HINDEASTRAEA DISCOIDEA WHITE FROM THE EAGLE FORD SHALE DALLAS COUNTY, TEXAS

Fondren Science Series, Number 2

BY
BOB F. PERKINS

SOUTHERN METHODIST UNIVERSITY PRESS
1951

FONDREN SCIENCE SERIES

No. 1 A New Elasmosaur from the Eagle Ford Shale of Texas
Part I: Systematic Description, by S. P. Welles
(May 10, 1949) $1.50

Part II: The Elasmosaur and Its Environment,
by Ellis W. Shuler (April 17, 1950) $1.50

No. 2 *Hindeastraea discoidea* White from the Eagle Ford Shale,
Dallas County, Texas, by Bob F. Perkins
(April 17, 1951) $1.00

SOUTHERN METHODIST UNIVERSITY PRESS
DALLAS

Hindeastraea discoidea White from the Eagle Ford Shale, Dallas County, Texas

BY BOB F. PERKINS*

INTRODUCTION

In 1888 Charles White[1] made *Hindeastraea discoidea* the type of a new genus of Cretaceous coral. The type specimen was reported to have been collected from the Ripley (Navarro) formation near Terrell, Kaufman County, Texas. The next year Robert T. Hill[2] reported what he considered to be the same species in the shales at Eagle Ford, Dallas County, Texas. The note was not accompanied by a description, and the corals were referred incorrectly to the genus *Isastrea.* Although the occurrence of these corals in the Eagle Ford has been known to many collectors other than Hill, there has been no attempt to describe them.

The following discussion includes a systematic description of the species, a columnar section showing the stratigraphic position, and speculations concerning the conditions of sedimentation in the upper Eagle Ford.

The author wishes to express his gratitude to Dr. C. C. Albritton, Jr., for his invaluable aid in preparation of the manuscript and for the generous amount of time given for consultation and discussion concerning the problem of the paper. Thanks are also due Mrs. Kathleen Keathley for her many helpful suggestions. Gratitude is also expressed to Dr. John W. Wells of Cornell University for reading the manuscript and offering many invaluable suggestions and criticisms.

Grateful acknowledgment is also made to William Louis Turner, Jr., and P. B. Williamson, graduate students at Southern Methodist University, for their assistance in field work and in preparation of the columnar section of the upper Eagle Ford shale.

The author wishes also to express his gratitude to Dr. John B. Reeside, Jr., of the United States Geological Survey for his help in obtaining plastotypes of *Hindeastraea discoidea* White and *H. collinensis* Hoffmeister, and for his assistance in locating the specimens in the National Museum. Acknowledgments are also extended to Dr. C. R. Treadwell of George Washington University for working with Dr. Reeside in obtaining label information on the above named specimens.

The author also wishes to thank Dr. H. B. Stenzel of the Bureau of Economic Geology, Austin, Texas, for making the collections of the bureau available and aiding in the search for several specimens.

*Department of Geology, Southern Methodist University, Dallas, Texas.

[1]Charles Abiathar White, "On *Hindeastraea*, a new generic form of Cretaceous Astraeidae," Geol. Mag., ser. 3, vol. 5, no. 8, 1888, pp. 362-364.

[2]Robert T. Hill, "A preliminary annotated check list of the Cretaceous invertebrate fossils of Texas, accompanied by a short description of the lithology and stratigraphy of the system," Texas Geol. Survey, Bull. 4, 1889, p. 1.

SYSTEMATIC DESCRIPTION

Phylum COELENTERATA

Class ANTHOZOA Ehrenberg, 1834

Subclass HEXACORALLIA Haeckel, 1896

Order SCLERACTINIA Bourne, 1900

Suborder FAVIIDA Vaughan and Wells, 1943

Family ASTRANGIIDAE Verrill, 1869

Genus HINDEASTRAEA White, 1888

Genotype. *Hindeastraea discoidea* White, 1888. Navarro formation. Terrell, Kaufman County, Texas. (By original designation.)

Generic diagnosis. Corallum depressed or discoid. Colonies develop by extratentacular budding between calices. Corallite walls united and fused or separated by costate peritheca. Individual corallites polygonal to sub-circular in outline. Septa laminar and dentate; columella parietal.

Remarks. The genus *Hindeastraea* was originally compared by White[3] to the genus *Isastrea* of Milne Edwards and Haime. The differences in the two genera were given by White as follows: (1) *Isastrea* is massive in its growth form while *Hindeastraea* is not; (2) *Isastrea* is characterized by numerous dissepiments, but *Hindeastraea,* because of the shortness of the corallite axes, has little room for the development of dissepiments; and (3) in *Hindeastraea* the walls of the individual corallites form distinctive boundaries between the calices whereas in *Isastrea* these boundaries are much less distinctive.

Frech[4] did not consider the erection of this new genus justified, on the basis that the only "essential" difference between White's specimens and *Isastrea* was the absence or sparcity of dissepiments. Frech stated: "Dissepimente entstehen erst bei vorschreitendem Wachsthum, in jugendlichen Exemplaren ist für dieselben kein Raum." Evidently he believed that White had only juvenile or immature specimens of *Isastrea,* for he concludes with the statement: "Die neue Art ist als *Isastraea discoidea* White sp. zu bezeichnen."

Both Hill[5] and Felix[6] followed Frech's decision in referring the species to *Isastrea.* Adkins,[7] however, returned to the use of the generic name *Hindeastraea* in listing the species from the Navarro.

---

[3]White, p. 363.

[4]Felix Frech, "Charles White: On *Hindeastraea,* a new generic Form of Cretaceous Astraeidae," Neues Jahrbuch, Band I, 1889, p. 322.

[5]Hill, p. 1.

[6]Johannes Felix, "Anthozoa neocretacea," Fossilium Catalogus, pars 7, 1914, p. 7.

[7]Walter Scott Adkins, "Handbook of Texas Cretaceous Fossils," Texas, Univ., Bull. no. 2838, 1928, p. 75.

Hoffmeister[8] referred a single species (*H. collinensis*) from the Wolfe City sand of the Taylor marl to the genus.[9]

Subsequent studies by Vaughan and Wells[10] have resulted in a revision of the order Scleractinia and redefinition of the genera. *Isastrea* is placed in the suborder Fungiida, superfamily Agaricioidae, family Calamophylliidae. *Hindeastraea* is included in the suborder Faviida, family Astrangiidae.

The author is in agreement with Vaughan and Wells on the separation of the two genera and their taxonomic positions. The following serves to emphasize the more important differences between the two genera:

Hindeastraea	*Isastrea*
1. Septa laminar and imperforate	1. Septa fenestrate
2. Synapticulae absent	2. Synapticulae few
3. Extratentacular budding	3. Intratentacular budding
4. Plocoid coralla	4. Cerioid coralla
5. Dissepiments few or absent	5. Dissepiments numerous sometimes forming a paratheca

Hindeastraea discoidea White Plates I and II

Hindeastraea discoidea White, 1888. Geol. Mag., ser. 3, vol. 5, no. 8, p. 363, figs. 1-5.

Isastraea discoidea Frech, 1889. Neues Jahrbuch, Band I, p. 322.

Isastrea discoidea Hill, 1889. Texas Geol. Survey, Bull. 4, pp. 1, 25, 51, 53, (name only).

Isastrea discoidea Hill, 1889. Check list of the invertebrate fossils from the Cretaceous formations of Texas, p. 7, (name only).

Isastrea discoidea Felix, 1914. Fossilium Catalogus, pars 7, p. 174, (name only).

Hindesastraea discoidea Adkins, 1928. Univ. of Texas, Bull. no. 2838, p. 75.

Hindeastraea discoidea Hoffmeister, 1929. U. S. Natl. Mus. Proc., vol. 76, art. 23, p. 1, pl. II, figs. 1, 1a.

Hindesastraea discoidea Wells, 1933. Bull. Am. Paleontology, vol. 18, no. 67, p. 225.

Isastrea discoidea Dallas Petroleum Geologists, 1941. Field and Laboratory, vol. 10, no. 1, p. 29, (name only).

Hindesastraea discoidea Vaughan and Wells, 1943. Geol. Soc. Am. Spec. Paper 44, p. 179.

Description. Corallum depressed or irregularly discoid; attached by base of initial corallite. Basal epitheca with radiating striae and concentrically arranged rugae.

---

[8]John Edward Hoffmeister, "A New Fossil Coral from the Cretaceous of Texas," U. S. Natl. Mus. Proc., vol. 76, art. 23, 1929, p. 1.

[9]Dr. John W. Wells suggests that *H. collinensis* is the same as *H. discoidea* as evidenced by specimen No. K1664 in the collection of the Bureau of Economic Geology, Austin, Texas. (John W. Wells to Margaret L. Hartley, Southern Methodist University Press. Letter dated October 9, 1950.)

The author, with the assistance of Dr. H. B. Stenzel, made a thorough search through the collections of the Bureau of Economic Geology but was unable to locate the specimen. Pending further evidence it is preferable to recognize both species as valid.

[10]Thomas Wayland Vaughan and John West Wells, *Revision of the Suborders, Families, and Genera of the Scleractinia,* Geol. Soc. Am. Spec. Paper 44, 1943, 363 pp.

Corallites from 1 to 10; width of individual corallites usually three times height. Walls of adjacent corallites in contact and fused, or separated by costate peritheca. Where in contact and fused, borders of corallites polygonal and well-defined; where separated by peritheca borders sub-circular.

Calices relatively shallow; only 1 to 1.5 mm. deep at fossa above columella and less near borders.

Septa prominent, arranged in three complete cycles. First cycle consists of four to six septa extending to center of corallite and joining columella. Septa of second cycle joined to one another or to septa of first cycle. Septa of third cycle may terminate as those of second but frequently are free at inner ends. Septa usually 24 in number but may range from 22 to 26; all subequal in thickness, thicker portions near the periphery becoming thinner near the centers of the calices. In less mature forms (1 to 4 calices) septa rise slightly out from corallite walls before arching downward to columella. In more mature forms (5 to 10 calices) septa pass from corallite walls to columella without arching. Septal edges dentate; faces subspinulose.

Columella spongy, formed by intermingling of septal ends. In mature forms (5 to 10 calices) columella about 2 mm. in diameter.

Corallites added by extratentacular budding between calices, usually at edge of corallum.

Dimensions. The diameters of the coralla were determined by measuring the length of the base and one side of the smallest rectangle which would enclose the specimen.

(Only the more complete and better preserved specimens are included.)

Specimen No.	No. of Calices	Dimensions of Corallum (mm.)	Diameter of initial corallite (mm.)	Height (mm.)
1.	1	6 x 6	6	3
2.	1	6 x 6	6	2
3.	1	7 x 7	7	3
4.	3	8 x 10	6	3
5.	4	10 x 12	6	4
6.	4	11 x 12	6	3
7.	4	11 x 14	6	3
8.	4	11 x 15	6	3
9.	4	12 x 15	7	4
10.	4	12 x 15	7	4
11.	5	12 x 15	4	4
12.	5	10 x 14	6	4
13.	6	12 x 16	7	4
14.	7	15 x 16	7	4
15.	7	14 x 17	6	5
16.	8	17 x 18	7	5
17.	10	15 x 19	6	5

Remarks on the species. (See Plate II)

The specimens of *Hindeastraea discoidea* from the Eagle Ford shale display several stages of growth.

The earliest growth stage represented is the one corallite stage.

Specimens of this stage are quite small, the diameter of the largest specimen examined being only 7 mm.

The next stage represented is the three corallite stage in which the two secondary corallites are of approimately the same size, probably indicating equal age.

The stage most abundantly represented is the four corallite stage. All the specimens of this stage are essentially the same except for size.

The specimens of the five corallite stage appear to be of two types. In one type the fifth corallite is added peripherally between the initial corallite and one of the secondary corallites. In the other type the fifth corallite is added adjacent to the initial corallite but not in contact with any of the others. These two types serve as points of departure for the ultimate development of two different types of mature coralla.

Specimens following the first type of development continue to add corallites until the initial corallite is completely surrounded by secondary corallites. A mature specimen of this type is quite symmetrical, the individual corallites having polygonal borders except on the periphery of the corallum, where they become sub-circular.

Coralla following the second type of development add the subsequent corallites in an irregular fashion until the initial corallite is completely surrounded. Mature specimens of this type are characterized by irregularly polygonal calices, partially developed corallites, and general assymmetry.

Specimens. White's type specimens are deposited in the United States National Museum. U. S. Natl. Mus. Cat. No. 19166.

Plastotypes of White's original specimens have been deposited in the Southern Methodist University Museum.

The specimens from the Eagle Ford shales herein described have been deposited in the Southern Methodist University Museum.

Occurrence. Type locality. Ripley (Navarro) formation, near Terrell, Kaufman County, Texas. The type specimens were collected from this locality by Dr. R. H. Loughridge and given to White for description. As the original field notes concerning the exact locality and stratigraphic position are not available the precise type locality is not determinable.[11]

Other localities. (See Figure 1.)

(1) Eagle Ford shale, near Dallas, Dallas County, Texas. In a thin calcareous bed in weathered shale, 375 feet west, 120 feet south of the intersection of U. S. Highway 80 and Chalk Hill Road.

(2) Eagle Ford shale, near Arcadia Park, Dallas County, Texas. In a thin calcareous bed in shale in a deep gulley. About one-half mile due south of the intersection of Jefferson Avenue and Justin Street.

Associated fauna. The following fossils were found associated with *Hindeastraea discoidea* at the Eagle Ford localities:

[11]Personal communication, Dr. John B. Reeside, letter dated May 18, 1950.

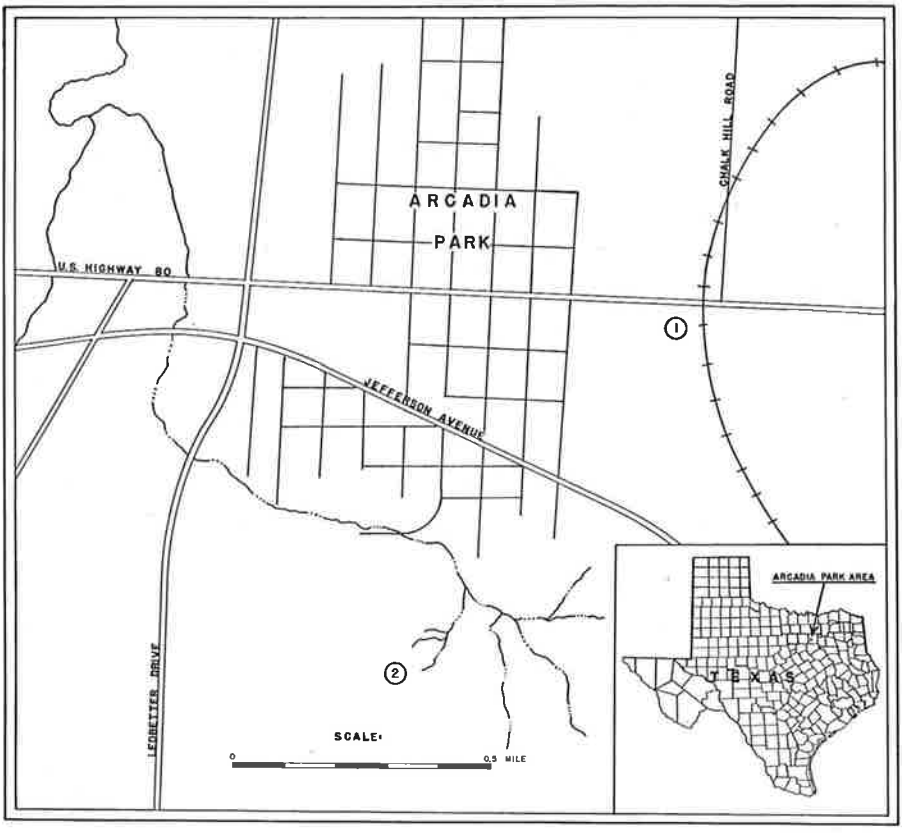

FIGURE I.— MAP OF THE ARCADIA PARK AREA, DALLAS COUNTY, TEXAS. NUMBERS REFER TO LOCALITIES WHERE HINDEASTRAEA DISCOIDEA WHITE HAS BEEN COLLECTED.

Microfauna:

Planulina eaglefordensis (Moreman)
Ammobaculites subcretaceous Cushman and Alexander
Globigerina cretacea d'Orbigny
Discorbis correcta Carsey
Epistomina sp.
Rheophax sp.
Vaginulina sp.
Gumbelina sp.
Ostracods

Megafauna:

Inoceramus dimidius White
Inoceramus sp.
Priontropis aff. *woolgari* Stanton
Turritelloid gastropods, about 10 mm. in length
Thin-shelled gastropods, 5 to 15 mm. in length
Thin-shelled pelecypods, 5 to 10 mm. in length
Fish teeth

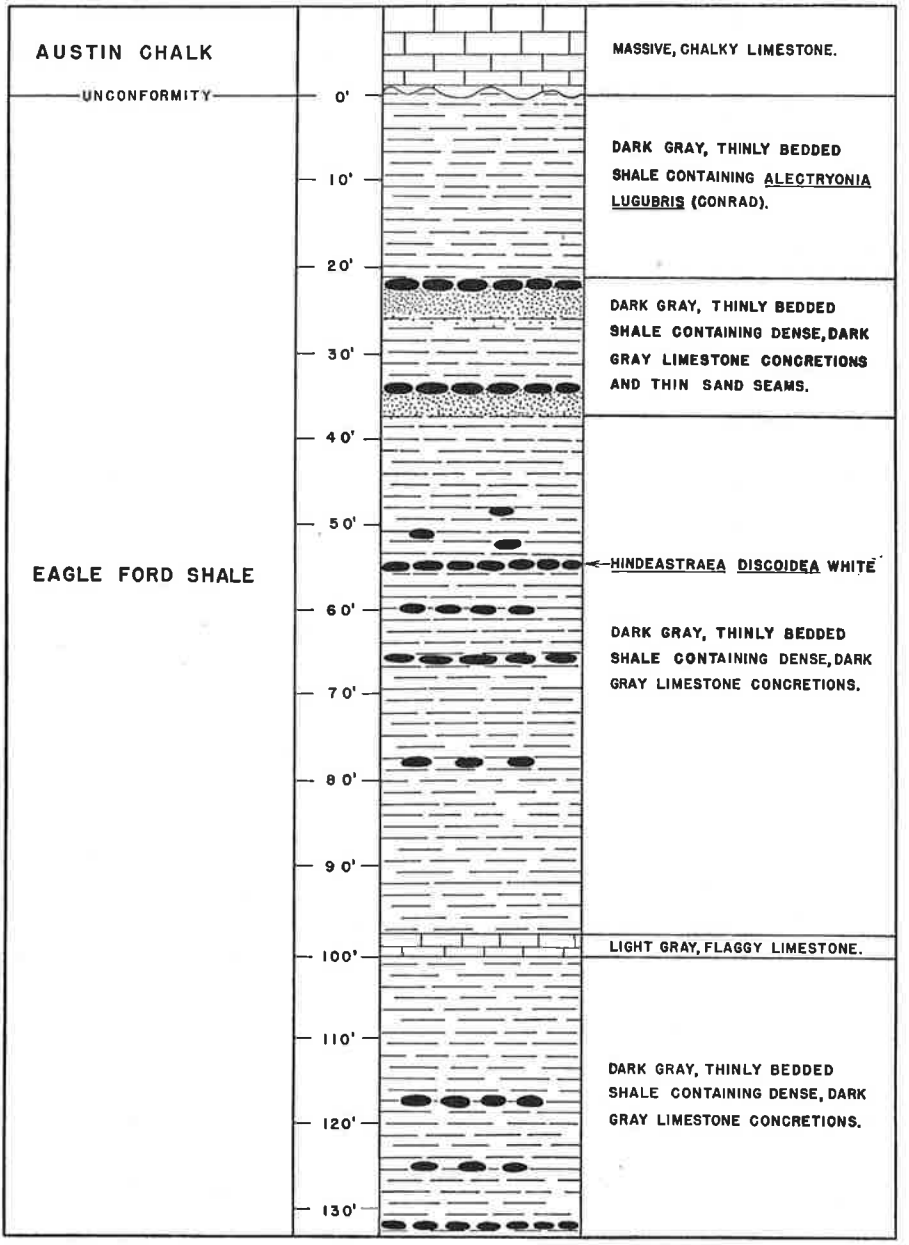

FIGURE 2.– COLUMNAR SECTION OF THE UPPER EAGLE FORD SHALE IN THE ARCADIA PARK AREA, DALLAS COUNTY, TEXAS.

Stratigraphic position. (See Figure 2 and Plate III)

The species is found in the Eagle Ford shale 55 feet below the base of Austin chalk. At this horizon there are scattered masses of nodular limestone, 4 to 8 cm. in thickness. The limestone has approximately

77.2 per cent of soluble material. The insoluble residue is composed of clayey material and fine quartz grains. Shell and coral fragments are found both internally and on the surfaces of the masses of limestone. The entire bed, with the exception of the upper 5 to 10 cm., contains abundant shell fragments. The upper zone, however, composed of calcareous clay, is void of fossils except for a few corals on the upper surface. Some of the nodular masses contain thin veinlets of calcite.

Within the masses of limestone the corals are arranged with the calices pointing either upward or downward. All the coralla on the upper surfaces of the masses which have been observed, however, are oriented with the calices upward.

Conditions of sedimentation at the horizon of Hindeastraea discoidea. The conditions under which the Eagle Ford shales were deposited are little known and are not likely to be understood until detailed information on the lithology and paleontology of the formation has been gathered. A study of *Hindeastraea discoidea* permits speculation concerning conditions of sedimentation at a single horizon.

The sandy calcareous bed in which *Hindeastraea discoidea* occurs was probably deposited during a stage in which the seas were comparatively shallow, 100 fathoms or less in depth.[12] The waters were relatively clear of muddy and colloidal matter and bottom currents carried only silt, fine sand, and shell fragments.

Evidently this situation was of relatively short duration, for soon after the species began to colonize the area deposition of the black muds characteristic of the Eagle Ford formation was resumed. This occurrence of *Hindeastraea discoidea* may represent a successful attempt on the part of the species to populate the Eagle Ford sea floor for a short period. Apparently, however, the species was not able to persist, but disappeared, not to return to the North Texas seas until Navarro time.

[12]Dr. John W. Wells to Margaret L. Hartley, Southern Methodist University Press. Letter dated October 9, 1950.

BIBLIOGRAPHY

ADKINS, W. S., *Handbook of Texas Cretaceous Fossils,* University of Texas Bulletin 2838, Austin, Texas, 1928, 385 pp.

FELIX, JOHANNES, "Anthozoa neocretacea," *Fossilium Catalogus,* pars 7, 1914, 128 pp.

FRECH, FELIX, "Charles White: On Hindeastraea, a New Generic Form of Cretaceous Astraeidae," *Neues Jahrbuch,* Band I, 1889, p. 322.

HILL, ROBERT THOMAS, "A Preliminary Annotated Check List of the Cretaceous Invertebrate Fossils of Texas, Accompanied by a Short Description of the Lithology and Stratigraphy of the System," *Texas Geological Survey Bulletin 4,* 1889, 57 pp.

Check List of the Invertebrate Fossils from the Cretaceous formations of Texas, Accompanied by Notes on Their Geographic and Geologic Distribution, Austin, Texas, 1889, 16 pp.

HOFFMEISTER, JOHN EDWARD, "A New Fossil Coral from the Cretaceous of Texas," *United States National Museum Proceedings,* vol. 76, art. 23, 1929, 3 pp.

SELLARDS, ELIAS HOWARD, Adkins, W. S., and Plummer, F. B., *The Geology of Texas,* University of Texas Bulletin 3232, Austin, Texas, 1933, 1007 pp.

VAUGHAN, THOMAS WAYLAND, *The Eocene and Lower Oligocene Coral Faunas of the United States with a Few Doubtfully Cretaceous Species,* United States Geological Survey, Monograph 39, Washington, 1900, 263 pp.

and WELLS, JOHN WEST, *Revision of the Suborders, Families, and Genera of the Scleractinia,* Geological Society of America Special Paper 44, 1943, 363 pp.

WHITE, CHARLES ABIATHAR, "On *Hindeastraea,* A New Generic Form of Cretaceous Astraeidae," Geological Magazine, ser. 3, vol. 5, no. 8, 1888, pp. 363-364.

WILLIAMSON, P. B., *Foraminifera from the Arcadia Park Section of the Eagle Ford Formation, Dallas County, Texas,* Unpublished Master's Thesis, Department of Geology, Southern Methodist University, 1950.

PLATES

PLATE I

Hindeastraea discoidea White. Eagle Ford shale, Dallas County, Texas. X 2

Figures 1-9. Growth stages in the species. Figures correspond to figures shown in diagrammatic outline of growth stages of Plate II. Calicular views.

Figure 10. Basal view of a four-corallite specimen, showing the basal epitheca marked by radiating striae and concentric rugae.

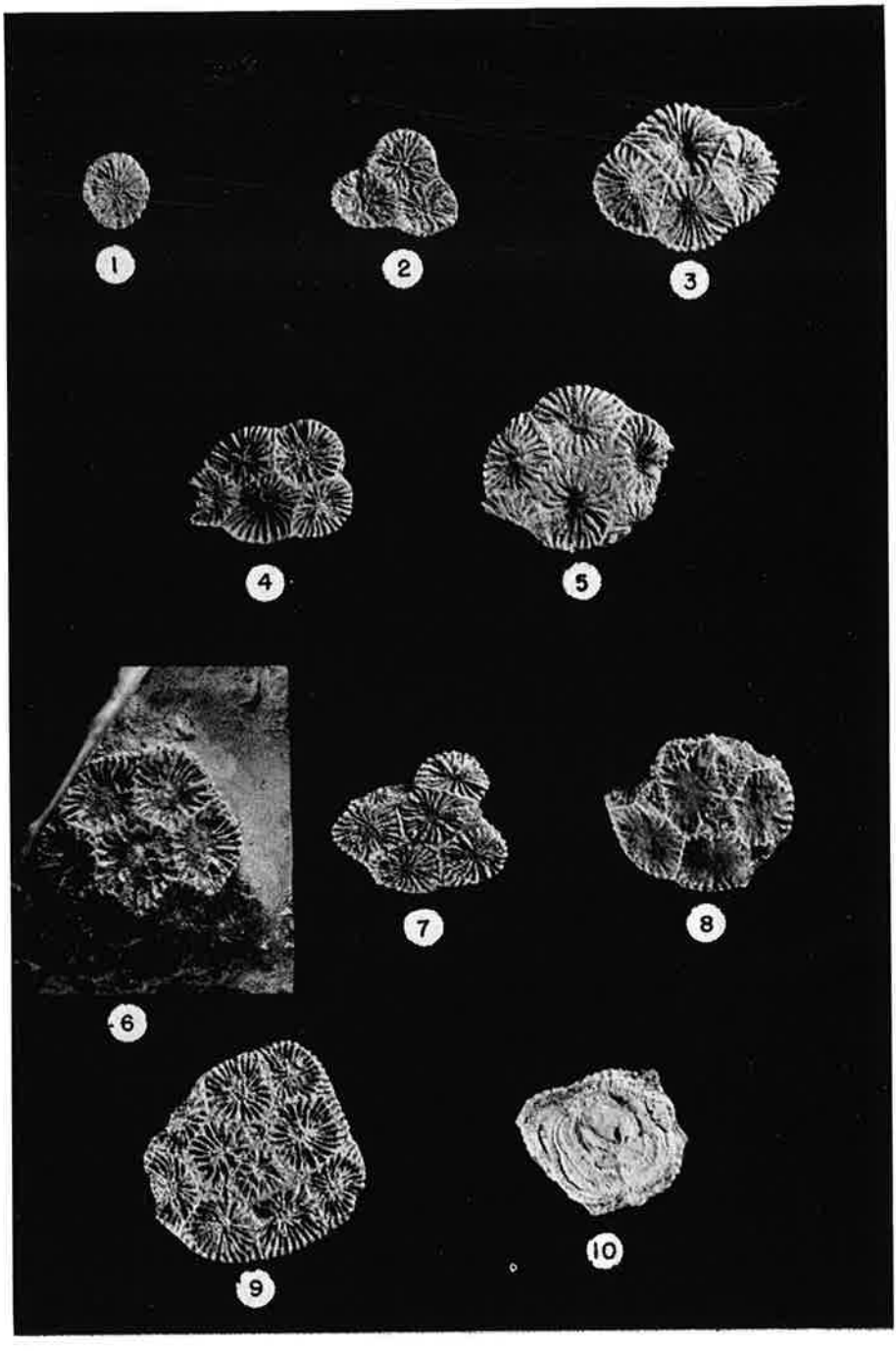
1
2
3
4
5
6
7
8
9
10

PLATE II

Growth stages in *Hindeastraea discoidea* White. X 2.
Figures 1-6. Addition of corallites in which each successive corallite is added adjacent to the initial and at least one secondary corallite.
Figures 7-9. Addition of corallites with the addition of the fifth corallite (Fig. 7) adjacent to the initial corallite but not in contact with any others. The additions then progress irregularly as seen in Figs. 8 and 9.
i=initial corallite.

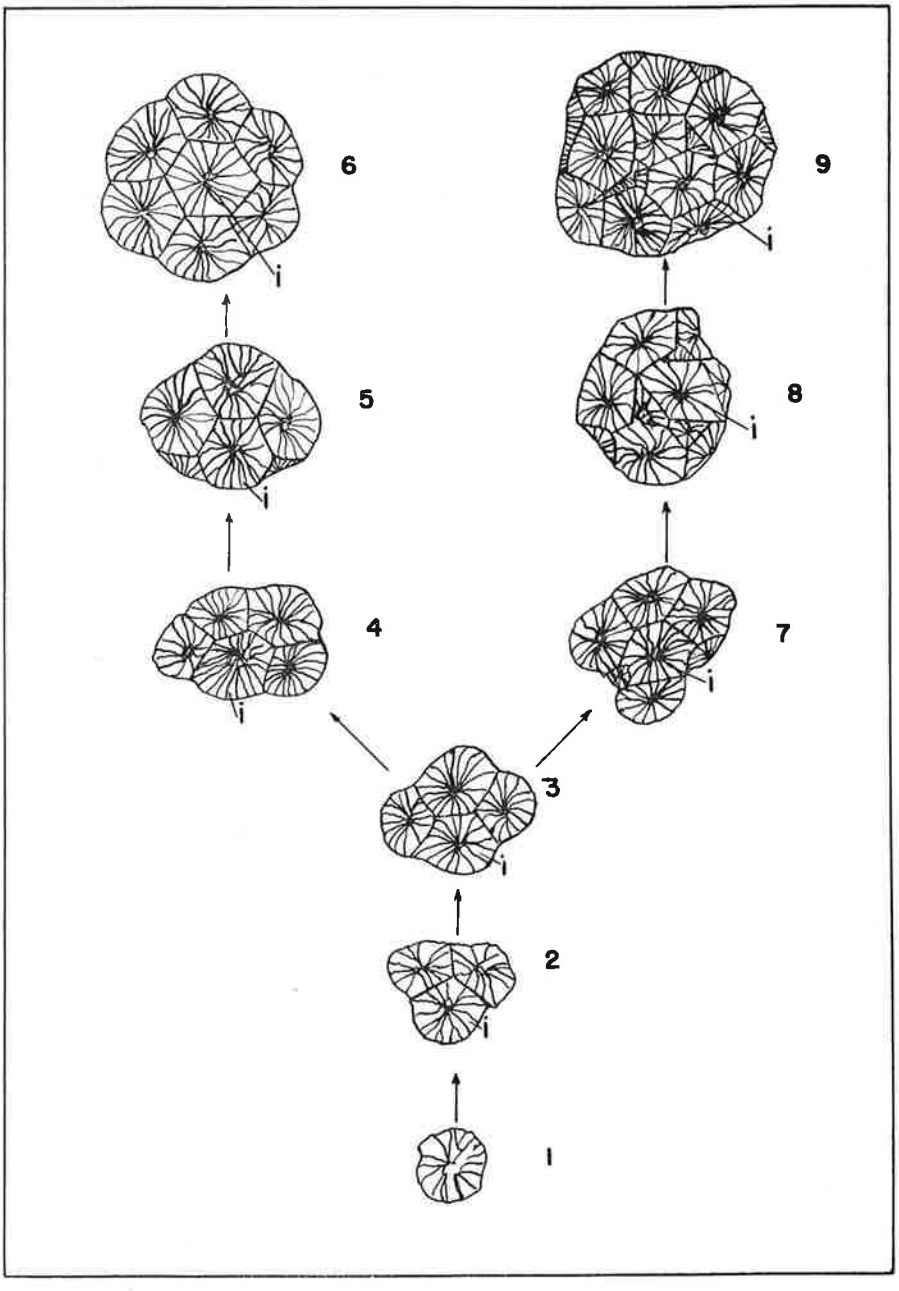
1
2
3
4
5
6
7
8
9
i

PLATE III

Cross-section of a mass of nodular limestone from the bed in which *Hindeastraea discoidea* White is found in the Eagle Ford shale, Dallas County, Texas. X ¾.

The section shows the random arrangement of the shell and coral fragments in the lower part of the mass and the absence of such fragments in the upper portions. Small veinlets of calcite are also shown.