

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

UNIVERSITY OF MICHIGAN

VOL. VII, No. 2, pp. 7-49 (14 pls.)

JULY 20, 1948

---

LOWER MIDDLE DEVONIAN SPECIES OF THE  
TETRACORAL GENUS *HEXAGONARIA* OF  
EAST-CENTRAL NORTH AMERICA

BY  
ERWIN C. STUMM



UNIVERSITY OF MICHIGAN PRESS  
ANN ARBOR

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

UNIVERSITY OF MICHIGAN

*Director:* LEWIS B. KELLUM

The series of contributions from the Museum of Paleontology is a medium for the publication of papers based entirely or principally upon the collections in the Museum. When the number of pages issued is sufficient to make a volume, a title page and a table of contents will be sent to libraries on the mailing list, and also to individuals upon request. Correspondence should be directed to the University of Michigan Press. A list of the separate papers in Volumes II-VI will be sent upon request.

**VOL. I.** The Stratigraphy and Fauna of the Hackberry Stage of the Upper Devonian, by C. L. Fenton and M. A. Fenton. Pages xi+260. Cloth. \$2.75.

**VOL. II.** Fourteen papers. Pages ix+240. Cloth. \$3.00. Parts sold separately in paper covers.

**VOL. III.** Thirteen papers. Pages viii+275. Cloth. \$3.50. Parts sold separately in paper covers.

**VOL. IV.** Eighteen papers. Pages viii+295. Cloth. \$3.50. Parts sold separately in paper covers.

**VOL. V.** Twelve papers. Pages viii+318. Cloth. \$3.50. Parts sold separately in paper covers.

**VOL. VI.** Ten papers. Pages viii+336. Paper covers. \$3.00. Parts sold separately.

VOLUME VII

1. The Priority of Dana, 1846-48, versus Hall, 1847, and of Rominger, 1876, versus Hall, 1876 (?1877), by Erwin C. Stumm. Pages 1-6. Price \$ .25.
2. Lower Middle Devonian Species of the Tetracoral Genus *Hexagonaria* of East-Central North America, by Erwin C. Stumm. Pages 7-49, with 14 plates. Price \$1.25.
3. A Revision of the Aulacophylloid Tetracoral Genus *Odontophylum*, by Erwin S. Stumm. Pages 51-61, with 2 plates. Price \$.35.

## LOWER MIDDLE DEVONIAN SPECIES OF THE TETRACORAL GENUS *HEXAGONARIA* OF EAST-CENTRAL NORTH AMERICA

By ERWIN C. STUMM

### CONTENTS

Introduction .....	7
Acknowledgments .....	8
Stratigraphic distribution .....	8
Systematic descriptions .....	11
<i>Hexagonaria hexagona</i> lineage .....	14
<i>Hexagonaria prisma</i> lineage .....	17
<i>Hexagonaria anna</i> lineage .....	25
<i>Hexagonaria alternata</i> lineage .....	32
Literature cited .....	33
Plates and descriptions .....	(after) 35

### INTRODUCTION

THE tetracoral genus *Hexagonaria* is widely distributed and is very characteristic of Middle and Upper Devonian strata. In eastern and east-central North America species of the genus first appear in the Onondaga limestone of New York and southwestern Ontario and in its correlative, the Bois Blanc formation of Michigan, both of which are of lower Onesquethaw age. A few are present in the overlying Detroit River formation, but the species become far more abundant and diversified in younger Onesquethaw strata, especially in the Columbus limestone of central and north-central Ohio and the Jeffersonville limestone of southern Indiana and northern Kentucky. The genus is also common in rocks of lower Cazenovia age. Species are present in the Delaware limestone of north-central Ohio, the Dundee and "Blue" limestones<sup>1</sup> of northwestern Ohio, and

<sup>1</sup>The field term "Blue" as applied to this limestone is used by Carman and Bassett (1935, p. 437) for a lithologic unit, officially unnamed, 8 feet 5 inches in thickness, lying between the typical Dundee limestone and the Silica shale. The coralline fauna of the bed indicates that it is closely related to the Dundee limestone.

the Dundee and Rogers City limestones of Michigan. They are numerous in the upper Middle Devonian Traverse group of Michigan and the Cedar Valley limestone of Iowa. The genus is well represented in the Upper Devonian Hackberry group of Iowa. This paper is concerned with the description and revision of species of *Hexagonaria* from strata of Onesquethaw and lower Cazenovia ages in east-central North America.

#### ACKNOWLEDGMENTS

I am indebted to Dr. G. M. Ehlers of the University of Michigan for the use of many thin sections of *Hexagonaria* prepared by him. I also wish to thank Dr. G. A. Stewart, of Ohio State University, for the loan of the holotypes of *H. stewartae* nom. nov. and *H. truncata* (Stewart), and Dr. P. H. Cloud, of Harvard University, for sending photographs and a cast of the holotype of *H. ovoidea* (Davis).

#### STRATIGRAPHIC DISTRIBUTION

The strata of Onesquethaw and lower Cazenovia ages in east-central North America are a series of limestones and dolomites flanking the Cincinnati arch. Those lying on the east flank extend northward into southwestern Ontario, and those lying along the west flank extend northward into the Michigan basin. Many of the formations are extremely difficult to correlate across the Cincinnati arch, especially at its northern end. The faunas of the Columbus-Delaware sequence on the east flank are quite distinct from those on the Dundee-“Blue” sequence on the west flank. Table I illustrates the general position of the formations under discussion, but it must be emphasized that in only a few cases can exact equivalence be proved in the formations placed at the same level.

Three species of *Hexagonaria* are present in beds of lowest Onesquethaw age. The new species *H. subcincta* is the only one so far found in the Bois Blanc formation. Many species of fossils from this formation indicate that it is equivalent to the Onondaga limestone of southwestern Ontario. *H. subcincta* closely resembles *H. cincta*, a Jeffersonville limestone species. The second species, *H. coalita*, is known only from drift specimens and has been assigned to the Onon-

TABLE I

GENERAL STRATIGRAPHIC POSITION OF THE FORMATIONS

Age	East flank of Cincinnati arch		Michigan basin	West flank of Cincinnati arch	
	North-central Ohio	Central Ohio	Michigan	North-western Ohio	South-eastern Indiana
Lower Cazenovia			Rogers City	"Blue"	?Middle Sellersburg
	Delaware	Delaware	Dundee	Dundee	?Lower Sellersburg
Onesquethaw	Columbus Detroit River	Columbus	Detroit River Bois Blanc	Detroit River	Jeffersonville

daga limestone solely on the basis of the lithology of the specimens. The third species, *H. prisma*, has a greater stratigraphic and geographic distribution than any other species of the genus, ranging throughout the Onesquethaw and occurring from southwestern Ontario to northern Kentucky. It is most common in the Columbus and Jeffersonville limestones, but has been identified from the Detroit River formation in southeastern Michigan and southwestern Ontario. The Detroit River formation thins out southward across Ohio; the overlying Columbus limestone thins northward from central Ohio and is not known north of Pelee Island in Lake Erie. The presence of a common species in these two formations may indicate that some of the Detroit River formation represents a dolomitic facies of the Columbus limestone.

Two more species, *H. curta* and *H. ovoidea*, are identified from the Columbus and Jeffersonville limestones, and three more, *H. cincta*, *H. bathycalyx*, and *H. ponderosa*, only from the Jeffersonville. Three of the six known species in these upper Onesquethaw formations are common to both. Other coralline and brachiopod elements in the faunas indicate the close equivalence of these two formations.

No close correlation of the lower Cazenovia strata has been made across the Cincinnati arch. Only one species, *H. sp. A aff. H. prisma*,

occurs on the east flank of the structure in the Delaware limestone, and it has not been found elsewhere. On the west flank of the arch and in the Michigan basin the genus is well represented by ten species and one subspecies. In northwestern Ohio two species have been found in the Dundee limestone, and four species and one subspecies in the overlying "Blue" limestone. The two species *H. anna* and *H. tabulata* are common to both formations, which indicates that the "Blue" limestone is closely related to the Dundee. *H. truncata* and *H. tabulata convexa* are known from the "Blue" limestone, and *H. sp. A* aff. *H. truncata* and *H. sp. B* aff. *H. prisma* only from the

TABLE II

STRATIGRAPHIC DISTRIBUTION OF THE SPECIES AND SUBSPECIES

Species	Bois Blanc	Onondaga	Detroit River	Columbus	Jeffersonville	Delaware	Dundee	"Blue"	Rogers City
<i>H. hexagona</i> lineage									
<i>ovoidea</i> .....	..	..	..	+	+	..	?	?	..
<i>stewartae</i> .....	..	..	..	..	..	..	..	..	..
<i>H. prisma</i> lineage									
<i>bathycalyx</i> .....	..	..	..	..	+	..	..	..	..
<i>cincta</i> .....	..	..	..	..	+	..	..	..	..
<i>coalita</i> .....	..	+	..	..	..	..	..	..	..
aff. <i>coalita</i> .....	..	..	..	..	..	..	?	..	?
<i>ponderosa</i> .....	..	..	..	..	+	..	..	..	..
<i>prisma</i> .....	..	+	+	+	+	..	..	..	..
sp. A aff. <i>prisma</i> .....	..	..	..	..	..	+	..	..	..
sp. B aff. <i>prisma</i> .....	..	..	..	..	..	..	+	..	..
<i>subcincta</i> .....	+	..	..	..	..	..	..	..	..
<i>H. anna</i> lineage									
<i>anna</i> .....	..	..	..	..	..	..	+	+	..
<i>borealis</i> .....	..	..	..	..	..	..	..	..	+
<i>convexa</i> .....	..	..	..	..	..	..	?	+	..
<i>curta</i> .....	..	..	..	+	+	..	..	..	..
<i>parva</i> .....	..	..	..	..	..	..	+	..	..
<i>tabulata</i> .....	..	..	..	..	..	..	+	+	..
<i>truncata</i> .....	..	..	..	..	..	..	..	+	..
aff. <i>truncata</i> .....	..	..	..	..	..	..	+	..	..
<i>H. alternata</i> lineage									
<i>alternata</i> .....	..	..	..	..	..	..	?	..	?

Dundee limestone of southeastern Michigan. In northern Michigan two species are found in the Dundee. One of these is *H. tabulata*, a species abundant in the Dundee and "Blue" limestones to the south; the other species, *H. parva*, is not known elsewhere.

In the Rogers City limestone the species *H. borealis* is very common; it is similar to but specifically distinct from *H. anna*. The other recognized species from northern Michigan, *H. aff. coalita* and *H. alternata*, are known only from float in a quarry in which both Dundee and Rogers City limestones are present, and hence their stratigraphic position is still in doubt.

No species are known from the Sellersburg formation overlying the Jeffersonville limestone in southeastern Indiana and northern Kentucky. Table II shows the stratigraphic distribution of the species and subspecies discussed in this paper.

All the types mentioned in the following descriptions are in the Museum of Paleontology, University of Michigan, unless other sources are designated.

## SYSTEMATIC DESCRIPTIONS

### Phylum COELENTERATA

#### Class ANTHOZOA

#### Subclass TETRACORALLA

#### Family Disphyllidae

### GENUS HEXAGONARIA GÜRICH, 1896

*Polyphyllum* de Fromentel, 1861 (non Blanchard, 1850), homonym.

*Hexagonaria* Gürich, 1896, p. 171.

*Prismatophyllum* Simpson, 1900, p. 218.

*Hexagoniophyllum* Gürich, 1909, p. 102.

*Genotype*.—By subsequent designation of Lang, Smith, and Thomas, 1940, p. 69, *Cyathophyllum hexagonum* Goldfuss, 1826, p. 61, pl. 19, figs. 5 e-f; pl. 20, figs. 1 a-b. The authors have selected the original of pl. 20, figs. 1 a-b as lectotype.

*Generic description*.—Cerioid coralla, typically of subhemispherical form, in which the individual corallites are bounded by polygonal walls of varying thickness. Calyxes with a flat or a sloping peripheral

platform and an axial pit. Axial bosses present in some species. Septa radially arranged, extending from the peripheral walls, long or short, equal or alternating in length. Septal carinae present to some extent in most species, weakly or strongly developed. Yardarm type of carinae predominate in some species; the alternating type is more common in others. Tabulae complete or incomplete, closely or widely spaced. Periaxial tabellae present in some forms. Dissepiments typically small, horizontal peripherally and inclined axially in wide dissepimentaria; dissepiments usually large and steeply inclined in narrow dissepimentaria.

*Remarks.*—A comparison of the external and internal characters of the different species shows that they can be divided into four distinct lineages, based largely on the septal structure, but partially on other features, such as the shape of the calyx, the disposition of the tabulae, and the arrangement of the dissepiments. Most of the distinguishing characters are, however, a result of the septal modifications.

These lineages are as follows:

(1) *Hexagonaria hexagona* lineage.—The septa extend from the peripheral walls with increasing dilation to the margins of the tabularia, and the minor ones terminate there, while the major ones, becoming very attenuate, continue to, or nearly to, the axes. This septal structure gives the appearance of inner walls at the margins of the tabularia, and for this reason many North American species of this lineage have been known by the term "*Acervularia davidsoni*." Externally in members of this lineage there are broad peripheral platforms, typically horizontal or everted, and small axial pits at a lower elevation, with the boundaries between the two steep or vertical. The tabularia are relatively narrow, and the tabulae are incomplete and are interfered with by the axial ends of the major septa. The dissepimentaria are correspondingly wide, and the dissepiments are peripherally horizontal and periaxially inclined.

(2) *Hexagonaria prisma* lineage.—The septa extend from the peripheral walls to the margins of the tabularia, and the minor terminate there, but since they are longer than those in the *H. hexagona* lineage, the tabularia are narrower. The major septa continue

without attenuation to, or nearly to, the axes, and may produce an axial whorl. In some species they become dilated in the axial region. Externally the peripheral platforms slope, usually at a low angle, toward the axial pits, and the line of demarcation between the two is never as strong or as steep as that in the *H. hexagona* lineage. This is due to the lack of attenuation of the major septa in the tabularia. In some species of this lineage conical axial bosses are produced by the major septa extending to the axes and becoming elevated at their axial ends. In others a circular axial boss is produced by an axial whorl of the major septa. Some of these have been described as cerioid species of *Eridophyllum* because of the external similarity of these circular bosses to an aulos. The tabularia are very narrow, and the tabulae are usually incomplete. The dissepimentaria are similar to those of species in the *H. hexagona* lineage but are proportionately larger.

(3) *Hexagonaria anna* lineage.—The septa extend from the peripheral walls one half to two thirds the distance to the axes and are of equal length, so that it is difficult or impossible to distinguish the major from the minor. Externally the calyxes have relatively narrow peripheral platforms, which may be almost horizontal or sloping. The axial pits are wide, with flat bases produced by the uppermost tabula. The tabularia are wide, and the tabulae may be complete or incomplete, and closely or distantly spaced. The dissepimentaria are rather wide in some species and quite narrow and intermittently developed in others.

(4) *Hexagonaria alternata* lineage.—The major septa extend from the peripheral walls two thirds to three fourths the distance to the axes. The alternate minor septa are short ridges extending inward 0.5 to 2 mm. from the periphery. Externally the calyxes have peripheral platforms which are wide and horizontal, and narrow and deep axial pits, the vertical walls of which are bounded by the axial ends of the major septa. The tabularia are of moderate size, and the tabulae may be complete or incomplete. The dissepimentaria occupy from one half to two thirds the width of the corallites. Because of the short minor septa the dissepiments show a characteristic herring-bone pattern in transverse section.

## HEXAGONARIA HEXAGONA LINEAGE

*Hexagonaria hexagona* (Goldfuss), 1826

(Pl. IV, Fig. I; Pl. VI, Figs. 1-2)

*Cyathophyllum hexagonum* Goldfuss, 1826, p. 61, pl. 19, figs. 5 e-f; pl. 20, figs. 1 a-b (non pl. 19, figs. 5 a-d).

*Cyathophyllum hexagonum* Edwards and Haime, 1851, p. 382.

*Hexagonaria hexagona* Gürich, 1896, p. 172.

*Hexagoniophyllum hexagonum* Gürich, 1909, p. 102, pl. 30, figs. 3 a-b.

*Hexagoniophyllum hexagonum* Lang and Smith, 1935, p. 550.

*Hexagonaria hexagona* Lang, Smith, and Thomas, 1940, p. 69.

Although the genotype species is not known from North American strata, it is here included since its internal structure has never been described or illustrated.

*Description.*—The corallum is cerioid, and possesses a low convex distal surface and a flattened proximal surface. Mature corallites are hexagonal or pentagonal in outline and 15 to 22 mm. in diameter. Occasional immature corallites average 10 mm. in diameter. The peripheral walls are thick and slightly elevated, and may be straight or curved. The calyces have broad, horizontal or slightly everted peripheral platforms ranging from 4 to 8 mm. in diameter, and axial pits 4 to 6 mm. in diameter and 2 to 3 mm. in depth. The boundaries between the peripheral platforms and axial pits are steep or vertical.

In transverse section the septa range from 34 to 42 in number in corallites of mature size. The major septa extend from the peripheral walls, with increasing dilation to the margins of the tabularia, and then, becoming very attenuate, continue across the tabularia. In some corallites they meet at the axis, and in others leave an axial space averaging 1 mm. in diameter. The minor septa extend, with increasing dilation, from the walls to the margins of the tabularia and there terminate abruptly. Both orders of septa are carinate, with yardarm carinae predominating. In some corallites carinae are not present on all the septa, and in others they may be present only on the parts near the margins of the tabularia. No carinae are present on the parts of the major septa occurring within the tabularia.

In longitudinal section the tabularia average 5 mm. in diameter and are composed of closely set incomplete tabulae, typically interrupted by the axial ends of the major septa. The dissepimentaria are

composed of dissepiments which are relatively small and distally arched near the periphery, and progressively smaller and more steeply inclined toward the margins of the tabularia. The innermost rows of dissepiments are vertically inclined.

*Occurrence*.—Middle Devonian; Eifel district and Bensberg, Germany. Hypotype from Paffrath, Eifel district, Germany.

*Type*.—Hypotype No. 23660.

*Hexagonaria ovoidea* (Davis) 1887

(Pl. I, Fig. 4; Pl. VI, Figs. 3-5)

*Cyathophyllum ovoideum* Davis, 1887, pl. 93, fig. 1.

*Cyathophyllum davidsoni* Davis, 1887, pl. 113, fig. 3 (probably not pl. 93, fig. 2).

*Description*.—The corallum is cerioid, growing in hemispherical masses, and is composed of polygonal corallites ranging from 7 to 14 mm. in diameter, with the majority averaging 10 mm. The calyxes have horizontal, everted, or gently sloping peripheral platforms and axial pits averaging 3 mm. in diameter. Elevation of the axial ends of the major septa produces small bosses in some of the corallites. The walls of the corallites are thick, and may be straight or curved.

In transverse section the septa range from 30 to 38 in corallites of mature size. The major septa extend from the periphery, with increasing dilation to the margins of the tabularia, and then, becoming very attenuate, continue to the axes. In some corallites they become slightly twisted at their axial ends. The minor ones extend, with increasing dilation, to the margins of the tabularia and terminate there. Both orders of septa are carinate across the dissepimentaria; the carinae are typically closely set, occasionally yardarm, but usually of the alternating type.

In longitudinal section the tabularia average 3 mm. in diameter and are composed of incomplete tabulae, most of which are anastomosed with the axial ends of the major septa. The dissepimentaria are composed of dissepiments which are of medium size and are distally convex along the periphery. The dissepiments are smaller and are inclined along the inner margins of the dissepimentaria.

*Remarks*.—This species is similar to the genotype species but differs in the smaller size of the corallites, the presence of small axial

bosses in the calyxes of many of the corallites, the smaller number of septa, and the greater proportion of alternating carinae.

*Occurrence.*—Jeffersonville limestone; southern Indiana and northern Kentucky. Columbus limestone; central and north-central Ohio.

*Types.*—Holotype (the original of Davis' pl. 93, fig. 1); in the Museum of Comparative Zoölogy, Harvard University; hypotypes Nos. 24223 and 24298, Museum of Paleontology, University of Michigan.

### *Hexagonaria stewartae* nom. nov.

(Pl. VI, Figs. 6-7)

*Prismatophyllum whitfieldi* Stewart, 1938, p. 52, pl. 10, figs. 3-4 (non *Acervularia whitfieldi* Fenton and Fenton, 1924, p. 57, pl. 14, figs. 1-3), homonym.

*Description.*—The corallum is cerioid and is composed of polygonal corallites averaging 9 mm. in diameter. In the holotype, the only specimen seen, no external features are visible.

In transverse section the polygonal walls are pentagonal, hexagonal, or heptagonal in outline and are thick and typically straight. Septa number from 30 to 34 in mature corallites. The major septa extend with moderate dilation from the walls to the margins of the tabularia, and then, becoming attenuate, approach or reach the axes. The minor septa terminate at the margins of the tabularia, distant about halfway between the periphery and the axis. Both orders of septa are carinate across the dissepimentaria, and the carinae are small and mainly of the offset type.

In longitudinal section the tabularia range from 2 to 3 mm. in diameter and are composed of closely set incomplete tabulae, most of which are interrupted by the axial ends of the major septa. The dissepimentaria are composed of small, axially inclined dissepiments.

*Remarks.*—This species resembles *H. ovoidea* in general form, but the corallites are much smaller, the polygonal walls thicker and straighter, and the dissepiments all axially inclined. *Acervularia whitfieldi* Fenton and Fenton, 1924, is a typical species of *Hexagonaria*. On being notified of this Dr. Stewart replied that, as I was revising the group, she would leave to me the renaming of *Prisma-*

*tophyllum whitfieldi* Stewart. I hereby rename *Prismatophyllum whitfieldi* Stewart, 1938 (non Fenton and Fenton, 1924), *Hexagonaria stewartae*, in honor of Dr. G. A. Stewart of Ohio State University.

*Occurrence*.—Dundee limestone, possibly from the "Blue" limestone member; northwestern Ohio.

*Types*.—Holotype No. 17785, Museum of Geology, Ohio State University, fragment and three thin sections of holotype, No. 15348, Museum of Paleontology, University of Michigan.

#### HEXAGONARIA PRISMA LINEAGE

#### *Hexagonaria prisma* (Lang and Smith), 1935

(Pl. I, Figs. 1-2; Pl. VIII, Figs. 1-7)

*Cyathophyllum rugosum* Edwards and Haime, 1851, p. 387, pl. 12, figs. 1 a-b (non *Astrea rugosa* Hall, 1843, p. 159), text fig. 2 on p. 159, with which Edwards and Haime identified their specimens).

*Cyathophyllum rugosum* Rominger, 1876, p. 106, pl. 37, fig. 2 (non fig. 1).

*Cyathophyllum rugosum* Davis, 1887, pl. 91, fig. 1, pl. 93, fig. 3.

*Prismatophyllum prisma* Lang and Smith, 1935, p. 558.

*Prismatophyllum prisma* Stewart, 1938, p. 50, pl. 9, figs. 13-15.

*Prismatophyllum prisma* Smith, 1945, p. 45, pl. 14, figs. 1-3.

*Description*.—The corallum is composed of cerioid corallites, which are long and, when calcified, easily separable. Complete coralla are rare, but large parts indicate a roughly hemispherical pattern of growth. The corallites are pentagonal or hexagonal in outline, those of mature size ranging from 10 to 20 mm. in diameter. The peripheral walls are thick and usually straight. The calyces have peripheral platforms typically sloping at a low angle toward the axial pits, and axial pits with sides sloping toward the axes at a greater angle. In many corallites there is little or no change in angle of slope between the two areas, in which case the axial pits are almost indistinguishable from the peripheral platforms. In none is the boundary between the platforms and the axial pits as abrupt and profound as in species of the *H. hexagona* lineage.

In transverse section the number of septa in corallites of mature size ranges from 44 to 52. The major septa extend to or almost to the axes, and the minor ones, about three fourths as long as the

major, terminate at the margins of the tabularia. The major septa do not become attenuate in the tabularia, and in some specimens may dilate in the latter. This results in a much more obscure line of separation of tabularia and dissepimentaria than that in species of the *H. hexagona* lineage. Both orders of septa are carinate in the dissepimentaria, and the carinae may be alternate or yardarm, with about an equal amount of each type represented.

In longitudinal section the tabularia are small, averaging from one fourth to one third the diameters of the corallites. The axial tabulae are complete or incomplete, nearly horizontal, and evenly spaced at distances of about 0.5 mm. These may be bordered by a series of periaxial tabellae inclined proximally toward the tabulae. In many corallites the periaxial tabellae are irregularly distributed; in others they are lacking. The dissepimentaria are wide and are composed of medium-sized dissepiments, which are nearly horizontal and distally convex near the periphery, and are inclined near the margins of the tabularia.

*Occurrence.*—The species is widespread both geographically and stratigraphically, being known from the Onondaga limestone of New York and Ontario, the Detroit River formation of Ontario and southeastern Michigan, the Columbus limestone of Ohio, and the Jeffersonville limestone of southern Indiana and northern Kentucky.

*Types.*—Lectotype in the Verneuil Collection, École des Mines, Paris. Hypotypes Nos. 24178, 24179, 24200, 24266, Museum of Paleontology, University of Michigan.

*Hexagonaria* sp. A aff. *H. prisma* (Lang and Smith)

(Pl. IX, Figs. 1-2)

*Description.*—The only known specimen of this species is a large subhemispherical corallum possessing a low convex distal surface. This surface has been weathered to a point where all the calyxes have been removed. The corallites visible on it are either pentagonal or hexagonal in outline and range from 10 to 23 mm. in diameter.

In transverse section the polygonal walls are thick and straight. The septa are radially disposed and range from 44 to 48 in number in the larger corallites. The major septa extend almost to the axes

in some of the corallites and only about one half the distance across the tabularia in others. The minor septa extend to the margins of the tabularia and in most corallites are about two thirds as long as the major ones. Both orders of septa are moderately thick throughout their length and are abundantly carinate. Short yardarm and offset carinae are present in about equal numbers.

In longitudinal section the tabularia average 5 mm. in diameter and are composed of complete or incomplete tabulae, which may be convex or relatively horizontal and which are spaced from 0.5 to 1 mm. apart. The dissepimentaria are wide and are composed of many rows of rather fine slightly inclined dissepiments. In many places the dissepiments are obscured by the upward and inward arching carinae.

*Remarks.*—The corallites in this species are larger, and their skeletal elements thicker and coarser than those in *H. prisma*. In addition, the species occupies a higher stratigraphic position than the latter. The species is referred provisionally to *H. prisma* until more information is obtained regarding its external structures.

*Occurrence.*—Delaware limestone; north-central Ohio.

*Type.*—Figured specimen No. 24217.

*Hexagonaria* sp. B aff. *H. prisma* (Lang and Smith)

(Pl. X, Figs. 6-7)

*Description.*—The only known specimen of this species is a fragment of a cerioid corallum lacking external structures.

In transverse section the corallites range from 10 to 15 mm. in diameter and are bounded by thin walls, which are straight or curved. The septa are thin, radially disposed, ranging from 40 to 44 in number in the larger corallites. Both orders of septa are long; the major extend from the walls almost to the axes, and the minor ones are very slightly shorter. Carinae are sparse and thin in the majority of the corallites. Most of them are of the offset type; a few are yardarm. Dissepiments are numerous, their intercepted edges appearing as parallel rows between the septa.

In longitudinal section the tabularia range from 3 to 4 mm. in diameter and are composed of incomplete tabulae, most of which are

distally convex and axially inclined. The dissepimentaria contain several rows of globose dissepiments, which are very convex distally.

*Remarks.*—The species is distinct from *H. prisma*. Because it is known only from a fragment whose structures are poorly preserved as a result of recrystallization, it is referred provisionally to *H. prisma* until better material is available.

*Occurrence.*—Dundee limestone; quarry of the Solvay Process Company at Sibley, two miles north of Trenton, Wayne County, Michigan.

*Type.*—Figured specimen No. 15256.

*Hexagonaria coalita* (Rominger), 1876

(Pl. I, Fig. 3; Pl. IX, Figs. 5-6)

*Cyathophyllum coalitum* Rominger, 1876, p. 108, pl. 38, fig. 4.  
? *Cyathophyllum coalitum* Lambe, 1901, p. 152.

*Description.*—The coralla are cerioid, growing in hemispherical masses and consisting of large corallites ranging from 25 to over 50 mm. in diameter. The walls of the corallites are thick, tetragonal, pentagonal, or hexagonal in outline, and straight or curved. Some sides of the walls are elevated, so that one corallite is at a higher level than parts of its neighbors. The calyxes have flat or gently sloping peripheral platforms and axial pits averaging 13 mm. in diameter. The major septa, shortly after entering the axial pits, are deflected sharply upward, producing conical axial bosses which project as much as 2 mm. above the margins of the pits. The bosses form the highest elevations in the corallites with flat peripheral platforms.

In transverse section the septa are radially disposed and range from 54 to 64 in number. In most corallites the major septa extend from the walls to the axes, becoming twisted at their axial ends. The minor septa are about three fourths as long and terminate at the borders of the tabularia. In many of the corallites the parts of the major septa that lie within the tabularia are slightly dilated. Both orders of septa are thickly carinate, with evenly spaced yardarm carinae. The carinae are confined to the parts of the septa that lie within the dissepimentaria and are spaced at an average distance of 1 mm. apart.

In longitudinal section the tabularia average 13 mm. in diameter and are composed of a confused series of incomplete tabulae, mixed with the twisted axial ends of the major septa. The wide dissepimentaria are composed of many rows of fine inclined dissepiments, which at many places are obscured by the upward and inwardly arching carinae.

*Occurrence.*—The three known specimens of this species, which are in the Rominger collection in the Museum of Paleontology at the University of Michigan, were collected from the drift in the vicinity of Ann Arbor, Michigan. The lithology of the matrix is a gray cherty limestone identical with that of the Onondaga limestone in the area extending from Port Colborne to Woodstock, Ontario. Lambe (1901, p. 152) recorded the species as occurring in the Onondaga limestone of Ontario, but the specimen on which he based his designation appears to be lost.

*Types.*—Holotype No. 8579; hypotype No. 24195.

*Hexagonaria* sp. aff. *H. coalita* (Rominger), 1876

(Pl. VII, Figs. 1-2)

*Description.*—The only known corallum of this species is cerioid, and is composed of very large corallites ranging from 30 to 50 mm. in diameter. It is incomplete, and no external features are preserved.

In transverse section the walls are mainly hexagonal in outline and are thick and usually straight. The septa are radially disposed and range from 54 to 66 in number in corallites of mature size. The major septa extend from the walls to the axes and the minor ones, averaging three fourths as long as the major, terminate at the borders of the tabularia. Both orders of septa maintain the same thickness throughout their length. They are carinate with evenly spaced yard-arm carinae.

In longitudinal section the tabularia average 15 mm. in diameter, and are composed of closely set mainly incomplete tabulae, occasionally interrupted by the axial ends of the major septa. The wide dissepimentaria contain medium-sized steeply inclined dissepiments.

*Remarks.*—Though similar to typical *H. coalita* in internal structure, this species has larger corallites. It occurs in beds younger than

those in which *H. coalita* is found and is preserved in an entirely different matrix, which consists of brown porous limestone. It is referred provisionally to *H. coalita* until specimens showing external features and having a more precise stratigraphic position are obtained.

*Occurrence*.—Dundee or Rogers City limestone, found in float on the floor of the quarry of the Michigan Limestone and Chemical Company, Rogers City, Michigan.

*Type*.—Figured specimen No. 24189.

*Hexagonaria bathycalyx* Stumm sp. nov.

(Pl. II, Fig. 1; Pl. IX, Figs. 3-4)

*Description*.—The corallum is cerioid and hemispherical, and is composed of corallites typically pentagonal or hexagonal in outline, ranging from 20 to 35 mm. in diameter. The walls are thick and usually straight. The calyxes have narrow peripheral platforms sloping steeply downward to wide axial pits of great depth. The bases of the axial pits are as deep as 20 mm. below the peripheral walls. The major septa extend across the pits and in some corallites form small axial bosses at their centers.

In transverse section the radially disposed septa range from 42 to 54 in number in corallites of mature size. The major septa extend from the walls to the axes, with little or no variation in thickness, and the minor septa, from one half to two thirds as long as the major, terminate at the margins of the tabularia. Both orders of septa are carinate across the dissepimentaria, and the carinae are typically of the yardarm type. The carinae are larger and more closely set in some corallites than in others.

In longitudinal section the tabularia range from 3 to 6 mm. in diameter and consist of complete or incomplete tabulae, which are very irregularly spaced. Groups of closely spaced incomplete tabulae are bounded above and below by complete tabulae. These groups are separated from each other by distances of 3 to 4 mm. The dissepimentaria are wide and are filled with many rows of small dissepiments, which are almost horizontal near the periphery and steeply inclined near the margins of the tabularia.

*Occurrence*.—Jeffersonville limestone; northern Kentucky.

*Type*.—Holotype No. 23659.

**Hexagonaria bathycalyx ponderosa** Stumm sp. et subsp. nov.

(Pl. III, Fig. 1)

*Description.*—The corallum is cerioid and hemispherical, and is composed of large pentagonal or hexagonal corallites, which range from 25 to 40 mm. in diameter. The walls are straight and conspicuously elevated; from them the sides of the calyces slope very steeply downward to wide and deep axial pits. In the holotype, the only known example of the species, the bases of some of the axial pits are as much as 60 mm. below the peripheral walls, but this unusual depth is due to solution of the upper parts of the tabularia. A depth of 20 mm. is characteristic of the axial pit of a well-preserved calyx. The septa range from 62 to over 70 in number in corallites of mature size. The major ones extend to the axes and form small axial bosses in some of the corallites. The minor ones terminate at the margins of the tabularia. Both orders are heavily carinate, with yardarm carinae. Dissepiments and tabulae are similar in structure to those in *H. bathycalyx*.

*Remarks.*—This subspecies is closely related to typical *H. bathycalyx*, but differs in the larger average size and greater axial depth of the calyces, and in the proportionately greater number of septa.

*Occurrence.*—Jeffersonville limestone; northern Kentucky.

*Type.*—Holotype No. 24323.

*Hexagonaria cincta* (Stainbrook)

(Pl. I, Fig. 5; Pl. X, Figs. 1-2)

*Cyathophyllum colligatum* Davis, 1887 (non *Eridophyllum colligatum* (Billings)), pl. 91, fig. 2; pl. 92, fig. 1; possibly also pl. 91, fig. 1.

*Prismatophyllum cinctum* Stainbrook, 1940, p. 275, pl. 37, figs. 3, 5, 6; pl. 36, fig. 4.

*Description.*—The coralla are cerioid, irregularly hemispherical, and composed of corallites that are pentagonal or hexagonal in outline, ranging from 10 to 20 mm. in diameter. The polygonal walls are thick, and straight or curved. The calyces are shallow, with wide peripheral platforms, which slope gently toward the margins of the axial pits and then increase in angle of slope to form the walls of the pits. The floors of the pits are occupied by axial whorls produced

by the ends of the major septa. These whorls may be elevated, forming circular axial bosses.

In transverse section the septa in the larger corallites range from 44 to 48 in number. The major septa extend into the tabularia, where they are deflected to form axial whorls, which occupy the central portions of the tabularia. The minor septa terminate at the margins of the tabularia. Both orders of septa are carinate across the dissepimentaria, with yardarm and offset types of carinae about equally represented.

In longitudinal section the tabularia average about 5 mm. in diameter and are composed of a tangled series of tabellae, which are greatly anastomosed with the axial ends of the major septa. The dissepimentaria consist of a thick series of small to medium-sized distally convex dissepiments. As in most species of *Hexagonaria*, the areas of smaller dissepiments are present in the zones of more abundant carinae.

*Occurrence*.—Jeffersonville limestone; Falls of the Ohio River and vicinity.

*Types*.—Holotype No. 1198, Stainbrook Collection; paratype No. 1172, Stainbrook Collection; Hypotype No. 24202, Museum of Paleontology, University of Michigan.

#### ***Hexagonaria subcincta* Stumm sp. nov.**

(Pl. II, Fig. 2; Pl. X, Figs. 3-5)

*Description*.—The coralla are cerioid, occurring in large lenticular or subhemispherical masses with flat or gently convex distal surfaces. They are composed of corallites that are pentagonal, hexagonal, or heptagonal in outline and range from 14 to 18 mm. in diameter. The calyxes have peripheral platforms, which are horizontal or everted, and axial pits, the central portions of which contain circular axial bosses with medial depressions.

In transverse section the peripheral walls are very thin and straight or curved. The septa average 36 in number in the majority of the corallites and are very thin and widely spaced. The major septa extend about halfway through the tabularia and then become sharply deflected, forming aulate rings and leaving the medial por-

tions of the tabularia unoccupied. There is considerable overlapping of septal ends around the rings, so that no true aulos is formed. The minor septa terminate at the margins of the tabularia. Both orders of septa are carinate across the dissepimentaria, with evenly spaced yardarm carinae.

In longitudinal section the tabularia are uniformly 3 mm. in diameter and contain horizontal tabulae, which are complete or incomplete and closely spaced. Near the margins of the tabularia a series of wavy lines represents the intercepted edges of the axial whorls. The dissepimentaria are composed of a thick series of small to medium-sized distally convex dissepiments.

*Remarks.*—Although this species superficially resembles *H. cincta*, it can easily be distinguished by the smaller number of septa, the exclusively yardarm carinae, the presence of aulate rings within the axial whorls, and the well-developed tabulae.

*Occurrence.*—Bois Blanc formation; northern Michigan.

*Types.*—Holotype No. 24233; paratypes Nos. 24236 and 24237.

#### HEXAGONARIA ANNA LINEAGE

##### *Hexagonaria anna* (Whitfield)

(Pl. V, Fig. 3; Pl. XI, Figs. 1-3; Pl. XIII, Figs. 1-2; Pl. XIV, Figs. 3-6)

*Stylastrea anna* Whitfield, 1882, p. 199.

*Stylastrea anna* Whitfield, 1893, p. 420, pl. 2, figs. 1-5.

*Prismatophyllum annum* Stewart, 1938, p. 49, pl. 9, figs. 11-12.

*Description.*—The coralla are cerioid, occurring in hemispherical masses and having corallites that range from 9 to 16 mm. in diameter, with the majority of those of mature size averaging 10 mm. The peripheral platforms slope gently to steeply inward to flat axial pits ranging from 3 to 4 mm. in diameter.

In transverse section the septa are radially disposed and range from 36 to 40 in number in corallites of mature size. Both orders of septa extend from the walls to the margins of the tabularia and terminate there. They are thin and abundantly carinate, with offset and yardarm carinae about equally developed.

In longitudinal section the tabularia range from 4 to 5 mm. in diameter and are composed of tabulae that are usually incomplete,

horizontal, or distally convex and spaced at an average distance of 1 mm. apart. The dissepimentaria consist of many rows of small, very thin dissepiments, which are distally convex peripherally and steeply inclined or vertical along the margins of the tabularia.

*Remarks.*—Whitfield's holotype, the original of his plate 2, figures 1-5, is lost. Three paratypes preserved in the Museum of Geology, Ohio State University, were studied by Stewart (1938, p. 50). One of these was removed and described by her as *Prismatophyllum whitfieldi* sp. nov. The other two paratypes are conspecific. One, noted by Stewart as having slightly larger corallites than the other, is here designated the lectotype.

*Occurrence.*—Dundee limestone; southeastern Michigan and northwestern Ohio. "Blue" limestone member; northwestern Ohio.

*Types.*—Lectotype, Museum of Geology, Ohio State University. Three thin sections of lectotype No. 15347, Museum of Paleontology, University of Michigan. Paratype, Museum of Geology, Ohio State University. Fragment and two thin sections of paratype No. 15349, Museum of Paleontology, University of Michigan.

### *Hexagonaria curta* Stumm sp. nov.

(Pl. IV, Figs. 2-3; Pl. XII, Figs. 1-6)

*Cyathophyllum rugosum* Rominger, 1876, pl. 37, fig. 1 (non fig. 2, which is *Hexagonaria prisma*).

*Prismatophyllum rugosum* Simpson, 1900, text fig. 44 on p. 219; text fig. 45 on p. 220.

*Description.*—The coralla are cerioid, occurring in large subhemispherical masses, with flat or low convex distal surfaces. They are composed of corallites that are irregularly tetragonal to octagonal in outline, with pentagonal and hexagonal ones in greater number. The corallites range from 6 to 13 mm. in diameter, with the majority averaging about 10 mm. The calyxes have steeply sloping peripheral platforms of variable width, from the inner edges of which there is an almost vertical drop of 2 to 3 mm. to small axial pits with flat bases.

In transverse section the peripheral walls are relatively thin, smooth, and, in most corallites, curved. The septa are equal in length and radially disposed, ranging from 36 to 44 in number in the larger corallites. Both orders extend from the peripheral walls a distance

of 4 or 5 mm. toward the axes, leaving an unoccupied space from 4 to 6 mm. in diameter at the center of each corallite. In nearly all young corallites the septa are very short. Both orders of septa are abundantly carinate, with yardarm carinae predominating. The septa in young corallites have very few carinae.

In longitudinal section the tabularia range from 3 to 6 mm. in diameter and contain tabulae that are complete or incomplete. Some tabulae are horizontal or irregularly curved; others are distally convex or concave. They are irregularly spaced, being from 0.5 to 3 mm. apart. A few periaxial tabellae are present. The dissepimentaria are composed of globose dissepiments, most of which are inclined toward the tabularia. The dissepiments are very irregular in both size and distribution. In a single corallite there may be 3 or 4 rows of large dissepiments at one level, and 6 or 7 rows of small dissepiments above or below them. In a few places the dissepiments are entirely absent, the tabulae then reaching the peripheral wall. The distribution of carinae is intermittent; the places where the carinae are most numerous are at the widest parts of the dissepimentaria containing the small dissepiments.

*Remarks.*—This species is similar to *H. anna*, but can be distinguished from it by the greater angle of slope of the peripheral platforms and the deeper axial pits. In addition, the variation in width of the dissepimentaria and in the size of the dissepiments also serves to distinguish this species from *H. anna* in which the dissepimentaria are persistently wide and contain only small dissepiments. In transverse section, however, the two species are very difficult to distinguish.

*Occurrence.*—Columbus limestone; central and north-central Ohio. Jeffersonville limestone; southern Indiana and northern Kentucky.

*Types.*—Holotype, No. 18853; paratypes Nos. 5313, 24209, 24212.

#### *Hexagonaria borealis* Stumm sp. nov.

(Pl. V, Fig. 4; Pl. XI, Figs. 4-6)

*Description.*—The coralla are cerioid and subhemispherical, having irregularly pentagonal or hexagonal corallites ranging from 7 to

13 mm. in diameter. The calyxes have flat peripheral platforms, at the inner ends of which are steep to vertical descents to relatively wide, flat-bottomed axial pits from 3 to 5 mm. in diameter and averaging 3 mm. in depth. The peripheral walls are thick, distinctly elevated, and curved or straight.

In transverse section the septa are of equal length. They range from 36 to 38 in number, and extend from the walls two thirds the distance to the axes. The majority of the septa are dilated for a distance of 1 to 2 mm. from the walls, and many of them have blunt, faintly rhopaloid axial ends. The septa are slightly to moderately carinate; most of the carinae are short and somewhat thickened, producing a beaded appearance in many of the septa.

In longitudinal section the tabularia average 4 mm. in diameter and are occupied by thin horizontal tabulae, most of which are complete and very closely set; at some places in the tabularia the tabulae are incomplete and more distantly spaced. The dissepimentaria are composed of dissepiments, which are small and gently to slightly inclined toward the axes.

*Remarks.*—The species resembles *H. anna* in many respects, but differs from it externally in that the calyxes have flat peripheral platforms. In transverse section the septa of *H. borealis* are thicker, with blunt carinae, and their axial ends are heavy and not attenuate, as they are in *H. anna*. In longitudinal section the two species are very similar, but a much larger number of the tabulae in *H. borealis* are complete and more closely set than those in *H. anna*.

*Occurrence.*—Rogers City limestone; northern Michigan.

*Types.*—Holotype No. 18865; paratypes Nos. 24194, 24213, 24316.

### *Hexagonaria truncata* (Stewart)

(Pl. XII, Figs. 7-8)

*Prismatophyllum truncatum* Stewart, 1938, p. 51, pl. 10, figs. 1-2.

*Description.*—The coralla are cerioid and consist of large corallites that are pentagonal or hexagonal in outline. No external structures are preserved on the holotype.

In transverse section the corallites of mature size range from 9 to 22 mm. in diameter and are bounded by thick, straight, locally

zigzag peripheral walls. The young corallites have thinner, curved walls, which gives them a semicircular appearance. The septa are radially disposed, ranging from 40 to 46 in number in the larger corallites, and are of equal length, typically extending from the walls about two thirds the distance to the axes. In young corallites they may reach only from one third to one half this distance. All the septa are abundantly carinate, with yardarm carinae predominating.

In longitudinal section the tabularia are variable in width, typically occupying the central third of the corallites. They consist of widely spaced complete tabulae and incomplete tabulae which are steeply inclined axially. The axial ends of the incomplete tabulae rest on the underlying complete tabulae. The dissepimentaria are composed of many rows of medium-sized to large, coarse dissepiments, which are distally convex peripherally and steeply inclined axially.

*Remarks.*—This species has the largest corallites of those comprising the *H. anna* lineage. It can also easily be distinguished from other species of the lineage by its large, coarse dissepiments, and by the alternation of complete tabulae and incomplete infundibuliform tabulae.

*Occurrence.*—Dundee limestone (“Blue” limestone member); northwestern Ohio.

*Type.*—Holotype No. 17786, Museum of Geology, Ohio State University.

*Hexagonaria* sp. A aff. *H. truncata* (Stewart)

(Pl. XIV, Figs. 1-2)

*Description.*—The species is known from only one specimen, a fragment of a cerioid corallum on which no external characters are preserved.

In transverse section the corallites are pentagonal or hexagonal in outline and range from 10 to 16 mm. in diameter. The peripheral walls are thick and usually straight. The septa are radially disposed and range from 30 to 32 in number. They are of equal length, extending from the walls two thirds to three fourths the distance to the axes. Carinae are very few, and are small, spinose representatives of the offset type.

In longitudinal section the tabularia occupy the central third of the corallites and contain complete and incomplete tabulae, which are either horizontal or distally convex. The dissepimentaria are filled with medium-sized to large, coarse dissepiments, which are distally convex peripherally and inclined axially.

*Remarks.*—Although similar to *H. truncata*, especially in longitudinal section, the species can easily be distinguished from it by the smaller average size of the corallites, the smaller number of septa, and the scarcity of carinae.

*Occurrence.*—Dundee limestone; southeastern Michigan.

*Type.*—Figured specimen No. 24263.

*Hexagonaria tabulata* Stumm sp. nov.

(Pl. V, Fig. 1; Pl. XI, Figs. 7-8; Pl. XIII, Figs. 5-6)

*Description.*—The coralla are cerioid and hemispherical and consist of small pentagonal or hexagonal corallites that range from 5 to 9 mm. in diameter. The walls are thick and, in most corallites, straight. The calyxes have peripheral platforms sloping gently to steeply downward to flat axial pits.

In transverse section the septa are radially disposed and range from 36 to 38 in number in average-sized corallites. They are of equal length, and extend from the walls one half to two thirds the distance to the axes. Carinae are poorly developed or absent. Some septa are quite smooth, and others show traces of very small offset carinae.

In longitudinal section the tabularia are wide, ranging from 3 to 4 mm. in diameter and containing thick tabulae that are incomplete or complete, horizontal or distally convex, and distantly spaced. A distance of 2 or 3 mm. between two complete tabulae is not uncommon. The dissepimentaria are relatively narrow and composed of 4 or 5 rows or medium-sized, coarse dissepiments that are axially inclined.

*Remarks.*—This species is most closely related to *H. anna*, but is easily distinguished from it by the smaller size of the corallites, the straighter and thicker polygonal walls, the absence of yardarm carinae, the thicker and more distantly spaced tabulae, and the narrower dissepimentaria filled with larger and coarser dissepiments.

*Occurrence.*—Dundee limestone and "Blue" limestone member;

northwestern Ohio. Dundee limestone; southeastern and northern Michigan.

*Types*.—Holotype No. 24244; paratypes Nos. 14381, 24187, 24242.

***Hexagonaria tabulata convexa* Stumm sp. et subsp. nov.**

(Pl. XIII, Figs. 7-9)

*Description*.—The subspecies is known from only one specimen. The corallum is cerioid. Its external structures are identical with those of *H. tabulata*.

In transverse section the septa are thinner and somewhat shorter than those in *H. tabulata*, extending in the majority of the corallites about halfway from the walls to the axes. Offset carinae are moderately developed on the septa of some corallites and are lacking on those of others. The walls are thin and usually curved.

In longitudinal section the subspecies is quite distinct from *H. tabulata*. The tabularia are very wide, ranging from 5 to 6 mm. in diameter, and contain tabulae that are mostly complete, distally convex, and distantly spaced from 1 to 3 mm. apart. The narrow dissepimentaria are composed of 2 to 3 rows of medium-sized, coarse dissepiments, which are vertically disposed and axially convex.

*Occurrence*.—Dundee limestone ("Blue" limestone member); northwestern Ohio.

*Type*.—Holotype No. 24220.

***Hexagonaria parva* Stumm sp. nov.**

(Pl. V, Fig. 2; Pl. XIII, Figs. 3-4)

*Description*.—The coralla are cerioid, and are composed of small corallites ranging from 4 to 7 mm. in diameter. They are tetragonal, pentagonal, or hexagonal in outline; their peripheral walls are strongly developed and distinctly zigzag. The calyces have gently to steeply sloping peripheral platforms and small, flat axial pits averaging 2 mm. in diameter and 2 mm. in depth.

In transverse section the septa range from 28 to 30 in number in mature corallites and are thin and quite short, extending from the walls one third to one half the distance to the axes. Carinae are very poorly developed and are of the offset type.

In longitudinal section the tabularia average 3 mm. in diameter and are composed of tabulae that are horizontal, complete, and spaced at distances ranging from 1 to 2 mm. apart. The majority of the tabulae are flanked by short periaxial tabellae, which are steeply inclined. The axial ends of the tabellae rest on the underlying complete tabula. The dissepimentaria are composed of 2 to 4 rows of small to medium-sized dissepiments that are gently inclined toward the axes.

*Remarks.*—This species is closely allied to *H. tabulata*, but may be distinguished from it by the smaller size of the corallites, the zigzag peripheral walls, the smaller number of septa in the corallites, and the periaxial tabellae.

*Occurrence.*—Dundee limestone; northern Michigan.

*Types.*—Holotype No. 24317; paratype No. 24186.

#### HEXAGONARIA ALTERNATA LINEAGE

#### *Hexagonaria alternata*, Stumm sp. nov.

(Pl. V, Fig. 5; Pl. XIV, Figs. 7-8)

*Description.*—The corallum is cerioid, and is composed of pentagonal or hexagonal corallites which range from 9 to 18 mm. in diameter. The peripheral walls are thick, straight, and slightly elevated. The calyces have broad, horizontal peripheral platforms with a vertical drop at their inner margins to narrow axial pits averaging 3 mm. in diameter and 3 mm. in depth.

In transverse section the walls are moderately thick and in most cases straight. The septa are thin and average 40 in number. The major ones extend from the walls about two thirds the distance to the axes, leaving unoccupied axial spaces averaging 3 mm. in diameter. The minor septa are short ridges, which never extend axially more than 2 mm. from the peripheral walls; many are much shorter. Between some major septa they are lacking. The peripheral ends of the septa in most of the corallites are greatly dilated. The major septa and the longer of the minor septa are carinate. Offset carinae are more common than those of the yardarm type. Owing to the shortness of the minor septa a characteristic herringbone pattern is developed in the dissepiments.

In longitudinal section the tabularia average 3 mm. in diameter and are occupied by zones of complete tabulae, which may be horizontal or distally convex, alternating with zones of small, distally convex tabellae. The dissepimentaria average 5 mm. in diameter and are composed of a thick series of dissepiments, which are medium to large, distally convex peripherally, and inclined axially.

*Remarks.*—The short, degenerate minor septa are the chief distinguishing structures of this species. Only one other known North American species, *H. kirki* (Stumm), from the lower Middle Devonian of Nevada, possesses this distinctive characteristic. It is a species with much larger corallites, in which the short minor septa reappear as discontinuous septal crests.

*Occurrence.*—Dundee or Rogers City limestone; Michigan Limestone and Chemical Company quarry at Rogers City, Michigan. The only known specimen of this species was found loose on the quarry floor, and it is impossible to determine in which formation it occurred.

*Type.*—Holotype No. 24184.

#### LITERATURE CITED

- BASSETT, C. F. 1935. Stratigraphy and Paleontology of the Dundee Limestone of Southeastern Michigan. Bull. Geol. Soc. Am., Vol. 46, pp. 425-462.
- DAVIS, W. J. 1887. Kentucky Fossil Corals, Part II. pls. 1-138. Geol. Surv. Kentucky.
- EDWARDS, H.M., AND HAIME, J. 1851. Mon. d. Polyp. Foss. Terr. Palaeoz. Arch. Mus. Hist. Paris, Vol. 5.
- EHLERS, G. M., AND RADABAUGH, R. E. 1938. The Rogers City Limestone, a New Middle Devonian Formation in Michigan. Pap. Mich. Acad. Sci., Arts, and Letters, Vol. 23 (1937), pp. 441-445.
- FENTON, C. L., AND FENTON, M. A. 1924. Stratigraphy and Fauna of the Hackberry Stage of the Upper Devonian. Contrib. Mus. Geol., Univ. Mich., Vol. I.
- FROMENTEL, É. de 1861. Introduction à l'étude des Polypiers fossiles.
- GOLDFUSS, G. A. 1826. Petrefacta Germaniae, Vol. I.
- GÜRICH, G. 1896. Das Palaeozoicum des polnischen Mittelgebirges. Verh. Russ.-Kais. Min. Gesell. St. Petersburg, Ser. 2, Vol. 32.
- 1909. Leitfossilien, Teil I, Kambrium und Silur; Teil II, Devon.
- HALL, J. 1843. Natural History of New York; Geology of New York, Part IV: Survey of the Fourth Geological District.
- LAMBE, L. 1901. A Revision of the Genera and Species of Canadian Paleozoic Corals. Contrib. Can. Paleontol., Geol. Surv. Canada, Vol. IV, Part II.

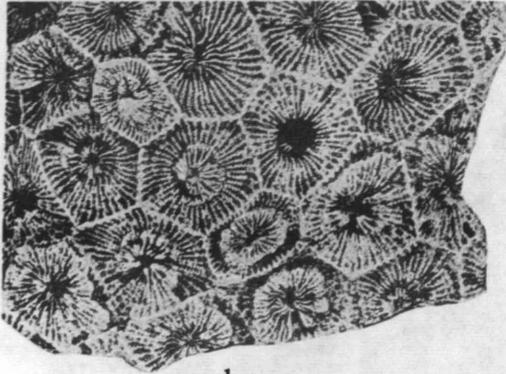
- LANG, W. D., AND SMITH, S. 1935. *Cyathophyllum caespitosum* Goldfuss and Other Devonian Corals Considered in a Revision of That Species. Quart. Journ. Geol. Soc. London, Vol. 91.
- — AND THOMAS, H. D. 1940. Index of Paleozoic Coral Genera. British Museum (Natural History).
- ROMINGER, C. 1876. Paleontology—Fossil Corals. Geol. Surv. Mich., Vol. III, Part II.
- SIMPSON, G. B. 1900. Preliminary Descriptions of New Genera of Paleozoic Rugose Corals. Bull. New York State Mus., Vol. 8, No. 39.
- SMITH, S. 1945. Upper Devonian Corals of the Mackenzie River Region, Canada. Geol. Soc. Am., Special Paper No. 59.
- STAINBROOK, M. A. 1940. *Prismatophyllum* in the Cedar Valley Beds of Iowa. Journ. Paleontol., Vol. 14, No. 3.
- STAUFFER, C. R. 1909. The Middle Devonian of Ohio. Geol. Surv. Ohio, Fourth Series, Bull. 10.
- STEWART, G. A. 1938. Middle Devonian Corals of Ohio. Geol. Soc. Am., Special Paper No. 8.
- WHITFIELD, R. P. 1882. Ann. New York Acad. Sci., Vol. 2, pp. 193–244.
- 1893. Ohio Geol. Surv., Vol. 7, pp. 407–494.

**PLATES AND DESCRIPTIONS**

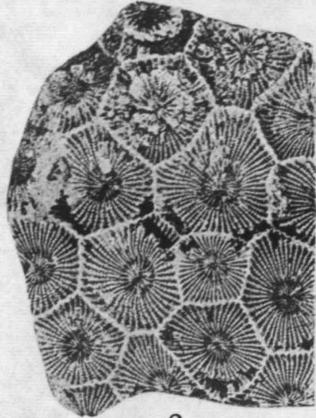
## EXPLANATION OF PLATE I

(All figures  $\times 1$ )

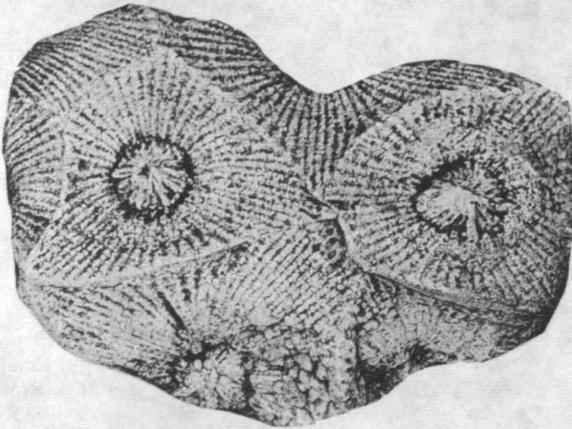
	PAGE
<i>Hexagonaria prisma</i> (Lang and Smith) .....	17
1. Distal surface of a specimen showing the calyces Hypotype No. 24231. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
2. Distal surface of another specimen, in which the septa and carinae are unusually well preserved. Hypotype No. 24227. Jeffersonville lime- stone, Falls of the Ohio River, near Louisville, Kentucky	
<i>Hexagonaria coalita</i> (Rominger) .....	20
3. View of distal surface of an incomplete corallum showing the well-devel- oped axial bosses. Holotype No. 8579. From the drift in the vicinity of Ann Arbor, Michigan; probably derived from the Onondaga lime- stone of Ontario	
<i>Hexagonaria ovoidea</i> (Davis) .....	15
4. Part of distal surface of a corallum showing the well-defined peripheral platforms and axial pits. Holotype No. 7910, Museum of Comparative Zoölogy, Harvard University. Jeffersonville limestone, Brownsboro Road, near and east of school for the blind, East Louisville, Kentucky	
<i>Hexagonaria cincta</i> (Stainbrook) .....	23
5. Distal surface of a specimen showing the axial whorls in the centers of the calyces. Hypotype No. 24202. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	



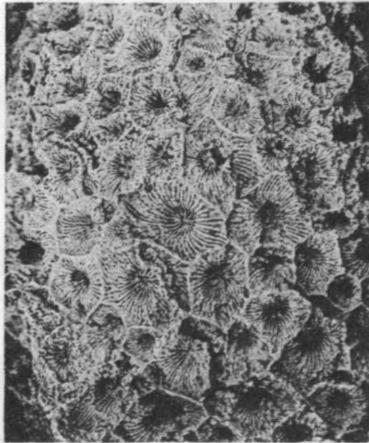
1



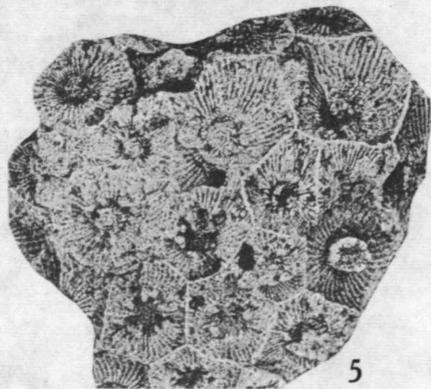
2



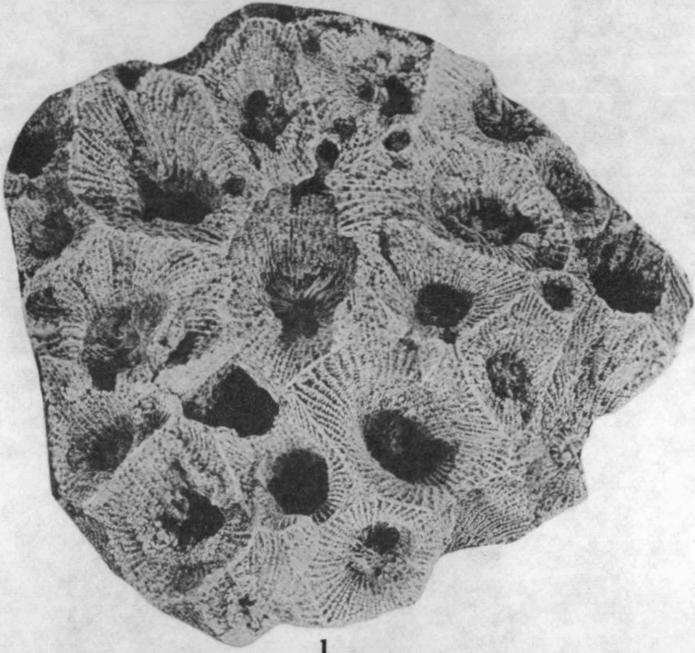
3



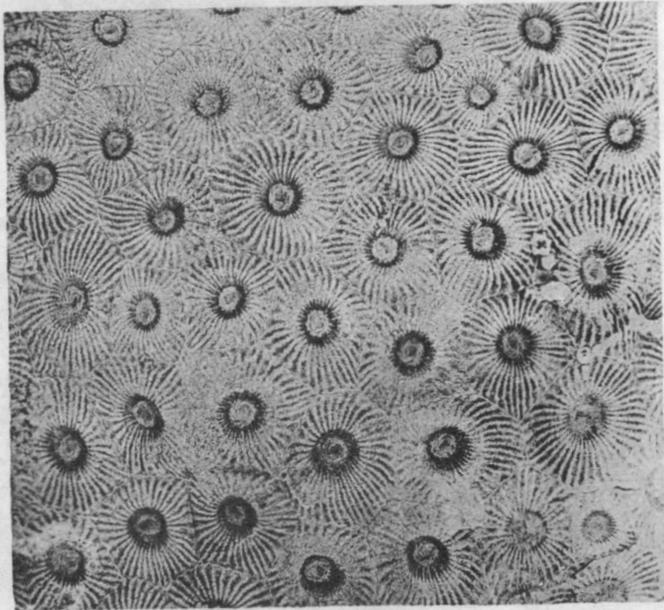
4



5



1



2

## EXPLANATION OF PLATE II

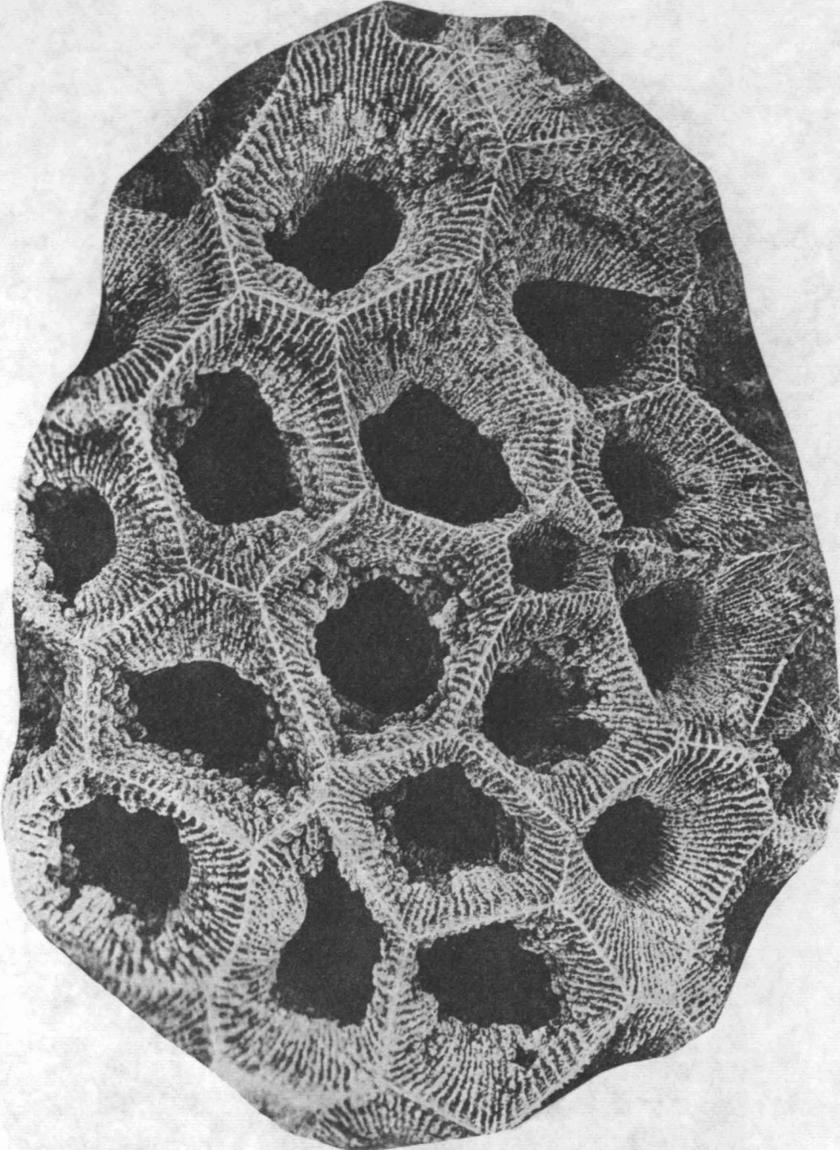
(Both figures  $\times 1$ )

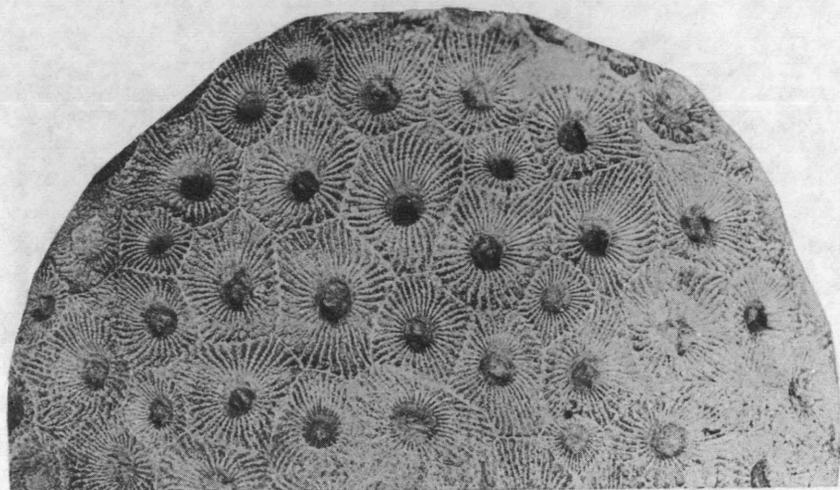
	PAGE
<i>Hexagonaria bathycalx</i> Stumm sp. nov. ....	22
1. View of distal surface of a corallum showing the deep funnel-shaped calyxes. Holotype No. 23659. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
<i>Hexagonaria subcincta</i> Stumm sp. nov. ....	24
2. View of a part of distal surface of a corallum on which the flat peripheral platforms, axial pits, and axial bosses with medial depressions are well shown. Holotype No. 24233. Bois Blanc formation, fence on Pierce and Son dairy farm, NW $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 14, T. 39 N., R. 4 W., about one mile from the west limits of Mackinac City, Michigan	

## EXPLANATION OF PLATE III

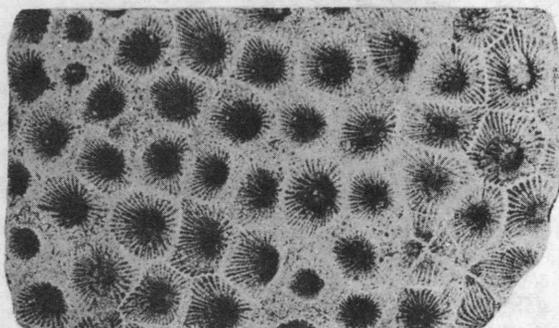
(Figure  $\times$  1)

	PAGE
<i>Hexagonaria bathycalyx ponderosa</i> Stumm sp. et subsp. nov. ....	23
1. Distal view of corallum showing the large, deep funnel-shaped calyxes. Holotype No. 24323. Jeffersonville limestone, Gardners Lane, near Louisville, Kentucky	

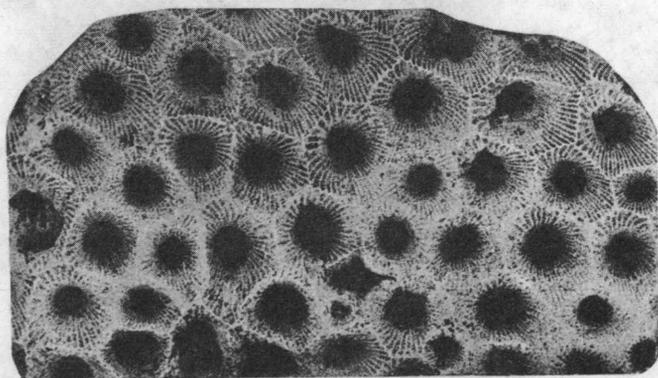




1



2



3

## EXPLANATION OF PLATE IV

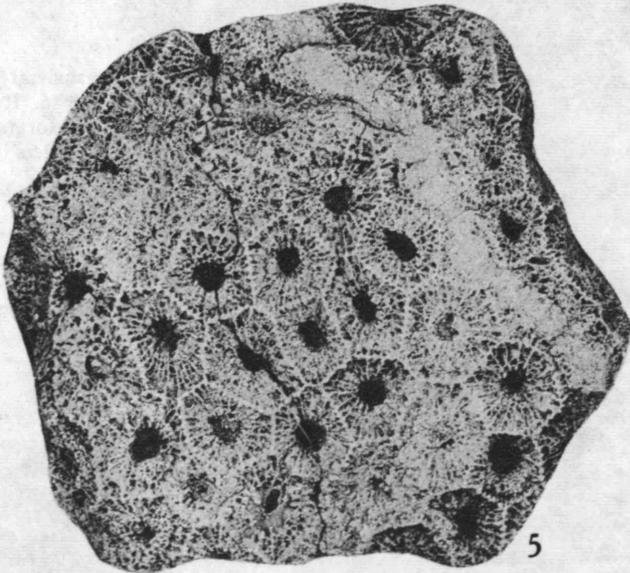
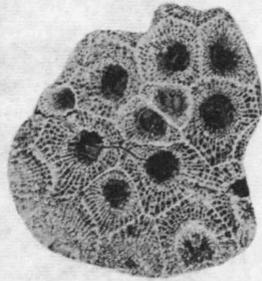
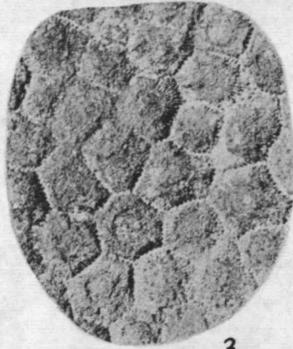
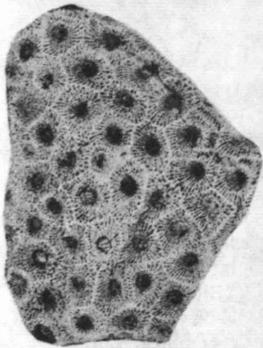
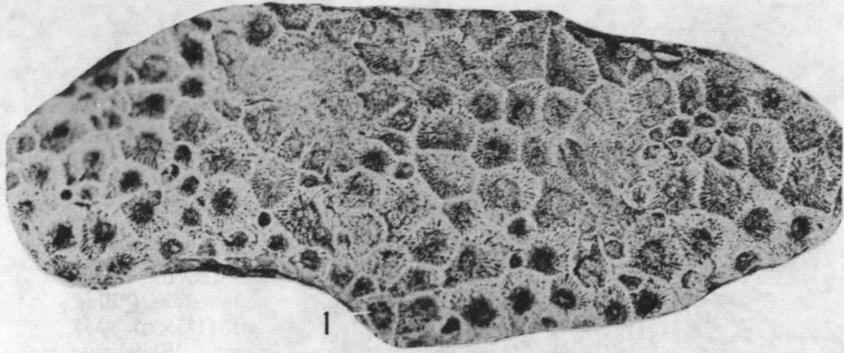
(All figures  $\times 1$ )

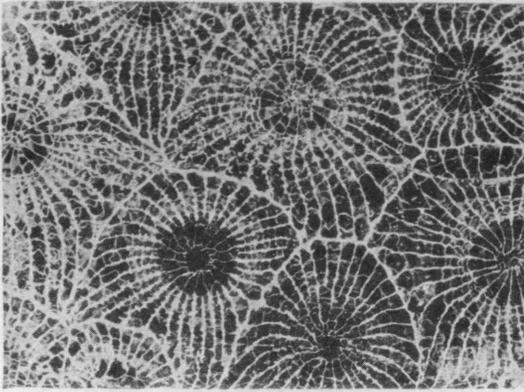
	PAGE
<i>Hexagonaria hexagona</i> (Goldfuss) .....	14
1. Distal surface of one half of a hemispherical corallum showing the low convex distal surface, the broad, flat or everted peripheral platforms, and the small, deep axial pits. Hypotype No. 23660. Middle Devonian, Paffrath, Eifel district, Germany	
<i>Hexagonaria curta</i> Stumm sp. nov. ....	26
2. Distal surface of a specimen showing calyxes with steeply sloping peripheral platforms and deep axial pits. Paratype No. 5313. Columbus limestone, near Sandusky, Ohio	
3. View of distal surface of another specimen, on which the septa are unusually well preserved. Holotype No. 18853. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	

## EXPLANATION OF PLATE V

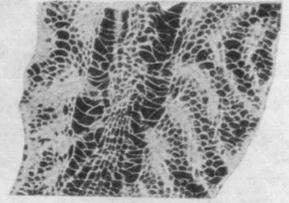
(All figures  $\times 1$ )

	PAGE
<i>Hexagonaria tabulata</i> Stumm sp. nov. ....	30
1. Distal surface of a corallum showing the thick walls and the sloping peripheral platforms. Holotype No. 24244. Dundee limestone ("Blue" limestone member), unit 12 of Carman in Bassett (1935, p. 438). Abandoned quarry of the Whitehouse Stone Company, Whitehouse, Lucas County, Ohio	
<i>Hexagonaria parva</i> Stumm sp. nov. ....	31
2. Distal surface of a specimen showing the small corallites with sloping peripheral platforms and small axial pits. Holotype No. 24317. Dundee limestone, between 15 and 30 feet below top of formation. Michigan Limestone and Chemical Company quarry, Rogers City, Michigan	
<i>Hexagonaria anna</i> (Whitfield) ....	25
3. Part of distal surface of a specimen in which the calyces are partly filled with matrix. The shallow sloping peripheral platforms can still be seen. Hypotype No. 24325. Dundee limestone ("Blue" limestone member), unit 9 of Carman in Bassett (1935, p. 437). New quarry of the Medusa Cement Company, about one mile north of Silica, Lucas County, Ohio	
<i>Hexagonaria borealis</i> Stumm sp. nov. ....	27
4. Distal surface of a specimen showing calyces with flat peripheral platforms and deep axial pits with flat bases. Paratype No. 24316. Rogers City limestone, bed above <i>Atrypa</i> bed in lower part of formation. Michigan Limestone and Chemical Company quarry, Rogers City, Michigan	
<i>Hexagonaria alternata</i> Stumm sp. nov. ....	32
5. Distal surface of a corallum showing degenerate minor septa, flat peripheral platforms, and narrow, deep axial pits. Holotype No. 24184. Dundee or Rogers City limestone. Quarry of the Michigan Limestone and Chemical Company, Rogers City, Michigan	

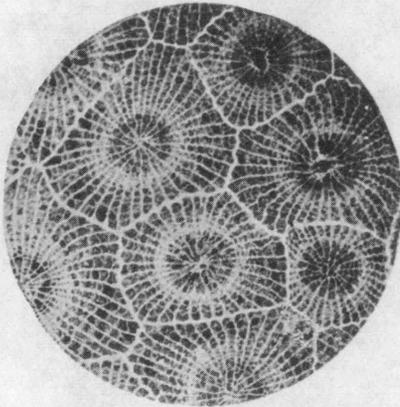




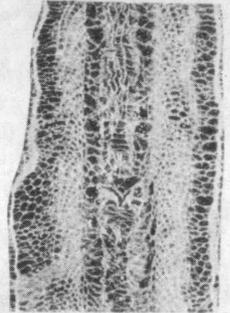
1



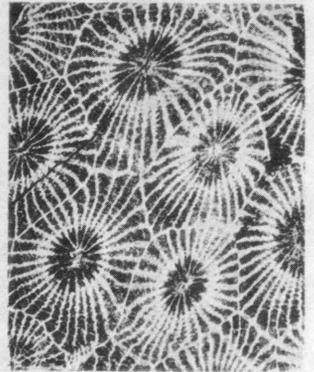
2



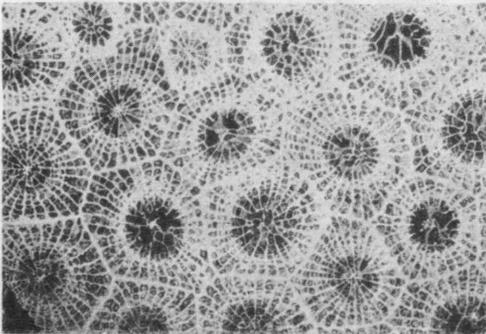
3



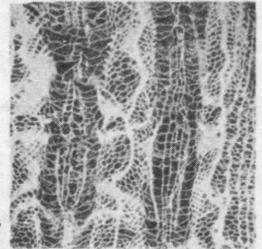
4



5



6



7

## EXPLANATION OF PLATE VI

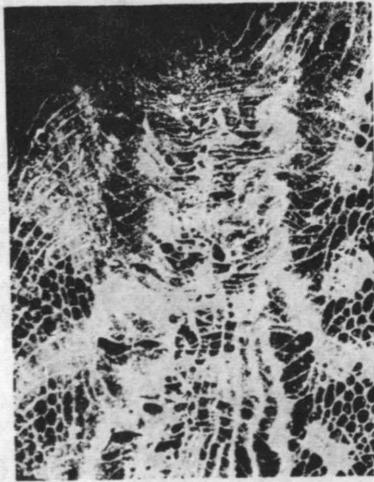
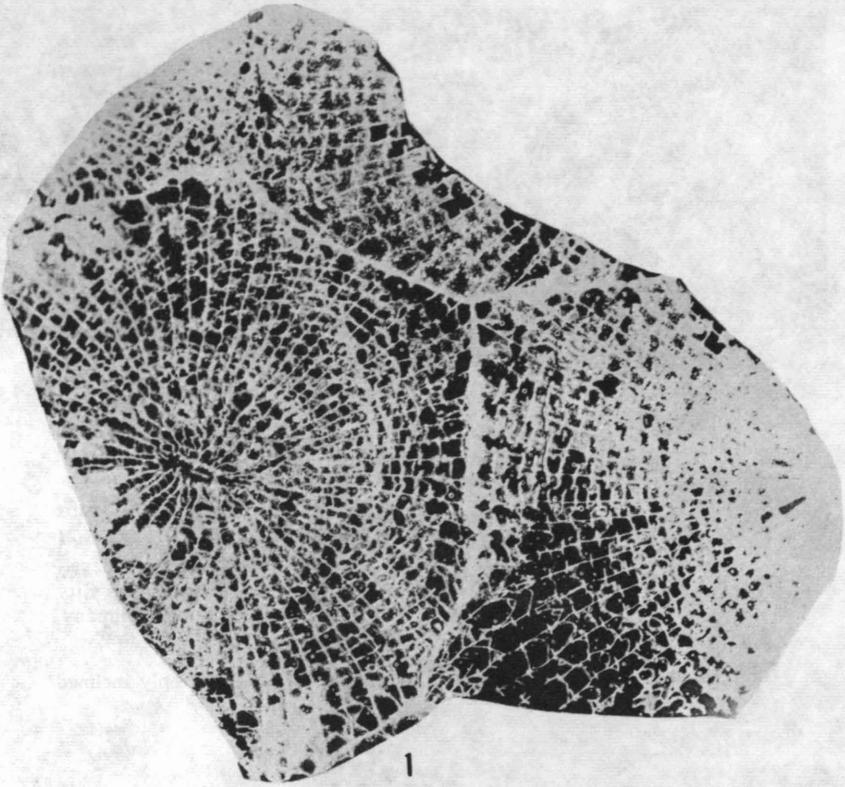
(All figures  $\times 2$ )

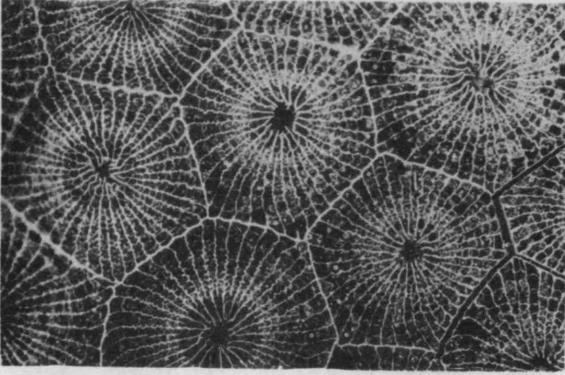
	PAGE
<i>Hexagonaria hexagona</i> (Goldfuss) .....	14
1. Transverse section. Hypotype No. 23660. Middle Devonian, Paffrath, Eifel district, Germany	
2. Longitudinal section of the same specimen, showing clearly the interruption of the tabulae by the axial ends of the major septa	
<i>Hexagonaria ovoidea</i> (Davis) .....	15
3. Transverse section, in which the irregularly curved walls are well shown. Hypotype No. 24223. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
4. Longitudinal section of the same specimen, showing the wide dissepimentaria and the interrupted tabulae in the tabularia	
5. Transverse section of another specimen, with greater than average dilation of the septa in the dissepimentaria. Hypotype No. 24303. Columbus limestone, Columbus, Ohio	
<i>Hexagonaria stewartae</i> Stumm nom. nov. ....	16
6. Transverse section showing the thick, straight peripheral walls and the wide tabularia. Holotype No. 15348. Dundee limestone (possibly from the "Blue" limestone member). Antwerp, Paulding County, Ohio	
7. Longitudinal section of the same specimen	

## EXPLANATION OF PLATE VII

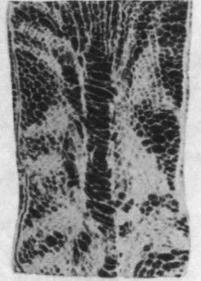
(Both figures  $\times 2$ )

	PAGE
<i>Hexagonaria</i> sp. aff. <i>H. coalita</i> (Rominger) .....	21
1. Transverse section showing the thick walls, long septa, and well-developed yardarm carinae. Hypotype No. 24189. Dundee or Rogers City limestone. Quarry of the Michigan Limestone and Chemical Company, Rogers City, Michigan	
2. Longitudinal section of the same specimen, showing the steeply inclined dissepiments and the interrupted tabulae	

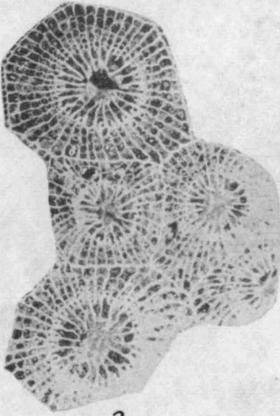




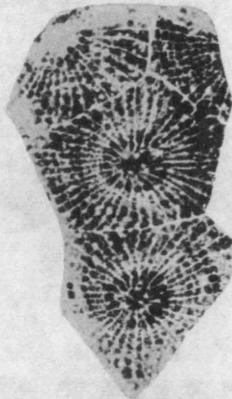
1



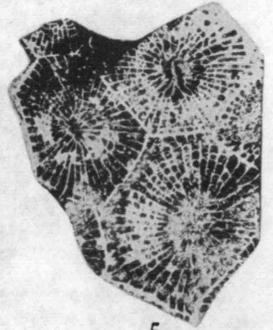
2



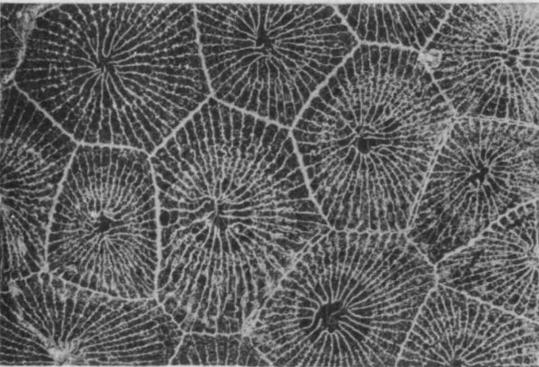
3



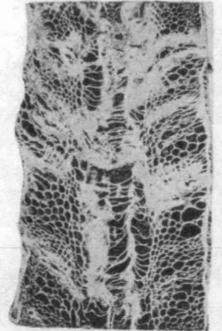
4



5



6



7

## EXPLANATION OF PLATE VIII

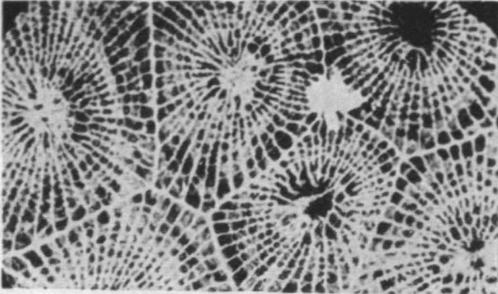
(All figures  $\times 2$ )

	PAGE
<i>Hexagonaria prisma</i> (Lang and Smith) .....	17
1. Transverse section of a specimen showing the straight-sided polygonal walls and the long carinate septa. Hypotype No. 24200. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
2. Longitudinal section of the same specimen, showing the wide dissepimentaria and the narrow tabularia with closely set horizontal tabulae	
3. Transverse section of another specimen, in which axial dilation of the major septa is well shown. Hypotype No. 24209. Columbus limestone, France Stone Company quarry, west city limits of Bellevue, Erie County, Ohio	
4. Transverse section of another specimen. Hypotype No. 24266. Detroit River formation (probably the Amherstberg member), north end of Livingston Channel cut in the Detroit River, east of Grosse Isle, Michigan	
5. Transverse section of another specimen. Hypotype No. 24179. Detroit River formation, second shaft of the International Salt Company mine at Oakwood, Detroit, Michigan, between depths of 350 and 390 feet below the surface and between 30 and 60 feet above base of formation	
6. Transverse section of a well-preserved specimen. Hypotype No. 24178. Top of Onondaga limestone or base of Detroit River formation, quarry of the North American Cyanamid, Ltd., two miles below Beachville, Ontario, on the Thames River	
7. Longitudinal section of the same specimen	

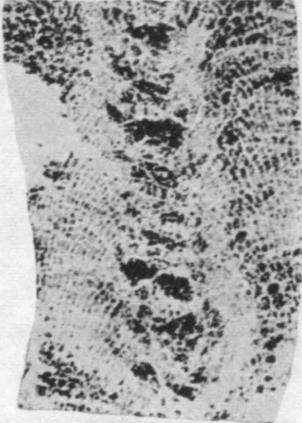
## EXPLANATION OF PLATE IX

(All figures  $\times 2$ )

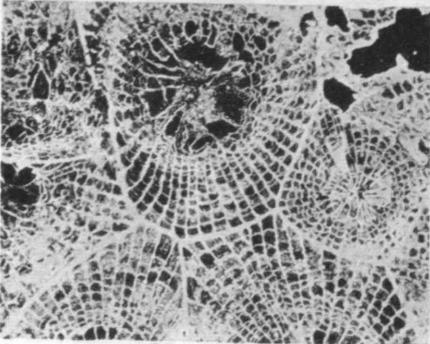
	PAGE
<i>Hexagonaria</i> sp. A aff. <i>H. prisma</i> (Lang and Smith) .....	18
1. Transverse section showing the thick walls and septa. Holotype No. 24217. Delaware limestone ( <i>Cystiphyllum</i> zone), unit 4 of Stauffer (1909, p. 123), quarry along railroad classification yard, about two miles south of Sandusky power plant substation, Sandusky, Ohio	
2. Longitudinal section of the same specimen, showing the strongly developed carinae	
<i>Hexagonaria bathycalyz</i> Stumm sp. nov. ....	22
3. Transverse section cut just below bases of calyxes. Holotype No. 23659. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
4. Longitudinal section of the same specimen, showing the intermittent development of the tabulae	
<i>Hexagonaria coalita</i> (Rominger) .....	20
5. Transverse section showing the curved walls, long septa, and long, thin yardarm carinae. Hypotype No. 24195. From the drift in the vicinity of Ann Arbor, Michigan (probably originally from the Onondaga limestone of Ontario)	
6. Longitudinal section of the same specimen (cf. Pl. VII, Fig. 2)	



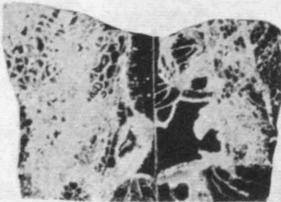
1



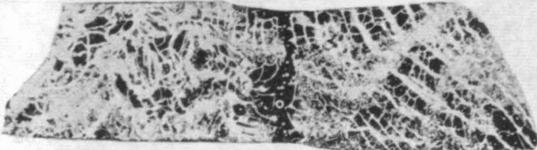
2



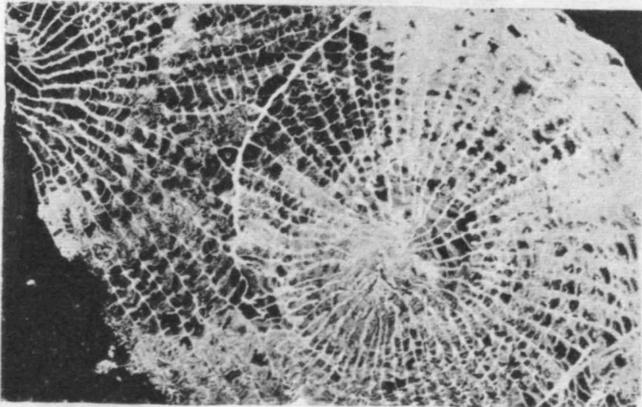
3

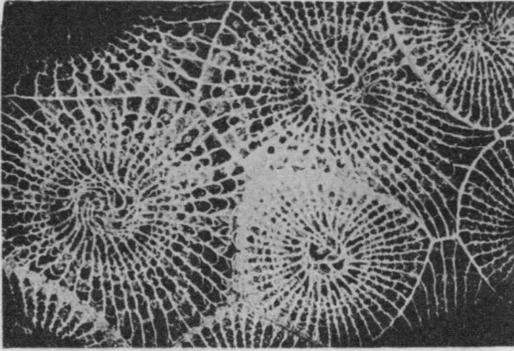


4

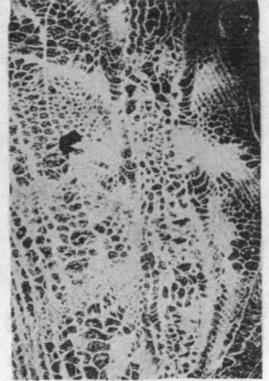


6

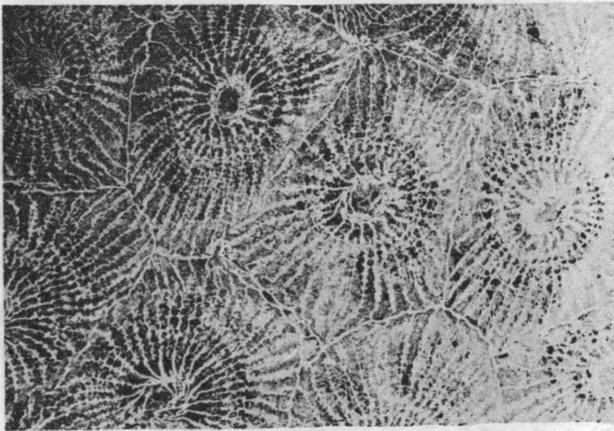




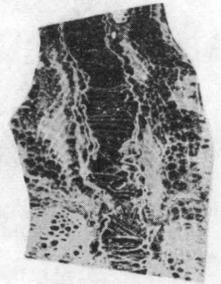
1



2



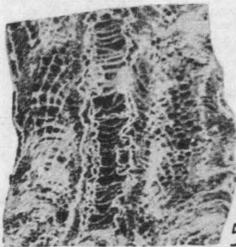
3



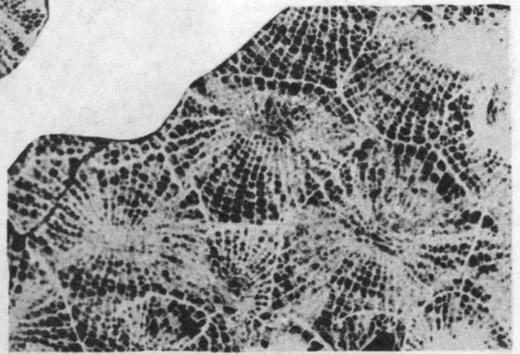
4



7



5



6

## EXPLANATION OF PLATE X

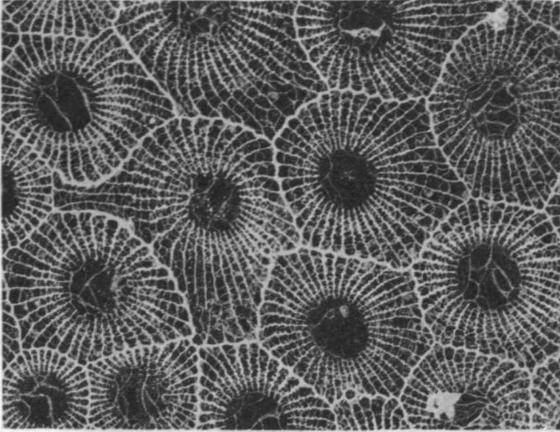
(All figures  $\times 2$ )

	PAGE
<i>Hexagonaria cincta</i> (Stainbrook) .....	23
1. Transverse section showing the solid axial whorls. Paratype (Stainbrook collection, No. 1172). Jeffersonville limestone, Jeffersonville, Indiana (after Stainbrook)	
2. Longitudinal section showing the incomplete tabulae anastomozed with the axial ends of the major septa. Holotype (Stainbrook collection, No. 1198) (after Stainbrook)	
<i>Hexagonaria subcincta</i> Stumm sp. nov. ....	24
3. Transverse section showing the aulate axial whorls, thin, distant septa, and yardarm carinae. Holotype No. 24233. Bois Blanc formation, fence on Pierce and Son dairy farm, one mile west of west limits of Mackinac City, Michigan	
4. Longitudinal section showing the complete, closely set horizontal tabulae. Paratype No. 24236. Same horizon and locality as the holotype	
5. Another longitudinal section, showing the intercepted edges of the aulate axial whorl just within the margins of the tabularium. Paratype No. 24237. Same horizon and locality as the holotype	
<i>Hexagonaria</i> sp. B. aff. <i>H. Prisma</i> (Lang and Smith) .....	19
6. Transverse section showing the long, thin septa and the closely set dissepiments. Hypotype No. 15256. Dundee limestone, quarry of the Solvay Process Company at Sibley, two miles north of Trenton, Wayne County, Michigan	
7. Longitudinal section of the same specimen, showing the very globose dissepiments and the irregularly spaced tabulae	

## EXPLANATION OF PLATE XI

(All figures  $\times 2$ )

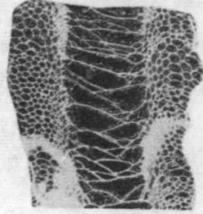
	PAGE
<i>Hexagonaria anna</i> (Whitfield) .....	25
1. Transverse section showing curved walls and short carinate septa. Lectotype No. 15347. Dundee limestone (probably "Blue" limestone member). Antwerp, Paulding County, Ohio	
2. Longitudinal section of the same specimen, showing small, fine dissepiments and incomplete tabulae	
3. Longitudinal section of another specimen, showing intermittent zones of carinae. Paratype No. 15349. Same horizon and locality as the lectotype	
<i>Hexagonaria borealis</i> Stumm sp. nov. ....	27
4. Transverse section showing thick, straight walls and short septa with blunt axial ends. Holotype No. 18865. Rogers City limestone, shore of Lake Huron, one mile north of Rockport, Michigan	
5. Longitudinal section showing the very closely set complete tabulae. Paratype No. 24194. Same horizon and locality as the holotype	
6. Longitudinal section of a specimen in which some incomplete tabulae are present. Paratype No. 24213. Rogers City limestone ( <i>Gypidula</i> bed). Michigan Limestone and Chemical Company quarry, Rogers City, Michigan	
<i>Hexagonaria tabulata</i> Stumm sp. nov. ....	30
7. Transverse section showing the straight walls and weakly carinate septa. Paratype No. 14381. Dundee limestone ("Blue" limestone member). Abandoned quarry of the Whitehouse Stone Company, Whitehouse, Lucas County, Ohio	
8. Longitudinal section of the same specimen, showing widely spaced complete and incomplete tabulae and coarse dissepiments	



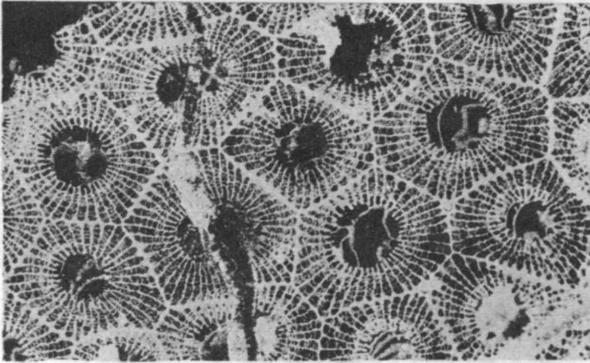
1



3



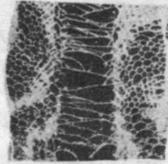
2



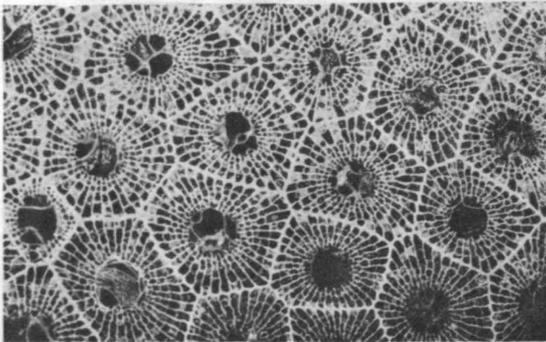
4



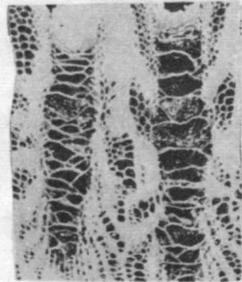
5



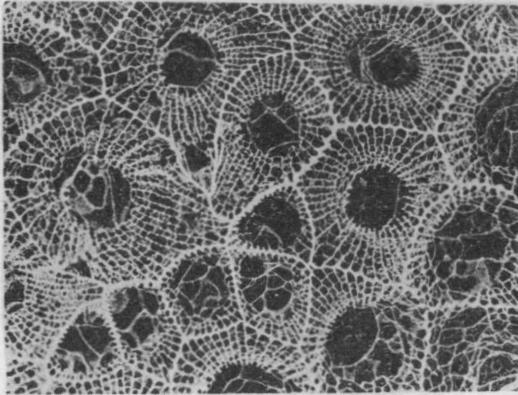
6



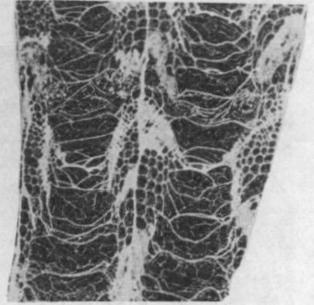
7



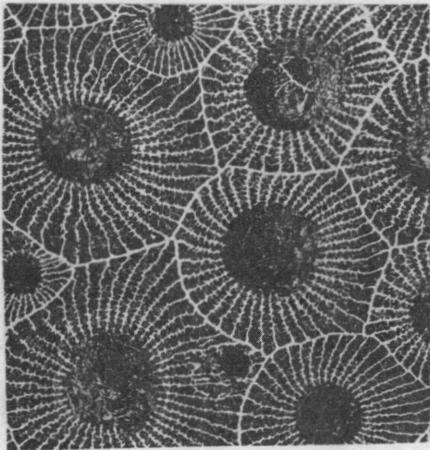
8



1



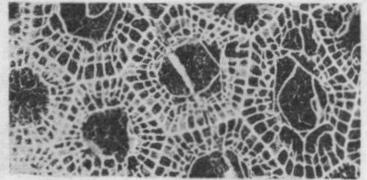
2



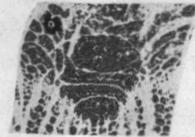
3



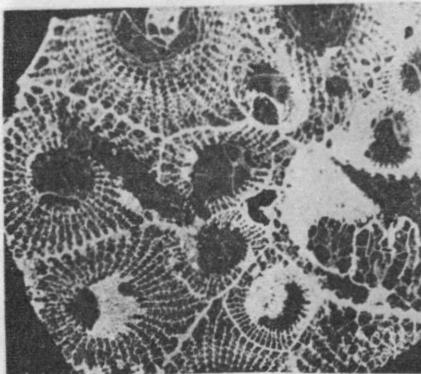
6



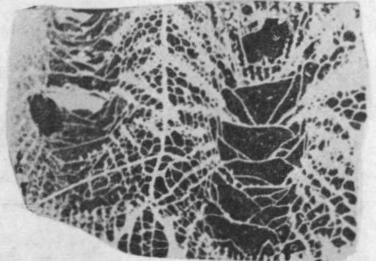
5



4



7



8

## EXPLANATION OF PLATE XII

(All figures  $\times 2$ )

	PAGE
<i>Hexagonaria curta</i> Stumm sp. nov. ....	26
1. Transverse section showing corallites of different sizes. Paratype No. 24209. Columbus limestone, northeast corner of large Marblehead quarry, Marblehead, Ottawa County, Ohio	
2. Longitudinal section showing widely spaced tabulae and the intermit- tently developed dissepimentaria. Paratype No. 24212. From the southeast corner of the same quarry	
3. Transverse section showing curved walls and short, thin septa with yardarm carinae. Holotype No. 18853. Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky	
4. Longitudinal section of the same specimen	
5. Transverse section of a specimen showing a group of young corallites. Paratype No. 18855. From the same horizon and locality as the holotype	
6. Longitudinal section of the same specimen, showing a zone of fine dis- sepiments with carinae below a zone of large, coarse dissepiments with- out carinae	
<i>Hexagonaria truncata</i> (Stewart) .....	28
7. Transverse section showing great variation in size of corallites and the heavily carinate septa. Holotype (Ohio State University No. 17786). Dundee limestone ("Blue" limestone member). Abandoned quarry of the Whitehouse Stone Company, Whitehouse, Lucas County, Ohio	
8. Longitudinal section of the same specimen, showing coarse dissepiments and the alternation of complete tabulae and infundibuliform, incom- plete tabulae	

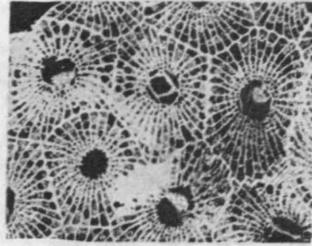
## EXPLANATION OF PLATE XIII

(All figures  $\times 2$ )

	PAGE
<i>Hexagonaria</i> sp. cf. <i>H. anna</i> (Whitfield) .....	25
1. Transverse section of a specimen doubtfully referred to this species. Figured specimen No. 24232. Dundee limestone, Solvay Process Company quarry at Sibley, two miles north of Trenton, Wayne County, Michigan	
2. Longitudinal section of the same specimen	
<i>Hexagonaria parva</i> Stumm sp. nov. ....	31
3. Transverse section showing the small corallites with zigzag walls and very short septa. Paratype No. 24186. Dundee limestone, unit 2 of Ehlers and Radabaugh (1938, p. 443). Michigan Limestone and Chemical Company quarry, Rogers City, Michigan	
4. Longitudinal section of the same specimen, showing widely spaced complete tabulae and periaxial tabellae	
<i>Hexagonaria tabulata</i> Stumm sp. nov. ....	30
5. Transverse section of a well-preserved specimen. Paratype No. 24187. Dundee limestone, Michigan Limestone and Chemical Company quarry, Rogers City, Michigan	
6. Longitudinal section of the same specimen. The dissepimentaria are somewhat recrystallized	
<i>Hexagonaria tabulata convexa</i> Stumm sp. et subsp. nov. ....	31
7. Transverse section showing the distantly spaced short, thin septa. Holotype No. 24220. Dundee limestone ("Blue" limestone member), unit 9 of Carman in Bassett (1935, p. 437). New quarry of the Medusa Cement Company, about one mile north of Silica, Lucas County, Ohio	
8. Longitudinal section of the same specimen, showing the narrow dissepimentaria and the widely spaced, complete distally convex tabulae	
9. Transverse section of a specimen doubtfully referred to this species. Figured specimen No. 24242. Dundee limestone, unit 6 of Carman in Bassett (1935, p. 438), four feet below top of unit. New Quarry of the Medusa Cement Company, about one mile north of Silica, Lucas County, Ohio	



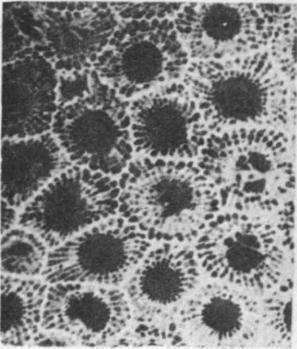
1



5



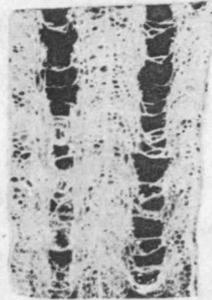
2



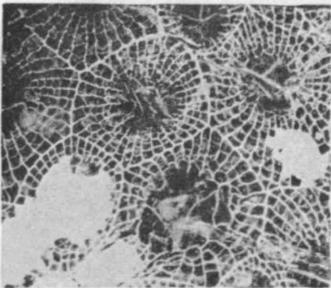
3



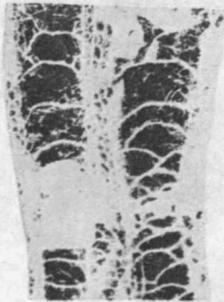
4



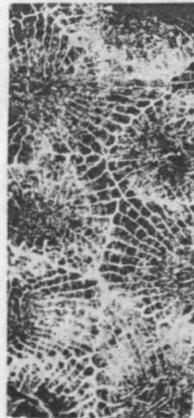
6



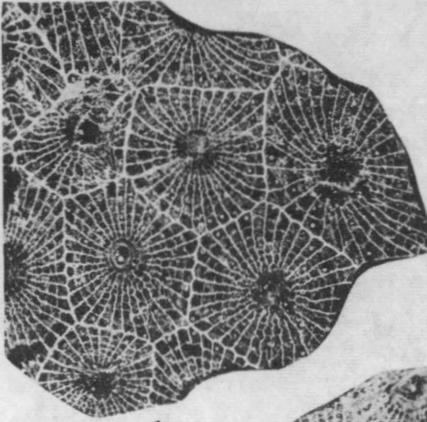
7



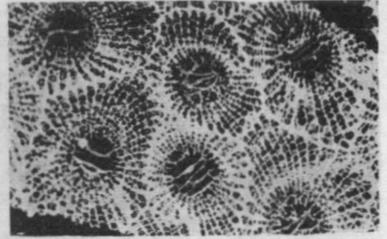
8



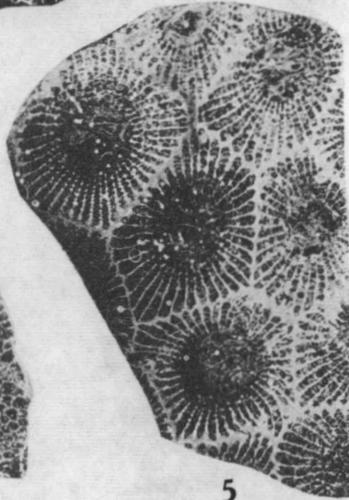
9



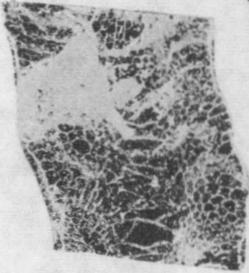
1



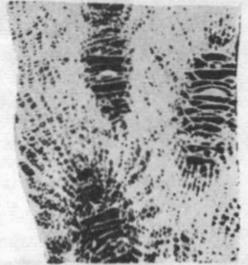
3



5



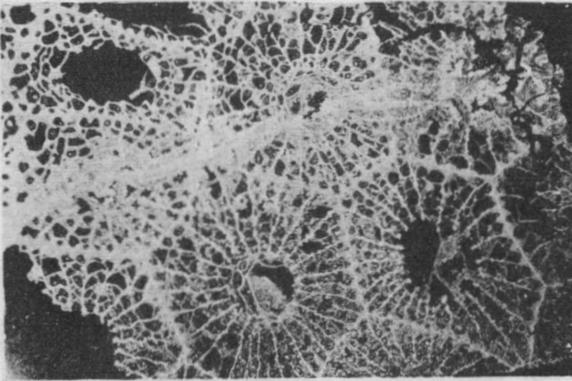
2



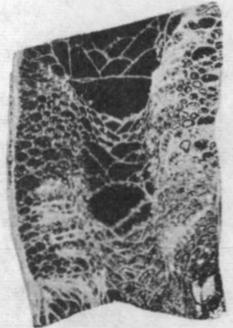
4



6



7



8

## EXPLANATION OF PLATE XIV

(All figures  $\times 2$ )

	PAGE
<i>Hexagonaria</i> sp. A aff. <i>H. truncata</i> (Stewart) .....	29
1. Transverse section, showing the large corallites with thin, weakly carinate septa. Hypotype No. 24263. Dundee limestone, 184 feet below the surface in shore shaft of water-intake tunnel of Detroit Waterworks Park, Detroit, Michigan	
2. Longitudinal section of the same specimen, showing coarse dissepiments and incomplete tabulae	
<i>Hexagonaria anna</i> (Whitfield) .....	25
3. Transverse section of a specimen with corallites slightly smaller than average. Hypotype No. 24319. Dundee limestone, Solvay Process Company quarry at Sibley, two miles north of Trenton, Wayne County, Michigan	
4. Longitudinal section of the same specimen	
5. Transverse section of a specimen with unusually thick walls. Hypotype No. 24222. Dundee limestone ("Blue" limestone member), unit 9 of Carman in Bassett (1935, p. 437). New quarry of the Medusa Cement Company, about one mile north of Silica, Lucas County, Ohio	
6. Longitudinal section of the same specimen	
<i>Hexagonaria alternata</i> Stumm sp. nov. ....	32
7. Transverse section showing the very short minor septa and the herringbone pattern of the dissepiments. Holotype No. 24184. Dundee or Rogers City limestone, quarry of the Michigan Limestone and Chemical Company, Rogers City, Michigan	
8. Longitudinal section of the same specimen, showing coarse dissepiments and alternation of tabulae and tabellae	

