LOWER CARBONIFEROUS CORALS FROM TURKEY

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ABSTRACT.—The object of the present paper is to deal with some simple and compound corals which have recently been collected from Turkey. They are mostly well preserved and generally associated with Brachiopoda, Foraminifera, Crinoidea, Bryozoa, Algae, and Gastropoda. The corals are identical with the European forms and indicate a Lower Carboniferous age. A list of fauna and a table showing the distribution of the corals are included. Lower Carboniferous Corals in I. and II. localities were known by early records, but their occurrences in the III., IV., V., and VI. localities were not hitherto recorded.

INTRODUCTION

THE corals described in this paper were collected by Prof. I. Ketin, Dr. M. Blumenthal, Mr. A. Gümüş, Dr. J. Louis and the author during the geological explorations in the years 1955 and 1956. The corals which were obtained from various localities are mostly well preserved and generally associated with other classes of Invertebrate fossils, such as Brachiopoda, Foraminifera, Crinoidea, Bryozoa, Gastropoda and Algae.

These corals are closely related to the European Lower Carboniferous forms, particularly those from Britain and Belgium. The coral representatives of I., II., III., IV., and V. localities indicate the Upper Visean age (*Dibunophyllum*-Zone of Vaughan), and VI. the Upper Tournaisian (*Syringothyris*-Zone of Vaughan). Their special interest lies in the fact that few—if indeed any—Lower Carboniferous Corals have been previously recorded from these localities, except those from Amasra (Localities I. and II.).

The material is in the Museum of the M. T. A. Institute, Ankara. The author is greatly indebted to Prof. I. Ketin, Dr. M. Blumenthal, Mr. A. Gümüş and Dr. J. Louis for supplying her with the additional material and giving her an opportunity to study them. She also wishes to express her appreciation of the great care taken by Messrs I. Tezcan and A. Liman in preparing thin sections and Messrs. A. Günce and I. Koçer in taking photographs reproduced in the accompanying plates.

The following list shows the localities from which the corals were obtained:

I — Tarlaagzi, Amasra, Bartin, Zonguldak.

II — Pakdere, Amasra, Bartin, Zonguldak.

III — Özbek, Yahyali, Kayseri.

IV — Kocadag, Pazarören, Pinarbaşi, Kayseri.

V — Salahattin, Hadim, Konya.

VI — Merdivendere, Karacahisar, Egridip, Isparta.

Table showing the distribution of Corals:

FAUNA	LOCALITY					
	I	II	III	IV	V	VI
Aulophyllum fungites (Fleming) ..	x					
Caninia cylindrica (Scouler) ..						x
Caninia sp. ..	x					x
Carcinophyllum vaughani Salée ..			x		x	
Clisiophyllum keyserlingi McCoy ..			x			
Clisiophyllid ..						x
Hexaphyllia sp. ..					x	
Lithostrotion irregulare (Phillips) ..	x			x		
Lithostrotion junceum (Fleming) ..		x				
Lithostrotion sp. ..						x
Paleosmilia murchisoni Edw. & Haime ..	x		x	x	x	
Syringopora sp. ..	x					x

The most characteristic forms are described in alphabetical order.

DESCRIPTION OF CORALS

AULOPHYLLUM FUNGITES (Fleming)
Pl. 11, figs. 1a, 1b

Turbinolia fungites Fleming, 1828, p. 510.

Clisiophyllum proplasum McCoy, 1849, p. 3; 1851, p. 95, pl. 3c, figs. 5, 5a.

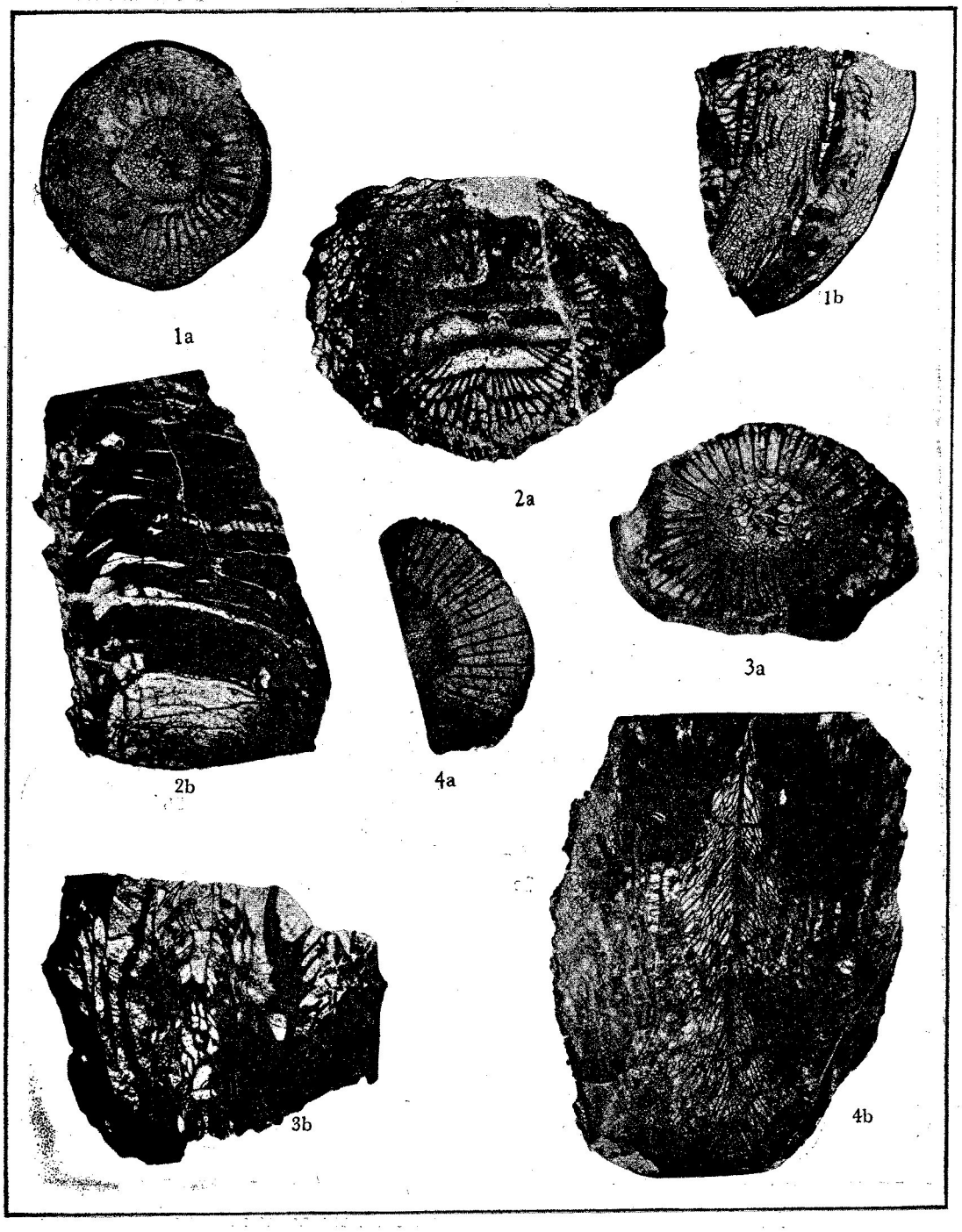
Aulophyllum fungites (Fleming); Smith, 1913; Smith and Lang, 1930, p. 187.

Aulophyllum fungites (Fleming); Hill, 1939, p. 83, pl. III, figs. 8-10.

Description: The corallum is cornute, slightly curved, distally incomplete, has slight constrictions on the epitheca. It was 4 cm. high before it was cut. The distal diameter of the coral is 2.4 cm.

Transverse section: In a transverse section, taken from the more distal part of the corallum, there are 94 septa of which the major are about 7 mm. long and extend almost to the central column, but leave a narrow

EXPLANATION OF PLATE 11



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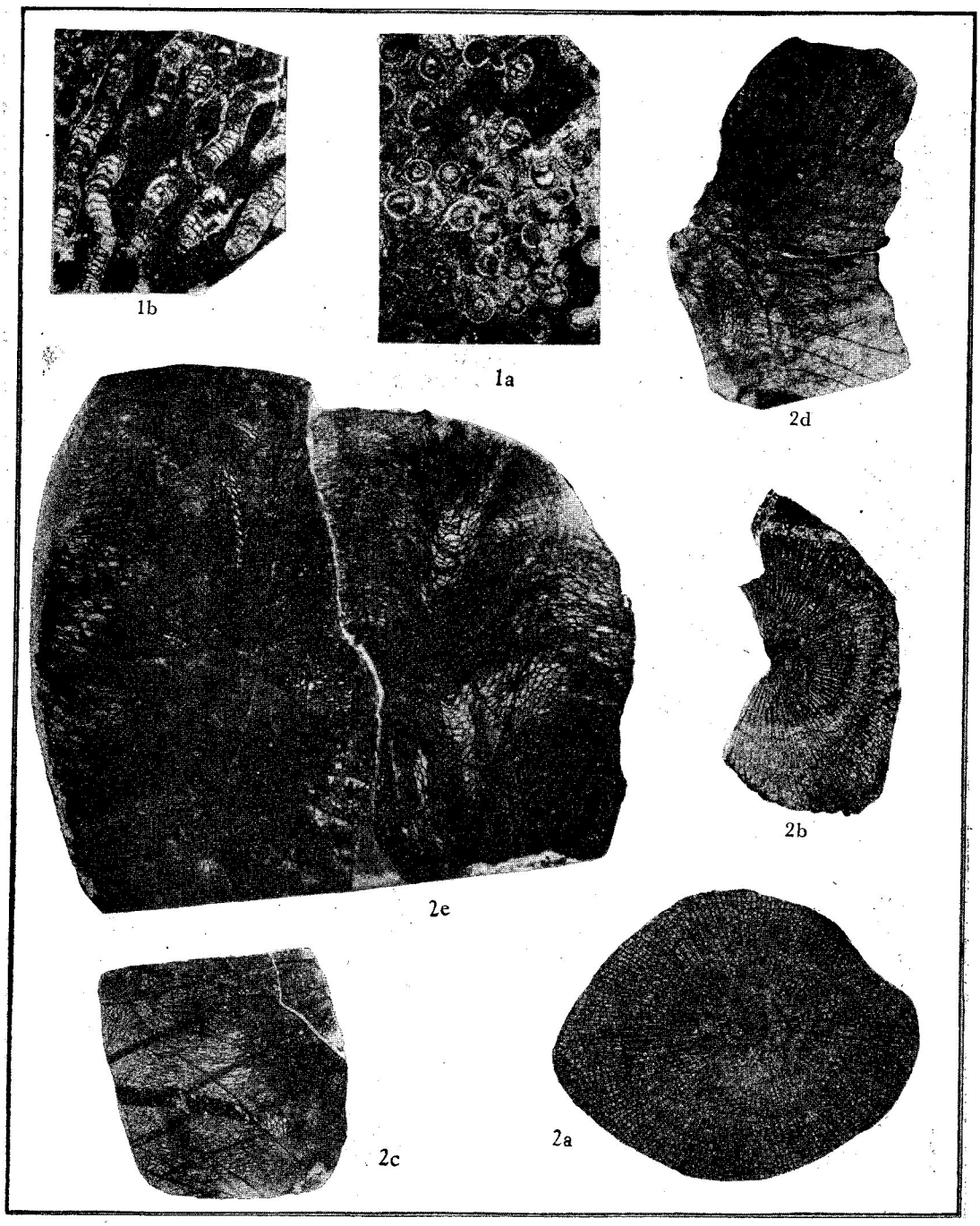


ÜNSALANER-KIRAGLI : LOWER CARBONIFEROUS CORALS FROM TURKEY

space of about 0.5 mm. The minor septa attain half that length and do not extend far from the dissepimentarium. The major septa are strongly thickened at the tabularium and some curve slightly approaching the central column. The fossula is somewhat conspicuous and occupied by a short septum. The central column is about 8 mm. in diameter and arranged in a radial design (Smith 1913, p. 67).

Longitudinal section: The central column is formed of flat or concave central vesicles, and closely packed, distally convex pericentral vesicles. The tabularium is occupied by 3 or 4 rows of large, irregular tabellae. The dissepimentarium is built up of 5 to 8 series of fairly small, globose and elongated dissepiments which are steeply inclined to the tabularium. The longitudinal section of the Turkish specimen is very similar to that given by Smith (1913, pl. VI, fig. 4b.).

Locality : I (specimen no. 350a, collected by Mr. A. Gümüş.).

Horizon : Lower Carboniferous (*Dibunophyllum* Zone). According to Charles (1933, p. 86), the species occur in the highest part of the D Zone of this locality.

CANINIA CYLINDRICA (Scouler)
Pl. 11, figs. 2a, 2b.

Siphonophyllia cylindrica Scouler in McCoy, 1843, p.187, pl. XXVII, fig. 5.

Caninia gigantea Michelin, 1843, pp. 81 and 255, pl. XVI, figs. 1a-c.

Zaphrentis cylindrica Edwards and Haime, 1852, p. 171, pl. XXXV, figs. 1, 1a-b.

Caninia cylindrica mut. γ Vaughan, 1905, p. 273, pl. XXIII, fig. 1.

Caninia cylindrica mut. γ Gröber, 1910, p. 43, pl. II, fig. 1.

Caninia cylindrica Scouler; Salée. 1910, p. 27, pls. II, III, IV and V, fig. 1.

Caninia cylindrica Scouler; Lewis, 1927, p. 374, pl. XVI, figs. 1a-b.

Description : Four coralla in the collection which agree very closely to the typical forms of the species are cylindrical, straight or slightly curved. They range in diameter from 4 cm. to 6 cm. and the tallest attain a length of 13 cm. The surface of the coralla is usually worn out.

Transverse section: The corallum with a diameter of 5 cm. has 64 major septa and 0.9 cm. wide dissepimentarium which is occupied by large outer dissepiments and smaller inner dissepiments. The septa are continuous at the innermost series of the dissepimentarium, but do not generally extend as far as the theca. They are thickened in the tabularium. The thickening varies from one part to another. The major septa are sub-equal but generally extend less than halfway in the tabularium. The minor septa are very short and usually more uniform in length than the major ones. The fossula is conspicuous. The cardinal septum and the septa bounding the fossula are strongly dilated.

Longitudinal section: The tabularium is about 3 cm. wide and occupied by generally complete, flat or gently concave tabulae which bend strongly downwards towards the dissepimentarium. The outer series of dissepiments are worn out in the specimen. Only a few fairly large, inclined and elongated dissepiments are observed.

Locality: VI (4 specimens nos. 6, 1, 4, and 8, Author's Collection).

Horizon : Upper Tournaisian (*Syringothyris*-Zone).

CARCINOPHYLLUM VAUGHANI Salée
Pl. 11, figs. 3a, 3b

Clisiophyllum (*Carcinophyllum*) θ Vaughan, 1905, p. 285, pl. XXIV, figs. 3-3b.

Carcinophyllum θ Vaughan, 1911, p. 377, pl. XXXI, fig. 5.

Carcinophyllum vaughani Salée, 1913, p. 256, pl. X, figs. 2-12.

Carcinophyllum vaughani Salée; Ryder, 1930, p. 340.

EXPLANATION OF PLATE 12

Description : Conical, elongate and slightly curved coralla, the tallest of which is 7.5 cm. long and has a distal diameter of 3 cm. The distal end of the coral is missing. The epitheca shows strong longitudinal ribbing and hollow rootlets near the proximal end.

Transverse section : There are 74 septa in a diameter of 3 cm. The major septa extend very close to the axial column and vary in length from 5 mm. to 8 mm. The minor septa attain about half or less than half that length. The septa become thicker in approaching to the inner wall, but do not extend as far as the theca. The peripheral area is narrow and formed of a few rows of very large vesicles. The axial column measures 8 mm. by 10 mm. in diameter and is made up of irregularly arranged septal lamellae. There is not any distinct mesial plate in my specimen. In this respect it approaches more closely to one of the specimens given by Salée (1913, pl. X, fig. 2a.).

Longitudinal section : The axial column is occupied by widely conical and dilated tabellae. The tabularium is bounded externally by stereoplasmic thickening of the periphery. The tabulae are few, incomplete and often distally convex. The dissepiments are large, elongated and strongly inclined towards the tabularium.

Localities : III, V (3 specimens, 64c, 64d, and Kr 51w, collected by Prof. I. Ketin and Dr. M. Blumenthal).

Horizon : Lower Carboniferous (S2-D1), the presence of rootlets shows that Turkish specimens belong to D1 Zone rather than S2 (see Vaughan 1905, p. 285).

CLISIOPHYLLUM KEYSERLINGI McCoy
Pl. 11, figs. 4a, 4b

Clisiophyllum keyserlingi McCoy; 1849, p. 2; 1851, p. 94, pl. 3c, figs. 4, 4a.

Clisiophyllum keyserlingi McCoy; Yü, 1937, pl. IV, figs. 3-3g.

Clisiophyllum keyserlingi McCoy; Hill, 1937, p. 60, pl. 1, figs. 1-14.

Description : The corallum is trochoid, slender and has a deep calice with a pronounced axial column. It was originally about 8.5 cm. high, but 2 cm. of the proximal part is missing. The corallum attains a maximum diameter of 2.8 cm. at the calice. Less than half of its length is eroded along the tabularium. The epitheca of the other half, which is mostly destroyed, shows transverse wrinkles.

Transverse section : The transverse section was cut from the proximal end of the specimen. It consists of about one half of a complete section and has a diameter of 2.2 cm. There are 64 septa in this half. The major septa are about 8 mm. long and dilated throughout their lengths. The minor septa are thin and penetrate only a very short distance into the tabularium. The dissepimentarium is about 3 to 4 mm. wide and formed of small, concentrically arranged dissepiments. The axial column which is bisected by long, thick median lamella, has 5 or 6 concentrically arranged tabellae crossed by straight septal lamellae.

Longitudinal section : The axial column is 13 mm. wide and is built up of numerous small and generally elongated tabellae which slope steeply downward from the median lamella. The structure between the axial column and the dissepimentarium is not very clear in the section, but large, strongly arched, more or less horizontal tabulae are observed in places. The dissepiments are regular, generally small, globose and inclined towards the tabularium.

Remarks : The specimen differs from the typical forms of the species in having major septa dilated in whole its length and more steeply inclined axial tabellae. In my opinion these differences can be easily included among those observed by Dr. Hill in the Scottish specimens (see Hill 1937, p. 64).

Locality : III (specimen no. 64b, collected by Prof. I. Ketin).

Horizon : Lower Carboniferous (*Dibunophyllum*-Zone).

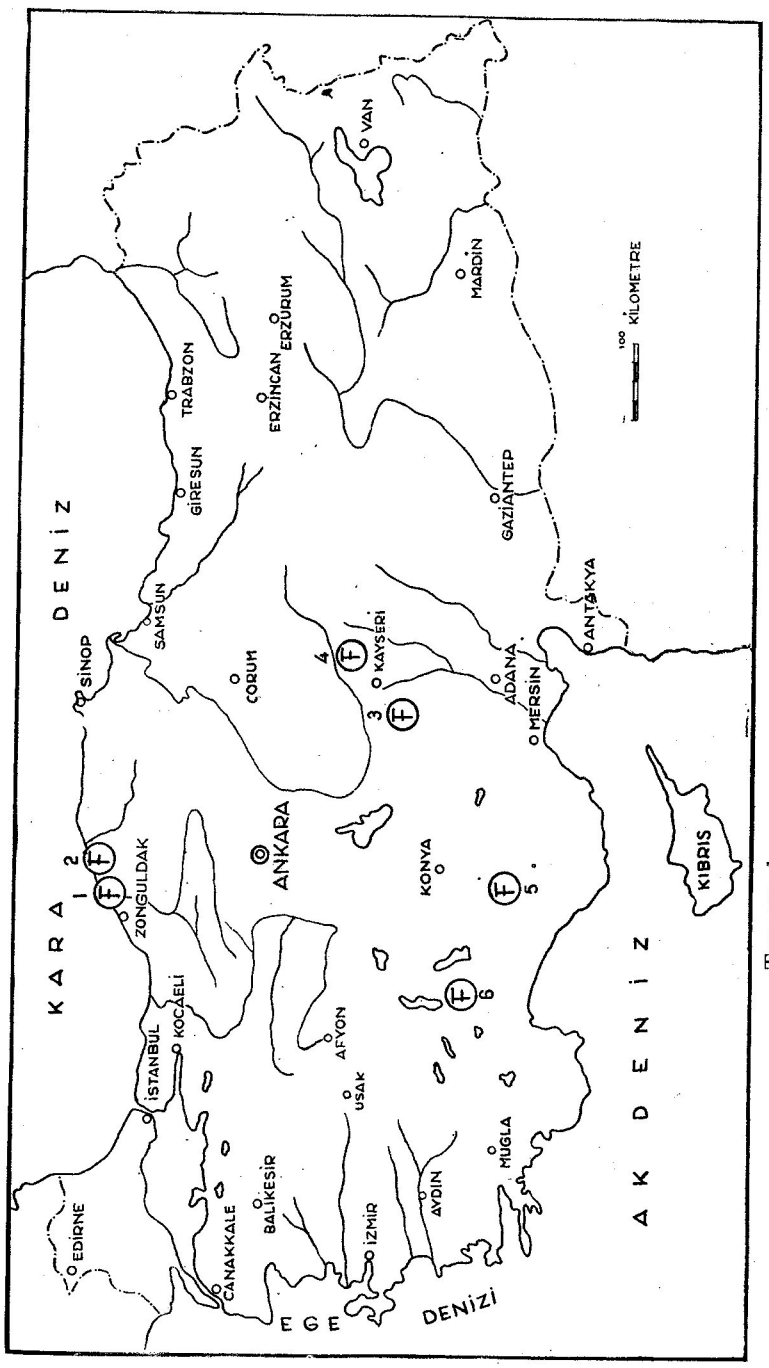
LITHOSTROTION JUNCEUM (Fleming)
Pl. 12, figs. 1a, 1b

Caryophyllia juncea Fleming, 1828, p. 508.

Lithostrotion junceum ; Edwards and Haime, 1852, p. 196, pl. XL, figs. 1-1b.

Lithostrotion junceum (Fleming); Hill, 1940, p. 171, pl. IX, figs. 3-8.

Description : The specimen is a small corallum with flat, triangular distal surface and conical base. It is 5 cm. by 4 cm. in diameter and 6 cm. high. The corallites which are cylindrical and slender vary in



TEXT-FIG. 1: MAP OF TURKEY SHOWING FOSSIL LOCALITIES

diameter from 2 mm. to 3 mm. The distances between the corallites are very variable.

Transverse section : The number of septa differ with size of the corallites. There are 36 septa in a diameter of 3 mm. The major septa generally reach the columella and rarely a few of them abut on neighbouring septa. The minor septa are often less than 0.30 mm. The styliform columella is very short in some corallites, but very elongated in others. Dissepiments are not developed.

Longitudinal section : The corallites are occupied by broadly conical and almost complete tabulae which are 2 or 3 in 1 mm. The pattern of the tabulae modifies according to the section. When the longitudinal section passes along the columella, the tabulae are conical, but further from it they are flattened domes. The tabulae strongly bend down on approaching the margin.

Locality : II (Specimen no. 1, collected by Dr. J. Louis).

Horizon : Lower Carboniferous (*Dibunophyllum*-Zone).

PALAEOSMILIA MURCHISONI Edwards and Haime
Pl. 12, figs. 2a-e

Palaeosmilia murchisoni Edwards and Haime, 1848, p. 261.

Cyathophyllum murchisoni Edwards and Haime, 1851, p. 369; 1852, p. 178, pl. xxxiii, figs. 3-3b.

Cyathophyllum θ Vaughan, 1905, p. 274, pl. xxiii, figs. 3-3b.

Cyathophyllum multilamellatum McCoy; Garwood, 1912, p. 562, pl. l, figs. 5-7.

Cyathophyllum (*Palaeosmilia*) *murchisoni* Edwards and Haime var. *pendelense* Parkinson, 1926, p. 231, pl. xii, figs. 2a, 2b.

Palaeosmilia murchisoni Edwards and Haime; Yü, 1937, pl. iii, figs. 4-4c.

Palaeosmilia murchisoni Edwards and Haime; Hill, 1940, p. 117, pl. vi, figs. 12,13.

Description : 17 Corals identical with the typical forms of the species are cylindrical and slightly curved. Some of the specimens are fragmentary and others are distally and proximally incomplete. On their weathered surface, closely set septal edges are exposed.

Transverse section : The corallum which was 8 cm. high before it was cut, has a distal diameter of 5.2 cm. by 4.1 cm. The original diameter is more than that. The epitheca and the outer series of dissepiments are worn out. There are 180 septa of which the major ones extend very close to the axis, but leave a free space of about 6 mm. in diameter. The minor septa are about half or less than half that length. The major septa are thicker than the minor and more dilated in the tabularium. The dissepimentarium is wide and occupied by concentrically arranged dissepiments. A long, narrow cardinal fossula is present.

Longitudinal section : The tabularium is 2.8 cm. wide and formed of 3 different series of tabellae:

1—Large, flat or slightly sagging central tabellae.

2—Small, convex, proximally inclined, and almost vertical pericentral tabellae. Both series form a flattened dome-shaped axial column.

3—Proximally concave periaxial tabellae.

The dissepimentarium is built up of two different series of dissepiments :

a—Large, irregular and steeply inclined inner series.

b—Small, regular and globose outer series.

Remarks : Other specimens which agree with the form described above differ in some details. Some of the corals have a fossula which is bounded by the leaning major septa, or tabularium with deeply sagging central tabellae. The specimens from Hadim (Konya) are exceptionally large and have diameters of more than 10 cm. They seem to be the largest members of the species known at present.

Localities : I, III, IV, V (17 specimens, collected by Prof. I. Ketin, Dr. M. Blumenthal and A. Gümüş).

Horizon : Lower Carboniferous (*Dibunophyllum*-Zone).

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