

FLORIDA STATE GEOLOGICAL SURVEY

HERMAN GUNTER, *State Geologist.*

BULLETIN No. 5.

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A FOSSIL TELEOST FISH OF THE SNAPPER FAMILY
(LUTIANIDAE) FROM THE LOWER
OLIGOCENE OF FLORIDA.

By WILLIAM K. GREGORY.

THE FORAMINIFERA OF THE MARIANNA
LIMESTONE OF FLORIDA

By W. STORRS COLE AND GERALD M. PONTON.

TALLAHASSEE, FLORIDA,

December, 1930.

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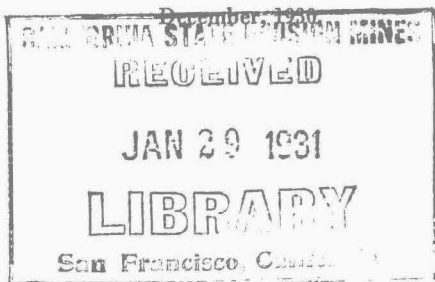
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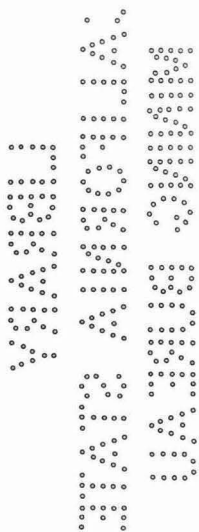
By WILLIAM K. GREGORY.

THE FORAMINIFERA OF THE MARIANNA LIMESTONE OF FLORIDA

By W. STORRS COLE AND GERALD M. PONTON.

TALLAHASSEE, FLORIDA,





LETTER OF TRANSMITTAL

*To His Excellency, Hon. Doyle E. Carlton,
Governor of Florida.*

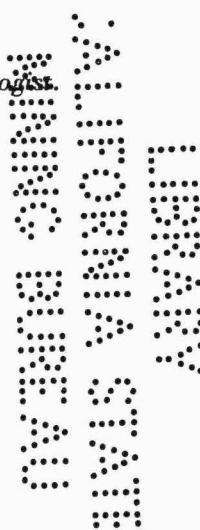
SIR:

I have the honor to submit herewith for publication the fifth scientific bulletin of this department, consisting of two paleontological papers based on Florida material. The first is a description of a new fossil fish from the Marianna limestone (the first ever found in that formation), by Dr. William K. Gregory of the American Museum of Natural History, New York, who is a recognized authority on fossil vertebrates. The second is a catalogue of foraminifera from the same formation, by Dr. W. Storrs Cole of Cornell University, Ithaca, N. Y., and Gerald M. Ponton, assistant state geologist. These minute fossils have recently been found to be very useful to oil geologists and others in the precise identification of geological horizons, and the present paper more than doubles the number of species known from our Marianna limestone, and describes several new ones.

Respectfully,

HERMAN GUNTER,
State Geologist.

Tallahassee, Florida,
October 9, 1930.



THE
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TABLE OF CONTENTS

A fossil teleost fish of the snapper family (Lutianidae) from the Lower Oligocene of Florida. By William K. Gregory. (Plates 1 to 4, Figures 1 and 2)	7
The foraminifera of the Marianna limestone of Florida. By W. Storrs Cole and Gerald M. Ponton. (Plates 5 to 11). Introduction	19
Descriptions of species:	
Textulariidae	27
Verneulinidae	28
Miliolidae	29
Lagenidae	29
Polymorphinidae	36
Nonionidae	37
Camerinidae	37
Buliminidae	38
Rotaliidae	40
Cassidulinidae	44
Globigerinidae	44
Globorotaliidae	45
Anomalinidae	45
Planorbulinidae	50
Orbitoididae	51
Plates	53
Index	69

A FOSSIL TELEOST FISH OF THE SNAPPER FAMILY (LUTIANIDAE) FROM THE LOWER OLIGOCENE OF FLORIDA.

By WILLIAM K. GREGORY,
American Museum of Natural History, New York.

Mr. Herman Gunter, State Geologist of Florida, has very kindly sent to me for identification and description three blocks of a creamy, fine-grained limestone containing the greater part of the skeleton and a good part of the scalation of a fossil fish. This proves to belong to the family of the Snappers (Lutianidae), which, so far as I can discover, has not hitherto been recorded from the early Tertiary of the Atlantic coast.*

The specimen was found by State road forces imbedded in limestone at a depth of 13 feet, in a road cut immediately east of the Chipola River, near Marianna, Jackson County, Florida. It was collected by Mr. B. H. Dickson in January, 1926. Mr. Gunter assures me that there can be no mistake as to the identification of the formation as the Marianna limestone, which is referred to the lower Oligocene.

I have compared the specimen with the skeletons of recent and fossil teleosts of the families Serranidae, Lutianidae and Haemulidae to which it is evidently allied; by far the closest resemblances are with the skeleton of *Lutianus*, from which it differs so far as known chiefly in having two or three more vertebrae. Repeated counts and estimates convince me that there are at least twenty-six and possibly twenty-seven vertebrae. As twenty-four vertebrae is given by Jordan and Evermann as a generic character of *Neomaenis* (*Lutianus*) one might be justified in referring the fossil to a distinct genus. But the detailed agreements of the parts of the dentition, skull and backbone that are

*Its resemblance to the red snapper (*Lutianus aya*), an important food fish of the Gulf of Mexico, is so strong that Mr. Dickson, the discoverer, when he brought it in, insisted that it was a red snapper and nothing else. Even the scales still have a decided pinkish color, not unlike the living species, although its age is probably to be reckoned in millions of years.—H. G.

preserved in the fossil with those of *Lutianus* are so close that I refer it tentatively to the genus *Lutianus*, recognizing the possibility that the ancestors of the genus *Lutianus* may have lost two or three vertebrae between lower Oligocene and recent times.

The plates show the fossil as preserved. On the basis of these pieces a tentative restoration has been drawn by Mrs. Louise Nash, under the writer's supervision. In this restoration the conjectural parts shown in dotted outlines are based on data obtained from recent species of *Lutianus*. The head lacks the preorbital and opercular series, but the imprint of the inner sides of these plates are well preserved, together with many other features of the skull and dentition.

Unfortunately the fossil is too imperfectly preserved to afford many of the data used by systematists in the differentiation of the various genera and species of the recent Lutianidae. On the other hand, the details of many of the skeletal parts are clearly shown and permit direct comparison with those of recent fishes. Accordingly the following formal description may be given:

Lutianus avus n.sp.

Holotype—V-4372 (Old No. 8581). Florida State Geological Survey.
Geologic horizon and locality—(See p. 7).

Specific characters.—Estimated total length about 490 millimeters. Head $3.2\pm$ in standard length (to beginning of caudal fin.) Depth 3. Snout (in head) $2.5\pm$. Eye $4\pm$. Maxillary $2.5\pm$. Vertebrae 26 or 27. Dorsal spines XIII (?), dorsal rays 14 (?). Upper canines 3; vomerine teeth in a diamond shape patch immediately in front of which is a crescent shaped elevation. Soft part of dorsal scaly near base. Pharyngeal teeth conical recurved. Scales large, ctenoid, $47\pm$ along lateral line. Apparently three anal spines, the first very short.

This species combines the diamond-shape patch of vomerine teeth characteristic of the living species of *Lutianus jordani* with the raised crescentic area of villiform teeth found in *L. aratus*. The general proportions of head and body are not markedly different from those of *L. jordani*, as recorded by Meek and Hildebrand.¹ The absolute size of body approaches that of *L. aya*.² It differs from *Neomaenis hagari* Jordan and Gilbert³ (from the Miocene of California) especially in its smaller head.

¹Field Mus. Nat. Hist. Chicago, Publication No. 226. The Marine Fishes of Panama. Part II, p. 495.

²B. W. Evermann and M. C. Marsh. The Fishes of Porto Rico. U. S. Fish Comm. Bull. for 1900, pl. 20.

³Fossil Fishes of Southern California. Leland Stanford Junior Univ. Publ. 1919, p. 48, pl. XV, figs. 1, 4.

This specimen establishes the fact that the family of snappers was already domiciled on our coast in lower Oligocene times. They are unrecorded from earlier formations in this country and may well be descendants of some of the numerous Upper Eocene and Lower Oligocene percomorphs of Europe.

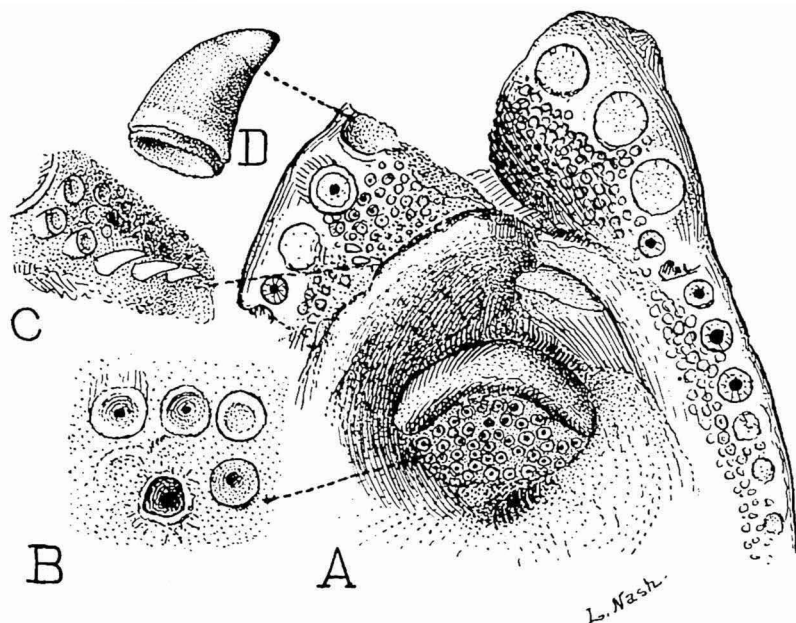


FIG. 1. *Lutianus avus*, type. Roof of mouth, showing vomerine, palatine and premaxillary teeth. A. Roof of mouth $\times \frac{5}{4}$. B. Alveoli of villiform teeth $\times 1\frac{1}{2}$. C. Small teeth on premaxilla $\times 5$. D. Caniniform tooth $\times 1\frac{3}{4}$.

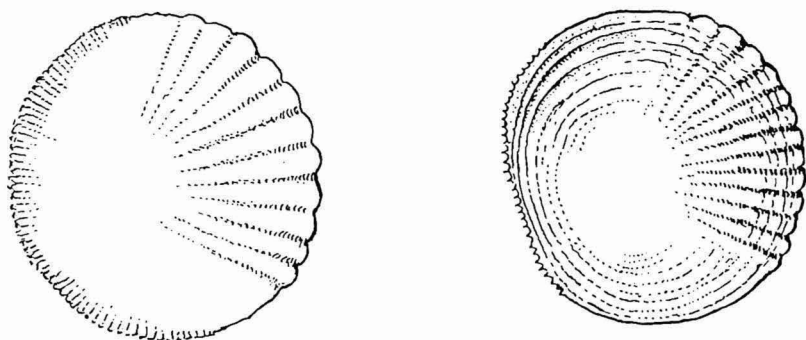


FIG. 2. Diagram of two scales $\times \frac{5}{4}$. Inner and outer views, posterior edge on the left.

[11]

PLATE I. Head and anterior part of body, left side, $\times 1$.

[11]

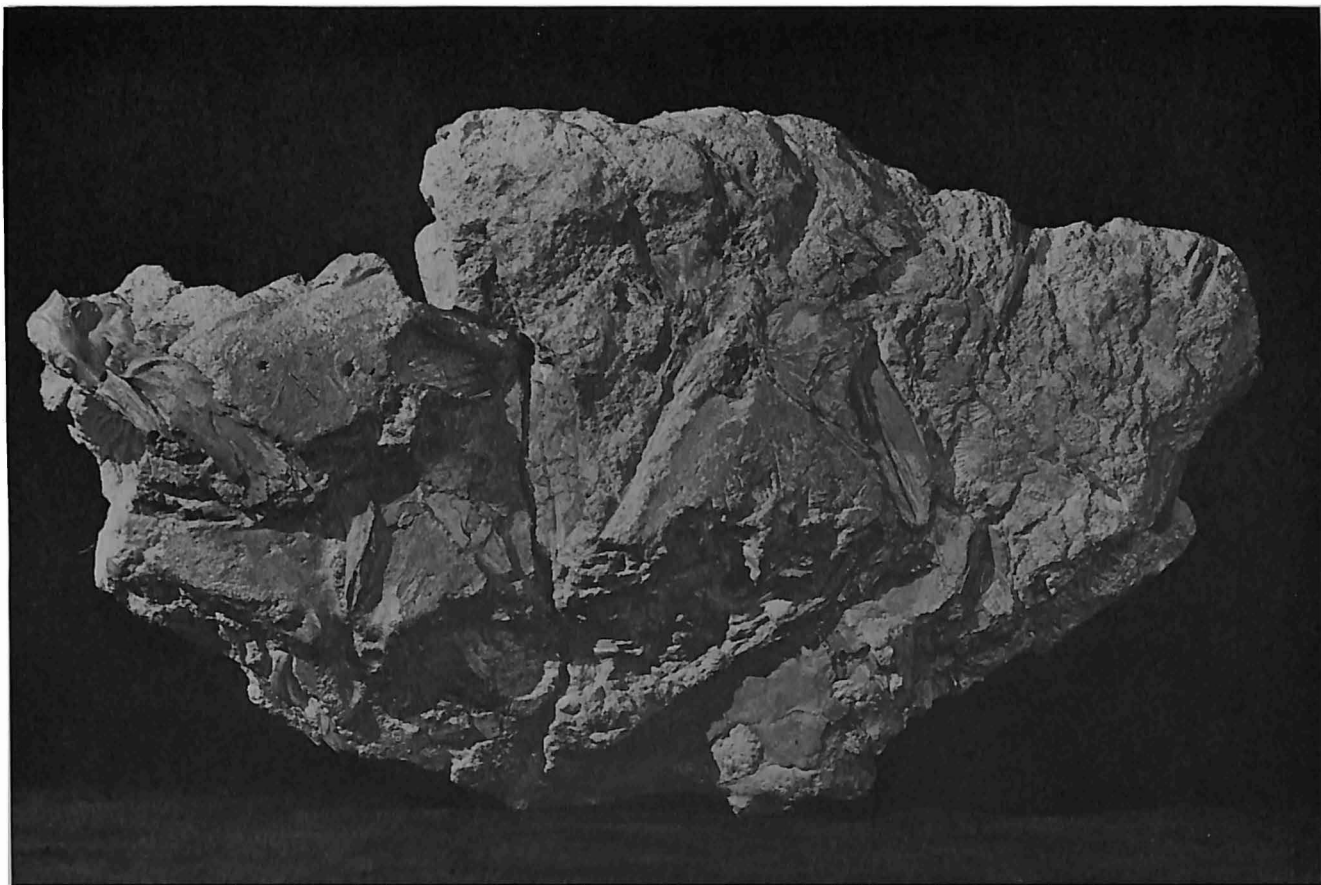


PLATE 1. Head and anterior part of body, left side, $\times 1$.

[13]



PLATE 2. Head and anterior part of body, right side, $\times 1$.

[13]

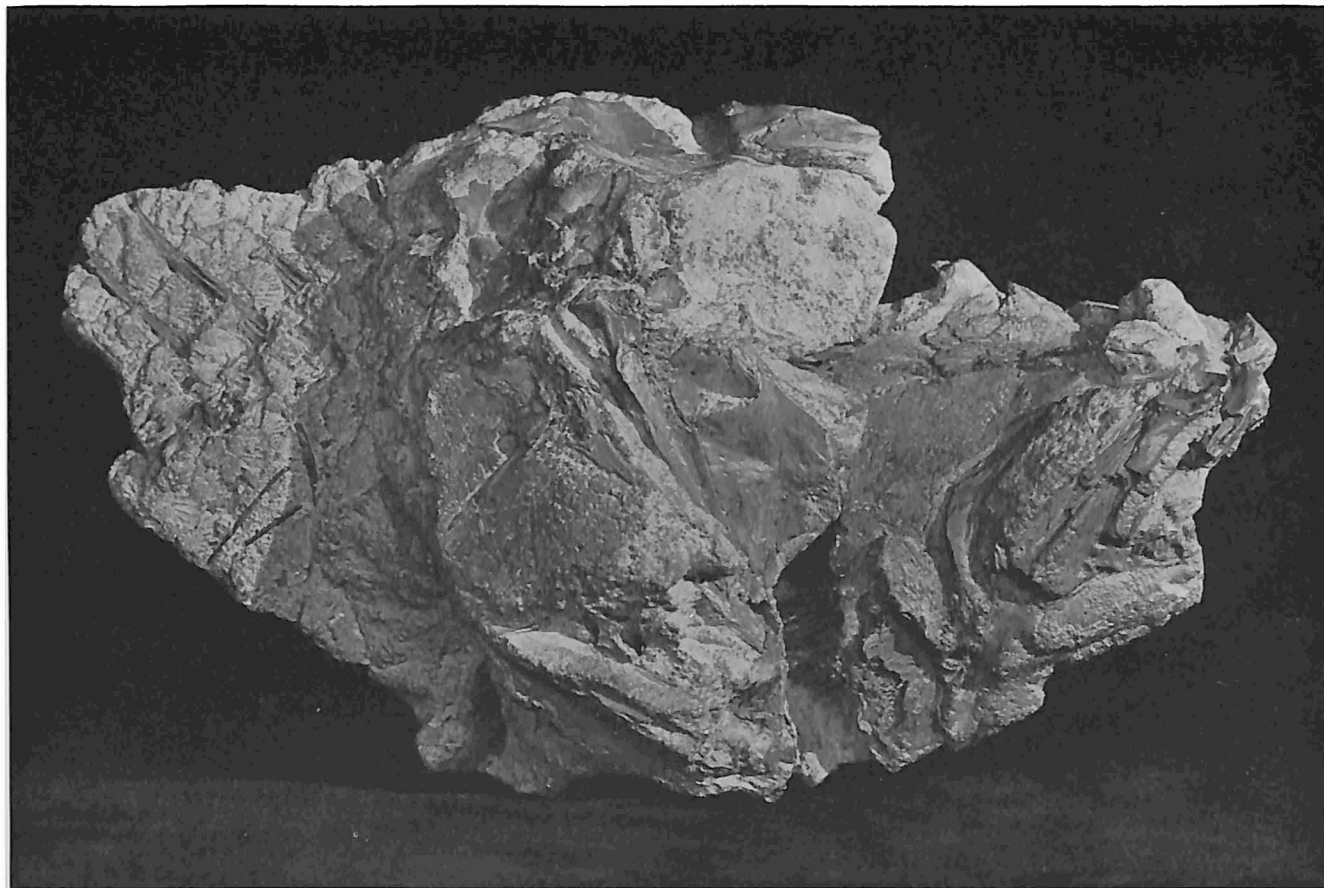


PLATE 2. Head and anterior part of body, right side, $\times 1$.

[15]

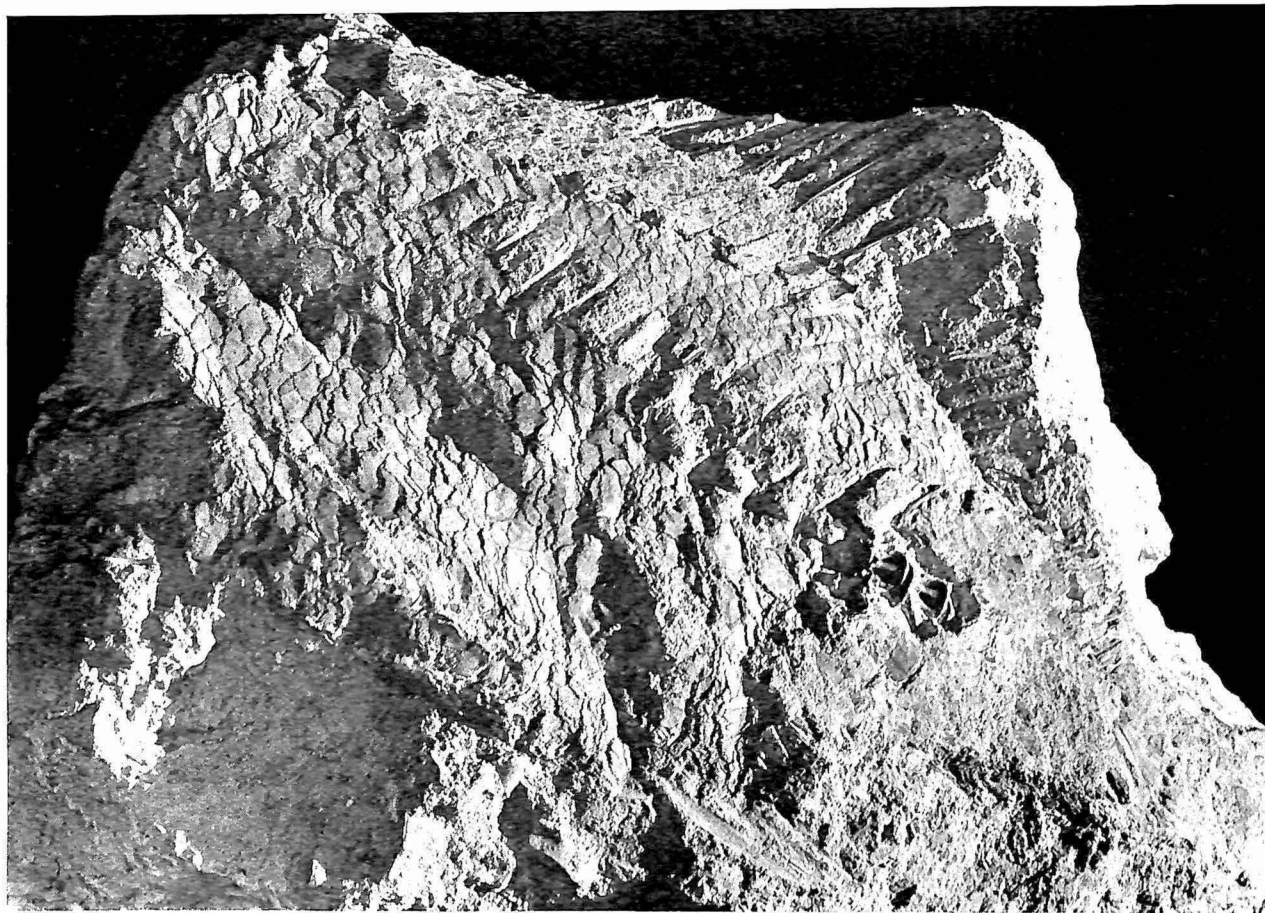


PLATE 3. Body, left side, $\times \frac{2}{3}$.

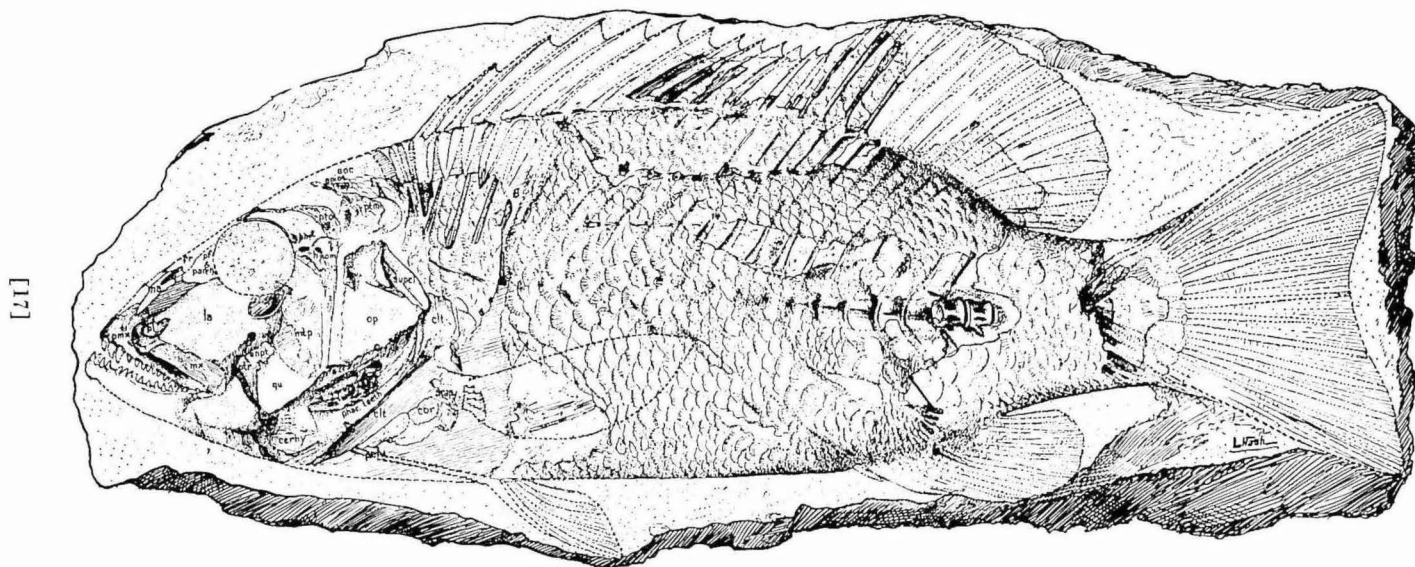


PLATE 4. Partial restoration of *Lutianus avus* $\times \frac{1}{10}$.

THE FORAMINIFERA OF THE MARIANNA LIMESTONE OF FLORIDA

By

W. STORRS COLE,
Cornell University, Ithaca, N. Y.,

and

GERALD M. PONTON,
Florida State Geological Survey, Tallahassee, Florida.

The Marianna limestone was named by Matson¹ in 1909 from exposures at Marianna, Jackson County, but in light of knowledge obtained later it was found that his definition when applied to the localities he reported included in addition to the Marianna limestone all of the Ocala limestone and most of the Glendon formation of western Florida. Cooke² in 1915 separated the formations and made it possible to re-define the Marianna limestone.

The Marianna limestone is now defined³ as the white limestone or "chimney rock" that overlies the Ocala limestone at Marianna and carries *Lepidocyclina mantelli* and *Pecten poulsoni*. The Marianna limestone is the lowest division of the Oligocene, Vicksburg Group,⁴ in Florida, and rests conformably on the Ocala limestone, the uppermost division of the Eocene.

The Marianna limestone is mostly a soft, white, homogeneous, somewhat porous rock. The purer parts contain about 93% to 95% calcium carbonate. The lower beds are less pure and are speckled with grains of glauconite. Most exposures show several ledges of hard, compact limestone. The rock weathers to a dirty gray. The

¹Matson, G. C., and Clapp, F. G., A Preliminary Report on the Geology of Florida; Florida Geol. Survey Second Ann. Rept., pp. 51-52, 1909.

²Cooke, C. W.: The Age of the Ocala Limestone; U. S. Geol. Survey Prof. Paper 95, p. 109, 1915.

³Cooke, C. W., and Mossom, S., Geology of Florida, Florida Geol. Survey Twentieth Ann. Rept., p. 63, 1929.

⁴Cooke, C. W., The Correlation of the Vicksburg Group; U. S. Geol. Survey Prof. Paper 133, p. 2, 1923.

greatest thickness known in Florida is at Marianna, where a section shows about 30 feet. The known outcrops in Florida are confined to a strip in Jackson County a few miles wide from north to south and extending from the neighborhood of Blue Springs, 5 miles northeast of Marianna, west for a distance of about 15 miles to Cottondale.

While the foraminiferal fauna from the Marianna and its equivalents is well known in Alabama and Mississippi, that of Florida has been neglected. It is of importance to record the species occurring in Florida, for here is the type locality of this limestone.

Cushman⁵ has published an excellent series of monographs on the Oligocene with check lists from numerous localities. It is unfortunate, however, that only two localities were reported from the Marianna limestone of Florida. From these two localities near Marianna he reports a total of 15 species. The present authors, in a detailed study, have been able to find and record 56 species and varieties, of which 6 are apparently new. That our knowledge of a locality, even after a comprehensive study, may well be incomplete is suggested in the results obtained by Howe⁶ in his studies on the Red Bluff Clay type locality, Red Bluff on Chickasawhay River, near Hiwance, Mississippi. Therefore, it is the present authors' purpose to record such information as has come to light in their investigations of this fauna, in the hope of increasing our scope of knowledge of the Foraminifera of Florida and of the Oligocene in general.

Even such a short paper as this would be incomplete without stating the authors' indebtedness to Mr. Herman Gunter, State Geologist, for his many helpful suggestions and the freedom he has allowed the authors in their investigations. The drawings were made by Mrs. Elizabeth Burckmyer, of Cornell University, Ithaca, N. Y.

The following nine localities⁷ all in Jackson County, Florida, were examined:

- I. Quarry of R. D. Daffin, Marianna. Quarry about 100 feet south of road leading from Marianna to old wagon bridge over Chipola River just east of Marianna, and about 100 yards west of the bridge. The old wagon bridge is now abandoned and

⁵Cushman, J. A., *The Foraminifera of the Byram Calcareous Marl*, U. S. Geol. Survey Prof. Paper 129, pp. 79-143, pl. 14, 35, 1922; also Prof. Paper 133, *The Foraminifera of the Vicksburg Group*, pp. 11-71, pl. 1-8, 1923.

⁶Howe, H. V., *Journ. Pal.*, vol. 2, no. 3, pp. 173-177, 1928.

⁷Further details of Marianna limestone localities are given by Mossom—*A Preliminary Report on the Limestones and Marls of Florida*, Florida Geol. Survey, Sixteenth Ann. Rept., 1925, and by Cooke and Mossom, *Geology of Florida*, Florida Geol. Survey Twentieth Ann. Rept., 1929.

is replaced by a new bridge on Florida State Road No. 1, about 200 feet up-stream.

F. S. G. S. sample No. M-305. This is likely U. S. G. S. locality No. 6767 described below. Sample collected by S. Mossom, July 10, 1924.

- II. Quarry of Philip Sexton, $1\frac{3}{4}$ miles northeast of Marianna.

F. S. G. S. sample No. M-459. Sample collected by S. Mossom, July 14, 1924.

- III. Blue Springs, Jackson County, Florida, $6\frac{1}{2}$ miles northeast of Marianna.

F. S. G. S. sample No. M-467. Sample collected by S. Mossom, July 11, 1924.

- IV. Quarry of C. Welch, one-half mile east of Cottdale on L. & N. R. R.

F. S. G. S. sample No. M-473. Sample collected by S. Mossom, Nov. 18, 1924.

- V. Quarry of M. A. Spate, $1\frac{1}{2}$ miles north of Cottdale.

F. S. G. S. sample No. M-478. Sample collected by S. Mossom, July 14, 1924.

- VI. Quarry of B. B. Jordan, Jr., about $\frac{3}{4}$ mile northeast of Cottdale.

F. S. G. S. sample No. M-585. Sample collected by H. Gunter, March 25, 1920.

- VII. Roof and wall of cave exposed in road-cut on Florida State Road No. 1, about 150 yards east of bridge over Chipola River just east of Marianna. (Fossil fish locality, see p. 7).

F. S. G. S. sample No. M-770. Sample collected by W. S. Cole and G. M. Ponton, July 6, 1929. This locality is about 100 yards northeast of U. S. G. S. locality No. 7241 described below.

- VIII. Small "Chimney Rock" quarry on east side of Marianna-Greenwood Road, $1\frac{1}{2}$ miles northeast of junction of this road with State Road No. 1, which junction is about 100 yards east of new highway bridge over Chipola River, just east of Marianna. F. S. G. S. sample No. M-760. Sample collected by W. S. Cole and G. M. Ponton, July 6, 1929.

- IX. Road-cut on State Road No. 1, about 100 feet west of bridge over Chipola River, just east of Marianna.

F. S. G. S. sample No. M-843. Collected by H. Gunter and G. M. Ponton, November 9, 1928.

TABLE 1.—LOCAL DISTRIBUTION OF SPECIES FROM THE VARIOUS STATIONS OF THE MARIANNA LIMESTONE OF FLORIDA.
(A, abundant; C, common; R, rare; V, very rare; X, reported without indication of abundance.)

[illegible]

TABLE 1.—LOCAL DISTRIBUTION OF SPECIES FROM THE VARIOUS STATIONS OF THE MARIANNA LIMESTONE OF FLORIDA.—*Continued.*
(A, abundant; C, common; R, rare; V, very rare; X, reported without indication of abundance.)

Species	Fla. State Geol. Surv. Cat. No.	U. S. G. S. Locality No. 7241 (Cushman)	U. S. G. S. Locality No. 6767 (Cushman)	I	II	III	IV	V	VI	VII	VIII	IX
<i>Eponides byramensis</i>	S-2008	....	X	A	A	A	A	A	A	A	A	..
<i>mariannensis</i>	S-2011	....	X	..	..	V	..	V	..	..	R	V
<i>advena</i>	S-2044	....	....	R	..	..	..	..	..	R	R	..
<i>Rotalia</i> sp.....	.....	....	....	..	..	R	..	..	..	..	..	..
<i>Siphonina advena</i>	S-2003	X	X	C	..	..	C	C	C	C	C	..
<i>Cancris sagra</i> †.....	S-2024	....	....	..	..	..	..	R	..	..	R	..
<i>Cassidulina globosa</i> †.....	S-2045	....	....	..	..	..	..	..	..	..	V	..
<i>Globigerina bulloides</i>	S-2046	X	....	C	..	..	..	C	C	..	C	..
<i>duertrei</i>	S-2047	....	X	R	..	..	..	..	..	..	..	..
<i>inflata</i> †.....	S-2048	....	....	..	..	..	..	C	C	C	C	..
<i>triloba</i> †.....	S-2049	....	....	C	C	..	C	C	C	C	C	C
<i>Globorotalia menardii</i>	S-2043	....	....	..	..	..	..	..	..	..	V	..
<i>Anomalina beta</i> *.....	S-2050	....	....	..	..	..	..	V	V	..	..	..
<i>bilateralis</i>	S-2004	....	....	A	A	A	A	A	A	A	A	A
<i>mississippiensis</i>	S-2000	....	X	C	C	C	C	C	C	C	C	C
<i>vicksburgensis</i>	S-2051	....	....	V	..	..	V	..	..	..	V	V
<i>Planulina byramensis</i>	S-2016	....	X	C	..	..	C	..	..	C	C	C
<i>mexicana</i> †.....	S-2052	....	....	..	..	..	V	..	..	..	V	..
<i>Cibicides americanus</i>	S-2026	....	....	C	..	..	C	C	..	C	C	C
<i>lobatulus</i>	S-2025	X	X	C	C	..	..	C	C	C	C	C
<i>pseudoungerianus</i>	S-2053	X	X	A	A	A	A	A	A	A	A	A
<i>Planorbulinella larvata</i>	S-2020	....	....	A	A	A	A	A	A	A	A	A
<i>Lepidocyclina mantelli</i>	S-2054	....	X	A	A	A	A	A	A	A	A	A
<i>mantelli</i> var. <i>papillata</i>	S-2055	....	....	..	..	..	..	..	..	C	C	..

*Species and varieties described by us as new.

†Species and varieties not previously reported from the Oligocene of the Southern States.

‡Species and varieties new to typical Marianna Limestone, but reported by Cushman in other members of the Vicksburg Group. (See Table No. 2.)

Cushman's Florida localities were as follows:

U. S. G. S. locality No. 6767⁸ Quarry south of road at top of first hill west of bridge over Chipola River east of Marianna. C. W. Cooke, collector. This is likely same locality as (I), as described above.

U. S. G. S. locality No. 7241.⁸ Quarries on south side of hill south of road and a quarter mile east of bridge over Chipola River, east of Marianna, Florida. C. W. Cooke and W. C. Mansfield, collectors. This locality is about 100 yards southeast of locality (VII) described above.

A summary table of the species from the individual localities is given in Table 1. For completeness, Cushman's localities from Florida have been included.

In Table 2 will be found species and varieties new to typical Marianna limestone, but reported by Cushman in other members of the Vicksburg Group:

TABLE 2.—SPECIES AND VARIETIES NEW TO TYPICAL MARIANNA LIMESTONE, BUT REPORTED BY CUSHMAN IN OTHER MEMBERS OF THE VICKSBURG GROUP.

	Byram Calcareous Marl	Glendon Limestone	Mint Spring, Calcareous Marl, member of Marianna Limestone	Red Bluff Clay
<i>Textularia mississippiensis</i>	X	X	X	X
<i>Lenticulina vicksburgensis</i> var. <i>aperta</i>	X	...	...	X
<i>Saracenaria italica</i>	...	X	X	...
<i>Nonion umbilicatum</i>	X	...	X	...
<i>Bulimina sculptilis</i>	...	...	...	X
<i>Discorbis</i> sp.....	X	...	X	X
<i>Cancris sagrus</i>	...	X	...	...
<i>Globigerina triloba</i>	X	...	...	...
<i>Anomalina vicksburgensis</i>	...	...	X	...

Cushman⁹ has listed from all localities in the typical Marianna limestone, 64 species and varieties, and Vaughan¹⁰ has reported *Lepidocyclina mantelli* var. *papillata*. The following list gives the ones which have been found by Cushman at other stations of the typical Marianna than the Florida ones, and which were not recorded by the present authors from Florida.

⁸U. S. Geol. Survey Prof. Paper 133, page 14, 1923.

⁹U. S. Geol. Survey, Prof. Paper 133, 1923.

¹⁰U. S. Nat., Mus., Proc. vol. 71, art. 8, p. 3, pl. 3, fig. 2-a, 2-b; pl. 4, fig. 1 and 2, 1927.

Textularia tumidulum
 agglutinans
 subhauerii var.
 mississippiensis var. *alabamensis*
Bolivina cookei
 frondea
Verneuilina rectimargo
Gaudryina quadrangularis
 advena
Clavulina byramensis var. *turgida*
Bulimina sp. ?
Cassidulina crassa
Lagenula sulcata
Nodosaria catenulata
Cristellaria submalligera
Polymorphina byramensis
 amygdaloides
 equalis
Pullenia quinqueloba
Spirillina vivipara
Discorbis orbicularis
Truncatulina wuellerstorfi (=our *Planulina mexicana*) ?
Rotalia dentata var. *parva*
Gypsina rubra
Spiroloculina byramensis
Quinqueloculina bicostata
 glabrata

From Cushman's original paper¹¹ it would appear that the Florida material was not very satisfactory. His samples were, undoubtedly, old ones which had been allowed to dry completely, and this dried material is very refractory and hard to work. By using much care in preparation, the junior author was able to obtain a considerable number of species from each locality. Very few specimens had to be discarded because of poor state of preservation, although specimens from some localities were better than others. Station No. VIII was worked in more detail than the others in order to obtain the most complete list possible.

As Cushman¹² has pointed out, the Vicksburg group is evidently paleontologically more or less of a faunal unit. The only Foraminifera

¹¹U. S. Geol. Survey, Prof. Paper 133, 1923, p. 13.

¹²Loc. cit., p. 11.

which definitely appear to be confined entirely to the Marianna are *Lepidocyclina mantelli* and its variety *papillata*, *Eponides mariannensis* and *Operculinella dia*. Vaughan¹³ states that "*Lepidocyclina mantelli* is certainly known from no other horizon." Using the small Foraminifera, the typical Marianna may be recognized by faunal grouping rather than by ranges of individual species.

Cushman¹⁴ and Schenck¹⁵ have pointed out that the factors of depth and temperature are of utmost importance in the grouping of individuals. That there was some slight physical difference in the deposition of the typical Marianna from the other members of the Vicksburg group is apparent from a study of its fauna. While many of its small Foraminifera are forms that range throughout the entire group, certain forms seem, from our present knowledge, to be restricted to it solely. Of these, *Lepidocyclina mantelli* and its variety *papillata* are the most important, *Eponides mariannensis* to date has been reported only from the Marianna, and *Operculinella dia*, while a new species, is so large that if it occurred in any other member, it should have been reported. Whether these last two mentioned forms indicate only a temporary migration or a short evolutionary change, only more detailed study can tell. For the present, the grouping of these forms, specifically mentioned above, with the others as indicated on our lists, will have to be taken as indicative of typical Marianna limestone.

¹³Vaughan, T. W., Acad. Nat. Sci. Phila., Proc., vol. LXXIX, p. 300, 1927.

¹⁴Cushman, J. A., Contr. Cushman Lab. Foram. Res., vol. 2, pt. 3, pp. 71-74, 1926.

¹⁵Schenck, H., Journ. Pal., vol. 2, no. 2, pp. 158-166, 1928.

DESCRIPTIONS OF SPECIES

Order FORAMINIFERA

Family TEXTULARIIDAE

Subfamily Textulariinae

Genus TEXTULARIA DeFrance, 1824

TEXTULARIA CONICA d'Orbigny

Plate 8, figure 8

Textularia conica d'Orbigny in De la Sagra, Hist. Fis. Pol. Nat. Cuba, Forams., 1839, p. 143, pl. 1, figs. 19, 20.

Textularia conica Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, pp. 16 and 17, pl. 1, figs. 5, 6.

Test short, conical, laterally compressed; chambers narrow, but long; sutures not very distinct; surface of the test slightly roughened by sand grains projecting through the cement; final chambers very flat, giving a flattened, abbreviated apertural face; mouth a narrow slit at the base of the last chamber.

Length 0.46 millimeter.

Our specimens agree very well with the figures given by Cushman and also with the original of d'Orbigny's. The only difference from the original that can be pointed out is that d'Orbigny's figure shows slightly more acute ends.

Locality: This species was found only at Station VIII, and is very rare.

TEXTULARIA MISSISSIPPIENSIS Cushman

Plate 10, figure 3

Textularia mississippiensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 90, 123, pl. 14, fig. 4.

Textularia mississippiensis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 17.

Original description:

"Test elongate, fairly broad, thickest in the middle, thence thinning toward the periphery, in end view biconvex, central portion curved; chambers rather low and broad, especially in the early stages, becoming somewhat higher in the adult; sutures covered by a coarsely arenaceous layer, meeting in the center and at the periphery, leaving the central portion of each chamber uncovered; periphery irregular, not definitely or regularly spinose, chamber walls smooth and finely perforate.

Length 0.40-0.75 millimeter."

Cushman found this species almost entirely limited to stations in Mississippi, and made a new variety, viz., *Textularia mississippiensis* var. *alabamensis*, which seemed to replace the typical form almost entirely in Alabama and was characteristic of the Marianna limestone.

Our specimens appear to be closer to the typical rather than to the variety *alabamensis*, as they lack the keel, are not sufficiently elongated, and the sutures appear to be covered with a distinct arenaceous layer.

Locality: Found in small numbers at Stations V and VIII.

TEXTULARIA PORRECTA H. B. Brady

Plate 10, figure 12

Textularia agglutinans d'Orbigny var. *porrecta* H. B. Brady, Challenger Rept., Zoology, vol. 9, 1884, p. 364, pl. 43, fig. 4.

Textularia porrecta Egger, K. bayer. Akad. Wiss. München, Abh., vol. 18, 1893, p. 269, pl. 6, figs. 17, 18.

Textularia porrecta Cushman, U. S. Prof. Paper 133, 1923, p. 16, pl. 1, fig. 8.

Test elongate, subcylindrical, slightly compressed, but with the periphery broadly rounded; sutures depressed when showing, but often concealed by the rough arenaceous character of the test; chambers rather numerous; about as high as long; aperture rather small, round, at the inner margin of the last formed chamber.

Length 0.81 millimeter.

The Marianna specimens agree very closely with Cushman's figure and description, except that the sutures are often not quite so pronounced. This may be due to condition of preservation. Brady's figure represents a more elongate type than is represented by either Cushman's figure or our specimens. With more specimens for study this might prove to be a different species from *porrecta*.

Locality: Very rare, in one sample only, from Station VIII.

Family VERNEUILINIDAE

Genus CLAVULINA d'Orbigny, 1826

CLAVULINA BYRAMENSIS Cushman

Plate 11, figure 2

Clavulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 92, pl. 16, fig. 1.

Clavulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 22, pl. 2, fig. 3.

Original description:

"Test elongate, subcylindrical, the early chambers triserial, forming but a small portion of the test, later ones uniserial, both portions rounded; sutures slightly depressed, often not very distinct otherwise; aperture terminal, central, rounded; wall coarsely arenaceous but smoothly finished. Maximum length 1 millimeter."

Locality: This is one of the relatively common and easily recognized forms in the Marianna, and was found at Stations I, VI, VIII and IX.

CLAVULINA BYRAMENSIS var. EXTANS Cushman

Plate 9, figure 9

Clavulina byramensis var. *extans* Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 22, pl. 2, fig. 6.

Original description:

"Variety differing from the typical form in the more elongate form and distinct chambers.

Length of adult specimens 0.3¹⁶ millimeter."

This variety occurs in smaller numbers than the typical. It may only represent a form of *byramensis* rather than a separate variety. As we have not made sections, we are still retaining the varietal name.

Locality: Common at Stations II, VI, VII and VIII.

Family MILIOLIDAE

Genus MASSILINA Schlumberger, 1893

MASSILINA DECORATA Cushman

Plate 10, figure 5

Massilina decorata Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 143, pl. 34, fig. 7.

Masillina decorata Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, pp. 55 and 56.

Original description:

"Test much flattened, elliptical or oval, slightly longer than wide, basal and apertural ends projecting, the apertural end narrowing to a small cylindrical neck, nearly in the longitudinal axis of the test; sutures rather indistinct; surface dull white; periphery rounded, the sides ornamented by very fine pits, giving a finely granular appearance to the test.

Maximum length 1 millimeter."

Our specimens agree exactly with the description given by Cushman.

Locality: Found only at Station VIII, and extremely rare there.

Family LAGENIDAE

Subfamily Nodosariinae

Genus ROBULUS Montfort, 1808

ROBULUS CULTRATUS Montfort

Plate 11, figure 9

Robulus cultratus Montfort, Conchyliologie systematique, vol. 1, 1808, p. 214, 54e genre.

Cristellaria cultrata Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 130, pl. 31, fig. 8; U. S. G. S. Prof. Paper 133, 1923, p. 29.

Test large, closely coiled, with 7-9 chambers in the last volution; sutures distinct, recurved, flush with the surface; surface of test smooth,

¹⁶This is a typographical error. The figure Cushman gives was drawn from a specimen 3.0 millimeters long. (Verified by Cushman, letter Aug. 4, 1930.)

unornamented; test generally bordered with a distinct, fairly heavy keel; aperture peripheral, radiate, distinct, with a secondary aperture directly below, but often concealed.

Diameter 1.8 millimeters.

The Marianna specimens agree exactly with the one figured by Cushman. Numerous forms have been placed under the specific name of *cultratus*, many of which undoubtedly do not belong there. Our specimens, however, agree very well with the type as given by Montfort.

Locality: This form occurs quite abundantly at all stations examined except No. IX.

Genus LENTICULINA Lamarck, 1804

LENTICULINA CRASSA d'Orbigny var. MARIANNENSIS, n. var.

Plate 6, figure 8

The variety differs from the typical in weaker development of the keel and in the shape of the apertural face which in the variety is nearly straight across.

Height 0.87 millimeters; width 1.04 millimeters.

Cotypes: Florida State Geological Survey, No. S-2028.

Locality: Specimens of this variety are very rare, and were found only at Station VIII.

LENTICULINA CONVERGENS (Bornemann)

Plate 11, figure 3

Cristellaria convergens Bornemann, Zeitschr. deutsch. geol. Gesell.; vol. 7, 1855, p. 327, pl. 13, figs. 16 and 17.

Cristellaria convergens Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 28, pl. 4, fig. 2.

Lenticulina convergens Cole and Gillespie, Bull. Am. Pal., vol. 15, No. 57 b, 1930, p. 7, pl. 3, fig. 1.

Test small, tightly coiled, biconvex, chambers, roughly triangular in shape, the final one produced; sutures on most specimens fairly distinct; aperture distinct, radiate.

Diameter: 0.40 millimeter.

Our specimens compare very well with Cushman's figure and also with specimens from the Meson formation (Middle Oligocene) of Mexico. As has been pointed out by the senior author in the Mexican paper, all the American forms are referable to Bornemann's figure 16 rather than 17 which should probably be considered a variety.

The American forms further have more pronounced sutures than given in the original description.

Locality: Rare, and found at Stations I and II only.

LENTICULINA ROTULATA (Lamarck)

Plate 10, figure 10

Lenticulites rotulata Lamarck, Annales Mus., vol. 5, 1804, p. 188, No. 3; vol. 8, 1806, pl. 62, fig. 11.

Cristellaria rotulata Cushman, U. S. Geol. Survey Prof. Paper 129, 1921, p. 130, pl. 32, fig. 1; U. S. Geol. Survey Prof. Paper 133, 1923, p. 29.

Test large, closely coiled; chambers numerous, peripheral margin acute rather than keeled, but in some specimens developing a very slight keel; sutures distinct, straight; aperture peripheral, radiate.

Diameter: 1.30 millimeters.

It is sometimes hard to distinguish *L. rotulata* from *Robulus cultratus* in the Marianna material. *L. rotulata* is generally smaller, without the indication of a distinct keel and straight sutures which are sometimes slightly raised.

Locality: This species was quite common at all stations examined, and Cushman found it at U. S. G. S. Station No. 6767.

LENTICULINA VICKSBURGENSIS (Cushman)

Plate 10, figure 7

Cristellaria vicksburgensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 130, pl. 31, figs. 6 and 7.

Cristellaria vicksburgensis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 29.

Original description:

"Test composed of few chambers, seven to eight in the visible coil; surface generally smooth, except on the sutures, which are marked by rather broad, curved, raised ridges, those near the earlier part of the coil broken into rounded knobs, especially near the umbilical area, the later ones more continuous; periphery angled, the early portion carinate; apertural face smooth and somewhat concave, with acute projecting angles; aperture radiate at the angle of the chamber.

Length 0.65-1.0 millimeter."

Locality: This is one of the most abundant and easily recognized species in the Marianna. It conforms absolutely to type and occurs in considerable numbers in all samples we examined, and Cushman found it at U. S. G. S. Station No. 6767.

LENTICULINA VICKSBURGENSIS var. APERTA (Cushman)

Cristellaria vicksburgensis var. *aperta* Cushman, U. S. Geol. Survey Prof. Paper No. 133, 1923, pp. 29, 30, pl. 4, fig. 4.

Original description:

"Variety differing from the typical form in the character of the sutures, which are broadly limbate, of clear shell material, and either not otherwise ornamented or with a single knob at the inner end; test otherwise smooth, often with a thin keel."

Cushman figured a specimen about 0.54 mm. in length and 0.42 mm. in width.

Locality: Very rare, at Stations I, V and VIII.

Genus MARGINULINA d'Orbigny, 1826

MARGINULINA PEDIFORMIS Bornemann

Plate 7, figure 3 (very young specimen)

Plate 7, figure 4 (adult specimen)

Marginulina pediformis Bornemann, Zeitschr. deutsch. geol. Gesell., vol. 7, 1855, p. 326, pl. 13, fig. 13.

Test cylindrical, elongate, slender, axis curved, composed of 5-6 chambers which gradually increase in size; sutures depressed, distinct; aperture eccentric on the margin, radiate, slightly produced.

Length 1.07 millimeters.

This form from the Marianna agrees very well with Bornemann's original figure in size, arrangement of chambers and general appearance. We are figuring a specimen which is evidently a young one of this species, as well as an adult specimen.

While greatly resembling *M. glabra* d'Orbigny, this species is less tumid and has more regularly shaped chambers.

Locality: This species is very rare, and was found only at Stations V and VIII.

Genus DENTALINA d'Orbigny, 1826

DENTALINA COMMUNIS d'Orbigny

Plate 8, figure 1

Nodosaria (Dentalina) communis d'Orbigny, Ann. Sc. Nat. vol. 7, 1826, p. 254, No. 35.

Nodosaria communis H. B. Brady, Challenger Rept., Zoology, vol. 9, 1884, p. 504, pl. 62, figs. 19-22.

Nodosaria communis Cushman, U. S. Nat. Mus. Bull. 71, 1913, pt. 3, p. 54, pl. 28, figs. 1, 2; U. S. Geol. Survey Prof. Paper 129, 1922, p. 129, pl. 30, fig. 4; U. S. Geol. Survey Prof. Paper 133, 1923, p. 27.

Dentalina communis Cushman, Florida State Geol. Survey Bull. 4, 1930, p. 27, pl. 5, fig. 1.

Test rather stout, axis curved, chambers rather numerous, increasing in size as added; amount of suture depression variable, in some specimens sutures nearly flush with the surface, in others quite strongly depressed especially toward the apertural end; initial end of test rather pointed; aperture produced, radiate, eccentric.

Length 2.6 millimeters.

This is one of the common forms, although generally broken. Specimens occurred at Stations II, III, V, VII and VIII. Cushman found it at U. S. G. S. Station 6767.

Genus NODOSARIA Lamarck, 1812

NODOSARIA LONGISCATA d'Orbigny

Plate 6, figure 4

Nodosaria longiscata d'Orbigny, Foram. Foss. du Bassin Tert. Vienne, 1846, p. 32, pl. 1, figs. 10-12.

Nodosaria ewaldi Reuss, Zeitschr. deutsch. geol. Gesell., vol. 3, 1851, p. 58, pl. 3, fig. 2.

Nodosaria filiformis Cushman (not d'Orbigny), U. S. Geol. Survey Prof. Paper 129, 1921, p. 129, pl. 30, figs. 1-3.

Nodosaria ewaldi Cushman, Jour. of Pal., vol. 1, 1927, No. 1, p. 153, pl. 24, figs. 1, 2.

Nodosaria longiscata Nuttall, Quart. Jour. Geol. Soc., vol. 89, 1928, pt. 1, p. 81, pl. 4, fig. 13.

Various names have been applied to this form, but from a study of our specimens and the various illustrations representing these forms, we have concluded that there is not enough variation to warrant separate names. Reuss in his description of *ewaldi* claims that it may be distinguished by the more produced aperture; but it seems to us that the amount that the aperture is produced is an individual characteristic rather than a specific one.

The Marianna forms, together with those figured by Cushman, have too elongated, cylindrical chambers to permit their being correlated with *N. filiformis*, which typically has shorter and more inflated chambers.

Locality: Only a few specimens were found, at Stations V, VII and VIII.

NODOSARIA cf. JACKSONENSIS Cushman and Applin.

Plate 6, figure 1

Nodosaria jacksonensis Cushman and Applin, Bull. Am. Assoc. Petrol. Geol., vol. 10, 1925, no. 2, p. 170, pl. 7, figs. 14-16.

Test slender, elongate, axis slightly curved; sutures distinct, depressed especially between the last formed chambers; chambers gradually increasing in size, subglobular to globular; aperture not observed.

Length 1.74 millimeters.

Our specimens are very similar to the ones described by Cushman and Applin from the Texas Eocene, except they appear to be slimmer. But for the present, we are referring them to Cushman and Applin's species.

Locality: Very rare, and found only at Station VI.

NODOSARIA OBLIQUA (Linné)

Plate 8, figures 9, 10

Nautilus obliquus Linné, Systema naturae, 12th ed., 1767, p. 1163; 13th (Gmelin's) ed., 1788, p. 3372, No. 14.

Nodosaria (Dentalina) obliqua (Linné) Parker and Jones, Annals and Mag. Nat. Hist., 3d ser., vol. 3, 1859, p. 482.

Nodosaria obliqua Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 129, pl. 30, figs. 6, 7; U. S. Geol. Survey Prof. Paper 133, 1923, p. 27.

Test elongate, large, chambers numerous, becoming more distinct as the apertural end is reached; surface ornamented with numerous, distinct costae which run the entire length of the test with occasional additional ones running between those already formed; aperture slightly produced, radiate.

Length 10 millimeters (?) when complete.

Most of our specimens are broken so that the separate pieces show only 5 or 6 chambers. We have enough pieces, however, to reconstruct the entire test. It is identical with the form figured by Cushman.

Locality: Common in all samples examined.

NODOSARIA VERTEBRALIS (Batsch)

Plate 10, figure 2

Nautilus (Orthoceras) vertebralis Batsch, Conchylien des Seesandes, 1791, p. 3, No. 6, pl. 2, figs. 6 a, b.

Nodosaria vertebralis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 27, pl. 4, fig. 1.

Test elongate, slender, but slightly tapering, chambers short, inflated, subglobular; sutures depressed; surface ornamented by a few, relatively heavy costae which run the entire length of the test; initial end often with a short, fairly heavy spine.

Length 1.5–4.0 millimeters.

Locality: Common at all stations except No. VII.

NODOSARIA LATEJUGATA Gumbel

Plate 6, figure 3

Nodosaria latejugata Gumbel, Abhandl. K. bay. Akad. Wiss. München, vol. 10, 1868, p. 619, pl. 1, fig. 32.

Nodosaria sp. Cushman, U. S. Geol. Survey Prof. Paper 129, 1921, p. 130, pl. 30, fig. 5.

Nodosaria latejugata Cushman and Hanna, Proc. Calif. Acad. Sci. 4th ser., vol. 16, 1927, No. 8, pp. 212-213, pl. 13, figs. 15-17.

Test relatively large, but composed of very few chambers, 4-5; chambers large, subglobular, the initial chamber the largest gradually decreasing in size toward the aperture; sutures depressed, pronounced; costae run the entire length of the test, comparatively few in number with wide spaces in between; aperture produced, slightly radiate.

Length 1.45 millimeters.

Cushman figured in his Mint Spring paper, U. S. Geol. Survey Prof. Paper 129, a form as *Nodosaria* sp. Later he referred it to *N. vertebralis*¹⁷. We have specimens from the Marianna which compare very well with Cushman's Mint Spring specimen. Also some of our specimens compare very favorably with *N. latejugata* as figured by Gumbel

¹⁷Cushman, J. A., U. S. Geol. Survey Prof. Paper 133, p. 28, 1923.

and later by Cushman and Hanna from the Eocene of California. We are placing our forms under Gümbel's species because of its relatively few inflated chambers and the appearance of its costae. It seems distinct from forms we are referring to *N. vertebralis*.

Locality: Found only at Station VIII, where it was very rare.

Genus SARACENARIA Defrance, 1824

SARACENARIA ITALICA Defrance

Plate 6, figure 5

Saracenaria italica Defrance, Dict. Sci. Nat., vol. 32, 1824, p. 177; vol. 47, 1827, p. 344.

Cristellaria italica H. B. Brady, Rept. Voy Challenger, Zool. vol. 9, 1884, p. 544, pl. 68, figs. 17, 18, 20-23.

Cristellaria italica Cushman, U. S. Nat. Mus. Bull. 100, 1921, p. 252, pl. 51, fig. 2.

Cristellaria italica Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 30, pl. 4, fig. 3.

Test rather large, stout, triangular in cross section, composed of a tightly coiled initial part followed by an uncoiled portion; uncoiled portion variable in length according to the age of the individual; chambers of uncoiled portion narrow; sutures fairly pronounced, sloping; aperture produced, radiate.

Length 1 millimeter.

This species is quite common at most of the stations examined by us. It does not follow the type as closely as one might like, but as there appears to be so many variations, we have placed it under this species for the present. Many of our specimens agree very closely with the figure given by Cushman in his Philippine report, U. S. Nat. Mus. Bull. 100.

Locality: Stations I, II, III, V, VII and VIII.

Genus FRONDICULARIA Defrance, 1824

FRONDICULARIA ZETA, n. sp.

Plate 5, figures 4 and 5

Test compressed, subelliptical in side view, widest about $\frac{3}{4}$ the way from the initial end, initial end more pointed than the apertural; initial end in the megaspheric form with a subspherical proloculum which appears as a raised knob on the outside of the shell, followed by 6 or 7 of the typical inverted V-shaped frondicularian chambers; sutures showing as depressed lines which are more pronounced in the center of the test and toward the apertural end; periphery bluntly rounded; surface entirely without ornamentation; aperture slightly produced, sometimes slightly radiate, often giving the appearance of two slightly produced lips.

Length 1.88 millimeter; width 1.22 millimeter.

Cotypes: Florida State Geological Survey, No. S-2032.

This is a very interesting form, although only a few individuals were found. No tendency to coil was observed in the sections made of megaspheric individuals.

The microspheric form was not observed.

Locality: Stations IV and V.

Family POLYMORPHINIDAE

Subfamily Polymorphininae

Genus GUTTULINA d'Orbigny, 1826

GUTTULINA PROBLEMA d'Orbigny

Plate 10, figure 11

Polymorphina (Guttulina) problema d'Orbigny, Annales Sci. Nat., vol. 7, 1826, p. 266, No. 14, Modèles, No. 61.

Guttulina problema d'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, 1846, p. 224, pl. 12, figs. 26-28.

Polymorphina (Guttulina) problema H. B. Brady, Challenger Rept., Zoology, vol. 9, 1884, p. 568, pl. 72, fig. 20; pl. 73, fig. 1.

Polymorphina (Guttulina) problema Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 94, pl. 18, fig. 1; U. S. Geol. Survey Prof. Paper 133, 1923, p. 33, pl. 5, fig. 6.

Test elongate, spindle shaped; chambers few, inflated, sutures distinct; apical end more or less rounded, apertural end more tapered; surface smooth; aperture radiate, slightly produced.

Length 0.83 millimeter.

Locality: This species was found at Stations II, VII and VIII, but is rare.

GLOBULINA GIBBA d'Orbigny

Plate 10, figure 6

Polymorphina (Globulina) gibba d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 226, No. 20, Modeles, No. 63.

Polymorphina gibba Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 93, pl. 17, fig. 3; U. S. Geol. Survey Prof. Paper 133, 1923, p. 31.

Globulina gibba Cushman, Florida State Geol. Survey Bull. 4, 1930, p. 34, pl. 5, fig. 21.

Test almost circular in front view, in end view broadly oval; chambers few, inflated, approximately triserially arranged; sutures fairly distinct; wall smooth; aperture radiate and slightly produced.

Length up to 0.7 millimeter.

Locality: Common at Stations I, II, III, V, and VIII.

Family NONIONIDAE

Genus NONION Montfort, 1808

NONION UMBILICATULUM (Montagu)

Plate 9, figure 1

Nautilus umbilicatululus Montagu Testacea Britannica, 1803, p. 191; Suppl., 1808, p. 78, pl. 18, fig. 1.

Nonionina umbilicatula Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 139, pl. 23, figs. 3, 4; U. S. Geol. Survey, Prof. Paper 133, p. 49.

Test biconvex, nearly circular in outline, symmetrical; deeply umbilicate; 8-10 chambers, comprising the last formed whorl; sutures slightly depressed, limbate; surface of test smooth, finely punctate; peripheral margin broadly rounded; aperture a narrow, curved slit at the base of the final chamber.

Diameter 0.50 millimeter.

Locality: Rare, at Stations I, V, VIII, and IX.

Family CAMERINIDAE

Subfamily Camerininae

Genus OPERCULINELLA Yabe, 1918

OPERCULINELLA DIA, n. sp.

Plate 6, figure 7, and

Plate 7, figures 11, 12, and 13

Test small, greatly compressed, volutions $3\frac{1}{2}$ to 4, the last one having about 22-24 chambers. Periphery in some specimens slightly thickened, central area of the test thickened, this thickening occupying half the area of the test, a marked area of depression often exists between these two thickened areas, especially in more adult specimens. Surface entirely unornamented, some specimens occasionally showing the septae as fine light lines, especially if the specimen is wet, extending from the periphery to the center of the test. In section the sutures for their first half are gently curved, in their last half strongly recurved.

Width 1.74 millimeter to 2.1 millimeter (from outer edge of aperture through the center.)

Length 2.03 millimeter to 2.6 millimeter (at right angles to above.)

Cotypes: Florida Geological Survey Cat. No. S-2039.

This species is evidently related to *Operculinella sabinensis* Cole, from the St. Maurice formation (Eocene). The arrangement and shape of the sutures is similar, except in *O. dia* they are more strongly recurved. *O. sabinensis* is larger, has more chambers in its final volution and is also thicker than the form described above.

Locality: *O. dia* with *Lepidocyclina mantelli* should make a splendid marker for the Marianna, as it occurs abundantly in every sample examined.

Family BULIMINIDAE

Subfamily Bulimininae

Genus BULIMINA d'Orbigny, 1826

BULIMINA SCULPTILIS Cushman

Plate 9, figure 11

Bulimina sculptilis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 23, pl. 3, fig. 3.

Original description:

"Test elongate, tapering, subacute at the initial end, broadly rounded at the apertural end, or somewhat contracted; chambers numerous, distinct; sutures slightly depressed; surface ornamented by longitudinal costae, raised considerably above the general surface of the test, comparatively few and continuous from the apex nearly to the aperture; aperture elongate, comma-shaped.

Maximum length 1 millimeter."

Our specimens from the Marianna are identical with specimens in the senior author's collection from the Red Bluff Clay, Mississippi, and also from the Alazan formation of Mexico. It is apparently one of the characteristic species of the Lower Oligocene.

Locality: Found only at Station VIII, and very rare there.

Subfamily Virgulininae

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA ARIANA, n. sp.

Plate 5, figure 7

Bolivina nitida Cushman (not H. B. Brady), U. S. Geol. Survey Prof. Paper 129, 1921, p. 91, pl. 15, fig. 4.

Test elongate, thin, tapering, broadest just below the apertural end; segments relatively few in number, regularly textularian in arrangement, each chamber bordered by an area of clear shell material which forms a relatively wide keel around the entire test; chambers broadest in the center of the test, regularly tapering toward the periphery, slightly recurved; aperture, regular, elongate.

Length 0.61 millimeter; width 0.36 millimeter.

Cotypes: Florida Geological Survey Cat. No. S-2041.

This species, while near *B. nitida* of Brady,¹⁸ differs in not having such a large, irregular aperture, and in not having such strongly recurved chambers. The border of clear shell material around each chamber is also more pronounced in *ariana* than in *nitida* giving consequently a broader keel.

Locality: Common at Stations I, II, V, VI, VII and VIII.

¹⁸*Bolivina nitida* H. B. Brady, Challenger Rept., Zoology, vol. 9, 1884, p. 420, pl. 52, figs. 30 a, b.

BOLIVINA CAELATA Cushman

Plate 9, figure 6

Bolivina caelata Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 19, pl. 2, fig. 2.

Original description:

"Test elongate, compressed, rhomboid, nearly twice as long as wide; chambers comparatively few, thickest toward the middle; sutures indistinct, except near the apertural end, curved; periphery acute, sometimes slightly carinate; surface ornamented by a reticulate pattern, but very irregular, consisting of irregularly longitudinal costae, crossed or connected by other curved costae, not in any general direction; aperture narrow, elongate.

Maximum length 0.5 millimeter."

Locality: This is a distinct and easily recognized species, and was common at Stations V, VI, VII and VIII.

Subfamily Reussiinae

Genus REUSSIA Schwager, 1877

REUSSIA SPINULOSA Reuss var. GLABRATA Cushman

Verneuilina spinulosa Reuss var. *glabrata* Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 92; U. S. Geol. Survey Prof. Paper 133, 1923, p. 21.

Original description:

"Test pyramidal, three-sided, widest above the middle, generally triangular in transverse section, the sides somewhat concave; angles of the test bluntly angled or even rounded, without spines; surface smooth; aperture small, at the inner side of the last formed chamber.

Maximum length 0.75 millimeter."

Locality: Very rare, and found only at Station VIII.

Subfamily Uvigerininae

Genus UVIGERINA d'Orbigny, 1826

UVIGERINA BYRAMENSIS Cushman

Plate 9, figure 7

Uvigerina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 95, 133, pl. 18, fig. 5; U. S. Geol. Survey Prof. Paper 133, 1923, pp. 34-35, pl. 4, figs. 10, 11.

Original description:

"Test minute, elongate, somewhat fusiform, initial end pointed; chambers numerous, distinct; sutures depressed; surface ornamented by longitudinal costae, rather thin and sharp; the last-formed chamber more distinct than the rest, the inner side concave, the other two sides slightly convex, giving a generally triangular section, the surface of the last-formed chamber smooth; the apertural end produced into a short cylindrical neck with a slight lip, the aperture circular.

Length 0.25-0.40 millimeter."

Locality: Very rare, but represented at Stations I, IV, VII and VIII.

UVIGERINA MARIANNENSIS, n. sp.

Plate 6, figure 6

Test minute, fusiform; chambers and sutures indistinct; test covered by numerous, rather prominent, raised costae which run the entire length of the test; aperture on a very short neck with a phialine lip.

Length 0.67 millimeter.

Holotype: Florida State Geological Survey Cat. No. S-2040.

This species is distinct from the other two *Uvigerina* associated with it because of its form and costae which extend unbroken the entire length of the test. In general appearance, *U. mariannensis* somewhat resembles *U. eocaena* Gümbel, but our form has more regular costae and a slightly different shape.

Locality: This form is very rare, and occurred only at Station No. II.

UVIGERINA PIGMEA d'Orbigny

Plate 9, figure 10

Uvigerina pigmea d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 269, pl. 12, figs. 8, 9, Modèles, No. 67.

Uvigerina pygmaea d'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, 1846, p. 190, pl. 11, figs. 25, 26.

Uvigerina pigmea Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 134, pl. 32, fig. 2; U. S. Geol. Survey Prof. Paper 133, 1923, p. 34.

Uvigerina pigmea Cushman, Florida State Geol. Survey Bull. 4, 1930, p. 49, pl. 9, figs. 3, 6.

Test subcylindrical, largest in the center, tapering to bluntly rounded ends; chambers numerous, inflated, triserially arranged; sutures slightly depressed; chambers ornamented with longitudinal costae which are not continuous; final chamber generally smooth; aperture at the end of a short cylindrical neck with a phialine lip.

Length 0.73 millimeter.

As Cushman has already pointed out the specimens from the Vicksburg group greatly resemble *pigmea* as described and figured by d'Orbigny in the Vienna basin monograph. The form described in the Annales Sci. Nat. is evidently a different form, as the final chamber is produced and spinose.

Locality: This form was fairly common at all stations except No. IV, and Cushman found it at U. S. G. S. Station No. 6767.

Family ROTALIIDAE

Subfamily Discorbisinae

Genus DISCORBIS Lamarck, 1804

DISCORBIS sp.

Plate 7, figures 1, 2

Test small, plano-convex, ventral side rather flat or slightly concave, dorsal side strongly convex, 6 chambers in the last volution; sutures

depressed, limbate with clear shell material; margin of test acute; wall very finely punctate; aperture a narrow, curved slit at the base of the final chamber on the ventral side.

Diameter 0.43 millimeter.

In the Marianna material, one specimen was found which is very similar to a form figured by Cushman¹⁹ as *D. auracana*. As he gives only a ventral view, it may be that his form is different than the Marianna specimen which we are considering the same as his.

Rosalina auracana of d'Orbigny is now referred to the genus *Valvulineria*.²⁰ Neither Cushman's figure nor our specimen from the Marianna shows the prominent flat valvular tooth on the ventral side which is characteristic of this genus.

It is probably that this form represents a new species and belongs in the genus *Discorbis*. We are figuring our specimen for future reference.

Locality: Stations III and VIII, where it is very rare.

Genus GYROIDINA d'Orbigny, 1826
GYROIDINA VICKSBURGENSIS (Cushman)

Rotalia vicksburgensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 139, pl. 35, figs. 3, 4.

Rotalia vicksburgensis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 46.

Cushman found this species in material from U. S. G. S. Station 7241, but it was not found by the authors.

Subfamily Rotaliinae

Genus EPONIDES Montfort, 1808
EPONIDES BYRAMENSIS (Cushman)

Plate 8, figures 5, 6

Pulvinulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 99, 138, pl. 22, figs. 4, 5; U. S. Geol. Survey Prof. Paper 133, 1923, p. 44.

Original description:

"Test small, biconvex, rotaliform, consisting of about three coils, seven to eight chambers in the last-formed one; on the dorsal side sutures oblique and at a considerable angle with the periphery, somewhat limbate; on the ventral side the chambers extend in to the center, which is usually not umbilicate; sutures nearly straight; surface polished, punctations appearing as light tubules against the translucent wall; aperture near the inner end of the chamber on the ventral side, with a definite valvular lip, the aperture hidden below but when examined found to be composed, in the adult, of several adjacent small rounded openings.

¹⁹Cushman, J. A., U. S. Geol. Survey Prof. Paper 129, 1922, pl. 32, fig. 6.

²⁰Cushman, J. A., Bull. Scripps Institute Oceanography, Tech. Ser. vol. 1, 1927, p. 160.

Maximum diameter 1.5 millimeters."

This is one of the most abundant forms. It is easily recognized and absolutely true to the type as far as we have observed.

Locality: All samples examined, and Cushman found it at U. S. G. S. Station No. 6767.

EPONIDES MARIANNENSIS (Cushman)

Plate 5, figures 8 and 9

Pulvinulina mariannensis Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 44, pl. 7, figs. 1-3.

Original description:

"Test unequally biconvex, the dorsal side nearly flat: chambers with a keel and slightly limbate sutures, obliquely curved, ventral side somewhat convex, sutures deeply depressed, with a deep umbilical central opening; aperture elongate at the base at the inner margin of the last-formed chamber; surface smooth. Maximum diameter 1.5 millimeters."

This species has been reported to date only from the Marianna limestone. It is distinct and readily recognized. It should prove to be one of the markers for this horizon.

Locality: Very rare, at Stations III, V and IX; rare, at Station VIII, and Cushman found it at U. S. G. S. Station 6767.

EPONIDES ADVENA (Cushman)

Plate 11, figures 10 and 11

Rotalia advena Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 46, pl. 7, figures 4-6.

Original description:

"Test rotaliform, composed of about three coils, nearly as high as broad, the last coil consisting of five or six chambers, umbonal region elevated, periphery broadly rounded, ventral side somewhat more convex than the dorsal; sutures slightly if at all depressed, only those of the last-formed coil distinct; aperture an elongate slit, several times as long as wide, the ends curved, on the ventral side at the inner margin of the last-formed chamber; wall finely punctate, smooth, somewhat shiny.

Diameter 0.80 millimeter or less."

Locality: This form was found at Stations I, VII and VIII, where it was rare.

Genus *ROTALIA* Lamarck, 1804

ROTALIA Sp.

Plate 11, figure 6

We are figuring a species of *Rotalia* for future reference. There is only one specimen and that is not too well preserved. Ventrally it looks very much like *R. byramensis* except that the spines are missing.

It may represent that species, but more and better specimens are needed for a specific determination.

Locality: Rare, at Station III.

Subfamily Siphonininae

Genus SIPHONINA Reuss, 1849

SIPHONINA ADVENA Cushman

Plate 11, figures 7 and 8

Siphonina advena Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 98, 137, pl. 22, fig. 12; U. S. Geol. Survey Prof. Paper 133, 1923, p. 42.

Original description:

"Test unequally biconvex, dorsal side usually less convex than the ventral; periphery subacute; chambers making up the last-formed coil; sutures distinct, on the dorsal side flush with the surface, on the ventral side, slightly depressed, on the dorsal side somewhat broadened and limbate, ventrally narrow; surface smooth but punctate; aperture with a short neck, compressed, with a phialine lip and elliptical aperture; color even in the fossil specimens somewhat brownish; wall thin and translucent.

Maximum diameter 0.50 millimeter."

Locality: Relatively a common form at Stations I, IV, V, VI, VII and VIII, and Cushman found it at U. S. G. S. Stations 7241 and 6767.

Subfamily Baggininae

Genus CANCRIS Montfort, 1808

CANCERIS SAGRA (d'Orbigny)

Plate 5, figure 6, and
plate 11, figure 1

Rotalina sagra d'Orbigny in De la Sagra, Hist. Fis. Pol. Nat. Cuba, Forams., 1839, p. 77, pl. 5, figs. 13-15.

Pulvinulina sagra Cushman, U. S. Geol. Surv., Bull. 676, 1918, p. 65, pl. 22, fig. 3; pl. 23, fig. 1.

Pulvinulina sagra Cushman, U. S. Geol. Surv. Prof. Paper 133, 1923, p. 45, pl. 6, figs. 9, 10.

Cancris sagra Cushman, Florida State Geol. Surv. Bull. 4, 1930, p. 56, pl. 11, figs. 4 a-c.

Test small, almost equally biconvex, slightly longer than wide, ventral side slightly more convex than the dorsal; 5-7 chambers in the last-formed coil, which increase rapidly as added, the final chamber occupying nearly half the test; sutures not depressed on the dorsal side, on the ventral side quite depressed; margin of the test decidedly angulate, often bordered with a slight keel; aperture a narrow slit opening into the umbilicus generally covered by a plate (which is, however, lost in most fossil specimens.)

Length 0.78 millimeter.

The forms which occur in the Marianna are apparently identical with the forms figured by Cushman from the Glendon limestone. A

comparison of Cushman's figures and our specimens with d'Orbigny's original figure of *Rotalina sagra*, indicate that there are some differences in form between the recent and Vicksburg specimens. Whether these differences are sufficient to make the fossil forms a different species can only be determined by a direct comparison of specimens. The form figured by Cushman under the name *Pulvinulina sagra* from the Miocene seems closer to d'Orbigny's figure than the Oligocene species. The Vicksburg form does not seem to be so elongated and the final chamber is of a different shape. This appearance of the final chamber, however, may be due to the lip over the umbilical area being broken away in the fossil specimens.

Locality: This form was found only at Stations V and VIII, and was rare there.

Family CASSIDULINIDAE

Subfamily Cassidulininae

Genus CASSIDULINA d'Orbigny, 1826

CASSIDULINA GLOBOSA Hantken

Plate 7, figure 7

Cassidulina globosa Hantken, A. magy. kir. foldt. int. evkon, vol. 4, 1875, (1876), p. 54, pl. 16, fig. 2.

Test small, globular; chambers few, inflated; sutures very slightly depressed, slightly limbate; wall smooth, very finely perforate; aperture comma-shaped in a slight depression.

Diameter 0.41 millimeter.

In size and shape, our specimens seem identical with the form described by Hantken from the *Clavulina szabo*i beds. It is very rare, and may easily be overlooked because of its small size.

Locality: Station No. VIII.

Family GLOBIGERINIDAE

Subfamily Globigerininae

Genus GLOBIGERINA d'Orbigny, 1826

Plate 8, figure 7, and

plate 9, figures 4 and 8

The classification of the various species in this genus is in a very chaotic state.

Numerous specimens were found at several localities which are referable to definite types at least, and these are listed below with the specific name questioned.

Globigerina bulloides d'Orbigny (?). Common at Stations I, V, VI, VIII, and Cushman found it at U. S. G. S. Station No. 7241.

Globigerina dutertrei d'Orbigny (?). Rare at Station I, and Cushman found it at U. S. G. S. Station No. 6767.

Globigerina inflata d'Orbigny (?). Common at Stations V, VI, VII and VIII.

Globigerina triloba Reuss (?). Common at all Stations except No. III.

Family GLOBOROTALIIDAE

Genus GLOBOROTALIA Cushman, 1927

GLOBOROTALIA MENARDII (d'Orbigny)

Plate 11, figures 4 and 5

Rotalia menardii d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 273; Modèles No. 10.

Pulvinulina menardii Cushman, U. S. Geol. Survey Prof. Paper 133, 1923, p. 45.

Globorotalia menardii Cushman, Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 175; Cushman and Wickenden, Proc. U. S. Nat. Mus., vol. 75, Art. 9, 1929, p. 13, pl. 6, figs. 2 a-c.

Test relatively large, unequally biconvex, ventral side slightly more convex than the dorsal; 6-8 chambers in the last formed coil; sutures almost flush with the surface, curved; surface unornamented, finely punctate; margin of the test angulate; not keeled; aperture a small slit situated at the margin of the last formed chamber.

Diameter: 1.16 millimeters.

Only one specimen which can be considered under this species was found in the Marianna material. Cushman has reported it previously from the Marianna limestone at one locality only, viz., 5 miles south of Jackson, Alabama. Our specimen is very similar to figures of recent material, except that it does not have as pronounced a keel as is generally figured on recent specimens. This is undoubtedly due to the state of preservation.

Locality: Station VIII.

Family ANOMALINIDAE

Subfamily Anomaliniinae

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA BETA, n. sp.

Plate 5, figures 1, 2, 3

Anomalina grosserugosa var. (?) Cushman, U. S. Geol. Survey Prof. Paper 129, 1921, p. 98, pl. 21, figs. 3-5.

Plano-convex, six chambers composing the last coil, margin strongly lobate; ventral side very convex with chambers strongly inflated, sutures depressed and showing as light lines, recurved; a knob of shell material often occupying the umbilical region; dorsal side flat or slightly concave, sutures strongly depressed, recurved; margin of shell bluntly rounded; aperture a curved opening at the inner margin at the periphery.

Diameter 0.70 millimeter.

This species is recorded by Cushman from the Byram marl as

Anomalina grosserugosa var. (?) and also by Howe²¹ from the type locality of the Red Bluff Clay, Mississippi. As Cushman has already pointed out in his paper, this species is very different from Gumbel's *A. grosserugosa*, but near a form figured by Brady in the Challenger report. *A. beta* differs from Brady's (which should probably be given another name) in its more lobate outline, and more plano-convex form. The sutures in *A. beta* are also more strongly recurved.

Locality: This species is very rare, and was found only at Stations V and VI.

ANOMALINA BILATERALIS Cushman

Plate 10, figures 8 and 9

Anomalina bilateralis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 97, 137, pl. 21, fig. 12; U. S. Geol. Survey Prof. Paper 133, 1923, pp. 42, 43.

"Test of about four coils, bilateral or nearly so, composed of numerous chambers, ten or more in the last-formed whorl, umbilical region on both sides with a knob of clear shell material, more pronounced on the dorsal side; chambers smooth, but coarsely punctate, more coarsely so on the ventral side; sutures broad and somewhat limbate with clear shell material; aperture a narrow curved opening at the base of the final chamber.

Maximum diameter, 1 millimeter."

Locality: Abundant at all stations examined.

ANOMALINA MISSISSIPPIENSIS Cushman

Plate 9, figures 2 and 3

Anomalina mississippiensis Cushman, U. S. Geol. Survey Prof. Paper, 129, 1922, pp. 98-137, pl. 21, figs. 6-8; U. S. Geol. Survey Prof. Paper 133, 1923, p. 43.

Original description:

"Test small, plano-convex, of about two and one-half coils, periphery slightly lobulate, bluntly rounded, dorsal side very much flattened, even slightly concave, ventral side very convex; chambers comparatively few, six to eight in the last-formed coil; sutures curved, on the dorsal side broad and limbate, even with the surface of clear shell material, on the ventral side narrower and depressed; the last-formed two or three chambers on the inner margin on the dorsal side slightly above the general surface; wall thin and translucent, especially on the dorsal side, smooth, on the ventral finely punctate and not so clear; aperture a curved opening at the inner margin at the periphery.

Length 0.25-0.35 millimeter, breadth 0.20-0.30 millimeter."

Locality: Common at all stations, and Cushman found it at U. S. G. S. Station No. 6767.

²¹Howe, H. V., Jour. of Pal., vol. 2, 1928, No. 3, pp. 173-176.

ANOMALINA VICKSBURGENSIS Cushman

Plate 9, figure 5

Anomalina vicksburgensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 137, pl. 35, figs. 5, 6; U. S. Geol. Survey Prof. Paper 133, 1923, p. 43.

Original description:

"Test equally biconvex, dorsal side more flattened than the ventral; chambers numerous, 10 to 12 in the last-formed coil; sutures slightly limbate; periphery rounded, not lobulate; wall between the sutures finely granular or punctate, ventral side with a clear mass of shell material at the umbilicus.

Diameter 0.35 millimeter."

The specimens examined by us have a fairly flat dorsal side; more strongly so than one would be led to believe from the original description. The other characters are the same as given in the original description.

Locality: Very rare at Stations I, IV, VIII and IX.

Genus PLANULINA d'Orbigny, 1826

PLANULINA MEXICANA Cushman

Plate 6, figure 2

Planulina mexicana Cushman, Contrib. Cush. Lab. Foram. Res., vol. 3, 1927, pt. 2, pp. 113-114, pl. 23, figs. 5 a, b.

Test complanate, compressed, composed of about $3\frac{1}{2}$ whorls with 12 chambers in the final volution; all the chambers visible and distinct from both sides of the test; sutures distinct, limbate, gently recurved; chamber walls distinctly perforate; periphery of test broadly rounded, not lobate; aperture small, at the base of the very narrow apertural face.

Diameter 0.79 millimeter.

This is apparently the same species as described by Cushman from the Alazan formation (Lowermost Oligocene) of Mexico. The chambers in the specimens we have from the Marianna when compared with specimens from Mexico in the collection of the senior author, show a slightly different shape, but hardly enough to give the Florida specimens varietal rank.

This may represent the "*Truncatulina*" *wuellerstorfi* reported by Cushman from the Marianna and Glendon limestones.

Locality: Very rare, and found only at Stations IV and VIII.

PLANULINA BYRAMENSIS (Cushman)

Plate 10, figure 1

Truncatulina byramensis Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 96, 136, pl. 20, figs. 4-6; U. S. Geol. Survey Prof. Paper 133, 1923, p. 41.

Original description:

"Test plano-convex, dorsal side slightly convex, ventral side flattened, peripheral margin subcarinate; about eight chambers in the last-

formed whorl, chambers on the ventral side failing to reach the center of the test, leaving a definite umbilical area which is filled with clear shell material; on the dorsal side each chamber at its inner border has the angles somewhat produced and a broad, rounded re-entrant near the middle; on the ventral side the inner half of the chamber is rather intricately lobed, the chambers themselves of lighter color; the sutures darker, of clear shell material; surface finely granular; aperture an elongate opening at the base of the last-formed chamber near its inner ventral border.

Diameter 0.35-0.75 millimeter."

Locality: Common at Stations I, IV, VII, VIII and IX, and Cushman found it at U. S. G. S. Station 6767.

Subfamily Cibicidinae

Genus CIBICIDES Montfort, 1808

CIBICIDES AMERICANUS (Cushman)

Plate 7, figures 5, 6

Truncatulina americana Cushman, U. S. Geol. Survey Bull. 676, 1918, p. 63, pl. 20, figs. 2, 3, pl. 21, fig. 1.

Truncatulina americana Cushman, U. S. Nat. Mus. Bull. 103, 1918, p. 68, pl. 23, figs. 2 a-c.

Truncatulina americana Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, p. 97, pl. 20, figs. 7-8.

Discorbis sp. ? U. S. Geol. Survey Prof. Paper 133, 1923, p. 39, pl. 6, figs. 5, 6.

Anomalina mantaensis Galloway and Morrey, Bull. Am. Pal., vol. 15, No. 55, 1929, pp. 28-29, pl. 4, fig. 5.

Cibicides americanus Cole and Gillespie, Bull. Am. Pal., vol. 15, No. 57 b, 1930, p. 14, pl. 4, fig. 4.

Cibicides americana Cushman, Florida State Geol. Survey Bull. No. 4, 1930, p. 61, pl. 12, fig. 5 a-c.

Test plano-convex, the ventral side strongly convex, the dorsal side generally slightly concave, 9-12 chambers in the final volution; chambers gradually increasing in size as added, narrow, recurved; sutures wide, pronounced, limbate; margin angulate, often with a slight indication of a keel; chambers fail to meet in the center on the dorsal side, leaving a marked umbilicus; on the ventral side, tightly coiled with a very small plug of clear shell material; chamber walls entirely unornamented, rather coarsely perforate; aperture ventral, but extending over into the dorsal umbilicus where it is generally covered with a small valvular flap.

Diameter 0.30 millimeter.

The placing of this form generically is unsatisfactory, as has been pointed out before by the senior author.²² Anna Martinotti²³ has

²²For a generic discussion, the reader is referred to Cole and Gillespie, Bull. Amer. Pal., vol. 15, no. 57 b, 1930, p. 14.

²³Martinotti, A., Atti. Soc. Ital., Milano, vol. LXII, Fas. III, IV, 1924, pp. 350, 351, pl. 7, figs. 62-64.

referred forms examined by her in Italy to *Truncatulina scarenaensis* of Hantken, placing Cushman's *T. americana* in synonymy. Later Galloway and Morrey²⁴ described a form from Ecuador as *Anomalina mantaensis* placing Cushman's *T. americana* from the Oligocene in synonymy, and further pointing out that the Miocene form described in Bull. 676 of the U. S. Geol. Survey should be considered the true *americana*.

While the form figured by Martinotti has the general appearance of *C. americanus*, *T. scarenaensis* Hantken is an entirely different species, as may be readily seen from the illustration and description.

The difference between the forms found in the American Oligocene and Miocene does not seem sufficient to the present authors to warrant the erection of a new species. We have examined forms from the Miocene (Choctawhatchee Marl) and the Oligocene (Byram Marl and Meson formation). These we have compared carefully with the Marianna specimens. The Oligocene forms are alike and agree very closely to the specimens from the Miocene. The only differences noted were that the Miocene forms seem to have a few less chambers in the final whorl and the sutures are not so broadly limbate. These minor differences do not in our mind constitute a sufficient cause for the erection of a new species.

Locality: Quite rare, at Stations I, IV, V, VII, VIII and IX.

CIBICIDES LOBATULUS (Walker and Jacob)

Plate 8, figures 2, 3

Nautilus lobatula Walker and Jacob, Adams's Essays on the Microscope, Kanmacher's ed., 1798, p. 642, pl. 14, fig. 36.

Truncatulina lobatula d'Orbigny, in Barker, Webb, and Berthelot, Histoire naturelle des îles Canaries, vol. 2, 1839, pt. 2, Foraminifères, p. 134, pl. 2, figs. 22-24; Foraminifères fossiles du bassin tertiaire de Vienne, 1846, p. 168, pl. 9, figs. 18-23.

Truncatulina lobatula Cushman, U. S. Geol. Survey Bull., 676, 1918, p. 16, pl. 1, fig. 10; p. 60, pl. 17, figs. 1-3; Carnegie Inst. Washington Pub. 291, 1919, p. 41; U. S. Geol. Survey Prof. Paper 129, 1922, pp. 96, 135, pl. 20, figs. 1-3; U. S. Geol. Survey Prof. Paper 133, 1923, p. 40.

Test plano-convex, flattened on the dorsal side, strongly convex ventrally, peripheral margin acute, without any indication of a keel; 7-9 chambers in the last-formed whorl; sutures depressed on the ventral side, nearly flush with the surface dorsally, limbate; wall smooth, punctate; aperture extending over on the dorsal side between the last-formed chamber.

Diameter: 0.5-1.00 millimeter.

²⁴Galloway and Morrey, Bull. Am. Pal., vol. 15, no. 55, 1929, pp. 28-29, pl. 4, fig. 5.

The Marianna specimens are apparently the same as specimens from the Byram marl and also from the Meson formation of Mexico. As Cushman has pointed out, they are not as typical of the original as one might wish, but it is best to refer these specimens to this species for the present.

Locality: This is a common species and was found at all stations except Nos. III and IV, and Cushman reports it from U. S. G. S. Stations Nos. 7241 and 6767.

CIBICIDES PSEUDOUNGERIANUS (Cushman)

Plate 10, figure 4

Truncatulina ungeriana H. B. Brady, Challenger Report, Zoology, vol. 9, 1884, pl. 94, figs. 9 a-c, (not *Rotalina ungeriana* d'Orbigny.)

Truncatulina ungeriana Cushman, U. S. Nat. Mus. Bull. 103, 1918, p. 69, pl. 24, fig. 1.
Truncatulina pseudoungeriana Cushman, U. S. Geol. Survey Prof. Paper 129, 1922, pp. 97, 136, pl. 20, fig. 9; U. S. Geol. Survey Prof. Paper 133, 1923, p. 40.

Original description:

"Test almost equally biconvex, periphery subacute; chambers nine to eleven in the last-formed whorl, those of the earlier whorls not showing on either the ventral or the dorsal side, being hidden on the dorsal side by the roughness of the surface and on the ventral side by the involute character; periphery lobulate; sutures distinct above the last whorl and very distinct below, as they are somewhat tumid on the ventral side; umbilical region filled nearly flush with the chambers by clear shell material, last few chambers on the dorsal side slightly above the surface on the inner margin; surface dorsally with coarse punctae, below smooth and more finely punctate; aperture at the periphery.

Diameter: 1 millimeter or less."

Locality: Fairly abundant at all stations examined, and Cushman found it at U. S. G. S. Stations 7241 and 6767.

Family PLANORBULINIDAE

Genus PLANORBULINELLA Cushman, 1927

PLANORBULINELLA LARVATA (Parker and Jones)

Plate 8, figure 4

Planorbulina vulgaris d'Orbigny var. *larvata* Parker and Jones, Annals and Mag. Nat. Hist., 3d ser., vol. 5, 1860, p. 294.

Planorbulina larvata Parker and Jones, Philos. Trans., vol. 155, 1865, p. 379, pl. 19, figs. 3 a, b.

Planorbulina larvata H. B. Brady, Challenger Rept., Zoology, vol. 9, 1884, p. 658, pl. 92, figs. 5, 6.

Planorbulina larvata Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, 1915, p. 706.

Planorbulina larvata Cushman, U. S. Nat. Mus. Bull. 71, 1915, pt. 5, p. 27, pl. 8, fig. 2; fig. 30 (in text); U. S. Geol. Survey Prof. Paper 133, 1923, p. 39, pl. 6, figs. 7, 8.

Test large, typically attached, discoidal, one side being flatter and smoother than the other indicating the attachment; chambers of the central portion indistinct, hidden by a secondary growth of granules or tubercles; peripheral chambers, distinct with markedly depressed sutures, arranged in a more or less regular pattern of annular rings; apertures numerous, peripheral.

Diameter: 0.50-2.00 millimeters.

This is an abundant and easily recognized species. The chambers are generally indistinct except in the outer ring. These show the alternating character extremely well.

This species, together with *Lepidocyclus mantelli* and *Operculinella dia* indicate the comparatively shallow, warm-water deposition of the Marianna limestone.

Locality: Found in all samples examined.

Family Orbitoididae
Subfamily Orbitoidinae

Genus LEPIDOCYCLINA Gümbel, 1868
LEPIDOCYCLINA MANTELLI (Morton)

Plate 7, figures 8, 9 and 10

Nummulites mantelli Morton, Am. Jour. Sci., vol. 23, 1833, p. 291, pl. 5, fig. 9.

Orbitoides (Lepidocyclus) mantelli Gümbel, Abhandl. kon. bay. Akad. Wiss. München, vol. 10, 1870, p. 718.

Lepidocyclus mantelli Cushman, U. S. Geol. Sur. Prof. Paper 125, 1926, p. 57, pls. 12-14.

Lepidocyclus mantelli Vaughan, Acad. Nat. Sci. Phila. Proc., vol. 74, 1927, pp. 299-300, pl. 23, figs. 1 a, 1 b, 2.

We are figuring a horizontal and a vertical section of what we consider to be this form for reference. For full details on the species, the reader is referred to the works above, especially Vaughan's.

Locality: Abundant and characteristic in all samples examined, and Cushman reports it from U. S. G. S. Station 6767.

LEPIDOCYCLINA (LEPIDOCYCLINA) MANTELLI var. PAPILLATA Vaughan

Lepidocyclus (Lepidocyclus) mantelli var. *papillata* Vaughan, U. S. Nat. Mus. Proc., vol. 71, 1927, Art. 8, p. 4, pl. 3, figs. 2a, 2b: pl. 4, figs. 1-2.

Lepidocyclus (Lepidocyclus) mantelli var. *papillata* Vaughan, Acad. Nat. Sci. Phila., Proc. vol. 79, 1927, p. 300.

Occurring with the typical *L. mantelli* at two of our stations are forms referable to Vaughan's variety in having a finely papillate outer surface, and small but well-developed pillars.

Locality: Found at Stations Nos. VII and VIII, and fairly common there.

PLATES 5-11

PLATE 5.

1. *Anomalina beta* n. sp.; dorsal view; holotype; $\times 40$. Page 45. Specimen figured from Station V.
2. *Anomalina beta* n. sp.; apertural view; holotype; $\times 40$. Page 45. Specimen figured from Station V.
3. *Anomalina beta* n. sp.; ventral view; holotype; $\times 40$. Page 45. Specimen figured from Station V.
4. *Frondicularia zeta* n. sp.; holotype; $\times 25$. Page 35. Specimen figured from Station IV.
5. *Frondicularia zeta* n. sp.; apertural view; holotype; $\times 25$. Page 35. Specimen figured from Station IV.
6. *Cancris sagra* (d'Orbigny); ventral view; $\times 48$. Page 43. Specimen figured from Station V.
7. *Bolivina ariana* n. sp.; holotype; $\times 48$. Page 38. Specimen figured from Station VIII.
8. *Eponides mariannensis* (Cushman); dorsal view; $\times 40$. Page 42. Specimen figured from Station VIII.
9. *Eponides mariannensis* (Cushman); side view; $\times 40$. Page 42. Specimen figured from Station VIII.

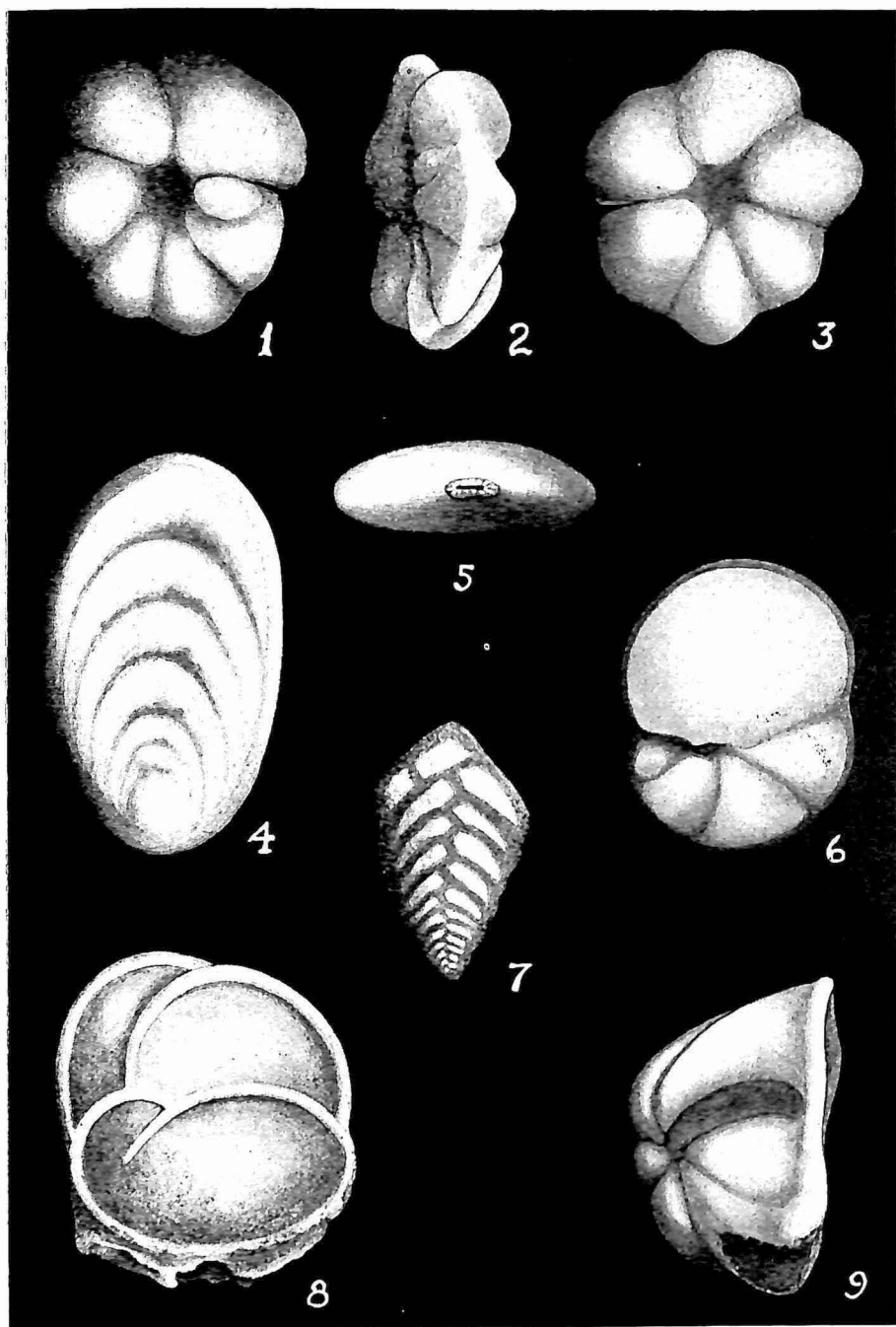


PLATE 6.

1. *Nodosaria* cf. *N. jacksonensis* Cushman and Applin; $\times 48$. Page 33. Specimen figured from Station VI.
2. *Planulina mexicana* Cushman; side view; $\times 48$. Page 47. Specimen figured from Station VIII.
3. *Nodosaria latejugata* Gumbel; $\times 48$. Page 34. Specimen figured from Station VIII.
4. *Nodosaria longiscata* d'Orbigny; $\times 48$. Page 33. Specimen figured from Station VIII.
5. *Saracenaria italica* DeFrance; $\times 48$. Page 35. Specimen figured from Station VIII.
6. *Uvigerina mariannensis* n. sp.; holotype; $\times 48$. Page 40. Specimen figured from Station II.
7. *Operculinella* dia n. sp.; side view; holotype; $\times 25$. Page 37. Specimen figured from Station VIII.
8. *Lenticulina crassa* (d'Orbigny) var. *mariannensis* n. var.; side view; holotype; $\times 48$. Page 30. Specimen figured from Station VIII.

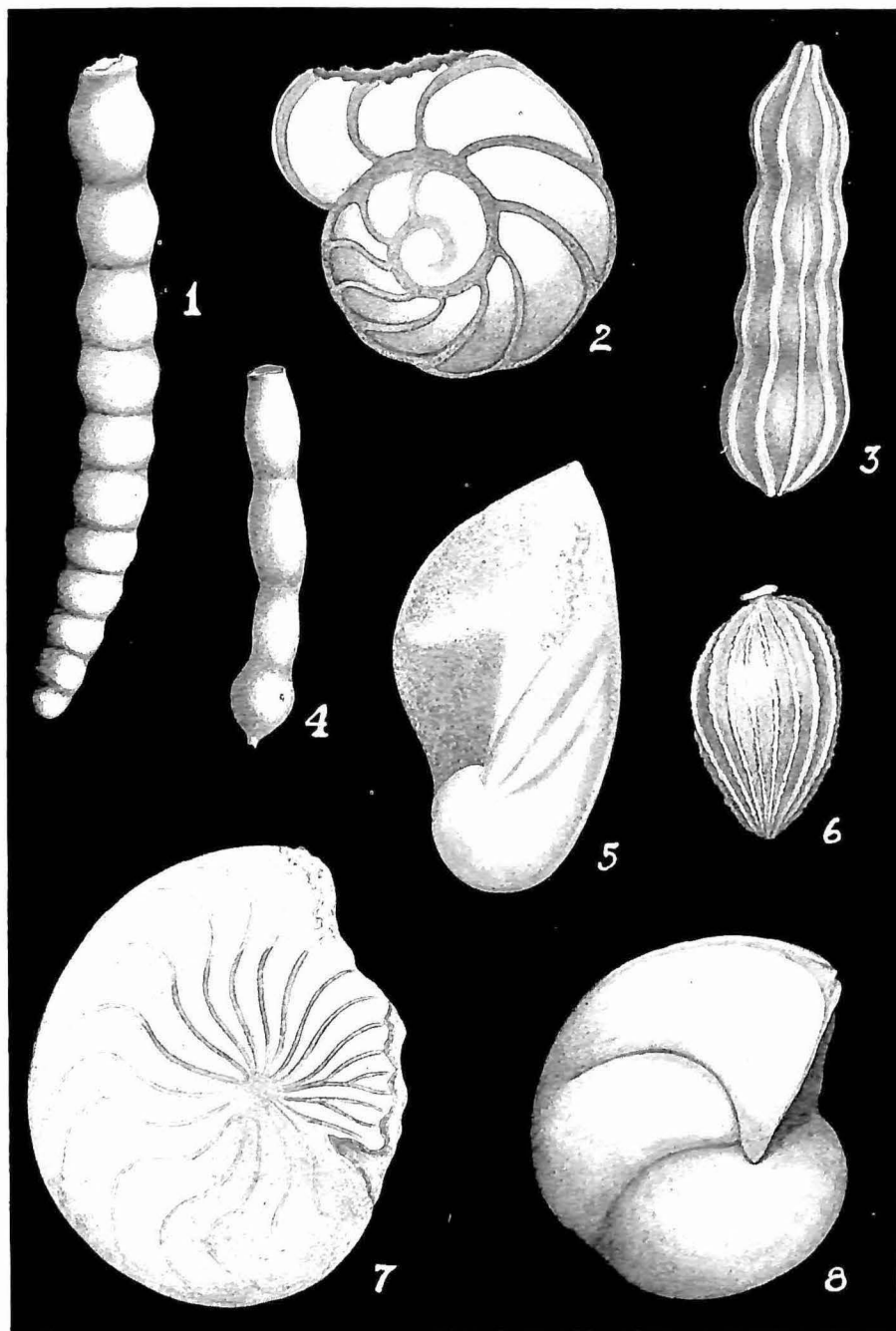


PLATE 7.

1. *Discorbis* sp.; ventral view; $\times 40$. Page 40. Specimen figured from Station VIII.
2. *Discorbis* sp.; dorsal view; $\times 40$. Page 40. Specimen figured from Station VIII.
3. *Marginulina pediformis* Bornemann; side view of a very young specimen; $\times 40$. Page 32. Specimen figured from Station V.
4. *Marginulina pediformis* Bornemann; side view of an adult; $\times 25$. Page 32. Specimen figured from Station VIII.
5. *Cibicides americanus* (Cushman); dorsal view; $\times 48$. Page 48. Specimen figured from Station VIII.
6. *Cibicides americanus* (Cushman); ventral view; $\times 48$. Page 48. Specimen figured from Station VIII.
7. *Cassidulina globosa* Hantken; apertural view; $\times 40$. Page 44. Specimen figured from Station VIII.
8. *Lepidocyclina* (*Lepidocyclina*) *mantelli* (Morton); vertical section; $\times 16$. Page 51. Specimen figured from Station VII.
9. *Lepidocyclina* (*Lepidocyclina*) *mantelli* (Morton); horizontal section; $\times 16$. Page 51. Specimen figured from Station VII.
10. *Lepidocyclina* (*Lepidocyclina*) *mantelli* (Morton); microspheric form; vertical section; $\times 16$. Page 51. Specimen figured from Station VII.
- 11, 12, 13. *Operculinella dia* n. sp.; sections showing internal arrangement of chambers; $\times 16$. Page 37. Specimen figured from Stations VII and VIII.

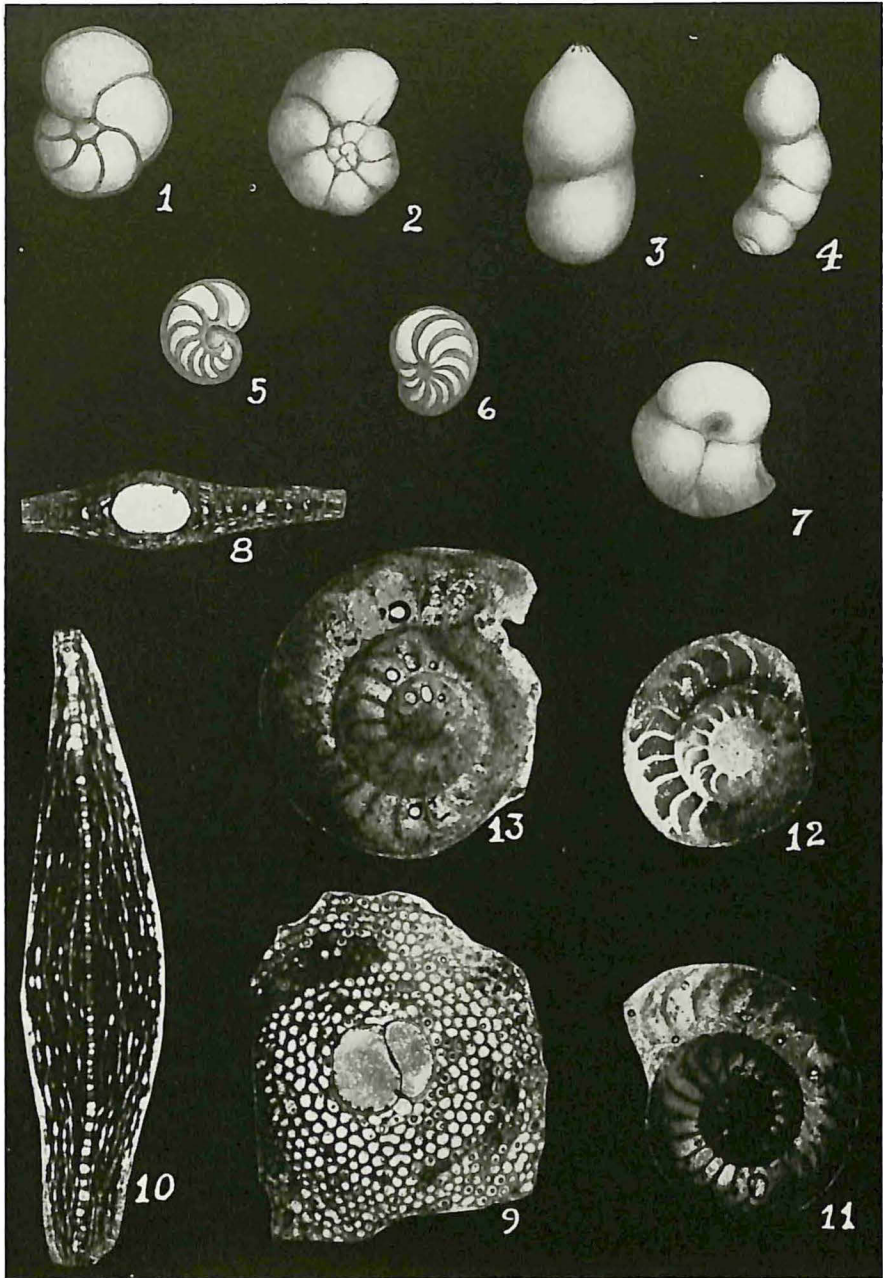


PLATE 8.

1. *Dentalina communis* d'Orbigny; $\times$ 25. Page 32. Specimens figured from Station VIII.
2. *Cibicides lobatulus* (Walker and Jacob); ventral view; $\times$ 25. Page 49. Specimens figured from Station VIII.
3. *Cibicides lobatulus* (Walker and Jacob); dorsal view; $\times$ 25. Page 49. Specimens figured from Station VIII.
4. *Planorbulinella larvata* (Parker and Jones); $\times$ 25. Page 50. Specimens figured from Station VIII.
5. *Eponides byramensis* (Cushman); ventral view; $\times$ 25. Page 31. Specimens figured from Station VIII.
6. *Eponides byramensis* (Cushman); dorsal view; $\times$ 25. Page 41. Specimens figured from Station VIII.
7. *Globigerina bulloides* d'Orbigny; dorsal view; $\times$ 80. Page 44. Specimens figured from Station VIII.
8. *Textularia conica* d'Orbigny; side view; $\times$ 80. Page 27. Specimens figured from Station VIII.
9. *Nodosaria obliqua* (Linné); initial end; $\times$ 25. Page 33. Specimens figured from Station VIII.
10. *Nodosaria obliqua* (Linné); central, more inflated chambers; $\times$ 25. Page 33. Specimens figured from Station VIII.

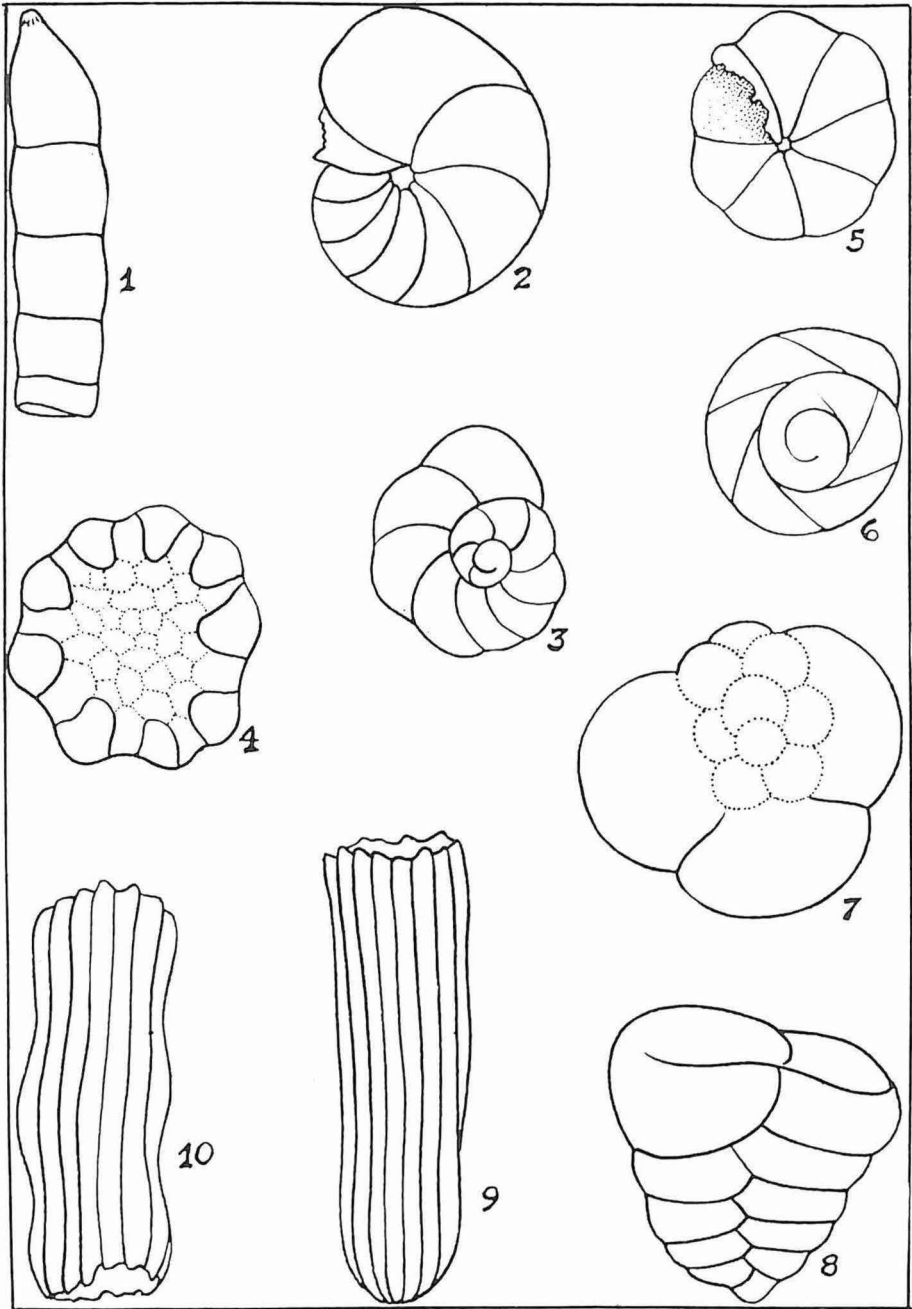


PLATE 9.

1. *Nonion umbilicatum* (Montagu); side view; $\times 80$. Page 37. Specimens figured from Station VIII.
2. *Anomalina mississippiensis* Cushman; ventral view; $\times 80$. Page 46. Specimens figured from Station VIII.
3. *Anomalina mississippiensis* Cushman; dorsal view; $\times 80$. Page 46. Specimens figured from Station VIII.
4. *Globigerina triloba* Reuss; ventral view; $\times 80$. Page 44. Specimens figured from Station VIII.
5. *Anomalina vicksburgensis* Cushman; dorsal view; $\times 80$. Page 47. Specimens figured from Station VIII.
6. *Bolivina caelata* Cushman; side view; $\times 80$. Page 39. Specimens figured from Station VIII.
7. *Uvigerina byramensis* Cushman; $\times 80$. Page 39. Specimens figured from Station VIII.
8. *Globigerina inflata* d'Orbigny; ventral view; $\times 80$. Page 44. Specimens figured from Station VIII.
9. *Clavulina byramensis* var. *extans* Cushman; $\times 25$. Page 29. Specimens figured from Station VIII.
10. *Uvigerina pigmea* d'Orbigny; $\times 80$. Page 40. Specimens figured from Station VIII.
11. *Bulimina sculptilis* Cushman; $\times 80$. Page 38. Specimens figured from Station VIII.

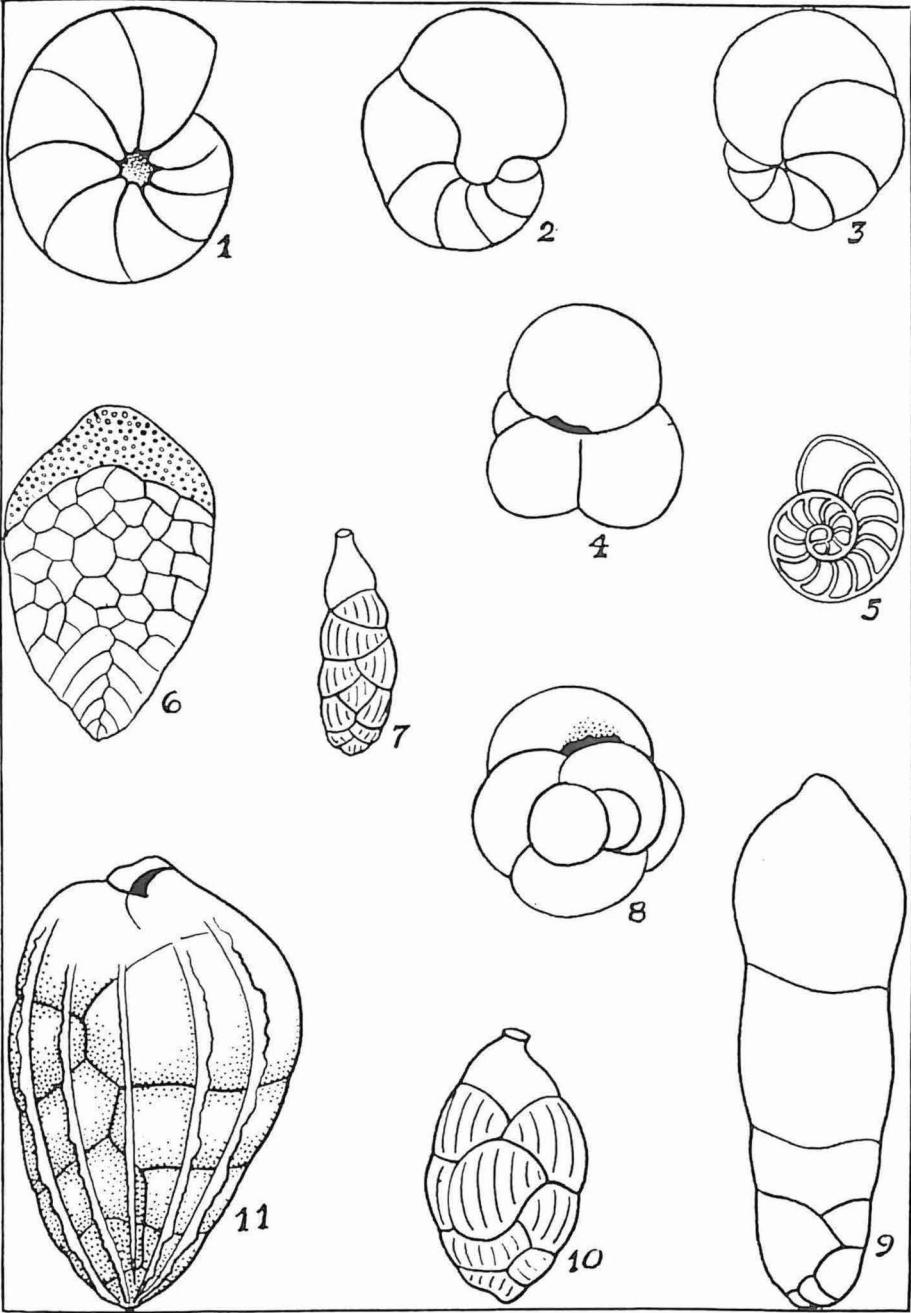


PLATE 10.

1. *Planulina byramensis* (Cushman); dorsal view; $\times 48$. Page 47. Specimens figured from Station IV.
2. *Nodosaria vertebralis* (Batsch); $\times 48$. Page 34. Specimens figured from Station VIII.
3. *Textularia mississippiensis* Cushman; side view; $\times 48$. Page 27. Specimens figured from Station VIII.
4. *Cibicides pseudoungerianus* (Cushman); ventral view; $\times 48$. Page 50. Specimens figured from Station IV.
5. *Massilina decorata* Cushman; $\times 48$. Page 29. Specimens figured from Station VIII.
6. *Globulina gibba* d'Orbigny; $\times 48$. Page 36. Specimens figured from Station II.
7. *Lenticulina vicksburgensis* (Cushman); $\times 48$. Page 31. Specimens figured from Station VIII.
8. *Anomalina bilateralis* Cushman; ventral view; $\times 48$. Page 46. Specimens figured from Station VIII.
9. *Anomalina bilateralis* Cushman; dorsal view; $\times 48$. Page 46. Specimens figured from Station VIII.
10. *Lenticulina rotulata* (Lamarck); side view; $\times 48$. Page 31. Specimens figured from Station III.
11. *Guttulina problema* d'Orbigny; $\times 48$. Page 36. Specimens figured from Station VIII.
12. *Textularia porrecta* H. B. Brady; $\times 48$. Page 28. Specimens figured from Station VIII.

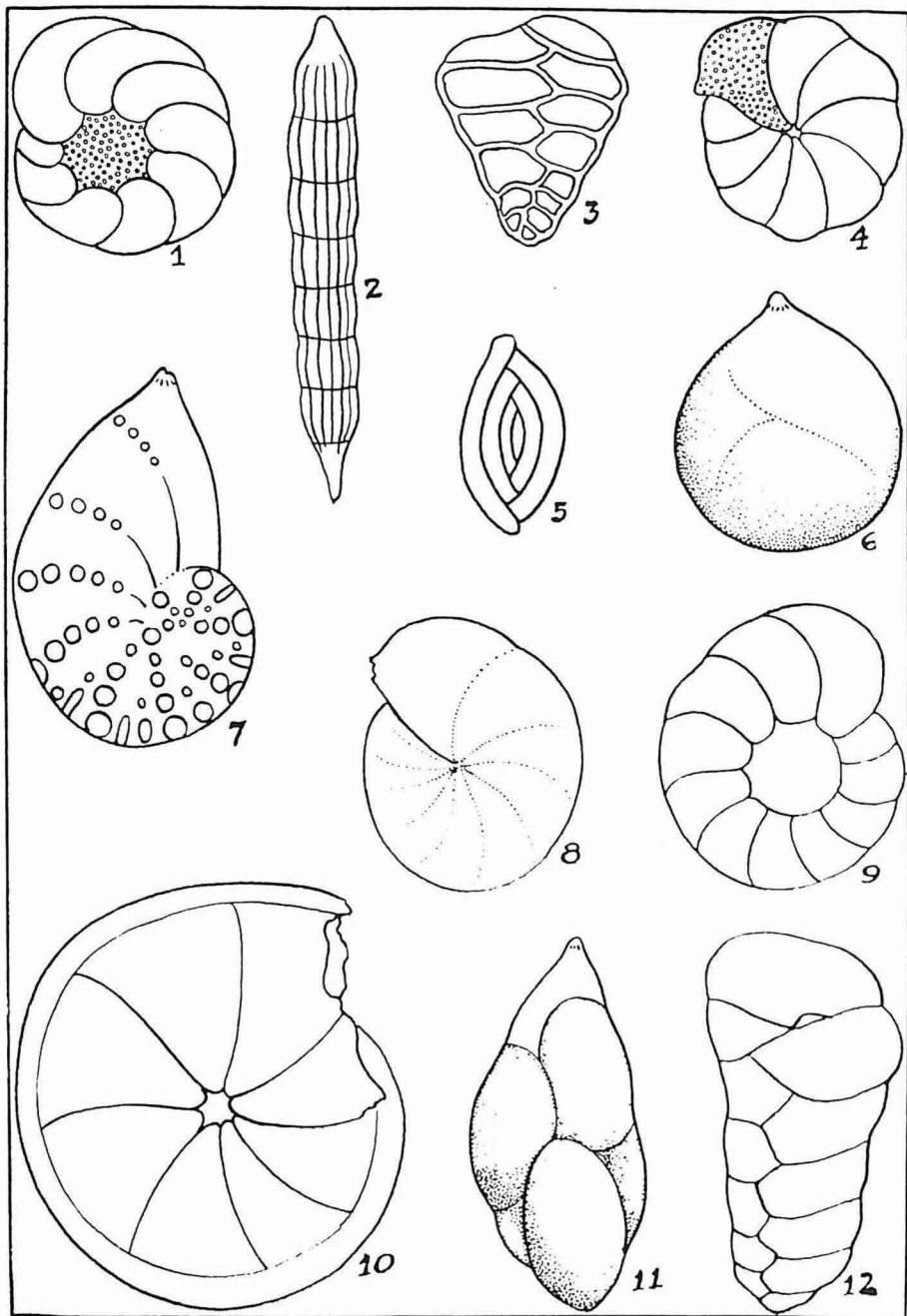
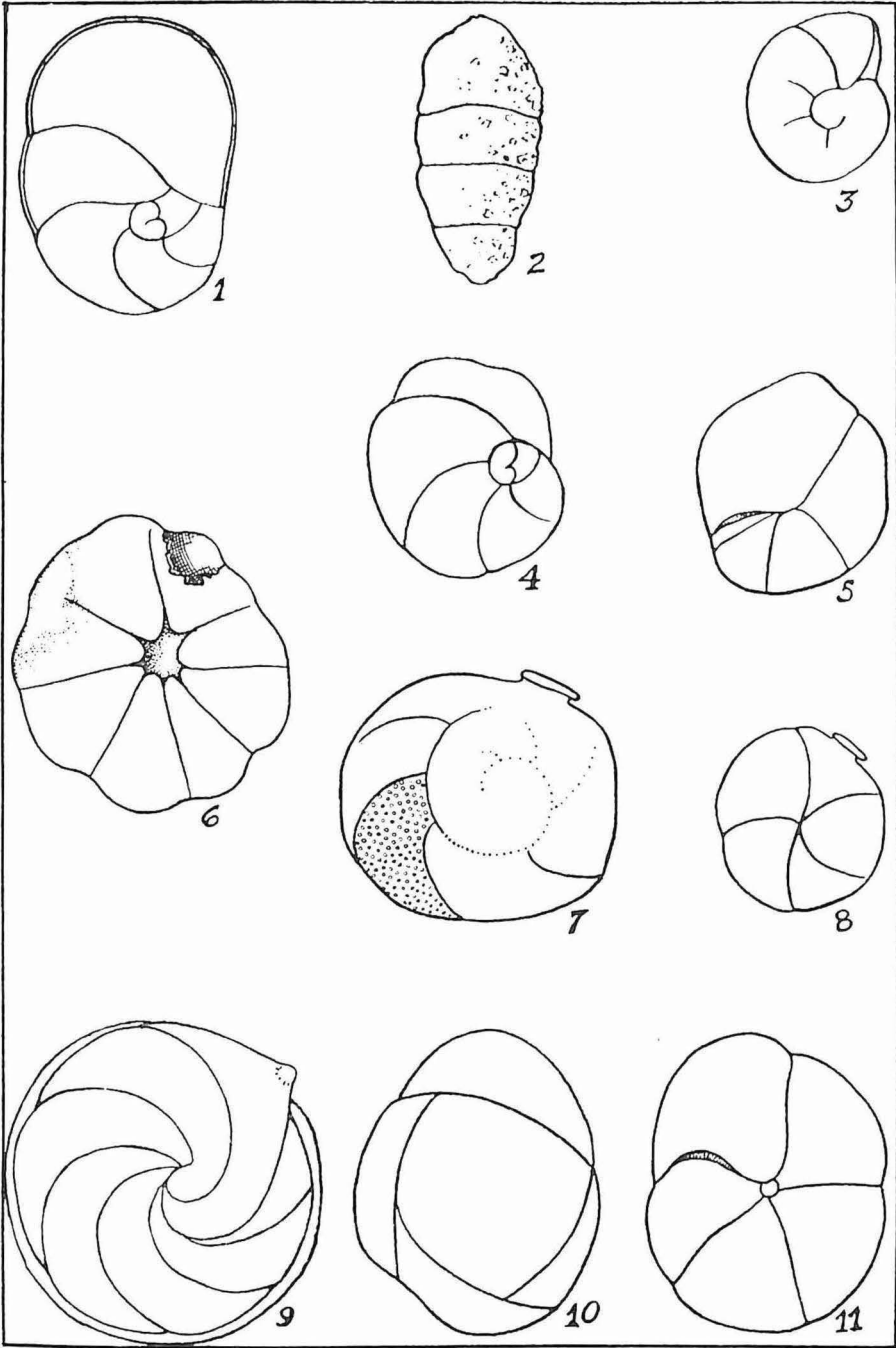


PLATE II.

1. *Canceris sagra* (d'Orbigny); dorsal view; $\times 48$. Page 43. Specimen figured from Station V.
2. *Clavulina byramensis* Cushman; $\times 40$. Page 28. Specimen figured from Station VIII.
3. *Lenticulina convergens* (Bornemann); side view; $\times 48$. Page 30. Specimen figured from Station I.
4. *Globorotalia menardii* (d'Orbigny); dorsal view; $\times 25$. Page 45. Specimen figured from Station VIII.
5. *Globorotalia menardii* (d'Orbigny); ventral view; $\times 25$. Page 45. Specimen figured from Station VIII.
6. *Rotalia* sp.; ventral view; $\times 25$. Page 42. Specimen figured from Station III.
7. *Siphonina advena* Cushman; dorsal view; $\times 80$. Page 43. Specimen figured from Station VIII.
8. *Siphonina advena* Cushman; ventral view of another specimen; $\times 80$. Page 43. Specimen figured from Station VIII.
9. *Robulus cultratus* (Montfort); side view; $\times 25$. Page 29. Specimen figured from Station III.
10. *Eponides advena* (Cushman); dorsal view; $\times 48$. Page 42. Specimen figured from Station VIII.
11. *Eponides advena* (Cushman); ventral view; $\times 48$. Page 42. Specimen figured from Station VIII.



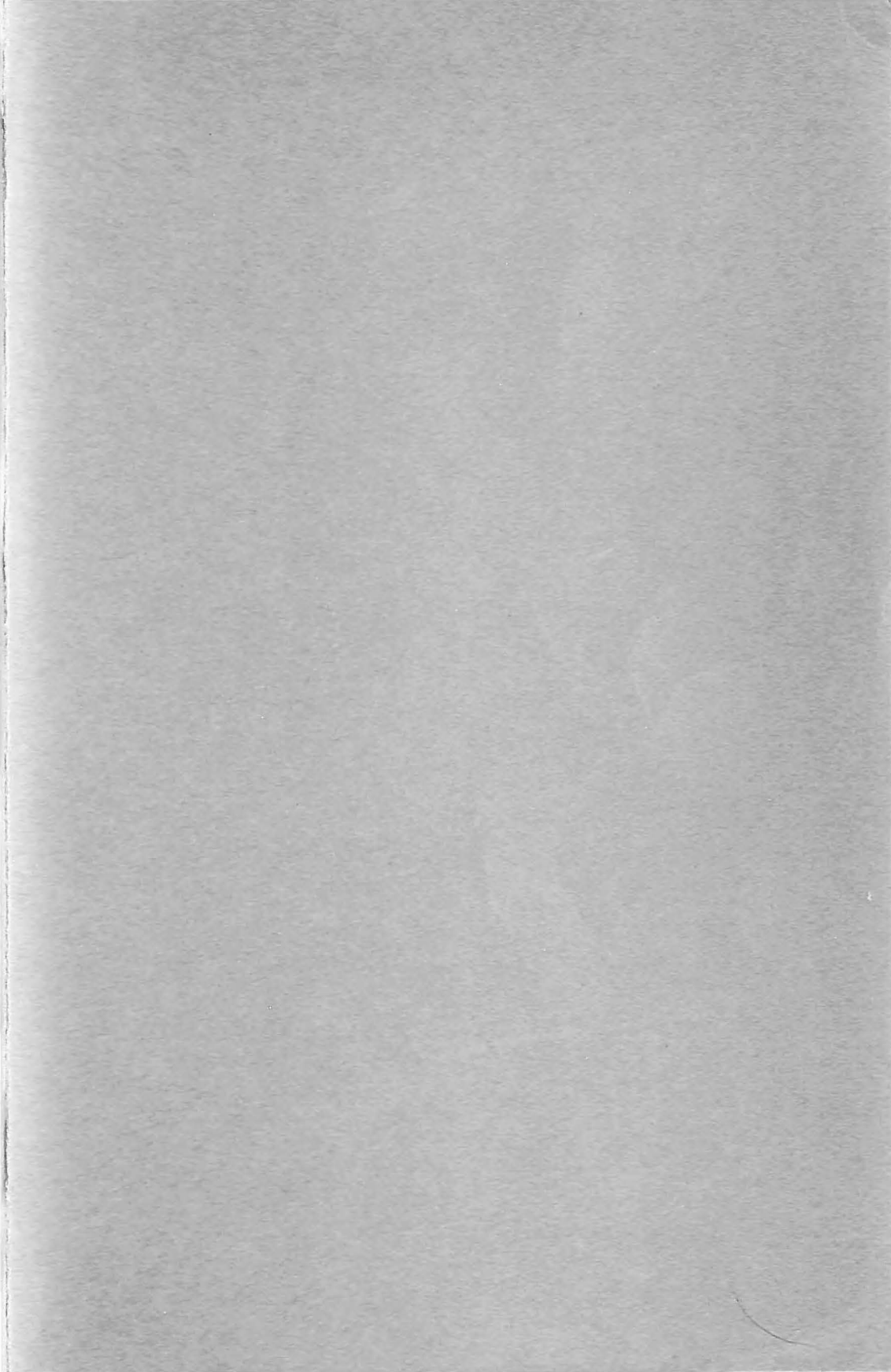
INDEX TO SPECIES

(NOTE: First page number indicates description, and second number plate.)

	PAGES
Anomalina beta	45, 54
bilateralis	46, 64
mississippiensis	46, 64
vicksburgensis	47, 62
Bolivinia ariana	38, 54
caelata	39, 62
Bulimina sculptilis	38, 62
Canceris sagra	43, 54
Cassidulina globosa	44, 58
Cibicides americanus	48, 58
lobatulus	49, 60
pseudoungerianus	50, 64
Clavulina byramensis	28, 66
var. extans	29, 62
Dentalina communis	32, 60
Discorbis sp.	40, 58
Eponides advena	42, 66
byramensis	41, 60
mariannensis	42, 54
Frondicularia zeta	35, 54
Globigerina bulloides	45, 60
dutertrei	45
inflata	45, 62
triloba	45, 62
Globorotalia menardii	45, 66
Globulina gibba	36, 64
Guttulina problema	36, 64
Gyroidina vicksburgensis	41
Lenticulina convergens	30, 66
crassa var. mariannensis	30, 56
rotulata	31, 64
vicksburgensis	31, 64
var. aperta	31
Lepidocyclina mantelli	51, 58
var. papillata	51
Marginulina pediformis	32, 58
Massilina decorata	29, 64
Nodosaria cf. N. jacksonensis	33, 56
latejugata	34, 56
longiscata	33, 56
obliqua	33, 60
vertebralis	34, 64
Nonion umbilicatum	37, 62
Operculinella dia	37, 56
Planorbulinella larvata	50, 60
Planulina byramensis	48, 64
mexicana	47, 56
Reussia spinulosa var. glabrata	39
Robulus cultratus	29, 66
Rotalia sp.	43, 66
Textularia conica	27, 60
mississippiensis	27, 64
porrecta	28, 64
Saracenaria italica	35, 56
Siphonina advena	43, 66
Uvigerina byramensis	39, 62
mariannensis	40, 56
pigmea	40, 62

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