

LOWER PERMIAN RUGOSE CORALS FROM KANGMAR COUNTY, SOUTH TIBET, CHINA

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ABSTRACT

Lower Permian strata are widely developed in South Tibet and yield abundant but poorly preserved rugose corals, brachiopods and bryozoans, especially in Kangmar County and adjacent regions where the selected Permian standard section of Gondwana facies of Tibet is located. Some solitary rugose corals from Kungurian to Kazanian age are systematically described herein. The descriptions include four identified species (three of them, *Lophophyllidium robustum*, *Plerophyllum tibeticum*, and *Plerophyllum jiangbuense* are new) and six indeterminate species belonging to six genera. The whole assemblage -containing genera such as *Plerophyllum*, *Pentaphyllum*, *Lophophyllidium* and *Euryphyllum*- place this assemblage in the Gondwana zoogeographical Realm.

Keywords: Rugosa, Taxonomy, Diagenesis, Zoogeography, Lower Permian, South Tibet, China.

RESUMEN

Los sedimentos del Pérmico Inferior están ampliamente desarrollados en el Tíbet meridional y han proporcionado corales rugosos, braquiópodos y briozoos frecuentes, pero mal preservados, especialmente en la región de Kangmar, donde se localiza la sección estándar del Pérmico para las facies de Gondwana del Tíbet. Se describen algunos corales rugosos sin diseppimentos procedentes de la Formación Baidingpu (Kunguriense a Kazaniense). Las descripciones incluyen diez especies de las cuales 3 son nuevas (*Lophophyllidium robustum*, *Plerophyllum tibeticum*, y *Plerophyllum jiangbuense*), y seis quedan en nomenclatura abierta, pertenecientes a seis géneros. La asociación en conjunto es típica del área de Gondwana, ya que contiene sólo rugosos sin diseppimentos, frecuentes en medios de aguas frías.

Palabras clave: Rugosos, Taxonomía, Diagénesis, Zoogeografía, Pérmico Inferior, Tíbet Meridional, China.

INTRODUCTION

Permian rocks are well exposed on the north slope of the Himalaya Mountains, especially in both limbs of the Kangmar Anticline. They are well known for their more or less completely developed Gondwana-facies marine sequence, ranging in age from Upper Carboniferous to Lower Permian (Asselian to Kazanian) and have been selected as the standard section in South Tibet (Table 1).

Permian rugose corals occur in the west of Kangmar County (Longitude 89° 30' E, Latitude 28° 30' N, Fig. 1), associated with abundant brachiopods and bryozoans at the Baidingpu Formation. The corals described herein were collected by one of us (Lin Baoyu) together with his colleagues of the Institute of Geology, Chinese Academy

of Geological Sciences during the field work of the Sino-French cooperative project "Tectonic Evolution of the Lithosphere of the Himalayas", from June to September of 1982.

The preservation of rugose corals from Kangmar is rather poor. They suffered erosion prior to burial, strong diagenetic alteration processes, tectonic deformation, and weathering which took place during their recent exhumation. The walls are usually eroded and weathered. Most specimens are fragmentary and show clear signs of transportation prior to burial; they are included in shelly marls and limestones containing abundant quartz grains, and form an allochthonous assemblage. Their biggest dimension is always parallel to the strata surface. Some of them are laterally compressed, mainly at the calicular

Stratigraphy		South Tibet (Kangmar District)	Europe	
P E R M I A N S Y S T E M	L o w e r S e r i e s	Baidingpu Formation (100 m)	Light gray crystalline limestone and marble yielding: <i>Chonetella nasuta</i> * <i>Stenosisma gigantea</i>	Kazanian Ufimian Kungurian
		Kangmar Formation (200 m)	Gray metamorphic shale with intercalated calcareous shale, carbonaceous shale and limestone lenses, yielding: <i>Costiferina</i> sp. <i>Stenosisma</i> sp. <i>Attenuatella</i> cf. <i>convexa</i>	Artinskian Sakmarian
		Kewoxika Formation (200 m)	Dark gray diamictite with intercalated quartz-sandstone	Asselian
	Carboniferous			

Table 1. Upper Carboniferous and Permian stratigraphy of the Kangmar District. * Stratigraphical position of collected rugose corals.

areas. Compression is usually at right angles to the cardinal-counter plane.

The microstructure is described when preserved, but the peripheral and calicular areas are commonly recrystallized or silicified. Spherulitic and botryoidal silicification took place in these outer areas after an early phase of recrystallization. Silicification may also affect axial zones of the corals, advancing from the calice. Only the inner preserved areas of corals show the septal microstructure, and the original microstructure of walls is usually lost. In some cases, recrystallisation reaches the centre of the corals and the primary microstructure is totally unknown.

The rugose coral assemblage from Baidingpu Formation is very characteristic; no dissepimented corals are present, and only corals belonging to the *Plerophyllina* are really common there:

- Euryphyllum* sp.
- Lophophyllidium jiezhangense* Lin
- Lophophyllidium robustum* sp. nov.
- Pentaphyllum* sp.
- Tachylasma* sp. A
- Tachylasma* sp. B
- Plerophyllum tibeticum* sp. nov.
- Plerophyllum jiangbuense* sp. nov.

- Plerophyllum* sp.
- Paracaninia* ? sp.

SYSTEMATIC PALAEONTOLOGY

Morphologic terminology and familial concepts follow Hill (1981) unless otherwise indicated. Microstructural terminology is generally that of Kato (1963) and Rodríguez (1989).

All specimens come from about 40 meters above the base of the Baidingpu Formation (Lower Permian), 600 m west of Jiangbu Temple, Shamada district, southwest of Kangmar County, Tibet, China. They are kept in the Beijing Museum of Geology, the Ministry of Geology and Mineral Resources, the People's Republic of China.

ORDER RUGOSA Edwards and Haime, 1850
Family **Hapsiphyllidae** Grabau, 1928
Genus *Euryphyllum* Hill, 1940

Euryphyllum sp.
Pl. I, fig. 1-2

Material: Two specimens, Kmc61-22, Kmc61-35, Jiangbu Temple, Baidingpu Formation.

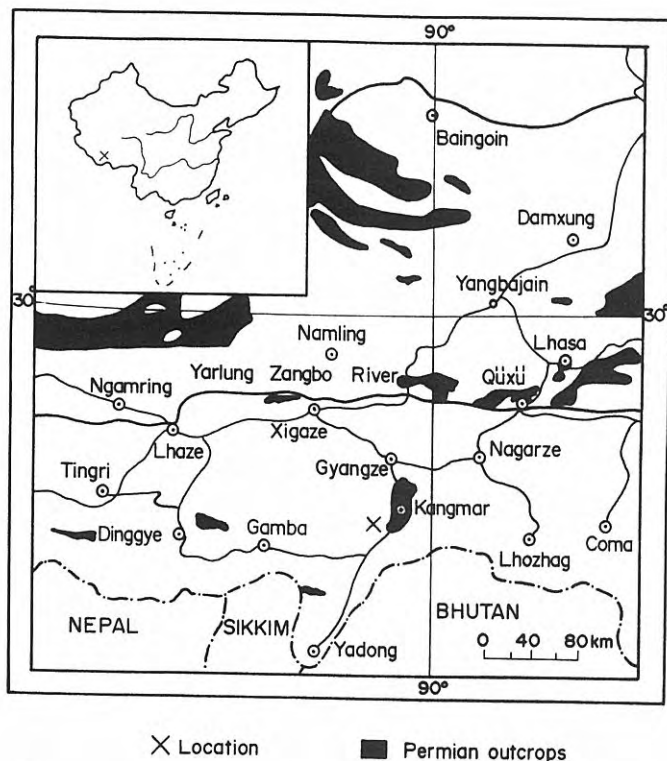


Figure 1. Location of fossil locality in South Tibet. The area covered by the large scale map is indicated in the inset.

Description

Small ceratoid corals with moderately developed septal grooves. The dimensions are 12x14 mm to 15x17 mm at the calice and 25 mm in length. The wall is 0.8 mm in thickness, but is totally recrystallised. Major septa are very long, prolonging to the centre, and thick. Their number is about 35. Cardinal septum is also long, but a little thinner and placed in a conspicuous, narrow, triangular fossula. Minor septa are absent. The pseudocolumella is composed of the thickened axial ends of the septa. No dissepiments are present. In longitudinal section, tabulae are thin, convex, very steeply inclined to the periphery and scarce. The pseudocolumella occupies half of calicular diameter, and consists of conjoined axial edges of septa. Both specimens included in this species show similar features, only the size being something larger in specimen Kmc61-35.

Remarks

The present form is closely related to the type species *Euryphyllum reidi* Hill, 1938-, but differs from it in

having very thick major septa and no minor septa. The poor preservation and scarcity of specimens impede further comparisons.

Family **Lophophyllidiidae** Grabau, 1928
Genus *Lophophyllidium* Grabau, 1928

Lophophyllidium jiezhangense Lin, 1983

Pl. I, figs 3-6

*1983 *Lophophyllidium jiezhangense* Lin, 100.

Material: Twelve specimens, Kmc51-1, Kmc51-9, Kmc53-1, Kmc54-2, Kmc55-1, Kmc61-8, Kmc61-13, Kmc61-18, Kmc61-19, Kmc61-37, Kmc61-42, Kmc61-45, Jiangbu Temple, Baidingpu Formation.

Description

Solitary coralla, of 15 mm mean diameter and 30 mm in length, varying from 12 mm to 17 mm in diameter and from 20 mm to 36 mm in length. The wall is thick (0.8 mm in thickness) and shows strong septal grooves. In sections immediately below the calice, the septa are of two orders. The major septa are long, thin to moderately thick, slightly rhopaloid in the inner end, unequal in length. The cardinal septum is a little shortened. The cardinal fossula is not clear. The counter septum is connected with the columella, which is large, oval to subquadrate and measures about 3.5 x 4.5 mm in cross section. The number of major septa is about 32. The minor septa are long and thick, about 1/3 - 1/4 the length of the major septa. In longitudinal section the tabulae are thin, mostly complete, sloping upwards towards the columella. They appear widely spaced and regularly concentric in cross section. The microstructure is obscure, usually recrystallised at the periphery, and badly preserved in the inner zone of the septa. Consequently it is not described.

Remarks

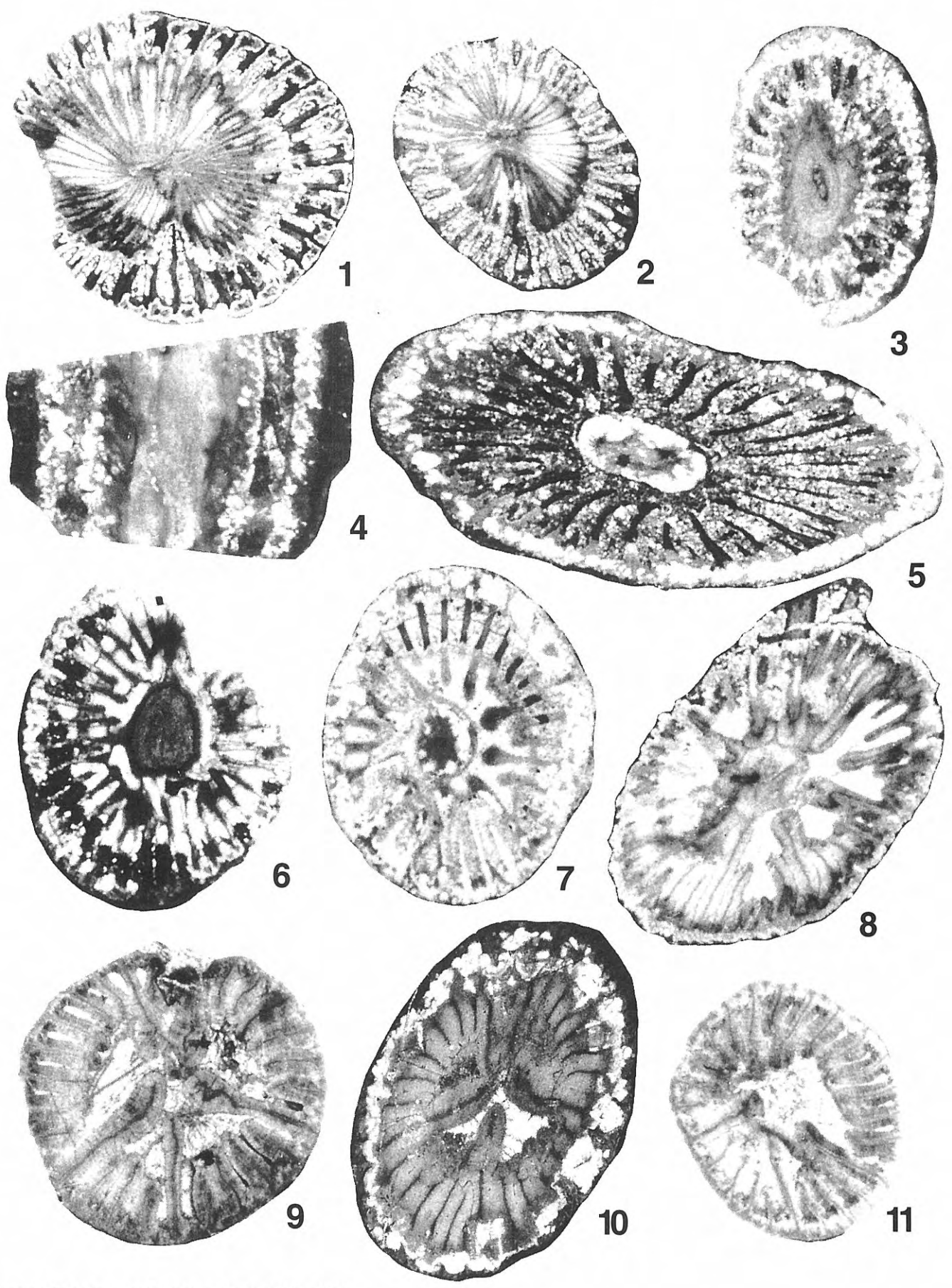
The specimens from Jiangbu have most features and dimensions in common with *Lophophyllidium jiezhangense* Lin, 1983, but differ from it by their slightly rhopaloid septa and much longer minor septa; these differences do not support the erection of a new species. The specimens from Kangmar county are very close to those described as *Lophophyllidium jiezhangense longiseptatum* by Lin (1983). The authors do not agree on the differences between the subspecies described by Lin (1983); consequently we do not include a subspecies name for our specimens.

Plate I

- 1-2 *Euryphyllum* sp. 1, Specimen Kmc61-35, transverse section. 2, Specimen Kmc61-22, transverse section.
3-6 *Lophophyllidium jiezhangense* Lin. 3, Specimen Kmc55-1, transverse section. 4, Specimen Kmc55-1, longitudinal section. 5, Specimen Kmc51-9, transverse section. 6, Specimen Kmc61-37, transverse section.
7-8 *Lophophyllidium robustum* sp. nov. 7, Specimen Kmc61-17 (Holotype), transverse section. 8, Specimen

- Kmc61-21 (Paratype), transverse section.
9-11 *Pentaphyllum* sp. 9, Specimen Kmc61-54, transverse section. 10, Specimen Kmc61-7, transverse section. 11, Specimen Kmc61-53, transverse section.

All specimens from Baidingpu Formation, 600 m west of Jiangbu Temple, Shamada district, southwest of Kangmar County, Tibet, China, Lower Permian. All figures x 3.5.



Lophophyllidium robustum sp. nov.

Pl. I, figs. 7-8

Holotype: Kmc61-17 (Pl. I, fig. 7).**Type locality:** Jiangbu Temple, Baidingpu Formation. (See above, p. 217).**Material:** One additional specimen, Kmc61-21 (paratype) from the same locality and horizon.**Derivatio nominis:** Latin adjectival derivation of the very thick (rothaloid) inner end of the major septa of this new species.**Diagnosis***Lophophyllidium* 14 mm in diameter, about 30 major septa, oval columella (3 x 4 mm in cross section), and no minor septa. The major septa vary strongly in length and show very thick inner ends.**Description**

Small ceratoid corals 14-15 mm in diameter and 20-24 mm in length. Calyx is very deep, about 10 mm in depth. The peripheral stereozone averages 1 mm thick and shows strong septal grooves. The major septa are thick, unequal in length and rothaloid; they vary in length between 1/5 and 3/4 the radius, but no hierarchy is noted in the length of the major septa with the exception of the protosepta. There are about 30 major septa. Minor septa are not developed. There is continuity between the counter septum and the columella. Other septa just touch the columella which is large, oval and measures 3 x 4 mm in cross section. Cardinal septum is long and cardinal fossula is not marked. The tabulae are very thin, scarce and declined from columella to the wall. The microstructure is not well preserved. The septa and the columella show fibronormal microstructure, but the wall is always recrystallised.

Remarks

This new species is larger in size than *L. pendulum* (Grabau, 1922). Its dimensions are similar to that of *Lophophyllidium jiezhangense* Lin, 1983, but differs from it in having no minor septa, strongly rothaloid major septa and high variation in the length of major septa. No other known species of *Lophophyllidium* show such rothaloid septa and variation in the length of the septa.

Family **Pentaphyllidae** Schindewolf, 1942Genus *Pentaphyllum* de Koninck, 1871*Pentaphyllum* sp.

Pl. I, figs. 9-11

Material: Three specimens, Kmc61-54, Km61-53 and Km61-7, Jiangbu Temple, Baidingpu Formation.**Description**

Small solitary corals 11 mm to 20 mm in diameter. The wall is thick (0.5 to 1 mm), partly eroded. All the septa are thick. Cardinal, alar, and counter-lateral septa are very long and rothaloid. The counter septum is very short. All the others are thick and short, subequal in length. The number of major septa is 24 to 28. Counter quadrants are strongly accelerated, the septal formula being C4A7K9A3C for 27 septa and C3A7K6A4C for 24 septa. Minor septa are mainly developed in cardinal quadrants, as triangular ridges only seen in stereozone. The tabulae are thin and scarce. The microstructure is quite well preserved. The septa are composed of trabecular mesoplasma and fibronormal stereoplasma.

Remarks

According to the diameter of corallum and the number of septa, this specimen fits into the variation of the type species, *P. armatum*, but differs from it by very thick major septa and strongly accelerated counter quadrants. Niermann (1975) described several species of *Pentaphyllum* from Upper Permian of Timor. Some of them show very thick septa (*P. elegans*, *P. pachys*, *P. parallelum*), but none of them show the strong acceleration of the counter quadrants, typical of the specimens from Kangmar.

Genus *Tachylasma* Grabau, 1928*Tachylasma* sp. A

Pl. II, fig. 1

Material: One single specimen, Kmc61-52, Jiangbu Temple, Baidingpu Formation.**Description**

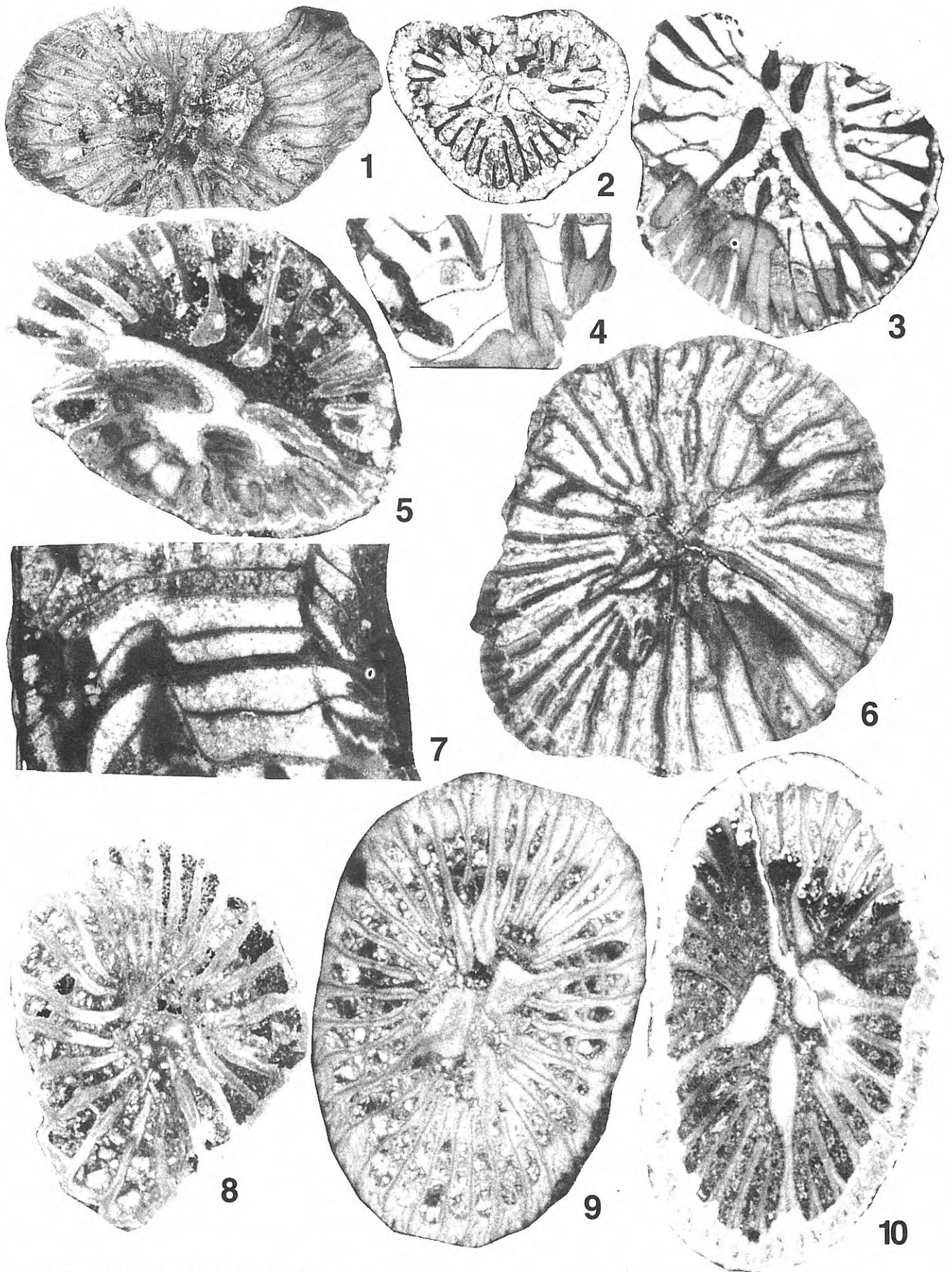
Solitary coral 19 mm in diameter, strongly eroded and deformed. The wall is thick (1.0 -1.2 mm in thickness), and the septa are also thickened, mainly in their inner border. Alar and counter-lateral septa are longer, nearly reaching the

Plate II

- 1 *Tachylasma* sp. A, Specimen Kmc61-52, transverse section.
- 2 *Tachylasma* sp. B, Specimen Kmc61-33, transverse section.
- 3-5 *Pterophyllum tibeticum* sp. nov. 3, Specimen Kmc61-16 (Holotype), transverse section. 4, Specimen Kmc61-16 (Holotype), longitudinal section. 5, Specimen Kmc61-10, (Paratype), transverse section.
- 6 *Pterophyllum* sp., Specimen Kmc61-39, transverse section.

- 7, 9-10 *Pterophyllum jiangbuense* sp. nov. 7, Specimen Kmc61-41 (Paratype), longitudinal section. 9, Specimen Kmc61-9 (Paratype), transverse section. 10, Specimen Kmc61-1 (Holotype), transverse section.
- 8 *Paracania?* sp., Specimen Kmc61-48, transverse section.

All specimens from Baidingpu Formation, 600 m west of Jiangbu Temple, Shamada district, southwest of Kangmar County, Tibet, China, Lower Permian. All figures x 3.5.



center, and rhopaloid. Some of them are connected with the tabulae to form an incomplete "inner wall". The cardinal and counter septa are thin and shorter. There are 32 major septa. Counter quadrants are accelerated, the septal formula being C5A9K10A4C. There are no minor septa. The microstructure is well preserved. The wall is microlamellar but the septa are fibronormal.

Remarks

According to the main morphological features, the diameter of corallum, and the number of septa, the present form is similar to *Tachylasma lhazeense* Lin, 1983, but differs from it in having thick and short major septa, and no minor septa. This specimen shows similar features to several Permian Chinese species (*T. yiduense*, *T. regulare*, *T. longhuiense*, *T. segmentum*, *T. minor*, etc, see Jia *et al.*, 1977 and Cao *et al.*, 1983). Nevertheless, its larger size and poor preservation impede to relate it to any of them.

Tachylasma sp. B

Pl. II, fig. 2

Material: Two specimens, Kmc61-31 and Kmc61-33, Jiangbu Temple, Baidingpu Formation.

Description

Small solitary corals 12 mm in diameter, partly recrystallised and deformed. The wall is thick; their thickness varying from 0.7 to 1 mm. Alar and counter-lateral septa are long, almost reaching the centre and are strongly rhopaloid. Two or three major septa in counter quadrants are also slightly rhopaloid. The rest of the major septa are thin and very variable in length. The counter septum is short but thick. The cardinal septum is also short but thin, and placed in a conspicuous cardinal fossula. The number of major septa is 28 in both specimens. The septal formula is C4A8K8A4C. Minor septa absent. The microstructure of the wall is completely destroyed, but the septa show a water-jet pattern.

Remarks

The specimen from Kangmar is similar to *Tachylasma longhuiense* Jiang, 1982, but differs from it by the very rhopaloid alar and counterlateral septa, and absence of minor septa. *T. jiangsuense* Chen and Yan in Zhu *et al.*, 1982, shows a similar pattern of major septa, but it possess well developed minor septa.

Family **Plerophyllidae** Koker, 1924
Genus *Plerophyllum* Hinde, 1890

Remarks

The three species from Kangmar included in *Plerophyllum* show large dimensions when compared with most Permian Chinese species of this genus (*P. hexaphylloidea* Zhao, 1976, *P. uniforme* Zhao, 1976, *P. huayingshanense* Fan, 1978, *P. guizhouense* Wang, 1978, etc). In addition *P. tibeticum*, *P. jiangbuense* and *P. sp.* (here described) possess thick walls and long and thick rhopaloid major septa, subequal in length. The distribution

of septa and thickenings in quadrants, development of rhopaloid feature of protosepta and the development of minor septa allow us to differentiate them easily.

Plerophyllum tibeticum sp. nov.

Pl. II, figs. 3-5

Holotype: Specimen Kmc61-16 (Pl. II, figs. 3-4).

Type locality: Jiangbu Temple, Baidingpu Formation (see above, p. 217).

Material: Three additional specimens, Kmc61-3, Kmc61-10 and Kmc61-24 (paratypes), from the same locality and horizon.

Derivatio nominis: Latin adjectival derivation of the provincial name -Tibet.

Diagnosis

Plerophyllum 18 to 22 mm in diameter, about 28 major septa, strongly accelerated counter quadrants and thickened septa in cardinal quadrants.

Description

Small curved solitary corals 18 to 22 mm in diameter and about 25 mm in length. The wall is usually partly eroded, and never surpasses 1 mm in thickness. The major septa are very variable in length. The alar and counter-lateral septa are longer than the others, almost reaching the axis of the coral. The cardinal is also longer, but less developed. The number of septa of the holotype is 28, counter quadrants being accelerated. The septal formula is C4A8K9A3C. The specimen Kmc61-10 possesses 27 septa and its septal formula is C3A7K9A4C. Most septa in the cardinal quadrants are thickened. The thickening increases towards the cardinal septum and towards the wall. No dissepiments are present. Tabulae are convex, very thin, scarce (4-6 each cm), and strongly declined towards the periphery. The microstructure is not well preserved. The septa show a fibronormal pattern, the microstructure of the wall being always recrystallised.

Remarks

This new species is similar to *Plerophyllum jiangbuense* sp. nov., but differs from it in having a larger corallum, a smaller number of septa, and accelerated counter quadrants. Its large dimensions do not fit with variation of any other Lower Permian species of *Plerophyllum*.

Plerophyllum jiangbuense sp. nov.

Pl. II, figs. 7, 9-10

Holotype: Specimen Kmc61-1 (Pl. II, fig. 10).

Type locality: Jiangbu Temple, Baidingpu Formation (see above, p. 217).

Material: Four additional specimens, Kmc61-9, Kmc61-20, Kmc61-38 and Kmc61-41, (paratypes), from the same locality and horizon.

Derivatio nominis: Latin adjectival derivation of the locality name Jiangbu, the type locality of this new species.

Diagnosis

Plerophyllum reaching about 17 mm diameter with 32 major septa in adult stage. Cardinal and alar septa are strongly rhopaloid. Counterlateral septa are prominent, but not very thickened. No minor septa.

Description

Ceratoid corals, 14-20 mm in diameter and about 35 mm in length. Deep calice. Wall is thin (about 0.2 mm in thickness), and there are 30 to 35 thick and long major septa in adult stage. Cardinal, alar, and counterlateral septa are longer than the other major septa. The cardinal, and especially the alar septa are strongly rhopaloid. Counterlaterals possess slightly thickened inner borders. Counterseptum is short. The septal formula of holotype in the adult stage is C6A8K8A6C. Other specimens show a similar, but slightly more irregular pattern (Kmc61-9 = C7A7K9A6C). No minor septa are present. Tabulae are thin, widely spaced and mainly complete. They are flat across the axis and slightly domed in the peripheral area. The microstructure is partly destroyed by recrystallisation, but it is well preserved in the septa of specimen Kmc61-9, which shows fibronormal to water-jet patterns.

Remarks

This species is characterised by its large diameter, the large number of major septa and the very rhopaloid cardinal and alar septa. According to the diameter, number of septa and septal formula it is similar to *P. tenuiseptum* Soshkina, 1928, but differs from it in having strongly rhopaloid alar septa and thickened major septa, which are features that do not possess any specimen of the Russian author.

Plerophyllum sp.

Pl. II, fig. 6

Material: Three specimens, Kmc61-39, Kmc61-27 and Kmc61-40, Jiangbu Temple, Baidingpu Formation.

Description

Turbinat solitary corals, 23 mm in diameter and 35 mm in length. The wall is thin, 0.7 mm in thickness. All the major septa are very long, reaching 3/4 to 4/5 of the radius. Cardinal, alar and counter-lateral septa prolongate to the centre; they are also a little thicker than the other major septa. The number of major septa is 31, the counter quadrants being accelerated. The septal formula is CSA8K9ASC. Minor septa are usually developed as crestal ridges at the wall; they are more developed around the counter septum. Tabulae are complete, horizontal or slightly convex. They are regularly spaced 4 to 5 in a distance of 5

mm. The septal microstructure is well preserved and shows fibronormal pattern.

Remarks

The present form is clearly different from other Permian species in having the protosepta reaching the centre and larger dimensions. It differs from *P. tibeticum* in developing minor septa, thinner and longer major septa. The very poor preservation impede further comparisons; consequently we maintain it in open nomenclature.

Genus *Paracania* Chi, 1937

Paracania ? sp.

Pl. II, fig. 8

Material: One specimen, Kmc61-48, Jiangbu Temple, Baidingpu Formation.

Description

Ceratoid coral 15 mm in diameter and 25 mm in length, partly compressed. It show deep longitudinal grooves and a deep calice. In cross section the wall is thin, about 0.5 mm in thickness, and undulating. All the major septa are long, about 4/5 of the radius, and thickened in their middle part. Some of them are slightly curved to the counter septum. Their number is 24. The cardinal septum is a little shorter than the other septa. Minor septa are very short if present (only seen in one or two places). In longitudinal section the wall is irregularly traced. Tabulae are slightly domed, horizontal at the center, and inclined to the wall at periphery. Microstructure of septa is fibronormal.

Remarks

The specimen of Kangmar County is doubtfully included in *Paracania* because of the thickened septa, deep calice, and long curved septa, shortened in adult stage. It is close to *P. nikitini* (Stuckenberg), the type species of *Pseudobradiphyllum* which was regarded by Weyer (1980) as junior synonym of *Paracania*, but differs from it in having small diameter and no minor septa.

CORAL FAUNA AFFINITIES

The Kangmar region is south of the Honghe-Karakorum suture which, running along the Yarlung Zangbo River Valley, separates the Gondwana and Tethys Realms. Consequently, this assemblage should show high affinities with other coral assemblages of the Gondwana zoogeographical Realm. Our knowledge of Upper Carboniferous and Permian Gondwana corals is very poor, but papers by Gerth (1921), Koker (1924), Schoupe and Stacul (1955, 1959), Niermann (1975) and Fedorowski (1986) on Permian corals from Timor, Fontaine (1961, 1988) on Permian Corals from Vietnam and Thailand, Lin (1983) on Lower Permian corals from Tibet, Finks (1953) on Upper Palaeozoic corals from Peru, Scrutton (1971) on Permo-Carboniferous corals from Venezuela, Maeda *et al.* (1973), Yamagiwa *et al.* (1974) and Wilson (1990) on Permian corals from

Bolivia and Pinto (1977) on Upper Carboniferous corals from Brazil give us enough information to know that the commonest rugosan representatives in the Gondwana realm are undissepimented corals (mainly lophophyllidiids and plerophyllids). Some dissepimented durhaminids also usually occur.

The assemblage from Kangmar shows higher quantities of plerophyllids when compared with any other Gondwana assemblages, and lacks dissepimented corals totally; it may be due to an even more southerly position and/or colder waters than other known Gondwana localities (see the paleogeographic reconstruction by Scotese *et al.* (1979). Most species from Kangmar show rhopaloid septa. It is an usual feature in plerophyllid corals, but very rare in lophophyllidiid corals. Presence of high percentage of corals having rhopaloid septa in the assemblage of Baidingpu Formation could be related with its peculiar environment.

The assemblage of the Baidingpu Formation is different in its composition and by far poorer than that described by Lin (1983) from the Langco Formation, also in the south flank of the Yarlung Zangbo River, and identical in age. That assemblage presents also only undissepimented rugose corals, but its diversity is much greater. The Plerophyllidae (which are dominant in the Baidingpu Formation) are scarcer in the Langco Formation. The absence of colonial or solitary corals with dissepiments in both assemblages seems to confirm the hypothesis of their assignment to cold waters, based also on the assemblages of brachiopods in both areas.

On the other hand, there are no similarities with other assemblages of the Lower Permian of China (Cao *et al.*, 1983, Fan, 1978, Jia *et al.*, 1977, Zhu *et al.*, 1982). All of them are located northwards from the great suture of Honghe Karakorum that runs along the valley of the Yarlung Zangbo River and show abundance of dissepimented corals, and belong to the Tethys Realm.

CONCLUSIONS

The corals from Jiangbu Temple show very poor preservation. They are reworked and show strong diagenetic and tectonic transformations. These features fit with the geological position of the locality, close to an important tectonic suture.

The poor preservation and scarcity of specimens impeded in some cases the accurate description and identification of some of the forms. Nevertheless, 4 species and 6 indeterminate species included in 6 genera of the families Hapsiphyllidae, Lophophyllidiidae, Pentaphyllidae and Plerophyllidae were described. Three species are new. Plerophyllid corals are dominant and most species show rhopaloid septa. Such a feature and the large size are in some cases the main difference between the species from Kangmar and other species belonging to the same genera. Those differences may be due to ecological factors.

The assemblage from Baingdipu Formation is composed exclusively of non-dissepimented corals. It may

be regarded as typical of cold and deep water, and shows affinities (to the generic level) with other Gondwana areas, such as Salt Range, Timor, Australia or South America. Only three genera and one species are in common with the rugose coral assemblage from Langco Formation, also in South Tibet, but in the Ngamring Lhaze region.

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