

中國古生物誌

總號第 144 冊

新乙種第 8 號

中國科學院古生物研究所編輯
古脊椎動物研究所

湖南上泥盆紀珊瑚化石

孫 雲 鑄



科學出版社

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插圖 2 圖版 12

中國科學院古生物研究所 編輯
古脊椎動物研究所
科學出版社 出版

1958 年 12 月

PALAEONTOLOGIA SINICA

Whole Number 144

New Series B No. 8

BOARD OF EDITORS

J. S. Lee, C. C. Young, H. C. Sze, Y. C. Sun,
T. H. Yin, C. C. Yü, S. Chen

THE UPPER DEVONIAN CORAL FAUNAS OF HUNAN

by

Y. C. Sun

(Institute of Geology, Ministry of Geology, Peking)

With 12 plates and 2 figures

Edited by Institute of Palaeontology Academia Sinica
Institute of Vertebrate Palaeontology

Published by Science Press

(Issued December 1958)

內 容 簡 介

關於世界上泥盆紀珊瑚化石報導不多，中國上泥盆紀珊瑚工作更差。本文描述中國湖南上泥盆紀珊瑚化石，極大部分為新種，其中有新屬二、新亞屬一。這不但對我國找鐵、找銻有幫助，並且可以解決中國南部上泥盆紀地層的劃分和對比問題(余田橋層時代問題等等)。

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編 輯 者	中國科學院古生物研究所 古脊椎動物研究所
出 版 者	科 學 出 版 社 北京朝陽門大街 117 號 北京市書刊出版業營業許可證出字第 061 號
印 刷 者	科學出版社上海印刷廠
總 經 售	新 華 書 店

1958 年 12 月第 一 版	書號：1575
1958 年 12 月第一次印刷	字數：60,000
道：0001—720	開本：787×1092 1/10
(滬) 報：0001—904	印張：3 2/5 插頁：6

定價：(10) 道林本 1.30 元
報紙本 1.10 元

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湖南上泥盆紀珊瑚化石

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一、前言

1927年,著者在德國馬堡大學開始德國 Eifel 山區中泥盆紀珊瑚的研究,當時德國僅有 Walther 從事德國上泥盆紀珊瑚的研究。1928年返國開始從事中國泥盆紀珊瑚的研究,大部分材料爲丁文江、趙亞曾、黃汲清等所採集,其中一部分關於 *Lythophyllidae* 和 *Ptenophyllidae* 曾於 1929 年在中國古生物學會宣讀,該文迄今未整理出版。

後來著者因從事奧陶紀三葉蟲和筆石的研究,材料移交計榮森,僅以一部分時間對上泥盆紀珊瑚種屬進行研究整理工作。

本文材料屬湖南湘鄉上泥盆紀,係 1934 年清華大學學生和著者所採集,另一部分補充材料係次年由北大趙金科所採集。切片係在前北京地質調查所和北京大學地質系所製,圖版照像係於 1936 年在訪問時期內在德國馬堡大學完成,共有圖版 12,圖 2。圖爲 Wedekind 教授和丁道衡所繪。著者對 Wedekind 教授、丁道衡、趙金科、計榮森、丁文江、趙亞曾和黃汲清諸先生以及前中國古生物誌編輯主任翁文灝教授的熱心支援和贊助均表示感謝。

由於抗日戰爭開始,出版受到影響。在這長時期中,蘇聯 Soshkina 及英國 Smith、英國 Hill、美國 Stumm 等均不斷地發表了上泥盆紀珊瑚的著述。

最近對二十多年舊稿重新詳加檢查。上泥盆紀珊瑚種屬繁多,有同屬異名的,有誤訂的,也有誤會原著者本意的。

本年冬,一方面重新校勘上泥盆紀珊瑚種屬工作,另一方面重新整理湖南上泥盆紀珊瑚材料。在工作中承地質研究所杜巴特洛夫專家,張仁山,長春地質勘探學院俞建章,北京大學樂森璿和南京古生物所俞昌民等協助和討論。1935—1936 年間手稿和圖版完成之後曾和 Schindewolf, Hill, Thomas, 丁道衡,俞建章等討論,著者一併致謝。

珊瑚化石均採自湖南湘鄉余田橋,共有 20 種。其中有二個新屬和一個新亞屬,新種 15。

研究的結果,湖南余田橋可分爲 *Sinodisphyllum* 帶(下)和 *Pseudozaphrentis* 帶(上),均屬上泥盆紀初期 *Frasnian*。

從珊瑚種屬的研究,該區珊瑚化石種羣可分爲四類。

第一類爲 *Disphyllum* 類,其中有樹枝狀叢狀 (*Pexiphyllum*, *Sinodisphyllum*, *Cyathophyllum*, *Macgeea*),多邊狀 (*Prismatophyllum*)和互通狀 (*Phillipsastraea*)。

第二類包括二個新屬, *Hunanophrentis* 和 *Pseudozaphrentis*。前者和 *Pynactis* 相似,後者發育程度較高,均屬 *Streptelasmataceae* 超科。

第三類以 *Keriophyllum* 爲代表。學者多認爲和 *Heliophyllum* 同屬。但從發生系統推斷似應歸入 *Ptenophyllidae* 科。

第四類爲 *Tabulophyllum* 盛產於中國南部和蘇聯俄羅斯地台上泥盆紀初期地層中。著者曾定爲 *Campophyllum*,對 Edwards 和 Haime 原定義加以修訂,並承 Wedekind 代繪立體圖。後來 Schindewolf 和 Hill 對 *Campophyllum* 屬型有異議,Stumm 另創了一個 *Breviphyllum* 新屬代替。因此,暫將 *Tabulophyllum* 屬歸入 *Leptoinophyllidae* Stumm。

四射珊瑚的分科是一項極其困難的工作，個別學者強調某一種特點進行更細的分類，往往造成不必要的新屬和新科。今後進行分科工作，尤應嚴格對待。

從四射珊瑚發展史和基本構造的排列（隔壁，鱗板和床板）來看，四射珊瑚大致可分單帶型，雙帶型和三帶型三大類，按時代也可分為志留泥盆紀，石炭紀和二疊紀。

湖南汨田橋上泥盆紀初期(D_3)珊瑚屬雙帶型。

二、種 屬 記 述

屬 *Pexiphyllum* Walther

(屬型 *Pexiphyllum rectum* Walther)

Pexiphyllum frechi Sun (新種)

(圖版 I. 圖 1a—e, 2a—c)

珊瑚個體長，圓柱狀，具有一級次級隔壁，近邊緣邊加厚。床板比較完全，排列成組。鱗板帶窄，具有2—3排球狀鱗板。床板帶闊，以灰質牆和鱗板帶明顯分開。正型標本(圖版 I. 圖 1)具有環節，體長32毫米，直徑約6—8毫米。

這種與 *Pexiphyllum rectum* (Walther, p. 36) 頗相似，但其床板帶的床板排列微有區別。

Walther 早經指出，這種的鱗板帶和床板帶之間有明顯的界綫，實為這屬的特徵。又和 *Phacellophyllum* 相似，但隔壁又顯然不同。無疑的，這種應屬 *Disphyllidae* 科。

屬 *Tabulophyllum* Fenton 和 Fenton

(屬型 *Tabulophyllum rectum* Fenton 和 Fenton)

這種是上泥盆紀的標準化石，珊瑚體多屬圓柱狀或為闊錐狀。隔壁短而細，鱗板呈人字形交錯。鱗板帶比較闊，由5排以上的細小鱗板組成。床板帶多不完全，有時化分為中央床板帶及兩側斜板帶。

1936年著者初步歸入 *Campophyllum* 屬，並作了進一步的修正，立體圖係由 Wedekind 教授所繪，但當時並未採用 Wedekind 創立的 *Campophyllidae* 科 (Wedekind 1921)。最近參閱新的文獻，才做了決定。湖南材料中可分別為下列三種

Tabulophyllum cylindricum Sun (新種)

Tabulophyllum curvatum Sun (新種)

Tabulophyllum gigantum Sun (新種)

Tabulophyllum cylindricum Sun (新種)

(圖版 I. 圖 3a—e; 圖版 II. 圖 1a—e)

圓柱狀，外壁具有環狀圓紋。一級隔壁短成曲屈狀，長約為直徑的 $1/3—1/2$ ，次級隔壁約為一級隔壁長度的 $1/3—1/2$ 。鱗板帶廣闊，由5排以上的小鱗板組成，大小不等。床板帶稀疏而不完全。

這屬和 *Disphyllum* 相似，屬 *Disphyllidae* 科。

層位和產地：湖南湘鄉上泥盆紀下部汨田橋層 *Pseudozaphrentis* 帶。

Tabulophyllum curvatum Sun (新種)

(圖版 I. 圖 4a—c, 5a—c)

中型彎柱狀，鱗板帶闊，由近10排左右的細小半球狀鱗板組成。床板帶窄，床板平，稀鬆且不完全。

正型(圖版 I. 圖 4)隔壁極細且短,長約為直徑 $2/3-1/2$ 。

層位和產地: 湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶(D_3^1)。

Tabulophyllum gigantum Sun (新種)

(圖版 III. 圖 1a—e, 圖 2; 圖版 II. 圖 2a—d)

大型,長柱狀,或闊錐狀,一級隔壁一般細而短,其中少數有時直達軸部,甚至彼此連結,但隔壁內端始終並未見形成內部旋捲如 *Ptychophyllum*。次一級短,約為一級的 $1/3$ 。鱗板甚多,成人字形排列。床板分化為中央床板帶和側板帶。

層位和產地: 湖南湘鄉上泥盆紀下部余田橋層 *Pseudozaphrentis* 帶(D_3^1)。

屬 *Disphyllum* de Fromental

亞屬 *Sinodisphyllum* Sun (新屬)

(亞屬型 *Sinodisphyllum variabile* Sun)

珊瑚體近柱狀,或錐狀,形似 *Disphyllum*。幼期灰質牆明顯,由於隔壁和鱗板的加厚。一級隔壁長而厚,次一級短。鱗板帶比較窄,多為數排半球狀鱗板組成。在橫切面上多呈半圓形。床板帶不完全,常分化為較平的中央部分和傾斜的側部。該屬幼期灰質圈特別顯著,床板帶和鱗板帶的界綫不明顯,尤其床板的變化極不穩定。因此創立了這個 *Sinodisphyllum* 新亞屬。

屬於本亞屬有下列二種:

Sinodisphyllum variabile Sun (新種)

Sinodisphyllum simplex Sun (新種)

層位和產地: 該亞屬屬余田橋層下部 *Sinodisphyllum* 帶化石。

Sinodisphyllum variabile Sun (新亞屬,新種)

(圖版 IV. 圖 1a—e, 2a—c; 圖版 V. 圖 1a—d; 圖版 VI 圖 1a—d)

這屬特徵見 *Sinodisphyllum* 新亞屬。體椎狀,床板帶的變化極不穩定為這種主要特徵(見縱面圖)。

層位和產地: 湖南湘鄉余田橋層下部 *Sinodisphyllum* 帶 D_3^1 。

Sinodisphyllum simplex Sun (新種)

(圖版 VI. 圖 2a—d; 圖版 V. 圖 2a—c, 3a—d)

圓柱狀具有 2—3 個突出環節。在橫斷面上鱗板間有人字形鱗板參雜。鱗板帶較窄。

正型標本(圖版 VI. 圖 Da—d)體長 56 毫米,最大直徑 19 毫米。

層位和產地: 湖南湘鄉上泥盆紀下部余田橋層 *Sinodisphyllum* 帶。

比較: 比 *Pseudozaphrentis* 新屬發育簡單,應歸入 *Disphyllidae* 較為適合。

層位和產地: 湖南湘鄉上泥盆紀余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Hunanophrentis* Sun (新屬)

特徵: 單體,大型,錐狀,尖端彎曲成角狀。隔壁極厚,呈左右對稱排列。鱗板帶極窄,為規則半圓狀鱗板組成(見切片上部剖面)。床板發育不完全。形似志留紀 *Pycnaactis* 屬,但隔壁的性質和排列,以及鱗板帶的特徵,均足以區別出來。在湖南材料中,有二種不同類型:第一種為 *Hunanophrentis uniforme* 類型。幼期隔壁極厚且長,在近軸部形成內端旋捲,成年期隔壁變短呈楔狀。左右對稱排列可從隔壁的粗細識別出來。第二種屬 *Hunanophrentis zaphrentoides* 類型。主隔壁和主內溝顯著,左右對稱排列更為顯著。主部隔壁極厚呈楔狀,彼此密接,對部隔壁也呈楔狀,但遠不及主部之厚。鱗板帶極窄,床板更不發育。

Hunanophrentis uniforme Sun (新屬, 新種)

(圖版 VII. 圖 1a—b; 圖版 VIII. 圖 1a—d, 圖 2a—d, 圖 3a—d)

角狀或彎錐狀, 尖端具彎鈎, 萼部漏斗狀。幼年期隔壁彎曲, 極厚, 但不彼此密接, 常在近軸部形成內旋捲。成年期(上部橫切面)隔壁變短, 厚度也減小, 但從隔壁的粗細可以識別主部和對部, 左右對稱排列不太明顯。鱗板帶極窄, 由鱗板組成, 形成極厚邊緣帶。

隔壁彎曲從邊緣達軸部, 厚度幾乎一致, 所以叫作 *Hunanophrentis uniforme*。

正型長 4—5 厘米, 直徑達 3—3.5 厘米。

層位和產地: 湖南湘鄉上泥盆紀下部汨田橋層 *Pseudozaphrentis* 帶。

Hunanophrentis zaphrentoides Sun (新屬, 新種)

(圖版 VII. 圖 2a—b)

角狀或為錐狀, 左右對稱排列極為明顯。主隔壁較小且短, 特別明顯。主隔壁極厚楔形彼此密接, 達直徑 2/3 左右; 對部隔壁較小且細, 長約為直徑的一半。

和 *Hunanophrentis uniforme* 的主要區別在: (1) 左右對稱排列特別明顯, (2) 主部和對部隔壁厚度的區別。

正型標本隔壁數目是 32。

層位和產地: 湖南湘鄉上泥盆紀初期汨田橋層下部 *Pseudozaphrentis* 帶。

屬 *Pseudozaphrentis* Sun (新屬)

比上述 *Hunanophrentis* 高級, 不但鱗板密多, 且有次級隔壁的存在。單體彎錐狀, 或曲柱狀, 一級隔壁幾達軸部, 在邊緣部分或中間部分成楔狀, 內端彎, 細而短。鱗板帶窄, 鱗板半圓狀, 床板帶闊, 床板上凸或平列極不規則。

灰質帶的形成由隔壁的變厚和鱗板的密集。在邊緣部分一級隔壁極厚多為楔狀, 到軸部變細。左右對稱排列一般不大明顯, 在個別種表現也很突出(如 *Pseudozaphrentis conicum* Sun)。

屬於這屬的有 *Pseudozaphrentis curvatum* Sun, *Pseudozaphrentis conicum* Sun 和 *Pseudozaphrentis difficile* Sun 三種。

層位和產地: 湖南湘鄉上泥盆紀初期汨田橋層 *Pseudozaphrentis* 帶(D_3^1)。

Pseudozaphrentis curvatum Sun (新屬, 新種)

(圖版 VII. 圖 3a—d; 圖版 IX. 圖 1a—e, 2a—d, 4a—b)

曲柱狀具有環節, 一級隔壁幾達軸部, 在邊緣部分極厚成楔狀, 內端則顯著變細, 次級隔壁較短, 也成楔狀。鱗板帶和床板帶界綫頗不明顯, 鱗板帶窄, 鱗板小由多排的半圓狀鱗板組成。床板帶較闊, 床板不完全常分化為不規則的中板和側板。

灰質帶接近邊緣, 幼期顯示左右對稱排列。

層位和產地: 湖南湘鄉上泥盆紀初期汨田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Pseudozaphrentis difficile Sun (新屬, 新種)

(圖版 VII. 圖 4a—e)

圓柱狀, 灰質帶邊緣部分的隔壁增厚處在中間部分, 一級隔壁不達軸部, 內端成紡錘形。次級隔壁極短, 在邊緣部分成三角狀, 偶然內伸成楔狀。左右對稱面明顯。和 *Pseudozaphrentis curvatum* Sun 相似, 但其灰質帶的位置, 珊瑚體外形以及隔壁的短小均屬這種的特徵。

層位和產地: 湖南湘鄉上泥盆紀初期汨田橋 *Pseudozaphrentis* 帶 D_3^1 。

Pseudozaphrentis conicum Sun (新屬, 新種)

(圖版 IX. 圖 3a—d)

外形椎狀，體長 35 毫米。最大直徑 27 毫米。邊緣部分隔壁成楔狀，近軸部則變細，但並不相連結。左右對稱排列最為顯著。主隔壁較短，長約為其他隔壁 2/3。灰質帶雖密接外壁，分界處非常明顯。鱗板帶窄，由 4—5 排半球狀鱗板組成。床板帶較寬，床板不完全，平列或略向上微凸，到兩側則分化成為側板。

層位和產地：湖南湘鄉上泥盆紀初期余田橋 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Keriophyllum* Wedekind

Lang, Smith 和 Thomas 等認為 *Keriophyllum* Wdcd 和 *Heliophyllum* Hall 係同屬異名，應當合併為一，但根據系統發生情況，*Heliophyllum* 的形成是由於 *Campophyllum* + 脊板，而 *Keriophyllum* 的形成則由於 *Ptenophyllum* + 脊板，因此上屬應單獨成立。最近蘇聯發刊古生物基礎(尚未出版)一書，著者得杜巴托洛夫之助，獲知蘇聯學者也贊成保留 *Keriophyllum* 屬，因此 *Keriophyllum* 屬仍應歸入 *Ptenophyllidae* 科。

Keriophyllum heterophylloides (Frech)

(圖版 XII. 圖 4a—c)

體近柱狀，一級隔壁極厚，具有脊板。鱗板帶和床板帶幾相等，鱗板帶較窄，由多排鱗板組成。床板帶較闊，床板不完全，常分化為較闊上凸的中板和傾斜的側板。

一級隔壁和次級隔壁數均為 33，一級隔壁較厚，次一級隔壁較細，長為一級隔壁的一半。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Keriophyllum conicum Sun (新種)

(圖版 X. 圖 2a—d)

體短錐形，長短相等約 30 毫米。萼口為火山口形，其直徑為 10 毫米。在橫切面上一級和次級隔壁各 23，均厚，但一級隔壁近軸部則變細，次級隔壁長度僅及一級的一半。

這種僅有一個標本，形似 *Keriophyllum heterophylloides*，但其體極短，且為錐形，其他如萼口和床板帶均有不同之處，目前暫定為新種。

層位和產地：湖南湘鄉上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Cyathophyllum* Goldfuss*Cyathophyllum flexuosum* Sun (新種)

(圖版 XII. 圖 1a—e, 2a—c.)

彎錐狀，幼期隔壁較厚，次級隔壁極短，長約為一級之 1/3。一級隔壁長而細直達軸部，其中幾對一級隔壁特別長，在軸部互相連接形成為明顯的對稱排列，以及各級隔壁的彎曲情況，和他種具有顯著的區別。

層位和產地：湖南湘鄉上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Cyathophyllum flexuosum var. *brevicum* Sun (新種, 新變種)

(圖版 XII. 圖 3a—c)

錐狀，彎曲，具有左右對稱排列的隔壁，極似前種，但其次級隔壁特短，主部和對部隔壁的發育有顯然不同的對照，以及隔壁的平直均足為這種的特徵。根據大小這種也可能屬 *Cyathophyllum flexuosum* Sun 的幼年體，今後仍須搜集這類珊瑚材料以便進一步的研究。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Prismatophyllum* Simpson

Prismatophyllum orientale Sun (新種)

(圖版 X. 圖 3a—b)

多邊形的塊狀複體珊瑚，萼口明顯，比較深。床板帶闊，分化為平行的中板和側板；鱗板帶較窄，由多排球狀鱗板組成。隔壁短，在邊緣部分較厚，近軸部則變細。隔壁和床板帶基本構造和 *Disphyllum* 同，應歸入 *Disphyllidae* 科。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Phillipsastraea* d'Orbigny

Phillipsastraea hennahi (Lonsdale)

(圖版 XI. 圖 1a—c)

互通形塊狀珊瑚，各個體大小相等，隔壁加厚，鱗板小而密集，床板多為不完全上凸床板組成。

和歐洲種相似，不但形狀大小相同，其隔壁數目(26)和直徑(3毫米)也完全一致。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Phillipsastraea bowerbanki (Edwards et Haime) Frech

(圖版 X. 圖 1a—b)

外形塊狀之複體珊瑚，具互通狀和多邊狀。外壁不發育，大小和排列也不一致，隔壁為顯著的紡錘狀加厚，床板帶和鱗板帶的交界明顯形成內壁。一級隔壁接近軸部附有脊板。鱗板帶由多排的小鱗板組成。床板密多，下凹現象頗為顯著。

這種隔壁數目，小型珊瑚個體，隔壁的平行的發育等均和德國種幾乎一致。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Phillipsastraea cf. monticola Reed

(圖版 XI. 圖 3a—b)

互通狀兼多邊狀的複體珊瑚。一般隔壁長，次級隔壁長約為一級的一半。床板帶較窄，常分化為中板和側板，鱗板帶闊為多數球狀鱗板組成。

和 *Prismatophyllum magnam* Fenton & Fenton 相似，但其外壁不明顯，隔壁多互通，內牆又不顯著，則顯然有別。因此暫和 *P. monticola* Reed 相比。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

Phillipsastraea verrilli (Meek)

(圖版 XI. 圖 4)

大型，多邊形複體珊瑚，各個突起的表現尤為明顯。一級隔壁長，在中部呈紡錘型的加厚，次級隔壁短，長約及一級的 $1/2$ — $2/3$ ，加厚的程度也比較薄弱。一級和次級隔壁均具有脊板。

這種珊瑚個體的形狀，大小，互通狀隔壁，外壁的模糊均和加拿大種相同，但中國種隔壁紡錘形的加厚更為顯著。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

屬 *Macgeea* Webster

Macgeea langi Sun (新種)

(圖版 XI. 圖 2a—b)

闊錐狀，至尖錐狀，樹枝狀複體珊瑚。一級隔壁長達到軸部中心，在中段特厚，具有脊板。次級隔壁內端也有些加厚，但極短，其長最多不過一級的 $1/2$ 。床板窄，密佈微向上凸或平列，鱗板帶多成平列狀。

這屬和 *Disphyllum* (*Phacellophyllum*) 相類似，但從其隔壁加厚構造來看，*Macgeea* 實屬高級的代表。

層位和產地：湖南上泥盆紀初期余田橋層 *Pseudozaphrentis* 帶 D_3^1 。

THE UPPER DEVONIAN CORAL FAUNAS OF HUNAN

Y. C. SUN

INTRODUCTION

The Upper Devonian coral faunas are hitherto very little known in Europe, America and Asia; they are practically unknown in China. As the coral faunas are good indices for the biostratigraphy, in 1928, the writer began to study the Devonian corals of whole China, of which large collections had been made by the late Mr. Y. T. Chao and the late Prof. V. K. Ting, etc. Although the Kwangsi Middle Devonian coral faunas, particularly the family *Lythophyllidae* and *Ptenophyllidae*, were first presented in 1929 by the writer at the first general meeting of the Palaeontological Society of China, the writer has transferred the whole Devonian material to the late Mr. Y. S. Chi owing to the pressure of other studies.

The present material described in this memoir is confined to the Frasnian (Upper Devonian) corals of the Shaitienchiao formation of Hsianghsiang, Hunan, collected in 1934, by the Tsinghua University Expedition of Peking directed by the writer, and from the basal member — the Lungkouchung member — of the same formation at the same locality, by Director K. K. Chao in the following year.

This material was essentially obtained from three different horizons and it consists of 20 species, of which five are European forms.

The coral faunas of the Upper Devonian of Hunnan may be grouped into two main zones as follows:

- II. *Phillipsastraea* zone
 - IIb. *Pseudozaphrentis curvatum* subzone
 - IIa. *Pseudozaphrentis difficile* subzone
- I. *Sinodisphyllum variabile* zone

This fauna is characterized by the presence of the *Phillipsastraea* fauna and corresponds to that of the Ibergerkalk limestone or the Upper *Manticoceras* Beds of Germany; but it is certainly much younger than the transitional Beds of the Middle and Upper Devonian of Germany (36, Walther, pp. 97—152).

The essential characteristic features of our coral fauna are also found in the Spanian Upper Devonian material collected by Wedekind in 1926 and through his kindness, the writer has the opportunity to compare our faunas with the Spanian and Walther's material.

Finally, the writer would express his sincere indebtedness to Prof. R. Wedekind for his valuable suggestions and discussions. This work was begun in 1934 at the Geological Survey of China, Peiping, and completed at Marburg in February, 1936. All the photographs are made at the Geological Institute of Marburg University, Germany.

THE GENERAL CHARACTERS OF THE UPPER DEVONIAN CORAL ASSEMBLAGES OF HUNAN

It is obvious that the Upper Devonian coral faunas of Hunan are very typical and characterized by several distinct features, by which we can distinguish those faunas from the lower Carboniferous as well as the Middle Devonian forms.

The assemblages of the coral fauna may be represented by three distinct groups possibly belonging to Streptelasmacea.

The most abundant forms in our collection is the *Disphyllum* group and include the following genera:

Phaceloid forms

Pexiphyllum

Disphyllum (*Sinodisphyllum*)

Cyathophyllum

Macgeea

Cerioid forms

Prismatophyllum

Astraeoid forms

Phillipsastraea

The next common group is the *Pseudozaphrentis* group which is represented by two new genera — *Pseudozaphrentis* and *Hunanophrentis*. The former is more advanced with dissepiments and minor septa independently developed, while the latter is characterized by its strongly dilated septa composed of long fibre-fascicules and bilateral symmetry, and apparently related to *Pynactis* of Silurian age.

The third group is the *Acanthophyllum* (*Ptenophyllum* Wedekind) group and represented by *Keriophyllum*.

The fourth group is the *Tabulophyllum* of the *Campophyllum* group.

DESCRIPTION OF GENERA AND SPECIES

Genus *Pexiphyllum* Walther, 1928

Pexiphyllum frechi Sun (sp. nov.)

Pl. I. Fig. 1a-e, 2a-c

Diagnosis: Phaceloid Rugose corals with the slender, cylindrical and annulated corallum, two orders of the septa dilated near the peripheral zone; tabulae complete or incomplete, usually arranged in groups; peripheral zone, with two or three rows of the small globose dissepiments. The central zone or tabularium is broad and distinctly separated from the narrow peripheral zone or the dissepimentarium by the stereomic wall.

Description: The holotype (Pl. I. Fig. 1) is phaceloid in form; the corallites are slender (32 mm long), cylindrical and small (6–8 mm) in diameter. They are usually constricted at

intervals, and with obvious annulations and striations.

Transverse section: There are 20 major septa which extend near to the centre and irregularly thickened in the peripheral zone. The minor septa have an equal number and are short, about one half the length of the major, and likewise thickened. The stereomic walls are distinct.

Longitudinal section: The very wide tabularium or central zone is characterized by the complete flat or slightly arched tabulae and also distinctly separated from the narrow dissepimentarium with two or more rows of the small globose dissepiments.

Remarks: The slender cylindrical form of the corallites, the irregular thickening of the septa of the peripheral zone, the presence of the annular walls, the very wide tabularium and the narrow dissepimentarium are the characteristic features of several Upper Devonian corals.

Wedekind founded the genus *Schluteria* which is characterized by the wide tabularium with the flat or slightly arched tabulae and the narrow dissepimentarium. The name *Schluteria* is preoccupied by Fritsch and A. de Grossouvre (14, Lang, p. 559) and certainly is a synonym of *Disphyllum*. Our form certainly belongs to the *Disphyllum* group.

Our form is distinguished from *Phacellophyllum* Gurich in the absence of the horizontal flat dissepiment in the dissepimentarium.

The genus *Pexiphyllum* founded by Walther (36, Walther, p. 36) is very similar to our form and is distinguished from our form only in the character of the tabulae. In *Pexiphyllum* the tabularium has two kinds of tabulae, with the flat tabulae at the middle and replaced by the cystose tabulae or tabellae at the sides, while in our species the tabulae is entirely complete, flat or slightly arched. Such distinction is only a specific character.

Stumm considers that Walther's genus *Pexiphyllum* might be congeneric with *Temnophyllum*, but the dissepimentarium of the former is distinctly differentiated as pointed out by Walther.

Horizon: *Pseudozaphrentis difficile* subzone.

Genus *Tabulophyllum* Fenton et Fenton, 1924

The genus *Tabulophyllum* is an index form of the Upper Devonian fauna and is characterized by the short and thin septa, the herring-bone arrangement of the dissepiments and the character of the tabulae. Both the tabularium and the dissepimentarium are variable, broad or narrow. The tabulae are usually incomplete, and differentiated into an axial transverse and a periaxial inclined series. In some cases they are broken into tabellae in the upper portion which are difficult to be distinguished from the true dissepiments (Pl. I. Fig. 3e). The dissepiments of the dissepimentarium are of common small globose types, never with horse-shoe or flat dissepiments and arranged in a few rows (usually four or more). In the typical form the boundary between the peripheral zone and the axial zone is not sharp and the tabulae occur widely apart, transversely or obliquely. This was referred to the *Campophyllum* of Upper Devonian age and the typical section of the *Campophyllum* was given by Wedekind (40, Wedekind, p. 61, Pl. 16. Fig. 97—99). Longitudinal sections of the present form exactly agrees with Wedekind's section, although the septa of our forms are apparently longer and thinner. The epitheca is usually thin.

Therefore the writer began to put this genus in *Campophyllum* E. et H.

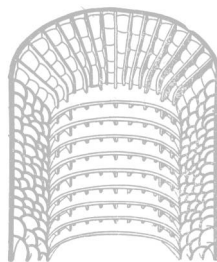


Fig. 1. Structure of *Tabulophyllum* (Drawn by Prof. Wedekind).

(emend. Sun 1936) and Prof. Wedekind generously prepared the text figure of this genus during my second visit to Marburg in 1936.

By careful study of this form it might belong to *Tabulophyllum*, but certainly belongs to the *Campophyllum* group.

***Tabulophyllum cylindricum* Sun (sp. nov.)**

Pl. I. Fig. 3a-e; Pl. II. Fig. 1a-e

Diagnosis: Slender cylindrical *Tabulophyllum* with the short, thin and zigzag septa and without a sharp boundary between the tabular zone and the peripheral zone. In the upper portion the tabulae are irregularly replaced by the tabellae.

Description: This species is represented by two specimens. The Holotype is rather slender, cylindrical and 38 mm long and 12 mm in its larger diameter. It is well striated and also annulated.

Transverse section: The major septa are more or less zigzag and short, about one third the length of the diameter, and the minor are still shorter, about one third the length of the major. The central part is free and sometimes traversed by several tabulae. The dissepiments are arranged in herring-bone pattern.

Longitudinal section: There is no sharp boundary between the tabular zone and the peripheral zone. The tabulae are transversely and obliquely arranged and more or less widely separated from one another. In the upper portion the tabulae are often replaced by the cystose structure or the tabellae. The peripheral zone is built of numerous rows of the smaller and larger globose dissepiments. The epitheca is also thin and rarely preserved.

This form is somewhat similar to some forms of *Disphyllum* in the thin and short septa, the thin epitheca and in the wide tabularium, but the herring-bone pattern of the dissepiments, the indistinction of the tabularium and dissepimentarium and the zigzag character of the septa of our form serve to distinguish it from those forms of *Disphyllum*. Certainly our form belongs to the family Disphyllidae.

Horizon: *Pseudozaphrentis difficile* subzone.

***Tabulophyllum curvatum* Sun (sp. nov.)**

Pl. I. Fig. 4a-c, 5a-c

Diagnosis: Large cylindrical or worm-shaped *Tabulophyllum* with very broad dissepimental zone composed of numerous rows of the small globose dissepiments and with the narrow tabular zone characterized by the horizontal and oblique tabulae. The major septa are thin and short and the minor septa comparatively shorter.

Description: This species is represented by several specimens. The corallum is large, subcylindrical or worm-shaped. The calice is shallow and the epitheca is apparently thin.

Transverse section: There are 18 major septa in the holotype (Pl. I. Fig. 4) which are rather thin and short, about two third the length of the diameter. The minor septa are very short and indistinct. The dissepiments are arranged in herring-bone pattern. A second specimen (Pl. I. Fig. 5) has 19 major septa and 19 minor septa.

Longitudinal section: Very characteristic is the narrow tabular zone which is characterized by the flat or oblique tabulae. The dissepimental zone is very wide and composed of

numerous rows of the small subglobose dissepiments.

Remarks: This species is easily distinguished from the other forms of this genus by its worm-shape of the corallum, the wide dissepimental zone and the narrow tabular zone.

Horizon: *Pseudozaphrentis difficile* subzone.

***Tabulophyllum gigantum* Sun (sp. nov.)**

Pl. III. Fig. 1a-e, Fig. 2; Pl. II. Fig. 2a-d

Diagnosis: Large, slightly bent cylindrical *Tabulophyllum* with flexuous, thin, short septa, very wide dissepimental zone composed of very small and crowded dissepiments and with incomplete tabulae which is differentiated into a transverse axial and an inclined periaxial series. The septa of the upper section are somewhat thickened and short near the periphery, while those of the lower end are long and occasionally with their inner ends bent and jointed together.

Description: Several large cylindrical curved forms are doubtfully referred to the genus *Tabulophyllum*. The striations are distinctly marked, but not annulated.

Transverse section: The major septa of the lower end are very thin, flexuous and long, and those of the upper portion are short and variable in length. The minor septa are very short, distinct and variable in length, about one third the length of the major. Near the periphery of the upper portion the septa are thickened by the crowded dissepiments. There are 40 major septa and 40 minor septa in the holotype (Pl. III. Fig. 1). The dissepiments are very crowded and irregularly arranged in herring-bone pattern.

Longitudinal section: The typical section (Pl. III. Fig. 1e) shows that the peripheral zone of the convex side is very wide and irregularly composed of numerous small dissepiments. The tabulae are few, flat, concave and widely separated.

Remarks: The general form and character of our form are somewhat similar to the form of *Ptychophyllum* (47, Stumm, p. 49-50, Pl. 24. Fig. 17-18), but the absence of a prominent axial whorl, the typical herring-bone pattern of the dissepiments and the character of tabulae (large flat and concave instead of small, arched tabulae) serve to distinguish our form from *Ptychophyllum*.

Horizon: *Pseudozaphrentis difficile* subzone.

Genus *Disphyllum* de Fromental

Subgenus *Sinodisphyllum* Sun (Subgen. nov.)

Genotype: *Sinodisphyllum variabile* Sun

This new genus is proposed for the *Disphyllum*-like corals with subconical to cylindrical forms and with a distinct stereozone formed by the dilatation of the septa and the thickening of the dissepiments. This stereozone usually begins to appear in the proximal conical end, but vanishes at the distal end. The major septa are long but slightly dilated, and the minor septa are short but distinct. The dissepiments are of subglobose type, numerous and commonly arranged in a concentric manner.

The tabulae are mostly incomplete, with an axial flat or slightly convex series and a