

陝西梁山下奧陶紀苔蘚蟲的發現*

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(附圖版、插圖各二)

奧陶紀苔蘚蟲在北美和東歐各地都非常豐富,已發現的種屬很多。在中國關於這方面的材料發現的還不多,報導的更少。根據筆者所知僅在遼寧太子河流域中奧陶紀馬家溝石灰岩中發現過數種,但因保存狀況很壞,除日人尾崎描述過二種外,其他材料尚未詳細研究。此外在揚子江中上游宜都、長陽一帶下奧陶紀地層中也曾發現過苔蘚蟲,因保存情況不好未作研究。在陝西南部梁山附近下奧陶紀地層中發現的苔蘚蟲雖種屬不多,但保存狀況和前二處比較起來稍好一些,計有二屬三種。其中有一新屬;另一屬雖在美洲和歐洲都比較普遍,在中國還是第一次見到,對這一屬來說又增加了它分佈的領域。本文是描述或說明這三個種的外形和內部構造,並討論新屬在苔蘚蟲的分類上所在的位置,以供同行參考。

梁山的標本是西北大學地質系霍世誠教授帶學生實習時在陝西南鄭縣西北約十數里的下梁山附近採得。這些標本和筆石 *Didymograptus* sp. 共生,產在黃綠色厚層狀頁岩裏面。在產上述化石的上面找到中奧陶紀重要的標準化石 *Yangtzeella poloi* (Martelli)。因此肯定它的時代是下奧陶紀上部,和揚子江下游的寧國頁岩相當。

種 的 描 述

變 口 目

科 *Constellaridae* Ulrich

屬 *Nicholsonella* Ulrich

Nicholsonella huoi Yang (新種)

(圖版 I, 圖 11, 12; 圖版 II, 圖 5—10; 插圖 1)

當前的新種是根據兩塊扁形亞枝狀標本建立的,高約 20 毫米,寬和高約相等,厚 7 毫米。硬體下端細而尖,中部很快膨脹起來,是硬體的最寬部分;上端和兩旁生有短而

* 1956 年 11 月 5 日收到。

粗的枝,使硬體呈鹿角狀。硬體表面大致平滑,有由間隙孔積聚而成的斑點;斑點較硬體表面略高一點,彼此的中心相距約 2 毫米。蟲室圓形,幾乎完全被形狀和大小都不規

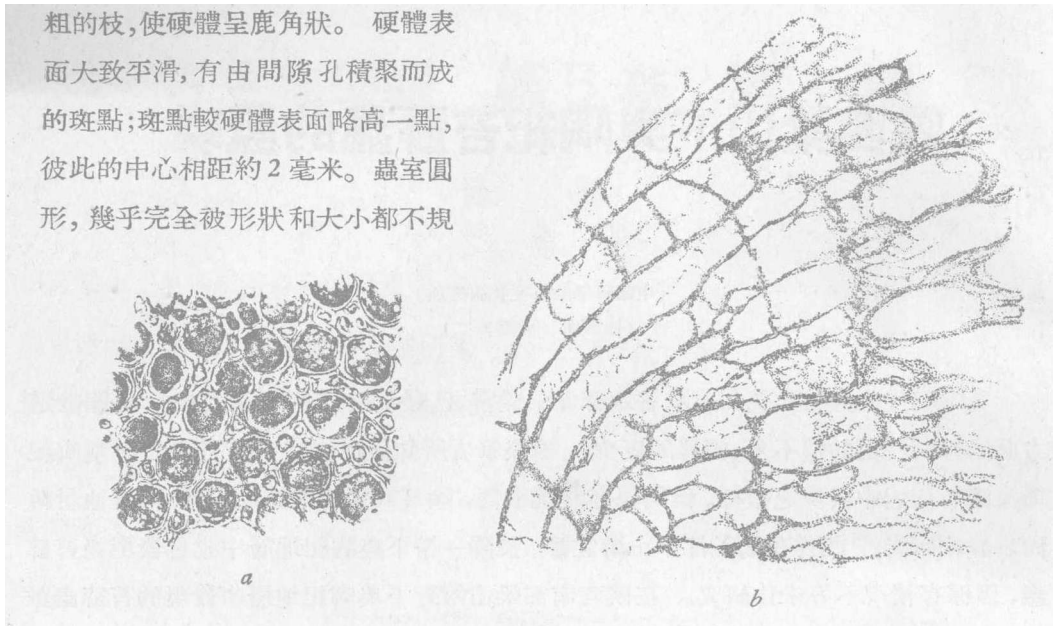


插圖 1 *Nicholsonella huoi* Yang
a. 弦切面, ×10; b. 縱切面, ×20

則的間隙孔所分開。體壁中等厚度,在體壁上尤其在蟲室和間隙孔交角的地方有許多細小黑點。這些小黑點代表着間隙孔,僅在表面顯著,在稍深一點的弦切面上就不易見到。

弦切面:從弦切面看,這一標本顯示得很美麗。蟲室幾乎為正圓形,四周圍繞着一束淺色光亮組織;正常的直徑為 0.30 毫米,小的僅 0.26 毫米,最大的可達 0.35 毫米;每 2 毫米的距離內蟲室的數目為 5—6 個。間隙孔的形狀和大小都不規則,從多邊形至亞圓形,數目很多,把蟲室幾乎完全分開。

縱切面:在縱切面可以看到蟲管由未成熟區到成熟區增長速度頗快,蟲管彎曲情況比較均勻。橫板數目不多,分佈範圍較廣,成熟區和未成熟區都有;在未成熟區彼此間距為 3—4 個管徑;在成熟區其數目增多 2—3 倍。體壁薄,略現彎曲現象,有時比較清楚,但多半都被許多細小黑點圍繞,界限不清,好像體壁是由細小點組成。間隙孔和蟲室僅有大小之分,其他情況完全相似。

橫切面:在橫切面可以見到蟲管的形狀大小不同,呈多角形,在中心區體壁很薄,但由微細的小黑點組成的組織仍能看到。

註釋:這一新種硬體的表面具有很多似間隙孔的小黑點,但到了內部這些小黑點即消失不見。這一特徵和在愛沙尼亞中奧陶紀下部海綠石石灰岩中所採的 *Nicholsonella gibbosa* Bassler 可以相比,但二者硬體的形狀不同,可以互相區別。我們這個新種的硬

體呈扁平亞枝形，而愛沙尼亞的標本呈規則的半圓球形至不規則的或伸長的結核狀塊體；這兩種的弦切面也很接近，但二者的縱切面差別較大，尤其是橫板的數目懸殊很大。*Nicholsonella gibbosa* 橫板很少，Bassler（1952）根據這一特徵另建一新屬而稱之為 *Revaltrypao*。新種的橫板數目較多。新種縱切面和北美的 *Nicholsonella pulchra* Ulrich 可以相比，但二者可以弦切面和硬體的形狀區別。就內部構造來說，當前這一新種和 *Nicholsonella gibbosa* 的關係比較密切，和 *Nicholsonella pulchra* 的關係較疏遠。就外形來說，和後一種的關係又比較接近。

登記號：8954（全型），8955（副型）。

隱口目

科 Stictoporellidae Nickles et Bassler

屬 *Trepocryptopora* Yang（新屬）

硬體兩層以中稜分開，呈薄板狀向外伸展，有時有二分法分成的枝。蟲室為管狀，自中稜生出，直通體面；管內具疊覆的橫板。蟲口卵形至橢圓形，無口圍，蟲室和蟲室之間被許多細小的多邊形的小孔隔開；這些小孔就代表間隙孔。間隙孔內有時有一、二條橫板，但常為細層狀組織代替。

屬型：*Trepocryptopora dichotomata* Yang

討論：這一屬具疊覆的橫板，是變口目中很多屬常有的特徵，尤其在 Heterotrypidae 科中的各屬這種現象更為常見。同時這一屬的成熟區和未成熟區之間無顯著界限，也和變口目相似。筆者猶豫很久，曾試將此屬放在變口目中。但仔細觀察硬體的特性、蟲管的形狀及蟲室和蟲室之間的空隙為無數的細孔佔據，這又表示和隱口目關係比較密切，尤其和 Stictoporellidae 科更為接近。這一新屬和 *Intrapora* 屬可以互比，但由於具疊覆狀橫板使二者易於分開。有些特徵和 *Pachydictya* 屬很相似，但新屬的中稜和縱列蟲室之間缺少管狀細孔，在縱切面看蟲室和蟲室之間也無泡狀組織，和 *Pachydictya* 不同。另一特徵是蟲管自中稜生出只有很短一段略顯傾斜，很快就直向硬體表面，成熟區和未成熟區無區別，和標準的隱口目不同。

這一屬在分類上的位置是尚待解決的問題，所有圓口目或隱口目的種屬都未見疊覆狀橫板，只有變口目中 *Batostoma*, *Dekayella* 等屬有這種特徵。按橫切面的疊覆橫板來說，應該放在變口目中。但研究其表面構造及就弦切面看許多特徵和隱口目比較接近，尤其和 Stictoporellidae 科更為密切。但這一科無疊覆橫板，把它放在這一科內也

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有不適宜的地方,如另立新科又感材料不足,所以暫時放在這一科內,以待將來更多事實發現後再決定。由於這一屬的發現,它具有變口目同時也具有隱口目的特徵,這又可說明這二個目之間的關係。

***Trepocryptopora dichotomata* Yang sp. nov. (新種)**

(圖版 1, 圖 1—10; 插圖 2)

硬體薄層狀,以二分法分成若干枝,有中稜把硬體分成兩層。硬體厚約 1 毫米,完整的形狀和大小尙不知道;當前的標本高達 30 毫米,寬達 10 毫米;表面平滑,無尖峯也

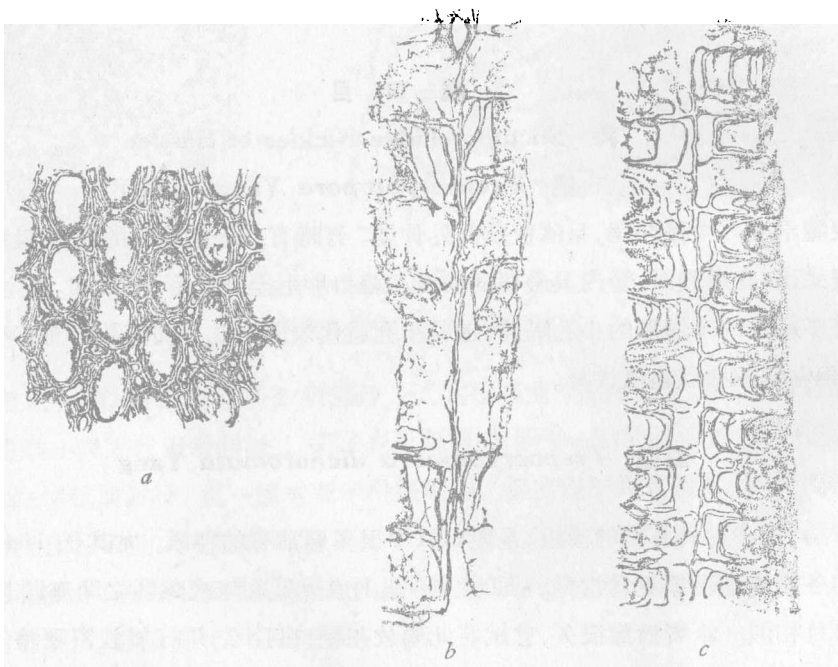


插圖 2 *Trepocryptopora dichotomata* Yang
a. 弦切面, $\times 10$; *b.* 縱切面, $\times 10$; *c.* 橫切面, $\times 20$

無斑點。蟲室橢圓形,彼此之間幾乎完全被間隙孔分開;排列規則,上下成行,斜交成列;沿着硬體縱的方向每 2 毫米內可見蟲室 4 個,斜方向 2 毫米內可見 5 個。蟲室的長直徑為 0.44 毫米;短直徑僅 0.20 毫米,體壁相當厚。間隙孔很多,未見刺孔。間隙孔呈卵形至多邊形,大小不等。

橫切面:在橫切面可以很清楚地看到呈細層狀的厚體壁從中稜生出來,直接通向硬體表面,不見彎曲。蟲管內有疊覆橫板是它的重要特徵;這些橫板排列的距離不等,每一管徑的長度內約有 2—4 條,每一蟲管內有 3—4 條,有時也可見到 5 條。間隙孔內一般無橫板,但有時也可見到 1—2 條。因為蟲管自中稜生出,直接通向硬體表面,所以成

熟區和未成熟區無顯著界限和區別。

縱切面：中稜和體壁都具細層狀構造。疊覆橫板常不平行，有時傾斜，互相交在一起，不如在橫切面上所見的那樣規則，分佈的情況也不均勻。

註釋：這一種的硬體成薄片狀，兩層之間有中稜分隔，在蟲室之間有無數小孔，在表面看來和隱口目比較密切，尤其和 *Intrapora* 可以互相比較，但從橫切面和縱切面來看，其內部構造因有疊覆的橫板和變口目中的 *Dekayella* 及 *Batostomella* 比較接近。這一種因蟲管內有橫板，未成熟區和成熟區無顯著區別，和 *Intrapora* 不同。室口（aperture）和假室口（vestibule）的寬度相等，也就是說成熟區的體壁無顯著加厚現象，和一般隱口目苔蘚蟲不同。有些特徵可以和採自美國米尼蘇達州中奧陶紀和蘇聯愛沙尼亞中奧陶紀的 *Pachydictya elegans* Ulrich 相比，但在縱切面因蟲室與蟲室之間未見泡狀組織，同時中稜中未見環狀細孔構造，二者可以區別。按硬體的外形及弦切面來看，有些地方和愛沙尼亞所產的 *Pachydictya flabellum* (Leuchtenberg) 相似，用縱切面來區別它們比較容易。

登記號：8950（全型），8951（副型），8952（另一副型）。

Trepocryptopora flabelata Yang sp. nov.（新種）

（圖版Ⅱ，圖 1—4）

這一種僅根據一塊不完整的標本建立的。硬體葉狀，有中稜，分兩層，長 20 毫米，寬 15 毫米，厚 1 毫米；體面光滑，未見尖峯或斑點。蟲室卵形至橢圓形，相鄰的蟲室之間完全被間隙孔分開。蟲室排列規則，縱、斜都成行，縱量每 2 毫米內 5 個，斜量每 2 毫米內有 6 個；長直徑 0.36—0.38 毫米，短直徑 0.22—0.24 毫米。體壁在弦切面看相當薄具細點結構。間隙孔的形狀和大小都不規則，但以多邊形者較多。

註釋：這一新種的特徵無論從縱切面看或從橫切面看都可以和前一種相比。和前種的區別是硬體葉狀不分岔，在一定距離內蟲室的數目不同，前一種每 2 毫米內縱量和斜量蟲室的數目為 4 個和 5 個，現在這一種為 5 個和 6 個，同時長直徑和短直徑之間的比例二種也不相同，所以另建立一個新種。

登記號：8953（全型）。

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SOME BRYOZOA FROM THE UPPER PART OF THE LOWER ORDOVICIAN OF LIANGSHAN, SOUTHERN SHENSI (INCLUDING A NEW GENUS)

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(with 2 Plates and 2 Text-figs.)

(ABSTRACT)

The present paper deals with 3 new species belonging to 2 different genera, of which one is unknown to the literature and the other is abundant both in North America and in Eastern Europe, yet it is first discovered in China. The material was collected by Prof. S. C. Huo and his colleagues and students of the Department of Geology, Northwest University during their recent field excursions in the Liangshan area of Southern Shensi. The hill, Liangshan, one of the important branches of the Tapashan Range, i.e., the southern limb of the Hanchung basin, is situated at 8 km west of the Hanchung city.

All the species described in the present paper were come from the same locality and the same horizon. They are associated with the important Ordovician fauna, *Didymograptus* sp. The age of the bryozoa is accordingly assigned to the upper part of the Lower Ordovician.

Family Stictoporellidae Nickles et Bassler

Genus *Trepocryptopora* gen. nov.

Zoarium bifoliate consists of leaf-like expansions or dichotomously branching stipes. Zooecia, developed from the median lamella and proceeded direct to the surface, are tubular and tabulated with overlapping diaphragms. Apertures oval to elliptical, without peristome, are separated by interspaces with numerous minute angular pits representing the opening of the numerous mesopores. The interspaces are usually laminated, occasionally with one or two diaphragms.

Genotype: *Trepocryptopora dichotomata* Yang (sp. nov.)

The overlapping diaphragms usually characterized the Trepostomatous bryozoa, especially the family Heterotrypidae. The writer for a long time hesitates to put the present genus under the order of Trepostomata, while the characters of the zoarial forms, the zooecial tubes and the interzooecial spaces with numerous cell-apertures or mesopores indicate that the genus is related with Cryptostomata, especially with Stictoporellidae. It may be compared with *Intrapora* Hall, but differs from the latter in having overlapping diaphragms in longitudinal section. In some

respects it resembles *Pachydictya* Ulrich, they may be distinguished by the presence of minute tubuli between the median lamella and between the longitudinal rows of zooecia of the latter. Another peculiar character of the present new genus is the uniformness of the zooecial tubes creating from the median lamella and extending directly to the surface of the zoorium. Only at the very beginning the zooecial walls are slightly inclined; no distinct difference between the mature and the immature regions as most of the typical Cryptostomatous do.

The systematic position of this genus is still a question remaining to be settled. According to the character of the overlapping diaphragms showing in longitudinal and transversal sections, the present genus is related to some genera of the order of Trepostomata, such as *Batostoma* and *Deyayella*, etc., but by the study of other characters shown in tangential sections many features are related to Cryptostomata. If the evidence is not enough to establish a new family, it may be probably more related to Stictoporellidae. Consequently, it is temporarily put under this family with an interrogative point. The present new genus bears characters both related to the order of Trepostomata and to the order of Cryptostomata and this is shown that these two orders in some respects are intimately related.

Trepocryptoporea dichotomata Yang (gen. et sp. nov.)

(Pl. I, figs. 1—10)

Zoarium bifoliate consists of leaf-like expansions or dichotomously branching stipes, about 1 mm in thickness. Size of the frond is unknown, but fragments up to 10 mm in width and 30 mm in height have been observed. The surface of the zoarium is generally smooth, no monticules or maculae have ever been detected. Zooecial apertures elliptical in outline almost completely separated from the neighbouring ones by mesopores are arranged in longitudinal and diagonal rows. Four apertures are counted longitudinally and about 5 are observed diagonally in a distance of 2 mm; the longer diameter is 0.44 mm and the shorter one is only 0.20 mm; the walls are rather thick. No acanthopores have ever been seen. Numerous mesopores are subcircular to angular in outline and irregular in size.

Transverse sections show that the thick laminated zooecial walls developed from the median lamella and directed to the surface. Overlapping diaphragms appearing in the zooecial tubes are peculiar in characters; they are distributed at unequal distances from two to four in each tube diameter. Three or four sometimes five diaphragms may be secured in each zooecial tube. In the mesopores usually none sometimes one or two diaphragms may be observed. The zooecial tubes being direct to the surface from the median lamella, there is no marked difference between the mature and the immature regions.

In longitudinal sections both the zooecial walls and the median lamella are laminated and the overlapping diaphragms are not so horizontal and so regularly disposed as seen in the transverse sections. They are usually inclined and sometimes intersected.

Remarks: The leaf-like, thin-expanded, bifoliate zoarial form and its surface character bearing numerous minute cell-apertures or vesiculose in the inter-apertural space of the present specimen are closely related to the cryptostomatous bryozoa; it may be compared with the genus *Intrapora*. While the overlapping diaphragms which commonly occurred in *Dekayella* and *Batostoma*, shown in the transverse and longitudinal sections, are related to Trepostomata. It differs from *Intrapora* in longitudinal section in having tabulated zooecial tubes and no sharp difference between the mature and immature regions. The vestibules are as wide as the zooecial apertures; this is quite different from the species of Cryptostomata. In some respects the present species may be compared with *Pachydictya elegans* Ulrich, a common species collected from the *Clitambonites* bed of Lower Trenton, Minnesota of North America and from Kuckers shale (C2), Baron Tolls' estate, Esthonia, U.S.S.R., but differs from it in the lacking of vesicular structures in the inter-apertural spaces, and in the absence of ring-like walls and minute tubuli between the median laminae. The zoarial form and the tangential section of the present species may also be compared with *Pachydictya flabellum* (Leuchtenberg) of Esthonia. They are separated readily by their longitudinal sections.

Trepocryptopora flabelata Yang (sp. nov.)

(Pl. II, figs. 1—4)

A single fragmentary specimen bearing a bifoliate leaf-like frond, about 1 mm in thickness, 15 mm in width and more than 20 mm in length, is attributed to this species. The surface of the zoarium, as in the preceding species, is generally smooth; maculae or monticules have not been observed. Zooecial apertures oval to elliptical are completely separated from the neighbouring ones by mesopores. They are arranged in longitudinal and diagonal rows. Five apertures may be secured in 2 mm longitudinally and 6 obtained diagonally in the same distance of length. Their longer diameter ranges from 0.36 to 0.38 mm and the shorter one varies from 0.22 to 0.24 mm. The zooecial walls, seen in tangential sections, are rather thin and granulose. Mesopores are irregular in size and shape, most of them are angular.

Remarks: All the characters both in longitudinal and in transverse sections of the present species may be compared with the preceding species. This species is separated from the preceding one by the leaf-like zoarium without branching stipes instead of a dichotomously branching frond and by a more number of zooecial apertures observed in the same distance of length. Four and five apertures are counted longitudinally and diagonally respectively in the preceding species, while in the present species five and six are secured. The ratio between the longer and the shorter diameters of the apertures of these two species is also different.

Nicholsonella huoi Yang (sp. nov.)

(Pl. I, figs. 11, 12; Pl. II, figs. 5—10)

Zoarium compressed, subramose about 7 mm thick, 20 mm high and about the same .

distance in length. Around the margin there are short, subramose branches, giving to the zoarium the appearance of the antlers of the moose. The surface is nearly smooth, having slightly raised maculae gathered by mesopores, about 2 mm apart measured from center to center. The zooecia are circular in outline, medium thick-walled, nearly completely isolated by mesopores irregular in size and shape. The walls of both the zooecia and mesopores bear numerous small granules which are commonly situated at the junction of walls. The small granules of the surface are external characters; they disappear internally.

Tangential sections present a pretty appearance. The zooecial apertures are nearly circular and surrounded by a cingulum of light-colored tissue; 5 to 6 zooecia in a distance of 2 mm. The diameters of the apertures are ordinarily 0.30 mm, though the smallest one is only 0.26 mm and the largest may reach 0.35 mm. Mesopores isolating the zooecial apertures are angular to subcircular and irregular in size and shape.

In longitudinal sections the zooecial tubes diverge with comparative rapidity and uniformity of curvature. Diaphragms occur throughout the tube, three or four times their diameter apart in the axial region, and averaging two or three times as many in a given space in the peripheral region. The zooecial walls are thin, slightly crenulated, and only occasionally show as definite sharp lines, usually being represented by a diffuse granular structure. The mesopores differ from the zooecia only in size and in being possibly more granular in structure.

Transverse sections show that, in the axial region, the tubes are of all sized and variously angular. The walls are comparatively thin and the granules or dots can also be detected.

Remarks: The numerous granules are confined only to the external surface and may not be detected internally. This peculiar character may be compared with *Nicholsonella gibbosa* Bassler [= *Revalotrypa gibbosa* (Bassler), 1952], a distinctive species from the Glauconite limestone, the lower part of Middle Ordovician of Esthonia. It differs from the latter in zoarial forms. The present species bears a compressed, subramose zoarium with branches around the margins instead of regular hemispherical to irregular, elongated or nodular lumps in that species. The tangential sections of these two species are similar, while the longitudinal sections are quite different, especially in the number and in the distribution of diaphragms. They may readily be separated from each other. The longitudinal section of *N. pulchra* Ulrich found from the Pierce limestone at Murfresboro, Tennessee, U.S.A. may be compared with the present species. They are separated readily by their tangential sections and their zoarial forms.

This species is named in honor of Prof. S. C. Huo of the Department of Geology, North-west University.

圖 版 說 明

下列各圖都未加潤飾,劉雪筠、龐茂芳二同志攝影;標本保存在中國科學院古生物研究所。

圖 版 I

圖 1—10. *Trepocryptopora dichotomata* Yang (新種)

- 1—4. 爲全型標本,登記號 8950; 5—7. 爲副型標本,登記號 8951; 8—10. 爲另一副型標本,登記號 8952。
1. 弦切面, ×20, 表示蟲室的形狀及其排列方式。間隙孔形狀和大小都不規則。
2. 和 1. 是同一弦切面, ×40, 更清楚的表示蟲室和間隙孔的形狀和大小。
3. 橫切面, ×20, 表示硬體兩層以中稜分開, 蟲管內有疊覆橫板, 間隙孔內橫板數目較少, 體壁較厚, 成細屑狀。
4. 縱切面, ×20。
5. 硬體外形, 原大, 表示硬體表面構造。
6. 和 5 是同一標本, 局部放大, ×5, 更清楚的表示硬體表面蟲室和間隙孔的排列情況。
7. 橫切面, ×20, 表示中稜和疊覆橫板以及硬體橫切面的完整形狀。
8. 另一標本的縱切面, 表示橫板彎曲的形狀。
9. 和 8 是同一標本, 橫切面, ×20。
10. 弦切面, ×20, 距硬體表面較深, 表示蟲室排列的形狀。

圖 11—12 *Nicholsonella huoi* Yang (新種)

11. 硬體的外形, 原大。
12. 硬體表面局部放大, ×3, 更清楚的表示表面構造。

EXPLANATION OF PLATES

Plate I

Figures 1—10. *Trepocryptopora dichotomata* Yang (sp. nov.)

- 1—4, Holotype, Cat. No. 8950.
- 5—7, Paratype, Cat. No. 8951.
- 8—10, Another paratype, Cat. No. 8952.
1. Tangential section, × 20, showing the size, shape and arrangement of the zooecia and mesopores.
2. The same tangential section, × 40, showing the character of the zooecia and mesopores more in detail.
3. Transverse section, × 20, showing the bifoliate zoarium separated by median lamella. The overlapping diaphragms being very clear.
4. Longitudinal section, × 20.
5. External structure of a part of the zoarium, natural size.
6. A part of the same specimen, × 5, showing the surface characters more in detail.
7. Transverse section, × 20, showing the complete form of the cross section of the zoarium and the overlapping diaphragm.
8. Longitudinal section of another specimen showing the diaphragms which are curved.
9. Transverse section of the same, × 20.
10. Tangential section, cut further from the surface of the zoarium, × 20.

Figures 11—12. *Nicholsonella huoi* Yang (sp. nov.)

11. Natural size of the zoarium.
12. A part of the same zoarium showing the surface characters more in detail. × 3.

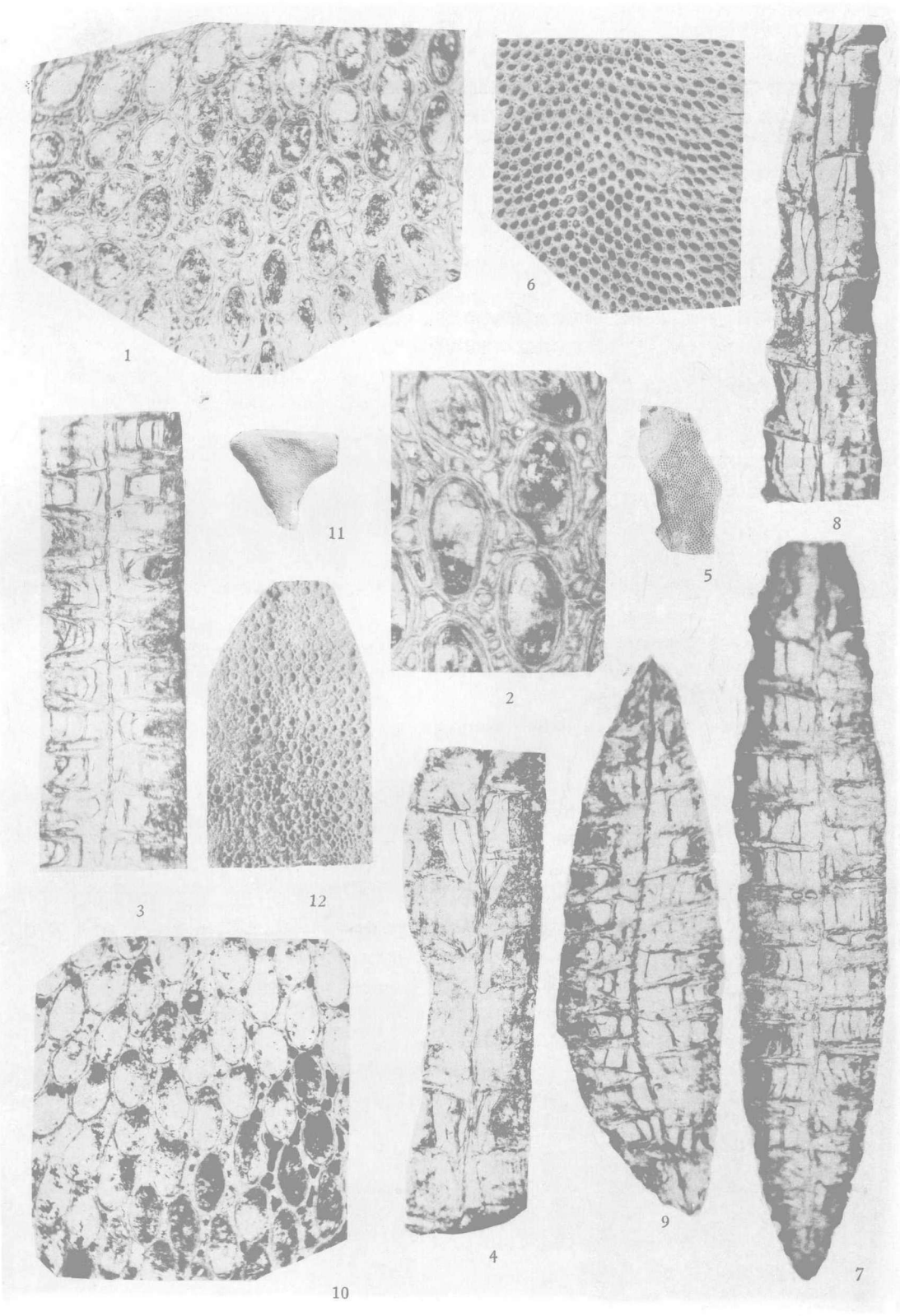


圖 版 II

圖 1—4. *Trepocryptopora flabellata* Yang (新種)

- 1. 和 2. 弦切面;圖 1, × 20, 表示蟲室和間隙孔排列的情況以及它們的大小。圖 2 同一弦切面, × 40, 更清楚地表示蟲室和間隙孔之間的關係。
- 3. 爲縱切面, × 20, 表示中稜、蟲室及疊覆橫板。
- 4. 硬體表面的一部分, × 3。
登記號 8953, 全型。

圖 5—10. *Nicholsonella huoi* Yang (新種)

- 5—9. 爲全型標本,登記號 8954。
- 10. 爲副型標本,登記號 8955。
- 5. 爲弦切面, × 20, 表示蟲室的形狀及間隙孔的大小。右邊的許多間隙孔是突起的位置。
- 同一弦切面, × 40, 更清楚地表示蟲室和間隙孔的構造。
- 7. 橫切面, × 10。
- 8. 縱切面, × 10, 表示蟲管內有稀疏的橫板。
- 9. 同一切面, × 20, 更清楚地表示體壁是由許多細小黑點組成。
- 10. 另一標本的弦切面, × 20。

Plate II

Figures 1—4. *Trepocryptopora flabellata* Yang (sp. nov.)

- 1. Tangential section, × 20, showing the size, shape and arrangement of the zooecia and mesopores.
- 2. Tangential section of the same, × 40, showing the characters more in detail.
- 3. Longitudinal section, × 20, showing bifoliate character and overlapping diaphragms more in detail.
- 4. A part of the surface character, × 3.
Cat. No. 8953.

Figures 5—10. *Nicholsonella huoi* Yang (sp. nov.)

- 5—9. Holotype, Cat. No. 8954.
- 10. Paratype, Cat. No. 8955.
- 5. Tangential section, × 20, showing the size and shape of the zooecia and mesopores. The right side represents a macula.
- 6. Tangential section of the same, showing the zooecia and mesopores more in detail, × 40.
- 7. Transverse section of the same, × 10.
- 8. Longitudinal section, × 10, showing zooecial tubes crossed by remote diaphragms.
- 9. Longitudinal section of the same, × 20, showing the minute granular zooecial walls.
- 10. Tangential section of another specimen, × 20.

