar septum is thin, short and in a form of peripheral splitting of a long septum already inserted prior to and adjacent to a new one. When visible, tabulae between septa are thin or thick, concave outward. Calcareous fibres are seen perpendicular on the peripheral side of each tabula. Faint growth lamellae are visible parallel to the direction of a septum. Counter septum is only a little longer and thicker than the other septa.

In longitudinal section, tabulae are seen only at the central portion of a corallum, where they are incomplete, vesicular and domed. Thickening of tabulae periodically appears at the interval of 5 mm. Four to five thin tabulae are seen between the thick ones. Growth line of a septum is seen steeply dipping towards the centre of corallite.

*Remarks:* Koker described *Euryphyllum cainodon* (1924) from Basleo, Timor. Wang (1947) also described the same species from Soenpek, Timor. Schouppé & Stacul's material (1959) also comes from Basleo, Timor. All of them are quite identical with each other. Septal fine structure of *Euryphyllum cainodon* from Timor was depicted by Kato (1963).

Cambodian material reported by Fontaine (1961) appears to have very short minor septa. So it may be more close to *Euryphyllum alloiteaui*. Polish form described by Rozkowska (1969) has no distinct cardinal fossula. So it is doubtful whether it belongs to *Euryphyllum cainodon* or not.

Specimens from Timor presumably denote Basleo stage, whereas Ishii, Kato & Nakamura (1969) recorded *Euryphyllum cainodon* from *Yabeina* zone. The present Kashmir material may be, therefore, Basleoan or Kazanian in age.

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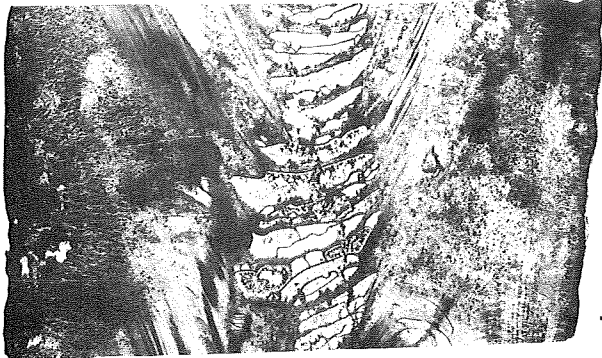
### Explanation of Plate 1

#### Figs. 1a-d: *Euryphyllum cainodon* (deKoninck) UHR 19807

- 1a: Weathered surface revealing longitudinal section of a corallite.
- 1b: Surface of the same corallite as shown in Fig. 1a, showing faint longitudinal striation, Natural size.
- 1c: Transverse section. Septal dilation is not quite large so as to leave interseptal space where some tabulae are visible. X4
- 1d: Longitudinal section showing vertical section of two opposite septa and incomplete tabulae. Note periodicity in the thickening of tabulae. X4

#### Figs. 2a-b: *Euryphyllum cainodon* (deKoninck) UHR 19808

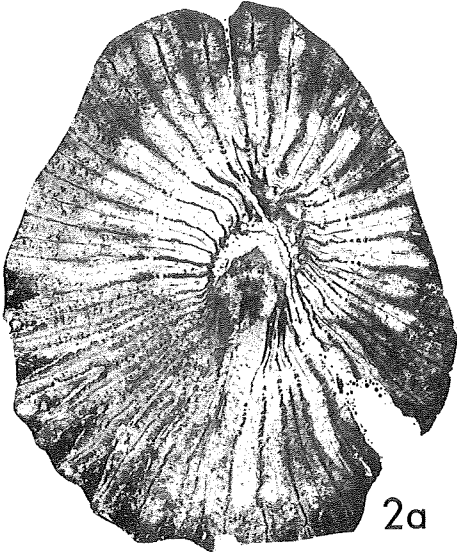
- 2a: Transverse section showing thick and somewhat rotated major septa. X4
- 2b: Longitudinal section, in which septa occupy most space, but domed tabulae are to be seen at the bottom of figure. X4



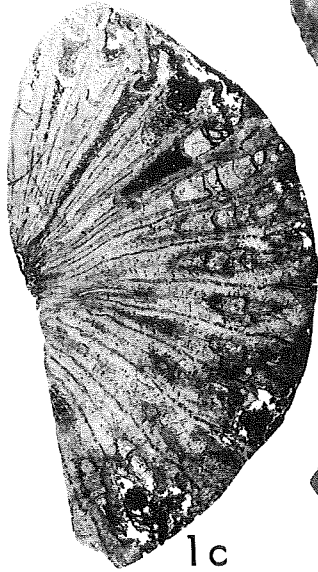
1d



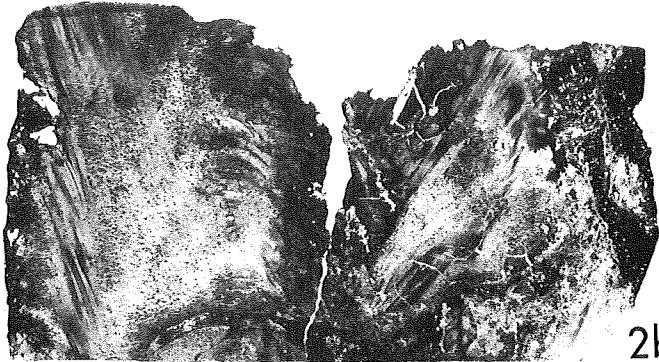
1a



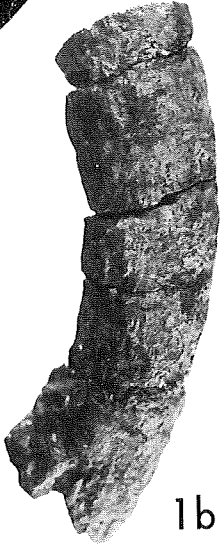
2a



1c



2b



1b



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