ON THE OCCURRENCE OF ARISTOCYSTIS FAUNAS IN CHINA

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With 2 plates

INTRODUCTION

The present collection made by S. S. Yoh in 1927 from the Middle Ordovician of Kweichou contains five species of cystoids.

During my furlough (1935-1936) I had the chance to compare the material with Jaekel's originals in Berlin, Reed's originals in Cambridge and have as a result been able to determine the following species in our collection.

1. *Aristocystis sinica* Sun (sp. nov.)
2. *Sinocystis loczyi* Reed
3. *Hemicosmites jaekeli* Sun (sp. nov.)
4. *Heliocrinus kweichouensis* Sun (sp. nov.)
5. *Stichocystis* sp.

Of these *Aristocystis sinica* Sun is the most abundant species and the zone containing this fauna should be designated the *Aristocystis sinica* zone.

The occurrence of *Aristocystis* in China is of great significance.

As *Aristocystis* was abundantly found in Bohemia, but was never known in the Baltic region, the occurrence of *Aristocystis sinica* in China indicates a certain connection between Bohemia and China during Middle Ordovician time; and makes it probable that the fauna originated in the Indo-Pacific Ocean and then migrated westward to Bohemia, but never

1 Associated with *Ogygites faunas* described by the writer in Palæontologia Sinica, Ser. B, Vol. VII, Fasc. 1.

extended into the Baltic province. This supposition is greatly strengthened by the fact that the *Aristocystis* fauna of S. China occurs earlier (Llandeilian) than that of Bohemia (Caradocian).

Finally I desire to express my thanks to Prof. J. Wanner of Bonn University, Prof. O. Schindewolf of Geological Survey of Germany, Berlin, and Dr. Cowper Reed of Sedgwick Museum, Cambridge for their help and critical discussion.

Class CYSTOIDEA L. V. Buch

Order DIPLOPORITA Jkl.

Suborder SPHÆRONITA Jkl.

Family ARISTOCYSTIDÆ Neumayr (emend. Jkl.)

Genus ARISTOCYSTIS Barr.

Aristocystis sinica Sun sp. nov.

Pl. I, Figs. 1a, b, c, Pl. II, Figs. 2 a, b.

Description:—This species is the most abundant form and represented by two fairly preserved thecas.

Theca oval in both longitudinal and transverse section; upper end (oral) broad, somewhat contracted or constricted at the lower half of the theca into a narrow end with the base of attachment.

Peristome (M) slit-like, usually twice longer than the width and with two pairs of very short and shallow grooves probably for the brachioles at both ends.

Anus (A) large, hexagonal, covered by six triangular plates forming a low pyramid and situated near the anterior of the mouth.

Hydropore (H) and genopores are situated between the mouth and the Anal pyramid.

The sutures of the theca are not preserved and therefore the number of the plates is indeterminable. But the whole surface of the theca is entirely covered by the worm-shaped or bent tubercles of double pores.

Measurements:—

specimen	length	width	thickness
a (Pl. II, Fig. 2)	53 mm	42 mm	19 mm
b (Pl. I, Fig. 1)	49 mm	41 mm	20 mm

Comparison:—This new species is characterized by its broad form and the characteristic Meristome. It differs greatly from *Aristocystis? dayon* Bather. (Reed, p. 8, pl. 1, fig. 1-5, Palæontologia Indica, new. Sers. Vol. II, No. 3) because the latter form has very thick plates, prominent rugose umboes and the simple-pore plate. But our form is closely related to Bohemian form *A. bohemicus* Barr. (Barr. p. 168, pl. 9-14, 36-38) in the character of the pores and in the arrangement of plates. However, the great width of the theca and the short form of the peristome serve to distinguish our new form from the Bohemian species.

Remarks:—As mentioned by Bather before, the *Aristocystis* was abundantly found in Bohemia, but was not recorded from America or from the Ordovician of either England or the Baltic province. Moreover, *Aristocystis dayon* Bather was also reported by Reed from the northern-Shan States, Burma, and differs greatly from the true *Aristocystis* Barr. by the regularity of the plates and the character of the tubercles without diplopores.

However, the discovery of the *Aristocystis sinica* is of rather significance by further convincing that *Aristocystis* was of Indo-Pacific origin and migrated into Bohemian Basin in the Upper Ordovican (Caradocian), but not extended into Baltic region. This can be further confirmed by the fact that our species occurs at a little lower horizon (Llandeilian) than the European form.

Aristocystis? sp.

Pl. I, Figs. 2 a, b, c.

Description:—Two fragmentary and compressed lower ends of the theca doubtfully referred to *Aritocystis* are represented in our collection.

One of the comparatively better examples shows the strongly compressed form, the irregularly rectangular plates, simple oval

tubercles of the double pores, the thin character of the theca and the conical end of the base which are the essential characters of *Aristocystis*. This might belong to *Aristocystis sinica* Sun, although the characteristic worm-shaped tubercles are scarcely developed in this example.

Comparison:—This is rather similar to *Codiacystis*[1] Jkl (=*Craterina* Barr.) in the general form of the theca, the simple oval shape of the tubercles; but the thin character of the theca, the irregular character of the plates and the character of the base serve to distinguish it from *Codiacystis*.

It differs also from *Aristocystis Bohemicus* Barr. in its rapid tapering of the lower end of the theca.

Remarks:—As the outstanding characters of *Aristocystis* are the double pored character of the tubercle, the absence of the stem, the irregular shape and the thin character of the plate. It seems to me that *Aristocystis dagon* Bather[2] is not the genus Arisacystis at all and should belong to a distinct genus *Pseudoaristocystis dagon* (Bather) Sun by having very thick form, the regularity of the plates, the prominent rugose character of the umbo and also by the character of the pores (not doubled).

Suborder SERIOLATA Jkl.

Family SINOCYSTIDÆ Sun

Genus SINOCYSTIS Reed

Sinocystis loczyi Reed

Pl. II, Figs. 1 a, b.

1917. *Sinocystis loczyi* Reed, Ordovician and Silurian Fossils from Yunnan, Palæontologia Indica, New Ser. Vol. VI, Mem. No. 3.

1 O. Jaekel, Stammesgeschichte der Pelmatozoen, I, Thecoidea und Cystoidea, pp. 398-402.

2 C. Reed, The Lower Palæozoic Fossils of the Northern Shan States, Burma. Palæontologia Indica N. S. Vol. II, No. 3, p. 8-13, Pl. 1, figs. 1-5.

Comparison:—This species is represented by a fair good specimen in our collection. It is 51 mm long and 44 mm in its large diameter of the theca.

Our form agrees with the Yunnan form in its oval form of the theca, the character of the numerous, irregular polygonal plates, the bifurcating process of the mouth and also in the position of the hydropore, genopore and the anus. However, the hydropore of our form is slit-like and obliquely situated at the right end of the mouth while the genital plates (usually five) are found between the large Anus and the mouth. The genopore is distinct and situates very near to the anus.

Remarks:—The Shihtien beds of Yunnan carrying *Sinocystis loczyi* was considered by Reed to be Lower Ordovician, the Shihtzepu (十字鋪) shale of Tsungyi district, Kweichou is certainly of the same formation yielding *Sinocystis loczyi* and also trilobites and graptolites of Llandeilian age.

Order DICHOPORITA Jkl.

Suborder IRREGULARIA Jkl.

Fam. CARYOCINIDÆ Jkl.

Genus HEMICOSMITES V. Buch

Hemicosmites Jaekeli Sun sp. nov.

Pl. II, Fig. 3.

Description:—Theca egg-shaped; basals (B) 4, large and pentagonal. Laterals of first row (L_1) (Lower half) 6, large, hexagonal or pentagonal with axial ridges and pores. Laterals of second row L_2 (Upper half) 9, very large, pentagonal. Roof-plates R (orals) very small, situated at the oral side.

All the plates are oranamented with the axial ridges and pores.

This species is represented by an incomplete extenal mold, both ends being broken away. It is easily distinguished from any known species in the small roof plates (oral plates) and also in the character of

the plates. This species is named in honour of the late Prof. O. Jaekel of the Kwangtung and Kwangsi Geological Survery, Canton, China.

An associated large external mold of the plate is pentagonal and ornamented with double rows of pores, probably belonging to the same species.

Remarks:—This form is referred to *Hemicosmites* by its small crown and the character of the plate. Another interesting fact should also be noted that our form occurs at a little lower horizon (Llandeilan) than the Baltic form (Caradocian) and is more primitive with the small form of theca, the small roof-plates and with less ornamented plates.

Fam. ECHINOSPHÆRITIDÆ Neumayr

Genus *Heliocrinus* Eichward

Heliocrinus kweichouensis Sun sp. nov.

Pl. II, Figs. 4 a, b.

Diagnosis:—Heliocrinus with the spherical theca, more numerous rhombic ridges and particularly with five? large basals.

Description:—This species is represented only by one half portion of the theca in which the suture of the plate are indistinct and a portion of the theca is preserved.

The theca is from spherical to oval in form and the stereotheca is ornamented with more crowded pore rhombic canals and ridges, about 3 in 1 mm.

The base is broad with five (?) large basals at its lower end. Mouth, anus and hydropore unknown.

Remarks:—This species agrees with *Heliocrinus subovals* Reed[1] in the character of the pore rhombic canals and ridges and in the size of the theca, but the character of the base of our form seems to distinguish it from the Yunnan species.

1 C. Reed, Palæontologia Indica, N. S. Vol. VI, No. 3, p. 17, pl. IV, fig. 5.

STICHOCYSTIS Jkl

Stichocystis sp.

Pl. I, Fig. 3.

1899. *Stichocystis (Caryocystis) gemetrica* (Ang.) Jkl, Stammesgeschichte der Pelmatozoen, p. 325-327, Taf. IX, 6.

Description:—This is represented only by one framentary portion of the pore rhombs. It agrees with the type species *Stichocystis (Caryocystis) gemetrica* (Ang) Jkl in its straight, very wide and parallel pore rhombs, the regularly and widely distributed pores and also in the size of the pore rhombs.

BIBLIOGRAPHY

Barrande, J. Systême Silurien du Centre de la Bohême, Pt. I, Vol. 7, 1887.

Jækel O. Stammesgeschichte der Pelmatozoen, I, Thecoidea und Cystoidea, 1899.

Jækel, O. Phylogenie und System der Pelmatozoen, Palæontologischen Zeitschrift Band 3, 1918.

Reed, F. A. Cowper. Supplementary memoir on New Ordovician and Silurian Fossils from the Northern Shan State, Palæontologia Indica, N. S. Vol. II, No. 1, 1915.

Reed, F. R. Cowper. Ordovician and Silurian Fossils from Yunnan, Palæontologia Indica, N. S. Vol. VI. No. 3, 1917.

Reed, F. R. Cowper. The lower Palæozoic Fossils of the Northern Shan States, Burma, Palæontologia Indica, N. S. Vol. II, No. 3, 1906.

Wanner, J. 3. Klasse Cystoidea V. Buch, Sonderabdruck aus dens Handwörterbuch der Naturwissenschaften, 1934.

Explanation of Plate I

PLATE I

Aristocystis sinica Sun (sp. nov.). ..... p. 478

Fig. 1a. Frontal view of the theca, natural size; A, anus. M, mouth.

1b. Lateral view of the same, natural size.

1c. Oral view of the same, showing the mouth (M) anus (A) and hydropore (H.), × 4. Syntype, Geological Survey Coll., Nanking. Cat. No. S. 1277.

Aristocystis? sp. ..... p. 479

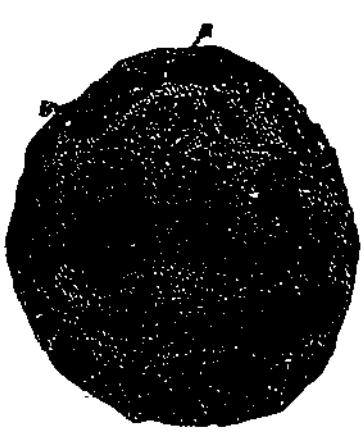
Fig. 2a, b. Two different views of one compressed lower portion of the theca, natural size.

Fig. 2c. Enlargement of the same, ×4, showing the plates (P) and the plate sutures (S). Geological Survey Coll. Cat. No. S. 1279.

Stichocystis sp. ..... p. 483

Fig. 3. One fragmentary portion of the pore rhombs, natural size. Geological Survey Coll. Cat. No. S.1283.

Shihtzepu formation (Middle Ordovician), Tsunyi district, Kweichou. S. S. Yoh Coll.



1a

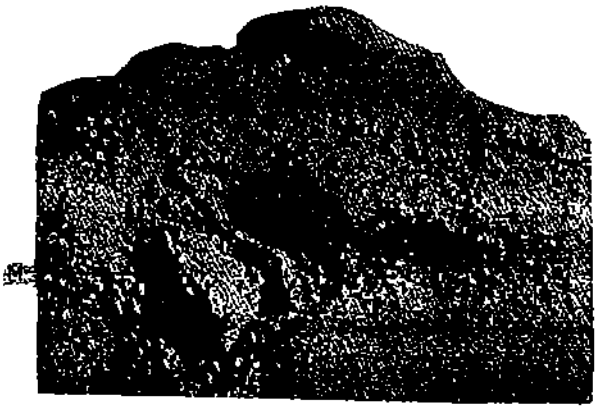
2c

2a

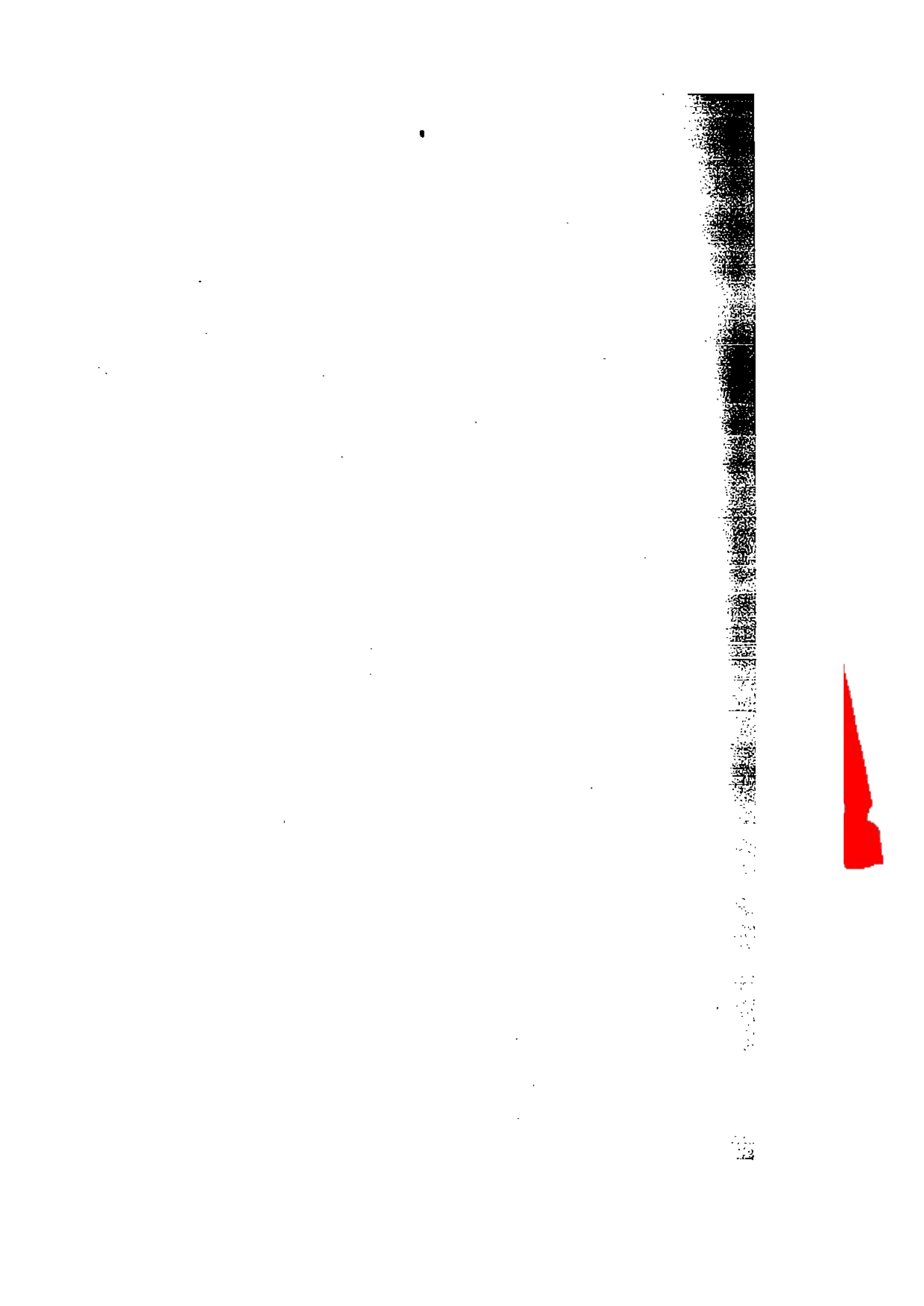
3

2b

1b



1c



Explanation of Plate II

PLATE II

Sinocystis loczyi Reed. ..... p. 480

Fig. 1a. Lateral view of the theca, natural size.

1b. Oral view of the same, natural size showing mouth (M), anus (A) and genopore? (G).

Plesiotype, Geological Survey Coll. Cat. No. S. 1280.

Hemicosmites jaekeli Sun (sp. nov.). ..... p. 481

Fig. 3. Frontal view of the theca, natural size, showing basals (B), laterals of 1st and 2nd order (L_1, L_2) and orals (R). Holotype. Geological Survey Coll. Cat. No. S. 1281.

Heliocrinus kweichouensis Sun (sp. nov.)..... p. 482

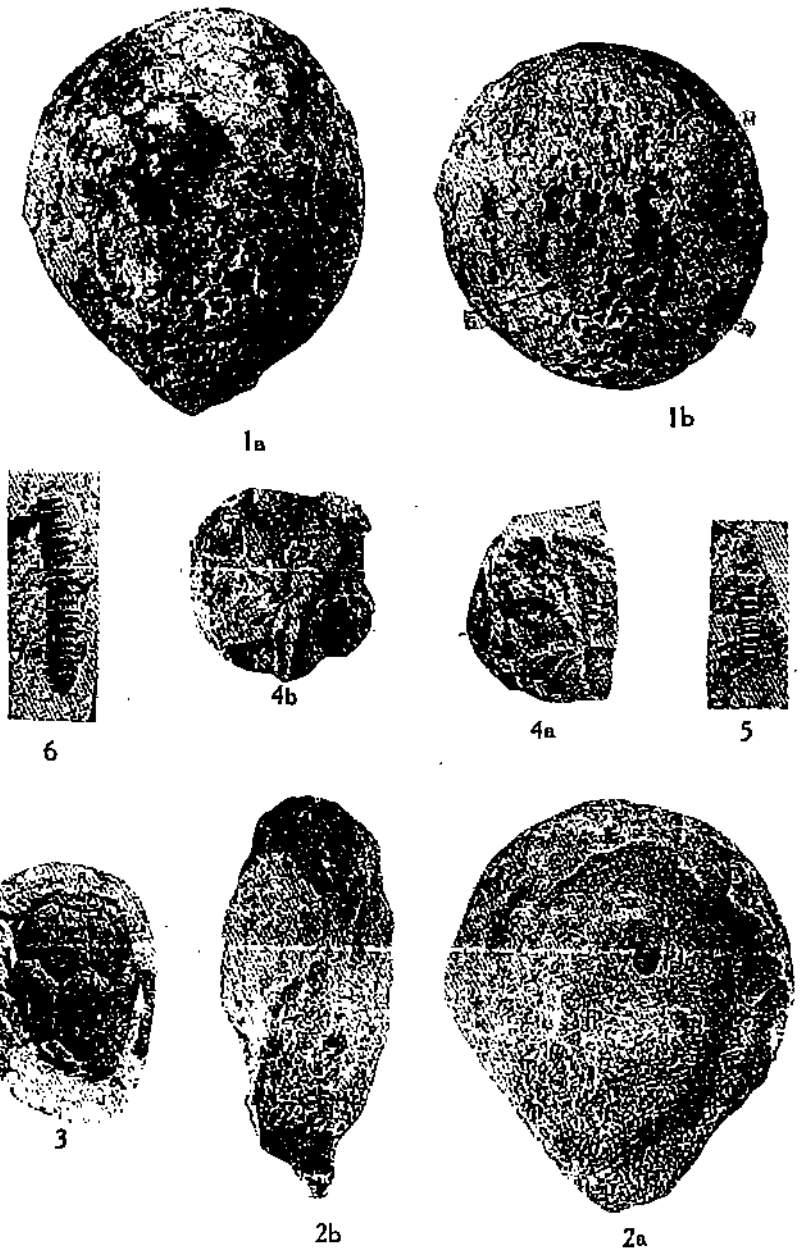
Fig. 4a. Portion of the theca, showing rhombic canals and ridges, natural size.

4b. Basal view of the same, showing basals, natural size. Holotype. Geological Survey Coll. Cat. No. S. 1282.

Cystoidea

Figs. 8,9, Stems.

Shihtzepu formation (Midle Ordovician) Tsunyi district, Kweichou. S. S. Yoh Col.


1a
1b
6
4b
4a
5
3
2b
2a